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**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  $\pi$ , 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  $v = u + at$

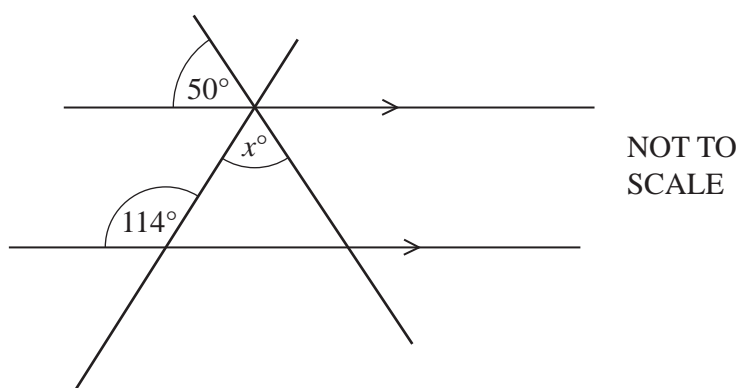
Find the value of  $v$  when  $u = 30$ ,  $a = -2$  and  $t = 7$ .

$v =$  ..... [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]

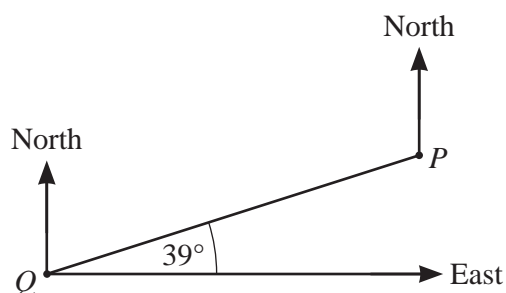
- 6 (a) Explain why 111 is not a prime number.

..... [1]

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

..... [1]

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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.

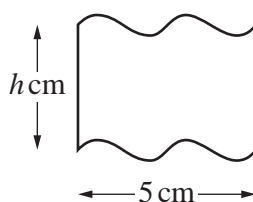
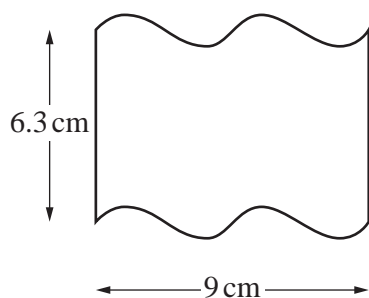
..... [2]

- 10 Expand and simplify.

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

..... [2]

11



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The two shapes are mathematically similar.

- (a) Find the value of  $h$ .

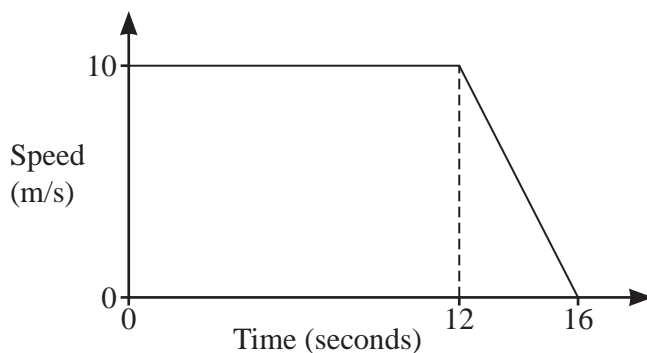
$h =$  ..... [2]

- (b) The area of the smaller shape is  $16 \text{ cm}^2$ .

Calculate the area of the larger shape.

.....  $\text{cm}^2$  [2]

12



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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.

.....  $\text{m/s}^2$  [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.

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

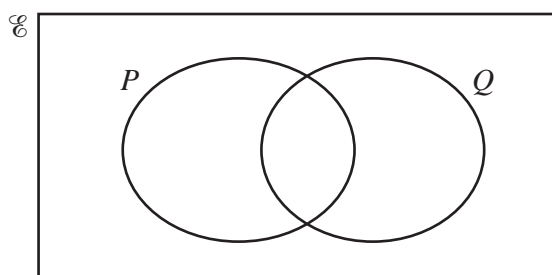
..... [2]

14  $y = 2w^2 - x$

Rearrange the formula to make  $w$  the subject.

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

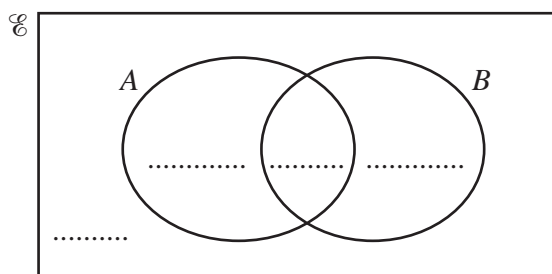
15 (a) On the Venn diagram, shade the region  $P \cup Q'$ .



[1]

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

Complete the Venn diagram.

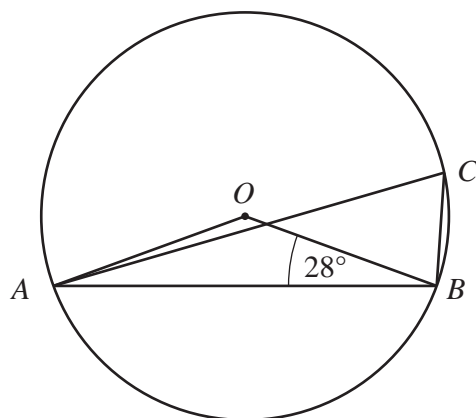


[2]

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

$\dots\dots\dots$  [2]

17 (a)

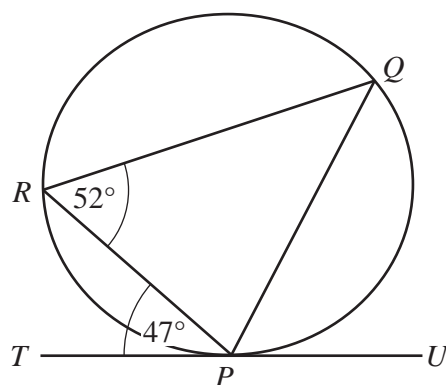

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$A$ ,  $B$  and  $C$  are points on a circle, centre  $O$ .  
Angle  $OBA = 28^\circ$ .

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.

.....  $\text{cm}^2$  [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  $55.2 \text{ cm}^2$ , 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  $42x^6 + 15x^{k-1}$ .

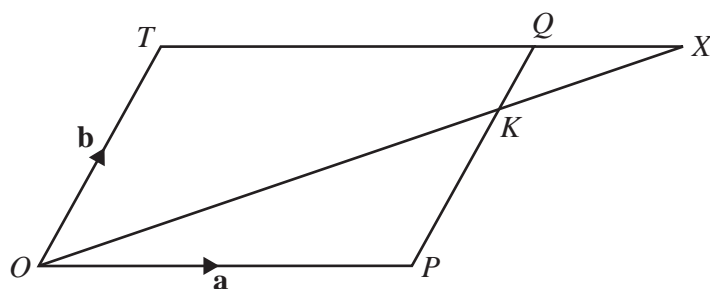
Find the value of  $a$  and the value of  $k$ .

$a =$  .....

$k =$  ..... [2]

**Question 26 is printed on the next page.**

26



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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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