

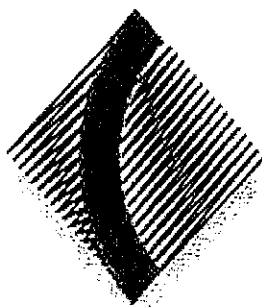
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NAME _____

CLASS 11MT _____

Total Mark ____ / 48

CHERRYBROOK TECHNOLOGY HIGH SCHOOL



2017

YEAR 11

AT1

MATHEMATICS

Time allowed – 45 minutes

THERE IS NO READING TIME

DIRECTIONS TO CANDIDATES:

- Write your name and class in the space provided at the top of this page.
- Attempt all questions.
- Reference Sheet is provided.
- For multiple-choice questions, please select A, B, C or D and write the letter in the answer column.
- All necessary working should be shown in the space provided. Full marks may not be awarded for careless or badly arranged work.
- Approved calculators may be used.

Questions		Working/Answers	Marks
1	Evaluate correct to 5 significant figures. $\sqrt[4]{\frac{28.1^2}{5^3}}$ (A) 1.5853 (B) 1.5854 (C) 1.58535 (D) 1.58530		1
2	Simplify (i) $4\sqrt{2} \times 6\sqrt{5}$ (ii) $3\sqrt{12} - 2\sqrt{18} + 4\sqrt{98}$	(i) (ii)	1 2
3	Jessica earns \$1140 each week. She spends $\frac{1}{3}$ of her salary on rent and utilities, $\frac{1}{4}$ on food and $\frac{1}{12}$ on outings. She saves the rest. How much does she save?		1
4	$\frac{3}{(4x+2)^7}$ can also be written as (A) $3(4x+2)^{-7}$ (B) $3(4x+2)^{\frac{1}{7}}$ (C) $[3(4x+2)]^{-7}$ (D) $3(4x+2)^{-\frac{1}{7}}$		1
5	Express $3.\dot{2}\dot{3}$ as a fraction in its simplest form using algebra.		2
6	Violins have increased by 6% in value in the past year. Luke has purchased a violin for \$3710 this year. What did the violin sell for in the previous year?		1

	Questions	Working/Answers	Marks
7	Simplify the following (i) $3x - (2 - 3x)$	(i)	1
	(ii) $\frac{y-2}{3} - \frac{y-3}{2}$	(ii)	2
	(iii) $a + ab + b + 1$	(iii)	2
8	To find the sum S of a series of numbers we can use $S = \frac{a(r^n-1)}{r-1}$. Find a when $S=118096$, $r=3$ and $n=10$		2
9	Fully factorise the following expressions (i) $3x^2 - 27$	(i)	1
	(ii) $a^2 + a - 110$	(ii)	1
	(iii) $y^3 + 27m^3$	(iii)	1

Questions		Working/Answers	Marks
10	Use the quadratic formula to find the possible values of x for the following equation: $3x^2 + 2x - 4 = 0$ Give your answers correct to 2 decimal places.		2
11	Solve $x^2 - 6x + 2 = 0$ by completing the square. Leave your answer in surd form.		2
12	If $a = 6, b = 4, c = 3$. Evaluate $a - b - c - a$		1
13	Solve the following equation $\frac{2}{x + 5} = \frac{3}{4} \quad (\text{where } x \neq -5)$		2
14	Solve the following inequality. $(4 - x)(2x - 3) \geq 0$		2

Questions		Working/Answers	Marks
19	Given that $x = \sqrt{3} + \sqrt{2}$, simplify the following expression and give your answer with a rational denominator (i) $x + \frac{1}{x}$	(i)	2
	(ii) Hence, solve $x^2 + \frac{1}{x^2}$	(ii)	1
20	Use the Elimination method to solve the following pair of simultaneous equations $2x + 3y = 5$ $x + 2y = 2$		3

	Questions	Working/Answers	Marks
21	Solve the following pair of simultaneous equations $xy = 5$ $2x - y = 9$		3

End of Test

Questions	Working/Answers	Marks
1 Evaluate correct to 5 significant figures. $4\sqrt[3]{\frac{28.1^2}{5^3}}$ (A) 1.5853 (B) 1.5854 (C) 1.58535 (D) 1.58530	B	1
2 Simplify (i) $4\sqrt{2} \times 6\sqrt{5}$ (ii) $3\sqrt{12} - 2\sqrt{18} + 4\sqrt{98}$	(i) $24\sqrt{10}$ (ii) $3\sqrt{12} - 2\sqrt{18} + 4\sqrt{98}$ $6\sqrt{3} - 6\sqrt{2} + 28\sqrt{2} \rightarrow$ $6\sqrt{3} + 22\sqrt{2} \rightarrow$ $2(3\sqrt{3} + 11\sqrt{2})$	1 2 1 mark
3 Jessica earns \$1140 each week. She spends $\frac{1}{3}$ of her salary on rent and utilities, $\frac{1}{4}$ on food and $\frac{1}{12}$ on outings. She saves the rest. How much does she save?	OR \$380	1
4 $\frac{3}{(4x+2)^7}$ can also be written as (A) $3(4x+2)^{\frac{1}{7}}$ (B) $3(4x+2)^{\frac{1}{7}}$ (C) $[3(4x+2)]^{\frac{1}{7}}$ (D) $3(4x+2)^{\frac{1}{7}}$	A	1
5 Express $3.2\bar{3}$ as a fraction in its simplest form using algebra.	$x = 3.2\bar{3} \dots$ $10x = 32.3\bar{3} \dots$ $x = 3.2\bar{3} \dots$ $9x = 29.1 \rightarrow$ $x = \frac{29.1}{9}$ NO mark if left like this $x = 3\frac{7}{30}$ or $\frac{97}{30} \rightarrow$ 1 mark.	2 1 mark.
6 Violins have increased by 6% in value in the past year. Luke has purchased a violin for \$3710 this year. What did the violin sell for in the previous year?	$x(106\%) = 3710$ $x = \frac{3710}{106\%}$ $= \$3500$	1

Questions	Working/Answers	Marks
7 Simplify the following (i) $3x - 2 + 3x$ (ii) $\frac{y-2}{3} - \frac{y-3}{2}$ (iii) $a + ab + b + 1$	(i) $3x - 2 + 3x = 6x - 2$ (ii) $\frac{(y-2) - \frac{(y-3)}{2}}{6} \rightarrow$ 1 mark $= \frac{2(y-2) - (y-3)}{6}$ $= \frac{2y-4-y+3}{6}$ $= \frac{y-1}{6} \rightarrow$ 1 mark (iii) $a + ab + b + 1 \rightarrow$ 1 mark $a(1+b) + 1(b+1) \rightarrow$ 1 mark $(a+1)(b+1) \rightarrow$ 1 mark $a(1+b) + b+1$ $a + 1 + b(a+1)$	1 2 1 mark
8 To find the sum S of a series of numbers we can use $S = \frac{a(r^n-1)}{r-1}$. Find a when $S=118096$, $r=3$ and $n=10$	$118096 = \frac{a(3^{10}-1)}{3-1}$ $a = \frac{118096 \times 2}{3^{10}-1}$ $a = 4 \rightarrow$ 1 mark	2 1 mark
9 Fully factorise the following expressions (i) $3x^2 - 27$ (ii) $a^2 + a - 110$ (iii) $y^3 + 27m^3$	(i) $3(x^2-9) \rightarrow$ 1 mark $3(x-3)(x+3)$ (ii) $a^2 + a - 110$ $a^2 + 11a - 10a - 110$ $a(a+11) - 10(a+11)$ $(a-10)(a+11)$ 1 mark (iii) $y^3 + 27m^3$ $(y^3 + 27m^3)$ $(y+3m)(y^2-3my+9m^2)$ 1 mark	1 1 1 1 mark

Questions	Working/Answers	Marks
10 Use the quadratic formula to find the possible values of x for the following equation: $3x^2 + 2x - 4 = 0$ Give your answers correct to 2 decimal places.	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-2 \pm \sqrt{2^2 - 4 \times 3 \times (-4)}}{2 \times 3}$ $= \frac{-2 \pm \sqrt{52}}{6}$ $x = 0.87$ or $x = -1.54$. (1 mark)	2
11 Solve $x^2 - 6x + 2 = 0$ by completing the square. Leave your answer in surd form.	$x^2 - 6x + 2 = 0$ $x^2 - 6x + 3 = -2 + 3$ $(x-3)^2 = 7$ $(x-3) = \pm\sqrt{7}$ $x = 3 \pm \sqrt{7}$ (1 mark)	2
12 If $a = 6, b = 4, c = 3$. Evaluate $ a - b - c - a $	$ a - b - c - a $ $ 6 - 4 - 3 - 6 $ $2 - 3 = -1$	1
13 Solve the following equation $\frac{2}{x+5} = \frac{3}{4}$ (where $x \neq -5$)	$\frac{2}{(x+5)} = \frac{3}{4}$ $3(x+5) = 2 \times 4$ $3x + 15 = 8$ $3x = 8 - 15$ $3x = -7$ $x = -\frac{7}{3} = -2\frac{1}{3}$ (1 mark)	2
14 Solve the following inequality. $(4 - x)(2x - 3) \geq 0$	$4 - x = 0$ $x = 4$ $2x - 3 = 0$ $x = 1.5$ $1.5 \leq x \leq 4$ (1 mark)	2

Questions	Working/Answers	Marks
15 Solve $ 3d + 10 = 5d - 2$	$3d + 10 = 5d - 2$ $-2d = -12$ $d = 6$ (1 mark) check for $d = -1$ L.H.S $ 3d + 10 $ $ 3(-1) + 10 = 7$ R.H.S $5d - 2$ $5(-1) - 2 = -7$ L.H.S $\neq$ R.H.S $d = 6$ is the only solution (1 mark)	2
16 Simplify $\frac{1}{x-2} + \frac{3}{x^2-4} - \frac{2}{x+2}$	$\frac{1}{x-2} + \frac{3}{(x-2)(x+2)} - \frac{2}{x+2}$ $\frac{x+2+3-2(x-2)}{(x-2)(x+2)}$ $\frac{x+2+3-2x+4}{(x-2)(x+2)}$ $= \frac{9-x}{(x-2)(x+2)}$ (1 mark)	3
17 Solve the following inequalities (i) $3 + 2y \geq 5y$ (ii) $1 \leq \frac{2x-1}{3} \leq 3$	(i) $3 + 2y \geq 5y$ $3y \leq 3$ $y \leq 1$ (ii) $1 \leq \frac{2x-1}{3} \leq 3$ $3 \leq 2x-1 \leq 9$ $4 \leq 2x \leq 10$ $2 \leq x \leq 5$ (1 mark)	2
18 Solve the following inequality and graph your solution on a number line. $ a + 4 \geq 6$	$a + 4 \geq 6$ or $a + 4 \leq -6$ $a \geq 2$ or $a \leq -10$  (1 mark)	2

Questions	Working/Answers	Marks
19 Given that $x = \sqrt{3} + \sqrt{2}$, simplify the following expression expressing your answer as a rational denominator (i) $x + \frac{1}{x}$	$\frac{\sqrt{3} + \sqrt{2} + \frac{1}{\sqrt{3} + \sqrt{2}} \times \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} - \sqrt{2}}}{\sqrt{3} + \sqrt{2} + \frac{\sqrt{3} - \sqrt{2}}{3 - 2}}$ $= 2\sqrt{3} \rightarrow 1 \text{ mark}$	2
(ii) Hence, solve $x^2 + \frac{1}{x^2}$ Hence means students are supposed to use part (i) to do part (ii)	$x^2 + \frac{1}{x^2} = \left(x + \frac{1}{x}\right)^2 - 2$ $= (2\sqrt{3})^2 - 2$ $= 10 \rightarrow 1 \text{ mark}$	1
20 Use the Elimination method to solve the following pair of simultaneous equations $2x + 3y = 5$ $x + 2y = 2$	$\begin{array}{r} 2x + 3y = 5 \rightarrow \textcircled{1} \\ x + 2y = 2 \rightarrow \textcircled{2} \\ \text{Multiplying } \textcircled{2} \text{ by } 2 \\ 2(x + 2y = 2) \\ 2x + 4y = 4 \rightarrow \textcircled{3} \end{array}$ $\begin{array}{r} \textcircled{3} - \textcircled{1} \\ 2x + 4y = 4 \\ 2x + 3y = 5 \\ \hline y = -1 \end{array}$ $\begin{array}{l} \text{Substituting } y = -1 \text{ in } \textcircled{1} \\ 2x + 3(-1) = 5 \\ 2x - 3 = 5 \\ 2x = 8 \\ x = 4 \end{array}$ $(4, -1)$	3

Questions	Working/Answers	Marks
21 Solve the following pair of simultaneous equations $xy = 5$ $2x - y = 9$	$xy = 5$ $y = \frac{5}{x}$ Substituting $y = \frac{5}{x}$ in $2x - y = 9$ $2x - \frac{5}{x} = 9$ $2x^2 - 5 = 9x$ $2x^2 - 9x - 5 = 0$ $2x^2 - 10x + x - 5 = 0$ $2x(x - 5) + 1(x - 5) = 0$ $(2x + 1)(x - 5) = 0 \rightarrow 1 \text{ mark}$ $2x + 1 = 0$ $x = -\frac{1}{2}$ Substitute $x = -\frac{1}{2}$ in $\textcircled{1}$ $y \times \left(-\frac{1}{2}\right) = 5$ $y = -10$ $y = 1$ $(5, 1)$	3

End of Test

* NO marks is carried if mistakes in linear equation on

