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0607/43

October/November 2021

2 hours 15 minutes

You must answer on the question paper.

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, 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.

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



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

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

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

3Answer **all** the questions.

- 1**
- The table shows the marks scored by 180 students in an examination.

Mark	0	1	2	3	4	5	6	7	8	9	10
Number of students	3	7	16	11	7	32	20	26	28	19	11

- (a) (i)**
- Write down the mode.

..... [1]

- (ii)**
- Write down the range.

..... [1]

- (iii)**
- Find the median.

..... [1]

- (iv)**
- Find the interquartile range.

..... [2]

- (v)**
- Calculate the mean.

..... [2]

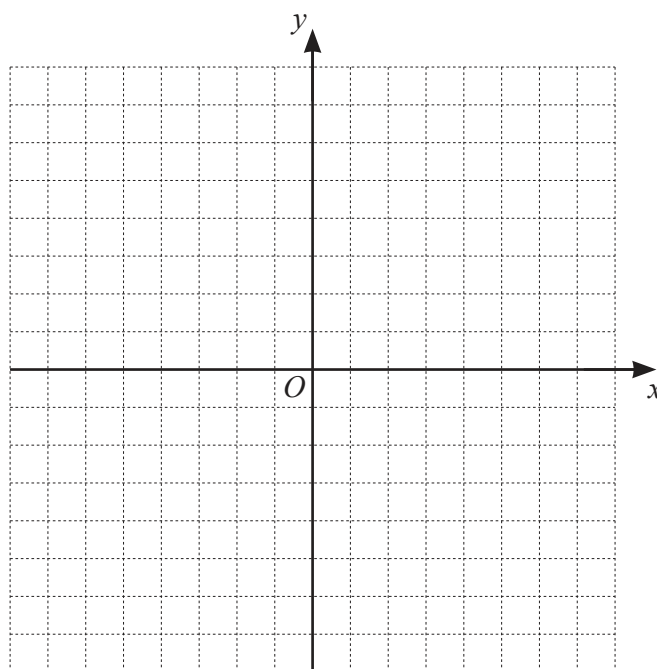
- (b)**
- A different group of 140 students take the same examination.
-
- The marks of the two groups are combined and the mean mark of the 320 students is 6.5 .

Find the mean mark of the 140 students.

..... [2]

4

- 2 You may use this grid to help you answer this question.



Transformation P is a rotation of 180° about the origin.

Transformation Q is a reflection in the line $y = x$.

- (a) Find the coordinates of the image of the point $(5, 2)$ under transformation P.

(..... ,) [1]

- (b) Find the coordinates of the image of the point $(5, 2)$ under transformation Q.

(..... ,) [1]

- (c) Find the coordinates of the image of the point (x, y) under transformation P followed by transformation Q.

(..... ,) [2]

- (d) Describe fully the **single** transformation that is equivalent to transformation Q followed by transformation P.

.....

..... [2]

5

- 3** Anna flies by plane from Manchester (UK) to Goa (India).
The plane flies a distance of 7650 km.

(a) The flight takes 8.5 hours.

(i) Calculate the average speed of the plane.

..... km/h [1]

- (ii)** The plane leaves Manchester at 20 45.
The local time in Goa is 5 hours 30 minutes ahead of the local time in Manchester.

Find the local time in Goa when the plane lands.

..... [2]

- (b)** The exchange rate is 1 pound (£) = 90 Indian rupees (INR).

(i) The cost of the flight is £299.

Calculate the cost of the flight in Indian rupees.

INR [1]

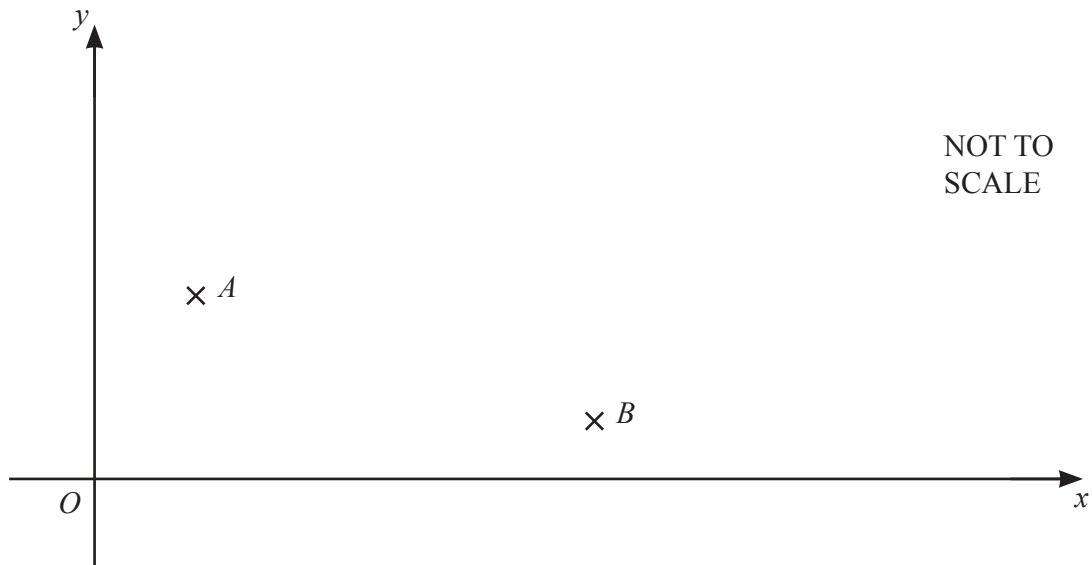
- (ii)** Anna returns to Manchester with 4014 Indian rupees.
She changes this money into pounds.

Calculate this amount in pounds.

£ [1]

6

4



The points $A(2, 5)$ and $B(10, 1)$ are shown on the diagram.

- (a) Find the gradient of the line AB .

..... [2]

- (b) Find the equation of the line AB .
Give your answer in the form $y = mx + c$.

$y =$ [2]

7

- (c) The point C has coordinates $(6, k)$ where $k > 0$.
The line CA is perpendicular to the line AB and $AC = AB$.

Find k .

$k = \dots\dots\dots$ [3]

- (d) The point D is such that $ABDC$ is a square.

Find the coordinates of D .

$(\dots\dots\dots, \dots\dots\dots)$ [2]

- (e) Find the area of triangle BCD .

$\dots\dots\dots$ [3]

8

- 5 (a)** Alana and Beau share \$200 in the ratio $x : y$.

An expression for the amount of money Alana receives is $\frac{200x}{x+y}$.

- (i)** Write down an expression for the amount of money Beau receives.

..... [1]

- (ii)** Alana and Beau are each given an extra \$50.
The ratio of the total amount of money that each person now has is 3 : 1.

Find the value of $\frac{x}{y}$.

$\frac{x}{y} =$ [5]

9

- (b) (i) On 1 January **each year** Bruno invests \$1000 in Bank A.
Bank A pays simple interest at a rate of 4% per year.

Show that the total value of Bruno's investment in Bank A at the end of 4 years is \$4400.

[3]

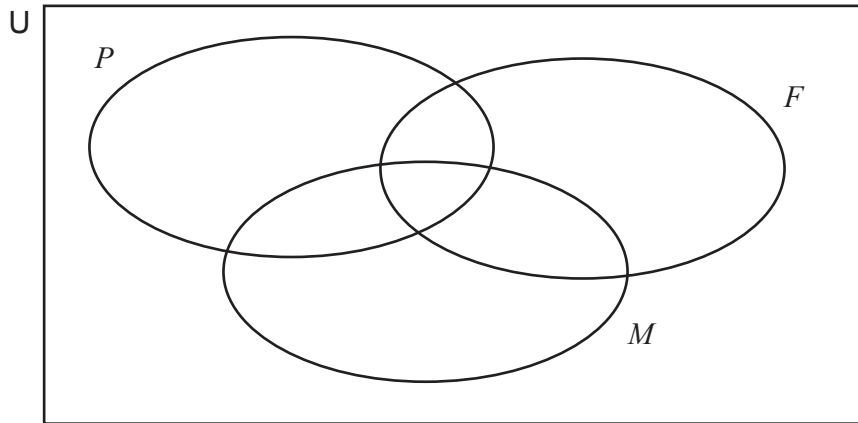
- (ii) On 1 January **each year** Bruno also invests \$1000 in Bank B.
Bank B pays compound interest at a rate of 3.5% per year.

Find the total value of Bruno's investment in Bank B at the end of 4 years.

\$ [3]

10

- 6 The Venn diagram shows the sets P , F and M .



$$U = \{\text{integer values of } x \mid 2 \leq x \leq 12\}$$

$$P = \{\text{prime numbers}\}$$

$$F = \{\text{factors of } 12\}$$

$$M = \{\text{multiples of } 3\}$$

- (a) List the elements of set P and the elements of set F .

$$P = \dots\dots\dots$$

$$F = \dots\dots\dots [2]$$

- (b) Write each element of U in the correct region of the Venn diagram.

[2]

- (c) List the elements of

(i) $F \cup M$,

$$\dots\dots\dots [1]$$

(ii) $P' \cap M$,

$$\dots\dots\dots [1]$$

(iii) $(P \cup F \cup M)'$.

$$\dots\dots\dots [1]$$

- (d) Find $n((P \cap F)' \cap M)$.

$$\dots\dots\dots [1]$$

11

- 7** y varies inversely as the square of x .
 $y = 5$ when $x = 3$.

(a) (i) Find y in terms of x .

$$y = \dots\dots\dots [2]$$

(ii) Find the value of x when $y = 20$.

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

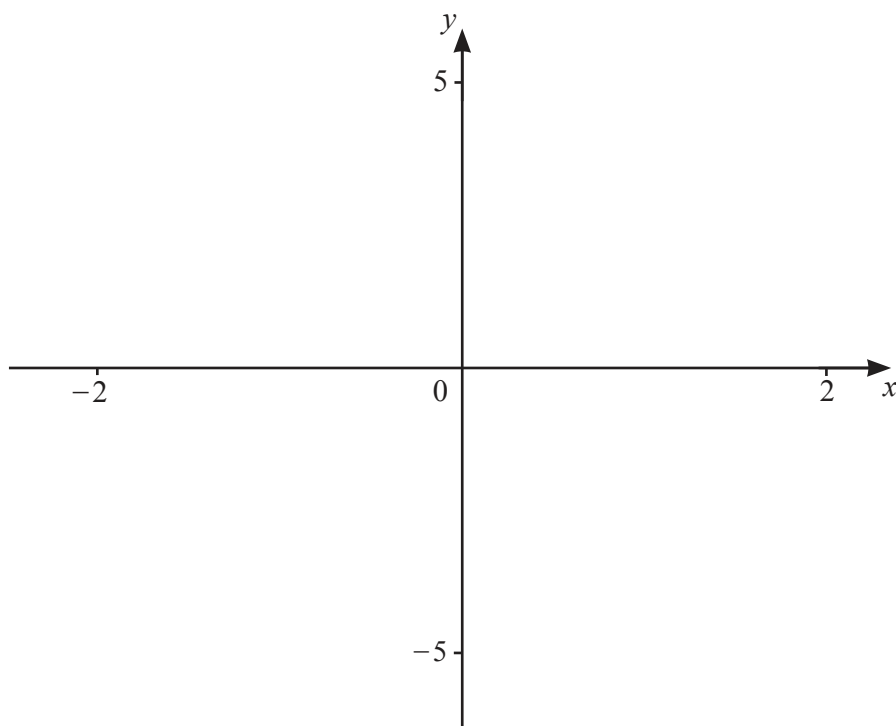
- (b)** z varies directly as the square root of y .
 $z = 12$ when $y = 9$.

Use your answer to **part (a)(i)** to find z in terms of x .

$$z = \dots\dots\dots [3]$$

12

8



$$f(x) = 3x - x^3 \text{ for } -2 \leq x \leq 2$$

(a) On the diagram, sketch the graph of $y = f(x)$. [2]

(b) Find the coordinates of the local maximum.

(..... ,) [1]

(c) Write down the x -coordinates of the points where the curve meets the x -axis.

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

(d) (i) Describe fully the **single** transformation that maps $y = f(x)$ onto $y = f(x+1)$.

.....

..... [2]

(ii) Solve $f(x) = f(x+1)$ for $-2 \leq x \leq 2$.

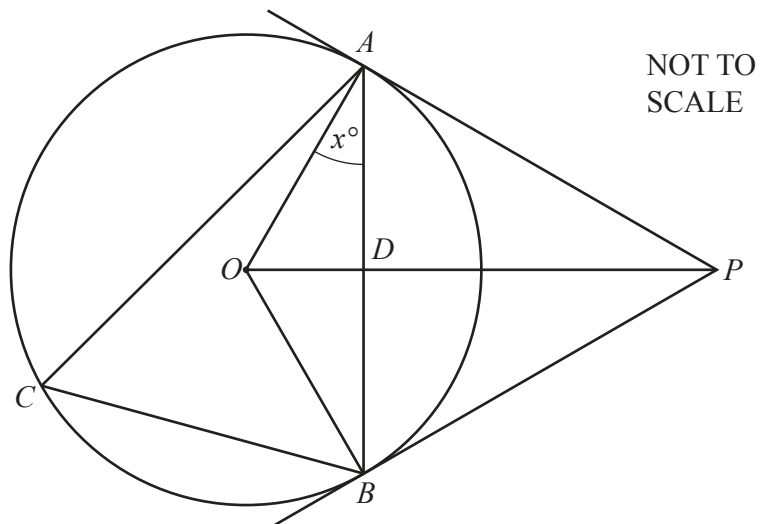
..... [2]

(iii) Solve $f(x) \geq f(x+1)$ for $-2 \leq x \leq 2$.

..... [2]

13

9



A , B and C lie on a circle, centre O .
 AP and BP are tangents to the circle.
 AB intersects OP at D and angle $OAB = x^\circ$.

(a) Write down the size of angle OBP .

Angle $OBP = \dots\dots\dots$ [1]

(b) Find, in terms of x ,

(i) angle AOD ,

Angle $AOD = \dots\dots\dots$ [1]

(ii) angle ACB ,

Angle $ACB = \dots\dots\dots$ [1]

(iii) angle APB .

Angle $APB = \dots\dots\dots$ [1]

(c) Write down the mathematical name of quadrilateral $AOBP$.

$\dots\dots\dots$ [1]

(d) Write down

(i) two triangles that are congruent,

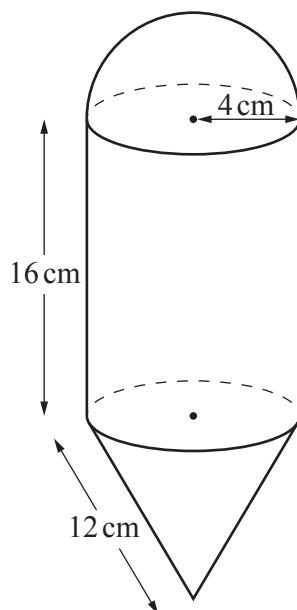
$\dots\dots\dots$ [1]

(ii) two triangles that are similar but not congruent.

$\dots\dots\dots$ [1]

14

10

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The diagram shows a solid made from a cylinder, a hemisphere and a cone, each with radius 4 cm.
The cylinder has length 16 cm.
The slant height of the cone is 12 cm.

(a) Find the volume of the solid.

..... cm³ [5]

15

- (b)** Show that the total surface area of the solid is $208\pi \text{ cm}^2$.

[4]

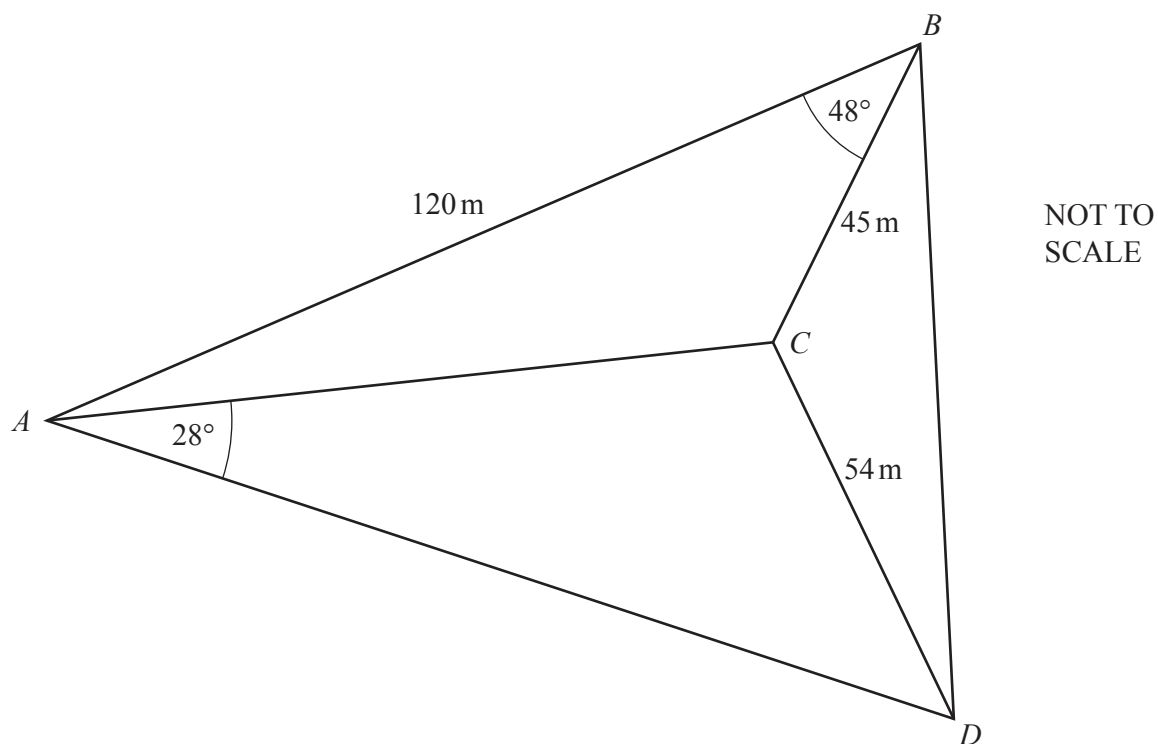
- (c)** A mathematically similar solid has a total surface area of $468\pi \text{ cm}^2$.

Find the radius of the cylinder in this solid.

..... cm [3]

16

11



Angles ACB and ACD are obtuse.

(a) Show that $AC = 95.9\text{ m}$ correct to the nearest 0.1 metre.

[3]

17

(b) Find angle ACD .

Angle $ACD = \dots\dots\dots$ [4]

(c) The area of triangle ABD is 5137 m^2 .

Calculate the area of triangle BCD .

$\dots\dots\dots \text{ m}^2$ [4]

18**12 (a)** Solve.

(i) $9 = 5 - \frac{2}{x}$

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

(ii) $\frac{6}{x-4} > 3$

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

(b) (i) Solve the equation, giving your answers correct to 3 significant figures.

$$2x^2 - 5x + 1 = 0$$

$$x = \dots\dots\dots \text{ or } x = \dots\dots\dots [3]$$

(ii) Use your answers to **part (b)(i)** to solve

$$2(\tan y)^2 - 5(\tan y) + 1 = 0 \quad \text{for } 0^\circ \leq y \leq 180^\circ.$$

$$y = \dots\dots\dots \text{ or } y = \dots\dots\dots [2]$$

19

- 13** Two bags each contain only blue balls and red balls.
Bag 1 contains 7 blue balls and 3 red balls.
Bag 2 contains 3 blue balls and 7 red balls.

Maria chooses a ball at random from Bag 1 and puts it into Bag 2.

- (a)** Find the probability that the ball chosen is blue.

..... [1]

- (b)** Maria now chooses a ball at random from Bag 2 and puts it into Bag 1.

- (i)** Find the probability that both balls chosen are red.

..... [2]

- (ii)** Find the probability that one of the balls chosen is red and the other is blue.

..... [3]

- (iii)** Find the probability that there are now exactly 7 blue balls in Bag 1.

..... [3]

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