SEPTEMBER 2016 MATHEMATICS PAPER 1 / WISKUNDE VRAESTEL 1
MEMORANDUM

NOTE:
- If a candidate answers a question TWICE, mark only the first one.
- 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 geurgans op ALLE aspekte van die memorandum van toepassing.

QUESTION/ *VRAAG* 1 (23)

#	SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD*	DESCRIPTORS/*BESKRYWERS*	Mark/ Punt
1.1.1	$x(5x+2)=0$ $x=0$ or/ *of* $x=-\frac{2}{5}$	 ✓✓Each root/ *Elke wortel*	(2)
1.1.2	$2x^2-3x-4=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-(-3)\pm\sqrt{(-3)^2-4(2)(-4)}}{2(2)}$ $=\frac{3\pm\sqrt{41}}{4}$ $x=-0{,}85$ or/ *of* $x=2{,}35$	✓ Std form/ vorm ✓Substitution/ *substitusie* ✓✓Each root/ *elke wortel* $x=-0{,}85$ or/ *of* $x=2{,}35$ **(-1, if incorrect rounding)**	(4)
1.1.3	$x^2-x-6\geq 6$ $x^2-x-12\geq 0$ $(x+3)(x-4)\geq 0$ $x<-3$ or/ *of* $x>4$	✓std form/ *vorm* ✓factors/ *faktore* ✓ both critical values/ *beide kritieke waardes* ✓notation / *notasie*	(4)
1.2	$x=y+3$ ……(1) Subst (1) into (2): $x^2+xy-2y^2=0$ ……(2) $\therefore (y+3)^2+y(y+3)-2y^2=0$ $\therefore y^2+6y+9+y(y+3)-2y^2=0$ $\therefore y^2+6y+9+y^2+3y-2y^2=0$ $\therefore 9y+9=0$ $\therefore y=-1$ $\therefore x=2$ OR/OF	✓x subject/ *onderwerp* ✓subst in (2) ✓simplify / *vereenvoudig* ✓value of y / *Waarde van* y ✓value of x/ *Waarde van* x	(5)

	$y = x - 3$ ……(1) Subst (1) into (2): $x^2 + xy - 2y^2 = 0$ ……(2) $\therefore x^2 + x(x-3) - 2(x-3)^2 = 0$ $\therefore x^2 + x^2 - 3x - 2x^2 + 12x - 18 = 0$ $\therefore 9x - 18 = 0$ $\therefore \quad x = 2$ $\therefore \quad y = -1$	✓**y** subject/ *onderwerp* ✓subst in (2) ✓simplify / *vereenvoudig* ✓value of x/ *Waarde van* x ✓value of y / *Waarde van* y	(5)
1.3	$x = \frac{-2 \pm \sqrt{13 - 2k}}{3}$ $\therefore \Delta = 13 - 2k \geq 0$ $\therefore 2k \leq 13$ $\therefore k \leq \frac{13}{2}$ ∴If $k = 6$, Δ is a perfect square and roots rational/ *As* $k = 6$ *sal* Δ *'n volkome vierkant wees en wortels Rasionaal*	✓$\Delta \geq 0$ ✓value/ w*aarde* $k \leq \frac{13}{2}$ ✓ deriving k = 6 / *afleiding* $k = 6$ **Answer only/ Slegs antwoord = FULL MARKS/VOLPUNTE**	(3)
1.4	If graphs intersect/ as grafieke sny: $f(x) = g(x)$ $\therefore x^2 - 2x - 3 = 2x + a$ $\therefore x^2 - 4x - 3 - a = 0$ If graphs do not intersect/ As grafieke nie sny nie: $\Delta < 0$ $(-4)^2 - 4(1)(-3-a) < 0$ $\therefore 16 + 12 + 4a < 0$ $\therefore 4a < -28$ $\therefore a < -7$	✓ equating *f* and *g*/ *stel f en g gelyk* ✓ $\Delta < 0$ ✓ Subst. ✓ Simplify/ *Vereenv* ✓ answer/ *antw.*	(5)
			[23]

QUESTION/ *VRAAG* 2 (15)

#	**SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD***	**DESCRIPTORS/*BESKRYWERS***	**Mark/ Punt**
2.1.1	$3\frac{1}{2}$; 3 ; $2\frac{1}{2}$	✓Answer/ *Antw.*	(1)
2.1.2	Arithmetic sequence/ *Rekenkundige ry*; $d = -\frac{1}{2}$ or /*of* $\frac{1}{2}$ is subtracted each time/ $\frac{1}{2}$ *word elke keer afgetrek*	✓ AS/ *RR*; ✓ $d = -\frac{1}{2}$	(2)
2.1.3	$T_n = a + (n-1)d$; $a = 3\frac{1}{2}$; $d = -\frac{1}{2}$; T_n = - 44,5 ; n =? $\therefore -44\frac{1}{2} = 3\frac{1}{2} + (n-1)\left(-\frac{1}{2}\right)$ $\therefore 4 - \frac{1}{2}n = -44\frac{1}{2}$ $\therefore -\frac{1}{2}n = -\frac{97}{2}$ $\therefore n = 97$	✓ Subst into/ *in* T_n ✓ T_n = - 44,5 ✓Answer/ *Antw*	(3)

2.2.1	$18 + 6 + 2+\ldots$ GS with $r = \frac{1}{3}$ / *MR met* $r = \frac{1}{3}$ Thus no negative term / *Dus geen term negatief.*	✓ GS with $r = \frac{1}{3}$ / *MR met* $r = \frac{1}{3}$ ✓ no negative term / *geen term negatief*	(2)
2.2.2	$T_{10} = ar^{n-1}$; $a = 18$; $r = \frac{1}{3}$; $n = 10$ $= 18\left(\frac{1}{3}\right)^9$ $= \frac{2}{2187}$	✓ Subst into/ *in* T_n ✓Answer/ *Antw*	(2)
2.2.3	$S_\infty - S_{10}$; $a = 18$; $r = \frac{1}{3}$; $n = 10$ $= \frac{a}{1-r} - \frac{a(1-r^n)}{1-r}$ $= \frac{18}{1-\frac{1}{3}} - \frac{18\left[1-\left(\frac{1}{3}\right)^{10}\right]}{1-\frac{1}{3}}$ $= 27 - 27\left[1-\left(\frac{1}{3}\right)^{10}\right]$ $= 4{,}57 \times 10^{-4}$	✓ Correct sum formulae ✓✓ Subst into sum formulae/ *Subst in somformules*: $a = 18$; $r = \frac{1}{3}$; $n = 10$ ✓ Simplify/ *Vereenv* ✓ answer/ *antw*	(5)
			[15]

QUESTION/ *VRAAG* 3 (11)

#	SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD*	DESCRIPTORS/*BESKRYWERS*	Mark/ Punt
3.1	$-3 \; -5; -7 - \cdots - 65$; AS/*RR*: a = -3; n = 32; d = -2 ; l = -65 $S_n = \frac{n}{2}[2a + (n-1)d]$ OR/*OF* $S_n = \frac{n}{2}[a + l]$ $S_{32} = \frac{32}{2}[2(-3) + (32-1)(-2)]$ | $S_{32} = \frac{32}{2}[(-3) + (-65)]$ $= \frac{32}{2}[-6 - 62]$ = -1088	✓ n = 32. ✓ Subst in sum formula/ *Subst in somformule* ✓ answer/ *antw*	(3)
3.2.1	$6 \; ; \; 5 + x \; ; \; -6 \; ; \; 6x$ $x + 5 - 6; -6 - (5 + x); 6x - (-6)$ $x - 1; -x - 11; 6x + 6$; 1st diff/ *verskil* $-x - 11 - (x - 1) = 6x + 6 - (-x - 11)$; 2nd diff/*verskil* $\therefore -2x - 10 = 7x + 17$ $\therefore x = -3$	✓ 1st diff/ *verskille* ✓ 2nd diff/*verskille* ✓ 2nd diff/*verskille* = ✓ Simplify/ *Vereenv.*	(4)
3.2.2	Sequence/ *Ry*: **6** ; **2** ; -6 ; -18; ... -4 ; -8 ; -12 1st diff/ *verskil* -4 ; -4 2nd diff/ *verskil* $2a = -4 \Rightarrow a$ = -2 $3a + b = -4 \Rightarrow 3(-2) + b = -4 \Rightarrow b$ = 2 $a + b + c = 6 \Rightarrow -2 + 2 + c = 6 \Rightarrow c$ = 6 $\therefore T_n = -2n^2 + 2n + 6$	✓ a = -2 ✓ b = 2 ✓c = 6 ✓Equation/ *Vergelyking*	(4)
			[11]

QUESTION/ *VRAAG* 4 (18)

#	SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD*	DESCRIPTORS/*BESKRYWERS*	Mark/ Punt
4.1	OC = 6 units/ *eenhede* A; B: *x*-intercepts/ *afsnitte*: Let/ *Stel* $y = 0$ $\therefore -2x^2 - 4x + 6 = 0$ $\therefore x^2 + 2x - 3 = 0$ $\therefore (x + 3)(x - 1) = 0$ $\therefore x = -3$ OR/*OF* $x = 1$ A$(-3;\ 0)$ and/ *en* B$(1;\ 0)$ $\Rightarrow$AB = 4 units/ *eenhede*	✓ OC = 6 ✓ Let/ *Stel* $y = 0$ ✓ Factors/ *Faktore* ✓ Both *x*-values/ *Beide x-waardes* ✓ answer/ *antw*	(5)
4.2	$x = -\frac{b}{2a} = -\left[\frac{-4}{2(-2)}\right] = -1$ OR/*OF* $f'(x) = -4x - 4 = 0 \Rightarrow x = -1$	✓Subst ✓ $x = -1$ OR/OF ✓Derivative/ Afgeleide = 0 ✓ $x = -1$	(2)
4.3	Subst. $x = -1$ in $f(x)$ $\therefore$ ST $= -2(-1)^2 - 4(-1) + 6$ $= 8$ units/ *eenhede*	✓ Subst. x = -1 ✓ answer/ *antw*	(2)
4.4	$m_{AC} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0-6}{-3-0} = 2$	✓ Subst. in *m* ✓ answer/ *antw*	(2)

4.5	$m_g = 2$; // lines/ *lyne*
	but/ *maar* $m_g = f'(x) = -4x - 4 = 2$
	$\therefore x = -\frac{3}{2}$
	$\therefore y = -2\left(-\frac{3}{2}\right)^2 - 4\left(-\frac{3}{2}\right) + 6 = 7\frac{1}{2}$
	$\Rightarrow$D$\left(-\frac{3}{2};\ 7\frac{1}{2}\right)$
	OR/*OF*
	Let eq. of tangent be/ Laat vgl. van raakl*:* $y = mx + k$
	$m_g = 2$; // lines/ *lyne* $\Rightarrow y = 2x + k$
	at D: $f(x) = g(x)$ $\therefore -2x^2 - 4x + 6 = 2x + k$
	$\therefore -2x^2 - 6x + 6 - k = 0$…….(1)
	For tangent/ *Vir raaklyn*: $\Delta = 0$
	$\therefore (-6)^2 - 4(-2)(6 - k) = 0$
	$\therefore 36 + 48 - 8k = 0 \Rightarrow k = 10{,}5$
	$\therefore -2x^2 - 6x + 6 - 10{,}5 = 0$ ……Subst *k* in (1)
	$\therefore 2x^2 + 6x + 4{,}5 = 0$ or/ *of* $4x^2 + 12x + 9 = 0$
	$\therefore (2x + 3)^2 = 0 \Rightarrow x = -\frac{3}{2}$
	$\therefore$ y $= 2\left(-\frac{3}{2}\right) + 10{,}5 = 7\frac{1}{2}$
	$\Rightarrow$D$\left(-\frac{3}{2};\ 7\frac{1}{2}\right)$
		✓ $m_g = 2$
		✓ $m_g = f'(x)$
		✓ $-4x - 4 = 2$
		✓ $x = -\frac{3}{2}$
		✓ $y = 7\frac{1}{2}$
		✓ $m_g = 2$
		✓ eqn/ *vgl:* $-2x^2 - 6x + 6 - k = 0$
		✓ $k = 10{,}5$
		✓ $x = -\frac{3}{2}$
		✓ $y = 7\frac{1}{2}$
			(5)

4.6	$a = -1$; the axis of symmetry/ *die simmetrie-as* OR/*OF* : $f(a + t) = f(a - t)$ $\therefore -2(a + t)^2 - 4(a + t) + 6 = -2(a - t)^2 - 4(a - t) + 6$ $\therefore -2a^2 - 4at - 2t^2 - 4a - 4t + 6 = -2a^2 + 4at - 2t^2 - 4a + 4t + 6$ $\therefore 8at + 8t = 0$ $\therefore 8t(a + 1) = 0$ $\therefore t = o$ or/*of* $\boldsymbol{a = -1}$	✓✓ $a = -1$ ✓ Subst. ✓ $a = -1$	(2)

	[18]

QUESTION/ *VRAAG* 5 (10)

#	SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD*	DESCRIPTORS/*BESKRYWERS*	Mark/ Punt
5.1	$x = 1$	✓ answer/ *antw*	(1)
5.2	x -int/*afsn*: Let/ *Stel* $y = 0$ $\frac{2+x}{x-1} = 0 \Rightarrow x = -2$ $\therefore \text{A}(-2;\ 0)$	✓ $y = 0$ ✓ $x = -2$	(2)
5.3	y -int/*afsn*: Let/ *Stel* $x = 0$ $\frac{2+0}{0-1} = y \Rightarrow y = -2$ $\therefore \text{B}(0;\ -2)$ Area/ Opp ΔAOB $= \frac{1}{2}$AO $\times$OB $= \frac{1}{2}(2)(2) = 2$ units^2/ $eenh^2$	✓ B$(0;\ -2)$ ✓ Subst. in Area formula ✓ answer/ *antw*	(3)
5.4	$f(x) = \frac{2+x}{x-1} = \frac{x-1+3}{x-1}$ $= \frac{x-1}{x-1} + \frac{3}{x-1}$ $= \frac{3}{x-1} + 1$	✓ $\frac{2+x}{x-1} = \frac{x-1+3}{x-1}$ ✓ Simplify to/ *Vereenv. tot*: $\frac{x-1}{x-1} + \frac{3}{x-1}$	(2)
5.5	$(3;\ 1)$	✓ 3 (CA from/ *vanaf* 5.2 - shift 2 units to the right/ *skuif 2 eenh regs*) ✓ 1	(2)
			[10]

QUESTION/ *VRAAG* 6 (8)

#	SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD*	DESCRIPTORS/*BESKRYWERS*	Mark/ Punt
6.1.1	$y > -1; y \in \mathbb{R}$	✓✓ $y > -1; y \in \mathbb{R}$	(2)
6.1.2	$g(x) = 2^x$ $\therefore g^{-1}: y = \log_2 x$	✓ $g(x) = 2^x$ ✓ $y = \log_2 x$	(2)
6.2.1	$k(x) = 3x^2 \ ; x \leq 0$	✓ $k(x) = 3x^2$ ✓ $x \leq 0$	(2)
6.2.2	$(0;0)$ OR/*OF* origin/ *oorsprong*	✓✓ Answer/ *Antw*	(2)
			[8]

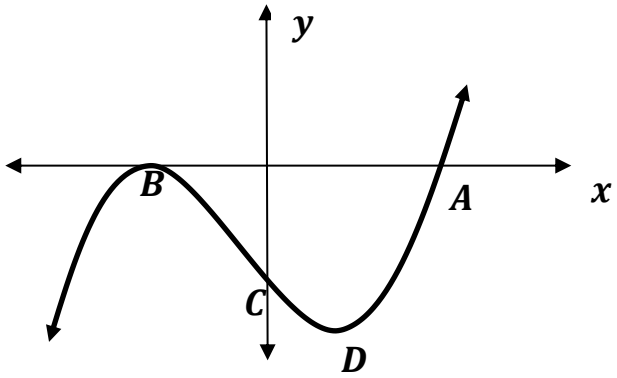
QUESTION/ *VRAAG* 7 (14)

#	SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD*	DESCRIPTORS/*BESKRYWERS*	Mark/ Punt
7.1	$A = P(1-i)^n$; P = R128 000; A = R45 500; n = 6; i = ? 45 500 = 128 000(1 - i)^6 $\therefore \sqrt[6]{\frac{45\,500}{128\,000}} = 1 - i$ $\therefore i = 1 - \sqrt[6]{\frac{45\,500}{128\,000}}$ $\therefore i$ = 0,15834 = 15,83% p.a/ *p.j*	✓ Subst. of P = 128 000 into depreciation formula ✓ Subst. of 45 500 and/ *en* n = 6 ✓ i the subject/ *die onderwerp* ✓ Answer/ *Antw*	(4)
7.2.1	$A = P(1+i)^n$; A = ?; P = 250 000; n = 12y = 48 quarters; i = 9,5% p.a = $\frac{9,5}{400}$ per quarter/ *per kwartaal* $\therefore A = 250\,000(1 + \frac{9,5}{400})^{48}$ = R 771 343,67	✓ Subst $i = \frac{9,5}{400} = 0,02375$ ✓ Subst n = 48 in correct formula ✓ Answer/ *Antw*	(3)
7.2.2	Home loan/ *Huislening* = 2 920 000 - 771 343,67 = R2 148 656, 33	✓ Answer/ *Antw*	(1)
7.2.3	$P_v = \frac{x[1-(1+i)^{-n}]}{i}$; P_v = 2 148 656, 33 ; i = 10,3% p.a $=\frac{10,3}{1200}$ p/m ; n = 20 y = 240 m $\therefore$ 2 148 656, 33 = $\frac{x\left[1-\left(1+\frac{10,3}{1200}\right)^{-240}\right]}{\frac{10,3}{1200}}$ $\therefore x$ = R 21 163, 87 OR/*OF* $F_v = \frac{x[(1+i)^n - 1]}{i}$ $\therefore 2\,148\,656,33\left(1+\frac{10,3}{1200}\right)^{240} = \frac{x\left[\left(1+\frac{10,3}{1200}\right)^{240}-1\right]}{\frac{10,3}{1200}}$ $\therefore x$ = R 21 163, 87	✓ Subst into correct formula ✓ Subst $i = \frac{10,3}{1200}$ ✓ Subst n = 240 ✓ Answer/ *Antw*	(4)
7.2.4	Interest/ *Rente* = Amount paid/ *bedrag betaal*- original loan/ *lening* = 21 163,87 × 240 - 2 148 656,33 = R 2 930 672, 47	✓ Calculation/ *berekening* ✓ Answer/ *Antw*	(2)
			[14]

QUESTION/ *VRAAG* 8 (15)

#	SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD*	DESCRIPTORS/*BESKRYWERS*	Mark/ Punt
8.1	$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ $= \lim_{h\to 0} \frac{\frac{2}{x+h} - \frac{2}{x}}{h}$ $= \lim_{h\to 0} \frac{\frac{2x-2(x+h)}{x(x+h)}}{h}$ $= \lim_{h\to 0} \frac{\frac{2x-2x-2h}{x^2+xh}}{h}$ $= \lim_{h\to 0} \frac{-2h}{x(x+h)} \times \frac{1}{h}$ $= \lim_{h\to 0} \frac{-2}{x^2+xh}$ $= \lim_{h\to 0} \frac{-2}{x^2+x(0)}$ $f'(x) = \frac{-2}{x^2}$	✓Subst $f(x+h)$ and/ *en* $-f(x)$ ✓Common denominator/ *Gemene noemer* ✓Simplify/ *Vereenv* ✓Subst. $h = 0$ ✓ Answer/ *Antw*	(5)
8.2.1	$h(x) = 2x^3 - \frac{4}{x} + 3\sqrt{x}$ $\therefore h(x) = 2x^3 - 4x^{-1} + 3x^{\frac{1}{2}}$ $\therefore h'(x) = 6x^2 + 4x^{-2} + \frac{3}{2}x^{\frac{-1}{2}}$	✓ Exponential form/ *eksponensiële vorm* ✓✓✓ Answer / *Antw* ***(-1 for notation in question** / -1 vir notasie in vraag)*	(4)
8.2.2	$D_x\left(\frac{8x^3-27}{2x-3}\right)$ $= D_x\left(\frac{(2x-3)(4x^2+6x+9)}{2x-3}\right)$ $= D_x(4x^2+6x+9)$ $= 8x + 6$	✓Simplify fraction/ *Vereenv breuk* ✓✓ Ans. / *Antw*	(3)
8.3	$m_{tan} = f'(x) = -3x^2 - 2$ $= -(3x^2+2)$ Which is always/ *wat altyd* < 0	✓ $m_{tan} = f'(x) = -3x^2 - 2$ ✓ $-(3x^2+2)$ ✓ Explain/ *Verduidelik*	(3)
			[15]

QUESTION/ *VRAAG* 9 (15)



#	SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD*	DESCRIPTORS/*BESKRYWERS*	Mark/ Punt
9.1	$f(x) = x^3 + x^2 - x - 1$ $\therefore (x-1)(x^2+2x+1) = 0$ $\therefore (x-1)(x+1)(x+1) = 0$ $\therefore x = 1 \text{ or/}of\ x = -1$ $\therefore$ AB = 2 units / *eenhede*	✓**(x - 1)** ✓(x^2+2x+1) ✓$(x+1)(x+1)$ ✓Both roots/ *Beide wortels* ✓$AB = 2$	(5)
9.2	$f'(x) = 0$ $\therefore 3x^2 + 2x - 1 = 0$ $\therefore (3x-1)(x+1) = 0$ $\therefore x = \frac{1}{3}$ or / *of* $x = -1$ $\therefore y = -\frac{32}{27}$ $\therefore D\left(\frac{1}{3}; -\frac{32}{27}\right)$	✓Derivative/ *Afgeleide* = 0 ✓ Values of x/ *Waardes van x* ✓Coordinates of D/ *Koördinate van D*	(3)
9.3	$f''(x) = 0$ $\therefore 6x + 2 = 0$ $\therefore x = -\frac{1}{3}$ $h''(x) < 0 \quad \vert \quad h''(x) > 0$ $-\frac{1}{3}$ The concavity changes at $x = -\frac{1}{3}$ *Die konkawiteit verander by* $x = -\frac{1}{3}$	✓ Linking second derivative with concavity / *Verbind tweede afgeleide met konkawiteit* ✓ $6x + 2 = 0$ ✓ explanation / *verduideliking*	(3)
9.4.1	$x > 1$	✓ Answer/ *Antw.*	(1)
9.4.2	$x < -1$ or/*of* $-\frac{1}{3} < x < 1$	✓$x < -1$ ✓✓$-\frac{1}{3} < x < 1$ • Notation (-1) / Notasie (-1)	(3)
			[15]

QUESTION/ *VRAAG* 10 (7)

#	SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD*	DESCRIPTORS/*BESKRYWERS*	Mark/ Punt
10.1	$t = 2$ $D(2) = 3 + \frac{1}{2}(2)^2 - \frac{1}{4}(2)^3$ $= 3 + 2 - 2$ $= 3\ m$	✓ Answer/*Antw.*	(1)
10.2	$D'(t) = t - \frac{3}{4}t^2$ $D'(3) = 3 - \frac{3}{4}(3)^2$ $= -3{,}75\ m/h$	✓ derivative / *afgeleide* ✓ Answer/*Antwoord*	(2)
10.3	$D'(t) = 0$ $t - \frac{3}{4}t^2 = 0$ $\times -4: \quad 3t^2 - 4t = 0$ $t(3t - 4) = 0$ $t = 0 \ \ or/of \ \ t = 1\frac{1}{3} = 1h\ 20\ m$ $\therefore Time/Tyd: 10{:}20$	✓ $D'(t) = 0$ ✓ factors / *faktore* ✓ both answers / *beide antwoorde* ✓ Final answer / *Finale antw.*	(4)
			[7]

QUESTION/ *VRAAG* 11 (14)

#	SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD*	DESCRIPTORS/*BESKRYWERS*	Mark/ Punt
11.1.1	$P(\text{female and}/\cap \text{green eyes}) = \frac{147}{540} = \frac{49}{180} = 27{,}22\%$ $P(\text{vrou en}/\cap \text{groen oë}) = \frac{147}{540} = \frac{49}{180} = 27{,}22\%$	$\frac{147}{540}$ or / *of* $\frac{49}{180}$ or/ *of* 27,22% ✓✓ Answer/ *Antw*	(2)
11.1.2	For events to be independent: $P(\text{female and}/\cap \text{ green eyes}) = P(\text{green eyes}) \times P(\text{female})$ $P(\text{green eyes}) \times P(\text{female}) = \frac{330}{540} \times \frac{240}{540} = \frac{22}{81} = 0{,}27$ $P(\text{female and}/\cap \text{green eyes}) = \frac{147}{540} = \frac{49}{180} = 0{,}27$ $\therefore P(\text{female and}/\cap \text{green eyes}) = P(\text{green eyes}) \times P(\text{female})$ **Events are independent and the learner is correct.** *Vir gebeure om onafhanklik te wees:* $P(\text{vrou en}/\cap \text{ groen oë}) = P(\text{groen oë}) \times P(\text{vrou})$ $P(\text{groen oë}) \times P(\text{vrou}) = \frac{330}{540} \times \frac{240}{540} = \frac{22}{81} = 0{,}27$ $P(\text{vrou en}/\cap \text{groen oë}) = \frac{147}{540} = \frac{49}{180} = 0{,}27$	✓ P(green eyes) = 330/540 ✓ P(female) = 240/540 ✓ 0,27 ✓ P(female and/∩ green eyes) = 0,27 ✓ Deduction ✓ P(groen oë) = 330/540 ✓ P(vrou) = 240/540 ✓ 0,27	

	$P(\text{vrou en}/\cap \text{groen oë}) = P(\text{groen oë}) \times P(\text{vrou})$ ***Gebeure is onafhanklik en die leerder is korrek.*** **Alternative/*Alternatief*:** For events to be independent: $P(\text{male and}/\cap \text{green eyes}) = P(\text{green eyes}) \times P(\text{male})$ $P(\text{green eyes}) \times P(\text{male}) = \frac{330}{540} \times \frac{300}{540} = \frac{55}{162} = 0{,}34$ $P(\text{male and}/\cap \text{green eyes}) = \frac{183}{540} = \frac{61}{180} = 0{,}34$ $P(\text{male and}/\cap \text{green eyes}) = P(\text{green eyes}) \times P(\text{male})$ **Events are independent and the learner is correct.** *Vir gebeure om onafhanklik te wees:* $P(\text{manlik en}/\cap \text{groen oë}) = P(\text{groen oë}) \times P(\text{manlik})$ $P(\text{groen oë}) \times P(\text{manlik}) = \frac{330}{540} \times \frac{300}{540} = \frac{55}{162} = 0{,}34$ $P(\text{manlik en}/\cap \text{groen oë}) = \frac{183}{540} = \frac{61}{180} = 0{,}34$ $P(\text{manlik en}/\cap \text{groen oë}) = P(\text{groen oë}) \times P(\text{manlik})$ ***Gebeure is onafhanklik en die leerder is korrek.***	✓ P(vrou en/ ∩ groen oë) = 0,27 ✓ Afleiding ✓ P(green eyes) = 330/540 ✓ P(male) = 300/540 ✓ 0,34 ✓ P(male and/∩ green eyes) = 0,34 ✓ Deduction ✓ P(groen oë) = 330/540 ✓ P(manlik) = 300/540 ✓ 0,34 ✓ P(manlik en/ ∩ groen oë) = 0,34 ✓ Afleiding	(5) (5)
11.2.1	$n(S) = \frac{10!}{2! \times 2! \times 3!} = 151200$	✓ Numerator/ Teller ✓ Denominator/ Noemer ✓ Answer / *Antw*	(3)
11.2.2	$n(E) = \frac{8!}{2! \times 2!} = 10080$ $\therefore P(E) = \frac{10080}{151200} = \frac{1}{15}$	✓ $\frac{8!}{2! \times 2!}$ ✓ 10080 ✓ $P(E) = \frac{10080}{151200}$ ✓ Answer / *Antw*	(4)
			[15]

TOTAL/ *TOTAAL*: 150