



**MALVERN**  
COLLEGE

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**SURNAME:**

**FIRST NAME:**

**PREP SCHOOL:**

**Malvern College Academic Scholarship Examinations 2024**

# **MATHEMATICS - Paper 1**

**Please read this information before the examination starts:**

- Paper 1: 60 mins
- Marks: 100
- Specimen
- No calculators are allowed for this paper
- Working must be shown to gain credit: No marks will be awarded for guessing or approaches that involve trial and improvement.



1. Find

a.  $2\frac{2}{5} \div 1\frac{1}{2}$

.....[3]

b. What is 30% of 70?

.....[3]

c. A bag of potatoes cost £1.49. How many bags could I buy with £10?

.....[2]

d. Calculate  $9^4 - 81^2$

.....[2]

2.

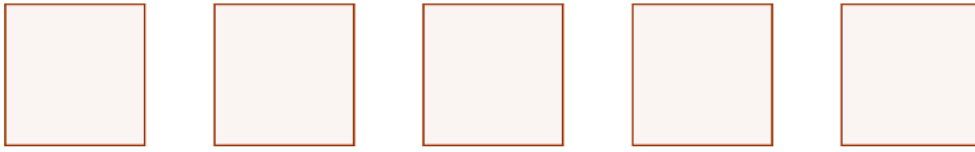
a. Write the number 0.0000007 in standard form.

.....[1]

b. Work out  $(4 \times 10^5) \div (8 \times 10^3)$ . Give your answer in standard form.

.....[2]

3.



Put a positive integer in each of the boxes above so that:

The mean of the five numbers is 6.

The median of the five numbers is 7.

The mode of the five numbers is 9.

[2]

4.

a. Factorise

i.  $12xy + 36y$

ii.  $15a^2b - 45ab^2$

.....[2]

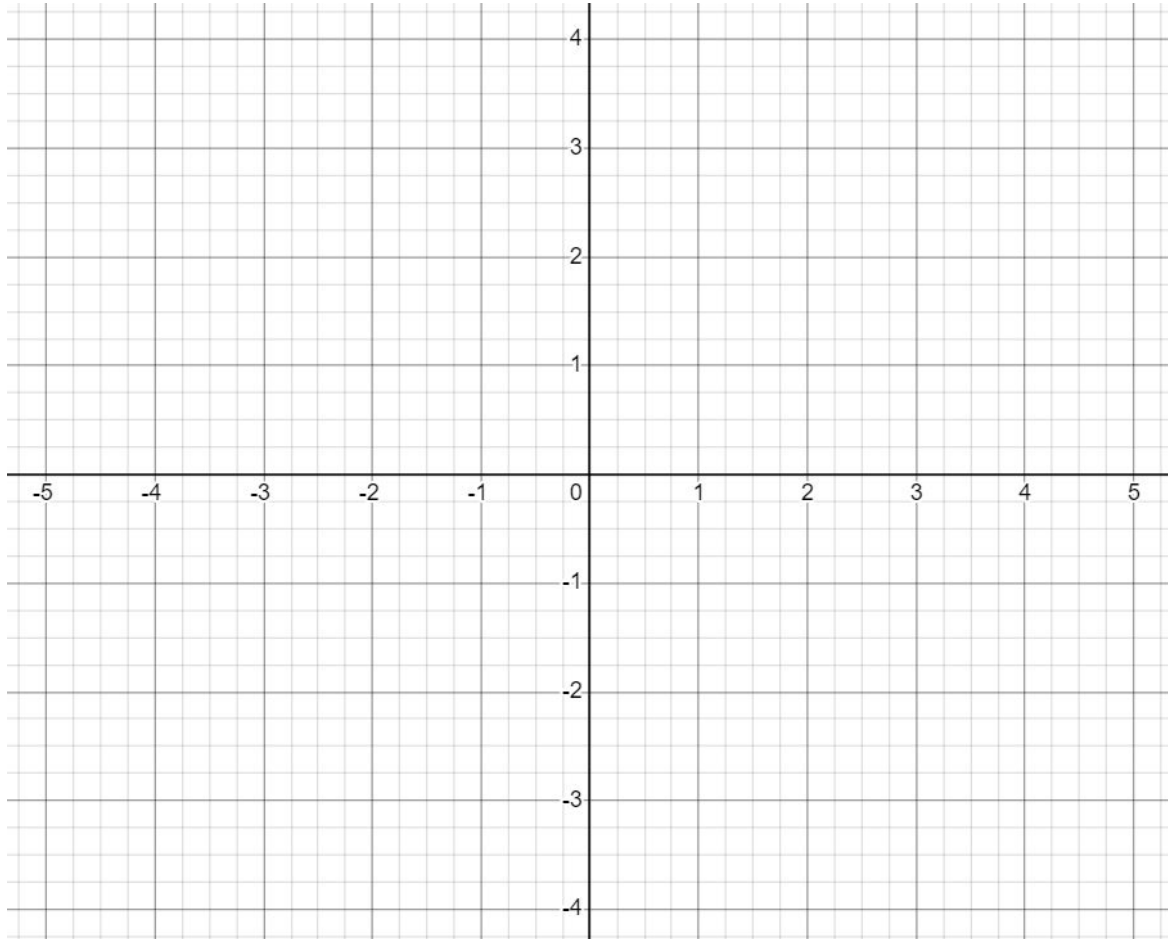
b. Find the value of  $73 \times 43 - 43 \times 16 + 43^2$

.....[2]

.....[3]

5. On the graph below, plot points to draw the curve  $y = 3 + x - x^2$   
Use the table to help you:

$x$	-3	-2	-1	0	1	2	3
$y$							



[2]

6. Simplify

a.  $3(x + 4) - 5(x - 3) + 7$

.....[2]

b.  $\frac{6x^2y}{2xy^3}$

.....[2]

7.

a. Solve

i.  $7x + 10 = 4x - 2$

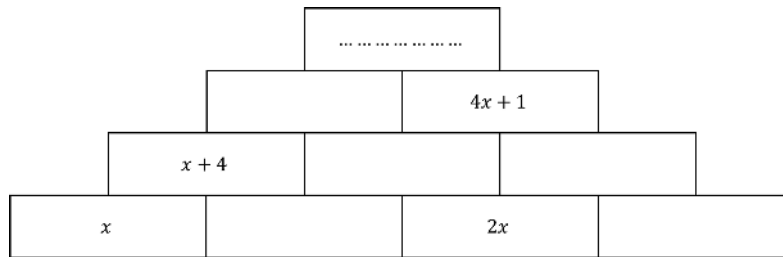
.....[2]

ii.  $\frac{30}{2x+1} = \frac{8}{x-3}$

.....[3]

b.

i. In the pyramid below, each brick is the sum of the two bricks on which it rests. Work out the expression missing from the top brick.



[2]

ii. If the value of the top brick is 2, what is the value of  $x$ ?

.....[1]

8. A bag contains 12 red counters and 6 blue counters.

a. If one counter is chosen at random, what is the probability that it is blue?

.....[1]

b. Some more blue counters are added to the bag, so that the probability of choosing a blue counter is now  $\frac{3}{7}$ . How many blue counters have been added to the bag?

.....[3]

9. Here is a trapezium  $ABCD$ :

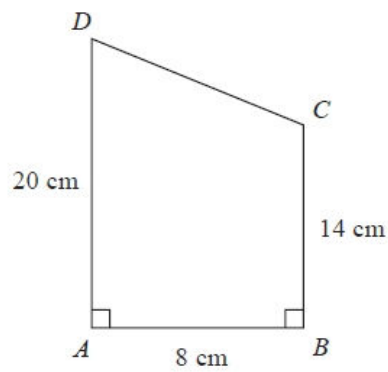


Diagram NOT accurately drawn

a. Calculate the length of  $CD$ .

.....[2]

b. The point  $E$  is the midpoint of  $BC$ . Calculate the length  $AE$ . Leave your answer as a square root.

.....[3]

10.

Complete the table below

Fraction (Simplest terms)	Decimal	Percentage
$\frac{3}{20}$		
	0.125	
		120%

[3]

11.

a. Here are some patterns made up of sticks.



Pattern number 1

Pattern number 2

Pattern number 3

i. In the space below, draw Pattern number 4

[1]

ii. Complete the table below to complete the arithmetic sequence.

Pattern number ( $n$ )	1	2	3	4	5
Number of dots ( $d$ )	1				

[1]

iii. Write down a formula for calculating the number of dots in the  $n$ th pattern.

.....[2]

iv. For which pattern number,  $n$ , are there 70 dots?

.....[2]



12.

- a. Simplify, giving your answer as a power of 2  
i.  $4^2 \times 16$

.....[2]

ii.  $2^{10x} \div 8^{2x-1}$

.....[3]

- b. Solve  $5^{x^3-6} = 25$

.....[3]

13.

$$A = 3^5 \times 5 \times 7^3$$
$$B = 2^3 \times 3 \times 7^4$$

- a. Find the Lowest Common Multiple (LCM) of A and B. Write your answer in index form.

.....[2]

$$C = 2^p \times 3^q \times 7^r$$

Given that:

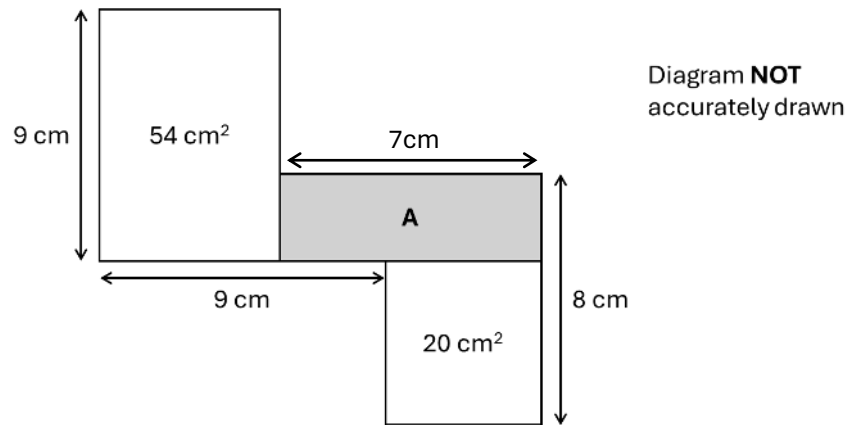
The HCF of B and C is  $2^3 \times 7$

The LCM of A and C is  $2^4 \times 3^5 \times 5 \times 7^3$

- b. Find the values of  $p$ ,  $q$  and  $r$ .

.....[3]

14. The diagram below shows three rectangles with some lengths and areas marked.



Calculate the area of the shaded rectangle **A**.

.....[3]

15.

- a. John Lewis is having a sale, and all items are 15% off.
  - i. A laptop is £200 at full price. What is the sale price?

.....[2]

- ii. A television is £153 in the sale. What is the full price?

.....[3]

16. In a school, all students study French or Spanish.

There are 168 students in Year 9.

The ratio of girls to boys in Year 9 is 4: 3.

$\frac{3}{4}$  of the boys in Year 9 study French.

a. How many girls are in Year 9?

.....[2]

b. How many boys in Year 9 study Spanish?

.....[2]

$x$  extra boys join Year 9 and the ratio of girls to boys is now 6: 5.

c. How many boys joined the school?

.....[2]

17. A football is made by sewing together **12 black pentagons** and **20 white hexagons**.  
There is a seam wherever two polygons meet along an edge.



How many seams are there on the football?

.....[3]

18.  $(2x + 23)$ ,  $(8x + 2)$  and  $(20x - 52)$  are three consecutive terms of an arithmetic sequence.  
Prove that the common difference of the sequence is 12

.....[4]

18. The diagram below shows a section of a regular polygon.

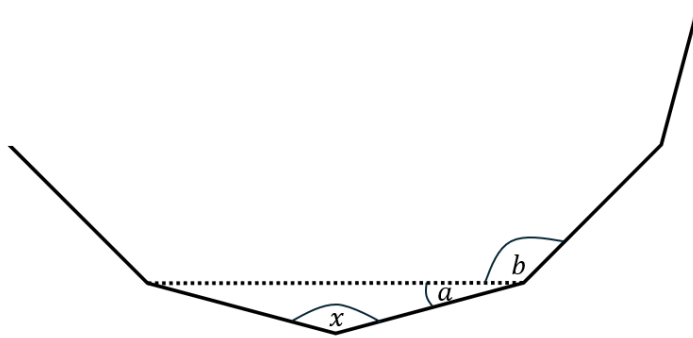


Diagram NOT accurately drawn

a. Find angle  $a$  in terms of  $x$ .

.....[2]

b. Show that  $b = \frac{3x-180}{2}$

.....[3]

c. Given that  $b = 126^\circ$ , calculate the number of sides of the polygon.

.....[3]

19. Fiza has 10 coins in a bag.  
There are three £1 coins and seven 50p coins.  
Fiza takes at random, 3 coins from the bag.

Work out the probability that she takes exactly £2.50

.....[4]





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