Name: ..... ( ) Class:.....

1 The model of a school is made to a scale of 1 : 50.

(a) If the height of the building in the model is 35 cm, find the actual height of the building in metres.

(b) The actual floor area of the hall is 250 m^2. Find the corresponding floor area of the hall of the model in cm^2.

Answer: (a) _____ m [1]

(b) _____ cm^2 [2]

2 (a) If 7 men take 2 hours to consume 100 burgers, how long would it take 5 men to consume 80 burgers, assuming every man consumes the burgers at the same rate?

(b) If y is inversely proportional to $(x^3 - 1)$ and $y = 28$ when $x = 2$, find the value of y when $x = 3$.

Answer: (a) _____ h [2]

(b) $y =$ _____ days [2]

3. (a) Expand and simplify the expression $2x(3-2x)+(2x+3)(7-4x)$.

(b) Given that that $ab=-6$ and $a^2+b^2=30$, find the value of $(a+b)^2$.

Answer: (a) _____ [2]

(b) _____ [2]

4 (a) Factorise completely $2(ab + cd) + 4bc + ad$.

(b) Simplify $\frac{x^2+3x-10}{x^2-4}$.

Answer: (a) _____ [2]

(b) _____ [3]

5. Solve the following equations

(a) $x^2 - 8x + 12 = 0$,

(b) $(2p+1)^2 = (p-2)^2$.

Answer: (a) $x =$ _____ or _____ [2]

(b) $p =$ _____ or _____ [2]

---

6. (a) Make x the subject of the formula $\frac{2x-3}{b} = \frac{x}{3y}$.

(b) Make p the subject of the formula $m = \sqrt{\frac{2-p^2}{np^2}}$

Answer: (a) _____ [2]

(b) _____ [2]

7. (a) Express the following as a single fraction in its simplest form.

$$\frac{c}{4c^2-9}+\frac{2}{2c-3}$$

(b) Solve the equation

$$\frac{x-2}{4}+\frac{5x+3}{3}=8$$

Answer (a) _____ [2]

(b) $x=$ _____ [2]

8. Solve the following simultaneous equations

$$2x+3y=17,$$

$$6x-5y=9.$$

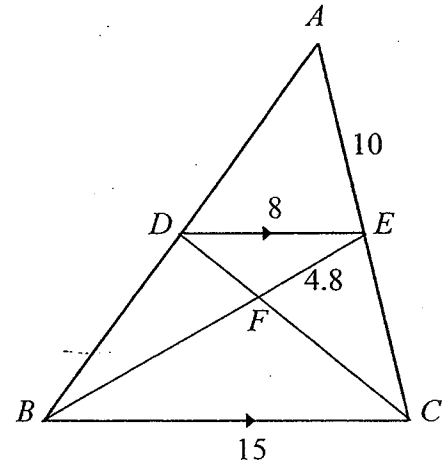
Answer: $x=$ _____, $y=$ _____ [3]

Name: .....( ) Class:.....

9 In the diagram DE is parallel to BC.

(a) Name two pairs of similar triangles.

(b) If $DE = 8$ cm, $EF = 4.8$ cm, $AE = 10$ cm and $BC = 15$ cm, calculate the lengths of BF and CE



Answer: (a) _____ [2]

(b) $BF =$ _____ cm, $CE =$ _____ cm [2]

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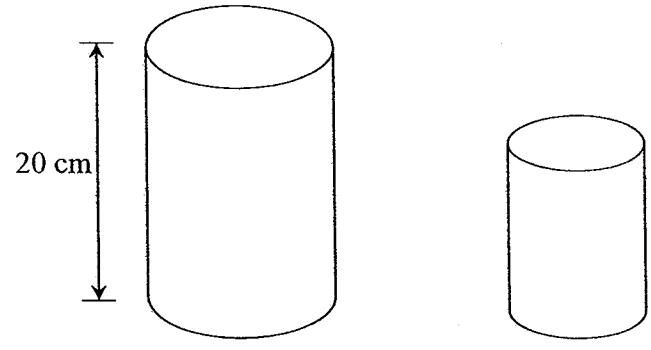
10 The volume of 2 similar cylinders are 250 cm^3 and 54 cm^3 respectively. Find the ratio of the area of the smaller cylinder to the area of the larger cylinder.



Answers _____ [3]

11 The diagram below shows the graph of the straight line $2x + y = 4$.

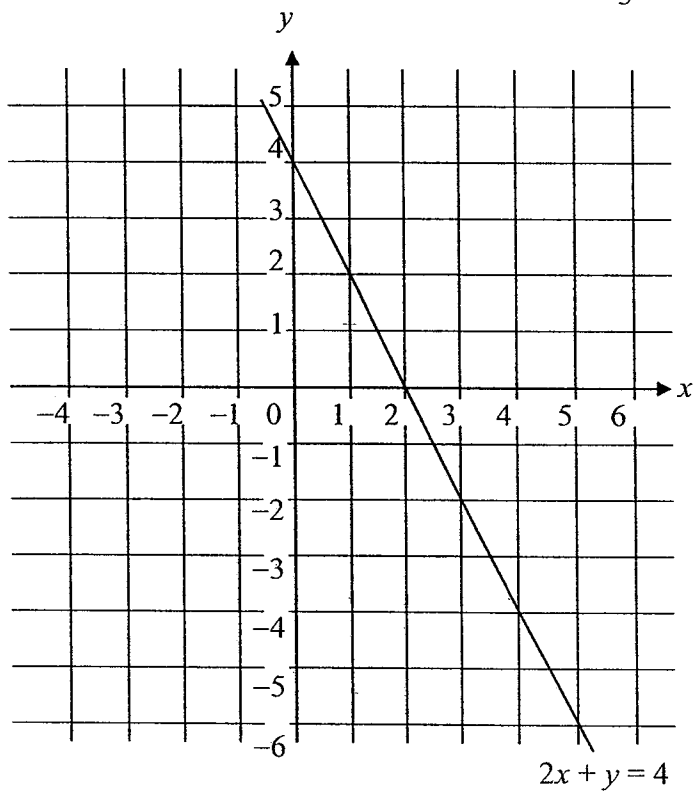
(a) Complete the table of values for the equation $y = \frac{1}{3}x - 3$.

X	-3	0	6
y	-4		-1

[1]

(b) Draw the line $y = \frac{1}{3}x - 3$ on the graph below. [1]

(c) Solve the simultaneous equations $2x + y = 4$, $y = \frac{1}{3}x - 3$ graphically.



Ans: (c) $x =$ _____ [1]

$y =$ _____ [1]

Name: .....( ) Class:.....

12 The diagram shows two straight lines : $l_1 : 4x+5y=2$ and l_2. Find

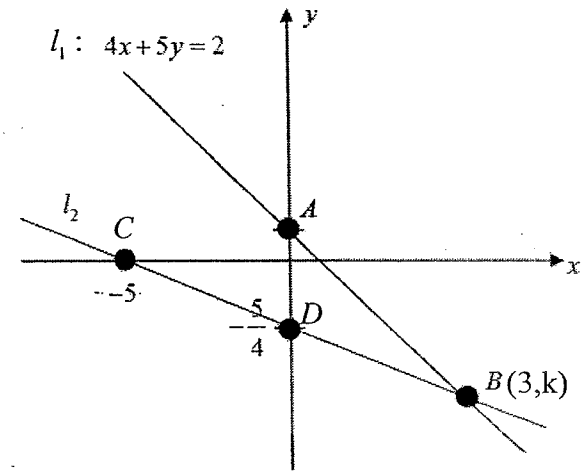
(a) the coordinates of point A,

(b) the gradient of line l_1,

(c) the equation of line l_2,

(d) the value of k if point B is (3,k),

(e) the length CD.



Answers (a) A(_____, _____) [1]

(b) _____ [1]

(c) _____ [2]

(d) $k=$ _____ [2]

(e) _____ units [2]

End of Paper

Name: ..... ( ) Class:.....

1 (a) 1 : 50

1 cm : 50 cm

35 cm : 50 x 35 cm

= 1750 cm

= 17.5 m

(b) 1 : 50

1 cm : 0.5m

$1\ cm^2 : 0.25\ m^2$

$0.25\ m^2 : 1\ cm^2$

$250\ m^2 : 1 \times 1000\ cm^2$

$= 1000\ cm^2$

Answer: (a) 17.5 m [1]

(b) 1000 cm^2 [2]

---

2 (a)

Men	**burgers**	**hours**
7	100	2
1	100	2x7 = 14
5	100	$\frac{14}{5}$
5	1	$\frac{14}{5\times100}$
5	80	$\frac{14}{5\times100} \times 80$ = 2.24 h

(b) $y = \frac{k}{x^3 - 1}$

when x = 2, y =28

$28 = \frac{k}{(2)^3 - 1}$

$28 = \frac{k}{8-1}$

(28)(7) = k

k = 196

$$y = \frac{196}{x^3 - 1}$$

when x = 3

$$y = \frac{196}{(3)^3 - 1}$$

$$y = \frac{196}{26}$$

$$y = 7\frac{7}{13} \text{ or } 7.54 \text{ (3 s.f)}$$

Answer: (a) 2.24 h [2]

(b) $y = 7\frac{7}{13}$ or 7.54 (3 s.f) [2]

---

3. (a) $2x(3-2x)+(2x+3)(7-4x)$
$= 6x-4x^2+14x-8x^2+21-12x$
$= -12x^2+8x+21$

(b) $(a+b)^2 = a^2+2ab+b^2$
$= a^2+b^2+2ab$
$= 30 + 2\,(-6)$
$= 18$

Answer: (a) $-12x^2+8x+21$ [2]

(b) 18 [2]

---

4 (a) $2(ab + cd) + 4bc + ad$
$= 2ab + 2cd + 4bc + ad$
$= 2ab + 4bc + 2cd + ad$
$= 2b(a+2c) + d(2c+a)$
$= (a+2c)(2b+d)$

(b) $\frac{x^2+3x-10}{x^2-4}$

$= \frac{(x+5)(x-2)}{(x-2)(x+2)}$

$= \dfrac{(x+5)}{(x+2)}$

Answer: (a) $(a+2c)(2b+d)$ [2]

(b) $\dfrac{(x+5)}{(x+2)}$ [3]

---

5. (a) $x^2 - 8x + 12 = 0$

$(x-6)(x-2) = 0$

$x = 6$ or $x = 2$

x	-6	-6x
x	-2	-2x
x^2	12	-8x

(b) $(2p+1)^2 = (p-2)^2$

$4p^2 + 4p + 1 = p^2 - 4p + 4$

$3p^2 + 8p - 3 = 0$

$(3p-1)(p+3) = 0$

$p = \dfrac{1}{3}$ or $p = -3$

3p	-1	-p
p	3	9p
$3p^2$	-3	8p

Answer: (a) $x = 6$ or $x = 2$ [2]

(b) $p = \dfrac{1}{3}$ or $p = -3$ [2]

---

6. (a) $\dfrac{2x-3}{6} = \dfrac{x}{3y}$

$3y(2x-3) = bx$

$6xy - 9y = bx$

$xy - bx = 9y$

$x(6y-b) = 9y$

$x = \dfrac{9y}{6y-b}$

(b) $m = \sqrt{\dfrac{2-p^2}{np^2}}$

$m^2 = \dfrac{2-p^2}{np^2}$

$m^2np = 2 - p^2$

$m^2np + p^2 = 2$

$p^2(m^2n+1) = 2$

$p^2 = \dfrac{2}{m^2n+1}$

$p^2 = \pm\sqrt{\dfrac{2}{m^2n+1}}$

Answer: (a) $x = \dfrac{9y}{6y-b}$ [2]

(b) $p^2 = \pm\sqrt{\dfrac{2}{m^2n+1}}$ [2]

7. (a) $\dfrac{c}{4c^2-9} + \dfrac{2}{2c-3}$

$= \dfrac{c}{(2c-3)(2c+3)} + \dfrac{2}{2c-3}$

$= \dfrac{c}{(2c-3)(2c+3)} + \dfrac{2(2c+3)}{(2c-3)(2c+3)}$

$= \dfrac{c+4c+6}{(2c-3)(2c+3)}$

$= \dfrac{5c+6}{(2c-3)(2c+3)}$

(b) $\dfrac{x-2}{4} + \dfrac{5x+3}{3} = 8$

Name: .....( ) Class:.....

$$\frac{3(x-2)+4(5x+3)}{12}=8$$

$$\frac{3x-6+20x+12}{12}=8$$

$$\frac{23x+6}{12}=8$$

$$23x+6=8\times12$$

$$23x=96-6$$

$$23x=90$$

$$x=\frac{90}{23}$$

$$x=3\frac{21}{23} \quad \text{or (3.91)}$$

Answer (a) $\frac{5c+6}{(2c-3)(2c+3)}$ [2]

(b) $x=3\frac{21}{23}$ [2]

---

8. $2x+3y=17,$ ----------(1)

$6x-5y=9$ ----------(2)

Eq(1) x 3

$6x+9y=51$ ----------(3)

Eq(3) - eq(2)

$14y=42$

$y=3$

Sub y = 3 into eq (1)

$2x+3(3)=17$

$2x=17-9$

$2x=8$

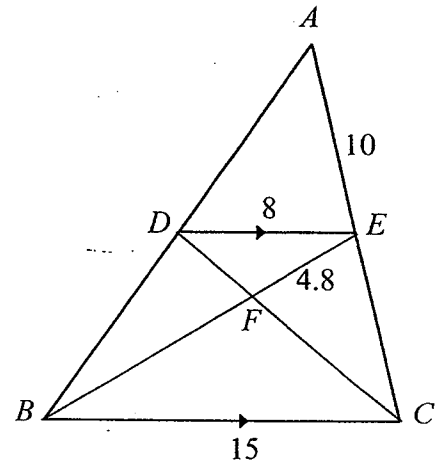
$x = 4$

Answer: $x = 4$, $y = 3$ [3]

9

(a) ΔABC & ΔADE

ΔDEF & ΔCBF



(b) $\frac{BF}{EF} = \frac{BC}{ED}$

$\frac{BF}{4.8} = \frac{15}{8}$

$BF = \frac{15}{8} \times 4.8$

$BF = 9$

$\frac{AC}{AE} = \frac{BC}{DE}$

$\frac{AC}{10} = \frac{15}{8}$

$AC = \frac{15}{8} \text{x} 10$

$AC = \frac{75}{4}$

$EC = \frac{75}{4} - 10$

$= \frac{35}{4}$

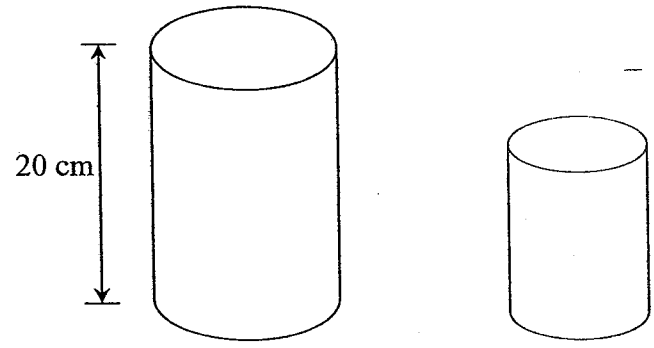
$= 8\frac{3}{4}$

(a)

Answer: (a) _____ ΔABC & ΔADE ,
ΔDEF & ΔCBF [2]

(b) BF = 9 cm, CE = $8\frac{3}{4}$ cm [2]

10



$$(\frac{l_2}{l_1})^3 = \frac{V_2}{V_1}$$

$$(\frac{l_2}{l_1})^3 = \frac{54}{250}$$

$$(\frac{l_2}{l_1}) = \sqrt[3]{\frac{54}{250}}$$

$$= \frac{3}{5}$$

$$\frac{A_2}{A_1} = (\frac{l_2}{l_1})^2$$

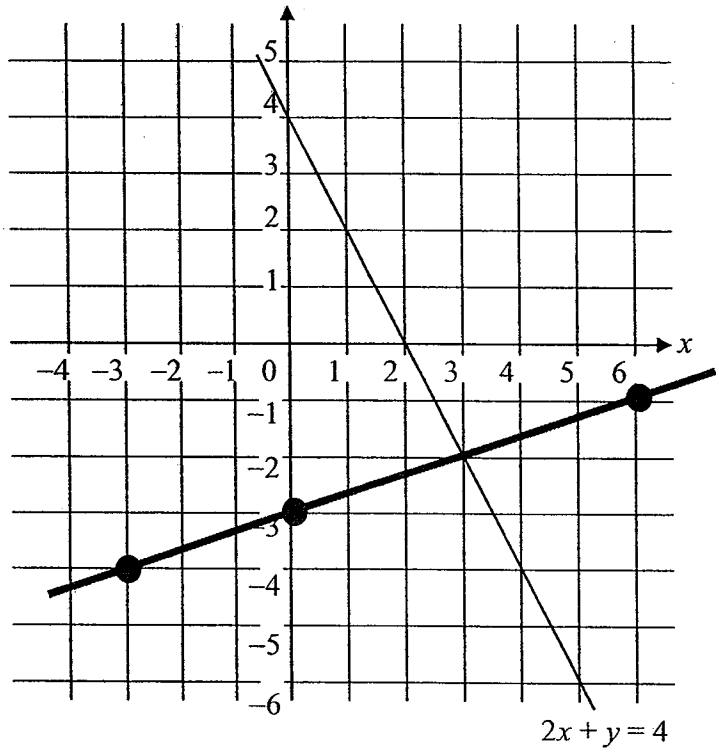
$$\frac{A_2}{A_1} = (\frac{3}{5})^2$$

$$= \frac{9}{25}$$

Answers _____ $\frac{9}{25}$ _____[3]

11

X	-3	0	6
y	-4	-3	-1



Ans: (c) $x =$ 3 [1]

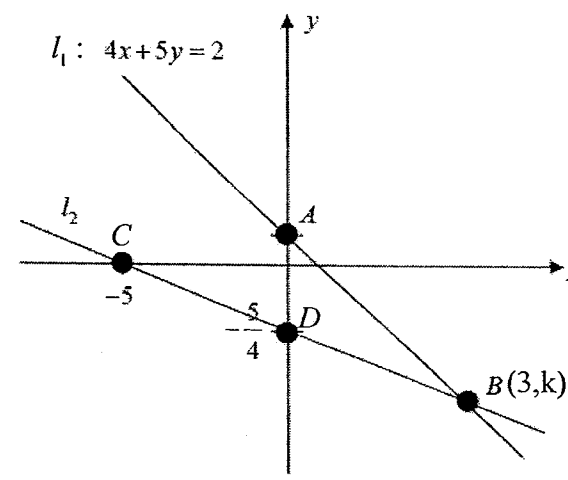
$y =$ -2 [1]

(a) $4x + 5 = 2$

$5y = -4x + 2$

$y = -\frac{4}{5}x + \frac{2}{5}$

Coordinates of A is $(0, \frac{2}{5})$



(b) Gradient $= -\frac{4}{5}$

(c) Gradient of $l_2 = \frac{-\frac{5}{4}-0}{0-(-5)}$

$= -\frac{1}{4}$

$l_2 : y = -\frac{1}{4}x - \frac{5}{4}$

(d) When x = 3, (From line l_1)

$y = -\frac{4}{5}(3) + \frac{2}{5}$

$= -2$

(e) CD $= \sqrt{(-\frac{5}{4}-0)^2 + (0-(-5))^2}$

$= \sqrt{\frac{25}{16}+25}$

= 5.15 units (3s.f)

Answers (a) A(0 , $\frac{2}{5}$) [1]

(b) $-\frac{4}{5}$ [1]

(c) $y = -\frac{1}{4}x - \frac{5}{4}$

[2]

(d) k = -2 [2]

(e) 5.15 units [2]

End of Paper

Answer **all** the questions

1. (a) Given that $s^2 + 5s = t^2 + 5t$ and that $s \neq t$, find the value of $\frac{1}{5}(s+t)$. [3]

(b) Factorise $4m^2 - 28mn + 49n^2$ completely.

Hence find the value of $\frac{m+n}{m-n}$ given $4m^2 - 28mn + 49n^2 = 0$. [4]

2. The safe speed for a train going around a corner is directly proportional to the square root of the radius of the curve. If the safe speed for a curve of radius 64 m is 12 m/s, find the safe speed for a curve of radius 81 m. [3]

3. A straight line with equation $\frac{x}{a} + \frac{y}{b} = 1$ passes through the point (1, 10) and is parallel to the line $y = 5x - 1$. Find the values of a and of b. [5]

4. Mrs Tan bought some fish and mutton.

(a) She bought x kg of fish for \$120. Write down an expression, in terms of x for the cost of 1 kg of fish. [1]

(b) She spent the same amount of money on mutton as for fish. She received 3 kg more mutton than fish. Write down an expression, in terms of x, for the cost of 1 kg of mutton that she bought. [1]

(c) The cost of 1 kg of fish is \$9 more than the cost of 1 kg of mutton. Write down an equation in terms of x and show that it reduces to $x^2 + 3x - 40 = 0$. [3]

(d) Solve the equation $x^2 + 3x - 40 = 0$. [2]

(e) How many kilograms of fish and of mutton did she buy? [2]

5. A bakery shop sells various types of bread. The table below shows the cost of 152 loaves of bread sold in a day.

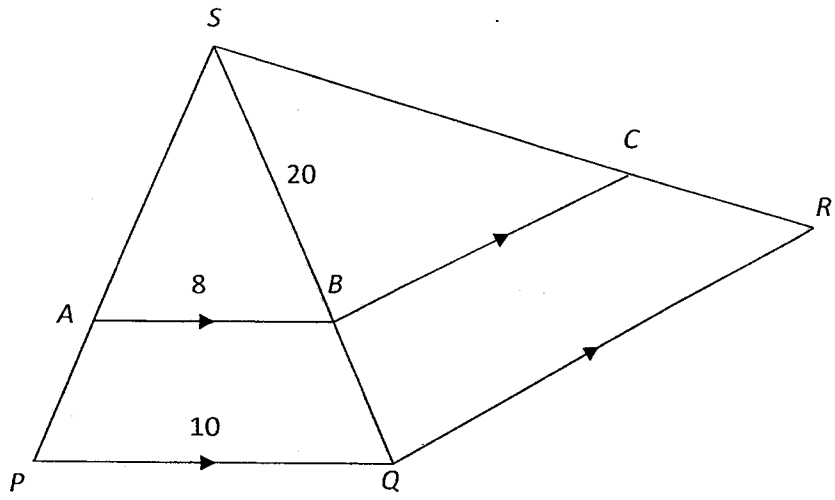
Cost of bread ($)	2.20	3.10	3.50	4.40
No. of loaves of bread sold	60	x	32	y

(a) Show that $x + y = 60$. [1]

(b) Given that the mean cost of bread is $ 3.00, show that $3.1x + 4.4y = 212$. [2]

(c) Solve the equations in (a) and (b) simultaneously to find the values of x and y. [3]

6. In the diagram below, $AB // PQ$, $BC // QR$, $AB = 8$ cm, $PQ = 10$ cm and $SB = 20$ cm.



Given that the area of $\Delta SBC = 40\,\text{cm}^2$,

(a) prove that ΔSAB is similar to ΔSPQ, [2]

(b) calculate the length of BQ, [2]

(c) find the area of $BCRQ$. [2]

7. The diagram shows a sketch of the graph $y = 2x^2 + 4x - 16$. Given that the $y-$coordinate of the minimum point is -18,

(i) find the $x-$coordinate of the minimum point and hence state the equation of the line of symmetry. [2]

Given that P and Q are points on the graph and the coordinates of P is $(1, p)$. The line PQ is parallel to the $x-$axis.

(ii) Find the coordinates of P and of Q. [3]

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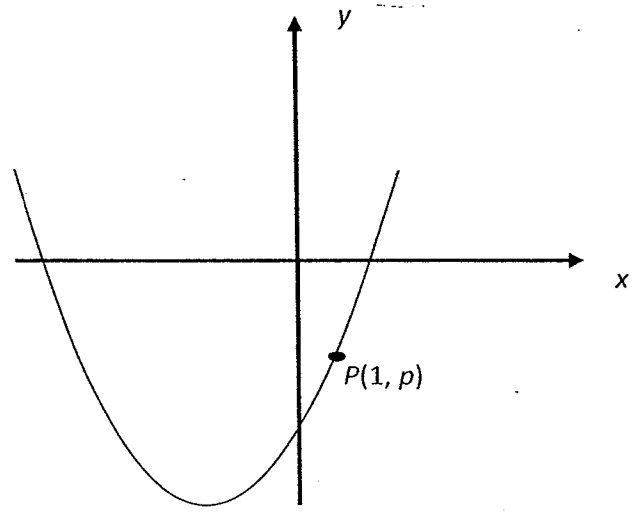


8. **Answer the whole of this question on a sheet of graph paper.**

Copy and complete the table for the equation $y = -x^2 + 2x + 3$.

x	-3	-2	-1	0	1	2
$y = -x^2 + 2x + 3$						

[2]

(a) Using a scale of 2 cm to 1 unit on the $x-$axis and 1 cm to 1 unit on the $y-$axis, draw the graph of $y = -x^2 + 2x + 3$ for $-3 \leq x \leq 2$. [4]

(b) Use your graph to find

(i) the maximum value of y, [1]

(ii) the equation of the line of symmetry, [1]

(iii) the value of x when $y = -2$. [1]

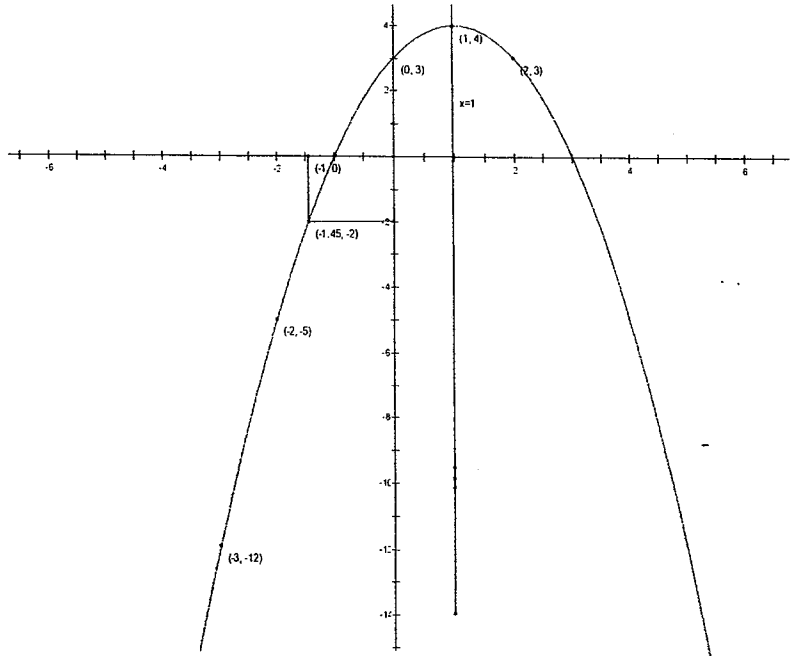
--- End of Paper ---

Paper 2 [50 Marks]

Qns	Answers	Marks
1a	$s^2+5t=t^2+5t$ $s^2-t^2+5s-5t=0$ $(s+t)(s-t)+5(s-t)=0$ $(s-t)(s+t+5)=0$ $s=t\ (rej.\because s\neq t),$ $s+t+5=0 \Rightarrow s+t=-5$ $\therefore \frac{1}{5}(s+t)=\frac{1}{5}\times(-5)$ $=-1$	M1 A1 A1
b	$4m^2-28mn+49n^2$ $=(2m)^2-2(2m)(7n)+(7n)^2$ $=(2m-7n)^2$ $If\ 4m^2-28mn+49n^2=0$ $(2m-7n)^2=0$ $2m=7n$ $m=\frac{7}{2}n$ $\therefore \frac{m+n}{m-n}=\frac{\frac{7}{2}n+n}{\frac{7}{2}n-n}$ $=\frac{\frac{9}{2}n}{\frac{5}{2}n}$ $=\frac{9}{5}\ or\ 1\frac{4}{5}$	M1 A1 M1 A1
2	$speed \propto \sqrt{radius}$ $S = K\sqrt{r}$ $If\ r = 64cm,\ s = 12\ m/s,$ $then\ 12 = K\sqrt{64},$ $K = \frac{3}{2}$ $When\ r = 81cm,$ $then\ S = \frac{3}{2}\times\sqrt{81}$ $= 13.5\ m/s$	B1 A1 A1

3	$\frac{1}{a}+\frac{10}{b}=1----(1)$ $\frac{x}{a}+\frac{y}{b}=1$ $bx+ay=ab$ $y=-\frac{b}{a}x+b$ $\therefore -\frac{b}{a}=5----(2)$ $From(2),\ b=-5a---(3)$ $Sub\ (3)\ into\ (1):$ $\frac{1}{a}+\frac{10}{-5a}=1$ $\frac{1}{a}-\frac{2}{a}=1$ $-\frac{1}{a}=1\Rightarrow a=-1$ $Sub\ a=-1\ into\ (3): b=5$	M1 M1 M1 A1 A1
4a	$\frac{\$120}{x}$	A1
b	$\frac{\$120}{x+3}$	A1
c	$\frac{120}{x}-\frac{120}{x+3}=9$ $120(x+3)-120x=9x(x+3)$ $120x+360-120x=9x^2+27x$ $9x^2+27x-360=0$ $x^2+3x-40=0$	M1 M1 A1
d	$x^2+3x-40=0$ $(x+8)(x-5)=0$ $\therefore x=-8\ or\ 5$	 A1, A1
e	She bought 5 kg of fish and 8 kg of mutton.	A1, A1
5a	$60+x+32+y=152$ $\therefore x+y=152-92=60$	A1
b	$\frac{2.20\times 60+3.10\times x+3.50\times 32+4.40\times y}{152}=3.00$ $132+3.10x+112+4.40y=456$ $3.1x+4.4y=456-132-112=212$	M1 M1

c	$x+y=60------(1)$ $3.1x+4.4y=212---(2)$ $(1)\times 3.1:\ \ 3.1x+3.1y=186-----(3)$ $(2)-(3):\ \ 1.3y=26$ $y=20$ $Sub\ y=20\,into\,(1):\ \ x=40$	M1 A1 A1
6a	$\because AB \,//\, PQ, corr.\angle s\ are\ equal,$ $\angle SAB=\angle SPQ$ $\angle SBA=\angle SQP,$ $\angle ASB=\angle PSQ\ \ (common\ \angle)$ $[Any\ two\ pairs\ of\ angles]$ $\therefore \Delta SAB\ is\ similar\ to\ \Delta SPQ$	M1 M1
b	$\frac{AB}{PQ}=\frac{SB}{SQ}$ $\frac{8}{10}=\frac{20}{20+BQ}$ $4(20+BQ)=100$ $20+BQ=25$ $BQ=5\ cm$	M1 A1
c	$\because BC \,//\, QR$ $\therefore \frac{20}{5}=\frac{SC}{CR}$ $\frac{20}{20+5}=\frac{20}{25}=\frac{4}{5}$ $\frac{Area\ of\ \Delta SBC}{Area\ of\ \Delta SQR}=\left(\frac{4}{5}\right)^2$ $\frac{40}{40+Area\ of\ BCRQ}=\frac{16}{25}$ $125=80+2\times Area\ of\ BCRQ$ $\therefore Area\ of\ BCRQ=\frac{125-80}{2}=22.5\ cm^2$	M1 A1
7(i)	$When\ y=-18,$ $-18=2x^2+4x-16$ $2x^2+4x+2=0$ $x^2+2x+1=0$ $(x+1)^2=0$ $x=-1$ Line of symmetry: $x=-1$	A1 A1

(ii)	*Since* $P(1, p)$ *is on the graph,* $p = 2\times1^2 + 4\times1 - 16$ $= -10$ $\therefore P(1, -10)$ *Since* $PQ // x-axis$, *so the coordinates of point* $Q(x, -10)$, $-10 = 2x^2 + 4x - 16$ $2x^2 + 4x - 6 = 0$ $x^2 + 2x - 3 = 0$ $(x+3)(x-1) = 0$ $\therefore x = -3$ *or* 1 *(point* P*)* $\therefore Q(-3, -10)$	A1 M1 (ecf 1) A1
8a	<table><tr><td>x</td><td>−3</td><td>−2</td><td>−1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>$y = -x^2 + 2x + 3$</td><td>−12</td><td>−5</td><td>0</td><td>3</td><td>4</td><td>3</td></tr></table> 	All correct: A2 1/2 wrong: A1 ≥ 3 wrong: 0 axes & scale: A1 smooth curve: A2 label the eqn: A1
b(i)	Max value of $y = 4$.	A1
(ii)	Eqn of line of symmetry: $x = 1$.	A1
(iii)	When $y = -2$, $x = -1.45$	Range: -1.4 *to* -1.5 A1