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ST. MARGARET'S SECONDARY SCHOOL.

Preliminary Examinations 2018

CANDIDATE NAME

CLASS

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REGISTER NUMBER

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MATHEMATICS**4045/01**

Paper 1

14 August 2018

Secondary 4 Normal (Academic)

2 hours

Additional Materials: NIL

READ THESE INSTRUCTIONS FIRST

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

Write in dark blue or black pen.

You may use a soft pencil for any diagrams or graphs.

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

Answer **all** the questions.

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

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

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 80.

For Examiner's Use

This document consists of **18** 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

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

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

Answer **all** the questions.

- 1 (a) Factorise $2x - 4y$.

Answer [1]

- (b) Express $\frac{2}{x-2y} - \frac{3}{4y-2x}$ as a single fraction in its lowest term.

Answer [2]

- 2 Solve these simultaneous equations.

$$\begin{aligned} 2x - y &= -7 \\ 5x + 7y &= 11 \end{aligned}$$

Answer $x =$

$y =$ [3]

- 3 (a) Simplify $\frac{a^2 \times \sqrt{a}}{a^{-4}}$, giving your answer in the form a^p .

Answer [2]

- (b) Simplify $\left(\frac{a}{2b^3}\right)^{-3}$ and express your answer in positive indices.

Answer [2]

- 4 (a) Given that $x^2 + 11x - 15 = (x + a)^2 + b$, find a and b .

[2]

Answer $a = \dots\dots\dots b = \dots\dots\dots$

- (b) Hence solve $x^2 + 11x - 15 = 0$.

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

5

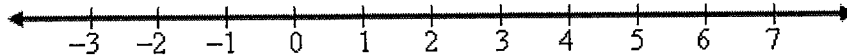
- 5 May invests \$3000 for 2 years.
She receives compound interest at 1.35% per year.

How much is the investment worth at the end of the two years?

[2]

Answer \$

6



- (a) Draw an arrow on the number line to represent each of the following:

- (i) -2.5 and label it A,
(ii) π and label it B.

[2]

- (b) (i) Solve the inequality $6(x - 2) < 9$.

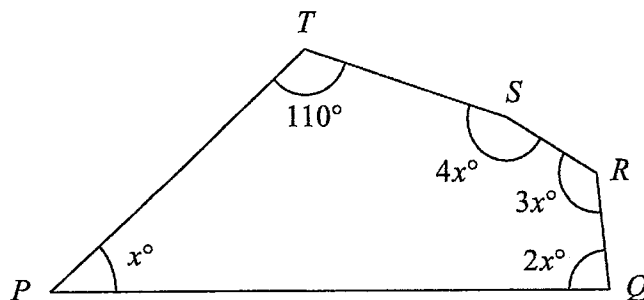
Answer [1]

- (ii) List down all the positive integers satisfied by the inequality.

Answer [1]

6

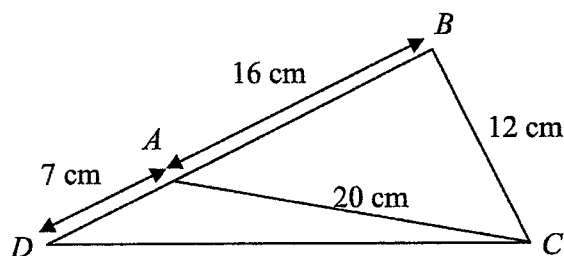
7



$PQRST$ is a pentagon. The angles P , Q , R , S and T are x° , $2x^\circ$, $3x^\circ$, $4x^\circ$ and 110° respectively. Find the value of x .

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

8



In $\triangle ABC$, $AB = 16$ cm, $BC = 12$ cm and $AC = 20$ cm. BA is produced to D and $AD = 7$ cm.

- (a) Explain why angle ABC is a right angle.

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

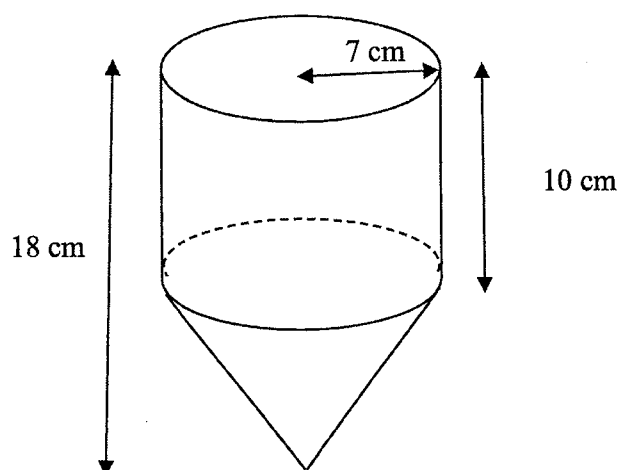
- (b) Write down the following as a fraction in its lowest term
 (i) $\cos \angle DAC$,

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

- (ii) $\tan \angle BDC$.

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

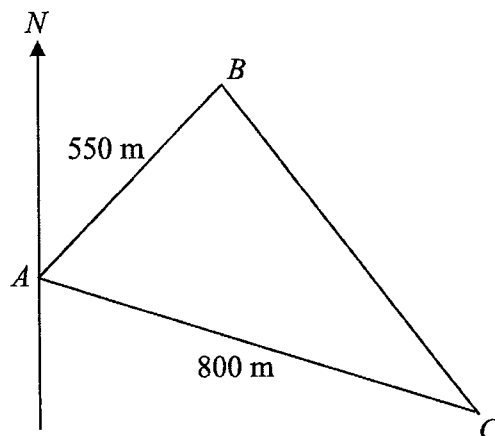
9



The solid is made up of a cone and a cylinder. The height of the cylinder is 10 cm and its radius is 7 cm. The total vertical height of the solid is 18 cm. Calculate the total surface area of the solid.

Answer cm² [3]

10



A , B and C are points on a plot of land on level ground where B and C are on a bearing of 040° and 120° from A respectively. $AB = 550\text{m}$ and $AC = 800\text{ m}$.

- (a) Find the bearing of A from C .

Answer [1]

- (b) Calculate the area of the plot of land ABC .

Answer m^2 [2]

- (c) Calculate the shortest distance from B to AC .

Answer m [2]

- 11 Light travels one metre in 3.33 nanoseconds.
Given that light travels from moon to earth in 1.3 seconds, calculate the distance between the moon and the earth in metre. Give your answer in standard form, correct to 3 significant figures. [1 nanosecond = 10^{-9} second]

Answerm [2]

- 12 On a map, an actual distance of 500 m is represented by 2 cm.
(a) Express the scale of the map in the form 1 : n.

Answer [1]

- (b) Calculate the length on the map representing an actual distance of 2.8 km.

Answer cm [1]

- (c) The area of a playground on the map is 4.8 cm^2 . Calculate the actual area of the playground in m^2 .

Answer m^2 [2]

13 The graph of $y = -x^2 - 4$ is drawn.

- (a) State whether the graph has a maximum point or a minimum point.

Answer $y = -x^2 - 4$ has a point. [1]

- (b) Find the coordinates of this point.

Answer (.....,) [1]

- (c) Amy claims that the graph cuts the x -axis at two points. Showing relevant working, explain if you agree with Amy or not.

Answer

 [1]

- 14 Peter weighs a sample of 60 persimmons from one of his trees (Species A). The results are summarized in the table below.

Mass (x grams)	No. of persimmons (f)
$120 < x \leq 125$	7
$125 < x \leq 130$	13
$130 < x \leq 135$	20
$135 < x \leq 140$	11
$140 < x \leq 145$	9

- (a) Calculate the estimated mean and standard deviation of the mass of his sample of 60 persimmons.

Answer Mean mass =g

Standard deviation = g [2]

Peter then weighs another sample of 60 persimmons from another tree (Species B). The estimated mean mass and standard deviation are recorded as follows.

Mean	130.2 g
Standard deviation	4.3 g

- (b) Peter concluded that the tree from species A consistently produces heavier persimmons compared to the tree from species B. Do you agree with Peter's conclusion? Give reasons.

Answer

.....

.....

.....

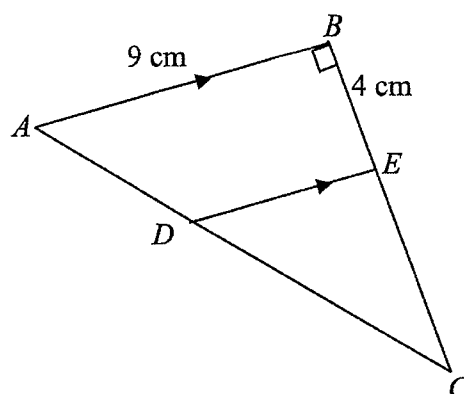
.....

.....

..... [2]

- 15 In the diagram, $\triangle CAB$ is an enlargement of $\triangle CDE$ with a scale factor 3 : 2.

$AB = 9$ cm and $BE = 4$ cm.



- (a) Calculate the length of DE .

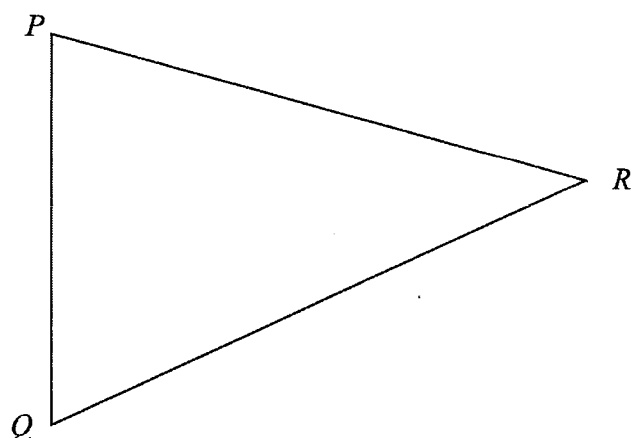
Answercm [1]

- (b) Calculate the length of CE .

Answer cm [2]

- (c) Calculate the area of $ABED$.

Answer cm^2 [2]



- (a) Construct the perpendicular bisector of PR . [1]
- (b) Construct the angle bisector of PRQ . [1]
- (c) Point A lies on both the perpendicular bisector of PR and the angle bisector of PRQ . Indicate in the diagram the point A with a cross. Measure and write down the length AQ .

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

17 (a) 11, 8, 5, 2, -1 , $\dots\dots\dots$

- (i) Write down the next two terms in this sequence.

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

- (ii) Find an expression for the n th term in this sequence.

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

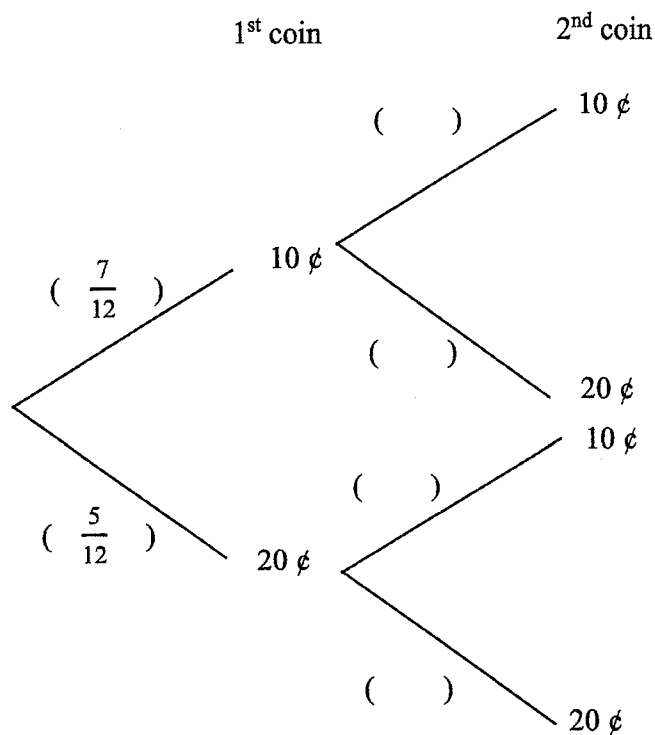
- (b) The n th term in a different sequence is given by $3n^2 - 5$.
Is 25 a term in this sequence? Give a reason for your answer.

Answer $\dots\dots\dots$

$\dots\dots\dots$

$\dots\dots\dots$ [2]

- 18 Irna has seven 10 cents coins and five 20 cents coins in her purse. She takes coins out of her purse at random, one after the other without replacement. The probability tree diagram below shows the possible outcomes.



- (a) Complete the probability tree diagram. [2]
- (b) Find the probability that the total value of the first two coins taken is 30 cents.

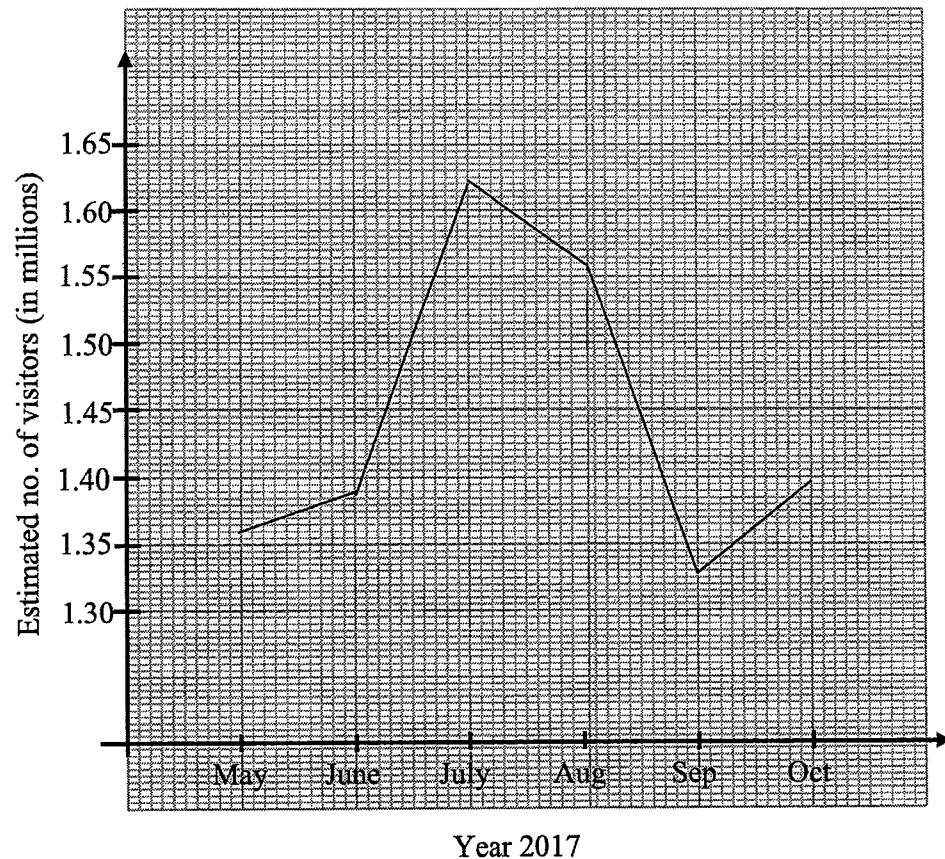
Answer [1]

- (c) Irna takes out a third coin from her purse. Find the probability that the total value of the three coins is 60 cents.

Answer [1]

- 19 The graph shows the number of international visitor arrivals to Singapore from May 2017 to October 2017.

International Visitor Arrivals to Singapore



- (a) State one feature of the graph that may be misleading and explain why.

Answer

.....

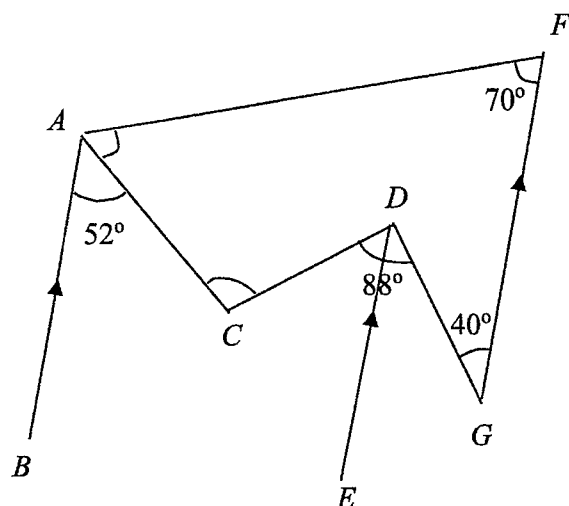
.....

..... [2]

- (b) The number of arrivals in May 2017 has dropped 6.8% from April 2017. If the number of arrivals in May 2017 was 1.37 million, calculate the number of arrivals in April 2017.

Answermillion [2]

- 20 In the diagram, AB , DE and FG are parallel lines. $\angle BAC = 52^\circ$, $\angle AFG = 70^\circ$, $\angle CDG = 88^\circ$ and $\angle DGF = 40^\circ$.



Find the value of

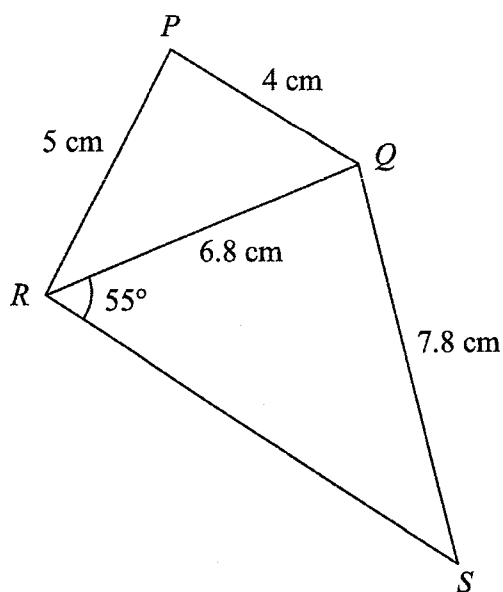
(a) angle CDE ,

Answer [1]

(b) angle CAF .

Answer [2]

- 21 In the diagram, $PQ = 4$ cm, $QS = 7.8$ cm, $PR = 5$ cm, $RQ = 6.8$ cm and $\angle QRS = 55^\circ$.



- (a) Calculate
angle PQR .

Answer [2]

- (b) angle RQS .

Answer [3]

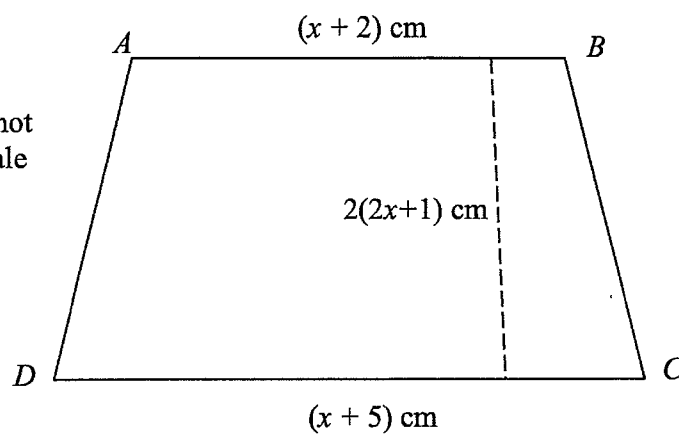
- (c) State with reasons if line PQ and line RS are parallel.

Answer

 [1]

22

Diagram is not
drawn to scale



$ABCD$ is a trapezium such that AB is parallel to DC . It is given that $AB = x + 2$ cm, $DC = x + 5$ cm and the perpendicular height is $2(2x + 1)$ cm. The area of the trapezium is 27 cm^2 .

Find the length AB .

Answercm [4]



ST. MARGARET'S SECONDARY SCHOOL.

Preliminary Examinations 2018

CANDIDATE NAME

CLASS

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REGISTER NUMBER

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MATHEMATICS**4045/02**

Paper 2

16 August 2018

Secondary 4 Normal (Academic)

2 hours

Additional Materials: Writing papers
Graph paper (1 sheet)

READ THESE INSTRUCTIONS FIRST

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

Write in dark blue or black pen.

You may use a soft pencil for any diagrams or graphs.

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

Answer **all** the questions.

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

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

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

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

For Examiner's Use

This document consists of **10** 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) Make p the subject in the equation below.

$$\frac{p - 2q}{3} = \frac{q}{r} \quad [2]$$

- (b) Given that $u = 20$ and $v = 15$, find the value of f given that [2]

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}.$$

2. (a) Solve $2x^2 + 3x - 7 = 0$, leaving your answers correct to 1 decimal place. [2]

- (b) Solve $2^{x-1} - 31 = (1 - x)^0$. [2]

3. (a) Factorise $2ab - 2a + b^2 - b$. [2]

- (b) Hence find the value of b in the equation below. [2]

$$\frac{1}{2ab - 2a + b^2 - b} + \frac{3}{2a + b} = 0$$

4. Timmy is x years old and his father is 30 years older than him. In 4 years' time, his father's age will be the square of his age.

- (a) Write down in terms of x , an expression for the age of the father. [1]

- (b) Form an equation in terms of x and show that it can be simplified to [3]

$$x^2 + 7x - 18 = 0.$$

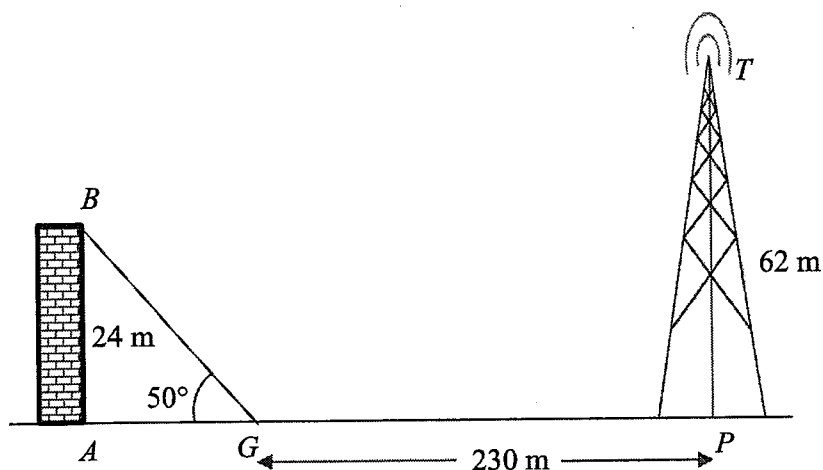
- (c) By solving the equation in part (b), find the age of Timmy in 4 years' time. [3]

5. (a) If it takes 5 workers to completely paint a house in 16 days,
- (i) write down the fraction of the house that will be painted in 3 days by the 5 workers, [1]
- (ii) calculate the additional number of workers needed if the house is to be completely painted in 10 days. [2]
- (b) Mr Tan wishes to exchange some Singapore dollars(S\$) to United States dollars(US\$). He found two money changers that quoted him exchange rates as shown below.

Honest Money Changer	Trusty Money Changer
$\text{S\$}100 = \text{US\$}73$	$\text{US\$}100 = \text{S\$}138$

Explain clearly which money changer Mr Tan should go to exchange his money. [2]

6.

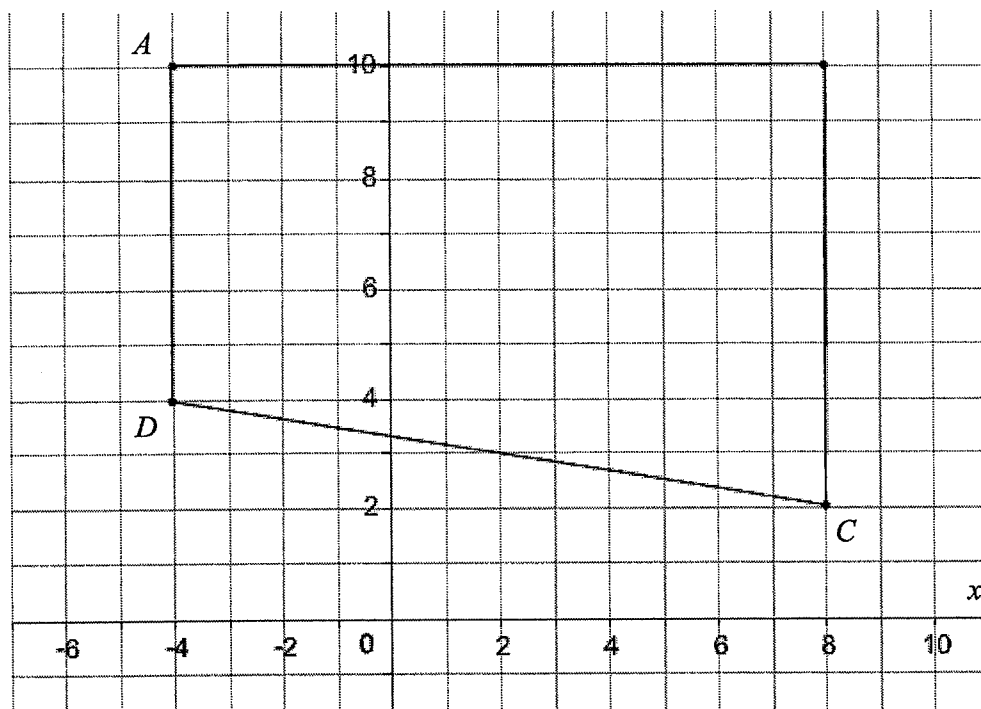


The angle of elevation of the top of the vertical building AB , from a point G is 50° . A vertical tower TP stands 230m away from G . Points A , G and P lie on a horizontal straight line, as shown in the diagram above. The building is 24m high and the tower is 62m tall.

- (a) Calculate the distance of G from the base of the building. [2]
- (b) Find the angle of depression of B from T . [3]

7.

SMSS 2018



The diagram shows the quadrilateral $ABCD$ drawn on square grid.

- (a) Write down the special name given to the quadrilateral $ABCD$. [1]
- (b) Calculate the area of $ABCD$. [2]
- (c) Calculate the perimeter of $ABCD$. [2]
Give your answer correct to 2 decimal places.
- (d) Find the gradient of CD . [2]

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

This table of values is for $y = x^2 - 6x + 4$.

x	-1	0	1	2	3	4	5	6	7
y	11	4	-1	-4	-5	p	-1	4	11

- (a) Calculate the value of p . [1]
- (b) Using a scale of 2cm to 1 unit, draw a horizontal x -axis for $-1 \leq x \leq 7$.
Using a scale of 1cm to 1 unit, draw a vertical y -axis for $-6 \leq y \leq 12$.
Draw the graph of $y = x^2 - 6x + 4$ for $-1 \leq x \leq 7$. [3]
- (c) Use the graph to find the values of x when $y = 2$. [2]
- (d) By drawing a tangent, find the gradient of the curve $y = x^2 - 6x + 4$ when $x = 5$. [2]
-

9. Elizabeth and her family bought some food items for a gathering over the weekend. The receipt from the supermarket is as shown below.

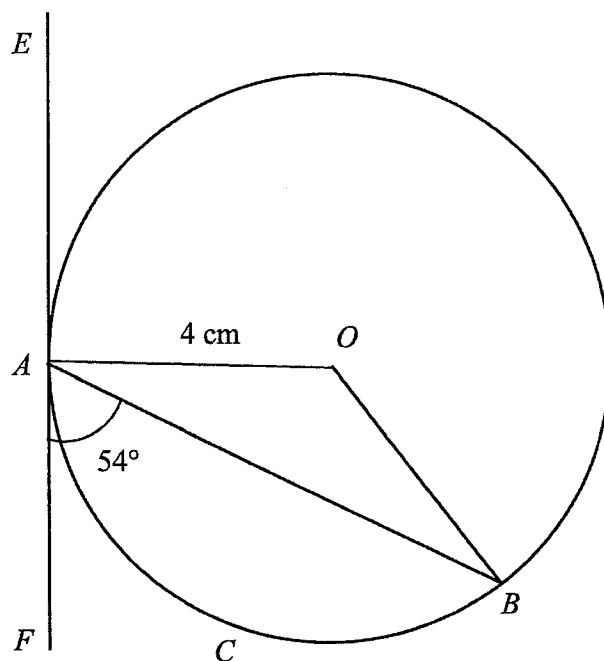
UEN No: S83CS0181L	
GST No: M4-0004578-0	
	SGD
L ROLL-CHC FLV CK28S	2.95
NORMAL PRICE 3.40	
L ROLL-CHC FLV CK28S	2.95
NORMAL PRICE 3.40	
K LEMON PUFF 800G	3.85
HD BISC CHESTNUT500G	2.75
HD BISC WHEAT 500G	2.75
BH B/FISH MURUKU 30S	3.50
BH B/FISH MURUKU 30S	3.50
LINK CARD	
2X 0.27-	
H M/CHSN/BIS500G	0.55-
SUBTOTAL	21.50
TOTAL	21.50
VISA	21.50
ITEMS PURCHASED: 7	
TOTAL SAVINGS: 1.45	
GST -- Rate -- Before GST - GST Amt	
7% \$XXX \$XXX	
NRIC # scanned for rebates	
REBATE AMT:	21.50
TRANSACTION TYPE: PTS ISSUED	
ACNT NO.	
PTS ADDED:	43.00
UPDATED PTS:	509.48
EXPIRING PTS:	0.00
TOTAL PTS:	509.48
APPROVED	

- (a) The first two items in the receipt are Chocolate Roll Flavoured cakes. Elizabeth bought 2 packets and received the discounts as shown. Calculate the percentage discount given for one packet of Chocolate Roll Flavoured cakes. [1]
- (b) Calculate the total percentage savings for this transaction. [2]
- (c) Elizabeth realised that GST was already included into the price of each item. Calculate the total amount before GST. [2]
- (d) According to the total amount of points added in the receipt, determine the total amount of money that Elizabeth's family has spent at the supermarket up to this transaction. State any assumption you make. [3]

Section B (8 marks)

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

10. (a)



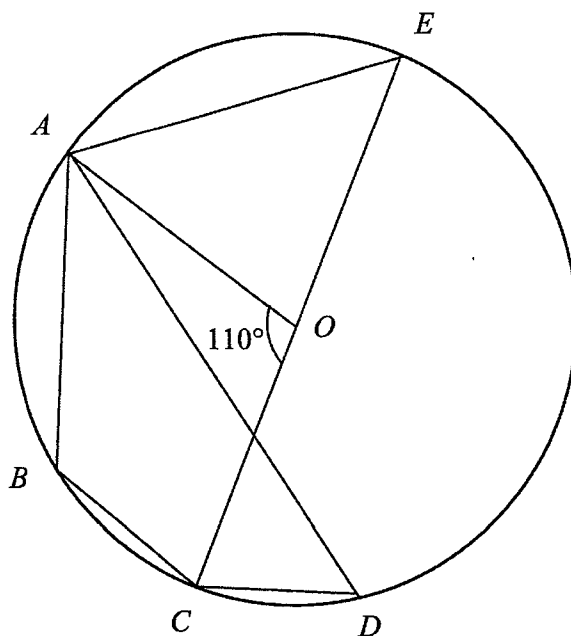
A , B and C are points on the circle with centre O .

EF is a tangent to the circle at A .

Angle $FAB = 54^\circ$ and $OA = 4$ cm.

- (i) Find angle AOB in degrees. [2]
- (ii) Convert the angle AOB you found in part (i) to radians. [1]
- (iii) Hence or otherwise, calculate the length of minor arc AB . [2]

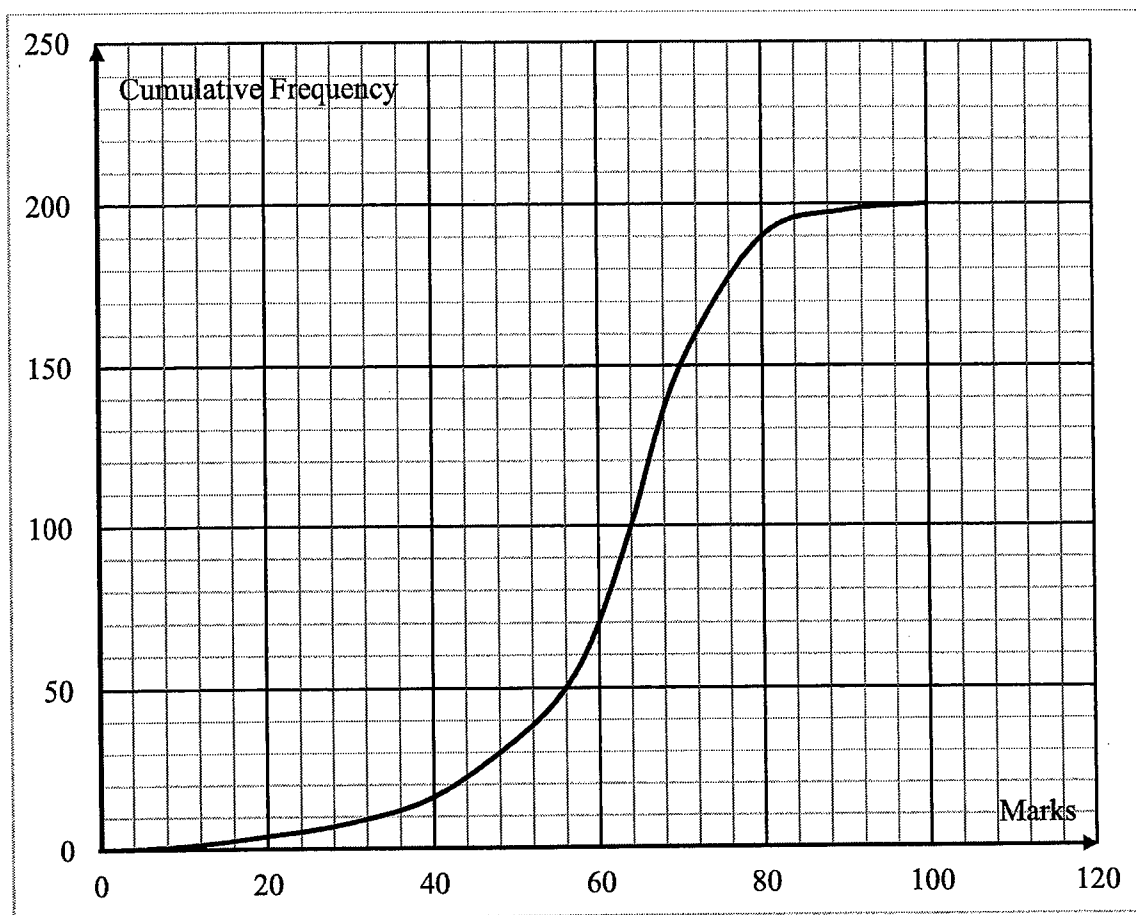
10. (b)



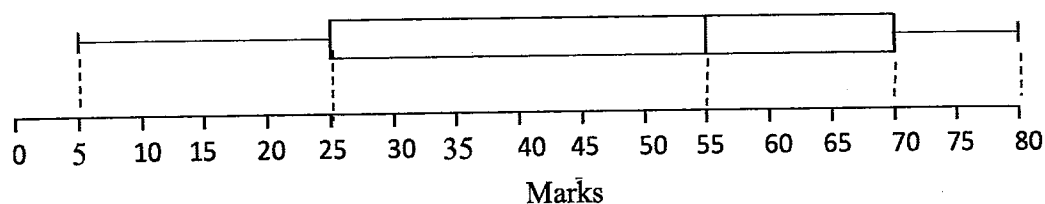
A, B, C, D and E are points on the circle with centre at O .
 Given that $\angle AOC = 110^\circ$ and COE is a straight line.
 Find

- | | |
|----------------------|-----|
| (i) $\angle ABC$, | [1] |
| (ii) $\angle ADC$, | [1] |
| (iii) $\angle CAE$. | [1] |

11. The graph below shows the cumulative frequency distribution of 200 students performance in Mathematics for the 2017 GCE N-level examinations.



- (a) From the graph above,
- (i) find the median mark, [1]
 - (ii) calculate the interquartile range, [2]
 - (iii) calculate the percentage of students who scored more than 80 marks. [3]
- (b) The same batch of students' performance in Science is shown in the box-and-whisker plot below.



Comment, giving reasons, on students' performance for the two subjects. [2]

Answers

1a) $2(x - 2y)$	18a) $\frac{6}{11}, \frac{5}{11}$
b) $\frac{7}{2(x-2y)}$	$\frac{7}{11}, \frac{4}{11}$
2) $x = -2, y = 3$	18b) $\frac{35}{66}$
3a) $a^{\frac{13}{2}}$	18c) $\frac{1}{22}$
3b) $\frac{8b^9}{a^3}$	19b) 1.47
4a) $a = 5.5, b = -45.25$	20a) 48°
4b) $x = 1.23, x = -12.2$	20b) 58°
5) \$3081.55	21a) 46.8°
6bi) $x < 3.5$	21b) 79.4°
6bii) 1, 2, 3	22) 3
7) $x = 43^\circ$	
8bi) $-\frac{4}{5},$ bii) $\frac{12}{23}$	
9) 828	
10a) 300° , b) 217000, c) 542	
11) 3.90×10^8	
12a) 1: 25000	
b) 11.2	
c) 300000	
13a) maximum, b) $(0, -4)$	
14a) mean = 133, SD = 6.05	
15a) 6	
b) 8	
c) 30	
16c) 4.5	
17ai) $-4, -7$	
17a ii) $14 - 3n$	

Qn	Steps	Marks	Comments
1(a)	$r(p - 2q) = 3q$ $p = \frac{3q + 2rq}{r} \text{ or } p = \frac{q(3 + 2r)}{r}$	M1 A1	Accepted: $p - 2q = 3\frac{q}{r}$ $p = \frac{3q}{r} + 2q$
1(b)	$\frac{1}{f} = \frac{3 + 4}{60}$ $f = \frac{60}{7} \text{ or } 8\frac{4}{7}$	M1 A1	$\frac{1}{f} = \frac{15 + 20}{300}$ $f = 8.57$
2(a)	$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(-7)}}{2(2)}$ $x = -2.8 \text{ or } x = 1.3$	M1 A1	
2(b)	$2^{x-1} = 32$ $x = 6$	M1 A1	
3(a)	$\frac{2a(b-1) + b(b-1)}{(b-1)(2a+b)}$	M1 A1	
3(b)	$1 + 3(b-1) = 0$ $b = \frac{2}{3}$	M1 A1	
4(a)	$x + 30$	B1	
4(b)	$x + 30 + 4 = (x + 4)^2$ $x + 34 = x^2 + 8x + 16$ $x^2 + 8x - x + 16 - 34 = 0 \text{ or final equation}$	B1 B1 B1	Form equation Algebraic expansion and manipulation to arrive at given equation.
4(c)	$(x + 9)(x - 2) = 0$ OR $x = \frac{-7 \pm \sqrt{7^2 - 4(1)(-18)}}{2(1)}$ $x = -9 \text{ (reject) or } x = 2$ Timmy's age in 4 years' time is 6 years old	M1 A1 B1	
5(a)(i)	$\frac{3}{16}$	B1	
5(a)(ii)	$\frac{x}{5} = \frac{16}{10}$ or other methods exhibiting inverse inverse	M1	X - number of workers needed to paint house in 10 days

	proportion. 3 additional workers	A1	
5(b)	Trusty Money Changer: S\$100 = US\$72.46 OR Honest Money Changer US\$100 = S\$136.98 OR Any equivalent method that allows a clear comparison between both money changers. Honest Money Changer	M1 A1	
6(a)	$\tan 50^\circ = \frac{24}{AG}$ $AG = 20.1m$	M1 A1	
6(b)	$\tan \theta = \frac{38}{230 + 20.138}$ Angle of depression is 8.6°	B1 M1 A1	Identify diff in ht = 38m θ - angle of depression of B from T.
7(a)	Trapezium	B1	
7(b)	$\frac{1}{2}(6+8)(12)$ 84 square units	M1 A1	
7(c)	$CD^2 = 12^2 + 2^2$ $Perimeter = 6 + 12 + 8 + \sqrt{148}$ Perimeter = 38.17 units	M1 A1	
7(d)	$gradient\ of\ CD = \frac{2-4}{8-(-4)}$ Or $gradient\ of\ CD = \frac{rise}{run} = \frac{-2}{12}$ $gradient\ of\ CD = -\frac{1}{6}$	M1 A1	
8(a)	$p = -4$	B1	
8(b)	Correct scale Points plotted Continuous smooth curve drawn	B1 B1 B1	
8(c)	$x = 0.35\ and\ 5.65 \pm 0.1$	B2	
8(d)	Tangent line drawn at $x = 5$ $gradient = 4 \pm 0.05$	B1 B1	
			Accepted:

9(a)	15.3%	B1	13.2% for students who did not include discount given on the Choc roll due to link points.
9(b)	$\% \text{ discount} = \frac{0.55 + 2 \times 0.45}{21.50 + 0.55 + 2 \times 0.45} \times 100\%$ $\% \text{ discount} = 6.32\%$	M1 A1	
9(c)	$\text{Amt before GST} = \frac{100}{107} \times 21.50$ $\text{Amt before GST} = \20.09	M1 A1	
9(d)	$\text{Total spent} = \frac{509.46}{43} \times 21.50$ $\text{Total spent} = \$254.5$	M1 A1	Accepted: $\frac{509.46}{2}$
	Assumptions: 1. No points were used before this transaction. 2. Points given are proportional to the amount spent. 3. Card for points was used in every transaction. 4. Any other sensible answers	B1	Reasonable misreading of total link points is accepted due to lack of clarity of print. E.g. they may read total link points as 509.48 or 508.46 or 508.48 which translate to final answer as \$254.74 or \$254.23 or 254.24 respectively.
10(a)(i)	$\angle OAB = 90^\circ - 54^\circ = 36^\circ$ $\angle AOB = 108^\circ$	M1 A1	
10(a)(ii)	$\angle AOB = 1.88 \text{ rad}$	B1	
10(a)(iii)	$\text{length of minor arc AB} = 4 \times 1.8849$ $\text{length of minor arc AB} = 7.54 \text{ cm}$	M1 A1	
10(b)(i)	$\angle ABC = 125^\circ$ $\angle ADC = 55^\circ$ $\angle CAE = 90^\circ$	B1 B1 B1	
11(a)(i)	Median = 64 marks	B1	
11(a)(ii)	Interquartile range = 70 – 56	M1	
	Interquartile range = 14 marks	A1	

11(a)(iii)	<i>Number scoring more than 80 marks</i>	M1	
	$= 200 - 190$		
	<i>Percentage scoring above 80 marks</i>	M1	
	$= \frac{10}{200} \times 100\%$		
	<i>Percentage scoring above 80 marks = 5%</i>	A1	
11(b)	Performed better in Math because Median(Math) higher than Median(Science)	B1	
	More consistent in Math marks than in Science because IQR(Math) smaller than IQR(Science)	B1	

