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basic education

Department:
Basic Education
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NASIONALE SENIORSERTIFIKAAT-EKSAMEN

MATHEMATICS P1/*WISKUNDE V1*

MARKING GUIDELINES/*NASIENRIGLYNE*

MAY/JUNE/*MEI/JUNIE* 2024

MARKS: 150
PUNTE: 150

These marking guidelines consist of 16 pages./
Hierdie nasienriglyne bestaan uit 16 bladsye.

APPROVED
2024-06-11

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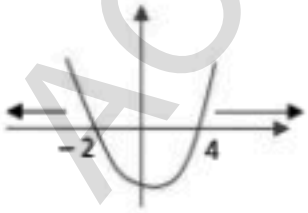
NOTE:

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

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	$3x^2+5x=0$ $x(3x+5)=0$ $x=0$ or $x=-\frac{5}{3}$	✓factors ✓both answers (2)
1.1.2	$4x^2+3x-5=0$ $x=\frac{-(3)\pm\sqrt{(3)^2-4(4)(-5)}}{2(4)}$ $x=0{,}80$ or $x=-1{,}55$	✓correct substitution into correct formula ✓answer ✓answer (3)
1.1.3	$(x-1)^2-9\geq 0$ $x^2-2x-8\geq 0$ $(x-4)(x+2)\geq 0$ $x=4$ or $x=-2$ $x\leq -2$ or $x\geq 4$ 	✓simplification ✓critical values ✓✓ $x\leq -2$ or $x\geq 4$ (4)
1.1.4	$5^{2x}-5^x=0$ $5^x(5^x-1)=0$ $5^x\neq 0$ or $5^x=1$ $x=0$ **OR/OF** $5^{2x}=5^x$ $2x=x$ $x=0$	✓✓common factor ✓ $5^x\neq 0$ ✓ $x=0$ (4) **OR/OF** ✓✓ $5^{2x}=5^x$ ✓ $2x=x$ ✓ $x=0$ (4)

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1.1.5	$\frac{x}{\sqrt{20-x}}=1$ $x=\sqrt{20-x}$ $x^2=20-x$ $x^2+x-20=0$ $(x+5)(x-4)=0$ $x=4$ or $x\neq -5$	✓isolating the surd ✓squaring both sides ✓standard form ✓both answers ✓selection (5)
1.2	$2x^2-y^2=7$ .... (1) $x+y=9$ .... (2) $y=9-x$ $2x^2-(9-x)^2=7$ $2x^2-81+18x-x^2=7$ $x^2+18x-88=0$ $(x+22)(x-4)=0$ $x=-22$ or $x=4$ $y=31$ or $y=5$ **OR/*OF*** $2x^2-y^2=7$ .... (1) $x+y=9$ .... (2) $x=9-y$ $2(9-y)^2-y^2=7$ $2(81-18y+y^2)-y^2-7=0$ $162-36y+2y^2-y^2-7=0$ $y^2-36y+155=0$ $(y-31)(y-5)=0$ $y=31$ or $y=5$ $x=-22$ or $x=4$	✓ $y=9-x$ ✓substitution ✓standard form ✓x-values ✓y-values (5) **OR/*OF*** ✓ $x=9-y$ ✓substitution ✓standard form ✓y-values ✓x-values (5)
1.3	$P\times T=(1-a)(1+a)(1+a^2)(1+a^4)...(1+a^{512})$ $P\times T=(1-a^2)(1+a^2)(1+a^4)...(1+a^{512})$ $P\times T=(1-a^4)(1+a^4)...(1+a^{512})$ $P\times T=(1-a^8)...(1+a^{512})$ $P\times T=(1-a^{512})(1+a^{512})$ $=1-a^{1024}$	✓$(1-a^4)$ ✓$(1-a^{512})$ ✓$1-a^{1024}$ (3)
		[26]

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QUESTION 2/*VRAAG 2*

2.1.1	$r=\frac{1}{2}$ Yes, because $-1<\frac{1}{2}<1$	✓yes ✓reason (2)
2.1.2	$S_\infty=\frac{a}{1-r}$ $S_\infty=\frac{4}{1-\frac{1}{2}}$ $\therefore S_\infty=8$	✓substitution of a and r into the correct formula ✓answer (2)
2.2	$\sum_{p=k}^{10}3^{p-1}=3^{k-1}+3^{k+1-1}+3^{k+2-1}+\ldots+3^9$ $=3^{k-1}+3^k+3^{k+1}+\ldots 3^9$ $S_n=\frac{a(r^n-1)}{r-1}$ $29\,520=\frac{3^{k-1}(3^{11-k}-1)}{3-1}$ $3^{10}-3^{k-1}=59\,040$ $3^{k-1}=9$ $k-1=2$ $\therefore k=3$	✓$3^{k-1}+3^k$ ✓$r=3$ ✓substitution of 3^{k-1} in correct sum formula ✓$n=11-k$ ✓answer (5)
		[9]

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QUESTION 3/*VRAAG* 3

3.1.1	3 ; 7 ; 12 ; 18 ∨ ∨ ∨ First diff: 4 ; 5 ; 6 ∨ ∨ Second diff: 1 ; 1 $2a=1$ $a=\frac{1}{2}$ $3a+b=4$ $3\left(\frac{1}{2}\right)+b=4$ $b=\frac{5}{2}$ $a+b+c=3$ $\frac{1}{2}+\frac{5}{2}+c=3$ $c=0$ $T_n=\frac{1}{2}n^2+\frac{5}{2}n$	✓ $2a=1$ ✓ $3\left(\frac{1}{2}\right)+b=4$ ✓ $\frac{1}{2}+\frac{5}{2}+c=3$ (3)
3.1.2	$13\,527=\frac{1}{2}n^2+\frac{5}{2}n$ $n^2+5n-27\,054=0$ $(n-162)(n+167)=0$ $n=162$ or $n=-167$ $T_{161}=13\,363$ $13\,527-13363=164$ 164 must be added. **OR/*OF*** $T_n=3+$ sum of 1st differences $13527=3+4+5+\ldots+n$ $S_n=\frac{n}{2}[2(4)+(n-1)(1)]$ $=\frac{n}{2}(7+n)$ $3+\frac{n}{2}(7+n)=13\,527$ $6+7n+n^2=27\,054$ $n^2+7n-27\,048=0$ $(n-161)(n+168)=0$ $n=161$ $\therefore T_n=3+n$ $T_{161}=3+161$ $=164$	✓ $13\,527=\frac{1}{2}n^2+\frac{5}{2}n$ ✓ answers for n ✓ $13\,527-13363$ ✓ 164 (4) **OR/*OF*** ✓ $13527=3+4+5+\ldots+n$ ✓ $3+\frac{n}{2}(7+n)=13\,527$ ✓ answers for n ✓ 164 (4)

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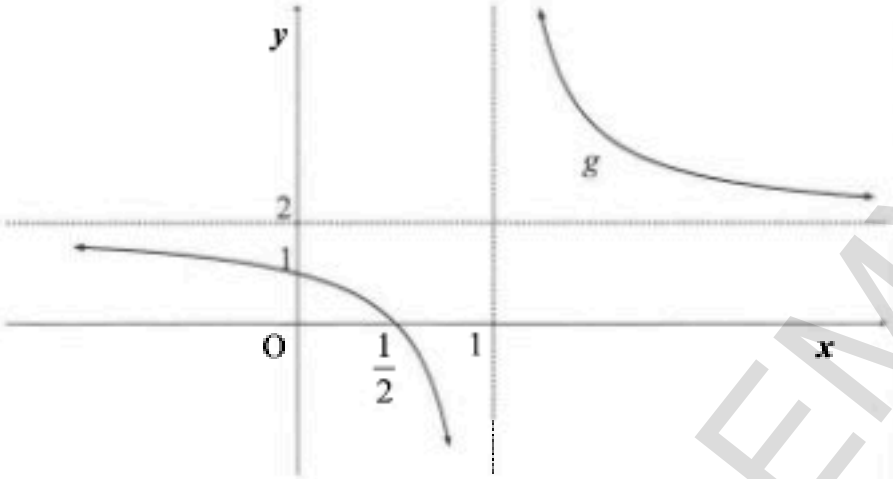
3.2.1	$T_n = 8+(n-1)(3)$ $T_n = 3n+5$ $41 = 3n+5$ $36 = 3n$ $n = 12$	✓ $T_n = 3n+5$ ✓ $T_n = 41$ ✓answer (3)
3.2.2a	$P_{41} = 12$	✓answer (1)
3.2.2b	$P_8 = a+7d = 1$ $P_{11} = a+10d = 2$ $3d = 1$ $d = \frac{1}{3}$ $a+7\left(\frac{1}{3}\right) = 1$ $a = -\frac{4}{3}$ **OR/*OF*** $n = 3P_n + 5$ $1 = 3P_1 + 5$ $-4 = 3P_1$ $P_1 = -\frac{4}{3}$ **OR/*OF*** $T_n = 3n+5$ $1 = 3n+5$ $n = -\frac{4}{3}$ $\therefore P_1 = -\frac{4}{3}$	✓ $a+7d = 1$ ✓ $a+10d = 2$ ✓value of d ✓value of a (4) **OR/*OF*** ✓ $n = 3P_n + 5$ ✓✓ $1 = 3P_1 + 5$ ✓ $P_1 = -\frac{4}{3}$ (4) **OR/*OF*** ✓✓ $1 = 3n+5$ ✓ $n = -\frac{4}{3}$ ✓ $P_1 = -\frac{4}{3}$ (4)
		[15]

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QUESTION 4/*VRAAG 4*

4.1	$x=1$ $y=2$	✓$x=1$ ✓$y=2$ (2)
4.2		✓x-intercept ✓y-intercept ✓asymptotes ✓shape (4)
4.3	$x<\frac{1}{2}$ or $x>1$ **or/of** $\left(-\infty;\frac{1}{2}\right)$ or $(1;\infty)$	✓$x<\frac{1}{2}$ ✓$x>1$ (2)
4.4	$y=-(x-1)+2$ $y=-x+3$ **OR/*OF*** $y-2=-(x-1)$ $y=-x+3$ **OR/*OF*** $y=-x+c$ $2=-(1)+c$ $c=3$ $\therefore y=-x+3$	✓$m=-1$ ✓substitution of pt of intersection of the asymptotes (2) **OR/*OF*** ✓$m=-1$ ✓substitution of pt of intersection of the asymptotes (2) **OR/*OF*** ✓$m=-1$ ✓substitution of pt of intersection of the asymptotes (2)
		[10]

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QUESTION5/VRAAG 5

5.1	$P'(2;4)$	✓$x=2$ ✓$y=4$ (2)
5.2	$f(x)=\log_a x$ $2=\log_a 4$ $a^2=4$ $a=2$	✓substitute (4 ; 2) ✓$a^2=4$ (2)
5.3	$y=2^x$	✓ $y=2^x$ (1)
5.4	$1=\log_2 x$ $\therefore x=2$ T(2 ; 1) RT = 2 units P'T = 3 units Area of $\Delta RTP' = \frac{1}{2}.RT.TP'$ $= \frac{1}{2}\times 2\times 3 = 3$ units^2	✓$x=2$ ✓RT = 2 units ✓P'T = 3 units ✓answer (4)
		[9]

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QUESTION 6/*VRAAG 6*

6.1	$y \geq -4$ or $y \in [-4;\infty)$	✓ $y \geq -4$ (1)
6.2	$x^2 - 2x - 3 = 0$ $(x-3)(x+1) = 0$ $x = 3$ or $x = -1$ $\therefore$ E(3 ; 0) and D(−1 ; 0)	✓ $= 0$ ✓both x-values ✓correct identification of coordinates (3)
6.3	P(0 ; − 3) $\therefore m_g = 1$ $\therefore g(x) = x - 3$	✓ m_g ✓equation (2)
6.4	$f(x) > g(x)$ $x < 0$ or $x > 3$	✓ $x < 0$ ✓ $x > 3$ (2)
6.5	Distance $= -x^2 + 2x + 3 - x + 3 = -x^2 + x + 6$ $D' = -2x + 1 = 0$ or/of $x = -\frac{b}{2a} = -\frac{1}{2(-1)}$ $\therefore x = \frac{1}{2}$ $\therefore x = \frac{1}{2}$ $D\left(\frac{1}{2}\right) = -\left(\frac{1}{2}\right)^2 + \frac{1}{2} + 6$ $= \frac{25}{4} = 6{,}25$	✓ $-x^2 + 2x + 3$ ✓distance between graphs ✓method ✓x-value ✓answer (5)
6.6	$f'(x) = m_g$ $2x - 2 = 1$ $x = \frac{3}{2}$ Point on f and k: $\left(\frac{3}{2}; \frac{-15}{4}\right)$ $k(x) = g(x) - n$ $\therefore -\frac{15}{4} = \left(\frac{3}{2} - 3\right) - n$ $\therefore n = 2\frac{1}{4} = \frac{9}{4} = 2{,}25$ **OR/OF** $f(x) = k(x)$ $x^2 - 2x - 3 = x - 3 - n$ $x^2 - 3x + n = 0$ $\Delta = b^2 - 4ac$ $= (-3)^2 - 4(1)(n)$ To touch : $\Delta = 0$ $0 = 9 - 4n$ $4n = 9$ $n = \frac{9}{4} = 2{,}25$	✓$2x - 2 = 1$ ✓$x = \frac{3}{2}$ ✓$\frac{-15}{4}$ ✓$-\frac{15}{4} = \left(\frac{3}{2} - 3\right) - n$ ✓answer (5) **OR/OF** ✓equating ✓standard form ✓substitution into Δ ✓$\Delta = 0$ ✓answer (5)
		[18]

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QUESTION 7/VRAAG 7

7.1	$A = P(1-i)^n$ $8\,337{,}75 = 13\,000(1-i)^6$ $i = 0{,}0714\ldots$ $r = 7{,}14\%$	✓correct formula ✓substitution ✓answer (3)
7.2	$F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $80\,000 = \frac{x\left[\left(1+\frac{8{,}6}{1200}\right)^{36} - 1\right]}{\frac{8{,}6}{1200}}$ $x = \text{R}1\,955{,}78$ Thandi's total = 1 955,78 × 36 = R 70 408,08 Eric's total = 1 402,31 × 48 = R 67 310,88 Difference = 70 408,08 – 67 310,88 = R3 097,20	✓i ✓substitution into correct formula ✓answer ✓answer (4)
7.3	$225\,000\left(1+\frac{0{,}09}{12}\right)^3 = \frac{5\,500\left[1-\left(1+\frac{0{,}09}{12}\right)^{-n}\right]}{\frac{0{,}09}{12}}$ $0{,}3137734959\ldots = 1-\left(1+\frac{0{,}09}{12}\right)^{-n}$ $\left(1+\frac{0{,}09}{12}\right)^{-n} = 0{,}6862265041\ldots$ $-n = \log_{\left(1+\frac{0{,}09}{12}\right)} 0{,}6862265041\ldots$ $n = 50{,}394375\ldots$ $n = 51$	✓i ✓substitution into A-formula ✓$n = 3$ into A-formula ✓substitution into P_v-formula ✓correct use of logs ✓$n = 51$ (6)
		[13]

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QUESTION8/*VRAAG* 8

8.1

$f(x)=\frac{1}{x}$

$f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$

$f'(x)=\lim_{h\to 0}\frac{\frac{1}{(x+h)}-\frac{1}{x}}{h}$

$f'(x)=\lim_{h\to 0}\frac{x-(x+h)}{x(x+h)}\times\frac{1}{h}$

$f'(x)=\lim_{h\to 0}\frac{-h}{x(x+h)}\times\frac{1}{h}$

$f'(x)=\lim_{h\to 0}\frac{-1}{x(x+h)}$

$f'(x)=-\frac{1}{x^2}$

✓ $f(x+h)=\frac{1}{x+h}$

✓ $\frac{\frac{1}{(x+h)}-\frac{1}{x}}{h}$

✓ $\frac{-h}{x(x+h)}\times\frac{1}{h}$

✓ $\frac{-1}{x(x+h)}$

✓answer

(5)

OR/*OF*

$f(x)=\frac{1}{x}$

$f(x+h)=\frac{1}{x+h}$

$f(x+h)-f(x)=-\frac{h}{x(x+h)}$

$f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$

$f'(x)=\lim_{h\to 0}\frac{-h}{x(x+h)}\times\frac{1}{h}$

$f'(x)=\lim_{h\to 0}\frac{-1}{x(x+h)}$

$f'(x)=-\frac{1}{x^2}$

OR/*OF*

✓ $f(x+h)=\frac{1}{x+h}$

✓ $f(x+h)-f(x)=-\frac{h}{x(x+h)}$

✓ $\frac{-h}{x(x+h)}\times\frac{1}{h}$

✓ $\frac{-1}{x(x+h)}$

✓answer

(5)

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8.2.1	$\frac{d}{dx}\left(\sqrt{4x^6}+\sqrt{2}.x^2\right)$ $=\frac{d}{dx}\left(2x^3+\sqrt{2}.x^2\right)$ $=6x^2+2\sqrt{2}x$	✓ $2x^3$ ✓ $6x^2$ ✓ $2\sqrt{2}x$ (3)
8.2.2	$g(x)=\frac{3x^4-4x^2+6}{x^2}$ $g(x)=3x^2-4+6x^{-2}$ $g'(x)=6x-12x^{-3}$	✓ $3x^2-4+6x^{-2}$ ✓ $6x$ ✓ $-12x^{-3}$ (3)
8.3	$f(x)=3x^2+bx+c$ $f'(x)=6x+b$ $f'(1)=6+b=9$ $\therefore b=3$ $f(1)=3+3+c=0$ $c=-6$ $\therefore f(x)=3x^2+3x-6$	✓ $f'(1)=6+b=9$ ✓ $b=3$ ✓ $f(1)=3+3+c=0$ ✓ value of c (4)
		[15]

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QUESTION9/*VRAAG* 9

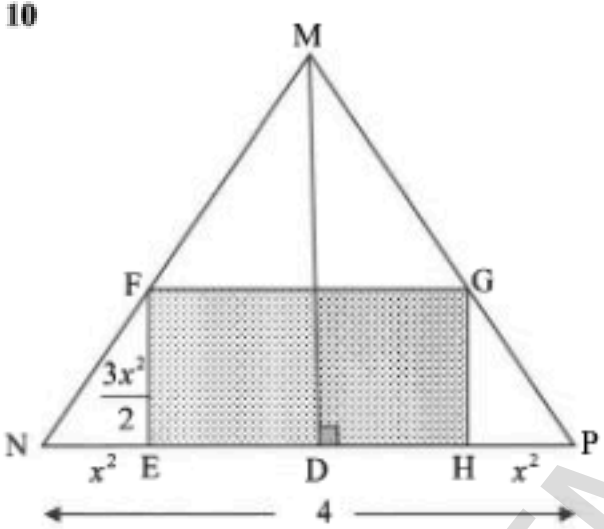
9.1	$f(x)=ax^3+bx^2+cx-5$ $-5=a(0+1)^2(0-5)$ $-5=-5a$ $a=1$ $f(x)=(x+1)(x+1)(x-5)$ $f(x)=(x^2+2x+1)(x-5)$ $f(x)=x^3-3x^2-9x-5$ $\therefore b=-3$ and $c=-9$	✓$(x+1)^2$ ✓$f(x)=a(x+1)^2(x-5)$ ✓substitution $(0;-5)$ (3)
9.2	$f(x)=x^3-3x^2-9x-5$ $f'(x)=3x^2-6x-9$ $x^2-2x-3=0$ $(x-3)(x+1)=0$ $x=3$ or $x=-1$ Minimum value at $x=3$	✓$f'(x)=3x^2-6x-9$ ✓$f'(x)=0$ ✓factors ✓$x=3$ (4)
9.3	$f''(x).f(x)>0$ Point of inflection: $x=1$ $x<1$; $x\neq -1$ or $x>5$	✓$x<1$ ✓$x\neq -1$ ✓$x>5$ (3)
9.4	$-32<-t<-5$ $5<t<32$ **OR/*OF*** Shift up less than 32 units $\therefore 5<t<32$	✓-32 ✓$-32<-t<-5$ ✓$5<t<32$ (3) **OR/*OF*** ✓less than 32 units ✓✓$5<t<32$ (3)
		[13]

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QUESTION 10/VRAAG 10



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10.1	$\frac{NE}{EF}=\frac{2}{3}=\frac{x^2}{b}$ $3x^2=2b$ $\therefore b=\frac{3x^2}{2}$ $EH=4-2x^2$ Area EFGH $=(4-2x^2)\left(\frac{3x^2}{2}\right)$ $A(x)=6x^2-3x^4$ **OR/OF** In ΔDMP: $\tan P=\frac{3}{2}$ In ΔHGP: $\tan P=\frac{GH}{x^2}$ $\frac{GH}{x^2}=\frac{3}{2}$ $\therefore b=\frac{3x^2}{2}$ $EH=4-2x^2$ Area EFGH $=(4-2x^2)\left(\frac{3x^2}{2}\right)$ $A(x)=6x^2-3x^4$	✓$\frac{NE}{EF}=\frac{2}{3}=\frac{x^2}{b}$ ✓$b=\frac{3x^2}{2}$ ✓$EH=4-2x^2$ ✓$(4-2x^2)\left(\frac{3x^2}{2}\right)$ (4) **OR/OF** ✓$\frac{GH}{x^2}=\frac{3}{2}$ ✓$b=\frac{3x^2}{2}$ ✓$EH=4-2x^2$ ✓$(4-2x^2)\left(\frac{3x^2}{2}\right)$ (4)
10.2	$A(x)=6x^2-3x^4$ $A'(x)=12x-12x^3=0$ $12x(1-x^2)=0$ $\therefore x\neq 0$ or $x=-1$ or $x=1$ $\therefore$ max area: $A(1)=6(1)^2-3(1)^4=3\text{ cm}^2$	✓$12x-12x^3$ ✓$A'(x)=0$ ✓selection of $x=\pm 1$ ✓answer (4) [8]

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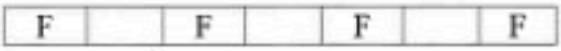
QUESTION 11/VRAAG 11

11.1	$P(A) + P(B) = 0,52$ $0,4 + P(B) = 0,52$ $P(B) = 0,12$	✓substitution into rule ✓answer (2)
11.2.1	$P(\text{sandwich}) = \frac{4}{25} = 0,16$ **OR/OF** $0,02 + 0,01 + 0,04 + 0,09 = \frac{4}{25} = 0,16$	✓$\frac{4}{25} = 0,16$ (1) **OR/OF** ✓$\frac{4}{25} = 0,16$ (1)
11.2.2	P(at least two events) = 0,02 + 0,01 + 0,03 + 0,04 = 0,1	✓✓0,02 + 0,01 + 0,03 + 0,04 (2)
11.2.3	P(not any) = 1 – (0,02 + 0,01 + 0,03 + 0,04 + 0,04 + 0,09 + 0,2) = 0,57	✓complementary rule ✓0,57 (2)
11.3.1	7! = 5040	✓7! (1)
11.3.2	$P(\text{4 players alphabetically}) = \frac{1}{7 \times 6 \times 5 \times 4} = \frac{1}{840}$	✓✓840 ✓$\frac{1}{840}$ (3)

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11.3.3	 F arrangements: 4! M arrangements: 5 options with 3 males = $5 \times 4 \times 3$ $4! \times 5 \times 4 \times 3$ $= 1\,440$ **OR/*OF*** 10 Options: F M F M F M F M F M F M F F F F M F M F M F M F M F F M M F M F F M F M F M F F F M F M F F M F M M F F M F F M M F F M F M F M F F F M F M Hence $10 \times 4! \times 3! = 1440$	✓5 × 4 × 3 ✓✓4! × 5 × 4 × 3 (3) **OR/*OF*** ✓10 ✓✓10 × 4! × 3! (3)
		[14]
		TOTAL/*TOTAAL*: 150

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DEPARTMENT OF BASIC EDUCATION
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