



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

**2010**

Year 8

Yearly Examination

# Mathematics

### General Instructions

- Working time – 90 minutes
- Write using black or blue pen
- Calculators may be used
- All *necessary* working should be shown in every question if full marks are to be awarded.
- All answers to be given in simplified exact form unless otherwise stated.
- 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.

Class	Teacher	
8Ma1	Mr. Hespe	
8Ma2	Ms. Kilmore	
8Ma3	Ms. Ward	
8MaA	Mr. McQuillan/Mr. Boros	
8MaB	Mr. Gainford	
8MaC	Ms. Kilmore/Ms. Evans	

NAME:

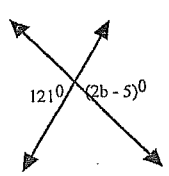
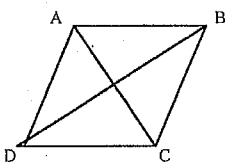
Examiner: *F.Nesbitt*

Question	Mark	
A		/20
B		/20
C		/20
D		/19
E		/20
F		/19
<b>Total</b>		<b>/118</b>

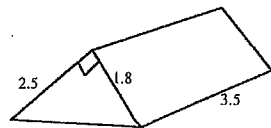
### SECTION A CONTINUED

10	Determine the range of this set of scores. 49, 50, 48, 51, 50	
11	$A = \{1, 5\}$ Write all the subsets of A	
12	Evaluate: $\frac{16.1^2}{4.5 - \sqrt{3.9}}$ correct to 1 decimal place.	
13	Arrange in ascending order: $\frac{3}{5}, \frac{\sqrt{3}}{5}, 0.53, 55\%$	
14	What is the complement of $68^\circ$ ?	
15	Simplify fully: $\frac{(2a^2b)^3}{4a^2b^2}$	
16	Write as a fully simplified ratio: 2.4 : 6	
17	Express 103785 in Scientific Notation.	
18	Write the reciprocal of $2\frac{7}{8}$	

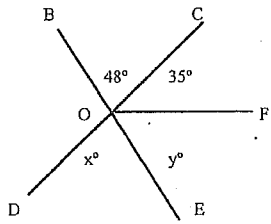
SECTION A (20 Marks)

1	Find 15% of 3L	
2	Simplify $3+4 \pmod{6}$	
3	Expand and simplify $(x-3)(x+4)$	
4	Find the value of b  	
	Are the triangles with the following sides right angled? yes or no (i) 51 cm, 68 cm and 85 cm (ii) 57 cm, 76 cm and 95 cm	
6	Factorise completely $3mn - 6nr$	
7	A letter is chosen at random from the letters a, e, i, o, u What is the probability it is either a or e?	
8	Find the area of this rhombus if AC and DB are 6 cm and 8 cm long.  	
9	Solve: $6(m-3) = 12$	

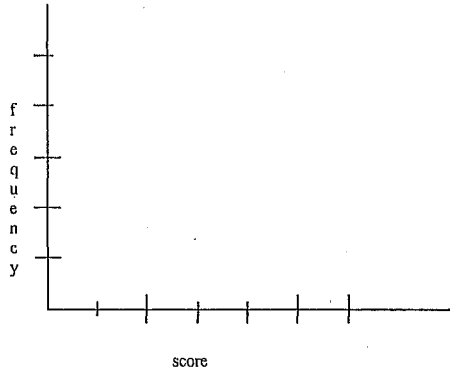
SECTION B CONTINUED

7	If $a = \frac{5}{4}, b = \frac{3}{10}$ and $c = \frac{2}{3}$ , find as a simplified fraction (a) $a + b - c$ (b) $\sqrt{\frac{bc}{a}}$	2
8	Find the annual percentage rate of Simple Interest if \$12 000.00 had earned \$19 800.00 in interest after 15 years.	1
9	A movie ran for 93 minutes. At what time did it start if it finished at 1:15 p.m.?	1
10	Find the surface area of this right triangular prism. Measurements are in metres. Answer to the nearest cm.  	2
11.	A fish tank is 90 cm long, 60 cm wide and 45 cm high. (a) Find the volume of the tank.	1
	(b) How deep is the water in the tank when it contains 200 L of water? (1000 L = 1 m <sup>3</sup> )	2
12	Round 0.075 to the nearest hundredth	1

SECTION B

1	(i) Solve this inequation: $4x + 3 \leq 11$  (ii) graph the solution on a number line	2
2	Expand and simplify fully:  $3p[2p - q - 3(2p - q)]$	2
3	Divide \$2600 in the ratio 1 : 2 : 10	1
4	If \$x is invested at y% per year, write an expression for the amount of money after one year	1
5	 <p>In the figure above BE and CD are straight lines</p> <p>(i) Name a pair of adjacent angles. (ii) Find the values of x and y giving reasons.</p>	3
6	What was the original price of a sweater which was sold for \$ 65 at a sale where everything was reduced by 20%	1

SECTION C CONTINUED

4	(a) Complete the table below.																			
	<table border="1"> <thead> <tr> <th>Outcome (x)</th> <th>Frequency (f)</th> <th>fx</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>4</td> <td></td> </tr> <tr> <td>6</td> <td>5</td> <td></td> </tr> <tr> <td>7</td> <td>2</td> <td></td> </tr> <tr> <td>8</td> <td>1</td> <td></td> </tr> <tr> <td>9</td> <td>3</td> <td></td> </tr> </tbody> </table> <p>Totals:</p>	Outcome (x)	Frequency (f)	fx	5	4		6	5		7	2		8	1		9	3		
Outcome (x)	Frequency (f)	fx																		
5	4																			
6	5																			
7	2																			
8	1																			
9	3																			
	(b) Find:	6																		
	(i) the mean																			
	(ii) the median																			
	(iii) the mode																			
	(iv) the range																			
	(c) Put the above information on a frequency polygon in the space below.	2																		
																				

SECTION C

1 The divided bar graph below shows the various favourite sports watched by a group of 720 people who were surveyed. By measuring the space and showing all working, calculate the number of people who watch

(a) Rugby \_\_\_\_\_ 3

(b) Tennis \_\_\_\_\_

(c) Soccer \_\_\_\_\_

soccer	tennis	basketball	rugby
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2 What percentage of each shape is shaded? 3

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3 (a) Use the rule  $y = \frac{1}{2}x + 1$  to complete this table. 4

x	-2	0	2	3
y				

Sketch  $y = \frac{1}{2}x + 1$  on the set of axes below. 2

SECTION D CONTINUED

5. Solve 2

$$9m - \frac{3m}{4} = 7$$

6 Find a value of b which would make this line pass through the point (3, 5) 2

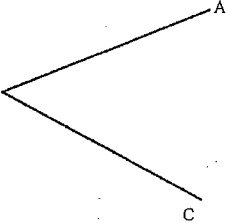
$$y = 3x - b$$

7 Complete this multiplication table for ( mod 5) 3

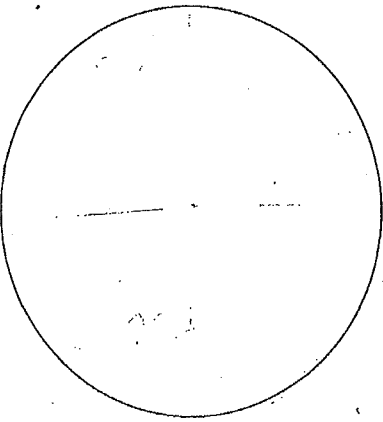
X	0	1	2	3	4
0	0	0	0	0	0
1	0	1	2	3	4
2	0	2	4	1	
3	0	3	1		
4	0	4			

8 Draw the net of a triangular prism below 3

## SECTION D

1	<p>(a) Using a pair of compasses, bisect the angle ABC below, showing all construction marks 3</p>  <p>(b) Measure the angle ABC.</p>
2	<p>(a) Mark had \$300.00. He decided to go to the races. Each time he backed a horse he lost 20% of his remaining money. If he backed three horses, how much of his money was left?</p> <p>(b) When Mark's money fell below \$100.00 he decided to go home. How many horses had he backed by then? 2</p>
3.	<p>(a) The surface area of a cube is <math>150 \text{ cm}^2</math>. What is its side length? 2</p> <p>(b) What is the side length of a cube with surface area A sq cm?</p>
4	<p>Write as a single, simplified fraction 2</p> $\frac{3b}{5} + 2b + \frac{b}{2} - \frac{b}{6}$

## SECTION E CONTINUED

5	<p>In an International school the students came from a number of different countries and had a variety of first languages. The 660 students had the following percentages of first languages. Spanish 25%, French 10%, German 15%, Chinese 30%, Malay 5%. The rest spoke a variety of other languages.</p> <p>(a) Calculate the number of students who spoke each Language. 5</p>
	<p>(b) Represent the information accurately on a sector graph below, calculating the size of each angle. 5</p> 

SECTION E

1	<p>It took two and a half hours by train for Jane to get to her grandmother's house. If the train had increased its speed by 20% how long would the journey have taken ?</p>	3												
2	<p>A two digit number has tens digit <math>x</math> and units digit <math>y</math>. If the digit 4 is placed between <math>x</math> and <math>y</math> what is the value of the new number in terms of <math>x</math> and <math>y</math> ?</p>	2												
3	<p>Find the values of P, Q and R in the multiplication table below</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 0 10px;">P</td> <td style="padding: 0 10px;">Q</td> <td style="padding: 0 10px;">R</td> <td></td> </tr> <tr> <td colspan="3" style="border-top: 1px solid black;"></td> <td style="text-align: right; padding-right: 10px;">3 X</td> </tr> <tr> <td style="padding: 0 10px;">Q</td> <td style="padding: 0 10px;">Q</td> <td style="padding: 0 10px;">Q</td> <td></td> </tr> </table>	P	Q	R					3 X	Q	Q	Q		3
P	Q	R												
			3 X											
Q	Q	Q												
4	<p>Find the value of <math>x</math></p> <p>(a) <math>13 \times 5 = x \pmod{11}</math></p> <p>(b) <math>2 \div 8 = x \pmod{11}</math></p>	2												

SECTION F CONTINUED

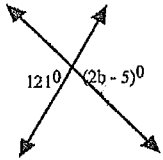
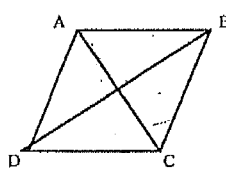
3	<p>A real estate agent receives commission on the value of any house he sells at the following rates.</p> <p>3% of the first \$50 000, 2% of the next \$100 000 and 1% of the rest</p> <p>If his commission on a house was \$6 500 what was the selling price? (show working)</p>	2
4	<p>One worker can complete a construction job in 6 hours. A second worker takes 9 hours to do the same job. Show that, if they work together, they will finish the job in 3 hours and 36 minutes.</p> <p>(show working)</p>	3
5	<div style="text-align: center;"> </div> <p>The square above has sides of length 1 unit and is divided into areas X, Y, Z AND R. E is the midpoint of DC.</p> <p>(a) Name a pair of similar triangles.</p> <p>(a) By considering altitudes, express the areas X, Y, Z and R as fractions of the area of the square.</p> <p>(b) Hence write the ratios of the areas R:Z:Y:X</p>	5

SECTION F

1	<div> </div> <p>The Venn diagram above shows a class of 28 music students who play the piano P, the Guitar G or the violin V. All of the students play at least one of these instruments. Three students play all three, 5 play only the piano and guitar, 6 play the guitar and violin but not the piano. A total of 4 play the piano and violin only and a total of 16 play the guitar. There are 15 piano players.</p> <p>(a) Put this information on the Venn diagram above. 3          (b) How many students : 4              (i) play only the violin ?              (ii) play the piano and the guitar ?              (iii) play the piano or the guitar ?              (iv) play only one instrument</p>
2	<p>A 10L container of juice has 2L of juice removed and replaced with water. After a thorough blending, a further 2L of the mixture was taken out and replaced with water. What fraction of this new mixture is juice? (show working) 2</p>

SECTION A (20 Marks) - SBHS - Yr 8 Yrly - 2010 Solutions

SECTION A CONTINUED

1	Find 15% of 3L	0.45 L 450ml.
2	Simplify $3+4 \pmod{6}$	1
3	Expand and simplify $(x-3)(x+4)$	$x^2 - 3x + 4x - 12$ $x^2 + x - 12$ $-7 = \frac{1}{2}$
4	Find the value of b 	$2b - 5 = 121$ $2b = 126$ $b = 63$ 63
	Are the triangles with the following sides right angled? yes or no (i) 51 cm, 68 cm and 85 cm (ii) 57 cm, 76 cm and 95 cm	i) YES. ii) YES.
6	Factorise completely $3mn - 6nr$	$3n(m-2r)$
7	A letter is chosen at random from the letters a, e, i, o, u What is the probability it is either a or e?	$\frac{2}{5}$
8	Find the area of this rhombus if AC and DB are 6 cm and 8 cm long. 	$A = \frac{1}{2} \times d_1 \times d_2$ $= \frac{1}{2} (6 \times 8)$ $= 24 \text{ cm}^2$
9	Solve: $6(m-3) = 12$	$m-3=2$ $m=5$

10	Determine the range of this set of scores. 49, 50, 48, 51, 50	3
11	$A = \{1, 5\}$ Write all the subsets of A	$\{1\}$ $\{5\}$ $\{1, 5\}$ $\{\}$
12	Evaluate: $\frac{16.1^2}{4.5 - \sqrt{3.9}}$ correct to 1 decimal place.	102.7
13	Arrange in ascending order: $\frac{3}{5}, \frac{\sqrt{3}}{5}, 0.53, 55\%$	$\frac{\sqrt{3}}{5}, 0.53, 55\%, \frac{3}{5}$
14	What is the complement of $68^\circ$ ?	$22^\circ$
15	Simplify fully: $\frac{(2a^2b)^3}{4a^2b^2}$	$2a^4b$
16	Write as a fully simplified ratio: 2.4 : 6	12 : 30 2 : 5
17	Express 103785 in Scientific Notation.	$1.03785 \times 10^5$
18	Write the reciprocal of $\frac{7}{8}$	$\frac{8}{7}$



SECTION B

1	(i) Solve this inequation: $4x + 3 \leq 11$	$4x \leq 8$ $x \leq 2$	2
	(ii) graph the solution on a number line		
2	Expand and simplify fully:	$6p^2 - 3pq$ $= 3p[-4p + 2q]$ $3p[2p - q - 6p + 2q]$ $= 6pq - 12p^2$	2
3	Divide \$2600 in the ratio 1 : 2 : 10	$\frac{200}{\text{per share}}$ $\$200, \$400, \$2000$	1
4	If \$x is invested at y% per year, write an expression for the amount of money after one year	$x + x \times \frac{y}{100}$ $= x + \frac{xy}{100}$	1
5	<p>In the figure above BE and CD are straight lines</p> <p>(i) Name a pair of adjacent angles.</p> <p>(ii) Find the values of x and y giving reasons.</p>	<p>i) adj <math>\angle</math>'s</p> <p><math>\angle BOC \text{ \&amp; } \angle COF</math>  <math>\angle COF \text{ \&amp; } \angle FOE</math>  <math>\angle FOE \text{ \&amp; } \angle EOD</math>  <math>\angle EOD \text{ \&amp; } \angle DOB</math>  <math>\angle DOB \text{ \&amp; } \angle BOC</math></p> <p>ii) <math>x = 48^\circ</math> (vert opp)</p> <p><math>y = 180 - (35 + 48)</math>  <math>= 97^\circ</math> (L sum st line)</p>	3
6	What was the original price of a sweater which was sold for \$ 65 at a sale where everything was reduced by 20%	$100\% = \$81.25$ $\$65 = 80\%$ $1\% = 0.8125$	1

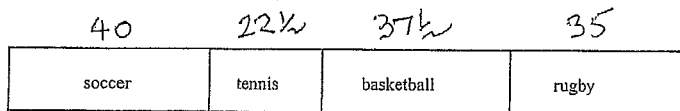
SECTION B CONTINUED

7	If $a = \frac{5}{4}, b = \frac{3}{10}$ and $c = \frac{2}{3}$ , find as a simplified fraction	<p>(a) <math>a + b - c = \frac{5}{4} + \frac{3}{10} - \frac{2}{3} = \frac{53}{60}</math></p> <p>(b) <math>\sqrt{\frac{bc}{a}} = \sqrt{\frac{\frac{3}{10} \times \frac{2}{3}}{\frac{5}{4}}} = \frac{2}{5}</math></p>	2
8	Find the annual percentage rate of Simple Interest if \$12 000.00 had earned \$19 800.00 in interest after 15 years.	$19800 = 12000 \times R \times 15$ $I = PRT$ $T = 11\%$	1
9	A movie ran for 93 minutes. At what time did it start if it finished at 1:15 p.m.?	$93 \text{ min} - 15 = 78$ $1:15 \rightarrow 1:00 \rightarrow 12:00$ $11:42$	1
10	Find the surface area of this right triangular prism. Measurements are in metres. Answer to the nearest cm.	<p><math>SA = 1.8 \times 3.5 + 2.5 \times 3.5</math>  <math>+ \frac{1}{2} \times 1.8 \times 2.5 \times 2</math>  <math>3.5 \times \sqrt{4.9}</math>  <math>= 30.33 \text{ m}^2</math></p>	2
11.	A fish tank is 90 cm long, 60 cm wide and 45 cm high.	<p>(a) Find the volume of the tank.</p> <p><math>V = 0.9 \times 0.6 \times 0.45 = 0.243 \text{ m}^3</math> or <math>243000 \text{ cm}^3</math></p> <p>(b) How deep is the water in the tank when it contains 200 L of water? (1000 L = 1 m<sup>3</sup>)</p> <p><math>200 \text{ L} = 0.2 \text{ m}^3</math>     <math>h = 0.37</math>  <math>0.2 = 0.9 \times 0.6 \times h</math>     <math>= 37 \text{ cm}</math></p>	1
12	Round 0.075 to the nearest hundredth	0.08	1

SECTION C

1 The divided bar graph below shows the various favourite sports watched by a group of 720 people who were surveyed. By measuring the space and showing all working, calculate the number of people who watch

- (a) Rugby  $40 \times 720 \div 135 = 187$  3  
 (b) Tennis 120  
 (c) Soccer 213



$L = 135$

2 What percentage of each shape is shaded? 3



$60\%$



$\frac{6}{10} \times 100\% = 60\%$

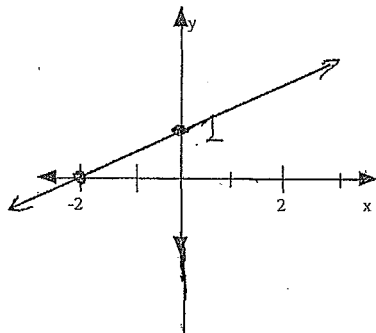


$87\frac{1}{2}\%$

3 (a) Use the rule  $y = \frac{1}{2}x + 1$  to complete this table. 4

x	-2	0	2	3
y	0	1	2	$2\frac{1}{2}$

Sketch  $y = \frac{1}{2}x + 1$  on the set of axes below. 2



SECTION C CONTINUED

4 (a) Complete the table below.

Outcome (x)	Frequency (f)	fx
5	4	20
6	5	30
7	2	14
8	1	8
9	3	27

cf  
4  
9  
11  
12  
15

Totals: 15 99

(b) Find:  
 (i) the mean

$\frac{99}{15} = 6.6$

(ii) the median

8th outcome = 6

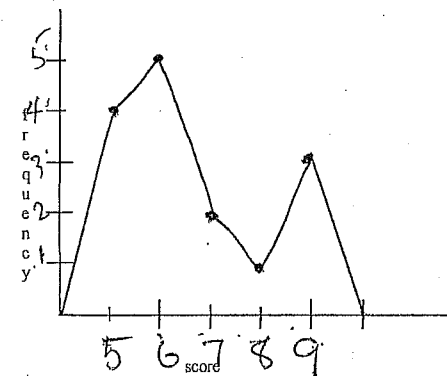
(iii) the mode

6

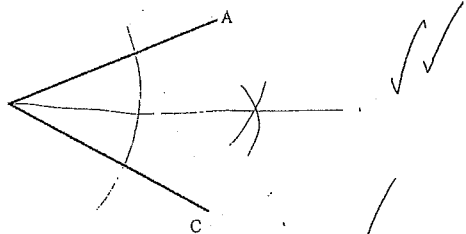
(iv) the range

4

(c) Put the above information on a frequency polygon in the space below. 2



1 (a) Using a pair of compasses, bisect the angle ABC below, showing all construction marks 3



(b) Measure the angle ABC. 50° ✓

2 (a) Mark had \$300.00. He decided to go to the races. Each time he backed a horse he lost 20% of his remaining money. If he backed three horses, how much of his money was left?  $300 \times .8 \times .8 \times .8 = \$153.60$  ✓

(b) When Mark's money fell below \$100.00 he decided to go home. How many horses had he backed by then?  $300 \times (.8)^n < 100$   
 $(.8)^n < \frac{1}{3}$  Trial + error  
 $\Rightarrow n = 5$  ✓

3 (a) The surface area of a cube is  $150 \text{ cm}^2$ . What is its side length?  $SA = 6 \times s^2 = 150$   
 $s^2 = 25 \rightarrow s = 5 \text{ cm}$  ✓

(b) What is the side length of a cube with surface area A sq cm?  $\sqrt{\frac{A}{6}}$  ✓

4 Write as a single, simplified fraction 2

$$\frac{3b}{5} + 2b + \frac{b}{2} - \frac{b}{6} = \frac{18b + 60b + 15b - 5b}{30}$$

$$= \frac{98b}{30} = \frac{49b}{15}$$

5. Solve 2

$$9m - \frac{3m}{4} = 7$$

$$36m - 3m = 28$$

$$33m = 28$$

$$m = \frac{28}{33} = 1.848$$
 ✓✓

6 Find a value of b which would make this line pass through the point (3, 5) 2

$$y = 3x - b$$

$$(3, 5) \Rightarrow 5 = 9 - b$$

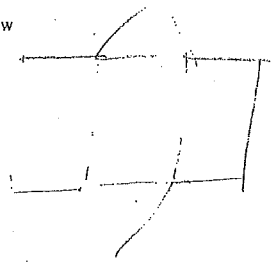
$$b = 4$$
 ✓✓

7 Complete this multiplication table for (mod 5) 3

X	0	1	2	3	4
0	0	0	0	0	0
1	0	1	2	3	4
2	0	2	4	1	3
3	0	3	1	4	2
4	0	4	3	2	1

$\frac{1}{2}$  each  $\rightarrow 6 \times \frac{1}{2} = 3$  ✓✓

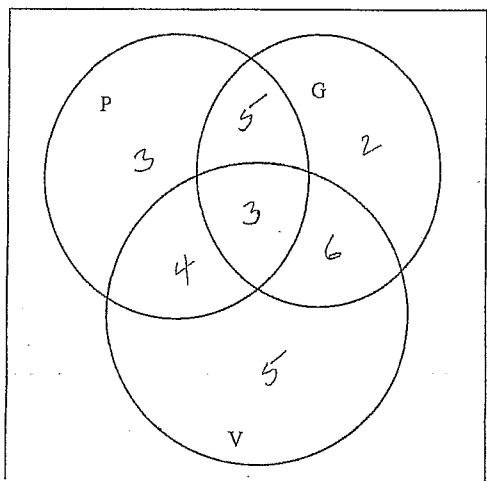
8 Draw the net of a triangular prism below 3



1	<p>It took two and a half hours by train for Jane to get to her grandmother's house. If the train had increased its speed by 20% how long would the journey have taken?</p> <p> <math>S = \frac{D}{T}</math>      <math>D = ST</math>      <math>\frac{1.2D}{2.5} = \frac{D}{T}</math>  <math>S = \frac{D}{2.5}</math>      <math>1.2S = T</math>      <math>T = \frac{2.5}{1.2}</math> </p> <p>125mins 2hrs 50mins</p>	3									
2	<p>A two digit number has tens digit <math>x</math> and units digit <math>y</math>. If the digit 4 is placed between <math>x</math> and <math>y</math> what is the value of the new number in terms of <math>x</math> and <math>y</math>?</p> <p><math>x4y</math>      <math>100x + 40 + y</math></p>	2									
3	<p>Find the values of P, Q and R in the multiplication table below</p> <p> <math>R = 8</math>  <math>Q = 4</math>  <math>P = 1</math> </p> <table style="margin-left: 100px;"> <tr> <td>P</td> <td>Q</td> <td>R</td> </tr> <tr> <td colspan="2" style="border-top: 1px solid black;"></td> <td>3 X</td> </tr> <tr> <td>Q</td> <td>Q</td> <td>Q</td> </tr> </table>	P	Q	R			3 X	Q	Q	Q	3
P	Q	R									
		3 X									
Q	Q	Q									
4	<p>Find the value of <math>x</math></p> <p>(a) <math>13 \times 5 = x \pmod{11}</math>      10</p> <p>(b) <math>2 + 8 = x \pmod{11}</math>      <math>2 + 7 = 3</math></p>	2									

5	<p>In an international school the students came from a number of different countries and had a variety of first languages. The 660 students had the following percentages of first languages. Spanish 25%, French 10%, German 15%, Chinese 30%, Malay 5%. The rest spoke a variety of other languages.</p> <p>(a) Calculate the number of students who spoke each language.</p> <p>           Spanish 165      15% others            French 66      Malay 33            German 99      Other 99            Chinese 198         </p> <p>(b) Represent the information accurately on a sector graph below, calculating the size of each angle.</p>	5
		5

SECTION F



The Venn diagram above shows a class of 28 music students who play the piano P, the Guitar G or the violin V. All of the students play at least one of these instruments. Three students play all three, 5 play only the piano and guitar, 6 play the guitar and violin but not the piano. A total of 4 play the piano and violin only and a total of 16 play the guitar. There are 15 piano players.

- (a) Put this information on the Venn diagram above. 3
- (b) How many students : 4
- (i) play only the violin ? 5
  - (ii) play the piano and the guitar ? 8
  - (iii) play the piano or the guitar ? 23
  - (iv) play only one instrument 10

2 A 10L container of juice has 2L of juice removed and replaced with water. After a thorough blending, a further 2L of the mixture was taken out and replaced with water. What fraction of this new mixture is juice? (show working) 2

$$\frac{8}{10} \times \frac{8}{10} = \frac{64}{100}$$

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

SECTION F CONTINUED

3 A real estate agent receives commission on the value of any house he sells at the following rates. 2

3% of the first \$50 000, 2% of the next \$100 000 and 1% of the rest  
 If his commission on a house was \$6 500 what was the selling price? (show working)

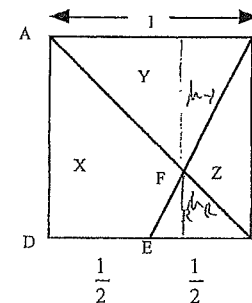
$$(6500 - \frac{3}{100} \times 50000 - \frac{2}{100} \times 100000) \times 100 + 150000 = 450000$$

$\therefore \$450000$

4 One worker can complete a construction job in 6 hours. A second worker takes 9 hours to do the same job. Show that, if they work together, they will finish the job in 3 hours and 36 minutes. 3

(show working) Together  $\Rightarrow \frac{1}{6} + \frac{1}{9}$  of job/hour  
 $\Rightarrow \frac{5}{18}$  of job/hour  
 $\therefore$  They take  $\frac{18}{5}$  hours/job,  
 i.e. 3 hours 36 minutes.

5 5



The square above has sides of length 1 unit and is divided into areas X, Y, Z AND R. E is the midpoint of DC.

- (a) Name a pair of similar triangles.  $\triangle ABF, \triangle CFE$
- (a) By considering altitudes, express the areas X, Y, Z and R as fractions of the area of the square.

$$\frac{h_Y}{h_R} = \frac{2}{1} \quad Y = \frac{2}{3} \times \frac{1}{2} \text{ of square} = \frac{1}{3}$$

$$R = \frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$$

$$Z = \frac{1}{4} - \frac{1}{12} = \frac{1}{6}$$

$$X = 1 - \frac{1}{3} - \frac{1}{6} - \frac{1}{12} = \frac{5}{12}$$

- (b) Hence write the ratios of the areas R:Z:Y:X
- $$R:Z:Y:X = \frac{1}{12} : \frac{1}{6} : \frac{1}{3} : \frac{5}{12}$$
- $$= 1 : 2 : 4 : 5$$