



# Cambridge IGCSE™

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**MATHEMATICS (US)**

**0444/21**

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, center 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.
- Calculators must **not** be used in this paper.
- You may use tracing paper.
- You must show all necessary work clearly.
- All answers should be given in their simplest form.

## INFORMATION

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

This document has **12** pages.

## Formula List

For the equation

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Lateral surface area,  $A$ , of cylinder of radius  $r$ , height  $h$ .

$$A = 2\pi rh$$

Lateral surface area,  $A$ , of cone of radius  $r$ , sloping edge  $l$ .

$$A = \pi rl$$

Surface area,  $A$ , of sphere of radius  $r$ :

$$A = 4\pi r^2$$

Volume,  $V$ , of pyramid, base area  $A$ , height  $h$ .

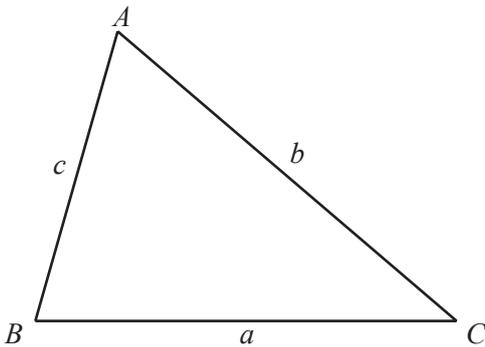
$$V = \frac{1}{3}Ah$$

Volume,  $V$ , of cone of radius  $r$ , height  $h$ .

$$V = \frac{1}{3}\pi r^2 h$$

Volume,  $V$ , of sphere of radius  $r$ .

$$V = \frac{4}{3}\pi r^3$$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{Area} = \frac{1}{2}bc \sin A$$

1 Write down a prime number between 30 and 40.

..... [1]

2 Work out  $3^4 - 2^3$ .

..... [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 Kirsty changes \$384 into pounds (£) when  $\text{£}1 = \$1.20$ .

Work out the amount Kirsty receives.

£ ..... [2]

5 Write 180 as a product of its prime factors.

..... [2]

6 Work out  $\frac{3}{7} - \frac{2}{21}$ .

Give your answer as a fraction in its simplest form.

..... [2]

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

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

$s =$  ..... [1]

(b) Solve for  $t$ .

$t =$  ..... [2]

8 Factor completely.

$$14xy - 7y^2$$

..... [2]

9                    22,        17,        12,        7,        2,        ...

(a) Find the next term of the sequence.

..... [1]

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

..... [2]

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

Find the size of the largest angle.

..... [3]

11 Work out  $2 \times 10^{100} - 2 \times 10^{98}$ , giving your answer in scientific notation.

..... [2]

- 12 A train passes through a station at a speed of 72 km/h.  
The length of the station is 100 m.  
The train takes 7 seconds to completely pass through the station.

Work out the length of the train.

..... m [3]

- 13 Simplify  $\sqrt{250} + \sqrt{810}$ .

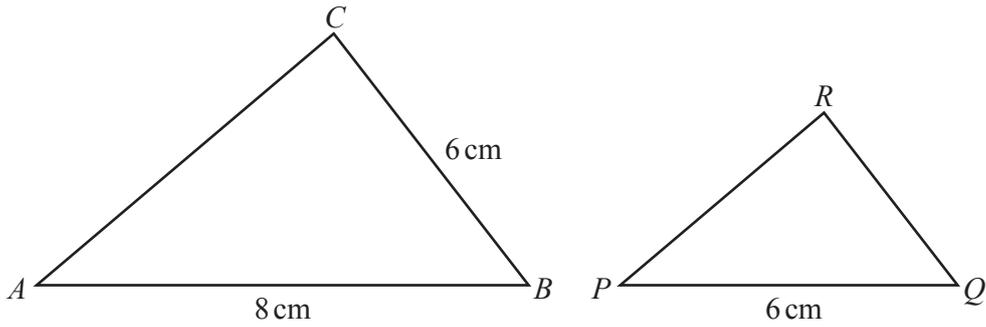
..... [2]

- 14  $4^x = \frac{1}{64}$

Find the value of  $x$ .

$x =$  ..... [1]

15



NOT TO SCALE

Triangle  $ABC$  is mathematically similar to triangle  $PQR$ .

(a) Work out  $QR$ .

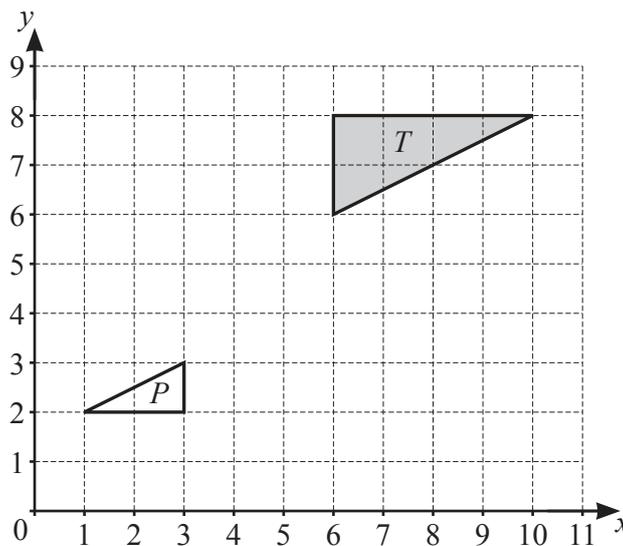
$QR = \dots\dots\dots$  cm [2]

(b) The two triangles are the cross-sections of two mathematically similar prisms. The surface area of the larger prism is  $640 \text{ cm}^2$ .

Work out the surface area of the smaller prism.

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

16



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

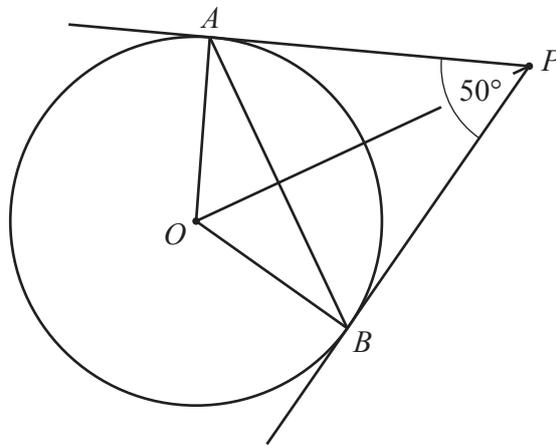
.....  
 .....

[3]

17 Find the radius of a sphere of volume  $\frac{9}{2}\pi \text{ cm}^3$ .

..... cm [3]

18



NOT TO SCALE

The diagram shows a circle, center  $O$ .  
 $PA$  and  $PB$  are tangents to the circle at the points  $A$  and  $B$ .  
 Angle  $APB = 50^\circ$ .

(a) Write down the mathematical name for triangle  $PAB$ .

..... [1]

(b) Work out.

(i) Angle  $PAB$

Angle  $PAB =$  ..... [1]

(ii) Angle  $OAB$

Angle  $OAB =$  ..... [1]

(c) Write down a pair of triangles that are congruent.

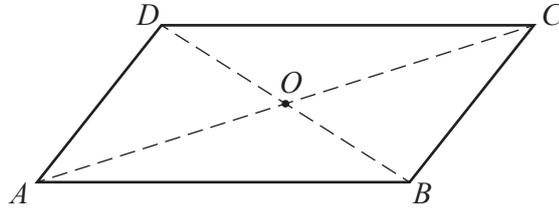
..... and ..... [1]

- 19 (a) A vertex of a square-based pyramid is vertically above the center of the base.

Write down the number of planes of symmetry for this pyramid.

..... [1]

- (b)



NOT TO SCALE

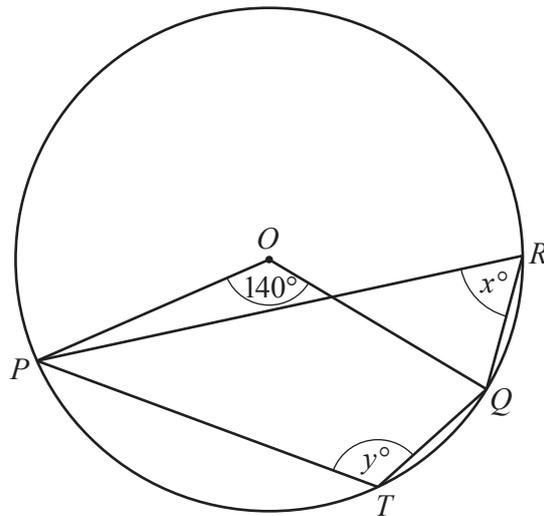
$ABCD$  is a parallelogram and its diagonals meet at  $O$ .

Describe fully the **single** transformation that maps the parallelogram onto itself but with the points  $A, B, C$  and  $D$  in different positions.

.....

..... [2]

20



NOT TO SCALE

$P, T, Q$  and  $R$  are points on a circle, center  $O$ .  
Angle  $POQ = 140^\circ$ .

- (a) Work out the value of  $x$  and give a geometrical reason for your answer.

$x =$  ..... because .....

..... [2]

- (b) Work out the value of  $y$ .

$y =$  ..... [1]

21 Solve.

$$\frac{t}{3t-2} = \frac{3}{5}$$

$$t = \dots\dots\dots [3]$$

22 Solve.

$$2\sqrt{x} + 1 = 7 - \sqrt{x}$$

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

23 Factor completely.

$$1 - q - a + aq$$

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

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

..... [2]

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

(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]

26  $w$  varies directly as the square root of  $y$ .

$y$  varies inversely as  $x$ .

When  $x = 4$ ,  $y = 16$  and  $w = 8$ .

Find  $w$  in terms of  $x$ .

$w =$  ..... [3]

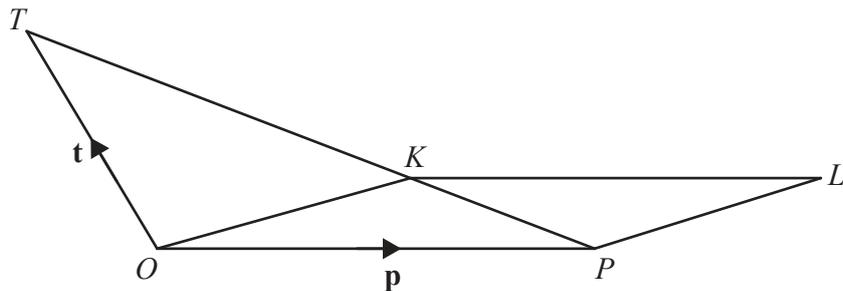
Questions 27 and 28 are printed on the next page.

27 Simplify.

$$\frac{x-3}{x^2-2x-3}$$

..... [2]

28



NOT TO SCALE

The diagram shows a triangle  $OPT$  and a parallelogram  $OPLK$ .  
 The position vector of  $P$  is  $\mathbf{p}$  and the position vector of  $T$  is  $\mathbf{t}$ .  
 $K$  is on  $PT$  so that  $PK : KT = 1 : 2$ .

Find in terms of  $\mathbf{p}$  and  $\mathbf{t}$ ,

(a)  $\overrightarrow{PK}$ ,

$\overrightarrow{PK} = \dots\dots\dots$  [2]

(b) the position vector of  $L$ , giving your answer in its simplest form.

..... [2]

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