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SWISS COTTAGE SECONDARY SCHOOL
SECONDARY FOUR NORMAL ACADEMIC
PRELIMINARY EXAMINATION

NA

Name: _____ ()

Class: _____

MATHEMATICS SYLLABUS A

4045/01

Paper 1

Wednesday 15 August 2018

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your class, 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.

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 total number of 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 either your calculator value or 3.142.

For Examiner's use

80

This document consists of **20** printed pages.

Setter: Ms Tan Hui Lan
Vetter: Ms Yeo Koon Koon

[Turn over

*We Nurture Students to **Think, Care and Lead** with **P.R.I.D.E.***

*Mathematical Formulae**Compound Interest*

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

Measurement

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

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

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

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

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

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

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

Trigonometry

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

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

Statistic

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

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

Answer **all** the questions.

- 1 By rounding each number to 1 significant figure, **estimate** the value of

$$\frac{9.81 \times \sqrt{3.52}}{5.39}$$

You must show your working.

Answer [2]

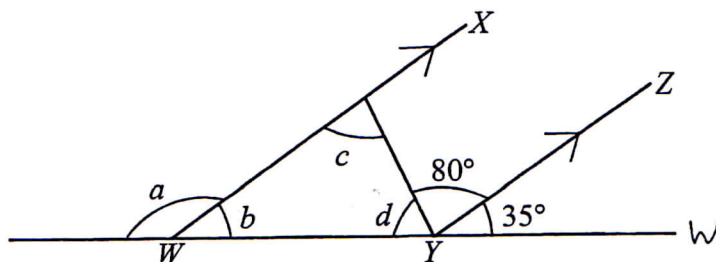
- 2 (a) Solve $\frac{6x}{x-1} = 3$.

Answer $x =$ [2]

- (b) Solve the inequality $-3y \leq 11$.

Answer [1]

- 3 In the diagram, WX is parallel to YZ .



Show, giving reasons, that the angle a is 145° .

Answer

.....

.....

.....

[2]

- 4 The first five terms of a sequence are

$7, 13, 19, 25, 31, \dots, \dots$

For this sequence,

- (a) find an expression for the n th term,

Answer [1]

- (b) show that 153 is **not** a term in the sequence.

Answer

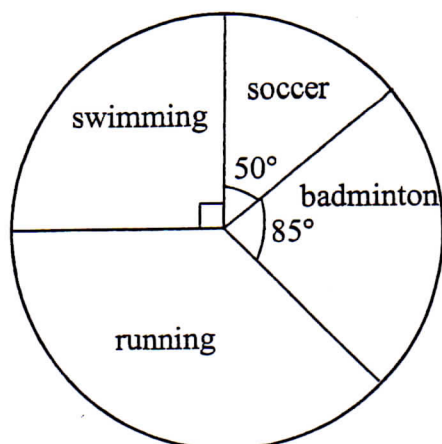
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[1]

- 5 The students from a class were asked to choose their favourite sport. The results are shown in the pie chart below.



A student was chosen at random. Calculate the probability that

- (a) this student's favourite sport is running,

Answer [2]

- (b) this student's favourite sport is **not** badminton.

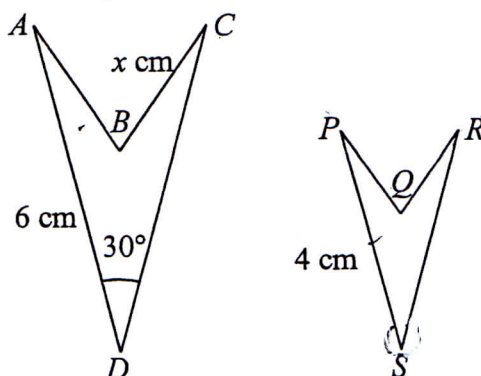
Answer [1]

- 6 Make w the subject of the formula $x = \sqrt{y + wz^2}$.

Answer [2]

- 7 Quadrilateral $PQRS$ is a reduction of quadrilateral $ABCD$.

Angle $ADC = 30^\circ$, $AD = 6$ cm, $BC = x$ cm and $PS = 4$ cm.



Find

- (a) the scale factor,

Answer [1]

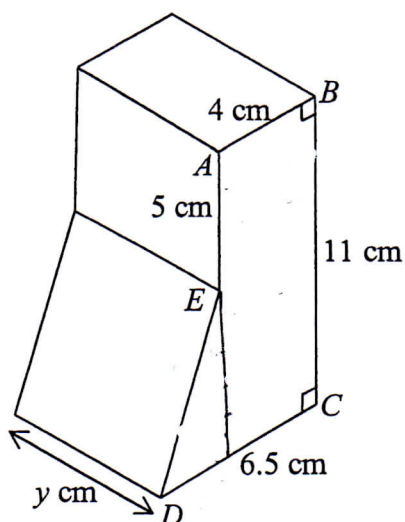
- (b) QR in terms of x ,

Answer $QR = \dots\dots\dots$ cm [1]

- (c) the reflex angle PSR .

Answer [1]

- 8 A prism has a cross-section $ABCDE$.



$AB = 4$ cm, $BC = 11$ cm, $CD = 6.5$ cm and $AE = 5$ cm.

Angle $ABC = \text{angle } BCD = 90^\circ$.

The length of the prism is y cm.

Given that the volume of the prism is 309 cm^3 , calculate y .

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

- 9 (a) Simplify $\frac{5f^2g}{2} \div \frac{3f}{4g}$.

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

- (b) Write as a single fraction in its simplest form

$$\frac{1}{2x-1} + \frac{3}{x+1}.$$

Answer [2]

- 10 The table shows the number of hours spent using the handphone by a class of 20 students in a particular day.

Number of hours	$0 \leq x < 1$	$1 \leq x < 2$	$2 \leq x < 3$	$3 \leq x < 4$	$4 \leq x < 5$
Frequency	3	8	6	p	1

- (a) Find p .

Answer $p =$ [1]

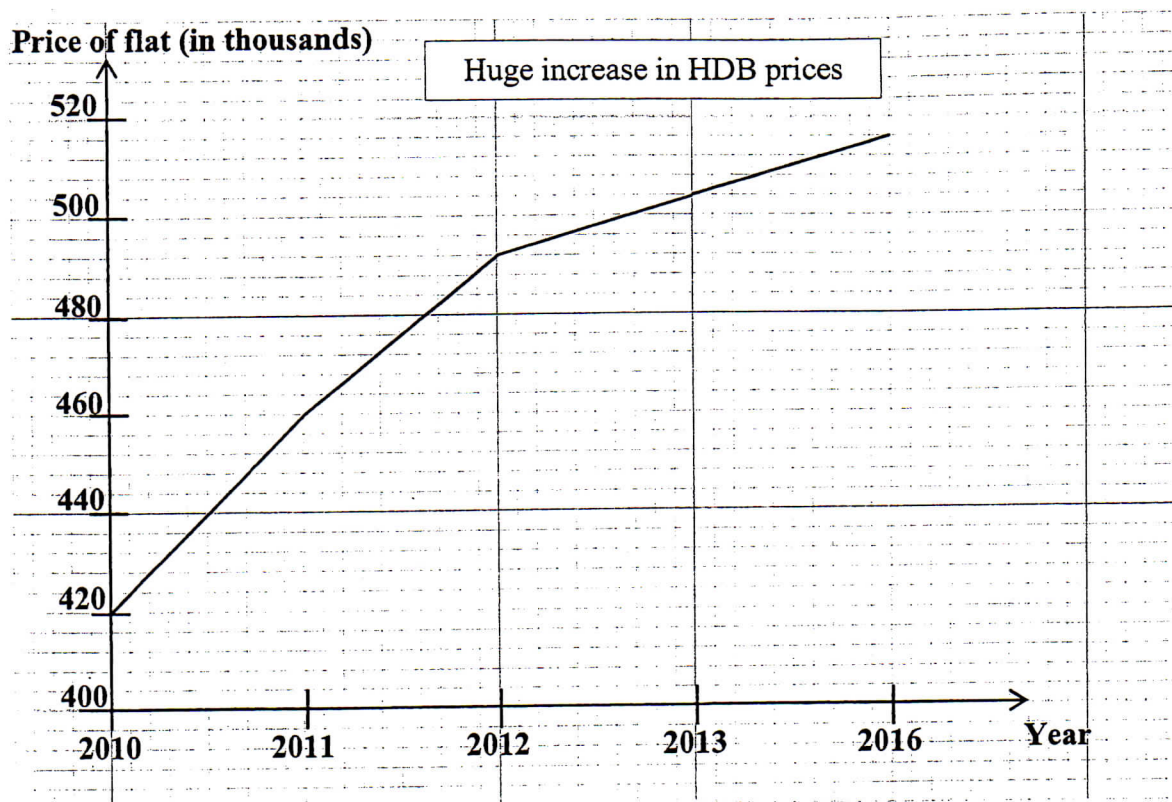
- (b) State the modal class.

Answer [1]

- (c) Calculate an estimate for the mean number of hours spent using the handphone.

Answer hours [3]

- 11 The graph below shows the average price of a 4-room flat in Choa Chu Kang estate over a few years.



State one feature of the graph that may be misleading and explain why.

Answer

.....

.....

.....

[2]

- 12 Solve the simultaneous equations.

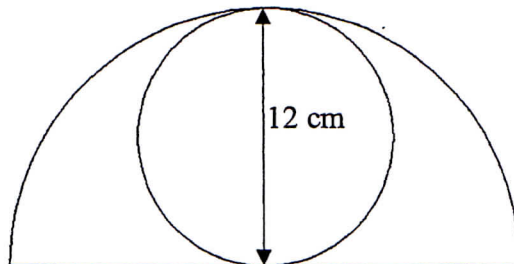
$$2x - y = 4$$

$$3x + 2y = 6$$

Answer $x = \dots\dots\dots$

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

- 13 The diagram shows a circle with diameter 12 cm inscribed into a semicircle.



Taking π as $\frac{22}{7}$,

- (a) find the area of the semicircle,

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

- (b) Convert the area in (a) to m^2 .

Answer m^2 [1]

- 14 Benny bought a new vacuum cleaner. The list price was \$310.

He received a discount of 15%.

- (a) What was the discounted price he paid for the vacuum cleaner?

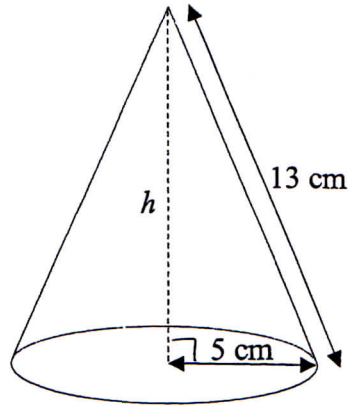
Answer \$ [2]

- (b) Benny sold the vacuum cleaner he bought to a friend at \$289.85.

Calculate his percentage profit.

Answer % [2]

- 15 A cone has a circular base of radius 5 cm and a slant height of 13 cm.



Calculate

- (a) the perpendicular height, h , of the cone,

Answer $h = \dots\dots\dots$ cm [2]

- (b) the volume of the cone.

Answer $\dots\dots\dots$ cm³ [2]

- 16 The following stem-and-leaf diagram shows the marks of some students for a test.

0		9						
1		3	5	5	6	8		
2		0	1	2	4	5	7	9
3		0	0					

Key 2 1 means 21

- (a) Find

- (i) the median,

Answer [1]

- (ii) the range.

Answer [1]

- (b) The passing mark for the test was 15.

Emily said that $26\frac{2}{3}\%$ of the students failed the test.

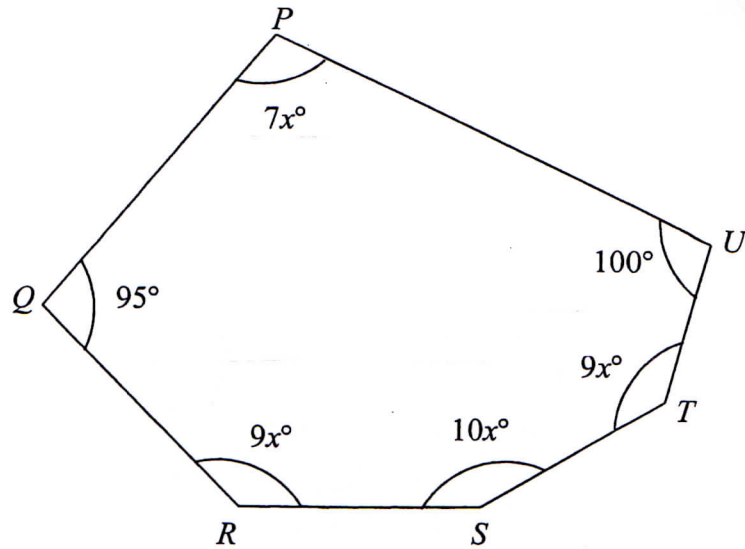
Do you agree with her? Give a reason for your answer.

Answer

.....

..... [1]

17



In the hexagon $PQRSTU$, angle $PQR = 95^\circ$ and angle $PUT = 100^\circ$.

Find

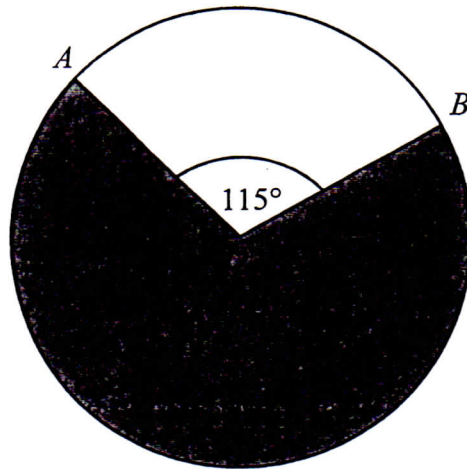
(a) x ,

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

(b) the value of the largest angle.

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

- 18 The diagram shows a circle with centre O and radius 8 cm.
 A and B are points on the circumference and angle $AOB = 115^\circ$.



Find, leaving all your answers in terms of π ,

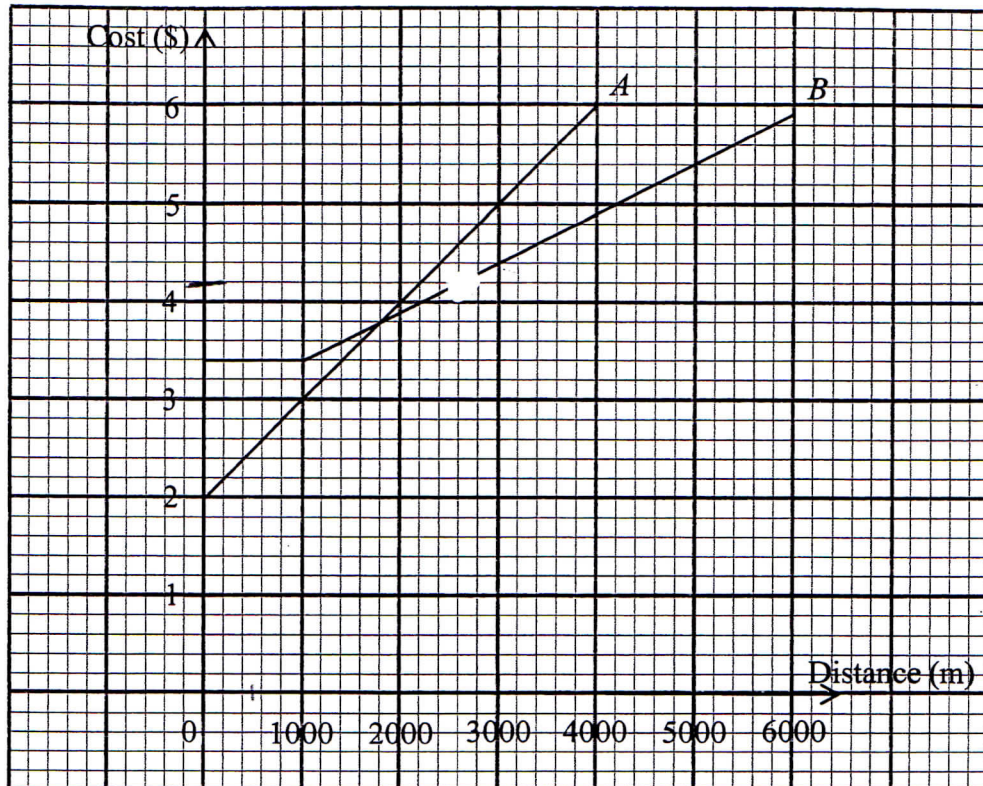
- (a) the length of the minor arc AB ,

Answer $AB = \dots\dots\dots$ cm [2]

- (b) the area of the shaded region.

Answer $\dots\dots\dots$ cm² [2]

- 19 The graph shows the charges of two taxi companies, A and B .



- (a) Find the fare charged by company B when the distance is 2.6 km.

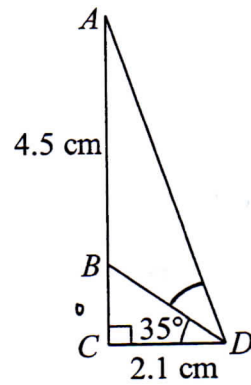
Answer \$ [1]

- (b) Company A charges a fixed cost of \$2 and a constant rate of y cents per 500 m.
Find y .

Answer $y =$ [1]

- (c) Find the range of distance d for which it will be cheaper to use company A .

Answer [1]



The diagram shows a right-angled triangle ACD .

$AB = 4.5\text{ cm}$, $CD = 2.1\text{ cm}$ and angle $BDC = 35^\circ$.

- (a) Calculate the length of BC .

Answer $BC = \dots\dots\dots\text{ cm}$ [2]

- (b) Find angle ADB .

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

21 A is the point $(1, 0.5)$ and B is the point $(-2, 5)$.

(a) Calculate the gradient of the line AB .

Answer [2]

(b) Find the equation of the line AB .

Answer [2]

(c) A point $(3, m)$ lies on the line AB . Find m .

Answer $m =$ [1]

22 The scale of a map is 4 : 200 000.

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

Find p .

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

- (b) The actual distance between two towns is 4.5 km.

How far, in cm, is this distance on the map?

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

- (c) A reservoir covers an area of 32 cm^2 on the map.

Calculate the actual area of the reservoir in km^2 .

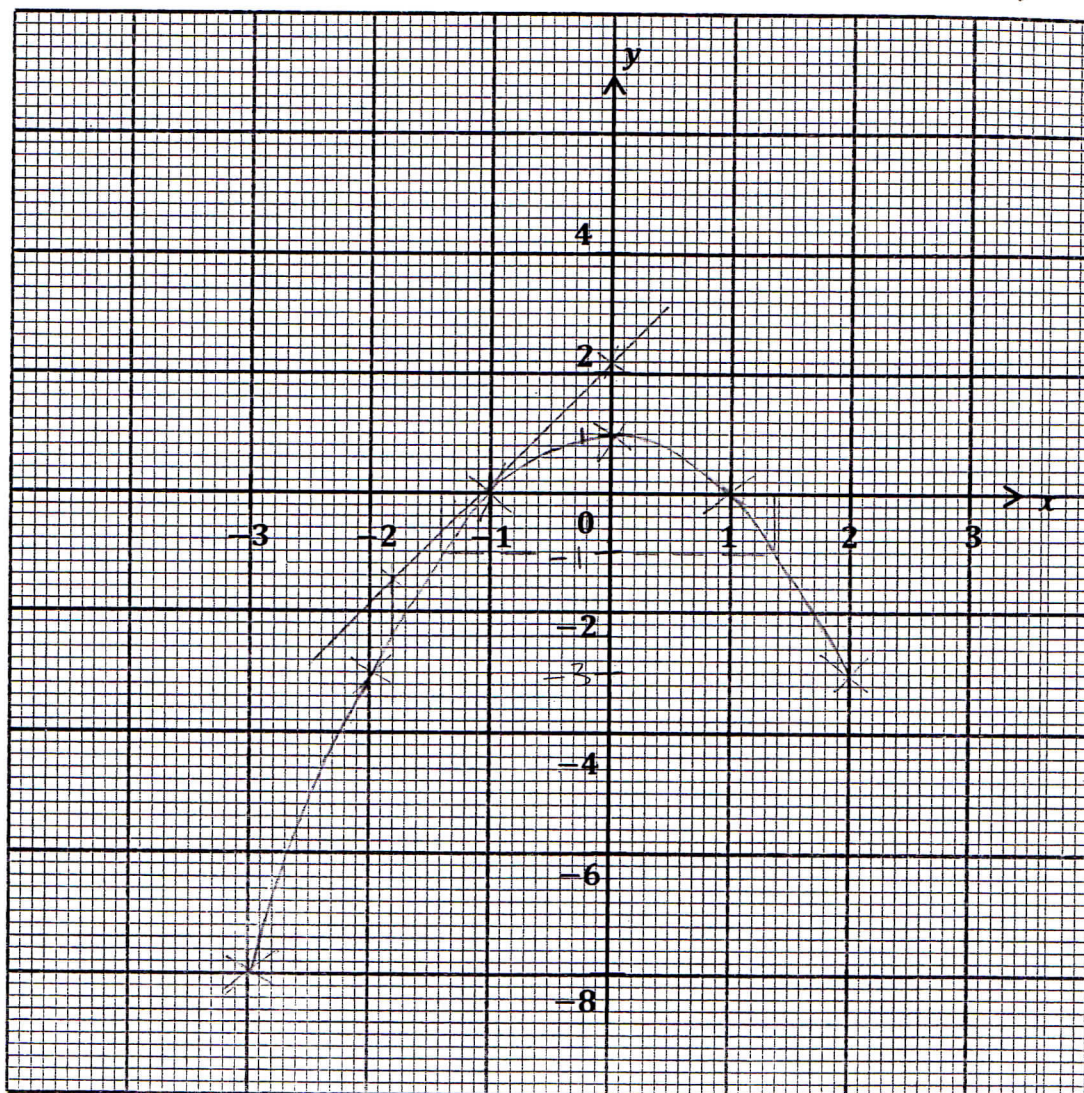
Answer $\dots\dots\dots \text{km}^2$ [2]

- 23 (a) Complete the table for $y = -x^2 + 1$.

x	-3	-2	-1	0	1	2
y	-8		0	1	0	-3

[1]

- (b) Draw the graph of $y = -x^2 + 1$.



[2]

- (c) Find the values of x when $y = -1$.

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

- (d) By drawing a tangent, find the gradient of the graph when $x = -1$.

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

End of paper

1	$\frac{9.81 \times \sqrt{3.52}}{5.39}$ $\approx \frac{10 \times \sqrt{4}}{5}$ $= 4$	[M1] [A1]
2(a)	$\frac{6x}{x-1} = 3$ $6x = 3(x-1)$ $6x = 3x - 3$ $6x - 3x = -3$ $3x = -3$ $x = \frac{-3}{3}$ $x = -1$	[M1] Cross-multiply & expand [A1]
2(b)	$-3y \leq 11$ $3y \geq -11$ $y \geq \frac{-11}{3}$ $y \geq -3\frac{2}{3}$	[B1]
3	$\angle d = 180^\circ - 80^\circ - 35^\circ \text{ (adjacent } \angle\text{s on a straight line)}$ $= 65^\circ$ $\angle a = 80^\circ + 65^\circ \text{ (corresponding } \angle\text{s, } WX \parallel YZ)$ $= 145^\circ$ Alternatively, $\angle b = 35^\circ \text{ (corresponding } \angle\text{s, } WX \parallel YZ)$ $\angle a = 180^\circ - 35^\circ \text{ (adjacent } \angle\text{s on a straight line)}$ $= 145^\circ$ Or any other relevant working	[M1] [A1] [M1] [A1]

4(a)	$T_n = a + (n-1)d$ $= 7 + (n-1)6$ $= 7 + 6n - 6$ $= 1 + 6n$	[B1]
4(b)	Let $1 + 6n = 153$ $6n = 152$ $n = \frac{152}{6}$ $n = 25\frac{1}{3}$ Since n is not an integer / whole number, 153 is not a term in the sequence.	[B1]
5(a)	$\frac{360^\circ - 90^\circ - 50^\circ - 85^\circ}{360}$ $= \frac{3}{8}$	[M1] [A1]
5(b)	$\frac{360^\circ - 85^\circ}{360^\circ}$ $= \frac{55}{72}$	[B1]
6	$x = \sqrt{y + wz^2}$ $x^2 = y + wz^2$ $x^2 - y = wz^2$ $\frac{x^2 - y}{z^2} = w$ $w = \frac{x^2 - y}{z^2}$	[M1] [A1]
7(a)	$\frac{4}{6} = \frac{2}{3}$	[B1]
7(b)	$QR = \frac{2}{3}x \text{ cm}$	[B1]

7(c)	$\angle PSR = 30^\circ$ Reflex $\angle PSR = 360^\circ - 30^\circ$ ($\angle$ s at a point) $= 330^\circ$	[B1]
8	Cross-section area = Area of rectangle + Area of trapezium $= (4 \times 5) + \frac{1}{2} \times (4 + 6.5) \times 6$ $= 20 + 31.5$ $= 51.5 \text{ cm}^2$ $y = 309 + 51.5$ $= 6$	[M1] [M1] [A1]
9(a)	$\frac{5f^2g}{2} \div \frac{3f}{4g}$ $= \frac{5f^2g}{2} \times \frac{4g}{3f}$ $= \frac{5fg}{1} \times \frac{2g}{3}$ $= \frac{10fg^2}{3}$	[M1] Convert + into $\times$ [A1]
9(b)	$\frac{1}{2x-1} + \frac{3}{x+1}$ $= \frac{1 \times (x+1)}{(2x-1) \times (x+1)} + \frac{3 \times (2x-1)}{(x+1) \times (2x-1)}$ $= \frac{x+1}{(2x-1)(x+1)} + \frac{6x-3}{(x+1)(2x-1)}$ $= \frac{x+1+6x-3}{(2x-1)(x+1)}$ $= \frac{7x-2}{(2x-1)(x+1)}$	[M1] Common denominator [A1]
10(a)	$p = 20 - 3 - 8 - 6 - 1$ $= 2$	[B1]
10(b)	$1 \leq x < 2$	[B1]
10(c)	$\frac{(0.5 \times 5) + (1.5 \times 8) + (2.5 \times 6) + (3.5 \times 2) + (4.5 \times 1)}{20}$ $= \frac{40}{20}$ $= 2$	[M2] Midvalue - M1 Formula - M1 [A1]
11	The title of the graph is biased. It does not allow the reader to make his own judgement. OR The prices of the flat for years 2014 and 2015 are missing. The prices may have decreased in these two years OR The vertical axis did not start from zero. The increase in price may be exaggerated.	[B1] 1 mark for feature, 1 mark for reason. [B1] [M1] Valid use of substitution or elimination method [A1]
12	$2x - y = 4$ -----(1) $3x + 2y = 6$ -----(2) $(1) \times 2, \quad 4x - 2y = 8$ ---(3) $(2) + (3), \quad 7x = 14$ $x = \frac{14}{7}$ $x = 2$ Substitute $x = 2$ into (1) $2(2) - y = 4$ $4 - y = 4$ $-y = 4 - 4$ $-y = 0$ $y = 0$	[M1] Valid use of substitution or elimination method [A1]
13(a)	Area of semicircle $= \frac{1}{2} \times \frac{22}{7} \times 12^2$	[M1]

13(b)	$226\frac{2}{7} \div 100 \div 100 = 0.0226 \text{ m}^2$	[A1]
14(a)	$\frac{85}{100} \times 310 = \263.50	[M1] [A1]
14(b)	$\frac{289.85 - 263.50}{263.50} \times 100 = 10\%$	[M1] [A1]
15(a)	$h = \sqrt{13^2 - 5^2} = 12 \text{ cm}$	[M1] [A1]
15(b)	$\frac{1}{3}\pi(5)^2(12) = 314.1593 \text{ cm}^3 = 314 \text{ cm}^3(3 \text{ sf})$	[M1] [A1]
16(a)	21	[B1]
16(b)	$30 - 9 = 21$	[B1]
16(c)	Percentage of students who fail $= \frac{2}{15} \times 100 = 13\frac{1}{3}\%$ Therefore, I do not agree.	Correct conclusion with appropriate Mathematical reasoning [B1]
17(a)	Sum of interior angles $= (6 - 2) \times 180^\circ = 720^\circ$ $95^\circ + 7x^\circ + 100^\circ + 9x^\circ + 10x^\circ + 9x^\circ = 720^\circ$ $195^\circ + 35x^\circ = 720^\circ$ $35x^\circ = 720^\circ - 195^\circ$	[M1] [M1] [A1]

	$35x^\circ = 525^\circ$ $x^\circ = \frac{525^\circ}{35}$ $x = 15$	[A1]
17(b)	$10 \times 15^\circ = 150^\circ$	[B1]
18(a)	$\frac{115}{360} \times 2\pi(8) = 5\frac{1}{9}\pi \text{ cm}$	[M1] [A1]
18(b)	$\frac{360^\circ - 115^\circ}{360^\circ} \times \pi(8)^2 = 43\frac{5}{9}\pi \text{ cm}^2$	[M1] [A1]
19(a)	\$4.20	[B1]
19(b)	50	[B1]
19(c)	$0 \leq d < 1800$	[B1]
20(a)	$\tan 35^\circ = \frac{BC}{2.1}$ $2.1 \tan 35^\circ = BC$ $BC = 1.47044 \text{ cm}$ $BC = 1.47 \text{ cm}(3 \text{ sf})$	[M1] [A1]
20(b)	$\tan \angle ADC = \frac{1.47044 + 4.5}{2.1}$ $\angle ADC = \tan^{-1}\left(\frac{5.97044}{2.1}\right) = 70.6215^\circ$ $\angle ADB = 70.6215^\circ - 35^\circ = 35.6215^\circ = 35.6^\circ(1 \text{ dp})$	[M1] [A1]

21(a)	$\frac{0.5-5}{1-(-2)}$ $= -1.5$	[M1] [A1]
21(b)	$y = mx + c$ $0.5 = (-1.5)(1) + c$ $c = 2$ $\therefore y = -1.5x + 2$	[M1] [A1]
21(c)	$m = -1.5(3) + 2$ $m = -2.5$	[B1]
22(a)	4 cm : 200 000 cm 1 cm : 50 000 cm 1 cm : 0.5 km $\therefore p = 0.5$	[B1]
22(b)	$4.5 + 0.5$ $= 9$ cm	[M1] [A1]
22(c)	1 cm : 0.5 km $(1 \text{ cm})^2 : (0.5 \text{ km})^2$ 1 cm ² : 0.25 km ² $0.25 \times 32 = 8$ cm ²	[M1] [A1]



SWISS COTTAGE SECONDARY SCHOOL
SECONDARY FOUR NORMAL ACADEMIC
PRELIMINARY EXAMINATION

NA

Name: _____ () Class: _____

MATHEMATICS SYLLABUS A

4045/02

Paper 2

Thursday 16 August 2018

2 hours

Additional Materials: Answer paper (8 sheets)

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Section A

Answer **all** the questions.

Section 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 the answers in degrees to one decimal place.
For π , use either your calculator value or 3.142.

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

This document consists of **10** printed pages.

Setter: Ms Ng Poh Keow
Vetter: Ms Yeo Koon Koon

[Turn over

*We Nurture Students to **Think, Care and Lead** with **P.R.I.D.E.***

Mathematical Formulae*Compound interest*

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistic

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

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

Section A (52 marks)

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

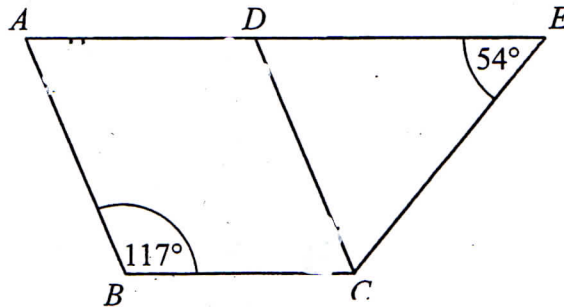
1 (a) Calculate

(i) $\sqrt[3]{(-15)^2 + 4.63 \times 0.28}$, [1]

(ii) $\frac{(0.95)^{-0.25}}{2.7 + 15.63}$. [1]

(b) Given that $8^4 \times (32)^{\frac{1}{5}} = 2^n$, find n . [2]

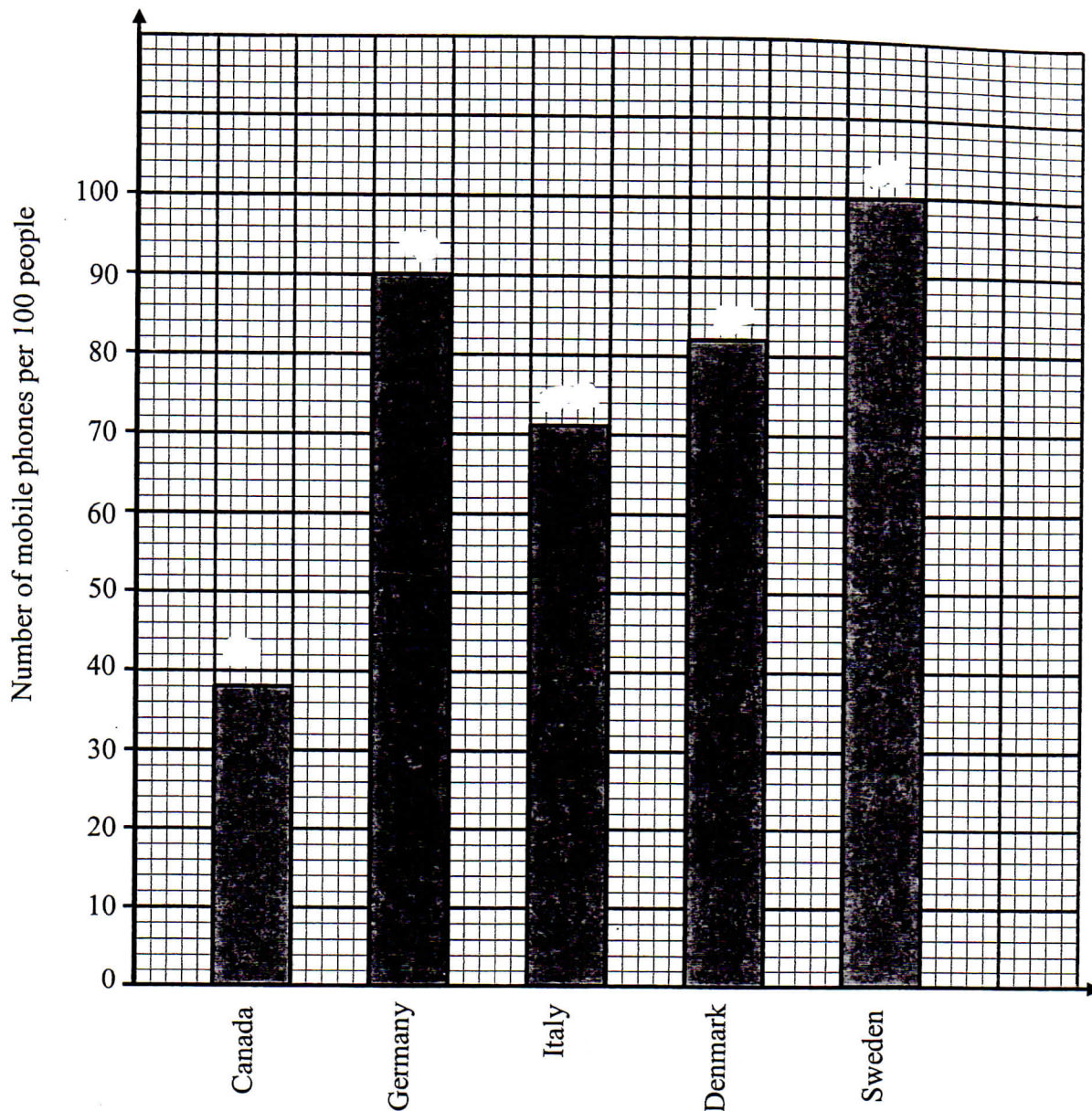
2 Dexter walks at an average speed of 4 km/h for 15 minutes and then runs 2.6 km in 10 minutes.

Calculate his average speed, in km/h, for the **whole** journey. [4]3 In the diagram, $ABCD$ is a parallelogram. ADE is a straight line.Angle $ABC = 117^\circ$ and angle $CED = 54^\circ$ 

(a) Find, stating your reasons,

(i) angle ADC , [1](ii) angle CDE . [1](b) Using your answers to part (a), explain why triangle CDE is isosceles. Show all your workings. [2]

- 4 The bar graph shows the number of mobile phones per 100 people in five countries.



- (a) How many **more** mobile phones per 100 people are there in Denmark than in Italy? [1]
- (b) In Canada, there are 36 800 000 people.

Calculate the number of mobile phones in Canada.

Give your answer in standard form correct to 3 significant figures. [2]

- (c) Alvin says, "Everyone has a mobile phone in Sweden."

Is Alvin correct? Explain your answer. [1]

- 5 (a) Express 198 as a product of its prime factors. [2]
- (b) Find the highest common factor of 198 and 90. [2]
- (c) Explain why a prime number cannot be a perfect cube. [1]
-

- 6 (a) Which of these ratios are equivalent to the ratio $x : y$?

$$x - 2 : y - 2 \quad x^2 : y^2 \quad 5x : 5y \quad \frac{1}{y} : \frac{1}{x} \quad [2]$$

- (b) Jack invested \$30 000 for 5 years at 2.1% compound interest.

Calculate the total interest that Jack will earn. [3]

- 7 PQR is a triangular field.
 $QR = 100$ m and angle $PRQ = 95^\circ$.
 The bearing of P from Q is 052° .

- (a) Construct an accurate scale drawing of the field.
 Use a scale of 1 cm to represent 10 m. [3]

- (b) A flag pole, F , is situated in the field.
 It is on the perpendicular bisector of QR and also on the bisector of angle PQR .

Construct and label the position of the flag pole on your scale drawing. [2]

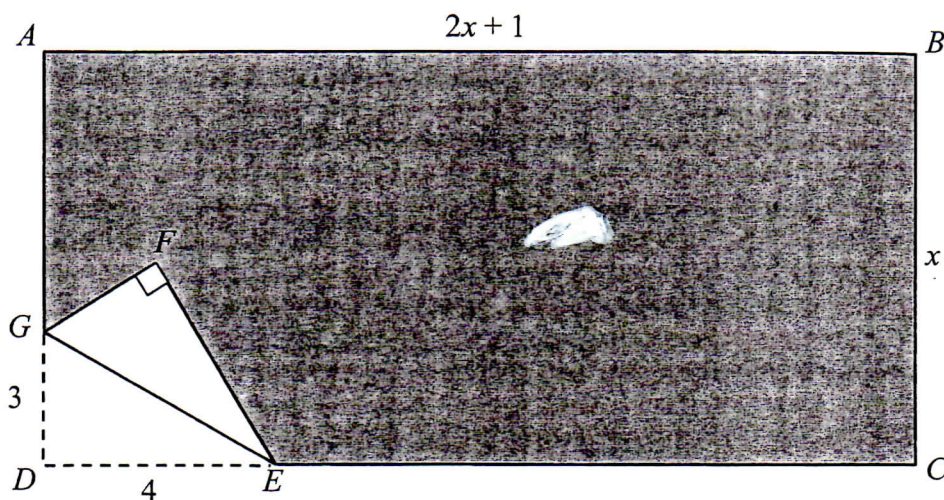
- 8 (a) Simplify $\sqrt{\frac{50x^{14}}{2x^0}}$. [2]

- (b) Factorise completely

(i) $12a^2 - 35a - 3$, [2]

(ii) $243p^2 - 48$. [2]

- 9 The diagram shows a rectangular piece of paper $ABCD$ which has been folded along EG such that D has moved to F .



$AB = (2x + 1)$ cm, $BC = x$ cm, $DE = 4$ cm and $GD = 3$ cm.

The shaded area $ABCEFG$ is 159 cm^2 .

- (a) Write down an equation in x and show that it simplifies to $2x^2 + x - 171 = 0$. [3]
- (b) Solve the equation $2x^2 + x - 171 = 0$ and hence find the length of AB . [4]

- 10 The poster shows the admission ticket prices and the two modes of purchase for admission tickets to a museum.

Admission Ticket Price	
Adult	\$ 33
Child Ages 3 to 12 years old	\$ 22
Senior Citizen Ages 60 years old and above	\$ 16
All prices are inclusive of GST	

Online Purchase

Save 15% when you buy tickets online.

Ticketing Counter Purchase

- Loyal Gold Card Members' Special Promotion in May and June**
Enjoy 55% off child admission tickets for the period 1 May 2018 to 30 June 2018.
Enjoy 10% off adult admission tickets for the period 1 May 2018 to 31 December 2018.
- Prestige Rewards Card Members' Promotion**
Enjoy 30% off senior admission tickets for the period 1 June 2017 to 1 August 2018.

- (a) Mr Huang and his wife, both aged 38 years old, planned to bring their three primary school children to the museum on 5 June 2018.

If the family purchased their admission tickets at the ticketing counter/upon arrival, what is the overall percentage discount they could get by using a Loyal Gold card? [4]

- (b) Another group which consists of 10 adults aged 59 years old and below, 5 children and 2 senior citizens aged 60 years old and above visited the museum on 12 June 2018.

Joel claimed that the group will be able to save an amount of at least \$40 if they were to purchase their admission tickets using both Loyal Gold and Prestige Rewards cards at the ticketing counter upon arrival as compared to purchase the tickets online.

Do you agree with Joel?

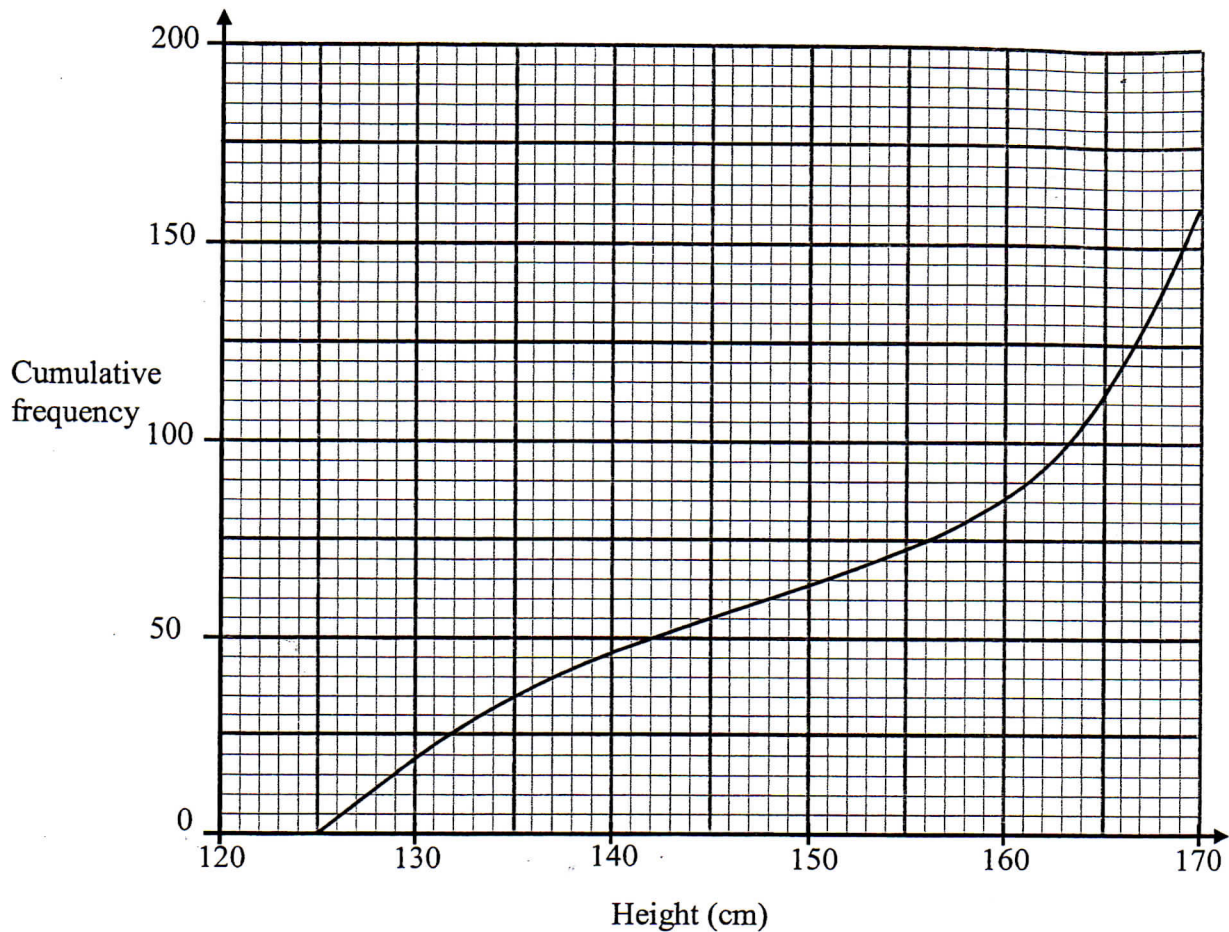
Show workings to support your answer.

[4]

Section B (8 marks)

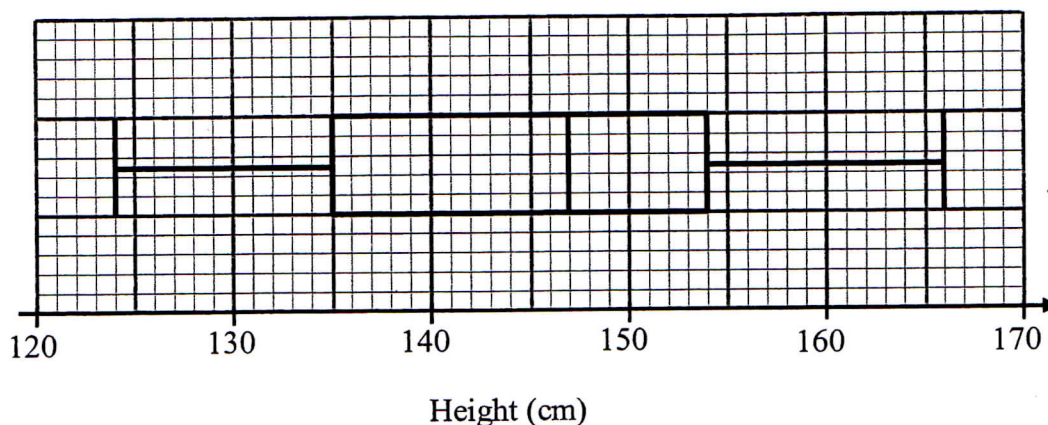
Answer **one** question from this section. Each question carries 8 marks.

- 11 The heights, in cm, of 160 students from school A were measured. The cumulative frequency graph summarises the results.



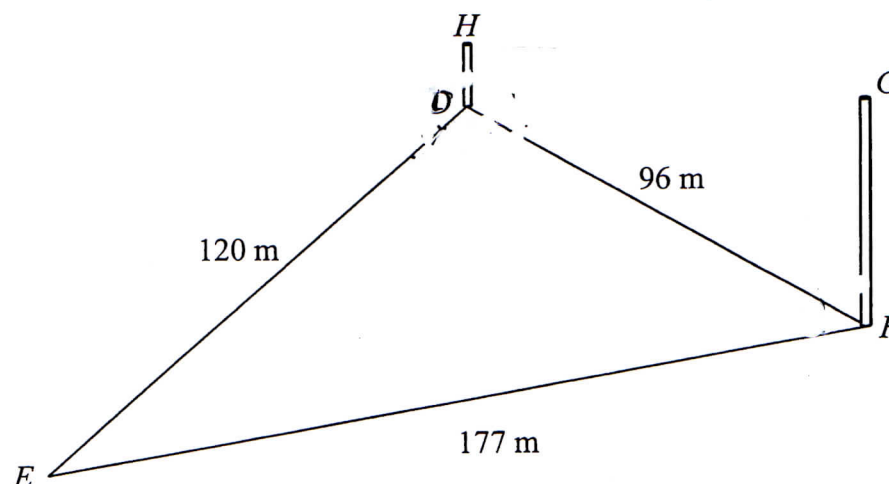
- (a) Use the graph to estimate
- (i) the median, [1]
 - (ii) the interquartile range, [2]
 - (iii) the number of students who are taller than 161 cm tall. [1]

- (b) The heights, in cm, of 160 students from school B were measured. The results are summarized in the box-and-whisker plot below.



Compare the heights of the students from the two schools in two different ways. [4]

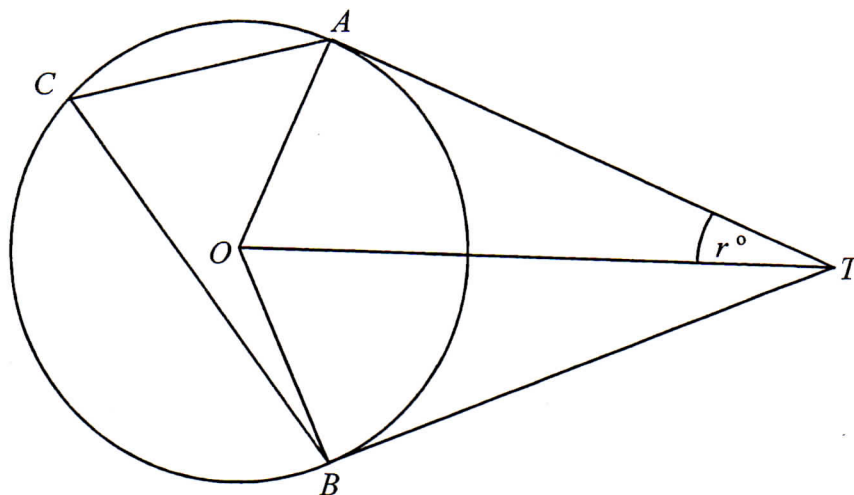
- 12 (a) D, E and F are three points on level ground.
 $DE = 120$ m, $EF = 177$ m and $FD = 96$ m.



- (i) Find angle EDF . [3]
- (ii) D and F are the foot of the vertical masts DH and FG respectively. It is given that $DH = 8$ m and $FG = 12$ m.

Calculate the angle of elevation of G from H . [2]

(b)



A , B and C are points on the circle centre O .
 AT and BT are tangents to the circle.
 Angle $OTA = r^\circ$.

Find in terms of r ,

(i) angle AOB , [2]

(ii) angle ACB . [1]

End of Paper

Qn	Marking Point	Marks Awarded	Remarks								
1ai	6.093 861 064 = 6.09 (3sf)	B1									
1aii	0.055 259 459 63 = 0.055 3 (3sf)	B1									
1b	$8^4 \times (32)^{\frac{1}{5}} = 2^n$ $(2^3)^4 \times (2^5)^{\frac{1}{5}} = 2^n$ $2^{12} \times 2^1 = 2^n$ $2^{13} = 2^n$ $n = 13$	M1 A1	Must be indices with base of 2								
2	Distance he walked $= 4 \times \frac{15}{60} = 1 \text{ km}$ Total distance = 1 + 2.6 = 3.6 km Total time taken $= \frac{15}{60} + \frac{60}{60}$ $= \frac{75}{60}$ or $\frac{5}{4} \text{ h}$ Average speed $= 3.6 \div \frac{75}{60}$ $= 8.64 \text{ km/h}$	M1 M1 M1 A1	Average speed concept								
3ai	angle $ADC = 117^\circ$ (Opposite angles of parallelogram)	B1	Accept equivalent reasons								
3aii	angle $CDE = 180^\circ - 117^\circ = 63^\circ$ (Adjacent angles on a straight line)	B1	Accept equivalent reasons								
3b	angle $DCE = 180^\circ - 54^\circ - 63^\circ = 63^\circ$ Triangle CDE is isosceles as it has a pair of equal angles.	M1 A1	Accept equivalent reasons								
4a	$82 - 71 = 11$	B1									
4b	$\frac{36\,800\,000}{100} \times 38$ $= 13\,984\,000$ $= 1.40 \times 10^7$	M1 A1	M1 for dividing by 100								
4c	No, because this numerical value of 100 phones per 100 people refers to the average number of phones for the population. or figures given: $\frac{50(0)+50(2)}{100} = 100$ phones per 100 people	B1									
5a	$198 = 2 \times 3^2 \times 11$	B2	B1 – at least 2 correct prime factor								
5b	<table><tr><td>2</td><td>90, 198</td></tr><tr><td>3</td><td>45, 99</td></tr><tr><td>3</td><td>15, 33</td></tr><tr><td>5</td><td>11</td></tr></table> $HCF = 2 \times 3^2 = 18$	2	90, 198	3	45, 99	3	15, 33	5	11	M1 A1	
2	90, 198										
3	45, 99										
3	15, 33										
5	11										

Qn	Marking Point	Marks Awarded	Remarks
5c	A prime number can only have factors which include the number 1 and itself. A perfect cube will have the powers of its prime factors to be divisible by 3. Thus a prime number cannot be a perfect cube.	B1	Accept equivalent reasons
6a	$5x : 5y$ $\frac{1}{x} : \frac{1}{y}$	B2	1 mark for each correct ratio
6b	Amount $= 30000 \left(1 + \frac{2.1}{100}\right)^5$ $= \$\ 33\ 285.10759$ $= \$\ 33\ 285.11\ (2dp)$ Interest = $\$ 33\ 285.11 - 30\ 000 = \$\ 3\ 285.11$ Refer to attached.	M1 M1 A1	Find interest accrued
7		B5	B1 – 10 cm for QR B1 – 95° B1 – 38° B1 – perpendicular bisector B1 – angle bisector
8a	$\sqrt{\frac{50x^{14}}{2x^0}}$ $= \sqrt{25x^{14}}$ $= 5x^7$	M1 A1	zero indices concept
8bi	$12a^2 - 35a - 3 = (12a + 1)(a - 3)$	B2	
8bii	$243p^2 - 48$ $= 3(81p^2 - 16)$ $= 3[(9p)^2 - 4^2]$ $= 3(9p + 4)(9p - 4)$ Area of rectangle $= x(2x + 1)\ cm^2$	M1 A1	1 mark for partial factorisation
9a	Area of 2 triangles = $3 \times 4 = 12\ cm^2$ Shaded area = 159 $x(2x + 1) - 12 = 159$ $2x^2 + x - 12 - 159 = 0$ $2x^2 + x - 171 = 0\ (shown)$ $2x^2 + x - 171 = 0$ $(x - 9)(2x + 19) = 0$ $x = 9$ or $x = -9.5$	M1 M1 M1, A1	
9b	$AB = 2(9) + 1 = 19\ cm$ Ticket cost at counter without Loyal Gold card $= 33 \times 2 + 22 \times 3$ $= \$132$	M1 M1 M1, A1	
10a	Ticket cost at counter with Loyal Gold card $= \frac{90}{100} \times 33 \times 2 + \frac{45}{100} \times 22 \times 3$ $= \$59.40 + \29.70 $= \$89.10$	M1	

1121 = \$89.10