Cambridge IGCSE™

CANDIDATE NAME

CENTER NUMBER

CANDIDATE NUMBER

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.

[Turn over

Formula List

For the equation $ax^2 + bx + c = 0$ $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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. $V = \frac{4}{3}\pi r^3$
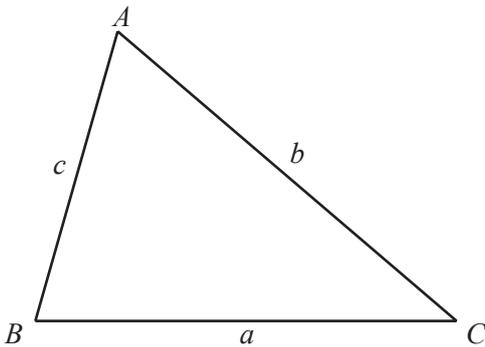
$\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

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

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 £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 nth 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
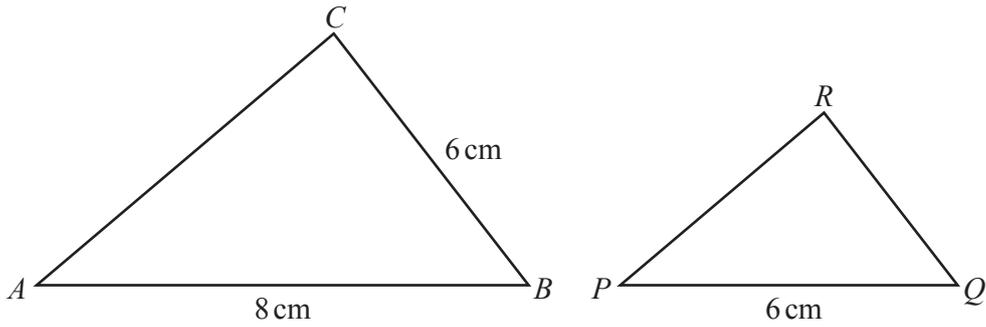
Triangle *ABC* is mathematically similar to triangle *PQR*.

(a) Work out *QR*.

QR = ... cm [2]

(b) The two triangles are the cross-sections of two mathematically similar prisms.
The surface area of the larger prism is 640 cm².

Work out the surface area of the smaller prism.

.... cm² [2]

16
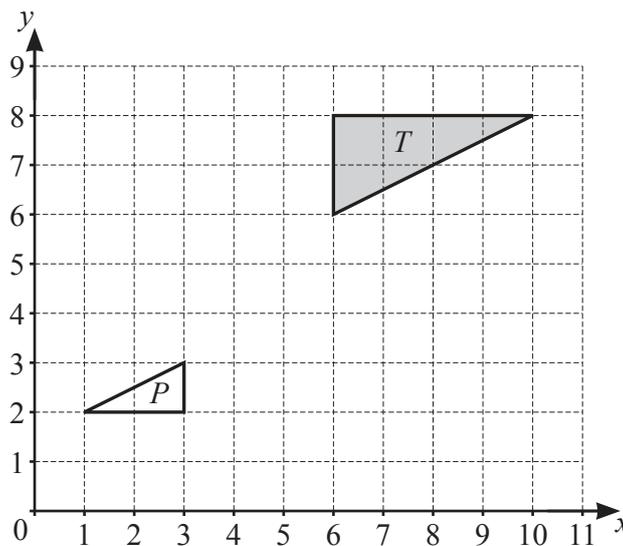
Describe fully the **single** transformation that maps triangle *T* onto triangle *P*.

....

.... [3]

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

.... cm [3]

18

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

(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)
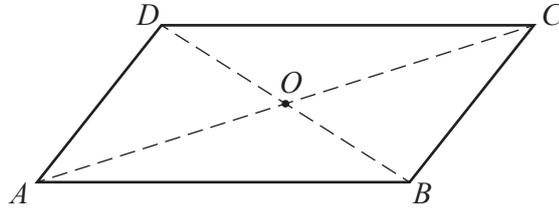
NOT TO
SCALE

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
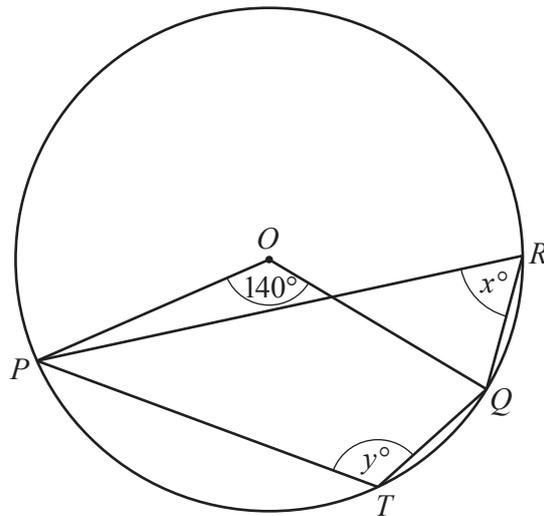
NOT TO
SCALE

P, *T*, *Q* and *R* are points on a circle, center *O*.
Angle *POQ* = 140°.

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

$t =$ .... [3]

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

$x =$ .... [2]

23 Factor completely.
$$1 - q - a + aq$$

.... [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.

 [Turn over

27 Simplify.

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

.... [2]

28
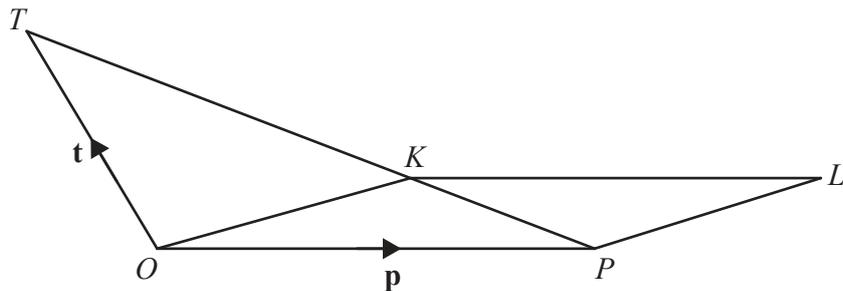
NOT TO SCALE

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

Find in terms of **p** and **t**,

(a) $\overrightarrow{PK}$,

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

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

.... [2]