

NEWINGTON COLLEGE



Mid Year Examination 2011

YEAR 8 MATHEMATICS

Time allowed: 90 minutes

NAME: _____ Teacher: _____

- Outcomes being assessed:**
1. Factorises simple algebraic expressions and uses this to simplify simple algebraic fractions.
 2. Operates with percentages.
 3. Uses algebraic techniques to solve linear equations and simple inequalities.
 4. Uses and applies Pythagoras' Theorem.
 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.

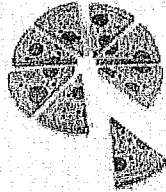
Outcome	Mark
Algebra	/20
Percentages	/20
Equations	/30
Pythagoras' Theorem	/20
Data	/10
Total	/100

Teacher's Comment:

Student's Comment:

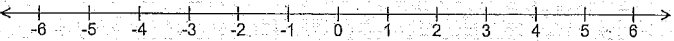
SECTION 1	ALGEBRA	20 Marks
1.	True or False $x + 4 = \frac{x}{4}$	1
2.	Circle the UNLIKE term $\frac{3p}{4}, 7pt, -8p, p$	1
3.	Simplify by collecting like terms: (a) $3y^2 + 5y^2$ (b) $8 + 6t - 4 - 9t$	2
4.	Simplify these expressions: (a) $2m \times 3k$ (b) $8m^9 + 2m^3$ (c) $\frac{5xy}{10xy}$ (d) $\frac{6p \times 2p}{4p - 2p}$ (e) $(5k^5)^2$	6

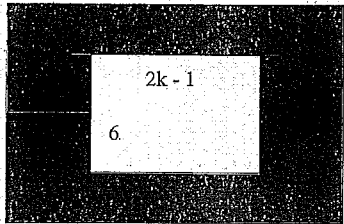
5. Factorise fully $2py - 8$	1
6. Find the average of $2a$, $3a$ and $4b$	1
7. Simplify $\frac{4x + 4y}{9x + 9y}$	2
8. Expand and simplify $3m - 7(1 - 2m)$	2
9. Simplify $\frac{2x}{7} - \frac{x}{2} =$	2
10. Simplify completely $\frac{7m^2n^3}{8k^3m^4} \times \frac{12mk^4}{21n^5}$	2

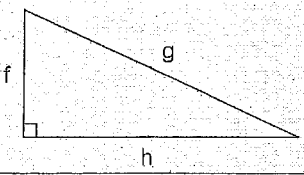
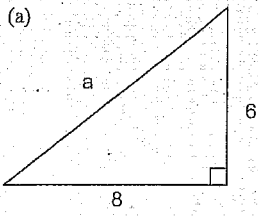
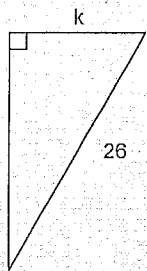
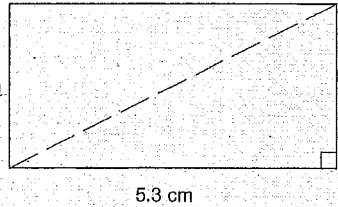
SECTION 2	PERCENTAGES	20 Marks
1.	Convert $\frac{2}{5}$ to a percentage.	1
2.	Find 25% of \$200	1
3.	If the population of a country increases by 6% then what will the new population be as a percentage of the original population?	1
4.	Convert to a fraction in simplest form: (a) 54% (b) 624%	1 1
5.	During a season Oscar scores 16 goals. The next season he increases his goal scoring by 37.5%. How many goals does he score?	2
6.	A pizza is sliced into 8 equal pieces and I eat one of the pieces. What percentage of the pizza remains? 	2

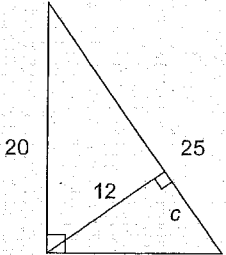
7.	During a 10% off sale Jack buys a DVD for \$35.10. (a) What was the original price of the DVD? (b) How much did Jack save?	2 1
8.	A 30g muesli bar contains 26.4% fat. If this is 12% of the recommended daily intake (RDI) of fat, then how many grams is the RDI of fat?	3
9.	Alex buys a house for \$480 000 and sells it for \$552 000. What percentage profit has he made?	2
10.	A car salesman receives a commission each month of 2.6% on the first \$200 000 of sales and 3.4% for the remaining sales. What was the value of his sales in a month in which he earned a commission of \$7920?	3

SECTION 3 EQUATIONS, INEQUALITIES AND FORMULAE	30 marks
1. Which of these expressions is an equation: A) $5p - 1$ or B) $2p = 3$	1
2. If $x \geq -3$, would $x = 0$ satisfy this inequality?	1
3. Given $A = \frac{1}{2}bh$, $b=20$ and $h=15$, find the value of A.	1
4. Solve the following equations: (a) $x + 7 = 12$ (b) $3p = -15$ (c) $8(t - 3) = -40$ (d) $8n - 3 = 6n - 8$ (e) $5 + \frac{x}{2} = 7$	9

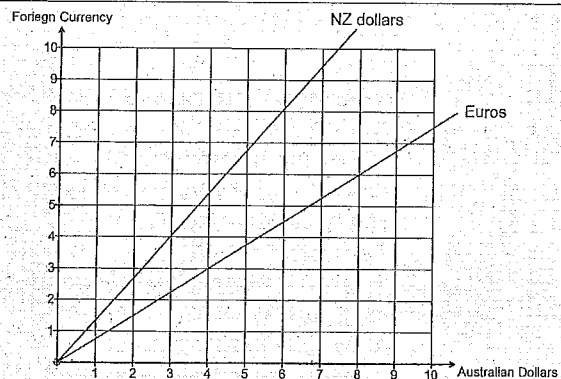
<p>5. Graph the solution of $x > -4$ on this number line:</p> 	1
<p>6. If $S = \frac{n}{2}(a + l)$, $S=20$, $a=13$ and $l=12$, find the value of n</p>	3
<p>7. Solve the inequation $\frac{x-6}{2} \leq -5$ and graph your solution on the number line.</p>	3
<p>8. The product of a number and 6 is 84. By letting the number be y,</p> <p>(a) Write an equation describing the problem using y</p> <p>(b) Find y</p>	2
<p>9. Show by calculation that $n = -4$ is a solution to the equation $3(n - 2) = 2 + 5n$</p>	2

<p>10. The sum of three consecutive numbers (numbers that follow one another) is equal to 42.</p> <p>By forming an equation using x, solve the equation to find the three numbers.</p>	3
<p>11. In the diagram below, the shaded region has an area of 70 cm^2. All measurements are in centimetres.</p>  <p>(a) Form an equation to represent the shaded region. (The area formula for a rectangle is $A = \text{Length} \times \text{Breadth}$)</p> <p>(b) Solve the equation to find the value of the pronumeral k.</p>	4

SECTION 4 PYTHAGORAS' THEOREM		20 Marks
<p>1. State Pythagoras' Theorem for this triangle.</p> 	1	1
<p>2. Calculate the value of the pronumeral:</p> <p>(a)</p>  <p>(b)</p> 	2	2
<p>3. Calculate the length of the diagonal, correct to 1 decimal place.</p> 	3	3

<p>4. In front of a wall I dig a garden bed 3 metres in width. How high up the wall can a 10 metre ladder reach, given that the foot of the ladder can't be placed in the garden bed? Give your answer to the nearest centimetre.</p>	3
<p>5. Calculate the value of the pronumeral to one decimal place.</p> 	3

2.



- a) \$NZ8 is equal to how many Australian dollars?
- b) \$6 in Australian dollars is equal to how many Euros?
- c) Lucy goes to several online DVD stores. She has the option of buying a DVD at one store for \$NZ40 or at another store for 30 Euros. Which option should she choose? Use mathematical working to justify your answer.

1

1

2

NEWINGTON COLLEGE



Mid Year Examination 2011
YEAR 8 MATHEMATICS

Time allowed: 90 minutes

NAME: SOLUTIONS Teacher: _____

- Outcomes being assessed:
1. Factorises simple algebraic expressions and uses this to simplify simple algebraic fractions.
 2. Operates with percentages.
 3. Uses algebraic techniques to solve linear equations and simple inequalities.
 4. Uses and applies Pythagoras' Theorem.
 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.

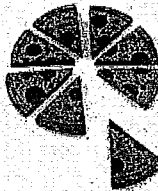
Outcome	Mark
Algebra	/20
Percentages	/20
Equations	/30
Pythagoras' Theorem	/20
Data	/10
Total	/100

Teacher's Comment:

Student's Comment:

SECTION 1	ALGEBRA	20 Marks
1.	True or False $x+4 = \frac{x}{4}$ TRUE	1
2.	Circle the UNLIKE term $\frac{3p}{4}, (7pt), -8p, p$	1
3.	Simplify by collecting like terms: (a) $3y^2 + 5y^2$ $8y^2$ (b) $8 + 6t - 4 - 9t$ $4 - 3t$	2
4.	Simplify these expressions: (a) $2m \times 3k = 6mk$ ✓ (b) $8m^2 + 2m^3 = 4m^6$ ✓ (c) $\frac{5xy}{10xy} = \frac{1}{2}$ ✓ (d) $\frac{6p \times 2p}{4p - 2p} = \frac{12p^2}{2p}$ ✓ $= 6p$ ✓ (e) $(5k^5)^2 = 25k^{10}$ ✓	6

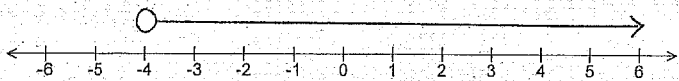
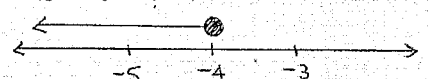
5. Factorise fully	$2py - 8 = 2(py - 4)$	1
6. Find the average of $2a, 3a$ and $4b$	$\frac{2a + 3a + 4b}{3} = \frac{5a + 4b}{3}$	1
7. Simplify	$\frac{4x + 4y}{9x + 9y} = \frac{4(x+y)}{9(x+y)} = \frac{4}{9}$	2
<div style="border: 1px solid black; padding: 2px;"> No marks for correct answer but incorrect cancelling i.e. getting $\frac{x}{12} = \frac{4}{9}$ </div>		
8. Expand and simplify	$3m - 7(1 - 2m) = 3m - 7 + 14m = 17m - 7$	2
9. Simplify	$\frac{2x}{7} - \frac{x}{2} = \frac{4x}{14} - \frac{7x}{14} = \frac{-3x}{14}$	2
<div style="border: 1px solid black; padding: 2px;"> No marks for $\frac{x}{5}$ </div>		
10. Simplify completely	$\frac{7m^3n^3}{8k^3m^4} \times \frac{12mk^4}{21n^5} = \frac{84m^3n^3k^4}{168m^4n^5k^3} = \frac{k}{2mn^2}$	2

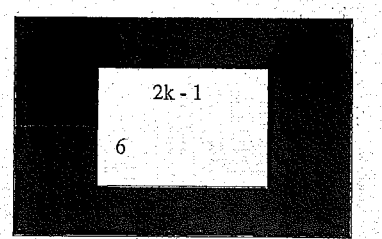
SECTION 2 PERCENTAGES		20 Marks
1. Convert $\frac{2}{5}$ to a percentage.	40%	1
2. Find 25% of \$200	\$50	1
3. If the population of a country increases by 6% then what will the new population be as a percentage of the original population?	106%	1
4. Convert to a fraction in simplest form:		
(a) 54%	$\frac{54}{100} = \frac{27}{50}$	1
(b) 624%	$\frac{624}{100} = \frac{156}{25} = 6\frac{6}{25}$	1
<div style="border: 1px solid black; border-radius: 15px; padding: 5px; display: inline-block;"> Only deduct 1 mark if both are unsimplified </div>		
5. During a season Oscar scores 16 goals. The next season he increases his goal scoring by 37.5%. How many goals does he score?	$\frac{37.5}{100} \times 16 = 6$ $16 + 6 = 22$ ∴ Oscar scores 22 goals	2
6. A pizza is sliced into 8 equal pieces and I eat one of the pieces. What percentage of the pizza remains?	 $\frac{7}{8} \times 100 = 87.5\%$	2

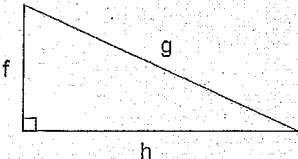
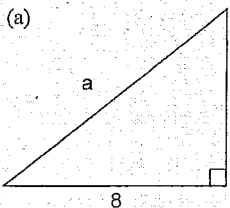
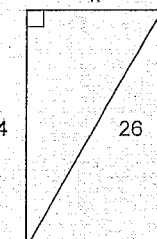
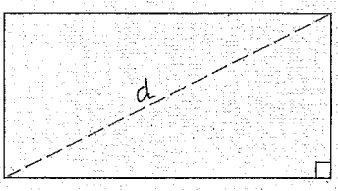
<p>7. During a 10% off sale Jack buys a DVD for \$35.10.</p> <p>(a) What was the original price of the DVD?</p> <p style="margin-left: 40px;">90% of the price is \$35.10 ✓ 1% of the price is \$0.39 ✓ 100% of the price is \$39.00 ✓</p> <p>(b) How much did Jack save?</p> <p style="margin-left: 40px;">\$3.90</p>	<p>2</p> <p>1</p>
<p>8. A 30g muesli bar contains 26.4% fat. If this is 12% of the recommended daily intake (RDI) of fat, then how many grams is the RDI of fat?</p> <p style="margin-left: 40px;">$\frac{26.4}{100} \times 30g = 7.92g$ ✓ 12% of RDI is 7.92g ✓ 1% of RDI is 0.66g ✓ 100% of RDI is 66g ✓</p>	<p>3</p>
<p>9. Alex buys a house for \$480 000 and sells it for \$552 000. What percentage profit has he made?</p> <p style="margin-left: 40px;">Profit = \$552 000 - \$480 000 = \$72 000 ✓</p> <p style="margin-left: 40px;">$\frac{72000}{480000} \times 100\% = 15\%$ ✓</p>	<p>2</p>
<p>10. A car salesman receives a commission each month of 2.6% on the first \$200 000 of sales and 3.4% for the remaining sales. What was the value of his sales in a month in which he earned a commission of \$7920?</p> <p style="margin-left: 40px;">$\frac{2.6}{100} \times \\$200000 = \\$5200$ ✓ \$7920 - \$5200 = \$2720 ✓ 3.4% is \$2720 ✓ 1% is \$800 ✓ 100% is \$80 000 ✓</p>	<p>3</p>

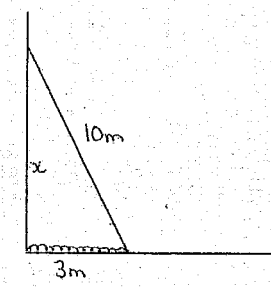
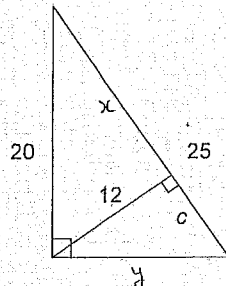
∴ Total sales = \$200 000 + 4 \$80 000
 = \$280 000 ✓

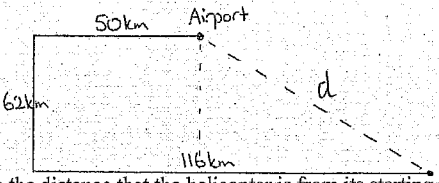
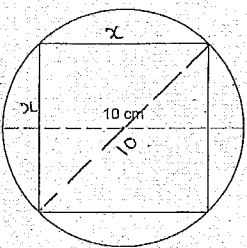
SECTION 3 EQUATIONS, INEQUATIONS AND FORMULAE	30 marks
<p>1. Which of these expressions is an equation:</p> <p style="margin-left: 40px;">A) $5p - 1$ or B) $2p = 3$</p>	<p>1</p>
<p>2. If $x \geq -3$, would $x = 0$ satisfy this inequation?</p> <p style="margin-left: 40px;">YES</p>	<p>1</p>
<p>3. Given $A = \frac{1}{2}bh$, $b=20$ and $h=15$, find the value of A.</p> <p style="margin-left: 40px;">$A = \frac{1}{2} \times 20 \times 15 = 150$</p>	<p>1</p>
<p>4. Solve the following equations:</p> <p>(a) $x + 7 = 12$ $x = 5$ ✓</p> <p>(b) $3p = -15$ $p = -5$ ✓</p> <p>(c) $8(t - 3) = -40$ $8t - 24 = -40$ ✓ $8t = -16$ ✓ $t = -2$ ✓</p> <p>(d) $8n - 3 = 6n - 8$ $2n - 3 = -8$ ✓ $2n = -5$ ✓ $n = \frac{-5}{2}$ ✓</p> <p>(e) $5 + \frac{x}{2} = 7$ $\frac{x}{2} = 2$ ✓ $x = 4$ ✓</p>	<p>9</p>

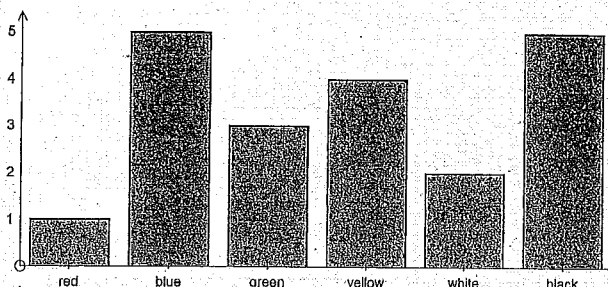
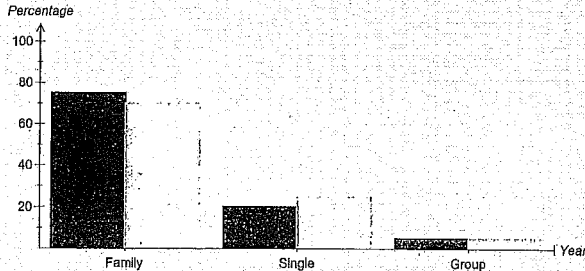
<p>5. Graph the solution of $x > -4$ on this number line:</p> 	1
<p>6. If $S = \frac{n}{2}(a+1)$, $s=20$, $a=13$ and $l=12$, find the value of n</p> <p>$20 = \frac{n}{2}(13+12)$ ✓ $40 = 25n$ ✓ $20 = \frac{n}{2} \times 25$ ✓ $n = 1.6$ ✓ $20 = \frac{25n}{2}$</p>	3
<p>7. Solve the inequation $\frac{x-6}{2} \leq -5$ and graph your solution on the number line.</p> <p>$x-6 \leq -10$ ✓ $x \leq -4$ ✓</p> 	3
<p>8. The product of a number and 6 is 84. By letting the number be y,</p> <p>(a) Write an equation describing the problem using y</p> <p>$6y = 84$ ✓</p> <p>(b) Find y</p> <p>$y = 14$ ✓</p>	2
<p>9. Show by calculation that $n = -4$ is a solution to the equation $3(n-2) = 2 + 5n$</p> <p>LHS = $3(-4-2)$ RHS = $2+5 \times -4$ $= 3 \times -6$ $= 2-20$ $= -18$ ✓ $= -18$ ✓</p> <p>\therefore LHS = RHS $\therefore n = -4$ is a solution</p>	2

<p>10. The sum of three consecutive numbers (numbers that follow one another) is equal to 42.</p> <p>By forming an equation using x, solve the equation to find the three numbers.</p> <p>$x + x+1 + x+2 = 42$ ✓ <u>Must use equation</u> $3x + 3 = 42$ ✓ $3x = 39$ $x = 13$ ✓ \therefore 3 numbers are 13, 14, 15</p>	3
<p>11. In the diagram below, the shaded region has an area of 70 cm^2. All measurements are in centimetres.</p>  <p>(a) Form an equation to represent the shaded region. (The area formula for a rectangle is $A = \text{Length} \times \text{Breadth}$)</p> <p>$70 = 8(3k+2) - 6(2k-1)$ ✓ ✓ one mark for each rectangle</p> <p>(b) Solve the equation to find the value of the pronumeral k.</p> <p>$70 = 24k + 16 - 12k + 6$ ✓ $70 = 12k + 22$ $48 = 12k$ $k = 4$ ✓</p>	4

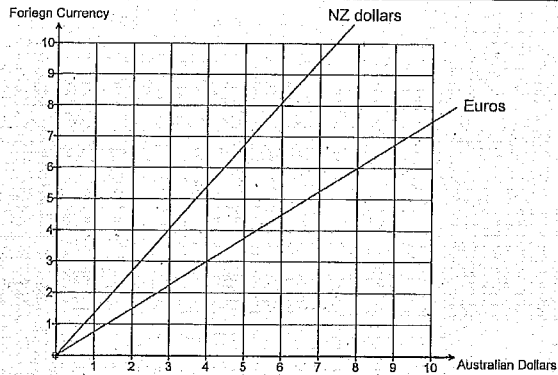
SECTION 4 PYTHAGORAS' THEOREM		20 Marks
1. State Pythagoras' Theorem for this triangle.	 $g^2 = f^2 + h^2$	1
2. Calculate the value of the pronumeral:	<p>(a)</p>  $a^2 = 6^2 + 8^2$ $a^2 = 100$ $a = 10$	2
	<p>(b)</p>  $26^2 = k^2 + 24^2$ $k^2 = 26^2 - 24^2$ $k^2 = 100$ $k = 10$	2
3. Calculate the length of the diagonal, correct to 1 decimal place	 $d^2 = 5.3^2 + 3.4^2$ $d^2 = 39.65$ $d = 6.3 \text{ (1 d.p.)}$	3

4. In front of a wall I dig a garden bed 3 metres in width. How high up the wall can a 10 metre ladder reach, given that the foot of the ladder can't be placed in the garden bed? Give your answer to the nearest centimetre.	 $10^2 = x^2 + 3^2$ $x^2 = 10^2 - 3^2$ $x^2 = 91$ $x = 9.539392014$ $x = 9.54 \text{ (nearest cm)}$	3
5. Calculate the value of the pronumeral to one decimal place.	 $20^2 = x^2 + 12^2$ $x^2 = 20^2 - 12^2$ $x^2 = 256$ $x = 16$ $c = 25 - 16$ $c = 9$ <p>OR</p> $25^2 = y^2 + 20^2$ $y^2 = 25^2 - 20^2$ $y^2 = 225$ $y = 15$ $15^2 = c^2 + 12^2$ $c^2 = 15^2 - 12^2$ $c^2 = 81$ $c = 9$	3

6.	A helicopter takes off from the Airport and flies due west for 50 km, it then changes course to fly due south for 62 km, and changes course again to fly due east for 116 km.		1
(a)	Draw a neat diagram, showing all values		
(b)	Calculate the distance that the helicopter is from its starting point.	$116\text{km} - 50\text{km} = 66\text{km}$ ✓ $d^2 = 66^2 + 62^2$ ✓ $d^2 = 8200$ ✓ $d = 90.55\text{ km (2 d.p.)}$ ✓	3
7.	Calculate the length of the side of the largest square that will fit inside a circle of diameter 10 cm. Give your answer to 1 decimal place.	 $x^2 + x^2 = 10^2$ ✓ $2x^2 = 100$ $x^2 = 50$ $x = 7.1\text{ cm (1 d.p.)}$ ✓	2

SECTION 4	DATA REPRESENTATION		10 marks
<p>1. Alex buys a bag of mixed jellybeans. He records the colours of the jellybeans in the column graph below:</p> 			
	<p>a) How many of the jellybeans were white? 2</p>		1
	<p>b) What were the least common jellybean? red</p>		1
	<p>c) How many jellybeans were there in total? 20</p>		1
	<p>d) What fraction of the jellybeans were not black? $\frac{15}{20} = \frac{3}{4}$ accept either</p>		1
<p>2. The graph below shows the types of households that people lived in during 1992 and 2003.</p> 			
	<p>a) What type of household was most common in 1992? family</p>		1
	<p>b) Which type of household increased from 1992 to 2003? single</p>		1

2.



- a) \$NZ8 is equal to how many Australian dollars? $\$6$ (or $\$5.90$) 1
- b) \$6 in Australian dollars is equal to how many Euros? $\$4.50$ 1
- c) Lucy goes to several online DVD stores. She has the option of buying a DVD at one store for \$NZ40 or at another store for 30 Euros. Which option should she choose? Use mathematical working to justify your answer. 2

$$\$NZ40 = \$30$$

$$30 \text{ Euros} = \$40$$

\therefore Should choose the \$NZ40 option

No working = no marks