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GCSE MATHS

Geometry and measures

Edexcel 1MA1 | Subtopic collection Topic 47

Congruence and geometric proof

Higher tier

Past paper question booklet

16	2003-2024	Higher
question groups	available papers	tier

Before you begin

1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

Name _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

14.

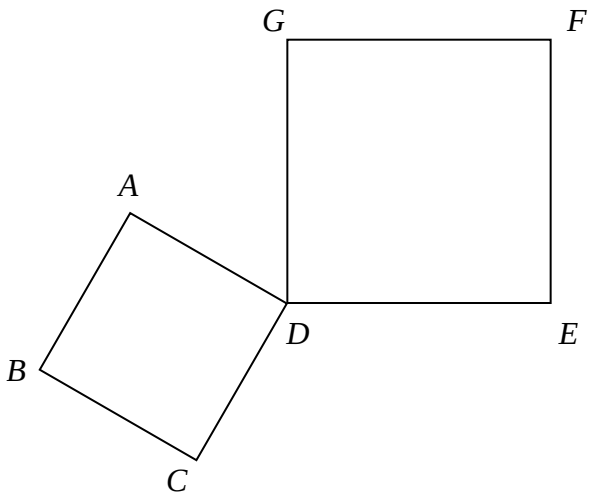


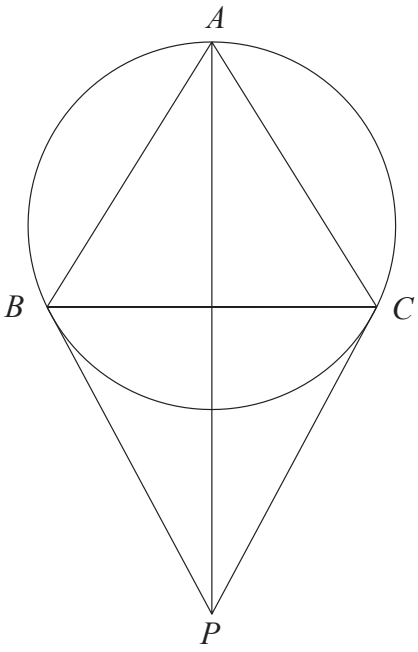
Diagram **NOT** accurately drawn

ABCD and *DEFG* are squares.

Prove that triangle *CDG* and triangle *ADE* are congruent.

(3)

16.



A, B and C are three points on the circumference of a circle.
Angle ABC = Angle ACB.
PB and PC are tangents to the circle from the point P.

(a) Prove that triangle APB and triangle APC are congruent.

(3)

Angle $BPA = 10°$.

(b) Find the size of angle ABC.

.....°

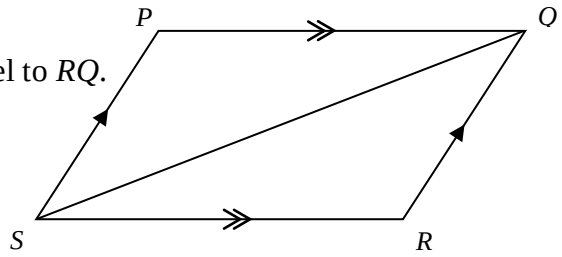
(4)

Question 15 (5 marks)

PQRS is a quadrilateral. *PQ* is parallel to *SR*. *SP* is parallel to *RQ*.

(*a*) Prove that triangle *PQS* is congruent to triangle *RSQ*.

(*b*) In quadrilateral *PQRS*, angle *SPQ* is obtuse.
Explain why *PQRS* cannot be a cyclic quadrilateral.



24.

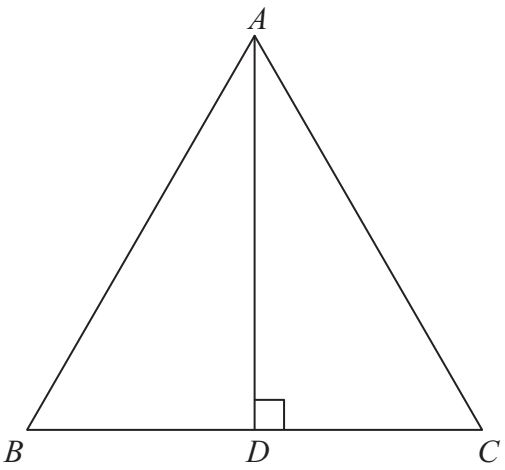


Diagram **NOT** accurately drawn

ABC is an equilateral triangle.
D lies on *BC*.
AD is perpendicular to *BC*.

(a) Prove that triangle *ADC* is congruent to triangle *ADB*.

(3)

(b) Hence, prove that $BD = \frac{1}{2}AB$.

(2)

(Total 5 marks)

Q24

22.

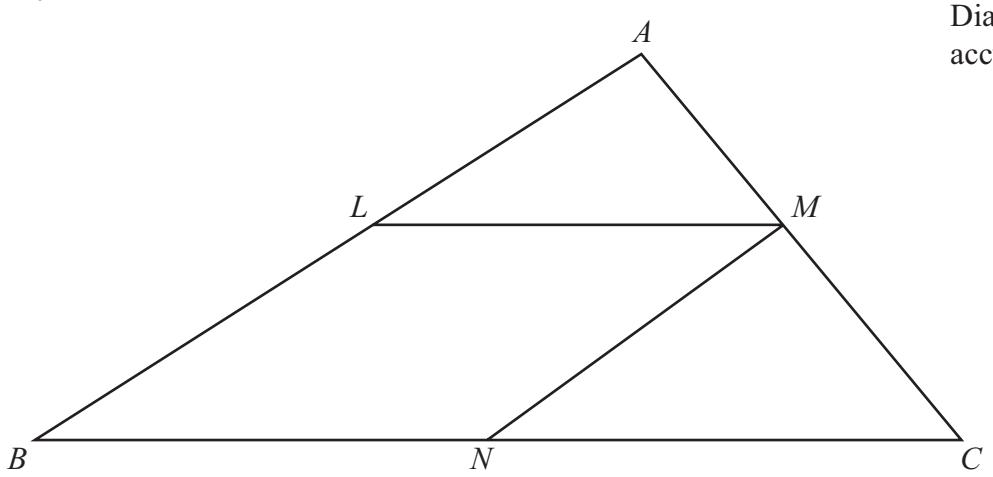


Diagram **NOT** accurately drawn

The diagram shows a triangle ABC.

$LMNB$ is a parallelogram where
L is the midpoint of AB,
M is the midpoint of AC,
and N is the midpoint of BC.

Prove that triangle ALM and triangle MNC are congruent.
You must give reasons for each stage of your proof.

Q22

(Total 3 marks)

22

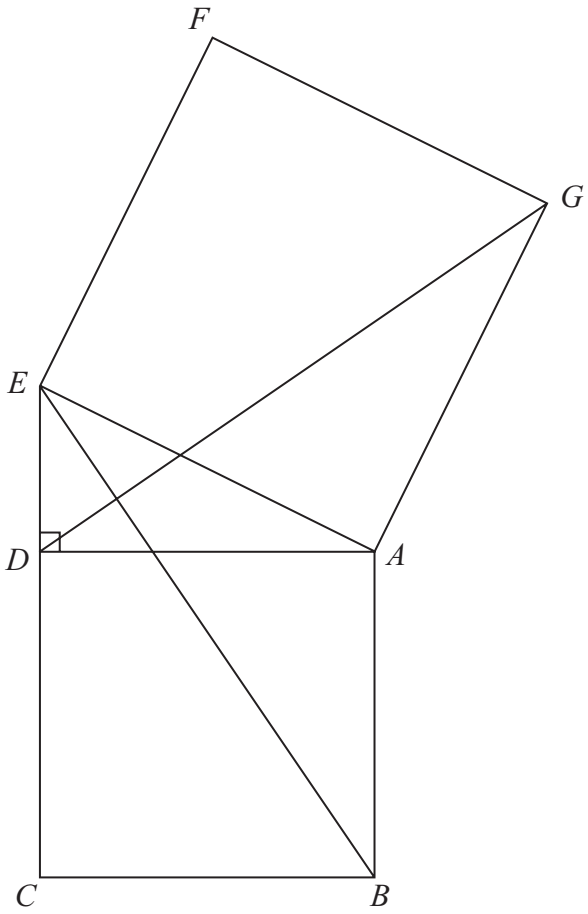


Diagram **NOT** accurately drawn

In the diagram,

ADE is a right-angled triangle,
ABCD and *AEFG* are squares.

Prove that triangle *ABE* is congruent to triangle *ADG*.

(Total for Question 22 is 3 marks)

***28**

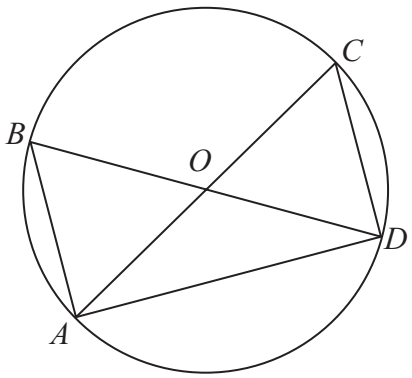


Diagram **NOT** accurately drawn

AOC and *BOD* are diameters of a circle, centre *O*.

Prove that triangle *ABD* and triangle *DCA* are congruent.

(Total for Question 28 is 3 marks)

13 Here is a rectangle.

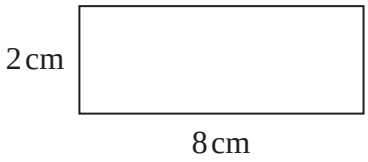


Diagram **NOT** accurately drawn

The 8-sided shape below is made from 4 of these rectangles and 4 congruent right-angled triangles.

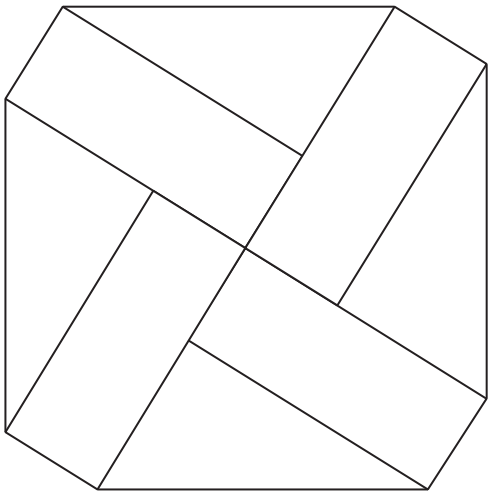


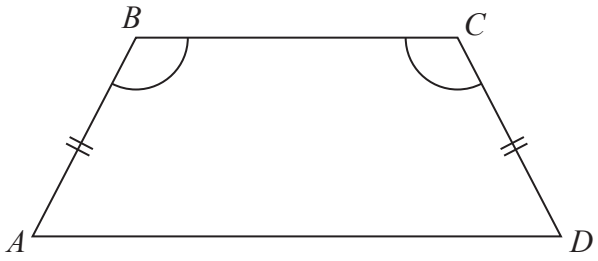
Diagram **NOT** accurately drawn

Work out the perimeter of the 8-sided shape.
You must show all your working.

..... cm

(Total for Question 13 is 5 marks)

21 $ABCD$ is a quadrilateral.

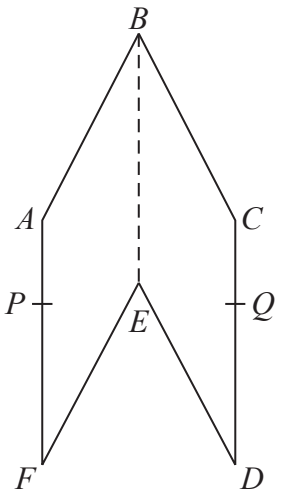


$AB = CD$.
Angle ABC = angle BCD.

Prove that $AC = BD$.

(Total for Question 21 is 4 marks)

22 The diagram shows a hexagon $ABCDEF$.



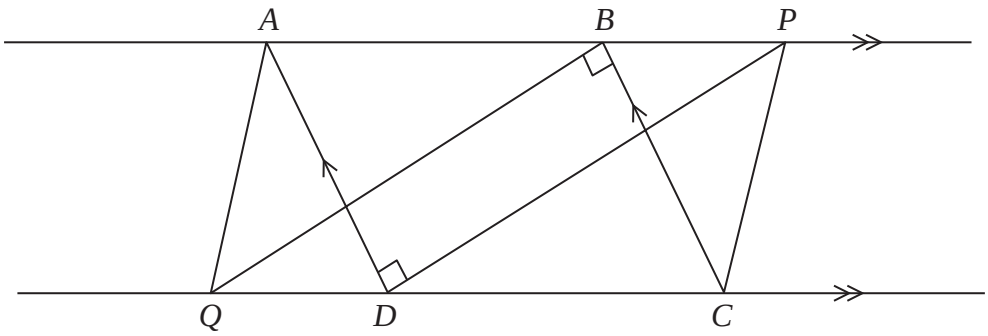
$ABEF$ and $CBED$ are congruent parallelograms where $AB = BC = x$ cm.
P is the point on AF and Q is the point on CD such that $BP = BQ = 10$ cm.

Given that angle $ABC = 30°$,

prove that $\cos PBQ = 1 - \dfrac{(2-\sqrt{3})}{200}x^2$

(Total for Question 22 is 5 marks)

21



ABCD is a parallelogram.
ABP and *QDC* are straight lines.
Angle *ADP* = angle *CBQ* = 90°

(a) Prove that triangle *ADP* is congruent to triangle *CBQ*.

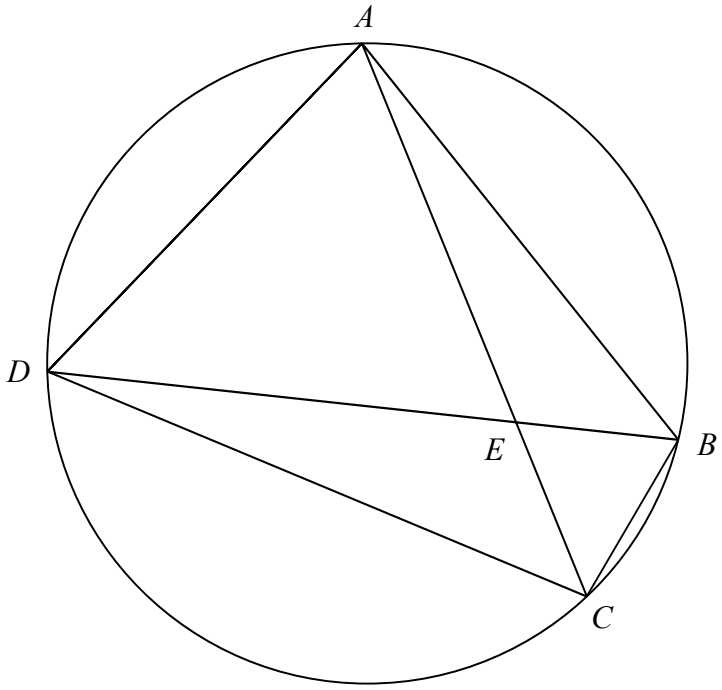
(3)

(b) Explain why *AQ* is parallel to *PC*.

(2)

(Total for Question 21 is 5 marks)

22 A, B, C and D are four points on a circle.



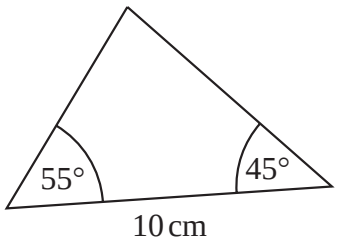
AEC and DEB are straight lines.

Triangle AED is an equilateral triangle.

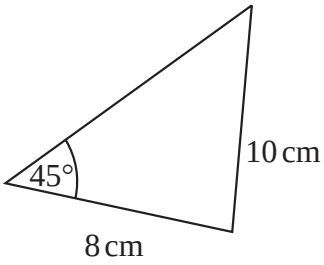
Prove that triangle ABC is congruent to triangle DCB.

(Total for Question 22 is 4 marks)

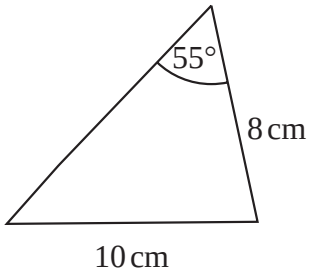
4 The diagram shows four triangles.



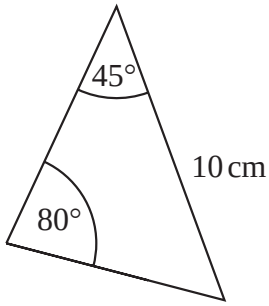
Triangle **A**



Triangle **B**



Triangle **C**



Triangle **D**

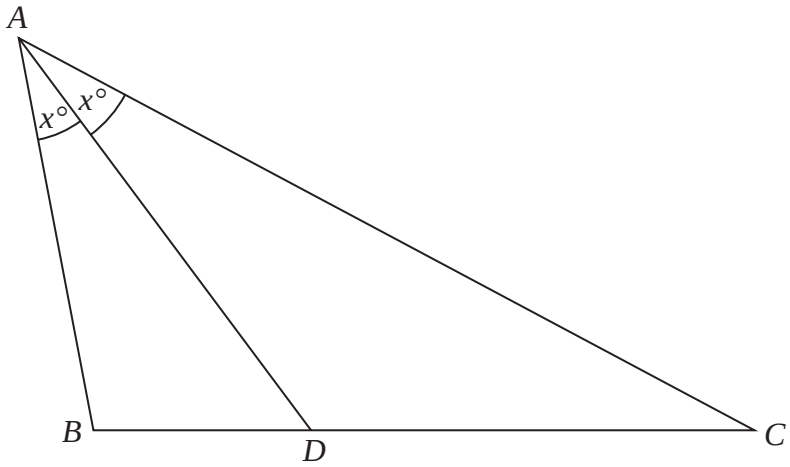
Two of these triangles are congruent.

Write down the letters of these two triangles.

..... and .....

(Total for Question 4 is 1 mark)

23 ABC is a triangle.

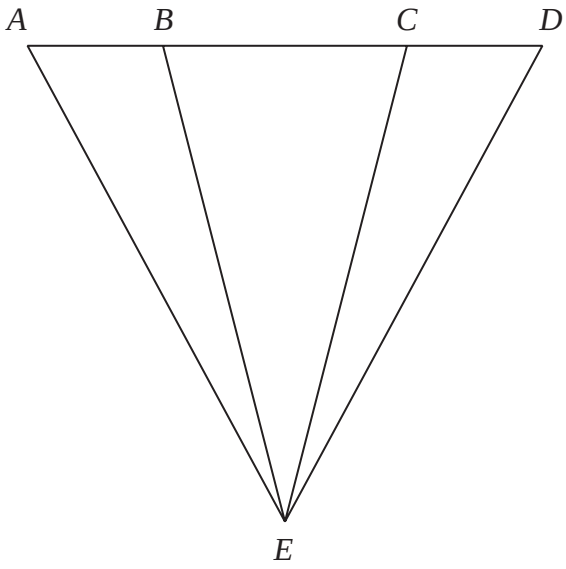


D is the point on BC such that angle BAD = angle DAC = $x°$

Prove that $\frac{AB}{BD} = \frac{AC}{DC}$

(Total for Question 23 is 4 marks)

20 The diagram shows a triangle ADE.

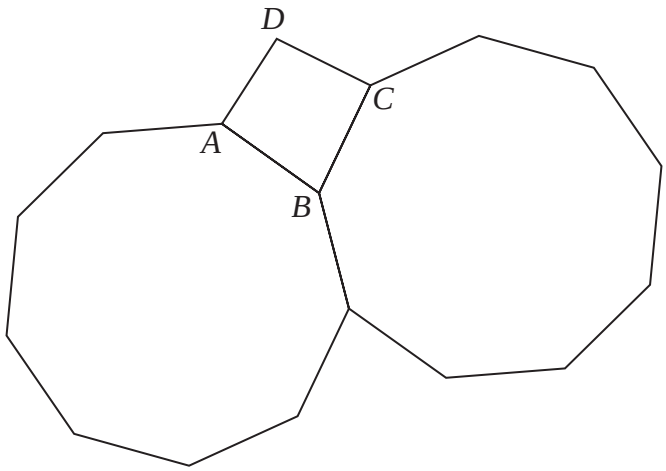


$AE = DE$
$AB : BC : CD = 1 : 2 : 1$

Prove that triangle ACE is congruent to triangle DBE.

(Total for Question 20 is 3 marks)

9 The diagram shows two congruent regular 9-sided polygons.
ABCD is a quadrilateral.



Show that *ABCD* is **not** a square.

(Total for Question 9 is 3 marks)