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Mathematical Formulae*Compound Interest*

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

Measurement

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

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

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

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

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

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

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** questions.

- 1 Express 0.55 cm to $3\frac{5}{8}$ mm as a ratio in its lowest terms.

Answer : [2]

- 2 A bag contains 8 green balls, 5 red balls and 7 blue balls. A ball is chosen at random.
Find the probability that
(a) the ball is green,

Answer [1]

- (b) the ball is not blue.

Answer [1]

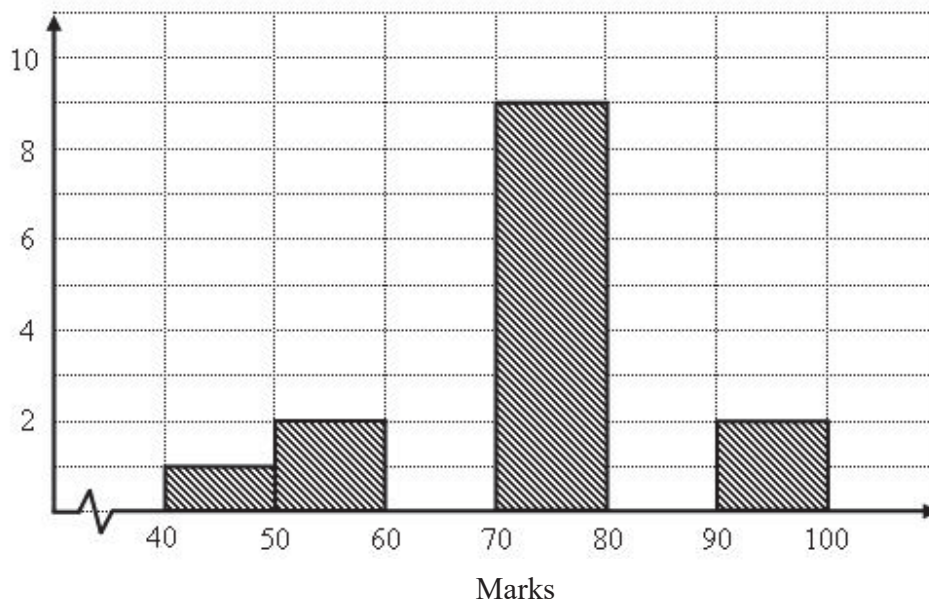
- 3 Jack wants to go Christmas shopping to buy a shirt costing \$59.95, two books costing \$14.50 each and three cameras costing \$225.43 each.
By rounding off the costs of each item to 2 significant figures, estimate the amount of cash Jack should bring for his shopping trip.

Answer \$..... [2]

- 4 A group of 25 students sat for a Mathematics test in which all marks scored are whole numbers. The frequency table below shows the distribution of the marks obtained.

Mark (x)	Number of students (Frequency)
$40 < x \leq 50$	1
$50 < x \leq 60$	2
$60 < x \leq 70$	8
$70 < x \leq 80$	9
$80 < x \leq 90$	3
$90 < x \leq 100$	2

Number of students



- (a) The same information is represented using a histogram.

Complete the histogram.

[1]

- (b) A pie chart is used to represent the data in the table.

- (i) Find the angle of the sector that represents the number of students who scored more than 70 marks.

Answer° [1]

- (ii) Explain why a histogram is preferred to a pie chart to represent this data.

Answer [1]

- 5 (a) Given that $a = 8 + 3b$, find the value of a when $b = -4$.

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

- (b) Make y the subject of $x = 3y + 5z$.

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

-
- 6 (a) Simplify $2x - 5(2 - 3x)$.

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

- (b) Solve $\frac{8}{a+3} = 5$.

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

- 7 Calculate the length of the line joining the points $(0, 5)$ and $(-1, -2)$.

Answer [2]

- 8 (a) Solve the inequality $-2x \leq -20$.

Answer [1]

- (b) Hence, write down the least value of x if x is

- (i) a positive integer,

Answer $x =$ [1]

- (ii) a prime number.

Answer $x =$ [1]

- 9 Solve these simultaneous equations.

$$-5x + y = 3$$

$$4x + 3y = 47$$

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

- 10 (a) The circumference of the Earth is 4.0075×10^4 km.

Assume that the Earth is spherical and take $\pi = 3.142$.

Find the diameter of the Earth, giving your answer in standard form.

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

- (b) The speed of light is 3×10^8 m/s. Express this speed in km/h.

Answer $\dots\dots\dots$ km/h [2]

- 11 (a)** Write these numbers in order of size, starting with the smallest.

$$9.21 \times 10^{-3} \quad \sqrt[3]{\frac{4}{5}} \quad 0.22^5 \quad \frac{9}{1000}$$

Answer [2]
smallest largest

- (b) Write $\frac{2^3 \times 2^6}{2^4}$ as a single power of 2.

Answer [1]

- 12** The floor plan of a house is drawn to a scale of 1 : 1000.

- (a)** The length of the house on the plan is 23 cm.
Find the actual length, in metres, of the house.

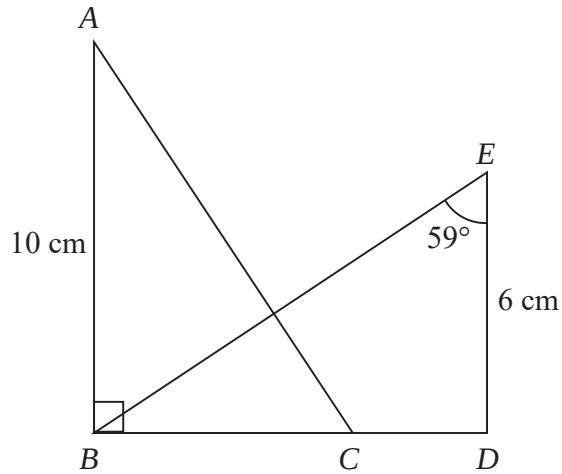
Answer m [2]

- (b)** The area of the bathroom is 5.7 m^2 .
Find the area, in cm^2 , of the bathroom on the plan.

Answer cm² [2]

- 13** In the diagram below, triangle ABC is congruent to triangle BDE .

Angle $ABC = 90^\circ$, angle $BED = 59^\circ$. $AB = 10$ cm and $DE = 6$ cm.



Find

- (a) angle BAC ,

Answer [1]

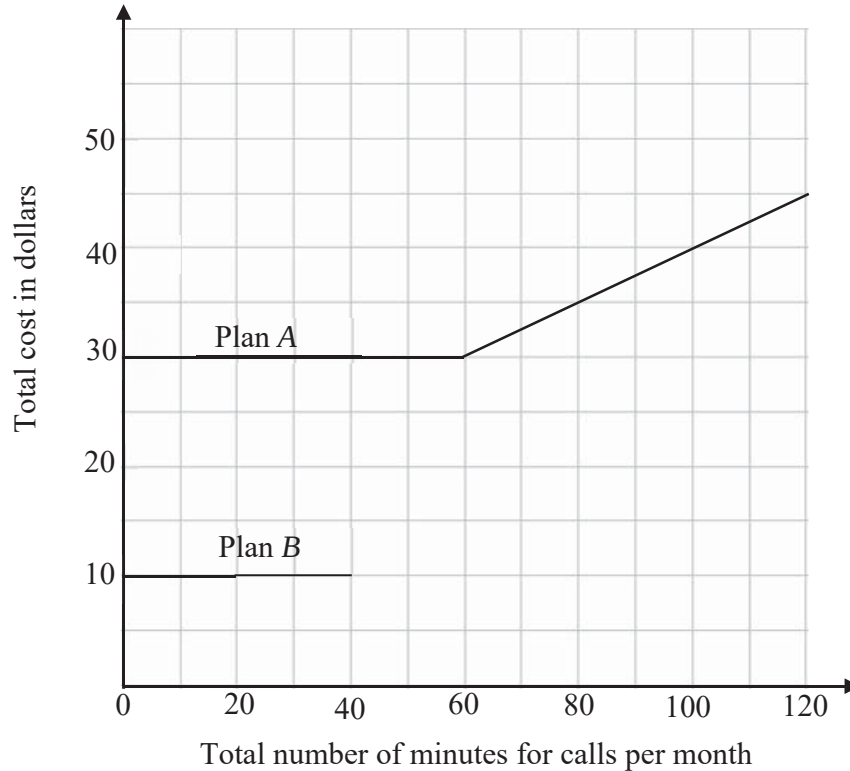
- (b) the length of CD .

Answer [2]

- 14 A mobile phone company offers their customers the choice of two price plans.

	Plan A	Plan B
Monthly subscription	\$30	\$ p
Amount of free talk time per month	60 minutes	40 minutes
Cost for each minute above the free talk time	25 cents	50 cents

The graph below shows the charges for Plan A and Plan B.



- (a) Complete the graph for Plan B. [1]

- (b) Find p .

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

- (c) Sam is considering changing his mobile phone plan from Plan B to Plan A. His monthly bill will be cheaper using Plan A if he talks more than a certain number of minutes.

What is this number?

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

- (d) Which plan is cheaper if a person talks for 60 min a month and by how much?

Answer Plan $\dots\dots\dots$ by \$ $\dots\dots\dots$ [1]

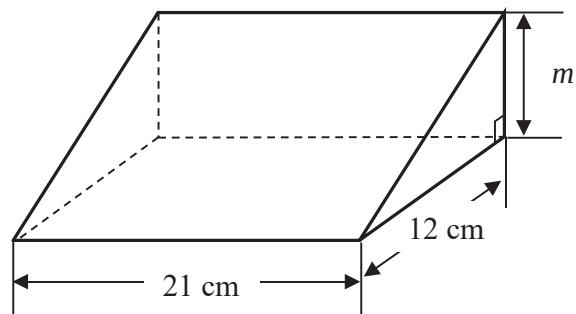
- 15 (a)** Alan bought an iPad mini for \$329. He sold it online and made a profit of 135% on the price he paid for it. Find the price at which he sold the iPad Mini.

Answer \$..... [2]

- (b)** Given that the cost price of a pair of tennis shoes was \$68, the store owner could make a profit of 25% of cost price after selling the shoe at the discounted price of 15%. Find the original selling price of this pair of tennis shoes.

Answer \$..... [2]

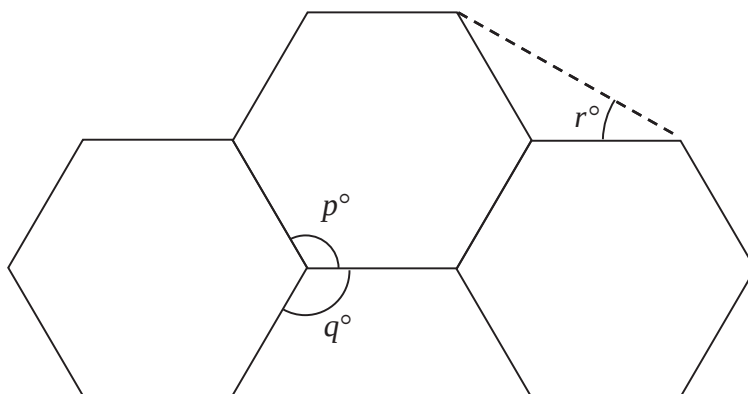
- 16** The diagram shows a prism with a volume of 567 cm^3 .



Find the value m .

Answer $m =$ [2]

- 17 The diagram shows three regular hexagons.



Find the values of

- (a) p ,

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

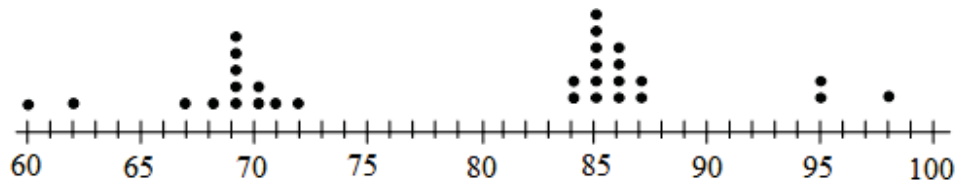
- (b) q ,

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

- (c) r .

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

- 18 The following dot diagram represents the marks of a class of students in a Mathematics quiz.



- (a) State the modal mark.

Answer [1]

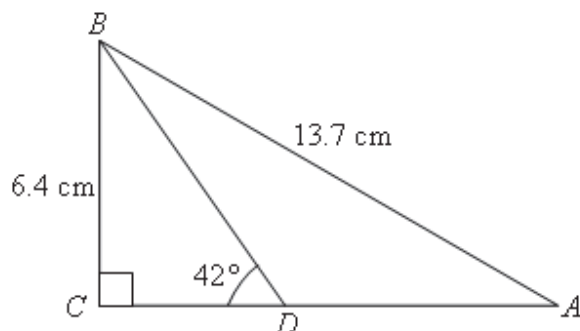
- (b) Find the percentage of students who obtained more than 84 marks.

Answer% [2]

- 19 Simplify $\frac{2x+14}{x^2+14x+49}$.

Answer [3]

- 20 Angle $BCA = 90^\circ$, angle $CDB = 42^\circ$, $BC = 6.4$ cm and $AB = 13.7$ cm.



Find

- (a) AC ,

Answer cm [1]

- (b) angle CAB ,

Answer $^\circ$ [2]

- (c) AD .

Answer cm [3]

- 21** Mr Lim left his home at 0935 and cycled at a constant speed of 2.5 m/s from his house and reached a supermarket at 0945. He bought some groceries there and left 25 minutes later. On the return journey, he traveled at twice the speed.

(a) Find the distance between his house and the supermarket, leaving your answer in km.

Answer km [2]

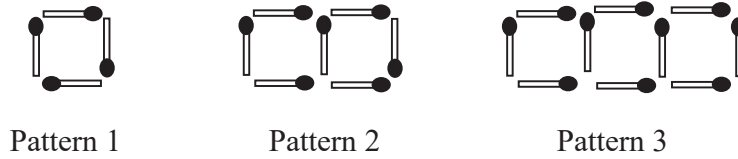
(b) Find the average speed for the entire journey in km/h.

Answer km/h [3]

-
- 22** Factorise $27a^2 - 48$.

Answer [2]

- 23 The diagram shows some patterns made using matchsticks.



- (a) Complete the table.

Pattern Number	Number of matchsticks
1	4
2	7
3	10
4	
5	

[1]

- (b) Write down an expression, in terms of n , for the number of lines in Pattern n .

Answer [1]

- (c) Which pattern would have 100 matchsticks?

Answer Pattern [1]

- (d) How many matchsticks would there be in Pattern 10?

Answer [1]

24 The equation of a straight line is $3y + 2x + 6 = 0$.

Find

(a) the gradient of the line,

Answer [1]

(b) the coordinates of the point where the line intersects the y -axis,

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

(c) the coordinates of the point at which the line intersects the line $y = 4$,

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

(d) the equation of a line, parallel to the given line, that passes through the point $(3, 2)$.

Answer [2]

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Mathematical Formulae*Compound interest*

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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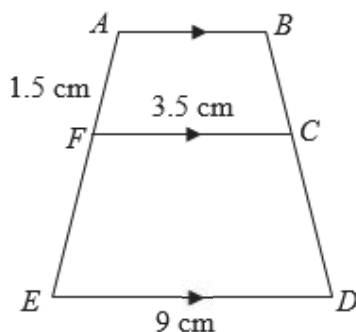
Section A (52 marks)Answer **all** the questions in this section**1** Calculate

(a) $6.78 + 4.2 \times 1.5$, [1]

(b) $\frac{2.61 + 4.12}{5.73 \times 0.39}$. [1]

2 (a) Simplify $3b^3 \times (4b^5)^2$. [2]

(b) Solve $7 \div 343^x = \frac{1}{7}$. [2]

3 (a) Jack deposited \$4000 at 1.25% per annum simple interest for 15 months.
Find the interest earned after 15 months. [2]**(b)** Adam invested \$50 000 in an account which pays 2.5% per month compound interest.
Find the total amount in the account at the end of 1 year. [2]**4**

The trapezium $ABCF$ and $FCDE$ are similar. $FC = 3.5$ cm, $DE = 9$ cm and $AF = 1.5$ cm.
Find

(a) the value of $\frac{AB}{FC}$, [2]

(b) the length of FE . [2]

- 5 The force, F newtons, between two magnets is inversely proportional to the square of the distance, d centimetres, between them. When $F = 4$ newtons, $d = 5$ centimetres.

Find

- (a) a formula connecting F and d , [2]
 (b) F when d is 7 centimetres, [1]
 (c) d when F is 6.25 newtons. [1]
-

- 6 (a) Factorize $6a^2 - 3ab - 10ac + 5bc$. [2]

(b) Simplify

(i) $\frac{5a^3b^2}{16xy} \div \frac{80ab^3}{48xy^2}$, [2]

(ii) $\frac{4}{x} - \frac{3}{5x-1}$. [3]

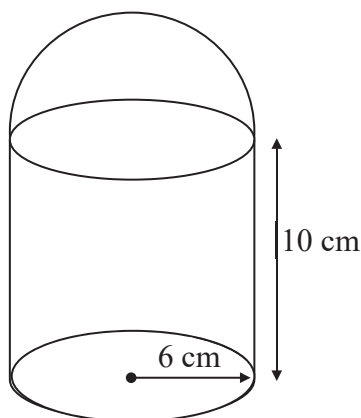
- 7 The breakdown of the cost for the usage of water is as follows.

Amount payable for water used	\$ 1.35 per m^3
Water Conservation fee	30% of the amount payable for the water used
Administrative fee	\$0.35 per m^3
Good and Services tax	7% of the amount payable for the water used and the Water Conservation Fee

If a household used 37 m^3 of water in February, find the amount payable in that month for the

- (a) water used, [1]
 (b) administrative fee, [1]
 (c) water conservation fee, [1]
 (d) overall water bill, including GST. [2]
-

- 8 The iron solid is made up of a hemisphere joined to a cylinder with a radius of 6 cm and a height of 10 cm as shown.



- (a) Calculate
- (i) the volume of the hemisphere, [2]
 - (ii) the volume of the cylinder, [2]
 - (iii) the total volume of the solid. [1]
- (b) If the solid is melted to form a pyramid of a base area of 250 cm^2 , find the height of the pyramid. [2]

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

The table below is for $y = 2x^2 - 5x - 4$

x	-3	-2	-1	0	0.5	1	2	3	4	5
y	p	14	3	-4	-6	-7	-6	-1	8	21

- (a) Calculate the value of p . [1]
- (b) Using a scale of 2 cm to 1 unit, draw a horizontal x -axis for $-3 \leq x \leq 5$.
Using a scale of 2 cm to 5 units, draw a vertical y -axis for $-7 \leq y \leq 30$.
Plot the graph of $y = 2x^2 - 5x - 4$ for $-3 \leq x \leq 3$. [2]
- (c) Find the values of x when $y = 10$. [2]
- (d) By drawing a tangent, find the gradient of the curve $y = 2x^2 - 5x - 4$ when $x = 2$. [2]

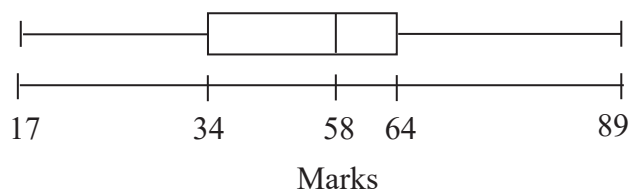
10 A stamping machine produces either small or large bottle caps.

- (a) It can produce x small bottle caps in 5 minutes. Write down an expression, in terms of x , for the time taken to produce one small bottle cap in seconds. [1]
- (b) In 5 minutes, the machine can produce 20 more small bottle caps than large ones. Write down an expression, in terms of x , for the time taken to produce one large bottle cap in seconds. [1]
- (c) The machine takes 1.25 seconds longer to produce one large bottle cap than one small bottle cap.
- (i) Write down an equation in terms of x and show that it reduces to $x^2 - 20x - 4800 = 0$. [3]
- (ii) Solve the equation $x^2 - 20x - 4800 = 0$. [2]
- (d) Hence, find the number of large bottle caps that can be produced in 1 minute. [1]
-

Section B (8 marks)

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

- 11 (a)** The box-and-whisker diagram below illustrates the Mathematics results of a test.



- (i) Find the range. [1]
- (ii) Find the interquartile range. [1]
- (iii) Compare the usefulness of the range and interquartile range in measuring the spread of marks. [1]

- (b)** The students of schools *A* and *B* took a common Mathematics quiz.

The table below shows the distribution of marks obtained by the students.

School A:

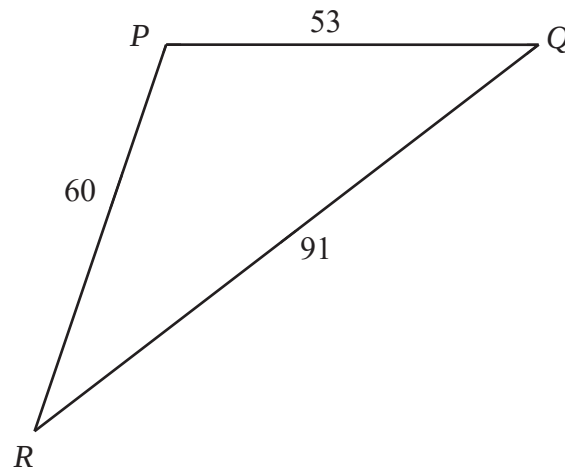
Marks (x)	Frequency
$1 \leq x \leq 5$	5
$6 \leq x \leq 10$	17
$11 \leq x \leq 15$	24
$16 \leq x \leq 20$	4

School B:

Mean = 10.8
Standard Deviation = 3.2

- (i) Find estimates for the mean and the standard deviation of the marks. [3]
- (ii) Which school achieved better results? [1]
- Give a reason for your answer.
- (iii) Which school achieved more consistent results? [1]
- Give a reason for your answer.

12 (a)



In a triangular field, $PQ = 53$ m, $PR = 60$ m and $QR = 91$ m.

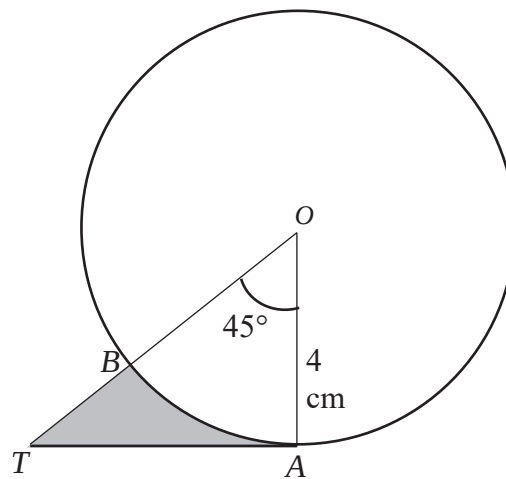
(i) Show that angle $QPR = 107.1^\circ$.

[3]

(ii) Find the area of triangle PQR .

[2]

- (b) The diagram shows a circle, centre O , with radius 4 cm. AT is tangent to the circle. OBT is a straight line and angle $AOT = 45^\circ$. (Take $\pi = \frac{22}{7}$)



Calculate

(i) the area of the minor sector AOB ,

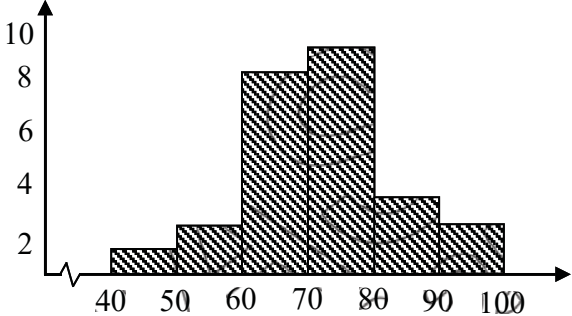
[1]

(ii) the shaded area.

[2]

-End of paper-

Fajar Secondary School Prelim 2017
Sec 4N(A) Mathematics Paper 1 Answer Scheme

1.		$0.55 \text{ cm} : 3\frac{5}{8} \text{ mm}$ $5.5 \text{ mm} : 3.625 \text{ mm}$ $5500 : 3625$ $44 : 29$	M1 (convert unit) A1
2.	(a)	$\frac{2}{5}$	B1
	(b)	$\frac{13}{20}$	B1
3.		$\$60 + 2(\$15) + 3(\$230)$ $= \$780$	M1 (convert costs to 2sf) A1
4.	(a)	No of students  Marks	B1
	(b)(i)	Required <i>angle</i> = $\frac{14}{25} \times 360$ $\approx 201.6^\circ$	B1
	(b)(ii)	The histogram data is continuous and the distribution of marks from low to high is clearly seen while a pie chart is used to compare percentages and it is not easy to see the distribution.	B1
5.	(a)	$a = 8 + 3b$ $a = 8 + 3(-4)$ $a = -4$	B1
	(b)	$x = 3y + 5z$ $3y + 5z = x$ $3y = x - 5z$ $y = \frac{x - 5z}{3}$	M1 A1

6.	(a)	$2x - 5(2 - 3x)$ $= 2x - 10 + 15x$ $= 17x - 10$	B1
	(b)	$\frac{8}{a+3} = 5$ $5a + 15 = 8$ $5a = -7$ $a = \frac{-7}{5}$	M1 A1
7.		length of line $= \sqrt{(-1-0)^2 + (-2-5)^2}$ $= \sqrt{1+49}$ $= \sqrt{50}$ $= 7.07 \text{ units (correct to 3 sig. fig.)}$ Hence, the length of line is 7.07 units.	M1 A1
8.	(a)	$-2x \leq -20$ $x \geq \frac{-20}{-2} \quad \left(\begin{array}{l} \text{Divide both sides by } -2 \text{ and} \\ \text{reverse the inequality sign} \end{array} \right)$ $x \geq 10$	B1
	(b)	(i) If x is a positive integer, the least value of x is 10.	B1
		(ii) If x is a prime number, the least value of x is 11.	B1
9.		$-15x + y = 3 \quad - (1)$ $4x + 3y = 47 \quad - (2)$ $(1) \times 3, 3(-15x + y) = 3(3)$ $\quad -15x + 3y = 9 \quad - (3)$ $(2) - (3), (4x + 3y) - (-15x + 3y) = 47 - 9$ $4x + 3y + 15x - 3y = 38$ $19x = 38$ $x = 2$ Substitute $x = 2$ into (1),	M1 A1

12	(a)	$1\text{ cm} \rightarrow 10\text{ m}$ $23\text{ cm} \rightarrow 230\text{ m}$	M1 A1
	(b)	$10\text{ m} \rightarrow 1\text{ cm}$ $100\text{ m}^2 \rightarrow 1\text{ cm}^2$ $5.7\text{ m}^2 \rightarrow 0.057\text{ cm}^2$	M1 A1
13.	(a)	$\angle DBE = 180^\circ - 90^\circ - 59^\circ$ ($\angle$ sum of Δ) $= 31^\circ$ $\angle BAC = \angle DBE$ $= 31^\circ$	B1
	(b)	ΔABC is congruent to ΔBDE (given) $BD = AB$ $= 10\text{ cm}$ $BC = DE$ $= 6\text{ cm}$ $CD = BD - BC$ $= 10 - 6$ $= 4\text{ cm}$	M1 A1
14	(a)	The graph shows two cost plans. Plan A has a fixed cost of \$30 for up to 60 minutes, then increases linearly. Plan B has a fixed cost of \$10 for up to 40 minutes, then increases linearly. The lines intersect at 100 minutes for a total cost of \$40.	B1

	(b)	10	B1
	(c)	100 min	B1
	(d)	B by \$10	B1
15.	(a)	$\text{Price that he sold} = \frac{235}{100} \times 329$ $= \$773.15$	M1 A1
	(b)	$\frac{68 \times 1.25}{0.85}$ $= \$100$	M1 A1
16.		$567 = \frac{1}{2}(12 \times h) \times 21$ $h = 4.5 \text{ cm}$	M1 A1
17.	(a)	$\text{Sum of interior angles of a hexagon} = (6 - 2) \times 180^\circ$ $= 720^\circ$ $p^\circ = \frac{720^\circ}{6}$ $= 120^\circ$ $p = 120$	M1 A1
	(b)	$q^\circ + 120^\circ + 120^\circ = 360^\circ \text{ (}\angle\text{s at a point)}$ $q^\circ + 240^\circ = 360^\circ$ $q = 120$	 B1
	(c)	$r^\circ + 120^\circ + 120^\circ = 180^\circ \text{ (}\angle\text{ sum of } \Delta\text{)}$ $2r^\circ + 240^\circ = 180^\circ$ $2r^\circ = 60^\circ$ $r = 30$	 B1
18	(a)	85 % of students who obtained 85 marks or more	B1
	(b)	$= \frac{15}{30} \times 100$ $= 50\%$	M1 A1

19		$\frac{2x+14}{x^2+14x+49}$ $= \frac{2(x+7)}{(x+7)(x+7)}$ $= \frac{2(x+7)}{(x+7)^2}$ $= \frac{2}{x+7}$	M1 $2(x+7)$ M1 $(x+7)(x+7)$ A1
20	(a)	$\sqrt{13.7^2 - 6.4^2}$ $= 12.1 \text{ cm}$	B1
	(b)	$\sin \angle CAB = \frac{6.4}{13.7}$ $\angle CAB = 27.8^\circ$	M1 A1
	(c)	$\tan 42^\circ = \frac{6.4}{DC}$ $DC = 7.11 \text{ cm}$ $AD = 12.11 - 7.11$ $= 5.00 \text{ cm}$	M1 M1 ($AD = AC - CD$) A1
21	(a)	Distance from house to supermarket $= 2.5 \times 10 \times 60$ $= 1500 \text{ m}$ $= 1.5 \text{ km}$	M1 A1
	(b)	Time taken for return journey $= \frac{10}{2}$ $= 5 \text{ min (since speed is doubled)}$ Or $\frac{1500}{5 \text{ m/s}} = 300 \text{ s}$ $= 5 \text{ min}$ Time taken for entire journey = $(10 + 5 + 25) \text{ min}$ $= \frac{40}{60} \text{ h}$ $= \frac{2}{3} \text{ h}$	M1

		$\text{Average speed} = \frac{\text{Total Distance}}{\text{Total Time Taken}}$ $= \frac{1.5 \times 2}{\frac{2}{3}}$ $= \frac{3}{\frac{2}{3}}$ $= 4.5 \text{ km/h}$	M1 A1
22		$27a^2 - 48 = 3(9a^2 - 16)$ $= 3[(3a)^2 - 4^2]$ $= 3(3a + 4)(3a - 4)$	M1 A1
23	(a)	No. of matchsticks of each pattern as follow: Pattern 1 : 4 Pattern 2 : $7 = 4 + 3$ Pattern 3 : $10 = 4 + 2 \times 3$ Pattern 4 : $x = 4 + 3 \times 3$ $= 13$ Pattern 5 : $y = 4 + 4 \times 3$ $= 16$	B1
	(b)	Pattern n : $4 + (n-1) \times 3$ $= 4 + 3n - 3$ $= 3n + 1$	B1
	(c)	Let the number of matchsticks in Pattern n is 100. $1 + 3n = 100$ $3n = 99$ $n = 33$	B1
	(d)	Pattern 10 : $3(10) + 1 = 31$	B1
24	(a)	$3y + 2x + 6 = 0$ $3y = -2x - 6$ $y = -\frac{2}{3}x - 2$ $m = -\frac{2}{3}$	B1
	(b)	At y-axis, $x = 0$,	

		$y = -\frac{2}{3}(0) - 2$ $y = -2$ Hence, the coordinates of the point is $(0, -2)$.	B1
	(c)	At point of intersection, $y = 4$, $4 = -\frac{2}{3}x - 2$ $-\frac{2}{3}x = 6$ $-2x = 18$ $x = -9$ Hence, the coordinates of the point is $(-9, 4)$.	M1 A1
	(d)	Equation of second line: $y = -\frac{2}{3}x + c$ Since $(3, 2)$ lies on second line, $2 = -\frac{2}{3}(3) + c$ $2 = -2 + c$ $c = 4$	M1 A1

Fajar Secondary School Prelim 2017
 Sec 4N(A) Mathematics Paper 2 Answer Scheme

1.	(a)	13.08	B1
	(b)	3.01	B1
2.	(a)	$3b^3 \times (4b^5)^2 = 3b^3 \times 4^2 b^{5 \times 2}$ $(ab)^m = a^m b^m$ $= 3b^3 \times 16b^{10}$ $= 3 \times 16b^{3+10}$ $a^m \times a^n = a^{m+n}$ $= 48b^{13}$	M1 A1
	(b)	$7 \div 343^x = \frac{1}{7}$ $7 \div 7^{3x} = 7^{-1}$ $1 - 3x = -1$ $3x = 2$ $x = \frac{2}{3}$ Or $343^x = 49$ $7^{3x} = 7^2$ $3x = 2$ $x = \frac{2}{3}$	M1 (7^{3x} or 7^{-1}) A1
3.	(a)	Interest earned $= \frac{4000 \times 1.25 \times 1.25}{100}$ $= \$62.50$	M1 A1
	(b)	$A = P \left(1 + \frac{R}{100} \right)^n$ $= 50000 \left(1 + \frac{215}{100} \right)^{12}$ $= \$67244.44$ (2 decimal place)	M1 A1
4	(a)	Given that trapeziums $ABCF$ and $FCDE$ are similar, $\frac{AB}{FC} = \frac{FC}{ED}$ $= \frac{3.5}{9}$ $= \frac{7}{18}$	M1 A1

		Hence, the value of $\frac{AB}{FC}$ is $\frac{7}{18}$.	
	(b)	Given that trapeziums $ABCF$ and $FCDE$ are similar, $\frac{FE}{AF} = \frac{ED}{FC}$ $\frac{FE}{1.5} = \frac{9}{3.5}$ $= \frac{9}{3.5} \times 1.5$ $= 3\frac{6}{7} \text{ cm}$	M1 A1
5.	(a)	Since F is inversely proportional to d^2, then $F = \frac{k}{d^2}$, where k is a constant. When $F = 4$ and $d = 5$, $4 = \frac{k}{5^2}$ $k = 4(25)$ $= 100$ $\therefore F = \frac{100}{d^2}$	M1 ($k = 100$) A1
	(b)	When $d = 7$, $F = \frac{100}{7^2}$ $= 2\frac{2}{49} \text{ N}$	B1
	(c)	When $F = 6.25$, $6.25 = \frac{100}{d^2}$ $d^2 = 16$ $d = \sqrt{16}$ $= \pm 4$ Since $d > 0$, then $d = 4$ cm.	B1
6	(a)	$6a^2 - 3ab - 10ac + 5bc = 3a(2a - b) - 5c(2a - b)$ $= (2a - b)(3a - 5c)$	M1 A1
	(b)(i)	$\frac{5a^3b^2}{16xy} \div \frac{80ab^3}{48xy^2} = \frac{5a^3b^2}{16xy} \times \frac{48xy^2}{80ab^3}$ $= \frac{3a^2y}{16b}$	M1 (convert divide to multiply) A1

	(b)(ii)	$\frac{4}{x} - \frac{3}{5x-1} = \frac{4(5x-1) - 3x}{x(5x-1)}$ $= \frac{20x - 4 - 3x}{x(5x-1)}$ $= \frac{17x - 4}{x(5x-1)}$	M1 M1(expansion) A1
7	(a)	$1.35 \times 37 = \$49.95$	B1
	(b)	$0.35 \times 37 = \$12.95$	B1
	(c)	$\frac{30}{100} \times 49.95 = \14.99	B1
	(d)	$\left(\frac{7}{100}\right) \times (49.95 + 14.99) = \4.55 $\$49.95 + \$12.95 + \$14.99 + \$4.55 = \$82.44$	M1 A1
8	(a)(i)	Volume of hemisphere $= \frac{1}{2} \times \frac{4}{3} \pi r^3$ $= \frac{1}{2} \times \frac{4}{3} \times \pi \times 6^3$ $= 452.3893421$ $= 452 \text{ cm}^3$	M1 A1
	(a)(ii)	Volume of cylinder $= \pi r^2 h$ $= \pi \times 6 \times 6 \times 10$ $= 1130.973355$ $= 1130 \text{ cm}^3$	M1 A1
	(a)(iii)	Total volume = $452.3893421 + 1130.973355$ $= 1583.362697$ $= 1580 \text{ cm}^3$	B1 ECF
	(b)	Volume = $\frac{1}{3} \times \text{base area} \times h$ $1583.362697 = \frac{1}{3} \times 250 \times h$ $h = 19.0 \text{ cm}$	M1 A1 ECF
9	(a)	29	B1

	(b)		
	(c)	-1.7, 4.2	B1B1
	(d)	$\text{Gradient} = \frac{15}{5}$ $= 3$	C1-tangent drawn correctly A1
10	(a)	Since x small bottle caps are produced in 5 minutes, Time taken to produce 1 small bottle cap $= \frac{5}{x} \text{ min}$ $= \frac{5}{x} \times 60 \text{ s}$ $= \frac{300}{x} \text{ s}$	B1
	(b)	Since the machine can produce 20 more small bottle caps than large ones in 5 min, No. of large bottle caps produced in 5 minutes = $(x - 20)$ Given that $(x - 20)$ large bottle caps are produced in 5 minutes,	

		Time taken to produce 1 large bottle cap $= \frac{5}{x-20} \text{ min}$ $= \frac{5}{x-20} \times 60 \text{ s}$ $= \left(\frac{300}{x-20} \right) \text{ s}$	B1
	(c)(i)	Since the machine takes 1.25 seconds longer to produce a large bottle cap than a small bottle cap, Time taken to produce 1 large bottle cap – Time taken to produce 1 small bottle cap = 1.25 $\frac{300}{x-20} - \frac{300}{x} = 1.25$ $\frac{300x - 300(x-20)}{x(x-20)} = 1.25$ $\frac{300x - 300x + 6000}{x^2 - 20x} = 1.25$ $\frac{6000}{x^2 - 20x} = 1.25$ $6000 = 1.25(x^2 - 20x)$ $6000 = 1.25x^2 - 25x$ $1.25x^2 - 25x - 6000 = 0$ $x^2 - 20x - 4800 = 0 \text{ (Shown)}$	M1 (forming equation) M1 (expansion) A1
	(c)(ii)	$x^2 - 20x - 4800 = 0$ $(x-80)(x+60) = 0$ $x-80=0 \text{ or } x+60=0$ $x=80 \quad x=-60$	M1 (factorization) A1
	(d)	Since the no. of caps is a positive number, $x = 80$. No. of large bottle caps produced in 5 minutes = $(80) - 20$ $= 60$ No. of large caps produced in 1 minute = $\frac{60}{5}$ $= 12$	B1
11	(a)(i)	Range: $89-17=72$	B1
	(ii)	Interquartile range $= 64 - 34$ $= 30$	B1
	(iii)	The range represents how far the lowest and highest marks are while interquartile range represents the middle half of the marks making interquartile range a more useful measure of spread.	B1

	(b)(i)	$\text{Mean} = \frac{5(3) + 17(8) + 24(13) + 4(18)}{5 + 17 + 24 + 4}$ $= 10\frac{7}{10} \text{ or } 10.7$ $\text{Standard Deviation} = \sqrt{\frac{5(3)^2 + 17(8)^2 + 24(13)^2 + 4(18)^2}{5 + 17 + 24 + 4} - \left(10\frac{7}{10}\right)^2}$ $= 3.9$	B1 M1 A1
	(b)(ii)	School B because the mean mark of the students is higher than that from School A.	B1
	(b)(iii)	School B because the standard deviation of the mark of the students is smaller than School A.	B1
12	(a)(i)	$\cos \angle QPR = \frac{53^2 + 60^2 - 91^2}{2(53)(60)}$ $= -\frac{1872}{6360}$ $\angle QPR = \cos^{-1}\left(-\frac{1872}{6360}\right)$ $= 107.1179^\circ$ $\approx 107.1^\circ \text{ (1 decimal place)}$	M1 M1 A1
	(ii)	Area of triangle PQR $= \frac{1}{2}(60)(53)\sin 107.1^\circ$ $= 1519.56$ $= 1520\text{m}^2$	M1 A1
	(b)(i)	$\text{Area} = \frac{45}{360} \times \frac{22}{7} \times 4^2$ $= 6\frac{2}{7}\text{cm}^2$	B1
	(b)(ii)	$\text{Shaded area} = \frac{1}{2} \times 4 \times 4 - 6\frac{2}{7}$ $= 1\frac{5}{7}\text{cm}^2$	M1 A1