



CANDIDATE  
NAME

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CENTER  
NUMBER

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CANDIDATE  
NUMBER

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## 0444/21

May/June 2023

**1 hour 30 minutes**

You will need: Geometrical instruments

- 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.

- 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  $h$ .

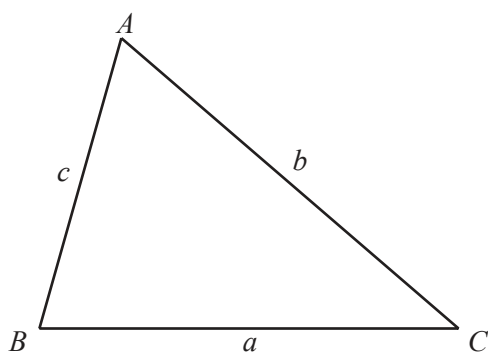
$$V = \frac{1}{3}Ah$$

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

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

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

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

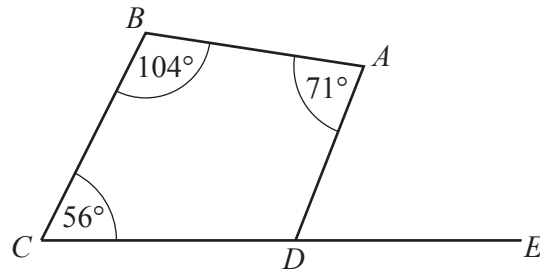


$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

1

NOT TO  
SCALE

$CDE$  is a straight line.

Find angle  $ADE$ .

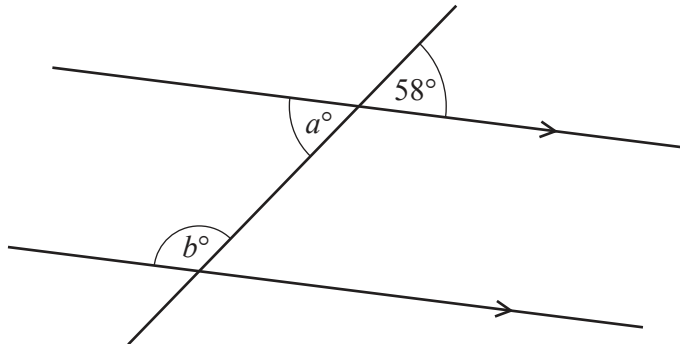
..... [2]

- 2 A train journey starts at 21 43.  
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.

$a =$  ..... because .....

$b =$  ..... because ..... [4]

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

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

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  $\pi$ .

.....  $\text{cm}^3$  [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.

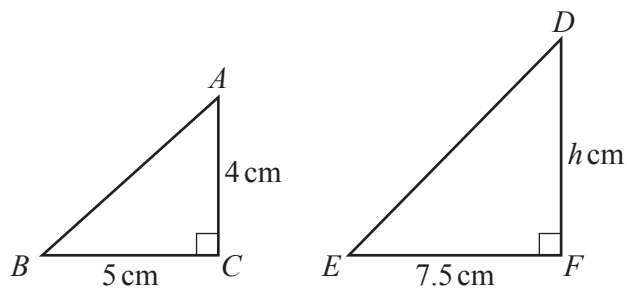
(a) 2      7      12      17

..... [2]

(b) 2      10      50      250

..... [2]

9



NOT TO  
SCALE

Triangle  $ABC$  is similar to triangle  $DEF$ .

Work out the value of  $h$ .

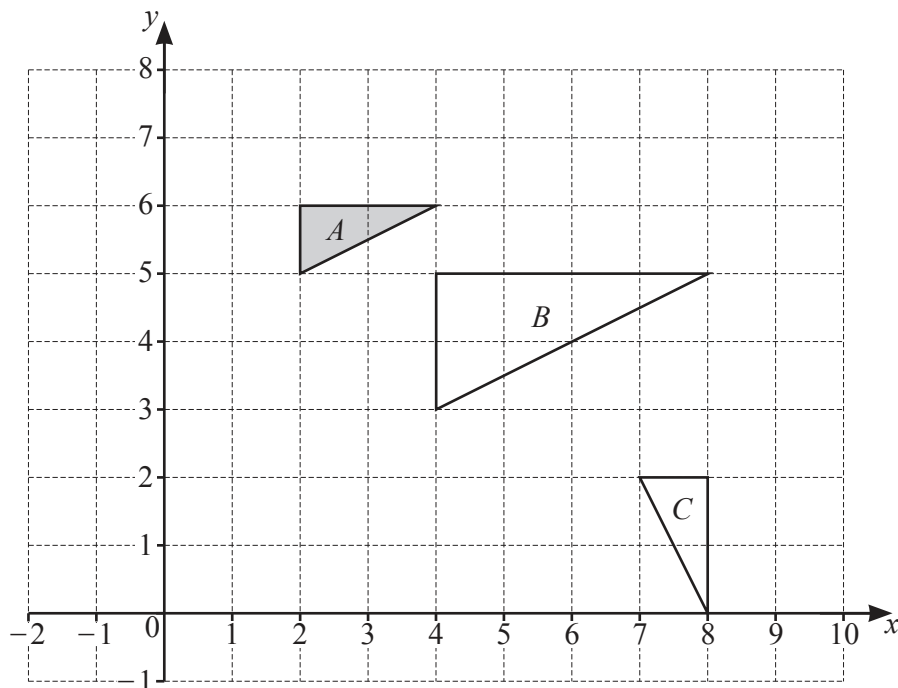
$h =$  ..... [2]

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]

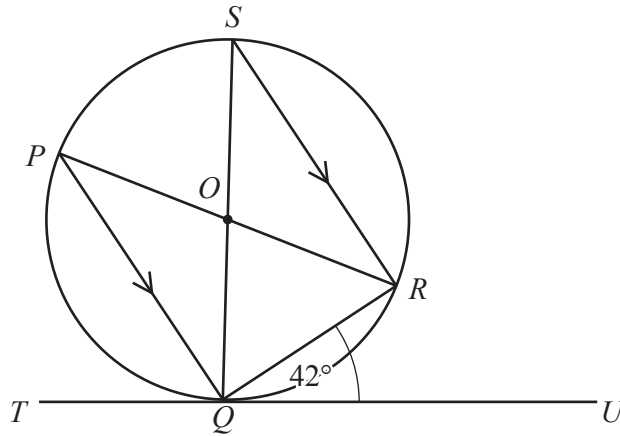
(ii) triangle *A* onto triangle *C*.

.....  
 ..... [3]

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

[2]

12

NOT TO  
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$P$ ,  $Q$ ,  $R$ , 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  $QSR = \dots\dots\dots$  [1](b) angle  $PQS$ Angle  $PQS = \dots\dots\dots$  [1](c) angle  $POS$ .Angle  $POS = \dots\dots\dots$  [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  $r$ .

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

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

Find  $y$  when  $x = 1$ .

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

- 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.

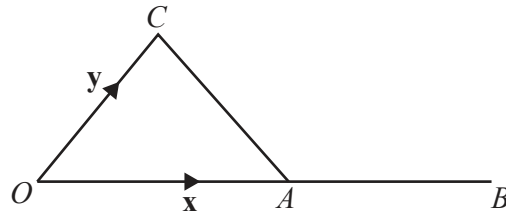
$$\dots\dots\dots [3]$$



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

..... [2]

(b)



NOT TO  
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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]

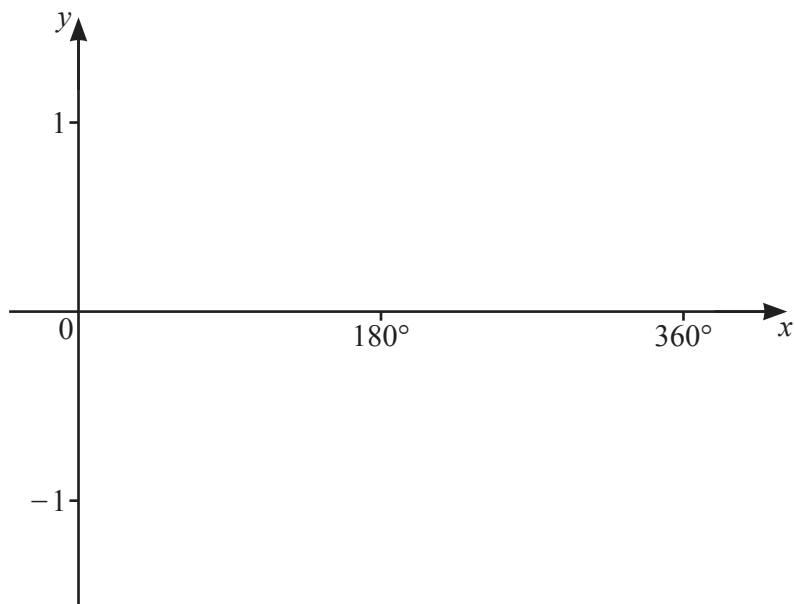
18 (a) Simplify  $(3\sqrt{2})^2$ .

..... [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  $0^\circ \leq x \leq 360^\circ$ .

$x =$  ..... or  $x =$  ..... [3]

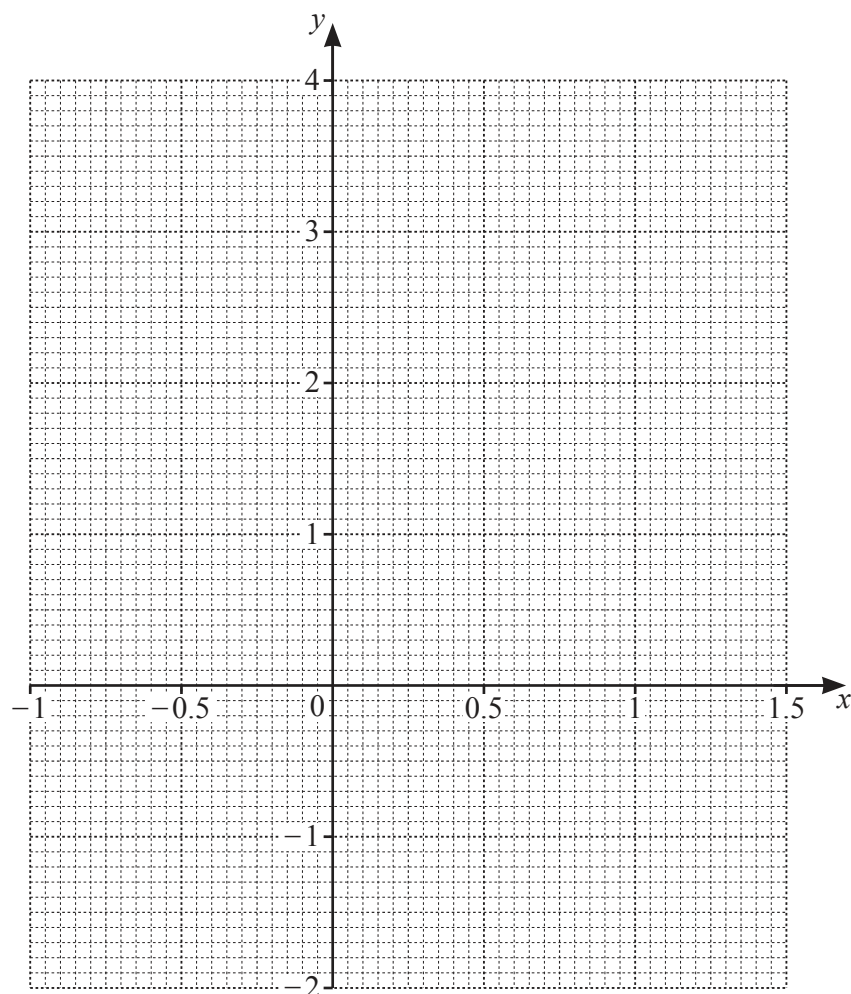
20 The table shows some values for  $y = 3x^2 - 2x - 1$ .

$x$	-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  $-1 \leq x \leq 1.5$ .



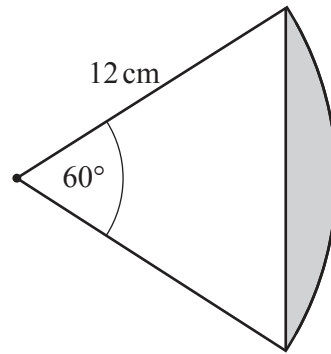
[3]

(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

NOT TO  
SCALE

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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