Name:	Index Number:	Class:

YIO CHU KANG SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2018
SECONDARY TWO NORMAL (ACADEMIC)

MATHEMATICS

Paper 1 — 1 hour

8 October 2018 (Monday)

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 blue or black pen.
You may use a HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer all the 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 will result in loss of marks.
The total of the marks for this paper is 40.

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.

For Examiner's Use
40

Setter: Mr William Wong B H

Mathematical Formulae

Mensuration

Curved surface area of a cone = πrl

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

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

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

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Answer **all** the questions.

1 **(a)** Simplify the expression $\frac{x}{3}+\frac{x-2}{7}$.

Answer ..... [2]

(b) Hence find the value of the expression $\frac{x}{3}+\frac{x-2}{7}$ when $x=2$.

Answer ..... [1]

---

2 The speed of a bullet, s, fired from a gun is inversely proportional to the square root of its mass, m. When the mass is 64 g, the speed is 676 m/s.

(a) Find an equation connecting s and m.

Answer ..... [2]

(b) Find the mass of the bullet if its speed is 520 m/s.

Answer ..... g [1]

---

3 Peter travels 1.2 km to go to a wet market from his home.
He found that the journey is represented by a length of 3 cm on a map.

(a) Find the scale of the map in the form $1:r$.

Answer 1 : ..... [1]

(b) A sports hall near his home measured 7 cm on the map.
Find the actual distance, in km, between the sports hall and his home.

Answer ..... km [1]

(c) A park has an actual area of 2 km^2.
Find the area of the park, in cm^2, if it is drawn on another map with a scale of 1 : 50 000.

Answer ..... cm^2 [2]

DANYAL EDUCATION

4 Solve the following simultaneous equations.

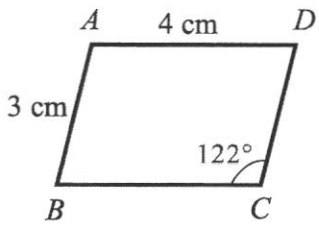
$$3x - y = -2$$
$$x - 3y = -30$$

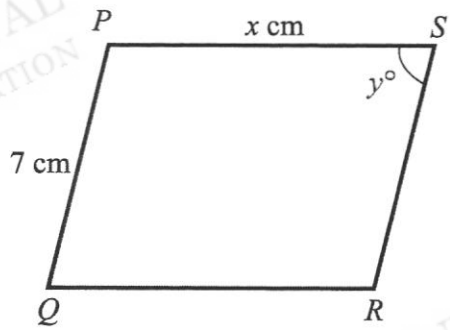
Answer $x =$ .....

$y =$ ..... [3]

---

5 $ABCD$ and $PQRS$ are parallelograms where $AB = 3$ cm, $AD = 4$ cm, $\angle BCD = 122°$, $PQ = 7$ cm, $PS = x$ cm, $\angle PSR = y°$.





Given that $PQRS$ is similar to $ABCD$, find the value of

(a) x,

Answer $x =$ ..... [2]

(b) y.

Answer $y =$ ..... [2]

6 Factorise the expression $x^2 + 7x - 18$ completely.

Answer ..... [2]

---

7 Simplify the following algebraic fractions.

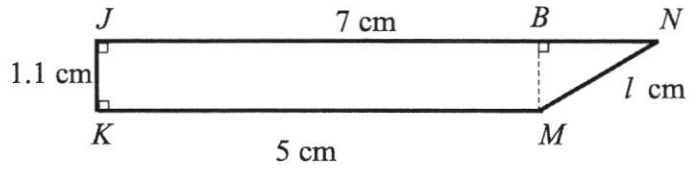
(a) $\frac{5ab^3}{14} \times \frac{28a^2}{b^4}$,

Answer ..... [1]

(b) $\frac{p^3q}{15q-50} \div \frac{p^2}{9q-30}$.

Answer ..... [2]

8 The blade of a penknife $JKMN$ is shown below where $JK = 1.1$ cm, $KM = 5$ cm, $JN = 7$ cm, $\angle JKM = \angle KJN = 90°$ and $MN = l$ cm.



(a) State the name of the quadrilateral $JKMN$.

Answer ..... [1]

(b) The blade is broken along the line BM where BMN is a right-angled triangle.
Find

(i) BN,

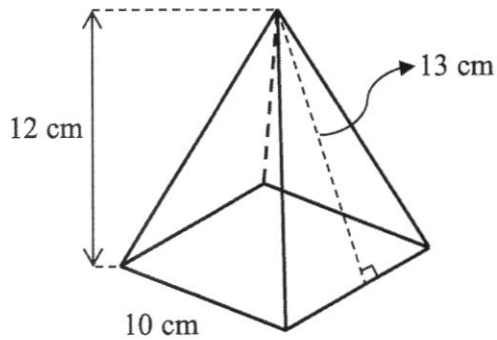
Answer $BN =$ ..... cm [1]

(ii) l.

Answer $l =$ ..... cm [2]

9 **(a)** A right pyramid has a vertical height of 12 cm and a square base with sides of 10 cm.

Find its volume.



Answer ..... cm^3 [1]

(b) Given also that slant heights of the triangular faces are 13 cm, find its total surface area.

Answer ..... cm^2 [2]

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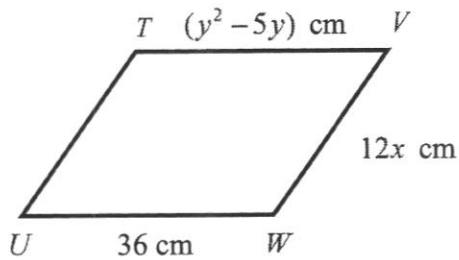
10 A rhombus *TUWV* is shown in the diagram below.



Find the value of

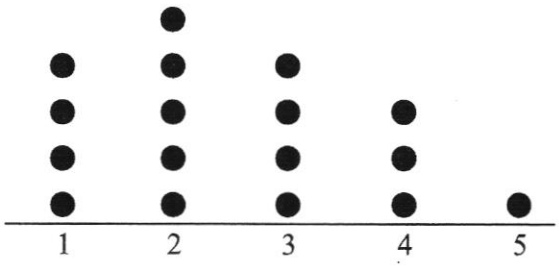
(a) x,

Answer $x =$ ..... [2]

(b) y.

Answer $y =$ ..... [2]

11 The number of hours spent per day on the usage of mobile devices for 17 students is studied. The data is represented by the dot diagram below.



Number of hours spent per day

(a) Find the mean number of hours spent per day on mobile devices.

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Answer ..... hours [2]

(b) Find the median number of hours spent per day on mobile devices.

Answer ..... hours [1]

(c) Find the modal number of hours spent per day on mobile devices.

Answer ..... hours [1]

12 A student shot a basketball into a ring. He noticed that he made 48 successful shots out of the 112 attempts.

(a) Find the probability that he made a successful shot.
Leave your answer as a fraction in its simplest form.

Answer ..... [1]

(b) After a week of training and practices, the student managed to make 38 successful shots out of 85 attempts.
By calculating the new probability of successful shots and making a comparison with your answer in **(a)**, state whether he made an improvement in his shooting skill after one week of training.
Answer

The new probability of making a successful shot is .....

The student **did** / **did not** improve in his shooting skill.

(Circle the correct answer)

[2]

Name:	Index Number:	Class:

YIO CHU KANG SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2018
SECONDARY TWO NORMAL (ACADEMIC)

MATHEMATICS
Paper 2

1 hour 30 minutes

Additional Materials: Answer Paper
Graph Paper

11 October 2018 (Thursday)

READ THESE INSTRUCTIONS FIRST

Write your index number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** the 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 will result in loss of marks.
The total of the marks for this paper is 60.

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.

For Examiner's Use
60

Setter: Mr William Wong B H

This document consists of **6** printed pages and **2** blank pages.

Mathematical Formulae

Mensuration

Curved surface area of a cone = πrl

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

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

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

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1 **(a)** Factorise the following expressions.

(i) $28x^2y+44xy$ [1]

(ii) $3a(b+2)+5(b+2)$ [1]

(iii) $4x^2-12x+9$ [2]

(b) Compute the following without using a calculator.

298^2-4 [2]

---

2 **(a)** Solve the inequality $2(y+3)-7y \leq -3(y+8)$. [2]

(b) Hence, state

(i) the smallest value of y if y is an integer, [1]

(ii) the smallest value of y if y is a prime number. [1]

---

3 Solve the following equations.

(a) $7(2p-1)+1=5(p+6)$ [2]

(b) $\frac{2r+21}{3}=\frac{3r+37}{7}+1$ [3]

---

4 **(a)** Jack and Ismail ate a total of 48 plates of sushi during a dinner buffet.

Ismail ate $(z+1)$ plates of sushi. If he ate 4 more plates than Jack, find the value of z. [2]

(b) The average speed of a car is 3 times faster than a truck on a road.

(i) If the speed of the car is $(x+15)$ km/h, write down an expression, in terms of x, for the average speed of the truck. [1]

(ii) If the difference in their distance is 50 km after 1 hour of travelling on the road, find the value of x. [4]

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5 **(a)** Find the number of sides of a regular polygon given that the sum of its <u>interior</u> angles is 1440°. Show your workings clearly. [2]

(b) The <u>exterior</u> angles of a hexagon are 45°, 60°, 85°, 100°, $2y°$ and $3y°$.

Find the value of y. [2]

6 **(a)** Construct a triangle where $PQ = 8$ cm, $QR = 7$ cm and angle $PQR = 110°$. [2]

(b) Construct the angle bisector of angle PQR in your drawing in part **(a)**. [2]

(c) Construct the perpendicular bisector of QR in your drawing in part **(a)**. [2]

---

7 Given that y is directly proportional to $(x+3)$ in the table below.

x	1	2	b
y	12	a	30

Find

(a) an equation relating x and y, [2]

(b) the values of a and of b. [2]

---

8 The following stem-and-leaf diagram shows the weight of students of a particular class in a primary school.

Weight (kg)

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

Key : 3 \| 7 means 37 kg

(a) How many students are there in the class? [1]

(b) Find

(i) the mean weight, [2]

(ii) the median weight, [1]

(iii) the modal weight. [1]

(c) Find the probability of picking a student who weighs more than 50 kg. [1]

(d) A new student joins the class and the new mean weight of the class is changed to 48 kg. Find the weight of the new student in kg. [2]

9 An ice-cream cone sold in Sweetie Dessert Shop (Diagram 1) can be modelled by a hemisphere and an inverted right circular cone as shown in Diagram 2.

The diameter of the hemisphere and the cone is 5 cm, and the vertical height of the cone is 12 cm.

Diagram 1

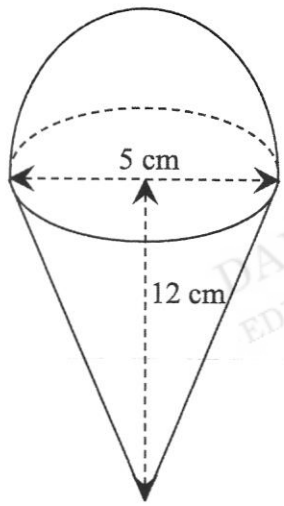

Diagram 2

The entire ice-cream cone is made up of:

- A hollow cone biscuit wrapped round by a piece of paper,
- Ice-cream that fills up the interior of the biscuit cone, together with a hemispherical top.

Find

(a) the slant height of the cone, [2]

(b) the amount of paper needed to wrap around the biscuit cone, [1]

(c) the total surface area of the model in Diagram 2, [2]

(d) the volume of the ice-cream in the entire ice-cream cone. [3]

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

10 The table of values of two equations are given below respectively.

$y = 2x - 5$

x	1	3	5
y	a	1	5

$y = -2x + 3$

x	-1	b	3
y	5	3	-3

(a) Find the values of a and of b in the tables. [1]

(b) Using a scale of 2 cm to 1 unit on both axes, draw and label the graphs of the two equations. [3]

(c) By using the graphs drawn in **(b)**, solve the following simultaneous equation.

$$y = 2x - 5$$
$$y = -2x + 3$$ [1]

(d) A line passes through two coordinates $(-1, 6)$ and $(3, -2)$.

(i) Find the gradient of the line. [2]

(ii) By drawing the line on your graph in **(b)**, find its y-intercept. [1]

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YIO CHU KANG SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2018
SECONDARY TWO NORMAL (ACADEMIC)

MATHEMATICS Paper 1 **Marking Scheme**

1 **(a)**
$$\frac{x}{3}+\frac{x-2}{7}=\frac{7x}{21}+\frac{3(x-2)}{21}$$
$$=\frac{7x}{21}+\frac{3(x-2)}{21}$$ [M1]
$$=\frac{7x+3x-6}{21}$$
$$=\frac{10x-6}{21}$$ [A1]

(b) $\frac{10(2)-6}{21}=\frac{2}{3}$ OR $\frac{2}{3}+\frac{2-2}{7}=\frac{2}{3}$ [A1]

2 **(a)** Find an equation connecting s and m.

$s=\frac{k}{\sqrt{m}}$

$k=s\sqrt{m}=676\sqrt{64}=5408$ [M1]

$\therefore \quad s=\frac{5408}{\sqrt{m}}$ [A1]

(b)
$520=\frac{5408}{\sqrt{m}}$

$m=(\frac{5408}{520})^2$

$m=108\frac{4}{25}g$ OR $108.16g$ [A1]

3 **(a)** 3 cm : 1.2 km
= 3 cm : 120000 cm
= 1 : 40000 [A1]

(b) 3 cm : 1.2 km
= 1 cm : 0.4 km
= 7 cm : 2.8 km [A1]

(c)
1 : 50 000
= 1 cm : 0.5 km

$(1\text{ cm})^2 : (0.5\text{ km})^2$
= $1\text{ cm}^2 : 0.25\text{ km}^2$ [M1]
= $8\text{ cm}^2 : 2\text{ km}^2$ [A1]

4 $3x-y=-2$ ---------- Eq (1)

$x-3y=-30$ ---------- Eq (2)

<u>By Substitution:</u>

Eq(2), $x=3y-30$ ---------- Eq (3)

Sub. Eq(3) into Eq(1), $3(3y-30)-y=-2$ [M1]

$9y-90-y=-2$

$8y=88$

$y=11$ ------ Sub. into Eq(3), [A1]

$x=3(11)-30$

$x=3$ [A1]

<u>By Elimination:</u>

Eq(2) x 3, $3x-9y=-90$ ---------- Eq (3)

Eq(3) – Eq(1), $-9y-(-y)=-90-(-2)$ [M1]

$-9y+y=-90+2$

$8y=88$

$y=11$ ------ Sub. into Eq(3), [A1]

$x=3(11)-30$

$x=3$ [A1]

5 $\frac{AB}{PQ}=\frac{BC}{QR}=\frac{CD}{RS}=\frac{DA}{SP}$ (ratio of corresponding sides of similar figures)

$\frac{3}{7}=\frac{BC}{QR}=\frac{CD}{RS}=\frac{4}{x}$

(a) $\frac{3}{7}=\frac{4}{x}$ [M1]

$x=\frac{4\times 7}{3}=9\frac{1}{3}$ [A1]

(b) $y^\circ=\angle PSR=\angle ADC$ (Corresponding angles of similar figures)

$y^\circ=180^\circ-\angle QRS$ (Interior angles of parallel lines *PS* & *QR*)

$y^\circ=180^\circ-\angle BCD$ (Corresponding angles of similar figures)

$y^\circ=180^\circ-122^\circ$ [M1]

$y=58$ [A1]

6

	x	$+9$
x	x^2	$+9x$
-2	$-2x$	-18

[M1]

$\therefore\ x^2+7x-18=(x+9)(x-2)$ [A1]

7 **(a)** $\dfrac{5ab^3}{14}\times\dfrac{28a^2}{b^4}=\dfrac{10a^3}{b}$ [A1]

(b) $\dfrac{p^3q}{15q-50}\div\dfrac{p^2}{9q-30}=\dfrac{p^3q}{15q-50}\times\dfrac{9q-30}{p^2}$ [M1]

$=\dfrac{p^3q}{5(3q-10)}\times\dfrac{3(3q-10)}{p^2}$

$=\dfrac{3pq}{5}$ [A1]

8 **(a)** *JKMN* is a **trapezium**. [A1]

(b) **(i)** $BN=7-5=2$ cm [A1]

(ii) $l^2=BM^2+BN^2$ (Pythagoras Theorem)

$=JK^2+BN^2$

$l=\sqrt{1.1^2+2^2}$ [M1, ECF allowed]

$l\approx 2.28$ (3 s.f.g.) [A1]

9 **(a)** Volume $=\dfrac{1}{3}\times$ base area $\times$ height

$=\dfrac{1}{3}\times 10\times 10\times 12$

$=400$ cm^3 [A1]

(b) Base area $=10\times 10=100$ cm^2

Lateral Surface/ Arear of Triangle $=\dfrac{1}{2}\times 10\times 13=65$ cm^2

Total surface area. $=100+65\times 4$ cm^2 [M1]

$=360$ [A1]

10 **(a)** $12x=36$ (Sides of rhombus are equal in length) [M1]

$x=3$ [A1]

(b) $y^2-5y=36$ (Sides of rhombus are equal in length)

$y^2-5y-36=0$

$(y-9)(y+4)=0$ [M1]

$y=9$ or $y=-4$ (Rejected) [A1]

	y	-9
y	y^2	$-9y$
$+4$	$+4y$	-36

11 **(a)** Mean number of hours spent per day

$$= \frac{1\times4+2\times5+3\times4+4\times3+5\times1}{17}$$ [M1]

$$= 2\frac{9}{17} \text{ hours} \quad \text{OR} \quad \mathbf{2.53} \text{ hours (3 s.f.g.)}$$ [A1]

(b) Medium number of hours spent per day $= 2$ hours [A1]

(c) Modal number of hours spent per day $= 2$ hours [A1]

12 **(a)** $\text{P(successful shot)} = \frac{48}{112} = \frac{3}{7}$ hours [A1]

(b)

$\text{P(}\mathbf{new}\text{ successful shot)} = \frac{38}{85} \approx 0.447$ hours

$\text{P(successful shot)} = \frac{48}{112} = \frac{3}{7} \approx 0.429$ hours

The probability of making successful shot is higher after the one-week training, hence his shooting skill **did** improve.

Answer

The new probability of making successful shot is $\frac{38}{85}$. [A1]

The student (**did**) / ~~**did not**~~ improve in his shooting skill. [A1]

DANYAL EDUCATION

END-OF-YEAR EXAMINATION 2018
SECONDARY TWO NORMAL(ACADEMIC)
MATHEMATICS PAPER 2

Marking Scheme

1 **(a)** **(i)** $28x^2y+44xy=4xy(7x+11)$ [A1]

(ii) $3a(b+2)+5(b+2)=(3a+5)(b+2)$ [A1]

(iii)

	$2x$	-3
$2x$	$4x^2$	$-6x$
-3	$-6x$	$+9$

[M1]

OR

$4x^2-12x+9=(2x)^2-2(2x)(3)+(3)^2$ [M1]

$=(2x-3)^2$ [A1]

(b) $298^2-4=298^2-2^2$

$=(298+2)(298-2)$ [M1]

$=(300)(296)$

$=88800$ [A1]

2 **(a)** $2(y+3)-7y \le -3(y+8)$

$2y+6-7y \le -3y-24$

$-2y \le -30$ [M1]

$y \ge 15$ [A1]

(b) **(i)** Smallest integer $y=15$ [A1]

(ii) Smallest prime number $y=17$ [A1]

3 **(a)** $7(2p-1)+1=5(p+6)$

$14p-7+1=5p+30$ [M1]

$9p=36$

$p=4$ [A1]

(b) $\frac{2r+21}{3}=\frac{3r+37}{7}+1$

$\frac{2r+21}{3}=\frac{3r+37+7}{7}$ OR $7(2r+21)=3(3r+37)+21$ [M1]

$7(2r+21)=3(3r+44)$

$14r+147=9r+132$ [M1]

$5r=-15$

$r=-3$ [A1]

4 **(a)** $(z+1)+(z+1)-4=48$ [M1]

$z=25$ [A1]

(b) **(i)** Average speed of the truck $=\frac{x+15}{3}$ km/h [A1]

(ii) Distance travelled by car after 1 hour $=(x+15)$ km/h $\times 1$ h $=(x+15)$ km

Distance travelled by truck after 1 hour $=\frac{x+15}{3}$ km/h $\times 1$ h $=\frac{x+15}{3}$ km

$(x+15)-\frac{x+15}{3}=50$ [M1]

$\frac{3(x+15)-(x+15)}{3}=50$ OR $3(x+15)-(x+15)=150$ [M1]

$3x+45-x-15=150$ [M1]

$2x=120$

$x=60$ [A1]

5 **(a)** $(n-2)\times 180°=1440°$ (Sum of Interior angles of a polygon) [M1]

$180n-360=1440$

$180n=1800$

$n=10$ [A1]

(b) $45°+60°+85°+100°+2y°+3y°=360°$ (Sum of Exterior angles of a polygon) [M1]

$5y+290=360$

$5y=70$

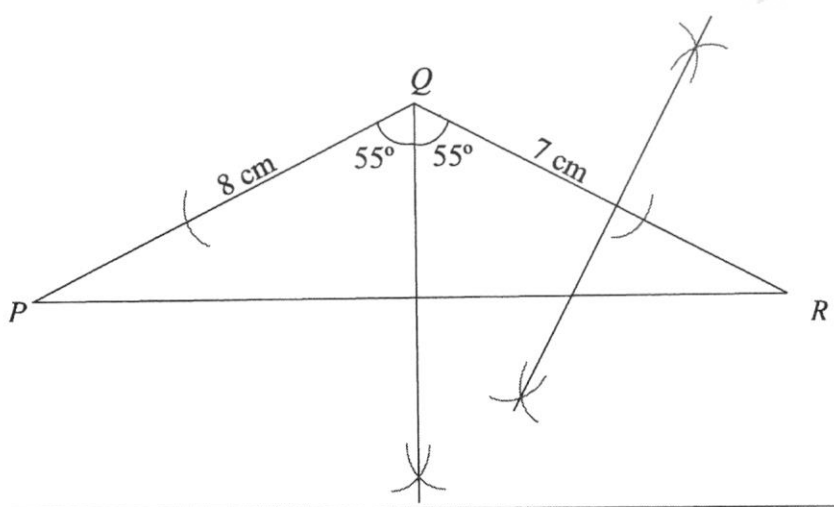
$y=14$ [A1]

6 **(a)** $\angle PQR=110°$ [A1]

$PQ=8$ cm and $QR=7$ cm [A1]

(b) - One arc constructed to cut PQ and RQ, and one pair of construction arcs drawn. [M1]
- Angle bisector splits $\angle PQR$ into half. [A1]

(c) - Two pairs of construction arcs drawn. [M1]
- Bisector split QR into half and is perpendicular to QR. [A1]



7 **(a)** $y = k(x+3)$, where k is a constant,

$12 = k(1+3)$ [M1]

$k = 3$

$\therefore \quad y = 3(x+3)$ [A1]

(b) $a = 3(2+3) = 15$ [A1]

$30 = 3(b+3)$

$b = 7$ [A1]

8 **(a)** Number of students in the class = 16 [A1]

(b) **(i)** Mean weight $= \dfrac{37+38+39+39+41+46+46+46+47+48+51+52+54+58+59+60}{16}$

$= \dfrac{761}{16}$ [M1]

$= 47\dfrac{9}{16}$ kg OR 47.5625 kg [A1]

(ii) Median weight $= \dfrac{46+47}{2} = 46.5$ kg [A1]

(iii) Modal weight = 46 kg [A1]

(c) $\mathrm{P}(\geq 50 \text{ kg}) = \dfrac{6}{16} = \dfrac{3}{8}$ OR 0.375 [A1]

(d) Let the weight of the new student be w kg.

$\dfrac{761+w}{17} = 48$ [M1]

$761 + w = 816$

$w = 55$ kg [A1]

9 **(a)** $l^2 = 2.5^2 + 12^2$ (Pythagoras' Theorem) [M1]

$l = 12.245765$ or

≈ 12.2 cm [A1]

(b) Curved surface area of the cone $= \pi rl$

$= \pi(\dfrac{5}{2})(12.25765)$

$= 96.27136325$

≈ 96.3 cm^2 (3 s.f.g.) [A1]

(c) Curved surface area of the hemisphere $= \dfrac{1}{2} \times 4\pi r^2$

$= 2\pi(\dfrac{5}{2})^2$

$= 12.5\pi$ or 39.27 cm^2 [M1]

Total surface area of the solid $= 96.27 + 39.27$

≈ 136 cm^2 (3 s.f.g.) [A1]

(d) Volume of cone $= \frac{1}{3}\pi r^2 h = \frac{\pi}{3}(2.5^2)(12) = 25\pi$ or 78.54 cm^3 [M1]

Volume of hemisphere $= \frac{1}{2} \times \frac{4}{3}\pi r^3 = \frac{2\pi}{3}(2.5^3) = \frac{125\pi}{12}$ or 32.72 cm^3 [M1]

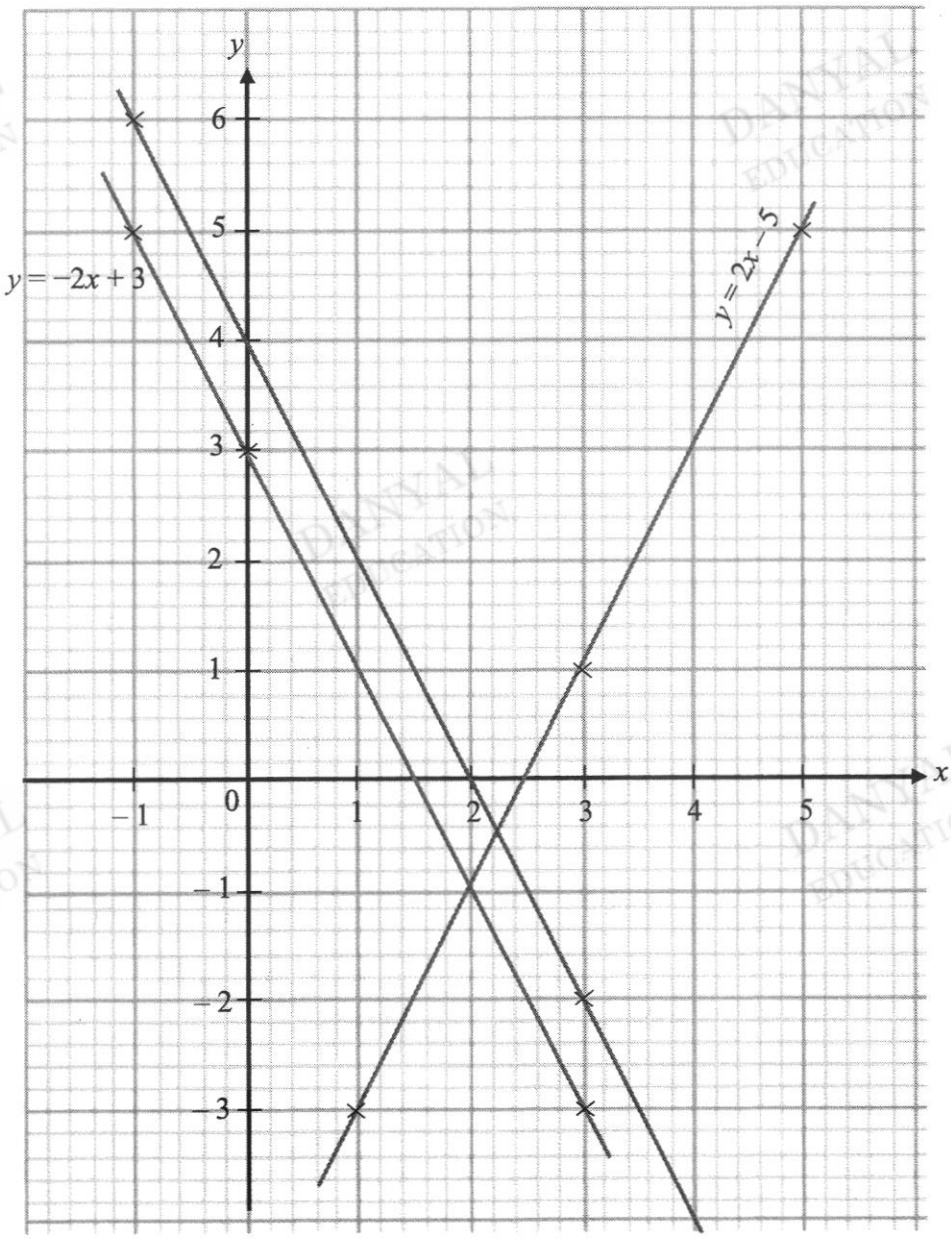
Total volume of the solid $= 25\pi + \frac{125}{12}\pi \approx 111$ cm^3 (3 s.f.g.) [A1]

10 **(a)** $a = 2(1) - 5 = -3$

$3 = -2b + 3$

$b = 0$ [A1 only if BOTH values of a and b are correct]

(b)



Points are marked accurately, lines are drawn accurately, and equations are labelled. [A3]

(c) $x = 2$, $y = -1$ [A1]

(d)

(i) Gradient of the line $= \frac{6-(-2)}{-1-3} = \frac{8}{-4}$ [M1]

$= -2$ [A1]

(ii) y-intercept $= 4$ [A1]

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