



# THE KING'S SCHOOL

## Mathematics Level 2

Year 9

Assessment Task

November 2010

- Time Allowed: 90 minutes.
- Attempt **ALL** questions.
- Marks for each question are indicated on the examination paper.
- Board-approved calculators may be used.
- Show all necessary working.
- Answers are to be written in the booklets provided.
- Start a new writing booklet for each Question.
- Write your Name and Mathematics Class on each Section.

Question	Algebra	Data	Geometry	Measurement	Number	Total
1	/38					/38
2	(a), (b), (c), (d) /13			(e), (f), (g), (h) /13	(i), (j), (k) /10	/36
3		(f) /10	(a) /12		(b), (c), (d), (e) /15	/37
<b>Totals</b>	<b>/51</b>	<b>/10</b>	<b>/12</b>	<b>/13</b>	<b>/25</b>	<b>/111</b>

**Question 1 Algebra (38 marks)****Marks**

(a) Simplify each of the following:

(i)  $6xy - 4y - 3yx - y$  **2**

(ii)  $\frac{16mn}{2n}$  **1**

(iii)  $3xy \times (-5x)$  **1**

(iv)  $\frac{3m}{4n} \div \frac{15}{16n}$  **2**

(v)  $\frac{2m}{3} - \frac{m}{5}$  **2**

(vi) Factorise completely  $12a^2 + 16a$  **2**

(vii) Expand and simplify  $10a - 2(a + 4)$  **2**

(viii) Expand and simplify  $(2x + 3)(x - 4)$  **3**

(b) Simplify each of the following:

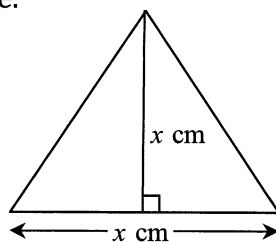
(i)  $32y^7 \div 8y^2$  **2**

(ii)  $(2x^3)^2$  **2**

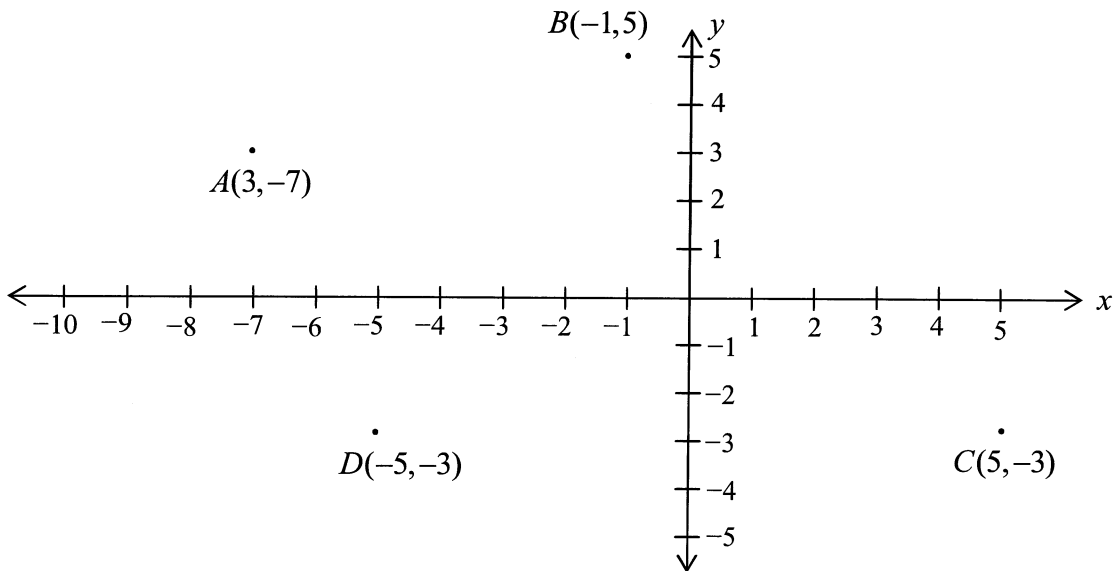
**Question 1 continues on the next page**

**Question 1 Algebra (continued)****Marks**

- (b) (iii)  $9x^0$  1
- (iv) Write using a negative index,  $\frac{2}{x^3}$  1
- (v) Write using a fractional index,  $\sqrt[3]{x}$  1
- (vi) Simplify:  $x^{\frac{1}{2}} \times x^{\frac{1}{4}}$  1
- (c) Solve each of the following equations:
- (i)  $4 + x = -3$  1
- (ii)  $\frac{x}{3} - 2 = 10$  2
- (iii)  $\frac{2x - 5}{5} = \frac{50 - x}{7}$  3
- (d) Solve each of the following inequations:
- (i)  $x + 6 > -2$  1
- (ii)  $3 - 2x < 9$  2
- (e) Solve each of the following problems by first forming an equation:
- (i) The angles of a quadrilateral are  $3x^\circ$ ,  $5x^\circ$ ,  $8x^\circ$  and  $4x^\circ$ . Find the size of the largest angle. 2
- (ii) Sam and Jack have \$400 between them. Sam has four times as much as Jack. How much does each boy have? 2
- (iii) The area of this triangle is  $18 \text{ cm}^2$ . Find its height given that is the same length as its base. 2

**End of Question 1**

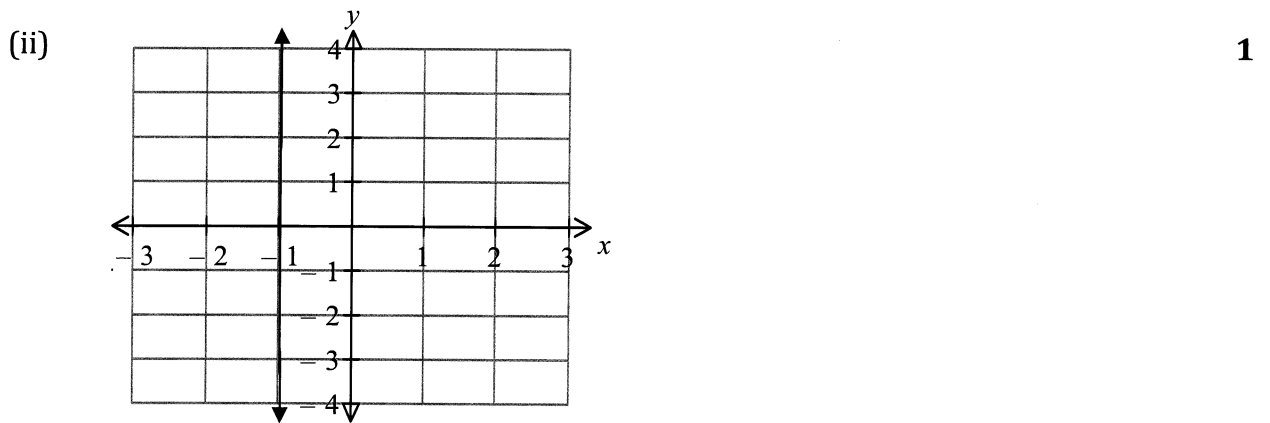
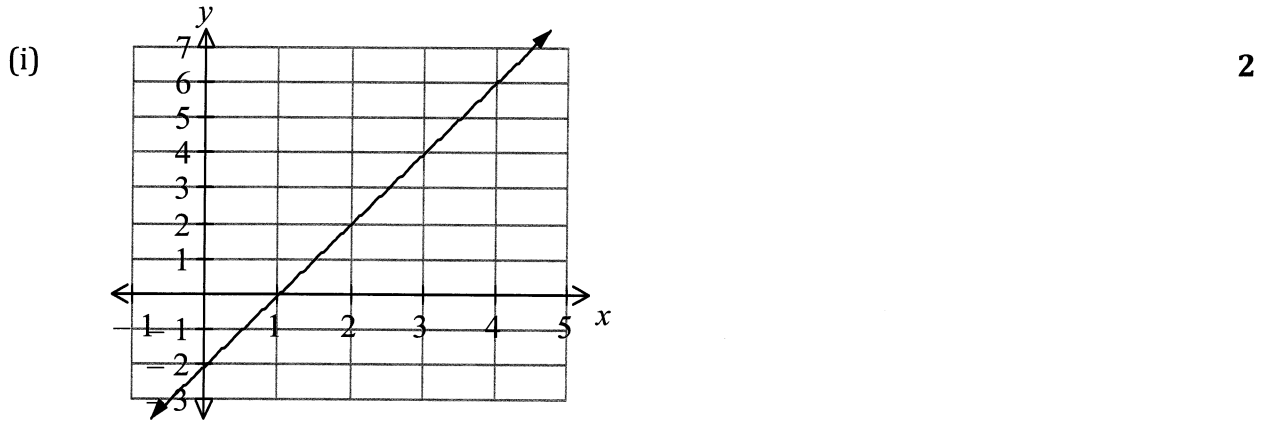
- (a) For the following set of points  $A(3,-7)$ ,  $B(-1,5)$ ,  $C(5,-3)$  and  $D(-5,-3)$ , find:



- (i) Which point, shown above, has been plotted incorrectly. 1
- (ii) Using the Gradient Formula  $m = \frac{y_2 - y_1}{x_2 - x_1}$ , find the gradient of the line  $BC$ . 2
- (iii) Find the distance  $BC$  using the formula  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$  2
- (iv) What is the equation of the line  $DC$ ? 1
- (b) Show that the point  $(-2,7)$  lies on the line  $5x + 2y = 4$ . 1
- (c) **Answer on the separate graph paper provided**
- Graph the following pair of lines and find their point of intersection  $\begin{cases} y = x - 1 \\ y = -2x + 5 \end{cases}$  3

**Question 2 continues on the next page**

(d) What are the equations of each of the lines shown below.



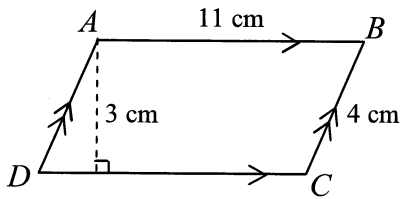
(e) Correct to 1 decimal place, if necessary, find the perimeter of:



Question 2 continues on the next page

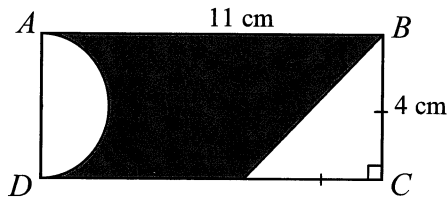
(f) Find the area of  $ABCD$ .

1



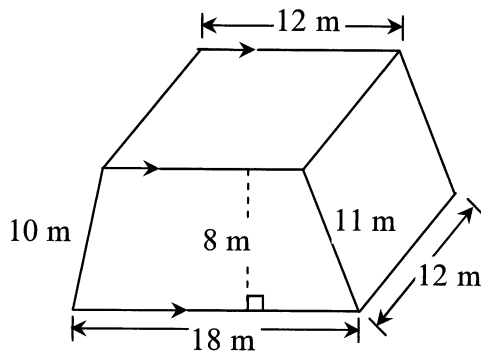
(g) Find the shaded area of  $ABCD$  correct to one decimal place.

4



(h) Find the surface area of the following trapezoidal prism.

4



(i) Using the tax table below, answer the following questions.

Taxable income	Tax on this income
\$1-\$6000	Nil
\$6001-\$20 000	17 cents for each \$1 over \$6000
\$20 001-\$50 000	\$2380 + 30 cents for each \$1 over \$20 000
\$50 001-\$60 000	\$11 380 + 42 cents for each \$1 over \$50 000
\$60 001 and over	\$15 580 + 47 cents for each \$1 over \$60 000

Matthew has an annual salary of \$58 200. His tax deductions are \$2 320 per annum.  
Find:

- (i) his taxable income 1
- (ii) the amount of tax he pays 3
- (iii) Find the Medicare levy if it is 1.5% of his taxable income 1

Question 2 continues on the next page

**Question 2 Measurement & Number (continued)****Marks**

- 
- (j) Ben works a 38 hour week at a rate of \$8.62 per hour:
- (i) Calculate the amount he earns in 1 week **1**
  - (ii) Calculate his holiday loading if 17 ½ % is given on 4 weeks wages **2**
- (k) Find the amount Jack will pay for a mountain bike worth \$336 if he pays \$45 deposit and \$17.50 per month for 18 months. **2**

**End of Question 2**

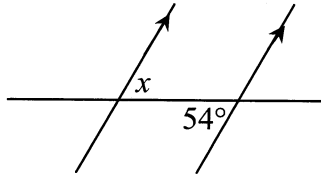
Start a new writing booklet

Question 3 Geometry, Number and Data (37 marks)

Marks

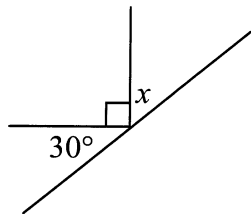
(a) Find the values of  $x$  in each of the following cases. Give reasons. All diagrams are not drawn to scale.

(i)



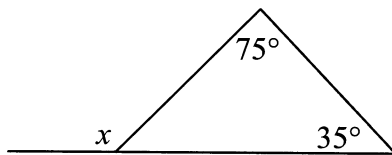
2

(ii)



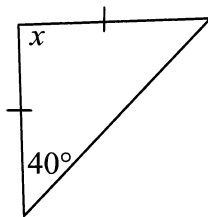
2

(iii)



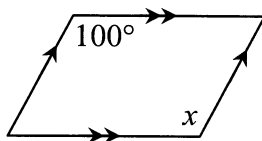
2

(iv)



2

(v)



2

(vi) Find the size of each interior angle of a regular nonagon.

2

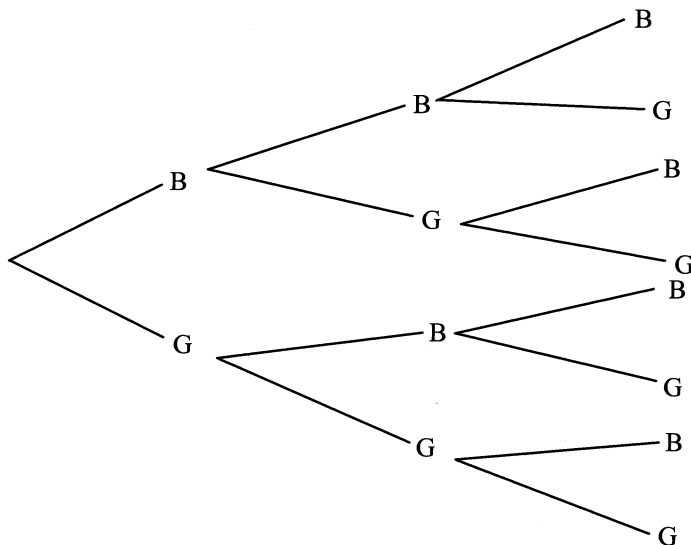
Question 3 continues on the next page



(b) The numbers 1 to 30 are written on cards. If one card is chosen at random, what is the probability, as a fraction, that the number on the card will:

- (i) be even 1
- (ii) be divisible by 6 1
- (iii) be less than 17 1
- (iv) have 4 in it 1
- (v) greater than 12 1

(c) The tree diagram below represents a family of 3 children. Use it to answer the questions below.



(i) List all possible outcomes in the sample space. 2

Find the probability of the family having:

- (ii) 2 daughters and 1 son 1
- (iii) 3 sons 1
- (iv) no daughters 1
- (v) at least one daughter 1

**Question 3 continues on the next page**

**Question 3 Geometry, Number & Data (continued)****Marks**

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(d) Simplify

(i) 2 L to 5 mL

**1**

(ii) 16 : 64

**1**

(e) Write 44 500 km

(i) correct to 1 significant figure

**1**

(ii) correct to 2 significant figures

**1**

**Question 3 continues on the next page**

**Question 3 Geometry, Number & Data (continued) Answer on Sheet**

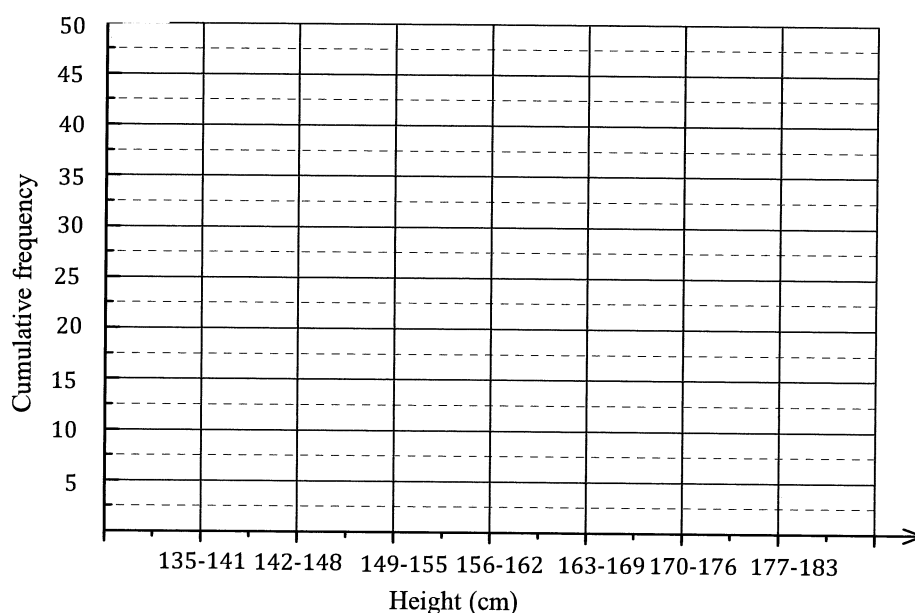
**Marks**

(f) The height of 50 students in Year 9 were measured and recorded to the nearest cm.

Complete the frequency distribution table below and then answer the questions. **3**

Heights cm	Tally	Class centre	Frequency	Cumulative frequency	Frequency × class centre
135-141		138	2	2	276
142-148					435
149-155					912
156-162					1749
163-169		166	15	37	2490
170-176					1557
177-183					720
			$\sum f = 50$		$\sum fx = 8139$

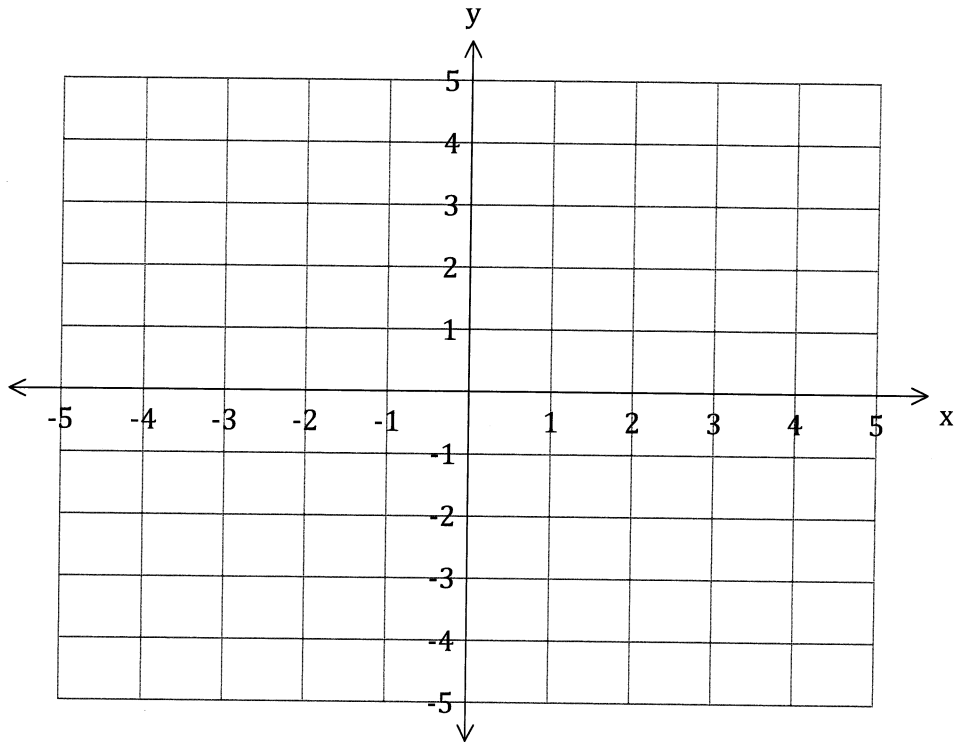
- (i) What is the modal class? **1**
- (ii) What is the mean height, to the nearest cm? **2**
- (iii) How many students have a height of 162 cm or less? **1**
- (iv) How many students have a height of greater than 169 cm? **1**
- (v) Using the table above, draw a cumulative frequency distribution histogram and an ogive. **2**



**End of Assessment Task**

Class \_\_\_\_\_ Name \_\_\_\_\_

**Question 2(c)**



Solutions 2010  
 5.2 Mathematics  
 Nov Assessment

$$(iii) \frac{2x-5}{5} = \frac{50-x}{7}$$

$$7(2x-5) = 5(50-x)$$

$$14x - 35 = 250 - 5x \quad \text{1 mark}$$

$$\begin{array}{r} +5x \\ \hline 19x - 35 = 250 + 35 \end{array}$$

$$19x - 35 = 250 \quad \text{1 mark}$$

$$\begin{array}{r} +35 \\ \hline 19x = 285 \end{array}$$

$$\begin{array}{r} \div 19 \\ \hline x = 15 \end{array} \quad \text{1 mark}$$

Question 1

(a)(i)  $3xy - 5y$  1 mark each

(ii)  $8m$  1 mark

(iii)  $-15x^2y$  1 mark

(iv)  $\frac{3m}{4n} \times \frac{16n}{5}$  1 mark

$\frac{4m}{5x}$  1 mark

(v)  $\frac{2m}{3} \times \frac{5}{5} - \frac{m}{5} \times \frac{3}{3}$  1 mark

$\frac{7m}{15}$  1 mark

(vi)  $4a(3a+4)$  1 mark each factor

(vii)  $10a - 2a - 8$  1 mark  
 $8a - 8$  1 mark

(viii)  $2x(x-4) + 3(x-4)$  1 mark

$2x^2 - 8x + 3x - 12$  1 mark

$2x^2 - 5x - 12$  1 mark

(b)(i)  $4y^5$  1 mark each

(ii)  $4x^6$  1 mark each

(iii)  $9$  1 mark

(iv)  $2x^{-3}$  1 mark

(v)  $x^{\frac{1}{3}}$  1 mark

(vi)  $x^{\frac{3}{4}}$  1 mark

(c)(i)  $4 + x = -3$   
 $\begin{array}{r} -4 \\ \hline x = -7 \end{array}$  1 mark

(ii)  $\frac{x}{3} - 2 = 10$   
 $\begin{array}{r} +2 \\ \hline \frac{x}{3} = 12 \end{array}$  1 mark  
 $\begin{array}{r} \times 3 \\ \hline x = 36 \end{array}$  1 mark

(d)(i)  $x + 6 > -2$   
 $\begin{array}{r} -6 \\ \hline x > -8 \end{array}$  1 mark

(ii)  $3 - 2x < 9$   
 $\begin{array}{r} -3 \\ \hline -2x < 6 \end{array}$  1 mark  
 $\begin{array}{r} \div -2 \\ \hline x > -3 \end{array}$  1 mark

(e)(i)  $3x + 5x + 8x + 4x = 360$

$20x = 360$  1 mark  
 $\begin{array}{r} \div 20 \\ \hline x = 18 \end{array}$

$\therefore 8x = 8 \times 18$   
largest  $\angle = 144^\circ$  1 mark

(ii) 5 parts = \$400  
 1 part = \$80

$\therefore$  Sam has \$320 Jack has \$80 1 mark each

(iii)  $18 = \frac{1}{2}x^2$  1 mark

$36 = x^2$

$x = 6$

$\therefore$  height = 6cm 1 mark

## Question 2

(a)(i) A

$$(ii) m_{BC} = \frac{-3-5}{5--1} \quad \text{1 mark}$$

$$= \frac{-8}{6}$$

$$= -\frac{4}{3} \quad \text{1 mark}$$

$$(iii) d_{BC} = \sqrt{(5--1)^2 + (-3-5)^2} \quad \text{take 1 mark/error}$$

$$= \sqrt{36+64}$$

$$= \sqrt{100} = \underline{10 \text{ units}}$$

$$(iv) y = -3$$

$$(b) \quad 5x + 2y = 4$$

$$\text{LHS} = 5(-2) + 7(2)$$

$$= -10 + 14$$

$$= 4$$

$$= \text{RHS}$$

$$\therefore (-2, 7) \text{ lies on } 5x + 2y = 4 \quad \text{1 mark}$$

(c) 1 mark for each line  
1 mark for pt of intersection

$$(d)(i) m = \frac{2}{1} = 2$$

$$b = -2$$

$$y = 2x - 2 \quad \begin{array}{l} \text{1 mark gradient} \\ \text{1 mark y-intercept.} \end{array}$$

$$(ii) \underline{x = -1}$$

$$(e) (i) x^2 = 6^2 + 8^2$$

$$x^2 = 100$$

$$x = 10 \quad \text{1 mark}$$

$$\therefore \text{perimeter} = 6 + 8 + 10$$

$$= \underline{24 \text{ m}} \quad \text{1 mark}$$

$$(ii) P = 15 + 15 + \frac{1}{4} \times 2 \times \pi \times 15 \quad \text{1 mark}$$

$$= 30 + \frac{15\pi}{2}$$

$$= \underline{\left(\frac{60 + 15\pi}{2}\right) \text{ cm}} \quad \text{1 mark}$$

$$(f) A = bh$$

$$= 3 \times 11$$

$$= \underline{33 \text{ cm}^2} \quad \text{1 mark}$$

$$(g) A_{\text{rect.}} = 11 \times 4$$

$$= 44 \text{ cm}^2 \quad \text{1 mark}$$

$$A_{\text{semi circle}} = \frac{1}{2} \times \pi \times 2^2$$

$$= 2\pi \text{ cm}^2 \quad \text{1 mark}$$

$$A_{\text{triangle}} = \frac{1}{2} \times 4 \times 4$$

$$= 8 \text{ cm}^2 \quad \text{1 mark}$$

$$A_{\text{shaded}} = 44 - 8 - 2\pi$$

$$= 29.716$$

$$\doteq \underline{29.7 \text{ cm}^2} \quad \text{1 mark}$$

$$(h) SA = (11 \times 12) + (10 \times 12) + (12 \times 12)$$

$$\text{1 mark} \rightarrow + (18 \times 12) + 2 \left[ \frac{8}{2} (18 + 12) \right]$$

$$\text{per 2 sides} = 131 + 120 + 144 + 216 + 270$$

$$= \underline{881 \text{ m}^2} \quad \text{1 mark}$$

$$(i)(i) \text{ taxable income} =$$

$$58200 - 2320$$

$$= \underline{\$55880} \quad \text{1 mark}$$

$$(ii) \text{ tax} = \$11380 + \text{1 mark}$$

$$(55880 - 50000) \times 0.42 \quad \text{1 mark}$$

$$11380 + 2469.60$$

$$= \underline{\$13849.60} \quad \text{1 mark}$$

$$(iii) \frac{1.5}{100} \times 55880$$

$$= \underline{\$88.20} \quad \text{1 mark}$$

$$(j)(i) 38 \times 8.62$$

$$= \underline{\$327.56/\text{week}} \quad \text{1 mark}$$

$$(ii) 327.56 \times 4 \times \frac{117.5}{100} \quad \text{1 mark}$$

$$= \underline{\$1539.53} \quad \text{1 mark}$$

$$(k) \text{ pay} = 45 + 17.50 \times 18 \quad \text{1 mark}$$

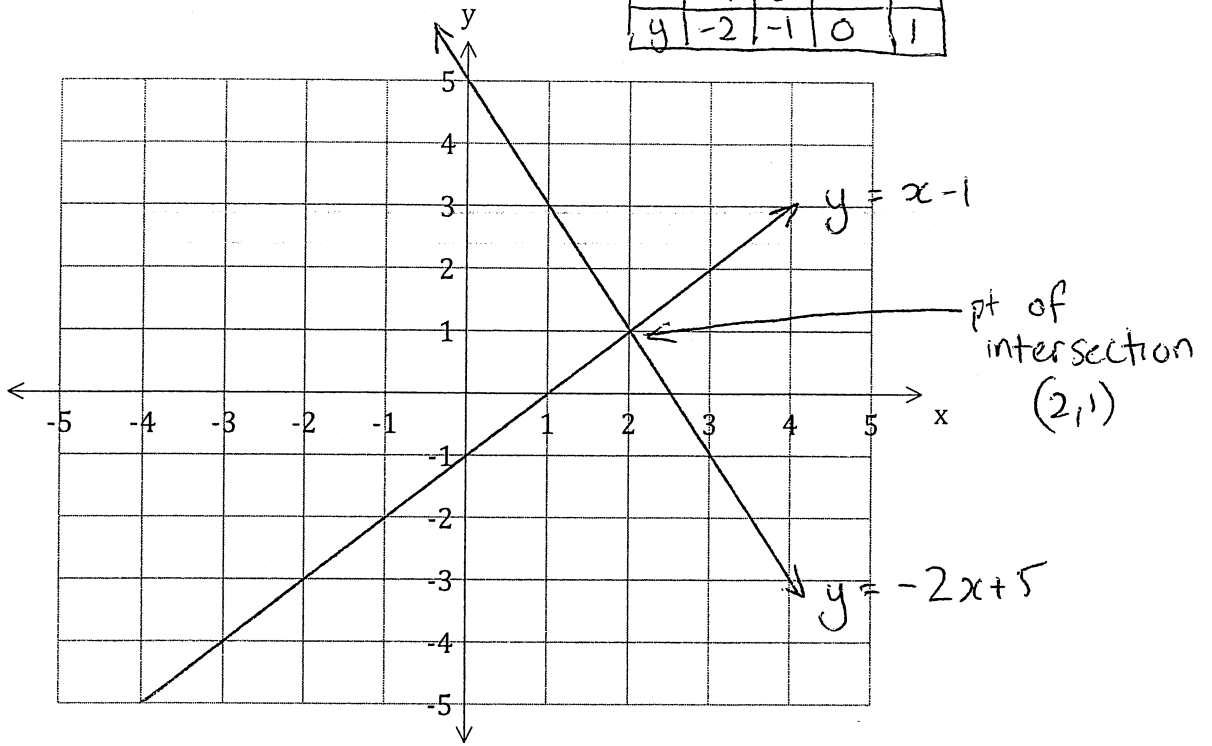
$$= 45 + 315$$

$$= \underline{\$360} \quad \text{1 mark.}$$

Question 2(c)

$$y = x - 1$$

x	-1	0	1	2
y	-2	-1	0	1



$$y = -2x + 5$$

x	0	1	2	3
y	5	3	1	-1

### Question 3

(e)(i) 40 000 1 mark

(iii) 45 000 1 mark

(a)(i)  $x = 54^\circ$  (alt  $\angle$ s parallel lines) 1 mark

(ii)  $x + 90 + 30 = 180$  (str  $\angle$ ) 1 mark

$x = 60^\circ$  1 mark

(iii)  $x = 75 + 35$  (ext  $\angle$  of  $\Delta$  is equal to sum of opp int.  $\angle$ s) 1 mark

$x = 110^\circ$  1 mark

(iv)  $x + 40 + 40 = 180$  ( $\angle$ s opp. equal sides in isos) 1 mark

$x = 100^\circ$  1 mark

(v)  $x = 100^\circ$  (opp  $\angle$ s in parallelogram) 1 mark

(vi)  $(9-2) \times 180 = 1260$  1 mark

$\frac{1260}{9} = 140^\circ$  1 mark

(b)(i)  $\frac{1}{2}$  1 mark

(ii)  $\frac{5}{30} = \frac{1}{6}$  1 mark

(iii)  $\frac{16}{30} = \frac{8}{15}$  1 mark

(iv)  $\frac{4}{30} = \frac{2}{15}$  1 mark

(v)  $\frac{17}{30}$  1 mark

(c)(i) { BBB, BBG, BGB, BGG } 1 mark

{ GBB, GBG, GGB, GGG } 1 mark

(ii)  $P(BGG) + P(GGB) + P(GBG)$

$= \left(\frac{1}{2}\right)^3 + \left(\frac{1}{2}\right)^3 + \left(\frac{1}{2}\right)^3$

$= \frac{3}{8}$  1 mark

(iii)  $\frac{1}{8}$  1 mark

(iv)  $1 - \frac{1}{8} = \frac{7}{8}$  1 mark

(v)  $\frac{1}{8}$  1 mark

(d)(i) 2000 : 5

400 : 1 1 mark

(ii) 1 : 4 1 mark



**Question 3 Geometry & Data (continued) Answer on Sheet**

**Marks**

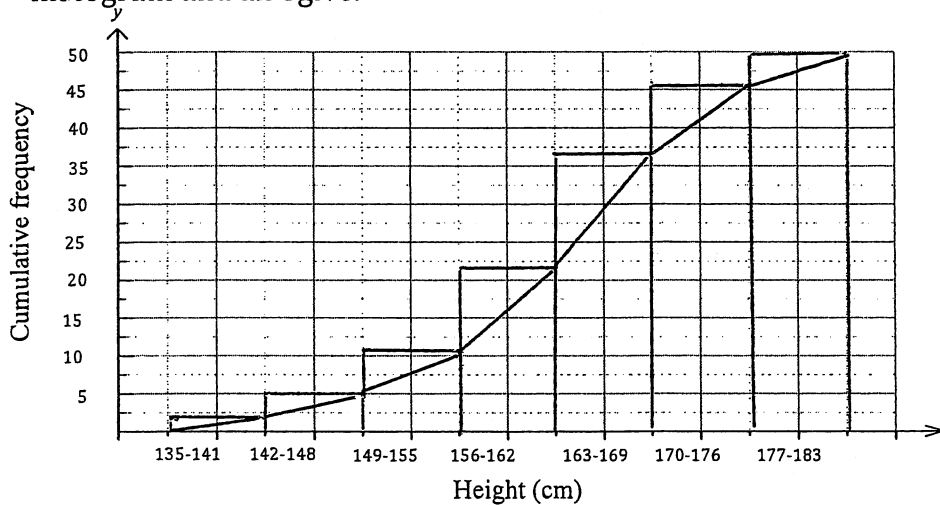
(g) The height of 50 students in Year 9 were measured and recorded to the nearest cm.

157	164	167	175	179	172	159	166	145	174
169	150	152	153	178	158	169	149	139	161
164	183	175	168	165	145	158	176	161	176
167	164	153	140	177	159	155	158	173	163
157	171	165	170	165	160	166	162	166	146

Complete the frequency distribution table below and then answer the questions. **3**

Heights cm	Tally	Class centre	Frequency	Cumulative frequency	Frequency × class centre
135-141		138	2	2	276
142-148		145	3	5	435
149-155		152	6	11	912
156-162		159	11	22	1749
163-169		166	15	37	2490
170-176		173	9	46	1557
177-183		178	4	50	712
			$\sum f = 50$		$\sum fx = 8131$

- (i) What is the modal class? *163-169 cm* **1**
- (ii) What is the mean height, to the nearest cm?  $\bar{x} = \frac{\sum fx}{\sum f} = \frac{8131}{50} = 162.62 = \underline{163 \text{ cm}}$  **2**
- (iii) How many students have a height of 162 cm or less? *22* **1**
- (iv) How many students have a height of greater than 169 cm? *13* **1**
- (v) Using the table above, draw a cumulative frequency distribution histogram and an ogive. **2**



*1 histogram  
1 ogive*

**End of Assessment Task**