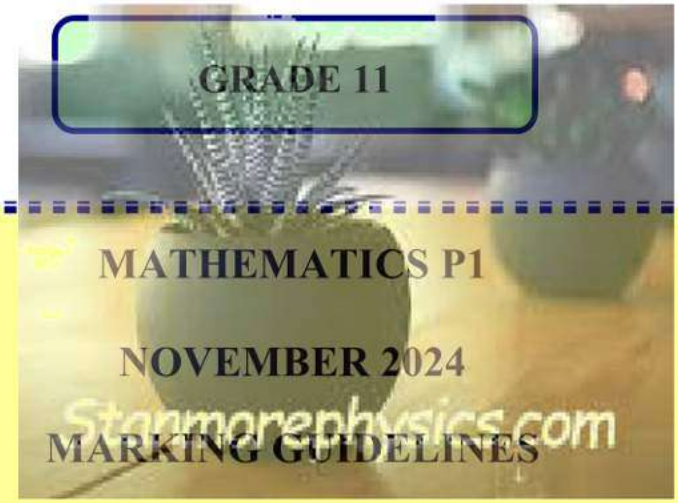
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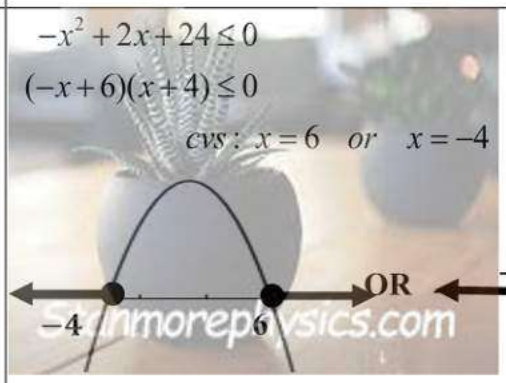
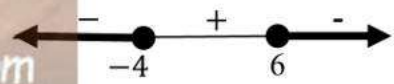
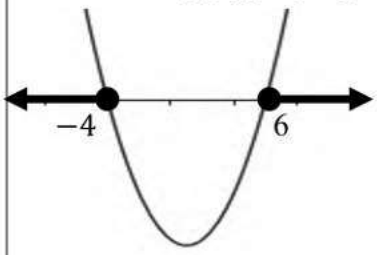
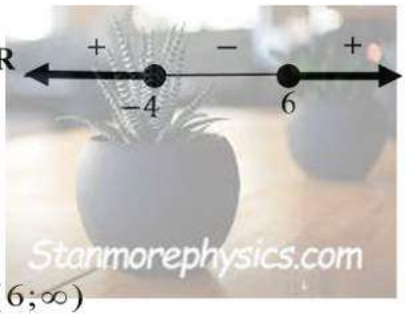
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GRADE 11
Marking Guidelines

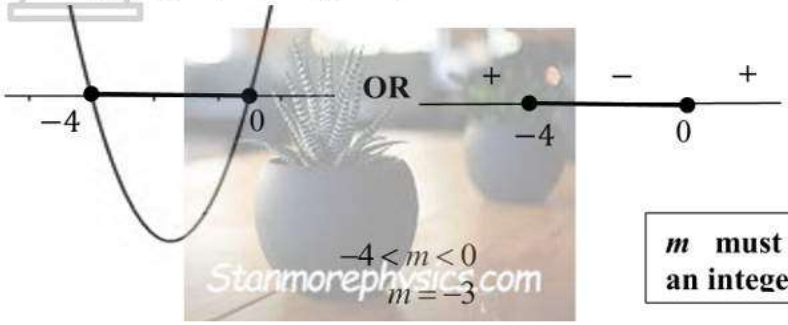
QUESTION 1

1.1.1	$x^2 - 7x = -1$ $x^2 - 7x + 1 = 0$ $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \dfrac{-(-7) \pm \sqrt{(-7)^2 - 4(1)(1)}}{2(1)}$ $x = 0{,}15 \quad or \quad x = 6{,}85$ **Penalise 1 mark for incorrect rounding**	✓A standard form ✓CA substitution ✓CA answer ✓CA answer (4)
1.1.2	$-x^2 + 2x + 24 \le 0$ $(-x+6)(x+4) \le 0$ $cvs: x = 6 \quad or \quad x = -4$   $x \le -4 \quad or \quad x \ge 6$ **OR** $x \in (-\infty; -4] \cup [6; \infty)$ **OR** $-x^2 + 2x + 24 \le 0$ $x^2 - 2x - 24 \ge 0$ $(x-6)(x+4) \ge 0$ $cvs: x = 6 \quad or \quad x = -4$  **OR**  $x \le -4 \quad or \quad x \ge 6$ **OR** $x \in (-\infty; -4] \cup [6; \infty)$	✓A factors ✓CA critical values (**accept** if shown on a sketch or on a number line) ✓CA answer ✓CA answer (4) **OR** ✓A factors ✓CA critical values (**accept** if shown on a sketch or on a number line) ✓CA answer ✓CA answer (4)
1.1.3	$(2^x - 1)(2x - 1) = 0$ $2^x = 2^0 \quad or \quad 2x = 1$ $x = 0 \quad or \quad x = \dfrac{1}{2}$	✓A $2^x = 2^0$ ✓A answer ✓A answer (3)

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1.1.4	$\sqrt{2x+5}=x+3$ $\left(\sqrt{2x+5}\right)^2=(x+3)^2$ $2x+5=x^2+6x+9$ $x^2+4x+4=0$ $(x+2)(x+2)=0$ $\therefore x=-2$	✓A squaring on both sides ✓CA standard form ✓CA factors ✓CA answer (4)
1.2	Substitute equation 1 into equation 2: $y=2+5x$ and $2xy-7=-x^2$ $2x(2+5x)-7=-x^2$ $4x+10x^2-7+x^2=0$ $11x^2+4x-7=0$ $(11x-7)(x+1)=0$ $x=\frac{7}{11}$ or $x=-1$ $y=2+5\left(\frac{7}{11}\right)$ or $y=2+5(-1)$ $y=\frac{57}{11}$ or $y=-3$	✓A substitution ✓CA standard form ✓CA factors ✓CA x-values ✓CA y-values (5)
	OR Substitute equation 1 into equation 2: $2xy-7=-x^2$ $2\left(\frac{y-2}{5}\right)y-7=-\left(\frac{y-2}{5}\right)^2$ $25\times\left(\frac{2y^2-4y}{5}-7\right)=-\frac{y^2-4y+4}{25}\times 25$ $5\left(2y^2-4y\right)-175=-\left(y^2-4y+4\right)$ $0=-y^2-10y^2+4y+20y-4+175$ $0=-11y^2+24y+171$ $0=11y^2-24y-171$ $0=(11y-57)(y+3)$ $y=\frac{57}{11}$ or $y=-3$ $x=\frac{\left(5\frac{2}{11}\right)-2}{5}$ or $x=\frac{(-3)-2}{5}$ $x=\frac{7}{11}$ or $x=-1$	**OR** ✓A substitution ✓CA standard form ✓CA factors ✓CA y-values ✓CA x-values (5)

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1.3	$\Delta = m^2 + 4m$ $\Delta < 0$ $m^2 + 4m < 0$ $m(m+4) < 0$ *cvs*: $m = 0$ *or* $m = -4$  $-4 < m < 0$ $m = -3$ **m must be an integer**	✓A $m^2 + 4m < 0$ ✓CA factors ✓CA interval solution for m ✓CA integer answer (4)
1.4	$x = \sqrt{x + \sqrt{x + \sqrt{x + \sqrt{x + \sqrt{x + \sqrt{x....}}}}}}$ $x^2 = x + \sqrt{x + \sqrt{x + \sqrt{x + \sqrt{x + \sqrt{x....}}}}}$ $x^2 = x + x$ $x^2 = 2x$ $x^2 - 2x = 0$ $x(x-2) = 0$ $x = 0$ or $x = 2$	✓A squaring on both sides ✓A $x^2 = x + x$ ✓CA factors ✓CA both answers (4)
		[28]

QUESTION 2

2.1.1	$\frac{10^{x+2}.25^{x}.8^{x}}{16^{x+1}.125^{x+1}.2}$ $=\frac{(5.2)^{x+2}.5^{2x}.2^{3x}}{2^{4(x+1)}.2.5^{3(x+1)}}$ $=\frac{5^{x+2}.2^{x+2}.5^{2x}.2^{3x}}{2^{4x+4+1}.5^{3x+3}}$ $=5^{x+2+2x-3x-3}.2^{x+2+3x-4x-5}$ $=5^{-1}.2^{-3}$ $=\frac{1}{5}.\frac{1}{8}$ $=\frac{1}{40}$	✓A splitting to prime bases ✓CA using the exponential laws ✓CA simplification ✓CA answer (4)
2.1.2	$\frac{3^{102}.3^{101}}{3^{204}-6.3^{201}}$ $=\frac{3^{203}}{3^{201}(3^{3}-6)}$ $=\frac{3^{2}}{21}$ $=\frac{3}{7}$ **OR** $\frac{3^{102}.3^{101}}{3^{204}-6.3^{201}}$ $=\frac{3^{203}}{3^{203}(3^{1}-6.3^{-2})}$ $=\frac{1}{\left(\frac{7}{3}\right)}$ $=\frac{3}{7}$	✓A 3^{203} ✓A correct factors in denominator ✓CA answer (3) **OR** ✓A 3^{203} ✓A correct factors in denominator ✓CA answer (3)

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2.2	$x^{\frac{2}{3}} - 5x^{\frac{1}{3}} + 6 = 0$ $\left(x^{\frac{1}{3}} - 2\right)\left(x^{\frac{1}{3}} - 3\right) = 0$ $x^{\frac{1}{3}} = 2$ or $x^{\frac{1}{3}} = 3$ $x^{\frac{1}{3}\times 3} = 2^3$ or $x^{\frac{1}{3}\times 3} = 3^3$ $x = 8$ or $x = 27$ **OR** $x^{\frac{2}{3}} - 5x^{\frac{1}{3}} + 6 = 0$ let $x^{\frac{1}{3}} = k$ $k^2 - 5k + 6 = 0$ $(k-2)(k-3) = 0$ $k = 2$ or $k = 3$ $x^{\frac{1}{3}} = 2$ or $x^{\frac{1}{3}} = 3$ $x^{\frac{1}{3}\times 3} = 2^3$ or $x^{\frac{1}{3}\times 3} = 3^3$ $x = 8$ or $x = 27$	✓A factors ✓CA both equations ✓CA raising both sides to power 3 ✓CA both answers (4) **OR** ✓A factors ✓CA both equations ✓CA raising both sides to power 3 ✓CA both answers (4)
2.3	$\frac{x.\sqrt{\sqrt{y}}}{2} = \sqrt{\frac{3}{2}.\sqrt{\frac{9}{2}}}$ $= \sqrt{\frac{3}{2}.\frac{3}{\sqrt{2}}}$ $= \sqrt{\frac{3}{2}.\frac{3}{\sqrt{2}}.\frac{\sqrt{2}}{\sqrt{2}}}$ $= \sqrt{\frac{9\sqrt{2}}{4}}$ $= \frac{\sqrt{9\sqrt{2}}}{\sqrt{4}}$ $= \frac{3.\sqrt{\sqrt{2}}}{2}$ $\frac{x.\sqrt{\sqrt{y}}}{2} = \frac{3.\sqrt{\sqrt{2}}}{2}$ $\therefore x = 3$ and $y = 2$	✓A $\frac{3}{\sqrt{2}}$ ✓A rationalising the denominator i.e. multiplying by $\frac{\sqrt{2}}{\sqrt{2}}$ ✓CA $\frac{\sqrt{9\sqrt{2}}}{\sqrt{4}}$ ✓CA $\frac{3\sqrt{\sqrt{2}}}{2}$ ✓CA $x-$value & ✓CA $y-$value (6)
		[17]

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GRADE 11
Marking Guidelines

QUESTION 3

3.1.	$T_n = -3n + k$ $12 = -3(1) + k$ $k = 15$ $T_n = 15 - 3n$	✓A substitution of constant difference and any given (n ; T_n) ✓CA answer (2)
3.2	$T_{10} = 15 - 3(10)$ $= -15$	✓A substitution of $n=10$ ✓CA answer (2)
3.3	$T_n = 15 - 3n$ $-316 = 15 - 3n$ $-331 = -3n$ $110,333 = n$ $\therefore -316$ is NOT a term in a pattern	✓CA $T_n = -316$ ✓CA conclusion (2)
3.4.	$4x+y\ ;\ -2x-1\ ;\ y+3\ ;\ .....$ 12 9 $-2x-1-(4x+y)=12$ $-2x-1-4x-y=12$ $-6x-y=13$ $y=-6x-13 \quad .....(1)$ $y+3-(-2x-1)=9$ $y+3+2x+1=9$ $y+2x=5 \quad .....(2)$ substitute (1) to (2) $(-6x-13)+2x=5$ $-4x=18$ $\frac{-4x}{-4}=\frac{18}{-4}$ $x=-\frac{9}{2}=-4\frac{1}{2}=-4,5$ $y=-6x-13$ $y=-6(-4,5)-13$ $y=14$	✓A first equation ✓A second equation ✓CA substituting (1) into (2) ✓CA value of x ✓CA value of y (5)
		[11]

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QUESTION 4

4.1.	11 ; 11	✓✓AA answers (2)
4.2	-13 ; -1 ; 7 ; ..... ; -2101 12 ; 8 ; 4 -4 ; -4 **Since Q4.2 is a proof, all marks are accuracy.** $2a=-4$ $3(-2)+b=12$ $-2+18+c=-13$ $\therefore a=-2$ $b=18$ $c=-29$ **OR** $2a=-4$ $a=-2$ $T_n=-2n^2+bn+c$ $-1=-2(2)^2+b(2)+c$ $7=2b+c$ $c=7-2b$.....(1) $T_n=-2n^2+bn+c$ $7=-2(3)^2+b(3)+c$ $c=25-3b$.....(2) $\therefore 7-2b=25-3b$ $b=18$ $c=7-2(18)$ $c=-29$	✓A $2a=-4$ ✓A $3(-2)+b=12$ ✓A $-2+18+c=-13$ (3) **OR** ✓A $2a=-4$ ✓A $-1=-2(2)^2+b(2)+c$ ✓A $7=-2(3)^2+b(3)+c$ (3)
4.3	$T_n=-2n^2+18n-29$ $-2101=-2n^2+18n-29$ $0=-2n^2+18n-29+2101$ $0=-2n^2+18n+2072$ $0=n^2-9n-1036$ $0=(n+28)(n-37)$ $n\neq -28$ *or* $n=37$ There are 37 terms in a pattern	✓A equating T_n to -2101 ✓CA standard form ✓CA factors ✓CA answer with rejection (4)
4.4	The value of a is negative. $\therefore T_n$ has a maximum value. $T_4 = T_5 = 11$. $\therefore$ the maximum value of T_n is 11. The maximum value of Q_n is $2(11) = 22$ **Answer only, full marks**	✓CA $T_4 = T_5 = 11$ ✓CA maximum value of T_n is 11. ✓CA answer (3)
4.5	$T_n=-4n+16$ $=2(-2n+8)$ $2(-2n+8)$ is a multiple of 2. $\therefore$ the sequence of first differences are even numbers.	✓CA general term of first differences ✓CA common factor of 2 (2)

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QUESTION 5

5.1	$x=2$ and $y=1$	✓A answer & ✓A answer (2)
5.2	$f(x)=\frac{a}{x+p}+q$ $f(x)=\frac{a}{x-2}+1$ $3=\frac{a}{4-2}+1$ $2=\frac{a}{2}$ $4=a$ $\therefore f(x)=\frac{4}{x-2}+1$ **Since the 5.2 is a proof, all marks are accuracy.**	✓A substituting asymptotes $(2;1)$ ✓A substituting point $(4;3)$ (2)
5.3	$f(0)=\frac{4}{0-2}+1$ $f(0)=-1$ B$(0;-1)$	✓A let $x=0$ ✓A answer (2)
5.4	$m=1$ $y=1x+c$ $1=1(2)+c$ **OR** $-1=c$ $\therefore y=1x-1$ $m=1$ $y-y_1=m(x-x_1)$ $y-1=1(x-2)$ $y=1x-2+1$ $\therefore y=1x-1$	✓A value of m ✓A answer (2)
5.5	$0=\frac{4}{x-2}+1$ $-1=\frac{4}{x-2}$ $-2=x$ $\therefore -2\le x<2$	✓A let $y=0$ ✓CA $x-$value ✓✓CA answer (4)
5.6	$h(x)=\left(\frac{1}{4}.x\right)^{-1}$ $h(x)=\left(4^{-1}.x\right)^{-1}$ $h(x)=4^{1}.x^{-1}$ $h(x)=\frac{4}{x}$ translation of 2 units to the left , and 1 unit down	✓A simplified equation of h. ✓A translation of 2 units to the left ✓A 1 unit down (3)

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[15]

QUESTION 6

6.1	R(0;6)	✓A coordinates of R (1)
6.2	$x_P = 6 - 8$ $= -2$	✓A answer (1)
6.3	$y = a(x - x_1)(x - x_2)$ $y = a(x - (-2))(x - (6))$ $y = a(x + 2)(x - 6)$ $6 = a(0 + 2)(0 - 6)$ $6 = a(-12)$ $a = -\frac{1}{2}$ $\therefore y = -\frac{1}{2}(x + 2)(x - 6)$ $\therefore y = -\frac{1}{2}(x^2 - 4x - 12)$ $\therefore y = -\frac{1}{2}x^2 + 2x + 6$ **OR**	**Since the 6.3 is a proof, all marks are accuracy.** ✓A subst. of -2 and 6 ✓A substitution of $(0;6)$ ✓A substitution of $-\frac{1}{2}$ ✓A simplification (4) **OR** ✓A substitution of $(0;6)$ ✓A setting up 2 equations ✓A solving equations simultaneously ✓A simplification

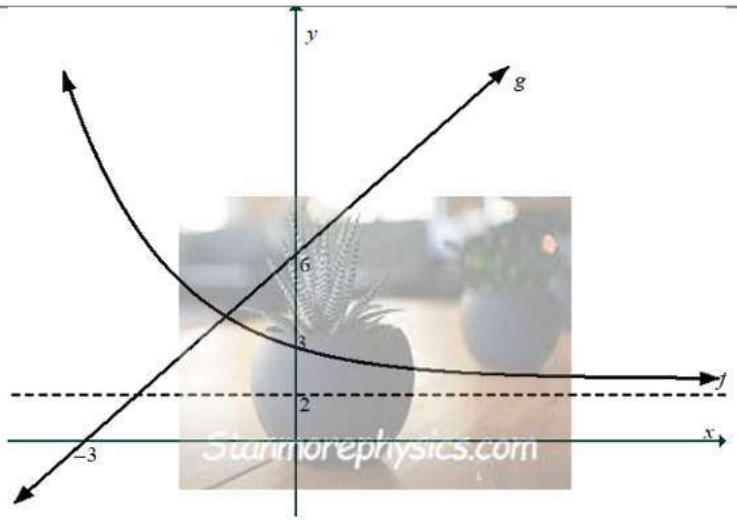
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	$y = a(x+p)^2 + q$ $y = a(x-2)^2 + q$ $6 = a(0-2)^2 + q$ $6 - 4a = q$.....(1) *if* $x = -2$ $0 = a(-2-2)^2 + q$ $0 = 16a + q$ $-16a = q$.....(2) $\therefore 6 - 4a = -16a$ $12a = -6$ $\frac{12a}{12} = \frac{-6}{12}$ $a = -\frac{1}{2}$ $q = -16\left(-\frac{1}{2}\right)$ $q = 8$ $\therefore y = -\frac{1}{2}(x-2)^2 + 8$ $\therefore y = -\frac{1}{2}(x^2 - 4x + 4) + 8$ $\therefore y = -\frac{1}{2}x^2 + 2x + 6$	(4)
6.4	$x = -\frac{b}{2a}$ $= -\frac{2}{2\left(-\frac{1}{2}\right)}$ $= 2$ $y = -\frac{1}{2}(2)^2 + 2(2) + 6$ $= 8$ $S(2;8)$ **Answer only, full marks**	✓A substitution ✓CA value of x ✓CA value of y (3)
6.5	$y \in \mathbb{R}, y \leq 8$ **OR** $y \in (-\infty;8]$	✓CA answer (1)
6.6	$x < -2$ or $0 \leq x < 6$ **OR** $x \in (-\infty;-2)$ or $x \in [0;6)$	✓✓✓AA answer (3)
6.7	For roots of h to be real , h cannot be shifted downwards by more than 8 units. $\therefore d \geq -8$ **OR**	✓✓CA answer (2) **OR**

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	$y=-\frac{1}{2}x^2+2x+6+d$ $\Delta=b^2-4ac$ $\Delta=(2)^2-4\left(-\frac{1}{2}\right)(6+d)$ $\Delta=16+2d$ $16+2d\geq 0$ ($\Delta\geq 0$ for intersection with x-axis) $2d\geq -16$ $\therefore d\geq -8$	✓✓CA answer (2)
6.8	$\text{MN}(x)=h(x)-k(x)$ $=\left(-\frac{1}{2}x^2+2x+6\right)-(6-x)$ $=-\frac{1}{2}x^2+3x$ $x=-\frac{b}{2a}$ $=-\frac{3}{2\left(-\frac{1}{2}\right)}$ $=3$ $\text{MN}(x)=-\frac{1}{2}(3)^2+3(3)$ $=\frac{9}{2}$ or $4\frac{1}{2}$ or $4,5$	✓A subtracting two equations ✓CA expression of MN ✓CA value of x ✓CA answer (4)
		[19]

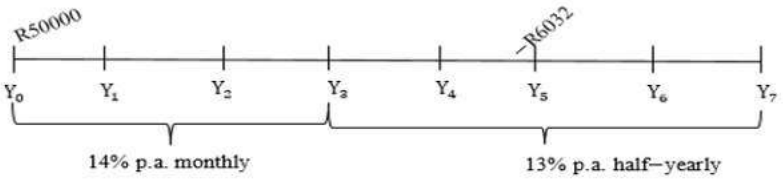
QUESTION 7

7.1.		**for *g*:** ✓A $x-$intercept ✓A $y-$intercept **for *f*:** ✓A $y-$intercept ✓A decreasing shape ✓A asymptote (5)
7.2.1	$(3;4)$	✓A value of x ✓A value of y (2)
7.2.2	$-3\leq x\leq -1$	✓✓AA answer

	OR $x \in [-3;-1]$	**OR** ✓✓AA answer (2)
7.2.3	$k < -6$ **OR** $k \in (-\infty;-6)$	✓✓AA answer (2) **OR** ✓✓AA answer (2)
		[11]

QUESTION 8

8.1.	$A=P(1+i.n)$ $51600 = 30000(1+0,12.n)$ $\frac{\left(\frac{51600}{30000}-1\right)}{0,12} = n$ $\therefore n = 6$ years **n must be a positive integer**	✓A subst. to correct formula ✓CA answer (2)
8.2	$A=P(1-i)^n$ $20416 = P(1-0,025)^8$ $\frac{20416}{(1-0,025)^8} = P$ $\therefore P \approx 25000$ bees **Penalise a mark if NOT rounded to whole number**	✓A reducing balance formula ✓A substitution ✓CA answer (3)

8.3	$A=P(1+i)^n$ $13867=10050\left(1+\frac{x}{4}\right)^{16}$ $\left(\sqrt[16]{\frac{13867}{10050}}-1\right)4=x$ $\therefore x=0,0813000046.....\times 100\%$ $\therefore x=8,13\%$	✓A subst. into correct formula ✓A $\frac{i}{4}$ & 16 ✓CA simplification ✓CA answer (4)
8.4.1	 $A=P(1+i)^n$ $A=50000\left(1+\frac{0,14}{12}\right)^{36}$ $A=R75913,30$	✓A subst into correct formula ✓A $\frac{i}{12}$ & 36 ✓A answer (3)
8.4.2	$A=P(1+i)^n$ $A_5=75913,30\left(1+\frac{0,13}{2}\right)^4$ $A_5=R97659,906-R6032$ $=R91627,906$ $A_7=R91627,906\left(1+\frac{0,13}{2}\right)^4$ $A_7=R117876,22$ **OR** $A_7=\left[75913,30\left(1+\frac{0,13}{2}\right)^4-6032\right].\left(1+\frac{0,13}{2}\right)^4$ $A_7=R117876,22$	✓CA $75913,30\left(1+\frac{0,13}{2}\right)^4$ ✓A −R6032 ✓CA $R91627,906\left(1+\frac{0,13}{2}\right)^4$ ✓CA answer (4) **OR** ✓CA $75913,30\left(1+\frac{0,13}{2}\right)^4$ ✓A −R6032 ✓A $\left(1+\frac{0,13}{2}\right)^4$ ✓ CA answer (4)
		[16]

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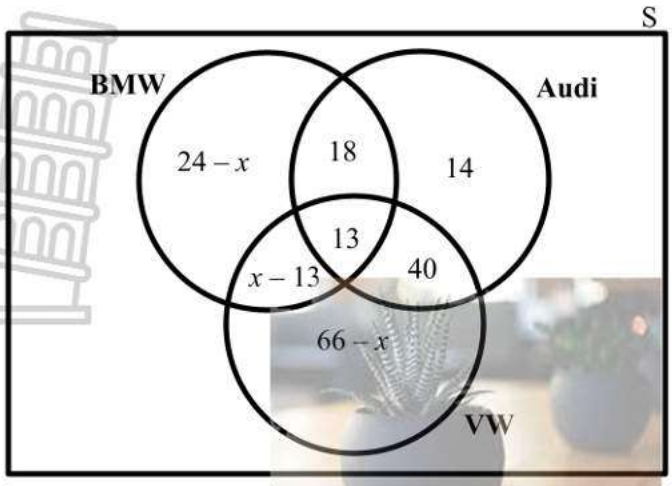
QUESTION 9

9.1.1.	$P(B) = 1 - P(\text{not } B)$ $= 1 - 0,77$ $= 0,23$	✓A substitution to correct rule ✓A answer (2)
9.1.2	$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $0,425 = 0,38 + 0,23 - P(A \text{ and } B)$ $P(A \text{ and } B) = 0,38 + 0,23 - 0,425$ $P(A \text{ and } B) = 0,185$ $P(A \text{ and } B) = 0,19$	✓ A substitution to correct rule ✓CA answer (2)

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9.2.1	NOT Mutually Exclusive, $P(\text{girl and arriving late}) \neq 0$.	✓A NO ✓A reason (2)
9.2.2	$P(\text{boy and arriving on time}) = P(\text{boy}) \times P(\text{arriving on time})$ $\frac{3}{16} = \frac{30}{y} \times \frac{40}{y}$ $3y^2 = 19200$ $\frac{3y^2}{3} = \frac{19200}{3}$ $y^2 = 6400$ $y = \sqrt{6400}$ $y = 80$ **y must be a positive whole number**	✓A rule of independent event ✓A $\frac{30}{y}$ ✓A $\frac{40}{y}$ ✓CA answer (4)
		[10]

QUESTION 10

10.1.1		✓A 20 ✓A 18 and 40 ✓A $x-13$ ✓A $24-x$ and $66-x$ (4)
10.2	let the number of boys be x $P(\text{boy and boy}) = P(\text{first boy}) \times P(\text{second boy})$ $\frac{7}{20} = \frac{x}{25} \times \frac{x-1}{24}$ $\frac{7}{20} = \frac{x^2-x}{600}$ $4200 = 20x^2 - 20x$ $x^2 - x - 210 = 0$ $(x-15)(x+14) = 0$ $x = 15 \text{ or } x \neq -14$ $\text{total number of girls} = 25-15$ $= 10$	✓A $\frac{x}{25}$ ✓A $\frac{x-1}{24}$ ✓A product $= \frac{7}{20}$ ✓A answer (boys) ✓A answer (girls) (5)
		[9]

TOTAL: 150

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