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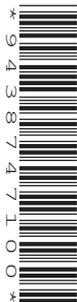
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MATHEMATICS (US)

0444/23

Paper 2 (Extended)

October/November 2020

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. Blank pages are indicated.

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 . $A = 2\pi rh$

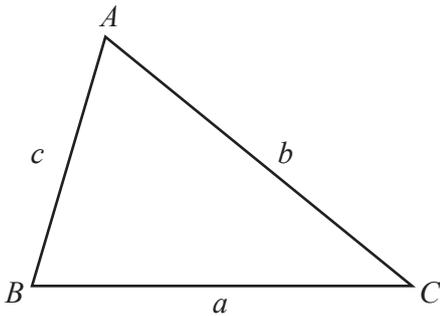
Lateral surface area, A , of cone of radius r , sloping edge l . $A = \pi rl$

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 the cube number that is greater than 50 but less than 100.

..... [1]

- 2 Find $\sqrt{0.25}$.

..... [1]

- 3 In triangle ABC , $BC = 7.6$ cm and $AC = 6.2$ cm.

Using a compass and ruler only, construct triangle ABC .

Leave in your construction arcs.

The side AB has been drawn for you.



[2]

- 4 Simplify.
 $a^2 \div a^6$

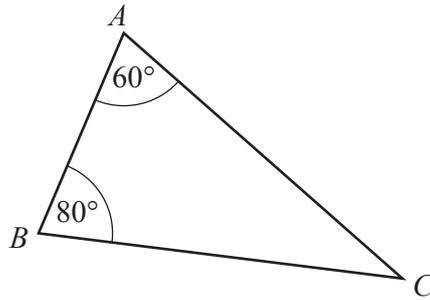
..... [1]

- 5 Megan changes 20 pounds (£) into dollars when the exchange rate is $\text{£}1 = \$1.20$.

Work out how many dollars she receives.

\$ [1]

6



NOT TO
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The diagram shows triangle ABC .

The triangle is reflected in the line BC to give a quadrilateral $ABDC$.

- (a) Write down the mathematical name of the quadrilateral $ABDC$.

..... [1]

- (b) Find angle ACD .

Angle $ACD =$ [2]

- 7 Change $457\,000\text{ cm}^2$ into m^2 .

..... m^2 [1]

8 $(2\sqrt{2} + 3)^2 = a\sqrt{2} + b$

Find the value of a and the value of b .

$a = \dots\dots\dots$

$b = \dots\dots\dots$ [2]

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

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

$\dots\dots\dots$ [3]

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

$$\begin{aligned} 3x - 8y &= 22 \\ x + 4y &= 4 \end{aligned}$$

$x = \dots\dots\dots$

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

11 A bag contains 7 red disks and 5 green disks.

- (a) Helen takes one disk at random, records the color, and replaces it in the bag. She does this 120 times.

Find how many times she expects to take a green disk.

..... [2]

- (b) Helen adds 9 red disks and some green disks to the disks already in the bag.

The probability of taking a red disk is now $\frac{2}{3}$.

Find the number of green disks that Helen added to the bag.

..... [2]

12 A straight line, l , has equation $y = 5x + 12$.

- (a) Write down the slope of line l .

..... [1]

- (b) Find the coordinates of the point where line l crosses the x -axis.

(.....,) [2]

- (c) A line perpendicular to line l has slope k .

Find the value of k .

$k =$ [1]

- 13 Brad goes to bed at 21 25.
He is in bed until 07 08 the next day.

Work out the length of time that Brad is in bed.

..... h min [1]

14 $N = 2^4 \times 3 \times 7^5$

$PN = K$, where P is an integer and K is a square number.

Find the smallest value of P .

$P =$ [2]

15 $m = 2p + \sqrt{\frac{x}{y}}$

Solve for x .

$x =$ [3]

- 16 A paperweight has height 3 cm and volume 27 cm^3 .
A mathematically similar paperweight has height 4 cm.

Calculate the volume of this paperweight.

..... cm^3 [3]

- 17 Adil and Brian are paid the same wage.
Adil is given a 10% pay decrease and his new wage is \$180.
Brian is given a 10% pay increase.

Work out Brian's new wage.

\$ [3]

- 18 (a) Simplify. $(4xy^2)^3$

..... [2]

(b) $25 = 125^k$

Find the value of k .

$k =$ [1]

19 Robert makes model cars.

The cost, $C(n)$, in dollars, of making n cars is given by the function $C(n) = 20 + 15n$.

(a) In one week, he makes at least 1 car and at most 5 cars.

Write down the domain and range of $C(n)$.

Domain =

Range = [2]

(b) By selling n cars, Robert receives $\$22n$.

Find the smallest number of cars he must sell to make a profit.

..... [3]

20 Factor.

$$3x + 8y - 6ax - 16ay$$

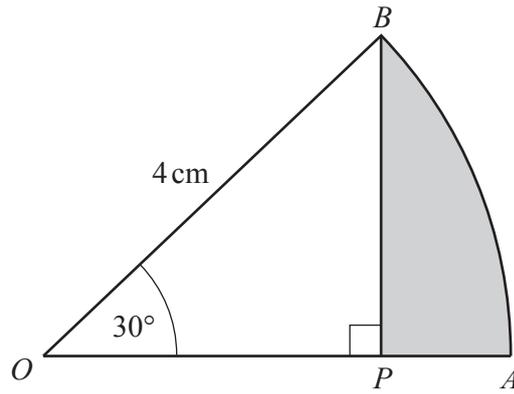
..... [2]

21 y varies inversely as the square root of x .

When $x = 25$, $y = 7$.

Find y in terms of x .

$y =$ [2]



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OAB is the sector of a circle, center O .
 $OB = 4$ cm and angle $AOB = 30^\circ$.
 BP is perpendicular to OA .

(a) $AP = a + b\sqrt{3}$

Find the value of a and the value of b .

$a = \dots\dots\dots$

$b = \dots\dots\dots$ [3]

(b) The area of the shaded region is $c\pi + d\sqrt{3}$.

Find the value of c and the value of d .

$c = \dots\dots\dots$

$d = \dots\dots\dots$ [3]

- 23 The table shows information about the times, t seconds, taken by each of 100 students to solve a puzzle.

Time (t seconds)	$0 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 60$
Frequency	20	30	50

- (a) Calculate an estimate of the mean time.

..... s [4]

- (b) Emmanuel draws a histogram to show this information.
The table shows the heights, in cm, of some of the bars for this histogram.

Complete the table.

Time (t seconds)	$0 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 60$
Height of bar (cm)	3		

[3]

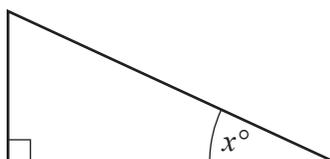
Questions 24 and 25 are printed on the next page.

24 Simplify.

$$\frac{x^2 - 25}{x^2 - 17x + 60}$$

..... [4]

25



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$$\sin x^\circ = \frac{3}{5}$$

(a) Find the value of $\cos x^\circ$.

..... [2]

(b) Use your answer to **part (a)** to find the value of $\cos(180 - x)^\circ$.

..... [1]

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