



**SYDNEY BOYS HIGH SCHOOL**  
MOORE PARK, SURRY HILLS

**Year 10**

**Half Yearly Examination 2007**

# Mathematics

**Examiner: E. Choy**

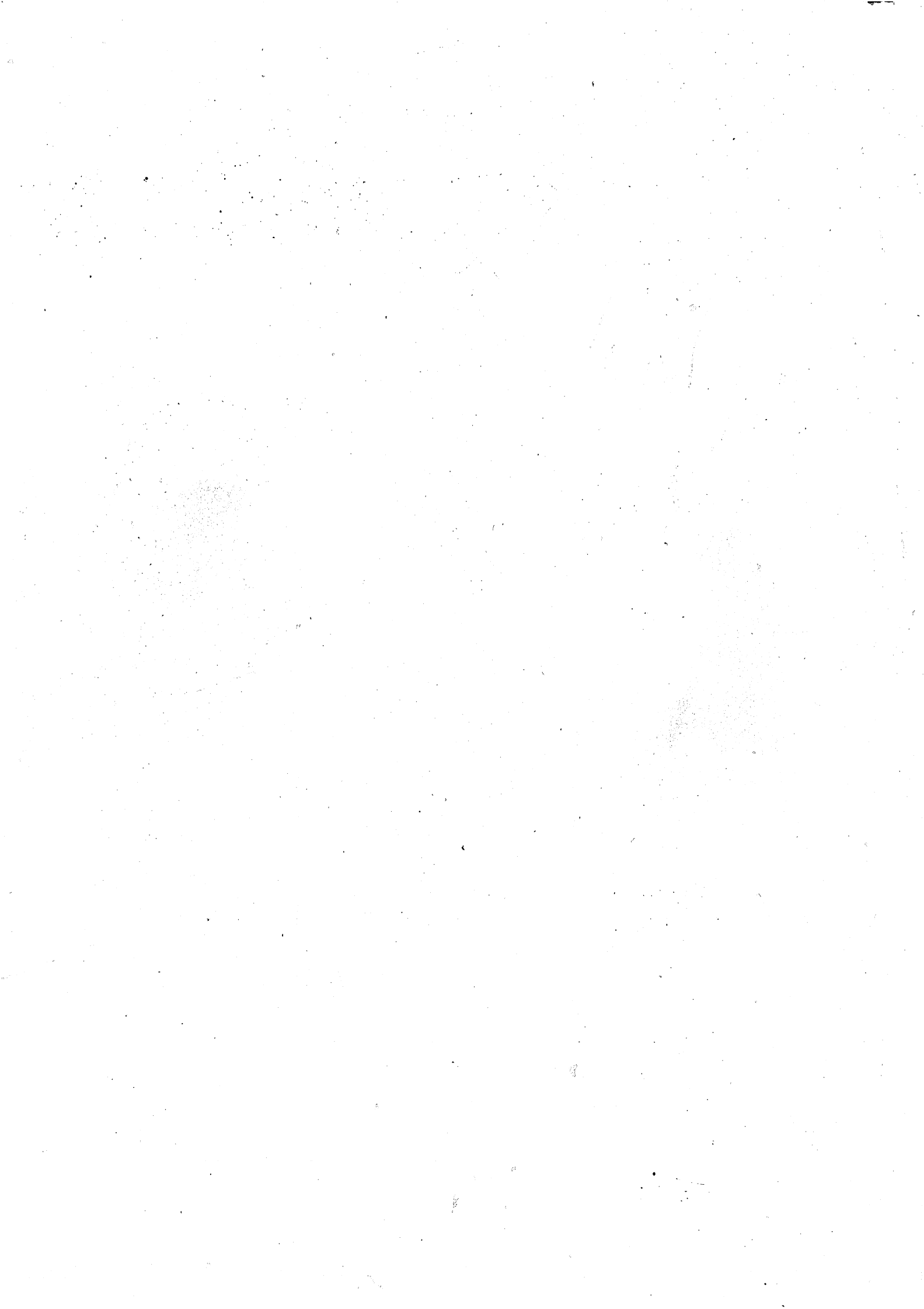
### *General Instructions*

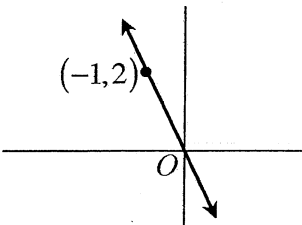
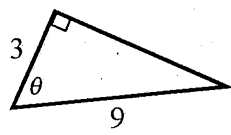
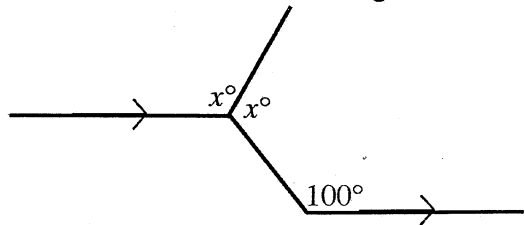
- Working time – 90 minutes
- Write using black or blue pen.
- *Approved* calculators may be used.
- All necessary working should be shown in every question if full marks are to be awarded.
- Marks may not be awarded for messy or badly arranged work.
- If more space is required, clearly write the number of the QUESTION on one of the back pages and answer it there. Indicate that you have done so.
- Clearly indicate your class by placing an X, next to your class

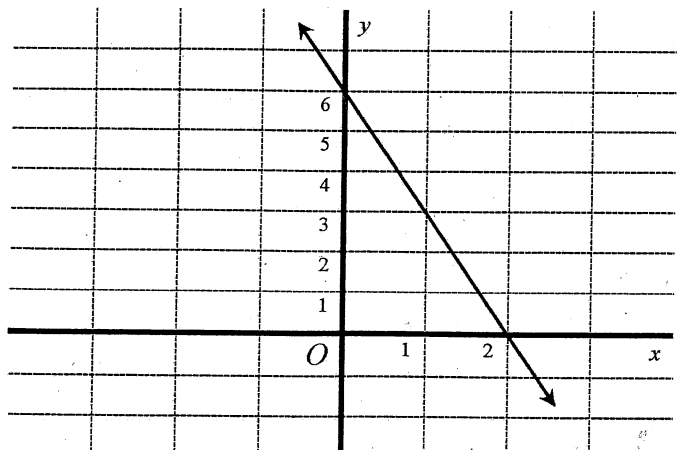
**NAME:**

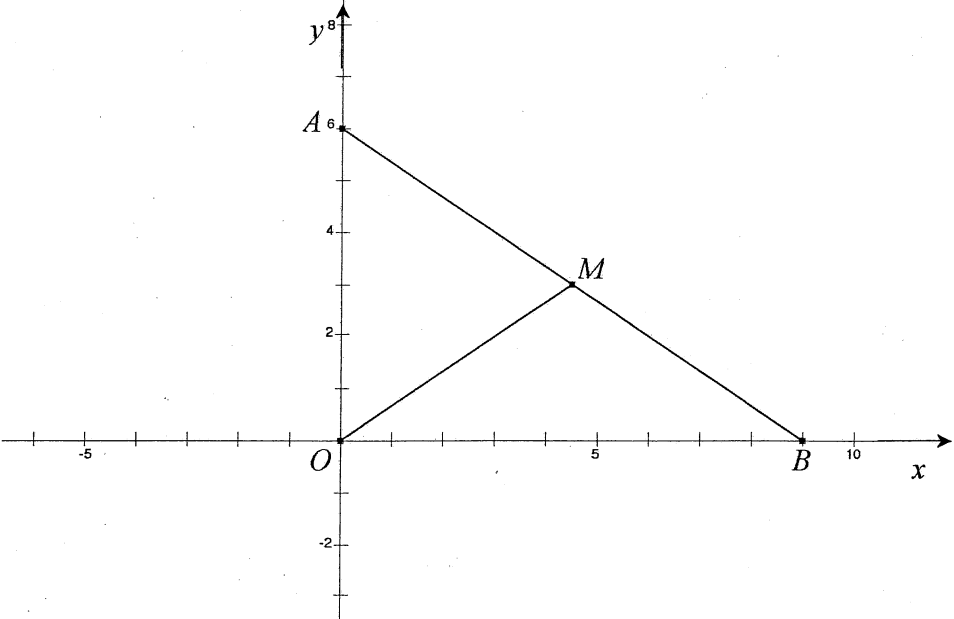
Class	Teacher	
10 A	Mr Boros	
10 B	Ms Evans	
10 C	Ms Nesbitt	
10 D	Mr Kourtesis	
10 E	Mr Gainford	
10 F	Ms Ward	

Section	Mark
<b>A</b>	<b>/20</b>
<b>B</b>	<b>/16</b>
<b>C</b>	<b>/16</b>
<b>D</b>	<b>/16</b>
<b>E</b>	<b>/16</b>
<b>F</b>	<b>/16</b>
<b>Total</b>	<b>/100</b>



Section A (20 Marks)		ANSWERS	
1	Simplify (a) $n^6 \div n$  (b) $(2p^4)^3$		1  1
2	What is the slope of the given line?  		1
3	Simplify $\frac{a-b}{b-a}$		1
4	 Find the size of the angle $\theta$ in the diagram. Give your answer to the nearest minute.		1
5	Solve the quadratic equation $x^2 = 1$		1
6	Write 10.5% p.a. as a monthly rate		1
7	Factorise $6x^2 - 9x$		1
8	Simplify $\sqrt{12} + \sqrt{27}$		1
9	What is the value of $x$ in the diagram?  		1
10	Evaluate $8000(1.005)^{24}$ correct to 4 significant figures		1
11	What is one half of $4^{200}$ ? Leave your answer in simplified index form		2

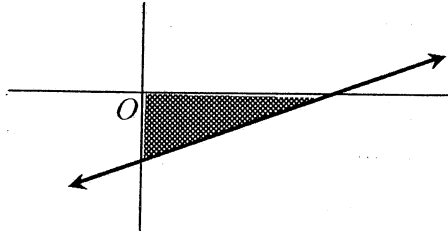
12	What is the value of $-x^2$ when $x = -4$ ?	1
13	How many square centimetres are there in one square metre?	1
14	Expand and simplify $(2x+3)^2$	1
15	Write as a simple decimal $0.\bar{3} + 1.4$	1
16	Write down the two solutions of the equation $(4x-5)(x+2) = 0$	1
17	If $p = \frac{5}{4}$ , $q = \frac{3}{10}$ and $v = \frac{2}{3}$ then write $t$ as a simple fraction given that $t = \sqrt{\frac{pq}{v}}$	1
18	Write down the equation of this line  	1

Section B (16 Marks)	ANSWERS																																																		
19 The base of a right prism has an area of $2500 \text{ cm}^2$ . Find the volume of the prism in cubic metres, if its height is 400 cm.		2																																																	
20 Use the back-to-back stem and leaf plot below to answer the following questions.  (a) What is the range in this class test?  (b) What is the value of $m$ if the median for the boys is 20? <table border="1" style="margin: 10px auto;"> <thead> <tr> <th colspan="4">Boys</th> <th></th> <th colspan="4">Girls</th> </tr> </thead> <tbody> <tr> <td>9</td><td>8</td><td>8</td><td>4</td> <td>0</td> <td>8</td><td>9</td><td></td><td></td> </tr> <tr> <td><math>m</math></td><td>8</td><td>6</td><td>1</td> <td>1</td> <td>3</td><td>3</td><td>4</td><td>5</td><td>5</td> </tr> <tr> <td>9</td><td>2</td><td>2</td><td>1</td><td>1</td> <td>2</td> <td>1</td><td>3</td><td>7</td><td>7</td><td>7</td> </tr> <tr> <td></td><td>5</td><td>3</td><td>2</td> <td>3</td> <td>4</td><td>5</td><td>5</td><td></td><td></td> </tr> </tbody> </table>	Boys					Girls				9	8	8	4	0	8	9			$m$	8	6	1	1	3	3	4	5	5	9	2	2	1	1	2	1	3	7	7	7		5	3	2	3	4	5	5				1  2
Boys					Girls																																														
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21 What is the greatest value that you can have for the probability of an event occurring?		1																																																	
22 In the diagram, $M$ is the midpoint of $AB$ , where $A$ and $B$ are $(0,6)$ and $(9,0)$ respectively. <div style="text-align: center; margin: 20px 0;">  </div>		1  1																																																	

23 Find the equation of the straight line with  $y$ -intercept equal to  $-3$  and gradient equal to  $-\frac{1}{2}$ . 2

24 Find the area of the shaded region defined by the intersection of the line  $L$  with the coordinate axes. 2

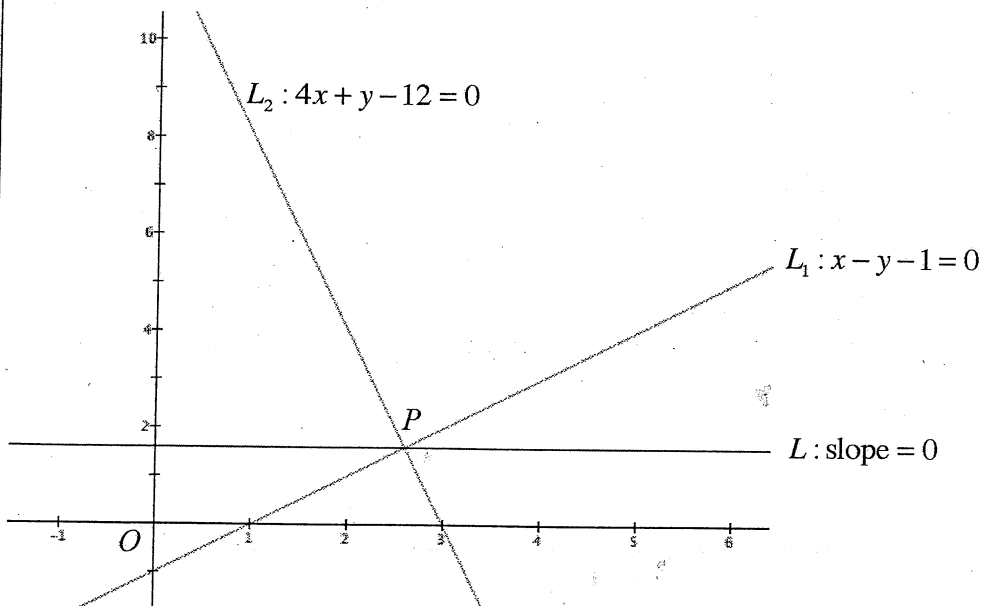
The equation of  $L$  is  $\frac{x}{5} - \frac{y}{2} = 1$



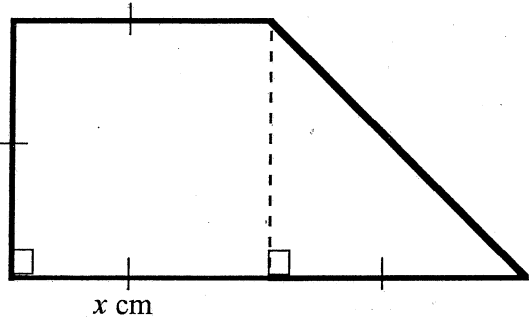
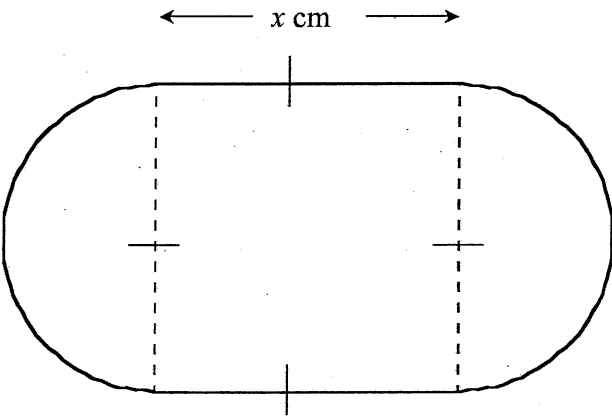
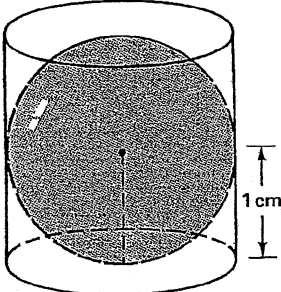
25 Using the diagram below, find:

(a) the coordinates of  $P$ ; 2

(b) the equation of the line  $L$  2

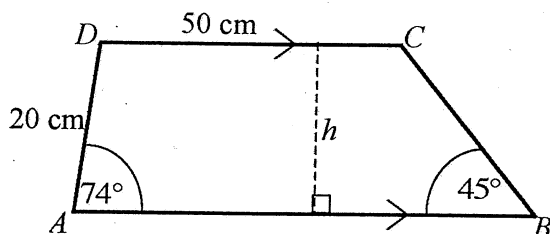


	Section C (16 Marks)	ANSWERS	
26	One side of a rectangle is longer than the other side by 1 cm. If its area is $30 \text{ cm}^2$ , find its perimeter.		2
27	Solve $(x-1)^2 - 8(x-1) + 12 = 0$		2
28	Solve $-\frac{1}{4}x \leq 3$ and graph the solution on a number line.		2
29	(a) Find all the values of $x$ that satisfy $1 \leq 2x - 5 \leq 7$  (b) Graph the solution on a number line.		1  1
30	When an amount of money $\$P$ is invested for $n$ years at a rate of $r\%$ interest compounded per annum it amounts to $\$A_n$ where $A_n = P\left(1 + \frac{r}{100}\right)^n$ . How much money must be invested at 12% pa if it is to amount to $\$10\,000$ after 5 years?		2
31	A tank with capacity $8 \times 10^7$ litres empties at a rate of 5 kL per hour. How long will it take to empty the tank?		2
32	Simplify $\left(\frac{2a^{-1}}{b^2}\right)^2$ . Do not have negative indices or brackets in your answer.		2
33	Write $\sqrt{450}$ in the form $k\sqrt{2}$ where $k$ is an integer.		2

	Section D (16 Marks)	ANSWERS	
34	Find a formula for the perimeter of the figure shown 		2
35	Find a formula for the area of the figure shown. 		2
36	The figure shows a sphere with radius 1 cm that fits exactly inside a cylinder.  Find: (a) the volume of the sphere (in terms of $\pi$ ); (b) the height of the cylinder; (c) the volume of the cylinder (in terms of $\pi$ ).		1 1 1



37  $ABCD$  is a trapezium such that  $AD = 20$  cm,  $CD = 50$  cm,  $\angle DAB = 74^\circ$ ,  $\angle CBA = 45^\circ$ .



Calculate the value of

(a) the distance  $h$ , correct to 1 decimal place;

3

(b) the length of  $AB$ , correct to 1 decimal place.

3

38 Bob is 6 km and  $N60^\circ E$  from Albert. Charlie is 4 km and  $N30^\circ W$  from Bob. What is the compass bearing of Charlie from Albert?

3

**Section E (16 Marks)**

39 Two different numbers are chosen at random from 1 to 5.

What is the probability that

(a) both of them are even?

2

(b) neither of them are even?

2

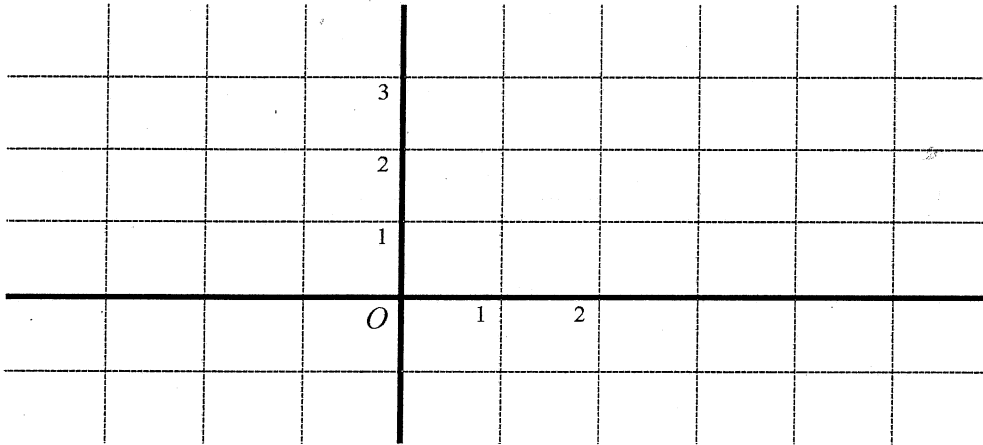
40 A box contains 12 cards numbered 1 to 12. If a card is drawn from the box, what is the probability that it is divisible by 2 or divisible by 3?

3

41

(a) Graph, on the number plane below,  $y = 2^x$ , for  $-2 \leq x \leq 2$ , showing the  $y$ -intercept and the coordinates of the end-points.

(b) Graph  $y = x^2 + 2x + 1$  on the *same* number plane, clearly showing the  $x$ -intercepts and the vertex



(c) How many times do the two graphs intersect?

42

Sketch the graph that is represented by  $x^2 + y^2 = 16$ , showing all essential information.

43

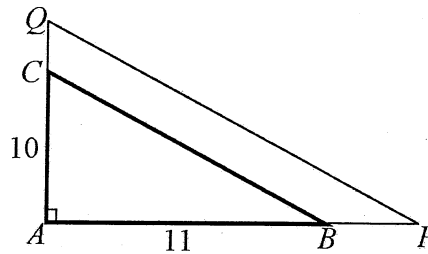
(a) Simplify  $\frac{1}{n} - \frac{1}{n+1}$

(b) Hence, evaluate the following sum  $\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \dots + \frac{1}{100 \times 101}$

**Section F (16 Marks)**

- 44 A cylinder has a radius of  $r$  metres and a height of  $h$  metres.
- (a) Find the volume, in terms of  $r$  and  $h$ , of the cylinder with its radius increased by 20% and the height increased by 10%. 2
- (b) By what percentage has the volume of the cylinder increased? 1

- 45 In the diagram,  $\triangle ABC$  is right-angled at  $A$ . The sides  $AB$  and  $AC$  are 11 metres and 10 metres respectively.  $AB$  is produced to  $P$  and  $AC$  is produced to  $Q$  so that  $BP$  and  $CQ$  are in the ratio 4 : 3.



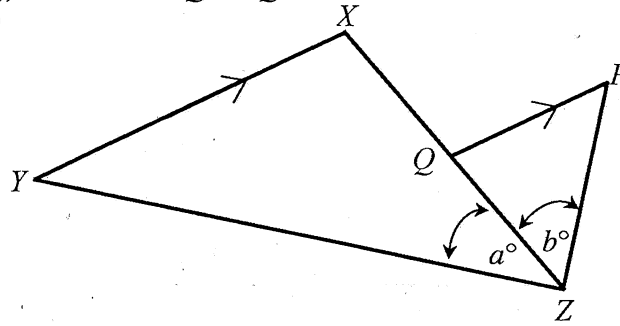
Let  $BP = 4x$  and  $CQ = 3x$ .

- (a) Show that the quadrilateral  $BCQP$  has area  $\left(6x^2 + \frac{73}{2}x\right)\text{m}^2$  3
- (b) For what value(s) of  $x$  is the area of the quadrilateral  $BCQP$  greater than or equal to the area of  $\triangle ABC$ ? 2

46

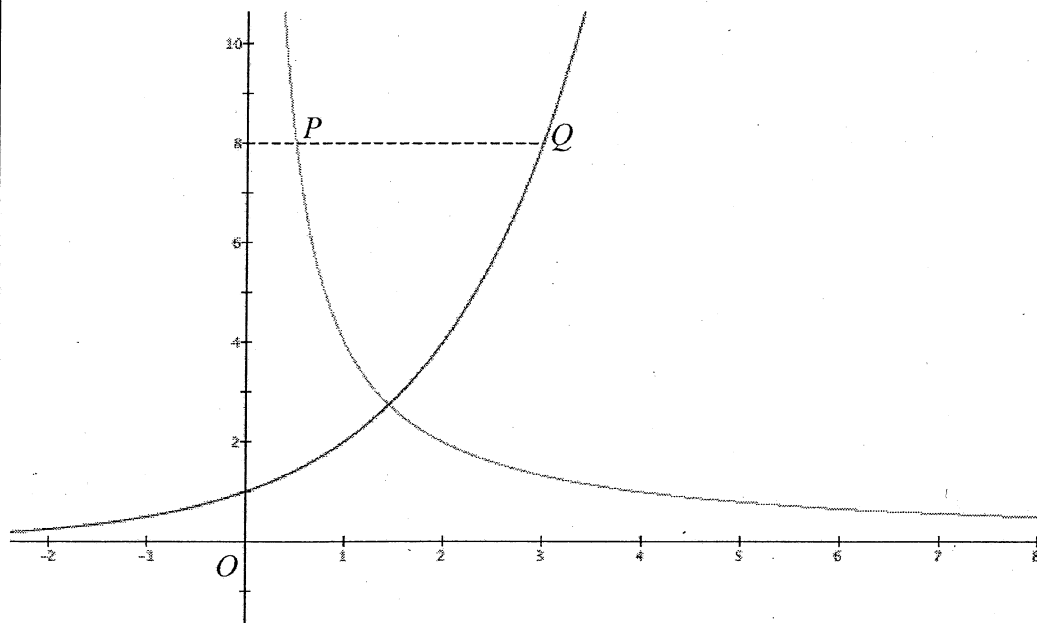
In the figure  $XY \parallel PQ$ ,  $XY = XZ$  and  $QP = QZ$ .  
Show that  $a + b = 90$

2



47

The diagram below shows the curve  $y = 2^x$  and part of the curve  $xy = 4$ .  
The points  $P$  and  $Q$  lie on the curves shown below.



(a) Write down the coordinates of the point  $Q$ .

2

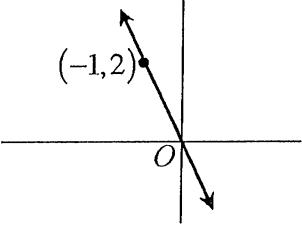
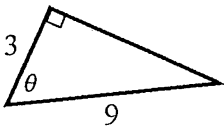
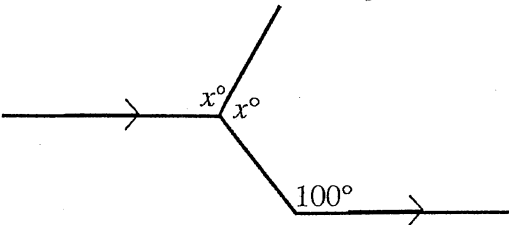
(b) Find the length of interval  $PQ$ .

2

48

Find all the solutions of the equation  $(x^2 - 7x + 11)^{x^2 - 11x + 30} = 1$

2

	Section A (20 Marks)	ANSWERS	
1	Simplify (a) $n^6 \div n$  (b) $(2p^4)^3$	a) $n^5$  b) $8p^{12}$	1  1
2	What is the slope of the given line?  	$-2$	1
3	Simplify $\frac{a-b}{b-a} = \frac{a-b}{-(a-b)} = \frac{1}{-1}$	$-1$	1
4	 Find the size of the angle $\theta$ in the diagram. Give your answer to the nearest minute.	$\theta = 70^{\circ} 32'$	1
5	Solve the quadratic equation $x^2 = 1$	$\pm 1$	1
6	Write 10.5% p.a. as a monthly rate	$0.825\%$	1
7	Factorise $6x^2 - 9x$	$3x(2x - 3)$	1
8	Simplify $\sqrt{12} + \sqrt{27}$  $2\sqrt{3} + 3\sqrt{3}$	$5\sqrt{3}$	1
9	What is the value of $x$ in the diagram?  	$130^{\circ}$	1
10	Evaluate $8000(1.005)^{24}$ correct to 4 significant figures	$9017$	1
11	What is one half of $4^{200}$ ? Leave your answer in simplified index form  $4^{200} = 2^{400} \quad \frac{2^{400}}{2} = 2^{399}$	$= 2^{399}$	2

12	What is the value of $-x^2$ when $x = -4$ ?  $-(-4)^2$	$-16$	1
13	How many square centimetres are there in one square metre?	10,000	1
14	Expand and simplify $(2x+3)^2$	$4x^2 + 12x + 9$	1
15	Write as a simple decimal $0.\dot{3} + 1.4$	$1.7\dot{3}$	1
16	Write down the two solutions of the equation $(4x-5)(x+2)=0$	$x = \frac{5}{4}, -2$	1
17	If $p = \frac{5}{4}$ , $q = \frac{3}{10}$ and $v = \frac{2}{3}$ then write $t$ as a simple fraction given that $t = \sqrt{\frac{pq}{v}}$	$\frac{3}{4}$	1
18	Write down the equation of this line  	$m = \frac{6-0}{0-2} = -3$ $y - y_1 = m(x - x_1)$ $y - 6 = -3(x - 0)$ $y = -3x + 6$	1

	<b>Section B (16 Marks)</b>	<b>ANSWERS</b>	
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19 The base of a right prism has an area of  $2500 \text{ cm}^2$ . Find the volume of the prism in cubic metres, if its height is 400 cm.

$$2500 \times 400 = 1000000$$

$$1 \text{ m}^3$$

2

20 Use the back-to-back stem and leaf plot below to answer the following questions.

- (a) What is the range in this class test?  $35-4$
- (b) What is the value of  $m$  if the median for the boys is 20?

Boys					Girls			
9	8	8	4	0	8	9		
$m$	8	6	1	1	3	3	4	5
9	2	2	1	1	2	1	3	7
	5	3	2	3	4	5	5	

$$31$$

$$(4-35) \left(\frac{1}{2}\right)$$

$$9 \text{ (or } 19)$$

1

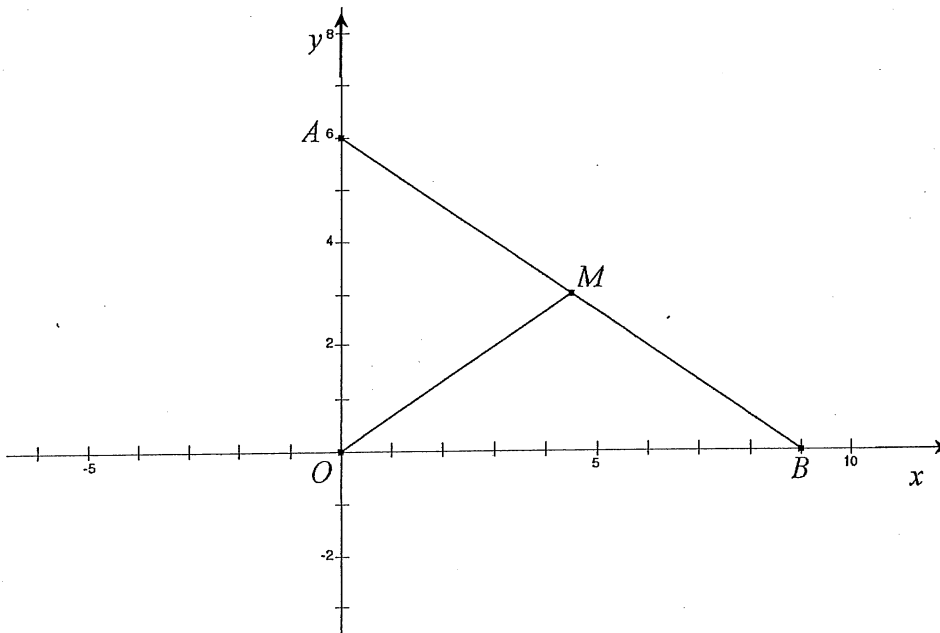
2

21 What is the greatest value that you can have for the probability of an event occurring?

$$1$$

1

22 In the diagram,  $M$  is the midpoint of  $AB$ , where  $A$  and  $B$  are  $(0,6)$  and  $(9,0)$  respectively.



- (a) Find the coordinates of  $M$ .

$$\left(\frac{9}{2}, 3\right)$$

- (b) Show that  $OM = AM$

$$OM = \sqrt{\left(\frac{9}{2}\right)^2 + 3^2}$$

$$AM = \sqrt{\left(\frac{9}{2}\right)^2 + (6-3)^2}$$

$$= \sqrt{\frac{81}{4} + 9}$$

$$= \sqrt{117}$$

1

1

23 Find the equation of the straight line with  $y$ -intercept equal to  $-3$  and gradient equal to  $-\frac{1}{2}$ .

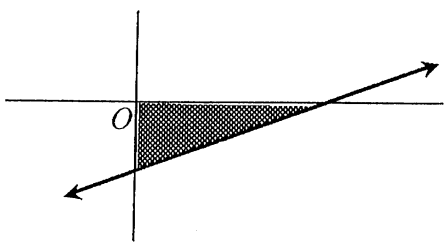
$$y = -\frac{1}{2}x - 3$$

24 Find the area of the shaded region defined by the intersection of the line  $L$  with the coordinate axes.

The equation of  $L$  is  $\frac{x}{5} - \frac{y}{2} = 1$

$$A = \frac{1}{2} \times 5 \times 2$$

$$= 5 \text{ unit}^2$$



25 Using the diagram below, find:

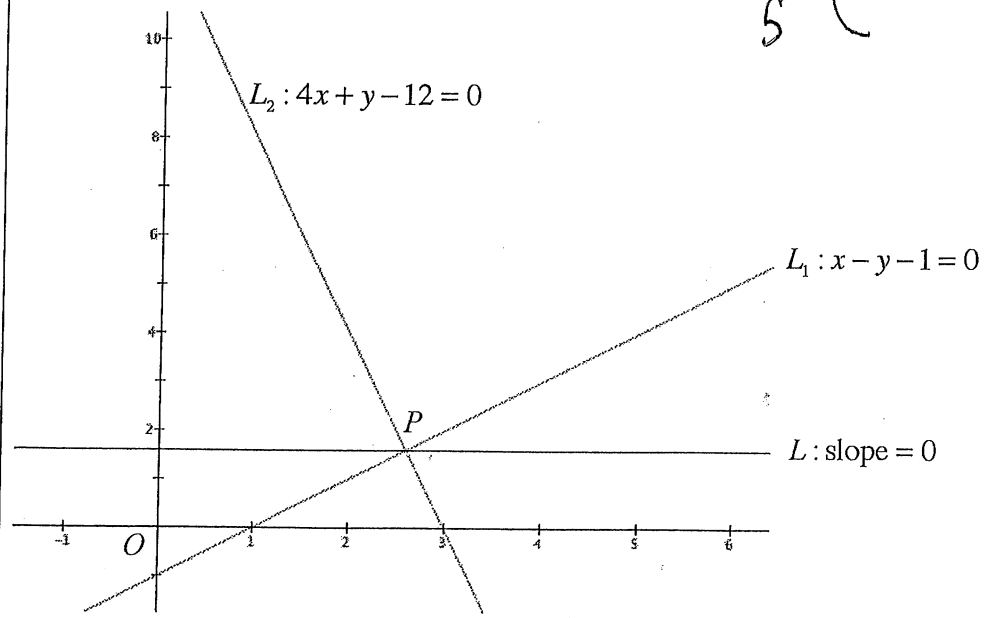
(a) the coordinates of  $P$ ;

$$\begin{array}{r} 4x + y - 12 = 0 \\ x - y - 1 = 0 \\ \hline 5x - 13 = 0 \\ x = \frac{13}{5} \end{array}$$




$$\begin{array}{r} \frac{13}{5} - 1 = y \\ y = \frac{8}{5} \\ P\left(\frac{13}{5}, \frac{8}{5}\right) \end{array}$$

(b) the equation of the line  $L$

$$y = \frac{8}{5} (= 1.6)$$





	Section C (16 Marks)	ANSWERS	
26	<p>One side of a rectangle is longer than the other side by 1 cm.</p> <p>If its area is <math>30 \text{ cm}^2</math>, find its perimeter.</p> 	$x(x+1) = 30$ $x^2 + x - 30 = 0$ $(x+6)(x-5) = 0$ $x = -6 \text{ or } x = 5$ <del><math>x = -5</math></del> $P = 22$	2
27	<p>Solve <math>(x-1)^2 - 8(x-1) + 12 = 0</math></p> $x^2 - 2x + 1 - 8x + 8 + 12 = 0$ $x^2 - 10x + 21 = 0$	$(x-3)(x-7) = 0$ $x = 3 \text{ or } x = 7$	2
28	<p>Solve <math>-\frac{1}{4}x \leq 3</math> and graph the solution on a number line.</p> $-x \leq 12 \Rightarrow$	$x \geq -12$ 	2
29	<p>(a) Find all the values of <math>x</math> that satisfy <math>1 \leq 2x - 5 \leq 7</math></p> $6 \leq 2x < 12$ $3 \leq x < 6$ <p>(b) Graph the solution on a number line.</p>	$3 \leq x < 6$ 	1
30	<p>When an amount of money <math>\\$P</math> is invested for <math>n</math> years at a rate of <math>r\%</math> interest compounded per annum it amounts to <math>\\$A_n</math> where <math>A_n = P\left(1 + \frac{r}{100}\right)^n</math>.</p> <p>How much money must be invested at 12% pa if it is to amount to <math>\\$10\,000</math> after 5 years?</p> $10\,000 = P(1.12)^5$	<del>10000</del> $P = \frac{10\,000}{(1.12)^5}$ $P = \$5\,674.27$	2
31	<p>A tank with capacity <math>8 \times 10^7</math> litres empties at a rate of 5 kL per hour.</p> <p>How long will it take to empty the tank?</p>	$\frac{8 \times 10^7}{5 \times 10^3}$ $1.6 \times 10^4$ <del>16000</del> 16000 hours	2
32	<p>Simplify <math>\left(\frac{2a^{-1}}{b^2}\right)^2</math>.</p> <p>Do not have negative indices or brackets in your answer.</p>	$\frac{4}{a^2 b^4}$	2
33	<p>Write <math>\sqrt{450}</math> in the form <math>k\sqrt{2}</math> where <math>k</math> is an integer.</p> $\sqrt{9} \times \sqrt{25} \times \sqrt{2}$	$15\sqrt{2}$	2

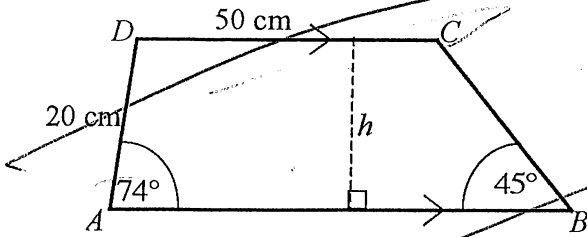
Section D (16 Marks)

ANSWERS

Question	Problem Statement	Diagram	Handwritten Answer	Mark
34	Find a formula for the perimeter of the figure shown		$4x + \sqrt{2x^2}$ $4x + \sqrt{2}x$	2
35	Find a formula for the area of the figure shown.		$\pi \left(\frac{x}{2}\right)^2 + x^2$ $x^2 + \frac{\pi x^2}{4}$	2
36	The figure shows a sphere with radius 1 cm that fits exactly inside a cylinder.		(a) $\frac{4}{3} \pi r^3$ (b) $2\pi r^2$ (c) $\pi r^2 h$ $\pi(1)^2 \cdot 2$ $= 2\pi \text{ cm}^2$	1 1 1

37	<p>ABCD is a trapezium such that AD = 20 cm, CD = 50 cm, <math>\angle DAB = 74^\circ</math>, <math>\angle CBA = 45^\circ</math>.</p> <p>Calculate the value of</p> <p>(a) the distance <math>h</math>, correct to 1 decimal place;</p> <p>(b) the length of AB, correct to 1 decimal place.</p>	<p><math>\sin 74 = \frac{h}{20}</math> <math>h = 20 \sin 74</math> <math>= 19.2 \text{ cm}</math></p> <p>(b) <math>\tan 45^\circ = 1</math> <math>BE = 19.2 \text{ cm}</math> <math>\cos 74^\circ = \frac{AE}{20}</math> <math>AE = \frac{20 \cos 74^\circ}{1} = 5.5</math> <math>AB = 5.5 + 50 + 19.2 = 74.7 \text{ cm}</math></p>	3
38	<p>Bob is 6 km and <math>N60^\circ E</math> from Albert. Charlie is 4 km and <math>N30^\circ W</math> from Bob. What is the compass bearing of Charlie from Albert?</p> <p><math>\tan CAB = \frac{4}{6}</math> <math>\angle CAB = 33^\circ 41'</math> <math>\angle NAB = 60^\circ</math> <math>\angle NAC = 60^\circ - 33^\circ 41'</math> Bearing of C from A <math>N26^\circ 19' E</math></p>		3

37  $ABCD$  is a trapezium such that  $AD = 20$  cm,  $CD = 50$  cm,  $\angle DAB = 74^\circ$ ,  $\angle CBA = 45^\circ$ .



Calculate the value of

(a) the distance  $h$ , correct to 1 decimal place;

(b) the length of  $AB$ , correct to 1 decimal place.

38 Bob is 6 km and  $N60^\circ E$  from Albert. Charlie is 4 km and  $N30^\circ W$  from Bob. What is the compass bearing of Charlie from Albert?

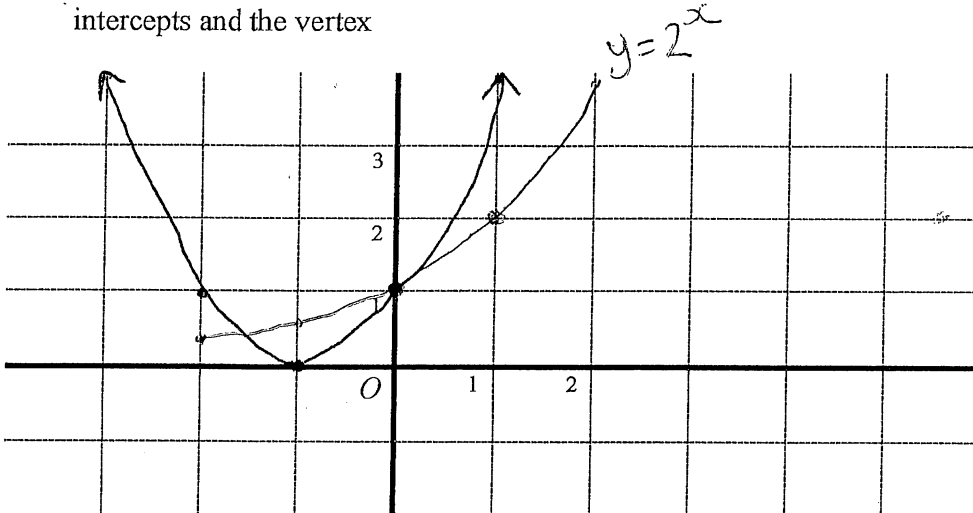
Section E (16 Marks)			
39	Two different numbers are chosen at random from 1 to 5. What is the probability that (a) both of them are even? (b) neither of them are even?	$1/2, 3/4, 5$ $3/5 / 2/5$ $0 E$ $2/5 \times 1/4$ $2/4 / 2/4, 3/4 / 1/4$ $3/5 \times 2/4$ $0 E, 0 E, EE$	$1/10$ $3/10$
40	A box contains 12 cards numbered 1 to 12. If a card is drawn from the box, what is the probability that it is divisible by 2 or divisible by 3?	<del>1</del> <del>2</del> <del>3</del> <del>4</del> 5 <del>6</del> <del>7</del> <del>8</del> <del>9</del> <del>10</del> 11 <del>12</del>	$8/12 = 2/3$ omitting 1 number $= 2/3$ (with working)

$8/12 \neq 3/4$

41

(a) Graph, on the number plane below,  $y = 2^x$ , for  $-2 \leq x \leq 2$ , showing the  $y$ -intercept and the coordinates of the end-points.

(b) Graph  $y = x^2 + 2x + 1$  on the *same* number plane, clearly showing the  $x$ -intercepts and the vertex



(c) How many times do the two graphs intersect?

2

2

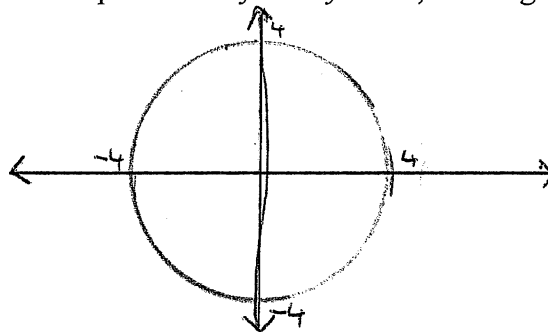
$$0 = (x+1)^2$$

$$\therefore x = -1$$

1

42

Sketch the graph that is represented by  $x^2 + y^2 = 16$ , showing all essential information.



2

43

(a) Simplify  $\frac{1}{n} - \frac{1}{n+1} = \frac{n+1 - n}{n(n+1)}$

$$= \frac{1}{n(n+1)}$$

(b) Hence, evaluate the following sum  $\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \dots + \frac{1}{100 \times 101}$

$$\frac{1}{1} - \frac{1}{2} + \frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} \dots \dots \dots + \frac{1}{100} - \frac{1}{101}$$

$$= 1 - \frac{1}{101}$$

$$= \frac{100}{101}$$

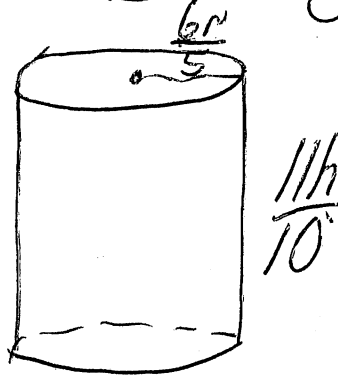
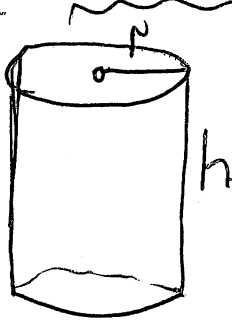
2

2

Section F 4R10 2007 Half Yearly

16.

44/ (a)



$$V = \pi r^2 h$$

$$\begin{aligned} V &= \pi \times \left(\frac{6r}{5}\right)^2 \times \frac{11h}{10} \\ &= \pi \times \frac{36r^2}{25} \times \frac{11h}{10} \\ &= \frac{\pi \times 396r^2 h}{250} \\ &= \frac{198\pi r^2 h}{125} \quad (2) \\ &= (1.584\pi r^2 h) \end{aligned}$$

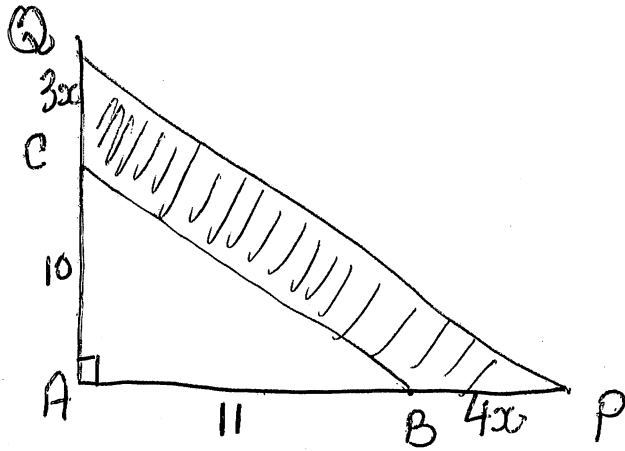
$$r + 20\%r = r + \frac{r}{5} = \frac{5r+r}{5} = \frac{6r}{5}$$

$$h + 10\%h = h + \frac{h}{10} = \frac{10h+h}{10} = \frac{11h}{10}$$

$$\begin{aligned} (b) & \frac{1.584\pi r^2 h - \pi r^2 h}{\pi r^2 h} \times \frac{100}{1} \% \\ &= \frac{\pi r^2 h (1.584 - 1)}{\pi r^2 h} \times \frac{100}{1} \% \\ &= 58.4 \% \quad (1) \end{aligned}$$

45

(a)



$$\frac{BP}{CQ} = \frac{4}{3}$$

$$\text{Area } \triangle ABC = \frac{1}{2} \times 11 \times 10 = 55 \text{ m}^2$$

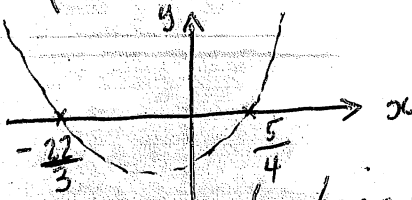
$$\text{Area } \triangle APQ = \frac{1}{2} (11 + 4x)(10 + 3x)$$

$$\begin{aligned} \text{So area } BCQP &= \frac{1}{2} (11 + 4x)(10 + 3x) - 55 \text{ m}^2 \\ &= \frac{1}{2} (110 + 33x + 40x + 12x^2) - 55 \\ &= \frac{1}{2} (12x^2 + 73x + 110) - 55 \\ &= 6x^2 + \frac{73x}{2} \text{ m}^2 \end{aligned} \quad (3)$$

$$(b) \quad 6x^2 + \frac{73x}{2} \geq 55$$

$$12x^2 + 73x - 110 \geq 0$$

$$(3x + 22)(4x - 5) \geq 0$$

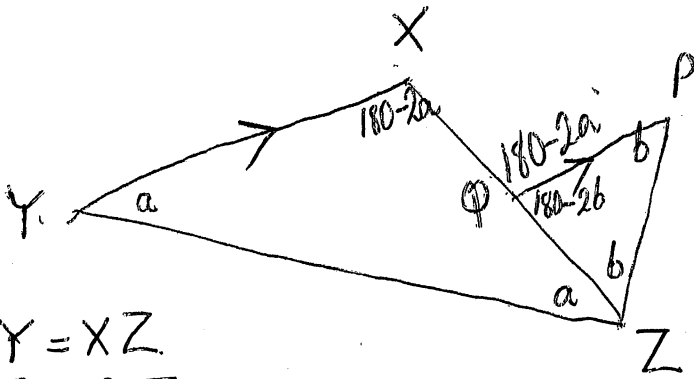


curve above or touching x axis

$$x \leq -\frac{22}{3} \text{ and } x \geq \frac{5}{4}$$

(2)

(46)



$$XY = XZ$$
$$QP = QZ$$

$\hat{X}YZ = a$  because  $XY = XZ$ ,  $\triangle XYZ$  isosceles, equal base angles -

$\hat{QPZ} = b$  because  $QP = QZ$ ,  $\triangle QPZ$  isosceles, equal base angles -

Since  $XY \parallel PQ$   $\hat{XQP} = 180 - 2a$  alternate angles -

$\therefore 180 - 2a + 180 - 2b = 180^\circ$  straight line angle -

$$180 = 2a + 2b$$

$$a + b = 90^\circ$$

(2)

(47) Q is on curve  $y = 2^x$

a) The y value is 8

$$\text{So } 8 = 2^x$$

$$x = 3$$

Q(3, 8)

(2)

b) P is on curve  $xy = 4$   
The y value is 8  $y = \frac{4}{x}$

$$\text{So } 8 = \frac{4}{x}$$

$$8x = 4$$

$$x = \frac{1}{2}$$

P( $\frac{1}{2}$ , 8)

So OQ is 3 units

OP is  $\frac{1}{2}$  unit

$$\therefore PQ = 3 - \frac{1}{2} = 2\frac{1}{2} \text{ units}$$

(2)



48

$$(x^2 - 7x + 11)^{x^2 - 11x + 30} = 1$$

now in index form  $(x^2 - 7x + 11)^0 = 1$

$$\text{So } (x^2 - 7x + 11)^{x^2 - 11x + 30} = (x^2 - 7x + 11)^0$$

equate indices  $x^2 - 11x + 30 = 0$

$$(x-5)(x-6) = 0$$

$$x = 5 \text{ and } x = 6 \quad \checkmark$$

2

Also when  $x^2 - 7x + 11 = 1$

$$x^2 - 7x + 10 = 0$$

$$(x-5)(x-2) = 0$$

$$x = 5, x = 2$$

Solns are  $x = 2, x = 5, x = 6$

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