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MATHEMATICS (US)

0444/21

Paper 2 (Extended)

May/June 2021

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 .

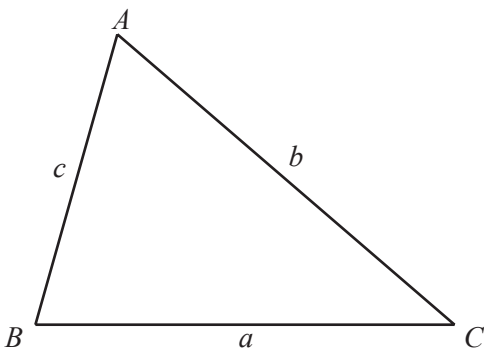
$$V = \frac{1}{3}Ah$$

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

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

Volume, V , of sphere of radius r .

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

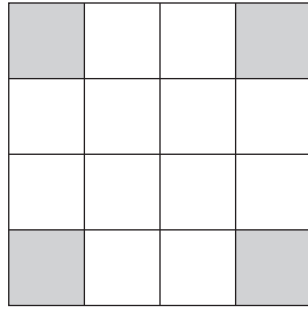


$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

1



(a) Write down the order of rotational symmetry of this diagram.

..... [1]

(b) On the diagram, draw all the lines of symmetry.

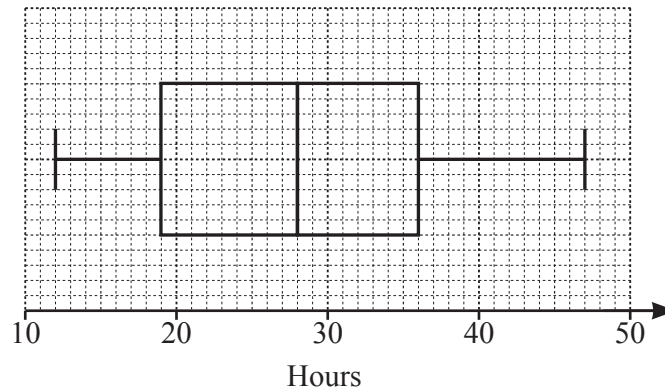
[2]

2 The probability that a train is late is 0.15 .

Write down the probability that the train is not late.

..... [1]

3 The box plot shows the number of hours that some students studied last week.



Find

(a) the range,

..... h [1]

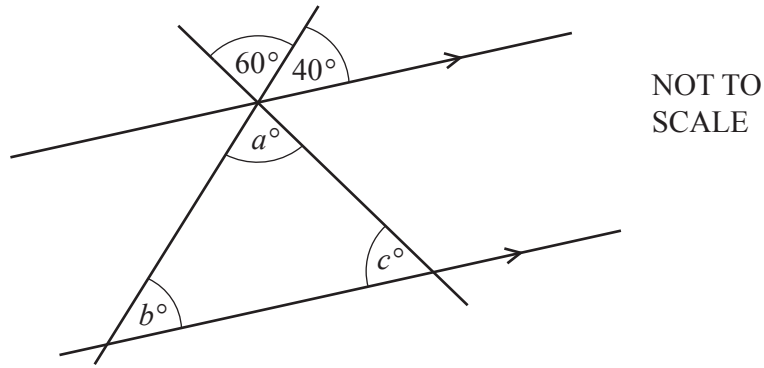
(b) the median,

..... h [1]

(c) the interquartile range.

..... h [1]

4



The diagram shows two parallel lines intersected by two straight lines.

Find the values of a , b , and c .

$a =$
 $b =$
 $c =$ [3]

5 Work out.

(a) $\begin{pmatrix} 6 \\ -5 \end{pmatrix} + \begin{pmatrix} 8 \\ -1 \end{pmatrix}$

$\begin{pmatrix} \\ \end{pmatrix}$ [1]

(b) $3 \begin{pmatrix} -4 \\ 7 \end{pmatrix}$

$\begin{pmatrix} \\ \end{pmatrix}$ [1]

6 The distance between two towns is 300 km.

(a) Calculate the average speed of a car that takes 4 hours to travel this distance.

..... km/h [1]

(b) Calculate the time taken by another car that travels at an average speed of 90 km/h.
Give your answer in hours and minutes.

..... h min [2]

- 7 (a) The n th term of a sequence is $n^2 + 3n$.

Find the first three terms of this sequence.

.....,, [2]

- (b) These are the first five terms of a different sequence.

25 18 11 4 -3

Find the n th term of this sequence.

..... [2]

- 8 Solve the system of linear equations.
You must show all your working.

$$2x + y = 3$$

$$x - 5y = 40$$

$$x =$$

$$y = [3]$$

9 Work out $1\frac{3}{8} - \frac{5}{6}$.

Give your answer as a fraction in its simplest form.

..... [3]

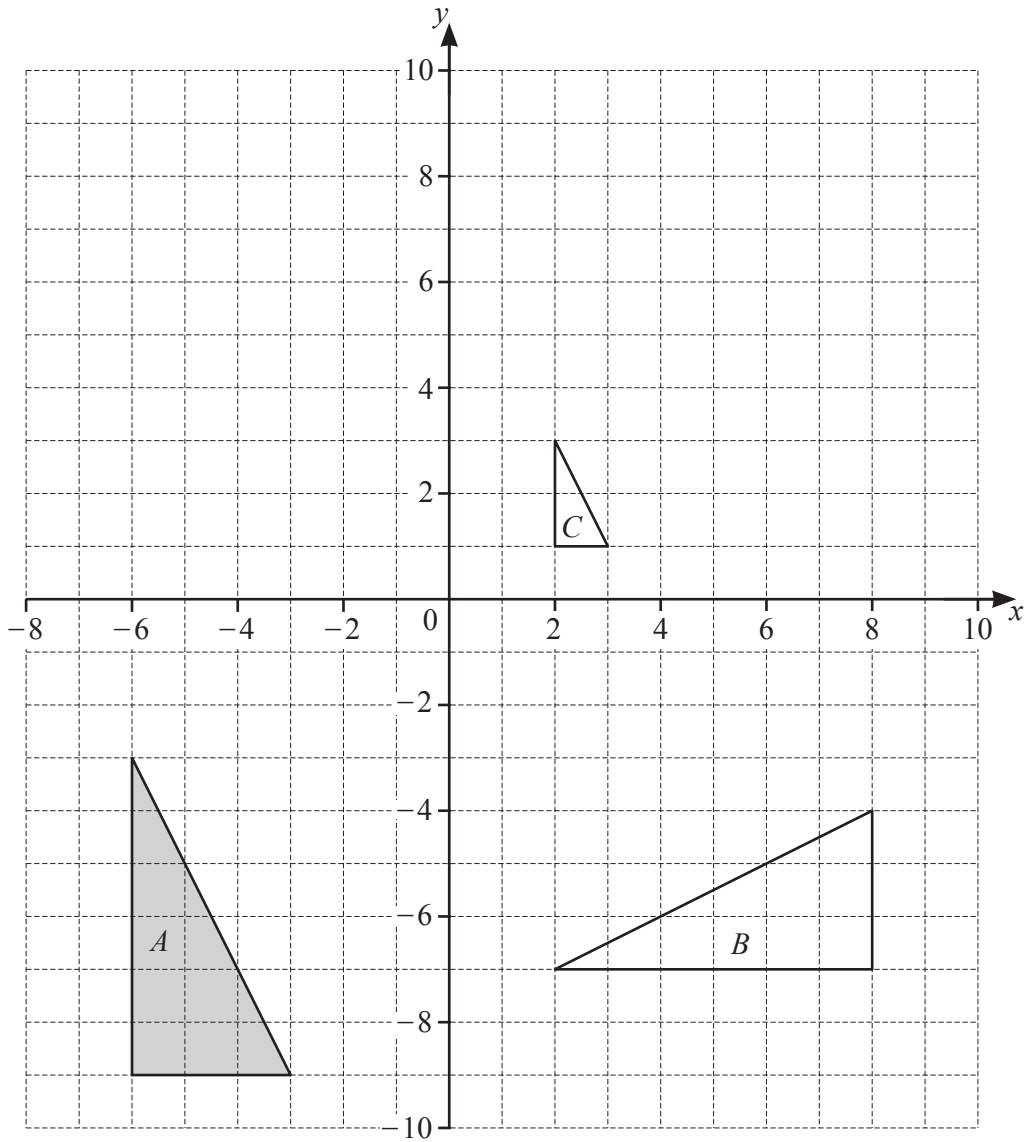
10 A is the point $(3, -5)$ and B is the point $(9, 3)$.

(a) Find the coordinates of the midpoint of AB .

(.....,) [2]

(b) Find the length of AB .

..... [3]



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

(i) triangle A onto triangle B ,

.....
 [3]

(ii) triangle A onto triangle C .

.....
 [3]

(b) Draw the image of triangle A after a translation by the vector $\begin{pmatrix} 2 \\ 10 \end{pmatrix}$. [2]

- 12 (a) Simplify fully.
 $(4ab^5)^4$

..... [2]

(b) $2p^{\frac{1}{3}} = 6$

Find the value of p .

$p =$ [1]

(c) $81^2 \div 3^t = 9$

Find the value of t .

$t =$ [2]

- 13 Annie invests \$8000 at a rate of 1% per year compound interest.

Work out the value of her investment at the end of 2 years.

\$ [2]

- 14 On a map, a lake has an area of 32 cm^2 .
The scale of the map is 1 cm represents 0.2 km.

Calculate the actual area of the lake.
Give your answer in km^2 .

..... km^2 [2]

- 15 y varies directly as the square root of $(x - 3)$.
When $x = 28$, $y = 20$.

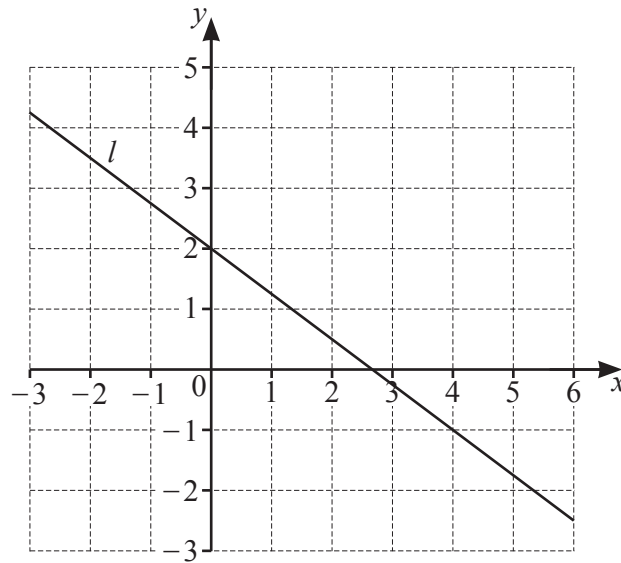
Find y when $x = 39$.

$y =$ [3]

- 16 Solve for h .

$$2mh = g(1 - h)$$

$h =$ [4]



(a) Find the slope of line l .

..... [2]

(b) Find the equation of line l in the form $y = mx + b$.

$y =$ [2]

(c) Find the equation of the line that is perpendicular to line l and passes through the point $(12, -7)$.
Give your answer in the form $y = mx + b$.

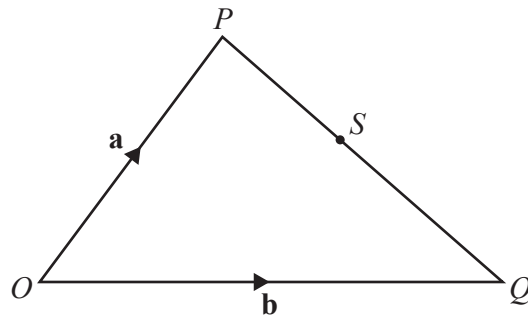
$y =$ [3]

- 18 A bag contains 3 blue buttons, 8 white buttons, and 5 red buttons.
Two buttons are picked at random from the bag, without replacement.

Work out the probability that the two buttons are either both red or both white.

..... [3]

19



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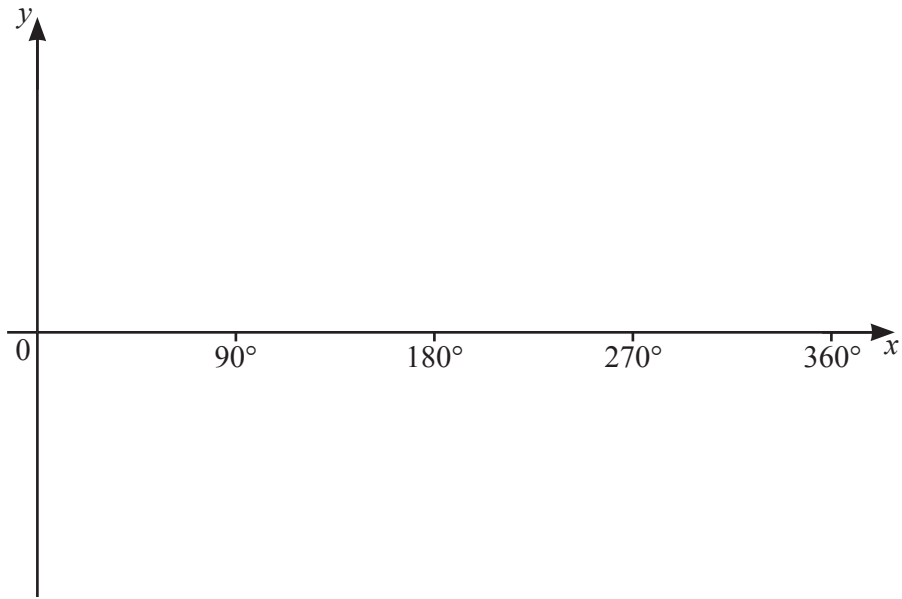
S is a point on PQ such that $PS : SQ = 4 : 5$.

Find \overrightarrow{OS} , in terms of \mathbf{a} and \mathbf{b} , in its simplest form.

$\overrightarrow{OS} =$ [2]

Question 20 is printed on the next page.

20 (a) Sketch the graph of $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$.



[2]

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

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

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