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WOODLANDS RING SECONDARY SCHOOL

Name : _____ Reg No. _____ Class : _____

EXAMINATION : PRELIMINARY EXAMINATION

LEVEL : SECONDARY 4 NORMAL ACADEMIC DATE: 07 Aug 2018

SUBJECT : MATHEMATICS (4045/1) PAPER: 1

DURATION : 2 hours MAX MARKS: 80

SETTER(S) : Mrs Sharon Sim Parent's/Guardian's Signature:

INSTRUCTIONS TO CANDIDATES

Write your name, class and register number on all the work you hand in.

Write in dark blue or black pen in the spaces provided on the Question Paper.

You may use a pencil for any diagrams or graphs.

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 with the answer.

Omission of essential working will result in loss of marks.

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.

For Examiner's Use

/80

This paper consists of **16** printed pages including the cover page.

Mathematical Formulae*Compound interest*

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

Mensuration

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

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

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

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

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

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

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

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 By writing each value correct to 1 significant figure, estimate the value of

$$\frac{36.71 \times 2.88}{\sqrt{143.9} - 1.85}$$

Show your working.

Answer [2]

- 2 (a) Express 540 as a product of its prime factors.

Answer [1]

- (b) Given that $3375 = 3^3 \times 5^3$, find the highest common factor and lowest common multiple of 540 and 3375.

Answer HCF = [1]

LCM = [1]

- (c) Find the smallest integer a such that $540a$ is a perfect square.

Answer $a =$ [1]

- 3 (a) Express 85 km/h in m/s, giving your answer correct to 4 significant figures.

Answer m/s [2]

- (b) A train started its journey at a speed of 75 km/h for 1.5 hours.
It then travelled for 2.5 hours at x km/h.
Given that the average speed of the train for the entire journey was 85 km/h, find the value of x .

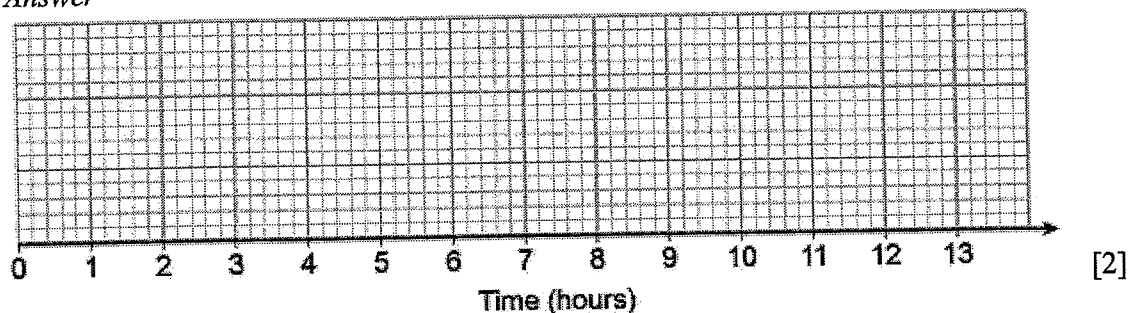
Answer $x =$ [3]

- 4 The following shows some information about the length of time cars stayed in a car park.

Shortest time	30 minutes	Lower quartile	2 hours
Longest time	12 hours	Interquartile range	3 hours
		Median	4 hours

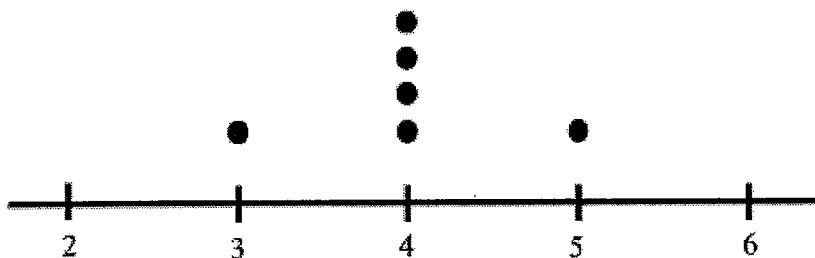
Draw a box-and-whisker plot to represent this information.

Answer



5

- 5 (a) A symmetrical dot diagram is used to represent a set of 6 data values as shown.



This set of data has mean = median = mode = 4.

Draw an asymmetrical (non-symmetrical) dot diagram below with 6 data values using the number line below, such that the mean, median and mode are the same as the above diagram.

Answer



[2]

- (b) State the appropriate sign ($<$, $=$ or $>$) in the statement below.

Answer

The standard deviation of the symmetrical diagram is the standard deviation of the asymmetrical diagram.

[1]

6

Pancake Recipe

30 g butter
300 ml milk
225 g plain flour
2 large eggs

Makes 15 pancakes

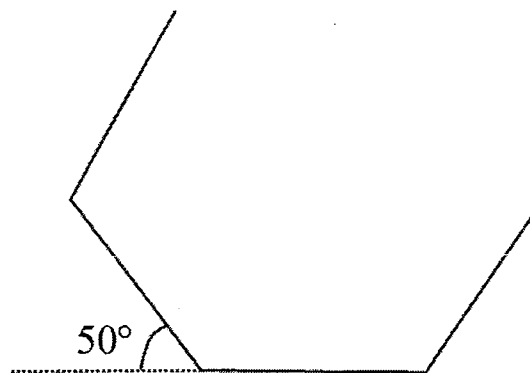
Sean wants to use the above recipe to make 28 pancakes.

How many grams of plain flour will he need?

Answer g [2]

6

7



Ian says that this diagram is part of a regular polygon.
Is he correct?
Show your working.

Answer

 [2]

8 (a) Factorise $25x^2 - 121$.

Answer [1]

(b) Solve $\frac{25x^2}{121} - 1 = 0$.

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

- 9 (a) Given that $3^f = 3^5 \times 3^{-2}$, find f .

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

- (b) Simplify $\sqrt[3]{a^2} \div \sqrt{a^3}$. Leave your answer in positive index notation.

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

- 10 Solve the following simultaneous equations.

$$2x + 3y = 48$$

$$4x + y = 36$$

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

- 11 Solve $x^2 - 8x + 14 = 0$, leaving your answers correct to 2 decimal places.

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

- 12 A number is chosen randomly from 2-digit numbers that are less than 30. What is the probability that it will be a prime number?

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

- 13 The body mass index, *BMI*, for a person of mass m kg and height h metres is given by the formula

$$BMI = \frac{m}{h^2}$$

Tony has a mass of 50 kg and height of 157 cm.

- (a) Calculate Tony's *BMI*.

Answer [2]

A *BMI* above 23 indicates that the mass is outside of the healthy range.
Tom's height is 1.80 m.

- (b) What is the maximum mass that Tom should have so that he is within the healthy range?

Answer kg [2]

- 14 c is directly proportional to d^2 . It is given that $c = 20$ when $d = 5$.
(a) Find an expression for c in terms of d .

Answer [2]

- (b) Find the value of c when $d = 8$.

Answer $c =$ [1]

15 A plan of a playground is drawn on a scale 1 : 120.

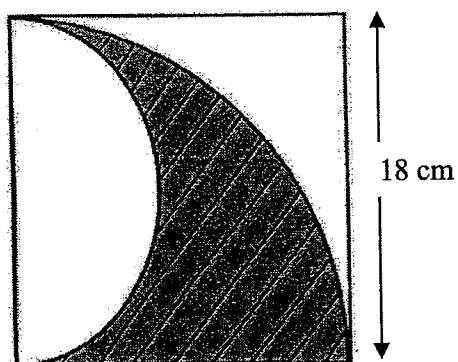
- (a) The actual length of the playground is 60 m.
How long is the length of the playground in metres, on the plan?

Answer m [1]

- (b) The area of the playground on the plan is 1000 cm^2 .
What is the actual area, in square metres, of the playground?

Answer m^2 [2]

- 16 The figure below shows a square of sides 18 cm.
It contains a pattern made up of a semicircle and a quadrant.
Calculate the perimeter of the shaded region, leaving your answer in the form $a + b\pi$.



Answer cm [3]

17 The first five terms of a sequence are 4, 10, 16, 22, 28, ...

- (a) Write down an expression, in terms of n , for the n^{th} term of the sequence.

Answer [1]

- (b) Find the 40th term of the sequence.

Answer [1]

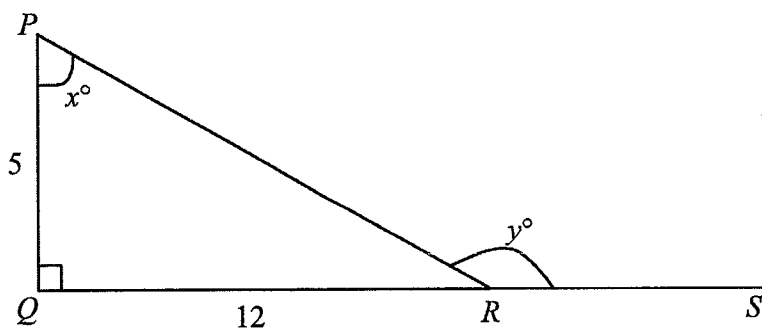
18 (a) Gary bought a shirt for \$95. He then sold it to David for \$120. Express the profit Gary made as a percentage of what he paid for it.

Answer % [2]

- (b) David then sells it to Mark at a loss of 10% of what he paid for. How much did Mark pay for the shirt?

Answer \$ [2]

19



In the diagram above, PR is a straight line, $PQ = 5$ cm, $QR = 12$ cm and $\angle PQR = 90^\circ$.

(a) Write, in terms of a fraction in its simplest form, the value of

(i) $\tan x^\circ$,

Answer [1]

(ii) $\sin y^\circ$

Answer [2]

(iii) $\cos y^\circ$

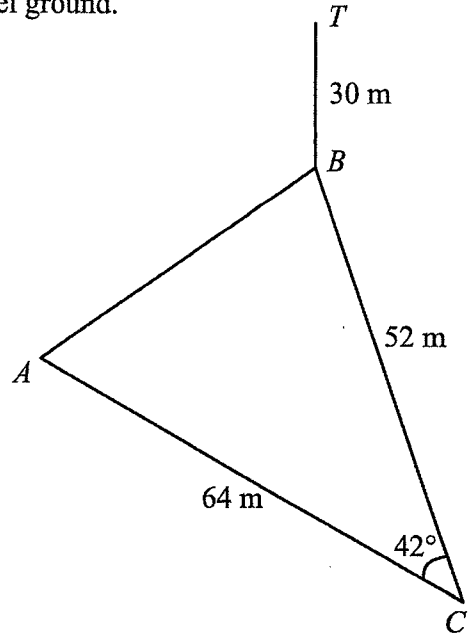
Answer [1]

(b) Calculate the shortest distance from Q to the line PR .

Answer cm [2]

- 20 In the diagram, A , B and C are three points on level ground.
 $AC = 64$ m, $BC = 52$ m and $\angle ACB = 42^\circ$.

(a) Calculate the length of AB .



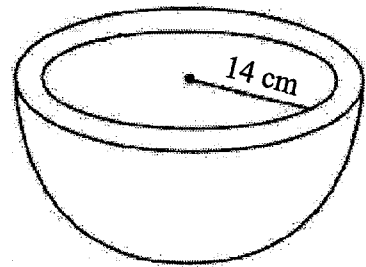
Answer m [3]

- (b) There is a tower T , height 30 m, on point B .
 Calculate the angle of elevation of the top of the tower from A .

Answer $^\circ$ [2]

- 21 The diagram shows a hemispherical bowl of thickness 1 cm.

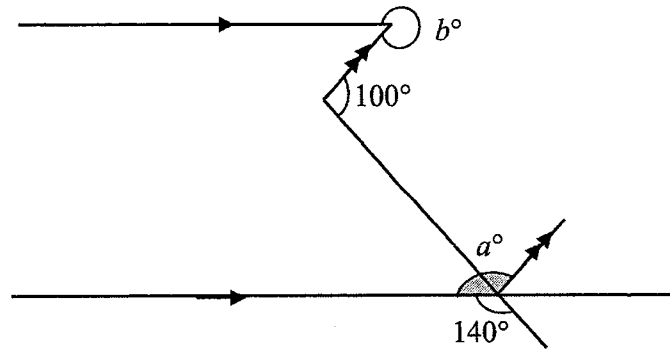
Calculate the volume of the material of the bowl.



Answer cm^3 [2]

14

22



In the diagram, there are two pairs of parallel lines.

Giving your reasons clearly, find the values of

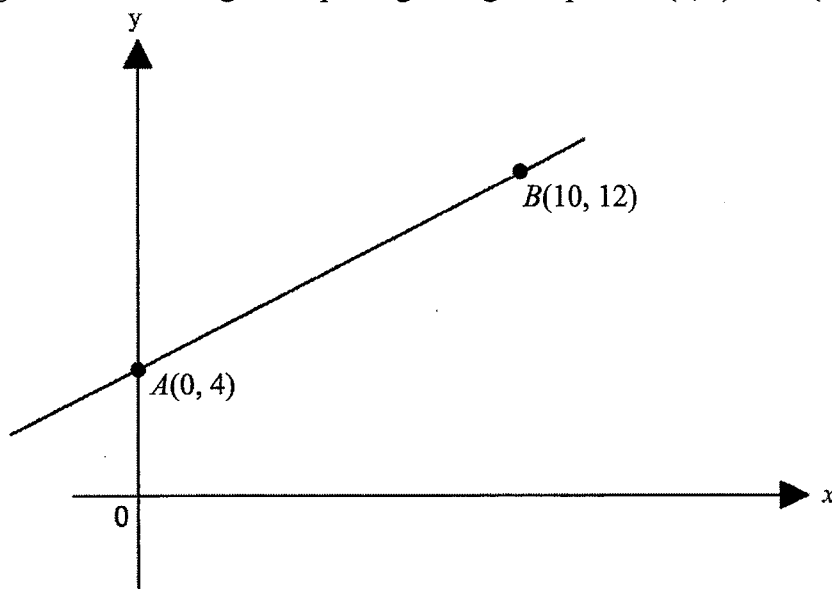
(a) a ,

Answer $a = \dots\dots\dots$ [2]

(b) b .

Answer $b = \dots\dots\dots$ [2]

- 23 The diagram shows a straight line passing through the points $A(0, 4)$ and $B(10, 12)$.



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

Answer [1]

- (b) Write down the equation of the line AB .

Answer [1]

- (c) Calculate the length of the line segment AB .

Answer units [2]

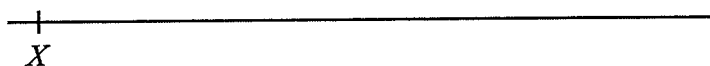
- (d) Another line, parallel to the y -axis and passing through the point $(4, 8)$ meets AB at point C .
Find the coordinates of point C .

Answer (.....,) [2]

- 24 In triangle XYZ , $XY = 5.5$ cm, $XZ = 6.2$ cm and $YZ = 9$ cm.
The point X has already been drawn on the line.
Construct

- (a) triangle XYZ accurately, [2]
- (b) the perpendicular bisector of the line XZ and [1]
- (c) the angle bisector of $\angle ZXY$. [1]

Answer



[END OF PAPER]



WOODLANDS RING SECONDARY SCHOOL

Name : _____ Reg No. _____ Class : _____

EXAMINATION : PRELIMINARY EXAMINATION

LEVEL : SECONDARY 4 NORMAL ACADEMIC DATE: 13 Aug 2018

SUBJECT : MATHEMATICS (4045/2) PAPER: 2

DURATION : 2 hours MAX MARKS: 60

SETTER(S) : Mdm Sri Ratinawati Parent's/Guardian's Signature: _____

INSTRUCTIONS TO CANDIDATES

Write your answers and working on the separate answer papers provided.

Write your name, class and register number on all the work you hand in.

Write in dark blue or black pen on both sides of the paper.

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Section A

Answer **all** questions.

Section B

Answer **one** question.

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

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.

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

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*Mathematical Formulae**Compound interest*

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Section A (52 marks)Answer **all** the questions in this section.

- 1 A scientist models the population of a colony of penguins using the formula, $P = 8000 \times 0.93^t$, where t is the number of years after 2015.

(a) Write down the value of P in 2015. [1]

(b) Find the number of penguins that the model predicts there will be in 2018. Give your answer correct to the nearest whole number. [1]

- 2 (a) It takes 2 groundsmen 180 minutes to cut the grass of a cricket ground. 8 groundsmen have been hired to cut the grass of a cricket ground on a Sunday at 12.55 pm.

Assuming all the groundsmen work at the same rate, at what time will they finish the task? [2]

(b) Using the formula

$$v = u + at,$$

find the value of u when $t = 3$, $a = 0.5$ and $v = 13.2$. [2]

- 3 Benny has \$6000, which he wants to invest for three years. He is choosing between two savings accounts which pay compound interest.

Account 1

2.5% per annum

Fixed for 3 years

Account 2

Year 1: 1.0% per annum

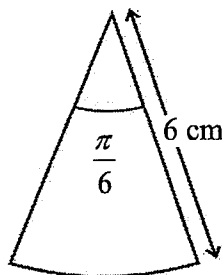
Year 2: 1.5% per annum

Year 3: 5.0% per annum

Which account should he choose if he wants to receive the greatest possible amount of interest? Show working to support your answer. [4]

4

- 4 The diagram shows a sector of a circle.



Find, leaving your answer in terms of π ,

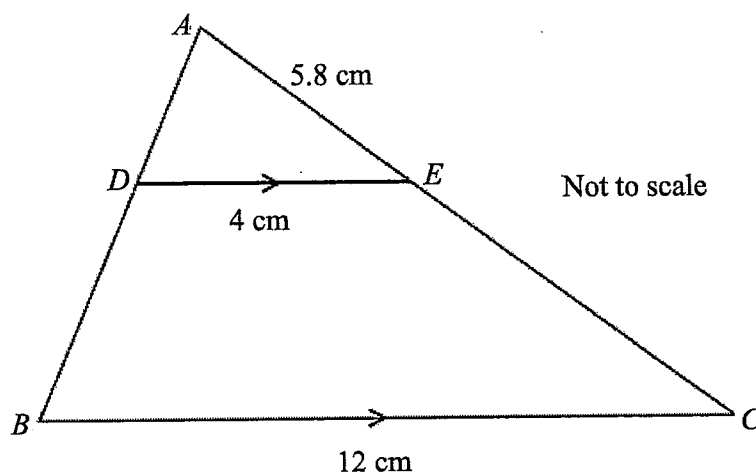
- (a) the perimeter of the sector,

[2]

- (b) the area of the sector.

[2]

- 5 In the diagram, BC is parallel to DE .



- (a) Prove that triangle ABC is similar to triangle ADE .

[2]

- (b) Calculate the length of EC .

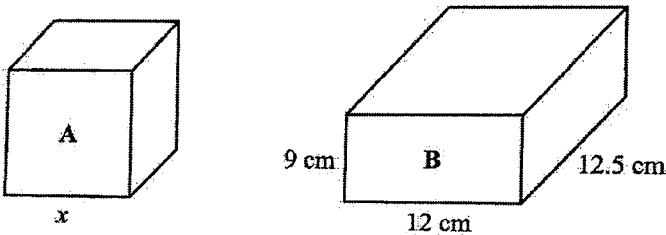
[3]

- 6 The table summarises the marks of 200 students of Woodlands Ring Secondary School in the last Mathematics examination.

Mark (x)	$0 < x \leq 10$	$10 < x \leq 20$	$20 < x \leq 30$	$30 < x \leq 40$	$40 < x \leq 50$
Frequency	10	20	55	68	47

- (a) Find estimates for the mean and the standard deviation of these marks. [3]
 Greendale Secondary School sat the same examination.
 For Greendale Secondary School, the mean mark was 33.2 and the standard deviation was 14.7.
- (b) Which school had the better marks? [1]
 Give a reason for your answer.
- (c) Which school had the more consistent marks? [1]
 Give a reason for your answer.

- 7 Figure A shows a cube of length x cm.
 Figure B shows a cuboid of dimensions 9 cm by 12 cm by 12.5 cm.



- It is given that Volume of A : Volume of B = 3 : 2.
 Find the value of x . Give your answer correct to two decimal places. [5]

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

The variables x and y are connected by the equation $y = x^2 - 3x + 2$. Some corresponding values of x and y are given in the following table.

x	-2	-1	0	1	2	3	4	5
y	12	p	2	0	q	2	6	12

(a) Find the value of p and of q . [2]

(b) Draw the graph of $y = x^2 - 3x + 2$ for $-2 \leq x \leq 5$.

Use a scale of 2 cm to represent 1 unit on the horizontal x -axis and 1 cm to represent 1 unit on the vertical y -axis. [3]

(c) By drawing a tangent, find the gradient of the curve at $x = 3$. [2]

9 (a) Simplify $\frac{4x}{y^4 z^4} \div \frac{2}{y^2 z^3}$. [2]

(b) Factorise fully $2x^2 + 22x + 48$. [2]

(c) (i) By completing the square, $x^2 + 8x - 5$ can be expressed in the form $(x + p)^2 + q$.

Find p and q . [2]

(ii) Hence, or otherwise, solve $x^2 + 8x - 5 = 0$. [2]

10 Jimmy has been asked to paint the wooden table tops and sides on the outdoor tables at the café he works at. There are 20 tables to be painted. Each table has a cylindrical top with a diameter of 90 cm and is 3 cm thick. He has a 2.5 litre tin of paint with the following guidelines.

Covers 12 m² per litre
Allow 2 coats.

(a) Can he paint all of the tables using the tin of paint? You must show your working.

(b) State an assumption that you made when calculating your answer in part (a). [5]

(c) Jimmy claims that using natural bristle brush tends to absorb water-based products, which increases the amount of paint being applied by 10%. [1]

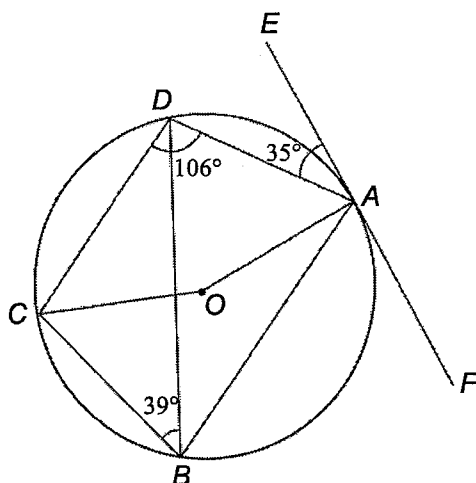
Do you think 2.5 litre tin of paint is sufficient? Verify with numerical calculations.

[2]

Section B (8 marks)

Answer **one** question from this section.

- 11 (a) A, B, C and D are points on the circumference of a circle centre O .
 EF is a tangent to the circle at A . Angle $EAD = 35^\circ$, angle $CDA = 106^\circ$ and angle $DBC = 39^\circ$.



Calculate

(i) angle OAD ,

[1]

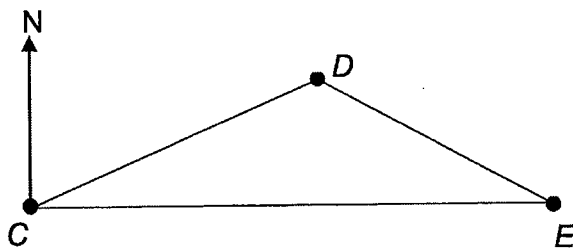
(ii) angle ABD ,

[1]

(iii) angle DCO .

[2]

- (b) During an orienteering competition, Martini runs 457 m on a bearing of 060° from Checkpoint C to Checkpoint D . She then runs 350 m to Checkpoint E due east of Checkpoint C .

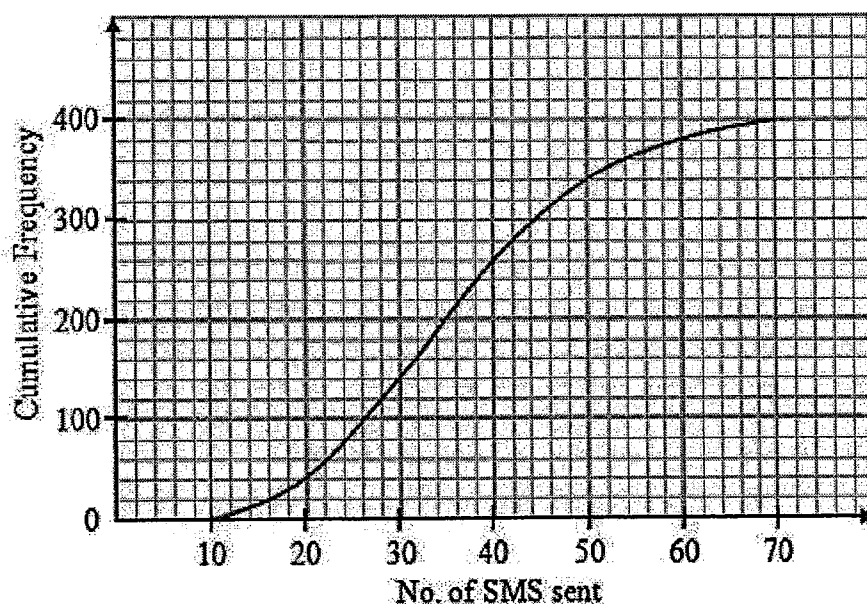
Calculate the distance from Checkpoint E to Checkpoint C .

Give your answer correct to 1 decimal place.

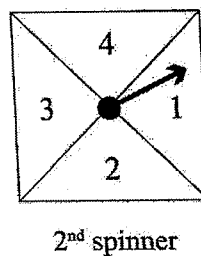
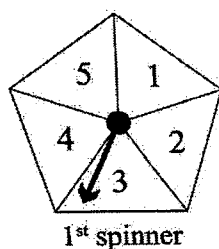
[4]

- 12 (a) The cumulative frequency graph below shows the results of a survey on the number of SMS sent by 400 students in a week. The graph has been drawn using the data from a grouped frequency table.

Cumulative frequency curve of the number of SMS sent by 400 students



- (i) Estimate the median number of SMS sent. [1]
 - (ii) Estimate the interquartile range. [2]
 - (iii) Explain why your answers to part (i) and (ii) above are only estimates. [1]
- (b) Genie has two fair spinners. She spins each spinner once and records the number shown.



- (i) Find the probability that Genie will obtain an odd number? [2]
- (ii) Find the probability that sum of numbers on the two spinners is 7. [2]

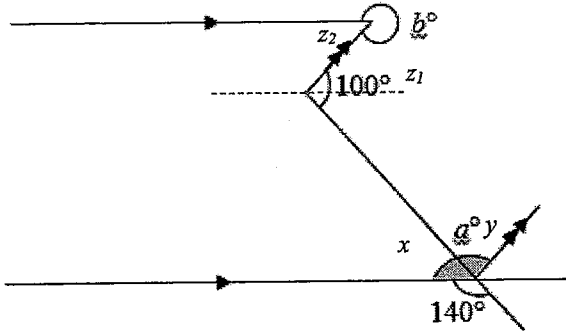
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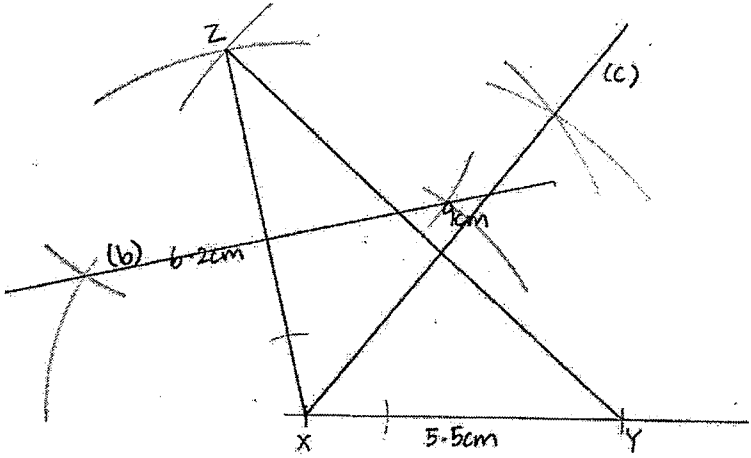
Qn	Working	Marks
1	$\frac{40 \times 3}{\sqrt{100} - 2}$ $= 15$	M1 (1 s.f.) A1
2(a)	$540 = 2^2 \times 3^3 \times 5$	B1
2(b)	$HCF = 3^3 \times 5$ $= 135$ $LCM = 2^2 \times 3^3 \times 5^3$ $= 13500$	B1 B1
2(c)	$540a = 2^2 \times 3^4 \times 5^2$ $a = 3 \times 5$ $= 15$	B1
3(a)	$85 \text{ km/h} = \frac{85 \times 1000}{3600}$ $= 23.61 \text{ m/s (4 s.f.)}$	M1 A1
3(b)	Total distance travelled $= (75 \times 1.5) + (x \times 2.5)$ $= 112.5 + 2.5x \text{ km}$ Total time taken $= 1.5 + 2.5$ $= 4 \text{ h}$ $\frac{112.5 + 2.5x}{4} = 85$ $112.5 + 2.5x = 340$ $2.5x = 227.5$ $x = 91$	M1 M1 A1
4	Time (hours)	M1 – shortest & longest M1 – Q1, Q2 & Q3
5(a)	Mirror image also accepted (2 dots at 3 and 1 dot at 6)	M1 – mode = 4 M1 – mean and mode = 4
5(b)	<	B1

Qn	Working	Marks
6	15 pancakes $\rightarrow$ 225 g 28 pancakes $\rightarrow \frac{225}{15} \times 28$ $= 420$ g	M1 A1
7	Number of sides $= \frac{360}{50}$ $= 7.2$ Ian is not correct since the number of sides is not a whole number.	M1 A1
8(a)	$25x^2 - 121 = (5x+11)(5x-11)$	B1
8(b)	$\frac{25x^2}{121} - 1 = 0$ or $\frac{25x^2}{121} - 1 = 0$ $25x^2 - 121 = 0$ $25x^2 = 121$ $(5x+11)(5x-11) = 0$ $x^2 = \frac{121}{25}$ $x = -\frac{11}{5}$ or $x = \frac{11}{5}$ $x = \pm \sqrt{\frac{121}{25}}$ $x = -\frac{11}{5}$ or $x = \frac{11}{5}$	M1 A1
9(a)	$f = 5 + (-2)$ $= 3$	B1
9(b)	$\sqrt[3]{a^2} \div \sqrt{a^3} = a^{\frac{2}{3}} \div a^{\frac{3}{2}}$ $= a^{\frac{5}{6}}$ $= \frac{1}{a^{\frac{5}{6}}}$	M1 A1
10	$2x + 3y = 48$ --- (1) $4x + y = 36$ --- (2) (1) $\times$ 2: $4x + 6y = 96$ --- (3) (3) - (2): $5y = 60$ $y = 12$ Sub $y = 12$ into (1): $2x + 3(12) = 48$ $2x = 12$ $x = 6$	M1 A1 A1

Qn	Working	Marks
11	$x = \frac{-(-8) \pm \sqrt{8^2 - 4(1)(14)}}{2(1)}$ $= \frac{8 \pm \sqrt{8}}{2}$ $= 5.41 \text{ or } 2.59 \text{ (2 d.p.)}$	M1 A2
12	2-digit numbers less than 30 = 20 Prime numbers are: 11, 13, 17, 19, 23, 29 $P(\text{prime number}) = \frac{6}{20}$ $= \frac{3}{10}$	M1 A1
13(a)	$BMI = \frac{50}{1.57^2}$ $= 20.3 \text{ (3 s.f.)}$	M1 A1
13(b)	$\frac{m}{1.80^2} \leq 23$ $m \leq 74.52$ Max. mass = 74.52 kg	M1 A1
14(a)	$c = kd^2$ $20 = k(5^2)$ $k = \frac{4}{5}$ Ans: $c = \frac{4}{5}d^2$	M1 A1
14(b)	$c = \frac{4}{5}(8)^2$ $= \frac{256}{5} = 51\frac{1}{5} = 51.2$	B1
15(a)	$1 \text{ cm} \rightarrow 120 \text{ cm}$ $= 1.2 \text{ m}$ $1.2 \text{ m} \rightarrow 1 \text{ cm}$ $60 \text{ m} \rightarrow \frac{60}{1.2} \text{ cm}$ $= 50 \text{ cm}$ Length of playground = 0.5 m	B1
15(b)	$\text{Area scale} = 1^2 \text{ cm}^2 : 1.2^2 \text{ m}^2$ $= 1000 \text{ cm}^2 : 1.44 \times 1000 \text{ m}^2$ Area = 1440 m ²	M1 (area scale) A1

16	Circumference of semicircle $= \frac{\pi \times 18}{2}$ $= 9\pi$ Circumference of quadrant $= \frac{\pi \times 36}{4}$ $= 9\pi$ Perimeter $= 9\pi + 9\pi + 18$ $= 18 + 18\pi$ cm	M1 M1 A1
17(a)	$T_n = 6n - 2$	B1
17(b)	$T_{40} = 238$	B1
18(a)	Profit $= \frac{120 - 95}{95} \times 100\%$ $= 26\frac{6}{19}\% \text{ or } 26.3\%$	M1 A1
18(b)	Mark pays $= 120 \times \frac{90}{100}$ $= \$108$	M1 A1
19(a)	(i) $\tan x^\circ = \frac{12}{5}$	B1
	(ii) $PR = \sqrt{5^2 + 12^2}$ $= 13$ $\sin y^\circ = \sin \angle PRQ$ $= \frac{5}{13}$	M1 A1
	(iii) $\cos y^\circ = -\cos \angle PRQ$ $= -\frac{12}{13}$	B1
19(b)	Let the shortest distance be h . $\frac{1}{2} \times 5 \times 12 = \frac{1}{2} \times 13 \times h$ $30 = \frac{13}{2}h$ $h = \frac{60}{13}$ or 4.62	M1 A1
20(a)	$AB^2 = 52^2 + 64^2 - 2(52)(64)\cos 42^\circ$ $AB = \sqrt{6800 - 6656\cos 42^\circ}$ $AB = 43.05378m$ $= 43.1$ m (3 s.f.)	M1 M1 A1
20(b)	Angle of elevation $= \angle TAB$ $\tan \angle TAB = \frac{30}{43.05378}$ $\angle TAB = 34.869^\circ$ $= 34.9^\circ$ (1 d.p.)	M1 A1

21	$\begin{aligned}\text{Volume of material} &= \frac{2}{3}\pi(15^3) - \frac{2}{3}\pi(14^3) \\ &= 2250\pi - \frac{5488}{3}\pi \\ &= \frac{1262}{3}\pi \\ &= 1321.56 \\ &= 1320 \text{ cm}^3 \text{ (3 sig. fig.)}\end{aligned}$	M1 A1
22(a)	 $a = x + y$ $x = 180^\circ - 140^\circ$ (adj. $\angle$s on a st. line) $= 40^\circ$ $y = 180^\circ - 100^\circ$ (int. $\angle$s, // lines) $= 80^\circ$ $a = 120$	M1 A1
22(b)	Drawing a parallel line at 80°, $\angle z_1 = 100 - 40^\circ$ (alt. $\angle$s, // lines) $= 60^\circ$ $\angle z_2 = 60^\circ$ (alt. $\angle$s, // lines) $b = 360^\circ - 60^\circ$ ($\angle$s at a pt.) $= 300$	M1 A1
23(a)	$\begin{aligned}\text{Gradient} &= \frac{12-4}{10-0} \\ &= \frac{4}{5} \text{ or } 0.8\end{aligned}$	B1
23(b)	$y = \frac{4}{5}x + 4$	B1
23(c)	$\begin{aligned}\text{Length of } AB &= \sqrt{(12-4)^2 + (10-0)^2} \\ &= 12.806 \text{ units} \\ &= 12.8 \text{ units (3 s.f.)}\end{aligned}$	M1 A1

23(d)	Equation of line : $x = 4$ Sub $x = 4$ into $y = \frac{4}{5}x + 4$ $y = \frac{4}{5}(4) + 4$ $= \frac{36}{5} \text{ or } 7\frac{1}{5} \text{ or } 7.2$ Coordinates of C is (4, 7.2)	M1 A1
24(a)	Construction lines Accuracy 	M1 M1
24(b)	Both construction lines and accuracy	B1
24(c)	Both construction lines and accuracy	B1

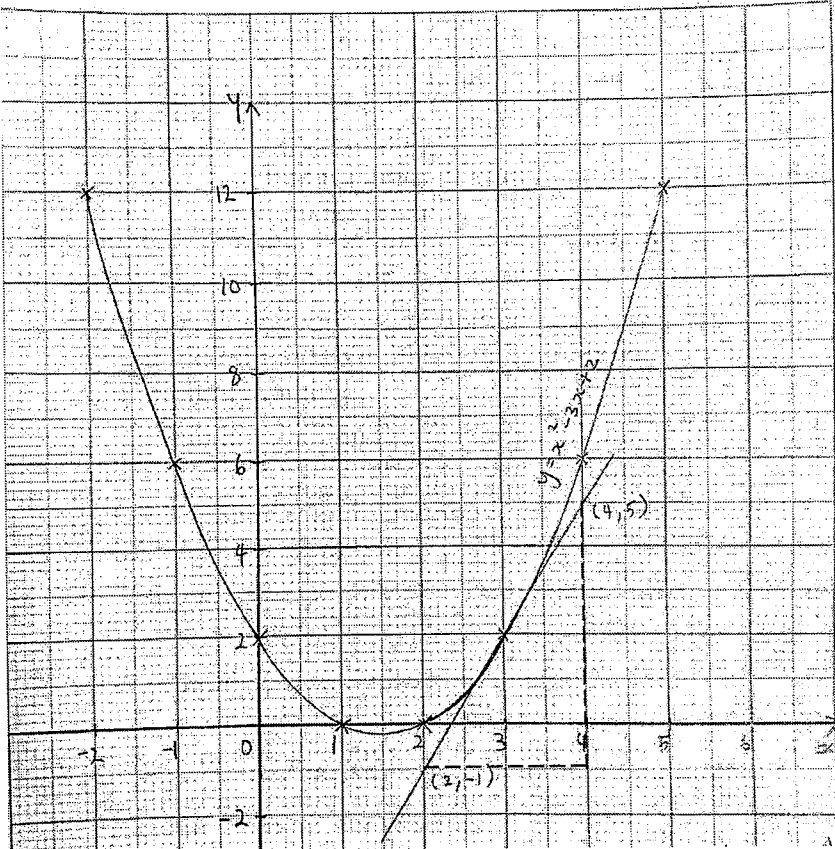
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Sec 4NA Mathematics Marking Scheme
Preliminary Examination 2018

1	(a) In 2015, $t = 0$ $P = 8000 \times 0.93^0$ $= 8000 \times 1$ $= 8000$ (b) In 2018, $t = 3$ $P = 8000 \times 0.93^3$ $= 6434.856$ $= 6435 \text{ (nearest whole number)}$	[B1] [B1]
2	(a) It took 2 groundsman 180 minutes. It would take 1 groundsman $180 \times 2 = 360$ minutes It would take 8 groundsman $360 / 8 = 45$ minutes <i>Alternative:</i> $\left. \begin{array}{l} 8 \text{ groundsman} - \frac{2 \times 180}{8} \\ = 45 \text{ min} \end{array} \right\}$ So they will finish 45 minutes after 12.55 pm which is 1.40 pm or 13.40hrs (b) $v = u + at$ $13.2 = u + (0.5 \times 3)$ $13.2 = u + 1.5$ $u = 13.2 - 1.5$ $u = 11.7$	[M1] [A1] [M1] [A1]
3	Account 1: The multiplier for an increase of 2.5% is 1.025. Balance after 3 years = 6000×1.025^3 $= \$6461.34375$ $= \$6461.34 \text{ (nearest cent)}$ Account 2: Balance after 3 years = $6000 \times 1.01 \times 1.015 \times 1.05$ $= \$6458.445$ $= \$6458.45 \text{ (nearest cent)}$ So Benny should invest in Account 1.	[M1] [M1] [M1- for finding final balance for both a/c] [A1]

4	(a) Arc Length = $6\left(\frac{\pi}{6}\right)$ $= \pi \text{ cm}$ Perimeter of sector = $\pi + 6 + 6$ $= (\pi + 12) \text{ cm}$ (b) Area of circle = $\frac{1}{2}(6)^2\left(\frac{\pi}{6}\right)$ $= 3\pi \text{ cm}^2$	[M1] [A1] [M1] [A1]
5	(a) $\hat{AED} = \hat{ACB}$ (corresponding angles are equal) $\hat{ADE} = \hat{ABC}$ (corresponding angles are equal) $\hat{DAE} = \hat{BAC}$ = common angle Therefore, triangle ABC is similar to triangle ADE (b) $\frac{4}{12} = \frac{5.8}{AC}$ (corr. $\angle$s of similar Δs) $AC = 17.4 \text{ cm}$ $EC = 17.4 - 5.8$ $= 11.6 \text{ cm}$	[M1] [M1] [M1] [M1] [A1]
6	(a) Mean = $\frac{\sum fx}{\sum f}$ $= \frac{10(5) + 20(15) + 55(25) + 68(35) + 47(45)}{200}$ $= \frac{6220}{200}$ $= 31.1 \text{ marks}$ Standard deviation = $\sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$ $= \sqrt{\frac{10(5^2) + 20(15^2) + 55(25^2) + 68(35^2) + 47(45^2)}{200} - \left(\frac{6220}{200}\right)^2}$ $= \sqrt{\frac{217600}{200} - \left(\frac{6220}{200}\right)^2}$ $= \sqrt{120.79}$ $= 11.0 \text{ (to 3 s.f.)}$	[M1] [M1] [A1]

	(b) Greendale has better marks than Woodlands Ring as the mean mark of Greendale is higher.	[A1]
	(c) Woodlands Ring had more consistent marks than Greendale as the standard deviation of the marks of Woodlands Ring is smaller.	[A1]
7	Volume of cuboid B = $9 \times 12 \times 12.5$ $=1350 \text{ cm}^3$ Volume of cube A = $\frac{1350}{2} \times 3$ $=2025 \text{ cm}^3$ $x^3 = 2025$ $x = \sqrt[3]{2025}$ $=12.6514$ $=12.65 \text{ cm (correct to 2 d.p)}$	[M1] [M1] [M1] [M1] [A1]

8	(a) When $x = -1$ When $x = 2$ $y = (-1)^2 - 3(-1) + 2$ $y = 6$ $\therefore p = 6$ $y = (2)^2 - 3(2) + 2$ $y = 0$ $\therefore q = 0$ (b) Drawing of graph.  (c) gradient = $\frac{-1-5}{2-4}$ $= \frac{-6}{-2}$ $= 3 \ (\pm 0.3)$	[B1]correct for p [B1]correct for q [1] scale and label [1] correctly plotted [1]smooth curve through the points [M1- correct tangent drawn] [A1]
9	(a) $\frac{4x}{y^4 z^4} \div \frac{2}{y^2 z^3}$ $= \frac{4x}{y^4 z^4} \times \frac{y^2 z^3}{2}$ $= \frac{2x}{y^2 z}$	[M1] [A1]

$$(b) \ 2x^2 + 22x + 48$$

$$= 2(x^2 + 11x + 24)$$

$$= 2(x+8)(x+3)$$

[M1]

[A1]

$$(c) \ (i) \ x^2 + 8x - 5$$

$$= \left(x + \frac{8}{2}\right)^2 - \left(\frac{8}{2}\right)^2 - 5$$

[M1]

$$= (x+4)^2 - 21$$

[A1]

$$\therefore p = 4, \ q = -21$$

$$(ii) \ x^2 + 8x - 5 = 0$$

$$(x+4)^2 - 21 = 0$$

$$(x+4)^2 = 21$$

$$x+4 = \pm\sqrt{21}$$

[M1]

$$x = -4 \pm \sqrt{21}$$

$$x = 0.583 \text{ or } -8.58 \text{ (correct to 3 s.f.)}$$

[A1]

Alternative:

$$x^2 + 8x - 5 = 0$$

$$x = \frac{-8 \pm \sqrt{8^2 - 4(1)(-5)}}{2(1)}$$

[M1]

$$\approx 0.582, \ -8.58 \text{ (3 s.f.)}$$

[A1]

10	(a) Area of circle = πr^2 $= \pi \times 45^2$ $= 6361.72 \text{ cm}^2$ Area of curved surface area = $(\pi \times d) \times 3$ $= (\pi \times 90) \times 3$ $= 848.230 \text{ cm}^2$ Paint required for one table (2 coats) = $2 \times (6361.72 + 848.230)$ $= 144.19 \text{ cm}^2$ Paint required for 20 tables = 20×144.19 $= 288\,398 \text{ cm}^2$ Coverage used by tin = 12×25000 $= 300\,000 \text{ cm}^2$ Therefore, Jimmy can paint all of the tables with the 2.5 litre tin of paint. (b) -No paint is wasted from spillage -Tables need exactly two coats of paint. (c) $100\% \rightarrow 288398 \text{ cm}^2$ $110\% \rightarrow 317237.8 \text{ cm}^2$ $317237.8 - 300\,000 = 17237.8 \text{ cm}^2$ No, it is not sufficient, Jimmy requires more than 2.5 litre of paint.	[M1] [M1] [M1] [M1] [A1] [B1] [M1] [B1]
11	(a) (i) $\angle OAD = 90^\circ - 35^\circ$ (tangent $\perp$ radius) $= 55^\circ$ (ii) $\angle ABD = 180^\circ - 106^\circ - 39^\circ$ ($\angle$s in opp. segment) $= 35^\circ$ (iii) $\angle COA = (39^\circ + 35^\circ) \times 2$ ($\angle$ at centre = $2 \times \angle$ at circumference) $= 148^\circ$ $\angle DCO = 360^\circ - 148^\circ - 55^\circ - 106^\circ$ (sum of $\angle$s in a quadrilateral) $= 51^\circ$ <i>Alternative:</i> (iii) $\angle COD = 2(39^\circ)$ ($\angle$ at centre = $2 \times \angle$ at circumference) $= 78^\circ$	[B1] [B1] [M1] [A1] [M1]

	$\angle DCO = \frac{180^\circ - 78^\circ}{2} \text{ base } \angle \text{ s of isos } \Delta)$ $= 51^\circ$ (b) $\frac{\sin E}{457} = \frac{\sin 30^\circ}{350}$ $\hat{E} = 40.757^\circ$ $\hat{D} = 180^\circ - 30^\circ - 40.757^\circ$ $= 109.243^\circ$ $\frac{CE}{\sin 109.243^\circ} = \frac{350^\circ}{\sin 30^\circ}$ $\therefore CE = 660.89^\circ$ $\approx 660.9\text{m (1 dcp)}$	[A1] [M1] [M1] [M1] [A1]
12	(a) i) From the graph, median = 35 SMS ii) From the graph, lower quartile = 26 upper quartile = 44 interquartile range = 44 - 26 $= 18 \text{ SMS}$ iii) The answers are estimates because they're based on grouped data, rather than the actual data values.	[B1] [M1] Both correct Q1 and Q3. [A1] [B1]
	(b) (i) $P(\text{Odd numbers}) = \frac{3}{5} \times \frac{1}{2}$ $= \frac{3}{10}$ (ii) $P(\text{sum of numbers is 7}) = \left(\frac{1}{5} \times \frac{1}{4}\right) + \left(\frac{1}{5} \times \frac{1}{4}\right) + \left(\frac{1}{5} \times \frac{1}{4}\right)$ $= \frac{3}{20}$ <i>Alternative:</i> Total possible outcomes = 5 x 4 $= 20$ Required outcomes = 3 (5,2) (3,4) (4,3)	[M1] [A1] [M1] [A1] [M1]

	$\therefore P(\text{sum of numbers is } 7) = \frac{3}{20}$	[A1]
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