MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
CAMBRIDGE ASSESSMENT INTERNATIONAL EDUCATION
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER S

INDEX NUMBER

MATHEMATICS

4052/01

Paper 1

October/November 2024

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 **19** printed pages and **1** blank page.

Singapore Examinations and Assessment Board

Cambridge Assessment International Education

Mathematical Formulae

Compound interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

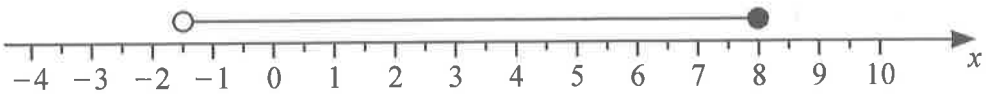
$$\text{Standard deviation} = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \left(\frac{\Sigma fx}{\Sigma f}\right)^2}$$

Answer **all** the questions.

1 Simplify $3y-7-5y+4+4y-2$.

Answer $2y-5$ [2]

2



Write down the inequality that represents the numbers indicated on the number line.

Answer $-1.5 < x \leq 8$ [1]

3 The cash price of a garden fountain is \$2250.
Arman buys the fountain using hire purchase.
She pays a deposit of 18% of the cash price plus 24 equal monthly payments of \$92.75 .

(a) Calculate the total amount that Arman pays for the fountain.

$(0.18 \times 2250) + 24 \times 92.75 = 2631$

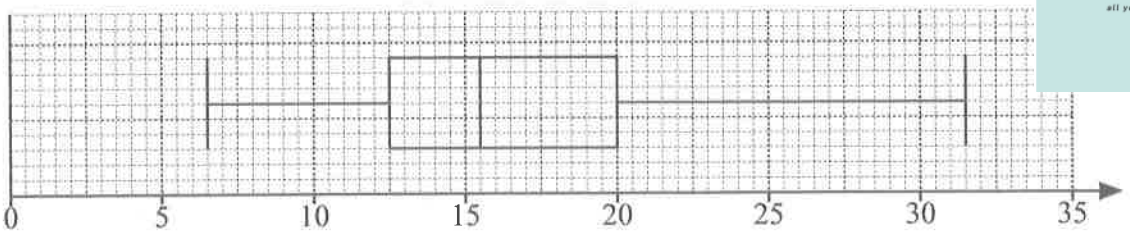
Answer \$ 2631 [2]

(b) Calculate the extra cost of using hire purchase as a percentage of the cash price.

$\frac{2631-2250}{2250} \times 100 = 16\frac{14}{15}\,\%$
$= 16.9\,\%$ (3sf)

Answer $16\frac{14}{15}$ % [2]

4



The box-and-whisker plot gives information about the times, in hours, that 120 adults spent on social media in one week.

(a) Use the box-and-whisker plot to find the median time.

Answer 15.5 hours [1]

(b) Rishi says, "There are almost twice as many adults who spent more than 20 hours on social media as there are adults who spent less than 12.5 hours".

Is he correct?
Give a reason for your answer.

No. 25% of adults spent more than 20h and 25% spent less than 12.5h.

[1]

---

5 Express as a single fraction in its simplest form $\frac{7x}{6} - \frac{3(x+1)}{8} - \frac{7x-6}{24}$.

$\frac{28x}{24} - \frac{9(x+1)}{24} - \frac{7x-6}{24}$

$= \frac{28x - 9x - 9 - 7x + 6}{24}$

$= \frac{12x - 3}{24} = \frac{4x-1}{8} =$

Answer $\frac{4x-1}{8}$ [3]

---

6 A map of Singapore has a scale of 1 : 200 000.

(a) The scale can be written in the form 1 cm : n km.

Find the value of n.

1cm : 2km

Answer $n =$ 2 [1]

(b) The distance on the map from Changi Airport to Bukit Panjang is 18.9 cm.

Calculate the actual distance, in kilometres, between these two places.

18.9 × 2 : 37.8

Answer 37.8 km [1]

(c) The area of Singapore is 728.6 km^2.

Calculate the area, in square centimetres, of Singapore on the map.

1cm : 2km

$1cm^2 : 4km^2$

$\frac{728.6}{4} = 182.15$

cannot round off!

Answer 182.15 cm^2 [2]

---

7 Factorise.

(a) $18a - 24b + 15c$

Answer 3(6a - 8b + 5c) [1]

(b) $3 + 2m^2xy - 2my - 3mx$

$3 - 3mx + 2m^2xy - 2my$

$= 3(1 - mx) - 2my(-mx + 1)$

$= (3 - 2my)(1 - mx) =$

Answer (3 - 2my)(1 - mx) [2]

---

8 In this sequence, the difference between any two consecutive terms is the same number.

w 15 x y z ...

The sum of the first five terms is 105.

Find the values of w, x, y and z.

Let difference be a

$w = 15 - a$

$x = 15 + a$

$y = 15 + 2a$

$z = 15 + 3a$

$15 - a + 15 + 15 + a + 15 + 2a + 15 + 3a = 105$

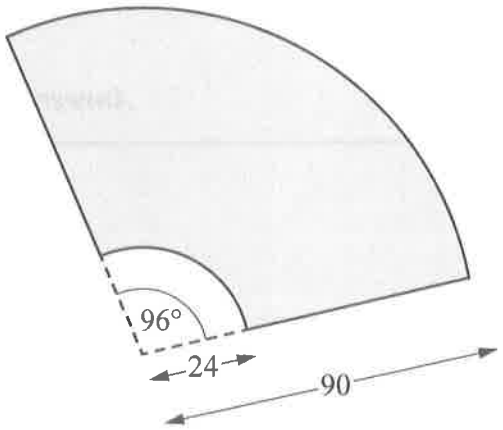
$75 + 5a = 105$

$5a = 30$

$a = 6$

Answer $w =$ 9 $x =$ 21 $y =$ 27 $z =$ 33 [2]

9



In the diagram, the shaded area represents the area cleaned by a windscreen wiper.
All lengths are in centimetres.

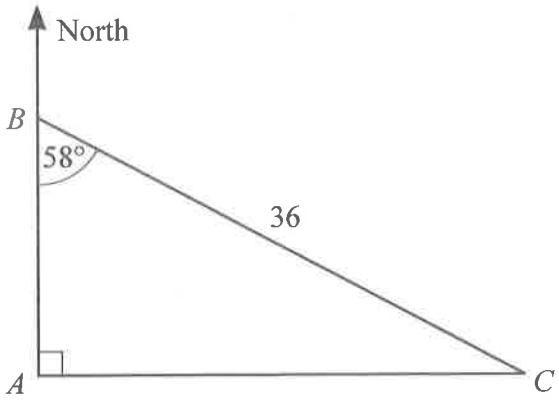
Calculate the shaded area.

$\frac{96}{360} \times \pi(90)^2 - \frac{96}{360} \times \pi(24)^2$

$= 2006.4\pi = 6300 cm^2$ (3sf)

Answer 6300 cm^2 [2]

10



A, B and C are three points on horizontal ground.
Angle $ABC = 58°$, angle $BAC = 90°$ and $BC = 36$ m.

(a) Calculate the distance AC.

$\sin 58 = \frac{AC}{36}$

$AC = 36\sin 58° = 30.5$ (3sf)

Answer $AC =$ 30.5 m [2]

(b) Calculate the perimeter of triangle ABC.

$\cos 58 = \frac{AB}{36}$ $\quad AB = 36\cos 58°$

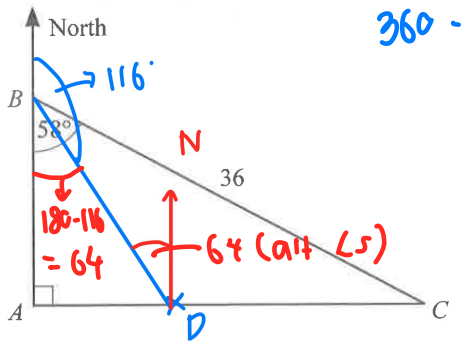
Perimeter $= 36\cos 58° + 36\sin 58° + 36$

$= 89.6$m (3sf)

Answer 85.6 m [2]

(c) The point D is on a bearing of 116° from B.

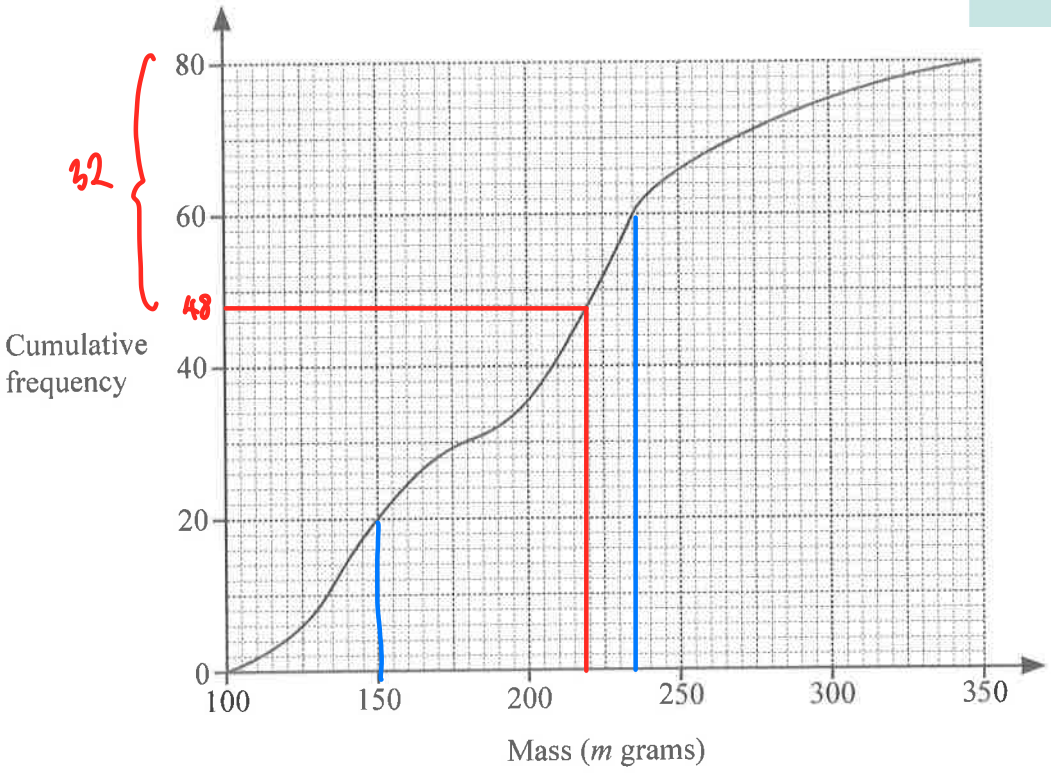
Find the bearing of B from D.



$360 - 64 = 296°$ (∠s at a point)

Answer 296° [1]

11 A group of 80 people estimated the mass, m grams, of a potato.
The cumulative frequency diagram represents their estimates.



(a) Use the diagram to find the interquartile range of the estimated masses.

235 - 150 = 85

Answer ..... 85 ..... g [2]

(b) One of these people is chosen at random.
The probability that the person's estimate is greater than k grams is $\frac{2}{5}$.

Find the value of k. $\frac{2}{5} \times 80 = 32$

Answer $k =$ ..... 220 ..... [2]

12 $D = \frac{a}{b} - bc^2$

(a) Find D when $a = 98.31$, $b = 18.31$ and $c = 0.361$.
Give your answer correct to 2 significant figures.

Answer $D =$ 3.0 [2]

(b) Rearrange the formula to make c the subject.

$bc^2 = \frac{a}{b} - D$

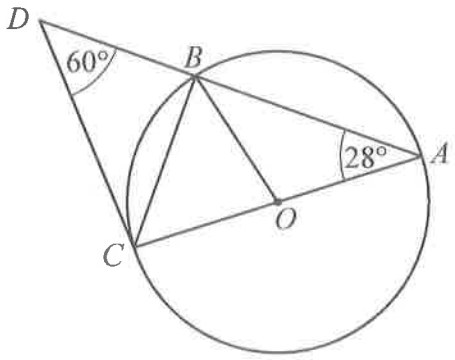
$c^2 = \frac{a}{b^2} - \frac{D}{b}$

$c = \pm\sqrt{\frac{a}{b^2} - \frac{D}{b}}$

-1 if no $\pm$

Answer $c =$ $\pm\sqrt{\frac{a}{b^2} - \frac{D}{b}}$ [3]

13



A, B and C are points on a circle, centre O.
ABD and AOC are straight lines, angle $CAB = 28°$ and angle $BDC = 60°$.

(a) Find angle OBC.
Give a reason for each step of your working.

$\angle BOC = 2 \times 28° = 56°$ ($\angle$ at centre $= 2\angle$ at circumference)

$\angle OBC = \frac{180 - 56}{2} = 62°$ (base $\angle$s of isos. $\triangle$)

[2]

(b) Explain why DC is **not** a tangent to the circle.

$\angle DCA = 180° - 60° - 28° = 92°$ ($\angle$ sum of $\triangle$)

since $\angle DCA \neq 90°$, it is not a tangent since tangent $\perp$ radius.

[1]

14 Solve these simultaneous equations.

$$6x + 5y = 2$$
$$10x - 4y = 65$$

You must show your working.

$6x = 2 - 5y$

$x = \frac{2-5y}{6}$

$10\left(\frac{2-5y}{6}\right) - 4y = 65$

$20 - 50y - 24y = 390$

$-74y = 370$

$y = -5$

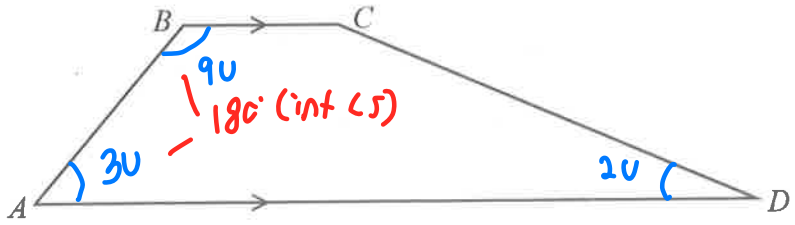
$x = \frac{9}{2}$

Answer $x =$ ..... $\frac{9}{2}$ .....

$y =$ ..... -5 .....

[3]

15



ABCD is a trapezium.
The ratio angle *CBA* : angle *BAD* : angle *ADC* = 9 : 3 : 2.

Find angle *BCD*.

$180(4-2) = 360°$

$120 = 180°$

$9+3+2 = 14u$

$14u = 210°$

$\angle BCD = 360 - 210 = 150°$

Answer Angle *BCD* = ... 150 ..... [3]

---

16 Alice invested some money into an account paying compound interest at 3.2% per year. After 5 years, the money had earned **total interest** of $2132.16 .

Calculate the amount of money Alice invested in the account.

$P(1+\frac{32}{100})^5 = P + 2132.16$

$(1+\frac{32}{100})^5 P - P = 2132.16$

$P = \$12499.99$ (2dp)

Answer $ 12499.99 [3]

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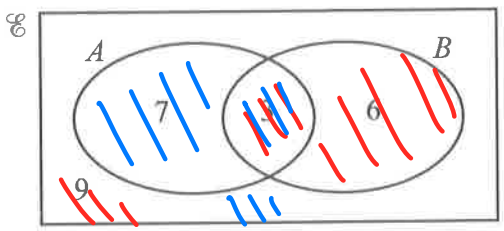
17 The Venn diagram shows the universal set and the number of elements in each of its subsets.



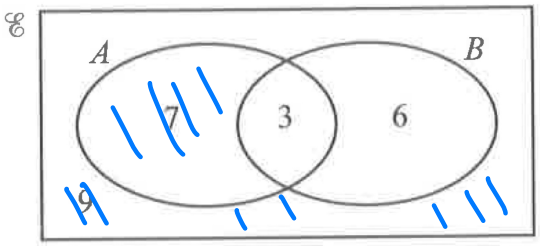
6, 7, 3 are not elements!

Find the value of

(a) $n((A' \cup B) \cap (A \cup B'))$

Answer 12 [1]

(b) $n((A \cap B') \cup (A \cup B)')$



Answer 16 [1]

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18 **(a)** Write 263 in standard form.

Answer 2.63×10^2 [1]

(b) **(i)** Write 3.4×10^{99} in the form $A \times 10^{100}$.

Answer 0.34×10^{100} [1]

(ii) Work out $(4.7 \times 10^{100}) + (3.4 \times 10^{99})$.
Give your answer in standard form.

$4.7 \times 10^{100} + 0.34 \times 10^{100}$
$= 5.04 \times 10^{100}$

Answer 5.04×10^{100} [1]

---

19 Written as a product of its prime factors, $720 = 2^4 \times 3^2 \times 5$.

The highest common factor (HCF) of 720 and N is $2^4 \times 5$.
The lowest common multiple (LCM) of 720 and N is $2^6 \times 3^2 \times 5^3$.

Find the value of N.

$N = 2^6 \times 5^3 = 8000$

Answer $N =$ 8000 [2]

---

20 $\sin(2x°) = 0.561$

Find two possible values of x in the range $0 \leqslant x \leqslant 90$.

$0 \leq 2x < 180°$

$2x = 34.125$ or 145.875

Answer $x =$ 17.1 or $x =$ 72.9° [2]

21 12 24 8 21 28 17 $2p$ $4p^2$

The list shows information about the number of text messages Li received each day for 8 days.

The mean number of text messages per day is 17.5 .

(a) Show that $p = 2.5$.

Answer

$12+24+8+21+28+17+2p+4p^2 = 17.5(8)$

$4p^2+2p+110 = 140$

$4p^2+2p-30 = 0$

$2p^2+p-15 = 0$

$(2p-5)(p+3) = 0$

$p = \frac{5}{2}$ or $p = -3$ (rej -ve)

[3]

(b) The standard deviation for Li's data is 7.89 .

For the same 8 days, Li's sister also received some text messages.
For her data, the mean is 20 and the standard deviation is 9.51 .

By commenting on (1.) the means and (2.) the standard deviations, compare the distributions for the number of text messages received by Li and his sister.

1. The sister received more as her mean is higher (20 > 17.5)

2. Li's messages were more consistent as her s.d was lower (7.89 < 9.51)

[2]

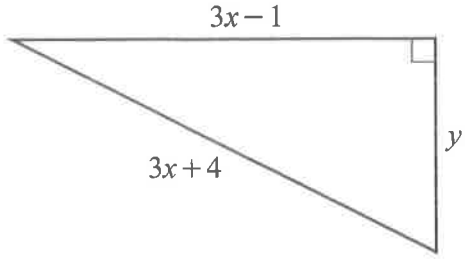
---

22 Expand $(2x-3)(3x^2+2x-5)$.

$6x^3+4x^2-10x-9x^2-6x+15$

$= 6x^3-5x^2-16x+15$

Answer $6x^3-5x^2-16x+15$ [2]



The right-angled triangle has sides $(3x-1)$, $(3x+4)$ and y, where x and y are integers.

(a) Show that y is an odd number.

Answer

By Pythagoras' Theorem,

$(3x+4)^2 = (3x-1)^2 + y^2$

$9x^2 + 24x + 16 = 9x^2 - 6x + 1 + y^2$

$y^2 = 30x + 15$

$y = \sqrt{30x+15}$

Since 3 can be factorised from $30x+15$, this is divisible by 3, hence, $30x+15$ always odd, square root will always be odd

[4]

(b) Find a possible value of y and the corresponding value of x.

Answer $x =$ 7 ..... $y =$ 15 ..... [2]

24 Simplify $\dfrac{3x^2+6x}{x^4-16}$.

$\dfrac{3x(x+2)}{(x^2-4)(x^2+4)} = \dfrac{3x(x+2)}{(x+2)(x-2)(x^2+4)}$

$= \dfrac{3x}{(x-2)(x^2+4)} =$

Answer ..... [3]

---

25 Solve the equation $x^2-12x+17=0$ by completing the square.
Give your solutions correct to 2 decimal places.

$x^2-12x+(-\frac{12}{2})^2-(-\frac{12}{2})^2+17$

$= (x-6)^2-19$

$= 0$

$(x-6)^2 = 19$

$x-6 = \pm\sqrt{19}$

$x = \sqrt{19}+6$ or $-\sqrt{19}+6$

Answer $x =$ 10.36 or 1.64 [3]

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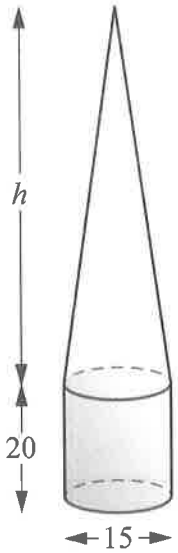
26 (a)



A sealed container is made by joining a cylinder to a cone.
The cylinder has diameter 15 cm and height 20 cm.
The cone has diameter 15 cm and height h cm.

The container is half full of water.
The water exactly fills the cylinder, as shown.

Find the value of h.

$r = 7.5$

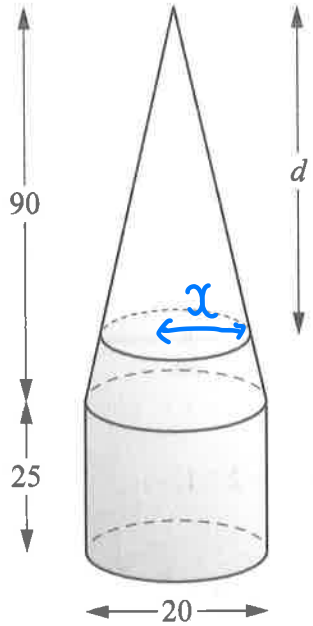
$\pi(7.5)^2(20) = \frac{1}{3}\pi(7.5)^2(h)$

$20 = \frac{1}{3}h$

$h = 60$

Answer $h =$ 60 [2]

(b)



A second container is also made from a cylinder and cone, each with diameter 20 cm. The height of the cylinder is 25 cm and the height of the cone is 90 cm.

The container is half full of water, as shown.

$r = 10$

Calculate the depth, d cm, of the empty space.

$\frac{x}{10} = \frac{d}{90}$

$x = \frac{1}{9}d$

$V_{air} = \frac{1}{3}\pi(\frac{1}{9}d)^2(d) = \frac{1}{243}\pi d^3$

$V_{cone} = \pi(10)^2(25) + \frac{1}{3}\pi(10)^2(90)$

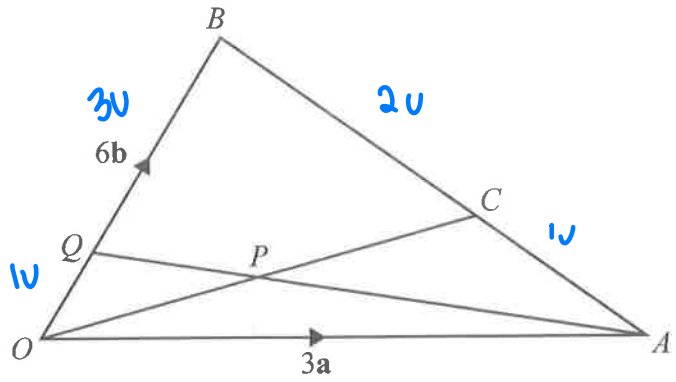
$= 2500\pi + 3000\pi = 5500\pi$

$= \frac{2}{243}\pi d^3$ $\times 2$

$d^3 = 668250$

$d = 87.4$ (3SF)

Answer $d =$ 87.4 [4]



OAB is a triangle.
C is the point on BA such that $BC : CA = 2 : 1$.
$\overrightarrow{OA} = 3\mathbf{a}$ and $\overrightarrow{OB} = 6\mathbf{b}$.

(a) Show that the position vector of C is given by $\overrightarrow{OC} = 2\mathbf{a} + 2\mathbf{b}$.

Answer

$\overrightarrow{BA} = \overrightarrow{BO} + \overrightarrow{OA} = 3\underset{\sim}{a} - 6\underset{\sim}{b}$

$\overrightarrow{BC} = \frac{2}{3}(3\underset{\sim}{a} - 6\underset{\sim}{b}) = 2\underset{\sim}{a} - 4\underset{\sim}{b}$

$\overrightarrow{OC} = \overrightarrow{OB} + \overrightarrow{BC}$

$= 6\underset{\sim}{b} + 2\underset{\sim}{a} - 4\underset{\sim}{b} = 2\underset{\sim}{a} + 2\underset{\sim}{b}$ =

[2]

(b) P is the midpoint of OC and Q is a point on OB such that APQ is a straight line.
$AQ = mAP$ and $OQ = nOB$ where m and n are numbers.

Find the ratio $OQ : QB$.

$\overrightarrow{OP} = \frac{1}{2}(2\underset{\sim}{a} + 2\underset{\sim}{b}) = \underset{\sim}{a} + \underset{\sim}{b}$

$\overrightarrow{AP} = \overrightarrow{AO} + \overrightarrow{OP} = -3\underset{\sim}{a} + \underset{\sim}{a} + \underset{\sim}{b} = \underset{\sim}{b} - 2\underset{\sim}{a}$

$\overrightarrow{AQ} = m(\underset{\sim}{b} - 2\underset{\sim}{a})$ $\quad \overrightarrow{OQ} = n(6\underset{\sim}{b})$

$\overrightarrow{OA} = \overrightarrow{OQ} + \overrightarrow{QA} = 6n\underset{\sim}{b} - m\underset{\sim}{b} + 2m\underset{\sim}{a}$

$= (6n - m)\underset{\sim}{b} + 2m\underset{\sim}{a}$

$= 3\underset{\sim}{a}$

$6n - m = 0$

$2m = 3$

$m = \frac{3}{2}$

$6n = \frac{3}{2}$

$n = \frac{1}{4}$

$\frac{OQ}{OB} = \frac{1}{4}$

$\frac{OQ}{QB} = \frac{1}{3}$

Answer 1 : 3 [4]

(c) The area of triangle $OBC = 25\,cm^2$.

Find the area of triangle OAC.

$\frac{OAC}{OBC} = \frac{\frac{1}{2} \times AC \times h}{\frac{1}{2} \times BC \times h} = \frac{AC}{BC} = \frac{1}{2}$

$\frac{1}{2} \times 25 = 12.5$

Answer 12.5 cm^2 [1]

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