SYDNEY BOYS HIGH SCHOOL

YEAR 7 MATHEMATICS

Half Yearly Examination: May 2009

Time Allowed: 60 minutes

Examiner: ...

INSTRUCTIONS:

- All questions may be attempted.
- Marks may be deducted for careless or badly arranged work.
- All working and answers are to be written in this test booklet.
- If you wish to rewrite an answer, draw a line through your faulty answer. If necessary, rewrite your answer on the back page of this booklet. Show the section, number and part of the answer being rewritten.
- **Calculators may not be used.**

Name: _____

Class	
7E Mr Gainford	
7F Mr Elliott	
7M Mr Boros	
7R Mr Choy	
7S Ms Roessler	
7T Mr Choy	

Section A	/20
Section B	/20
Section C	/20
Section D	/20
Section E	/20
Total	/100

Question 1 (17 marks)

(a) Write the numeral 203056 in words. [1]

(b) Write down the place value of the 5 in the following: [3]

(i) 6705

(ii) 10523

(iii) 2.651

(c) Are the following True (T) or False (F)? [6]

(i) $x \times x = 2x$

(ii) $-a + b = -b + a$

(iii) $x + 1 \div y = \dfrac{x+1}{y}$

(iv) $a - (-b) = a + b$

(v) $|-9+5| = 14$

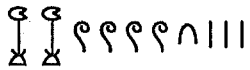
(vi) $|7 \times -5| = 35$

(d) Write the numeral for $6 \times 100000 + 8 \times 1000 + 6 \times 100 + 7 \times 1$. [1]

(e) Arrange the following in ascending order 10001, 11000, 10111, 1111 [2]

(f) By how much does the number 24753 increase if the digit 7 is replaced by a 9? [1]

(g) Write the following Egyptian numeral in Hindu-Arabic form. [1]



(h) Twelve million added to twelve thousand equals (as a numeral) [1]

(i) Find the difference between 72 and 38. [1]

Question 2 (16 marks)

(a) Draw a number plane and plot the points $A(3,1)$, $B(-2,2)$ and $C(0,-1)$ on it clearly labelling them. [3]

(b) Which of the symbols $<$, $>$ or $=$ should be used in the place of $\square$ to make a true statement in each of the following? [5]

(i) $2^2 \square 2 \times 2$

(ii) $3^2 \square 3 \times 2$

(iii) $-4^2 \square -4 \times 4$

(iv) $(-5)^2 \square (7-6)^2$

(v) $-8 \times 2 - 3 \square -8 \times (2-3)$.

(c) Write the following in expanded form in the bases specified: [2]

(i) 9403_{ten}

(ii) 11010_{two}

(d) $0.002 - 8$ equals? [1]

(e) Write the following in Roman numerals: [3]

(i) 42

(ii) 2009.

(f) Determine $n(A)$ given: [2]

(i) $A = \{2, 4, 6, 8, 10\}$

(ii) A is the set of even numbers.

Question 3 (17 marks)

(a) Are the following True (T) or False (F)? [5]

(i) $\{x, y, z\} \leftrightarrow \{\triangle, \square, \bigstar\}$

(ii) The set of letters in the alphabet is a finite set.

(iii) The set of students in Year 7 of average height is well defined.

(iv) $\{\triangle, \square, \bigstar\} = \{\square, \triangle, \bigstar\}$

(v) $1 \notin \{\text{square numbers}\}$

(b) Simplify the following: [4]

(i) $5a + 2b - a$

(ii) $8 - (13 - (4 - 7))$

(iii) $-2 \times (-8 \div 4 + 3 \times -6)$

(c) Evaluate $25 \times 381 \times 4$ [2]

(d) Which of the symbols $\in$, $\subset$, $\notin$ or $\not\subset$ should be used in the place of $\square$ to make a true statement in each of the following? [3]

(i) $5 \square \{5, 10, 15, 20\}$

(ii) $\{4, 5\} \square \{1, 3, 5, 7\}$

(iii) $\{\} \square \{0\}$.

(e) Write 42 in binary form. [2]

(f) The sum of two numbers is 224. One of the numbers is 147. What is the other number? [1]

Question 4 (16 marks)

(a) Rewrite the following expressions using mathematical symbols: [2]

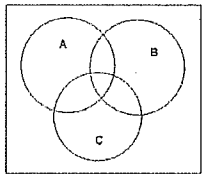
(i) 15 less than Δ is equal to 32

(ii) The square root of 2 is approximately equal to 1.4

(b) Complete the table of values given the rule $y = 1 - 2x$ [2]

x	-2	-1	0	2
y				

(c) Shade the area that represents $(A \cup B) \cap C$ on the Venn diagram below [2]



(d) Three more than negative one is added to the product of six and five less than three. What is the result? [2]

(e) Using the distributive law, or otherwise, calculate the following: [4]

(i) $23 \times 94 + 23 \times 6$

(ii) 13×999

(f) Complete the following in binary [4]

(i)

$$\begin{array}{r} 1\ 1\ 1\ 0\ + \\ \quad 1\ 1\ 1 \\ \hline \end{array}$$

(ii)

$$\begin{array}{r} 1\ 1\ 1\ 0\ - \\ \quad 1\ 1\ 1 \\ \hline \end{array}$$

Question 5 (17 marks)

(a) The average of -5, -3 and a third number is 2. What is the third number? [2]

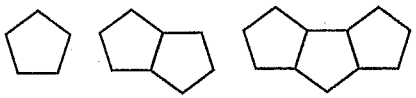
(b) Use long division to calculate $8781 \div 31$ writing your answer as a mixed numeral. [2]

(c) Use the square root algorithm to evaluate $\sqrt{105625}$ [3]

(d) Find the sum of [2]

$1 - 2 + 3 - 4 + 5 - 6 + \ldots - 998 + 999 - 1000$

(e) Consider the pattern below that is made from matchsticks. [3]



If P represents the number of pentagons and N represents the number of matchsticks needed.

(i) What is the rule connecting N and P?

(ii) How many matchsticks are needed if there are 20 pentagons?

(f) (i) Draw a Venn diagram to display the following information: [5]

$n(A) = 5$, $n(B) = 8$, $n(A \cap B) = 4$ and $n(\overline{A}) = 6$.

(ii) Hence, or otherwise, find:

(α) $n(A \cup B)$

(β) $n(\overline{B})$

(γ) $n(E)$

Question 6 (15 marks)

(a) A box of apples costs \$4, a box of oranges costs \$3 and a box of lemons costs \$2. A person buys 8 boxes of fruit at a cost of \$23. If at least one box of each kind of fruit is bought, find the largest possible number of boxes of apples. [2]

(b) In a basketball competition there are 8 teams. If each team plays each other team twice then what is the total number of matches played? [2]

(c) Find the values of $\square$ and $\triangle$ if they represent different digits [2]

$$\begin{array}{r} 3\ \square\ \triangle \\ +\ \triangle\ \square\ 3 \\ \hline 1\ \square\ 1\ \square \end{array}$$

(d) Find the values of □, △ and ★ if they represent different digits [3]

$$\begin{array}{r} \square\ \square\ \triangle\ \times \\ \qquad\quad \triangle \\ \hline \bigstar\ \triangle\ 5\ \triangle \end{array}$$

(e) Using each digit from 4, 6, 8, 9 once only find the largest number formed by [2]

□□ × □□.

(f) The people of Evenland never use odd digits. [4]

Instead of counting 1, 2, 3, 4, 5, 6, 7, ...

an Evenlander counts 2, 4, 6, 8, 20, 22, 24, ...

(i) What are the next three numerals for an Evenlander?

(ii) What is an Evenlander's version of the numeral 111?

End of paper

Use this space if you wish to REWRITE any answers

Clearly indicate the QUESTION number

Yr 7 Half-Yearly

Q(1)

(a) 2030506. 1

Two hundred & three thousands and fifty-six.

(b) (i) 5×10^0 (5 units). 1

(ii) 5×10^2 1

(iii) 5×10^{-2} 1

(c) F, F, F, T, F, T. 6

(d) 608607 1

(e) 11000, 1011, 1000, 1111 2 1111, 10001, 1011, 11000

(f) 200 1

(g) 2413. 1

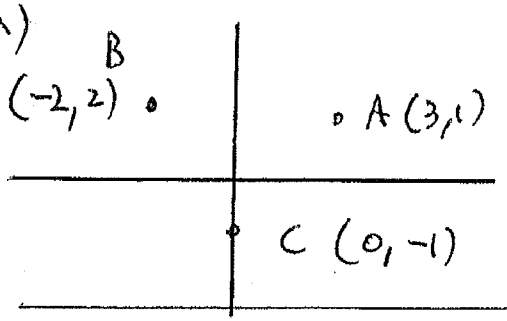
(h) 12012000. 1

(i) 34. 1

[17]

Q(2) [16]

(a)



3

(b)

(i) $2^2 = 2 \times 2$ 1

(ii) $3^2 > 3 \times 2$ 1

(iii) $-4^2 = -4 \times 4$ 1

(iv) $(-5)^2 > (7-6)^2$ 1

(v) $-8 \times 2 - 3 < -8 \times (2-3)$ 1

(c)

(i) $9 \times 10^3 + 4 \times 10^2 + 3$ 1

(ii) $11010_2 = 1 \times 2^4 + 1 \times 2^3 + 1 \times 2$ 1 1

(d) −7.998. 1

(e) (i) 42 = XLII 3

(ii) 2009 = MMIX

(f)

(i) $n(A) = 5$ 1

(ii) $n(A) = 500$, 5. 1 1

Question 3 (17 marks)

(a) Are the following True (T) or False (F)? [5]

(i) $\{x, y, z\} \leftrightarrow \{\triangle, \square, \bigstar\}$ T

(ii) The set of letters in the alphabet is a finite set. T

(iii) The set of students in Year 7 of average height is well defined. F

(iv) $\{\triangle, \square, \bigstar\} = \{\square, \triangle, \bigstar\}$ T

(v) $1 \notin$ {square numbers} F

(b) Simplify the following: [4]

(i) $5a + 2b - a$

$4a + 2b$

(ii) $8 - (13 - (4 - 7))$

-8

(iii) $-2 \times (-8 \div 4 + 3 \times -6)$

40

(c) Evaluate $25 \times 381 \times 4$ [2]

38100

(d) Which of the symbols $\in$, $\subset$, $\notin$ or $\not\subset$ should be used in the place of $\square$ to make a true statement in each of the following? [3]

(i) $5 \square \{5, 10, 15, 20\}$ $\in$

(ii) $\{4, 5\} \square \{1, 3, 5, 7\}$ $\not\subset$

(iii) $\{\} \square \{0\}$. $\subset$

(e) Write 42 in binary. [2]

2^5	2^4	2^3	2^2	2^1	2^0
32	16	8	4	2	1
1	0	1	0	1	0

101010_2.

(f) The sum of two numbers is 224. One of the numbers is 147. What is the other number? [1]

$224 = 147 + x$.

$x = 224 - 147$

$= 77$.

Question 4 (16 marks)

(a) Rewrite the following expressions using mathematical symbols: [2]

(i) 15 less than Δ is equal to 32

$\Delta - 15 = 32$ (1)

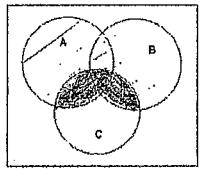
(ii) The square root of 2 is approximately equal to 1.4

$\sqrt{2} \doteq 1.4$ (1)

(b) Complete the table of values given the rule $y = 1 - 2x$ [2]

x	-2	-1	0	2
y	5	3	1	-3

(c) Shade the area that represents $(A \cup B) \cap C$ on the Venn diagram below [2]



(d) Three more than negative one is added to the product of five less than three. [2]

What is the result?

$(-1+3) \times 5$

$+2$

(e) Using the distributive law, or otherwise, calculate the following: [4]

(i) $23 \times 94 + 23 \times 6$

2300 (2)

(ii) 13×999 $(13 \times 1000) - 13 = 12987$ (2)

(f) Complete the following in binary [4]

(i)

$$\begin{array}{r} 1\ 1\ 1\ 0\ + \\ 1\ 1\ 1 \\ \hline 1\ 0\ 1\ 0\ 1 \end{array}$$

(2)

(ii)

$$\begin{array}{r} 1\ 1\ 1\ 1\ 0\ - \\ 1\ 1\ 1 \\ \hline 1\ 1\ 1 \end{array}$$

(2)

Question 5 (17 marks)

(a) The average of -5, -3 and a third number is 2. What is the third number? [2]

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

$$-8+x = 6$$

$$x = 14$$

(b) Use long division to calculate $8781 \div 31$ writing your answer as a mixed numeral. [2]

$$\begin{array}{r} 283 \\ 31\overline{)8781} \\ 62 \\ \hline 258 \\ 248 \\ \hline 101 \\ 93 \\ \hline 8 \end{array}$$

$283\frac{8}{31}$

(c) Use the square root algorithm to evaluate $\sqrt{105625}$ [3]

$$\begin{array}{r} 325 \\ \overline{)105625.} \\ 9\downarrow \\ \hline 156 \\ 124 \\ \hline 3225 \\ 3225 \\ \hline \end{array}$$

$62\underline{5}$

$645\underline{5}$

$$\sqrt{105625} = 325$$

(d) Find the sum of [2]

$$1-2+3-4+5-6+\ldots-998+999-1000$$

totals $-1+2-2\ 3-3$

$1 + 3 + 5 + 7 \ldots 999$

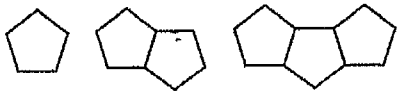
$+-2 -4 -6 -8 \ldots -1000$

-500

500×-1

$= -500$

(e) Consider the pattern below that is made from matchsticks. [3]



If P represents the number of pentagons and N represents the number matchsticks needed.

(i) What is the rule connecting N and P?

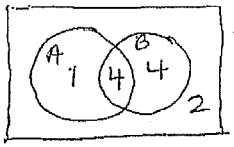
$$n = 4p + 1$$

(ii) How many matchsticks are needed if there are 20 pentagons?

81

(f) (i) Draw a Venn diagram to display the following information: [5]

$n(A) = 5$, $n(B) = 8$, $n(A \cap B) = 4$ and $n(\overline{A}) = 6$.



(ii) Hence, or otherwise, find:

(α) $n(A \cup B)$ 9

(β) $n(\overline{B})$ 3

(γ) $n(E)$ 11

Question 6 (15 marks)

(a) A box of apples costs \$4, a box of oranges costs \$3 and a box of lemons costs \$2. A person buys 8 boxes of fruit at a cost of \$23. If at least one box of each kind of fruit is bought, find the largest possible number of boxes of apples. [2]

Apples	oranges	lemons	cost
1	1	1	9
3	1	1	17
4	1	1	21
4	1	2	23
3	1	4	23

∴ 3 boxes of apples.

(b) In a basketball competition there are 8 teams. If each team plays each other team twice then what is the total number of matches played? [2]

Each team plays 14 matches.

∴ 8 teams play $14 \times 8 \div 2$ matches

$= 56$

28 = (1) 112 = (4)

(c) Find the values of □ and △ if they represent different digits [2]

$$\begin{array}{r} 3\ \square\ \triangle \\ +\ \triangle\ \square\ 3 \\ \hline 1\ \square\ 1\ \square \end{array}$$

307 + 703 = 1010

□ = 0

△ = 7

(d) Find the values of □, △ and ★ if they represent different digits [3]

$$\begin{array}{r} \square\ \square\ \triangle\ \times \\ \triangle \\ \hline \bigstar\ \triangle\ 5\ \triangle \end{array}$$

□ = 7

△ = 6

★ = 4

(e) Using each digit from 4, 6, 8, 9 once only find the largest number formed by □□ × □□. [2]

94 × 86 = 8084

94 × 86 = (1½)

(f) The people of Evenland never use odd digits. [4]

Instead of counting 1, 2, 3, 4, 5, 6, 7, ...

an Evenlander counts 2, 4, 6, 8, 20, 22, 24, ...

(i) What are the next three numerals for an Evenlander?

26, 28, 40

(ii) What is an Evenlander's version of the numeral 111?

Base 5, with substituted numerals.

5	111	
5	22	1
5	4	2
	0	4

∴ $111_{ten} = 421_{five}$

$= 842_{evenland}$

End of paper