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MATHEMATICS

0580/21

Paper 2 (Extended)

May/June 2022

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. Any blank pages are indicated.

- 1 Write down a prime number between 30 and 40.

..... [1]

- 2 Calculate $4^5 - 5^4$.

..... [1]

- 3 Jason starts a run at 10.05 am and finishes at 1.02 pm.

Work out the time Jason takes to complete the run.

..... h min [1]

- 4 Calculate $\frac{1-0.7}{0.45-0.38}$, giving your answer correct to 4 significant figures.

..... [2]

- 5 Kirsty changes \$380.80 into pounds (£) when £1 = \$1.19.

Calculate the amount Kirsty receives.

£ [2]

- 6 Write 180 as a product of its prime factors.

..... [2]

- 7 **Without using a calculator**, work out $\frac{3}{7} - \frac{2}{21}$.

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

..... [2]

8 $s = \frac{1}{2}at^2$

- (a) Work out the value of s when $a = 0.9$ and $t = 4$.

$s =$ [1]

- (b) Rearrange the formula to find t in terms of s and a .

$t =$ [2]

- 9 Factorise completely.

$$14xy - 7y^2$$

..... [2]

10 22, 17, 12, 7, 2, ...

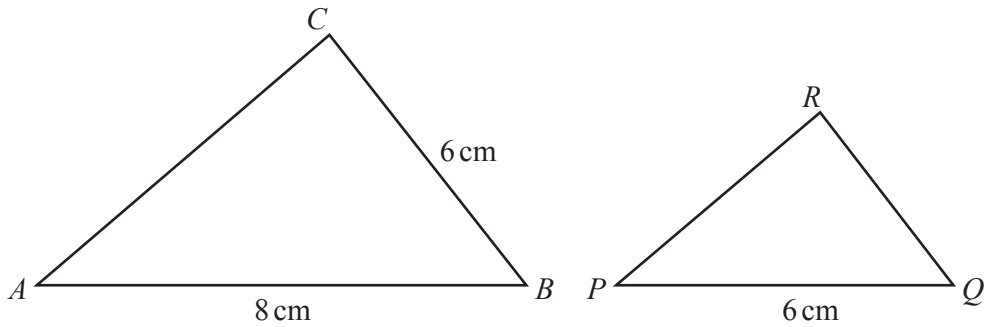
(a) Find the next term of the sequence.

..... [1]

(b) Find the n th term of the sequence.

..... [2]

11



NOT TO SCALE

Triangle ABC is mathematically similar to triangle PQR .

(a) Calculate QR .

$QR =$ cm [2]

(b) The two triangles are the cross-sections of two mathematically similar prisms.
The volume of the larger prism is 320 cm^3 .

Calculate the volume of the smaller prism.

..... cm^3 [2]

- 12 The interior angles of a pentagon are in the ratio $4 : 5 : 5 : 7 : 9$.

Find the size of the largest angle.

..... [3]

- 13 Work out $2 \times 10^{100} - 2 \times 10^{98}$, giving your answer in standard form.

..... [2]

- 14 A train passes through a station at a speed of 108 km/h.
The length of the station is 120 m.
The train takes 7 seconds to completely pass through the station.

Work out the length of the train.

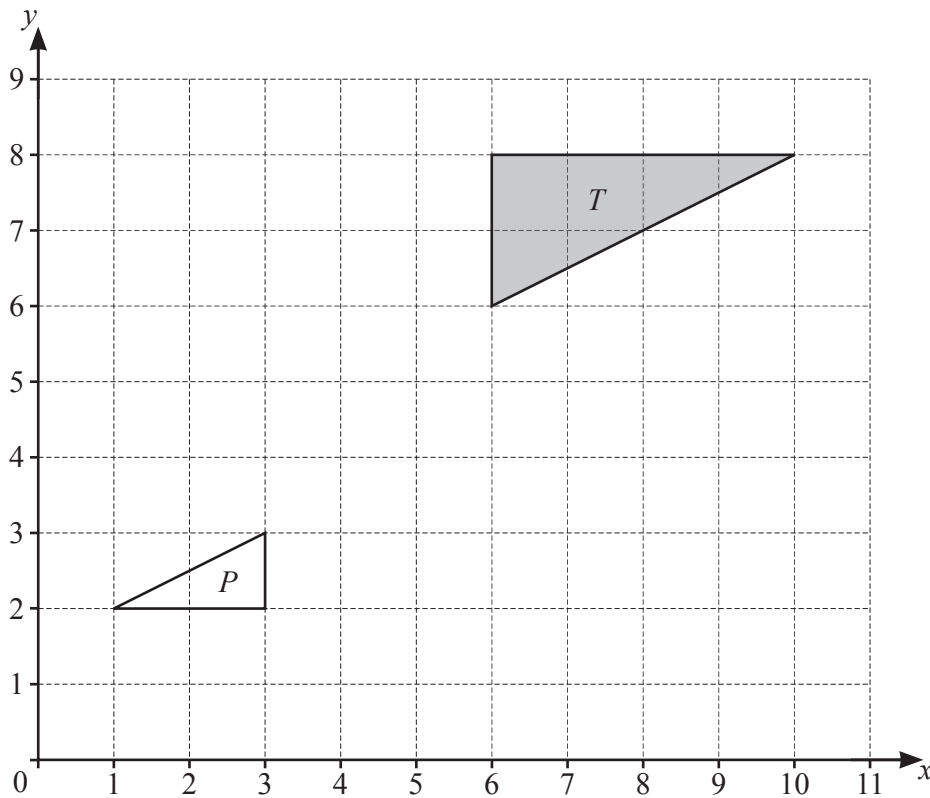
..... m [3]

15 $4^x = \frac{1}{64}$

Find the value of x .

$x = \dots\dots\dots$ [1]

16



Describe fully the **single** transformation that maps triangle T onto triangle P .

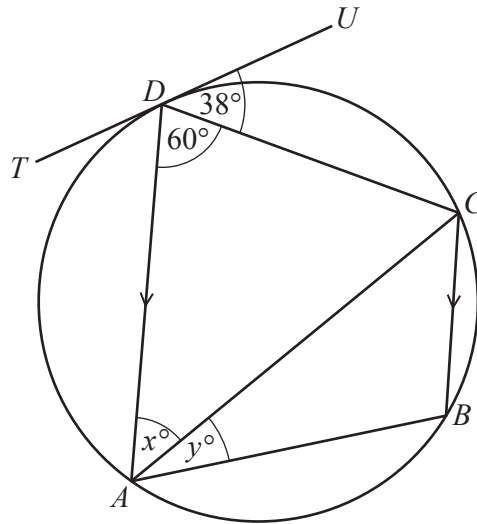
.....
 [3]

17 Find the radius of a hemisphere of volume 80 cm^3 .

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

18



NOT TO SCALE

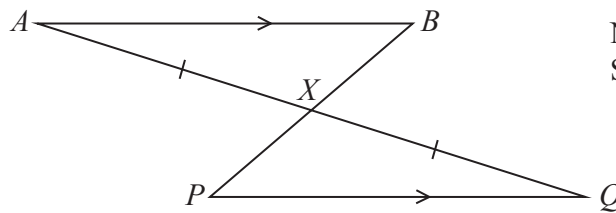
A, B, C and D are points on a circle.
 TU is a tangent to the circle at D .
 DA is parallel to CB .

Find the value of x and the value of y .

$x = \dots\dots\dots$

$y = \dots\dots\dots$ [3]

19



NOT TO SCALE

In the diagram, AB is parallel to PQ .
 AQ and PB intersect at X with $AX = XQ$.

Complete the following statements.

In triangles ABX and QPX ,

$AX = XQ$ is given information.

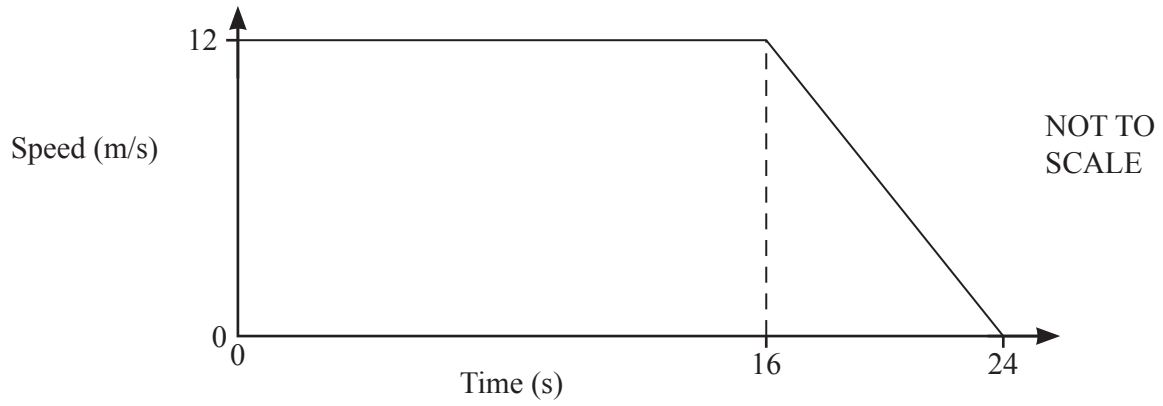
Angle $BAX =$ Angle because

Angle $AXB =$ Angle because

Triangle ABX is congruent to triangle QPX because of the congruency criterion

$PX = \dots\dots\dots$ because the triangles are congruent. [4]

20



The diagram shows the speed–time graph for 24 seconds of a car journey.

Calculate

(a) the deceleration of the car in the final 8 seconds,

..... m/s² [1]

(b) the total distance travelled during the 24 seconds.

..... m [2]

21 Factorise completely.

$$1 - q - a + aq$$

..... [2]

22 Simplify fully $(216y^{216})^{\frac{2}{3}}$.

..... [2]

23 $x^2 + 8x + 10 = (x + p)^2 + q$

(a) Find the value of p and the value of q .

$p =$

$q =$ [2]

(b) Solve.

$$x^2 + 8x + 10 = 30$$

$x =$ or $x =$ [2]

24 A cuboid measures 24 cm by 12 cm by 8 cm.

Calculate the length of a diagonal of the cuboid.

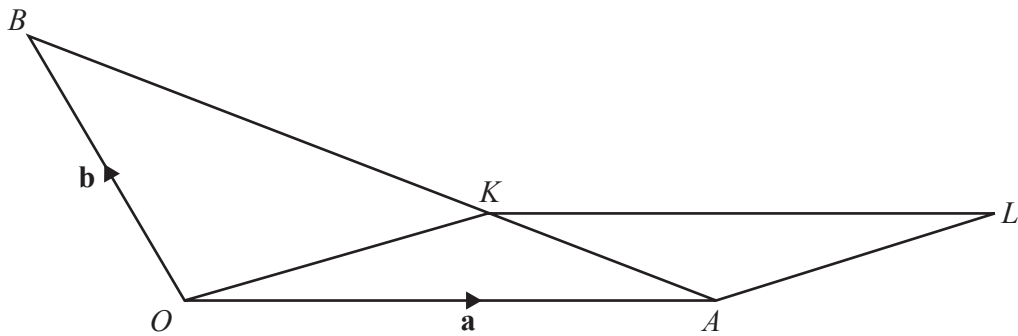
..... cm [3]

- 25 w is proportional to the square root of y .
 y is inversely proportional to x .
 When $x = 4$, $y = 16$ and $w = 8$.

Find w in terms of x .

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

26



NOT TO SCALE

The diagram shows a triangle OAB and a parallelogram $OALK$.
 The position vector of A is \mathbf{a} and the position vector of B is \mathbf{b} .
 K is a point on AB so that $AK : KB = 1 : 2$.

Find the position vector of L , in terms of \mathbf{a} and \mathbf{b} .
 Give your answer in its simplest form.

$\dots\dots\dots$ [4]

27 The line $y = x + 1$ intersects the graph of $y = x^2 - 3x - 11$ at the points A and B .

Find the coordinates of A and the coordinates of B .
You must show all your working.

A (..... ,)

B (..... ,) [4]

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