



SYDNEY BOYS HIGH SCHOOL
MOORE PARK, SURRY HILLS

Year 8

Yearly Examination 2011

Mathematics

Examiner: R.Elliott

General Instructions

- Working time –90 minutes
- Write using black or blue pen.
- Approved calculators may be used.
- All necessary working **MUST** be shown in every question if full marks are to be awarded.
- Clearly indicate your class by placing an X, next to your class
- Marks may not be awarded for untidy or badly arranged work.
- Answer in simplest exact form unless otherwise stated.

- 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.

NAME:

Class	Teacher
8MaA	Ms Chen/Mr McQuillan
8MaB	Ms Ward
8MaC	Ms Nesbitt
8Ma1	Mr Boros
8Ma2	Ms Chen/Mr Comben
8 Ma3	MR McQuillan

Question	Mark
1	/16
2	/16
3	/16
4	/15
5	/17
6	/16
Total	/96

Year 8 YEARLY 2011

SECTION A

	QUESTION	ANSWER	MARKS
1	Evaluate $8 - 3 \times 7$		1
2	Simplify $5 \times 3 \text{ mod } 6$.		1
3	Simplify $3x^2 + 6x$		1
4	Solve: $3 - x = 7$		1
5	Find correct to 2 dec. places $\frac{\sqrt{5}}{\sqrt{2} - 0.4^2}$		2
6	Write $\frac{5}{8}$, 62%, $\sqrt{0.36}$, $\frac{1}{\sqrt{3}}$ in ascending order.		1
7	What is the quotient of $6x^3$ and $3x$?		1
8	Two angles of size x° and 73° are co-interior angles of parallel lines. Find x .		1
9	A man received a discount of 25% On a microwave. He paid \$84. What was the marked price?		1
10	How many subsets are there of a set with two elements?		1
11	Expand and simplify $(2x - 5)(2 - x)$		1
12	A rectangle has one side measuring 12cm. and a diagonal of 15 cm. Find the length of the other side.		1
13	What is the difference between $(6 - x)$ and $(x + 3)$?		1
14	The difference between the squares of two consecutive integers is d . Find an expression for the smaller of these integers in terms of d .		1
15	The Marathon is a race over 42km. An athlete runs it in 2 hours and 8 minutes. What speed in metres per second is this?		1

SECTION B

	QUESTION	ANSWER AND WORKING	MARKS
1	<p>Solve these equations, showing all necessary working:</p> <p>(I) $3X - 1 = 14$</p> <p>(II) $X - 7 = 3X - 35$</p> <p>(III) $2(1 - X) - 3 = X$</p> <p>(iv) $\frac{1}{2} - \frac{2}{x} = 1$</p>		<p>1</p> <p>2</p> <p>2</p> <p>3</p>
2	<p>The sum of $(x-2)$ and $\frac{3x}{5}$ is 1. Write this as an equation and solve.</p>		3
3	<p>The area of a figure is given by the formula</p> $A = \frac{h}{2}(x + y).$ <p>If $A=60$, $h=9$ and $x=11$ find y.</p>		3
4	<p>A 10 metre length of pipe is cut in 7 places to produce smaller pipes of equal length. How long is each piece?</p>		2

SECTION C

	QUESTION	ANSWER AND WORKING	MKS																																				
1	<p>Complete this multiplication table in modulo 5</p> <p>(i) What is the reciprocal of 3 (mod 5)?</p> <p>(ii) Find $4 \div 3 \pmod{5}$</p> <p>(iii) Solve $3x - 1 \equiv 1 \pmod{5}$</p>	<table border="1"> <thead> <tr> <th>X</th> <th>0</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	X	0	1	2	3	4	0						1						2						3						4						5
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4	<p>Seven cubes are glued face to face as shown in the diagram. The volume of the solid is 448 cm^3. Find the surface area.</p> <p>(diagram to be glued here)</p>		3																																				

SECTION E

	QUESTION	ANSWER AND WORKING	MARKS																																			
1	For the set of scores 7,11,5,8,4,8,6,8,7 and 2 Find the (i) Mean (ii) Range (iii) Median (iv) Mode		4																																			
2	Here is the stem and leaf plots for two classes in a maths test <table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="2">Class A</th> <th>STEM</th> <th colspan="2">Class B</th> </tr> <tr> <th>LEAF</th> <th>STEM</th> <th>LEAF</th> <th>STEM</th> <th>LEAF</th> </tr> </thead> <tbody> <tr> <td>9 7 3 1 1</td> <td>4</td> <td>3 5 7 9</td> <td></td> <td></td> </tr> <tr> <td>8 5 4 0</td> <td>5</td> <td>4 6 8</td> <td></td> <td></td> </tr> <tr> <td>6 3</td> <td>6</td> <td>2 7 9 9</td> <td></td> <td></td> </tr> <tr> <td>9 9 8</td> <td>7</td> <td>5 6 7 7</td> <td></td> <td></td> </tr> <tr> <td>7 7 3</td> <td>8</td> <td>9</td> <td></td> <td></td> </tr> </tbody> </table> (i) How many students in class B? (ii) Find the median for (a) Class A (b) Class B (iii) State which class had the better average mark and why.	Class A		STEM	Class B		LEAF	STEM	LEAF	STEM	LEAF	9 7 3 1 1	4	3 5 7 9			8 5 4 0	5	4 6 8			6 3	6	2 7 9 9			9 9 8	7	5 6 7 7			7 7 3	8	9			(i) (ii) (a) (b) (iii)	5
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SECTION F

	QUESTION	ANSWER AND WORKING	MARKS
1	Write as simple ratios (i) $3\frac{1}{2} : 140\%$ (ii) 0.07: 75%		2
2	A woman leaves her estate of \$71,000 to her three sons to be distributed according to their ages. Tom is twice as old as Dick and 9 years older than Harry. How much did Harry get?		2
3	A man's bones make up 18% of his mass. If a man's bones weigh 20kg, how much did he weigh?		2
4	In how many ways can a powerboard with four on/off switches be arranged so that no two adjacent switches are in the off position?		2
5	Explain why 97 can not be written as the sum of two prime numbers.		2
6	Find the value of this continuous product $\left(1 + \frac{3}{1}\right)\left(1 + \frac{5}{4}\right)\left(1 + \frac{7}{9}\right)\left(1 + \frac{9}{16}\right) \dots etc. \left(1 + \frac{41}{400}\right)$		2
7	A man has 100 notes of denomination \$5 and \$10. He has a total of \$865. How many of each does he have?		2
8	2000 is divided by a positive integer N the remainder is 5. List all possible values of N.		2

SECTION A

	QUESTION	ANSWER	MARKS
1	Evaluate $8-3 \times 7$	-13	1
2	Simplify $5 \times 3 \text{ mod } 6$	3	1
3	Simplify $3x^2 + 6x$	$3x^2$	1
4	Solve: $3-x=7$	$x=-4$	1
5	Find correct to 2 dec. places $\frac{\sqrt{5}}{\sqrt{2-0.4^2}}$	1.78	2
6	Write $\frac{5}{8}, 62\%, \sqrt{0.36}, \frac{1}{\sqrt{3}}$ in ascending order. 0.625, 0.6, 0.577	$\frac{1}{\sqrt{3}}, \sqrt{0.36}, 62\%, \frac{5}{8}$	1
7	What is the quotient of $6x^3$ and $3x$?	$2x^2$	1
8	Two angles of size x° and 73° are co-interior angles of parallel lines. Find x .	107°	1
9	A man received a discount of 25% On a microwave. He paid \$84. What was the marked price?	\$112	1
10	How many subsets are there of a set with two elements?	4	1
11	Expand and simplify $(2x-5)(2-x)$	$4x - 2x^2 - 10 + 5x$ $= -2x^2 + 9x - 10$	1
12	A rectangle has one side measuring 12cm. and a diagonal of 15 cm. Find the length of the other side.	9cm	1
13	What is the difference between $(6-x)$ and $(x+3)$?	$3-2x$	1
14	The difference between the squares of two consecutive integers is d . Find an expression for the smaller of these integers in terms of d .	$\frac{d-1}{2}$	1
15	The Marathon is a race over 42km. An athlete runs it in 2 hours and 8 minutes. What speed in metres per second is this?	$\frac{42000}{128 \times 60} \approx \frac{175}{32} \text{ m/s}$	1

$$(n+1)^2 - n^2 = d \quad \approx 5.47 \text{ m/s}$$

$$n^2 + 2n + 1 - n^2 = d$$

SECTION B

	QUESTION	ANSWER AND WORKING	MARKS
1	Solve these equations, showing all necessary working: (I) $3X-1=14$ (II) $X-7=3X-35$ (III) $2(1-X)-3=X$ (iv) $\frac{1}{2} - \frac{2}{x} = 1$	$3X = 15$ $X = 5$ <hr/> $-2X = -28$ $X = 14$ <hr/> $2 - 2X - 3 = X$ $-1 = 3X$ $X = -\frac{1}{3}$ <hr/> $(x2x) x-4 = 2x$ $-x = 4$ $x = -4$	1 2 2 3
2	The sum of $(x-2)$ and $\frac{3x}{5}$ is 1. Write this as an equation and solve.	$x-2 + \frac{3x}{5} = 1$ $5x-10+3x = 5$ $8x = 15$ $x = \frac{15}{8} = 1\frac{7}{8}$	3
3	The area of a figure is given by the formula $A = \frac{h}{2}(x+y)$. If $A=60, h=9$ and $x=11$ find y .	$60 = \frac{9}{2}(11+y)$ $120 = 99 + 9y$ $21 = 9y$ $y = \frac{21}{9} = 2\frac{1}{3}$	3
4	A 10 metre length of pipe is cut in 7 places to produce smaller pipes of equal length. How long is each piece?	$\frac{10}{8} \text{ m}$ $= 1.25 \text{ m}$	2

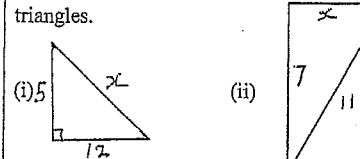
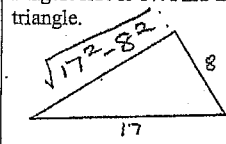
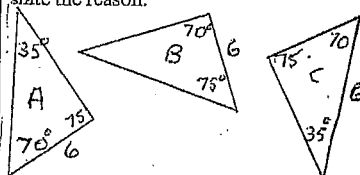
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3	A line XY, of length 16cm, bisects the line PQ, of length 12 cm., at right angles. Find the area and perimeter of the figure XPYQ. 	<p>Area = $\frac{1}{2}(12)(16)$ Perimeter = 40 $= 96$</p>	2																																				
4	Seven cubes are glued face to face as shown in the diagram. The volume of the solid is 448 cm^3 . Find the surface area. 	<p>$7x^3 = 448$ $x^3 = 64$ $x = 4$</p> <p>SA = $4 \times 4 \times 30$ SA = 480 cm^2</p>	3																																				

(SECTION C CONT.)			
5	Given $\frac{m}{m+n} = -3$ Find the value of $\frac{m}{n}$	<p>$m = -3m - 3n$ $4m = -3n$ $\therefore \frac{m}{n} = -\frac{3}{4}$</p>	2
6	A new solid is formed by gluing square base pyramids to the faces of a cube. How many faces does this new solid have?	<p>$4 \times 6 = 24$</p>	2

13

SECTION D

QUESTION	ANSWER AND WORKING	MARKS
1 Find the unknown side in each of these triangles. 	(i) $x = \sqrt{5^2 + 12^2} = \sqrt{169} = 13$ (ii) $x = \sqrt{11^2 - 7^2} = \sqrt{72}$	4
2 This triangle is right angled and the longest side is 17. Find the area of the triangle. 	$A = \frac{1}{2}bh$ $= \frac{1}{2}(8) \times \sqrt{17^2 - 8^2}$ $= \frac{1}{2}(8) \sqrt{225}$ $= 4 \times 15$ $= 60 \text{ units}^2$	2
3 Name the two congruent triangles and state the reason. 	$A \cong B \text{ (AAS)}$	3
4 A farmer raises chickens and sheep. The head count of the animals is 86 and his leg count is 218. How many sheep does he have?	$86 \text{ animals} = C + S$ $218 = 2(C) + 4(S)$ $218 = 2(86 - S) + 4(S)$ $218 = 172 - 2S + 4S$ $2S = 218 - 172$ $2S = 46$ $S = 23$ 23 Sheep	2
5 A boy plays 450 games of solitaire with a success rate of 80%. He goes on a winning streak and raises his percentage to 90%. How many games did he win in this streak?	$\frac{0.8x}{450} = 0.8$ $x = 360 \text{ games won}$ $360 + A = 90 \Delta = 450$ $450 + A = 90 \Delta = 450$	2
6 On an analog clock, through how many degrees does the hour hand move between 8:20 am and 2:15 pm?	$14\frac{2}{3} \times 15' - 08\frac{1}{2} \times 20' = 5 \text{ hr } 55$ 355 min $\frac{355}{720} \times 360 = 177.5$	2



$$360 + \Delta = 0.9(450 + \Delta)$$

$$360 + \Delta = 405 + 0.9\Delta$$

$$0.1\Delta = .45$$

$$\Delta = 450$$

SECTION E

QUESTION	ANSWER AND WORKING	MARKS																																			
1 For the set of scores 7, 11, 5, 8, 4, 8, 6, 8, 7 and 2. Find the (i) Mean (ii) Range (iii) Median (iv) Mode	(i) Mean $\frac{66}{10} = 6.6$ ① (ii) Range $11 - 2 = 9$ ① (iii) Median $\frac{7+7}{2} = 7$ ① (iv) Mode 8 ①	4																																			
2 Here is the stem and leaf plots for two classes in a maths test	<table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="2">Class A</th> <th>STEM</th> <th colspan="2">Class B</th> </tr> <tr> <th>LEAF</th> <th>STEM</th> <th></th> <th>LEAF</th> <th>STEM</th> </tr> </thead> <tbody> <tr> <td>9 7 3 1 1</td> <td>4</td> <td>4</td> <td>3 5 7 9</td> <td>4</td> </tr> <tr> <td>8 5 4 0</td> <td>5</td> <td>5</td> <td>4 6 8</td> <td>5</td> </tr> <tr> <td>6 3</td> <td>6</td> <td>6</td> <td>2 7 9 9</td> <td>6</td> </tr> <tr> <td>9 9 8</td> <td>7</td> <td>7</td> <td>5 6 7 7</td> <td>7</td> </tr> <tr> <td>7 7 3</td> <td>8</td> <td>8</td> <td>9</td> <td>8</td> </tr> </tbody> </table>	Class A		STEM	Class B		LEAF	STEM		LEAF	STEM	9 7 3 1 1	4	4	3 5 7 9	4	8 5 4 0	5	5	4 6 8	5	6 3	6	6	2 7 9 9	6	9 9 8	7	7	5 6 7 7	7	7 7 3	8	8	9	8	5
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(i) How many students in class B?	(i) 16 ①																																				
(ii) Find the median for (a) Class A (b) Class B	(ii) (a) $\frac{62+67}{2} = 64\frac{1}{2}$ ① (b) 58 ①																																				
(iii) State which class had the better average mark and why.	$\bar{x}_A = \frac{1060}{17} = 62.4$ $\bar{x}_B = \frac{1013}{16} = 63.3$ B better average, higher % generally																																				
3 A boy scored 52%, 46%, and 73% in the first three term tests. What must he score in the next test to achieve an average of 60%?	$\frac{52\% + 46\% + 73\% + x}{4} = 60\%$ next test 69% ②	2																																			
4 A basketball game lasts for 48 minutes. If a team has 8 players and 5 are on the court at all times how long does each player get on the court if playing time is evenly shared?	$\frac{48 \times 5}{8} = 30 \text{ mins}$ ② $48 \times 5 = 240 \text{ player minutes}$	2																																			
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6 Five consecutive positive odd integers add to give a sum of 105. What is the smallest number?	$x + (x+2) + (x+4) + (x+6) + (x+8) = 105$ $x \text{ is odd}$ $5x + 20 = 105$ $5x = 85$ $x = 17$ ②	2																																			

SECTION F

	QUESTION	ANSWER AND WORKING	MARKS
1	Write as simple ratios (i) $3\frac{1}{2} : 140\%$ (ii) $0.07 : 75\%$	(i) $5 : 2$ (ii) $7 : 75$	2
2	A woman leaves her estate of \$71,000 to her three sons to be distributed according to their ages. Tom is twice as old as Dick and 9 years older than Harry. How much did Harry get?		2
3	A man's bones make up 18% of his mass. If a man's bones weigh 20kg, how much did he weigh?	$M \times 0.18 = 20$ $M = 111.1 \text{ kg}$	2
4	In how many ways can a powerboard with four on/off switches be arranged so that no two adjacent switches are in the off position?	$\begin{matrix} \text{XX} \checkmark \checkmark & \text{XX} \checkmark \times \\ \checkmark \text{XX} \checkmark & \times \checkmark \text{XX} \\ \checkmark \checkmark \text{XX} & \checkmark \text{XXX} \\ \text{XXX} \checkmark & \times \text{XXX} \end{matrix}$ $2^4 - 8 = 8$	2
5	Explain why 97 can not be written as the sum of two prime numbers.	All prime numbers are odd except 2. Odd + odd = Even. $\therefore 2 + 95 = 97$ but 95 is not a prime.	2
6	Find the value of this continuous product $\left(1 + \frac{3}{1}\right)\left(1 + \frac{5}{4}\right)\left(1 + \frac{7}{9}\right)\left(1 + \frac{9}{16}\right) \dots \text{etc.} \left(1 + \frac{41}{400}\right)$	$\left(\frac{4}{1}\right)\left(\frac{9}{4}\right)\left(\frac{16}{9}\right)\left(\frac{25}{16}\right) \dots \left(\frac{441}{400}\right)$ 4.41	2
7	A man has 100 notes of denomination \$5 and \$10. He has a total of \$865. How many of each does he have?	$\$5 = 27 \text{ notes}$ $\$10 = 73 \text{ notes}$	2
8	2000 is divided by a positive integer N the remainder is 5. List all possible values of N.	3, 7, 15, 19, 21, 35, 57, 95, 105, 133, 285, 399, 665, 1495	2