FINAL

KWAZULU-NATAL PROVINCE

EDUCATION

REPUBLIC OF SOUTH AFRICA

MATHEMATICS P1

SEPTEMBER 2025

MARKING GUIDELINES

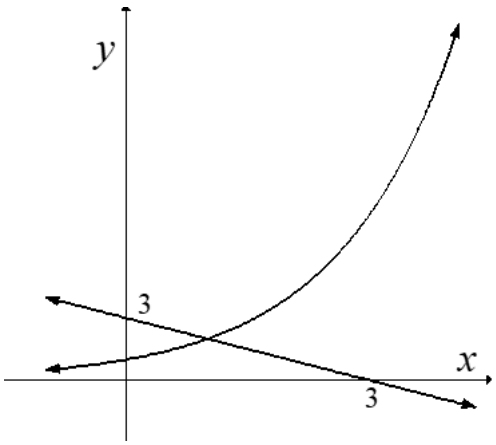
NATIONAL SENIOR CERTIFICATE

GRADE 12

MARKS: 150

These marking guidelines consist of 16 pages.

QUESTION 1

1.1.1	$x^2-11x+30=0$ $(x-6)(x-5)=0$ $x=6$ or $x=5$	✓ A factors ✓ CA answer ✓ CA answer (3)
1.1.2	$3x^2+9x+4=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-(9)\pm\sqrt{(9)^2-4(3)(4)}}{2(3)}$ $x=-2,46$ or $x=-0,54$	✓A substitution ✓ CA answer ✓ CA answer (3)
1.1.3	$\left(\frac{1}{2}\right)^{-x}(3-x)\le 0$ $\left(\frac{1}{2}\right)^{-x}>0$ **or** $(2)^x>0$ $3-x\le 0$ $x\ge 3$ OR $x\in[3;\infty)$ **OR** $\left(\frac{1}{2}\right)^{-x}(x-3)\ge 0$ $\left(\frac{1}{2}\right)^{-x}>0$ **or** $(2)^x>0$ $x-3\ge 0$ $x\ge 3$ OR $x\in[3;\infty)$ **OR**  $x\ge 3$ OR $x\in[3;\infty)$	✓A $\left(\frac{1}{2}\right)^{-x}>0$ **or** $(2)^x>0$ ✓A $3-x\le 0$ ✓A answer (3) **OR** ✓A $\left(\frac{1}{2}\right)^{-x}>0$ **or** $(2)^x>0$ ✓A $x-3\ge 0$ ✓A answer (3) **OR** ✓A exponential graph drawn ✓A straight line drawn ✓A answer (3)

1.1.4	$\sqrt{2-7x}+2x=0$ $\sqrt{2-7x}=-2x$ $\left(\sqrt{2-7x}\right)^2=(-2x)^2$ $4x^2+7x-2=0$ $(4x-1)(x+2)=0$ $x\neq\frac{1}{4}$ or $x=-2$	✓A isolating the surd ✓CA squaring both sides ✓CA standard form ✓CA answers ✓CA selection (5)
1.2	$\frac{2^{4025}+2^{4023}}{4^{2011}}$ $=\frac{2^{4022+3}+2^{4022+1}}{2^{4022}}$ $=\frac{2^3.2^{4022}+2.2^{4022}}{2^{4022}}$ $=\frac{2^{4022}(8+2)}{2^{4022}}$ $=10$ **OR** $\frac{2^{4025}+2^{4023}}{4^{2011}}$ $=\frac{2^{4023+2}+2^{4023}}{2^{4022}}$ $=\frac{2^{4023}(2^2+1)}{2^{4022}}$ $=2(4+1)$ $=10$	✓A 2^{4022} ✓A common factor ✓CA answer (3) **OR** ✓A 2^{4022} ✓A common factor ✓CA answer (3)
1.3	$y=2x-1$ $(3x-y)(x+y)=0$ $(3x-(2x-1))(x+2x-1)=0$ $(x+1)(3x-1)=0$ $x=-1$ or $x=\frac{1}{3}$ $y=2(-1)-1$ or $y=2\left(\frac{1}{3}\right)-1$ $y=-3$ or $y=-\frac{1}{3}$ **OR**	✓A making y subject of the formula ✓CA substitution ✓CA simplification ✓CA x-values ✓CA y-values (5) **OR**

	$y = 2x - 1$ $(3x - y)(x + y) = 0$ $3x^2 + 2xy - y^2 = 0$ $3x^2 + 2x(2x - 1) - (2x - 1)^2 = 0$ $3x^2 + 2x - 1 = 0$ $(3x - 1)(x + 1) = 0$ $x = -1$ or $x = \frac{1}{3}$ $y = -3$ or $y = -\frac{1}{3}$ **OR** $x = \frac{y+1}{2}$ $\left[3\left(\frac{y+1}{2}\right) - y\right]\left[\left(\frac{y+1}{2}\right) + y\right] = 0$ $\left(\frac{1}{2}y + \frac{3}{2}\right)\left(\frac{3}{2}y + \frac{1}{2}\right) = 0$ $y = -3$ or $y = -\frac{1}{3}$ $x = -1$ or $x = \frac{1}{3}$	✓A making y the subject of the formula ✓CA substitution ✓CA standard form ✓CA x-values ✓CA y-values (5) **OR** ✓A making x subject of the formula ✓CA substitution ✓CA simplification ✓CA x-values ✓CA y-values (5)
1.4	Let the one integer be x and the other integer y. $(x + y)^2 = x^2 + 2xy + y^2$ $x^2 + y^2 = (x + y)^2 - 2xy$ $= m^2 - 2n$ Answer only: Full marks	✓A $(x + y)^2 = x^2 + 2xy + y^2$ ✓A $x^2 + y^2 = (x + y)^2 - 2xy$ ✓A $x^2 + y^2 = m^2 - 2n$ (3)
		[25]

QUESTION 2

2.1.1	$T_2 - T_1 = T_3 - T_2$ $2x+1-(x-3) = 4x-1-(2x+1)$ $x+4 = 2x-2$ $x = 6$	{ ✓A $2x+1-(x-3) = 4x-1-(2x+1)$ ✓CA simplification ✓CA answer (3)
2.1.2	3 ; 13 ; 23 ; ... $a = 3$; $d = 10$ $T_7 = a + 6d$ $= 3 + 6(10)$ $= 63$ CA: Only for an AS	✓CA arithmetic sequence ✓CA substitution ✓CA answer (3)
2.2.1	$T_5 = 46$	✓A answer (1)
2.2.2	$2a = 4$ $a = 2$ $3a + b = 5$ $3(2) + b = 5$ $b = -1$ $a + b + c = 2$ $2 - 1 + c = 2$ $c = 1$ $T_n = 2n^2 - n + 1$	✓A value of a ✓CA value of b ✓CA value of c ✓CA answer (4)
2.2.3	1st differences : 5 ; 9 ; 13 ; ... $a = 5$; $d = 4$ $S_n = \frac{n}{2}[2a + (n-1)d]$ $= \frac{n}{2}[2(5) + (n-1)4]$ $= \frac{n}{2}[4n + 6]$ $= 2n^2 + 3n$ **OR** $T_n = 4n + 1$ $S_n = \frac{n}{2}[a + l]$ $S_n = \frac{n}{2}[5 + 4n + 1]$ $= \frac{n}{2}[4n + 6]$ $= 2n^2 + 3n$	✓A substitution of $a = 5$ ✓A substitution of $d = 4$ ✓A $\frac{n}{2}[4n + 6]$ (3) **OR** ✓A substitution of $a = 5$ ✓A substitution of $l = T_n$ ✓A $\frac{n}{2}[4n + 6]$ (3)

2.2.4	$T_1 + S_{40}$ $= 2 + 3320$ $= T_{41}$ $\therefore 41^{st}$ term **OR** $T_n = 2n^2 - n + 1 = 3322$ $2n^2 - n - 3321 = 0$ $n = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(-3321)}}{2(2)}$ $n = 41$ or $-40{,}5$ $\therefore 41^{st}$ term Answer only: Full marks	✓A $T_1 + S_{40}$ ✓A answer **OR** ✓CA substitution ✓CA answer (2)
		[16]

QUESTION 3

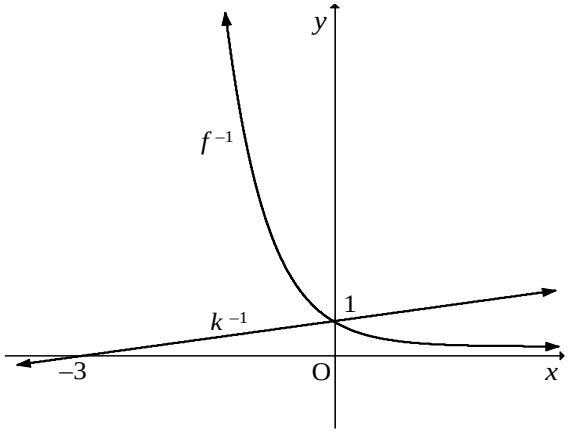
3.1	$r = \sqrt{3}$ $T_n = ar^{n-1}$ $\frac{1}{2}\left(\sqrt{3}\right)^{n-1} = \frac{81\sqrt{3}}{2}$ $\left(\sqrt{3}\right)^{n-2} = 81$ $\left(3^{\frac{1}{2}}\right)^{n-2} = 3^4$ $\frac{1}{2}n - 1 = 4$ $n = 10$	✓A value of r ✓CA $\frac{1}{2}\left(\sqrt{3}\right)^{n-1} = \frac{81\sqrt{3}}{2}$ ✓CA LHS and RHS as powers of 3 ✓CA answer (4)
	OR $r = \sqrt{3}$ $T_n = ar^{n-1}$ $\frac{1}{2}\left(\sqrt{3}\right)^{n-1} = \frac{81\sqrt{3}}{2}$ $\left(\sqrt{3}\right)^{n-2} = 81$ $n - 2 = \log_{\sqrt{3}} 81$ $n = 10$	**OR** ✓A value of r ✓CA $\frac{1}{2}\left(\sqrt{3}\right)^{n-1} = \frac{81\sqrt{3}}{2}$ ✓CA correct use of logarithms ✓CA answer (4)

3.2	$\sum_{k=0}^{\infty} 9p^k = 9 + 9p + 9p^2 + \ldots$ $a = 9 \;;\; r = p$ $S_\infty = \frac{a}{1-r}$ $S_\infty = \frac{9}{1-p}$ $\sum_{m=1}^{7} (-27)\left(-\frac{2}{3}\right)^m = (-27)\left(-\frac{2}{3}\right) + (-27)\left(-\frac{2}{3}\right)^2 + \ldots + (-27)\left(-\frac{2}{3}\right)^7$ $a = 18 \;;\; r = -\frac{2}{3}$ $S_7 = \frac{-27\left[\left(-\frac{2}{3}\right)^7 - 1\right]}{-\frac{2}{3} - 1} = \frac{926}{81}$ $\frac{9}{1-p} = \frac{926}{81}$ $926(1-p) = 729$ $926p = 197$ $p = \frac{197}{926} = 0,21$	✓A expanding ✓CA substitution in S_∞ formula ✓A $a = 18 \;;\; r = -\frac{2}{3}$ ✓CA substitution in S_n formula ✓CA equating ✓CA answer (6)
		[10]

QUESTION 4

4.1	$C(0\,;3)$	✓A answer (1)
4.2	$B\left(\frac{x_1+x_2}{2}\,;\,\frac{y_1+y_2}{2}\right)$ $B\left(\frac{0+4}{2};\frac{3-1}{2}\right)$ $B(2\,;1)$	✓A $\frac{0+4}{2}$ ✓CA $\frac{3-1}{2}$ (2)
4.3	$g(x)=\frac{a}{x-2}+1$ $t=1$ $r=-2$ Subst.$(0\,;3)$: $\frac{a}{0-2}+1=3$ **OR** subst.$(4\,;-1)$: $\frac{a}{4-2}+1=-1$ $a=-4$	✓A value of t ✓A value of r ✓CA substituting $(0\,;3)$ **OR** $(4\,;-1)$ ✓CA value of a (4)
4.4	$x=-1$ and $y=0$	✓CA $x=-1$ ✓CA $y=0$ (2)
4.5	$f(x)=\frac{1}{2}(x+2)^2+w$ Subst.$(2\,;1)$: $\frac{1}{2}(2+2)^2+w=1$ $w=-7$ $f(x)=\frac{1}{2}(x^2+4x+4)-7$ $f(x)=\frac{1}{2}x^2+2x-5$	✓A substituting $(2\,;1)$ ✓A value of w ✓A $f(x)=\frac{1}{2}(x^2+4x+4)-7$ (3)
4.6	Minimum value of $f=-7$ $\therefore\ -7<k<-5$	✓A minimum value of f ✓✓CA; A answer (3)
4.7	$\frac{1}{2}x^2+2x-5=-x+3$ $\frac{1}{2}x^2+3x-8=0$ $x^2+6x-16=0$ $(x+8)(x-2)=0$ $x=-8$ or $x=2$ $\therefore\ -8<d<2$ **OR** $d\in(-8\,;2)$	✓A equating ✓A $x=-8$ ✓✓CA A answer (4)
		[19]

QUESTION 5

5.1	$\mathrm{D}(1\,;0)$	✓A answer (1)
5.2	$f(x)=\log_b x$ Subst. $\left(\frac{1}{4};1\right)$: $1=\log_b\left(\frac{1}{4}\right)$ $b=\frac{1}{4}$	✓A substituting $\left(\frac{1}{4}\,;1\right)$ ✓CA value of b (2)
5.3	$k(x)=mx-3$ Subst. $(1;0)$: $0=m(1)-3$ $m=3$ **OR** $m=\frac{-3-0}{0-1}$ $=3$ Answer only: Full marks	✓CA substituting x-intercept ✓CA value of m **OR** ✓CA substitution ✓CA answer (2)
5.4	$x>0$ **OR** $x\in(0\,;\infty)$	✓A answer (1)
5.5	$f(x)=\log_{\frac{1}{4}} x$ $f^{-1}(x)\colon x=\log_{\frac{1}{4}} y$ $y=\left(\frac{1}{4}\right)^x$ **OR** $y=(4)^{-x}$ Answer only: Full marks	✓A $f^{-1}(x)\colon x=\log_{\frac{1}{4}} y$ ✓CA answer (2)
5.6	$f^{-1}(x)=\frac{1}{4}$ If $\left(\frac{1}{4}\right)^x=\frac{1}{4}$, then $x=1$ If $\left(\frac{1}{4}\right)^x=16$, then $x=-2$ $-2\le x\le 1$ Answer only: Full marks	✓CA $x=-2$ ✓CA ✓A answer (3)
5.7		f^{-1}: ✓ A shape ✓ A y-intercept k^{-1}: ✓ A shape ✓ A y-intercept (4)
		[15]

QUESTION 6

6.1.1	$1+i_e=\left(1+\frac{i_N}{m}\right)^m$ $i_e=\left(1+\frac{0,0715}{4}\right)^4-1$ $i_e=7,34\%$ p.a.	✓A substitution ✓CA answer (2)
6.1.2	$A=P(1+i)^n$ $17\ 628,78=10\ 000\left(1+\frac{0,0715}{4}\right)^{4n}$ $\left(1+\frac{0,0715}{4}\right)^{4n}=\frac{17628,78}{10\ 000}$ $4n=\log_{\left(1+\frac{0,0715}{4}\right)}\left(\frac{17628,78}{10\ 000}\right)$ $4n=32$ $n=8$ years **OR** $A=P(1+i)^n$ $17\ 628,78=10\ 000(1+0,0734)^n$ $(1+0,0734)^n=\frac{17\ 628,78}{10\ 000}$ $n=\log_{(1+0,0734)}\left(\frac{17628,78}{10\ 000}\right)$ $n=8$ years	✓A substitution into correct formula ✓CA isolate $\left(1+\frac{0,0715}{4}\right)^{4n}$ ✓CA use of logarithms ✓CA answer (4) **OR** ✓A substitution ✓CA isolate $(1+0,0734)^{4n}$ ✓CA use of logarithms ✓CA answer (4)

6.2.1	OB = present value of remaining instalments $P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $P = \frac{10\ 492{,}56\left[1-\left(1+\frac{0{,}1125}{12}\right)^{-115}\right]}{\frac{0{,}1125}{12}}$ $P = \text{R}736\ 498{,}33$ **OR** $\text{OB} = \text{A} - \text{F}$ $= 1000\ 000\left(1+\frac{0{,}1125}{12}\right)^{125} - \frac{10\ 492{,}56\left[\left(1+\frac{0{,}1125}{12}\right)^{125}\right]}{\frac{0{,}1125}{12}}$ $= \text{R}736\ 498{,}33$	✓A $n = 115$ in P-formula ✓A $i = \frac{0{,}1125}{12}$ ✓CA substitution into correct formula ✓CA answer (4) **OR** ✓A $n = 125$ in both formulas ✓A $i = \frac{0{,}1125}{12}$ ✓A subst. into correct formulas ✓CA answer (4)
6.2.2	$A = P(1+i)^n$ $A = 736\ 498{,}33\left(1+\frac{0{,}1125}{12}\right)^5$ $A = 771\ 675{,}10$ number of instalments remaining = 110 $P_V = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $771\ 675{,}10 = \frac{x\left[1-\left(1+\frac{0{,}1125}{12}\right)^{-110}\right]}{\frac{0{,}1125}{12}}$ $0{,}64172198855x = 7234{,}454063$ $x = \text{R}11\ 273{,}50$	✓CA substitution into compound interest formula ✓CA value of A ✓A $n = 110$ ✓CA substitution into correct formula ✓CA answer (5)
		[15]

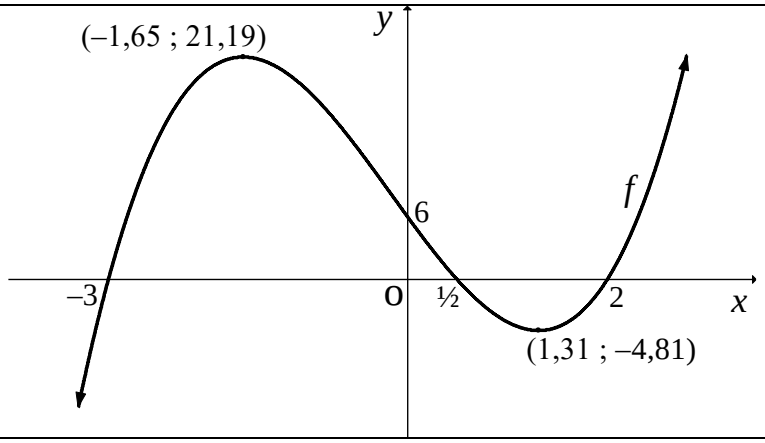
QUESTION 7

7.1	$f(x+h) = -5x^2 - 10xh - 5h^2$ $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h\to 0} \frac{-5x^2 - 10xh - 5h^2 - (-5x^2)}{h}$ $= \lim_{h\to 0} \frac{-5x^2 - 10xh - 5h^2 + 5x^2}{h}$ $= \lim_{h\to 0} \frac{-10xh - 5h^2}{h}$ $= \lim_{h\to 0} \frac{h(-10x - 5h)}{h}$ $= \lim_{h\to 0} (-10x - 5h)$ $= -10x$	✓A value of $f(x+h)$ ✓CA substitution ✓CA simplifying ✓CA factors ✓CA answer (5)
7.2.1	$y = \frac{x^3 - 27}{x - 3}$ $y = \frac{(x-3)(x^2 + 3x + 9)}{x - 3}$ $y = x^2 + 3x + 9$ $\frac{dy}{dx} = 2x + 3$	✓A factors ✓CA $2x$ ✓CA $+3$ (3)
7.2.2	$D_x\left[x\left(4 - x^{-\frac{1}{2}}\right)\right]$ $= D_x\left[4x - x^{\frac{1}{2}}\right]$ $= 4 - \frac{1}{2}x^{-\frac{1}{2}}$	✓A $4x - x^{\frac{1}{2}}$ ✓CA 4 ✓CA $-\frac{1}{2}x^{-\frac{1}{2}}$ (3)

7.3	$f(x)=ax^2;\quad x>0$ $f'(x)=2ax$ $f'(4)=8a$ $f^{-1}:\quad x=ay^2;\ y>0$ $\therefore y=\sqrt{\frac{x}{a}}$ and $f^{-1}(1)=\sqrt{\frac{1}{a}}$ $f'(4)=f^{-1}(1)$ $\therefore 8a=\sqrt{\frac{1}{a}}$ $64a^2=\frac{1}{a}$ $a=\frac{1}{4}$	✓A $f'(4)=8a$ ✓A $f^{-1}:\quad x=ay^2$ ✓CA $f^{-1}(1)=\sqrt{\frac{1}{a}}$ ✓CA equating ✓CA answer (5)
		[16]

QUESTION 8

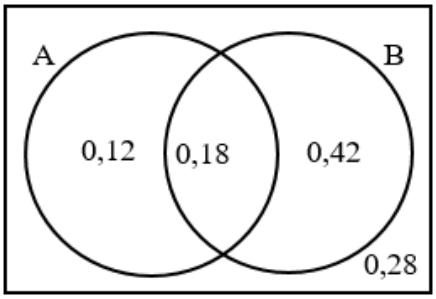
8.1	$(x-2)(2x^2+5x-3)=0$ $(x-2)(2x-1)(x+3)=0$ $x=2$ or $x=\frac{1}{2}$ or $x=-3$	✓A $2x^2+5x-3$ ✓CA $(2x-1)(x+3)$ ✓CA answers ($x=\frac{1}{2}$; $x=-3$) (3)
8.2	At turning points: $f'(x)=6x^2+2x-13=0$ $x=\frac{-(2)\pm\sqrt{(2)^2-4(6)(-13)}}{2(6)}$ $x=-1,65$ or $x=1,31$ Turning points: $(1,31\ ;\ -4,82)$ $(-1,65\ ;\ 21,19)$	✓A $6x^2+2x-13=0$ ✓CA substitution ✓CA both x values ✓CA both y values (4)

8.3		✓A shape ✓CA x and y intercepts ✓CA turning points (3)
8.4	x-coordinate of point of inflection: $x=-0,17$ $x<-1,65$ or $-0,17<x<1,31$ **OR** x-coordinate of point of inflection: $x=-0,17$ $x\in(-\infty\ ;\ -1,65)$ or $x\in(-0,17\ ;\ 1,31)$	✓A x-value ✓CA $x<-1,65$ ✓✓CA CA $-0,17<x<1,31$ (4) **OR** ✓A x-value ✓CA $x\in(-\infty\ ;\ -1,65)$ ✓✓CA CA $x\in(-0,17\ ;\ 1,31)$ (4)
		[14]

QUESTION 9

9.1	$V=\pi r^2h=300$ $\therefore\ h=\dfrac{300}{\pi r^2}$	✓A $\pi r^2h=300$ (1)
9.2	Total surface area $=\pi r^2+2\pi rh$ $=\pi r^2+2\pi r\left(\dfrac{300}{\pi r^2}\right)$ $=\pi r^2+\dfrac{600}{r}$ $=\pi r^2+600r^{-1}$ For a minimum: $A'(r)=2\pi r-600r^{-2}=0$ $2\pi r^3=600$ $r=\sqrt[3]{\dfrac{300}{\pi}}$ $r=4,57$ cm	✓A formula ✓CA substitution ✓CA derivative = 0 ✓CA $2\pi r^3=600$ ✓CA value of r (5)
		[6]

QUESTION 10

10.1.1	$P(A \text{ and } B) = P(A) \times P(B)$ Independent events $= 0,3 \times 0,6$ $= 0,18$  CA on condition: • That independent events was used; and • That probability values are between 0 and 1	✓A $P(A) \times P(B) = 0,3 \times 0,6$ ✓A 0,18 ✓CA 0,12 & 0,42 ✓CA 0,28 (4)
10.1.2 (a)	$P(B \text{ only}) = 0,42$	✓CA answer (1)
10.1.2 (b)	$P(B \text{ or not } A) = P(\text{not } A) + P(B) - P(\text{not } A \text{ and } B)$ $= 0,7 + 0,6 - 0,42$ $= 0,88$ **OR** $P(B \text{ or not } A) = 0,18 + 0,42 + 0,28$ $= 0,88$ **OR** $P(B \text{ or NOT } A) = 1 - P(A \text{ only})$ $= 1 - 0,12$ $= 0,88$	✓CA substitution ✓CA answer (2) **OR** ✓CA substitution ✓CA answer (2) **OR** ✓CA substitution ✓CA answer (2)
10.2.1	$8 \times 8 \times 8 \times 8 = 8^4 = 4096$	✓A answer (1)
10.2.2 (a)	$8 \times 7 \times 6 \times 5 = 1680$	✓A answer (1)

10.2.2 (b)	No. of different codes starting with a '2,3 or 4' $= (3\times6\times5\times2) = 180$ No. of different codes starting with a '5' $= (1\times6\times5\times1) = 30$ Total no. of different codes $= 180 + 30 = 210$ $\text{Probability} = \frac{\text{no. of codes between 2000 and 6000}}{\text{no of codes in the sample space}}$ $= \frac{210}{1680} = \frac{1}{8} = 0{,}125$ **OR** No. of different codes ending with a '0': $= (4\times6\times5\times1) = 120$ No. of different codes ending with a '5' $= (3\times6\times5\times1) = 90$ Total no. of different codes $= 120 + 90 = 210$ $\text{Probability} = \frac{\text{no. of codes between 2000 and 6000}}{\text{no of codes in the sample space}}$ $= \frac{210}{1680} = \frac{1}{8} = 0{,}125$	✓A $3\times6\times5\times2$ ✓A $1\times6\times5\times1$ ✓CA adding ✓CA dividing by no in sample space ✓ CA answer (5) **OR** ✓A $4\times6\times5\times1$ ✓A $3\times6\times5\times1$ ✓CA adding ✓CA dividing by no in sample space ✓ CA answer (5)
		[14]

TOTAL: 150