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CAMBRIDGE INTERNATIONAL MATHEMATICS

0607/43

Paper 4 (Extended)

May/June 2021

2 hours 15 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, centre 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.
- You should use a graphic display calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly and you will be given marks for correct methods, including sketches, even if your answer is incorrect.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π , use your calculator value.

INFORMATION

- The total mark for this paper is 120.
- The number of marks for each question or part question is shown in brackets [].

This document has **20** pages. Any blank pages are indicated.

Formula List

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

Curved surface area, A , of cylinder of radius r , height h . $A = 2\pi rh$

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

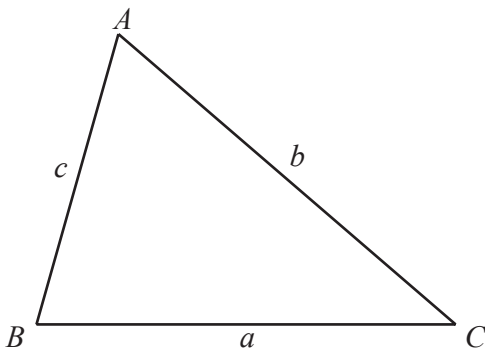
Curved surface area, A , of sphere of radius r . $A = 4\pi r^2$

Volume, V , of pyramid, base area A , height h . $V = \frac{1}{3}Ah$

Volume, V , of cylinder of radius r , height h . $V = \pi r^2 h$

Volume, V , of cone of radius r , height h . $V = \frac{1}{3}\pi r^2 h$

Volume, V , of sphere of radius r . $V = \frac{4}{3}\pi r^3$



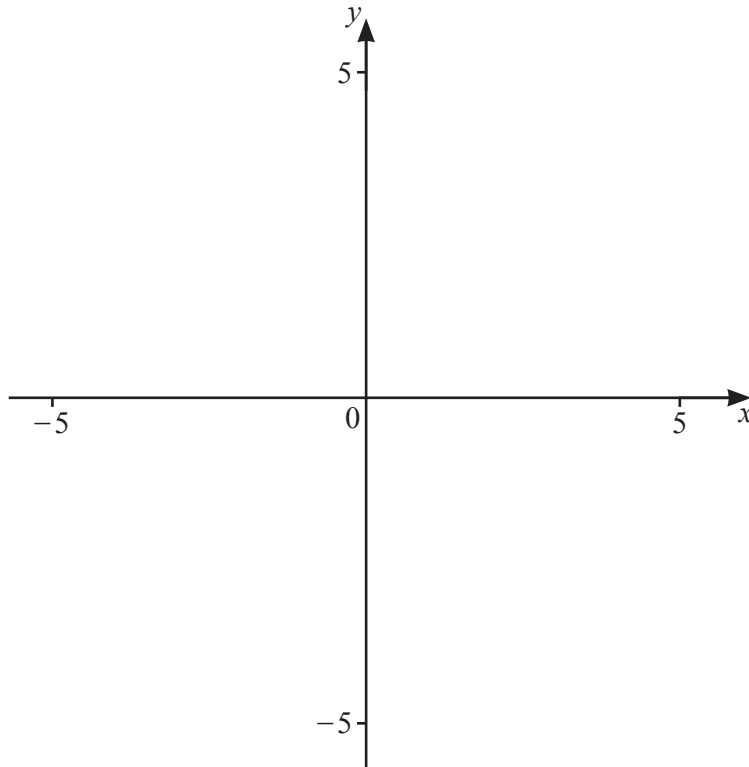
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

Answer **all** the questions.

1



$$f(x) = x - \frac{4}{x}$$

(a) On the diagram, sketch the graph of $y = f(x)$ for values of x between -5 and 5 . [2]

(b) Find the zeros of $f(x)$.

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

(c) Solve the equation $f(x) = 2$.

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

(d) $g(x) = f(x + 2)$

(i) On the same diagram, sketch the graph of $y = g(x)$ for values of x between -5 and 5 . [2]

(ii) Describe fully the **single** transformation that maps the graph of $y = f(x)$ onto the graph of $y = g(x)$.

.....

..... [2]

2 (a) Increase \$55 by 250%.

\$ [2]

(b) (i) Beatrice invests \$500 at a rate of 1.5% per year simple interest.

Find the amount Beatrice has at the end of 12 years.

\$ [3]

(ii) Dan invests \$500 at a rate of 1.5% per year compound interest.

Find the difference between Dan's amount and Beatrice's amount at the end of 12 years.

\$ [3]

(c) Eva invests an amount of money at a rate of 2.1% per year compound interest.

Find the number of complete years it takes for Eva's investment to double in value.

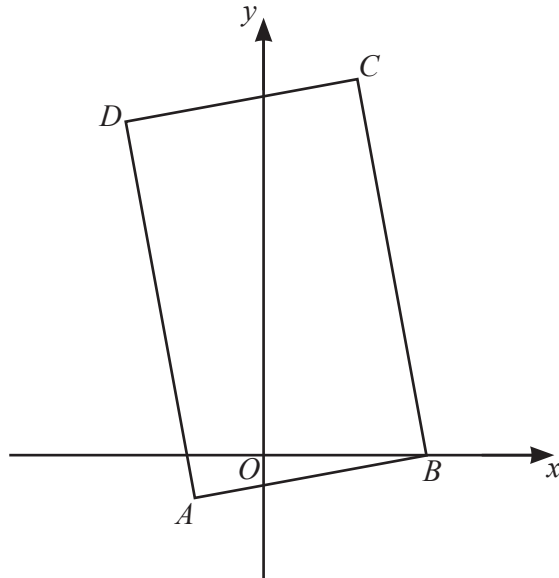
..... [4]

- (d) Each year the value of Fred's car reduces by 15% of its value at the start of that year.
The value of the car is now \$5158.65 .

Find the value of Fred's car 3 years ago.

\$ [3]

3



NOT TO
SCALE

$ABCD$ is a rectangle.

A is the point $(-2, -1)$ and B is the point $(5, 0)$.

(a) Find the equation of BC .

..... [4]

(b) C is the point $(p, 14)$.

Find the value of p .

$p =$ [2]

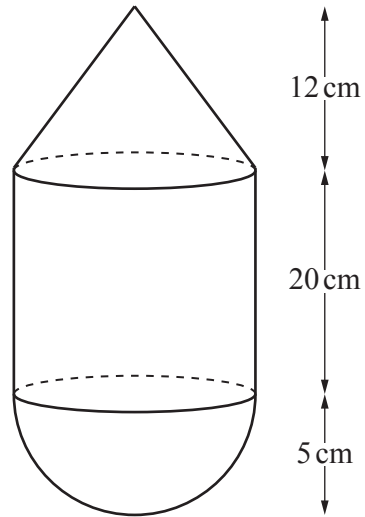
(c) Find the coordinates of point D .

(.....,) [2]

(d) Find the area of rectangle $ABCD$.

..... [4]

4



NOT TO
SCALE

The diagram shows a solid made by joining a cone and a hemisphere to a cylinder.
The radius of each of the three shapes is 5 cm.
The height of the cylinder is 20 cm and the height of the cone is 12 cm.

(a) Calculate the total surface area of the solid.

..... cm² [5]

(b) The total volume of the solid is $\frac{2050\pi}{3} \text{ cm}^3$.

It is melted down and made into spheres of radius 1.2 cm.

(i) Find the greatest number of spheres that can be made.

..... [3]

(ii) Work out the percentage of the $\frac{2050\pi}{3} \text{ cm}^3$ that remains after the spheres have been made.

..... % [3]

- 5 (a) There are 200 students in a school.
The table shows information about their heights, h cm.

Height, h cm	$150 < h \leq 165$	$165 < h \leq 170$	$170 < h \leq 175$	$175 < h \leq 180$	$180 < h \leq 190$	$190 < h \leq 200$
Frequency	7	17	43	64	49	20

Calculate an estimate of the mean height.

..... cm [2]

- (b) A biased die in the shape of a cube is numbered 0, 1, 1, 2, 3 and 3.
It is rolled 100 times.
The table shows the results.

Score	0	1	2	3
Frequency	x	y	30	45

The mean score is 2.13 .

Find the value of x and the value of y .

$x =$

$y =$ [3]

- 6 (a) Ten students compare their test marks in Physics (x) and Chemistry (y). The table shows the results.

Student	A	B	C	D	E	F	G	H	I	J
Physics (x)	50	48	31	80	65	85	27	30	45	53
Chemistry (y)	55	56	30	83	63	90	30	32	45	55

- (i) Write down the type of correlation between the Physics and Chemistry marks.

..... [1]

- (ii) Find the equation of the line of regression, giving y in terms of x .

$y =$ [2]

- (iii) Student K scores 70 in the Physics test.

Use your answer to **part (a)(ii)** to estimate this student's mark in Chemistry.

..... [1]

- (b) The stem-and-leaf diagram shows information about the speeds of cars passing a school.

4	2	2	3	4	5	8	
5	1	3	3	4	4	5	7 9
6	0	0	1	1	2	5	

Key : 4 | 5 = 45 km/h

Find

- (i) the range,

..... km/h [1]

- (ii) the median,

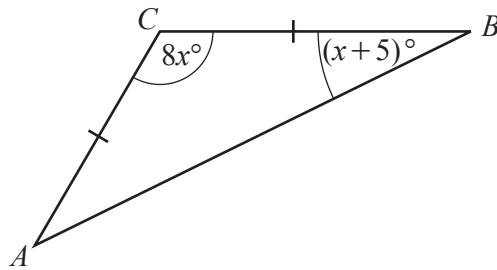
..... km/h [1]

- (iii) the lower quartile.

..... km/h [1]

7 In this question all lengths are in centimetres.

(a)



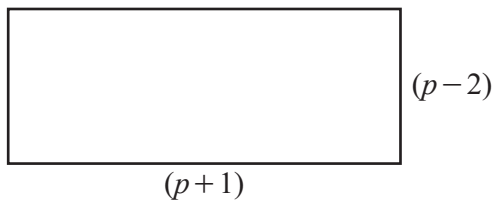
NOT TO
SCALE

In triangle ABC , $AC = BC$, angle $ABC = (x + 5)^\circ$ and angle $ACB = 8x^\circ$.

Find the value of x .

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

(b)



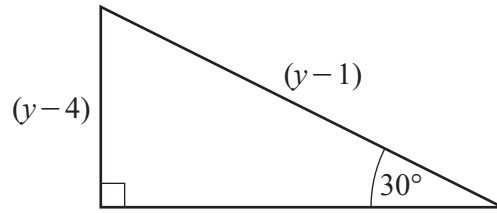
NOT TO
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The diagram shows a rectangle with sides of length $(p + 1)$ and $(p - 2)$.
The area of the rectangle is 90 cm^2 .

Find the value of p .

$p = \dots\dots\dots$ [4]

(c)

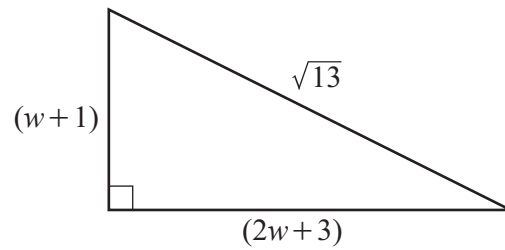
NOT TO
SCALE

The diagram shows a right-angled triangle.

Find the value of y .

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

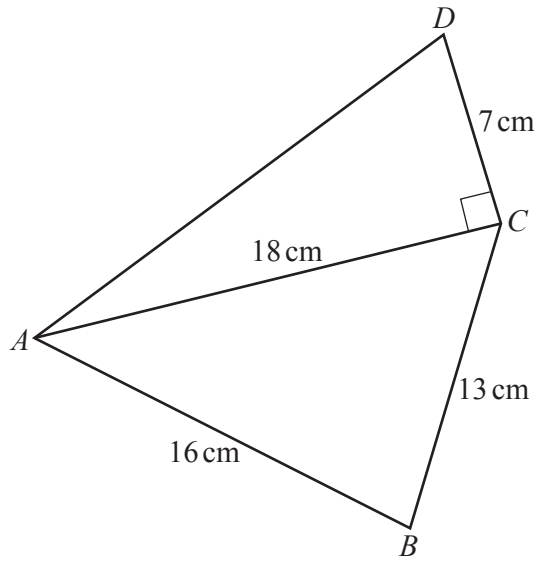
(d)

NOT TO
SCALE

The diagram shows a right-angled triangle with sides of length $(w+1)$, $(2w+3)$ and $\sqrt{13}$.

Work out the area of the triangle.

$\dots\dots\dots \text{cm}^2$ [6]



NOT TO SCALE

(a) Calculate angle BCA and show that it rounds to 59.57° , correct to 2 decimal places.

[3]

(b) Find the area of quadrilateral $ABCD$.

..... cm^2 [3]

(c) Find the shortest distance from A to BC .

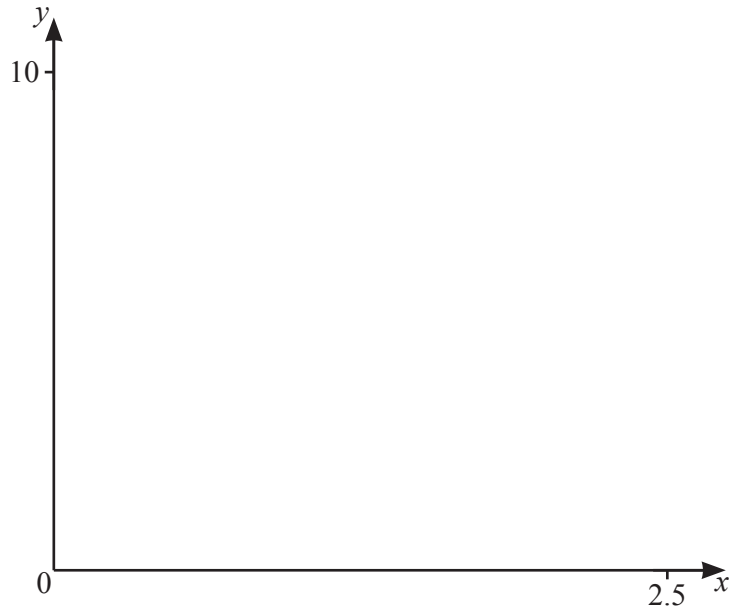
..... cm [2]

(d) D is due north of B .

Find the bearing of B from C .

..... [6]

9



$f(x) = x^x, x > 0$

(a) On the diagram, sketch the graph of $y = f(x)$ for $0 < x \leq 2.5$. [2]

(b) Find the coordinates of the local minimum point.

(.....,) [2]

(c) (i) Find x when $f(x) = 3x$.

..... [3]

(ii) Solve $f(x) \geq 3x$.

..... [2]

- 10 (a) Kris can go to school by bus or by taxi.
On any day the probability that Kris goes by bus is 0.9 .

When Kris goes by bus, the probability that she is late for school is 0.06 .
When she goes by taxi, the probability that she is late for school is 0.01 .

- (i) Find the probability that, on any day, Kris is late for school.

..... [3]

- (ii) Find the probability that, on any day, Kris is not late for school.

..... [1]

- (iii) In one year, Kris attends school on 200 days.

Find the number of days Kris is expected not to be late.

..... [1]

- (b) Alex also goes to school by bus or by taxi.
The probability that Alex goes by bus is 0.8 .

The probability that Alex goes by bus **and** is late is 0.12 .

Find the probability that Alex is late when he goes by bus.

..... [2]

11 (a) $f(x) = 3x + 2$ $g(x) = x^2$ $h(x) = 2^x$

(i) Find $f(2)$.

..... [1]

(ii) Find $f(g(3))$.

..... [2]

(iii) Find the value of $\frac{h(g(3))}{g(h(3))}$.

..... [3]

(iv) Find $f^{-1}(x)$.

$f^{-1}(x) =$ [2]

(v) Find $h^{-1}(x)$.

$h^{-1}(x) =$ [2]

(b) (i) Find the value of $\log_3 81 - \log_9 \left(\frac{1}{3}\right)$.

..... [2]

(ii) $\log_b 25 = \frac{2}{3}$

Find the value of b .

$b =$ [2]

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