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Answer **all** the questions.

- 1 (a) Calculate $\frac{15.5^3}{6.13 - 2.39}$.

Write down the first five digits of your answer.

Answer [1]

- (b) Write your answer to **part (a)** correct to 2 significant figures.

Answer [1]

- 2 The angles, in degrees, of a quadrilateral $ABCD$ are represented by these expressions:
 Angle $A = 2(3x + 20)$, angle $B = 2(x + 10)$, angle $C = 10(x - 2)$ and
 angle $D = 80 - 2x$.

- (a) Calculate the value of x .

Answer $x =$ [2]

- (b) What is the name of the quadrilateral?

Answer [1]

- 3 Express $\frac{2a+b}{4} - \frac{5b-3a}{3}$ as a single fraction in its simplest form.

Answer [3]

- 4 (a) Simplify $2(3m+2n) - 5(m+2n)$.

Answer [2]

- (b) Petrol costs p cents per litre.
John buys some petrol and it costs him s dollars.
Find an expression, in terms of p and s , for the number of litres that John buys.

Answer litres [2]

5 The first four terms of a sequence are 40, 33, 26, 19.

(a) Write down the 6th term of the sequence.

Answer [1]

(b) Find an expression, in terms of n , for the n th term of the sequence.

Answer [1]

(c) Find the 55th term of the sequence.

Answer [1]

6 (a) Solve $6x \leq 50$.

Answer [1]

(b) Hence, find

(i) the greatest integer value of x if x is a prime number,

Answer $x =$ [1]

(ii) the sum of all the positive odd integers which satisfy $6x \leq 50$.

Answer [1]

- 7 (a) Express 140% as a mixed number in its simplest form.

Answer [1]

- (b) Express 4.06 as a percentage.

Answer % [1]

- (c) Express 6 hours : 1200 seconds as a ratio in its simplest form.

Answer : [1]

- 8 (a) Convert 36 km/h to m/s.

Answer m/s [1]

- (b) Convert 1200 m/s to km/h.

Answer km/h [1]

- 9 A car leaves Town A for Town B , which are 540 km apart, at an average speed of 90 km/h. At the same time, a truck leaves Town B for Town A and travels along the same road at half the speed of the car.

(a) If the car meets the truck in y hours, find the distance travelled, in terms of y , by

(i) the car,

Answer km [1]

(ii) the truck.

Answer km [1]

(b) (i) Write down an equation, in terms of y , and show that it simplifies to $135y = 540$.

Answer

[1]

(ii) Solve the equation to find the distance travelled by the truck when the two vehicles meet.

Answer km [2]

- 10 **Diagram I** shows a stick of Mentos which is in the shape of a cylinder. The cylinder has diameter 2 cm and height 10 cm.

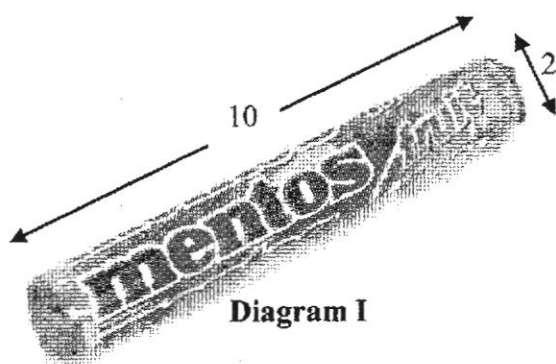


Diagram I

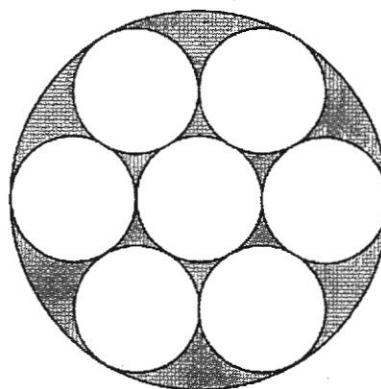


Diagram II

Diagram II shows the top view of a container holding seven sticks of Mentos. The container is in the shape of a cylinder and the seven sticks of Mentos, just fit into the container.

- (i) Show that the volume of the inside of the cylindrical container is $90\pi \text{ cm}^3$.

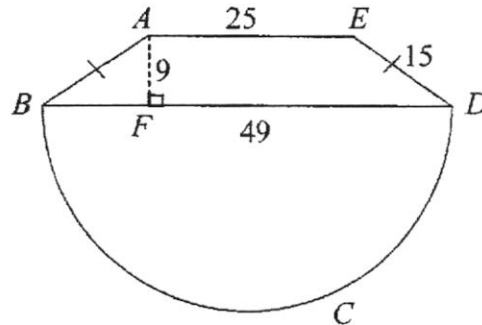
Answer

[2]

- (ii) Calculate the percentage of the volume of the container that is **not** occupied by the sticks of Mentos.

Answer % [2]

- 11 The figure shows the side view of a light bulb.
It is made up of a trapezium $ABDE$ and a semicircle BCD .
 $AB = ED = 15$ cm, $AE = 25$ cm, $AF = 9$ cm and $BD = 49$ cm.



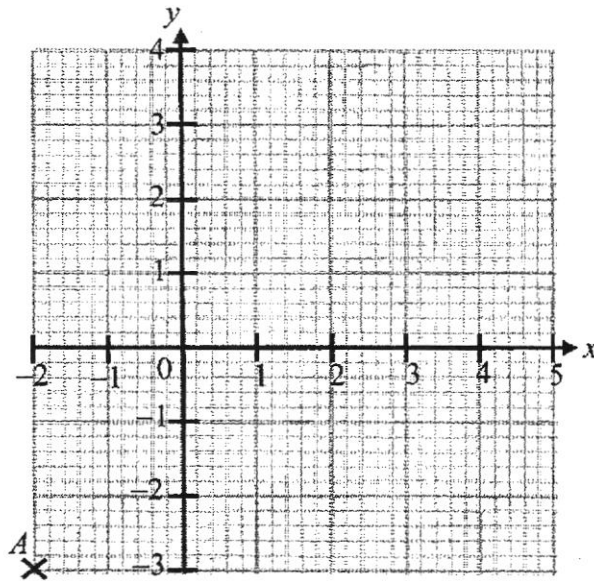
Calculate

- (a) the perimeter of the figure,

Answer cm [2]

- (b) the area of the figure.

Answer cm^2 [2]



- (a) Write down the coordinates of point A .

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

- (b) B is the point $(1, 4)$ and C is the point $(5, 4)$.
Write down the equation of line BC .

Answer [1]

- (c) Calculate the area of triangle ABC .

Answer units² [1]

- (d) Find the coordinates of the point D such that $ABCD$ is a parallelogram.

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

- (e) Calculate the area of parallelogram $ABCD$.

Answer units² [1]

- 13 A computer shop offers discounts to customer who pays \$18 to become a member.

Item	Members' discount
Tablet	20% off
Power Bank	10% off
Folio Case	5% off

Ying wants to buy a tablet which costs \$950.

The salesman suggests that she joins as a member.

- (a) How much less does she pay in total if she joins as a member and buys the tablet?

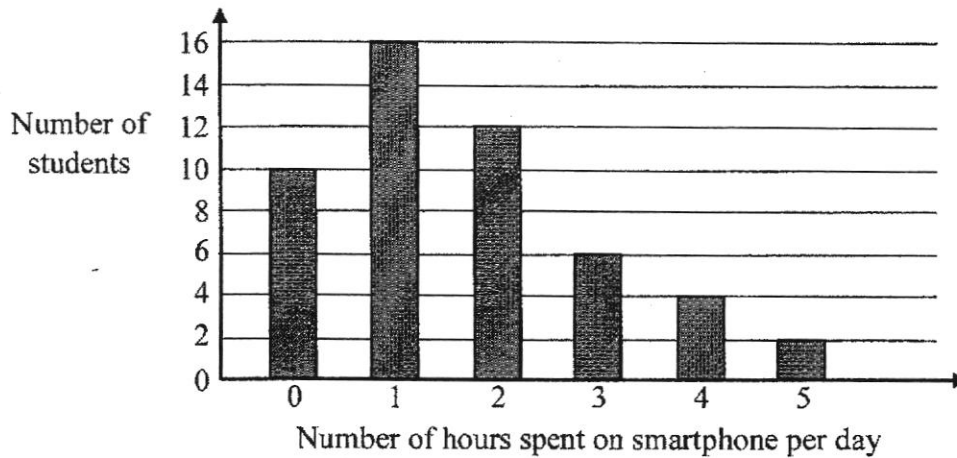
Answer \$ [2]

After she joins as a member and bought the tablet, the salesman offers Ying a further 15% discount on the members' price for a power bank and folio case.

- (b) Write down a formula for the total amount, T , that she needs to pay for a power bank and folio case.
Use p and c to represent the original price of a power bank and a folio case respectively.

Answer $T =$ [2]

- 14 The bar chart shows the results of a survey on the number of hours spent on smartphone per day by a group of students.



- (a) Find the number of students who took part in the survey.

Answer students [1]

- (b) Find the number of students who did not use smartphone at all.

Answer students [1]

- (c) Find the ratio of the number of students who spent 1 hour on smartphone per day to the number of students who spent 4 hours on smartphone per day.

Answer : [1]

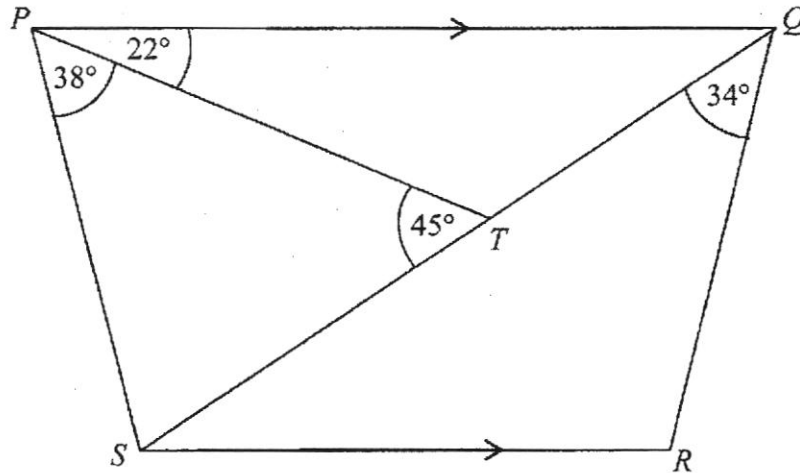
- (d) Find the percentage of students who spent more than 2 hours on smartphone per day.

Answer % [2]

~ END OF PAPER 1 ~

- 1 (a) In 2017, the cash price of a television is \$3159.
Elyon buys this television on hire purchase.
He pays a deposit of \$1053 followed by 24 monthly instalments of \$90.
- (i) What percentage of \$3159 is \$1053? [1]
- (ii) What is the total amount that Elyon will pay for the television? [2]
- (iii) Find the additional cost of buying the television on hire purchase as a percentage of the cash price. [2]
- (b) Kenny buys an identical television.
To pay for it, he borrows the whole cost of \$3159 for 2 years at simple interest of 2.5% per annum.
Find the total amount that Kenny pays for the television. [2]
- (c) The price of the television in 2017 is 4% more than the price in 2016.
Calculate the price in 2016. [2]
- (d) By selling an article for \$264, a shopkeeper will incur a loss of 4% on its cost.
At what price must he sell the article in order to make a profit of 8% on its cost? [3]
-

2 (a)



$PQRS$ is a trapezium. QTS is a straight line.

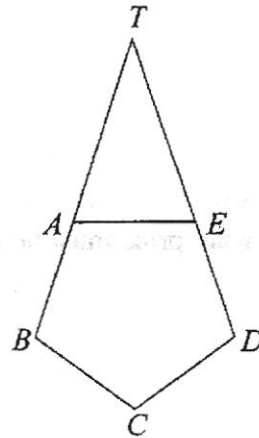
Angle $SQR = 34^\circ$, angle $PTS = 45^\circ$, angle $SPT = 38^\circ$ and angle $TPQ = 22^\circ$.

Calculate the reflex angle QRS .

Give a reason for each step of your working.

[4]

(b) $ABCDE$ is a regular 5-sided polygon.



(i) Find $\angle ABC$.

[2]

(ii) Given that BA produced meets DE produced at T , find $\angle ATE$.

[3]

(c) Stephen designed a badge for his youth club.

It has four sides.

None of the sides are parallel.

It has one pair of equal angles.

It has 2 pairs of equal sides.

Its diagonals cross at right angles.

What shape is the badge?

[1]

- 3 (a) Sue is thinking of having a water meter.
These are the two ways she can pay for the water she uses.

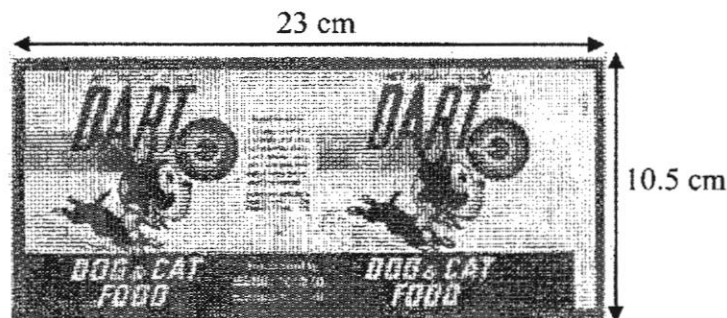
Water Meter A charge of \$27.60 per year plus \$1.19 for every cubic metre of water used	No Water Meter A charge of \$107 per year
---	---

Sue uses an average of 150 litres of water each day.
She wants to pay as little as possible for the water she uses.
Should Sue have a water meter?
Justify your answer with calculations.

[2]

- (b) The picture shows the dimensions of a label taken from a cylindrical tin of dog & cat food. The label covers all the curved surface of the tin with no overlap.
Calculate the volume of the tin.

[3]



Label is taken from https://www.ebay.com/sch/i.html?_nkw=label+dog+food

- (c) David is playing with 595 one-centimetre cubes.
- (i) He uses some of the cubes to make a cuboid measuring 9 cm by 8 cm by 7 cm.
Calculate the total surface area of the cuboid. [2]
- (ii) David uses all 595 cubes to make a cuboid.
All the sides of the cuboid are longer than 1 cm.
Find the dimensions of the cuboid. [2]
- (iii) David makes the largest cube possible using some of the 595 cubes.
How many cubes does he have left over? [2]

- 4 (a) Jenna takes 9 minutes and Luke takes 15 minutes to complete one lap around the path. They run in the same direction and maintain the same lap times. How many more laps will Jenna have completed than Luke when they next meet again at the starting line? [2]
- (b) Farrah's mobile phone passcode is a four-digit number.
All four digits are different.
The first digit is an even prime number.
The second and third digits have a sum of 8 and a product of 15.
The fourth digit is double the third digit.
What is Farrah's passcode? [2]
- (c) (i) Express 6804 as the product of its prime factors. [1]
- (ii) Given that $\frac{6804}{x} = y^2$, where x and y are integers and y is as large as possible, find the values of x and y . [1]
- (iii) The lowest common multiple of two numbers is 6804.
The highest common factor of these two numbers is 567.
Both numbers are greater than 567.

Find the two numbers. [2]
-

5 (a) Solve the equation $\frac{2x-1}{5} + \frac{4x+5}{10} = \frac{5}{2}$. [3]

(b) Answer the whole of part (b) on a sheet of graph paper.

The variables x and y are connected by the equation $2y = x - 1$.
Some corresponding values of x and y are given in the table below.

x	-3	-1	1	3	5
y	-2	p	0	1	q

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

(ii) Using a scale of 2 cm to represent 1 unit on each axis, draw a horizontal x -axis for $-3 \leq x \leq 5$ and a vertical y -axis for $-4 \leq y \leq 4$.

On your axes, plot the points given in the table and join them with a straight line. [2]

(iii) Write down the coordinates of the point where this line crosses the y -axis. [1]

(iv) Find the gradient of this line. [1]

~ End of Paper 2 ~

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MARK SCHEME

1(a) 995.68 **cao** **B1**1(b) 1000 $\sqrt{\text{B1}}$

2(a) $2(3x + 20) + 2(x + 10) + 10(x - 2) + 80 - 2x = 360$ **M1**

$16x + 120 = 360$

$16x = 240$

$x = 15$ **A1**

2(b) Parallelogram **correct spelling** **B1**

3 $\frac{2a+b}{4} - \frac{5b-3a}{3} = \frac{3(2a+b)}{12} - \frac{4(5b-3a)}{12}$ **M1**

$= \frac{6a+3b-20b+12a}{12}$ **M1**

$= \frac{18a-17b}{12}$ or better **A1**

4(a) $2(3m+2n) - 5(m+2n) = 6m+4n-5m-10n$ **M1**

$= m-6n$ **A1**

4(b) $\frac{100s}{p}$ **B2**

$\$ \frac{p}{100}$ OR 100s cents seen	OR
	B1

5(a) 5 **B1**5(b) $47 - 7n$ **B1**5(c) -338 **B1**

Secondary One Express

2017 EOY Exam Math P1

MARK SCHEME

6(a) $x \leq \frac{50}{6}$ or better **B1**

6(b)(i) 7 **B1**

6(b)(ii) $1 + 3 + 5 + 7 = 16$ **B1**

7(a) $\frac{140}{100} = 1\frac{2}{5}$ **B1**

7(b) $4.06 \times 100\% = 406\%$ **B1**

7(c) $21600 : 1200 = 18 : 1$ **B1**

8(a) $36 \times \frac{1000}{60 \times 60} = 10 \text{ (m/s)}$ **B1**

8(b) $1200 \times \frac{\frac{1}{60 \times 60}}{\frac{1}{1000}} = 4320 \text{ (km/h)}$ **B1**

9(a)(i) 90y **B1**

9(a)(ii) 45y **B1**

9(b)(i) $90y + 45y = 540$ **AG1**
 $135y = 540$

9(b)(ii) $y = 4$ **B1**
 $45 \times 4 = 180 \text{ km}$ **B1**

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MARK SCHEME

10(a)	Diameter of cylinder = 6 cm Vol. of cylinder = $\pi \times 3^2 \times 10$ = $90\pi \text{ cm}^3$	soi	B1 AG1	
10(b)	Vol. of one stick of Mentos = $10\pi \text{ cm}^3$ Required % = $\frac{90\pi - 70\pi}{90\pi} \times 100\%$ = $22\frac{2}{9} (\%)$	soi	M1 A1	22.2(2...)
11(a)	Arc length of semicircle = $24.5\pi \text{ cm}$ Perimeter of the figure = $15 + 25 + 15 + 24.5\pi$ = $250 (\text{cm}) (3\text{S.F.})$		M1 A1	249.756616 249.789 ($\pi = 3.142$)
	NB: No A1 if final answer is expressed as a multiple of π			
11(b)	Area of trapezium ABDE = $\frac{1}{2} \times 9 \times (25 + 49)$ = 333 cm^2 Area of the figure = $333 + \frac{1}{2} \pi \left(\frac{49}{2}\right)^2$ = $1280 (\text{cm}^2) (3\text{S.F.})$		M1 A1	1275.970495 1275.99275 ($\pi = 3.142$)
	NB: No A1 if final answer is expressed as a multiple of π			
12(a)	$(-2, -3)$		B1	
12(b)	$y = 4$		B1	
12(c)	$\frac{1}{2} \times (5 - 1) \times (4 - (-3)) = 14 (\text{unit}^2)$		B1	
12(d)	$(2, -3)$		B1	
12(e)	$4 \times 7 = 28 (\text{unit}^2)$		B1	

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MARK SCHEME

$$\begin{aligned} \text{13(a)} \quad \text{Amount less} &= \frac{20}{100} \times \$950 - \$18 && \text{M1} \\ &= \$172 && \text{A1} \end{aligned}$$

Alternative:

OR

$$\begin{aligned}\text{Amount less} &= \$950 - \left(\frac{80}{100} \times \$950 + \$18 \right) && \text{M1} \\ &= \$172 && \text{A1}\end{aligned}$$

13(b) $T = 0.85(0.9p + 0.95c)$ **B2**

$0.85 \times 0.9p$	OR	$0.85 \times 0.95c$	OR B1
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14(a) $10 + 16 + 12 + 6 + 4 + 2 = 50$ (students) **B1**

14(b)	10 (students)	B1
--------------	---------------	-----------

14(c) $16 : 4 = 4 : 1$ **B1**

14(d) $\frac{8 + 4 + 2}{\text{their } 50} \times 100\%$ M1
= 28 (%) $\sqrt{A1}$

- 1(a)(i)** $\frac{1053}{3159} \times 100 (\%) = 33\frac{1}{3} \%$ **B1** Accept $33.\dot{3}\%$ OR 33.3%
OR $33.3(3..)\%$
Ignore (%)
B0 for 33 OR $33\frac{1}{3}$ without %
- 1(a)(ii)** Total amount = $\$1053 + 24 \times \90 **M1** for 2160 soi
= $\$3213$ **A1**
- 1(a)(iii)** Extra cost = $\$3213 - \3159
= $\$54$
Required % = $\frac{54}{3159} \times 100\%$ **M1** if no % seen, award **SC1**
= 1.709401709%
= 1.71% (3S.F.) **A1** Accept $1\frac{83}{117}\%$ oe
SC1 for 1.71 or better without %
- 1(b)** Simple Interest = $\frac{\$3159 \times 2.5 \times 2}{100}$ **M1 OR**
= $\$157.95$
Total amount = $\$3159 + \157.95
= $\$3316.95$ **A1**
- SC1 for**
 $\frac{\$3159 \times 2.5}{100} = \78.975
OR
 $\frac{102.5}{100} \times \$3159 = \$3237.975$

M0A0 for
 $\frac{2.5}{100} \times \$1579.50$
- 1(c)** Price in 2016 = $\frac{100}{104} \times \$3159$ **M1**
= $\$3037.50$ **A1**
- 1(d)** 96% of the cost = $\$264$ **B1** soi
108% of the cost = $\frac{264}{96} \times 108$ **M1**
= $\$297$ **A1**

- 2(a) $\angle PQT + 22^\circ = 45^\circ$ (ext. $\angle$ of Δ) M1
 $\angle PQT = 23^\circ$
 their $23^\circ + 34^\circ + \angle QRS = 180^\circ$ (int. $\angle$, $PQ \parallel SR$) M1 $\checkmark$ their 23°
 $\angle QRS = 123^\circ$
 Reflex $\angle QRS +$ their $123^\circ = 360^\circ$ ($\angle$ s at a pt.) M1 $\checkmark$ their 123°
 Reflex $\angle QRS = 237^\circ$ $\checkmark$ A1

SC1 for correct numerical answer with degree unit with no supporting reason OR wrong reason given for each step of the working

SC2 for correct numerical answer with degree unit with at least one correct supporting reason

- 2(b)(i) $\angle ABC = \frac{3 \times 180^\circ}{5}$ M1 OR 1 ext. $\angle = \frac{360^\circ}{5}$
 $= 108^\circ$ A1 $\angle ABC = 180^\circ - 72^\circ$
 (adj. $\angle$ s on a st. line)
 $= 108^\circ$
- 2(b)(ii) $\angle TAE +$ their $108^\circ = 180^\circ$ (adj. $\angle$ s on a st. line) M1 $\checkmark$ their 108°
 $\angle TAE = 72^\circ$
 $\angle TEA =$ their 72° (base $\angle$ s of an isos. Δ)
 $\angle ATE +$ their $72^\circ +$ their $72^\circ = 180^\circ$ ($\angle$ sum of an isos. Δ) M1 $\checkmark$ their 72°
 $\angle ATE = 36^\circ$ $\checkmark$ A1
- 2(c) A Kite B1

- 3(a) With water meter
 On average, total amount pays by Sue = $\$27.60 + \$1.19 \times 0.15 \times 365$ M1
 $= \$92.75$

Thus, Sue should have a water meter because it is \$14.25 cheaper assuming Sue uses an average of 150 litres of water each day for 365 days. A1

- 3(b) $2\pi r = 23$
 $r = \frac{23}{2\pi}$ cm M1
- Volume of the tin = $\pi \left(\frac{23}{2\pi} \right)^2 10.5$ M1
 $= 442.0130657 \text{ cm}^3$
 $= 442 \text{ cm}^3$ (3S.F.) A1 Accept 442.(0...)
 NB: A0 if no units seen

3(c)(i)	Total surface area of the cuboid = $2(9 \times 8 + 9 \times 7 + 7 \times 8)$ = 382 cm^2	M1 A1
3(c)(ii)	Dimensions of the cuboid = 17 cm by 7 cm by 5 cm B2 B1 if no units given	
3(c)(iii)	Largest cube possible measures 8 cm by 8 cm by 8 cm M1 soi Number of cubes left over = $595 - 8^3$ = 83 A1	
4(a)	LCM of 15 and 9 = 45 5 laps for Jenna and 3 for Luke gives a difference of 2 laps	M1 A1
4(b)	2 5 3 6 B2 for the correct passcode B1 for 5 and 3 as the 2 nd and 3 rd number OR 2 as the 1 st digit OR 6 as the last digit.	
4(c)(i)	$6804 = 2^2 \times 3^5 \times 7$ B1	
4(c)(ii)	$x = 21, y = 18$ B1 for both correct	
4(c)(iii)	$567 = 3^4 \times 7$ M1 2268 and 1701 A1 OR B1 for any two of 1134, 1701, 2268	

5(a) $\frac{2x-1}{5} + \frac{4x+5}{10} = \frac{5}{2}$

$\frac{4x-2}{10} + \frac{4x+5}{10} = \frac{25}{10}$ or better M1

$4x-2+4x+5=25$ or better M1

$x = 2\frac{3}{4}$ o.e. A1

5(b) refer to the graph paper

~ End of Paper 2~

Scale: 2 cm rep. 1 unit on both axes

5(b)(i) $p = -1$ B1 $q = 2$ B1(b)(iii) $(0, -0.5)$ B1

(b)(iv) Gradient = 0.5 B1

5(b)(ii)

P1 for all points plotted correctly

S1 for using the correct scale and
labelled the x-axis and y-axis