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MATHEMATICS

0580/22

Paper 2 (Extended)

October/November 2023

1 hour 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π , use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 70.
- The number of marks for each question or part question is shown in brackets [].

This document has **12** pages.

1 Write 24.07839

(a) correct to 2 decimal places

..... [1]

(b) correct to the nearest 10.

..... [1]

2 Write down the number that is 9 greater than -23 .

..... [1]

3 $v = u + at$

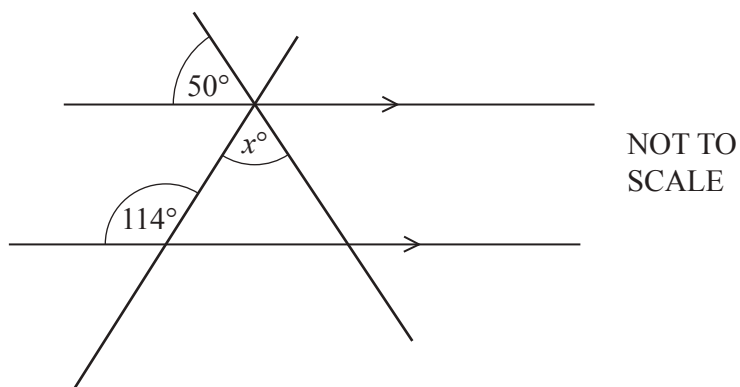
Find the value of v when $u = 30$, $a = -2$ and $t = 7$.

$v =$ [2]

4 Change 62 000 millimetres into kilometres.

..... km [1]

5



The diagram shows two intersecting straight lines crossing two parallel lines.

Find the value of x .

$x =$ [2]

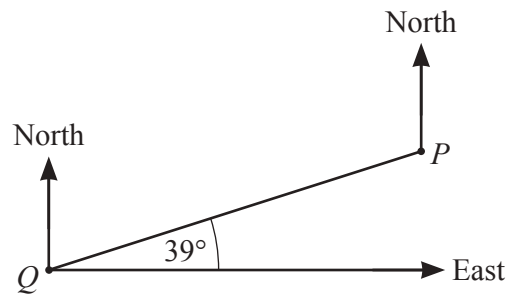
- 6 (a) Explain why 111 is not a prime number.

..... [1]

- (b) Find a prime number between 110 and 120.

..... [1]

7



NOT TO
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Find the bearing of Q from P .

..... [2]

- 8 **Without using a calculator**, work out $3\frac{1}{8} - 1\frac{3}{4}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

9 Write 90 as a product of its prime factors.

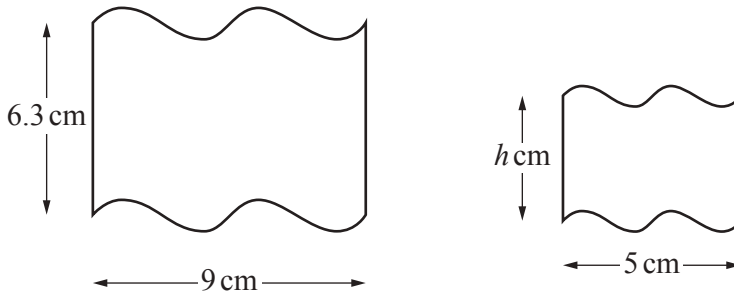
..... [2]

10 Expand and simplify.

$$2(t + w) + 3(w - t)$$

..... [2]

11



NOT TO SCALE

The two shapes are mathematically similar.

(a) Find the value of h .

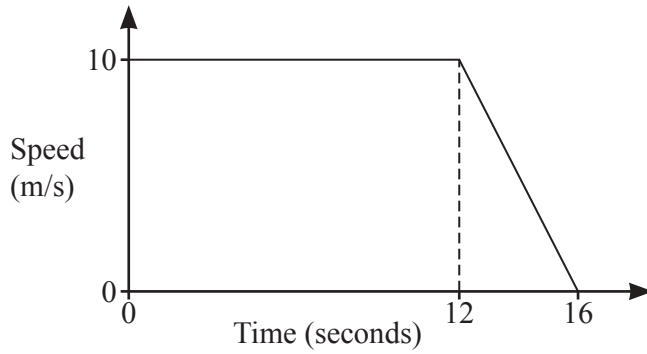
$h =$ [2]

(b) The area of the smaller shape is 16 cm^2 .

Calculate the area of the larger shape.

..... cm^2 [2]

12



NOT TO SCALE

The diagram shows a speed–time graph for 16 seconds of a car journey.

(a) Find the deceleration of the car in the final 4 seconds.

..... m/s² [1]

(b) Find the total distance travelled during the 16 seconds.

..... m [2]

13 (a) $3^{3p} \times 3^{2p} = 729$

Find the value of p .

$p =$ [2]

(b) Simplify.

$$(32x^{10})^{\frac{1}{5}}$$

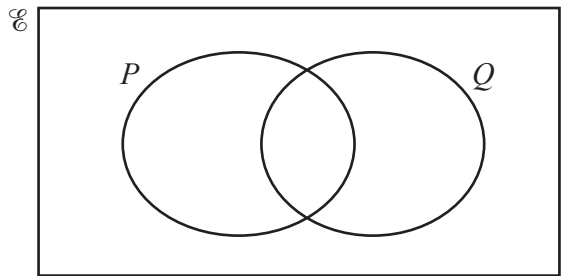
..... [2]

14 $y = 2w^2 - x$

Rearrange the formula to make w the subject.

$w = \dots\dots\dots$ [3]

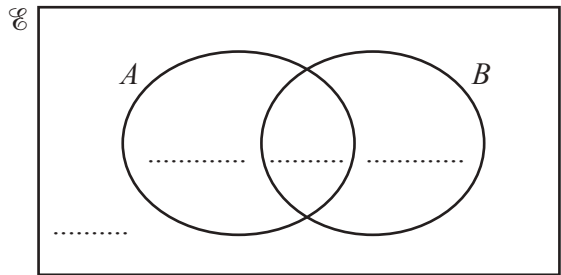
15 (a) On the Venn diagram, shade the region $P \cup Q'$.



[1]

(b) $n(E) = 20$ $n(A \cup B)' = 1$ $n(A) = 12$ $n(B) = 10$

Complete the Venn diagram.

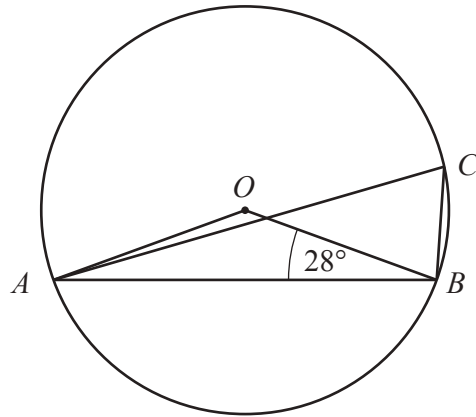


[2]

16 Find the lowest common multiple (LCM) of $12x^8$ and $8x^{12}$.

$\dots\dots\dots$ [2]

17 (a)

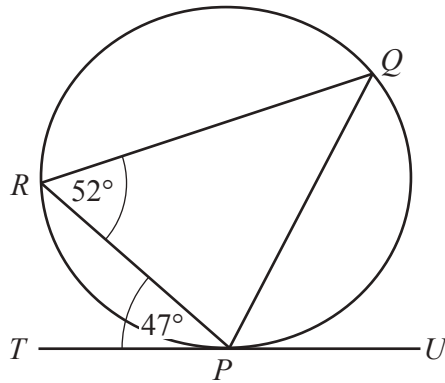
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A , B and C are points on a circle, centre O .
Angle $OBA = 28^\circ$.

Find angle ACB .

Angle $ACB = \dots\dots\dots$ [2]

(b)

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P , Q and R are points on a circle.
 TU is a tangent to the circle at P .
Angle $TPR = 47^\circ$ and angle $PRQ = 52^\circ$.

Find angle RPQ .

Angle $RPQ = \dots\dots\dots$ [2]

18 A solid cylinder has radius 5 cm and height 8 cm.

Calculate the total surface area of the cylinder.

..... cm^2 [4]

19 Find the n th term of each sequence.

(a) 11, 8, 5, 2, -1, ...

..... [2]

(b) 1, 5, 25, 125, 625, ...

..... [2]

- 20 The area of a rectangle is 55.2 cm^2 , correct to 1 decimal place.
The length of the rectangle is 9 cm, correct to the nearest cm.

Calculate the upper bound of the width of the rectangle.

..... cm [3]

- 21 The line $y = x + 1$ intersects the curve $y = x^2 + x - 3$ at two points.

Find the coordinates of the two points.

(..... ,)

(..... ,) [4]

- 22 x is inversely proportional to the square root of w .
When $w = 16$, $x = 3$.

Find x in terms of w .

$x = \dots\dots\dots$ [2]

- 23 Some students record their reaction times.
The table shows the results.

Reaction time (t seconds)	$0 < t \leq 6$	$6 < t \leq 10$
Frequency	18	16

On a histogram, the height of the block for the $0 < t \leq 6$ interval is 7.5 cm.

Calculate the height of the block for the $6 < t \leq 10$ interval.

$\dots\dots\dots$ cm [2]

24 Simplify.

$$\frac{ax - 2a - x + 2}{a^2 - 1}$$

..... [4]

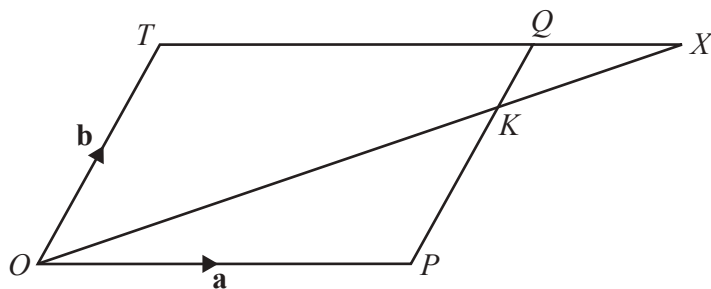
25 The derivative of $2ax^7 + 3x^k$ is $42x^6 + 15x^{k-1}$.

Find the value of a and the value of k .

$a =$

$k =$ [2]

Question 26 is printed on the next page.



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The diagram shows a parallelogram $OPQT$.

The position vector of P is \mathbf{a} and the position vector of T is \mathbf{b} .

K is on PQ so that $PK : KQ = 3 : 1$.

The lines OK and TQ are extended to meet at X .

Find the position vector of X in terms of \mathbf{a} and \mathbf{b} .

Give your answer in its simplest form.

..... [3]

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