



SECONDARY 4 PRELIMINARY EXAMINATION
in preparation for the
General Certificate of Education Ordinary Level

CANDIDATE
NAME

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INDEX
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MATHEMATICS

4052/02

Paper 2

October/November 2026

2 hours 15 minutes

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, index number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO **NOT** WRITE ON ANY BARCODES.

Answer **all** the questions.

The number of marks is given in brackets [] at the end of each question or part question.

If working is needed for any question it must be shown with the answer.

Omission of essential working will result in loss of marks.

The total of the marks for this paper is 90.

The use of an approved scientific calculator is expected, where appropriate.

If the degree of accuracy is not specified in the question and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142.

This document consists of **21** printed pages and **1** blank page.

***Mathematical Formulae****Compound interest*

$$\text{Total amount} = P\left(1 + \frac{r}{100}\right)^n$$

Mensuration

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Area of a triangle } ABC = \frac{1}{2}ab \sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2}r^2\theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

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

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

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$





TURN OVER FOR QUESTION 1





- 1 (a) Express as a single fraction $\frac{3x+5}{3} - \frac{7x-4}{2}$.

Answer [2]

- (b) Solve $9x + 4 \geq 6 - 2x > 3x$.

Answer [3]

- (c) It is given that $a = \frac{b-c^2}{2b}$.

- (i) Find a when $b = 1.2$ and $c = -3$.

Answer $a =$ [1]

- (ii) Express b in terms of a and c .

Answer $b =$ [3]





(d) Simplify $\frac{5ab^2}{3c} \div \frac{20b^4}{9a^3c^2}$

Answer [2]

(e) Solve the equation $\frac{2x}{x+2} - \frac{x}{2x^2+3x-2} = 1$.

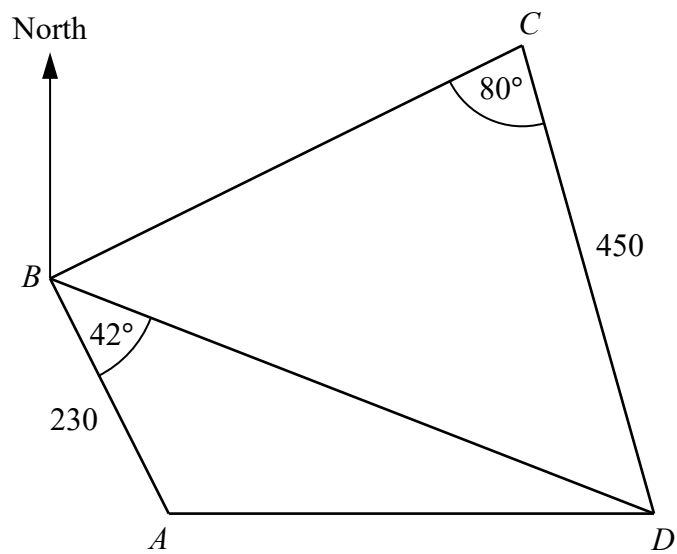
Give your solutions correct to 2 decimal places.

Answer $x =$ or [5]





2



$ABCD$ is a park on horizontal ground crossed by a path BD .
 $CD = 450$ m and $AB = 230$ m
Angle $BCD = 80^\circ$, angle $ABD = 42^\circ$ and angle BAD is obtuse.
The bearing of C from B is 075° .
The bearing of D from B is 110° .

(a) Calculate BD .

Answer m [3]





(b) Calculate the area of the park.

Answer m² [3]

- (c) A vertical 170 m-tower stands at B .
Peter walks from P to Q along BD .
The angle of elevation of the top of the tower from Q is 035° .
The distance between P and Q is 300 m.

Find the angle of elevation of the top of the tower from P .

Answer [4]





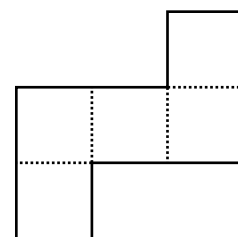
- 3 The diagram shows part of a number grid.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

- (a) A zig-zag outlining five numbers, as shown, is placed on the grid.
The zig-zag is placed in a different position on the grid.
The sum of the largest and smallest of the numbers outlined is 154.

Complete the zig-zag to show the numbers outlined.

Answer



[3]



- (b) The zig-zag is placed in a different position on the grid.
The difference between the product of the top right and bottom left numbers and the product of the left and right numbers is found.

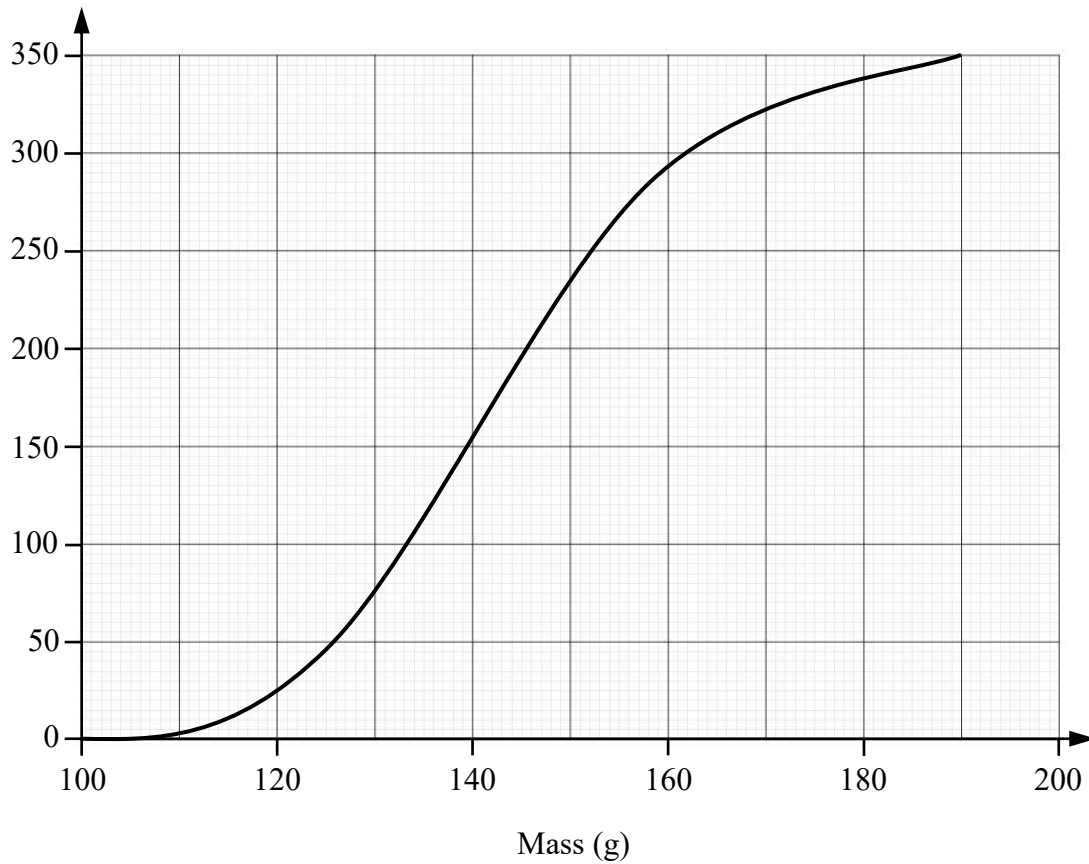
Show that this difference is always 24.

[3]





- 4 The masses, in grams, of 350 apples in bag A are recorded.
The cumulative frequency curve shows the distribution of the results.



(a) Use the curve to estimate

- (i) the percentage of the apples from bag A which mass is over 150 g.

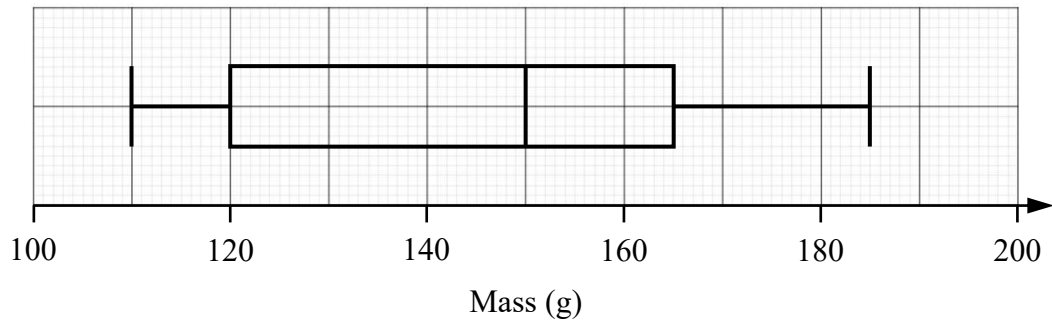
Answer % [1]

- (ii) the 90th percentile for bag A.

Answer [1]



The masses, in grams, of 350 apples in bag B are recorded.
The results are shown in the box-and-whiskers diagram.



(b) Use the two diagrams to complete this table for the two bags of apples.

Bag	Lower quartile	Median	Upper quartile	Interquartile range
A				
B				

[4]

(c) Based on your results in part (a), make two comments between the distribution of the masses of the apples in the two bags.

1.

.....

2.

..... [2]



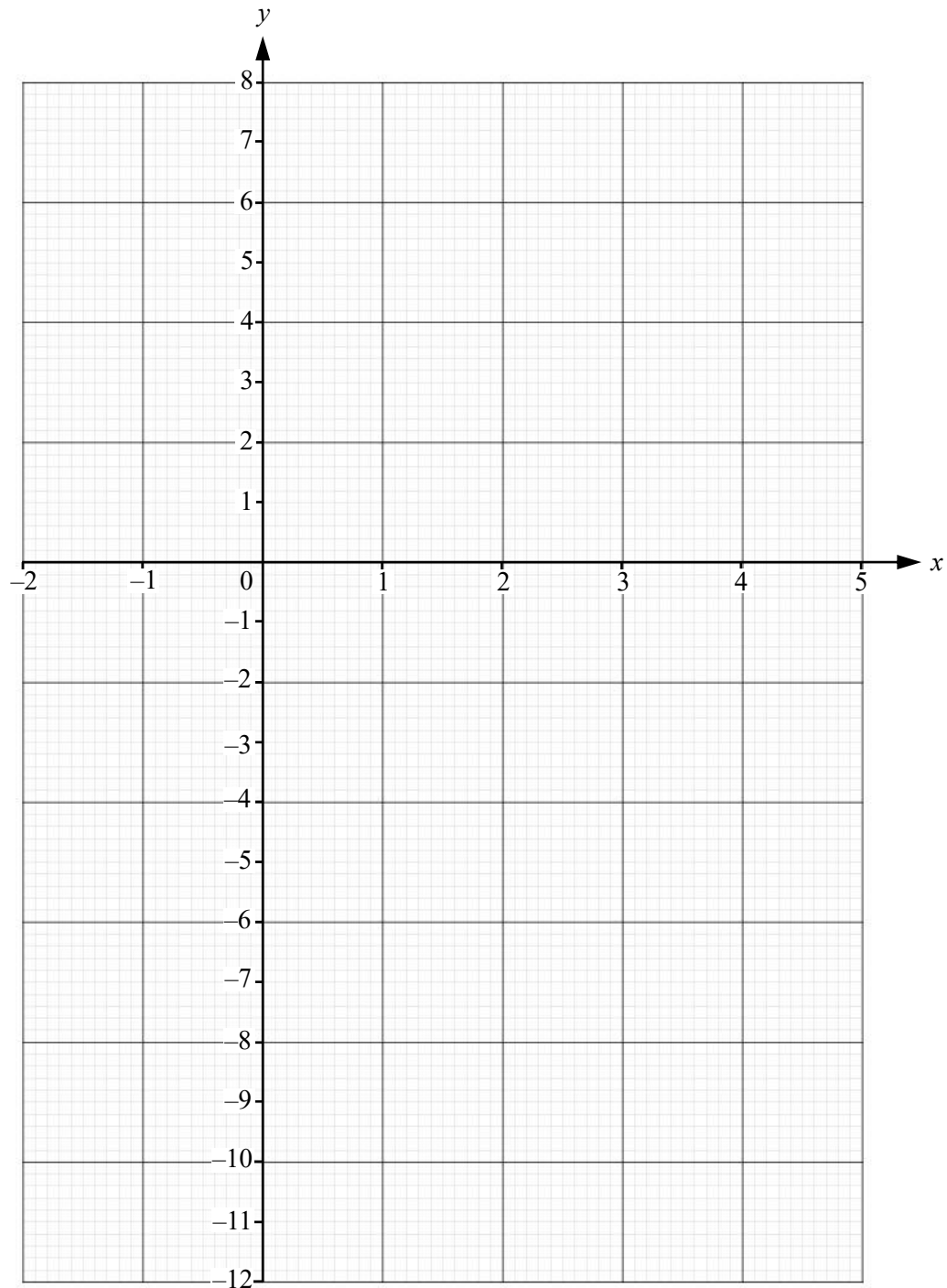


- 5 (a) Complete the table of values for $y = \frac{x^3}{2} - 3x^2 + 5$.

x	-2	-1	0	1	2	3	4	5
y		1.5	5	2.5	-3	-8.5	-11	-7.5

[1]

- (b) On the grid, draw the graph of $y = \frac{x^3}{2} - 3x^2 + 5$ for $-2 \leq x \leq 5$.



[3]





(c) Write down the x -coordinate of the points where the x -axis intersects the curve.

Answer [2]

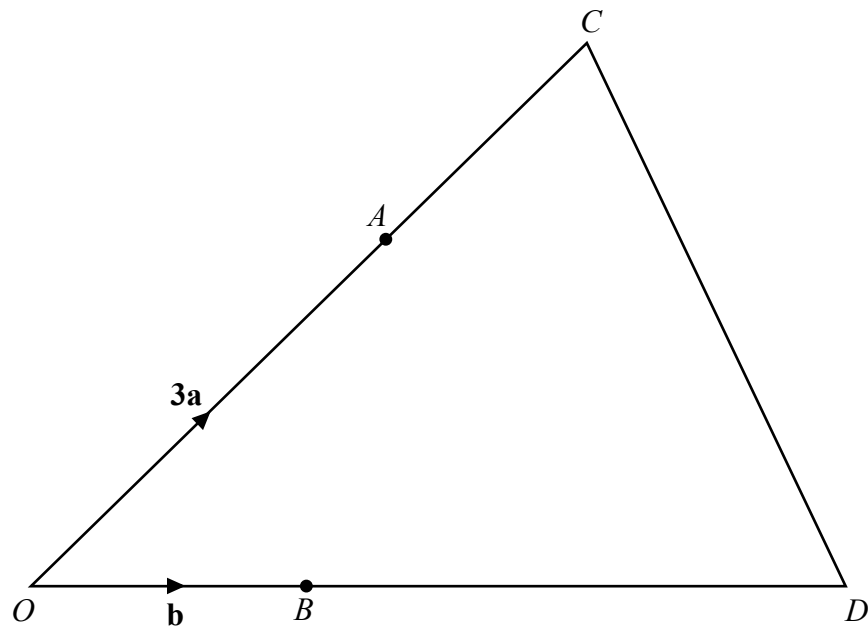
(d) By drawing a suitable line on the grid, solve the equation $x^3 - 6x^2 - 4x + 8 = 0$.

Answer [4]





6



OCD is a triangle.

A is a point on OC such that $OA : AC = 3 : 2$.

B is a point on OD such that $OB : BD = 1 : 2$.

X is a midpoint on CD .

$\overrightarrow{OA} = 3\mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

(a) Express, as simply as possible, in terms of $\mathbf{a}$ and $\mathbf{b}$.

(i) $\overrightarrow{AB}$

Answer $\overrightarrow{AB} = \dots\dots\dots$ [1]

(ii) $\overrightarrow{AX}$

Answer $\overrightarrow{AX} = \dots\dots\dots$ [3]





(b) Y is a point on OD .

Given that $\overrightarrow{YD} = \frac{1}{10}(7\mathbf{b} - \mathbf{a})$, explain why $AB \parallel XY$.

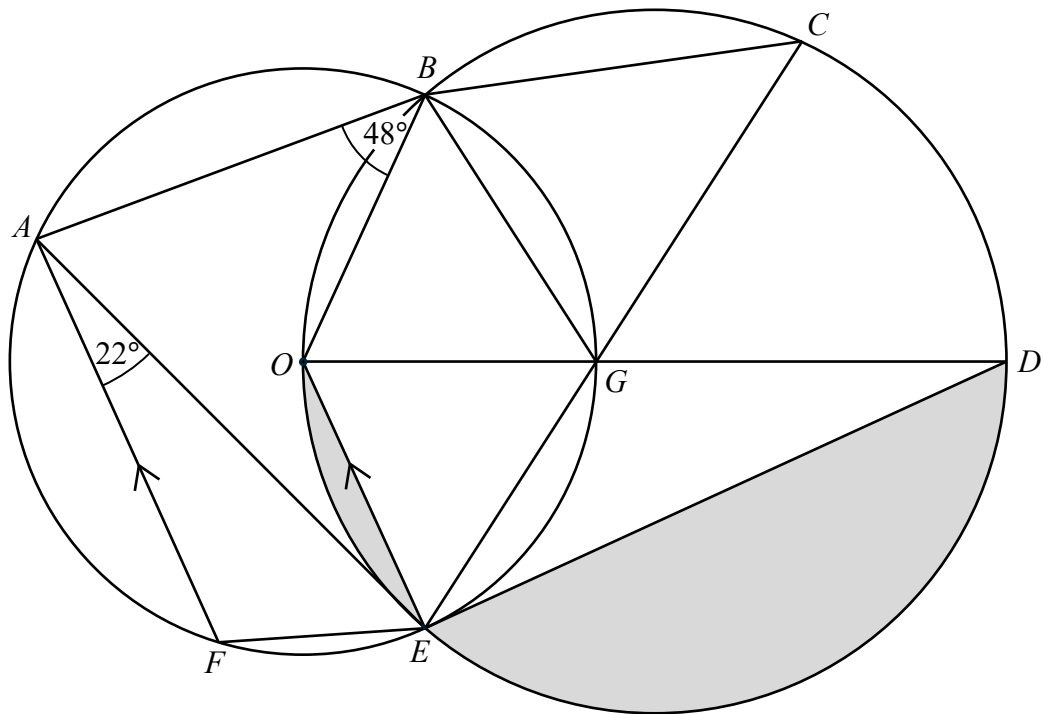
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..... [3]





7



A, B, G, E and F are points on the smaller circle, centre O.

O, B, C, D and E are points on the larger circle.

B and E are the intersection points of the two circles.

ED is a tangent to the smaller circle at point E.

EGC and OGD are straight lines.

AF is parallel to OE.

Angle $ABO = 48^\circ$ and angle $FAE = 22^\circ$.

(a) Name one pair of congruent triangles.

..... [1]

(b) Justify whether OD is a diameter of the larger circle.

.....

..... [2]





(c) Find angle BAE .

Give a reason for each step of your working.

Answer Angle $BAE = \dots\dots\dots$ [3]

(d) Find angle BCE .

Give a reason for each step of your working.

Answer Angle $BCE = \dots\dots\dots$ [2]

(e) The radius of the smaller circle is 8 cm.

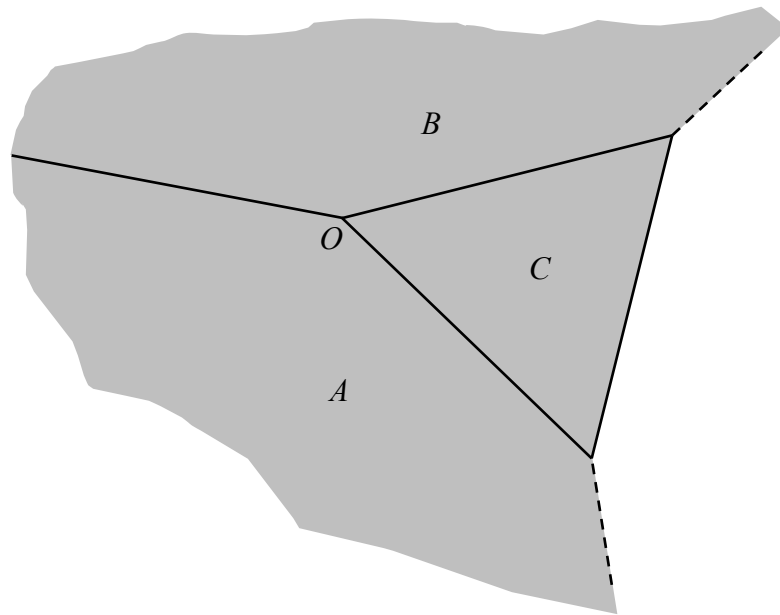
Calculate the total shaded area.

Answer cm^2 [4]





8



The diagram shows one interior angle of each of three regular polygons, A , B and C .
The three regular polygons fit together at point O .
 C is an equilateral triangle.

- (a) The number of equal sides A has is n .

Write down an expression, in terms of n , for one interior angle in A .

Answer [1]

- (b) B has 5 more equal sides than A .

Write down an expression, in terms of n , for one interior angle in B .

Answer [1]





(c) Form an equation in n and show that it reduces to

$$n^2 - 7n - 30 = 0.$$

[3]

(d) Solve the equation $n^2 - 7n - 30 = 0$.

Answer $n = \dots\dots\dots$ or $\dots\dots\dots$ [2]

(e) Explain why one of the solution in part (d) must be rejected.

.....

..... [1]

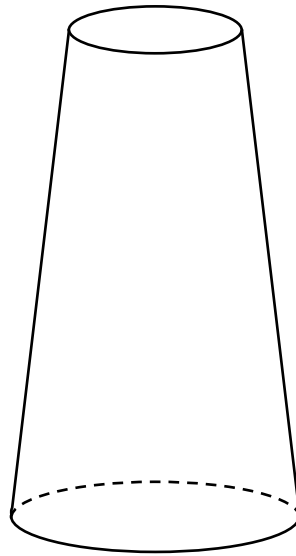
(f) Find the interior angle in polygon B .

Answer [2]





- 9 A small business manufactures ceramic vases.
The vase, as shown below, is formed by removing a smaller cone from a larger cone.



These are some information about the structure of the vase.

Frustum

- Radius of smaller cone: 3.5 cm
- Height of smaller cone: y cm
- Radius of larger cone: 5 cm
- Height of larger cone: $(y + 20)$ cm
- Height: 20 cm
- Top circular face is removed

- (a) Show that $y = 46.7$, correct to 3 significant figures.

[1]





(b) Calculate the volume of one vase.

Answer cm^3 [3]

A total of 1000 such ceramic vases are required to paint.

The table below shows the information about the three brands of paint.

Brand	Coverage per can	Volume	Price per can
A	2 m^2	500 ml	\$12.10
B	3 m^2	500 ml	\$10
C	4 m^2	500 ml	\$15.50

(c) Which brand of paint is the best choice for the business?

Justify your answer and show your calculations clearly.

.....

..... [7]





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