Name and Surname : SLT ....

Grade/Class : 11/.......... **Mathematics Teacher** : ....

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Memo/Solutions
MATHEMATICS
Final Assessment Paper 1
26 November 2021

1.1.1	$2x(3-x)=0$ ✓	
	$x=0$ or $x=3$ ✓	2
1.1.2	$5x^2-4x=2$	
	$5x^2-4x-2=0$ ✓ std form	
	$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$	
	$x=\frac{-(-4)\pm\sqrt{(-4)^2-4(5)(-2)}}{2(5)}$ ✓ sub	
	$=\frac{4\pm\sqrt{56}}{10}$	4
	$=-0{,}35$ ✓ or $1{,}15$ ✓	

1

1.1.3	$\sqrt{7+3x}+2x=0$	
	$\sqrt{7+3x}=-2x$ ✓ isolate	
	$(\sqrt{7+3x})^2=(-2x)^2$ ✓ square	
	$7+3x=4x^2$	
	$4x^2-3x-7=0$ ✓ std form	
	$(4x-7)(x+1)=0$	
	$x=-1$ or $x\neq\frac{7}{4}$ ✓ cnstrg	
	check soln $\therefore x=-1$	4
1.1.4	$x^2-2x-15\leq 0$	
	$(x+3)(x-5)\leq 0$ ✓ fact	
	critical values $x=-3$ or $x=5$	
	$+\ 0\ -\ 0\ +$ (-3, 5)	
	$\therefore -3\leq x\leq 5$ ✓✓ A	3
1.1.5	$3x^{-2}-10=0$	
	$3x^{-2}=10$ ✓ isolate	
	$x^{-2}=10/3$	
	$(x^{-2})^{-\frac{1}{2}}=\pm\left(\frac{10}{3}\right)^{-\frac{1}{2}}$ ✓ ± ✓ method $x=\pm 0{,}55$ ✓ ans	4

2

$(3k-1)(k-9)=0$

1.1.6	$3^{x+2} + 3^{2-x} = 82$	
	$3^x . 3^2 + 3^2 . 3^{-x} - 82 = 0$	
	$9 . 3^x + \frac{9}{3^x} - 82 = 0$ ✓ posit. exp	
	$9 . 3^{2x} + 9 - 82 . 3^x = 0$	
	$9 . 3^{2x} - 82 . 3^x + 9 = 0$ ✓ std form	
	$(9 . 3^x - 1)(3^x - 9) = 0$ ✓ factors	
	$3^x = \frac{1}{9}$ or $3^x = 9$ ✓ both	
	$3^x = 3^{-2}$ or $3^x = 3^2$	
	$x = -2$ or $x = 2$ ✓ ans both	5
1.2	$4x^2 - 5xy = 3 - 6y$ and $x - 2y = 3$	
	$x = 2y + 3$ ✓	
	$4(2y+3)^2 - 5(2y+3)y = 3 - 6y$ ✓ sub	
	$16y^2 + 48y + 36 - 10y^2 - 15y - 3 + 6y = 0$	
	$6y^2 + 39y + 33 = 0$	
	$\div 3: \ 2y^2 + 13y + 11 = 0$ ✓ std form	
	$(y+1)(2y+11) = 0$ ✓ factors	
	$y = -1$ or $-11/2$ ✓ both	
	$x = 2(-1) + 3$ $\quad = 2(-\frac{11}{2}) + 3$	
	$= 1$ $\quad = -8$ ✓ both	6
	$\therefore x = 1$ and $y = -1$ or	
	$x = -8$ and $y = -11/2$	

1.3	$\sqrt{x(5-x)-4}$ be non-real	
	non-real $\Delta < 0$	
	$x(5-x) - 4 < 0$ ✓ $\Delta < 0$	
	$5x - x^2 - 4 < 0$	
	$x^2 - 5x + 4 > 0$ ✓ std form	
	$(x-4)(x-1) > 0$ ✓ fact	
	+ − +	
	1 4 soln	5
	$x < 1$ or $4 < x$ ✓✓ A	and ; 0/2
1.4.1	$x + x + y = 60$	
	$y = 60 - 2x$ ✓	1
1.4.2	Area $= l \times b$	
	$= y \times x$	
	$= (60-2x)x$ ✓	1
	$= 60x - 2x^2$	
	$= -2x^2 + 60x$	
1.4.3	Max $x = -\frac{b}{2a} = \frac{-60}{2(-2)}$	
	$x = 15$ ✓	2
	Max area $= -2(15)^2 + 60(15) = 450 \ m^2$ ✓	

2.1 $\sqrt{18} - \sqrt{50} - \sqrt{32}$

$= \sqrt{9\times2} - \sqrt{25\times2} - \sqrt{16\times2}$ ✓ must be shown

$= 3\sqrt{2} - 5\sqrt{2} - 4\sqrt{2}$ ✓ simp

$= -6\sqrt{2}$ ✓

3

2.2 $\dfrac{3^{2n} - 9^{n+1}}{4.9^{n} + 3^{2n}}$ ✓ Simpl + prime bases

$= \dfrac{3^{2n} - 3^{2n+2}}{4.3^{2n} + 3^{2n}}$

$= \dfrac{3^{2n}(1-3^2)}{3^{2n}(4+1)}$ ✓ comm factors (both)

$= \dfrac{-8}{5}$ ✓ ans

3

2.3 $(0{,}125)^{\frac{2}{3}}$

$= \left(\dfrac{125}{1000}\right)^{2/3}$ or $\left(\dfrac{5^3}{10^3}\right)^{2/3}$ ✓ fraction

$\left(\sqrt[3]{\dfrac{125}{1000}}\right)^2$ $= \dfrac{5^2}{10^2}$ ✓

$= \left(\dfrac{5}{10}\right)^2$ $= \dfrac{25}{100}$

$= \left(\dfrac{1}{2}\right)^2$ $= \dfrac{1}{4}$ ✓

$= \dfrac{1}{4}$

3

5

2.4 $x^{\frac{2}{5}}\left(4x^{-\frac{2}{5}} - 8x^{\frac{5}{2}}\right)$

$= 4x^{0} - 8x^{\frac{29}{10}}$

$= 4 - 8x^{\frac{29}{10}}$ ✓ ✓

2

2.5 $\left(\sqrt{(3+a-2\sqrt{a})}\right)^2 - (\sqrt{a}-1)^2$ ✓ ✓

$= 3+a-2\sqrt{a} - (a-2\sqrt{a}+1)$

$= 3+a-2\sqrt{a} - a + 2\sqrt{a} - 1$

$= 2$ ✓

3

OR

$\left(\dfrac{125}{1000}\right)^{2/3}$

$= \left(\dfrac{1}{8}\right)^{2/3}$

$= \left(\dfrac{1}{2^3}\right)^{2/3}$

$= \left(2^{-3}\right)^{2/3}$

$= 2^{-2}$

$= \dfrac{1}{2^2}$

$= \dfrac{1}{4}$

6

3.1.1	19	1
3.1.2	$T_n = a + (n-1)d$	
	$T_n = 4 + (n-1)(3)$	
	$T_n = 3n + 1$	2
3.1.3	$T_{20} = 3(20) + 1$	
	$= 61$	1
3.1.4	$301 = 3n + 1$	
	$300 = 3n$	
	$100 = n$	2
3.2.1	T_1 T_3 T_5	
	$x - 1$ $2x - 3$ $x + 6$	
	$x - 2$ $-x + 9$ "2d"	
	$x - 2 = -x + 9$ equate	3
	$2x = 11$	
	$x = \frac{11}{2}$.	
3.2.2.	$T_1 = \frac{11}{2} - 1 = \frac{9}{2}$ $T_2 = \frac{9}{2} + \frac{7}{4}$	
	$T_3 = 2\left(\frac{11}{2}\right) - 3 = 8$ $= \frac{25}{4}$	
	$T_3 - T_1 = 2d$	
	$\frac{7}{2} = 2d$	
	$\frac{7}{4} = d$ ao $2/2$	2

4.1.1	25; 48; 69, 88, ...	
	25 48 69 88	
	23 21 19	
	−2 −2	
	$2a = -2$ $3a + b = 23$ $a + b + c = 25$	
	$a = -1$ $b = 26$ $-1 + 26 + c = 25$	
	$c = 0$	
	$\therefore T_n = -n^2 + 26n$	4
4.1.2	P.T.O.	

4.1.2. $T_n = -n^2 + 26n$

$T_{n+1} = -(n+1)^2 + 26(n+1)$

$= -(n^2 + 2n + 1) + 26n + 26$

$= -n^2 - 2n - 1 + 26n + 26$

$= -n^2 + 24n + 25$ ✓

$T_n + T_{n+1} = -21\,503$

$-n^2 + 26n + (-n^2 + 24n + 25) = -21\,503$ ✓

$-n^2 + 26n - n^2 + 24n + 25 = -21\,503$

$0 = 2n^2 - 50n - 21\,528$

$\div 2: \quad 0 = n^2 - 25n - 10\,764$ ✓

$0 = (n - 117)(n + 92)$ ✓

$\therefore n = 117$ or -92 reject

$\therefore$ terms T_{117} and T_{118} ✓

5

OR

$T_n = -n^2 + 26n$

$T_{n-1} = -(n-1)^2 + 26(n-1)$

$= -(n^2 - 2n + 1) + 26n - 26$

$= -n^2 + 2n - 1 + 26n - 26$

$= -n^2 + 28n - 27$

$T_{n-1} + T_n = -21\,503$

$-n^2 + 28n - 27 + (-n^2 + 26n) = -21\,503$

$-n^2 + 28n - 27 - n^2 + 26n = -21\,503$

$0 = 2n^2 - 54n - 21\,476$

$\div 2: \quad 0 = n^2 - 27n - 10\,738$

$0 = (n - 118)(n + 91)$

$\therefore n = 118$ or -91 reject

$\therefore$ terms T_{118} and T_{117}

4.2. $2 \; ; \; 6 \; ; \; 10$

4 4

$2a = 4$ $\quad 3(2) + b = 2$

$a = 2$ $\quad b = -4$

$T_{73} = a(73)^2 + b(73) + c$ ✓

$10\,363 = 2(73)^2 - 4(73) + c$

$-3 = c$

$\therefore T_n = 2n^2 - 4n - 3$ ✓ ✓ ✓

4

$ha = 3 \quad q = 3$
$va = 1 \quad p = 1$
0/2

5.1 $f(x) = \frac{a}{x-1} + 3$

$x = 1$ ✓, $y = 3$ ✓ (2)

5.2. $y = \frac{a}{0-1} + 3$ y-intercept

$y = -a + 3$, $y = 3 - a$ ✓

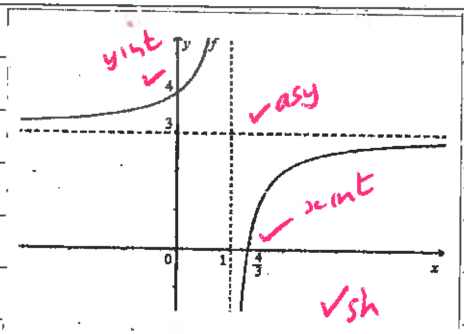
x-intercept $\Rightarrow$ ✓ $0 = \frac{a}{x-1} + 3$ equate to zero

$-3 = \frac{a}{x-1}$ (3)

$-3x + 3 = a$

$x = 1 - \frac{a}{3}$ ✓ or $x = \frac{3-a}{3}$

5.3



asmpts ✓
y-intercept ✓
x-intercept ✓
Shape ✓ (4)

5.4. $y = \frac{a}{x+2} + 1$ ✓ or $y = \frac{-1}{x+2} + 1$ (2)

6 $y = a(x-p)^2 + q$

$y = a(x+1)^2 + 8$

$y = a(x+1)^2 + 8$ ✓ ✓

sub in $(0;6)$

$6 = a(0+1)^2 + 8$ ✓ sub

$-2 = a$

$\therefore y = -2(x+1)^2 + 8$

$= -2(x^2 + 2x + 1) + 8$

$= -2x^2 - 4x - 2 + 8$

$= -2x^2 - 4x + 6$ ✓ (4)

7.1 $q = -6$ — 1

7.2 $y = b^x - 6$

y int $y = b^0 - 6$

$y = -5$

$D(0; -5)$ — 1

7.3 $y = b^x - 6$

Sub in $H(1; -4)$ — sub in

$-4 = b^1 - 6$

$2 = b$

$-\frac{b}{2a} = -\frac{1}{4}$

$-\frac{2}{2a} = -\frac{1}{4}$ — sub in 2

$-\frac{1}{a} = -\frac{1}{4}$

$a = 4$

$-4 = 4(1)^2 + 2(1) + c$ — sub in

$-10 = c$ — 4

1 b
2 a
1 c

7.4.1 $y = 2^x - 6$

$0 = 2^x - 6$

$6 = 2^x$

$\frac{\log 6}{\log 2} = x$

$2{,}58 = x$

$\therefore J(2{,}58; 0)$ — 3

13

7.4.2 $x \cdot g(x) \geq 0$ for:

$x \in (-\infty; 0]$ or $[2{,}58; \infty)$

$x \geq 2{,}58$ or $x \leq 0$ — 2

CA 7.4.1

penalty −1 and ;

7.5 $4x^2 + 2x - 10 = -k - 10$

$-\frac{41}{4} < K < -10$

$-\frac{41}{4} < -k - 10 < -10$

$-\frac{1}{4} < -k < 0$

$\frac{1}{4} > k > 0$ — 2

OR

PTO

7.6 $y = mx - 14$ tan $y = 4x^2 + 2x - 10$

$mx - 14 = 4x^2 + 2x - 10$ — equate

$0 = 4x^2 + 2x - mx + 4$

$0 = 4x^2 + x(2 - m) + 4$ — std form

$\Delta = (2-m)^2 - 4(4)(4)$

$= (2-m)^2 - 64$

For tan $\Delta = 0$ — $\Delta = 0$

$(2-m)^2 - 64 = 0$

$(2-m)^2 = 64$

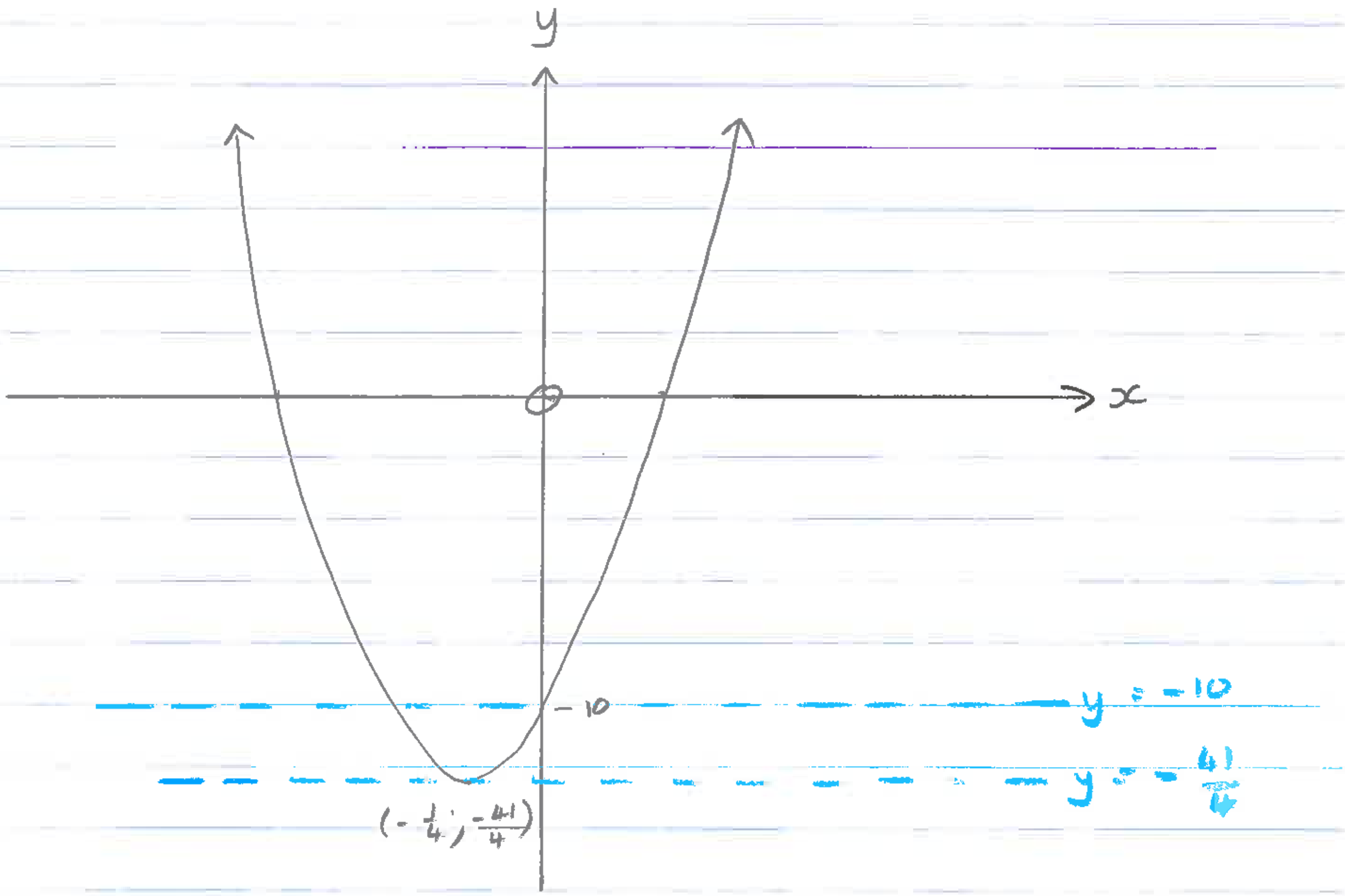
$2 - m = \pm 8$

$2 \pm 8 = m$

-6 or $10 = m$ — 5

14

7.5. $f: \; y = 4x^2 + 2x - 10$



$$4x^2 + 2x = -k$$
$$4x^2 + 2x - 10 = -k - 10$$
$$f(x) = K$$

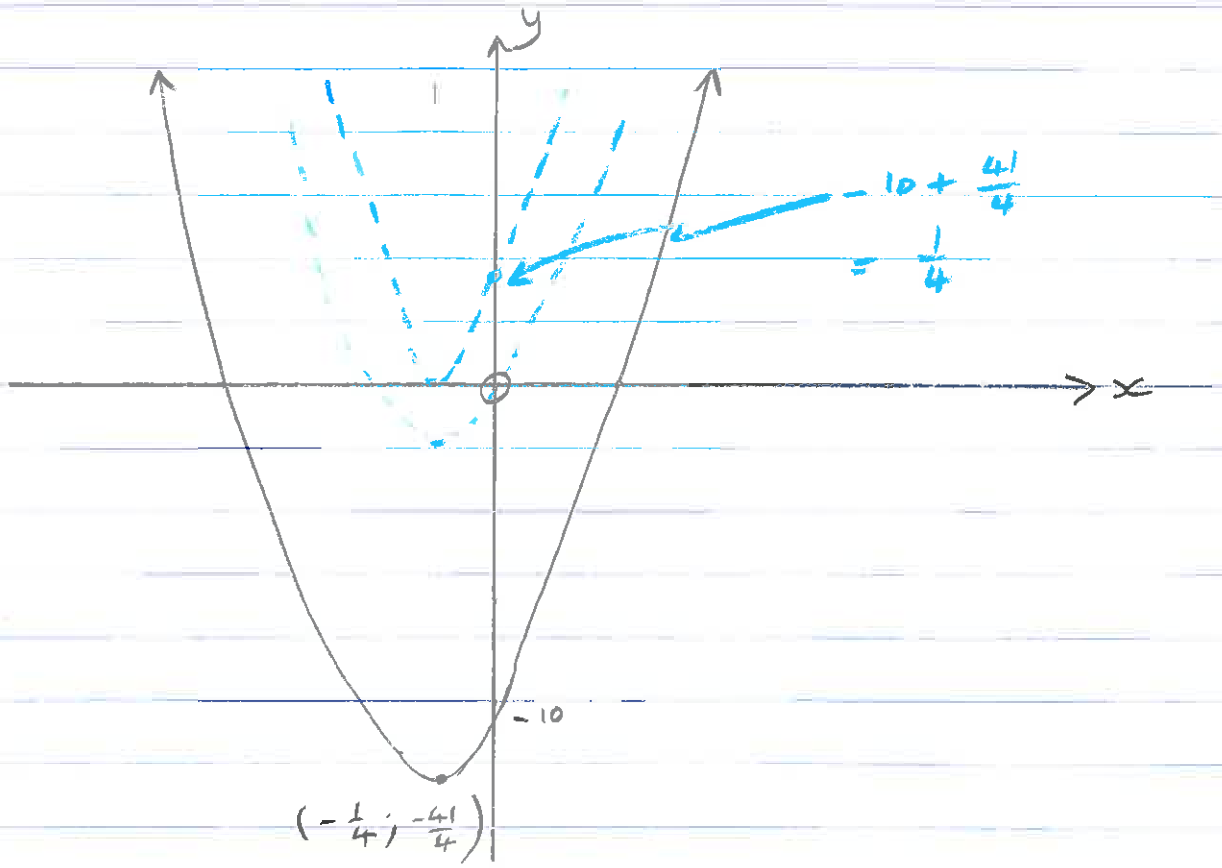
$y = f(x) \cap y = k$ 2 distinct - places

$$y_{tp} = 4\left(-\tfrac{1}{4}\right)^2 + 2\left(-\tfrac{1}{4}\right) - 10$$
$$= -\frac{41}{4}$$

$$-\frac{41}{4} < K < -10$$
$$-\frac{41}{4} < -k - 10 < -10$$
$$-\frac{1}{4} < -k < 0$$
$$\frac{1}{4} > k > 0$$

OR

$f: \quad y = 4x^2 + 2x - 10$



$$4x^2 + 2x = -k$$

$$4x^2 + 2x + k = 0$$

$$4x^2 + 2x + \underbrace{k}_{\text{yint}} = y \qquad \text{2 distinct} - x \text{ int}$$

$\therefore \uparrow\downarrow$

$$0 < \text{yint} < \frac{1}{4}$$

$$0 < k < \frac{1}{4}$$

8.1.1 R15 000 ✓ 1

8.1.2 Simple interest ✓ 1

8.1.3 $A = P(1+in)$

$31\,000 = 15\,000(1+6i)$ ✓ subt f

$\frac{31\,000}{15\,000} = 1+6i$

$i = \dfrac{\left(\frac{31}{15}-1\right)}{6}$

$i = 0,1778\ldots$

rate = 17,78 % ✓ 2

8.1.4 $A = P(1+in)$

$W = 15\,000\left(1+\frac{17,78}{100}\cdot 12\right)$ ✓

$= 47\,004$

$A = P(1+i)^n$

$47\,004 = 15\,000(1+i)^{12}$ ✓ sub in

root ✓ $\sqrt[12]{\frac{47\,004}{15\,000}} - 1 = i = 0,09985$

r = 9,99 % ✓ 4

8.2 $1 + i_{eff} = \left(1+\frac{i_{nom}}{m}\right)^m$

$i_{eff} = \left(1+\frac{8,5}{200}\right)^2 - 1$ ✓ st f

$= 0,0868\ldots$

r = 8,68 % ✓ 2

8.3 $A = P(1-i)^n$

$331\,527 = 500\,000(1-0,128)^n$ ✓ st f

$\frac{331\,527}{500\,000} = (0,872)^n$

$\dfrac{\log\left(\frac{331527}{500\,000}\right)}{\log 0,872} = n$ ✓ logs

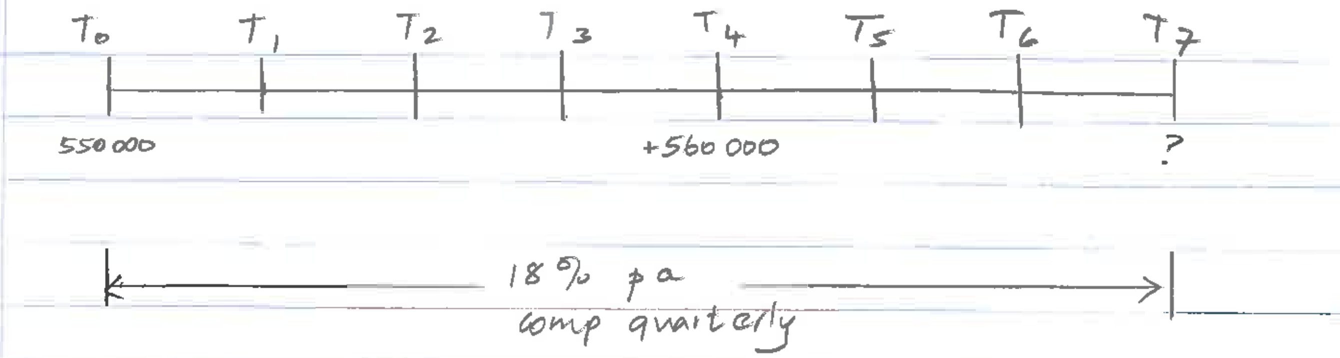
3 years $= n$ ✓ ans 3

8.4 $A = P_1(1+i)^n + P_2(1+i)^n$ ✓ i,n

$= R550\,000\left(1+\frac{0,18}{4}\right)^{7\times4} + 560\,000\left(1+\frac{0,18}{4}\right)^{12}$ ✓ Subt f in both

$= R2\,836\,028,60$ ✓ ans 4

8.4.



Snowball

$$A = P(1+i)^n$$

$T_0 - T_4$ $\quad A = 550\,000\left(1 + \frac{18}{400}\right)^{4\times 4}$ ✓

$= 1\ 112\ 303,58\ldots$

$+ 560\ 000$ ✓

$T_4 - T_7$ $\quad A = 1\ 672\ 303,58\ldots\left(1 + \frac{18}{400}\right)^{3\times 4}$ ✓

$= R\ 2\ 836\ 028,60$ ✓

4

Parallel

550 000 $\quad A = 550\ 000\left(1 + \frac{18}{400}\right)^{7\times 4}$ ✓

$= 1\ 886\ 334,99\ldots \rightarrow A$

560 000 $\quad A = 560\ 000\left(1 + \frac{18}{400}\right)^{3\times 4}$ ✓

$= 949\ 693,60\ldots \rightarrow B$

$A + B = 1\ 886\ 334,99\ldots + 949\ 693,60\ldots$ ✓

$= R\ 2\ 836\ 028,60$ ✓

4

9.1.1 $P(B) = 1 - P(B')$

$= 1 - 0{,}28$

$= 0{,}72$ (2)

9.1.2 $P(A)$ given $P(B) = 3P(A)$

$P(B) = 3P(A)$

$\frac{1}{3}P(B) = P(A)$

$\frac{1}{3}(0{,}72) = P(A)$

$0{,}24 = P(A)$ (2)

9.1.3 If A and B mutually exclusive

$P(A \text{ and } B) = 0$

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$P(A \text{ and } B) = P(A) + P(B) - P(A \text{ or } B)$

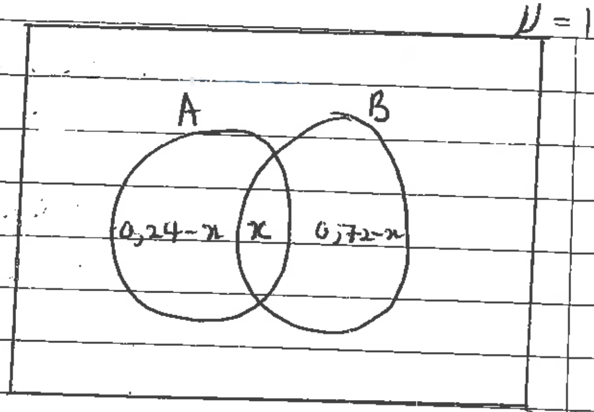
$= 0{,}24 + 0{,}72 - 0{,}96$ subs

$= 0{,}96 - 0{,}96$

$= 0$ ans

$\therefore$ The events are mutually exclusive. conclusion (3)

OR



$0{,}24 - x + x + 0{,}72 - x = 0{,}96$

$0 = x$

$\therefore P(A \cap B) = 0$

$\therefore$ A and B are mutually exclusive.

3

9.2.1 $a = 32 - 12$

$= 20$

$b = 80 + 48$

$= 128$. 2

9.2.2 a) $P(\text{watched TV}) = \frac{128}{160}$ 2

$= \frac{4}{5}$

b) $P(M \cap \text{watched TV}) = \frac{80}{160}$ 1

$= \frac{1}{2}$

9.2.3 $P(M) \times P(\text{watched TV})$

$\frac{100}{160} \times \frac{128}{160}$ ~~product~~

$= \frac{1}{2}$

$P(M \text{ and watched TV})$

$= \frac{1}{2}$

P.T.O

$\therefore P(M) \times P(\text{watched TV}) =$ condition

$P(M \cap \text{watched TV})$ conclusion

$\therefore$ events "being Male" and "watched TV" are independent. 4

9.3.1 $d = 5$ $9 - 4$

$e = 4$ $8 - 4$

$f = 7$ $20 - (d + e + 4)$ 4

$g = 5$ $21 - (e + 8 + 4)$

9.3.2 a) $P(A \text{ and } B \text{ and } C) = \frac{4}{54}$ 1

$= \frac{2}{27}$.

b) $P(C \text{ only}) = \frac{7}{54}$ 1

f

c) $P(\text{A and B, but not C}) = \frac{8}{54}$

8

$= \frac{4}{27}$ 1

d) $P(A \cap C') = \frac{8+5}{54}$

9 + 8

$= \frac{13}{54}$ 1

e) P(that a country uses exactly two methods) $= \frac{5+4+8}{54}$

d + e + 8

$= \frac{17}{54}$ 1

Total 150 Marks