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BOON LAY SECONDARY SCHOOL
PRELIMINARY EXAMINATION
2017

Name	()
Class	

Subject	:	MATHEMATICS SYLLABUS A
Paper No	:	1
Subject Code	:	4045/01
Level	:	SECONDARY FOUR NORMAL ACADEMIC
Date/Day	:	15 AUGUST 2017 (TUESDAY)
Time	:	1030 – 1230
Duration	:	2 HOURS

READ THESE INSTRUCTIONS FIRST

Before you start your exam, check that you have received the correct paper and the number of printed pages are correct.

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

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

Answer **all** 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 in the space below that question.

Omission of essential working will result in loss of marks.

The total marks for this paper is **80**.

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 3.142, unless the question requires the answer in terms of π .

For Examiner's Use

This question paper consists of 18 printed pages.

This section is to be completed by the Examiner.

Question Number	Marks Obtained	Maximum Marks
1		3
2		2
3		2
4		3
5		3
6		3
7		3
8		4
9		5
10		3
11		5
12		4
13		4
14		3
15		4
16		2
17		2
18		3
19		4
20		4
21		6
22		4
23		4
Total		80

Mathematical formulae

Compound Interest

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

Mensuration

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

Answer **all** the questions.

- 1 (a) Find $\sqrt{323}$.

Write down your answer correct to 1 decimal place.

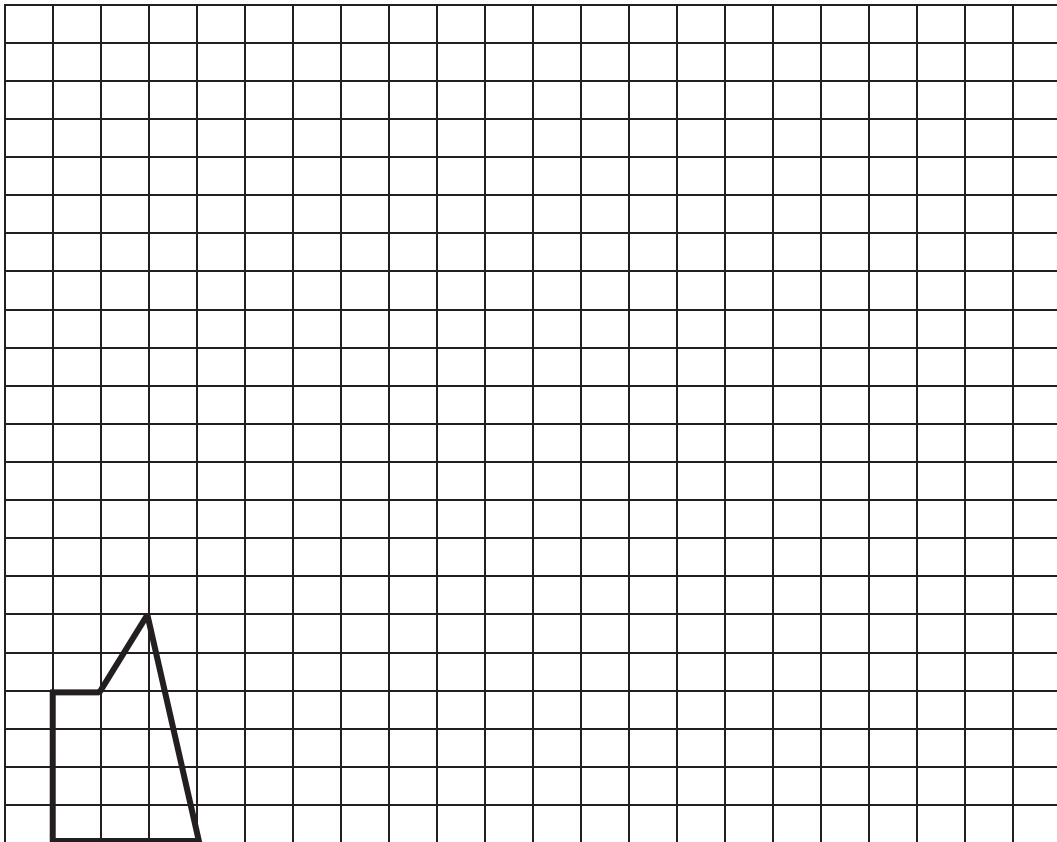
Answer [1]

- (b) By writing each of the value correct to 1 significant figure, estimate the value of

$$\sqrt{\frac{1.99 \times 8.45}{95.1}}. \text{ Show your working.}$$

Answer [2]

- 2 Draw on the grid an enlargement, scale factor 3, of the given figure.



[2]

- 3 Rearrange the equation to make x the subject.

$$V = R - (x - a)$$

Answer [2]

- 4 Solve these simultaneous equations.

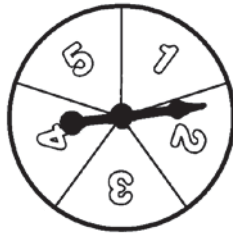
$$3x + 2y = -6$$

$$x - 2y = 8$$

Answer $x =$

$y =$ [3]

5



Qyra spins this fair spinner found at the funfair.
Calculate the probability that it lands on

(a) 4,

Answer [1]

(b) a number greater than 2,

Answer [1]

(c) a prime number.

Answer [1]

6

4, 7, 10, 13,

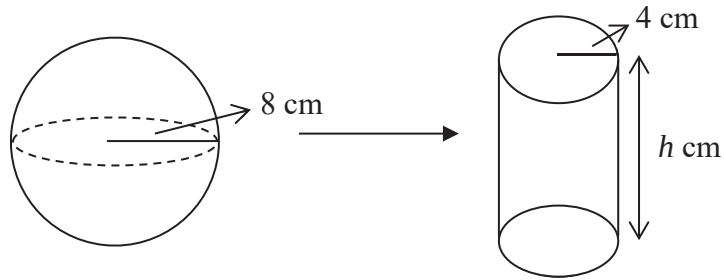
(a) Find an algebraic expression for the n th term in the sequence.

Answer [1]

(b) Show that 487 is a term in the sequence.

Answer [2]

- 7 A solid sphere of radius 8 cm is recast into a solid cylinder of radius 4 cm and height h cm. Find the value of h . (Take $\pi = 3.142$)



Answer $h = \dots\dots\dots$ cm [3]

- 8 Simplify

(a) $\frac{2}{x^2 - 1} - \frac{3}{x + 1},$

Answer $\dots\dots\dots$ [2]

(b) $5(m + 2n) - 4(2m - 3n).$

Answer $\dots\dots\dots$ [2]

- 9 (a)** Factorise completely $40xy - 8y$.

Answer [1]

- (b) (i)** Given that $x^2 - 6x + 15 = (x + a)^2 + b$, find a and b .

Answer $a =$

$b =$ [2]

- (ii)** Hence, or otherwise, solve $x^2 - 6x + 15 = 10$.

Answer $x =$ [2]

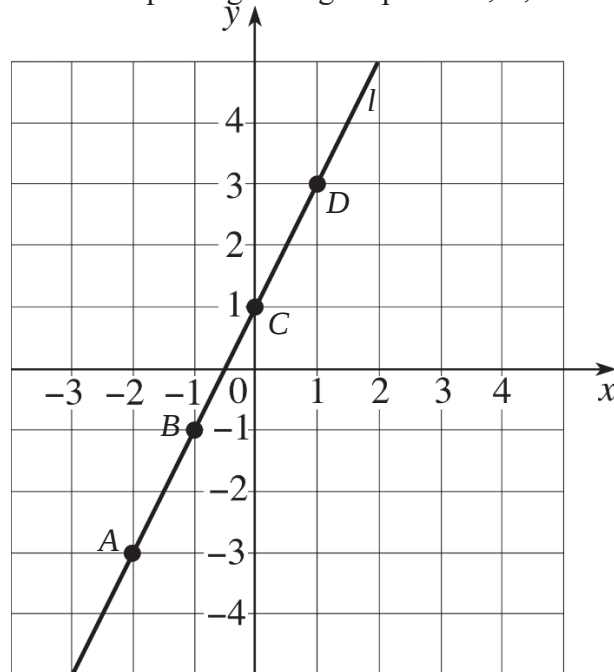
- 10 (a)** Solve $2(5 - x) = 6$.

Answer $x =$ [1]

- (b)** Solve the inequality $\frac{x - 4}{4} < 5$.

Answer [2]

- 11 The graph below shows line l passing through 4 points A , B , C and D .



- (a) The point A has coordinates $(-2, -3)$.
 The x -coordinate of a point E is half that of point A while the y -coordinate is 2 more than that of A .
 Does the point E lie on the line l ? Show your working.

Answer

[2]

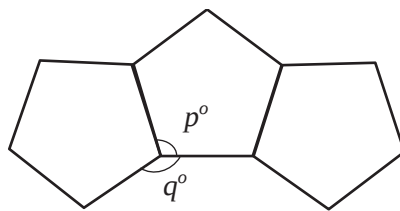
- (b) Find the equation of the line l .

Answer [2]

- (c) A straight line with negative gradient crosses the line l at C . Suggest the equation of this line.

Answer [1]

12



The diagram shows three regular pentagons.

(a) Find the value of

(i) p ,

Answer $p = \dots\dots\dots$ [1]

(ii) q ,

Answer $q = \dots\dots\dots$ [1]

(b) Additional pentagons are added to these three pentagons to form a closed ring surrounding a regular polygon.

What is the total number of pentagons which will form the ring?

Answer $\dots\dots\dots$ [2]

13 A map is drawn with a scale of 1: 25 000.

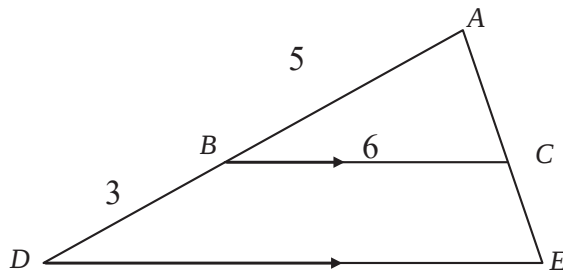
(a) The length of a road on the map is 40 cm. Find its actual length in km.

Answer km [2]

(b) The area of reservoir is 3.2 km^2 . Find the area of the reservoir on the map in cm^2 .

Answer cm^2 [2]

14 In the diagram, ABD and ACE are straight lines and BC is parallel to DE .
 $AB = 5 \text{ cm}$, $BC = 6 \text{ cm}$ and $BD = 3 \text{ cm}$.



(a) Name a pair of similar triangles.

Answer [1]

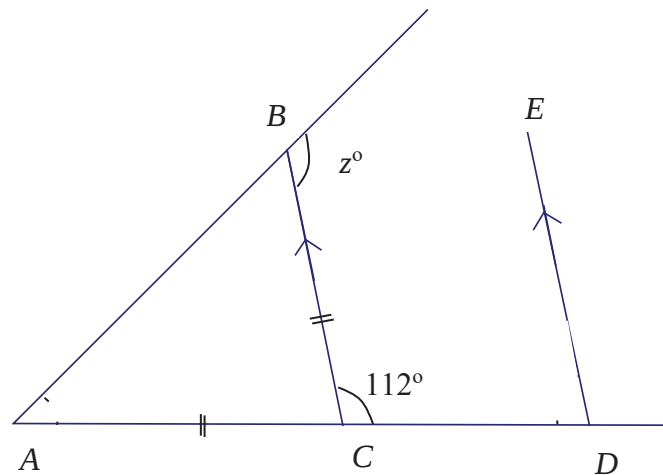
(b) Find the length of DE .

Answer cm [2]

- 15** Gavin went for a holiday to United Kingdom in May. He changed SGD4000 at the exchange rate of SGD 1 = £0.5510 in May (£ = pounds). He spent a total of £1670. When he returned to Singapore in June, he exchanged the remaining pounds (£) back to SGD at the exchange rate of SGD 1 = £0.5709. Calculate the amount lost in SGD from the difference in the exchange rates.

Answer SGD [4]

16



In the diagram, ABC is an isosceles triangle. The point D is on AC produced and DE is parallel to BC .

Show, giving reasons, that the angle z is 124° .

Answer

[2]

- 17 John visits Jolly Fruitshop and has \$5.80 with him.

Jolly Fruitshop	
Apples	40 cents each
Grapes	\$3.50 per kilogram
Banana	\$1.60 per bunch

- (a) Find the greatest number of apples that he can buy.

Answer [1]

- (b) How much money does he need to buy 1 dozen apples, 200g of grapes and 3 bunches of banana?

Answer \$..... [1]

18

Motorists driving less amid high costs and congestion

Annual car mileage



- (a) What feature of the graph makes the claim, “Motorists driving less amid high costs and congestion”, appear to be true?

Answer

[1]

- (b) The annual car mileage in 2014 is 17 500 km. This is a 12% decrease from 2008. Calculate the mileage in 2008.

Answer km [2]

- 19 (a) The numbers 2250 and 3375, written as a product of their prime factors, are

$$2250 = 2 \times 3^2 \times 5^3 \text{ and } 3375 = 3^3 \times 5^3.$$

Use these results to find

- (i) the HCF of 2250 and 3375,

Answer [1]

- (ii) the smallest positive integer value of n for which $2250n$ is a perfect cube.

Answer [1]

- (b) Three buses leave the bus interchange at 6 a.m. The first bus leaves the bus interchange at 9 minute intervals, the second bus at 12 minute intervals and the third bus at 4 minute intervals. At what time will the three buses next leave the terminal together?

Answer [2]

- 20 The stem-and-leaf diagram shows the mass in kg of a group of 20 students.

		<u>Masses (in kg)</u>					
4		2	4	5	6		
5		1	1	2	3	5	8
6		0	0	0	1	3	7
7		0	1	1	2		

Key: 4 2 means 42 kg

- (a) State the modal mass of the students.

Answer kg [1]

- (b) Find the median mass of the students.

Answer kg [1]

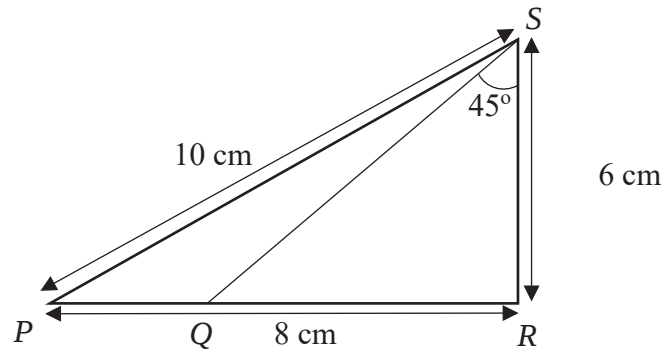
- (c) Melanie told her friends that more than 20% of the students were heavier than 70 kg.

Is this statement correct? Give a reason for your answer.

Answer

[2]

- 21 In the diagram, $SR = 6$ cm, $PR = 8$ cm, $PS = 10$ cm and $\angle QSR = 45^\circ$.



- (a) Show that triangle PRS is a right-angled triangle.

Answer

[2]

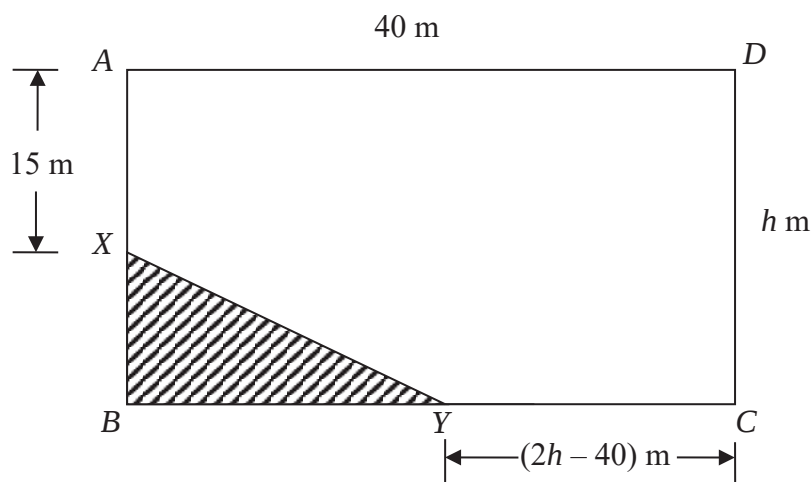
- (b) Calculate the length of QR .

Answer cm [2]

- (c) Calculate $\angle PSQ$.

Answer [2]

- 22 $ABCD$ is a rectangular field. Triangle XY is a portion of the rectangular field that is shaded.



If the perimeter of the field is 140 m , find

- (a) h ,

Answer $h = \dots\dots\dots$ [1]

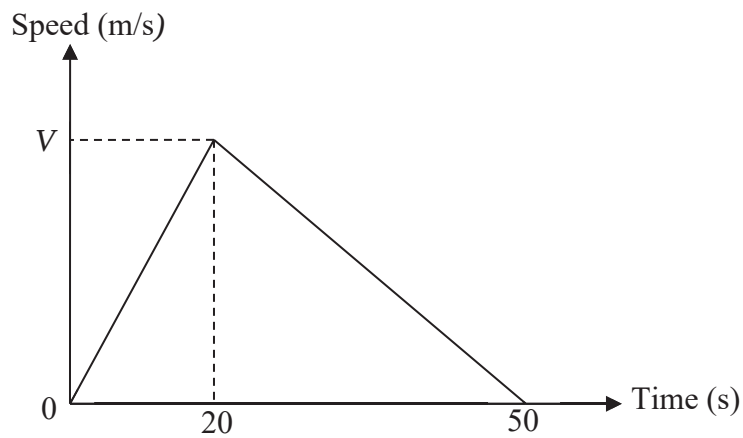
- (b) the area of $ABCD$,

Answer $\dots\dots\dots\text{ m}^2$ [1]

- (c) the area of triangle XY .

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

- 23 The figure below shows the speed-time graph of a man riding an electric bike over a period of 50 seconds.



If the total distance travelled by the electric bike is 300 m, find

- (a) the value of V ,

Answer [1]

- (b) the deceleration of the electric bike in the last 30 seconds,

Answer m/s^2 [1]

- (c) the distance travelled in the first 12 seconds.

Answer m [2]

End of Paper 1



BOON LAY SECONDARY SCHOOL PRELIMINARY EXAMINATION

2017

Name	()
Class	

Subject	:	MATHEMATICS SYLLABUS A
Paper No	:	2
Subject Code	:	4045/02
Level	:	SECONDARY FOUR NORMAL ACADEMIC
Date/Day	:	18 AUGUST 2017 (FRIDAY)
Time	:	1000 -1200
Duration	:	2 HOURS

READ THESE INSTRUCTIONS FIRST

Write your answers and working on the separate Writing Paper provided.

Write your name, class and index number 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.

Section A

Answer **all** questions.

Sections B

Answer **one** question.

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

The total number of marks for this paper is **60**.

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 degree to one decimal place.

For π , use either your calculator or 3.142.

At the end of the examination, fasten all your work securely together.

This question paper consists of 8 printed pages.

Mathematical Formulae

Compound interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

Section A (52 marks)

Answer **all** the questions in this section.

- 1** (a) Factorise completely

$$2ax + 8ay - 3bx - 12by . \quad [2]$$

(b) Simplify $\frac{8}{x^2 + 6x + 9} - \frac{1}{x + 3} . \quad [3]$

- 2** The coordinates of points A and B are (2, 5) and (4, 9) respectively.

(a) Calculate the length of AB. [1]

(b) Find the equation of AB. [2]

(c) Given that the point (k, 3k) lies on the line AB, find the value of k. [1]

- 3** (a) A car dealer bought a car for \$22,500. He sold it for \$29,800.

Calculate his profit as a percentage of the cost price. [2]

(b) Mr Leong bought the car for \$29,800 on hire purchase. He paid a 15% deposit plus 60 monthly payments of \$460 each. What is the total amount he paid for the car? [2]

- 4** (a) Mr Chandra's annual salary was S\$36,000 in the year 2016. Mr Chandra decided to invest 20% of his annual income for 2016 with a bank that pays a compound interest of 1.85% per annum. Calculate the interest earned, correct to the nearest cent, after 5 years. [3]

- (b) In a shop, a necklace is priced at S\$1,250.

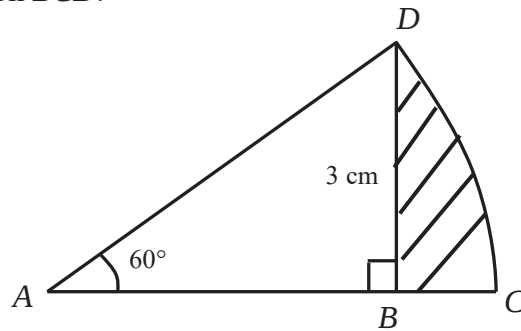
(i) An extra Goods and Services Tax of 7% is charged on it. How much is the necklace sold for? [1]

(ii) A bank exchanged Sterling Pound (£) and Singapore dollars (S\$) at a rate of £1=S\$1.796. Calculate, in pounds, the amount received for S\$1,250. [1]

[Turn over

- 5 In the diagram, $\angle BAD = 60^\circ$ and ADC is a sector of the circle with centre A . If $\angle DBA = 90^\circ$ and $BD = 3$ cm, find

- (a) the length of AB , [1]
 (b) the length of AD , [2]
 (c) the area of the shaded region BCD . [3]



- 6 (a) Simplify $3x^2 \times \left(\frac{1}{x}\right)^{-3} \div (2x)^2$, leaving your answer in its simplest form. [2]
 (b) Given that $4^{2x-3} = 32^{x+5}$, find x . [2]
 (c) Solve the inequality $x + 3 \leq 1 + 2x$. Show your solution on a number line. [3]

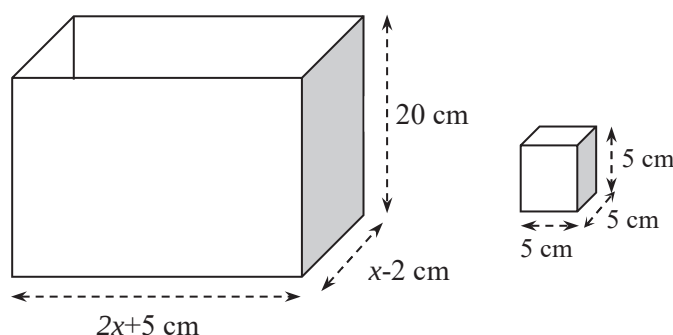
- 7 The dimensions of the tank are $(2x + 5)$ cm by $(x - 2)$ cm by 20 cm and its volume is $16\,200\text{ cm}^3$.

(a) Form an equation in terms of x and show that it reduces to

$$2x^2 + x - 820 = 0. \quad [2]$$

(b) Solve the equation $2x^2 + x - 820 = 0$. [3]

(c) Determine the maximum number of blocks with the dimensions 5 cm by 5 cm by 5 cm that can be placed completely into the tank. [1]



8 Answer the whole of this question on a single sheet of graph paper.

The table of values below is for the curve $y = x^3 - 5x + 2$.

x	-3	-2.5	-2	-1	0	1	2	2.5	3
y	a	-1.1	4	6	2	-2	0	5.1	14

- (a) Find the value of a . [1]
- (b) Using a scale of 2 cm to represent 1 unit on the x -axis and 1 cm to represent 2 units on the y -axis, draw the graph of $y = x^3 - 5x + 2$ for $-3 \leq x \leq 3$. [3]
- (c) Use your graph to find the value of y when $x = -1.5$. [1]
- (d) By drawing a tangent, find the gradient of the curve $y = x^3 - 5x + 2$ when $x = 2$. [2]

[Turn over

- 9 Diagram A shows a metal object called a plumb-bob that is suspended from a string that builders use as a vertical reference line.

Diagram B shows a simplified drawing of the plumb-bob. It is made up of a cylinder and a cone.

The height of the cylinder is 8 cm.

The height of the cone is 5 cm.

The common radius is 2.4 cm.

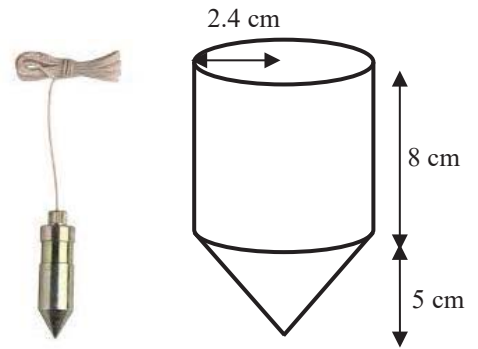


Diagram A

Diagram B

- (a) Calculate the total volume of the plumb-bob. [3]
- (b) Three types of metal are being considered as the material to be used to cast the plumb-bob. The attached string will break when the weight of the plumb-bob exceeds 1.5 kg.

The table shows these metals and their densities.

Metal	Zinc	Copper	Silver
Density (g/cm^3)	7.13	8.96	10.49

Given that density = mass $\div$ volume, which of these metals can be used to the plumb-bob?

Show your working clearly.

[2]

- (c) An engineer wants to purchase 80 plumb-bobs.

He compares the prices from Company X and Company Y.
Which company should he purchase from?

Show your working clearly.

Company X's sales plan	Company Y's sales plan
\$62 basic workmanship fee + \$47.68 per plumb-bob inclusive of 7% GST	\$50 basic workmanship fee + \$46.28 per plumb-bob before 7% GST

[3]

Section B (8 marks)

Answer **one** question from this section. Each question carries 8 marks.

- 10 (a)** The distribution of the weights of 30 students from class 4A is shown in the following table.

Weight, w kg	Frequency
$30 < w \leq 40$	2
$40 < w \leq 50$	8
$50 < w \leq 60$	13
$60 < w \leq 70$	5
$70 < w \leq 80$	2

- (i)** Calculate the mean and standard deviation of the 30 students. [3]

The weights of 30 students in class 4B are also recorded.

The mean weight is 56.2 kg and the standard deviation is 19.7 kg.

- (ii)** Which class of students weigh heavier? Give your reason. [1]

- (iii)** Which class of students has a more consistent weight? Give your reason. [1]

- (b)** A bag contains 5 green cards and 10 white cards. Jame picks two cards from the bag without replacement.

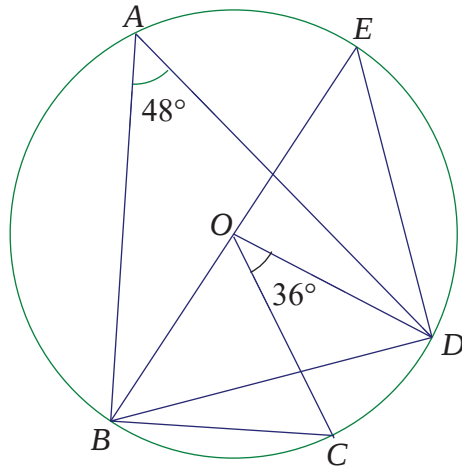
What is the probability that Jame chooses

- (i)** one green card and one white card, [2]

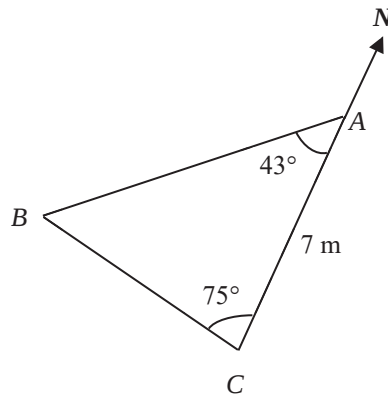
- (ii)** two cards of the same colour. [1]

[Turn over

- 11 (a) In the diagram, A, B, C, D and E are points on the circumference of a circle with centre O . It is given that $\angle DOC = 36^\circ$ and $\angle BAD = 48^\circ$.



- (i) Explain why $\angle BED = 48^\circ$. [1]
- (ii) Find $\angle CBD$. [1]
- (iii) Given that the radius of the circle is 6 cm and $DE = 5$ cm, find BD . [2]
- (b) In the diagram shown below, A, B , and C are three points on level ground. Point A is due north of C , with $AC = 7$ m, $\angle ACB = 75^\circ$ and $\angle CAB = 43^\circ$.



- (i) Show that the length of AB is 7.7 m. [3]
- (ii) Calculate the bearing of B from A . [1]

*****End of Paper*****

Qn	Part	Solutions	Marks
1	(a) (b)	$\sqrt{323} = 18.0$ (1 dp) $\sqrt{\frac{1.99 \times 8.45}{95.1}} = \sqrt{\frac{2 \times 8}{100}} = \sqrt{\frac{4}{25}}$ $= \frac{2}{5}$ or 0.4	B1 M1 A1
2			B1 for at least 3 sides – correct length and orientation
3		$V = R - (x - a)$ $V = R - x + a$ $x = R + a - V$	M1 A1
4		$3x + 2y = -6$ (1) $x - 2y = 8$ (2) From (2): $x = 8 + 2y$ (3) Sub (3) into (1) $3(8 + 2y) + 2y = -6$ $y = -\frac{15}{4}$ Sub $y = -\frac{15}{4}$ into (3) $x = 8 + 2\left(-\frac{15}{4}\right)$ $x = \frac{1}{2}$	M1 M1 Substitution leading to a solution for x or y A1

5	(a)	$\frac{1}{5}$	B1
	(b)	$\frac{3}{5}$	B1
	(c)	$\frac{3}{5}$	B1
6	(a)	$3n + 1$	B1
	(b)	$3n + 1 = 487$ $n = 162$	M1
		As n is an integer, 487 is a term in the sequence.	A1
7		$\frac{4}{3}\pi(8)^3 = \pi(4)^2 h$	M1
		$h = \frac{\frac{4}{3}\pi(8)^3}{\pi(4)^2}$	M1
		$h = 42\frac{2}{3} / 42.7cm$	A1
8	(a)	$\frac{2}{x^2 - 1} - \frac{3}{x + 1}$ $= \frac{2}{(x - 1)(x + 1)} - \frac{3}{x + 1}$ $= \frac{2 - 3(x - 1)}{(x - 1)(x + 1)}$ $= \frac{2 - 3x + 3}{(x - 1)(x + 1)}$ $= \frac{5 - 3x}{(x - 1)(x + 1)}$	M1
	(b)	$5(m + 2n) - 4(2m - 3n)$ $= 5m + 10n - 8m + 12n$ $= 22n - 3m$	A1
			M1 A1
9	(a)	$40xy \Rightarrow 8y \neq 8y(5x - 1)$	B1
	(b)	(i) $x^2 - 6x + 15$ $= x^2 - 6x + \left(\frac{6}{2}\right)^2 + 15 - \left(\frac{6}{2}\right)^2$ $= (x - 3)^2 + 6$ $a = -3, b = 6$	B1, B1
		(ii) $x^2 - 6x + 15 = 10$ $(x - 3)^2 + 6 = 10$ $(x - 3)^2 = 4$ $x - 3 = \pm 2$ $x = 1 \text{ or } x = 5$	M1 A1

10	(a)	$2(5 - x) = 6$ $10 - 2x = 6$ $2x = 4$ $x = 2$	B1
	(b)	$\frac{x-4}{4} < 5$ $x - 4 < 20$ $x < 24$	M1 A1
11	(a)	Co-ordinates of point E is $(-1, -1)$ which is the same as point B and hence, it lies on line l .	B1 B1
	(b)	Gradient = $\frac{3-1}{1-0} = 2$ $y = 2x + 1$	M1 A1
	(c)	$y = -2x + 1$ or any other suitable equation with negative gradient & y-int = 1.	B1
12	(a)	(i) $p = \frac{(5-2)}{5} \times 180^\circ = 108^\circ$	B1
		(ii) $q = 360^\circ - 2(108^\circ) = 144^\circ$	B1
	(b)	$\frac{(n-2)}{n} \times 180^\circ = 144^\circ$ $180n - 360 = 144n$ $180n - 144n = 360$ $36n = 360$ $n = 10$	M1 A1
13	(a)	$1 : 25\,000$ $= 1\text{ cm} : 0.25\text{ km}$ $= 40\text{ cm} : 0.25 \times 40\text{ km}$	M1 A1
	(b)	$= 40\text{ cm} : 10\text{ km}$ Area Scale $= (1\text{ cm} : 0.25\text{ km})^2$ $= 1\text{ cm}^2 : 0.0625\text{ km}^2$ $= 1 \times \frac{3.2}{0.0625} : 3.2\text{ km}^2$ $= 51.2\text{ cm}^2 : 3.2\text{ km}^2$	M1 A1
14	(a)	$\triangle ABC$ and $\triangle ADE$	B1
	(b)	$\frac{DE}{BC} = \frac{AD}{AB}$ $\frac{DE}{6} = \frac{8}{5}$ $DE = 9.6\text{ cm}$	M1 A1
15	(a)	Money exchanged = 4000×0.551 $= \text{£}2204$	M1
	(b)	Amount left = $2204 - 1670 = \text{£}534$	M1
		Lost in exchange = $\frac{534}{0.5510} - \frac{534}{0.5709}$ $= \text{SGD } 33.78$	M1 A1

16		$\angle ACB = 180^\circ - 112^\circ = 68^\circ$ (angles on a straight line) $\angle ABC = y = \frac{180^\circ - 68^\circ}{2}$ (isos Δ) $\angle ABC = 56^\circ$ (isos Δ) $z = 180^\circ - 56^\circ$ (angles on a straight line) $z = 124^\circ$ (shown)	M1 A1
17	(a) (b)	$\frac{5.8}{0.4} = 14.5$ Greatest number is 14 $\text{Total} = 12(0.4) + \frac{3.5}{5} + 3(1.6) = \10.30	B1 B1
18	(a) (b)	The graph is downward slope to indicate car mileage decreased $\frac{100}{100-12} \times 17500$ $= 19886$ $= 19900$ (3 sig fig)	B1 M1 A1
19	(a) (b)	(i) $HCF = 3^2 \times 5^3 = 1125$ (ii) $2250n = 2^3 \times 3^3 \times 5^3$ $n = \frac{2^3 \times 3^3 \times 5^3}{2 \times 3^2 \times 5^3} = 12$ $4 = 2^2$ $9 = 3^2$ $12 = 2^2 \times 3$ $LCM = 2^2 \times 3^2 = 36$ Time: 6.36 a.m.	B1 B1 M1 A1
20	(a) (b) (c)	60 kg $\frac{58+60}{2} = 59 \text{ kg}$ $\frac{3}{20} \times 100 = 15\%$ Not true. Only 15% of the students weigh more than 70 kg	B1 B1 M1 A1
21	(a) (b)	$PS^2 \leq 10^2 = 100$ $SR^2 + PR^2 = 6^2 + 8^2 = 100$ By Pythagoras' theorem, ΔPSR is a right angled triangle $\tan 45^\circ = \frac{QR}{6}$ $QR = 6 \tan 45^\circ = 6 \text{ cm}$	M1 A1 B1
	(c)	$\tan \angle PSR = \frac{8}{6}$ $\angle PSR = 53.130^\circ$ $\angle PSQ = 53.130^\circ - 45^\circ = 8.1^\circ$	M1 A1

22	(a)	$h + h + 40 + 40 = 140$ $h = 30 \text{ m}$	B1
	(b)	$40 \times 30 = 1200 \text{ m}^2$	B1
	(c)	$\frac{1}{2}[40 - (2(30) - 40)] \times (30 - 15)$ $= 150 \text{ m}^2$	M1 A1
23	(a)	$\frac{1}{2} \times 50 \times V = 300$ $V = 12$	B1
	(b)	$\frac{12}{50 - 20} = 0.4 \text{ m/s}^2$	B1
	(c)	$\frac{x}{12} = \frac{12}{20}$ $x = 7.2$ $\text{Distance} = \frac{1}{2} \times 12 \times 7.2 = 43.2 \text{ m}$	M1 A1

Answer Key

1 (a) $(2a - 3b)(x + 4y)$

(b) $\frac{5-x}{(x+3)^2}$

2 (a) 4.47 (3sf) (b) equation of AB is $y = 2x + 1$ (c) $k = 1$

3 (a) Profit % = 32.4% (b) Total amount paid = \$32070

4 (a) Amount = \$7891.10 Interest earned = \$691.10

(b)(i) \$ 1337.50 (ii) 695.99 Pound

5 (a) $AB = 1.73 \text{ cm}$ (3sf) (b) $AD = 3.46 \text{ cm}$ (3sf) (c) Area = 3.69 cm^2 (3sf)

6 (a) $\frac{3x^3}{4}$ (b) $x = -31$ (c) $x \geq 2$

7 (a) $(2x + 5)(x - 2)(20) = 16200$
 $\therefore 2x^2 + x - 820 = 0$

(b) $x = 20$ or $x = -20.5$

(c) Since $x = 20 \text{ cm}$ $\therefore$ Dimension of the box is 45cm by 18cm by 20cm

$\Rightarrow$ No of blocks required = $9 \times 3 \times 4 = 108$

8 (a) $a = -10$ (b) $y = 6 (\pm 0.4)$ (d) gradient = $6.67 (\pm 0.5)$

9 (a) $\cancel{\text{Total volume}} = \pi r^2 h + \frac{1}{3} \pi r^2 h$
 $= 144.764 + 30.159$
 $= 174.92$
 $= 175 \text{ cm}^2$ (3sf)

(b) Mass when casted in Zinc = $7.13 \times 174.9 = 1247.037 \text{ g}$
 Mass when casted in Copper = $8.96 \times 174.9 = 1567.104 \text{ g}$
 Mass when casted in Silver = $10.49 \times 174.9 = 1834.701 \text{ g}$
 Since 1.25 kg is less than 1.5 kg. Zinc should be used to cast the plump-bob.

(c) Total cost for company X = $62 + (80 \times 47.68) = \$ 3876.40$
 Total cost for company Y = $50 + (80 \times 1.07 \times 46.28) = \$ 4011.57$
 $\therefore$ Company X was cheaper than Company Y.

10 (a) (i) Mean = 54 kg SD = 9.78 kg (ssf)

(ii) Class 4B students weight heavier because the mean weight of 56.2 kg is greater than 54 kg.

(iii) The weight of the Class 4A students is more consistent since its SD 9.78 kg Is less than 19.7 kg

(b) (i) P(one green & one white)

$$= \left(\frac{5}{15} \times \frac{10}{14} \right) + \left(\frac{10}{15} \times \frac{5}{14} \right)$$

$$= \frac{10}{21}$$

(ii) P (two cards of the same colour)

$$= 1 - \frac{10}{21}$$

$$= \frac{11}{21}$$

11 (a) (i) angles in the same segment.

(ii) angle CBD = $\frac{1}{2}$ angle COD (angles at the centre = 2 angle at the circumference)

$$= \frac{36}{2} = 18^\circ$$

(iii) angle BDE = 90° (angle in semicircle)

In triangle BDE, By Pythagoras' Thm

$$BD^2 = 12^2 - 5^2$$

$$BD = \sqrt{119} = 10.9 \text{ cm (3sf)}$$

(b) (i) angle ABC = $180^\circ - 43^\circ - 75^\circ = 62^\circ$

By Sine rule $\frac{AB}{\sin 75} = \frac{7}{\sin 62}$

$$AB = 7.7 \text{ m (proven)}$$

(ii) The bearing of B from A

$$= 180^\circ + 43^\circ$$

$$= 223^\circ$$

*****End of Paper*****