Name:_____ ( )	Class:_____

SERVE·LEAD·EXCEL

40m

GREENDALE SECONDARY SCHOOL
End-of-Year Examination 2014

MATHEMATICS **4045/01**

Paper 1 13 October 2014

Secondary Two Normal Academic **1 hour**

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number and name on all the work you hand in.
Write in dark or blue 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** questions.

If working is needed for any question it must be shown with the answer.
Omission of essential working may result in loss of marks.
You are expected to use a scientific calculator to evaluate explicit numerical expressions.
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 required 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 **40**.

Question	Q1	Q2	Q3	Q4	Q5	Q6	Q7
Strand	N	S	A	A	A	A	A
Marks							

Question	Q8	Q9	Q10	Q11	Q12	Q13	Q14
Strand	N	M	M	A/M	S/P	G	G/A
Marks							

This document consists of 12 printed pages, including this cover page.

Mathematical Formulae

Compound interest

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

Mensuration

Curve surface area of a cone $= \pi rl$

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

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

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

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

Arc length $= r\theta$, where θ 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

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

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

For Examiner's Use Only

Answer all questions.

1 (a) Calculate $\dfrac{76.5 \div 5.3}{2.9 - 0.6}$.

Give your answer correct to 2 significant figures.

Answer (a) _____ [1]

(b) The distance between Shanghai and London is 9191 km.

Write 9191 to the nearest thousand.

Answer (b) _____ [1]

---

2 A group of 8 boys has a mean height of 1.80 m.
When Peter joins the group the mean height is then 1.79 m.
Find Peter's height.

Answer _____ m [2]

---

3 Factorise $24xy - 8y$.

Answer _____ [1]

For Examiner's Use Only

4 A bus can carry x passengers seated and 13 passengers standing.

(a) Write an expression for the maximum number of passengers that can be carried on y buses.

Answer (a) _____ [1]

(b) Given that $x = 60$, find the least number of buses required to carry 500 passengers.

Answer (b) _____ [2]

5 (a) Simplify $\frac{7p}{3} \div \frac{p}{4}$.

Answer (a) _____ [1]

(b) Expand and simplify $2(x+5)+3(x-5)$.

Answer (b) _____ [2]

For Examiner's Use Only

6 (a) Solve $2x \leq 8$.

Answer (a) _____ [1]

(b) Solve $\frac{x+2}{3} = \frac{4}{5}$.

Answer (b) $x =$ _____ [1]

7 y is directly proportional to x.

When $x = 4$, $y = 40$,

(a) Form an equation in terms of x and y.

Answer (a) $y =$ _____ [1]

(b) Find the value of y when $x = 15$.

Answer (b) $y =$ _____ [1]

For Examiner's Use Only

8 A plan of a house is drawn on the scale 1 : 100 .

(a) The width of the house is 9 m .

Find the width of the house on the plan.

Answer (a) _____ cm [1]

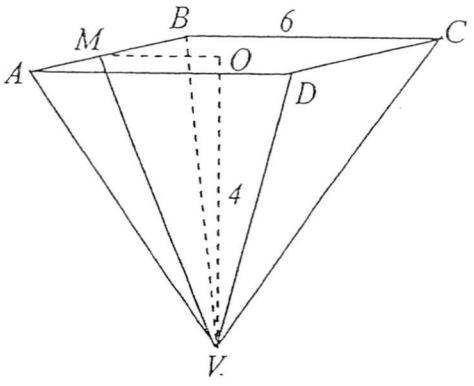
(b) The floor area of the plan is 800 cm^2 .

What is the floor area, in square metres, of the house?

Answer (b) _____ m^2 [2]

For Examiner's Use Only

9 The diagram below is a square base solid pyramid where $BC = 6$ cm and height $VO = 4$ cm . M is the midpoint of AB.



Find

(a) the length of VM.

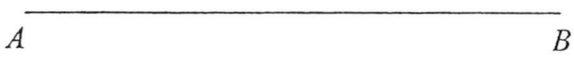
Answer (a) _____ cm [1]

(b) the total surface area of the solid pyramid.

Answer (b) _____ cm^2 [1]

For Examiner's Use Only

10 The triangle ABC has $AB = 7\,\text{cm}$, $AC = 10\,\text{cm}$ and angle $BAC = 35°$.
AB is drawn below.



(a) Complete accurately triangle ABC. [1]

(b) Construct perpendicular bisector on line AC. [1]

(c) Measure angle ABC.

Answer (c) $\angle ABC =$ _____ [1]

(d) Measure BC.

Answer (d) $BC =$ _____ cm [1]

For Examiner's Use Only

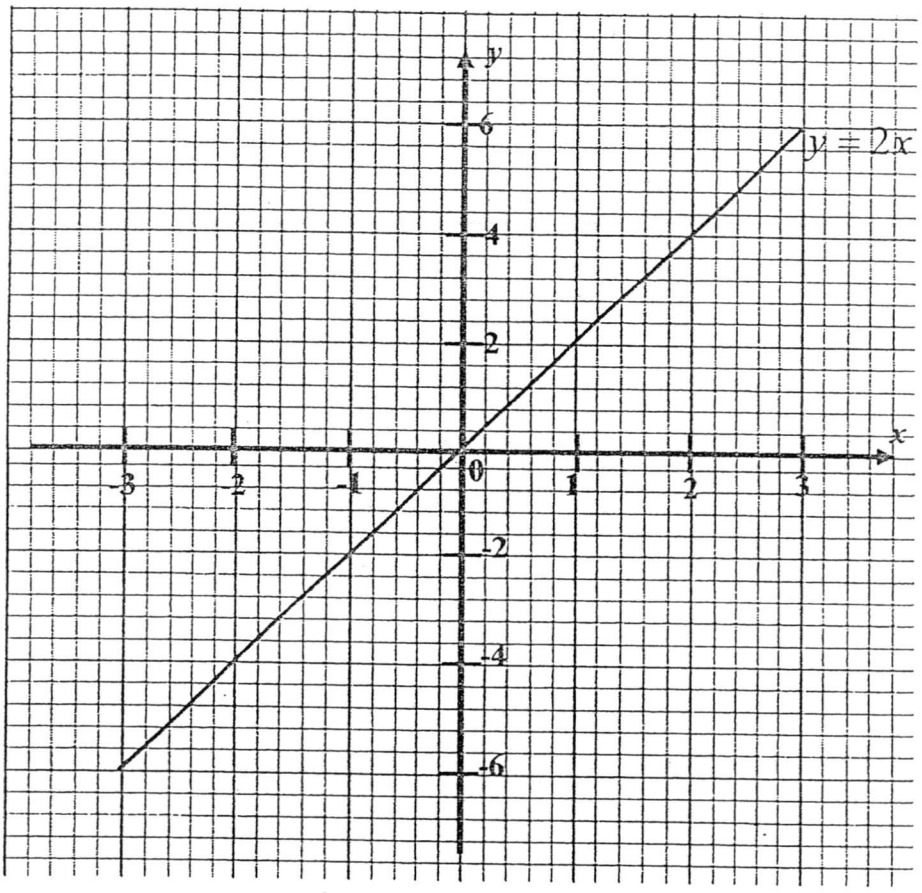
11 (a) From the graph $y = 2x$ drawn below, find the value of x when $y = 3$.

Answer (a) $x =$ _____ [1]

(b) Complete the table for the line $y = 3 - x$. [1]

x	-3	3
y		0

(c) Draw the graph $y = 3 - x$ on the axes below. [2]



(d) **Use your graph** to write down the solutions of the simultaneous equations.

$y = 2x$

$y = 3 - x$

Answer (d) $x =$ _____ [1]

$y =$ _____ [1]

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12 The stem-and-leaf diagram shows the number of marks obtained by 20 students in a test.

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

Key: 5 | 2 means 52

Find

(a) the modal mark,

Answer (a) _____ [1]

(b) the median mark.

Answer (b) _____ [1]

(c) Find the probability of selecting a student that obtained more than 70 marks.

Answer (c) _____ [1]

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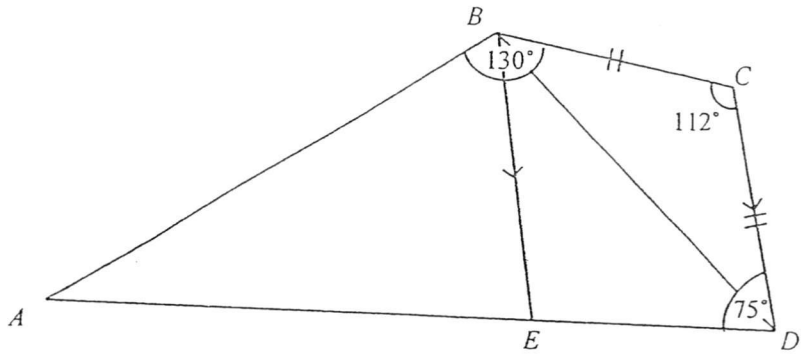


In the diagram $ABCD$ is a quadrilateral, E is a point on AD.
$\angle ABC = 130°$, $\angle BCD = 112°$, $\angle CDA = 75°$, $BC = CD$ and BE is parallel to CD.
Find

(a) $\angle BAD$,

Answer (a) $\angle BAD =$ _____ ° [1]

(b) $\angle BDE$,

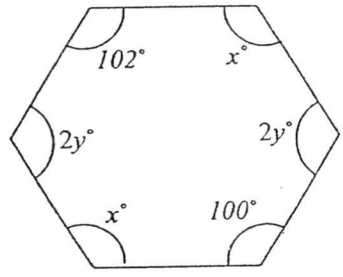
Answer (b) $\angle BDE =$ _____ ° [1]

(c) $\angle DBE$.

Answer (c) $\angle DBE =$ _____ ° [1]

For Examiner's Use Only

14 The diagram below shows an irregular hexagon.



(a) By calculating the total sum of interior angles of a hexagon, show that $x + 2y = 259$. [2]

(b) Hence, solve the two equations simultaneously to find x and y.

$$x + 2y = 259$$

$$x + y = 181$$

Answer (b) $x =$ _____ [1]

$y =$ _____ [1]

End of Paper

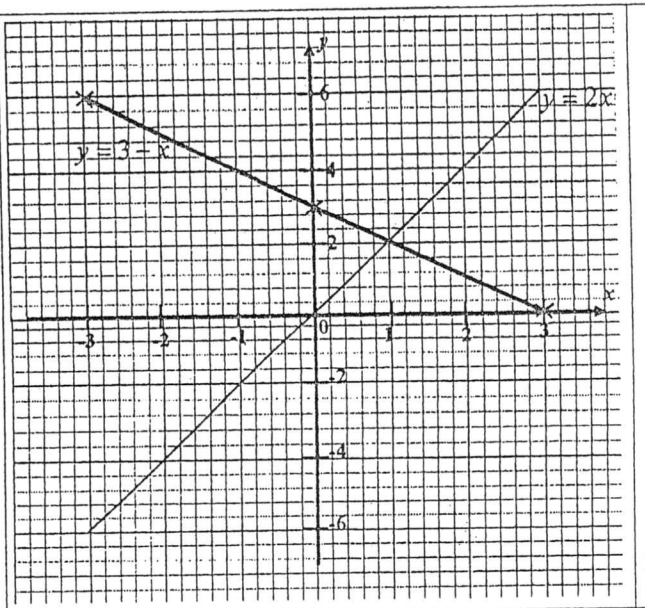
Greendale Secondary School
Secondary 2 Normal Academic
Mathematics End-Year Examination Paper 1/2014
Marking Scheme

Q.		Solution	Marks
1	(a)	6.3	B1
	(b)	9000	B1
		Total Marks	**2 marks**
2		Total height of 8 boys $= 1.80 \times 8$ $= 14.4$ m Total height of 9 boys $= 1.79 \times 9$ $= 16.11$ m Peter's height $= 16.11 - 14.4$ $= 1.71$ m	M1 A1
		Total Marks	**2 marks**
3		$24xy - 8y = 8y(3x - 1)$	B1
		Total Marks	**1 mark**
4	(a)	$y(x+13)$	B1
	(b)	$y(x+13) = 500$ $y(60+13) = 500$ $y = 500 \div 73$ $y = 6.8493$ Least number of buses = 7 buses	M1 (ecf) A1 (ecf)
		Total Marks	**3 marks**
5	(a)	$\frac{7p}{3} + \frac{p}{4}$ $= \frac{7p}{3} \times \frac{4}{p}$ $= 9\frac{1}{3}$	B1

	(b)	$2(x+5)+3(x-5)$ $= 2x+10+3x-15$ $= 5x-5$	M1 A1
		Total Marks	**3 marks**
6	(a)	$2x \le 8$ $x \le 4$	B1
	(b)	$\frac{x+2}{3} = \frac{4}{5}$ $5(x+2) = 12$ $5x + 10 = 12$ $5x = 2$ $x = \frac{2}{5}$	B1
		Total Marks	**2 marks**
7	(a)	$y = kx$ $40 = k(4)$ $k = 10$ $y = 10x$	B1
	(b)	$y = 10x$ $y = 10(15)$ $y = 150$	B1
		Total Marks	**3 marks**
8	(a)	map : actual 1 : 100 ? : 900 House width on plan = 9 cm	B1
	(bi)	area on map : actual area $(1\text{cm})^2 : (1\text{m})^2$ $1\text{cm}^2 : 1\text{m}^2$ $800\text{cm}^2 : ?$ Floor Area $= 1 \times 800$ $= 800\text{ m}^2$	M1 A1
		Total Marks	**3 marks**

9	(a)	$VM = \sqrt{(4)^2 + (3)^2}$ $VM = \sqrt{25}$ $VM = 5$ cm	B1
	(b)	Total Surface Area $= (6 \times 6) + \left(4 \times \frac{1}{2} \times 6 \times 5\right)$ $= 96\ \text{cm}^2$	B1
		Total Marks	**2 marks**
10	(a), (b)	Refer to attached paper	
	(c)	$\angle ABC = 101° (\pm 1°)$	B1
	(d)	$BC = 5.3$ cm $(\pm 0.1$ cm$)$	B1
		Total Marks	**4 marks**
11	(a)	$x = \frac{3}{2}$	B1
	(b)		B1

x	-3	0	3
y	6	3	0

	(c)		B1 (points) B1 (graph)
	(d)	$x = 1,\ y = 2$	B2
		Total Marks	**5 marks**
12	(a)	Mode = 54 marks	B1
	(b)	Median $= \frac{65 + 66}{2} = 65.5$ marks	B1
	(c)	$P(\text{more than 70 marks}) = \frac{3}{10}$	B1
		Total Marks	**3 marks**

13	(a)	$\angle BAD = 360° - 130° - 112° - 75°$ (sum of quad) $= 43°$	B1
	(b)	$\angle CDB = \frac{180° - 112°}{2}$ $= 34°$ $\angle BDE = 75° - 34°$ $= 41°$	B1
	(c)	$\angle DBE = 34°$ (alt $\angle$)	B1
		Total Marks	**3 marks**
14	(a)	$102° + x° + 2y° + 100° + x° + 2y° = 720°$ $202° + 2x° + 4y° = 720$ $2x + 4y = 518°$ $x + 2y = 259°$	M1 A1
	(b)	$x + 2y = 259$ ---(1) $x + y = 181$ ---(2) (1) – (2) $2y - y = 259 - 181$ $y = 78$ Sub $y = 78$ into (2) $x + y = 181$ $x + 78 = 181$ $x = 103$	 B1 B1
		Total Marks	**4 marks**

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Answer **all** questions.

1. (a) Factorise $x^2 - 9y^2$. [2]

(b) Hence, or otherwise, without the use of the calculator, find the value of $(5)^2 - 9(3)^2$. [1]

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2. (a) Express $\frac{x+2}{3} - \frac{3x-4}{5}$ as a single fraction. [2]

(b) Factorise $x^2 - 7x - 18$ completely. [2]

---

3. Given that x is the price for one pen and y is the price for one eraser, Ali spends \$22.50 to buy 5 pens and 7 erasers.

(a) Form an equation connecting x and y. [1]

Cindy spends \$13.50 to buy 3 pens and 5 erasers.

(b) Form a second equation connecting x and y. [1]

(c) Hence, find the total cost of 4 pens and 4 erasers. [1]

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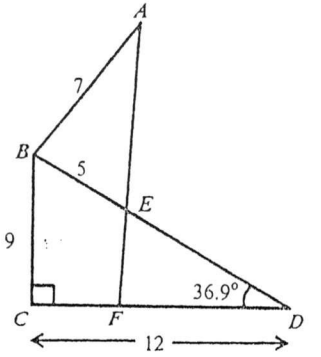
4. In a game, Tom, Sam and Hassan won some sweets in the ratio of 4 : 3 : 11. If they were to share the sweets equally, Hassan had to give both Tom and Sam a total of 10 sweets.

Find the

(a) amount of sweets Hassan won initially. [2]

(b) percentage increase in the amount of sweets Tom had after he received the sweets from Hassan. [2]

5.



In the diagram, $BC = 9$ cm, $CD = 12$ cm, $AB = 7$ cm, $BE = 5$ cm, $\angle BDC = 36.9°$ and $\angle BCD = 90°$.

(a) Show that the length BD is 15 cm. [1]

Given that triangle ABE is congruent to triangle DFE. Find the

(b) angle BAE, [1]

(c) length AF, [2]

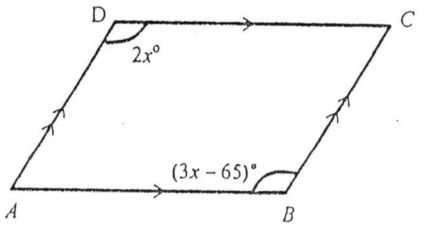
(d) length CF. [2]

---

6. $ABCD$ is a parallelogram. Given that $\angle ABC = (3x - 65)°$ and $\angle ADC = 2x°$. Find the

(a) value of x, [2]

(b) $\angle DAB$. [2]



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7. A survey on the amount of savings per week was conducted with a group of students.

The table shows the results.

Savings per week($x)	1	2	3	4	5
Number of students	15	18	4	10	3

(a) State the mode for this survey. [1]

(b) Calculate the mean savings per week. [2]

A student was chosen at random to receive a token of appreciation for taking part in the survey.

(c) Find the probability that the chosen student saved $4 per week. [1]

---

8. Betty travels 675 km at a speed of 60 km/h from Town A to Town B.

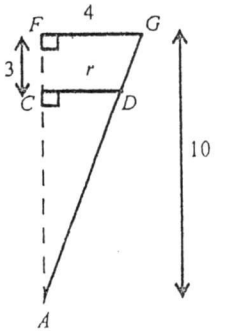
(a) Find the time taken in hours and minutes for Betty's journey from Town A to Town B. [2]

She then takes another 6 hours to travel from Town B to Town C at 80 km/h.

(b) Find the distance between Town B and Town C. [1]

(c) Find the average speed for Betty's journey from Town A to Town C. [2]

9.



The diagram above shows part of the cross section of an inverted cone with base radius FG and height AF. Given that $FG = 4$ cm, $FC = 3$ cm, $FA = 10$ cm, $CD = r$ cm, and triangle ACD is **similar** to triangle AFG.

(a) Show that $r = 2.8$ cm. [2]

The inverted cone is fully filled with milk tea and 10 spherical pearls. When all the pearls are removed, the height of the tea level drops by 3 cm.

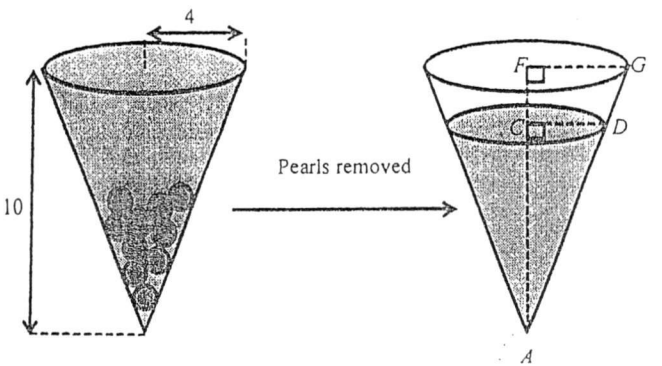


Figure 1 Figure 2

(b) Find the volume of the milk tea with the 10 spherical pearls as shown in Figure 1, [1]

(c) Use your answer in 9(a), find the volume of the milk tea without the spherical pearls as shown in Figure 2, [1]

(d) Hence, find the volume of 1 spherical pearl. [2]

---

10. **Answer the whole question on a single sheet of graph paper.**
The table below is for $2y = 4x - 3$

x	-2	-1	0	1	2
y	-5.5	-3.5	-1.5	0.5	p

(a) Calculate the value of p. [1]

(b) Using a scale of 4 cm to 1 unit, draw a horizontal x-axis for $-2 \le x \le 2$.

Using a scale of 2 cm to 1 unit, draw the vertical y-axis for $-6 \le x \le 4$.

Plot the graph of $2y = 4x - 3$ for $-2 \le x \le 2$. [3]

(c) Find the value of x when $y = 0$. [1]

(d) Find the gradient of the graph $2y = 4x - 3$. [1]

End of Paper

Greendale Secondary School
Secondary 2 Normal Academic
Mathematics End-of-Year Examination Paper 2/2014
Marking Scheme

Q:		Solution	Marks
1	(a)	$(x+3y)(x-3y)$	B2
	(b)	-56	B1
2	(a)	$\frac{x+2}{3}-\frac{3x-4}{5}$ $=\frac{5(x+2)-3(3x-4)}{15}$ $=\frac{5x+10-9x+12}{15}$ $\frac{-4x+22}{15}$	B1 A1
	(b)	$x^2-7x-18=(x-9)(x+2)$	B2
3	(a)	$5x+7y=22.50$ ----(1)	B1
	(b)	$3x+5y=13.50$ ----(2)	B1
	(c)	(1) – (2) $2x+2y=9$ $4x+4y=18$ Hence cost of 4 pens and 4 erasers is \$18.	A1
4	(a)	4 : 3 : 11 Total units = 18 To share equally, each will get 6 units. Hassan had to give 2 units to Tom and 3 units to Sam. 5 units -------10 sweets 11 units ------- $\frac{10}{5}\times 11=22$ sweets.	M1 A1
	(b)	% increase = $\frac{6-4}{4}\times 100\%$ $=50\%$	M1 A1
5	(a)	$BD=\sqrt{9^2+12^2}$ $=15$ cm	M1
	(b)	$\angle BAE=\angle FDE=36.9^\circ$	B1
	(c)	Given ΔABE is congruent to ΔDFE $FE=BE=5$ cm $AE=DE=(15-5)$ cm $=10$ cm	M1

		$AF=FE+AE$ $=10+5$ $=15$ cm	A1
	(d)	$DF=AB=7$ cm $CF=CD-DF$ $=(12-7)$ cm $=5$ cm	M1 A1
6	(a)	$2x=3x-65^\circ$ (Opp angles of //grams) $x=65^\circ$	M1 A1
	(b)	$\angle DAB=180^\circ-2(65^\circ)$ (int. angles, $AD//BC$) $=50^\circ$	M1 A1
7	(a)	Mode = \$2	A1
	(b)	Mean = $\frac{1\times 15+2\times 18+3\times 4+4\times 10+5\times 3}{15+18+4+10+3}$ = \$2.36	M1 A1
	(c)	P(students saved \$4 per week) = $\frac{10}{50}=\frac{1}{5}$	A1
8	(a)	Time taken for Betty's journey from Town A to Town B = $\frac{675km}{60km/h}$ $=11\frac{1}{4}h$ = 11h 15 min	M1 A1
	(b)	Distance between Town B and Town C = (80×6) km = 480 km.	A1
	(c)	Average Speed = $\frac{\text{total distance}}{\text{total time taken}}$ $=\frac{(675+480)\text{ km}}{\left(11\frac{1}{4}+6\right)\text{h}}$ = 66.95652174 = 67.0 km/h (3 s. f.)	M1 A1
9	(a)	Given ΔACD is similar to ΔAFG $\frac{AC}{AF}=\frac{CD}{FG}=\frac{AD}{AG}$ $\frac{10-7}{10}=\frac{r}{4}$ $r=2.8$	M1 A1

	(b)	Vol. of milk tea with 10 spherical pearls $= \frac{1}{3} \times \pi \times 4^2 \times 10$ $= 167.5516$ $= 168 \text{ cm}^3$ (3 s. f.)	B1
	(c)	Vol. of milk tea without the spherical pearls $= \frac{1}{3} \times \pi \times 2.8^2 \times (10 - 3)$ $= 57.4702$ $= 57.5 \text{ cm}^3$ (3 s. f.)	B1
	(d)	Vol. of 1 spherical pearl $= (167.5516 - 57.4702) \div 10$ $= 11.0 \text{ cm}^3$ (3 s. f.)	M1 A1

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