NEWINGTON COLLEGE

Mid Year Examination 2010

YEAR 8 MATHEMATICS

Time allowed: 90 minutes

NAME: _____ CLASS: _____

Outcomes being assessed:

1. Factorises simple algebraic expressions and uses this to simplify simple algebraic fractions.
2. Operates with percentages.
3. Uses and applies Pythagoras' Theorem.
4. Uses algebraic techniques to solve linear equations and simple inequalities.
5. Constructs, reads and interprets graphs, tables, chart and statistical information.

Directions to candidates

All questions may be attempted.
In each question, show all necessary working.
The use of hand-held non-programmable calculators is permitted.
Marks will be deducted for careless or badly arranged work.

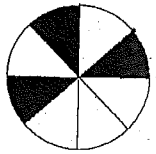
Outcome	Mark
Algebra	/20
Percentages	/20
Pythagoras' Theorem	/20
Equations	/30
Data	/10
Total	/100

Teacher's Comment:

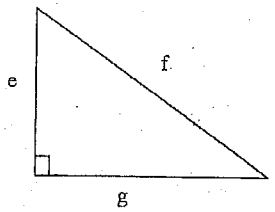
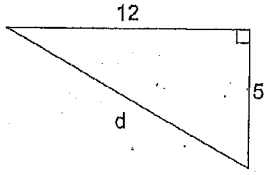
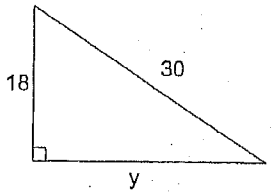
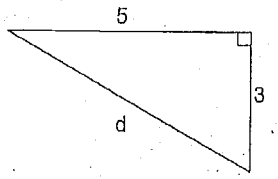
Student's Comment:

SECTION 1 **ALGEBRA**	**20 Marks**
1. The product of p and $3k$ can be written as	1
2. Circle the LIKE terms $ab^2, \frac{-ba^2}{3}, \frac{b^2a}{5}, -ab^2$	1
3. Simplify by collecting like terms: (a) $5k - 2k$ (b) $7p + 2x - 4x - 9p$	2
4. Simplify these expressions: (a) $2 \times p \times 3$ (b) $n^8 \div n^2$ (c) $-5my \times 2m$ (d) $(4x^3)^2$ (e) $-2p \times 4 - 6 \times 3p$	6

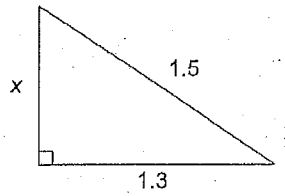
5. Expand $4p(3+4p)$	2
6. Factorise fully $8k-12ky$	1
7. Simplify completely (a) $\frac{2x}{3}\times\frac{9m}{4x}$ (b) $\frac{5m-1}{2}-\frac{m}{5}$ (c) $\frac{4c^2y^3}{7p^2cy^2}\div\frac{16cy^5}{21p^3c}$	6
8. If y is an even number, find the next two consecutive even numbers.	1

SECTION 2 PERCENTAGES	20 Marks
1. Convert 0.35 to a percentage.	1
2. Find 15% of 370 kg	1
3. Decrease \$47.50 by 80%	2
4. What percentage of this figure has been shaded? 	1
5. Change 48% to a simple fraction.	1
6. Express 4 grams as a percentage of 25 grams.	1
7. True or False $62.5\% = \frac{5}{8}$	1
8. Convert $6\frac{1}{5}\%$ to a decimal.	1

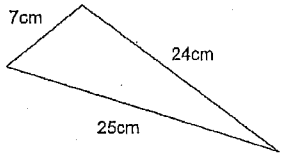
9. Peter gained 93% of a possible 600 marks. How many more marks would he need to have scored to gain 96% of the marks?	2
10. A coffee machine is bought for $895 and later sold for $950. (a) What is the profit gained? (b) Express the profit as a percentage of the cost price.	3
11. The price of a surfboard was increased by 24% and sold for $1200. Find the cost of the surfboard before the increase. Correct your answer to the nearest dollar.	2
12. A sales assistant is paid a commission of 14% on her weekly sales. Find her commission for a week in which she sells products to the value of $3450.	2
13. After spending 40% of his money on rent, a man had $450 left. How much is his rent?	2

SECTION 3 PYTHAGORAS' THEOREM	20 Marks
1. State Pythagoras' Theorem for this triangle. 	1
2. Find the length of the unknown side. a)  b) 	4
3. Find the length of the unknown side, correct to two decimal places. a) 	6

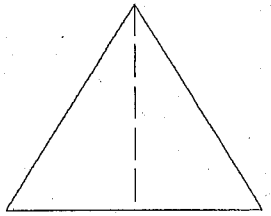
b)



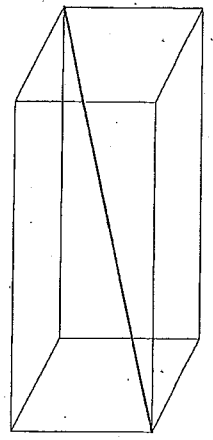
4. Use Pythagoras' Theorem to determine whether the triangle below is right-angled. 3



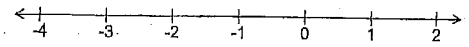
5. Find the vertical height of an equilateral triangle of side length 2cm. 3



6. Oscar has a cardboard box with dimensions $21cm \times 28cm \times 84cm$. Determine whether an umbrella of length $90cm$ will fit into the box by considering the length of the longest diagonal. 3

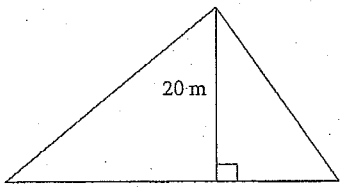


SECTION 4 EQUATIONS, INEQUATIONS AND FORMULAE	30 Marks
1. TRUE or FALSE $m = 4$ is a solution to the equation $-2m = 8$	1
2. If $y = mx + b$ and $m = 7$, $x = 4$ and $b = -3$, find the value of y.	2
3. Solve the following equations: (a) $p - 3 = 9$ (b) $\frac{c}{5} = -7$ (c) $4y - 3 = 7$ (d) $5(1 + 3x) = -10$ (e) $6p + 2 = 1 + 4p$ (f) $\frac{1 - 6x}{4} = -5$	12

4. Graph the solution of $x \leq -2$ on this number line:  	1
5. Find the missing step $2k + 3 = 15$ $2k = \_\_\_\_$ $k = 6$	1
6. Solve the inequation $4x - 1 > 2x + 9$ and graph your solution on the number line.	3
7. If $F = 32 + \frac{9c}{5}$, find the value of c when $F = 104$	2
8. 5 less than a number is -14. By letting the number be x : (a) Write an equation describing this problem (b) Find the number x	2

9. A man is twice as old as his son. If 9 years ago the sum of their ages was 66 years, find their present ages. Use an equation to solve this problem. — 3

10. The area of the triangle below is 24 square metres. — 3



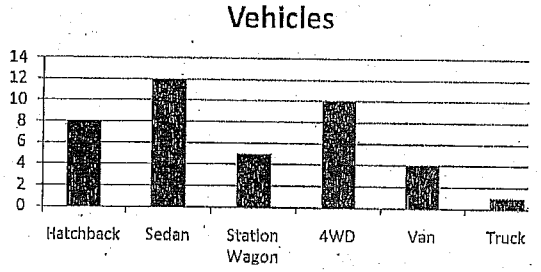
$(x - 4)$ *metres*

(a) Construct an equation to find x

(b) Find the length of the base of this triangle.

SECTION 5 DATA REPRESENTATION — 10 Marks

1. Alice recorded the cars that passed her house one afternoon and put this information into the graph below.



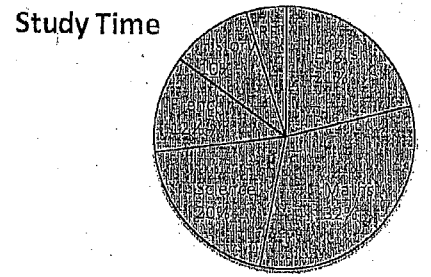
a) How many vans passed her house? — 1

b) Which was the most common type of vehicle to pass her house? — 1

c) How many vehicles in total passed her house? — 1

d) What fraction of vehicles were hatchbacks? — 1

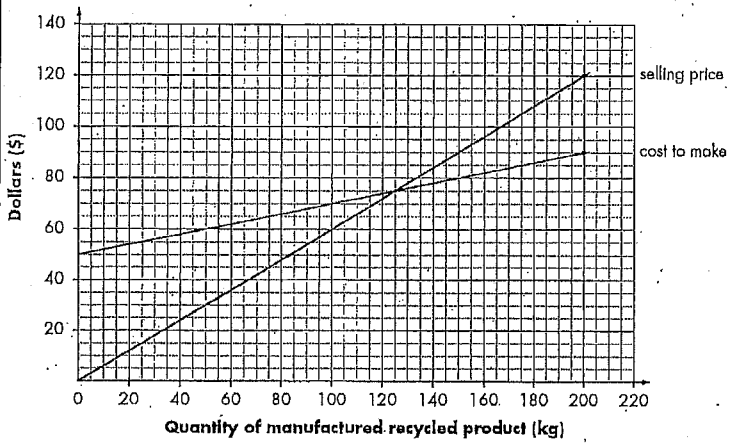
2. Lucy completed the sector graph below of the time that she spent studying for each subject for her exams.



a) What percentage is missing for studying RE? — 1

b) If she spent 500 minutes in total preparing for exams then how long did she spend studying for maths? — 2

3. Mr Green has a recycling business. He collects newspaper and turns it into shredded packing paper and garden mulch.
The graph below shows his monthly cost of manufacturing the recycled products and the price at which he sells them back to his clients.



a) How much recycled product does Mr Green need to manufacture in order to begin making a profit?

1

b) How much profit does he make on 200 kg of product?

1

c) In July, Mr Green made a loss of $10 on his recycled product. How much product did he manufacture that month?

1

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Percentages	/20
Pythagoras' Theorem	/20
Equations	/30
Data	/10
Total	/100

Teacher's Comment:

Student's Comment:

SECTION 1 ALGEBRA — 20 Marks

1. The product of p and $3k$ can be written as $p \times 3k$ $= 3pk$ ✓ — 1

2. Circle the LIKE terms — 1

(ab^2), $\frac{-ba^2}{3}$, $(\frac{b^2a}{5})$, $(-ab^2)$ ✓

3. Simplify by collecting like terms: — 2

(a) $5k - 2k = 3k$ ✓

(b) $7p + 2x - 4x - 9p = -2p - 2x$ ✓

4. Simplify these expressions: — 6

(a) $2 \times p \times 3 = 6p$ ✓

(b) $n^8 \div n^2 = n^6$ ✓

(c) $-5my \times 2m = -10m^2y$ ✓

(d) $(4x^3)^2 = 16x^6$ ✓

(e) $-2p \times 4 - 6 \times 3p = -8p - 18p$ ✓

$= -26p$ ✓

5. Expand — 2

$4p(3+4p) = 12p + 16p^2$ ✓ ✓ (1 for only one part correct)

6. Factorise fully — 1

$8k - 12ky = 4k(2 - 3y)$

7. Simplify completely. — 6

(a) $\frac{2x}{3} \times \frac{9m}{4x} = \frac{18xm}{12x} = \frac{3m}{2}$ ✓ ✓

(b) $\frac{5m-1}{2} - \frac{m}{5} = \frac{5(5m-1)}{10} - \frac{2m}{10}$ ✓

$= \frac{25m - 5 - 2m}{10}$

$= \frac{23m - 5}{10}$ ✓

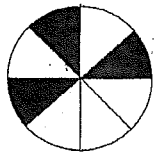
(c) $\frac{4c^2y^3}{7p^2cy^2} \div \frac{16cy^5}{21p^3c} = \frac{4c^2y^3}{7p^2cy^2} \times \frac{21p^3c}{16cy^5}$

$= \frac{3pc}{4y^4}$ ✓✓

(1 mark for $\frac{84c^3y^3p^3}{112c^2p^2y^7}$)

8. If y is an even number, find the next two consecutive even numbers. — 1

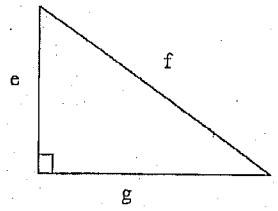
$y + 2, y + 4$

SECTION 2 PERCENTAGES	20 Marks
1. Convert 0.35 to a percentage. 35%	1
2. Find 15% of 370 kg 55.5 kg	1
3. Decrease \$47.50 by 80% ½ $0.8 \times 47.50 = 38$ ½ ½ $47.50 - 38 = 9.50$ ½ or 0.2×47.50 ½ $= \$9.50$ ½	2
4. What percentage of this figure has been shaded?  $\frac{3}{8} \times 100 = 37.5\%$	1
5. Change 48% to a simple fraction. $\frac{48}{100} = \frac{12}{25}$	1
6. Express 4 grams as a percentage of 25 grams. $\frac{4}{25} \times 100 = 16\%$	1
7. True or False $62.5\% = \frac{5}{8}$ TRUE	1
8. Convert $6\frac{1}{5}\%$ to a decimal. 0.062	1

9. Peter gained 93% of a possible 600 marks. How many more marks would he need to have scored to gain 96% of the marks? $0.93 \times 600 = 558$ marks $0.96 \times 600 = 576$ marks (1 for either 558 or 576) Peter needs to score 18 more marks. 2/	2
10. A coffee machine is bought for \$895 and later sold for \$950. (a) What is the profit gained? $\$950 - \$895 = \$55$ 1/ (b) Express the profit as a percentage of the cost price. $\frac{55}{895} \times 100 = 6.145...$ 1/ 1/ $= 6.15\%$ (correct to 2 dp)	3
11. The price of a surfboard was increased by 24% and sold for \$1200. Find the cost of the surfboard before the increase. Correct your answer to the nearest dollar. $124\% \rightarrow \$1200$ $1\% \rightarrow \frac{1200}{124}$ ½ $= 9.6774...$ $\therefore 100\%$ is \$967.74 \$968 to the nearest dollar 1/	2
12. A sales assistant is paid a commission of 14% on her weekly sales. Find her commission for a week in which she sells products to the value of \$3450. Commission $= \frac{14}{100} \times 3450$ 1/ $= \$483$ 1/	2
13. After spending 40% of his money on rent, a man had \$450 left. How much is his rent? $60\% \rightarrow \$450$ $1\% \rightarrow \frac{450}{60} = 7.5$ 1/ $40\% \rightarrow \$300$ $\therefore$ Rent is \$300 1/	2

SECTION 3 PYTHAGORAS' THEOREM — 20 Marks

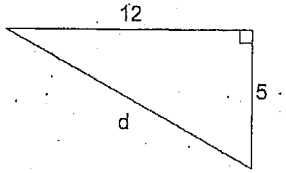
1. State Pythagoras' Theorem for this triangle. **1**



$e^2 + g^2 = f^2$

2. Find the length of the unknown side. **4**

a)

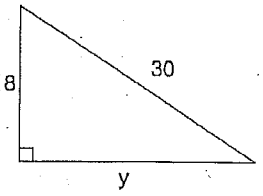


$d = \sqrt{12^2 + 5^2}$ 1

$= \sqrt{169}$

$= 13.$ 1

b)



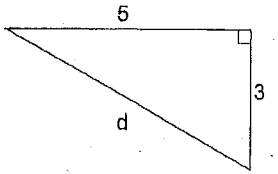
$y = \sqrt{30^2 - 18^2}$ 1

$= \sqrt{576}$

$= 24.$ 1

3. Find the length of the unknown side, correct to two decimal places. **6**

a)

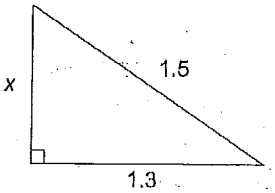


$d = \sqrt{5^2 + 3^2}$ 1

$= \sqrt{34}$ 1

$= 5.83$ 1

b)

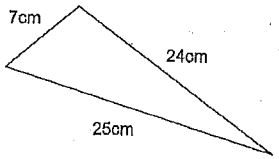


$x = \sqrt{1.5^2 - 1.3^2}$ 1

$= \sqrt{0.56}$ 1

$= 0.75$ 1

4. Use Pythagoras' Theorem to determine whether the triangle below is right-angled. **3**



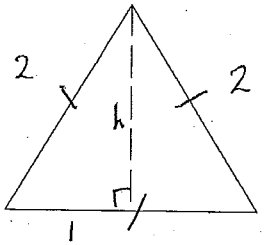
$7^2 = 49$ $24^2 = 576$ $25^2 = 625$ 1

$49 + 576 = 625$ 1

Since $7^2 + 24^2 = 25^2$ 1

then $\triangle$ is RIGHT ANGLED.

5. Find the vertical height of an equilateral triangle of side length 2cm. **3**

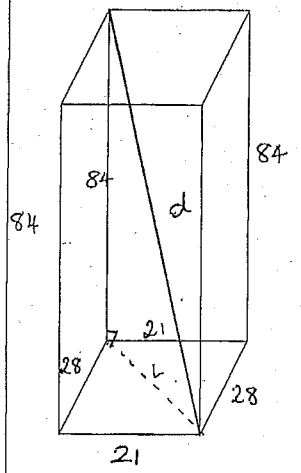


$h = \sqrt{2^2 - 1^2}$ 1

$= \sqrt{3}$ 1

$= 1.73$ (correct to 2 dp) 1

6. Oscar has a cardboard box with dimensions $21cm \times 28cm \times 84cm$. Determine whether an umbrella of length $90cm$ will fit into the box by considering the length of the longest diagonal. 3



Step 1 Find L

$L = \sqrt{28^2 + 21^2}$

$= \sqrt{784 + 441}$

$= \sqrt{1225}$ $(= 35)$

$= 35$ cm

Step 2 Find diagonal d

$d = \sqrt{84^2 + 35^2}$

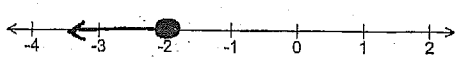
$= \sqrt{8281}$

$= 91$ cm

∴ If the length of the umbrella is 90 cm and the diagonal length of box is 91 cm, then the umbrella WILL fit into the box.

SECTION 4 EQUATIONS, INEQUATIONS AND FORMULAE	30 Marks
1. TRUE or FALSE $m = 4$ is a solution to the equation $-2m = 8$ $-2 \times 4 = -8$ ∴ FALSE	1
2. If $y = mx + b$ and $m = 7, x = 4$ and $b = -3$, find the value of y. $y = 7 \times 4 - 3$ 1 $= 28 - 3 = 25$ 1	2
3. Solve the following equations:	12
(a) $p - 3 = 9$ $p = 12$ 1	
(b) $\frac{c}{5} = -7$ $c = -35$ 1	
(c) $4y - 3 = 7$ $4y = 10$ 1 $y = \frac{10}{4} = 2\frac{1}{2}$ 1	
(d) $5(1+3x) = -10$ $5(1+3x) = -10$ $5 + 15x = -10$ 1 $15x = -15$ 1 $x = -1$ 1	
(e) $6p + 2 = 1 + 4p$ $2p = -1$ 1 $p = -\frac{1}{2}$ 1	
(f) $\frac{1-6x}{4} = -5$ $1 - 6x = -20$ 1 $-6x = -21$ 1 $x = \frac{-21}{-6} = 3\frac{1}{2}$ 1	

4. Graph the solution of $x \leq -2$ on this number line: — 1



1/

5. Find the missing step — 1

$2k + 3 = 15$

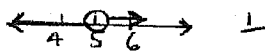
$2k = 12$ 1/

$k = 6$

6. Solve the inequation $4x - 1 > 2x + 9$ and graph your solution on the number line. — 3

$2x > 10$ 1/

$x > 5$ 1/



1/

7. If $F = 32 + \frac{9c}{5}$, find the value of c when $F = 104$ — 2

$104 = 32 + \frac{9c}{5}$ 1/

$\frac{9c}{5} = 72$ $c = \frac{72}{9/5} = 40$ 1/

8. 5 less than a number is -14. By letting the number be x : — 2

(a) Write an equation describing this problem $x - 5 = -14$ 1/

(b) Find the number x

$x = -9$ 1/

∴ The number is -9.

9. A man is twice as old as his son. If 9 years ago the sum of their ages was 66 years, find their present ages. Use an equation to solve this problem. — 3

Let son = x

father = $2x$

9 years ago

father = $2x - 9$ 1/

son = $x - 9$

$(2x - 9) + (x - 9) = 66$ 1/

$3x - 18 = 66$

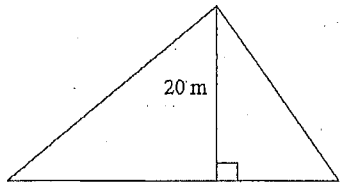
$3x = 84$

$x = 28$

∴ Son is 28 yrs old, 1/

father is 56 yrs old

10. The area of the triangle below is 24 square metres. — 3



$(x - 4)$ *metres*

(a) Construct an equation to find x $A = \frac{1}{2} \times \text{base} \times \text{height}$

$24 = \frac{1}{2} \times (x - 4) \times 20$ 1/

(or or $24 = 10(x - 4)$ or $24 = 10x - 40$)

(b) Find the length of the base of this triangle.

$\frac{1}{2} \times (x - 4) \times 20 = 24$

$10(x - 4) = 24$

$10x - 40 = 24$ 1/

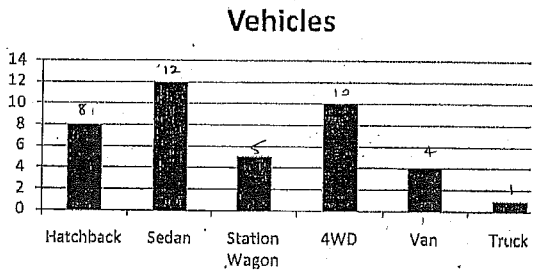
$10x = 64$

$x = 6.4$

∴ Base is $6.4 - 4 = 2.4$ metres 1/

SECTION 5 DATA REPRESENTATION — 10 Marks

1. Alice recorded the cars that passed her house one afternoon and put this information into the graph below.



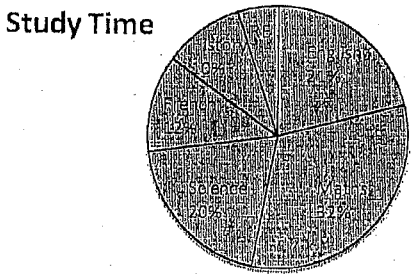
a) How many vans passed her house? 4 — 1

b) Which was the most common type of vehicle to pass her house? SEDAN. — 1

c) How many vehicles in total passed her house? 40 — 1

d) What fraction of vehicles were hatchbacks? $\frac{8}{40} = \frac{1}{5}$ — 1

2. Lucy completed the sector graph below of the time that she spent studying for each subject for her exams.

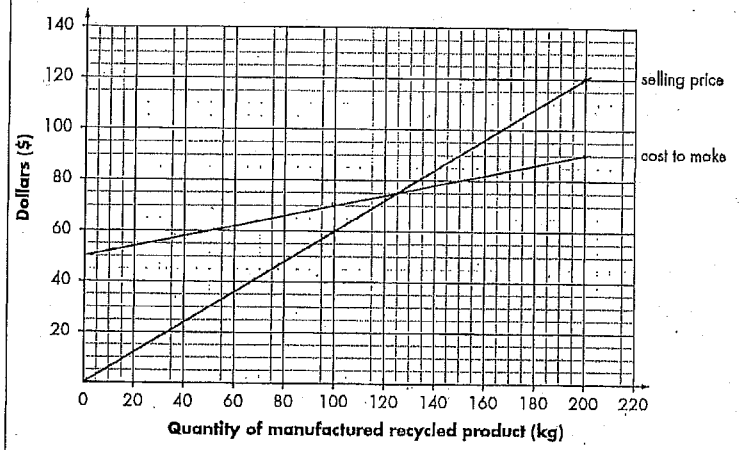


a) What percentage is missing for studying RE? 5% — 1

b) If she spent 500 minutes in total preparing for exams then how long did she spend studying for maths? — 2

32% × 500
= 160 minutes or 2 hours 40 minutes

3. Mr Green has a recycling business. He collects newspaper and turns it into shredded packing paper and garden mulch.
The graph below shows his monthly cost of manufacturing the recycled products and the price at which he sells them back to his clients.



a) How much recycled product does Mr Green need to manufacture in order to begin making a profit? — 1

125 kg.

b) How much profit does he make on 200 kg of product? — 1

Cost to make: $90
Sells = $120 ∴ Profit = $30.

c) In July, Mr Green made a loss of $10 on his recycled product. How much product did he manufacture that month? — 1

100 kg.