Chhetri Academy

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GCSE MATHS

Number

Edexcel 1MA1 | Subtopic collection Topic 05

Indices and roots

Higher tier

Past paper question booklet

32	2003-2025	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.

17. (a) Evaluate

(i) 3^{-2}

.....

(ii) $36^{\frac{1}{2}}$

.....

(iii) $27^{\frac{2}{3}}$

.....

(iv) $\left(\frac{16}{81}\right)^{-\frac{3}{4}}$

.....

(5)

(b) (i) Rationalise the denominator of $\frac{21}{\sqrt{7}}$ and simplify your answer.

.....

(ii) Expand $\left(\sqrt{5}+2\sqrt{3}\right)\left(\sqrt{5}-2\sqrt{3}\right)$
Express your answer as simply as possible.

.....

(4)

18.

(a) Find the value of $16^{\frac{1}{2}}$

.....

(1)

(b) Given that $\sqrt{40} = k\sqrt{10}$, find the value of k.

.....

(1)

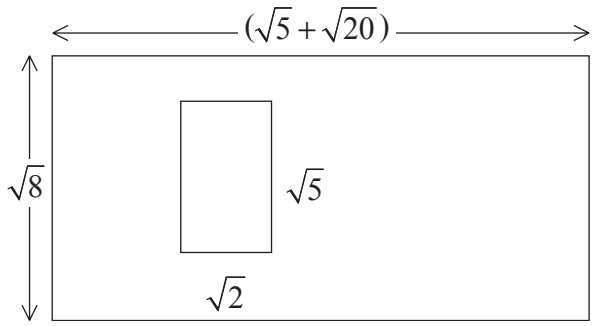


Diagram **NOT** accurately drawn

A large rectangular piece of card is $(\sqrt{5}+\sqrt{20})$ cm long and $\sqrt{8}$ cm wide.

A small rectangle $\sqrt{2}$ cm long and $\sqrt{5}$ cm wide is cut out of the piece of card.

(c) Express the area of the card that is left as a percentage of the area of the large rectangle.

%

.....

(4)

21. (a) Write down the value of $4^{\frac{3}{2}}$

.....

(1)

(b) Write $\sqrt{8}$ in the form $m\sqrt{2}$, where m is an integer.

.....

(2)

(c) Write $\sqrt{50}$ in the form $k\sqrt{2}$, where k is an integer.

.....

(2)

(d) Rationalise $\dfrac{1+\sqrt{2}}{\sqrt{2}}$

.....

(2)

Q21

(Total 7 marks)

Blank

10. (a) Write as a power of 7

(i) $7^8 \div 7^3$

.....

(ii) $\dfrac{7^2 \times 7^3}{7}$

.....

(3)

(b) Write down the reciprocal of 2

.....

(1) **Q10**

(Total 4 marks)

16. (a) Simplify $(a^2)^4$

.....

(1)

$2^{30} \div 8^9 = 2^x$

(b) Work out the value of x.

$x =$ .....

(2)

(Total 3 marks)

Q16

24. Find the value of

(i) 6^0

.....

(ii) $64^{\frac{1}{2}}$

.....

(iii) $\left(\frac{27}{8}\right)^{-\frac{2}{3}}$

.....

Q24

(Total 4 marks)

22. (a) Simplify $p^5 \times p^4$

.....

(1)

(b) Simplify $q^5 \div q^2$

.....

(1)

(c) Simplify $12tu^6 \div 6tu^5$

.....

(2)

(d) Simplify $(9w^2y^6)^{\frac{1}{2}}$

.....

(2)

(e) For $x > 1$, write the following expressions in order of size.
Start with the expression with the least value.

x^0 x^2 x x^{-2} $x^{\frac{1}{2}}$

.....

(2)

Q22

(Total 8 marks)

11 (a) Find the value of 5^0

.....

(1)

(b) Find the value of $27^{\frac{1}{3}}$

.....

(1)

(c) Find the value of 2^{-3}

.....

(1)

(Total for Question 11 is 3 marks)

9 (a) Simplify $a^4 \times a^5$

.....

(1)

(b) Simplify $\dfrac{45e^6f^8}{5ef^2}$

.....

(2)

(c) Write down the value of $9^{\frac{1}{2}}$

.....

(1)

(Total for Question 9 is 4 marks)

17 (a) Write down the value of 10^{-1}

.....

(1)

(b) Find the value of $27^{\frac{2}{3}}$

.....

(2)

(c) Write $\sqrt{75}$ in the form $k\sqrt{3}$, where k is an integer.

.....

(2)

(Total for Question 17 is 5 marks)

2 (a) Simplify $5^4 \times 5^6$

.....

(1)

(b) Simplify $7^5 \div 7^2$

.....

(1)

(Total for Question 2 is 2 marks)

22 (a) Simplify fully $(3e)^0$

.....

(1)

(b) Simplify fully $\left(\frac{64x^6}{25y^2}\right)^{-\frac{1}{2}}$

.....

(2)

(c) Write $\frac{5}{x-3} - \frac{4}{x+3}$ as a single fraction in its simplest form.

.....

(3)

(Total for Question 22 is 6 marks)

10 (a) Write down the value of 7^0

.....

(1)

(b) Write down the value of 2^{-4}

.....

(1)

(c) Rationalise the denominator of $\frac{14}{\sqrt{7}}$

Give your answer in its simplest form.

.....

(2)

(Total for Question 10 is 4 marks)

22 (a) Find the value of 2^{-3}

.....

(1)

$5\sqrt{5}$ can be written in the form 5^k

(b) Find the value of k.

.....

(1)

(c) Work out the value of $\left(\sqrt{12} - \sqrt{3}\right)^2$

.....

(2)

(Total for Question 22 is 4 marks)

10 (a) Simplify $a^4 \times a^3$

.....

(1)

(b) Simplify $(b^2)^7$

.....

(1)

(c) Write down the value of 3^0

.....

(1)

(d) Write down the value of 4^{-1}

.....

(1)

(Total for Question 10 is 4 marks)

20 y is inversely proportional to the square root of x.

When $x = 4$, $y = 9$

Work out the value of y when $x = 6$
Give your answer correct to 3 significant figures.

.....

(Total for Question 20 is 3 marks)

Question 17

June 2017 | 1MA1/1H | Original Q12

12 (a) Find the value of $81^{-\frac{1}{2}}$

.....

(2)

(b) Find the value of $\left(\frac{64}{125}\right)^{\frac{2}{3}}$

.....

(2)

(Total for Question 12 is 4 marks)

17 n is an integer.

Prove algebraically that the sum of $\frac{1}{2}n(n+1)$ and $\frac{1}{2}(n+1)(n+2)$ is always a square number.

(Total for Question 17 is 2 marks)

6 $p^3 \times p^x = p^9$

(a) Find the value of x.

$x =$ .....

(1)

$(7^2)^y = 7^{10}$

(b) Find the value of y.

$y =$ .....

(1)

$100^a \times 1000^b$ can be written in the form 10^w

(c) Show that $w = 2a + 3b$

(2)

(Total for Question 6 is 4 marks)

19 Given that $9^{-\frac{1}{2}} = 27^{\frac{1}{4}} \div 3^{x+1}$
find the exact value of x.

$x =$ .....

(Total for Question 19 is 3 marks)

11 (a) Find the value of $\sqrt[4]{81 \times 10^8}$

.....

(2)

(b) Find the value of $64^{-\frac{1}{2}}$

.....

(2)

(c) Write $\frac{3^n}{9^{n-1}}$ as a power of 3

.....

(2)

(Total for Question 11 is 6 marks)

17 y is directly proportional to the square root of t.
$y = 15$ when $t = 9$

t is inversely proportional to the cube of x.
$t = 8$ when $x = 2$

Find a formula for y in terms of x.
Give your answer in its simplest form.

.....

(Total for Question 17 is 4 marks)

Question 23

9 (a) Express $\sqrt{\frac{10^{360}}{10^{150} \times 10^{90}}}$ as a power of 10

.....

(3)

Liam was asked to express $(12^{50})^2$ as a power of 12

Liam wrote $(12^{50})^2 = 12^{50^2} = 12^{2500}$

Liam's method is wrong.

(b) Explain why.

.....

.....

.....

(1)

(Total for Question 9 is 4 marks)

Question 24

November 2022 | 1MA1/1H | Original Q3

3 Simplify $(2^{-5} \times 2^{8})^{2}$

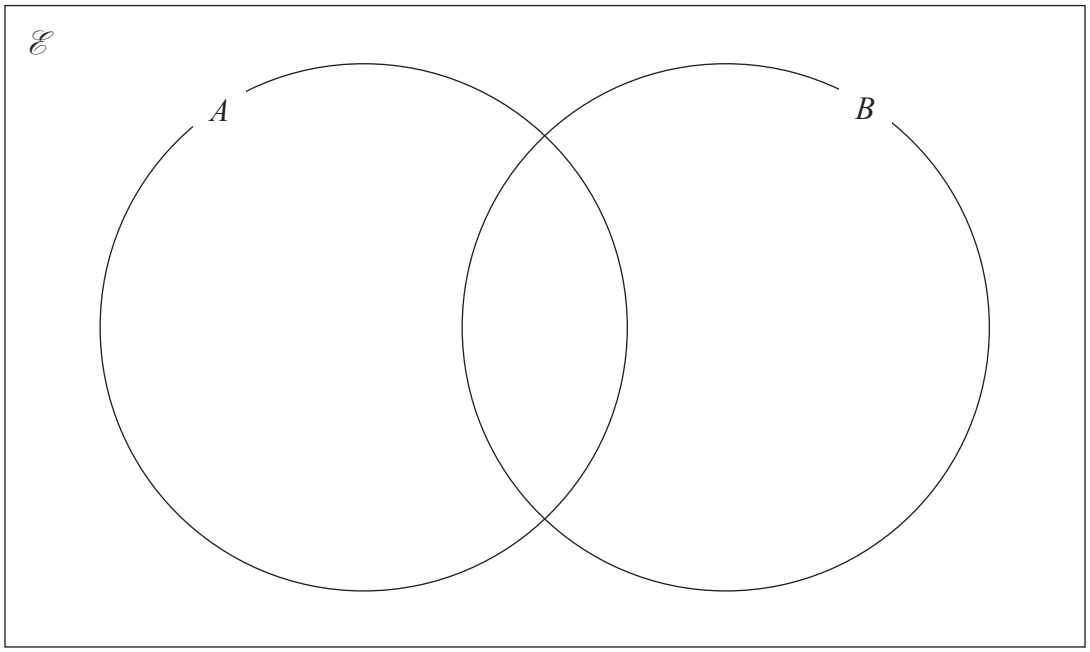
Give your answer as a power of 2

.....

(Total for Question 3 is 2 marks)

5 $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$A = \{\text{odd numbers}\}$
$B = \{\text{square numbers}\}$

(a) Complete the Venn diagram for this information.



(3)

A number is chosen at random from the universal set $\mathscr{E}$

(b) Find the probability that this number is in the set B'

.....

(2)

(Total for Question 5 is 5 marks)

Question 26

14 (a) Write $\frac{1}{16}$ in the form 4^n where n is an integer.

.....

(1)

(b) Work out the value of $8^{\frac{5}{3}} - 9^{\frac{3}{2}}$

.....

(3)

(Total for Question 14 is 4 marks)

13 An expression for the nth term of the sequence of triangular numbers is $\frac{n(n+1)}{2}$

Prove that the sum of any two consecutive triangular numbers is a square number.

(Total for Question 13 is 3 marks)

2 (a) (i) Write down the value of 5^0

.....

(1)

(ii) Write down the value of 5^{-2}

.....

(1)

(b) Write $\frac{2^5 \times 2^4}{2^3}$ in the form 2^n where n is an integer.

.....

(2)

(Total for Question 2 is 4 marks)

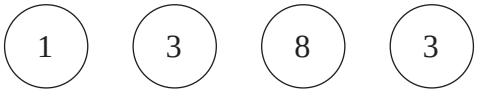
16 Zia has to set a 4-digit security passcode on her phone.

Each digit of the passcode is a number from 1 to 9
She can use each number more than once.

Zia tells her friend Amber that

the first digit is a cube number
the second digit is a prime number
the third digit is greater than 6
the fourth digit is an odd number.

The diagram shows one possible 4-digit passcode.



Amber is going to have one attempt at guessing Zia's passcode.

Work out the probability that Amber guesses Zia's passcode on the first attempt.

.....

(Total for Question 16 is 3 marks)

13 Here is a table of values of x and y.

x	2	4	6	8
y	0	4	8	12

Nadia says that y is directly proportional to x because the value of y increases by 4 as the value of x increases by 2

(a) Is Nadia correct?
You must give a reason for your answer.

.....

.....

.....

(1)

w is directly proportional to the square root of t.

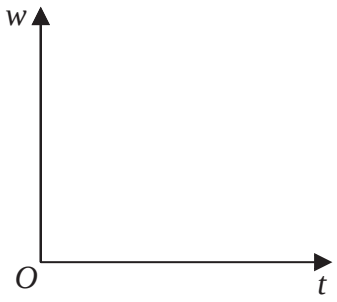
$w = 140$ when $t = 64$

(b) (i) Calculate the value of w when $t = 7.84$

$w =$ .....

(3)

(ii) On the axes below, sketch a graph to show the relationship between w and t.



(1)

(Total for Question 13 is 5 marks)

11 T is inversely proportional to w.

w is directly proportional to the cube root of d.

When $w = 6$, $T = 20$
When $w = 1$, $d = 8$

Find the value of d when $T = 48$

$d =$ .....

(Total for Question 11 is 5 marks)

11 $\dfrac{3^n \times 3^{20}}{3^8} = 3^{14}$

(a) Find the value of n.

$n =$ .....

(2)

(b) Write $\left(64m^{12}\right)^{\frac{2}{3}}$ in the form am^b where a and b are integers.

.....

(2)

(Total for Question 11 is 4 marks)