basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
SENIORSERTIFIKAAT-EKSAMEN
NATIONAL SENIOR CERTIFICATE EXAMINATIONS/
NASIONALE SENIORSERTIFIKAAT-EKSAMEN



MATHEMATICS P1/*WISKUNDE V1*

MARKING GUIDELINES/*NASIENRIGLYNE*

MAY/JUNE/*MEI/JUNIE* 2023

MARKS: 150
PUNTE: 150

These marking guidelines consist of 15 pages./
Hierdie nasienriglyne bestaan uit 15 bladsye.

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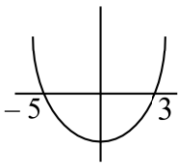
NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent Accuracy applies in all aspects of the marking guidelines.

LET WEL:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die EERSTE poging.*
- *Volgehoue akkuraatheid is DEURGAANS op ALLE aspekte van die nasienriglyne van toepassing.*

QUESTION 1/*VRAAG* 1

1.1.1	$x^2 - 7x + 12 = 0$ $(x-4)(x-3) = 0$ $x = 4$ or $x = 3$ Answer only: Full Marks	✓ factors ✓ $x = 4$ ✓ $x = 3$ (3)
1.1.2	$3x^2 + 5x - 1 = 0$ $x = \frac{-5 \pm \sqrt{5^2 - 4(3)(-1)}}{2(3)} = \frac{-5 \pm \sqrt{37}}{6}$ $\therefore x = 0{,}18$ or $x = -1{,}85$	✓standard form ✓substitution into the correct formula ✓ $x = 0{,}18$ ✓ $x = -1{,}85$ (4)
1.1.3	$x^2 + 2x - 15 < 0$ $(x-3)(x+5) < 0$ $x = 3$ or $x = -5$ $-5 < x < 3$ 	✓standard form ✓ critical values ✓✓answer (4)
1.1.4	$\sqrt{2(1-x)} = x - 1$ $\left(\sqrt{2(1-x)}\right)^2 = (x-1)^2$ $2 - 2x = x^2 - 2x + 1$ $x^2 - 1 = 0$ $\therefore x = 1$ and $x \neq -1$	✓squaring both sides ✓simplification ✓standard form ✓ answer with selection (4)

1.2	$3^{x+y}=27$ $x^2+y^2=17$ $3^{x+y}=3^3$ $x+y=3$ .....(1) $y=3-x$ $x^2+(3-x)^2=17$ $2x^2-6x-8=0$ $x^2-3x-4=0$ $(x-4)(x+1)=0$ $x=4$ or $x=-1$ $y=-1$ or $y=4$ **OR/*OF*** $3^{x+y}=27$ $x^2+y^2=17$ $3^{x+y}=3^3$ $x+y=3$ .....(1) $x=3-y$ $(3-y)^2+y^2=17$ $9-6y+y^2+y^2-17=0$ $2y^2-6y-8=0$ $y^2-3y-4=0$ $(y-4)(y+1)=0$ $y=-1$ or $y=4$ $x=4$ or $x=-1$	✓$3^{x+y}=3^3$ ✓$x+y=3$ ✓substitution ✓standard form ✓x-values ✓y-values (6) **OR/*OF*** ✓$3^{x+y}=3^3$ ✓$x+y=3$ ✓substitution ✓standard form ✓y-values ✓x-values (6)

1.3	$\frac{1}{\sqrt{1}+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+\ldots+\frac{1}{\sqrt{99}+\sqrt{100}}$ $=\frac{1}{\sqrt{1}+\sqrt{2}}\times\frac{\sqrt{1}-\sqrt{2}}{\sqrt{1}-\sqrt{2}}+\ldots$ $+\frac{1}{\sqrt{99}+\sqrt{100}}\times\frac{\sqrt{99}-\sqrt{100}}{\sqrt{99}-\sqrt{100}}$ $=-1+\sqrt{2}-\sqrt{2}+\sqrt{3}-\sqrt{3}+2\ldots-\sqrt{99}+10$ $=-1+10$ $=9$	✓rationalisation ✓ simplification ✓ answer (3)
		[24]

QUESTION 2/*VRAAG* 2

2.1.1	$\frac{1}{5}+\frac{1}{15}+\frac{1}{45}+\ldots$ $r=\frac{\frac{1}{15}}{\frac{1}{5}}=\frac{1}{3}$ $-1<\frac{1}{3}<1$ $\therefore$ the series is convergent.	✓ $r=\frac{1}{3}$ ✓ answer (any indicator of convergence) (2)
2.1.2	$S_{\infty}=\frac{a}{1-r}$ $=\frac{\frac{1}{5}}{1-\frac{1}{3}}$ $=\frac{3}{10}$	✓ substitution ✓ answer (2)
2.2.1	$4x\,;\frac{1}{81}$	✓ $4x$ ✓ $\frac{1}{81}$ (2)
2.2.2	$T_n=x+(n-1)x$ $=x+xn-x$ $=xn$ Answer only: Full Marks	✓ substitution ✓ answer (2)
2.2.3	$T_n=ar^{n-1}$ $T_{13}=\frac{1}{3}\left(\frac{1}{3}\right)^{13-1}$ $T_{13}=\left(\frac{1}{3}\right)^{13}$ or $\frac{1}{1594323}$ or $6{,}27\times10^{-7}$ or 3^{-13}	✓ $n=13$ ✓ $r=\frac{1}{3}$ ✓ answer (3)
2.2.4	$\sum_{n=1}^{21}P_n=S_{11}+S_{10}$ $=\frac{11}{2}[2x+10x]+\frac{\frac{1}{3}\left[1-\left(\frac{1}{3}\right)^{10}\right]}{1-\frac{1}{3}}$ $=66x+0{,}5$ $33{,}5=66x+0{,}5$ $\therefore x=\frac{1}{2}$	✓ S_{11} ✓ $+S_{10}$ ✓ arithmetic sum ✓ geometric sum ✓ $66x+0{,}5$ (A) ✓ answer (6)
		[17]

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QUESTION 3/*VRAAG* 3

3.1	$x \;;\; x \;;\; T_3;\ldots$ $0 \quad T_3-x$ 10	✓ $0 \quad T_3-x$ 10
	$2a=10 \qquad 3a+b=0$ $a=5 \qquad\quad b=-15$	✓ $2a=10$ ✓ $3a+b=0$
	$T_3-x-0=10$ $\therefore T_3=x+10$	
	$2x+T_3=28$ $2x+x+10=28$ $3x=18$ $x=6$	✓ $2x+T_3=28$ ✓ $x=6$
	$a+b+c=6$ $5-15+c=6$ $c=16$	✓ $5-15+c=6$
	$\therefore T_n=5n^2-15n+16$	(6)
	OR/*OF*	**OR/*OF***
	$2a=10$ $\therefore a=5$	✓ $2a=10$
	$T_1=a+b+c \quad T_2=4a+2b+c \quad T_3=9a+3b+c$ $=5+b+c \quad\quad =20+2b+c \quad\quad =45+3b+c$	
	$5+b+c=20+2b+c$ $b=-15$	✓ $5+b+c=20+2b+c$
	$T_1=-10+c \quad T_2=-10+c \quad T_3=c$	✓ $T_1=-10+c$ ✓ $T_2=-10+c$
	$T_1+T_2+T_3=-10+c-10+c+c$ $28=3c-20$ $c=16$	✓ $28=3c-20$ ✓ $c=16$ (6)

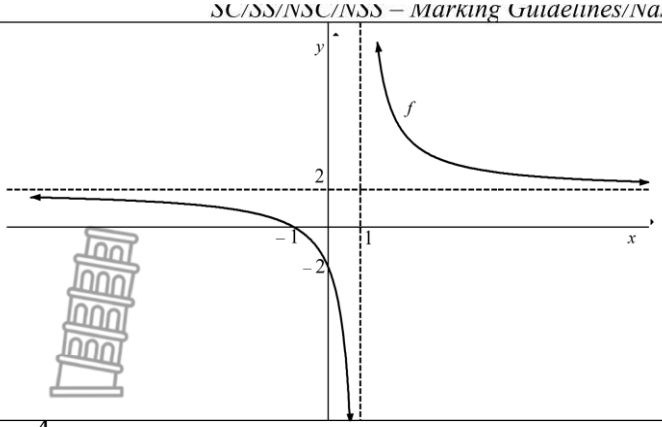
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3.2	$T_n = 5n^2 - 15n + 16$ $216 = 5n^2 - 15n + 16$ $5n^2 - 15n - 200 = 0$ $n^2 - 3n - 40 = 0$ $(n - 8)(n + 5) = 0$ $n = 8$ or $n \neq -5$ $\therefore T_8 = 216$	✓ equating ✓ standard form ✓ $n = 8$ (3)
		[9]

QUESTION 4/*VRAAG* 4

4.1.1	decreasing	✓ decreasing (1)
4.1.2	$y = \left(\frac{1}{3}\right)^x$ $x = \left(\frac{1}{3}\right)^y$ $\therefore y = \log_{\frac{1}{3}} x$ **OR/OF** $y = 3^{-x}$ $x = 3^{-y}$ $\therefore y = -\log_3 x$	✓ swop x and y ✓ answer (2) **OR/OF** ✓ swop x and y ✓ answer (2)
4.1.3	$x > 0; x \in R$	✓ answer (1)
4.1.4	$y = -5$	✓ answer (1)
4.2.1	$x = 1$ $y = 2$	✓ $x = 1$ ✓ $y = 2$ (2)
4.2.2	$\frac{4}{x-1} + 2 = 0$ $4 = -2x + 2$ $2x = -2$ $x = -1$	✓ let $y = 0$ ✓ $x = -1$ (2)

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4.2.3		✓ asymptotes ✓ x-intercept ✓ y-intercept ✓ shape (4)
4.2.4	$\frac{4}{x-1} \geq -2$ $\frac{4}{x-1} + 2 \geq 0$ $x \leq -1$ or $x > 1$	✓ $x \leq -1$ ✓ $x > 1$ (2)
4.2.5	$y = -x + c$ $2 = -3 + c$ $c = 5$ $y = -x + 5$ **OR/*OF*** $y = -x + c$ $2 = -1 + c$ $c = 3$ $y = -x + 3$ $y = -(x - 2) + 3$ $y = -x + 5$ **OR/OF** $y = -(x + p) + q$ $y = -((x - 2) + (-1)) + 2$ $y = -x + 5$	✓ intersection of axes at (3 ; 2) ✓ subst (3 ; 2) and $m = -1$ ✓ $y = -x + 5$ (3) **OR/*OF*** ✓✓ $-(x - 2) + 3$ ✓ $y = -x + 5$ (3) **OR/*OF*** ✓✓ $y = -((x - 2) + (-1)) + 2$ ✓ $y = -x + 5$ (3)
		[18]

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QUESTION 6/*VRAAG* 6

5.1	T.P$(-3;4)$	✓ -3 ✓ 4 (2)
5.2	$y \leq 4$ or $y \in (-\infty; 4]$	✓ answer (1)
5.3	$f(x) = g(x)$ $-(x+3)^2 + 4 = x + 5$ $-x^2 - 6x - 9 + 4 = x + 5$ $-x^2 - 7x - 10 = 0$ $x^2 + 7x + 10 = 0$ $(x+5)(x+2) = 0$ $x = -5$ or $x = -2$	✓ equating ✓ $-x^2 - 6x - 9$ ✓ standard form ✓ factors (4)
5.4	The graph must shift more than 2 and less than 5 units to the right $\therefore -5 < c < -2$	✓✓ answer (2)
5.5	$D(x) = f(x) - g(x) = -x^2 - 7x - 10$ Max : $-2x - 7 = 0$ **OR/OF** $x = \frac{-(-7)}{2(-1)}$ $x = -\frac{7}{2}$ $D\left(-\frac{7}{2}\right) = -\left(-\frac{7}{2}\right)^2 - 7\left(-\frac{7}{2}\right) - 10 = 2{,}25$ $\therefore k = 2{,}25$ $\therefore h(x) = x + 7{,}25$	✓ distance ✓ $-2x - 7 = 0$ ✓ $x = -\frac{7}{2}$ ✓ $k = 2{,}25$ ✓ $h(x) = x + 7{,}25$ (5)
		[14]

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QUESTION 6/*VRAAG* 6

6.1.1	$A = P(1+i)^n$ $A = 150\,000(1+0,065)^5$ A = R205 513	✓ substitution into the correct formula ✓ answer (2)
6.1.2	$A = P(1-in)$ $A = 150\,000(1-0,09\times 5)$ $A = 150\,000 - 67\,000$ A = R82 500	✓ substitution into the correct formula ✓ answer (2)
6.1.3	SF = A – T = 205 513 – 82 500 = R123 013 $F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $x = \frac{F\times i}{(1+i)^n - 1}$ $x = \frac{123\,013\times \frac{0,0785}{12}}{\left[\left(1+\frac{0,0785}{12}\right)^{59} - 1\right]\left(1+\frac{0,0785}{12}\right)}$ = R1 704,01	✓ answer ✓ $i = \frac{0,0785}{12}$ ✓ 59 and $\left(1+\frac{0,0785}{12}\right)$ (A) ✓ answer (A) (4)
6.2	$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $200\,000 = \frac{6\,000\left[1-\left(1+\frac{0,0525}{4}\right)^{-4n}\right]}{\frac{0,0525}{4}}$ $\frac{7}{16} = 1-\left(1+\frac{0,0525}{4}\right)^{-4n}$ $\frac{9}{16} = \left(\frac{1621}{1600}\right)^{-4n}$ $-4n = \frac{\log\frac{9}{16}}{\log\left(\frac{1621}{1600}\right)}$ $-4n = -44,1243\ldots$ n = 11,03 years	✓ substitution into correct formula ✓ simplification ✓ use of logs ✓ $-4n = -44,1243\ldots$ ✓ n = 11,03 years (5)
		[13]

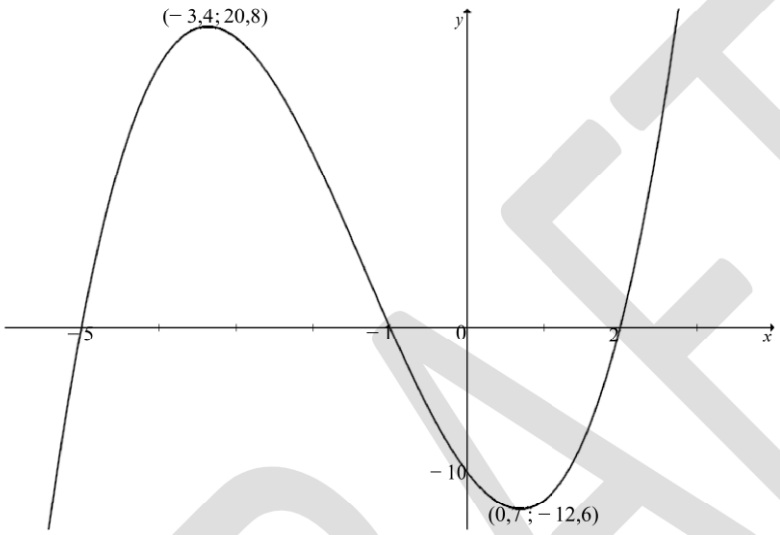
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QUESTION 7/*VRAAG* 7

7.1	$f(x)=-2x^2-1$ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $f'(x)=\lim_{h\to 0}\frac{-2(x+h)^2-1-\left(-2x^2-1\right)}{h}$ $f'(x)=\lim_{h\to 0}\frac{-2x^2-4xh-2h^2-1+2x^2+1}{h}$ $=\lim_{h\to 0}\frac{-4xh-2h^2}{h}$ $=\lim_{h\to 0}\frac{h(-4x-2h)}{h}$ $=-4x$ **OR/*OF*** $f(x+h)=-2(x+h)^2-1$ $f(x+h)=-2x^2-4xh-2h^2-1$ $f(x+h)-f(x)=-2x^2-4xh-2h^2-1+2x^2+1$ $f(x+h)-f(x)=-4xh-2h^2$ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $=\lim_{h\to 0}\frac{-4xh-2h^2}{h}$ $=\lim_{h\to 0}\frac{h(-4x-2h)}{h}$ $=-4x$	✓substitution into the correct formula ✓ $-2x^2-4xh-2h^2-1$ ✓ $-4xh-2h^2$ ✓common factor ✓answer (5) **OR/*OF*** ✓ $-2x^2-4xh-2h^2-1$ ✓ $-4xh-2h^2$ ✓substitution into the correct formula ✓common factor ✓answer (5)
7.2.1	$f(x)=-2x^3+3x^2$ $f'(x)=-6x^2+6x$	✓ $-6x^2$ ✓ $+6x$ (2)
7.2.2	$y=2x+\frac{1}{\sqrt{4x}}$ $y=2x+\frac{1}{2}x^{-\frac{1}{2}}$ $\frac{dy}{dx}=2-\frac{1}{4}x^{-\frac{3}{2}}$	✓ $\frac{1}{2}$ ✓ $x^{-\frac{1}{2}}$ ✓ 2 ✓ $-\frac{1}{4}x^{-\frac{3}{2}}$ (4)
7.3	$x<1$	✓✓ answer (2)
		[13]

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QUESTION 8/*VRAAG* 8

8.1	$y = -10$	✓ answer (1)
8.2	$f(x) = x^3 + 4x^2 - 7x - 10$ $f(2) = 2^3 + 4(2)^2 - 7(2) - 10 = 0$	✓ substitution of $x = 2$ ✓ $f(2) = 0$ (2)
8.3	$f(x) = (x-2)(x^2 + 6x + 5)$ $f(x) = (x-2)(x+5)(x+1)$	✓ $(x-2)$ ✓ $(x+5)$ ✓ $(x+1)$ (3)
8.4		✓ x- intercepts ✓ y-intercept ✓ sketching the graph with turning points in 2nd and 4th quadrant (3)
8.5.1	$x \in (-3,4\ ;\ 0,7)$ **OR/*OF*** $-3,4 < x < 0,7$	✓✓ $x \in (-3,4\ ;\ 0,7)$ (2)
8.5.2	$f(x) = x^3 + 4x^2 - 7x - 10$ $f'(x) = 3x^2 + 8x - 7$ $f''(x) = 6x + 8 = 0$ $\therefore x = -\frac{8}{6} = -\frac{4}{3} = -1,33$ **OR/*OF*** $\frac{-3,4 + 0,7}{2} = -1,35 = -1,35$	✓ $f''(x) = 6x + 8$ ✓ answer (2) **OR/*OF*** ✓ substitution ✓ answer (2)
8.5.3	$x \leq -3,4$ or $-1,33 \leq x \leq 0,7$ **OR/*OF*** $x \in (-\infty\ ;\ -3,4] \cup [-1,33\ ;\ 0,7]$	✓ $x \leq -3,4$ ✓✓ $-1,33 \leq x \leq 0,7$ (3)
		[16]

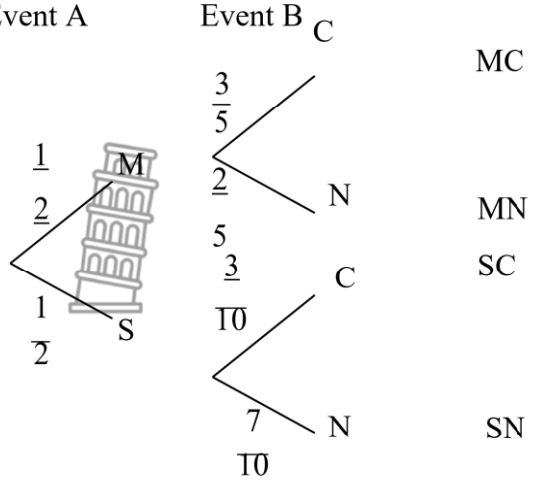
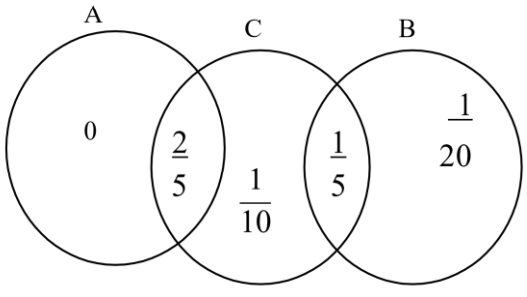
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QUESTION 9/VRAAG 9

9.1	Perimeter of the square = $12-6x$ Side length of square = $\frac{12-6x}{4}=\frac{6-3x}{2}=3-\frac{3}{2}x$	✓ $12-6x$ ✓ answer (2)
9.2	$V=\left(\frac{6-3x}{2}\right)^2(4x)$ $=\left(\frac{36-36x+9x^2}{4}\right)(4x)$ $=36x-36x^2+9x^3$ $V(x)=36x-36x^2+9x^3$ $V'(x)=36-72x+27x^2$ $36-72x+27x^2=0$ $36-72x+27x^2=0$ $9x^2-24x+12=0$ $3x^2-8x+4=0$ $(3x-2)(x-2)=0$ $x=\frac{2}{3}$ or $x=2$ $V\left(\frac{2}{3}\right)=36\left(\frac{2}{3}\right)-36\left(\frac{2}{3}\right)^2+9\left(\frac{2}{3}\right)^3$ $=\frac{32}{3}\text{m}^3=10{,}67\text{m}^3$	✓ $\left(\frac{6-3x}{2}\right)^2(4x)$ ✓ $\left(\frac{36-36x+9x^2}{4}\right)$ ✓ $36x-36x^2+9x^3$ ✓ V' ✓ $V'=0$ ✓ values ✓ answer (7)
		[9]

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QUESTION 10/*VRAAG* 10

10.1.1	Event A Event B  	✓ Event A ✓ Event B Medication: for P(C) = $\frac{3}{5}$ ✓ Event B sugar pill: for P(NC) = $\frac{7}{10}$ (3)
10.1.2	P(Not Cured) = P(M) × P(NC) + P(S) × P(NC) $= \left(\frac{1}{2}\right)\left(\frac{2}{5}\right) + \left(\frac{1}{2}\right)\left(\frac{7}{10}\right)$ $= \frac{11}{20} = 0,55$	✓substitution ✓answer (2)
10.2.1	P(A or B) = P(A) + P(B) – P(A and B) P(A and B) = $\frac{13}{20} - \frac{2}{5} - \frac{1}{4} = 0$ Events are mutually exclusive **OR/*OF*** P(A) + P(B) = $\frac{2}{5} + \frac{1}{4}$ $= \frac{13}{20}$ P(A or B) = P(A) + P(B) P(A and B) = 0 Events are mutually exclusive	✓ substitution ✓answer (P(A and B) = 0) (2) **OR/*OF*** ✓ substitution ✓answer (P(A and B) = 0) (2)
10.2.2	P(B and C) = $\frac{1}{5} = 0,2$ P(only C) = $\frac{7}{10} - \frac{2}{5} - \frac{1}{5} = \frac{1}{10} = 0,1$  	✓ P(B and C) = $\frac{1}{5}$ (A) ✓ $\frac{7}{10} - \frac{2}{5} - \frac{1}{5}$ ✓ $\frac{1}{10}$ (3)

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10.2.3	P(no event) $= 1 + \left(\frac{2}{5} + \frac{1}{10} + \frac{1}{5} + \frac{1}{20}\right) = \frac{1}{4} = 0,25$			✓1 – (P(A) or P(B) or P(C)) ✓answer (2)
10.3.1	$3! \times 5!$ $= 720$	Answer only: Full Marks		✓ 3! ✓ $3! \times 5!$ (A) (2)
10.3.2	$\frac{7! - 6! \times 2}{7!} = \frac{5}{7} = 0,71$ **OR/*OF*** $1 - \frac{6! \times 2}{7!}$ $= 1 - \frac{2}{7}$ $= \frac{5}{7} = 0,71$			✓ $7! - 6! \times 2$ ✓ denominator (7!) ✓ answer (3) **OR/*OF*** ✓ $6! \times 2$ ✓ denominator (7!) ✓ answer (3)
				[17]

TOTAL/*TOTAAL*: 150

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