SERVE·LEAD·EXCEL

GREENDALE SECONDARY SCHOOL
End-of-Year Examination 2018

60

MATHEMATICS

4045/01

Paper 1

5 October 2018

Secondary Two Normal Academic / SBB (NA)

1 hour 30 minutes

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.
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 may result in loss of marks.
The total number of marks for this paper is **60**.

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 requires the answer in
terms of π.

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

Question	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Strand	N	N	A	G	N	A	N	G	A
Marks									

Question	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18
Strand	S	A	N	A	G	G	S	G	N
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 $= \pi r l$

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

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

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

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

Arc length $= r\theta$, where θ is in radians

Sector Area $= \frac{1}{2}r^2\theta$, where θ 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)**   Express 140 as a product of its prime factors.

Answer (a) _____ [1]

(b)   Find the smallest integer, k, such that $140k$ is a perfect square.

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

---

2   **(a)**   Calculate 28% of $90.

Answer (a) $ _____ [1]

(b)   Express 60 millilitres as a percentage of 3 litres.

Answer (b) _____ % [2]

For Examiner's Use Only

3   Simplify the following expressions.

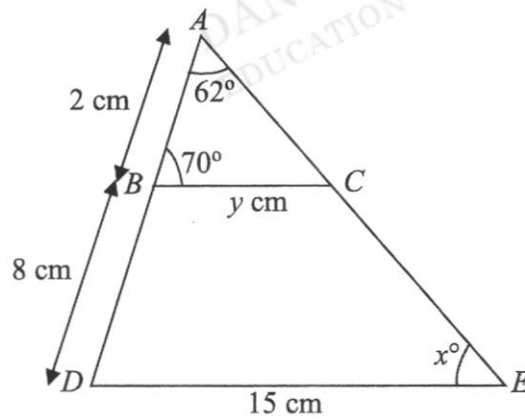(a) $6a^2 \times \dfrac{1}{ab}$

Answer (a) _____ [1]

(b) $\dfrac{x-5y}{6x+12y} \div \dfrac{7x-35y}{x+2y}$

Answer (b) _____ [2]

---

4    $\triangle ABC$ is similar to $\triangle ADE$.

Find the values of x and y.

Answer x = _____ [1]

y = _____ [2]

5   **(a)**   Express the ratio of $\dfrac{4}{7}:\dfrac{1}{3}$ in the simplest form.

Answer (a) _____ [1]

    (b)   In a metal alloy, copper and zinc are mixed in the ratio 5 : 3 by mass.

If the mass of a metal alloy is 4.8 kg, find the mass of zinc in it.

Answer (b) _____ kg [2]

---

6   Given that x satisfies the inequality $-2x > 10$,

    (a)   solve $-2x > 10$,

Answer (a) _____ [1]

    (b)   represent the solution **(a)** on a number line,

[2]

    (c)   what is the greatest integer that x can be?

Answer (c) _____ [1]

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7   The scale of a map is 1 : 30 000.

     (a)   The distance between two cities on the map is 18 cm.

            What is the actual distance between the cities in kilometres?
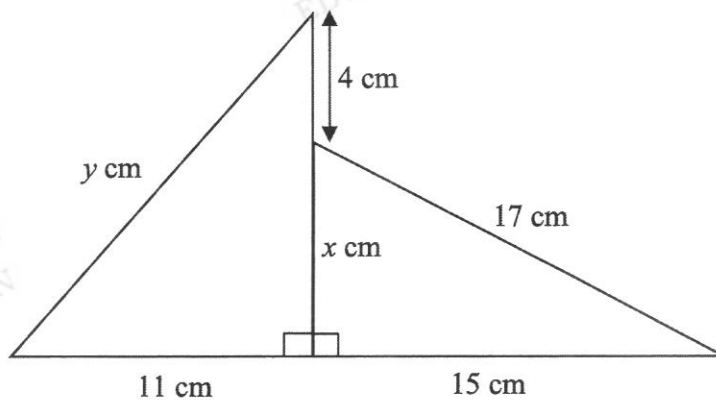
Answer (a) _____ km [1]

     (b)   A mountain has an actual area of 4.32 km^2.

            What is the area of the mountain on the map in square centimetres?

Answer (b) _____ cm^2 [2]

---

8   In the right-angled triangles below, find the values of x and y.

Answer x = _____ [2]

y = _____ [2]

9 Expand and simplify the following expressions.

  (a) $(3x+5)^2$

                Answer (a) _____ [2]

  (b) $(4x-7)(3+x)$

                Answer (b) _____ [2]

---

10 Peter's marks for 12 assignments are shown below.

  4 7 8 6 9 3 5 4 5 7 5 8

  Find

  (a) the mode,

                Answer (a) _____ marks [1]

  (b) the median,

                Answer (b) _____ marks [1]

  (c) the mean.

                Answer (c) _____ marks [2]

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11 Factorise the following completely.

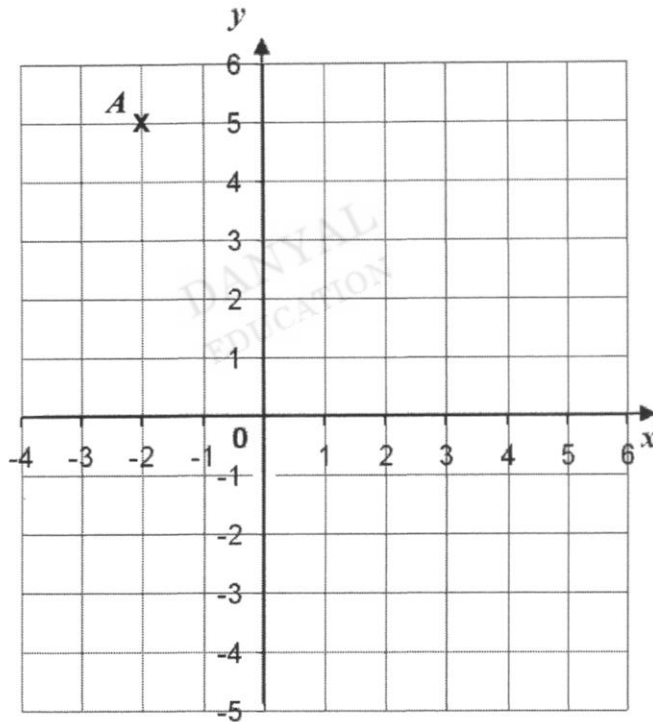   **(a)** $20a^2 - 4ab$

         Answer (a) _____ [1]

    (b) $p^2 - 23p + 42$

         Answer (b) _____ [2]

12

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

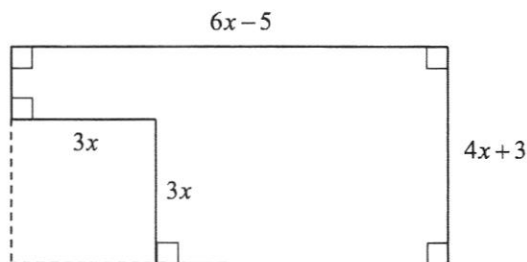   *Answer (a)* A(_____ , _____) [1]

    (b)   Point *B* has coordinates (4, 2). Find the gradient of the line *AB*.

         Answer (b) _____ [2]

13 The figure below shows a piece of land. The dimensions are in metres.

$6x - 5$

$3x$

$3x$

$4x + 3$

Find the area in terms of x in the simplest form.

Answer _____ m^2 [3]

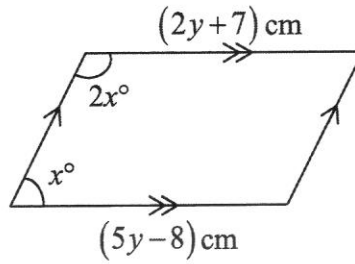
14 In triangle ABC, $AB = 9$ cm, $AC = 6$ cm and $BC = 8$ cm.

The line AB has been drawn as shown below.

A —————————————————— B

(a) Complete the triangle ABC. [2]

(b) Construct the angle bisector of $\angle ABC$. [2]

15   The diagram below shows a parallelogram.

Find the values of x and y.

$(2y+7)$ cm

$2x°$

$x°$

$(5y-8)$ cm

Answer x = _____ [2]

$y =$ _____ [2]

16   In a bag there are 21 red, 32 green and 17 blue coloured marbles. One marble is
picked at random.

Find the probability of getting

(a)   a blue marble,

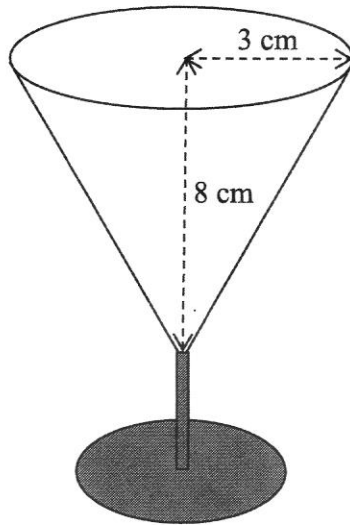*Answer (a)* _____ [1]

(b)   not a green marble,

Answer (b) _____ [1]

(c)   a yellow marble.

Answer (c) _____ [1]

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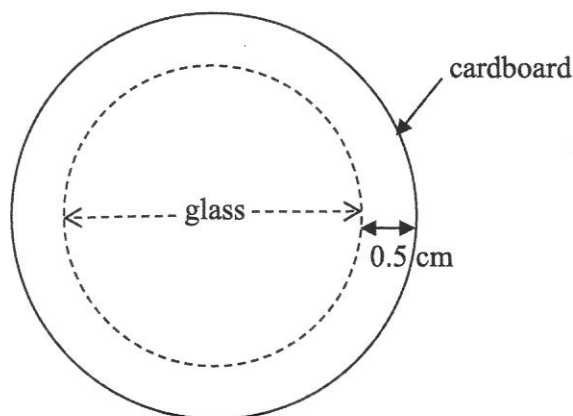**17**   A wine glass is in the shape of a cone of radius 3 cm and height of 8 cm.

(a)   Calculate the volume of water that it holds when full.

Answer (a) _____ cm^3 [2]

(b)   A circular cardboard is used to cover up the wine glass. There is an excess length of 0.5 cm around the glass when being placed in the centre.

Calculate the area of the circular cardboard.

Answer (b) _____ cm^2 [2]

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18   The line with equation $x + 2y = 2$ is drawn on the grid.
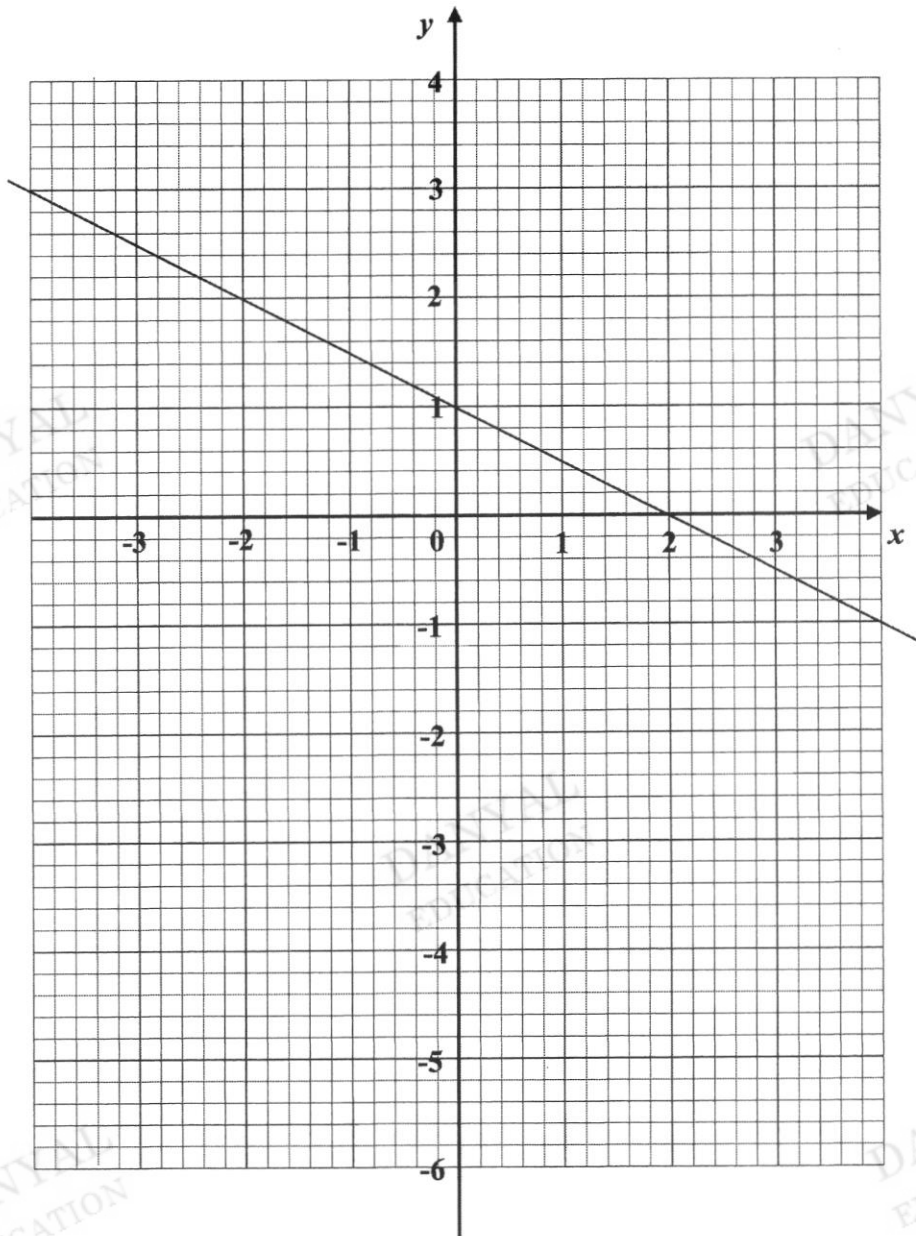
(a)   On the grid, draw the line with equation $y = x - 2$.   [2]

(b)   Hence, write down the solutions of the simultaneous equations,
         $x + 2y = 2$ and $y = x - 2$.

Answer (b) x = _____ *, y =* _____ [1]

SERVE-LEAD-EXCEL

GREENDALE SECONDARY SCHOOL
End-of-Year Examination 2018

MATHEMATICS   **4045/02**

Paper 2   2 October 2018

Secondary Two Normal Academic / SBB (NA)   **1 hour 30 minutes**

Additional Materials: Writing Paper
                             Graph Paper
                             Cover Page

Candidates answer on the Writing Paper.

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Answer **all** questions.
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The total number of marks for this paper is **45**.

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

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Answer **all** the questions.

1 (a) Simplify $\dfrac{4x}{5} + \dfrac{(3-x)}{2}$.   [2]

   (b) (i) Factorise $y^2 - 16$.   [1]

        (ii) Hence, simplify $\dfrac{2y^2 + 9y + 4}{y^2 - 16}$ completely.   [2]

2 (a) It takes 28 minutes for 4 identical pipes to fill a water vessel with water to
        the brim. How many pipes are required to fill the same water vessel in
        8 minutes?   [2]

   (b) y is directly proportional to $(x+2)$. Given that $y = 5$ when $x = 13$, find

        (i) the equation connecting y and x,   [2]

        (ii) the value of x when $y = 20$.   [1]

3 (a) Given that $(a-b)^2 = 12$ and $ab = -5$, find the value of $4a^2 + 4b^2$.   [3]

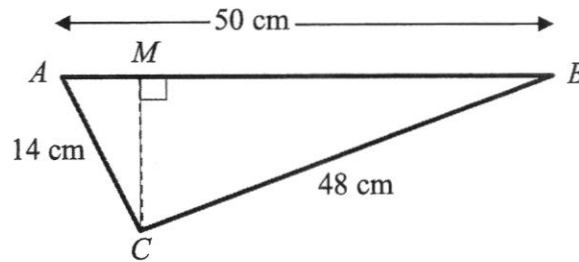   (b) Solve $\dfrac{5}{x-3} = \dfrac{4}{7x}$.   [2]
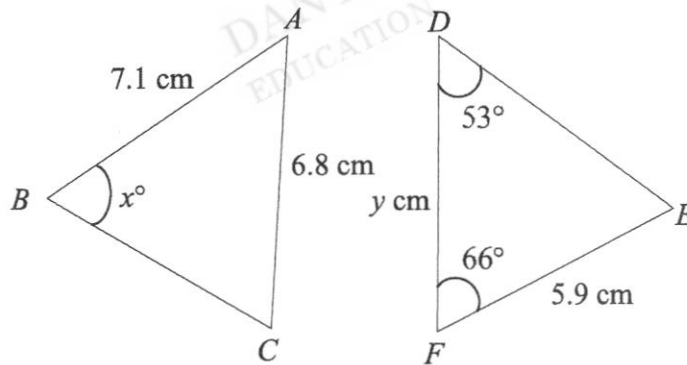
   (c) Solve the following simultaneous equations.   [3]

        $x + 2y = 17$

        $3x - y = 2$

4   In the figure below, $AB = 50$ cm, $BC = 48$ cm and $AC = 14$ cm.

(a)   Determine if $\triangle ACB$ is a right-angled triangle.   [2]

(b)   Find the length CM, which is the perpendicular distance from C to AB.   [2]

---

5   (a) $\triangle ABC$ is congruent to $\triangle DEF$.

$\angle EDF = 53°$, $\angle DFE = 66°$, $AB = 7.1$ cm, $AC = 6.8$ cm and $EF = 5.9$ cm.
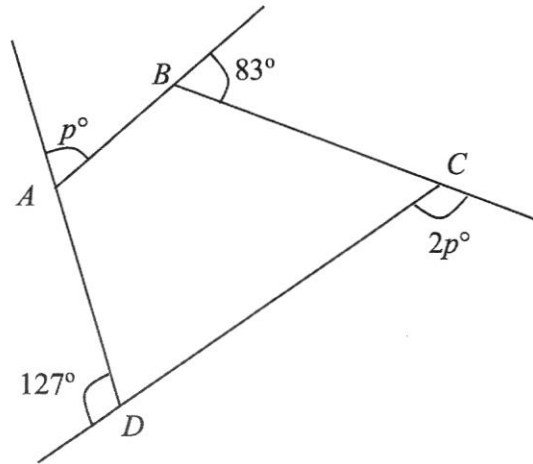

Find

(i) x,   [2]

(ii) y.   [1]

(b) In the diagram below, find the unknown p. [2]

(c) Given that the interior angle of a regular polygon is 160°, find the number of sides of the polygon. [2]

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6 The stem-and-leaf diagram below represents the Mathematics examination scores of 20 Secondary Two students in a class.

Stem	Leaf
3	5 9
4	3 7 7 7
5	2 2 5 6
6	2 3 8
7	0 8 9
8	6
9	3 3 5

Key : 3 | 5   means 35 marks

(a) Find the modal mark. [1]

(b) Find the median mark. [1]

(c) One student is selected at random. What is the probability that the student chosen passes the test given that the passing mark is 50? [1]

(d) In order to be able to study Additional Mathematics next year, these students must score at least 78 marks. What is the percentage of students who are able to take Additional Mathematics next year? [2]

7   **Answer the whole of this question on a sheet of graph paper.**

This table of values is for $y = 3x - 2$.

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

(a)   Find the value of q.   [1]

(b)   Draw the graph of $y = 3x - 2$.

Use a scale of 2 cm to 1 unit for the horizontal x-axis and a scale of

1 cm to 1 unit for the vertical y-axis.   [3]

(c)   Use your graph to find the value of x when $y = 4$.   [1]

---

8   A metal bolt is made up of a hemisphere with a cylinder at the centre. The height of
the cylinder is 1.6 cm and the radius of the hemisphere is 2.7 cm. The radius of the
base of the cylinder is a third of the radius of the hemisphere.
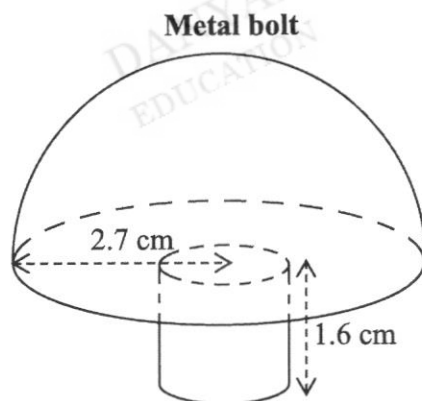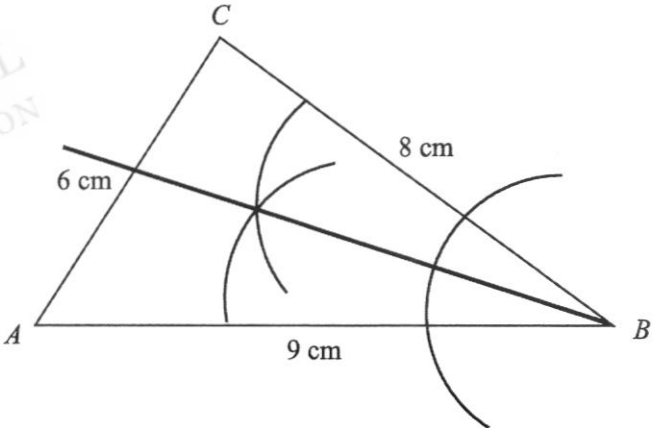
Metal bolt

(a)   Calculate the volume of the metal bolt.

Give your answer correct to the nearest cubic centimetres.   [3]

(b)   A factory melts a big piece of metal to produce the bolts. This piece of metal is

in the shape of a cuboid with dimensions 1 m by 0.8 m by 0.6 m.

A renovation company wants to order 10 000 metal bolts from the factory.

Is the big piece of metal sufficient to meet the order?   [3]

- END OF PAPER -

Qn no.	Solution	Marks
1. (a)	$2^2 \times 5 \times 7$	B1
(b)	$k = 35$	B1
2. (a)	$\dfrac{28}{100} \times \$90 = \$25.20$	B1
(b)	$\dfrac{60}{3000} \times 100\%$	M1
	$= 2\%$	A1
3. (a)	$\dfrac{6a}{b}$	B1
(b)	$\dfrac{x-5y}{6(x+2y)} \times \dfrac{x+2y}{7(x-5y)}$	M1
	$= \dfrac{1}{42}$	A1
4. (a)	$x = 180° - 70° - 62° = 48°$	B1
(b)	$y = \dfrac{2}{10} \times 15$	M1
	$= 3$	A1
5. (a)	$12 : 7$	B1
(b)	8 units → 4.8 kg	
	3 units → $\dfrac{4.8}{8} \times 3$	M1
	$= 1.8kg$	A1

6. (a)	$x < -5$	B1
(b)		B1 – correct direction and numbering B1 – unshaded circle (e.c.f)
(c)	-6	B1
7. (a)	Actual Distance $= 18 \times 0.3 = 5.4\ km$	B1
(b)	$1\ cm^2 \rightarrow 0.09\ km^2$ Area on the map $= 4.32 \div 0.09 = 48\ cm^2$	M1 A1
8. (a)	$x = \sqrt{17^2 - 15^2}$ $= 8$	M1 A1
(b)	$y = \sqrt{11^2 + 12^2}$ $= 16.3$	M1 A1
9. (a)	$(3x)^2 + 2(3x)(5) + (5)^2$ $= 9x^2 + 30x + 25$	M1 A1
(b)	$12x + 4x^2 - 21 - 7x$ $= 4x^2 + 5x - 21$	M1 A1
10. (a)	5	B1
(b)	$\dfrac{5+6}{2} = 5.5$	B1
(c)	$\dfrac{3+4+4+5+5+5+6+7+7+8+8+9}{12}$ $= 5.92 \quad / \quad 5\dfrac{11}{12}$	M1 A1

11. (a)	$4a(5a-b)$	B1
(b)	$p^2-23p+42=(p-2)(p-21)$	M1 A1

12. (a)	$A(-2,5)$	B1
(b)	Gradient $= \dfrac{5-2}{-2-4}$ $= -\dfrac{1}{2}$	M1 A1

13.	$(6x-5)(4x+3)-(3x)^2$ $=24x^2+18x-20x-15-9x^2$ $=15x^2-2x-15$	M1 M1 A1

14. (a), (b)		(a) B1 – Correct AC B1 – Correct BC (b) B1 – Construction lines B1 – Correct angle bisector

For 11(b):

$$\begin{array}{cc|c}
p & -2 & -2p \\
p & -21 & -21p \\
\hline
p^2 & +42 & -23p
\end{array}$$

15.	$3x = 180$	M1
	$x = \dfrac{180}{3}$	
	$x = 60$	A1
	$5y - 8 = 2y + 7$	M1
	$5y - 2y = 7 + 8$	
	$3y = 15$	
	$y = 5$	A1
16. (a)	$\dfrac{17}{70}$	B1
(b)	$\dfrac{19}{35}$	B1
(c)	0	B1
17. (a)	$\dfrac{1}{3} \times \pi \times 3^2 \times 8$	M1
	$= 75.4\ cm^3$	A1
(b)	$\pi \times 3.5^2$	M1
	$= 38.5\ cm^2$	A1
18. (a)	Table of values for $y = x - 2$. Eg:	M1 (or correct points on grid)
	Correct ruled straight line	A1
(b)	$x = 2, y = 0$	B1

Table for 18(a):

x	−2	0	2
y	−4	−2	0

Qn no.	Solution	Marks
1. (a)	$\dfrac{8x}{10} + \dfrac{15-5x}{10}$	M1
	$= \dfrac{3x+15}{10}$	A1
(b)(i)	$(y+4)(y-4)$	B1
(b)(ii)	$\dfrac{(2y+1)(y+4)}{(y+4)(y-4)}$	M1
	$= \dfrac{2y+1}{y-4}$	A1
2. (a)	28 min → 4 pipes	
	8 min → $\dfrac{4 \times 28}{8}$	M1
	$= 14 \ pipes$	A1
(b)(i)	$y = k(x+2)$	
	$k = \dfrac{5}{(13+2)}$	M1
	$= \dfrac{1}{3}$	
	$y = \dfrac{1}{3}(x+2)$	A1
(b)(ii)	$20 = \dfrac{1}{3}(x+2)$	
	$x+2 = 60$	
	$x = 58$	A1
3. (a)	$a^2 - 2ab + b^2 = 12$	M1
	$a^2 - 2(-5) + b^2 = 12$	
	$a^2 + b^2 = 2$	
	$4(a^2 + b^2) = 2 \times 4$	M1
	$4a^2 + 4b^2 = 8$	A1

(b)	$35x = 4x - 12$	M1
	$31x = -12$	
	$x = -\dfrac{12}{31}$	A1
(c)	$x + 2y = 17$ (1)	
	$3x - y = 2$ (2)	
	$(2) \times 2$:	
	$6x - 2y = 4$ (3)	
	$(1) + (3)$:	
	$(x + 2y) + (6x - 2y) = 17 + 4$	M1
	$7x = 21$	
	$x = 3$	A1
	Subst $x = 3$ into (1),	
	$3 + 2y = 17$	
	$2y = 14$	
	$y = 7$	A1
4. (a)	$14^2 + 48^2 = 2500$	M1
	$50^2 = 2500$	
	Since $14^2 + 48^2 = 50^2$,	
	therefore $\triangle ACB$ is a right-angled triangle by Pythagoras Theorem.	A1
(b)	$\dfrac{1}{2} \times CM \times 50 = \dfrac{1}{2} \times 14 \times 48$	M1
	$CM = \dfrac{336}{25}$	
	$CM = 13.44\ cm$	A1
5. (a)(i)	$x = 180 - 53 - 66$	M1
	$x = 61$	A1 or B2
(a)(ii)	$y = 6.8$	B1
(b)	$3p + 83 + 127 = 360$	M1
	$3p = 150$	
	$p = 50$	A1
(c)	$(n - 2) \times 180 = 160n$	M1
	$180n - 360 = 160n$	
	$20n = 360$	
	$n = 18$	A1

6. (a)	47 marks		B1
(b)	$\dfrac{56+62}{2}=59\ marks$		B1
(c)	$\dfrac{7}{10}$		B1
(d)	$\dfrac{6}{20}\times100\%$ $=30\%$		M1 A1

7. (a)	$q=7$		B1
(b)	See attached		B1 – correct scales B1 – plot points B1 – draw line
(c)	$x=2$		B1

8. (a)	$\text{Volume}=\left(\dfrac{2}{3}\times\pi\times2.7^3\right)+\left(\pi\times0.9^2\times1.6\right)$ $\qquad=45.295$ $\qquad=45\ \text{cm}^3$		M2 A1
(b)	$100\times80\times60=480000\ cm^3$		M1
	$\dfrac{480000}{45}$ $=10666$		M1 (e.c.f.)
	Yes, it is sufficient.		A1 (e.c.f.)