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MATHEMATICS (US)

0444/21

Paper 2 (Extended)

May/June 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, 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 .

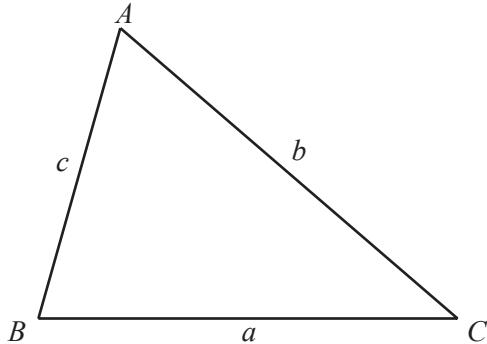
$$V = \frac{1}{3}Ah$$

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

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

Volume, V , of sphere of radius r .

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

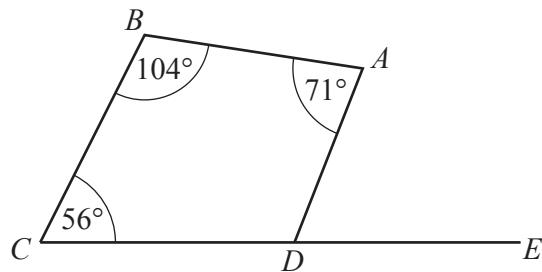


$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

1

NOT TO
SCALE*CDE* is a straight line.Find angle ADE .

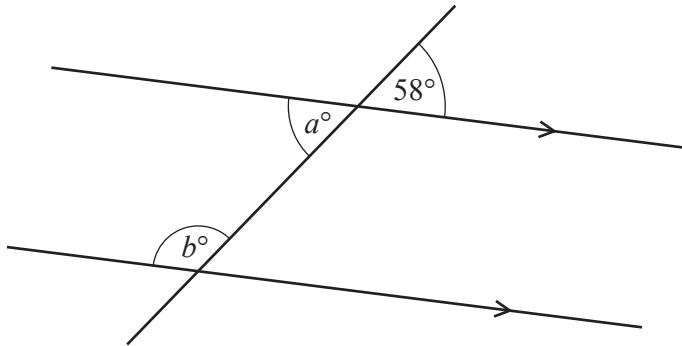
..... [2]

2 A train journey starts at 2143.
It takes 8 hours and 32 minutes.

Find the time the journey finishes.

..... [1]

3

NOT TO
SCALE

The diagram shows a straight line intersecting two parallel lines.

Find the value of a and the value of b , giving geometric reasons for your answers. $a = \dots$ because $b = \dots$ because [4]

4 By writing each number in the calculation correct to 1 significant figure, work out an estimate for the value of

$$\frac{6.7 \times 2.1}{18 - 5.9}.$$

You must show all your work.

..... [2]

5 Eric has four colors of paint.

The table shows the probability that he uses each color.

Colors	Red	Blue	Green	Yellow
Probability	0.3	0.4	0.1	x

Find the value of x .

$x =$ [2]

6 Work out the volume of a sphere with diameter 6 cm.

Give your answer in terms of π .

..... cm^3 [2]

7 The scale of a map is 1 : 250 000.

On a map, the length of an island is 6 cm.

Work out the actual length of the island, giving your answer in kilometers.

..... km [2]

8 The first four terms of two sequences are given.

Find the n th term of each sequence.

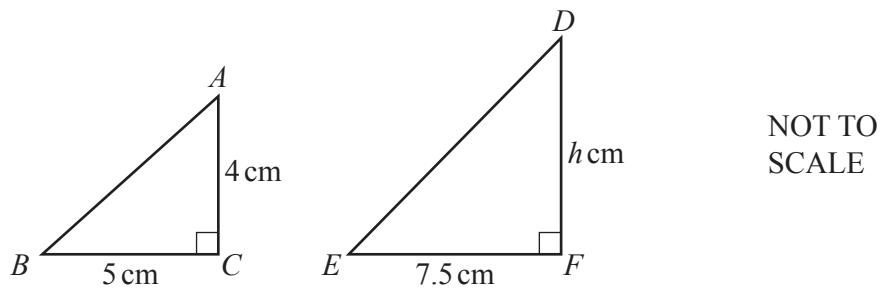
(a) 2 7 12 17

..... [2]

(b) 2 10 50 250

..... [2]

9



Triangle ABC is similar to triangle DEF .

Work out the value of h .

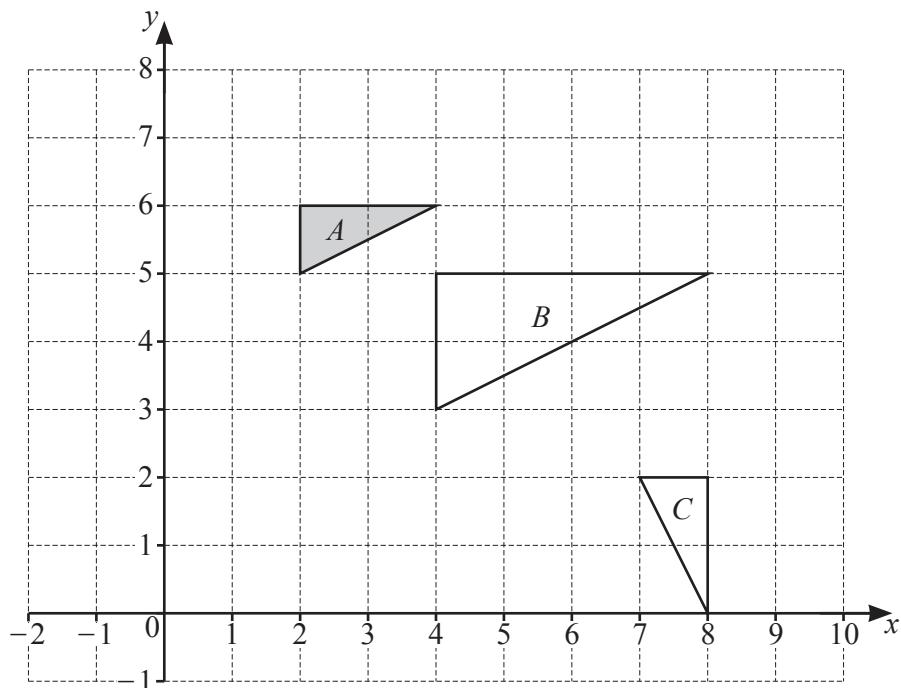
$h =$ [2]

10 Work out $2\frac{1}{7} \div \frac{5}{9}$.

Give your answer as a mixed number in its simplest form.

..... [3]

11



(a) Describe the **single** transformation that maps

(i) triangle A onto triangle B

..... [3]

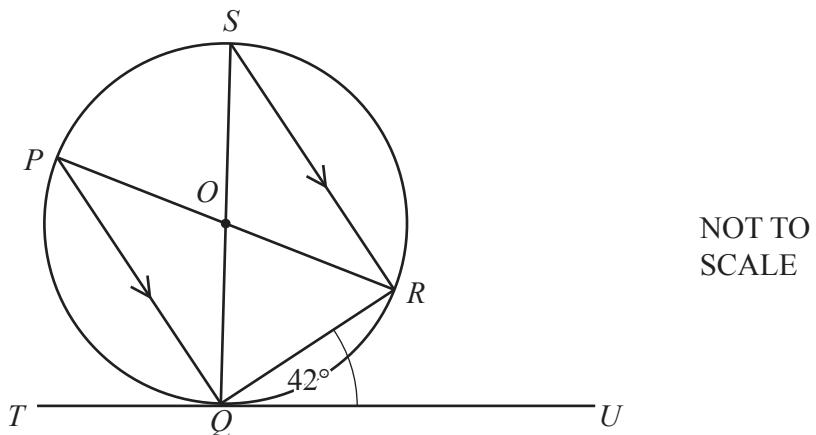
(ii) triangle A onto triangle C .

..... [3]

(b) Stretch triangle A with factor 2 and y -axis invariant.

[2]

12



P, Q, R , and S are points on the circle, and TQU is a tangent to the circle at Q .
 PR and SQ intersect at the center O and PQ is parallel to SR .
Angle $RQU = 42^\circ$.

Find

(a) angle QSR

Angle QSR = [1]

(b) angle PQS

Angle PQS = [1]

(c) angle POS .

Angle POS = [1]

13 Anya invests \$4000 in an account that pays simple interest at a rate of $r\%$ per year. At the end of 6 years, the account has earned \$480 in interest.

Find the value of r .

$$r = \dots \quad [2]$$

14 y varies as the square of $(x + 3)$.
When $x = 2$, $y = 50$.

Find y when $x = 1$.

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

15 A bag contains 5 green buttons, 2 blue buttons and 6 white buttons.
Maya takes two buttons at random from the bag, without replacement.

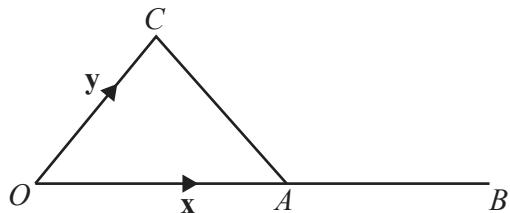
Work out the probability that one button is green and the other button is not green.

$$\dots \quad [3]$$

16 (a) Find the magnitude of the vector $\begin{pmatrix} -6 \\ 8 \end{pmatrix}$.

..... [2]

(b)



NOT TO
SCALE

The diagram shows a triangle OAC .

A is the midpoint of OB .

$\overrightarrow{OA} = \mathbf{x}$ and $\overrightarrow{OC} = \mathbf{y}$.

Find \overrightarrow{CB} in terms of \mathbf{x} and \mathbf{y} .

$\overrightarrow{CB} =$ [1]

17 Simplify $(81x^{12})^{\frac{3}{4}}$.

..... [2]

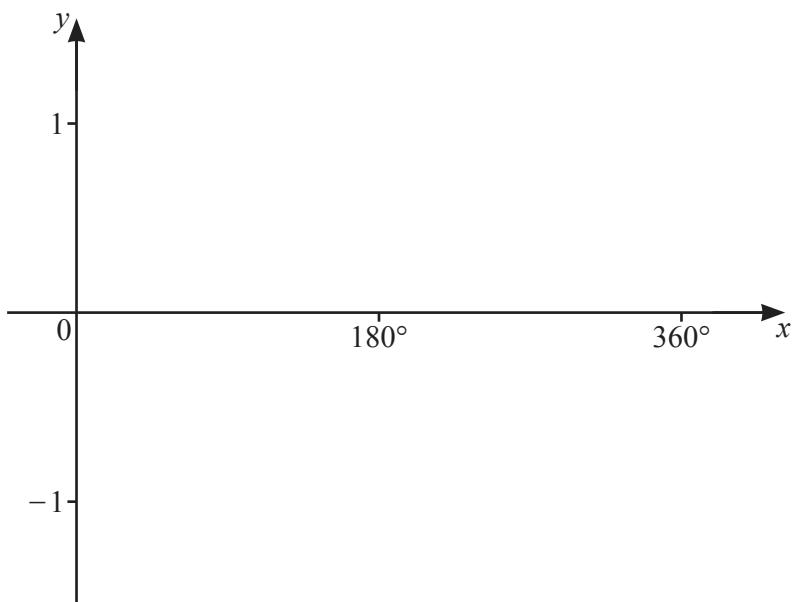
18 (a) Simplify $(3\sqrt{2})^2$.

..... [1]

(b) Write $(\sqrt{5} - \sqrt{3})^2$ in the form $a + b\sqrt{15}$.

..... [2]

19 (a) On the diagram, sketch the graph of $y = \cos x$ for $0^\circ \leq x \leq 360^\circ$.



[2]

(b) Solve the equation $2\cos x + 1 = 0$ for $0^\circ \leq x \leq 360^\circ$.

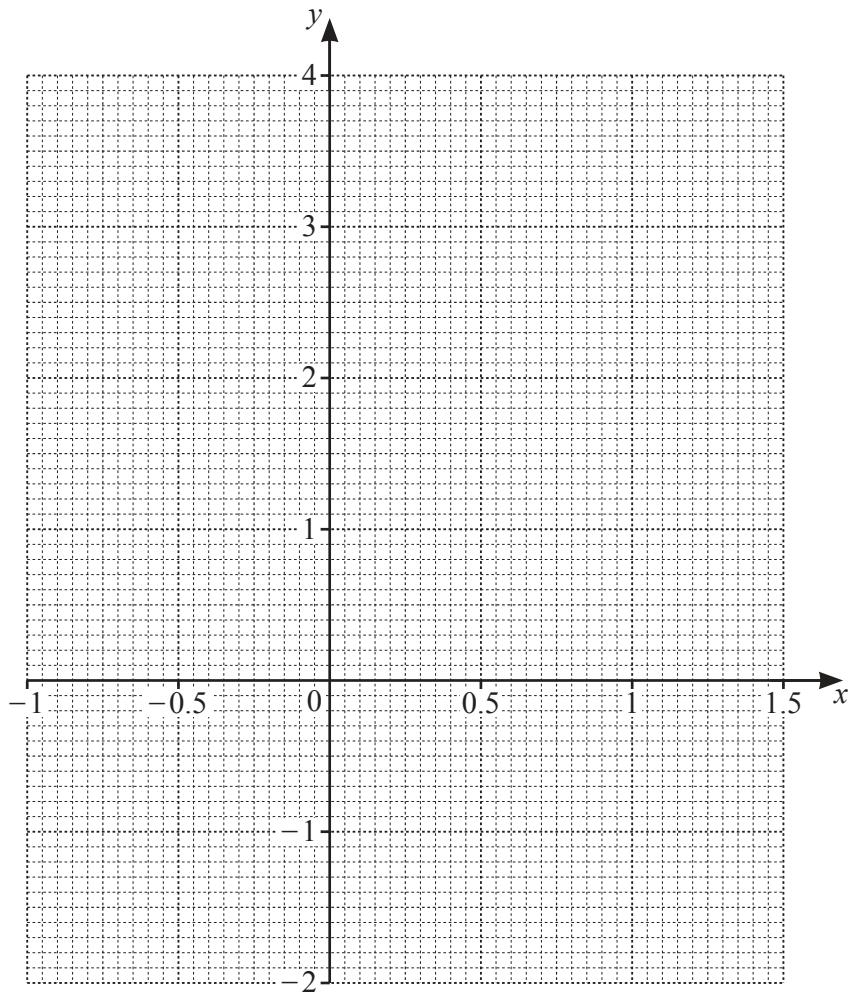
$x = \dots$ or $x = \dots$ [3]

20 The table shows some values for $y = 3x^2 - 2x - 1$.

x	-1	-0.5	0	0.5	1	1.5
y		0.75	-1	-1.25	0	2.75

(a) Complete the table. [1]

(b) On the grid, draw the graph of $y = 3x^2 - 2x - 1$ for $-1 \leq x \leq 1.5$.



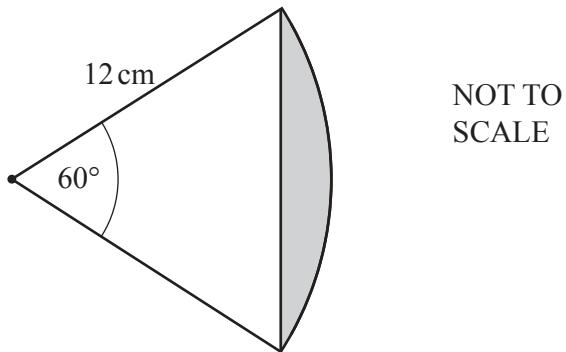
[3]

(c) By drawing a suitable straight line, solve the equation $3x^2 - 4x - 2 = 0$ for $-1 \leq x \leq 1.5$.

$x = \dots \dots \dots$ [3]

Questions 21 and 22 are printed on the next page.

21



The diagram shows a sector of a circle with radius 12 cm.

Find the area of the shaded segment.

Give your answer in the form $p\pi - q\sqrt{3}$, where p and q are integers.

..... [3]

22 Simplify $\frac{2x^2 - 11x - 6}{4x^2 + 2x}$.

..... [4]

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