basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIORSERTIFIKAAT-EKSAMEN

WISKUNDE V1

2016

PUNTE: 150

TYD: 3 uur

Hierdie vraestel bestaan uit 9 bladsye en 1 inligtingsblad.

INSTRUKSIES EN INLIGTING

Lees die volgende instruksies aandagtig deur voordat jy die vrae beantwoord.

1. Hierdie vraestel bestaan uit 11 vrae.
2. Beantwoord AL die vrae.
3. Nommer die antwoorde korrek volgens die nommeringstelsel wat in hierdie vraestel gebruik is.
4. Dui ALLE berekeninge, diagramme, grafieke, ensovoorts wat jy gebruik het om jou antwoorde te bepaal, duidelik aan.
5. Volpunte sal nie noodwendig aan slegs antwoorde toegeken word nie.
6. Jy mag 'n goedgekeurde, wetenskaplike sakrekenaar (nieprogrammeerbaar en niegrafies) gebruik, tensy anders vermeld.
7. Indien nodig, rond antwoorde tot TWEE desimale plekke af, tensy anders vermeld.
8. Diagramme is NIE noodwendig volgens skaal geteken NIE.
9. 'n Inligtingsblad met formules is aan die einde van die vraestel ingesluit.
10. Skryf netjies en leesbaar.

VRAAG 1

1.1 Los op vir x:

1.1.1 $4x^2 - 25 = 0$ (3)

1.1.2 $x^2 - 5x - 2 = 0$ (korrek tot TWEE desimale plekke) (3)

1.1.3 $(2-x)(x+4) \geq 0$ (3)

1.1.4 $x - 3x^{\frac{1}{2}} = 4$ (5)

1.2 Los op vir x en y:

$2x - y + 1 = 0$ en $x^2 - 3x - 4 - y = y^2$ (6)

1.3 Gegee: $f(x) = \sqrt{2x+1}$

1.3.1 Skryf die waardeversameling van f neer. (1)

1.3.2 Los op vir x as $f(x) = 2x - 1$. (5)
[26]

VRAAG 2

2.1 Gegee die rekenkundige reeks: $a + 13 + b + 27 + \ldots$

2.1.1 Toon aan dat $a = 6$ en $b = 20$ (2)

2.1.2 Bereken die som van die eerste 20 terme van die reeks. (3)

2.1.3 Skryf die reeks in VRAAG 2.1.2 in sigma-notasie. (2)

2.2 Gegee die meetkundige reeks: $(x-2) + (x^2 - 4) + (x^3 + 2x^2 - 4x - 8) + \ldots$

2.2.1 Bepaal die waardes van x waarvoor die reeks konvergeer. (4)

2.2.2 As $x = -\frac{3}{2}$, bereken die som tot oneindigheid van die gegewe reeks. (3)
[14]

VRAAG 3

Die eerste vier terme van 'n kwadratiese getalpatroon is -1 ; 2 ; 9 ; 20.

3.1 Bepaal die algemene term van die kwadratiese getalpatroon. (4)

3.2 Bereken die waarde van die 48^{ste} term van die kwadratiese getalpatroon. (2)

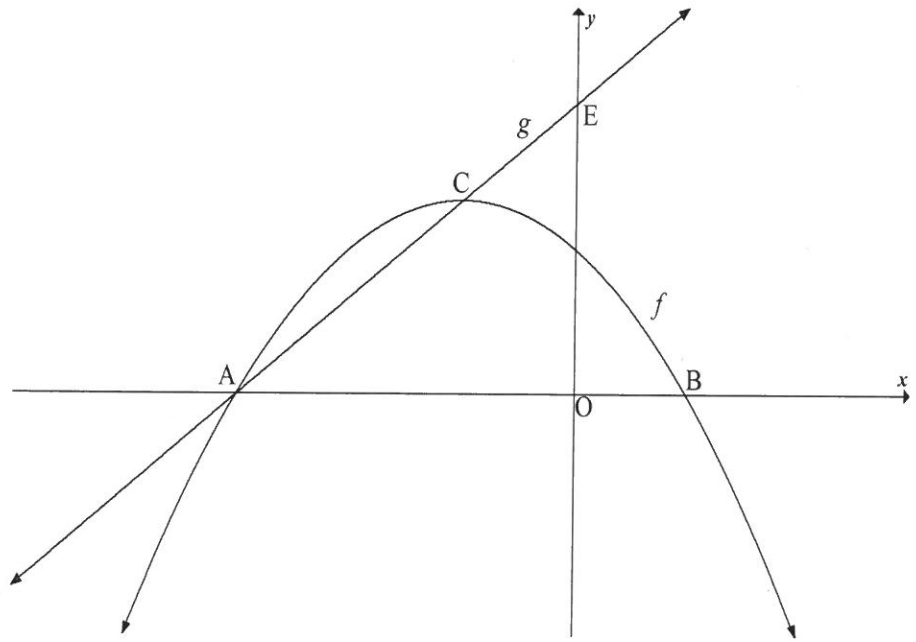
3.3 Toon aan dat die som van die eerste verskille van hierdie kwadratiese getalpatroon gegee kan word deur $S_n = 2n^2 + n$ (3)

3.4 As die som van die eerste 69 eerste verskille in VRAAG 3.3 gelyk is aan 9 591 (dit is, $S_{69} = 9\,591$), watter term van die kwadratiese getalpatroon het 'n waarde van 9 590? (2)

[11]

VRAAG 4

Die skets hieronder toon die grafieke van $f(x) = -x^2 - 2x + 3$ en $g(x) = mx + q$.
Grafiek f het x-afsnitte by A en B$(1\,;0)$ en 'n draaipunt by C.
Die reguitlyn g, wat deur A en C gaan, sny die y-as by E.



4.1 Skryf die koördinate van die y-afsnit van f neer. (1)

4.2 Toon aan dat $(-1\,;4)$ die koördinate van C is. (3)

4.3 Skryf die koördinate van A neer. (1)

4.4 Bereken die lengte van CE. (6)

4.5 Bepaal die waarde van k as $h(x) = 2x + k$ 'n raaklyn aan die grafiek van f is. (5)

4.6 Bepaal die vergelyking van g^{-1}, die inverse van g, in die vorm $y = ...$ (2)

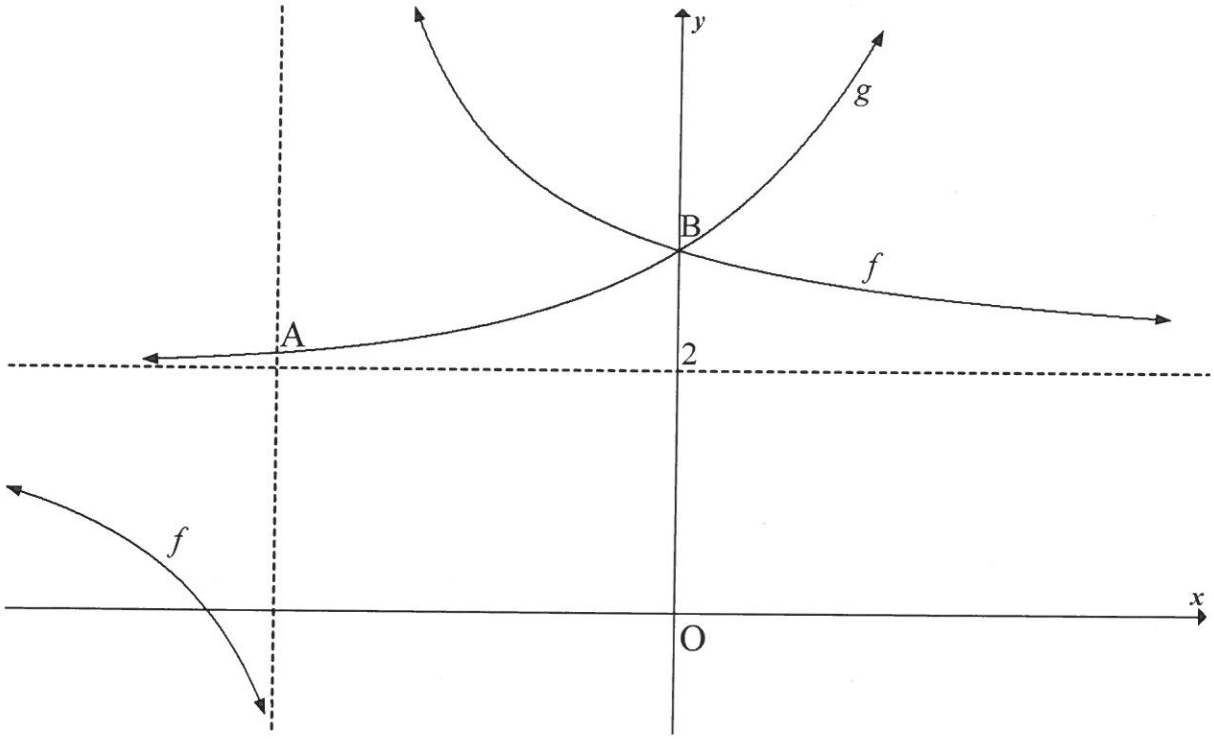
4.7 Vir watter waarde(s) van x is $g(x) \geq g^{-1}(x)$? (3)

[21]

VRAAG 5

Die skets hieronder toon die grafieke van $f(x)=\frac{3}{x-p}+q$ en $g(x)=2^x+r$ aan.

- g sny die vertikale asimptoot van f by A.
- B is die gemeenskaplike y-afsnit van f en g.
- $y=2$ is die gemeenskaplike horisontale asimptoot van f en g.



5.1 Skryf die waarde van r neer. (1)

5.2 Bepaal die waarde van p. (4)

5.3 Bepaal die koördinate van A. (3)

5.4 Vir watter waarde(s) van x is $f(x)-g(x)\geq 0$? (2)

5.5 As $h(x)=f(x-2)$, skryf die vergelyking van h neer. (2)
[12]

VRAAG 6

6.1 Hoe lank sal dit die prys van 'n bate neem om met 'n derde van sy oorspronklike waarde te verminder, indien dit teen 'n koers van 4,7% p.j. op 'n verminderde saldo depresieer? (4)

6.2 Lebogo het op 1 April 2016 'n trekker vir Rx gekoop.

- Sy sal hierdie trekker inruil wanneer sy dit oor vyf jaar op 1 April 2021 met 'n soortgelyke een vervang.
- Die trekker depresieer teen 20% p.j. volgens die verminderdesaldo-metode.
- Die prys van 'n soortgelyke trekker styg jaarliks met 18%.
- Lebogo bereken dat as sy R8 000 per maand in 'n delgingsfonds deponeer wat rente van 10% p.j. maandeliks saamgestel, betaal, sy genoeg geld sal hê om die vervangingskoste van die trekker te dek. Sy het op 30 April 2016 die eerste deposito in die fonds gemaak en sal tot 31 Maart 2021 voortgaan om dit aan die einde van elke maand te doen.

6.2.1 Bepaal, in terme van x, wat die boekwaarde van die huidige trekker op 1 April 2021 sal wees (dit is, 5 jaar nadat die trekker aangekoop is). Gee jou antwoord korrek tot VYF desimale plekke. (2)

6.2.2 Bepaal, in terme van x, wat die prys van 'n soortgelyke nuwe trekker op 1 April 2021 sal wees. Gee jou antwoord korrek tot VYF desimale plekke. (2)

6.2.3 Bereken die bedrag wat op 1 April 2021 in die delgingsfonds opgehoop sal wees. (4)

6.2.4 Bereken die waarde van x, die prys van die huidige trekker. Rond jou antwoord tot die naaste duisend af. (4)

[16]

VRAAG 7

7.1 Bepaal $f'(x)$ vanuit eerste beginsels as $f(x) = 3x^2 - 5$ (5)

7.2 Bepaal $\frac{dy}{dx}$ as:

7.2.1 $y = 2x^5 + \frac{4}{x^3}$ (3)

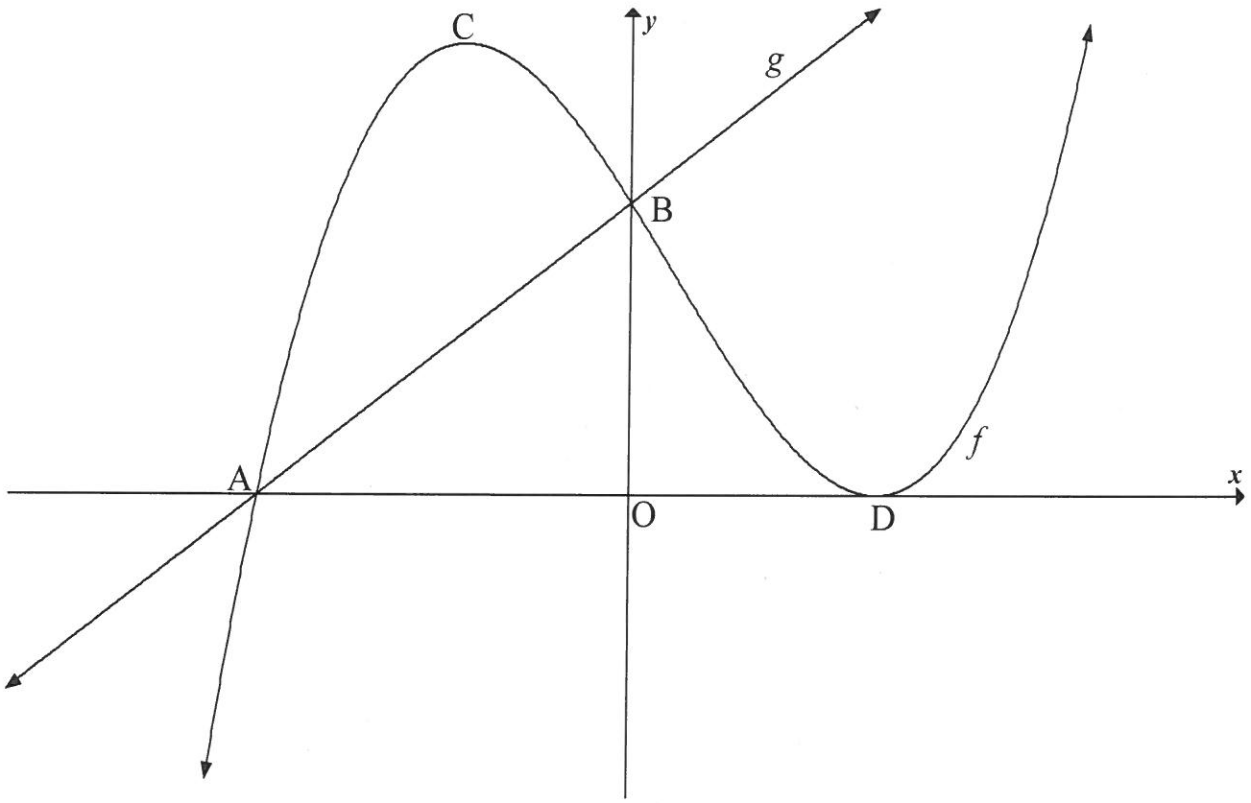
7.2.2 $y = \left(\sqrt{x} - x^2\right)^2$ (4)

[12]

VRAAG 8

Die grafieke van $f(x)=(x-2)^2(x-k)$ en $g(x)=mx+12$ is hieronder geskets.

- A en D is die x-afsnitte van f.
- B is die gemeenskaplike y-afsnit van f en g.
- C en D is draaipunte van f.
- Die reguitlyn g gaan deur A.



8.1 Skryf die y-koördinaat van B neer. (1)

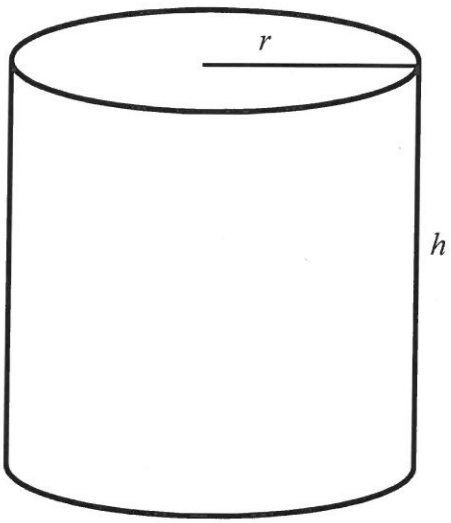
8.2 Bereken die x-koördinaat van A. (3)

8.3 As $k=-3$, bereken die koördinate van C. (6)

8.4 Vir watter waardes van x sal f konkaaf na onder wees? (3)
[13]

VRAAG 9

'n 340 mℓ-blikkie met hoogte h cm en radius r cm word hieronder getoon.



$1\ m\ell = 1\ cm^3$

9.1 Bepaal die hoogte van die blikkie in terme van die radius r. (3)

9.2 Bereken die radius van die blikkie, in cm, indien die buite-oppervlakte 'n minimum moet wees. (6)
[9]

VRAAG 10

10.1 'n Toernooi-organiseerder het 'n opname onder 150 lede by 'n plaaslike sportklub gedoen om uit te vind of hulle tennis speel of nie. Die resultate word in die tabel hieronder getoon.

	SPEEL TENNIS	**SPEEL NIE TENNIS NIE**
Manlik	50	30
Vroulik	20	50

10.1.1 Wat is die waarskynlikheid dat 'n lid wat willekeurig gekies word:

(a) Vroulik is (2)

(b) Vroulik is en tennis speel (1)

10.1.2 Is tennisspeel onafhanklik van geslag? Motiveer jou antwoord met die nodige berekeninge. (3)

10.2 Die waarskynlikheid dat gebeurtenis A en B sal plaasvind, word deur P(A) en P(B) onderskeidelik aangetoon.

Vir enige twee gebeurtenisse A en B, word gegee dat:

- $P(B') = 0,28$
- $P(B) = 3P(A)$
- $P(A \text{ of } B) = 0,96$

Is gebeurtenis A en B onderling uitsluitend? Motiveer jou antwoord. (4)
[10]

VRAAG 11

Vyf seuns en vier meisies gaan fliek. Hulle sit almal langs mekaar in dieselfde ry.

11.1 Een seun en meisie is 'n paartjie en wil langs mekaar op enige punt van die ry vriende sit. Op hoeveel verskillende maniere kan die hele groep sit? (3)

11.2 Indien al die vriende willekeurig langs mekaar sit, bereken die waarskynlikheid dat al die meisies langs mekaar sal sit. (3)
[6]

TOTAAL: 150

INLIGTINGSBLAD

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1+ni) \qquad A = P(1-ni) \qquad A = P(1-i)^n \qquad A = P(1+i)^n$$

$$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}\left[2a + (n-1)d\right]$$

$$T_n = ar^{n-1} \qquad S_n = \frac{a\left(r^n - 1\right)}{r-1} \;; r \neq 1 \qquad S_\infty = \frac{a}{1-r} \;; -1 < r < 1$$

$$F = \frac{x\left[(1+i)^n - 1\right]}{i} \qquad P = \frac{x\left[1 - (1+i)^{-n}\right]}{i}$$

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

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x-a)^2 + (y-b)^2 = r^2$$

In ΔABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

$$a^2 = b^2 + c^2 - 2bc.\cos A$$

$$\text{area } \Delta ABC = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta \qquad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta \qquad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha$$

$$\bar{x} = \frac{\sum x}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ of } B) = P(A) + P(B) - P(A \text{ en } B)$$

$$\hat{y} = a + bx \qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$

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SENIOR CERTIFICATE EXAMINATIONS/
SENIORSERTIFIKAAT-EKSAMEN

MATHEMATICS P1/*WISKUNDE V1*

2016

MEMORANDUM

MARKS/*PUNTE*: 150

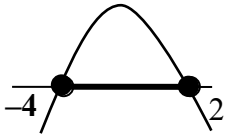
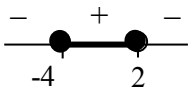
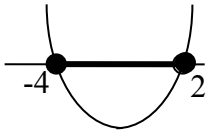
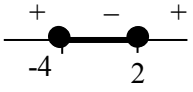
This memorandum consists of 20 pages and an addendum of 7 pages
Hierdie memorandum bestaan uit 20 bladsye en 'n addendum uit 7 bladsye.

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, sien slegs die EERSTE poging na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing.*

QUESTION/*VRAAG 1*

1.1.1	$4x^2 - 25 = 0$ $(2x-5)(2x+5) = 0$ $x = \frac{5}{2}$ or/of $x = -\frac{5}{2}$ **OR/*OF*** $4x^2 = 25$ $x^2 = \frac{25}{4}$ $x = \pm\sqrt{\frac{25}{4}}$ $x = \frac{5}{2}$ or/of $x = -\frac{5}{2}$	✓✓ factors ✓ answers (3) ✓ $x^2 = \frac{25}{4}$ ✓ $x = \pm\sqrt{\frac{25}{4}}$ ✓ answer (3)
1.1.2	$x^2 - 5x - 2 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(-2)}}{2(1)}$ $= \frac{5 \pm \sqrt{33}}{2}$ $x = 5{,}37$ or/of $x = -0{,}37$ **OR/*OF*** $x^2 - 5x + \frac{25}{4} = 2 + \frac{25}{4}$ $\left(x - \frac{5}{2}\right)^2 = \frac{33}{4}$ $x - \frac{5}{2} = \pm\frac{\sqrt{33}}{2}$ $x = \frac{5 \pm \sqrt{33}}{2}$ $x = -0{,}37$ or $x = 5{,}37$	✓ correct substitution into correct formula ✓ answer ✓ answer (3) ✓ for adding $\frac{25}{4}$ on both sides ✓answer ✓answer (3)

1.1.3	$(2-x)(x+4) \geq 0$  **OR / OF**  $-4 \leq x \leq 2$ **OR / OF** $x \in [-4; 2]$ **OR / OF** $(2-x)(x+4) \geq 0$ $(x-2)(x+4) \leq 0$  **OR / *OF***  $-4 \leq x \leq 2$ **OR / OF** $x \in [-4; 2]$	✓method ✓critical values in context of inequality ✓inequality or interval (3) ✓change of inequality ✓critical values in context of inequality ✓inequality or interval (3)
1.1.4	$x - 3x^{\frac{1}{2}} - 4 = 0$ $\left(x^{\frac{1}{2}} - 4\right)\left(x^{\frac{1}{2}} + 1\right) = 0$ $x^{\frac{1}{2}} = 4$ or $x^{\frac{1}{2}} = -1$ $x = 16$ N/A **OR/OF** $x - 3x^{\frac{1}{2}} - 4 = 0$ Let $x^{\frac{1}{2}} = k$ $k^2 - 3k - 4 = 0$ $(k-4)(k+1) = 0$ $x^{\frac{1}{2}} = 4$ or $x^{\frac{1}{2}} = -1$ $x = 16$ N/A **OR/OF** $x - 3x^{\frac{1}{2}} = 4$ $x - 4 = 3\sqrt{x}$ Restrictions/*Beperkings*: $9x = x^2 - 8x + 16$ $x \geq 4$ and $x \geq 0$ $x^2 - 17x + 16 = 0$ $(x-1)(x-16) = 0$ $x = 1$ or $x = 16$ N/A	✓ standard form ✓ factors ✓ $x^{\frac{1}{2}} = 4$ ✓ $x^{\frac{1}{2}} = -1$ ✓ answer (5) ✓ standard form ✓ factors ✓ $x^{\frac{1}{2}} = 4$ ✓ $x^{\frac{1}{2}} = -1$ ✓ answer (5) ✓ isolating $3\sqrt{x}$ or $3x^{\frac{1}{2}}$ ✓ standard form ✓ factors ✓ answers ✓ selection (5)

1.2	$y = 2x + 1$ $x^2 - 3x - 4 - (2x + 1) = (2x + 1)^2$ $x^2 - 3x - 4 - 2x - 1 = 4x^2 + 4x + 1$ $3x^2 + 9x + 6 = 0$ $x^2 + 3x + 2 = 0$ $(x + 2)(x + 1) = 0$ $x = -2$ or $x = -1$ If $x = -2$, then $y = -3$ If $x = -1$, then $y = -1$ **OR/OF** $x = \frac{y-1}{2}$ $\left(\frac{y-1}{2}\right)^2 - 3\left(\frac{y-1}{2}\right) - 4 - y = y^2$ $\frac{y^2 - 2y + 1}{4} - 3\left(\frac{y-1}{2}\right) - 4 - y = y^2$ $y^2 - 2y + 1 - 6y + 6 - 16 - 4y = 4y^2$ $3y^2 + 12y + 9 = 0$ $y^2 + 4y + 3 = 0$ $(y + 3)(y + 1) = 0$ $y = -3$ or $y = -1$ If $y = -3$, then $x = -2$ If $y = -1$, then $x = -1$	✓ y subject of formula ✓ substitution ✓ standard form ✓ factors ✓ values of x ✓ values of y (6) ✓ x subject of formula ✓ substitution ✓ standard form ✓ factors ✓ values of y ✓ values of x (6)
1.3.1	$2x + 1 \geq 0$ $x \geq -\frac{1}{2}$ **OR/OF** $\left[-\frac{1}{2}; \infty\right)$	✓ answer (1) ✓ answer (1)

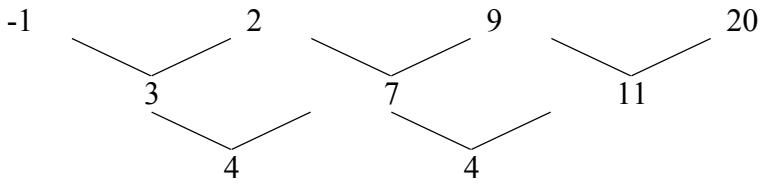
1.3.2	$f(x)=2x-1$ $\sqrt{2x+1}=2x-1$ Restrictions/*Beperkings* : $2x+1=4x^2-4x+1$ $x\geq -\frac{1}{2}$ and $x\geq \frac{1}{2}$ $4x^2-6x=0$ $x(4x-6)=0$ $x=\frac{3}{2}$ or $x=0$ $\therefore x=\frac{3}{2}$	✓ $\sqrt{2x+1}=2x-1$ ✓ standard form ✓ factors ✓ answers ✓ correct selection (5) **[26]**

QUESTION/*VRAAG 2*

2.1.1	$27-b=b-13$ $b=\frac{27+13}{2}$ $b=20$ $27-20=13-a$ $a=6$ **OR/OF** $27-13=2d$ $d=7$ $b=13+7=20$ $a=13-7=6$	✓ $27-b=b-13$ ✓ $27-20=13-a$ (2) ✓ $d=7$ or $27-13=2d$ ✓ $b=13+7$ $a=13-7$ (2)
2.1.2	$a=6 \quad d=7$ $S_n=\frac{n}{2}[2a+(n-1)d]$ $S_{20}=\frac{20}{2}[2(6)+(20-1)(7)]$ $=1450$ **OR/OF** $T_{20}=a+19(d)$ $=6+19(7)$ $=139$ $S_n=\frac{n}{2}[a+T_n]$ $S_{20}=\frac{20}{2}[6+139]$ $=1450$	✓ $d=7$ ✓ correct substitution into correct formula ✓ answer (3) ✓ $d=7$ ✓ $T_{20}=139$ ✓ answer (3)

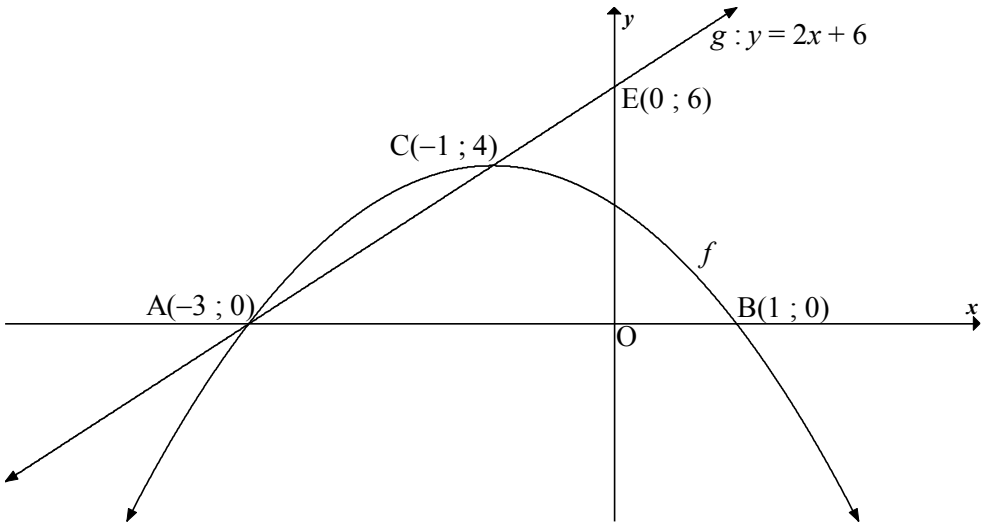
2.1.3	$T_n = 6+(n-1)(7)$ $= 7n-1$ $\sum_{n=1}^{20}(6+7(n-1))$ $= \sum_{n=1}^{20}(7n-1)$	✓ $T_n = 6+(n-1)(7)$ or $7n-1$ ✓ $\sum_{n=1}^{20}$ (2)
2.2.1	$r = \frac{(x-2)(x+2)}{x-2}$ or $r = \frac{(x^2-4)(x+2)}{x^2-4}$ $= x+2$ For convergence/Om te konvergeer: $-1 < r < 1$ $-1 < x+2 < 1$ $-3 < x < -1$	✓ $\frac{(x^2-4)}{x-2}$ or $\frac{(x-2)(x+2)}{x-2}$ or $\frac{(x^2-4)(x+2)}{x^2-4}$ ✓ $r = x+2$ ✓ $-1 < r < 1$ ✓ answer (4)
2.2.2	$\left(-\frac{7}{2}\right)+\left(-\frac{7}{4}\right)+\left(-\frac{7}{8}\right)+.....$ $S_\infty = \frac{a}{1-r}$ $= \frac{-\frac{7}{2}}{1-\frac{1}{2}}$ $= -7$ **OR/OF** $S_\infty = \frac{a}{1-r}$ $= \frac{(x-2)}{1-(x+2)}$ $= \frac{x-2}{-x-1}$ $= \frac{-\frac{3}{2}-2}{\frac{3}{2}-1}$ $= \frac{-\frac{7}{2}}{\frac{1}{2}}$ $= -7$	✓ $a = -\frac{7}{2}$ ✓ substitution into correct formula ✓ answer (3) ✓ substitution into correct formula ✓ substitution of $x = -\frac{3}{2}$ ✓answer (3) **[14]**

QUESTION/*VRAAG 3*

3.1	 $2a = 4$ $a = 2$ $3a + b = 3$ $b = -3$ $a + b + c = -1$ $c = 0$ $T_n = 2n^2 - 3n$ **OR/OF** $T_n = T_1 + (n-1)d_1 + \frac{(n-1)(n-2)}{2}d_2$ $= (-1) + (n-1)(3) + \frac{(n-1)(n-2)}{2}(4)$ $= -1 + 3n - 3 + 2n^2 - 6n + 4$ $= 2n^2 - 3n$	✓ 2^{nd} difference = 4 ✓ $a = 2$ ✓ $b = -3$ ✓ $T_n = 2n^2 - 3n$ (4) ✓ formula ✓ 2^{nd} difference = 4 ✓ simplifying ✓ $T_n = 2n^2 - 3n$ (4)
3.2	$T_n = 2n^2 - 3n$ $T_{48} = 2(48)^2 - 3(48)$ $= 4464$	✓ substitution ✓ answer (2)
3.3	$3 + 7 + 11.....$ $S_n = \frac{n}{2}[2a + (n-1)d]$ $= \frac{n}{2}[2(3) + (n-1)4]$ $= \frac{n}{2}[6 + 4n - 4]$ $= 2n^2 + n$	✓ $a = 3$ ✓ $d = 4$ ✓ substitution into correct formula (3)

3.4	$S_{69} = 9591$ and $T_1 = -1$ (of the original sequence/*van die oorspronklike ry*) $9591 + (-1) = 9590$ $S_{69} + T_1 = 9590$ The 70th term of the original sequence will have a value of 9590 **OR/OF** $2n^2 - 3n = 9590$ $2n^2 - 3n - 9590 = 0$ $(n - 70)(2n + 137) = 0$ $n = 70$ $T_{70} = 9590$	✓ $(9591) + (-1)$ ✓ 70 (2) ✓ $2n^2 - 3n - 9590 = 0$ ✓ 70 (2) **[11]**

QUESTION/*VRAAG 4*



4.1	(0 ; 3)	✓ (0 ; 3) (1)
4.2	$x = -\frac{b}{2a}$ or $-2x - 2 = 0$ $= -\frac{(-2)}{2(-1)}$ $\therefore x = -1$ $= -1$ $y = -(-1)^2 - 2(-1) + 3$ or $y = \frac{4ac - b^2}{4a}$ $= 4$ $= \frac{4(-1)(3) - (-2)^2}{4(-1)}$ $C(-1 ; 4)$	✓ $x = -\frac{(-2)}{2(-1)}$ or $-2x - 2 = 0$ ✓ simplification ✓ in the context of a turning point $-(-1)^2 - 2(-1) + 3$ $\frac{4(-1)(3) - (-2)^2}{4(-1)}$ (3)

4.3	B$(1\ ;\ 0)$ By symmetry/*Deur simmetrie* A$(-3\ ;\ 0)$ **OR/OF** $x^2+2x-3=0$ $(x+3)(x-1)=0$ $x=-3$ or $x=1$ A$(-3\ ;0)$	✓ A$(-3\ ;\ 0)$ (1) ✓ A$(-3\ ;\ 0)$ (1)
4.4	Equation of g: $m=\dfrac{4-0}{-1+3}$ $=2$ $y=2x+q$ **OR/OF** $y-0=2(x+3)$ $0=2(-3)+q$ or $4=2(-1)+q$ $y=2x+6$ $q=6$ or $y-4=2(x+1)$ $y=2x+6$ E(0 ;6) C(−1 ;4) CE $=\sqrt{(0+1)^2+(6-4)^2}$ $=\sqrt{5}$ units/2,24 units	✓ $m=2$ ✓subs of A(–3;0) or C (–1;4) ✓ $y=2x+6$ ✓ E(0 ;6) ✓substitution into distance formula ✓answer (6)
4.5	$f'(x)=-2x-2$. But $m_{\tan}=2$ $-2x-2=2$ $x=-2$ $f(-2)=3$ $y=2x+k$ $3=2(-2)+k$ $k=7$ **OR/OF** $-x^2-2x+3=2x+k$ $-x^2-4x+3-k=0$ $x^2+4x-3+k=0$ For equal roots : $\Delta=b^2-4ac=0$ $(-4)^2-4(-1)(3-k)=0$ $(4)^2-4(1)(k-3)=0$ $16+12-4k=0$ or $16-4k+12=0$ $k=7$ $k=7$	✓ $-2x-2$ ✓ $-2x-2=2$ ✓ $x=-2$ ✓ $y=3$ ✓answer (5) ✓ $-x^2-2x+3=2x+k$ ✓standard form ✓ $b^2-4ac=0$ ✓substitution ✓answer (5)

4.6	g: $y=2x+6$ g^{-1}: $x=2y+6$ $2y=x-6$ $y=\frac{x-6}{2}$ or $y=\frac{x}{2}-3$	✓ $x=2y+6$ ✓ $y=\frac{x-6}{2}$ or $y=\frac{x}{2}-3$ (2)
4.7	$g(x)\geq g^{-1}(x)$ $2x+6\geq\frac{x-6}{2}$ $4x+12\geq x-6$ $3x\geq -18$ $x\geq -6$	✓ $2x+6\geq\frac{x-6}{2}$ ✓ $4x+12\geq x-6$ ✓ $x\geq -6$ (3) **[21]**

QUESTION/*VRAAG 5*

5.1	$r=2$	✓$r=2$ (1)
5.2	$g(x)=2^x+2$ $g(0)=2^0+2=3$ B(0 ; 3) $3=\frac{3}{0-p}+2$ $p=-3$	✓ $g(0)=2^0+2$ ✓ $y=3$ ✓substitute B(0 ; 3) and $q=2$ ✓ $p=-3$ (4)
5.3	at A: $x=-3$ $y=2^{-3}+2=2\frac{1}{8}$ $A\left(-3\,;2\frac{1}{8}\right)$ or $A\left(-3\,;\frac{17}{8}\right)$ or $A(-3\,;2{,}125)$	✓ at A : $x=-3$ (p-value) ✓ substitute $x=-3$ into exponential eqution ✓ y-value (3)
5.4	$-3<x\leq 0$ **OR/ OF** $(-3\,;0]$	✓$-3<x$ ✓$x\leq 0$ (2)
5.5	$f(x)=\frac{3}{x+3}+2$ $f(x-2)=\frac{3}{x-2+3}+2$ $h(x)=\frac{3}{x+1}+2$	✓substitution of $x-2$ ✓ $h(x)=\frac{3}{x+1}+2$ (2) **[12]**

QUESTION/*VRAAG 6*

6.1	$A = P(1-i)^n$ $\frac{2}{3}P = P(1-0{,}047)^n$ $\frac{2}{3} = (1-0{,}047)^n$ $\log\frac{2}{3} = n\log(1-0{,}047)$ $n = \frac{\log\frac{2}{3}}{\log(1-0{,}047)}$ $n = 8{,}42$ years	✓A = $\frac{2}{3}$P ✓substitution into correct formula ✓logs ✓answer (4)
6.2.1	The book value of the tractor after 5 years/*Die boekwaarde van die trekker na 5 jaar* Book value $= x(1-0{,}2)^5$ or $x(0{,}8)^5$ $= 0{,}32768x$	✓ $x(1-0{,}2)^5$ or $x(0{,}8)^5$ ✓ $0{,}32768x$ (2)
6.2.2	Price of new tractor after 5 years/*Prys van nuwe trekker na 5 jaar* Book value $= x(1+0{,}18)^5$ or $x(1{,}18)^5$ $= 2{,}28776x$	✓ $x(1+0{,}18)^5$ or $x(1{,}18)^5$ ✓ $2{,}28776x$ (2)
6.2.3	$F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $= \frac{8000\left[\left(1+\frac{0{,}10}{12}\right)^{60} - 1\right]}{\frac{0{,}10}{12}}$ = R619 496,58	✓ $i = \frac{0{,}10}{12}$ ✓ $n = 60$ ✓ subst. into future value formula ✓ answer (4)

6.2.4	Sinking fund = New tractor price – Scrap value *Delgingsfonds = Nuwe trekker se prys – boekwaarde* $619\,496{,}58 = x(1+0{,}18)^5 - x(1-0{,}2)^5$ $619\,496{,}58 = x\left[(1{,}18)^5 - (0{,}8)^5\right]$ $x = \dfrac{619\,496{,}58}{\left[(1{,}18)^5 - (0{,}8)^5\right]}$ $x = \text{R}\,316\;\;057{,}15$ $x = \text{R}\,316\;\;000$ **OR/OF** $619\,496{,}58 = x(2{,}28776) - x(0{,}32768)$ $619\,496{,}58 = x[1{,}96008]$ $x = \dfrac{619\,496{,}58}{1{,}96008}$ $x = \text{R}\,316\;\;056{,}78$ $x = \text{R}\,316\;\;000$	✓ $619\,496{,}58$ ✓ $x(1+0{,}18)^5 - x(1-0{,}2)^5$ ✓ common factor x ✓ $\text{R}\,316\;\;000$ (4) ✓ $619\,496{,}58$ ✓ $x(2{,}28776) - x(0{,}32768)$ ✓ simplification ✓ $\text{R}\,316\;\;000$ (4) **[16]**

QUESTION/*VRAAG 7*

7.1	$f(x+h)=3(x+h)^2-5=3(x^2+2xh+h^2)-5$ $=3x^2+6xh+3h^2-5$ $f(x+h)-f(x)=3x^2+6xh+3h^2-5-3x^2+5$ $=6xh+3h^2$ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $=\lim_{h\to 0}\frac{6xh+3h^2}{h}$ $=\lim_{h\to 0}\frac{h(6x+3h)}{h}$ $=\lim_{h\to 0}(6x+3h)$ $=6x$ **OR/OF** $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $=\lim_{h\to 0}\frac{3(x+h)^2-5-(3x^2-5)}{h}$ $=\lim_{h\to 0}\frac{3x^2+6xh+3h^2-5-3x^2+5}{h}$ $=\lim_{h\to 0}\frac{6xh+3h^2}{h}$ $=\lim_{h\to 0}\frac{h(6x+3h)}{h}$ $=\lim_{h\to 0}(6x+3h)$ $=6x$	✓ $3x^2+6xh+3h^2-5$ ✓ $6xh+3h^2$ ✓ $\frac{f(x+h)-f(x)}{h}$ ✓ common factor/ $(6x+3h)$ ✓ answer (5) ✓ $\frac{f(x+h)-f(x)}{h}$ ✓ $3x^2+6xh+3h^2-5$ ✓ $6xh+3h^2$ ✓ common factor/ $(6x+3h)$ ✓ answer (5)
7.2.1	$y=2x^5+\frac{4}{x^3}$ $y=2x^5+4x^{-3}$ $\frac{dy}{dx}=10x^4-12x^{-4}$	✓ $2x^5+4x^{-3}$ ✓ $10x^4$ ✓ $-12x^{-4}$ (3)

7.2.2	$y=\left(\sqrt{x}-x^{2}\right)^{2}$ $y=\left(x^{\frac{1}{2}}-x^{2}\right)^{2}$ $=x-2x^{\frac{5}{2}}+x^{4}$ $\frac{dy}{dx}=1-5x^{\frac{3}{2}}+4x^{3}$	✓ $x-2x^{\frac{5}{2}}+x^{4}$ ✓1 ✓$-5x^{\frac{3}{2}}$ ✓$4x^{3}$ (4) **[12]**

QUESTION/*VRAAG 8*

8.1	$y = 12$	✓answer (1)
8.2	$12 = (0-2)^2(0-k)$ $k = -3$ $(x-2)^2(x+3) = 0$ $x = -3$ **OR/OF** $y = 0$ $(x-2)^2(x-k) = 0$ $(x^2 - 4x + 4)(x-k) = 0$ $x^3 - kx^2 - 4x^2 + 4kx + 4x - 4k = 0$ But $-4k$ is the y - intercept *Maar* $-4k$ *is die y-afsnit* $-4k = 12$ $k = -3$ $x = -3$	✓ substituting (0;12) ✓ $k = -3$ ✓ $x = -3$ (3) ✓$-4k$ ✓ $-4k = 12$ or $k = -3$ ✓ $x = -3$ (3)
8.3	$f(x) = x^3 + 3x^2 - 4x^2 - 12x + 4x + 12$ $f(x) = x^3 - x^2 - 8x + 12$ $f'(x) = 3x^2 - 2x - 8$ $3x^2 - 2x - 8 = 0$ $(3x+4)(x-2) = 0$ $x = -\frac{4}{3}$ or $x = 2$ $y = \frac{500}{27}$ or 18,52 or $18\frac{14}{27}$ $C\left(-\frac{4}{3}; 18{,}52\right)$	✓ $f(x) = x^3 - x^2 - 8x + 12$ ✓derivative ✓derivative equal to 0 ✓factors or formula ✓ $x = -\frac{4}{3}$ ✓ $y = \frac{500}{27}$ or 18,52 or $18\frac{14}{27}$ (6)

8.4	$f''(x) = 6x - 2$ $6x - 2 < 0$ $x < \frac{1}{3}$ f is concave down when $x < \frac{1}{3}$ *f is konkaaf na onder vir* $x < \frac{1}{3}$ **OR/OF** $f''(x) = 6x - 2$ $6x - 2 = 0$ $x = \frac{1}{3}$ f is concave down when $x < \frac{1}{3}$ *f is konkaaf na onder vir* $x < \frac{1}{3}$ **OR/OF** $x = \frac{x_c + x_d}{2}$ or/of $x = -\frac{b}{3a}$ $= \frac{-\frac{4}{3} + 2}{2}$ or/of $= -\frac{-1}{3(1)}$ $= \frac{1}{3}$ $= \frac{1}{3}$ f is concave down when $x < \frac{1}{3}$ *f is konkaaf na onder vir* $x < \frac{1}{3}$	✓ $6x - 2$ ✓✓ $x < \frac{1}{3}$ (3) ✓ $6x - 2$ ✓✓ $x < \frac{1}{3}$ (3) ✓ $\frac{-\frac{4}{3} + 2}{2}$ or $-\frac{-1}{3(1)}$ ✓✓ $x < \frac{1}{3}$ (3) **[13]**

QUESTION/*VRAAG 9*

9.1	$V = \pi r^2 h$ $\pi r^2 h = 340$ $h = \frac{340}{\pi r^2}$	✓formula ✓equating to 340 ✓ $h = \frac{340}{\pi r^2}$ (3)
9.2	$A = 2\pi r^2 + 2\pi rh$ $= 2\pi r^2 + 2\pi r\left(\frac{340}{\pi r^2}\right)$ $= 2\pi r^2 + \frac{680}{r}$ $A'(r) = 4\pi r - \frac{680}{r^2}$ $A'(r) = 0$ for minimum surface area/ *vir* min*imum buite-oppervlakte* $4\pi r - \frac{680}{r^2} = 0$ $r^3 = \frac{680}{4\pi} = \frac{170}{\pi}$ $= 54{,}11268$ $r = 3{,}78\,\text{cm}$	✓ $2\pi r^2 + 2\pi rh$ ✓substituting h ✓ $4\pi r - \frac{680}{r^2}$ ✓ $A'(r) = 0$ ✓ $r^3 = \frac{680}{4\pi}$ ✓answer (6) **[9]**

QUESTION/*VRAAG 10*

10.1.1 (a)	$\text{P(Female/Vroulik)} = \frac{70}{150} = \frac{7}{15} = 0,47$	✓ 70 ✓ answer (2)
10.1.1 (b)	$\text{P(Female playing tennis/Vroulik speel tennis)} = \frac{20}{150} = \frac{2}{15} = 0,13$	✓ answer (1)

10.1.2	$\text{P(Female/Vroulik)} = \frac{70}{150}$ $\text{P(Playing/Speel tennis)} = \frac{70}{150}$ $\text{P(Female playing tennis/Vrouliks speel tennis)} = \frac{20}{150} = 0,13$ $\text{P(Female/Vroulik)} \times \text{P(Playing/Speel tennis)} = \left(\frac{70}{150}\right)\left(\frac{70}{150}\right) = \frac{4900}{22500} = 0,22$ P(Female playing tennis/Vroulik speel tennis) ≠ P(Female/Vroulik) × P(Playing/Speel tennis) Therefore the event of playing tennis is not independent of gender./ Dus is die gebeurtenis om tennis te speel nie onafhanklik van geslag nie **OR/OF** $\text{P(Male/Manlik)} = \frac{80}{150}$ $\text{P(Playing/Speel tennis)} = \frac{70}{150}$ $\text{P(Male playing tennis/Manlik speel tennis)} = \frac{50}{150} = 0,33333$ $\text{P(Male/Manlik)} \times \text{P(Playing/Speel tennis)} = \left(\frac{80}{150}\right)\left(\frac{70}{150}\right) = \frac{5600}{22500} = 0,25$ P(Male playing tennis/Manlik speel tennis) ≠ P(Male/Manlik) × P(Playing/Speel tennis) Therefore the event of playing tennis is not independent of gender./ Dus is die gebeurtenis om tennis te speel nie onafhanklik van geslag nie. **OR/OF**	✓ $\text{P(Play ten)} = \frac{70}{150}$ ✓ $\left(\frac{70}{150}\right)\left(\frac{70}{150}\right) = \frac{4900}{22500} = 0,22$ ✓ P(F play t) ≠ P(F) × P(Play t) Not independent (3) ✓ $\text{P(Play ten)} = \frac{70}{150}$ ✓ $\left(\frac{80}{150}\right)\left(\frac{70}{150}\right) = \frac{5600}{22500} = 0,25$ ✓ P(M play t) ≠ P(M) × P(Play t) Not independent (3)

	$P(\text{Male}) = \frac{80}{150}$ $P(\text{Not playing tennis}) = \frac{80}{150}$ $P(\text{Male not playing tennis}) = \frac{80}{150} = 0,53333$ $P(\text{Male}) \times P(\text{Not playing tennis}) = \left(\frac{80}{150}\right)\left(\frac{80}{150}\right) = \frac{6400}{22500} = 0,28$ $P(\text{Male not playing tennis}) \neq P(\text{Male}) \times P(\text{Not playing tennis})$ Therefore the event of playing tennis in not independent of gender. **OR/OF** $P(\text{Female}) = \frac{70}{150}$ $P(\text{Not playing tennis}) = \frac{80}{150}$ $P(\text{Female not playing tennis}) = \frac{50}{150} = 0,3333$ $P(\text{Female}) \times P(\text{Not playing tennis}) = \left(\frac{70}{150}\right)\left(\frac{80}{150}\right) = \frac{5600}{22500} = 0,25$ $P(\text{Female not playing tennis}) \neq P(\text{Female}) \times P(\text{Not playing tennis})$ Therefore the events of playing tennis and gender are not independent.	✓ $P(\text{not play ten}) = \frac{80}{150}$ ✓ $\left(\frac{80}{150}\right)\left(\frac{80}{150}\right) = \frac{6400}{22500} = 0,28$ ✓ $P(\text{M not play t}) \neq P(\text{M}) \times P(\text{Not play t})$ Not independent (3) ✓ $P(\text{not play ten}) = \frac{80}{150}$ ✓ $\left(\frac{70}{150}\right)\left(\frac{80}{150}\right) = \frac{5600}{22500} = 0,25$ ✓ $P(\text{F not play t}) \neq P(\text{F}) \times P(\text{Not play t})$ Not independent (3)
10.2	$P(B) = 1 - P(B')$ $= 1 - 0,28$ $= 0,72$ $P(\text{A or B}) = P(\text{A}) + P(\text{B}) - P(\text{A and B})$ $0,96 = 0,24 + 0,72 - P(\text{A and B})$ $0,96 = 0,96 - P(\text{A and B})$ $P(\text{A and B}) = 0$ Events A and B are mutually exclusive *Gebeurtenis A en B is onderling uitsluitend*	✓ $P(B) = 0,72$ ✓ $P(A) = 0,24$ ✓ substitution into correct formula ✓ $P(\text{A and B}) = 0$ (4) **[10]**

QUESTION/*VRAAG 11*

11.1	2 x 2! x 7! = 20 160	✓ 2 x 2! ✓ 7! ✓ 20 160 (3)
11.2	All seated in 9! = 362 880 ways Girls seated together in 4! ways. With the girls as one unit they can all be seated in 4! 6! ways = 17280 *Almal sit op 9! = 362 880 maniere* *Meisies sit saam op 4! maniere.* *Met die meisies as 'n eenheid kan almal op* *4! 6!maniere = 17280 sit* P(all girls seated together/al die meisies sit saam) $= \frac{4!\,6!}{9!}$ $= \frac{17280}{362880}$ $= \frac{1}{21}$ $= 0{,}047619....$ $= 4{,}76\%$	✓ 9! or 362 880 ✓ 4! 6! or 17280 ✓ $\frac{17280}{362880}$ or $\frac{1}{21}$ or 0,047619 or 4,76% (3) **[6]**
	TOTAL/*TOTAAL:*	**150**