# Chhetri Academy

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GCSE MATHS

Geometry and measures

**Edexcel 1MA1 | Subtopic collection Topic 51**

# Constructions and loci

## Higher tier

Answers and examiner comments

| 27 | 2003-2025 | Higher |
| --- | --- | --- |
| question groups | available papers | tier |

### Using this booklet

1. Answer numbers match the companion question booklet.
2. Follow the original question number on marking tables.
3. Examiner comments are included where available.

**Name** _____ **Date** _____

Some entries use full source marking material in an appendix. Any unavailable mark schemes are identified beside the relevant answer.

# Original question 7

The full source mark scheme begins on page 36. Use the original paper code, tier and question number shown above.

# Original question 5

The full source mark scheme begins on page 90. Use the original paper code, tier and question number shown above.

# Original question 7

The full source mark scheme begins on page 141. Use the original paper code, tier and question number shown above.

# Original question 7

No matching mark scheme was available in the supplied archive for this question.

| | | | | | |
|---|---|---|---|---|---|
| 2 | | $30-(16+9)$ | 5 | 2 | M1 30 - "(16 + 9)" or "30 − 16" − 9 or "30 − 9" − 16<br>A1 cao |

| Question | | Working | Answer | Mark | Notes |
|---|---|---|---|---|---|
| 12 | (a) | | $-4$ | 1 | B1 for $-4^{o}C$ or Edinburgh |
| | (b) | | 7 | 1 | B1 for 7 (accept $-7$) |
| | (c) | | 2 | 1 | B1 for 2 or Leeds |

| | | | | | |
|---|---|---|---|---|---|
| 10 | (a) | | 58 | 1 | B1 57 to 59 (not inclusive) |
| | (b) | | 3.6 | 1 | B1 3.5 to 3.7 (not inclusive) |
| | (c) | $7-3.6$ | 3.4 | 1 | B1 for 3.3 to 3.5 (not inclusive) or ft on 7 – "(b)" provided "b" < 7 |

# Original question 16

The full source mark scheme begins on page 193. Use the original paper code, tier and question number shown above.

| | | | | |
|---|---|---|---|---|
| 17 | | Correct construction | 2 | M1 for two pairs of correct intersecting arcs (may both be on the same side of *AB*)<br>A1 for correct perpendicular bisector<br>(SC. B1 for line within guidelines if no marks awarded) |

1380_3H

| Question | | Working | Answer | Mark | Notes |
|---|---|---|---|---|---|
| 14 | | | Construction | 3 | M1 for arcs construction of 60 degrees<br>M1 (dep) for arcs bisector of '60 degrees' (not 90 degrees)<br>A1 (dep on both M marks) for 30 degrees within guidelines<br>OR<br>M1 for arc construction of 90 degrees<br>M1(dep) for arc construction of 60 degrees<br>A1 (dep on both M marks) for 30 degrees within guidelines |

| | | | | | |
|---|---|---|---|---|---|
| 10 | | | Region shaded | 3 | B1 for circle arc of radius 3cm (± 2mm) centre Burford<br>B1 for circle arc of radius 5 cm (± 2mm) centre Hightown<br>B1 for overlapping regions of circle arcs shaded |

| Question | | Working | Answer | Mark | Notes |
|---|---|---|---|---|---|
| 15 | | | Required region | 4 | M1 arc radius 5 cm centre *C*<br>M1 bisector of angle *BAD*<br>M1 line 3 cm from *DC*<br>A1 for correct region identified (see overlay) |

| | | | | |
|---|---|---|---|---|
| 7 | | Correct region shaded | 3 | B1 for perpendicular bisector within guidelines<br>B1 for arc of circle, centre A, within guidelines<br>B1 ft for a correct region shaded or otherwise indicated from their perpendicular bisector of AB and their arc drawn, centre A |

| PAPER: 5MB3H_01 | | | | |
|---|---|---|---|---|
| **Question** | **Working** | **Answer** | **Mark** | **Notes** |
| *8 | 179 ÷ 70 = 2.5(571.....)<br>275 ÷ 100 = 2.7(5)<br>399 ÷150 = 2.6(66....)<br><br><br><br><br><br><br><br>70 ÷ 179 = 0.39(11....)<br>100 ÷ 275 = 0.36(36...)<br>150 ÷399 = 0.37(59....) | 70 m*l* tube with reason | 4 | **Using pence per m*l***<br>M1 for a correct method of finding the cost per millilitre (or cost/10 m*l* etc) for one of the sizes<br>M1 for a correct method of finding the cost per millilitre (or cost/10 m*l* etc. must be consistent) for each of the sizes<br>A1 for 2.5(571.....) (70 m*l*) and 2.7(5) (100 m*l*) and 2.6(66....) (150 m*l*) or equivalent depending upon units used. These values can be rounded or truncated as long as they remain different<br>C1 (dep on M1) for selecting the tube with the best value for money based upon a comparison of their 3 values.<br>OR<br>**Using m*l* per 1p**<br>M1 for a correct method of finding the volume per pence (or £) for one of the sizes<br>M1 for a correct method of finding the volume per pence (or £) for each of the sizes, with consistent units<br>A1 for 0.39(11....) (70 m*l*) and 0.36(36...) (100 m*l*) and 0.37(59....) (150 m*l*) or equivalent depending upon units used. These values can be rounded or truncated as long as they remain different<br>C1 (dep on M1) for selecting the tube with the best value for money based upon a comparison of their 3 values. |

| | | | | |
|---|---|---|---|---|
| 7 | | Correct region shaded | 3 | B1 for perpendicular bisector within guidelines<br>B1 for arc of circle, centre A, within guidelines<br>B1 ft for a correct region shaded or otherwise indicated from their perpendicular bisector of AB and their arc drawn, centre A |

| PAPER: 5MB3H_01 | | | | |
|---|---|---|---|---|
| **Question** | **Working** | **Answer** | **Mark** | **Notes** |
| *8 | 179 ÷ 70 = 2.5(571.....)<br>275 ÷ 100 = 2.7(5)<br>399 ÷150 = 2.6(66....)<br><br><br><br><br><br><br><br>70 ÷ 179 = 0.39(11....)<br>100 ÷ 275 = 0.36(36...)<br>150 ÷399 = 0.37(59....) | 70 m*l* tube with reason | 4 | **Using pence per m*l***<br>M1 for a correct method of finding the cost per millilitre (or cost/10 m*l* etc) for one of the sizes<br>M1 for a correct method of finding the cost per millilitre (or cost/10 m*l* etc. must be consistent) for each of the sizes<br>A1 for 2.5(571.....) (70 m*l*) and 2.7(5) (100 m*l*) and 2.6(66....) (150 m*l*) or equivalent depending upon units used. These values can be rounded or truncated as long as they remain different<br>C1 (dep on M1) for selecting the tube with the best value for money based upon a comparison of their 3 values.<br>OR<br>**Using m*l* per 1p**<br>M1 for a correct method of finding the volume per pence (or £) for one of the sizes<br>M1 for a correct method of finding the volume per pence (or £) for each of the sizes, with consistent units<br>A1 for 0.39(11....) (70 m*l*) and 0.36(36...) (100 m*l*) and 0.37(59....) (150 m*l*) or equivalent depending upon units used. These values can be rounded or truncated as long as they remain different<br>C1 (dep on M1) for selecting the tube with the best value for money based upon a comparison of their 3 values. |

| | | | | | |
|---|---|---|---|---|---|
| 8 | | | Correct region | 3 | B1 for full line drawn 1.5 cm from edge of patio and parallel to it<br>B1 for full arc of circle radius 3 cm centre the centre of the pond<br>B1 ft for shading region to the right of their vertical line **and** outside the arc of their circle with correct centre |

PAPER: 1MA0_1H

| | | | | | |
|---|---|---|---|---|---|
| 10 | | | construction | 2 | M1 for a pair of arcs or a single arc, centre $C$, that cut line $AB$ **and** at least one pair of arcs not at $C$ within guidelines<br>A1 for perpendicular within guidelines with appropriate construction arcs<br><br>**OR**<br>M1 for an arc, centre $A$ radius $AC$ **and** an arc centre $B$ radius $BC$. The two arcs must intersect below $AB$<br>A1 for perpendicular within guidelines with appropriate construction arcs<br><br>(SC If M0 scored, B1 for correct perpendicular line within guidelines) |

| | | | | |
|---|---|---|---|---|
| 8 | | Correct position marked | 3 | M1 for perpendicular bisector of the line AC<br>M1 for arc of circle centre D radius 7cm<br>A1 for correct point |
| *9 | | No with comparison of correct figures. | 3 | M1 for correct method to find frame dimensions 15+5+5 (=25) and 10+5+5 (=20)<br>M1 for finding relationship between length and width for both<br>eg 15 ÷ 10 (=1.5) and 25 ÷ 20 (= 1.25) or for correct use of a scale factor to find a comparable length<br>C1 for correct conclusion following comparison of 2 correct comparable figures |

| Question | | Working | Answer | Mark | Notes |
|---|---|---|---|---|---|
| 9 | | | Correct line drawn | 2 | M1 for two pairs of relevant arcs drawn<br>A1 correct line drawn ( with arcs)<br><br>SC B1 Correct line no arcs visible |

| | | | | | |
|---|---|---|---|---|---|
| 6 | | | bisector | 2 | M1 for an appropriate pair of arcs or correct line drawn without construction arcs<br>A1 for perpendicular bisector of *AB* drawn with a pair of construction arcs |

<table>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>14</td><td>(a)</td><td></td><td>Correct construction</td><td>2</td><td>M1 for correct construction arcs or bisector within guidelines but no (or incorrect) construction arcs<br>A1 for bisector within guidelines with correct arcs shown</td></tr>
<tr><td></td><td>(b)</td><td></td><td>Correct construction</td><td>2</td><td>M1 for correct construction arcs or perpendicular within guidelines but no (or incorrect) construction arcs<br>A1 for perpendicular within guidelines with correct arcs shown</td></tr>
<tr><td>*15</td><td>(a)</td><td><table><tr><td></td><td>Age 16</td><td></td><td>Age 18</td></tr><tr><td>HV</td><td>310</td><td><</td><td>380</td></tr><tr><td>LV</td><td>80</td><td><</td><td>130</td></tr><tr><td>Median</td><td>180</td><td><</td><td>240</td></tr><tr><td>Range</td><td>230</td><td><</td><td>250</td></tr><tr><td>IQR</td><td>80</td><td>></td><td>70</td></tr></table></td><td>Compares: medians and spread</td><td>3</td><td>C1 for any correct comparison of the medians<br>C1 for any correct comparison of the IQRs or the ranges<br>C1 (dep on one C1) for either statement written in context</td></tr>
<tr><td></td><td>(b)</td><td></td><td>150</td><td>2</td><td>M1 for $\frac{3}{4}\times 200$ oe<br>A1 cao</td></tr>
</table>

# Original question 5

The full source mark scheme begins on page 208. Use the original paper code, tier and question number shown above.

| | | | | |
|---|---|---|---|---|
| 4 | | Perpendicular bisector | 2 | M1 for accurate line drawn without arcs, or appropriate arcs<br>A1 accurate line and appropriate arcs drawn |

| | | | | |
|---|---|---|---|---|
| 7 | | Correct region | 3 | B1 for perpendicular bisector of the line $AB$<br>B1 for arc of circle centre $B$ radius 4 cm<br>B1 for shading correct region |

| Paper: 1MA0/2H |
| --- |

| | | | | |
|---|---|---|---|---|
| 4 | perpendicular line constructed | C2<br><br>(C1 | for a fully correct construction with all relevant arcs drawn<br><br>for a perpendicular line drawn from *P* to the line *CD* or all relevant arcs drawn) | Perpendicular line segment between *P* and *CD* must be within guidelines<br>Accept dotted lines |

**Paper: 1MA1/1H**

| | | | | |
|---|---|---|---|---|
| 5 | Angle constructed | C2<br><br>(C1 | for fully correct construction with all arcs drawn<br><br>for line drawn within guidelines with no (or incorrect) construction arcs or correct arcs drawn and no line seen) | Full marks cannot be awarded if no construction lines are seen |

**Paper: 1MA1/1H**

| | | | | |
|---|---|---|---|---|
| 3 | Drawn | B2<br><br>(B1 | for a correct construction with all relevant arcs drawn<br><br>for all relevant arcs drawn<br>**or** for a bisector within guidelines but with no or insufficient arcs) | |

| Question | Answer | Mark | Mark scheme | Additional guidance |
|---|---|---|---|---|
| 4 | Explanation | C1 | for valid explanation identifying mistake,<br><br>**Acceptable examples**<br>It's on the wrong side of circle<br>She shaded inside the circle (but should be outside)<br>Shaded where *P* can't be<br>She shaded/drew less than 2cm<br>She shaded at most 2 cm<br>*P* should be outside (or on) the circle<br>*P* should be anywhere outside the 2cm radius<br>She shaded around point *C* not (at least) 2cm from point *C*<br>Nadia should have shaded away from the circle<br><br>**Not acceptable examples**<br>Shading is wrong or she shaded it incorrectly<br>Region is in the wrong place<br>Doesn't fit inside the circle<br>She shaded all the points between *C* and where all the points *P* could be<br>The question says at least 2cm and not only 2cm away<br>She shaded in too close<br>She shaded a circle not a square or should've drawn/shaded a square | |

| Paper: 1MA1/2H |
| --- |

GCSE

# Mark Scheme

## Mathematics A (1387)

June 2003

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June 2003

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# NOTES ON MARKING PRINCIPLES

## NOTES ON MARKING PRINCIPLES

**1 Three types of mark are available**

M marks - awarded for correct working seen or implied.
A marks - conditional accuracy marks which are awarded for accurate working following the award of M marks.
B marks - unconditional accuracy marks (independent of M).

**2 Abbreviations**

cao - correct answer only.
ft - follow through.
$\surd$ - Denotes a "follow through" answer.

*SC* - special case.
isw - ignore subsequent working.
oe - or equivalent (and appropriate).
NB: a candidate cannot benefit from both isw and ft.

**3 If no working shown, then**

correct answers normally score full marks
incorrect (even though nearly correct) answers score no marks.

**4 Marking instructions**

Misread loses A marks (and sometimes B marks) on that part but ft can be allowed on subsequent parts. M marks can still be earned. If in doubt contact your team leader.
If there is a wrong answer in the answer space DO CHECK the working in the body of the script.

- If it is clear from working that the "correct" answer has been obtained from incorrect working, award no marks. If in doubt contact your team leader.
- If there is a wrong answer in the answer space DO CHECK the working in the body of the script.
- If it is clear from working that the "correct" answer has been obtained from incorrect working, award no marks. If in doubt contact your team leader.

**5 Style of marking**

Answer correct: tick and write part mark in margin NEXT TO BRACKETED MARK.
Answer incorrect: cross, but show M, A or B marks if any earned in body of script and transfer the total of these to the margin next to the bracket mark.
Total for each double page at bottom right page (except for back if used), FINAL TOTAL IN RELEVANT BOX ON FRONT COVER.
Nought in margin for fully incorrect question or page AND FOR NO ATTEMPT.
Where no attempt has been made a line should be put in the answer space and zero in the margin next to the bracketed mark
CHOICE OF METHOD – No marks unless one answer is in answer space – then mark that.
CROSSED OUT WORK - if not replaced this should be marked (if legible).
There must always be a mark next to bracketed mark in the margin/

**6 Follow Through Marks**

Follow throughs are guided by two principles:

(a) Follow throughs which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous, do not award.
(b) Follow throughs which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

**7 Probability**

Probability answers must be given as fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least two decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

**8 Linear Equations**

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

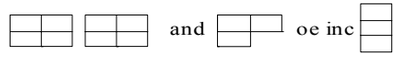
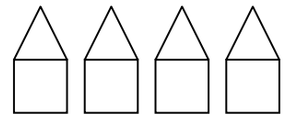
**9 Parts of questions**

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

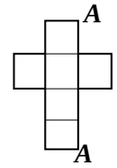
**Paper 5501**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 1 (a) | | 46 | 1 | B1 cao |
| (b) | | 3.4 | 1 | B1 oe |
| (c) | | Arrow at 430 | 1 | B1 allow ± half graduation |
| (d) | | Arrow at 3.7 | 1 | B1 allow ± half graduation<br>Accept indications other than arrows as long as they are clear |
| 2 | | 1.60<br>2.05 | 2 | B1 ) Condone<br>B1 ) reversal |
| 3 (a) | $\frac{18}{24}$ or $\frac{9}{12}$ or $\frac{6}{8}$ | $\frac{3}{4}$ | 2 | B2 for $\frac{3}{4}$ cao<br>(B1 for $\frac{18}{24}$ or $\frac{9}{12}$ or $\frac{6}{8}$) SC B1 for $\frac{1}{4}$ only |
| (b) | | 16 squares shaded | 1 | B1 cao |
| 4 (a) | | line | 1 | B1 within overlay tolerance |
| (b) | | midpoint | 1 | B1 within overlay tolerance ft from (a) ± 0.2cm |
| (c) | | rectangle | 1 | B1 for rectangle 6 cm ± 0.2cm by 4 cm ± 0.2cm |
| 5 | | kilograms, kg<br>litre, *l* or cubic metres, $m^3$<br>inches, in | 3 | B1<br>B1<br>B1 |
| 6 (a) | | parallel lines marked | 1 | B1 |
| (b) | | right angle marked | 1 | B1 |
| (c)(i) | | acute | 1 | B1 |
| (ii) | | reflex | 1 | B1 |

**Paper 5501**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 7 (i) | | sphere | 1 | B1 |
| (ii) | | cylinder | 1 | B1 Accept circular prism |
| (iii) | | pyramid | 1 | B1 Condone omission of "triangular" Accept tetrahedron |
| 8 (a)(i) | | 40 | 2 | B1 cao |
| (ii) | | 50 | | B1 cao |
| (b) | | 5 complete symbols | 1 | B1 cao |
| (c) | |  and  oe inc  | 1 | B1 |
| 9 (i) | | 9, 37, 56, 59, 75 | 5 | B1 cao |
| (ii) | | 0.067, 0.56, 0.6, 0.605, 0.65 | | B1 cao Ignore trailing zeros |
| (iii) | | –10, –6, –4, 2, 5 | | B1 cao |
| (iv) | | $\frac{2}{5}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$ | | B2 for all 4 correct<br>(B1 for any 3 in correct order)<br>SC B1 for all 4 in reverse order (applies to(iv) only ) |
| 10 (a) | |  | 1 | B1 |
| (b) | | Plotting (4, 24) | 1 | B1 ft from their matchsticks |
| (c) | | 60 | 1 | B1 cao |
| (d) | | $m = 6n$ | 2 | B2 for $m = 6n$ oe<br>(B1 for $6n$ oe or $m$ = multiple of $n$ except $m = n$) |
| 11 (i) | | 6, 12 | 4 | B1 cao |
| (ii) | | 4, 16 | | B1 cao |
| (iii) | | 3, 4, 6 or 3, 4, 6, 12 | | B1 Condone omission of 12 |
| (iv) | | 8, 27 | | B1 cao |

**Paper 5501**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 12 | | 2.43 | 4 | B1 for 36 or 0.36<br>B1 for 96 or 0.96<br>B1 for 125 or 1.25 If none of first 3 B1s awarded then<br>SC B1 for four 24s and five 25s seen OR 4 × 24 and 5 × 25 seen<br>B1 for 2.43 cao |
| 13 (a)(i) | | Edinburgh and Plymouth | 3 | B1 for Edinburgh or −7<br>B1 for Plymouth or 5 |
| (ii) | | 12 | | B1ft from (i) if one positive and one negative |
| (b) | | Cardiff and Belfast<br>London and Plymouth | 2 | B1 for Cardiff and Belfast OR −6 and −4<br>B1 for London and Plymouth OR 3 and 5 |
| 14 | | 5<br>9<br>8 | 3 | B1 cao<br>B1 cao<br>B1 cao |
| 15 (a) | |  | 2 | ✓ × <br>2 0 B2<br>1 0 B1<br>1 1 B1<br>2 1 B1 |
| (b) | $2 \times 2 \times 2$ | 8 | 2 | M1 for $2 \times 2 \times 2$<br>A1 for 8 cao |
| 16 (a) | | 30 | 1 | B1 cao |
| (b) | | 3 | 1 | B1 cao |
| (c) | $2 \times 29 = 58$<br>$5 \times 30 = 150$<br>$2 \times 31 = 62$<br>$1 \times 32 = 32$<br>$\frac{302}{10} = 30.2$ | 30.2 | 3 | M1 for freq × no pins<br>M1 (dep on 1st M1) for totalling and ÷ 10<br>A1 for 30.2 cao |

**Paper 5501**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 17 | | 7<br>5<br>5 13 33<br>52 23 | 3 | B3 all correct<br>(B2 for 4, 5 or 6 correct<br>B1 for 2 or 3 correct) |
| 18 (a)(i)<br>(ii)<br>(iii)<br>(iv)<br>(b) | | $4c$<br>$p^4$<br>$8g$<br>$10pr$ OR $10rp$<br>$10y - 15$ | 4<br><br><br><br>1 | B1 oe<br>B1 cao<br>B1 oe<br>B1<br>B1 cao Accept $10y + - 15$ |
| 19 | | $\frac{2}{3}$ | 3 | M1 for 3 rows (9 squares) shaded<br>M1 for 2 columns (10 squares) shaded<br>A1 for $\frac{2}{3}$ |
| | $\frac{3}{5} = \frac{9}{15}$<br>$\frac{2}{3} = \frac{10}{15}$ | $\frac{2}{3}$ | 3 | M1 for $\frac{3}{5} = \frac{9}{15}$<br>M1 for $\frac{2}{3} = \frac{10}{15}$<br>A1 for $\frac{2}{3}$ |
| | $\frac{3}{5} = 0.6$<br>$\frac{2}{3} = 0.66$ or $0.67$ or better | $\frac{2}{3}$ | 3 | M1 for $\frac{3}{5} = 0.6$ ) Accept<br>M1 for $\frac{2}{3} = 0.66$ or $0.67$ or better ) percentages<br>A1 for $\frac{2}{3}$ |

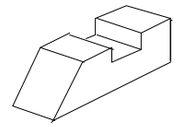
**Paper 5501**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 20 (a) | 955 × 48 = 7640 + 38200 = 45840<br>OR<br>48 × 955 = 240 + 2400 + 43200 = 45840 | 458.40 | 3 | M1 for complete correct method (condone one computational error)<br>A2 for 458.40 cao<br>(A1 for digits 4584 OR ft if M1 awarded) |
| (b) | 48 \| 696.0 → 14.5; 48, 216, 192, 24 0, 24 0 | 14.50 | 3 | M1 for 1 as first digit in answer and remainder 21<br>M1 (dep) 4 as second digit in answer<br>A1 for 14.50 (Accept 14.5) |
| 21 (a) | | $12x$ | 1 | B1 oe |
| (b) | | $12x + 10y$ | 2 | B2 oe ft from (a)<br>(B1 $12x$ + multiple of $y$ or $10y$ seen)<br>SC B1 for $x = 12x + 10y$ OR $y = 12x + 10y$ |

**Paper 5501**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 22 | $\frac{1}{3}+\frac{1}{4}=\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$<br>$1-\frac{7}{12}=\frac{5}{12}$ | $\frac{5}{12}$ | 3 | M1 for $\frac{4}{12}$ **and** $\frac{3}{12}$ oe<br>A2 for $\frac{5}{12}$ oe<br>(A1 for $\frac{7}{12}$)<br>B1 for 1–"$\left(\frac{1}{3}+\frac{1}{4}\right)$" correctly evaluated |
| | $1-\frac{1}{3}=\frac{2}{3}$ , $1-\frac{1}{4}=\frac{3}{4}$<br>$\frac{8}{12}-\frac{3}{12}=\frac{5}{12}$ or $\frac{9}{12}-\frac{4}{12}=\frac{5}{12}$ | $\frac{5}{12}$ | 3 | B1 for $\frac{2}{3}$ or $\frac{3}{4}$ seen<br>M1 for $\frac{8}{12}-\frac{3}{12}=\frac{5}{12}$ or $\frac{9}{12}-\frac{4}{12}=\frac{5}{12}$<br>A1 for $\frac{5}{12}$ oe |
| | | $\frac{5}{12}$ | 3 | M1 for 0.25 and 0.33 or better<br>A1 for 0.58 or better<br>A1 for $0.41\dot{6}$ or recurring |
| 23 (a)<br>(b)(i)<br><br>(ii) | <br>180 – (54 + 54) | 54<br>72<br><br>Reason | 1<br>3 | B1 cao<br>M1 for 180 – (54 + 54)<br>A1 ft from (a) if $x < 90$<br>B1 for mentioning<br>isosceles and equal or base angles<br>or<br>equal sides and equal or base angles |

**Paper 5501**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 24 (a) | | Bryani | 2 | M1 for $4 \times 9$ or $4 \times 3 \times 3$ or $4 \times x \times x$ or square $x$ first or square 3 first<br>A1<br>SC $4 \times 3^2$ with Bryani scores B2 |
| (b) | | 64 | 1 | B1 cao |
| 25 (a) | |  dotted line may be solid | 3 | B2 for rectangle base 3 squares and height 4 squares<br>(B1 for rectangle with one correct dimension)<br>B1 for horizontal line 1 cm from top)<br>SC B2 for completely correct elevation on its side |
| (b) | |  | 2 | B2 for perspective drawing showing slant face and cutout<br>B1 for perspective drawing with either slant face cutout omitted |
| 26 (a) | $20 \times 2$ or $\frac{20}{30} \times 60$ or $20 \div \frac{1}{2}$ | 40 | 2 | M1 for $20 \times 2$ or $\frac{20}{30} \times 60$ or $20 \div \frac{1}{2}$<br>A1 cao |
| (b) | $\frac{20}{60}$ or $\frac{1}{3}$ or 20 minutes | line from (45, 20) to (65, 0) | 2 | M1 for $\frac{20}{60}$ or $\frac{1}{3}$ or 20 minutes seen<br>A1 for correct line<br>SC If M0, B1 for line from (45, 20) to ($t$, 0) where $t > 45$ or B1 for a line of the correct gradient. |

**Paper 5502**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 1 (a) | | $\frac{7}{100}$ | 1 | B1 cao accept 0.07 |
| (b) | | 0.18 | 1 | B1 cao |
| (c) | 20 in 100 oe | 40 | 2 | M1 for sight of 20 in 100 or 20 × 2<br>A1 cao |
| 2 (a) | | 6cm | 2 | B1 for 6 ± 0.2 or 60 ± 2<br>B1 indep for cm or mm consistent with 1st B1 |
| (b) | | At centre | 1 | B1 within overlay |
| (c) | | Circle drawn | 1 | B1 all within overlay |
| 3 | | See diagram | 3 | B3 all correct – see separate sheet<br>(B2 for 3 correct<br>B1 for 2 correct) |
| 4 (a) | | $\frac{1}{4}$ oe | 1 | B1 cao |
| (b) | | 0.75 | 1 | B1 cao |
| (c) | | 75% | 1 | B1 cao |
| (d)(i) | | 9 | 2 | B1 accept answer in range 9 - 9.2 |
| (ii) | | 15 - 16 | | B1 accept answers in range15 - 16 |
| 5 (a) | | 9:30 | 1 | B1 cao |
| (b) | | 2hrs 45 min | 2 | B2 for 2hr 45 min or 2 $\frac{3}{4}$ hr or 165 minutes<br>B1 2:45 or 2.45 or 165 or 45min + 1hr + 1hr oe |
| (c) | | 17 | 1 | B1 cao |
| 6 (a) | 96 × 4 | 3.84 | 2 | M1 for 96 × 4 or digits 384<br>A1 cao |
| (b) | 3 × 96 + 40 = 328 | (0).56 | 2 | M1 for 3 × 96 + 40 or digits 328 or digits 56<br>A1 cao accept 56p |

**Paper 5502**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 7 (a) | | 54 000 | 1 | B1 cao accept 54 thousand |
| (b) | | 50 000 | 1 | B1 (accept ten thousand or 10 000) oe |
| 8 (a) | | 14 | 1 | B1 cao |
| (b) | | 6 | 1 | B1 cao |
| (c) | | Correct reflection | 2 | B2 fully correct<br>(B1 correct reflection in a line parallel to the mirror line or condoning 1 block error in shape or position of shape) |
| 9 (a) | | Missing horiz label<br>1 (and 6) missing on vertical scale | 2 | B1<br>B1 |
| (b) | | Correct graph | 2 | B1 for bar up to 4 for yellow<br>B1 for bar up to 2 for green |
| (c) | | Blue | 1 | B1 cao |
| (d) | 3 + 5 + 4 + 2 | 14 | 1 | B1 ft from (b) |
| (e) | | $\frac{3}{14}$ | 1 | B1 ft on '14' |
| 10 | Barry (8) because you double<br>Kath (7) because you add, 1,2,3 | | 2 | B1 oe<br>B1 oe<br>SC: B1 for correct rules only |
| 11 (a) | | $2n$ | 1 | B1 for $2n$ or $n + n$ OR $2 \times n$ OR $n \times 2$ OR $n2$ |
| (b) | | $2n + 15$ | 1 | B1 for "$2n$" + 15 oe |
| (c) | | 20q | 1 | B1 cao |
| 12 (a) | 1 + 3 + 5 + 8 + 5 | 22 | 2 | M1 add frequencies<br>A1 cao |
| (b) | | No, is>no of cups of coffee in the table | 1 | B1 'average cannot be bigger than 6' oe OR 'Average must be less than 6 oe' |
| 13 (a) | | Trapezium | 1 | B1 cao ignore spelling |
| (b) | | (2, 3) | 1 | B1 cao |
| (c) | | Isosceles | 1 | B1 cao ignore spelling |
| (d) | | $Q$ correct | 1 | B1 cao |

**Paper 5502**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 14 (a) | | 250 000 | 1 | B1 cao |
| (b) | $\frac{28}{4}$ | 7 | 2 | M1 for $\frac{28}{4}$ oe or "250000" × 28<br>A1 cao<br>**SC** B1 for 7 000 000 |
| 15 (a) | | 10 | 1 | B1 cao |
| (b) | | 5.5 | 1 | B1 ±0.3 pounds |
| (c) | $\frac{110}{22}$ | 50 | 3 | M1 for use of graph at 11 or $\frac{110}{22}$<br>A1 for 5<br>A1 cao<br>**SC** B2 for 49.5 – 50.6 |

**Paper 5502**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 16 (a) | $269.30 - 56.80 = 212.50$<br>$\frac{212.50}{42.50}$ | 6 | 2 | M1 for $\frac{269.30 - 56.80}{42.50}$ or 5 seen<br>A1 cao |
| (b) | 5% of £269.30<br>£269.30 – "£13.465"<br><br>OR $\frac{95}{100} \times 269.30$ | 255.83 or 255.84 | 3 | M1 for $(5 \div 100) \times 269.30$<br>M1 for $269.30 - $ "13.465"<br>A1 cao<br>OR M2 for $\frac{95}{100} \times 269.30$<br>A1 cao<br>**Alternative Method:**<br>M1 for $\frac{5}{100} \times 56.80$ $(= 2.84)$<br>and $\frac{5}{100} \times 42.50$ (=2.12(5))<br>(OR 53.96 AND 40.38 (40.375) seen<br><br>M1 for $56.80 -$ "2.84" (= 53.96)<br>$42.50 -$ "2.12(5)" ( = 40.375 or 40.38)<br>"5" × "40.375" + "53.96"<br>A1 cao |
| 17 | $4.1^2 \times 1.07 = 16.81 \times 1.07$ | 17.9867 | 2 | M1 for ("4.1") followed by squaring, or sight of 16.81<br>A1 cao<br>SC: *B1 for 18 or better with no working* |
| 18 (a) | | 60 | 1 | B1 cao |
| (b) | $360 - 60 - 90 - 90$ | 120 | 2 | M1 for $360 -$ " 60 " $- 90 - 90$ or $180 -$ "60"<br>A1 cao |
| (c) | $6 \times 2$ | 12 | 2 | M1 for $6 \times 2$<br>A1 cao for 12 |

**Paper 5502**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 19 (a)(i) | $240 \times 5 = 1200$ | 1250 | 3 | B1 cao 1250 |
| (ii) | $\frac{50}{'1250'}$ | $\frac{1}{25}$ | | M1 cao $\frac{50}{'1250'}$<br>A1 for $\frac{1}{25}$ in its simplest form |
| (b) | $\frac{60}{100} \times 1000 = 600$ | 12:5 | 3 | M1 for $\frac{60}{100} \times 1000$ oe<br>A1 for 600<br>A1 cao |
| 20 (a) | | $x + 2$ | 1 | B1 accept $2 + x$ but not $x = x + 2$ |
| (b) | $x + 5 + x + 5 + x + 2 + x + 2$ | $4x + 14$ | 2 | M1 adding 4 sides, two of which are '$x + 2$' (all sides to be linear expressions in $x$)<br>**SC** $x + 5 + x + 2 \times 2$ gets M1<br>A1 for correct simplified answer or $(20 - 14) \div 4$ oe gets M1 |
| (c) | '$4x + 14$' = 20 | 1.5 oe | 2 | M1 for equation<br>A1 cao |
| 21 | $\sum f = 90$ | Angles drawn, labelled | 3 | M1 for 1 person = 4°or one angle correct in table or pie chart<br>A1 any 2 correctly drawn angles in pie chart<br>A1 fully correct chart labelled |
| 22 (a) | | $2p - q$ | 2 | B1 cao for $2p$<br>B1 cao for $-q$ accept $(-q + 2p)$, $2p - 1q$ and $2p + -q$ |
| (b) | $5x = 3 + 4$ | 1.4 | 2 | M1 for either (+3 or sight of 7) or (÷ 5 or sight of 0.8 and 0.6)<br>A1 cao accept $\frac{7}{5}$ or $1\frac{2}{5}$ |

**Paper 5502**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 23 (a) | | $\frac{4\times5}{2}$ | 1 | B1 cao |
| (b) | $1+2+3+4+5+6+7+8$ | $\frac{8\times9}{2}$ | 1 | B1 cao |
| (c) | $\frac{100\times101}{2}$ | 5050 | 1 | B1 cao |
| 24 | 0 \| 5 7 8 8<br>1 \| 0 0 0 0 2 5 5 5 6<br>2 \| 0 0 0 4 5<br>3 \| 3 5<br><br>Key 1 \| 2 = 12 (min) | See working | 3 | B1 for stem 0, 1, 2, 3 or 0, 10, 20, 30<br>B1 for accurate unordered leaves condone 1 error or omission<br>B1 for key and ordered leaves all correct |
| 25 | $3.2\times2.8=8.96$<br>$2\times4.5\times2.8=25.2$<br>$2\times4.5\times28.8=28.8$<br>$\frac{62.96}{2.5}\times2.99$ | £75.30 | 5 | M1 for area of any face found correctly<br>M1 for 2 areas found correctly<br>A1 for 62.96 or 54<br>M1 for $\frac{'62.96'}{2.5}\times2.99$<br>Al cao<br>Alternate method for candidates who round up $\frac{"62.92"}{2.5}$<br>M1 for "26" × 2.99<br>A1 for £77.74 cao<br>**SC**: *for top included B2 for 71.92 $m^2$ seen or*<br>B3 for £86.02 seen<br>**SC** B4 for £64.58 or £65.78 seen |
| 26 | $2.5\times10\,000$ | 25 000 | 2 | M1 for $2.5\times100\times100$<br>A1 cao |

**Paper 5503**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 1 (a)(i) | | $8g$ | 2 | B1 oe |
| (ii) | | $10rp$ | | B1 for $10pr$ or $10\ rp$ |
| (b) | | $10y - 15$ | 1 | B1 cao accept $10y$ - + 15 |
| (c) | $6x + 8 - 12x + 15$ | $-6x + 23$ | 2 | M1 for 3 correct terms out of 4<br>A1 cao |
| 2 | | $m = 6n$ | 2 | B2 for $m = 6n$ oe accept $6 \times n$, $n$ 6<br>(B1 for $6n$ alone, or $6n$ +1 oe OR m = multiple of $n$ except $m = n$) |
| 3 (i) | | 0.067, 0.56, 0.6, 0.605, 0.65 | 1 | B1 cao Ignore trailing zeros |
| (ii) | | $-10, -6, -4, 2, 5$ | 1 | B1 cao |
| (iii) | | $\frac{2}{5}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$ | 2 | B2 all four correct<br>(B1 any three in correct order)<br>SC: B1 all 4 in reverse order |
| 4 | | 7<br>5<br>5 13 33<br>52 23 | 3 | B3 all correct<br>(B2 for 4, 5 or 6 correct entries)<br>(B1 for 2, 3 correct entries) |

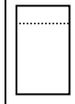
**Paper 5503**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 5 | | $\frac{2}{3}$ | 3 | M1 for 3 rows (9 squares) shaded<br>M1 for 2 columns (10 squares) shaded<br>A1 |
| | OR<br>$\frac{3}{5}=\frac{9}{15}$<br>$\frac{2}{3}=\frac{10}{15}$<br>Therefore $\frac{2}{3}>\frac{3}{5}$ | $\frac{2}{3}$ | | M1 for $\frac{3}{5}=\frac{9}{15}$<br>M1 for $\frac{2}{3}=\frac{10}{15}$<br>A1 |
| | OR<br>$\frac{3}{5}=0.6$ or percent<br>$\frac{2}{3}=0.66$ or 0.67 or better<br>Therefore $\frac{2}{3}>\frac{3}{5}$ | $\frac{2}{3}$ | | M1 for $\frac{3}{5}=0.6$ or percent<br>M1 for $\frac{2}{3}=0.66$ or 0.67 or better<br>A1 |
| 6 | $2\times 29=58$<br>$5\times 30=150$<br>$2\times 31=62$<br>$1\times 32=32$<br>$\frac{302}{10}=30.2$ | 30.2 | 3 | M1 for freq × no. pins (at least 3)<br>M1 for totalling and for ÷ 10<br>(dep on 1st M1)<br>A1 cao |
| 7 (a) | | | 2 | B1 for 180° rotation (wrong centre)<br>B1 cao |
| (b) | | | 3 | B1 for any enlargement sf other than 1<br>B1 for all sides halved<br>B1 for position |

**Paper 5503**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 8 (a) | | $12x$ | 1 | B1 oe |
| (b) | | $12x + 10y$ | 2 | B2 oe or ft from (a)<br>(B1 for $12x$ + a multiple of $y$ or $10y$ seen)<br>**SC** B1 for $x = 12x + 10y$ or $y = 12x + 10y$ |
| 9 | $\frac{1}{3}+\frac{1}{4}=\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$<br><br>$1-\frac{7}{12}=\frac{5}{12}$<br>OR<br>$1-\frac{1}{3}=\frac{2}{3}, 1-\frac{1}{4}=\frac{3}{4}$<br>$\frac{9}{12}-\frac{4}{12}=\frac{5}{12}, \frac{8}{12}-\frac{3}{12}=\frac{5}{12}$ | $\frac{5}{12}$ | 3 | M1 for $\frac{4}{12}$ and $\frac{3}{12}$ oe<br>A2 for $\frac{5}{12}$ oe<br>(A1 for getting $\frac{7}{12}$)<br>(B1 for $1 - \frac{"1}{3} + \frac{1"}{4}$ correctly evaluated)<br>OR<br>B1 for $\frac{2}{3}$ or $\frac{3}{4}$ seen<br>M1 for $\frac{3}{4}-\frac{1}{3}=\frac{9}{12}-\frac{4}{12}$ or $\frac{2}{3}-\frac{1}{4}=\frac{8}{12}-\frac{3}{12}$<br>A1 for $\frac{5}{12}$ oe<br>OR<br>M1 0.25 and 0.33 or better<br>A1 for 0.58 or better<br>A1 for 0.416 *recurring* |
| 10 (a) | | 54 | 1 | B1 cao |
| (b)(i) | 180 – (54 +54) | 72 | 3 | M1 for 180 – (“54” + “54”)<br>A1 for 72° ft from (a) if $x < 90°$ |
| (ii) | | | | B1 for mentioning isosceles and equal or base angles or equal sides and equal or base angles |

**Paper 5503**

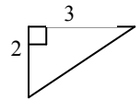
| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 11 (a) | Bryani was correct<br>$4 \times 3^2 = 4 \times 9 = 36$ | Bryani | 2 | M1 for $4 \times 9$ or $4 \times 3 \times 3$ or "square the three/$x$ then multiply by four"<br>A1 Bryani<br>**SC** $4 \times 3^2$ with Bryani gets B2 |
| (b) | | | 1 | B1 cao |
| 12 (a) | |  | 3 | B2 for rectangle height 4 squares, base 3 squares<br>(B1 for rectangle with one correct dimension)<br>B1for line 1 square from the top<br>**SC** B2 for completely correct elevation on its side |
| (b) | | | 2 | B2 for perspective drawing showing slant face and cut out<br>(B1 for perspective drawing with either slant face or cut out omitted or one aspect incorrect) |
| 13 (a) | $20 \times 2$ or $\frac{20}{30} \times 60$ or $20 \div \frac{1}{2}$ | 40 | 2 | M1 for $20 \times 2$ or $\frac{20}{30} \times 60$ or $20 \div \frac{1}{2}$<br>A1 cao |
| (b) | $\frac{20}{60}$ or $\frac{1}{3}$ or 20 minutes seen | Line from<br>(45, 20) to (65, 0) | 2 | M1 for $\frac{20}{60}$ or $\frac{1}{3}$ or 20 minutes seen<br>A1 for correct line<br>**SC** If M0, B1 for line from (45, 20) to ($t$, 0) where $t > 45$ or a line of the correct gradient |
| 14 (i) | | 119.31 | 3 | B1 cao |
| (ii) | | 119 310 | | B1 cao |
| (iii) | | 1.23 | | B1 cao |

**Paper 5503**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 15 | $\frac{10}{100}\times 12000$<br>12 000 – 1200 = 10 800<br>$\frac{10800}{10}=1080$<br>10 800 – 1080 = £9720 | £9720 | 3 | M1 for $\frac{10}{100}\times 12000$ or sight of 1200 or 2400 or 10 800 or 9600<br>M1 (dep) for $\frac{10}{100}\times(12\,000-\frac{10}{100}\times 12000)$ or sight of 1080<br>A1 cao<br>Alternative mark scheme<br>M2 for $12000\times(1-\frac{10}{100})^2$<br>(M1 for $12000\times(1-\frac{10}{100})$<br>A1 cao |
| 16 (a) | $2p = 6$ | $p = 3$ | 2 | M1 for $7p - 5p = 8 - 2$ or $2p$ or 6<br>A1 cao |
| (b) | $7r - 5r = -20 - 2$ | –11 | 2 | M1 for $7r + 2 = 5r - 20$ or $\frac{7r}{5}+\frac{2}{5}=r-4$ or $7r - 5r = 20 - 2$ or $\frac{7r}{5}-r=-4-\frac{2}{5}$<br>A1 cao |
| 17 | | $5n + 1$ | 2 | B2 oe<br>(B1 for $5n$ seen)<br>NB: $n$ = gets B1 max |

**Paper 5503**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 18 (a) | –1, 0, 1 | | 2 | B2 for –1, 0, 1<br>(B1 for –1, 0 or 0,1 or –1,1 or –2, -1, 0, 1 only) |
| (b) | (–1, –1), (0, –1), (1, –1), (0, 0), (1, 0), (1, 1) | | 3 | B3 for 6 points correct<br>B2 for 3 points correct<br>B1 for 1 point correct<br>**NB** –B1 each additional point over six |
| 19 (a) | Triangle with vertices at (0,0) (0,–2) and (3,0) | | 2 | M1 for correct orientation<br>A1 cao |
| (b) | Rotation, 180°, centre (0,1)<br>Enlargement sf - 1 centre (0,1) | | 2 | B2 for 180° 'rotation' centre (0, 1)<br>B2 for Enlargement sf - 1 centre (0,1)<br>(B1 for any two of the three parts)<br>NB: B0 if additional transformation is included |
| 20 | Bisector of $\angle BAC$<br>Arc around $A$<br>Region | | 3 | B3 cao<br>(B2 for either two correct boundaries, no shading/ wrong shading or one correct boundary, one incorrect boundary with valid shading)<br>(B1 for either two incorrect boundaries but one drawn from $A$ and one intersection, with valid shading or one correct boundary)<br>Ignore shading outside the triangle |
| 21 | | Length<br>Volume<br>Area | 3 | B1 for Length<br>B1 for Volume<br>B1 for Area |
| 22 (a) | Unbiased question with choices | | 2 | B1 for unbiased question<br>B1 for at least 2 choices |
| (b) | | | 2 | Classification 1: A biased question<br>Classification 2: A restricted sample of people<br>Classification 3: Not specifying a range of foods<br>Classification 4: Nothing to do with eating habits<br>B2 reasons which satisfy 2 different classifications<br>(B1 a reason which satisfies one classification) |



**Paper 5503**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 23 (a) | $6 \times 10^2 \times 8 \times 10^4$<br>$48 \times 10^6$ | $4.8 \times 10^7$ | 3 | M1 for $6 \times 10^a \times 8 \times 10^b$ oe, $a$ and $b$ integers including 0<br>A1 for $48 \times 10^6$ oe<br>A1 cao |
| (b) | 200 000 + 30 000 | 230000 | 2 | B2 cao<br>(B1 for sight of 200 000 or 30 000 or $2.3 \times 10^5$ or $23 \times 10^4$) |
| 24 (i) | | 64 | 4 | B1 cao |
| (ii) | | 3 | | B1 cao |
| (iii) | $\sqrt{16 \times 9} = \sqrt{144}$ | 12 | | B2 cao<br>(B1 for sight of $\sqrt{2^4} \times \sqrt{9}$ or better, or 144 seen) |
| 25 (i) | Tangent 90° to diameter /radius/ line from (through) centre | 27° | 4 | B1 for 27° cao<br>B1 for reason |
| (ii) | 180 –(90+ "27")<br>angle in semicircle (is 90°)/Alternate segments /angle at centre twice at circumference | 63° | | B1 ft for 90–"27" if not 63°<br>B1 for reason |
| 26 (a)(i) | | 152 | 2 | B1 cao |
| (ii) | | 177 | | B1 cao |
| (b) | | | 3 | B1 for median marked at 167<br>B1 ft for postion of box with its ends at "152" and "177"<br>B1 for position of whiskers with ends at 132 and 182<br>NB: For any points plotted between 141 and 149 give a tolerance of an extra ± 1 square |
| 27 | $x^2 + xy + xy + y^2$ | $x^2 + 2xy + y^2$ | 2 | M1 for at least 3 of the 4 terms correct<br>A1 cao |
| | | 25 | 2 | M1 for recognising 3.47 + 1.53 (= 5)<br>A1 cao |

**Paper 5504**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 1 (a) | $4.1^2 \times 1.07 = 16.81 \times 1.07$ | 17.9867 | 2 | M1 for (4.1) followed by squaring, or sight of 16.81<br>A1 cao<br>SC: B1 for 18 or better with no working |
| (b) | | $(1.6 + 3.8 \times 2.4) \times 4.2$ | 1 | B1 cao<br>Allow additional brackets if they give an expression with value 45.024 |
| 2 (a) | 269.30 – 56.80 = 212.50 | 6 | 2 | M1 for $\frac{269.30 - 56.80}{42.50}$ or 5 seen<br>A1 cao |
| (b) | 5% of £269.30<br>£269.30 – "£13.465"<br><br>OR $\frac{95}{100} \times 269.30$ | 255.83 or 255.84 | 3 | M1 for (5 ÷ 100) × 269.30<br>M1 (dep) for 269.30 – "13.465"<br>A1 cao<br>OR M2 for $\frac{95}{100} \times 269.30$<br>A1 cao<br>**Alternative Method:**<br>M1 for $\frac{5}{100} \times 56.80$ (= 2.84)<br>and $\frac{5}{100} \times 42.50$ (=2.12(5))<br>(OR 53.96 AND 40.38 (40.375) seen<br><br>M1 for 56.80 – "2.84" (= 53.96)<br>42.50 – "2.12(5)" ( = 40.375 or 40.38)<br>"5" × "40.375" + "53.96"<br>A1 cao |

**Paper 5504**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 3 (a) | | 60 | 1 | B1 cao |
| (b) | 360 – 60 – 90 – 90 | 120 | 2 | M1 for 360 – "60" – 90 – 90 or 180 – "60"<br>A1 cao |
| (c) | $6 \times 2$ | 12 | 2 | M1 for $6 \times 2$<br>A1 cao 12 |
| (d) | | Correct drawing | 2 | B2 for triangle and construction lines (see overlay)<br>(B1 for 1 line of length 4cm and correct arcs crossing OR for correct triangle with either no arcs or incorrect arcs)<br>SC: B1 similar triangle drawn with construction lines |
| 4 a(i) | $240 \times 5 = 1200$ | 1250 | 3 | B1 cao 1250 |
| (ii) | $\frac{50}{1250}$ | $\frac{1}{25}$ | | M1 $\frac{50}{"1250"}$<br>A1 oe in its simplest form |
| (b) | $\frac{60}{100} \times 1000 = 600$<br>600: 250 | 12:5 | 3 | M1 for $\frac{60}{100} \times 1000$ oe<br>A1 for 600<br>A1 cao |
| 5 (a) | | $x + 2$ | 1 | B1 |
| (b) | $x + 5 + x + 5 + x + 2 + x + 2$ | $4x + 14$ | 2 | M1 adding 4 sides, two of which must be '$x + 2$' (all sides to be linear expressions in $x$)<br>A1 for correct simplified answer |
| (c) | "$4x + 14$" = 20 | 1.5 | 2 | M1 for equation "$4x + 14$" = 20 OR $\frac{20-14}{4}$ oe<br>A1 cao |

**Paper 5504**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 6 (a) | | $2p - q$ | 2 | B1 cao for $2p$<br>B1 cao for $-q$ accept $-q + 2p$ and $2p - 1q$ |
| (b) | $5x = 3 + 4$ | 1.4 | 2 | M1 for either (+3 or sight of 7) or (÷ 5 or sight of 0.8 and 0.6)<br>A1 cao accept $\frac{7}{5}$ or $1\frac{2}{5}$ |
| 7 (a) | | $\frac{4\times5}{2}$ | 1 | B1 cao |
| (b) | $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8$ | $\frac{8\times9}{2}$ | 1 | B1 cao |
| (c) | $\frac{100\times101}{2}$ | 5050 | 1 | B1 cao |
| (d) | | $\frac{n(n+1)}{2}$ | 2 | B2 cao<br>(B1 for any quadratic in $n$) |
| 8 | $3.2 \times 2.8 = 8.96$<br>$2 \times 4.5 \times 2.8 = 25.2$<br>$2 \times 4.5 \times 3.2 = 28.8$<br>$\frac{62.96}{2.5} \times 2.99$ | 75.30 | 5 | M1 for area of any face found correctly<br>M1 for 2 areas seen<br>A1 for 62.96 or 54<br>M1 for $\frac{'62.96'}{2.5} \times 2.99$<br>A1 cao<br>Alternate method for candidates who round up $\frac{"62.96"}{2.5}$<br>M1 for "26" $x$ 2.99<br>A1 for £77.74 cao<br>SC: for top included B2 for 71.92 $m^2$ seen or<br>B3 for £86.02 or £86.71<br>SC: B4 for £64.58 or £65.78 seen |

**Paper 5504**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 9 | $2.5 \times 10000$ | 25000 | 2 | M1 for $2.5 \times 10000$ or $2.5 \times 100 \times 100$<br>A1 cao |
| 10 (a) | $\sum f = 90$<br>(88), 144, 32, 96 | Angles drawn, labelled | 3 | M1 for 1 person = 4° or one angle correct in table or pie chart<br>A1 any 2 angles correctly drawn in pie chart<br>A1 fully correct chart labelled |
| (b) | $0.38 + 0.27 + 0.15$ | 0.20 | 2 | M1 1 – sum<br>A1 cao |
| 11 | 0 \| 5 7 8 8<br>1 \| 0 0 0 0 2 5 5 5 6<br>2 \| 0 0 0 4 5<br>3 \| 3 5<br>Key 1 \| 3 = 13 (min) | See working column | 3 | B1 for stem 0, 1, 2, 3 or 0, 10, 20, 30<br>B1 for accurate unordered leaves condone 1 error or omission<br>B1 for key and ordered leaves all correct |
| 12 (a) | $V = \pi \times 4^2 \times 10$ | 502 – 503 | 2 | M1 for $\pi \times 4^2 \times 10$<br>A1 502 – 503 |
| (b) | $P^2 = 10^2 + 8^2$<br>$P = \sqrt{164}$ | $\sqrt{164} < 13$ | 3 | M1 for sight of a correct right-angled triangle<br>M1 for $10^2 + 8^2$<br>A1 for conclusion based on a correct calculation or 12.8 seen |
| 13 (a) | $2 \times 30$ | $2 \times 2 \times 3 \times 5$ | 4 | M1 for systematic method, eg division, factor trees (at least one prime)<br>A1 cao |
| | $2 \times 48$ | $2^5 \times 3$ | | M1 for systematic method, eg division, factor trees (at least one prime)<br>A1 cao |
| (b) | | 12 | 1 | B1 cao |
| (c) | $2^5 \times 3 \times 5$ | 480 | 2 | B2 cao<br>B1 for $2^5 \times 3 \times 5$ or any correct common multiple |

**Paper 5504**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 14 (a) | | 150 < C ≤ 200 | 2 | M1 use of cum freq to find the cost of the 20th or 20.5th car<br>OR $\frac{1}{2}\Sigma f$ or $\frac{1}{2}(\Sigma f + 1)$<br>A1 eg 150 to 200 |
| (b) | | No, because the 21st value is in the same interval | 1 | B1 20.5th or 21st in same interval or an alternative correct explanation |
| (c) | 80% = 5200<br>$\frac{5200}{80}\times 100$ | 6500 | 3 | M1 for (100 – 20) % = 5200<br>M1 for $\frac{5200}{"80"}\times 100$<br>A1 cao |
| 15 (a) | $x^2(x+1) = 230$ | AG | 2 | M1 for $x \times x \times (x+1)$ or $x \times x \times x + 1$ oe<br>A1 cao from $x \times x \times (x+1)$ |
| (b) | '5 – 150<br>5.1 – 158.7<br>5.2 – 167.6<br>5.3 – 177.0<br>5.4 – 186.6<br>5.5 – 196.6<br>5.6 – 207.0<br>5.7 – 217.7<br>5.8 – 228.8<br>5.9 –240.2<br>5.85 – 234.4 | 5.8 | 4 | B 2 for trial between 5.8 and 5.9 inclusive<br>(B1 for different trial between 5 and 6 inclusive)<br>B1 for different trial between 5.8 and 5.85 (not including 5.8)<br>B1 (dep on at least one previous B1) cao for 5.8, 5.81, 5.811 |

**Paper 5504**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 16 | $\pi \times \left(\frac{15}{2}\right)^2 = 176.715$ | $88.4\text{cm}^2$ | 3 | M1 for $\pi \times \left(\frac{15}{2}\right)^2$<br>A1 88.3 – 88.4<br>B1(ind) for cm² |
| 17 (a) | $5 = 0.5x + 1$ | 8 | 2 | M1 for $5 = 0.5x + 1$<br>A1 cao |
| (b) | | $y = \frac{1}{2}x + c$ | 1 | B1 $y = \frac{1}{2}x + c$, c ≠ 1, oe |
| (c) | | $x = 2y - 2$ OR $x = 2(y - 1)$ | 2 | M1 for correctly multiplying both sides by 2 or correctly isolating $\frac{x}{2}$<br>A1 for $x = 2(y - 1)$, $x = \frac{y-1}{0.5}$, $x = \frac{y-1}{\frac{1}{2}}$ oe<br>SC: B1 for $x = 2y - 1$ |
| 18 | $4x - 6y = 22$<br>$15x + 6y = 54$<br>$19x = 76$ | $x = 4,\ y = -1$ | 4 | M1 for coefficients of $x$ or $y$ the same followed by correct operation , one arithmetical error<br>A1 cao<br>M1(dep on previous M mark) for sub for other variable<br>A1 cao<br>Trial and improvement –0 unless both $x$ and $y$ correct values found |

**Paper 5504**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 19 (a) | $SF = \frac{10}{6}$<br>$\frac{10}{6} \times 4.8 = 8$ | 8 | 2 | M1 for sight of $\frac{10}{6}$ or $\frac{6}{10}$ or 1.67 or better or $\frac{CD}{10} = \frac{4.8}{6}$<br>A1 cao |
| (b) | $\frac{10}{6} \times 4.5 - 4.5 = 3$ | 19.8 | 2 | M1 for use of SF from (a) to find *BC* or *AC* and adding 4 sides<br>A1 cao |
| 20 | $\frac{6 \times 10^{15}}{3.2 \times 10^{8}}$<br>$1.875 \times 10^{7}$ | $4.3 \times 10^{3}$ | 3 | B3 for $4.3 \times 10^{3}$ to $4.34 \times 10^{3}$<br>(B2 for $1.875 \times 10^{7}$ oe or 4300 to 4340 or final answer of $1.9 \times 10^{7}$)<br>(B1 for sight of $6 \times 10^{15}$ oe or $3.2 \times 10^{8}$ oe) |
| 21 | $8.5 \times \tan 38 = 8.5 \times 0.7813$ | 6.64 | 3 | M1 for correct use of trig, eg $\tan 38 = \frac{opp}{8.5}$<br>M1 for 8.5 × tan38<br>A1 6.64 – 6.641 |

**Paper 5504**

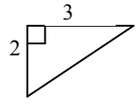
| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 22 (a) | | No, as you would expect about 100. Yes, as it is possible to get 200 sixes with a fair dice | 1 | B1 for a consistent answer |
| (b) | $\frac{1}{6}, \frac{5}{6}$ + labels | | 3 | B1 for $\frac{5}{6}$ on the red dice, *not six* branch<br>B1 for a fully complete tree diagram with all branches labelled<br>B1 for $\frac{1}{6}$, $\frac{5}{6}$ on all remaining branches as appropriate |

**Paper 5505**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 1 (i)<br>(ii)<br>(iii) | | 119.31<br>119310<br>1.23 | 3 | B1 cao<br>B1 cao<br>B1 cao |
| 2 | $\frac{10}{100}\times 12000 = 1200$<br>12 000 – 1200 = 10 800<br>10 800 ÷ 10 =1080<br>10 800 – 1080 = £9720 | 9720 | 3 | M1 for $\frac{10}{100}\times 12\,000$ or sight of 1200 or 2400 or 10 800 or 9600<br>M1 (dep) for $\frac{10}{100}\times(12\,000 - \frac{10}{100}\times 12\,000)$ or sight of 1080<br>A1 cao<br>Alternative markscheme<br>M2 for $12000\times\left(1-\frac{10}{100}\right)^2$<br>(M1 for $12000\times\left(1-\frac{10}{100}\right)$ )<br>A1 cao |
| 3 | $7r - 5r = -20 - 2$ | –11 | 2 | M1 for $7r + 2 = 5r - 20$ or $\frac{7r}{5} + \frac{2}{5} = r - 4$<br>or $7r - 5r = -20 - 2$ or $\frac{7r}{5} - r = -4 - \frac{2}{5}$<br>A1 cao |

**Paper 5505**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 4 (a) | | –1, 0, 1 | 2 | B2 for –1, 0, 1 only<br>(B1 for –1, 0 or 0,1 or –1, 1 or –2, -1, 0, 1 only) |
| (b) | | (–1,–1)(0,–1)<br>(1,–1) (0, 0)<br>(1, 0) (1, 1) | 3 | B3 for 6 points correct<br>(B2 for 3 points correct)<br>(B1 for 1 point correct)<br>*NB: –B1 for each additional point over six* |
| 5 | | $5n + 1$ | 2 | B2 oe<br>(B1 for $5n$ seen)<br>NB: $n$ = gets B1 max |
| 6 (a) | Triangle with vertices at (0,0) (0,–2) and (3,0) | | 2 | M1 for correct orientation<br>A1 cao |
| (b) | Rotation, 180°, centre (0,1)<br>Enlargement sf –1 centre (0,1) | | 2 | B2 for 180° 'rotation' centre (0, 1) or for Enlargement sf - 1 centre (0,1)<br>(B1 for any two of the three parts)<br>NB: B0 if additional transformation is included |
| 7 | Bisector of $\angle BAC$<br>Arc around $A$<br>Region | See overlay | 3 | B3 cao<br>(B2 for either two correct boundaries, no shading/ wrong shading or one correct boundary, one incorrect boundary with valid shading)<br>(B1 for either two incorrect boundaries but one drawn from $A$ and one intersection, with valid shading or one correct boundary)<br>Ignore shading outside the triangle |
| 8 | | Length<br>Volume<br>Area | 3 | B1 for Length<br>B1 for Volume<br>B1 for Area |



**Paper 5505**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 9 (a) | Unbiased question with choices | | 2 | B1 for unbiased question<br>B1 for at least 2 choices |
| (b) | Leading question and a restricted sample | | 2 | Classification 1: A biased question<br>Classification 2: A restricted sample of people<br>Classification 3: Not specifying a range of foods<br>Classification 4: Nothing to do with eating habits<br>B2 reasons which satisfy 2 different classifications<br>(B1 a reason which satisfies one classification) |
| 10 (a) | $6 \times 10^2 \times 8 \times 10^4$<br>$48 \times 10^6 = 4.8 \times 10^7$ | $4.8 \times 10^7$ | 3 | M1 for $6 \times 10^a \times 8 \times 10^b$ oe, $a$ and $b$ integers including 0<br>A1 for $48 \times 10^6$ oe<br>A1 cao |
| (b) | 200 000 + 30 000 = 230 000 | 230 000 | 2 | B2 cao<br>(B1 for sight of 200 000 or 30 000 or $2.3 \times 10^5$ or $23 \times 10^4$) |
| 11 (a) | $x^2 + xy + xy + y^2$ | $x^2 + 2xy + y^2$ | 2 | M1 for at least 3 of the 4 terms correct<br>A1 cao |
| (b) | | 25 | 2 | M1 for recognising 3.47 + 1.53 (= 5)<br>A1 cao |
| 12 (i) | Tangent 90° to diameter /radius/ line from (through) centre | 27° | 4 | B1 for 27° cao<br>B1 for reason |
| (ii) | 180 –(90+ "27")<br>angle in semicircle (is 90°)/Alternate segments /angle at centre twice at circumference | 63° | | B1 ft for 90–"27" if not 63°<br>B1 for reason |
| 13 (i) | | $p^9$ | 1 | B1 cao |
| (ii) | | $6q^6$ | 2 | B2 for $6q^6$<br>(B1 for sight of $\frac{6q^9}{q^3}$ or $3q \times 2q^5$ or $3q^4 \times 2q^2$ or $6 \times q \times q \times q \times q \times q \times q$ or final answer of the form $kq^6$, $k > 0$) |

**Paper 5505**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 14 (a)(i) | | 152 | 2 | B1 cao |
| (ii) | | 177 | | B1 cao |
| (b) | | | 3 | B1 for median marked at 167<br>B1 ft for postion of box with its ends at "152" and "177"<br>B1 for position of whiskers with ends at 132 and 182<br>NB: For any points plotted between 141 and 149 give a tolerance of an extra ± 1 square |
| 15 | (arc = ) $\frac{40}{360} \times 2\pi \times 9$<br>$= 2\pi$ | $2\pi + 18$ | 4 | M1 for $\frac{40}{360} \times$<br>M1 for $2\pi \times 9$<br>M1 (dep) for $\frac{40}{360} \times 2\pi \times 9$ oe<br>A1 for $\frac{18 \times \pi}{9} + 18$ oe exact form |
| 16 (i) | | 1 | 1 | B1 cao |
| (ii) | | $\frac{1}{16}$ | 1 | B1 cao accept 0.0625 |
| (iii) | | 64 | 1 | B1 cao condone ± 64 |

**Paper 5505**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 17 (a) | $F \propto 1/x^2$<br>$F = k/x^2$<br>$4 = k / 3^2$<br>$F = 36/x^2$ | $F = \frac{36}{x^2}$ | 3 | M1 for $F = k/x^2$ seen or implied. ($k \neq 1$)<br>M1 (dep) for subst. or sight of $k = 36$<br>A1 for $F = 36/x^2$ |
| (b) | | 9 | 1 | B1 ft for 9 (ft on $F = kx^n$, $n \neq 0$) |
| (c) | $64 = \frac{36}{x^2}$<br>$x^2 = \frac{36}{64}$<br>$x = \pm\frac{3}{4}$ | $\frac{6}{8}$ | 2 | M1 for $x^2 = \frac{"36"}{64}$<br>A1 for $\frac{6}{8}$ oe (condone $\pm$)<br>*SC: Use of $F = kx^2$ max M1 M1 A0 B1 ft M0 A0*<br>*SC: Use of* $F = \frac{k}{\sqrt{x}}$<br>*max M1 M1 A0 B0 M1* ($\sqrt{x} = \frac{4\sqrt{3}}{64}$) *A0* |
| 18 | $(5+\sqrt{3})(5-\sqrt{3}) = 5\times5 - 5\sqrt{3} + 5\sqrt{3} - \sqrt{3}\sqrt{3}$<br>$= 5\times5 - 3$<br>$\frac{22}{\sqrt{22}} = \frac{22\sqrt{22}}{22}$ | $\sqrt{22}$ | 3 | B1 for correct expansion $25 - 5\sqrt{3} + 5\sqrt{3} - \sqrt{3}\ \sqrt{3}$ with 1st three terms reducing to 25 **without** any errors seen<br>B1 (indep) for $\sqrt{3}\ \sqrt{3} = 3$<br>B1 for $\sqrt{22}$ coming from $\frac{22}{\sqrt{22}}$<br>(S.C $\frac{(5+\sqrt{3})(5-\sqrt{3})\sqrt{22}}{22}$ gets B1) |

**Paper 5505**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 19 (a) | | 60<br>40 | 2 | B1 cao<br>B1 cao |
| (b) | | correct bars | 2 | B1 for $30 < x \leq 40$ with an area of 2½ squares<br>B1 for $40 < x \leq 70$ with an area of 3 squares<br>*SC:* $\frac{0}{4}$ *give M1 if clearly using area or frequency density* |
| 20 (a) | $6x + 8 - 12x + 15$ | $-6x + 23$ | 2 | M1 for 3 of the 4 terms $6x$, $+8$, $-12x$, $+15$ correct<br>A1 cao |
| (b) | | $32x^5y^{15}$ | 2 | B2 cao<br>(B1 for two of 32, $x^5$, $y^{15}$) |
| (c) | $\frac{(n+1)(n-1)}{n+1} \times \frac{2}{n-2}$<br>$\frac{2(n-1)}{n-2}$ | $\frac{2(n-1)}{n-2}$ | 3 | M1 for $k(n + 1)(n - 1)$<br>M1 dep for $\frac{(n+1)(n-1)}{(n+1)} = n - 1$<br>A1 for $\frac{2(n-1)}{n-2}$ |
| 21 | Vertices at<br>$(-3, -1\frac{1}{2}), (-4\frac{1}{2}, -1\frac{1}{2}), (-3, -4\frac{1}{2})$ |  | 3 | B1 for all sides $\times 1\frac{1}{2}$<br>B1 for correct orientation with 2 vertices almost correct<br>B1 cao |

**Paper 5505**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 22 | Total = 3 + 5 + 2 (=10)<br>$\frac{3}{10}\times\frac{3}{10}\times\frac{5}{10}\left(=\frac{45}{1000}\right), \frac{3}{10}\times\frac{3}{10}\times\frac{2}{10}\left(=\frac{18}{1000}\right)$<br>$\frac{5}{10}\times\frac{5}{10}\times\frac{3}{10}\left(=\frac{75}{1000}\right), \frac{5}{10}\times\frac{5}{10}\times\frac{2}{10}\left(=\frac{50}{1000}\right)$<br>$\frac{2}{10}\times\frac{2}{10}\times\frac{3}{10}\left(=\frac{12}{1000}\right), \frac{2}{10}\times\frac{2}{10}\times\frac{5}{10}\left(=\frac{20}{1000}\right)$<br>$3\times\left(\frac{"45"}{1000}+\frac{"18"}{1000}+\frac{"75"}{1000}+\frac{"50"}{1000}+\frac{"12"}{1000}+\frac{"20"}{1000}\right)$<br>$\frac{660}{1000}$ | $\frac{660}{1000}$ oe | 5 | M3 for all six expressions seen OR their combined equivalents<br>(M2 for four expressions seen OR their combined equivalents)<br>(M1 for two expressions seen OR their combined equivalents)<br><br>M1 sum of 18 relevant products condone 1 slip<br><br>A1 for $\frac{660}{1000}$ oe<br>*SC: without replacement maximum M4 A0*<br>SC: Just 2 beads: Answer either $\frac{38}{100}$ oe OR $\frac{28}{90}$ oe B1 |

**Paper 5505**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 23 (a)(i) | | $6\mathbf{b} - 6\mathbf{a}$ | 2 | B1 for $6\mathbf{b} - 6\mathbf{a}$ oe |
| (ii) | | $6\mathbf{a}$ | | B1 for $6\mathbf{a}$ oe |
| (b) | $\overrightarrow{EX} = \overrightarrow{EB} + \overrightarrow{BX}$<br>$= 12\mathbf{b} + \frac{1}{2}\overrightarrow{BC}$ | $12\mathbf{b} - 3\mathbf{a}$ | 2 | M1 for $\overrightarrow{EX} = \overrightarrow{EB} + \overrightarrow{BX}$ oe vector journey in a form ready for straightforward substitution<br>A1 for $12\mathbf{b} - 3\mathbf{a}$ oe |
| (c) | $\overrightarrow{AY} = \frac{5}{3}\overrightarrow{AB}$ or $\overrightarrow{BY} = \frac{2}{3}\overrightarrow{AB}$<br>$\overrightarrow{EY} = 16\mathbf{b} - 4\mathbf{a}$ or $\overrightarrow{XY} = 4\mathbf{b} - \mathbf{a}$<br>$\overrightarrow{EY} = 4\overrightarrow{XY}$ or $\overrightarrow{EX} = 3\overrightarrow{XY}$ or $\overrightarrow{EY} = \frac{4}{3}\overrightarrow{EX}$ | Printer Answer | 3 | B1 for either $\overrightarrow{AY} = \frac{5}{3}\overrightarrow{AB}$ or $\overrightarrow{BY} = \frac{2}{3}\overrightarrow{AB}$ oe<br>B1 ft for either $\overrightarrow{EY} = 16\mathbf{b} - 4\mathbf{a}$ or $\overrightarrow{XY} = 4\mathbf{b} - \mathbf{a}$<br>ft only on parts (*a*) and (*b*)<br>B1 for either $\overrightarrow{EY} = 4\overrightarrow{XY}$ or $\overrightarrow{EX} = 3\overrightarrow{XY}$ or $\overrightarrow{EY} = \frac{4}{3}\overrightarrow{EX}$ oe **plus** conclusion of *E*, *X*, *Y* on the same straight line |
| 24 (a)(i) | | $(5, -4)$ | 4 | B1 cao |
| (ii) | | $(2, -9)$ | | B1 cao |
| (iii) | | $(2, 4)$ | | B1 cao |
| (iv) | | $(1, -4)$ | | B1 cao |
| (b) | | $(x-2)^2 - 4$ | 4 | B4 for $(x-2)^2 - 4$ oe eg. $x^2 - 4x$<br>(B3 for $(x+2)^2 - 4$ or $(x-2)^2 + 4$)<br>(B2 for $x^2 - 4$ or $(x-2)^2$ OR $x^2 + bx$, $b \neq 0$ OR $(x+2)^2 + 4$ OR $f(x-2) - 4$)<br>(B1 for $x^2 + 4$ or $(x+2)^2$ or $ax^2 + bx$ or $x^2 + bx + c$ OR $x - 2 - 4$ or $x^2 - 2 - 4$, $a, b, c \neq 0$) |

**Paper 5506**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 1 (a) | $V = \pi \times 4^2 \times 10$ | 502 – 503 cm$^3$ | 2 | M1 for $\pi \times 4^2 \times 10$<br>A1 502 – 503 |
| (b) | $P^2 = 10^2 + 8^2$<br>$P = \sqrt{164}$ | $\sqrt{164} < 13$ | 3 | M1 for sight of correct right angled triangle<br>M1 for $10^2 + 8^2$<br>A1 for conclusion based on a correct calculation<br>Or 12.8 seen |
| 2 (a)(i) | $2 \times 30$ | $2 \times 2 \times 3 \times 5$ | 4 | M1 for systematic method, eg division, factor trees (at least one prime)<br>A1 cao |
| (ii) | $2 \times 48$ | $2^5 \times 3$ | | M1 for systematic method, division, factor trees (at least one prime)<br>A1 cao |
| (b) | | 12 | 1 | B1 cao |
| (c) | $2^5 \times 3 \times 5$ | 480 | 2 | B2 cao<br>B1 for $2^5 \times 3 \times 5$ or any correct common multiple |

**Paper 5506**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 3 (a) | | $150 < C \leq 200$ | 2 | M1 use of cum freq to find the cost of the $20^{th}$ or $20.5^{th}$ car<br>OR $\frac{1}{2}\Sigma f$ th or $\frac{1}{2}(\Sigma f + 1)$ th car.<br>A1 eg 150 to 200, 150 – 200 |
| (b) | | No, because the $21^{st}$ value is in the same interval | 1 | B1 for $20.5^{th}$ or $21^{st}$ value in the same internal consistent with 'a'<br>OR<br>Refers to the median value being low in the interval (statement to be mathematically correct)<br>See additional sheet |
| (c) | 80% = 5200<br>$\frac{5200}{80} \times 100$ | 6500 | 3 | M1 for (100 – 20)% = 5200<br>M1 for $\frac{5200}{"80"} \times 100$<br>A1 cao |

**Paper 5506**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 4 (a) | $x^2(x + 1) = 230$ | AG | 2 | M1 for $x \times x \times (x+1)$ or $x \times x \times x + 1$ oe, $x^2(x+1)$, $x^2 \times x + 1$<br>A1 cao from $x \times x \times (x+1)$, no need to see 230 |
| (b) | 5 – 150 6 – 252<br>5.1 – 158.7<br>5.2 – 167.6<br>5.3 – 177.0<br>5.4 – 186.6<br>5.5 – 196.6<br>5.6 – 207.0<br>5.7 – 217.7<br>5.8 – 228.8<br>5.9 –240.2<br>5.85 – 234.4 | 5.8 | 4 | B2 for trial between 5.8 and 5.9 inclusive evaluated<br>(B1 for trial between 5 and 6 inclusive evaluated)<br>B1 for different trial between 5.8 and 5.85 (not including 5.8)<br>B1 dep on at least are previous B1 5.8, 5.81, 5.811 |
| 5 | $\pi \times \left(\frac{15}{2}\right)^2 = 176.715$ | 88.4 $cm^2$ | 3 | M1 for $\pi \times \left(\frac{15}{2}\right)^2$ seen<br>A1 88.3 – 88.4<br>B1 for cm² (independent) |

**Paper 5506**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 6 (a) | $5 = 0.5x + 1$ | 8 | 2 | M1 for $5 = 0.5x + 1$<br>A1 cao |
| (b) | | $y = \frac{1}{2}x + c$ | 1 | B1for $y = \frac{1}{2}x + c$, $c \neq 1$, oe |
| (c) | | $x = 2y - 2$ OR<br>$x = 2(y - 1)$ | 2 | M1for correctly multiplying both sides by 2 or correctly isolating $\frac{x}{2}$<br>A1 for $x = 2(y - 1)$, $x = \frac{y-1}{0.5}$, $\frac{y-1}{\frac{1}{2}}$ oe<br>SC B1 for $x$= 2y -1 |
| 7 | $4x - 6y = 22$<br>$15x + 6y = 54$<br>$19x = 76$ | $x = 4,\ y = -1$ | 4 | M1 for coefficients of $x$ or $y$ the same followed by correct operation, allow one arithmetical error<br>A1 cao<br>M1 (dep) for correct sub for other variable<br>A1 cao<br>Trial and improvement 0 marks unless both correct values of $x$ and $y$ found |
| 8 (a) | SF = $\frac{10}{6}$<br>$\frac{10}{6} \times 4.8 = 8$ | 8 | 2 | M1 for sight of $\frac{10}{6}$ or $\frac{6}{10}$ or 1.67 or better or $\frac{CD}{10} = \frac{4.8}{6}$<br>A1 cao |
| (b) | $\frac{10}{6} \times 4.5 - 4.5 = 3$ | 19.8 | 2 | M1 for use of SF from "a" to find AC or BC or $\frac{BC}{4.5} = \frac{4}{6}$ and adding 4 sides<br>A1 cao |

**Paper 5506**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 9 | $\frac{6\times10^{15}}{3.2\times10^{8}}$<br><br>$1.875\times10^{7}$ | $4.3\times10^{3}$ | 3 | B3 for $4.3\times10^{3}$ to $4.34\times10^{3}$<br>(B2 for $1.875\times10^{7}$ oe or 4300 to 4340, final answer of $1.9\times10^{7}$<br>B1 for sight of $6\times10^{15}$ oe or $3.2\times10^{8}$ oe) |
| 10 | $8.5\times\tan38$<br>$=8.5\times0.7813$<br>$\frac{8.5}{\sin(90-38)}=\frac{AB}{\sin38}$<br>$AB=\frac{8.5\times\sin38}{\sin(90-38)}$<br>$=\frac{5.2331}{0.788}=6.64$ | 6.64 | 3 | M1 for correct use of trig, eg $\tan 38=\frac{opp}{8.5}$<br>M1 for $8.5\times\tan38$<br>A1 6.64 – 6.641<br>OR<br>M1 for correct substitution into the sine rule<br>M1 (dep) for correct rearrangement for $AB$=<br>A1 6.64 – 6.641 |
| 11 (a) | | No, as you would expect about 100. Yes, as it is possible to get 200 sixes with a fair dice | 1 | B1 for a consistent answer<br>See additional sheet |

**Paper 5506**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| (b) | $\frac{1}{6}, \frac{5}{6}$ + labels | | 3 | B1 for $\frac{5}{6}$ on the red dice, *not six* branch<br>B1 for a fully complete tree diagram with all branches labelled<br>B1 for $\frac{1}{6}$ and $\frac{5}{6}$ on all remaining branches as appropriate |
| (c)(i) | $\left(\frac{1}{6}\right)^2$ | $\frac{1}{36}$ | 2 | M1 $\left(\frac{1}{6}\right)^2$ or $\frac{1}{6}\times\frac{1}{6}$ only or 0.28<br>A1 $\frac{1}{36}$ or 0.03 or better |
| (ii) | $1-\left(\frac{5}{6}\right)^2$<br>OR<br>$\frac{1}{6}\times\frac{5}{6}+\frac{5}{6}\times\frac{1}{6}+\frac{1}{6}\times\frac{1}{6}$ | $\frac{11}{36}$ | 3 | M2 for $1-\left(\frac{5}{6}\right)^2$ or $1-\frac{5}{6}\times\frac{5}{6}$<br>A1 cao<br>OR<br>M1 for $\frac{1}{6}\times\frac{5}{6}$ oe<br>M1 for 2 or 3 only of $\frac{1}{6}\times\frac{5}{6}, \frac{5}{6}\times\frac{1}{6}$, "a"<br>A1 for $\frac{11}{36}$ or 0.31 or better |

**Paper 5506**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 12 (a) | $\pi \times 30 \times \frac{7.5^2}{3} - \pi \times 10 \times \frac{2.5^2}{3} = 1767 - 65$ | 1700 | 3 | M1 for either $\pi \times 30 \times \frac{7.5^2}{3}$ or $\pi \times 10 \times \frac{2.5^2}{3}$<br>M1 (dep) for difference<br>A1 1700 – 1702<br>**SC** B1 Using d instead of r, 6800 – 6808 |
| (b) | $\frac{S}{2\pi d} = \sqrt{h^2 + d^2}$<br>$\left(\frac{S}{2\pi d}\right)^2 = h^2 + d^2$ | $h = \sqrt{\frac{S^2 - 4\pi^2 d}{4\pi^2 d^2}}$ | 3 | M1 for correctly isolating $\sqrt{h^2 + d^2}$ or $h^2 + d^2$ or $h + d$ or $kh^2$ or $kh$<br>M1(indep) squaring both sides<br>A1<br>$h = \sqrt{\frac{S^2 - 4\pi^2 d^4}{4\pi^2 d^2}}$, $h = \frac{\sqrt{S^2 - 4\pi^2 d^4}}{2\pi d}$<br>$h = \sqrt{\left(\frac{S}{2\pi d}\right)^2 - d^2}$ |
| (c) | $\left(\frac{30}{20}\right)^2 \times 450$ or $450 \div \left(\frac{20}{30}\right)^2$ | 1012.5 | 2 | M1 for sight of correct $SF^2$ including 4:9<br>A1 1010 to 1013 |

**Paper 5506**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 13 (a) | $\frac{2x(x+20)}{2} = 400$ | As given | 2 | M1 $\frac{2x(x+20)}{2}$ or $\frac{2x \times x + 20}{2}$ or $2x(x + 20) = 800$<br>A1 cao following correct working, no need for = 400<br>*SC B1* $2x \times x + \frac{1}{2} \times 2x(10 - \frac{x}{2}) \times 2$ |
| (b) | $\frac{-20 \pm \sqrt{20^2 - 4 \times 1 \times (-400)}}{2}$<br>$= \frac{-20 \pm 44.721}{2}$ | 12.361 | 3 | M1 for correct sub, up to signs, in the quad formula<br>A1 for 44.7 or $\sqrt{2000}$<br>A1 for 12.3606 – 12.361, ignore negative solution<br>T.I B3 for 12.361<br><br>OR<br>Completing the square<br>M1 for $(x+10)^2$ seen<br>A1 for $-10 \pm \sqrt{500}$<br>A1 for 12.3606 – 12.361 ignore negative solution |

**Paper 5506**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 14 (a) | $0.5\times 8\times 15\times \sin 70^0$ | 56.4 | 2 | M1 for correct sub into area formula<br>A1 56.38 – 56.4 |
| (b) | $AB^2 = 8^2 + 15^2 - 2\times 8\times 15\times \cos 70^0 = 206.9$<br><br>EITHER<br>$0.5\times AB\times CX$ ='56.38'<br><br>OR<br>$\frac{\sin B}{8} = \frac{\sin 70}{\sqrt{'206.9'}}$<br>$B = 31.5$<br>15 sin '31.5' | 7.84 | 4 | M1 for correct sub into cos rule<br>A1 for 206.9 - 207 or 14.38 – 14.4<br><br>EITHER<br>M1 for use of area rule to find CX<br>A1 7.83 – 7.84<br>OR<br>M1 for correct use of sine rule to find sin B or sin A and then sight of 15sin B *or* 8 sin A<br>A1 7.83 – 7.84 |

**Paper 5506**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 15 (a) | $4a^2-4a+1-(4b^2-4b+1)=$<br><br>$4(a^2-b^2)-4(a-b)$<br>$4(a-b)(a+b-1)$<br><br>OR<br>$((2a-1)-(2b-1))((2a-1)+(2b-1))$<br>$(2a-2b)(2a+2b-2)$ | AG | 3 | Expansion Method<br>M1 for a correct expansion of any one of the three terms<br>M1(dep) on an attempt to expand all 3 terms and show LHS = RHS<br>A1 fully correct algebra<br>RHS exp is $4\left(a^2+ab-a-ba-b^2+b\right)$<br><br>OR Factorisation Method<br>M1 for attempt to use difference of 2 squares on LHS<br>M1 for one bracket correctly simplified<br>A1 fully correct |
| (b) | Any 2 odd square numbers have the above form<br><br>If $a$ and $b$ are both even or odd then $a-b$ is even, so $4(a-b)$ is a multiple of 8<br>If one of $a$,$b$ is odd, then $a+b-1$ is even, so $4(a+b-1)$ is a multiple of 8 | | 3 | B1 'any 2 square nos have the above form' (may be implied by sight of $(2a-1)^2-(2b-1)^2$ in part (b))<br>B1 first reason<br>B1 second reason<br><br>SC B1 for $(2r+1)^2-(2r-1)^2$<br>B1 for 8r |
| 16 (a) | $g_L=\dfrac{2\times 4.495}{1.35^2\times\sin 30.5}$<br><br>$g_u=\dfrac{2\times 4.505}{1.25^2\times\sin 29.5}$ | 9.719<br><br>11.710 | 4 | B2 for any 4 of 4.505, 1.25, 29.5, 4.495, 1.35, 30.5 seen (B1 for any two or three seen)<br>B1 for 11.710 – 11.7103<br>B1 cao 9.719 – 9.71904 |
| (b) | Round, until lower and upper bounds agree | 10 | 1 | B1 for 10 + reason " they agree to this level of accuracy" |

**Paper 5506**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 17 (a)(i) | | $xy$ | 3 | B1 cao |
| (ii) | | $y^2$ | | B1 for $y^2$ or $y \times y$ |
| (iii) | | $\frac{x}{2}$ | | B1 for $\frac{x}{2}$ or $0.5x$ or $2^{-1}x$ |
| (b) | Divide to get $2y = 1$ | $q = -1$ | 2 | M1 for $2y = 1$ or $\frac{x}{2} = 32$ or $p + q = 5$ or $1 + p + 2q = 5$ |
| | | $p = 6$ | | A1 cao |
| 18 (a) | $x^2 - 2mx + m^2 - k$ | $k = m^2$ | 2 | M1 for correct exp of $(x - m)^2$ or correct completion of the square eg $\left(x - \frac{2m}{2}\right)^2 - \left(\frac{2m}{2}\right)^2$ |
| | | | | A1 cao |
| | | | | SC B1 for $k = -m^2$ |
| (b)(i) | Min value is $-m^2$ | $-m^2$ | 3 | M1 for recognition that min value occurs when $(x - m)^2 = 0$ (either (b)(i) or (b)(ii) correct implies this M1) |
| (ii) | $x = m$ | $m$ | | A1 ft on '$k$', " $-k$" gets M1 A0 |
| | | | | A1 cao |
| 19 | $0.06 \times 0.05 = 0.003$ | No | 2 | M1 for $0.06 \times 0.05$ |
| | | | | A1 correct conclusion based on 0.003 or 0.06 x 0.05 stated as $\neq 0.0011$ |
| | | | | OR M1 for statement that for the two events to be independent P (BL and CL) = P(BL) × P(CL) |

| Paper 5506 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 20 | | 50<br><br>50<br>4 | 3 | B1 50 or $\frac{100}{2}$<br>B1 for 50 or "$a$"<br>B1 4 or $\frac{360}{90}$ oe |

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# NOTES ON MARKING PRINCIPLES

## NOTES ON MARKING PRINCIPLES

**1 Three types of mark are available**

M marks - awarded for correct working seen or implied.
A marks - conditional accuracy marks which are awarded for accurate working following the award of M marks.
B marks - unconditional accuracy marks (independent of M).

**2 Abbreviations**

cao - correct answer only.
ft - follow through.
$\surd$ - Denotes a "follow through" answer.

*SC* - special case.
isw - ignore subsequent working.
oe - or equivalent (and appropriate).
NB: a candidate cannot benefit from both isw and ft.

**3 If no working shown, then**

correct answers normally score full marks
incorrect (even though nearly correct) answers score no marks.

**4 Marking instructions**

Misread loses A marks (and sometimes B marks) on that part but ft can be allowed on subsequent parts. M marks can still be earned. If in doubt contact your team leader.
If there is a wrong answer in the answer space DO CHECK the working in the body of the script.

- If it is clear from working that the "correct" answer has been obtained from incorrect working, award no marks. If in doubt contact your team leader.
- If there is a wrong answer in the answer space DO CHECK the working in the body of the script.
- If it is clear from working that the "correct" answer has been obtained from incorrect working, award no marks. If in doubt contact your team leader.

**5 Style of marking**

Answer correct: tick and write part mark in margin NEXT TO BRACKETED MARK.
Answer incorrect: cross, but show M, A or B marks if any earned in body of script and transfer the total of these to the margin next to the bracket mark.
Total for each double page at bottom right page (except for back if used), FINAL TOTAL IN RELEVANT BOX ON FRONT COVER.
Nought in margin for fully incorrect question or page AND FOR NO ATTEMPT.
Where no attempt has been made a line should be put in the answer space and zero in the margin next to the bracketed mark
CHOICE OF METHOD – No marks unless one answer is in answer space – then mark that.
CROSSED OUT WORK - if not replaced this should be marked (if legible).
There must always be a mark next to bracketed mark in the margin/

**6 Follow Through Marks**

Follow throughs are guided by two principles:

(a) Follow throughs which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous, do not award.
(b) Follow throughs which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

**7 Probability**

Probability answers must be given as fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least two decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

**6 Linear Equations**

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

**8 Parts of questions**

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

| PAPER 5501 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 1 | | | K: 1020<br>L: 8.06 | 2 | B1 for 1020 or 1,020<br>B1 for 8.06 Accept £8.06p and £8,06 |
| 2 | (a) | | 28, 33 | 2 | B1, B1<br>(B1 ft for "28" + 5 if both numbers >25) |
| | (b) | | | 1 | B1 for add 5, +5, for going up in 5's the difference is 5 oe |
| | (c) | | | 1 | B1 for they end in 3 and 8, it ends in 7;<br>or refers to 383 and 388 are in sequence |
| 3 | (a)(i) | | $\frac{1}{2}$ | 2 | B2 for ½ accept half<br>(B1 for an equivalent unsimplified fraction eg 4/8 or 50% or 0.5) |
| | (ii) | | 2 rectangles shaded | 1 | B1 for correct shading (any 2 rectangles) |
| | (b)(i) | | 40 | 4 | B1 for 40 cao |
| | (ii) | | 150 000 | | B1 for 150 000 cao (accept 150,000 not 150.000) |
| | (iii) | | 6.55 | | B1 for 6.55 cao not $6.5^{½}$ |
| | (iv) | | $\frac{3}{8}$ | | B1 for $\frac{3}{8}$ oe accept 0.375 |
| | (c) | | Cross 3cm from *A* | 1 | B1 mark a cross 3 cm (±2 mm) from *A* |
| 4 | (a)(i) | | metres | 2 | B1 for metres (m) |
| | (ii) | | grams | | B1 for grams (g) |
| | (b) | | miles | 1 | B1 for miles |
| 5 | (a) | | (3, 2) | 1 | B1 for (3, 2) |
| | (b)(i) | | *Q* at (0, 3) | 1 | B1 for *Q* plotted correctly on *y*-axis at (0, 3) ±2mm |
| | (ii) | | *R* at (−2, −3) | 1 | B1 for *R* plotted correctly at (−2, −3) ±2mm |
| 6 | (a)(i) | | 30 | 2 | B1 for 30 |
| | (ii) | | 25 | | B1 for 25 |
| | (b)(i) | | 4 shapes | 2 | B1 for drawing 4 shapes |
| | (ii) | | 1½ shapes | | B1 for drawing 1½ shapes |

| PAPER 5501 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 7 | (a) | | 30 | 1 | B1 for 30 |
| | (b) | $20 \times 3 + 5$ | 65 | 2 | M1 for $20 \times 3 + 5$ oe<br>A1 for 65 |
| 8 | (a) | | Draws perp. | 1 | B1 for correctly drawing perp must touch line or cut line *AB* ± 2mm |
| | (b) | | Sketches a cylinder | 1 | B1 for sketching cylinder |
| 9 | (a) | 1974<br>6580<br>8554 | 855.4 | 3 | M1 for complete method with relative place value correct, condone 1 error in multiplication<br>A2 cao<br>(A1 for digits 8554 seen or A1 for "855.4" dependent on 1 arithmetic error) |
| | (b) | 990 ÷ 69 = 14.3…. or 14 rem 24 | 14 | 4 | Method 1 - Everything excluding long division<br>M2 for a valid method with no errors …need to see 966 or 1035<br>(M1 for a valid method, including estimation, that reaches an answer between 901 and 1099 inclusive. Ignore errors.)<br>A2 for 14 with a fully correct method<br>(A1 (dep on 1st M1) for an answer between 14 and 15 inclusive. Ignore errors. Cannot have used estimation.)<br>Note: Estimation can only score a maximum of M1 unless accompanied by another method or 966 or 1035 see (award M2)<br>Method 2 – long division method<br>M2 for 990 ÷ 69 = integer answer between 12 and 19 inclusive and rem 30 seen<br>(M1 for 990 ÷ 69 with 1 in tens column.)<br>A2 for 14 with fully correct method<br>(A1 (dep on 1st M1) for an answer between 14 and 15 inclusive.) |

| PAPER 5501 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 10 | (a)(i) | | 7 | 2 | B1 for 7 |
| | (ii) | | −10 | | B1 for −10 |
| | (b)(i) | | 6 | 2 | B1 for 6 (accept −6) |
| | (ii) | | 8 | | B1 for 8 (accept −8) |
| | (c) | | −7 | 1 | B1 for −7 cao |
| 11 | (a) | | B and D | 2 | B1, B1 (–1 each extra) |
| | (b)(i) | | A | 2 | B1 for A |
| | (ii) | | 3 | | B1 for 3 |
| 12 | (a) | 800 − 144 | 656 | 2 | M1 for at least 1 digit correct and in correct position<br>needs to be 3 digit number<br>A1 for 656 |
| | (b) | 144 is less than 200 so Trudy is wrong | | 2 | B1 for 200<br>B1ft for 'correct' explanation based on cand's "200" |
| | (c) | $\frac{45\times800}{100}$ | 360 | 2 | M1 for 45 × 800 ÷ 100 oe<br>A1 for 360 |
| | (d) | $\frac{176}{800}\times100$ | 22 | 2 | M1 for $\frac{176}{800}\times100$ oe<br>A1 for 22 |
| 13 | (a)(i) | | 25 | 4 | B1 for 25 |
| | (ii) | | 28 | | B1 for 28 |
| | (iii) | | 5 and 20 | | B1 for 5 and 20 |
| | (iv) | | 26 and 33 | | B1 for 26 and 33 |
| | (b) | $2^3 = 8$<br>or $2^3 = 2 \times 2 \times 2$<br>(which is not 6) | | 1 | B1 for valid 'explanation' |
| 14 | | | 10<br>$m^2$ | 2 | B1 for 10<br>B1 indep for $m^2$. |

| PAPER 5501 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 15 | (a) | $\frac{11}{12}-\frac{10}{12}$ | $\frac{1}{12}$ | 2 | M1 for correctly writing both fractions to a common denominator<br>A1 for $\frac{1}{12}$ oe |
| | (b) | $\frac{70\times400}{200}$ | 140 | 2 | B2 for 140 (accept 136)<br>(B1 for sight of any two of 70, 400 or 200) |
| 16 | (a) | | $2y$ | 1 | B1 for $2y$ or $2\times y$, $y2$, $y\times2$ |
| | (b) | | $3p^2$. | 1 | B1 for $3p^2$ or $3\times p^2$ or $p^2\times3$ or $p^2 3$ |
| | (c) | | $x(x-3)$ | 2 | B2 for $x(x-3)$<br>(B1 for $x$ ($x$…….))<br>$\frac{25}{60}$ wrongly cancelled gets B1 ISW |
| 17 | (a) | | 2 23 9 34<br>15 2 9 26<br>17 25 18 60 | 3 | B3 for all correct<br>(B2 for 4 or 5 entries correct)<br>(B1 for 2 or 3 entries correct) |
| | (b) | | $\frac{25}{60}$ | 1 | B1 for $\frac{25}{60}$ or $\frac{5}{12}$ oe<br>$\frac{25}{60}$ wrongly cancelled gets B1 ISW |

| PAPER 5501 | | | | | |
|---|---|---|---|---|---|
| | **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 18 | (a)(i) | | 60 | 2 | B1 for 60 |
| | (ii) | | | | B1 for all **angles equal** so equilateral triangle oe |
| | (b)(i) | | 130 | 3 | B1 for 130 |
| | (ii) | | | | B1 for isosceles triangle oe or 2 angles equal accept $\angle Q = \angle R$<br>B1 for angles on a straight **line** add up to **180°**oe (180° could be in working) |
| | (c) | | 64 | 1 | B1 for 64 |
| 19 | (a) | | 1 | 1 | B1 for 1 |
| | (b) | | 3 | 1 | B1 for 3 |
| | (c) | $9\times1+3\times2+5\times3+3\times4$ (= 42)<br>"42" ÷ 20 | 2.1 | 3 | M1 for $9\times1$, $3\times2$, $5\times3$, $3\times4$ or for 42 seen<br>M1 (dep) for "42" ÷ 20<br>A1 for 2.1 or $2\frac{1}{10}$ or $2\frac{2}{20}$ |
| 20 | (a) | | 09 05 | 1 | B1 for 09 05 oe |
| | (b) | | 7 | 1 | B1 for 7 |
| | (c) | | 10 | 1 | B1 for 10 |
| | (d) | 7km in 20 mins | 21 | 3 | B1 for 20 (minutes) oe or $\times3$ seen<br>M1 for $\frac{"7"}{"20"}$<br>A1 cao<br>[SC: "7" × 3 seen gets B1 M1] |

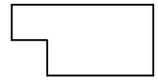
| PAPER 5501 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 21 | Vertices of new triangle at<br>(2, −2) (2, 6) and (6, −2) | Correct triangle drawn | 3 | B3 cao<br>(B2 for either correct triangle in wrong translated position or<br>for 2 vertices correct)<br>(B1 a right angled triangle with horizontal length 4 or vertical length 8 in the same orientation as the shaded triangle)<br>SC B2 for s + 3 totally correct |
| 22 (a)<br>(b)<br>(c) | <br><br>8560 ÷ (10 × 10) | 8<br>Pentagon<br>85.6 | 1<br>1<br>2 | B1 for 8<br>B1 for pentagon<br>M1 for 8560 ÷ (10 × 10) oe<br>A1 for 85.6 |
| 23 | $2x + x + 100 + 47 = 360$<br>$2x + x = 360 - 100 - 47$<br>$x = 71$<br>Largest angle = $2x$ = | 142 | 4 | M1 for $2x + x + 100 + 47 = 360$ or 360 – 147 or 213 seen<br>M1 dep for correctly separating $x$-terms and non $x$ terms or "360 – 147" ÷ 3<br>A1 for $x = 71$provided M2 awarded<br>A1 ft for 142 |

| PAPER 5502 | | | | | |
|---|---|---|---|---|---|
| | **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 1 | (a) | | Diagram | 1 | B1 cao |
| | (b) | | 22, 26 | 1 | B1 cao |
| | (c) | | 46 | 1 | B1 cao |
| 2 | (a) | £5.95 + £1.62 + 25p + 2 × 48p = £8.78 | 1.22 | 3 | M1 for 3 of £5.95, £1.62, 25p, 48p seen with intention to add or 170 seen<br>A1 for £8.78<br>A1 ft from " 8.78" |
| | (b) | 160 ÷ 12 = 13.(333…) | 14 | 2 | M1 for 160 ÷ 12, or 13 or better or 12 × 13 or 12 × 14<br>A1 14 cao |
| | (c) | "14" × £12.20 = £170.8**0** | 170.80 | 2 | M1 for "14" × 12.20<br>A1 for 170.8**0** or 158.6**0** if 13 in (b)<br>NB: 170.8 or 158.6 gets M1 A0 |
| 3 | (a)(i) | | 1459 | 1 | B1 cao |
| | (ii) | | 9541 | 1 | B1 cao |
| | (b) | | 9 + 5 = 14 | 1 | B1 cao |
| | (c) | | 0 | 1 | B1 cao |
| 4 | (a) | | 1123 | 1 | B1 cao |
| | (b) | | 1125 | 1 | B1 cao |
| | (c) | | 43 | 1 | B1 cao |
| | (d) | 67 – "43" | 24 | 2 | M1 for 67 – "43"<br>A1 ft from "43" |
| | (e)(i) | | 80 | 2 | B1 cao |
| | (ii) | | 56 – 58 | | B1 answer in range 56 to 58 inc |
| | (f) | | Completes graph | 2 | B2 for (Apr , 70) and (May , 60 < p < 65) plotted and joined (B1 for one point plotted) |

| PAPER 5502 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 5 | (a)(i) | | 4 | 1 | B1 cao |
| | (ii) | | 10 | 1 | B1 cao |
| | (b) | | 28 | 2 | B2 for 28<br>(B1 for 29 or $14 \times 2$) |
| 6 | (a) | | $\frac{3}{4}$ | 1 | B1 accept 0.75, 75% |
| | (b) | $\frac{3}{4} \times 28 = 21$ | 15.54 | 3 | M1 for $\frac{3}{4} \times 28$ or 21 seen<br>M1 for "21" $\times$ 74 or $28 \times 74$ or $7 \times 74$<br>A1 cao |
| | (c)(i) | | 44 – 46 | 2 | B1 44 – 46 inc |
| | (ii) | | 5.2 – 5.4 | | B1 5.2 – 5.4 inc |
| 7 | (a) | | Correct shape | 1 | B1 |
| | (b) | | Correct shape | 1 | B1 |
| 8 | (a) | | Hexagon | 1 | B1 |
| | (b) | | Right | 1 | B1 cao |
| | (c) | | Drawing | 2 | B2 for 7 additional hexagons with at least 2 points at which 3 hexagons meet<br>(B1 for one point at which 3 hexagons meet) |
| 9 | (a) | | $\frac{3}{4}$ | 2 | M1 $\frac{80-20}{80}$ or $\frac{60}{80}$ or 0.75 (oe)<br>A1 cao Do not accept equivalents |
| | (b) | | 15 | 1 | B1 cao |
| | (c) | | Iron and Cook set | 1 | B1 for both Accept mixer and fryer |
| | (d) | | Microwave | 1 | B1 cao |
| | (e) | | Bar chart | 2 | B1 one column (mixer): 70, 90<br>B1 second column (fryer): 70, 85<br>[SC: B1 columns correct but reversed] |

| PAPER 5502 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 10 | (a) | | Acute | 1 | B1 |
| | (b) | | Reflex | 1 | B1 |
| | (c) | | reason | 1 | B1 reason eg 120 + 230 = 350 ≠ 360 |
| 11 | (a) | | $\frac{1}{2}$ | 1 | B1 for $\frac{1}{2}$ oe |
| | (b) | | reason | 1 | B1 for reason e.g could get 30 heads |
| 12 | (a) | $7.5 \times 4$ | 30 | 2 | M1 for $7.5 \times 4$ or $7\frac{1}{2} \times 4$<br>A1 cao |
| | (b) | $\sqrt{(42.25)}$ | 6.5 | 2 | B2 for 6.5 (B1 for 42.25) |
| 13 | (a) | | $6x$ | 1 | B1 accept $6 \times x$, $x6$ oe |
| | (b) | | $x - 4$ | 1 | B1 cao |
| | (c) | | $12(x - 4)$ | 1 | B1 for $12(x - 4)$ or $12x - 48$ or $12 \times x - 48$ oe |
| | (d) | | $18x - 48$ | 2 | M1 for "$6x$" + "$12(x - 4)$" or "$6x$" + "$12x - 48$" oe<br>A1 ft $18x - 48$, $2(9x - 24)$, $3(6x - 16)$, $6(3x - 8)$ |
| 14 | (a) | | 90 | 2 | B2 for $90 \pm 2$ (B1 for $9 \pm 0.2$) |
| | (b) | | 317 | 1 | B1 for $317 \pm 4$ |
| 15 | (a) | Accurate drawing of triangle | | 2 | B1 cao for 38° (±2°)<br>B1 cao (indep) for BC drawn 7.3 cm (±2mm) and completing the triangle. |
| | (b) | Measure angle A | 63° | 1 | B1 for 63° (±2°) or ft their diagram (±2°) |

| PAPER 5502 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 16 | (a) | $0 \times 1 = 0$<br>$1 \times 1 = 1$<br>$2 \times 4 = 8$<br>$3 \times 8 = 24$<br>$4 \times 8 = 32$<br>$5 \times 7 = 35$ | 100 | 3 | M1 col 1 × col 2 (at least 3 shown)<br>M1 (dep) sum of totals<br>A1 cao<br>SC: M1 M1 A0 for 101 |
| | (b) | Either<br>$35.50 \div 1.42 = 25$; $26.99 - 25 = 1.99$<br>Cheaper in the USA<br>Or<br>$26.99 \times 1.42 = 38.33$; $38.33 - 35.50 = 2.83$<br>Cheaper in the USA | | 3 | M1 $35.50 \div 1.42$<br>A1 25 seen<br>B1 ft (dep on M1) £1.99 with conclusion (must have units)<br>**OR**<br>M1 $26.99 \times 1.42$<br>A1 38.32 or 38.33… seen<br>B1 ft (dep on M1) \$2.83 or \$2.82 with conclusion (must have units) must be to 2dp |
| 17 | (a) | | -1, (1), (3), 5, 7, 9 | 2 | B2 cao<br>(B1 for 2 values) |
| | (b) | | Graph | 2 | B1 ft for plotting points ±1/2 square<br>B1 cao for line between $x = -2$ and $x = 3$ |
| | (c)(i) | | 0.4 | 2 | B1 for 0.4 or ft from single straight line with positive gradient |
| | (ii) | | 1.2 | | B1 for 1.2 or ft from single straight line with positive gradient |

| PAPER 5502 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 18 | (a) | | Plots | 1 | B1 cao |
| | (b) | | description | 1 | B1 dynamic relationship or "positive" (correlation) |
| | (c) | | line of best fit | 1 | Line within overlay region, and to the extent of. |
| | (d)(i) | 280 g → | reading | 2 | B1 ft from single straight line of positive gradient (±1/2 square) |
| | (ii) | 120 pages → | reading | | B1 ft from single straight line of positive gradient (±1/2 square) |
| 19 | | | 200<br>150<br>225<br>150<br>10 | 3 | B3 cao<br>(B2 for three correct, or B1 for one correct) |
| 20 | (a) | |  | 2 | B1 B1 for correct sketch – ignore additional internal lines<br>B1 B0 for rectangle or right-angled triangle or correct shape without line<br>NB 3-D sketch gets B0 B0 |
| | (b) | |  | 2 | B1 B1 for correct plan – ignore internal lines – accept a rotated plan, not reflected<br>B1 B0 for a single rectangle drawn<br>NB 3-D sketch gets B0 B0 |
| 21 | (a) | 163.25 – 35.50 = 127.75<br>127.75 ÷ 18.25 = 7 | 8 | 3 | M1 163.25 – 35.50 (or sight of 127.75)<br>M1 (dep) "127.75" ÷ 18.25<br>A1 cao<br>SC: M2 for 7 days |
| | (b) | 1.175 × £64 or $\frac{17.5}{100}$ × 64 or £11.20 seen | 75.20 | 2 | M1 1.175 × 64, 0.175 × 64 oe or 11.20 or 75.2 seen or 6.40, 3.20 and 1.60 seen<br>A1 cao |

| PAPER 5502 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 22 | (a) | | 6 | 1 | B1 cao |
| | (b) | | $t^2 - 2t$ | 1 | B1 oe |
| | (c ) | | $3(y - 4)$ | 1 | B1 Accept $3 \times (y - 4)$ or $3(y - 4$ |
| 23 | (a) | | Reason | 1 | B1 Makes some mention of bias either directly or making reference to an insufficient or biased range of responses |
| | (b) | | Reason | 1 | B1 (a) an insufficient range of responses<br>(b) No mention of money<br>(c) No time frame in the question<br>(d) Misunderstanding of "A lot" and "Not much" |

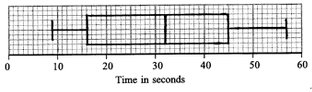
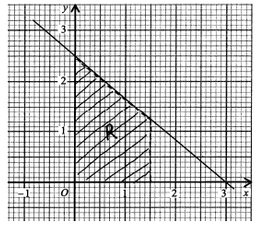
| PAPER 5503 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 1 | | | 10. | 1 | B1 for 10 |
| 2 | (a)(i) | | $3e + 2f$ | 2 | B1 for $3e + 2f$ |
| | (ii) | | $3p^2$ | | B1 for $3p^2$ |
| | (b) | $5 \times -3 + 1$ | $-14$ | 2 | M1 for $5 \times -3 + 1$<br>A1 for $-14$ |
| 3 | | 1974<br>$\frac{6580}{8554}$ | 855.4 | 3 | M1 for complete correct method with relative place value correct, condone 1 error in multiplication.<br>A2 cao<br>(A1 for digits 8554 seen or A1 ft for "855.4" dependent on one arithmetic error only) |
| 4 | (a) | | 2 23 9 34<br>15 2 9 26<br>17 25 18 60 | 3 | B3 all correct<br>(B2 for 4 or 5 entries correct)<br>(B1 for 2 or 3 entries correct) |
| | (b) | | $\frac{25}{60}$ | 1 | B1 for $\frac{25}{60}$ or $\frac{5}{12}$ oe |
| 5 | (a) | $\frac{45}{100} \times 800$ | 360 | 2 | M1 for $\frac{45}{100} \times 800$ oe<br>A1 for 360 |
| | (b) | $\frac{176}{800} \times 100$ | 22 | 2 | M1 for $\frac{176}{800} \times 100$ oe<br>A1 for 22 |

| PAPER 5503 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 6 | (a) | $\frac{11}{12}-\frac{10}{12}$ | $\frac{1}{12}$ | 2 | M1 for correctly writing both fractions to a common denominator<br>A1 for $\frac{1}{12}$ oe |
| | (b) | $\frac{70\times400}{200}$ | 140 | 2 | B2 for 140 (accept 136)<br>(B1 for sight of any two of 70, 400 or 200) |
| 7 | (a)(i) | | 60 | 2 | B1 for 60 |
| | (ii) | | | | B1 for all angles equal so equilateral triangle oe |
| | (b)(i) | | 130 | 3 | B1 for 130 |
| | (ii) | | | | B1 for isosceles triangle oe<br>B1 for angles on a straight line add up to 180°oe |
| | (c) | | 64 | 1 | B1 for 64 |
| 8 | | $9\times1+3\times2+5\times3+3\times4$ (=42)<br>"42" ÷ 20 | 2.1 | 3 | M1 for $9\times1$, $3\times2$, $5\times3$, $3\times4$ or for 42 seen<br>M1 (dep) "42" ÷ 20<br>A1 for 2.1 or $2\frac{1}{10}$ or $2\frac{2}{20}$ |
| 9 | (a) | | 09 05 | 1 | B1 for 09 05 oe |
| | (b) | | 7 | 1 | B1 for 7 |
| | (c) | | 10 | 1 | B1 for 10 |
| | (d) | 7 km in 20 minutes | 21 | 3 | B1 for 20 (minutes) oe or $\times3$ seen<br>M1 for $\frac{"7"}{"20"}$<br>A1 cao<br>SC: "7" $\times3$ gets B1 M1 |

| PAPER 5503 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 10 | | Vertices of new triangle at<br>(2, −2) (2, 6) and (6, −2) | Correct triangle drawn | 3 | B3 cao<br>(B2 for either correct triangle in wrong translated position or<br>for 2 vertices correct)<br>(B1 for a right-angled triangle with horizontal length 4 or vertical length 8 in the same orientation as shaded triangle)<br>SC B2 for scale factor 3, totally correct |
| 11 | | $2^2 + 3 =$ | 7 which is not even | 2 | B2<br>(B1 for correctly evaluating $n^2 + 3$ with a prime number value for $n$.) |
| 12 | (a) | 360 ÷ 5 | 72 | 2 | M1 for 360 ÷ 5 oe<br>A1 for 72 |
| | (b) | 8560 ÷ (10 × 10) | 85.6 | 2 | M1 for 8560 ÷ (10 × 10) oe<br>A1 for 85.6 |
| | (c)(i) | Least length = 100.5 | 100.5 | 2 | B1 for 100.5 |
| | (ii) | Greatest length = 101.5 | 101.5 | | B1 for 101.5 or 101.499 or better |
| 13 | | $2x + x + 100 + 47 = 360$<br>$2x + x = 360 - 100 - 47$<br>$x = 71$<br>Largest angle = $2x$ = | 142 | 4 | M1 for $2x + x + 100 + 47 = 360$ or 360 – 147 or 213 seen<br>M1 (dep) for correctly separating $x$-terms and non $x$ terms or $\frac{"360-147"}{3}$<br>A1 for $x = 71$<br>A1 ft (provided M2 awarded) for "142" |
| 14 | (a)(i) | | 2.21 | 2 | B1 for 2.21 |
| | (ii) | | 0.013 | | B1 for 0.013 |
| | (b) | LCM = 3 × 13 × 17 = 3 × 221 | 663 | 2 | M1 for 3 × 13 × 17 oe<br>A1 for 663 |

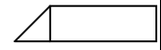
| PAPER 5503 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 15 | | | Tick boxes 1,3 & 6 | 3 | B1 for $\frac{\pi abc}{2d}$; B1 for $2a^2$; B1 for $2\left(c^2+d^2\right)$<br>(−B1 for each additional expression ticked (>3) to a minimum of 0) |
| 16 | | $200 \times 0.2$ | 40 | 2 | M1 for $200 \times 0.2$ or $\frac{40}{200}$ seen<br>A1 for 40 |
| 17 | (a) | eg $2 \mid \underline{108}$<br>$2 \mid \underline{54}$<br>$3 \mid \underline{27}$<br>$3 \mid \underline{9}$<br>3 | $2^2 \times 3^3$ | 3 | M2 for full systematic method of at least 4 divisions by prime numbers oe factor trees; condone 1 calculation error<br>(M1 for 108 written as a correct product(s) with only one non-prime or equivalent division or a full process with 2 calculation errors.)<br>A1 for $2^2 \times 3^3$ (accept $2 \times 2 \times 3 \times 3 \times 3$) |
| | (b) | | 12 | 1 | B1 for 12 |
| 18 | | Perpendicular from P to intersecting arcs (within tramlines); perpendicular at least 2cm long | | 2 | M1 relevant pair of arcs crossing within tramlines<br>A1<br>SC M1 AO for a full construction of a perpendicular to AB not passing through P. |
| 19 | | $15 \times 10$ | 150 $cm^3$. | 3 | M1 for $15 \times 10$<br>A1 for 150<br>B1 for $cm^3$. |

| PAPER 5503 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 20 | | | $y = 2x + 6$ | 2 | B2 for $y = 2x + 6$<br>(B1 for $y = 2x + k$, $k \neq 1$ or for $y = mx + 6$, m $\neq 0$ or for $2x + 6$) |
| 21 | | $6\frac{2}{5} = \frac{32}{5}$<br>Area of triangle = $\frac{1}{2} \times \frac{5}{8} \times 6\frac{2}{5}$ (=2)<br>Length of a side of sq. = $\sqrt{18 \times "2"}$ (=6)<br>Perimeter of square = 4 × 6 | 24 | 5 | B1 for $6\frac{2}{5} = \frac{32}{5}$ oe or $3\frac{1}{5} = \frac{16}{5}$ or $\frac{30}{8} + \frac{2}{8}$ oe (or implied by area of triangle=2)<br>M1 for $\frac{1}{2} \times \frac{5}{8} \times 6\frac{2}{5}$ oe<br>M1 for area of square = 18 × product of two lengths<br>A1 for $\sqrt{18 \times "2"}$<br>A1 for 24 |
| 22 | (a) | | $x(x-3)$ | 2 | B2 for $x(x-3)$<br>(B1 for $x$ (…….)) |
| | (b) | | $k^3$. | 1 | B1 for $k^3$. |
| | (c)(i) | $4x + 20 + 3x - 21$ | $7x - 1$ | 4 | M1 for **three** of 4 terms $4x + 20 + 3x - 21$ (or better)<br>A1 for $7x - 1$ |
| | (ii) | $x^2 + 3yx + 2xy + 6y^2$ | $x^2 + 5xy + 6y^2$ | | M1 for **three** of 4 terms $x^2 + 3yx + 2xy + 6y^2$<br>A1 for $x^2 + 5xy + 6y^2$ |
| | (d) | | $(p+q)(p+q+5)$ | 1 | B1 for $(p+q)(p+q+5)$ |

| PAPER 5503 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 23 | (a) | | 32 | 1 | B1 for 32 (accept 31.5 to 33.5 inclusive) |
| | (b) |  | | 3 | B1 for ends of whiskers at 9 and 57, (with a box)<br>B1 for ends of box at 16 and 45 ($\pm 0.5$)<br>B1 for median marked at 32 or a complete box and whisker diagram drawn with a median inside the box |
| | (c) | Median(B)>Median(G); on average boys take longer<br>IQR(B)>IQR(G); times for boys have a greater spread | | 2 | B1 eg for comparison of medians<br>B1 eg for comparison of (interquartile) ranges |
| 24 | (a) | $6y = 15 - 5x$ | $y = \frac{15-5x}{6}$ | 2 | M1 for either $6y = 15 - 5x$ or -6 $y = 5x - 15$ or for $\frac{5x}{6} + y = \frac{15}{6}$ or a correct ft on sign error to $y=$<br>A1 for $y = \frac{15-5x}{6}$ oe |
| | (b) | $6k + 5(-21) = 15$ | 20 | 2 | M1 for substitution of $x = -21$ (or $x = 21$) into given equation or candidate's answer to (a)<br>A1 for $k = 20$ |
| | (c)(i) |  | Region R indicated | 3 | B2 correct region shaded (accept unshaded if R clear)<br>(B1 shaded or R region satisfies 3 of the 4 given inequalities with same boundaries) |
| | (ii) | | (1,1) | | B1 for (1,1) |

| PAPER 5503 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 25 | (a) | | 60 | 1 | B1 for 60<br>B1 for *BDC* = 25 |
| | (b) | eg Angle *BDC* = 25<br>*ADB* = 60 − 25 | 35 | 2 | [Award the mark for equivalent approaches]<br>B1 ft for (a) − 25 |
| | (c) | Ben is correct; angle *DAB* = 65 + 25 = 90 and since angle in a semi-circle is 90°, *BD* must be a diameter | | 1 | B1 for full valid justification |

| PAPER 5504 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 1 | (a) | Accurate drawing of triangle | | 2 | B1 cao for 38º (±2º)<br>B1 cao (indep) for BC drawn 7.3 cm (±2mm) and completing the triangle. |
| | (b) | Measure angle A | 63º | 1 | B1 for 63º (±2º) or ft their diagram (±2º) |
| 2 | (a) | 0 × 1 = 0<br>1 × 1 = 1<br>2 × 4 = 8<br>3 × 8 = 24<br>4 × 8 = 32<br>5 × 7 = 35 | 100 | 3 | M1 col 1 × col 2 (at least 3 shown) could be implied by answers.<br>M1 (dep) sum of totals<br>A1 cao<br>SC: M1 M1 A0 for 101 |
| | (b) | Either<br>$35.50 ÷ 1.42 = £25; £26.99 - £25 = £1.99<br>Cheaper in the USA<br>Or<br>£26.99 × 1.42= $38.33; $38.33 - $35.50 = $2.83<br>Cheaper in the USA | | 3 | M1 35.50 ÷ 1.42<br>A1 25 seen<br>B1 ft (dep on M1) £1.99 with conclusion; units needed<br>OR:<br>M1 26.99 × 1.42<br>A1 38.33 or 38.32…seen<br>B1 ft (dep on M1) $2.83 or $2.82 with conclusion; units needed |
| 3 | (a) | | -1, (1), (3), 5, 7, 9 | 2 | B2 cao<br>(B1 for 2 values) |
| | (b) | | Graph | 2 | B1 ft for plotting points ±1/2 square<br>B1 cao for line between $x = -2$ and $x = 3$ |
| | (c)(i) | | 0.4 | 2 | B1 0.4 or ft single straight line with positive gradient |
| | (ii) | | 1.2 | | B1 1.2 or ft single straight line with positive gradient |

| PAPER 5504 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 4 | (a) | |  | 2 | B1 Rectangle drawn<br>B1 Triangle attached<br>Ignore additional internal lines; 3D sketch gets B0 |
| | (b) | |  | 2 | B1 single Rectangle drawn<br>B1 Attached smaller rectangle drawn<br>Accept rotated plan, Ignore internal lines down; Nets get B0 |
| 5 | (a) | £163.25 - £35.50 = £127.75<br>£127.75 ÷ £18.25 = 7 | 8 | 3 | M1 163.25 – £35.50 (or sight of £127.75)<br>M1 (dep) "127.75" ÷ 18.25<br>A1 cao<br>SC: M2 for 7 days |
| | (b) | 1.175 × £64 or $\frac{17.5}{100}$ × 64 or £11.20 seen | 75.20 | 2 | M1 1.175 × 64.00 0.175 × 64 oe or 11.20 or 75.2 seen<br>OR<br>6.40, 3.20, and 1.60 seen<br>A1 cao |
| | (c) | 54 × £2.38 = | 128.52 | 2 | M1 54 × £2.38<br>A1 cao |
| 6 | | Tessellation | Drawing | 2 | B2 seven additional hexagons, with at least 2 points at which 3 hexagons meet<br>(B1 one point at which 3 hexagons meet). |
| 7 | | | 200<br>150<br>225<br>150<br>10 | 3 | B3 cao<br>(B2 for three correct, or B1 for one correct) |
| 8 | (a)(i) | Bearing measured | 70 | 2 | B1 70 ± 4 |
| | (ii) | Bearing measured | 317 | | B1 317 ± 4 |
| | (b) | Locus (circle) drawn & shaded | | 2 | B1 circle ±2 mm centre Manchester<br>B1 shading with accurate or approximate circle within tolerance |

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| | No | Working | Answer | Mark | Notes |
| 9 | (a) | | Plots | 1 | B1 cao |
| | (b) | | Description | 1 | B1 dynamic relationship or "positive" (correlation) |
| | (c) | | Line of best fit | 1 | Line within overlay region, and to the extent of. |
| | (d)(i) | 280 g → | Reading | 2 | B1 ft from single straight line of positive gradient (±1/2 square)<br>B1 ft from single straight line of positive gradient (±1/2 square) |
| | (ii) | 120 pages → | Reading | | |
| 10 | (a) | $\frac{1}{6}, \frac{3}{8}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$ | | 2 | B2 for all correct<br>(B1 for 1 error or all correct but wrong order, or use of a common denominator decimals). |
| | (b) | 3/5, 65%, 2/3, 0.72, 3/4 | | 2 | B2 for all correct<br>(B1 for 1 error or all correct but wrong order or conversions to decimals oe) |
| 11 | (a) | | 182, 178, 180, 184 | 2 | M1 mean of any three consecutive months, eg (147 + 161 + 238) ÷ 3 oe<br>A1 cao |
| | (b) | Sale price = 80%<br>Fun Friday price = 70% of 80% = 56% (oe) | | 2 | B1 B1 for a fully correct explanation involving a worked example (oe)<br>B1 a partially complete explanation |

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| | No | Working | Answer | Mark | Notes |
| 12 | (a) | | Reason | 1 | B1 makes a mention of bias, either directly, or making reference to an insufficient or biased range of responses. |
| | (b)(i) | | Reason | 1 | B1 make some mention of any one of (a) an insufficient range of responses (b) no mention of money (c) no time frame in the question (d) misunderstanding of "a lot" or "not much" |
| | (ii) | | Question | 2 | B2<br>B1 for each of the following upto B2<br>(a) an improved question eg time frame made clear (b) response boxes (imperfect) (c) response boxes no errors<br>OR<br>For suggesting a generally improved question<br>(a) a question clearly in the context of changes to the canteen<br>(b) at least 3 boxes showing a full range of responses |
| 13 | (a) | $20y - 18y = 16 - 9$ oe<br>$2y = 7$ | $3\frac{1}{2}$ oe | 3 | M1 $20y - 18y = 16 - 9$ oe<br>M1 $2y = 7$<br>A1 cao |
| | (b) | $40 - x = 3(4 + x)$<br>$40 - x = 12 + 3x$<br>$40 - 12 = x + 3x$<br>$4x = 28$ | 7 | 3 | M1 multiplying through by 3: $3 \times \frac{40 - x}{3} = 3 \times 4 + 3 \times x$<br>A1 $40 - 12 = x + 3x$<br>A1 cao |
| 14 | (a) | | $12(x\text{-}4)$ | 1 | B1 for $12(x - 4)$ or $12x - 48$ or $12 \times x - 48$ oe<br>$x = 12\ (x - 4)$ gets B0 |
| | (b) | | $18x\text{-}48$ | 2 | M1 $6x +$ "$12(x - 4)$" or $6x +$ "$12x - 48$"<br>A1 ft a linear expression $18x - 48$, $2(9x - 24)$, $3(6x - 16)$, $6(3x - 8)$ |

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| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 15 | | $x$ $x^3 - 2x$<br>4.1 60.7(21)<br>4.2 65.6(88)<br>4.3 70.9(07) Accept answer to 1 dp<br>4.22 66.7(114) or more<br>4.23 67.2(269)<br>4.24 67.7(45)<br>4.25 68.2(656) | 4.2 | 4 | B2 for trial $4.1 \leq x \leq 4.3$ evaluated<br>(B1 for trial $4 < x < 5$ evaluated)<br><br>B1 for different trial $4.225 \leq x \leq 4.25$ evaluated<br><br>B1 (dep on at least one previous B1) for 4.2 cao |
| 16 | (a) | | $1.0 \times 10^{-9}$ | 1 | B1 accept $1 \times 10^{-9}$ or just $10^{-9}$ |
| | (b) | $1 \div 5 \times 10^{-9}$ | $2 \times 10^{8}$ | 2 | M1 for $1 \div$ ("$5 \times 10^{-9}$") or digit 2 with zeros only seen<br>Condone omission of bracket for M1.<br>A1 cao |
| 17 | (a) | $\frac{6.27 \times 4.52}{4.81 + 9.63} = \frac{28.3404}{14.44} = 1.962631579$ | 1.9626… | 2 | B2 for 1.9626…<br>(B1 for 28.34 or 14.44) |
| | (b) | | 1.96 | 1 | B1 ft from (a) as rounded to 1dp or 2dp.<br>Do not accept 2, 2.00, but accept 2.0 |
| 18 | | | $d = 4n + 6$ | 2 | B2 $d = 4n + 6$ oe<br>(B1 $d = 4n + k$, $k$ an integer or 0, $4n + 6$, $n = 4n + 6$) |
| 19 | | Vol = $\pi \times 3.8^2 \times 2.5 = \pi \times 14.44 \times 2.5$<br>= 45.36… × 2.5 = 113.411<br>Mass = "113" × 1.5 = 170.1165 | 170 | 4 | M1 for $\pi \times r^2 \times 2.5$ where $r$ = is 3.8 or 7.6<br>A1 if $r = 3.8$<br>M1 for "113" × 1.5<br>A1 for 169.5 – 170.3 cao |

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| | No | Working | Answer | Mark | Notes |
| 20 | (a) | $10^2 + 6^2$ or 136<br>$\sqrt{(100+36)}$ or $\sqrt{136} = 11.66\ldots$ | 11.7 | 3 | M1 $10^2 + 6^2$ or 136 seen<br>M1 (dep) $\sqrt{100+36}$ or $\sqrt{136}$<br>A1 11.66 – 11.7 |
| | (b) | $\cos x = \frac{8}{10}$ or 0.8<br>$x = \cos^{-1} 0.8 = 36.869^\circ$ | 36.9 | 3 | M1 for $\cos = \frac{8}{10}$, cos = 0.8 (oe)<br>M1 (dep) for $\cos^{-1}$ (oe)<br>A1 for 36.86 – 36.9 |
| 21 | | $18x - 6y = 99$ $\quad 12x - 4y = 66$<br>$8x + 6y = 18$ $\quad 12x + 9y = 27$<br>$26x = 117$ $\quad -13y = 39$ | $x = 4\frac{1}{2}$<br>$y = -3$ | 4 | M1 correct process to eliminate either $x$ or $y$ (condone one error)<br>A1 cao for non – eliminated one.<br>M1 (dep on 1st M1) for correct substitution of their found value.<br>A1 cao (need both) |
| 22 | | $\frac{133}{72} = 1.8472$, $\frac{160}{82} = 1.9512$<br>OR<br>$\frac{72}{133} = 0.54135, \frac{82}{160} = 0.5125$<br>OR<br>$\frac{160}{133} = 1.203\ldots, \frac{82}{72} = 1.1388\ldots$<br>OR<br>$\frac{133}{160} = 0.83125\ldots, \frac{72}{82} = 0.878$ | 1.84..≠ 1.95..<br>1.20..≠ 1.13.. | 3 | M1 for $\frac{133}{72}$ (= 1.8472…) oe Accept 1.8, 1.85<br>M1 for $\frac{160}{82}$ (=1.9512…) oe consistent pairing Accept 2.0, 1.9<br>**OR** M1 for $\frac{160}{133}$ (= 1.203…) oe<br>M1 for $\frac{82}{72}$ (=1.1388) oe<br>A1 for enough decimal places to show that the ratios are not equal; since the scale factors are different the shapes cannot be similar.<br>NB Do Not need conclusion |

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| | No | Working | Answer | Mark | Notes |
| 23 | (a) | | 0.4, 0.6<br>0.4, 0.6,<br>0.4 | 2 | B1 for LHS: (0.6), 0.4<br>B1 for RHS: 0.6, 0.4, 0.6, 0.4 |
| | (b) | (30 × 42) – (25 × 42.8) = 1260 – 1070 = 190<br>190 ÷ 5 = | 38 | 3 | M1 for (30 × 42) – (25 × 42.8) or 1260 – 1070 or 190 seen<br>M1 (dep) for "190" ÷ 5<br>A1 cao |
| 24 | (a) | £12000 × 0.25 = £3000; £12000 – £3000 = £9000<br>£9000 × 0.25 = £2250; £9000 – £2250 = £6750<br>£6750 × 0.25 = £1687.50; £6750 – £1687.50 = | £5062.50 | 3 | M1 for 12000 × 0.75 (=9000) oe or £3000 or £23437.50 seen<br>M1 (dep) for at least two further depreciation calculations (complete steps)<br>A1 cao<br>**OR** M2 for $12000 \times (0.75)^3$ or 5062.50 seen<br>(M1 for $12000 \times (0.75)^n$, $n = 2$ or 4) |
| | (b) | 0.8 × 0.8 × 0.8 × 0.8 (oe) | 0.4096 | 2 | M1 $0.8^4$ (oe)<br>A1 cao |

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| | No | Working | Answer | Mark | Notes |
| 1 | (a)(i)<br>(ii)<br>(b) | <br><br>LCM = 3 × 13 × 17 = 3 × 221 | 2.21<br>0.013<br>663 | 2<br><br>2 | B1 for 2.21<br>B1 for 0.013<br>M1 for 3 × 13 × 17 oe<br>A1 for 663 |
| 2 | | | Tick boxes 1,3 & 6 | 3 | B1 for $\frac{\pi abc}{2d}$; B1 for $2a^2$; B1 for $2(c^2 + d^2)$<br>(−B1 for each additional expression ticked (>3) to a minimum of 0) |
| 3 | (a)<br><br><br>(b) | 200 × 0.2<br><br><br>0.2 + 0.4 | 40<br><br><br>0.6 | 2<br><br><br>2 | M1 for 200 × 0.2 or $\frac{40}{200}$ seen<br>A1 for 40<br>M1 for 0.2 + 0.4<br>A1 for 0.6 |
| 4 | (a)<br><br><br><br><br><br>(b) | eg 2 \| 108<br>2 \| 54<br>3 \| 27<br>3 \| 9<br>3<br><br><br><br>12 | $2^2 \times 3^3$<br><br><br><br><br><br>12 | 3<br><br><br><br><br><br>1 | M2 for full systematic method of at least 4 divisions by prime numbers oe factor trees; condone 1 calculation error<br>(M1 for 108 written as a correct product with only one non-prime or equivalent division or a full process with 2 calculation errors.)<br>A1 for $2^2 \times 3^3$ (accept 2 × 2 × 3 × 3 × 3)<br><br>B1 for 12 |
| 5 | | Perpendicular from P to intersecting arcs (within tramlines); perpendicular at least 2 cm long | | 2 | M1 relevant pair of arcs crossing within tramlines<br>A1<br>SC M1A0 for full construction of a line perpendicular to AB not through P |
| 6 | | 15 × 10 | 150 $cm^3$. | 3 | M1 for 15 × 10<br>A1 for 150<br>B1 for $cm^3$ |

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| | No | Working | Answer | Mark | Notes |
| 7 | (a) | | $k^3$. | 1 | B1 for $k^3$. |
| | (b)(i) | $4x + 20 + 3x - 21$ | $7x - 1$ | 4 | M1 for **three** of 4 terms $4x + 20 + 3x - 21$ (or better)<br>A1 for $7x - 1$ |
| | (ii) | $x^2 + 3yx + 2xy + 6y^2$ | $x^2 + 5xy + 6y^2$ | | M1 for **three** of 4 terms $x^2 + 3yx + 2xy + 6y^2$<br>A1 for $x^2 + 5xy + 6y^2$ |
| | (c) | | $(p+q)(p+q+5)$ | 1 | B1 for $(p+q)(p+q+5)$ |
| | (d) | | $m^8$ | 1 | B1 for $m^8$. |
| | (e) | | $6r^3t^6$ | 2 | B2 for $6r^3t^6$<br>(B1 for $.....r^3t^6$ or for $6....t^6$ ) |
| 8 | (i) | Least length = 100.5 | 100.5 | 2 | B1 for 100.5 |
| | (ii) | Greatest length = 101.5 | 101.5 | | B1 for 101.5; ACCEPT 101.499 or better |
| 9 | | $6\frac{2}{5} = \frac{32}{5}$<br>Area of triangle = $\frac{1}{2} \times \frac{5}{8} \times 6\frac{2}{5}$ (= 2)<br>Length of a side of sq. = $\sqrt{18 \times "2"}$ (=6)<br>Perimeter of square = 4 × 6 | 24 | 5 | B1 for $6\frac{2}{5} = \frac{32}{5}$ oe or $3\frac{1}{5} = \frac{16}{5}$ oe or $\frac{30}{8} + \frac{2}{8}$ oe (or implied by area of triangle=2)<br>M1 for $\frac{1}{2} \times \frac{5}{8} \times 6\frac{2}{5}$ oe<br>M1 for (area of square) = 18 × product of two lengths<br>A1 = $\sqrt{18 \times "2"}$<br>A1 for 24 |

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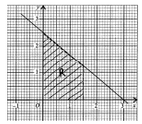
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 10 | (a) | $6y = 15 - 5x$ | $y = \frac{15-5x}{6}$ | 2 | M1 for either $6y = 15 - 5x$ or for $\frac{5x}{6} + y = \frac{15}{6}$ or $-6y = 5x - 15$ or a correct ft on sign error to $y =$<br>A1 for $y = \frac{15-5x}{6}$ oe |
| | (b) | $6k + 5(-21) = 15$ | 20 | 2 | M1 for subst. of $x = -21$ (or $x = 21$) into given eq$^n$ or answer to (a)<br>A1 for $k = 20$ |
| | (c)(i) |  | Region R indicated | 3 | B2 correct region shaded (accept unshaded if R clear)<br>(B1 shaded (R) region satisfies 3 of the 4 given inequalities with same boundaries) |
| | (ii) | | (1,1) | | B1 for (1,1) |
| 11 | (a) | | $y = 2x + 6$ | 2 | B2 for $y = 2x + 6$<br>(B1 for $y = 2x + k$, $k \neq 1$ or for $y = mx + 6$, $m \neq 0$ or for $2x+6$) |
| | (b) | Grad of $AB = 2$; Grad of $BC = \frac{-1}{"2"}$ | $y = -\frac{1}{2}x + 6$ | 2 | M1 for Grad of $BC = \frac{-1}{"2"}, -\frac{1}{2}$<br>or grad of $BC = -\frac{1}{\text{grad of AB}}$<br>A1 ft for $y = -\frac{1}{2}x + 6$ oe ft on wrong coeff. of $x$ in (a) |
| | (c) | Eg A rectangle is always a cyclic quadrilateral because the opposite angles of a rectangle always add up to 180° (90+90) | | 1 | B1 for valid explanation. (eg lines from the pt of int. of diagonals of rect to all 4 vertices are equal(radii)) |
| 12 | | Vertices of new triangle at<br>$(-1, -4)$ $(-4, 2)$ and $(2, 2)$ | Correct triangle drawn | 3 | B3 cao<br>(B2 for 3 correct vertices no triangle or triangle with 2 correct vertices<br>(B1 for triangle with two of six co-ordinates correct from using P as centre or any isosceles triangle with base 6 and height 6) |

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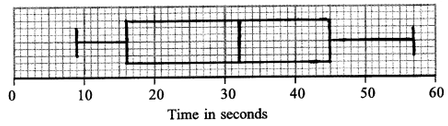
| | No | Working | Answer | Mark | Notes |
| 13 | (a) | | 32 | 1 | B1 for 32 (accept 31.5 to 33.5 inclusive) |
| | (b) |  | | 3 | B1 for ends of whiskers at 9 and 57 (with a box)<br>B1 for ends of box at 16 and 45/46 ($\pm$ 0.5)<br>B1for median marked at "32"or complete box and whisker diagram drawn with a median inside the box |
| | (c) | Median(B)>Median(G); on average boys take longer<br>IQR(B)>IQR(G); times for boys have a greater spread | | 2 | B1 eg for comparison of medians (ft on diagrams)<br>B1 eg for comparison of (interquartile) ranges (ft on diagram) |
| 14 | | Reading top to bottom frequencies are 20; 18; 45; 52 | | 2 | B2 all correct<br>(B1 for one frequency correct) |
| 15 | (a) | $1600 = p\,q^0$.; $400 = pq^2$<br>$q^2 = 0.25$ | $p = 1600$<br>$q = 0.5$ | 3 | M1 for either $400 = pq^2$ or $1600 = pq^0$<br>B1 for $p = 1600$<br>A1 for $q = 0.5$ |
| | (b) | $V = pq^{-2}$ | 6400 | 2 | M1 for recognition that t = –2<br>A1 for 6 400 |

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| | No | Working | Answer | Mark | Notes |
| 16 | (a) | (I) $AB = AC$ (triangle $ABC$ is isosceles)<br>(II) PB = PC tangents (from a point to a circle are) equal<br>(III) AP = AP (common side)<br>so the 2 triangles are congruent ,SSS. | | 3 | B3 for I, II, III with congruency reason<br>(B2 for any two of I, II or III)<br>(B1 for any one of the I, II or III) |
| | (b) | $BPC = 20°$<br>$PBC$ (or $PCB$) = 90-1/2 "20" (= 80°)<br>$BAC = PBC$ = "80" | 50° | 4 | B4 for 50°<br>(B3 for $BAC = 80°$)<br>(B2 for $PBC = 80°$ or $PCB = 80°$)<br>(B1 for $APC = 10°$ or $BPC = 20°$ or a middle angle = 90°)<br>SC if clear numerical slip seen eg "$PBC$ = 180 – 90 – 10 = 70" then goes on to get correct ft angle $ABC = 55$ deduct 1 from total so this cand would get B4–1 = B3 |
| 17 | (a) | $\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$<br>$= \overrightarrow{OA} + \frac{2}{3}(6\mathbf{c} - 6\mathbf{a})$<br>$= 6\mathbf{a} + 4\mathbf{c} - 4\mathbf{a}$ | $2\mathbf{a} + 4\mathbf{c}$ | 3 | M1 for $\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$ or any correct vector journey involving $\overrightarrow{OP}$<br>M1 for $\overrightarrow{AP} = \frac{2}{3}(6\mathbf{c} - 6\mathbf{a})$ oe or $\overrightarrow{CP} = \frac{1}{3}(-6\mathbf{c} + 6\mathbf{a})$ oe or reverse vectors<br>A1 for $2\mathbf{a} + 4\mathbf{c}$ oe (accept unsimplified) |
| | (b) | Eg $\overrightarrow{OM} = \overrightarrow{OC} + \overrightarrow{CM} = 6\mathbf{c} + 3\mathbf{a}$<br>$\overrightarrow{OM} = 1.5\overrightarrow{OP}$ | $\overrightarrow{OM} = 1.5\overrightarrow{OP}$ so $OPM$ is a straight line | 2 | B1 for $\overrightarrow{OM} = 6\mathbf{c} + \frac{1}{2}(6\mathbf{a})$ or $\overrightarrow{PM} = 2\mathbf{c} + \mathbf{a}$ unsimplified or reverse vectors<br>B1 for a fully correct proof. |

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| | No | Working | Answer | Mark | Notes |
| 18 | (a) | | 4 | 1 | B1 for 4 condone $\pm$ 4 |
| | (b) | | 2 | 1 | B1 for 2 condone $\pm 2$ |
| | (c) | $\sqrt{160} = 4\sqrt{10}$ ;<br>$\left[\frac{\sqrt{8}\left(\sqrt{5}+\sqrt{20}\right)-\sqrt{2}\times\sqrt{5}}{\sqrt{8}\left(\sqrt{5}+\sqrt{20}\right)}\right]\times 100$<br>$\left[\frac{6\sqrt{10}-\sqrt{10}}{6\sqrt{10}}\right]\times 100$ | $\frac{500}{6}$ | 4 | B1 for **either** $\sqrt{160} = 4\sqrt{10}$ or $\sqrt{8} = 2\sqrt{2}$ **or** $\sqrt{20} = 2\sqrt{5}$<br>M1 for $\left[\frac{\sqrt{8}\left(\sqrt{5}+\sqrt{20}\right)-\sqrt{2}\times\sqrt{5}}{\sqrt{8}\left(\sqrt{5}+\sqrt{20}\right)}\right]$ oe $(\times 100)$<br>B1 for either $6\sqrt{10} - \sqrt{10}$ or $6\sqrt{10}$<br>A1 for $\frac{500}{6}$ (accept 83.3 if no obvious earlier error) |

| PAPER 5505 | | | | | |
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| | No | Working | Answer | Mark | Notes |
| 19 | (a)(i) | | $(2x-7)(x-14)$ | 3 | M1 $x^2$ term and constant term $(\pm 98)$ obtained<br>or $2x(x-14) - 7(x-14)$ or $x(2x-7) - 14(2x-7)$<br>A1 for $(2x-7)(x-14)$ |
| | (ii) | | $x = \frac{7}{2}$; $x = 14$ | | B1ft ft (i) provided of form $(2x\pm a)(x\pm b)$ |
| | (b)(i) | | $\frac{7}{n+7}$ | 3 | B1 for $\frac{7}{n+7}$ oe |
| | (ii) | $\frac{7}{n+7} = \frac{2}{5} \Rightarrow 2(n+7) = 5 \times 7$<br>$2n = 21$ | $n$=10.5 is not possible since $n$ has to be an integer | | M1 for $2(n+7) = 5\times 7$ or $n+7=5\times 3.5$ (can be implied) ft (b)(i) fractional in terms of n and < 1<br>A1 ft for $n$=10.5 not possible (since $n$ not integer) oe |
| | (c) | $2\times\left(\frac{n}{n+7}\right)\times\left(\frac{7}{n+7}\right) = \frac{4}{9}$<br>$14n\times 9 = 4(n+7)^2$<br>$14n\times 9 = 4(n^2+14n+49)$<br>$4n^2+56n+196-126n = 0$ | $2n^2 - 35n + 98 = 0$ | 5 | M1 for $\left(\frac{n}{n+7}\right)\times\left(\frac{7}{n+7}\right)$ seen<br>M1 for $2\times\left(\frac{n}{n+7}\right)\times\left(\frac{7}{n+7}\right)$ oe $(=\frac{4}{9})$<br>M1(dep on 1st M) elimination of fractions within an equation<br>B1 3 terms correct in expansion of $(n+7)^2 = n^2 + 7n + 7n + 49$<br>A1 full valid completion to printed answer |

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| | No | Working | Answer | Mark | Notes |
| | (d) | $\frac{7}{n+7}\times\frac{7}{n+7}=\frac{7}{21}\times\frac{7}{21}=$ | $\frac{1}{9}$ | 2 | M1 for $\frac{7}{n+7}\times\frac{7}{n+7}$ or better or ft [answer (b)(i)]$^2$<br>or $1-\frac{4}{9}-(\frac{n}{n+7})^2$<br>A1 for $\frac{1}{9}$ oe cao |
| 20 | (a)(i) | | $y=1+\sin x$ | 2 | B1 for $y=1+\sin x$ |
| | (ii) | | $y=2\sin x$ | | B1 for $y=2\sin x$<br>SC both (i) f($x$) + 1, (ii) 2f($x$) B1 |
| | (b) | Stretch parallel to $y$-axis scale factor 3<br>Stretch parallel to $x$-axis scale factor $\frac{1}{2}$ | | 3 | M1 for 'stretch'<br>A1 for Stretch parallel to $y$-axis scale factor 3 oe<br>A1 for Stretch parallel to $x$-axis scale factor $\frac{1}{2}$ oe<br>SC if M0 award BI for "sf 3 vertically" **and** "sf $\frac{1}{2}$ horizon." |

| PAPER 5506 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 1 | | Question | 2 | B1 for each of the following upto B2<br>(a) an improved question eg time frame made clear (b) response boxes (imperfect) (c) response boxes no errors<br>OR<br>For suggesting a generally improved question<br>(a) a question clearly in the context of changes to the canteen<br>(b) at least 3 boxes showing a full range of responses |
| 2 | Locus (circle) drawn & shaded | | 2 | B1 circle centre Manchester ±2mm<br>B1 shading with accurate or approximate circle within tolerance |
| 3 (a) | | 182, 178, 180, 184 | 2 | M1 mean of any three consecutive months, eg (147 + 161 + 238) ÷ 3 oe<br>A1 cao |
| (b) | Sale price = 80%<br>Fun Friday price = 70% of 80% = 56% (oe) | | 2 | B1 B1 for a fully correct explanation involving a worked example (oe)<br>B1 a partially complete explanation |
| 4 | $x$ $x^3 - 2x$<br>4.1 60.7(21)<br>4.2 65.6(88)<br>4.3 70.9(07)<br>4.22 66.7(114)<br>4.23 67.2(269)<br>4.24 67.7(45)<br>4.25 68.2(656) | 4.2 | 4 | B2 for trial $4.1 \leq x \leq 4.3$ evaluated<br>(B1 for trial $4 < x < 5$ evaluated)<br><br>B1 for different trial $4.225 \leq x \leq 4.25$ evaluated<br><br>B1 (dep on at least one previous B1) for 4.2 cao |

| PAPER 5506 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 5 | (a) | | $1.0 \times 10^{-9}$ | 1 | B1 accept $1 \times 10^{-9}$ or just $10^{-9}$ |
| | (b) | $1 \div (5 \times 10^{-9})$ | $2 \times 10^{8}$ | 2 | M1 for $1 \div$ ("$5 \times 10^{-9}$") or digit 2 with zeros only seen<br>Condone omission of bracket for M1.<br>A1 cao |
| 6 | (a) | $\frac{6.27 \times 4.52}{4.81 + 9.63} = \frac{28.3404}{14.44} = 1.962631579$ | 1.9626… | 2 | B2 for 1.9626…<br>(B1 for 28.34… or 14.44) |
| | (b) | | 1.96 | 1 | B1 ft from (a) as rounded to 1dp or 2dp.<br>Do not accept 2, 2.00, but accept 2.0 |
| 7 | | | $d = 4n + 6$ | 2 | B2 $d = 4n + 6$ oe<br>(B1 $d = 4n + k$, $k$ an integer $\neq 6$, $4n + 6$, $n = 4n + 6$) |
| 8 | | Vol = $\pi \times 3.8^2 \times 2.5 = \pi \times 14.44 \times 2.5$<br>$= 45.36\ldots \times 2.5 = 113.411$<br>Mass = "113" × 1.5 = 170.1165 | 170 | 4 | M1 for $\pi \times r^2 \times 2.5$ where $r$ = is 3.8 or 7.6<br>A1 if $r = 3.8$<br>M1 for "113" × 1.5<br>A1 for 169.5 – 170.3 cao |

| PAPER 5506 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 9 | (a) | $10^2 + 6^2$ or 136<br>$\sqrt{(100 + 36)}$ or $\sqrt{136} = 11.66\ldots$ | 11.7 | 3 | M1 for $10^2 + 6^2$ or 136 seen<br>M1 (dep) $\sqrt{100+36}$ or $\sqrt{136}$<br>A1 11.66 – 11.7 |
| | (b) | Cos $x$ = 8/10 or 0.8<br>$x = \cos^{-1} 0.8 = 36.869^o$ | 36.9 | 3 | M1 for cos = $\frac{8}{10}$, cos = 0.8(oe)<br>M1 (dep) for $\cos^{-1}$ (oe)<br>A1 for 36.86 – 36.9<br><br>M1 Use of sine rule and $x$ found<br>M1 for $x = 90 - \sin^{-1}$("0.8")<br>A1 for 36.86 – 36.9 |
| 10 | | $18x - 6y = 99$ $12x - 4y = 66$<br>$8x + 6y = 18$ $12x + 9y = 27$<br>$26x = 117$ $-13y = 39$ | $x = 4\frac{1}{2}$<br>$y = -3$ | 4 | M1 correct process to eliminate either $x$ or $y$ (condone one error)<br>A1 cao for non – eliminated one.<br>M1 (dep on 1st M1) for correct substitution of their found value.<br>A1 cao (need both) |

| PAPER 5506 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 11 | | $\frac{133}{72} = 1.8472\,,\ \frac{160}{82} = 1.9512$<br>OR<br>$\frac{72}{133} = 0.54135, \frac{82}{160} = 0.5125$<br>OR<br>$\frac{160}{133} = 1.203...., \frac{82}{72} = 1.1388....$<br>OR<br>$\frac{133}{160} = 0.83125...., \frac{72}{82} = 0.878$ | 1.84..≠ 1.95..<br>1.20..≠ 1.13.. | 3 | M1 for $\frac{133}{72}$ (= 1.8472…) oe Accept 1.8, 1.85<br>M1 for $\frac{160}{82}$ (=1.9512…) oe consistent pairing Accept 2.0, 1.9<br><br>**OR** M1 for $\frac{160}{133}$ (= 1.203…) oe<br>M1 for $\frac{82}{72}$ (=1.1388) oe<br>A1 for enough decimal places to show that the ratios are not equal; since the scale factors are different the shapes cannot be similar.<br>NB Do Not need conclusion |
| 12 | (a) | £12000 × 0.25 = £3000; £12000 – £3000 = £9000<br>£9000 × 0.25 = £2250; £9000 – £2250 = £6750<br>£6750 × 0.25 = £1687.50; £6750 – £1687.50 = | £5062.50 | 3 | M1 for 12000 × 0.75 (=9000) oe or £3000 or £23437.50 seen<br>M1 (dep) for at least two further depreciation calculations (complete steps)<br>A1 cao<br>**OR** M2 for 12000 × $(0.75)^3$ or 5062.50 seen<br>(M1 for 12000 × $(0.75)^n$, $n = 2$ or 4) |
| | (b) | 0.8 × 0.8 × 0.8 × 0.8 (oe) | 0.4096 | 2 | M1 $0.8^4$ (oe)<br>A1 cao |

| PAPER 5506 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 13 | $r^2 = \frac{3\times10}{\pi h} = \frac{3\times10}{\pi 1.5} = \frac{3\times10}{4.712..} = 6.36, 6.37$<br>$r = \sqrt{6.366\ldots}$ | 2.52-2.54 | 3 | M1 for correct rearrangement to give $r^2 = \frac{3V}{\pi h}$<br>or $30 \div 4.712..$ or $6.36 - 6.37$<br>*Allow 0.3, 0.33 for* $\frac{1}{3}$<br>M1 (dep) for $\sqrt{}$<br>A1 cao 2.52 – 2.54 |
| 14 (a) | | 0.4<br>0.6,0.4,<br>0.6,0.4 | 2 | B1 for LHS: (0.6), 0.4<br>B1 for RHS: 0.6, 0.4, 0.6, 0.4 |
| (b) | $0.6 \times 0.6$ | 0.36 | 2 | M1 $0.6 \times$ "0.6" [0 < "0.6" < 1]<br>A1 cao |
| (c) | $(30 \times 42) - (25 \times 42.8) = (1260 - 1070 = 190$<br>$190 \div 5 =$ | 38 | 3 | M1 for $(30 \times 42) - (25 \times 42.8)$ or $1260 - 1070$ or 190 seen<br>M1(dep) for "190" ÷ 5<br>A1 cao 38 |

| PAPER 5506 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 15 | (a) | $S = \frac{k}{f^2};\ 125 = \frac{k}{8^2};\ k = 8000$ | $S = \frac{8000}{f^2}$ | 3 | M1 for $S = \frac{k}{f^2}$<br>M1 for $125 = \frac{k}{8^2}$<br>A1 cao<br>These marks can be awarded if the full formula appears in part (b), rather than in part (a).<br>[SC: $S = \frac{125}{64} f^2$ M1 M0 A0, $S = 1.95(3125) f^2$ M1 M0 A0 $S = \frac{1000}{f}$ M1 M0 A0] |
| | (b) | | 500 | 1 | B1 cao |

| PAPER 5506 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 16 | $0.5 \times 3.2 \times 8.4 \times \text{Sin } B = 10$<br>sin $B = 0.74404\ldots$<br>48.077<br>$AC^2 = 3.2^2 + 8.4^2 - 2 \times 3.2 \times 8.4 \times \cos B$<br>$AC^2 = 44.8815\ldots..$<br>$AC = 6.69\ (936\ldots)$<br>Perimeter = 18.3<br><br>Use the altitude $AD$, $\frac{h \times 8.4}{2} = 10 \Rightarrow h = (2.381)$<br><br>$BD = \sqrt{3.2^2 - h^2} = 2.139$<br>$DC = 6.261$<br><br>$AC = \sqrt{2.38^2 + '6.261'^2} = 6.69(936)$<br><br>Perimeter = 18.3 | 18.3 | 6 | M1 for $0.5 \times 3.2 \times 8.4 \times \sin B$ ( = 10)<br>A1 for sin B = 0.74(404…) or B = 47.7 – 48.1<br>M1 for $3.2^2 + 8.4^2 - 2 \times 3.2 \times 8.4 \times \cos$ "48.077"<br>M1(dep) for $AC^2$ = "44.8(815)"….. with correct order of evaluation<br>A1 $AC = 6.69 - 6.7$<br>A1 18.29 – 18.3<br><br>**for** $\frac{h \times 8.4}{2} = 10 \Rightarrow h = (2.381)$<br><br>M1 for $BD^2 = 3.2^2 - "2.381"^2$<br>A1 $BD = 2.1 - 2.2$<br><br>M1 (dep) $AC^2 = "2.381"^2 + "6.261"^2$<br>A1 $AC = 6.69 - 6.7$<br>A1 18.29 – 18.3 |

| PAPER 5506 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 17 | (a) | $(x + 8)^2 = x^2 + (x + 5)^2$<br>$x^2 + 16x + 64 = 2x^2 + 10x + 25$ | | 4 | B1 for angle $OTA = 90°$ (implied by use of Pythagoras with $OA$ as hypotenuse)<br>M1 $(x + 8)^2 = x^2 + (x + 5)^2$ oe<br>M1 for correct squaring of $x$+8 or $x$+5<br>A1 for completion following correct working |
| | (b) | $(+6 + \sqrt{(6^2 - - 4\times39)})/2$<br>$= (6 \pm \sqrt{(36 + 156)})/2$<br>$= (6 \pm \sqrt{192})/2 = (6 + 13.856)/2$ | 9.93 | 3 | M1 for substitution into quadratic formula, allow sign errors in $b$ and $c$<br>M1 for $x = (6 \pm \sqrt{192})/2$ [+ alone will do]<br>A1 for 9.92 – 9.93 |
| | | | | | M1 for $(x-3)^2-9-39$<br>M1 for $x = 3 \pm \sqrt{48}$ [+ alone will do it]<br>A1 for 9.92 – 9.93<br>T&I= 9.93 gets M1,M0,A0 |
| 18 | | $EB = 60 \times \tan 30°$<br>$BD = \sqrt{(60^2 + 60^2)}$<br>$\tan BDE = 34.64 \div 84.85$ | 22.2° | 4 | M1 for $EB = 60\times\tan30$<br>M1 for $BD = \sqrt{(60^2 + 60^2)}$<br>M1 for $\tan BDE =$ "34.64" ÷ "84.85"<br>A1 22.17 – 22.21 |
| | | $EB = 60 \times\tan 30°$ (= 34.64)<br>$ED^2 = 60^2 + (\frac{60}{\cos 30})^2$<br>$ED = \sqrt{8400} = (91.65)$<br>$\text{Angle} = \sin^{-1}\left(\frac{EB}{\sqrt{8400}}\right) = 22.2$ | | | M1 for $EB = 60 \times\tan 30°$ oe<br>M1 for fully correct method for $ED$<br>M1 for $\sin BDE = \left(\frac{'34.84'}{'\sqrt{8400}'}\right)$(oe)<br>A1 22.17 – 22.21 |

| PAPER 5506 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 19 | (a) | $x^2 + 6^2 = 25$<br>$x^2 = -11$ | | 2 | M1 substitutes $y$=6 to get $x^2$+36 = 25<br>A1 deduces $x^2$=25-36<0; impossible, (so line does not intersect curve) |
| | (b) | $y^2 = (2x - 2)^2$<br>$x^2 + (2x - 2)^2 = 25$<br>$x^2 + 4x^2 - 8x + 4 = 25$<br>$5x^2 - 8x + 4 - 25 = 0$<br>$5x^2 - 8x - 21 = 0$<br>$(5x + 7)(x - 3) = 0$ or<br>$x = \frac{--8 \pm \sqrt{(-8)^2 - 4 \times 5 \times (-21)}}{10} = \frac{8 \pm \sqrt{484}}{10}$<br>So $x = 3$, or $x = -1.4$<br>Subs into either equation gives:<br>$y = 4$, or $y = -4.8$ | $x = 3$<br>$y = 4$<br><br>$x = -1.4$<br>$y = -4.8$ | 6 | M1 $y^2=(2x-2)^2$ seen or implied<br>A1 $x^2 + 4x^2 - 8x + 4 = 25$ (oe expanded form)<br>M1 correct attempt to solve 3 term quadratic equation<br>A1 $x = 3$, $x = -1.4$<br><br>M1 (dep on previous Ms) Sub one value of $x$ into either equation gives:<br>A1 $y = 4$, $y = -4.8$<br>NB: incorrectly matched pairs loses the final A1. |

| PAPER 5506 | | | | | |
|---|---|---|---|---|---|
| | No | Working | Answer | Mark | Notes |
| 20 | (a) | 400.005 ÷ 59.95 = 6.672310<br>6.672310 ÷ 1000 × 3600 = 24.02032<br>399.995 ÷ 60.05 = 6.661032<br>6.661032 ÷ 1000 × 3600 = 23.97972 | 24.020<br>23.980 | 5 | B1 for 400.005 or 59.95 seen oe<br><br>M1 for "400.005" ÷ "59.95" where "400.005" ∈ [400.005,400.5] and "59.95" ∈ [59.5,59.95] oe<br><br>B1 for 399.995 or 60.05 seen oe<br><br>M1 for "399.995" ÷ "60.05" where "399.995" ∈ [399.5,399.95] and "60.05" ∈ [60.05,60.5] oe<br><br>A1 23.979-23.980 and 24.020-24.0204 |
| | (b) | 24.0 because to 1dp the answers are the same | | 1 | B1cao for 24.0 with reason |
| | (c) | 177 × 50/477 = 18.553 → 19 → 18<br>111 × 50/477 = 11.635 → 12<br>86 × 50/477 = 9.0147 → 9<br>82 × 50/477 = 8.595 → 9<br>21 × 50/477 = 2.201 → 2 | 18<br>12<br>9<br>9<br>2 | 3 | M1 for $\frac{50}{"477"} \times 177$ or 111 or 86 or 82 or 21<br>A1 for all integers or better answers, at least 3 correct<br>A1 cao |
| 21 | (a) | $40 - x = 3(4 + x)$<br>$40 - x = 12 + 3x$<br>$40 - 12 = x + 3x$<br>$4x = 28$ | 7 | 3 | M1 multiplying through by 3:<br>$3 \times \frac{40 - x}{3} = 3 \times 4 + 3 \times x$<br>A1 $40 - 12 = x + 3x$<br>A1 cao |
| | (b) | $\frac{2x(2x - 3)}{(2x - 3)(2x + 3)} = \frac{2x}{2x + 3}$ | $\frac{2x}{2x + 3}$ | 3 | B1 for $(2x-3)(2x+3)$<br>B1 for $2x(2x-3)$ or $(2x + 0)(2x + 3)$<br>B1 cao |

| PAPER 5506 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 22 | Distance from $x$ axis is $y$.<br>Distance from (0, 2) is $\sqrt{(x^2+(y-2)^2)}$<br>$y^2 = x^2 + (y-2)^2$<br>$y^2 = x^2 + y^2 - 4y + 4$<br>$0 = x^2 - 4y + 4$<br>$4y = x^2 + 4$ and finish | | 4 | B1 for $(x-0)^2 + (y-2)^2$ or $\sqrt{((x-0)^2+(y-2)^2)}$ oe seen<br>B1 for $y = \sqrt{(x-0)^2+(y-2)^2}$<br>or $y^2 = (x-0)^2 + (y-2)^2$ oe<br>B1 $(y-2)^2 = y^2 - 4y + 4$ seen<br>B1 for $4y = x^2 + 4$ and finish |

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Edexcel GCSE

# Mathematics A 1387

June 2007

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**Mark Scheme**

Edexcel GCSE
Mathematics A 1387

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**NOTES ON MARKING PRINCIPLES**

1 **Types of mark**
M marks: method marks
A marks: accuracy marks
B marks: unconditional accuracy marks (independent of M marks)

**2 Abbreviations**
cao – correct answer only
ft – follow through
isw – ignore subsequent working
SC: special case
oe – or equivalent (and appropriate)
dep – dependent
indep - independent

**3 No working**
If no working is shown then correct answers normally score full marks
If no working is shown then incorrect (even though nearly correct) answers score no marks.

**4 With working**
If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.
If there is no answer on the answer line then check the working for an obvious answer.

**5 Follow through marks**
Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

**6 Ignoring subsequent work**

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

**7 Probability**

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

**8 Linear equations**

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

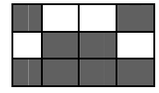
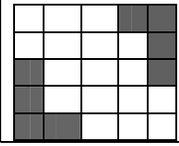
**9 Parts of questions**

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

**Remember: if you are having difficulty making a decision on how you should mark a candidate response contact your Team Leader for advice, or send the item to review.**

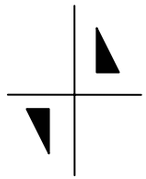
| Paper 5521_01 | | | | | |
|---|---|---|---|---|---|
| No | | Working | Answer | Mark | Notes |
| 1 | | Cat ||||/|| 8<br>Dog |||| | 6<br>Fish || 2<br>Hamster |||| 4 | 8, 6, 2, 4 | 3 | M1 for attempt to tally or one frequency correct in either column<br>A1 for 1 frequency correct or all tallies correct in correct column<br>A1 for all frequencies correct (accept if /20) |
| 2 | | | 27, 35, 42, 67, 118 | 1 | B1 cao |
| 3 | (a) | | Diameter drawn | 1 | B1 for a diameter |
| | (b) | | Right angle marked | 1 | B1 *R* marked correctly |
| | (c) | | Rectangle drawn | 1 | B1 for a rectangle |
| 4 | (a) | | 40 | 1 | B1 cao |
| | (b) | | 50 | 1 | B1 cao |
| | (c) | | 3 full loaves<br>4 full loaves + 1 half loaf | 2 | B1 for 3 full loaves<br>B1 for 4 full loaves + 1 half loaf |
| 5 | (a) | | 7252 | 1 | B1 cao |
| | (b) | | Three thousand and eighty six | 1 | B1 accept 3 thousand and eighty six (condone 0 hundred) |
| | (c) | | 4600 | 1 | B1 accept 4600 |
| | (d) | | 200 | 1 | B1 for 200 or 2 hundred or 100 or hundred |
| 6 | (i) | | Cube | 2 | B1 for 'cube' (accept 'cuboid') ignore spelling |
| | (ii) | | Cylinder | | B1 for 'cylinder' ignore spelling |
| 7 | | $5 \times 100$ | 500 | 2 | B2 for 490 or 500 or 510<br>(B1 for either 5 or 5.0 or 100 seen) |

| Paper 5521_01 | | | | | |
|---|---|---|---|---|---|
| No | | Working | Answer | Mark | Notes |
| 8 | (a) | | 8.4 cm or 84 mm | 2 | B2 allow ±2mm<br>(B1 for 8.4 or 84, B1 for appropriate unit) |
| | (b) | | 37° | 1 | B1 allow ±2° |
| 9 | (a) | | Carbon black | 1 | B1 accept 'black carbon' accept 26% |
| | (b) | | 0.1(0) | 1 | B1 cao |
| | (c) | | 0.04 | 1 | B1 cao |
| | (d) | $\frac{26}{100}$ | $\frac{13}{50}$ | 2 | M1 for $\frac{26}{100}$<br>A1 cao |
| 10 | (a) | | 97 | 1 | B1 cao |
| | (b) | | London Reading | 1 | B1 cao |
| | (c) | 41 + 57 + 58 | 156 | 3 | M1 for two of 41, 57, 58<br>M1(dep) for '41' + '57' + '58'<br>A1 cao |
| 11 | (a) | | 3 | 1 | B1 cao allow ± 0.2 |
| | (b) | | –5 | 1 | B1 cao allow ±0.2 |

| Paper 5521_01 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 12 | (a) | | Centimetres (cm)<br>miles<br>litres (*l*) | 3 | B3 (B1 for each correct answer) accept abbreviations |
| | (b) | | 300 | 1 | B1 cao |
| | (c) | '1500>1400' or '1.5>1.4' | Reason | 1 | B1 for No and '1500>1400' or '1.5>1.4' |
| 13 | (a) | Height of bars 12, 8, 6<br>lines drawn between points | Bars drawn | 2 | B2 for 3 bars correctly drawn<br>(B1 for 2 bars correct) |
| | (b) | | July and August | 1 | B1 oe |
| | (c) | 24 – 4 | 20 | 1 | B1 (Accept '4 to 24' oe) |
| | (d) | The temperatures are rising | Temp's rising oe | 1 | B1 for reason |
| 14 | (a) (i) | | $(-4, 3)$ | 2 | B1 cao |
| | (ii) | | $(2, -1)$ | | B1 cao |
| | (b) (i) | *D* marked at $(-4, -1)$ | Point marked on grid | 2 | B1 for point marked at $(-4, -1)$ cao |
| | (ii) | | $(-4, -1)$ | | B1 ft |
| 15 | (a) | |  | 1 | B1 cao |
| | (b) | |  | 1 | B1 cao |

| Paper 5521_01 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 16 (a) | | (Pat +) reason | 1 | B1 correct comment (Pat may be implied) |
| (b) | 21 ÷ 3 | 7 | 1 | B1 cao |
| 17 (i) | | S marked at 1 | 3 | B1 for S within ½ cm of 1 |
| (ii) | | P marked at 0 | | B1 for P marked at 0 cao |
| (iii) | | Q marked at "1/3" | | B1 for Q marked at 1/3 ± 1 cm use overlay |
| 18 | 6 + 6 + 3 or $2\frac{1}{2}\times 6$ | 15 | 3 | M1 for realizing 6 glasses in one bottle<br>M1 for realizing 3 glasses in ½ a bottle<br>A1 cao<br>(M2 for attempt to find $2\frac{1}{2}\times 6$) oe |
| 19 | 15 and 16 parts shaded<br><br>Alternative 1<br>$\frac{3}{4}=0.75,\ \frac{4}{5}=0.8$<br><br>Alternative 2<br>$\frac{3}{4}=\frac{15}{20},\ \frac{4}{5}=\frac{16}{20}$ | $\frac{4}{5}$ + reason | 3 | M1 for correctly shading 15 parts for 3/4<br>M1 for correctly shading 16 parts for 4/5<br>A1 (dependent on M2) for selection of 4/5<br><br>Alternative 1<br>M1 for $\frac{3}{4}=0.75$<br>M1 for $\frac{4}{5}=0.8$<br>A1 (dep on M2) for selection of 0.8 or $\frac{4}{5}$ or $\frac{16}{20}$<br><br>Alternative 2<br>M1 for $\frac{3}{4}=\frac{15}{20}$<br>M1 for $\frac{4}{5}=\frac{16}{20}$<br>A1(dep on M2) for selection of $\frac{4}{5}$ or $\frac{16}{20}$ |

| Paper 5521_01 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 20 (a) | | −5 (−3) (−1) 1 3 5 | 2 | B2 cao<br>(B1 for any 2 or 3 correct) |
| (b) | Points plotted | Line | 2 | B2 for line from (−1, −5) to (4, 5)<br>(B1 ft for plotting at least 5 "points") |
| 21 | Shapes shaded on grid | 6 tessellating shapes | 2 | B2 for fully correct with 5 or more additional shapes, no gaps<br>(B1 for 4 shapes tessellating with at least one shape inverted, with or without the given shape ignore extras) |
| 22 (a) | | $\frac{7}{20}$ | 1 | B1 for $\frac{7}{20}$ oe |
| (b) | 7 + 2 (or 20 – 11) are not lime flavour | $\frac{9}{20}$ | 1 | B1 for $\frac{9}{20}$ |
| (c) | | 0 | 1 | B1 for 0, zero or nought ($\frac{0}{20}$ gets B0) |
| 23 (a) | | $4a$ | 1 | B1 accept $4\times a$, $a \times 4$, $a4$ |
| (b) | | $12b$ | 1 | B1 accept $12\times b$, $b \times 12$, $b12$ |
| (c) | | $2a + 6b$ | 2 | B2 cao<br>(B1 for $2a$ or $6b$ seen) |
| (d) | | $x(x-6)$ | 2 | B2 cao<br>(B1 for $x(ax+b)$ where $a$, $b$ are numbers not equal to 0 or $x - 6$ seen on its own, or as part of an expression) |
| 24 (a) | | 40 | 1 | B1 cao |
| (b) | | 45 | 1 | B1 for 42 – 48 accept ¾ hour |
| (c) | $40\times 2$ or $\frac{40}{30}\times 60$ or $40\div\frac{1}{2}$ | 80 | 2 | M1 for $40\times 2$ or $\frac{40}{30}$ or $40\div\frac{1}{2}$<br>A1 cao<br>NB $\frac{40}{45}\times 60$ gets M0 A0 |

| Paper 5521_01 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 25 (a) | | 4560 | 1 | B1 cao |
| (b) | | 45.6 | 1 | B1 cao |
| (c) | | 2.4 | 1 | B1 cao |
| 26 | $-7 - 3 = -10$<br>$2 \times -10 = -20$<br>$-20 \div 4$ | $-5$ | 3 | M1 for substitution of 2 and $-7$ into $p(q - 3)$ or sight of -20 or $-14 - 6$<br>M1dep for '$-20$' $\div 4$<br>A1 cao<br>B1 SC for sight of $-10$ if M0 awarded |
| 27 (a) |  | Reflection in $y$-axis | 1 | B1 cao |
| (b) |  | Rotation by half turn about (0,0) | 2 | B2 cao<br>(B1 for half turn not about (0,0).) |
| (c) | | Enlargement<br>Scale factor 3<br>Centre (0,0) | 3 | B1 for 'enlargement'<br>B1 for "scale factor 3" or 3 seen<br>B1 for 'centre (0,0) |
| 28 (a) | | Reason | 1 | B1 for 'The frequencies are nearly equal' oe |
| (b) | $1\times26+2\times26+3\times23+4\times25 = 247$<br>247/100 | 2.47 | 3 | M1 for $fx$ (attempting at least 2 relevant products)<br>M1 for $\sum fx \div 100$<br>A1 2.47 cao |

| Paper 5521_01 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 29 | 5 × 5 × 6 | 150 | 4 | M1 for attempt at 1 division (e.g. 40 ÷ 8), may be implied by marks or number on one edge of diagram or by 5 or 6 seen<br>M1 for attempt at 3 divisions (40÷8, 40÷8, 60÷10), may be implied by marks or numbers on diagram or by 5,5 and 6 seen.<br>M1 (dep on 1st M1) for "5" × "5" × "6"<br>A1 cao<br><br>Alternatively<br>M1 for 40 × 40 × 60 **or** 8 × 8 × 10 **or** 96000 or 640 seen<br>M1 for 40 × 40 × 60 **and** 8 × 8 × 10 or 96000 **and** 640 seen<br>M1 (dep on 1st M1) for "(40 × 40 × 60)" ÷ "(8 × 8 × 10)"<br>A1 cao<br><br>SC:B1 for dividing area of one carton face by area of corresponding box face if M0 |

| Paper 5521_02 | | | | | |
|---|---|---|---|---|---|
| No | | Working | Answer | Mark | Notes |
| 1 | (a) | Draw diagram. | Diagram | 1 | B1 cao |
| | (b) | | 13,16 | 1 | B1 cao |
| | (c) | | 31 | 1 | B1 cao |
| 2 | (a) | | 8 | 1 | B1 cao |
| | (b) | | 14 | 2 | B2 for 14 (B1 for 13 or 15) |
| | (c) | | 16 | 2 | B2 for 16 (B1 for 15, 17 or 8) |
| 3 | (a) | | 4,7 drawn | 2 | B2 for car height 4 and bus height 7, (B1 for one correct) |
| | (b) | | 6 | 1 | B1 cao |
| | (c) | | Walk | 1 | B1 |
| | (d) | | 27 | 1 | B1 cao |
| 4 | (a) | | 40 | 1 | B1 for 40–41 inclusive |
| | (b) | | 12 | 1 | B1 for 11.5 – 12.5 inclusive |
| 5 | (a) | | Row complete | 2 | B2 for 1+..+11; 36 (B1 for one of the 2 cells complete) |
| | (b) | | Square | 1 | B1 "square" |
| 6 | | One line of symmetry | | 1 | B1 within 2mm of centre of base / 2mm of vertex |

| Paper 5521_02 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 7 (a) (i) | | 09 06 | 2 | B1 (accept 9 06 oe) |
| (ii) | | 39 | | B1 cao |
| (b) | | 06 55 | 1 | B1 (accept 6 55 oe) |
| (c) | | 2h 6min | 1 | B1 cao |
| (d) | | 15 min | 2 | M1 for 0906 – 0645 – "(c)"<br>or 0906 – 0645 − 2hr 6min<br>or 2hr 21min − "(c)" or 2hr 21min − 2hr 6 min<br>or 141 − 126 or 20 − 5<br>A1 cao<br><br>SC: B1 for 55 or 75 or 93 seen |
| 8 (i) | | 8,10,12,20 or 30 | 3 | B1 at least one of 8, 10, 12, 20, 30 (no extras) |
| (ii) | | 8,12 or 20 | | B1 at least one of 8,12, 20 (no extras) |
| (iii) | | 3 or 5 | | B1 3 or 5 or both (no extras) |
| 9 (a) | | C or G | 1 | B1 at least one of C or G ( no extras) |
| (b) | | A and F | 1 | B1 cao |
| (c) | | 2 | 1 | B1 (accept –2) |
| 10 (a) | | $\frac{7}{10}$ | 1 | B1 7/10 oe |
| (b)(i) | | 4 squares | 2 | B1 4 squares shaded |
| (ii) | | 80% | | B1 80% or ft from unshaded part<br>(no ft from 0% or 100%) |
| (c)(i) | | 2.5 | 2 | B1 2.4–2.6 inclusive |
| (ii) | | 1.7 | | B1 1.6–1.8 inclusive |
| 11 (a) | | 2 | 1 | B1 for 2 or –2 |
| (b) | | 14 | 1 | B1 for 14 or –14 |

| Paper 5521_02 | | | | | |
|---|---|---|---|---|---|
| No | | Working | Answer | Mark | Notes |
| 12 | | 2 × 8.50 = 17.00<br>3 × 4.50 = 13.50<br>Total = 30.50<br><br>50.00 – 30.50 | 19.5(0)(*p*) | 3 | M1 for adding 5 correct values<br>or 2 × 8.50 + 3 × 4.50 (ignore units)<br>or 30.5(0) or 3050 seen<br>M1 dep for 50 − "30.50" (ignore units)<br><br>(OR M1for adding at least 1 adult ticket and at least 1 child ticket **and** subtracting from 50)<br>A1 cao<br>SC: B1 for 24 or 37 or 2400 or 3700 seen |
| 13 | (a) | | Hexagon | 1 | B1 |
| | (b)(i) | | 120 | 2 | B1 cao |
| | (ii) | | Str line | | B1 reference to a (straight) line and 180° |
| | (c) | | Obtuse | 1 | B1 Accept "interior" |
| 14 | (a) | 2, 2, 3, 3, 3, 4, 4, 4, 5, 6 | 3.5 | 2 | M1 ordering the numbers (condone 1 error or omission)<br>A1 cao |
| | (b) | 36 ÷ 10 | 3.6 | 2 | M1 sum of numbers ÷ 10<br>A1 cao<br>SC B1 for 3r 6 |
| | (c) | 6 – 2 | 4 | 1 | B1 cao |
| 15 | (a) | | Paul | 1 | B1 cao |
| | (b) | 36 ÷ 2 oe | 18 | 1 | B1 cao |
| | (c) | 60/360 = | 1/6 | 2 | M1 60/360 oe<br>A1 cao |

| Paper 5521_02 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 16 | | 4.7 ÷ 5.9 = 0.796610169 | 0.7966.. | 2 | B2 for 0.7966 or better<br>(B1 for 0.8, 0.80, 0.79, 0.796, 0.797 or digits 59 seen |
| 17 | | $6x - 7 + 7 = 38 + 7$<br>$6x = 45$ | 7.5 | 2 | M1 $6x = 45$ or +7 both sides<br>A1 7.5 oe; accept 45/6 oe |
| 18 | | **55** 61 74 **190**<br>33 **17** **10** 60<br>**88** **78** 84 250 | **55** 61 74 **190**<br>33 **17** **10** 60<br>**88** **78** 84 250 | 3 | B3 all six entries correct<br>(B2 for 4 or 5 entries correct)<br>(B1 for 2 or 3 entries correct) |
| 19 | (a) | 900 × 1.70 = | 1530 | 2 | M1 900 × 1.7(0) or digits 153(0) seen<br>A1 cao |
| | (b) | 160 ÷ 1.70 = | £94.12 or £94.11 | 2 | M1 160 ÷ 1.7(0) or digits 941(....) seen<br>A1 cao |
| 20 | (a)(i) | 180 – 54 (=126)<br>"126" ÷ 2 | 63 | 3 | M1 for (180–54) ÷ 2<br>A1 cao |
| | (ii) | | Reason | | B1 (indep) angles in triangle add to 180 OR equal angles in isosceles triangle OR equal angles and 2 sides the same (B0 if any incorrect reasoning given eg parallel, equilateral triangle) |
| | (b) | 180 – "$x$" | 117 | 1 | B1 117 or ft 180 – "$x$" if $x < 90$ |
| 21 | (a) | 3 × 35 + 50 | 155 | 2 | M1 for 3 × 35 + 50 or digits 155 seen<br>A1 cao |
| | (b) | 260 – 50 = 210<br>210 ÷ 35 = | 6 | 3 | M1 for 260–50 or 210 seen.<br>M1 for "260-50" ÷ 35 or 210÷35<br>A1 cao<br>SC B1 for starting at a number between 100 and 170 and adding at least two 35's and showing a total between 230 and 290<br>OR<br>For adding at least three 35's, perhaps with other numbers, and showing a total between 180 and 240 (or between 230 and 290 if 50 is included in the sum) |

| Paper 5521_02 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| (c) | | P=35$h$ + 50 | 3 | B3 for P=35$h$+50 or P=35×$h$+50 oe<br>(B2 for correct RHS or P=$h$ + 50 ×35 or P=35$h$+$k$ where $k$ is numerical oe)<br>(B1 for P = some other linear expression in $h$, OR $h$ + 50 ×35 OR 35h seen)<br>NB: P=$h$ scores no marks; ignore £ signs.<br>SC B2 for $h = \frac{P-50}{35}$ |
| 22 (a) |  | Elevation | 2 | B2 for 4 vertical squares. Accept 4 by 1 rectangle.<br>(B1 for 4 vertical squares with one square added or one parallelogram added at the top, or 3 vertical squares, or 4 horizontal squares) |
| (b) |  | Plan | 2 | B2 for 2 adjacent squares, vertical or horizontal. Accept 2 by 1 rectangle.<br>(B1 for 3 adjacent horizontal or vertical squares or a rectangle with sides in the ratio 2:1) |
| 23 (i)<br>(ii)<br>(iii) | | 5<br>9<br>6 | 3 | B1 cao<br>B1 cao<br>B1 cao |
| 24 | $45.00 + 45.00 \times \frac{15}{100} =$<br>$45.00 + 6.75 =$ | 51.75 | 3 | M2 for $45.00 + 45.00 \times \frac{15}{100}$ oe<br>or $45.00 \times 1.15$ oe OR $45.00 + 6.75$ OR complete method or 5175 seen.<br>(M1 for $45.00 \times \frac{15}{100}$ oe OR 6.75 seen OR 675 seen<br>OR correct method for calculating 15% of 45)<br>A1 cao<br>SC Award B2 for an answer of 38.25 |

| Paper 5521_02 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 25 (a) | | Points | 1 | B1 all three points ±1 full square |
| (b) | | Negative | 1 | B1 Negative (ignore additional descriptors unless contradictory) |
| (c) | | lobf | 1 | B1 A single straight line drawn to cross between (5,30), (5,40) and (40,0), (40,15); accept freehand if considered to be straight. |
| (d)(i) | | 18–25 | 2 | B1 18g–25g inclusive OR if not in this range ft ±1 square dep on single straight line with negative gradient. |
| (ii) | | 30–40 | | B1 30–40 min inclusive OR if not in this range ft ±1 square dep on single straight line with negative gradient |
| 26 | | 300<br>3<br>75<br>150 | 3 | B3 for 4 correct answers<br>(B2 for 2 or 3 correct answers)<br>(B1 for 1 correct answer) |
| 27 | π × 0.65 | 2.04–2.05 | 2 | M1 for π × 0.65 or 3.14 x 0.65 or 3.142 x 0.65<br>A1 for 2.04–2.05<br>SC Award B1 for 2.0 seen (not 2) |
| 28 | 5 miles = 8 km<br>70mph÷5×8 = 112 km/h<br>OR<br>120km/h ÷ 8 × 5 = 75 mph<br>Faster than 70 mph | 70mph<br>(Great Britain)<br>(112 km) | 3 | M1 5 miles = 8 km; OR 70 mph is about 100 km/h OR 1km=0.6(25) miles OR 1mile=1.6km oe<br>M1 70 ÷ 5 × 8 (=112) or 120 ÷ 8 × 5 (=75)<br>A1 (dep on at least M1) GB or 70 mph<br>Refer to both answer line and working.<br>NB GB or 70 mph without working scores 0 marks |

| Paper 5523_03 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 1 | | Cuboid drawn | 2 | B2 for correct isometric drawing in any orientation (ignore points 'behind', mark 7 vertices only); accept lines drawn near to dots as long as there is no ambiguity.<br>(B1 for one of the three faces drawn correctly **or** for an isometric drawing of any cuboid) |
| 2 | Different makes of car<br>Tally<br>Frequency | Make of car<br>Tally<br>Frequency | 3 | B1 for make of car or list of at least 3 different makes<br>B1 for tally or tally marks<br>B1 for frequency or totals |
| 3 | | 6 tessellating shapes | 2 | B2 for fully correct with 5 or more additional shapes, no gaps<br>(B1 for 4 or more shapes tessellating, with at least one shape inverted, with or without the given shape, ignore extras) |
| 4 | 24.90 ÷ 3 or 8.30<br>24.90 – '8.30' or 2 × 8.30 | 16.6(0) | 3 | M1 for 24.90 ÷ 3 or 8.30<br>M1 (dep) for 24.90 – “8.30” or 2 × “8.30”<br>A1 for 16.60 or 16.6 |

**Paper 5523_03**

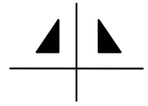
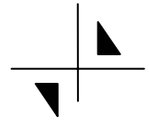
| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 5 | 315 × 24<br>24 × 315<br>1260<br>6300<br>7560<br>7560<br><br>**3 1 5**<br>0 6 \| 0 2 \| 1 0 — **2**<br>1 2 \| 0 4 \| 2 0 — **4**<br>7 5 6 0<br><br>**300 10 5**<br>6000 \| 200 \| 100 — **20**<br>1200 \| 40 \| 20 — **4**<br>6000+200+100+1200+40+20 = 7560<br><br>**3 0.1 0.05**<br>60 \| 2 \| 1 — **20**<br>12 \| 0.4 \| 0.2 — **4**<br>60 + 2 + 1 + 12 + 0.4 + 0.2 = 75.6 | 75.6(0) | 3 | M1 for a complete method with relative place value correct. Condone 1 multiplication error, addition not necessary.<br>**OR**<br>M1 for a complete grid with not more than 1 multiplication error, addition not necessary.<br>**OR**<br>M1 for sight of a complete partitioning method, condone 1 multiplication error, final addition not necessary.<br><br>A1 for 7560 or digits 756(0)<br>A1 (dep on M1, but not previous A1) for correct placement of decimal point. |

| Paper 5523_03 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 6 | 15 and 16 parts shaded<br><br>Alternative 1<br>$\frac{3}{4} = 0.75$ or 75%, $\frac{4}{5} = 0.8$ or 80%<br><br>Alternative 2<br>$\frac{3}{4} = \frac{15}{20}$, $\frac{4}{5} = \frac{16}{20}$ | $\frac{4}{5}$ + reason | 3 | M1 for shading 15 parts for $\frac{3}{4}$<br>M1 for shading 16 parts for $\frac{4}{5}$<br>A1 (dep on M2) for selection of $\frac{4}{5}$ with correct shading<br><br>Alternative 1<br>M1 for $\frac{3}{4} = 0.75$ or 75%<br>M1 for $\frac{4}{5} = 0.8$ or 80%<br>A1 (dep on M2) for selection of 0.8 or 80% or $\frac{4}{5}$ with correct decimals or percentages<br><br>Alternative 2<br>M1 for $\frac{3}{4} = \frac{15}{20}$ oe<br>M1 for $\frac{4}{5} = \frac{16}{20}$ oe<br>A1 (dep on M2) for selection of $\frac{4}{5}$ or $\frac{16}{20}$ with equivalent fractions |

| Paper 5523_03 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 7 | | $5 \times 5 \times 6$ | 150 | 4 | M1 for attempt at 1 division (e.g. $40 \div 8$), may be implied by marks or number on one edge of diagram or by 5 or 6 seen<br>M1 for attempt at 3 divisions ($40 \div 8$, $40 \div 8$, $60 \div 10$), may be implied by marks or numbers on diagram or by 5,5 and 6 seen.<br>M1 (dep on 1st M1) for "5" × "5" × "6"<br>A1 cao<br><br>Alternatively<br>M1 for $40 \times 40 \times 60$ **or** $8 \times 8 \times 10$ **or** 96000 or 640 seen<br>M1 for $40 \times 40 \times 60$ **and** $8 \times 8 \times 10$ or 96000 **and** 640 seen<br>M1 (dep on 1st M1) for "$(40 \times 40 \times 60)$" ÷ "$(8 \times 8 \times 10)$"<br>A1 cao<br><br>SC:B1 for dividing area of one carton face by area of corresponding box face if M0 |
| 8 | (a) | | $\frac{7}{20}$ | 1 | B1 for $\frac{7}{20}$ oe |
| | (b) | 7 + 2 (or 20 – 11) are not lime flavour | $\frac{9}{20}$ | 1 | B1 for $\frac{9}{20}$ oe |
| | (c) | | 0 | 1 | B1 for 0, zero or nought ($\frac{0}{20}$ gets B0) |
| 9 | (a) | | $80x$ | 1 | B1 for $80x$ (accept $80 \times x$, $x80$, $x \times 80$) seen |
| | (b) | | $95y$ | 1 | B1 for $95y$ (accept $95 \times y$, $y95$, $y \times 95$) seen |
| | (c) | | $80x + 95y$ | 2 | M1ft for adding "$80x$" and "$95y$" (algebraic expressions only)<br>A1 for $80x + 95y$ |

**Paper 5523_03**

| No | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 10 (a) | | 40 | 1 | B1 cao |
| (b) | | 45 | 1 | B1 for 42 to 48 (accept 3/4 hour) |
| (c) | $40\times2$ or $\frac{40}{30}\times60$ or $40\div\frac{1}{2}$ | 80 | 2 | M1 for $40 \times 2$ or $\frac{40}{30}$ or $40\div\frac{1}{2}$<br>A1 cao<br>NB $\frac{40}{45}\times 60$ gets M0 A0 |
| 11 (a) | $3\times3-4\times2$ or $9-8$ | 1 | 2 | M1 for substitution of 3 and 2 into expression or 9 and 8 seen<br>A1 cao |
| (b) | $-7-3=-10$<br>$2\times-10=-20$<br>$-20\div4$ | $-5$ | 3 | M1 for substitution of 2 and $-7$ into $p(q-3)$ or sight of -20 or $-14-6$<br>M1 (dep) for "$-20$" $\div 4$<br>A1 cao<br>SC: B1 for $-10$ seen if M0 |
| 12 (a) | 6 \| 8 9 7<br>7 \| 8 5 9 6 3<br>8 \| 1 3 1 7 1<br>9 \| 0 1 | 6 \| 7 8 9<br>7 \| 3 5 6 8 9<br>8 \| 1 1 1 3 7<br>9 \| 0 1 | 3 | M1 for unordered diagram (condone one error)<br>A1 cao<br>B1 for key (eg 6 \| 7 = 67) |
| (b)(i) | | Explanation | 2 | B1 for '(order numbers and) select middle value' oe |
| (ii) | | 79 | | B1 cao |

| Paper 5523_03 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 13 | (a) |  | Reflection in $y$-axis | 1 | B1 for triangle with vertices at (-1, 1) (-3, 1) and (-1,4) |
| | (b) |  | Rotation by half turn about (0, 0) | 2 | B2 for triangle with vertices (-1, -1) (-3, -1) and (-1, -4)<br>(B1 for half turn not about (0,0)) |
| | (c) | | Enlargement<br>Scale factor 3<br>Centre (0, 0) | 3 | B1 for 'enlargement'<br>B1 for 'scale factor 3' or 3 seen<br>B1 for 'centre (0,0)'<br>B0 for any combination of transformations |
| 14 | (a) | | 4560 | 1 | B1 cao |
| | (b) | | 45.6 | 1 | B1 cao |
| | (c) | | 2.4 | 1 | B1 cao |
| 15 | (a) | $4a-2a+5b+b$ | $2a+6b$ | 2 | B2 cao<br>(B1 for $2a$ or $6b$ seen) |
| | (b) | | $x(x-6)$ | 2 | B2 cao<br>(B1 for $x(ax+b)$ where $a$, $b$ are numbers not equal to zero or $x-6$ seen on its own, or part of an expression) |
| | (c) | | $3x-2x^3$ | 2 | B2 cao<br>(B1 for $3x$ or $2x^3$) |
| | (d) | | $4x(3y+x)$ | 2 | B2 cao<br>(B1 for $2(6xy+2x^2)$ or $4(3xy+x^2)$ or $x(12y+4x)$ or $2x(6y+2x)$ or $4x(\quad)$) |

| Paper 5523_03 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 16 | (a) | $1 - (0.2 + 0.3 + 0.1)$ | 0.4 | 2 | M1 for $1 - (0.2 + 0.3 + 0.1)$<br>A1 for 0.4 oe, accept $\frac{0.4}{1}$ |
| | (b) | $0.2 \times 200$ | 40 | 2 | M1 for $0.2 \times 200$<br>A1 cao<br>NB $\frac{40}{200}$ is M1 A0, 40 out of 200 is M1 A1 |
| 17 | (a) (i) | $180 - 2 \times 25$ | 130 | 3 | M1 for $180 - 2 \times 25$<br>A1 cao |
| | (ii) | | Reason | | B1 for mentioning isosceles and equal (or base) angles or equal sides and equal (or base) angles |
| | (b) | $180 - 95$ | 85 | 1 | B1 cao |
| 18 | (a) (i) | | $7^5$ | 3 | B1 cao |
| | (ii) | | $7^4$ | | B2 cao<br>(B1 for sight of $7^5$ or $7^{2+3}$ or $7 \times 7^3$ or $7^1 \times 7^3$ or $7^2 \times 7^2$ or $7^{2+3-1}$) |
| | (b) | | $\frac{1}{2}$ | 1 | B1 for $\frac{1}{2}$ or 0.5 or $2^{-1}$ |
| 19 | (a) | | $3 \times 10^7$ | 1 | B1 cao |
| | (b) | | 0.002 | 1 | B1 cao |

| Paper 5523_03 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 20 | | Box plot | 2 | 3 aspects:<br><br>1st aspect – vertical line for median<br>2nd aspect – box using correct quartiles<br>3rd aspect – whiskers (could be single line) drawn with correct end points<br><br>B2 for fully correct box plot<br>(B1 for 1 aspect) |
| 21 (a) | e.g.<br>2 \| 126<br>3 \| 63<br>3 \| 21<br>7 | $2\times3\times3\times7$ | 2 | M1 for a systematic method of at least 2 correct divisions by a prime number oe factor trees; can be implied by digits 2, 3, 3, 7 on answer line.<br>A1 for $2\times3^2\times7$ or $2\times3\times3\times7$ |
| (b) | $2\times3\times7$ | 42 | 2 | B2 cao<br>(B1 for 6, 14, 21 or $2\times3\times7$) |
| 22 | $\frac{8}{3}\times\frac{5}{4}=\frac{8\times5}{3\times4}=\frac{40}{12}$ | $3\frac{1}{3}$ | 3 | B1 for $\frac{8}{3}$ oe improper fraction or $\frac{5}{4}$ oe improper fraction<br>M1 (dep on B1) for multiplying numerator and denominator of "$\frac{8}{3}$" and "$\frac{5}{4}$"<br>A1 for $3\frac{1}{3}$ oe mixed number or $\frac{10}{3}$<br><br>OR<br><br>B1 for 1.25 and 2.67 or 2.66(…)<br>M1 (dep on B1) for correct method of multiplication<br>A1 for $3.\dot{3}$ |

| Paper 5523_03 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 23 | | | 2 | M1 for a relevant pair of intersecting arcs<br>A1 for line drawn within guidelines, at least 3cm in length, accept broken line<br>[SC: B1 for line drawn within guidelines if M0] |
| 24 (a) | | $-1, 0, 1, 2, 3$ | 2 | B2 cao (-1 each error or omission) |
| (b)(i) | | $x \geq \frac{7}{2}$ | 3 | M1 for $2x \geq 7$, condone use of = sign or wrong equality<br>A1 for $x \geq \frac{7}{2}$ oe as final answer |
| (ii) | | 4 | | SC:B1 for 3.5 or $\frac{7}{2}$ seen if M0<br>B1 ft from $x \geq$ "$\frac{7}{2}$" |
| 25 | $4x + 2y = 8$<br>$4x - 10y = 20$<br>$12y = -12$<br>$y = -1$<br>$4x + 2(-1) = 8$<br>$x = 2.5$ | $x = 2.5$<br>$y = -1$ | 3 | M1 for correct process to eliminate either $x$ or $y$ (condone one arithmetical error)<br>M1 (dep) for substituting found value into either equation<br>A1 for $x = 2.5$, $y = -1$<br>[SC: B1 for $x = 2.5$ or $y = -1$ if M0] |

| Paper 5523_03 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 26 | | Interior angle of hexagon =<br>180 – (360 ÷ 6) = 120<br>360 – (90 + 120) | 150 | 4 | Alternative 1<br>M1 for 360 ÷ 6<br>A1 for 60<br>M1 (dep on M1) for "60" + 90<br>A1 cao<br><br>Alternative 2<br>M1 for 360 ÷ 6<br>A1 for 60<br>M1 (dep on M1) for 360 – (2 × "60" + 90)<br>A1 cao<br><br>Alternative 3<br>M1 for (6 – 2) × 180 ÷ 6<br>A1 for 120<br>M1 (dep on M1) for 360 – (90 + "120")<br>A1 cao |
| 27 | (a) | | (16), 50, 82, 96, 100 | 1 | B1 cao |
| | (b) | Cumulative freq. diag. curve/ segments | Cum. freq graph | 2 | B1 for 4 or 5 points plotted correctly ± 1 full (2mm) square depending on sensible table (condone 1 addition error)<br>B1 (dep) for points joined by curve or line segments provided no gradient is negative - ignore any part of graph outside range of their points.<br>(SC:B1 if 4 or 5 points plotted not at end but consistent within each interval and joined) |
| | (c) | 100 – 42 | 58 | 2 | M1 (ft dep on graph being cf) for reading from graph at 18 or 19, can be implied by answer in range 40 to 46<br>A1 for answer in range 56 to 60 or ft for 100 – '42' ±1 full (2mm) square |

| Paper 5523_04 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 1 | (a) | 900 × 1.70 = | 1530 | 2 | M1 900 × 1.7(0) or digits 153(0) seen<br>A1 cao |
| | (b) | 160 ÷ 1.70 = | £94.12 or £94.11 | 2 | M1 160 ÷ 1.7(0) or digits 941(....) seen<br>A1 cao |
| 2 | (a) | 4.7 ÷ 5.9 = 0.796610169 | 0.7966.. | 2 | B2 for 0.7966 or better<br>(B1 for 0.8, 0.80, 0.79, 0.796, 0.797 or digits 59 seen) |
| | (b) | 0.82, 0.8, 0.85, 0.66, 0.875<br>0.66, 0.8, 0.82, 0.85, 0.875<br>2/3, 4/5, 0.82, 85%, 7/8 | 2/3, 4/5, 0.82, 85%, 7/8 | 2 | B2 correct order (oe decimals in order)<br>(B1 correct order reversed, or one error in ordered listing)<br>with or without decimal equivalents.<br>NB Accept 0.67 or 0.66 |
| 3 | | **55** 61 74 **190**<br>33 **17** **10** 60<br>**88** **78** 84 250 | **55** 61 74 **190**<br>33 **17** **10** 60<br>**88** **78** 84 250 | 3 | B3 all 6 correct<br>(B2 for 4 or 5 entries correct)<br>(B1 for 2 or 3 entries correct) |
| 4 | (a) | –3 (–1) (1) 3 5 7 | **–3**, 3, **5**, **7** | 2 | B2 all correct<br>(B1 2,3 correct) |
| | (b) | (-2,-3),(-1,-1),(0,1),(1,3),(2,5),(3,7) | line | 2 | B2 cao for line from $x = -2$ to $x = 3$<br>(B1 plotting at least 5 points correctly or single line passing through (0, 1) or single line of gradient 2)<br>The six possible points are:<br>(-2,-3), (-1,-1), (0,1), (1,3), (2,5), (3,7) |
| | (c)(i) | | –2 | 2 | B1 $y = -2$ or ft from line segment |
| | (ii) | | 2.5 | | B1 $x = 2.5$ or ft from line segment |

| Paper 5523_04 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 5 | (a) (i) | 180 – 54 (=126)<br>"126" ÷ 2 | 63 | 3 | M1 for (180–54) ÷ 2<br>A1 cao |
| | (ii) | | Reason | | B1 (indep) angles in triangle add to 180 OR equal angles in isosceles triangle OR equal angles and 2 sides the same (B0 if any incorrect reasoning given eg parallel, equilateral triangle) |
| | (b) | 180 – "$x$" | 117 | 1 | B1 117 or ft 180 – "$x$" if $x < 90$ |
| 6 | | 15/120×360 = 45 Plain<br>40/120×360 = 120 Cheese & Onion<br>55/120×360 = 165 Salt & Vinegar<br>10/120 × 360 = 30 Beef | 45°, 120°, 165°, 30° | 4 | M1 evidence of method for at least one angle (could be implied by one correct angle of four on pie chart or in the table)<br>A2 All four angles drawn ±2° tolerance, any order<br>(A1 at least 2 angles correctly drawn ±2°, or all 4 angles in the table)<br>B1 (dep on at least 1 angle drawn correctly, and exactly 4 sectors) for labels (flavour or frequency; initials will do)<br>NB: Ignore the table if the pie chart provides the marks. |
| 7 | (a) | 260 – 50 = 210<br>210 ÷ 35 = | 6 | 3 | M1 for 260–50 or 210 seen.<br>M1 for "260-50" ÷ 35 or 210÷35<br>A1 cao |
| | (b) | | P=35$h$ + 50 | 3 | B3 for P=35$h$+50 or P=35×$h$+50 oe<br>(B2 for correct RHS or P=$h$ + 50 ×35 or P=35$h$+$k$ where $k$ is numerical oe)<br>(B1 for P = some other linear expression in $h$, OR $h$ + 50 ×35 OR 35h seen)<br>NB: P=$h$ scores no marks; ignore £ signs.<br>SC B2 for $h = \frac{P-50}{35}$ |
| 8 | (a) |  | Elevation | 2 | B2 for 4 vertical squares. Accept 4 by 1 rectangle.<br>(B1 for 4 vertical squares with one square added or one parallelogram added at the top, or 3 vertical squares, or 4 horizontal squares) |

| Paper 5523_04 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| (b) |  | Plan | 2 | B2 for 2 adjacent squares, vertical or horizontal. Accept 2 by 1 rectangle.<br>(B1 for 3 adjacent horizontal or vertical squares or a rectangle with sides in the ratio 2:1) |
| 9 (a) | | Points | 1 | B1 all three points ±1 full square. |
| (b) | | Negative | 1 | B1 Negative. Ignore other descriptors unless contradictory. |
| (c) | | lobf | 1 | B1 A single straight line drawn to cross between (5,30), (5,40) and (40,0), (40,15); accept freehand if considered to be straight. |
| (d)(i)<br>(ii) | | 18–25<br>30–40 | 2 | B1 18g–25g inclusive OR if not in this range ft ±1 square dep on single straight line with negative gradient.<br>B1 30–40 min inclusive OR if not in this range ft ±1 square dep on single straight line with negative gradient. |
| 10 | | 300, 3, 75, 150 | 3 | B3 for 4 correct<br>(B2 for 2 or 3 correct)<br>(B1 for 1 correct) |
| 11 (a) | $6x - 7 + 7 = 38 + 7$<br>$6x = 45$ | 7.5 | 2 | M1 $6x = 45$ or +7 both sides<br>A1 7.5 oe; accept 45/6 |
| (b) | $5y - 2 = 10$ or $20y - 8 = 40$<br>$5y = 12$ $20y = 48$ | $2\frac{2}{5}$ | 3 | M1 $20y–8(=40)$ or $\frac{4(5y-2)}{4} = \frac{40}{4}$ or $5y–2=10$<br>M1 (indep) for correct rearrangement into the form $ay=b+c$ or better (eg $20y=40+8$ or $5y=10+2$, using own terms)<br>A1 for $2\frac{2}{5}$, 2.4 oe |
| 12 | 5 miles = 8 km<br>70mph÷5×8 = 122 km/h<br>OR<br>120km/h ÷ 8 × 8 = 75 mph<br>Faster than 70 mph | 70mph<br>(Great Britain)<br>(112 km) | 3 | M1 5 miles = 8 km; OR 70 mph is about 100 km/h OR 1km=0.6(25) miles OR 1mile=1.6km oe<br>M1 70 ÷ 5 × 8 (=112) or 120 ÷ 8 × 5 (=75) oe<br>A1 (dep on at least M1) GB or 70 mph<br>Refer to both answer line and working.<br>NB GB or 70 mph without working scores 0 marks. |

| Paper 5523_04 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 13 (a) | $\pi \times 0.65$ | 2.04–2.05 | 2 | M1 for $\pi \times 0.65$ or $3.14 \times 0.65$ or $3.142 \times 0.65$ oe<br>A1 2.04–2.05<br>SC Award B1 for 2.0 seen (not 2) |
| (b) | 1000 ÷ "(a)" | 487–491 | 2 | M1 for 1000 (or 100) ÷ "(a)"<br>A1 for 487–491 |
| 14 | $45.00 + 45.00 \times \frac{15}{100} =$<br>$45.00 + 6.75 =$ | 51.75 | 3 | M2 for $45.00 + 45.00 \times \frac{15}{100}$ oe<br>or $45.00 \times 1.15$ oe OR $45.00 + 6.75$ OR complete method or 5175 seen.<br>(M1 for $45.00 \times \frac{15}{100}$ oe OR 6.75 seen OR 675 seen OR correct method for calculating 15% of 45)<br>A1 cao<br>SC Award B2 for an answer of 38.25 |
| 15 | | 273 | 2 | M1 for 728 ÷ 8 or 728 ÷ "3+5" or 91<br>A1 cao<br>SC B1 for 455, or for 273:455 |
| 16 | 3 24 3.7 46.9(53)<br>4 60 3.8 51.0(72)<br>3.1 26.6(91) 3.9 55.4(19)<br>3.2 29.5(68) 3.21 29.8(66…)<br>3.3 32.6(37) 3.22 30.1(66…)<br>3.4 35.9(04) 3.23 30.4(68..)<br>3.5 39.3(75) 3.24 30.7(72...)<br>3.6 43.0(56) 3.25 31.0(78...) or 31 | 3.2 | 4 | B2 for trial between 3.2 and 3.3 inclusive<br>(B1 for trial between 3 and 4 inclusive)<br>B1 for different trial between 3.21 and 3.25 inclusive<br>B1 (dep on at least one previous B1) cao for 3.2 as final answer.<br>NB: embedded answers: –B1; award Bs for evaluations rounded or truncated to at least 1 dp or for 31 |

| Paper 5523_04 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 17 | $45^2 + 34^2 =$<br>$2025 + 1156 = 3181$<br>$\sqrt{3181} = 56.4$ | 56 | 4 | M1 for $45^2 + 34^2$<br>M1 (dep) for $\sqrt{(2025 + 1156)}$<br>A1 for 56.4 …<br>B1 for rounding their diagonal to the nearest integer (dep on evidence from decimal)<br>NB 56 as the final answer gets full marks.<br>NB Scale drawings result in 0 marks. |
| 18 | $2000 \times (1.055)^3$<br>Interest = 2348.48 – 2000 = | 348.48 | 3 | M1 for 5.5/100 × 2000 (oe) or 330 or 2330 or 110 or 2110<br>M1 (dep) for 5.5/100 × (2000 + "110" + "116.05") or 122.4… seen<br>A1 cao (accept only 348.48 or 348.49)<br>**OR**<br>M2 for $2000 \times (1.055)^3$ or 2348.48(…) or 2348.49 seen<br>(M1 for $2000 \times (1.055)^n$, $n \neq 3$)<br>A1 for 348.48 or 348.49<br>[SC: B2 for 2348.48 - 2348.49] |
| 19 | | Line | 2 | B2 line fully within tramlines, crossing AB and CD<br>(B1 a straight line which crosses AB within the tramline, and also crosses CD)<br>NB: Accept dotted or dashed lines, but not curves; accept freehand if considered to be straight.<br>SC B1 for a perpendicular bisector of AB that is at least half way from AB to CD within the tramlines |
| 20 (a) | | $90<t\leq100$ | 1 | B1 for $90<t\leq100$; accept 90-100. |
| (b) | 65×12=780<br>75×22=1650<br>85×23=1955<br>95×24=2280<br>105×19=1995<br>8660/100= | 86.6 | 4 | M1 for use of $fx$ with $x$ consistent within intervals (including end points). Allow one slip.<br>M1 (dep) for use of midpoints<br>M1 (dep on 1st M1) for use of $\sum fx/100$ or $\sum fx/\sum f$<br>A1 86.6 |

| Paper 5523_04 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 21 | (a) | $8 \times \frac{10}{4}$ | 20 | 2 | M1 $\frac{10}{4}$ or $\frac{4}{10}$ or 0.4 or 2.5 oe seen<br>A1 cao<br>NB ratios get M0 unless of the form 1:*n*<br>OR<br>M1 $\frac{8}{4}, \frac{4}{8}$ oe seen<br>A1 cao |
| | (b) | $15 \times \frac{4}{10}$ | 6 | 2 | M1 $15 \times \frac{4}{10}$ oe<br>A1 cao |
| 22 | (a) | $x^2 - 4x + 3x - 12 = x^2 - x - 12$ | $x^2 - x - 12$ | 2 | M1 for exactly 4 terms correct ignoring signs (eg $x^2$, 4*x*, 3*x*, 12) or 3 correct terms out of 4 terms with correct signs (eg 3 out of 4 of $x^2$, –4*x*, +3*x*,–12)<br>A1 cao |
| | (b) | $(x+2)(x+5)$ | $(x+2)(x+5)$ | 2 | B2 cao<br>(B1 for exactly one of $(x+2)$, $(x+5)$) |
| | (c) | $6=15+4q-20$ $6-15=4(q-5)$<br>$p-3t=4q-4t$ $6-3\times5=4(q-5)$ | 2 ¾ | 3 | M1 for correct substitution of *p* and *t*.<br>M1 for correct expansion of $4(q-t)$ oe (eg $4q-20$, $4q-4t$)<br>A1 11/4 or 2 ¾ or 2.75<br>OR<br>M1 for correct substitution of *p* and *t*.<br>M1 for $\frac{p-3t}{4} = q-t$ oe<br>A1 11/4 or 2 ¾ or 2.75 |

| Paper 5523_04 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 23 | (a) | $9.9\times10^8 - 6.0\times10^7$ | $9.3\times10^8$ | 2 | M1 for $99\times10^7 - 6\times10^7$ or $9.9\times10^8 - 0.6\times10^8$ or conversion of either to an ordinary number, or 930000000 or $93\times10^7$ or $9.3\times10^n$ where $n$ is any positive integer<br>A1 cao |
| | (b) | $\frac{6.0-4.5}{4.5}\times100 = \frac{1.5}{4.5}\times100 =$<br>or $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7}\times100$ | 33.3% | 3 | M2 $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7}\times100$ oe<br>(M1 for $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7}$ or $\frac{6.0\times10^7 - 4.5\times10^7}{6.0\times10^7}\times100$ oe<br>A1 cao<br>OR<br>M2 $\frac{6.0\times10^7}{4.5\times10^7}\times100$ -100 =<br>(M1 $\frac{6.0\times10^7}{4.5\times10^7}\times100$ or 133.33(%))<br>A1 cao<br>NB Accept any of the above expressions without any reference to $10^7$. |
| 24 | | LCM (40,24) = 120<br>Bread buns 120÷40<br>Burgers 120÷24<br>OR<br>Bread buns: 40 is $2\times2\times2$ (×5)<br>Burgers: 24 is $2\times2\times2$ (×3) | Bread buns 3<br>Burgers 5 | 3 | M1 attempt to find LCM by eg lists of multiples, or summing of 40 and 24.<br>A1 identify 120 (as LCM)<br>A1 cao (both)<br>OR<br>M1 expansion of either number into its prime factors in a factor tree or $8\times5$ or $8\times3$<br>A1 both expansions correct<br>A1 cao (both)<br>SC B2 if answers given the wrong way around |

| Paper 5523_04 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 25 | 8 × 41 = 328<br>2 × 29 = 58<br>328 – 58 = 270<br>270 ÷ 6 = 45 | 45 | 3 | M1 for either 8 × 41 (=328) or 2 × 29 (=58)<br>M1 (dep) “328” – “58” (=270)<br>A1 cao<br>NB 328 and/or 58 on the answer line gets M1 (implied); 270 on the answer line gets M2 (implied) |

| Paper 5525_05 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 1 (a) | $1 - (0.2 + 0.3 + 0.1)$ | 0.4 | 2 | M1 for $1 - (0.2 + 0.3 + 0.1)$<br>A1 for 0.4 oe, accept $\frac{0.4}{1}$ |
| (b) | $0.2 \times 200$ | 40 | 2 | M1 for $0.2 \times 200$<br>A1 cao<br>NB $\frac{40}{200}$ is M1 A0, 40 out of 200 is M1 A1 |
| 2 | $650 - 430 = 220$<br>1 choc ice costs 110p<br>$650 - 5 \times 110 = 100$p | 50 | 3 | M1 for $650 - 430$ or 220 or 110 oe seen<br>M1 for $650 - 5 \times \frac{'220'}{2}$ or $430 - 3 \times \frac{'220'}{2}$ oe<br>A1 for 50p or £0.50 or £0.5<br><br>*Alternative scheme*<br>$2x + 5y = 650$<br>$2x + 3y = 430$ oe<br>M1 for subtracting two simultaneous equations to eliminate $x$ (lollies)(2 or 3 terms correct)<br>M1 for $650 - 5 \times 'y'$ or $430 - 3 \times 'y'$ oe<br>A1 for 50p or £0.50 or £0.5<br><br>*Alternative scheme*<br>M1 for $3\times (2x + 5y = 650)$ evaluated and $5 \times (2x + 3y = 430)$ evaluated oe (5 or 6 terms correct)<br>M1 for subtraction of equations to eliminate $y$ (choc ices)(2 or 3 terms correct ft)<br>A1 for 50p or £0.50 or £0.5 |

| Paper 5525_05 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 3 | | question + response boxes oe | 2 | 1st aspect: One question (eg 'how long does it take you to travel to school?' or 'What time did you leave home to get to school?'); ignore other questions.<br>2nd aspect: Response list (at least two), not overlapping.<br>3rd aspect: Some mention of units (eg minutes) in either question or responses<br>B2 for all three aspects, or B1 for just one aspects. |
| 4 | 2 [(3×1) + (4×1)] +<br><br>(3×6) + (1×6) + (2×6) + (4×6) + (1×6) + (5×6) | 110<br><br>$cm^2$ | 4 | M1 for attempt to find the area of one face<br>M1 for at least 6 faces with intention to add<br>A1 cao<br>B1 (indep) for $cm^2$ (with or without numerical answer) |
| 5 | $\left(\frac{-6+4}{2}\right), \left(\frac{5+3}{2}\right)$ | (–1, 4) | 2 | B2 cao<br>[B1 for (–1,*a*) or (b,4) or (4,-1)] |
| 6 | | Box plot | 2 | 3 aspects:<br><br>1st aspect – vertical line for median<br>2nd aspect – box using correct quartiles<br>3rd aspect – whiskers (could be single line) drawn with correct end points<br><br>B2 for fully correct box plot<br>(B1 for 1 aspect) |
| 7 | | | 2 | M1 for a relevant pair of intersecting arcs<br>A1 for line drawn within guidelines, at least 3cm in length, accept broken line<br>[SC: B1 for line drawn within guidelines if M0] |

| Paper 5525_05 | | | | | |
|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 8 | (a) | e.g.<br>2 \| 126<br>3 \| 63<br>3 \| 21<br>7 | $2\times3\times3\times7$ | 2 | M1 for a systematic method of at least 2 correct divisions by a prime number oe factor trees; can be implied by digits 2, 3, 3, 7 on answer line.<br>A1 for $2\times3^2\times7$ or $2\times3\times3\times7$ |
| | (b) | $2\times3\times7$ | 42 | 2 | B2 cao<br>(B1 for 6, 14, 21 or $2\times3\times7$) |
| 9 | (a) | | $-1,0,1,2,3$ | 2 | B2 cao (-1 each error or omission) |
| | (b)(i) | | $x\geq\frac{7}{2}$ | 3 | M1 for $2x\geq7$, condone use of = sign or wrong equality<br>A1 for $x\geq\frac{7}{2}$ oe as final answer |
| | (ii) | | 4 | | SC:B1 for 3.5 or $\frac{7}{2}$ seen if M0<br>B1 ft from $x\geq$ "$\frac{7}{2}$" or $x>$"$\frac{7}{2}$" |
| 10 | (a)(i) | | $7^5$ | 3 | B1 cao |
| | (ii) | | $7^4$ | | B2 cao<br>(B1 for sight of $7^5$ or $7^{2+3}$ or $7\times7^3$ or $7^1\times7^3$ or $7^2\times7^2$ or $7^{2+3-1}$) |
| | (b) | | $\frac{1}{2}$ | 1 | B1 for $\frac{1}{2}$ or 0.5 or $2^{-1}$ |
| 11 | (a) | $5n=m+21$ | $n=\frac{m+21}{5}$ | 2 | M1 for $5n=m+21$ or for attempt to divide three terms by 5<br>A1 $n=\frac{m+21}{5}$ oe |

| Paper 5525_05 | | | | |
|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| (b) | $4p-8q=3p+2$<br>$p-8q=2$<br>$p=8q+2$ | $p=8q+2$ | 3 | M1 for $4p-aq$ or $\frac{3}{4}p+b$ where $a$ is an integer and $b$ is a number<br>M1 (dep) for taking one term correctly to LHS or RHS of expression<br>A1 $p=8q+2$ oe |
| 12 | | $y=\frac{1}{2}x+3$ | 2 | B2 for $y = ½x + 3$ oe<br>(B1 for $y = ½x + c$, $c \neq 7$ or $y = mx + 3$ oe or $½x + 3$ or $M = ½x + 3$ ) |
| 13 | $\frac{8}{3}\times\frac{5}{4}=\frac{8\times5}{3\times4}=\frac{40}{12}$ | $3\frac{1}{3}$ | 3 | B1 for $\frac{8}{3}$ oe or $\frac{5}{4}$ oe<br>M1 (dep on B1) for multiplying numerator and denominator of "$\frac{8}{3}$" and "$\frac{5}{4}$"<br>A1 for $3\frac{1}{3}$ oe mixed number or $\frac{10}{3}$<br><br>*OR*<br>B1 for 1.25 and 2.67 or 2.66(…)<br>M1(dep on B1) for correct method of multiplication<br>A1 for $3.\dot{3}$ |
| 14 | $4x+2y=8$<br>$4x-10y=20$<br>$12y=-12$<br>$y=-1$<br>$4x+2(-1)=8$<br>$x=2.5$ | $x=2.5$<br>$y=-1$ | 3 | M1 for correct process to eliminate either $x$ or $y$ (condone one arithmetical error)<br>M1 (dep) for substituting found value into either equation<br>A1 for $x = 2.5$, $y = -1$<br><br>[SC: B1 for $x = 2.5$ or $y = -1$ if M0] |

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|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 15 | | Interior angle of hexagon =<br>180 – (360 ÷ 6) = 120<br>360 – (90 + 120) | 150 | 4 | Alternative 1<br>M1 for 360 ÷ 6<br>A1 for 60<br>M1 (dep on M1) for "60" + 90<br>A1 cao<br><br>Alternative 2<br>M1 for 360 ÷ 6<br>A1 for 60<br>M1(dep on M1) for 360 – (2 × "60" + 90)<br>A1 cao<br><br>Alternative 3<br>M1 for (6 – 2) × 180 ÷ 6<br>A1 for 120<br>M1(dep on M1) for 360 – (90 + "120")<br>A1 cao |
| 16 | (a) | | (16), 50, 82, 96, 100 | 1 | B1 cao |
| | (b) | Cumulative freq. diag. curve/ segments | Cum. freq graph | 2 | B1 ft for 4 or 5 points plotted correctly ± 1 full (2mm) square depending on sensible table (condone 1 addition error)<br>B1 (dep) for points joined by curve or line segments provided no gradient is negative - ignore any part of graph outside range of their points.<br>(SC:B1 if 4 or 5 points plotted not at end but consistent within each interval and joined) |

| Paper 5525_05 | | | | | |
|---|---|---|---|---|---|
| No | | Working | Answer | Mark | Notes |
| | (c) | $100 - 42$ | 58 | 2 | M1 (ft dep on graph being cf) for reading from graph at 18 or 19, can be implied by answer in range 40 to 46<br>A1 for answer in range 56 to 60 or ft for 100 –'42' ±1 full (2mm) square |
| 17 | (a) | | 0.6 and 0.7,0.3,0.7 | 2 | B1 for 0.6 on LH branch<br>B1 for 0.7, 0.3 and 0.7 on RH branches |
| | (b) | $0.4\times0.3$ | 0.12 | 2 | M1 for $0.4\times0.3$<br>A1 0.12 oe |
| | (c) | $0.4\times0.7+0.6\times0.3$ | 0.46 | 3 | M1 for '$0.4\times0.7$' or '$0.6\times0.3$'<br>M1 for addition of two products from correct branches<br>A1 0.46 oe<br>Alternative<br>M2 for an attempt to evaluate 1-($0.3\times0.4$ +'$0.6\times0.7$')<br>A1 cao |
| 18 | | $x = 0.4545...$<br>so $100x = 45.4545...$<br>$99x = 45$<br>$x = \frac{45}{99} = \frac{15}{33}$ | proof | 3 | M1 for $100x = 45.45\ldots$ or $10000x = 4545.45\ldots$<br>M1 (dep) for subtraction of both sides<br>A1 for $\frac{15}{33}$ from correct proof |
| 19 | | $\left(\sqrt{3}\right)^2 + \sqrt{3}\sqrt{2} - \sqrt{3}\sqrt{2} - \left(\sqrt{2}\right)^2$<br>$= 3 - 2$ | 1 | 2 | B2 cao<br>(B1 for $\sqrt{3}\sqrt{3} + \sqrt{3}\sqrt{2} - \sqrt{3}\sqrt{2} - \sqrt{2}\sqrt{2}$ oe,<br>$\sqrt{3}\sqrt{3} - \sqrt{2}\sqrt{2}$ oe,<br>or for 2,3, $\sqrt{4}$ $\sqrt{6}$ $\sqrt{9}$ seen) |
| 20 | (a) | $\frac{96}{24}$ or 4<br>$\sqrt{4}$ or 2 | 8 | 3 | M1 for $\frac{96}{24}$ or $\frac{24}{96}$ or 4 or $\frac{1}{4}$ oe<br>M1 for $\sqrt{\frac{96}{24}}$ or $\sqrt{\frac{24}{96}}$ or $\sqrt{'4'}$ or $\frac{1}{\sqrt{'4'}}$ or 2 or $\frac{1}{2}$ oe<br>A1 cao |

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|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| | (b) | $12\times2^3$ | 96 | 2 | M1 for '2'$^3$ or 8<br>A1 cao |
| 21 | (a) | $x\times3-x\times2x^2$ | $3x-2x^3$ | 2 | B2 cao<br>(B1 for a two term expression with either $3x$ or $2x^3$) |
| | (b) | | $4x(3y+x)$ | 2 | M1 for taking out a factor of $x$, $2x$, 2, 4 or $4x$<br>A1 cao |
| | (c) | $\frac{5a}{b^2}$ | $\frac{5a}{b^2}$ | 2 | B2 for $\frac{5a}{b^2}$ or $5ab^{-2}$ (accept $\frac{5a}{1b^2}$)<br>( B1 for either dealing with the numbers or dealing with the powers of $a$) |
| | (d) | $\frac{\cancel{x-3}}{\cancel{(x-3)}(x+3)}$ | $\frac{1}{x+3}$ | 2 | M1 for $(x-3)(x+3)$<br>A1 cao |
| 22 | (a) | | $\mathbf{a}+\mathbf{b}$ | 1 | B1 $\mathbf{a}+\mathbf{b}$ oe |
| | (b) | $ED=\mathbf{a}$<br>$DX=-2\mathbf{b}+2\ AC=2\mathbf{a}$<br>(So, $DX=2ED$) | $2\mathbf{a}$ | 3 | M1 for $(DX=)\ DA+AX$<br>A1 for $(DX=)\ -2\boldsymbol{b}+2$ ("$\boldsymbol{a}+\boldsymbol{b}$")<br>A1 $2\boldsymbol{a}$ from fully correct proof |
| 23 | | $\pi(2x)^2h=\frac{4}{3}\pi(3x)^3$<br>$h=\frac{\frac{4}{3}\pi(3x)^3}{\pi(2x)^2}$ | $9x$ | 3 | M1 for $\pi(2x)^2h=\frac{4}{3}\pi(3x)^3$ (condone absence of brackets)<br>M1 (dep) for valid algebra that gets to $h=ax$ (condone one error in powers of numerical constants)<br>A1 cao |

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| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 24 | (i) | $n^2+(n+1)^2=2(n^2+n)+1$ | $2n^2+2n+1$ | 4 | M1 for at least 3 terms correct from $n^2+n+n+1$<br>A1 for $2n^2+2n+1$ oe |
| | (ii) | | $2(n^2+n)$ is always even<br>so $2(n^2+n)+1$ is always odd | | M1 for recognizing $2n^2$ is always even<br>A1ft complete proof for their quadratic<br><br>*Alternative method*<br>M1 for recognizing that if $n^2$ is odd then $(n+1)^2$ is even or vice versa<br>A1 for complete proof |
| 25 | | | 42<br>318 | 2 | B1 for answer in range 36 – 48<br>B1 for answer in range 312 – 324 |
| 26 | (a) | $(x-3)^2-3^2+15$ | $p=3, q=6$ | 2 | B2 for $p=3$ and $q=6$<br>(B1 for $p=3$ OR $q=6$)<br>SC: award B2 for $(x-3)^2+6$ if $p$ and $q$ are not identified |
| | (b) | | Sketch | 2 | B1 for U shaped curve<br>B1 ft for TP in first quadrant (ft if TP not in first quadrant) |
| 27 | (a) | Graph translated 2 units upwards through points<br>(–4, 2), (–2, 4), (0,2) and (3,5) | Sketch | 2 | M1 for a vertical translation<br>A1 curve through points (–4, 2), (–2, 4), (0,2) and (3,5) ± ½ square |
| | (b) | Graph reflected in $x$-axis through points<br>(–4,0), (–2, –2), (0, 0) and (3, -3) | Sketch | 2 | M1 for reflection in $x$-axis or $y$-axis<br>A1 curve through points (–4,0), (–2, –2), (0, 0) and (3, -3) ± ½ square |

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|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 1 | | 273 | 2 | M1 for 728 ÷ 8 or 728 ÷ "3+5" or 91<br>A1 cao<br>SC B1 for 455 or 273:455 |
| 2 | | $3n - 1$ | 2 | B2 for $3n - 1$ oe<br>(B1 for $3n + k$ where $k \neq -1$ but $k$ could be 0) |
| 3 | 3 24 3.7 46.9(53)<br>4 60 3.8 51.0(72)<br>3.1 26.6(91) 3.9 55.4(19)<br>3.2 29.5(68) 3.21 29.8(66…)<br>3.3 32.6(37) 3.22 30.1(66…)<br>3.4 35.9(04) 3.23 30.4(68..)<br>3.5 39.3(75) 3.24 30.7(72...)<br>3.6 43.0(56) 3.25 31.0(78...) or 31 | 3.2 | 4 | B2 for trial between 3.2 and 3.3 inclusive<br>(B1 for trial between 3 and 4 inclusive)<br>B1 for different trial between 3.21 and 3.25 inclusive<br>B1 (dep on at least one previous B1) cao for 3.2<br><br>NB: embedded answers: –B1; award Bs for evaluations rounded or truncated to at least 1 dp or for 31 |
| 4 | 2 is the only even prime number and the product of 2 odd numbers is odd | Yes | 2 | B2 for 'yes' and '2 is the only even prime number and the product of two odd numbers is odd' oe<br>(B1 for 'yes' and either '2 is the only even prime number' oe **or** 'the product of two odd numbers is odd' oe) |
| 5 | $45^2 + 34^2 =$<br>$2025 + 1156 = 3181$<br>$\sqrt{3181} = 56.4$ | 56 | 4 | M1 for $45^2 + 34^2$<br>M1 for $\sqrt{(2025 + 1156)}$<br>A1 for 56.4 …<br>B1 for rounding their diagonal to the nearest integer (dep on evidence from decimal)<br>NB 56 with no incorrect working as the final answer gets full marks.<br>NB Scale drawings result in 0 marks. |

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|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 6 | 2000 × $(1.055)^3$<br>Interest = 2348.48 – 2000 = | £348.48 | 3 | M1 for 5.5/100 × 2000 (oe) or 330 or 16.5/100×2000 or 2330 or 110 or 2110<br>M1 (dep) for 5.5/100 × (2000 + "110" + "116.05") or 122.4… seen<br>A1 cao (accept only 348.48 or 348.49)<br>**OR**<br>M2 for 2000 × $(1.055)^3$ or 2348.48(…) or 2348.49 seen<br>(M1 for 2000 × $(1.055)^n$, $n \neq 3$)<br>A1 for 348.48 or 348.49<br>[SC: B2 for 2348.48 - 2348.49] |
| 7 (a) | | Line | 2 | B2 line fully within tramlines, crossing AB and CD<br>(B1 a straight line which crosses AB within the tramline, and also crosses CD)<br>NB: Accept dotted or dashed lines, but not curves; accept freehand if considered to be straight.<br>SC B1 for the perpendicular bisector of *AB* reaching halfway or more from *AB* |
| (b) | | Region | | B2 correct arc ±2mm and shaded within. Allow dotty or continous arc.<br>(B1 inaccurate arc and shaded or accurate arc unshaded) |
| 8 | 65×12=780<br>75×22=1650<br>85×23=1955<br>95×24=2280<br>105×19=1995<br>8660/100= | 86.6 | 4 | M1 for use of $fx$ with $x$ consistent within intervals (including end points). Allow one slip even if outside interval<br>M1 (dep) for use of midpoints<br>M1 (dep on 1st M1) for use of $\sum fx/100$ or $\sum fx/\sum f$<br><br>A1 86.6 |

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| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 9 | | Distance ÷ time: 1400 ÷ 2 h 20 min<br>20 mins is $\frac{1}{3}$ hour<br>1400 × 3 ÷ 7 = | 600 kph | 3 | B1 20 mins as $\frac{1}{3}$ hour or as 0.33……hour<br>M1 for distance ÷ time eg 1400 ÷ "2h 20 min"<br><br>A1 cao<br>OR<br>B1 2 hour 20min = 140 ( min)<br><br>M1 Speed = $\frac{1400}{140}$ = (10 km per minute)<br>A1 cao |
| 10 | (a) | $(x+18)+2x+(2x+7)=180$ | Equation | 2 | B2 for $(x+18)+2x+(2x+7)=180$ oe<br>(B1 for $(x+18)+2x+(2x+7)$ ) |
| | (b) | $5x+25 = 180$<br>$5x = 155$ | 31 | 2 | M1 for simplifying to at least $5x+25=180$ or 360 (may be earned in (a))<br>A1 for $x=31$ |
| 11 | (a) | (–14) –4 (0) 4 14 | –4, 4, 14 | 2 | B2 for all 3 values correct<br>(B1 for 1 or 2 values correct) |
| | (b) | | curve | 2 | B1 for all 5 points plotted correctly ± ½ square (ft from table if at least B1 awarded in (a))<br>B1 (indep) ft for any smooth curve through their points |

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|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 12 | (a) | $8 \times \frac{10}{4}$ | 20 | 2 | M1 $\frac{10}{4}$ or $\frac{4}{10}$ or 0.4 or 2.5 oe seen<br>A1 cao<br>NB ratios get M0 unless of the form 1:*n*<br>OR<br>M1 $\frac{8}{4}, \frac{4}{8}$ oe seen<br>A1 cao |
| | (b) | $15 \times \frac{4}{10}$ | 6 | 2 | M1 $15 \times \frac{4}{10}$ oe<br>A1 cao |
| 13 | (a) | $9.9\times10^8 - 6.0\times10^7$ | $\pm 9.3\times10^8$ | 2 | M1 for $99\times10^7 - 6.0\times10^7$ or $9.9\times10^8 - 0.60\times10^8$ or correct conversion of either to an ordinary number or 930000000 or $9.3\times10^n$ where *n* is any positive integer<br>A1 cao |
| | (b) | $\frac{6.0-4.5}{4.5} \times 100 = \frac{1.5}{4.5} \times 100 =$<br>or $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7} \times 100$ | 33.3% | 3 | M2 $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7} \times 100$ oe<br>(M1 for $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7}$ or $\frac{6.0\times10^7 - 4.5\times10^7}{6.0\times10^7} \times 100$ oe<br>A1 33.3 – 33.4<br>OR<br>M2 $\frac{6.0\times10^7}{4.5\times10^7} \times 100$ -100 or 33.3%<br>(M1 $\frac{6.0\times10^7}{4.5\times10^7} \times 100$ or 133.3% )<br>A1 33.3-33.4<br>NB Accept any of the above expressions without any reference to $10^7$. |

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|---|---|---|---|---|
| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 14 | LCM (40,24) = 120<br>Bread buns 120÷40<br>Burgers 120÷24<br>OR<br>Bread buns: 40 is $2 \times 2 \times 2$ (×5)<br>Burgers: 24 is $2 \times 2 \times 2$ (×3) | Bread Buns 3<br>Burgers 5 | 3 | M1 attempt to find LCM by eg lists of multiples, or summing of 40s and summing of 24s, with at least 3 numbers in each list<br>A1 identify 120 as LCM<br>A1 cao (both) **OR**<br>M1 expansion of either number into its prime factors in a factor tree or $8\times5$ or $8\times3$<br>A1 both expansions correct<br>A1 cao (both)<br>SC B2 if answers given the wrong way around |
| 15 | $\sin 32 = \frac{AB}{12}$<br>$AB = 12 \times \sin 32$<br>$AB = 6.35903\ldots$ | 6.36 | 3 | M1 $\sin 32 = \frac{AB}{12}$ (accept $\text{Sin}\ \frac{AB}{12}$)<br>M1 $12 \times \sin 32$ or $12 \times 0.5299..$<br>A1 accept 6.359 – 6.360<br>SC Gradians 5.78(1…)<br>Radians 6.62<br>Get M1M1A0 **OR**<br><br>Use of Sine Rule<br>$\frac{\sin 32}{AB} = \frac{\sin 90}{12}$ or $\frac{AB}{\sin 32} = \frac{12}{\sin 90}$ M1<br><br>$AB = \frac{12 \times \sin 32}{\sin 90}$ M1<br>$AB$ = 6.359 – 6.36 A1<br>SC Gradians 5.85(…)<br>Radians 7. 40(…)<br>M1M1A0 |

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|---|---|---|---|---|---|
| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 16 | | $8 \times 41 = 328$<br>$2 \times 29 = 58$<br>$328 - 58 = 270$<br>$270 \div 6 = 45$ | 45 | 3 | M1 for either $8 \times 41$ (=328) or $2 \times 29$ (=58)<br>M1 (dep) "328" – "58" (=270)<br>A1 cao<br>NB 328 and /or 58 on the answer line gets M1 (implied); 270 on the answer line gets M2 (implied) |
| 17 | (a) | $x^2 - 4x + 3x - 12 = x^2 - x - 12$ | $x^2 - x - 12$ | 2 | M1 for exactly 4 terms correct ignoring signs ($x^2$, $4x$, $3x$, 12) or 3 out of 4 terms with correct signs ($x^2$, $-4x$, $+3x$, $-12$)<br>A1 cao |
| | (b) | $6x^2 - 8x + 15x - 20 = 6x^2 + 7x - 20$ | $6x^2 + 7x - 20$ | 2 | M1 for exactly 4 terms correct ignoring signs ($6x^2$, $8x$, $15x$, 20) or 3 out of 4 terms with correct signs ($6x^2$, $-8x$, $+15x$, $-20$)<br>A1 cao |
| | (c) | $(x+2)(x+5)$ | $(x+2)(x+5)$ | 2 | B2 cao<br>(B1 for exactly one of $(x + 2)$, $(x + 5)$ ) |
| | (d) | | $12p^8q^3$ | 2 | B2 cao<br>(B1 for any 2 out of 3 terms correct in a product or 3 terms correct in a sum or part product) |
| | (e) | $6 = 15 + 4(q - 5)$<br>$6 = 15 + 4q - 20$<br>$11 = 4q$ | $2\frac{3}{4}$ | 3 | M1 for correct substitution of $p$ and $t$.<br>M1 for correct expansion of $4(q\text{-}t)$ oe (eg $4q$-20, $4q$-$4t$)<br>A1 11/4 or 2 ¾ or 2.75<br>OR<br>M1 for correct substitution of $p$ and $t$.<br>M1 for $\frac{p-3t}{4} = q - t$ oe<br>A1 11/4 or 2 ¾ or 2.75 |
| 18 | (a) | $T=kx$; $150=6k$; $k=25$ | $T=25x$ | 3 | M1 for $T=kx$ , $k$ algebraic<br>M1 subs $T=150$ and $x=6$ into $T = kx^n$ $(n \neq 0)$<br>A1 for $T=25x$ oe<br>SC B1 $T \propto 25x$ oe |

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| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| | (b) | $T = 25 \times 15 =$ | 375 | 1 | B1 ft on $k$ , $k \neq 1$ |
| | (c) | $600 = 25x$; $x = 600 \div 25 =$ | 24 | 1 | B1 ft on $k$ , $k \neq 1$ |
| 19 | | $\frac{120}{570} \times 50 = 10.5263$<br>$\frac{250}{570} \times 50 = 21.9298$<br>$\frac{200}{570} \times 50 = 17.5438$ | 10<br>22<br>18 | 3 | M1 method shown eg $\frac{120}{120+250+200} \times 50$ or one of 10.5(263) 21.9(298), 17.5(438)<br>**OR** 570 ÷ 50 = 11.4 and one of 120 ÷ 11.4 =10.526…) , 270 ÷ 11.4 (=21.9298…) , 200 ÷ 11.4 (=17.5438…)<br>A1 for 10.5(263), 21.9(298), 17.5(438) or 11, 22, 18<br>B1 correction to add to 50: 10, 22, 18 or 11, 22, 17 |
| 20 | | $x(x+1) + 4(2x–3) = (2x–3)(x+1)$<br>$x^2 + x + 8x – 12 = 2x^2 + 2x – 3x – 3$<br>$x^2 – 10x + 9 = 0$<br>$(x – 9)(x – 1) = 0$ | $x = 1,9$ | 5 | M1 for multiplying through by common denominator $(2x–3)(x+1)$<br>M1 (dep)for either $x^2 + x + 8x – 12$ or $2x^2 + 2x – 3x – 3$ oe<br>A1 for correct quadratic ( = 0 )<br>M1 for a correct method to solve 3 term quadratic<br>A1 cao for both solutions |
| 21 | | $AB^2 = 8^2 + 9^2 – 2×8×9×\cos40$<br>$AB^2 = 64 + 81 – 144×\cos40$<br>$AB^2 = 145 – 144 × 0.766$<br>$AB^2 = 145 – 110.31… = 34.6896$<br>$AB = \sqrt{34.6796} = 5.8897877$ | 5.89 | 3 | M1 Subs in Cos Rule: $8^2 + 9^2 – 2×8×9×\cos40$<br>M1 correct order of evaluation of $8^2 + 9^2 – 2×8×9×\cos40$<br>A1 cao 5.88 – 5.89<br>SC: Award B2 for one of<br>$AB^2 = 241.03…$ or $AB = 15.525…$ (radians)<br>$AB^2 = 28.50…$ or $AB = 5.33…$ (gradians) |
| 22 | (a) | | 24<br>30 | 2 | B1 24 cao<br>B1 30 cao |
| | (b) | Column $60 \leq w < 75$ at 10<br>Column $75 \leq w < 95$ at 4 | 10<br>4 | 2 | B1 10 and correct width (tol $\pm\frac{1}{2}$ small square)<br>B1 4 and correct width (tol $\pm\frac{1}{2}$ small square) |

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| **No** | **Working** | **Answer** | **Mark** | **Notes** |
| 23 (a) | | 100.5 | 1 | B1 cao |
| (b) | | 10.515 | 1 | B1 cao |
| (c) | $\frac{100.5}{10.515}$ | 9.5577746 | 2 | M1 for greatest distance divided by least time<br>Where 100 < greatest distance ≤ 100.5, 10.51 ≤ least time < 10.52<br><br>A1 for 9.555 – 9.56 |
| (d) | $\frac{99.5}{10.525}$ | 9.45368.. | 2 | M1 for least distance divided by greatest time<br>Where 99.5 ≤ least distance < 100, 10.52 < greatest time ≤10.53<br>A1 for 9.45 – 9.455 |
| 24 | $\frac{4}{7}\times\frac{4}{7}\times\frac{3}{7} + \frac{3}{7}\times\frac{3}{7}\times\frac{4}{7} =$<br>$\frac{48+36}{343} = \frac{84}{343}$<br>But there are three ways this can be achieved:<br>BBG, BGB, GBB<br>So the probability is<br>$\frac{84}{343}\times 3$<br><br>OR $1-\frac{64}{343}-\frac{27}{343}$<br><br>NB: 84/343 = 0.244897; 252/343 = 0.73469<br>$\frac{4}{7} = 0.57(142...)$ , $\frac{3}{7} = 0.42(857...)$ | $\frac{252}{343}$ | 3 | M1 for $\frac{4}{7}\times\frac{4}{7}\times\frac{3}{7}$ or $\frac{3}{7}\times\frac{3}{7}\times\frac{4}{7}$ oe or $\left(\frac{4}{7}\right)^3$ oe or $\left(\frac{3}{7}\right)^3$ oe or $\frac{91}{343}$ or 0.10(49…) or 0.13(99….)<br>M1 (indep) for identification of all 6 outcomes<br>(M2 for $1-\left[\left(\frac{4}{7}\right)^3+\left(\frac{3}{7}\right)^3\right]$) oe<br>A1 $\frac{252}{343}$, $\frac{36}{49}$ , 0.73(469…) oe |

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| **No** | | **Working** | **Answer** | **Mark** | **Notes** |
| 25 | (a) | $\frac{1}{3} \times \pi \times 5^2 \times 8 = \pi \times 25 \times 8 \div 3 =$<br>209.4395 | 209–210 | 2 | M1 for $\frac{1}{3} \times \pi \times 5^2 \times 8$<br><br>A1 for 209–210 |
| | (b) | Base radius = $\frac{216}{360} \times 15 = 9$<br>Height = $\sqrt{(15^2 - 9^2)} =$ | 12 | 4 | M1 for 216 ÷ 360<br>A1 for 9<br>M1 for $\sqrt{(15^2 - \text{“9”}^2)}$ , where “9” < 15<br>A1 cao |

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# Mark Scheme (Results)
# Summer 2010

GCSE

## GCSE Mathematics (1380)
## Paper 4H

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GCSE MATHEMATICS 1380 (LINEAR)

## NOTES ON MARKING PRINCIPLES

**1 Types of mark**

M marks: method marks
A marks: accuracy marks
B marks: unconditional accuracy marks (independent of M marks)

**2 Abbreviations**

cao – correct answer only
isw – ignore subsequent working
oe – or equivalent (and appropriate)
indep - independent
ft – follow through
SC: special case
dep – dependent

**3 No working**

If no working is shown then correct answers normally score full marks
If no working is shown then incorrect (even though nearly correct) answers score no marks.

**4 With working**

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

**5 Follow through marks**

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

**6 Ignoring subsequent work**

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

**7 Probability**

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

**8 Linear equations**

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

**9 Parts of questions**

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

**10 Use of ranges for answers**

If an answer is within a range this is inclusive, unless otherwise stated.

GCSE MATHEMATICS 1380 (LINEAR)

| 1380/4H | | | | |
|---|---|---|---|---|
| **Question** | **Working** | **Answer** | **Mark** | **Notes** |
| 1 | $120 \times 1.5$<br>$8 \times 1.5$<br>$420 \times 1.5$<br>$180 \times 1.5$ | 180<br>12<br>630<br>270 | 3 | M1 for $\times 6 \div 4$ or $\frac{6}{4}$ or ÷4×6 oe (120+60) or 1.5 seen or sight of any one of the four correct answers<br>A1 for 2 or more correct answers<br>A1 for 4 correct answers |
| 2 (a) | | Info plotted at (6.1, 32) | 1 | B1 for a correct plot $\pm$2mm |
| (b) | | positive | 1 | B1 for positive (correlation) |
| (c) | | 6.6 to 7.6 | 2 | M1 for single straight line segment with positive gradient that could be used as a line of best fit or an indication on the diagram from 40 on the umbrella axis.<br>A1 for an answer in the range 6.6 to 7.6 inclusive. |

GCSE MATHEMATICS 1380 (LINEAR)

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 3 (a) | $1.25 \times 620$ | 775 | 2 | M1 for $1.25 \times 620$ oe<br>A1 cao |
| (b) | $50 \div 1.25 = 40$<br>$42 - 40$<br>or<br>$42 \times 1.25 = 52.5$<br>$52.5 - 50 = 2.50$ | 2 | 3 | M1 for $50 \div 1.25$ (=40) oe<br>M1 (dep) for $42-$"40" or "40" - 42<br>A1 cao for £2<br>OR<br>M1 for $42 \times 1.25 (= 52.5)$ oe<br>M1 (dep) for "52.5"-50 or 50 - "52.5"<br>A1 cao for £2<br>[A0 for €2.5(0) or £2.5(0) without any working]<br>SC: Award B2 for -£2 |
| 4 (a) | | −2, 4, 7 | 2 | B2 for a fully correct table<br>(B1 for 1 or 2 correct entries) |
| (b) | | Straight line from (−2, −2) to (2, 10) | 2 | B2 for correct straight line from (−2, −2) to (2, 10)<br>(B1 ft for at least 4 correctly plotted points OR a single straight line passing through (0, 4) OR for a single line of gradient 3) |

GCSE MATHEMATICS 1380 (LINEAR)

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 5 (i) | 180 – 68 | 112 | 3 | B1 cao |
| (ii) | | | | B1 for 'alternate angles' or Z angles or 'corresponding angles' or F angles<br>**or**<br>B1 for '(angles on a straight) line $=180'$<br><br>Alternative:<br>B1 for 'allied angles' or 'co-interior angles'<br>or<br>B1 for '(vertically) opposite angles' |
| 6 (a) | $\frac{2}{3.95}$ | 0.5063(29113…) | 2 | B2 for 0.5063 or better.<br>(B1 for 0.5 or 0.50 or 0.506 or 0.51 or 3.95<br>or the fraction $\frac{40}{79}$ seen) |
| (b) | | 0.51 | 1 | B1 ft for 0.51 from their answer to part (a) which is written to two or more decimal places. |
| 7 | $\pi \times 12$ | 37.7 | 2 | M1 for $\pi \times 12$ accept π as $\frac{22}{7}$ or 3.1 or better<br>A1 for an answer in the range 37.6 to 37.8 |

GCSE MATHEMATICS 1380 (LINEAR)

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 8 | $x$ = 1 gives 11<br>$x$ = 2 gives 28<br>$x$ = 1.5, gives 18.(375)<br>$x$ = 1.6, gives 20.(096)<br>$x$ = 1.7, gives 21.(913)<br>$x$ = 1.8, gives 23.(832)<br>$x$ = 1.9, gives 25.(859)<br>$x$ = 1.85, gives 24.8(316..)<br>$x$ = 1.86, gives 25.(03..)<br>$x$ = 1.87, gives 25.2(3..)<br>$x$ = 1.88, gives 25.4(4..)<br>$x$ = 1.89, gives 25.6(5..) | 1.9 | 4 | B2 for a trial $1.8 \leq x \leq 1.9$ evaluated<br>(B1 for a trial $1 \leq x \leq 2$ evaluated)<br>B1 for a different trial $1.85 \leq x < 1.9$ evaluated<br>B1 (dep on at least one previous B1) for 1.9<br><br>Accept trials correct to the nearest whole number (rounded or truncated) if the value of $x$ is to 1dp but correct to 1dp (rounded or truncated) if the value of $x$ is to 2dp.<br><br>NB: no working scores no marks even if answer is correct. |
| 9 | $\frac{84}{350} \times 100$ | 24 | 2 | M1 for $\frac{84}{350} \times 100$<br>A1 cao |
| 10 (a) | $1-(0.15+0.3+0.35)=$ | 0.20 | 2 | M1 for $1-(0.15+0.3+0.35)$<br>A1 for 0.2 oe |
| (b) | $0.30 \times 500$ | 150 | 2 | M1 for $0.30 \times 500$<br>A1 cao<br>NB: $\frac{150}{500}$ etc. gets M1 A0<br>but “150 out of 500” gets M1 A1 |

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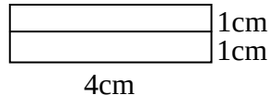
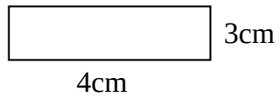
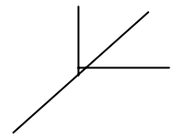
| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 11 (a) | | Base angles of an isosceles triangle are equal | 1 | B1 mentions **isosceles** (triangle) or **two sides the same** or **base angles equal**.<br>Accept equivalent reasons.<br>Do not accept incorrect statements. |
| (b) | $2x = 40$ | 20 | 2 | M1 for an attempt to move $x$ to LHS or -10 to RHS eg $-x$ each side or +10 each side or sight of $2x$ or 40<br>OR to move $3x$ or +30 or sight of $-2x$ or -40<br>A1 cao |
| 12 (a) | $0.5\times6\times14$ | 42 | 2 | M1 for $0.5\times6\times14$ oe<br>A1 cao |
| (b) | $\sqrt{6^2+14^2}$ = $\sqrt{232}$ | 15.23 | 3 | M1 for $6^2+14^2$ or 36+196 or 232<br>M1 for $\sqrt{36+196}$ or $\sqrt{232}$<br>A1 for answer in the range 15.2 to 15.3 |
| 13 (a) |  | Plan shown as two rectangles 1cm by 4cm | 2 | B2 cao<br>(B1 for a rectangle 4 cm x 1 cm or a rectangle 4 cm x 2 cm. Could be attached to other rectangles.)<br>Do not accept rectangles with additional external lines. |
| (b) |  | | 2 | B2 cao<br>(B1 for a rectangle with one correct dimension)<br>Do not accept rectangles with additional external lines.<br>NB: any orientation possible; ignore internal lines. |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 14 | (20×3 + 60×5 + 100×12 + 140×7 + 180×3) ÷ 30 =<br>(60 + 300 + 1200 + 980 + 540) ÷ 30=<br>= 3080 ÷ 30<br><br>Alternative:<br>(20.5×3 + 60.5×5 + 100.5×12 + 140.5×7 180.5×3) ÷ 30<br>= 3080 ÷ 30 | 102.7<br><br>103.2 | 4 | M1 for f × h for at least 3 consistent values of h in or at either end of intervals.<br>M1 (dep) for use of all correct mid-interval values (accept 20-20.5 etc)<br>M1 (dep on at least M1 scored) for $\sum fh \div 30$<br><br>A1 for 102.6 - 103.2 |
| 15 (a) | | −3, −2, −1, 0, 1 | 2 | B2 for all 5 correct values; ignore repeats, any order.<br>(−1 for each omission or additional value) |
| (b) | $3x - x > 7 + 2$<br>$2x > 9$ | $x > 4.5$ | 2 | M1 for an attempt to move x to LHS or $-2$ to RHS<br>eg $-x$ each side or $+2$ each side or sight of 2x or 9 or $2x>9$<br>or sight of 2x on LHS of (in)equality or 9 on RHS of (in)equality.<br>eg. $3x - x > 7 + 2$<br>A1 oe Allow $x > 4\frac{1}{2}$, $x > \frac{9}{2}$<br>[SC: B1 for $x = 4.5$, $x<4.5$ if M0 scored] |
| 16 | |  | 2 | B2 for correct locus within guidelines (overlay)<br>(B1 for a line drawn parallel to either given line OR a line passing through the angle outside of the guidelines OR a line drawn within the guidelines but not passing through angle) |

GCSE MATHEMATICS 1380 (LINEAR)

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 17 | $r^2 = \frac{A}{3}$ | $A = 3r^2$ | 2 | M1 for an attempt to square both sides $r^2 = \frac{A}{3}$<br>or an attempt to multiply both sides by $\sqrt{3}$<br>A1 cao |
| 18 (a) | | $1.55 \times 10^4$ | 1 | B1 cao |
| (b) | | 0.00248 | 1 | B1 cao |
| (c) | $24500 \div 0.000125 = 196000000$ | $1.96 \times 10^8$ | 2 | B2 cao<br>(B1 for 196000000 or $1.96\times10^4\times10^4$ oe or $1.96\times10^n$ or digits $196\times10^n$ where *n* is a number other than 8, or absent.) |
| 19 (a) | | $(x-2)(x-5)$ | 2 | M1 for $(x\pm2)(x\pm5)$<br>A1 for $(x-2)(x-5)$ |
| (b) | | $x = 2$, $x = 5$ | 1 | B1 cao or ft from (a) |
| 20 | cos 58° = $\frac{AB}{16}$<br>AB = 16 × cos 58° = 8.4787 | 8.48 | 3 | M1 for cos 58° = $\frac{AB}{16}$<br>M1 (dep) for 16 × cos 58°<br>A1 for 8.47- 8.48<br>[SC:M2 A0 for 1.9-1.91 [RAD] or 9.8-9.81 [GRAD]] |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 21 (a) | | 28.5 | 1 | B1 for 28.5 or 2850 cm or 28.499 or 28.49… or 28.49 recurring oe |
| (b) | $2\times(147.5+28.5)$ | 352 | 3 | B1 for upper bound of length = 147.5 or 14750 cm or 147.49 recurring oe<br>M1 for 2 × ("upper bound width" + "upper bound length") where these are not the given values.<br>A1 cao 351.999-352 |
| 22 (a) | $p^{5+4}$ | $p^9$ | 1 | B1 (accept $p^{5+4}$) |
| (b) | $q^{5-2}$ | $q^3$ | 1 | B1 (accept $q^{5-2}$) |
| (c) | | $2u$ | 2 | B2 (accept $2t^0u$, $2t^0u^1$oe)<br>(B1 for 2 correct terms from 2, $t^0$ and $u$ oe eg $u^1$) |
| (d) | | $3wy^3$ | 2 | B2 cao<br>(B1 for 2 correct terms from 3, $w$ and $y^3$ oe)<br>NB: accept $w^1$ for $w$. |
| (e) | | $x^{-2}\ \ x^0\ \ x^{\frac{1}{2}}\ \ x\ \ x^2$ | 2 | B2 cao<br>(B1 for any 4 in relative correct order, or all correct but in reverse order) |

GCSE MATHEMATICS 1380 (LINEAR)

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 23 | 50 : 18 = 25 : 9<br>Ratio of length = 5 : 3<br>Ratio of volume = 125 : 27<br>$500\times\frac{27}{125}$ | 108 | 4 | M1 for ratio of length =√50:√18 or √25 : √9 (or 5 : 3 or 3 : 5 seen) or 1.66-1.67 or 0.6<br>M1 for ratio of volume (mass) = "5"$^3$ : "3"$^3$ or $25^{\frac{3}{2}} : 9^{\frac{3}{2}}$ oe or 4.62-4.63 or 0.216<br>M1 (dep on at least M1) for 500 × "$\frac{9^{\frac{3}{2}}}{25^{\frac{3}{2}}}$"<br>or 500 ÷"4.62" or 500÷"4.63" or 500×"0.216"<br>A1 cao<br>[NB: ratios do not need to be presented as ratios as long as the relationship is clear] |
| 24 (a) | Explanation: Each member of the population has an equal chance of selection | | 1 | B1 for explanation |
| (b) | Description: Eg. number each stamp and use random select on calculator. | | 1 | B1 for an acceptable description |
| (c) | $50\times\frac{95}{662}$ = 7.175…. | 7 | 2 | M1 for $50\times\frac{95}{662}$ or 7.1, 7.2, 7.17, 7.18, 7.175…<br>A1 Accept 7 or 7.0 |

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| 25 (a) | | 12, 6 | 2 | M1 for frequency density calculation (implied by one answer), or 1cm$^2$=2 (trains), or fd=0.5 or 8cm$^2$=16<br>A1 both 12 and 6 |
| (b) | Bar of height 5cm (5-10)<br>Bar of height 1cm (30-50) | Height 5cm<br>Height 1cm | 2 | M1 for frequency density calculation (implied by one correct bar) or 1cm$^2$=2 (trains) or fd=0.5<br>A1 for bar of height 5cm (5 to 10) AND for bar of height 1 cm (30 to 50) 8cm$^2$=16 |
| 26 | $\frac{40}{360}\times\pi\times8^2$ – $\frac{1}{2}\times8^2\times\sin40^o$<br>= 22.34.... – 20.569...<br>OR<br>$\frac{40}{360}\times\pi\times8^2$ –<br>$8\times\sin20^o\times8\times\cos20^o$<br>= 22.34.... – 20.569... | 1.77 | 5 | M1 for $\frac{40}{360}$ oe seen or $0.1\dot{1}$ seen or ÷9<br>M1 for $\frac{40}{360}\times\pi\times8^2$ oe or sight of 22.3-22.35<br>M1 for $\frac{1}{2}\times8^2\times\sin40^o$ or $8\times\sin\ 20\times8\times\cos20$<br>or sight of 20.56-20.57<br><br>M1 (dep on at least one M1 scored) for the intention to find the difference between the area of triangle *OPS* and the area of sector *OPRS*<br>A1 for 1.74 -1.78<br>[B3: RAD: ±1.50(340...) or GRAD: 3.53(108...)] |
| 27 (a) | | $y$ = f($x$ – 5) | 1 | B1 cao |
| (b) | | (4, 3) | 2 | B2 cao<br>(B1 for one coord. correct (in correct position) or (3,4).) |

GCSE MATHEMATICS 1380 (LINEAR)

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# Mark Scheme (Results)

## Summer 2016

## Pearson Edexcel GCSE
## In Mathematics B (2MB01)
## Higher (Calculator) Unit 3

*PMT*

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**NOTES ON MARKING PRINCIPLES**

**1** All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

**2** Mark schemes should be applied positively.

**3** All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Note that in some cases a correct answer alone will not score marks unless supported by working; these situations are made clear in the mark scheme. Examiners should be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

**4** Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

**5** Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

**6** Mark schemes will award marks for the quality of written communication (QWC).
The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

**7 With working**

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Partial answers shown (usually indicated in the ms by brackets) can be awarded the method mark associated with it (implied).
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks; transcription errors may also gain some credit. Send any such responses to review for the Team Leader to consider.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

**8 Follow through marks**

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
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**9 Ignoring subsequent work**

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

**10 Probability**

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
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**11 Linear equations**
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

**12 Parts of questions**
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

**13 Range of answers**
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

| **Guidance on the use of codes within this mark scheme** |
| --- |
| M1 – method mark<br>A1 – accuracy mark<br>B1 – Working mark<br>C1 – communication mark<br>QWC – quality of written communication<br>oe – or equivalent<br>cao – correct answer only<br>ft – follow through<br>sc – special case<br>dep – dependent (on a previous mark or conclusion)<br>indep – independent<br>isw – ignore subsequent working |

| PAPER: 5MB3H/01 | | | | | |
|---|---|---|---|---|---|
| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 1* | | | Decision (supported) | 3 | M1 for correct first step e.g. 15 ÷ 3<br>M1 for complete method<br>C1 for correct decision with accurate figures |
| 2 | (a) | | Correct diagram | 2 | B2 cao<br>(B1 for correct orientation) |
| | (b) | | Enlargement, sf 4, centre (0, 1) | 3 | B1 for enlargement<br>B1 for scale factor 4<br>B1 for centre (0, 1) |
| 3 | | | $w = \frac{d+5}{2}$ | 2 | M1 for attempt to add 5 to both sides or divide both sides by 2 as a first step,<br>eg $d + 5 = 2w$ oe or $\frac{d}{2} = w - \frac{5}{2}$ oe<br>A1 for $w = \frac{d+5}{2}$ oe |

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| PAPER: 5MB3H/01 | | | | | |
|---|---|---|---|---|---|
| Question | | Working | Answer | Mark | Notes |
| 4 | | | 22.5 | 4 | M1 for $4(x - 8) = 2x + 13$<br>M1 for expansion of bracket or division of all terms by 4,<br>eg $4x - 32 = 2x + 13$, or $x - 8 = \frac{2x}{4} + \frac{13}{4}$<br>M1 for isolating $x$ and number terms eg $2x = 45$, $\frac{x}{2} = \frac{45}{4}$<br>A1 for $\frac{45}{2}$ or 22.5<br>OR<br>M1 for $(180 - 64) \div 2$ (= 58)<br>M1 for $4(x - 8)$ = "58" or $2x + 13$ = "58" or "58" – 13 (= 45)<br>M1 for isolating $x$ and number terms eg $4x = 90$, $2x = 45$ or "45" ÷ 2<br>A1 for $\frac{45}{2}$ or 22.5<br>OR<br>M1 for $64 + 4(x - 8) + 2x + 13$<br>M1 for $64 + 4(x - 8) + 2x + 13 = 180$<br>M1 for isolating $x$ and number terms eg $6x = 135$<br>A1 for $\frac{45}{2}$ or 22.5 |
| 5 | | | Correct region shaded | 3 | M1 for a circle centre $M$ or $N$ (accept arc of sufficient length to define the region)<br>M1 for circle centre M radius 5 cm **and** circle centre $N$ radius 3 cm (accept arc of sufficient length to define the region)<br>A1 for correct region shaded |

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| PAPER: 5MB3H/01 | | | | | |
|---|---|---|---|---|---|
| Question | | Working | Answer | Mark | Notes |
| *6 | | | Conclusion (supported) | 4 | M1 for $\pi \times 120^2$ (= 45 216 – 45 249)<br>M1 for "$\pi \times 120^2$" ÷ 1800<br>A1 for 25 – 25.2<br>C1 ft (dep on M2) for appropriate conclusion from their figures<br>OR<br>M1 for $\pi \times 120^2$ (= 45 216 – 45 249)<br>M1 for 20 × 1800<br>A1 for 36 000 and 45 216 – 45 249<br>C1 ft (dep on M2) for appropriate conclusion from their figures<br>OR<br>M1 for $\pi \times 120^2$ (= 45 216 – 45 249)<br>M1 for "$\pi \times 120^2$" ÷ 20<br>A1 for 2260 – 2263<br>C1 ft (dep on M2) for appropriate conclusion from their figures<br>OR<br>M1 for 1800 × 20<br>M1 for 36 000 ÷ $\pi$ (=11 457 – 11 465)<br>A1 for 107(.0…)<br>C1 ft (dep on M2) for appropriate conclusion from their figures |
| 7 | | | 161.50 | 5 | M2 for a correct method to decrease 6720 by 20%, eg 6720 × 0.8 (= 5376)<br>or 6720 × 0.2 (= 1344 and 6720 – 1344 (= 5376))<br>(M1 for a correct method to find 20% of 6720 eg 6720 × 0.2 or $\frac{20}{100} \times 6720$ (= 1344))<br>M1 for subtracting 1500 (= 3876) after a percentage calculation<br>M1 "3876" ÷ 24 after the subtraction of 1500<br>A1 for 161.5(0) |

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| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 8 | | 3 42<br>3.1 45.(291)<br>3.2 48.(768)<br>3.3 52.(437)<br>3.4 56.(304)<br>3.5 60.(375)<br>3.6 64.(656)<br>3.7 69.(153)<br>3.8 73.(872)<br>3.9 78.(819)<br>4 84<br>3.71 69.6(14811)<br>3.72 70.(078848)<br>3.73 70.5(45117)<br>3.74 71.(013624)<br>3.75 71.4(84375) | 3.7 | 4 | B2 for a trial between 3 and 4 exclusive<br>(B1 for a trial at 3 or 4 )<br>B1 for a different trial of $3.7 < x \leq 3.75$<br>B1 (dep on at least one previous B1) for 3.7<br><br>NB. Trials should be evaluated to at least 2 sf truncated or rounded for values of $x$ correct to 1 decimal place. Trials should be evaluated to at least 1 dp truncated or rounded for values of $x$ correct to 2dp.<br><br>**NB** No working scores 0 marks even if answer is correct |
| 9 | | | 618 | 4 | M1 for a method to find an area which is part of the cross section<br>M1 (dep) for a complete method to find the total area of the cross section<br>M1 (dep M1) for their cross sectional area × 12<br>A1 cao<br><br>**OR**<br>M1 for a method to find the volume of cuboid, 8 × 8 × 12 (= 768)<br>M1 for a method to find the volume of the triangular prism, ½ ×5 × 5 × 12(= 150)<br>M1 (dep M2) for a complete method for the volume of the prism<br>A1 cao |

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| Question | | Working | Answer | Mark | Notes |
| 10 | (a) | | 15.2 | 3 | M1 for $12.7^2 + 8.3^2$ or 161.29 + 68.89 or 230.18<br>M1 for √"$(12.7^2 + 8.3^2)$" or √"161.29 + 68.89" or $\sqrt{230.18}$<br>A1 for 15.2 or 15.17(168…) |
| | (b) | | 16.1 | 3 | M1 for $\sin 40° = \frac{DE}{25}$ oe or $\frac{DE}{\sin 40} = \frac{25}{\sin 90}$ oe<br>M1 for 25 sin 40°<br>A1 for 16.1 or 16.06(969…) |
| 11 | (a) | | 4.081 | 2 | M1 for 8.875 or $\frac{71}{8}$ or 2.979…or 4.08<br>A1 for 4.081 or 4.0809(5…)… |
| | (b) | | $4 \times 10^{-3}$ | 2 | M1 for $4 \times 10^n$, $n \neq -3$ or $a \times 10^{-3}$, $a \neq 4$ or 0.004 or $0.4 \times 10^{-2}$ or 1/250<br>A1 cao |
| 12 | | | $x < 2$ | 2 | M1 for an attempt to isolate $x$ and number terms or multiply all terms by 2,<br>or for $\frac{3}{2}x < 3$ or $-\frac{3}{2}x < -3$ or $x = 2$<br>A1 cao |
| 13 | (a) | | 0, 6, 4, –6 | 2 | B2 for all values correct<br>(B1 for any one value correct) |
| | (b) | | Graph drawn | 2 | M1 ft (provided B1 in (a) for at least 6 points plotted correctly from their table<br>A1 cao for correct curve drawn from (–4, –6) to (3, –6) |
| | (c) | | 1.5 to 1.6<br>and<br>–2.5 to –2.6 | 2 | M1 for correct use $y = 2$ (may be implied by one correct estimate) or correct use of formula.<br>A1 for 1.5 to 1.6 and –2.5 to –2.6 |

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| **Question** | | **Working** | **Answer** | **Mark** | **Notes** |
| 14* | | Sher Yas<br>**Old 19300 12560**<br>New 20265 13502<br>**Inc 965 942** | Correct comparison (supported) | 3 | M1 for a correct method to calculate the population at the beginning of the 10 year period for at least one place.<br>eg $\frac{20265}{1.05}$ (= 19 300) oe or $\frac{13502}{1.075}$ (= 12 560) oe<br>A1 for 965 (Sherbury) **and** 942(Yaston)<br>C1 (dep on M1) ft for statement comparing increases leading to conclusion based on two comparable amounts eg increase in Sherbury is greater than increase in Yaston |
| 15 | | $20x + 10y = 35$<br>$6x - 10y = -48$<br>$x = -\frac{1}{2}$<br>$y = \frac{9}{2}$<br>OR<br>$12x + 6y = 21$<br>$12x - 20y = -96$<br>$26y = 117$<br>$y = \frac{9}{2}$<br>$x = -\frac{1}{2}$ | $-\frac{1}{2}, \frac{9}{2}$ | 4 | M1 for a correct process to eliminate either variable (condone one arithmetic error)<br>A1 cao for either $x$ or $y$<br>M1 (dep on M1) for correct substitution of found value into one of the equations or appropriate method after starting again (condone one arithmetic error)<br>A1 cao<br>OR<br>M1 for full method to rearrange and substitute to eliminate either variable (condone one arithmetic error)<br>A1 cao for either $x$ or $y$<br>M1 (dep on M1) for correct substitution of found value into one of the equations or appropriate method after starting again (condone one arithmetic error)<br>A1 cao<br><br>**NB** Trial and improvement methods score 0 marks unless both $x$ and $y$ are correct |
| 16 | | | 226 | 2 | M1 for angle $ABC = 180 - 67$ (= 113)<br>A1 cao<br>OR<br>M1 for obtuse angle $AOC = 2 \times 67$ (= 134)<br>A1 cao |

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| Question | | Working | Answer | Mark | Notes |
| 17 | | | – 2.82, 19.82 | 3 | M1 for $\frac{--17 \pm \sqrt{(-17)^2 - 4\times1\times-56}}{2\times1}$ (condone one sign error) or $\left(x - \frac{17}{2}\right)^2$ oe<br>M1 for $\frac{17 \pm \sqrt{513}}{2}$ or for method leading to $\frac{17}{2} \pm \sqrt{\frac{513}{4}}$ oe<br>A1 for answers in the range 19.82 to 19.825; – 2.82 to –2.825 |
| 18 | | | 21.2 | 4 | M1 for correct use of sine rule to find *AB* or *BC*,<br>eg $\frac{6}{\sin 25} = \frac{AB}{\sin 120}$ or $\frac{6}{\sin 25} = \frac{BC}{\sin(180-120-25)}$<br>M1 for (*AB* =) $\frac{6}{\sin 25} \times \sin 120$ (= 12.2(951…)) or (*BC* =) $\frac{6}{\sin 25} \times \sin 35$ (= 8.1(431…)<br>M1(dep M2) for method to find area, eg 0.5 × 6 × "*AB*" sin35 or 0.5 × 6 × "*BC*" sin 120<br>A1 for answer in the range 21.1 – 21.2<br><br>OR (with perpendicular from *A* meeting *BC* extended at a point *X*)<br>M1 for method to find *AX*<br>M1 for method to find *BX*<br>M1(dep M2) for 0.5 × "*AX*" × "*BC*"<br>A1 for answer in the range 21.1 – 21.2 |
| *19 | | | 0.38 because the LB and UB agree to that number of figures | 5 | B1 for 10.75 or 10.85 or 10.84999…<br>B1 for 75.055 or 75.065 or 75.064999…<br>M1 for $\sqrt{\frac{10.85}{75.055}}$ as UB **OR** $\sqrt{\frac{10.75}{75.065}}$ as LB<br>A1 (dep on all previous marks) for both 0.3802… and 0.3784 must clearly come from working with correct values<br>C1 for 0.38 from 0.3784… and 0.3802 … **and** "both LB and UB round to 0.38"<br><br>**NB** An answer of 038(932….) without working scores no marks |

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| **Question** | | Working | **Answer** | **Mark** | **Notes** |
| 20 | | | 7.35 | 3 | M1 for $y \propto \frac{1}{\sqrt{x}}$ or $y = \frac{k}{\sqrt{x}}$ or $9 = \frac{k}{\sqrt{4}}$<br>M1 for $k = 9\sqrt{4}$ (=18)<br>A1 for 7.35 or 7.348… |
| *21 | | | $\frac{2}{3}$ (7**a** + 3**b**) and correct conclusion | 4 | M1 for correct vector for $\overrightarrow{OY}$, or $\overrightarrow{AP}$<br>eg $(\overrightarrow{OY}) = \overrightarrow{OA} + \overrightarrow{AY}$, or $\overrightarrow{OY} = \overrightarrow{OA} + \frac{2}{3}\overrightarrow{AP}$ may include terms in **a** and **b,** eg. 6**a** + $\overrightarrow{AY}$, 4**b** + 4**a** – **b** + $\overrightarrow{PY}$ or $\overrightarrow{AP} = \overrightarrow{AO} + \overrightarrow{OB} + \overrightarrow{BP}$ or –6**a** + 4**b** + 4**a** – **b** or – 2**a** + 3**b**<br>M1 for $(\overrightarrow{AY}) = \frac{2}{3}\overrightarrow{AP}$ or ⅔( –6**a** + 4**b** + 4**a** – **b**) or ⅔(–2**a** + 3**b**)<br>or $(\overrightarrow{PY} = \frac{1}{3}\overrightarrow{PA}$ or ⅓(– 4**a** + **b** – 4**b** + 6**a**) or ⅓(2**a** – 3**b**)<br>M1 for correct expression for $\overrightarrow{OY}$ in terms of **a** and **b,** eg $\frac{14}{3}$ **a** + 2**b**<br>C1 for $\frac{2}{3}$ (7**a** + 3**b**) and "$\overrightarrow{OY}$ is parallel to the vector 7**a** +3**b**" **oe** |

## Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

| PAPER: 5MB3H_01 | | | |
|---|---|---|---|
| **Question** | | **Modification** | **Notes** |
| Q2 | (a) | Grid enlarged. Shading changed to dotty shading. Labels added to shapes. Image labelled shape A. Rotation given and labelled shape B. Question changed to 'Describe fully the single transformation which maps shape A to shape B. One row top and bottom, one column left and right has been removed. Three answer lines given. | 2 cao<br>(B1 for correct orientation in third quadrant or correct quarter turn) |
| Q2 | (b) | Grid enlarged. Shading changed to dotty shading. Labels added next to the triangles 'triangle P' and 'triangle Q'. One column removed from the left. | B1 for enlargement<br>B1 for scale factor 4<br>B1 for centre (0, 1) |

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| PAPER: 5MB3H_01 | | | |
|---|---|---|---|
| **Question** | | **Modification** | **Notes** |
| Q4 | | Diagram enlarged. MLP only – x changed to y.<br>Braille only – measurements given in the text. | M1 for $4(x - 8) = 2x + 13$<br>M1 for expansion of bracket or division of all terms by 4,<br>eg $4x - 32 = 2x + 13$, $x - 8 = 2x/4 + 13/4$<br>M1 for isolating x and number terms eg $2x = 45$, $x/2 = 45/4$<br>A1 for 45/2 or 22.5<br>OR<br>M1 for $(180 - 64) \div 2$ (= 58)<br>M1 for $4(x - 8) = 58$ or $2x + 13 = 58$<br>M1 for isolating x and number terms eg $4x = 90$, $2x = 45$<br>A1 for 45/2 or 22.5<br>OR<br>M1 for $64 + 4(x - 8) + 2x + 13$<br>M1 for $64 + 4(x - 8) + 2x + 13 = 180$<br>M1 for isolating x and number terms eg $6x = 135$<br>A1 for 45/2 or 22.5 |
| Q5 | | Diagram kept the same size as original. Scale moved above the diagram and also put in the question paper. | B1 for circle centre M radius 5 cm<br>B1 for circle centre N radius 3 cm<br>B1 for correct region shaded |

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| PAPER: 5MB3H_01 | | | |
|---|---|---|---|
| **Question** | | **Modification** | **Notes** |
| Q6 | | Diagram enlarged. Cross changed to a filled in circle. Arrow heads removed. | M1 for $\pi \times 120^2$ (= 45238….)<br>M1 for "$\pi \times 120^2$" ÷ 1800<br>A1 for 25.0 – 25.2<br>C1 for "surface is large enough as 25 > 20" oe<br>OR<br>M1 for $\pi \times 120^2$ (= 45238….)<br>M1 for 20 × 1800<br>A1 for 36000<br>C1 for "surface is large enough as 36000 < 45238..." oe<br>OR<br>M1 for $\pi \times r^2 = 1800 \times 20$<br>M1 for 36000 ÷ π (=11459..)<br>A1 for 107.0…<br>C1 for "surface is large enough as 107…< 120" oe |
| Q9 | | Model provided for all candidates. Diagram enlarged and provided for MLP. | M1 for a method to find an area which is part of the cross section<br>M1 (dep) for a complete method to find the total area of the cross section<br>M1 (dep M2) for a complete method for the volume of the prism<br>A1 cao<br><br>OR<br>M1 for a method to find the volume of cuboid, 8 × 8 × 12<br>M1 for a method to find the volume of the triangular prism<br>M1 (depM2) for a complete method for the volume of the prism<br>A1 cao |

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| PAPER: 5MB3H_01 | | | |
|---|---|---|---|
| **Question** | | **Modification** | **Notes** |
| Q10 | (a) | Diagram enlarged.<br>Braille only: measurements given in the text. | M1 for $12.7^2 + 8.3^2$ or 161.29 + 68.89 or 230.18<br>M1 for $\sqrt{161.29 + 68.89}$ or $\sqrt{230.18}$<br>A1 for 15.2 or 15.17(168…) |
| Q10 | (b) | Diagram enlarged.<br>Braille only – measurements given in the text. | M1 for $\sin 40° = \frac{DE}{25}$ oe<br>M1 for 25 sin 40°<br>A1 for 16.1 or 16.06(969…) |
| Q13 | (a) | Wording added 'There are four spaces to fill.' | B2 for all values correct<br>(B1 for any one value correct) |
| Q13 | (b) | Grid enlarged. | M1 ft for at least 6 points plotted correctly from their table<br>A1 cao for correct curve drawn from (–4, –6) to (3, –6) |
| Q16 | | Diagram enlarged. Dot added at centre. | M1 for angle ABC = 180 – 67 (= 113)<br>A1 cao<br>OR<br>M1 for obtuse angle AOC = 2 × 67 (= 134)<br>A1 cao |

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| PAPER: 5MB3H_01 | | | |
|---|---|---|---|
| **Question** | | **Modification** | **Notes** |
| Q18 | | Diagram enlarged. | M1 for correct use of sine rule to find *AB* or *BC*,<br>eg $\frac{6}{\sin 25} = \frac{AB}{\sin 120}$<br>M1 for (*AB* =) $\frac{6}{\sin 25} \times \sin 120$ or (*BC* =) $\frac{6}{\sin 25} \times \sin 35$<br>M1(dep M2) for method to find area, eg 0.5×6×*AB*sin35 or 0.5×6×*BC* sin 120<br>A1 for answer in the range 21.1 – 21.2<br><br>OR (with perpendicular from *A* meeting *BC* extended at a point *X*)<br>M1 for method to find *AX*<br>M1 for method to find *BX*<br>M1(dep M2) for 0.5 × "*AX*" × "*BC*"<br>A1 for answer in the range 21.1 – 21.2 |
| Q21 | | Diagram enlarged. | M1 for correct vector for $\overrightarrow{OY}$,<br>eg $(\overrightarrow{OY}) = \overrightarrow{OA} + \overrightarrow{AY}$, may include terms in **a** and **b,** eg. 6**a** + $\overrightarrow{AY}$, 4**b** + 4**a** – **b** + $\overrightarrow{PY}$<br><br>M1 for $(\overrightarrow{AY} =) \frac{2}{3}\vec{A}P$ or $(\overrightarrow{PY} =) \frac{1}{3}\overrightarrow{PA}$<br>M1 for correct expression for $\overrightarrow{OY}$ in terms of **a** and **b,** eg $\frac{14}{3}$**a** + 2**b**<br>C1 for $\frac{2}{3}$(7**a** + 3**b)** and "$\overrightarrow{OY}$ is parallel to the vector 7**a** +3**b" oe** |

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## Question 4

Many students did not understand the meaning of perpendicular and were therefore unable to score on this question. Of those who did, the perpendicular was often simply drawn with no sensible attempt at construction; stray arcs were often seen. It was pleasing, however, to see a significant number of students gaining full marks, usually with arcs centre $D$ radius $DP$ and centre $C$ radius $CP$. Quite often the construction of a perpendicular bisector of $CD$ was seen; this gained no marks. A significant number of students seemed not to understand the definition of perpendicular.

**Question 3**

A significant number of learners were not familiar with the method required to accurately construct an angle bisector using compasses. Those who knew how to draw the relevant arcs usually gained full marks for completing the bisector accurately. There were many responses with arcs in places that were not required. In some cases, constructions such as a perpendicular bisector of one of the lines was seen. There were responses where one mark was awarded for an angle bisector within the guidelines, presumably from measuring the angle and halving it. To gain full marks on a construction's question all relevant construction lines must be seen.

### Question 4

Another reasoning question and one many learners found harder than 3(b). The question showed a response to a loci question where someone was asked to shade the region at least 2 cm from a fixed point. The response was incorrect as, even though they had drawn a circle, they had shaded inside rather than outside of the circle. Many struggled to articulate a correct response. We saw a lot of responses referring to a square or that the diagonals were not correct. That said, we saw many good replies with learners realising they should have shaded outside, or that they had shaded where $P$ could not be, rather than where it could be.