basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT

GRADE 12/*GRAAD* 12

MATHEMATICS P1/*WISKUNDE V1*

NOVEMBER 2017

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE:* *150*

This memorandum consists of 17 pages.
Hierdie memorandum bestaan uit* 17 *bladsye.

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:

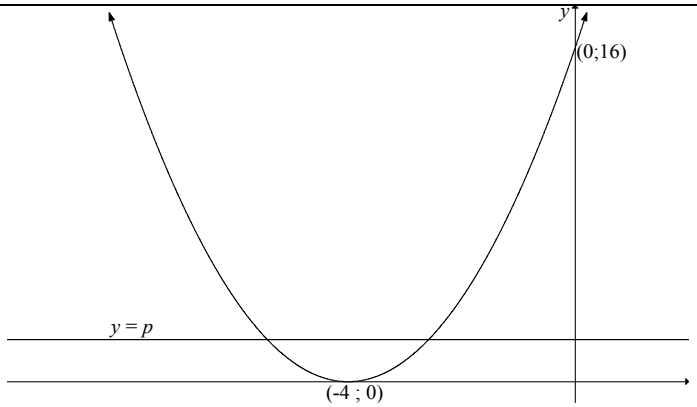
- *Indien 'n kandidaat 'n vraag TWEE KEER beantwoord, merk slegs die EERSTE poging.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyne van toepassing.*

QUESTION/*VRAAG* 1

1.1.1	$x^2+9x+14=0$ $(x+7)(x+2)=0$ $x=-7$ or $x=-2$	✓ factors ✓ $x=-7$ ✓ $x=-2$ (3)
1.1.2	$4x^2+9x-3=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-9\pm\sqrt{9^2-4(4)(-3)}}{2(4)}$ $=\frac{-9\pm\sqrt{129}}{8}$ $x=0{,}29$ or $x=-2{,}54$ **OR/*OF*** $x^2+\frac{9}{4}x+\frac{81}{64}=\frac{3}{4}+\frac{81}{64}$ $\left(x+\frac{9}{8}\right)^2=\frac{129}{64}$ $x+\frac{9}{8}=\pm\frac{\sqrt{129}}{8}$ $x=\frac{-9\pm\sqrt{129}}{8}$ $x=0{,}29$ or $x=-2{,}54$	✓ substitution ✓ simplification ✓ $x=0{,}29$ ✓ $x=-2{,}54$ **OR/*OF*** ✓ for adding $\frac{81}{64}$ on both sides ✓ simplification ✓ $x=0{,}29$ ✓ $x=-2{,}54$ (4)
1.1.3	$\sqrt{x^2-5}=2\sqrt{x}$ $x^2-5=4x$ $x^2-4x-5=0$ $(x-5)(x+1)=0$ $x=5$ or $x=-1$ $x=5$	✓ squaring both sides ✓ factors ✓ answers ✓ select $x=5$ (4)

1.2	$3x-y=4$ $y=3x-4$ $x^2+2xy-y^2=-2$ $x^2+2xy-y^2=-2$ $x^2+2x(3x-4)-(3x-4)^2=-2$ $x^2+6x^2-8x-(9x^2-24x+16)=-2$ $7x^2-8x-9x^2+24x-16=-2$ $-2x^2+16x-14=0$ $x^2-8x+7=0$ $(x-7)(x-1)=0$ $x=1$ or $x=7$ $y=3(1)-4$ $y=3(7)-4$ $y=-1$ or $y=17$ **OR/*OF*** $3x-y=4$ $x=\frac{y+4}{3}$ $x^2+2xy-y^2=-2$ $x^2+2xy-y^2=-2$ $\left(\frac{y+4}{3}\right)^2+2\left(\frac{y+4}{3}\right)x-y^2=-2$ $y^2+8y+16+6y^2+24y-9y^2=-18$ $-2y^2+32y+34=0$ $y^2-16y-17=0$ $(y-17)(y+1)=0$ $y=-1$ or $y=17$ $x=\frac{-1+4}{3}$ $x=\frac{17+4}{3}$ $x=1$ or $x=7$	✓ y subject of formula ✓ substitution ✓ correct standard form ✓ factors ✓ x-values ✓ y-values **OR/*OF*** ✓ x subject of formula ✓ substitution ✓ correct standard form ✓ factors ✓ y-values ✓ x-values (6)
1.3.1	$x^2+8x+16>0$ $(x+4)^2>0$ $x\in R,\ x\neq -4$ **OR/*OF*** $x^2+8x+16>0$ $(x+4)^2>0$ + + **– 4** The function values remain positive $x\in R,\ x\neq -4$	✓ $(x+4)^2$ ✓✓ $x\in R,\ x\neq -4$ **OR/*OF*** ✓ $(x+4)^2$ ✓✓ $x\in R,\ x\neq -4$ (3)

1.3.2



For two negative unequal roots:

$0 < p < 16$ ✓ ✓ $0 < p$ ✓✓ $p < 16$

OR/*OF*

OR/*OF*

$$x^2 + 8x + 16 = p$$

$$x^2 + 8x + 16 - p = 0$$

$$0 < 16 - p < 16$$

$$-16 < -p < 0$$

$$0 < p < 16$$

✓ ✓ $0 < p$ ✓✓ $p < 16$

OR/*OF*

OR/*OF*

$$x^2 + 8x + 16 = p$$

$$x^2 + 8x + 16 - p = 0$$

Roots are real and unequal :

$$8^2 - 4(16 - p) > 0$$

$$4p > 0$$

$$p > 0$$

$$\text{Roots are : } \frac{-8 \pm \sqrt{4p}}{2}$$

For both roots to be negative :

$$\sqrt{4p} < 8$$

$$4p < 64$$

$$p < 16$$

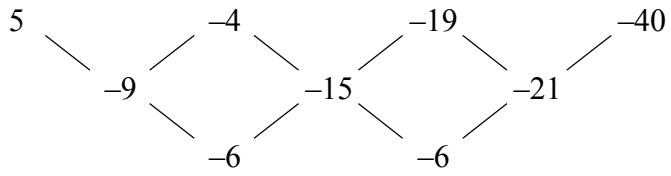
$$0 < p < 16$$

✓ ✓ $0 < p$ ✓✓ $p < 16$

(4)

[24]

QUESTION/*VRAAG* 2

2.1.1	 first differences: –9; –15; –21 second difference = – 6	✓ first differences ✓ – 6 (2)
2.1.2	$T_n = an^2 + bn + c$ $a = \frac{\text{second difference}}{2} = -3$ $3a + b = -9$ $3(-3) + b = -9$ $b = 0$ $a + b + c = 5$ $-3 + 0 + c = 5$ $c = 8$ $T_n = -3n^2 + 8$ **OR/*OF*** $T_n = T_1 + (n-1)d_1 + \frac{(n-1)(n-2)d_2}{2}$ $= 5 + (n-1)(-9) + \frac{(n-1)(n-2)(-6)}{2}$ $= 5 - 9n + 9 - 3n^2 + 9n - 6$ $T_n = -3n^2 + 8$	✓ $a = -3$ ✓ $3a + b = -9$ ✓ $b = 0$ ✓ $c = 8$ **OR/*OF*** ✓correct substitution onto correct formula ✓ $a = -3$ ✓ $b = 0$ ✓ $c = 8$ (4)
2.1.3	$-3n^2 + 8 = -25\,939$ $-3n^2 = -25947$ $n^2 = 8649$ $n = -93 \quad or \quad n = 93$ The 93rd term has a value of –25 939	✓ substitution ✓ $n^2 = 8649$ ✓ answer (3)

2.2.1	$2k-7\ ;\ k+8$ and $2k-1$ $k+8-(2k-7)=2k-1-(k+8)$ $-k+15=k-9$ $2k=24$ $k=12$ $2k-7;k+8$ and $2k-1$ $17\ ;20\ ;23.....$ $d=3$ $T_{15}=17+14(3)$ $=59$	✓ $k+8-(2k-7)=2k-1-(k+8)$ ✓$k=12$ ✓17 ✓ $d=3$ ✓$T_{15}=59$ (5)
2.2.2	Sequence is 17 ; 20 ; 23 ; 26 ; 29 ; 32 ……. Every alternate term of the sequence will be even / *Elke tweede term van die ry sal ewe wees* $20+26+32+.....$ $S_{20}=\frac{30}{2}[2(20)+(29)(6)]$ $=15[40+174]$ $=3210$	✓ $20+26+32+.....$ ✓$a=20\ \ d=6$ ✓subst into correct formula ✓ answer (4) **[18]**

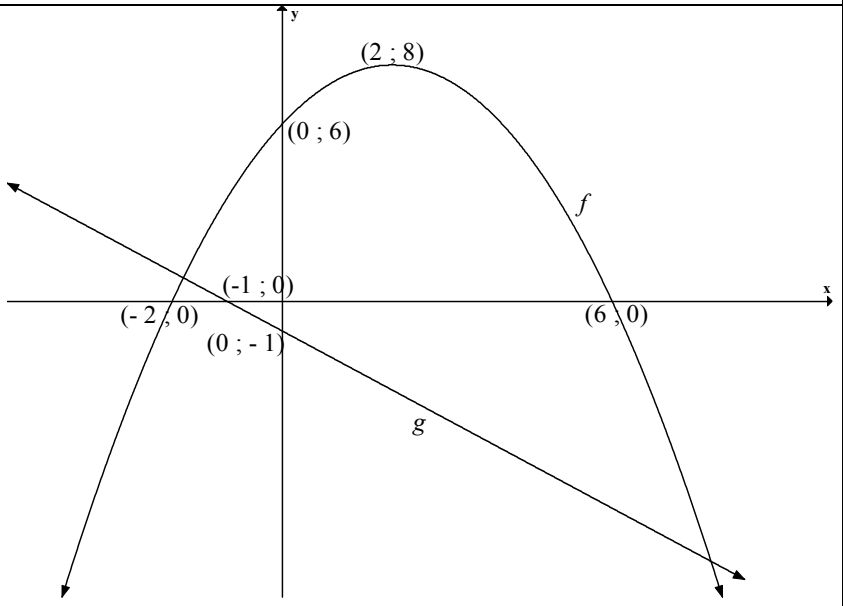
QUESTION/*VRAAG* 3

3.1	$a+ar=2$ $a(1+r)=2$ $a=\frac{2}{1+r}$ **OR/*OF*** $\frac{a}{1-r}-2=\frac{1}{4}$ $4a-8(1-r)=1-r$ $4a-8+8r=1-r$ $4a=9-9r$ $a=\frac{9-9r}{4}$	✓ $a+ar=2$ ✓ $a=\frac{2}{1+r}$ (2) ✓ $\frac{a}{1-r}-2=\frac{1}{4}$ ✓ $a=\frac{9-9r}{4}$ (2)

3.2	$S_\infty = T_1 + T_2 + \sum_{n=3}^{\infty} T_n$	
	$S_\infty = 2 + \frac{1}{4}$	✓ $S_\infty = 2 + \frac{1}{4}$
	$\frac{a}{1-r} = 2 + \frac{1}{4}$	
	$\frac{a}{1-r} = \frac{9}{4}$	✓ $\frac{a}{1-r} = \frac{9}{4}$
	$\left(\frac{2}{1+r}\right) \times \left(\frac{1}{1-r}\right) = \frac{9}{4}$	✓ substitution
	$\frac{2}{1-r^2} = \frac{9}{4}$	
	$8 = 9 - 9r^2$	✓ $9r^2 = 1$
	$9r^2 = 1$	✓ $r = \frac{1}{3}$
	$r = \frac{1}{3}$	✓ $a = \frac{3}{2}$
	$a = \frac{3}{2}$	
	OR/*OF*	**OR/*OF***
	$S_\infty = T_1 + T_2 + \sum_{n=3}^{\infty} T_n$	
	$S_\infty = 2 + \frac{1}{4}$	✓ $S_\infty = 2 + \frac{1}{4}$
	$\frac{a}{1-r} = 2 + \frac{1}{4}$	
	$\frac{a}{1-r} = \frac{9}{4}$	✓ $\frac{a}{1-r} = \frac{9}{4}$
	$4a = 9 - 9r$	
	$r = \frac{9-4a}{9}$	✓ $r = \frac{9-4a}{9}$
	$a + a\left(\frac{9-4a}{9}\right) = 2$	✓ substitution
	$9a + 9a - 4a^2 = 18$	
	$2a^2 - 9a + 9 = 0$	
	$(a-3)(2a-3) = 0$	
	$a = \frac{3}{2}$ or $a = 3$	✓ $a = \frac{3}{2}$
	$r = \frac{1}{3}$ or $r = -\frac{1}{3}$	✓ $r = \frac{1}{3}$
	N/A	(6) **[8]**

QUESTION/*VRAAG* 4

4.1	$f(x) = -ax^2 + bx + 6$ $f'(x) = -2ax + b$ $-2ax + b = 3$ at $x = -1$ $2a + b = 3$ [1] $f(-1) = \frac{7}{2}$ $-a - b + 6 = \frac{7}{2}$ $-2a - 2b + 12 = 7$ $2a + 2b = 5$ [2] [2] – [1] $b = 2$ $2a + 2 = 3$ $a = \frac{1}{2}$	✓ $-2ax + b$ ✓✓ $2a + b = 3$ ✓ $-a - b + 6 = \frac{7}{2}$ ✓solve simultaneously (5)
4.2	$f(x) = -\frac{1}{2}x^2 + 2x + 6$ x – intercepts: $-\frac{1}{2}x^2 + 2x + 6 = 0$ $-x^2 + 4x + 12 = 0$ $x^2 - 4x - 12 = 0$ $(x - 6)(x + 2) = 0$ $(-2\,;0)$ $(6\,;0)$	✓ $-\frac{1}{2}x^2 + 2x + 6 = 0$ ✓ $(-2\,;0)$ ✓ $(6\,;0)$ (3)

4.3	$f(x)=-\frac{1}{2}x^2+2x+6$ $f'(x)=0$ or $x=-\frac{b}{2a}$ or $x=\frac{-2+6}{2}$ $-x+2=0$ or $x=-\frac{2}{2.\left(-\frac{1}{2}\right)}$ $x=2$ or $x=2$ or $x=2$ $y=-\frac{1}{2}(2)^2+2(2)+6$ $=-2+4+6$ $=8$ TP $(2;8)$ **OR/OF** $y=-\frac{1}{2}(x^2-4x-12)$ $=-\frac{1}{2}[(x-2)^2-4-12]$ $=-\frac{1}{2}(x-2)^2+8$ TP $(2;8)$	✓ $-x+2$ / $-\frac{2}{2.\left(-\frac{1}{2}\right)}$ / $\frac{-2+6}{2}$ ✓ $x=2$ ✓ $y=8$ **OR/*OF*** ✓ $-\frac{1}{2}(x-2)^2+8$ ✓ $x=2$ ✓ $y=8$ (3)
4.4 4.6		4.4: *f*: ✓shape ✓*x*- intercepts ✓*y*- intercept ✓(2 ; 8) (4) 4.6: *g*: ✓ *x*- intercept ✓ *y*- intercept (2)
4.5	$0 < x < 4$	✓ $0 < x$ ✓✓ $x < 4$ (3)
4.7	$x \le -2$ or $-1 \le x \le 6$	✓ $x \le -2$ ✓ $x \ge -1$ ✓ $x \le 6$ (3) **[23]**

QUESTION/*VRAAG* 5

5.1	$y \neq -1$ **OR/*OF*** $R - \{-1\}$	✓✓ $y \neq -1$ **OR/*OF*** ✓✓ $R - \{-1\}$ (2)
5.2	$\text{D}(2\ ;-1)$ $g(x)=\frac{2}{x-2}-1$	✓ $\text{D}(2\ ;-1)$ ✓ $\frac{2}{x-2}-1$ (2)
5.3	$f(x)=\log_3 x.$ $\log_3 t=1$ $t=3$	✓correct substitution of A ✓✓ $t=3$ (3)
5.4	$x=\log_3 y$ $y=3^x$	✓interchange x and y ✓ $y=3^x$ (2)
5.5	$3^x < 3^1$ $x<1$	✓ $3^x < 3^1$ ✓ $x<1$ (2)
5.6	Equation of the axis of symmetry: $y=-x+1$ x-intercept of the axis of symmetry is at $x = 1$ f has an x-intercept at B(1 ; 0) Point of intersection: $(1\ ;0)$ **OR/*OF*** Since BE = ED = 1 and D lies on the axis of symmetry and the gradient of the axis of symmetry is –1, B will also lie on the axis of symmetry. But B also lies on f. Therefore B(1 ; 0) is the point of intersection between f and the axis of symmetry with a negative gradient./ *Omdat* BE = ED = 1 *en* D *op die simmetrie-as lê en die simmetrie-as se gradiënt* –1 *is, sal* B *ook op die simmetrie-as lê. Maar* B *lê ook op f. Dus is* B(1 ; 0) *die snypunt van f en die simmetrie-as met negatiewe gradiënt.*	✓ equation of axis of symmetry ✓ x-intercept ✓ $(1\ ;0)$ **OR/*OF*** ✓ BE = ED = 1 ✓ reasoning ✓ $(1\ ;0)$ (3) **[14]**

QUESTION/*VRAAG* 6

6.1	$A = P(1+i)^n$ $12\ 146{,}72 = 10\ 000\left(1+\frac{r}{12}\right)^{36}$ $\left(1+\frac{r}{12}\right)^{36} = 1{,}214672$ $1+\frac{r}{12} = \sqrt[36]{1{,}214672}$ $= 1{,}005416$ $\frac{r}{12} = 0{,}05416$ $r = 0{,}06500$ $r = 6{,}5\%$	✓ $\frac{r}{12}$ ✓ $n = 36$ ✓ correct substitution into formula ✓ $1+\frac{r}{12} = \sqrt[36]{1{,}214672}$ ✓ answer (5)
6.2.1	$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $235\ 000 = \frac{x\left[1-\left(1+\frac{0{,}11}{12}\right)^{-54}\right]}{\frac{0{,}11}{12}}$ $x = \frac{235000\times\frac{0{,}11}{12}}{\left[1-\left(1+\frac{0{,}11}{12}\right)^{-54}\right]}$ $= \text{R}5\ 536{,}95$ His monthly instalment is R 5 536,95	✓ $i = \frac{0{,}11}{12}$ ✓ $n = 54$ ✓ correct substitution in P ✓ answer (4)
6.2.2	$\text{Balance} = 235\ 000\left(1+\frac{0{,}11}{12}\right)^{12} - \frac{5\ 536{,}95\left[\left(1+\frac{0{,}11}{12}\right)^{12}-1\right]}{\frac{0{,}11}{12}}$ $= 192\ 296{,}17$ $\text{Interest} = (5\ 536{,}95\times 12) - (235\ 000 - 192\ 296{,}17)$ $= 66443{,}40 - 42\ 703{,}80$ $= 23\ 739{,}57$ **OR/*OF***	✓ $235\ 000\left(1+\frac{0{,}11}{12}\right)^{12}$ ✓ $\frac{5\ 536{,}95\left[\left(1+\frac{0{,}11}{12}\right)^{12}-1\right]}{\frac{0{,}11}{12}}$ ✓ R192 296,20 ✓ R66 443,40 ✓ R42 703,80. ✓ R23 739,60 **OR/*OF***

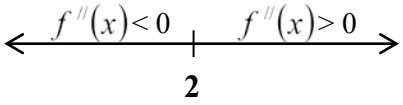
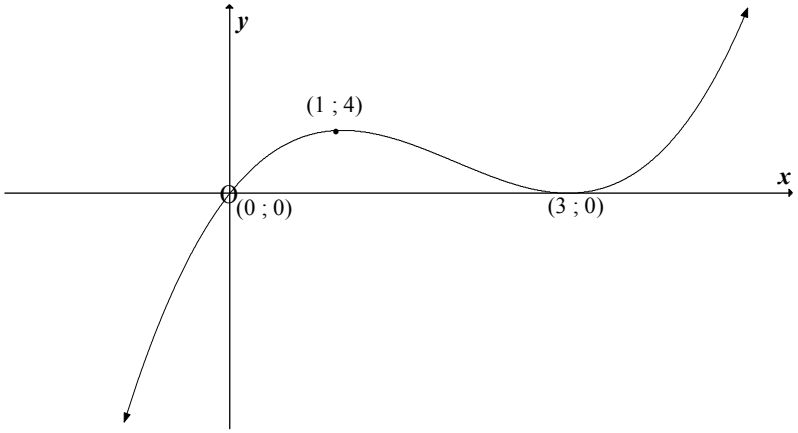
	Total amount paid in first year $= \text{R } 5\,536.95 \times 12$ $= \text{R}66\,443{,}40$	✓ R66 443,40
	Balance on loan after 1 year = P of remaining installments $\text{P} = \dfrac{x\left[1-(1+i)^{-n}\right]}{i}$	
	$= \dfrac{5536{,}95\left[1-\left(1+\dfrac{0{,}11}{12}\right)^{-42}\right]}{\dfrac{0{,}11}{12}}$	✓ $n = -42$ ✓ substitution into correct formula
	$= \text{R}192\,296{,}20$	✓ R192 296,20
	Amount paid off in the first year: R235 000 – R192 296,20 = R42 703,80.	✓ R42 703,80.
	Amount of interest = R66 443,40 – R42 703,80. = R23 739,60	✓ R23 739,60 (6) **[15]**

QUESTION/*VRAAG* 7

7.1	$f(x+h) = 2(x+h)^2 - (x+h)$ $= 2(x^2+2xh+h^2) - x - h$ $= 2x^2 + 4xh + 2h^2 - x - h$	✓ $2x^2 + 4xh + 2h^2 - x - h$
	$f(x+h) - f(x) = 2x^2 + 4xh + 2h^2 - x - h - 2x^2 + x$ $= 4xh + 2h^2 - h$	✓ $4xh + 2h^2 - h$
	$f'(x) = \lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$	✓ $f'(x) = \lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$
	$= \lim\limits_{h\to 0}\dfrac{4xh+2h^2-h}{h}$	✓subst. into formula
	$= \lim\limits_{h\to 0}\dfrac{h(4x+2h-1)}{h}$	✓ $\lim\limits_{h\to 0}(4x+2h-1)$
	$= \lim\limits_{h\to 0}(4x+2h-1)$	✓$4x-1$
	$= 4x-1$	
	OR/*OF*	**OR/*OF***

	$f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{2(x+h)^2-(x-h)-(2x^2-x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{2x^2+4xh+2h^2-x-h-2x^2+x}{h}$ $=\lim\limits_{h\to 0}\dfrac{4xh+2h^2-h}{h}$ $=\lim\limits_{h\to 0}\dfrac{h(4x+2h-1)}{h}$ $=\lim\limits_{h\to 0}(4x+2h-1)$ $=4x-1$	✓ $f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ ✓subst. into formula ✓ $2x^2+4xh+2h^2-x-h$ ✓ $4xh+2h^2-h$ ✓ $\lim\limits_{h\to 0}(4x+2h-1)$ ✓ $4x-1$ (6)
7.2.1	$D_x[(x+1)(3x-7)]$ $=D_x(3x^2-4x-7)$ $=6x-4$	✓ $3x^2-4x-7$ ✓ $6x-4$ (2)
7.2.2	$y=\sqrt{x^3}-\dfrac{5}{x}+\dfrac{1}{2}\pi$ $y=x^{\frac{3}{2}}-5x^{-1}+\dfrac{1}{2}\pi$ $\dfrac{dy}{dx}=\dfrac{3}{2}x^{\frac{1}{2}}+5x^{-2}$	✓ $x^{\frac{3}{2}}-5x^{-1}$ ✓ $\dfrac{3}{2}x^{\frac{1}{2}}$ ✓ $+5x^{-2}$ ✓ derivative of $\dfrac{1}{2}\pi$ is 0 (4) **[12]**

QUESTION/*VRAAG* 8

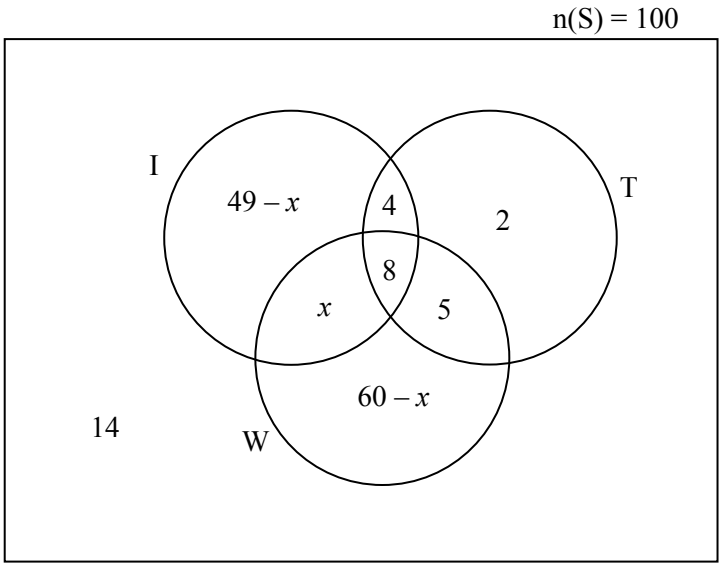
8.1	$f(x) = x^3 - 6x^2 + 9x$ $f'(x) = 3x^2 - 12x + 9$ $f''(x) = 6x - 12 = 0$ $x = 2$ $f''(0) = 6(0) - 12$ $= -12$ $f''(3) = 6(3) - 12$ $= 6$ Point of inflection at $x = 2$ 	✓✓ showing that $f''(x) = 0$ when $x = 2$ ✓✓ ✓ diagram (5)
8.2		✓shape ✓ (0 ; 0) ✓ (3 ; 0) ✓(1 ; 4) (4)
8.3	f concave up for $x > 2$ $y = -f(x)$ will be concave down for $x > 2$	✓✓ $x > 2$ (2)
8.4.1	$(3;7)$	✓ 3 ✓7 (2)
8.4.2	Do not agree with Claire as her statement is incorrect. Between $x = 1$ and $x = 3$ the graph of f is decreasing. Therefore at $x = 2$ the gradient will have a negative value. / *Stem nie saam met Claire nie, want haar stelling in verkeerd.* *Die grafiek van f is dalend/afnemend tussen $x = 1$ en $x = 3$.* *By $x = 2$ moet die gradiënt dus 'n negatiewe waarde hê.* **OR/*OF*** $f'(2) = 3(2)^2 - 12(2) + 9$ $= -3$ $\neq 1$	✓no ✓justification (2) **[15]**

QUESTION/*VRAAG* 9

	$y = x^2 + 2$ $\text{P}\left(x\,;x^2+2\right)$ $\text{B}(0\,;3)$	
	$\text{PB}^2 = (x-0)^2 + \left(x^2+2-3\right)^2$	✓ $(x-0)^2 + \left(x^2+2-3\right)^2$
	$= x^2 + x^4 - 2x^2 + 1$	
	$= x^4 - x^2 + 1$	✓ $x^4 - x^2 + 1$
	PB will be a minimum if PB^2 is a minimum	
	$\frac{d\left(\text{PB}^2\right)}{dx} = 0$	✓ $\frac{d\left(\text{PB}^2\right)}{dx} = 0$
	$4x^3 - 2x = 0$	✓ $4x^3 - 2x$
	$x\left(2x^2-1\right) = 0$	
	$x = 0 \quad \text{or} \quad x^2 = \frac{1}{2}$	
	$x = \frac{1}{\sqrt{2}}$	✓ $x = \frac{1}{\sqrt{2}}$
	$\text{PB}^2 = \left(\frac{1}{\sqrt{2}}\right)^4 - \left(\frac{1}{\sqrt{2}}\right)^2 + 1$	✓ $\text{PB}^2 = \left(\frac{1}{\sqrt{2}}\right)^4 - \left(\frac{1}{\sqrt{2}}\right)^2 + 1$
	$= \frac{1}{4} - \frac{1}{2} + 1$	
	$= \frac{3}{4}$	
	$\text{PB} = \frac{\sqrt{3}}{2} = 0{,}87$	✓ answer
	OR/*OF*	**OR/*OF***

	Gradient of tangent to curve $= 2x$	✓ $= 2x$
	Gradient of line joining B and the curve $= \dfrac{x^2+2-3}{x-0}$	
	$= \dfrac{x^2-1}{x}$	✓ $= \dfrac{x^2-1}{x}$
	Shortest distance will be where tangent to curve is perpendicular to the line joining P and the curve.	
	$\dfrac{x^2-1}{x} = -\dfrac{1}{2x}$	✓ $\dfrac{x^2-1}{x} = -\dfrac{1}{2x}$
	$2x(x^2-1) = -x$	
	$2x^3 - 2x = 0$	✓ $2x^3 - 2x = 0$
	$x(2x^2-1) = 0$	
	$x = 0 \quad \text{or} \quad x^2 = \dfrac{1}{2}$	
	$x = \dfrac{1}{\sqrt{2}}$	✓ $x = \dfrac{1}{\sqrt{2}}$
	$\text{PB}^2 = \left(\dfrac{1}{\sqrt{2}}\right)^4 - \left(\dfrac{1}{\sqrt{2}}\right)^2 + 1$	✓ $\text{PB}^2 = \left(\dfrac{1}{\sqrt{2}}\right)^4 - \left(\dfrac{1}{\sqrt{2}}\right)^2 + 1$
	$= \dfrac{1}{4} - \dfrac{1}{2} + 1$	
	$= \dfrac{3}{4}$	
	$\text{PB} = \dfrac{\sqrt{3}}{2} = 0{,}87$	✓ answer
	OR/*OF*	**OR/*OF***
	If the shortest distance is k, we want the circle $x^2 + (y-3)^2 = k^2$ to cut the parabola in 1 point	✓ $x^2 + (y-3)^2 = k^2$
	$x^2 = y - 2$	✓ $x^2 = y - 2$
	$x^2 = k^2 - (y-3)^2$	✓ $x^2 = k^2 - (y-3)^2$
	$= k^2 - y^2 + 6y - 9$	
	$y - 2 = k^2 - y^2 + 6y - 9$	✓ $y - 2 = k^2 - y^2 + 6y - 9$
	$y^2 - 5y - k^2 + 7 = 0$	
	$\Delta = 0$	✓ $\Delta = 0$
	$25 - 4(7 - k^2) = 0$	
	$4k^2 = 3$	✓ $25 - 4(7 - k^2) = 0$
	$k^2 = \dfrac{3}{4}$	
	$k = \dfrac{\sqrt{3}}{2}$	✓ answer
	So $k = \text{PB} = \dfrac{\sqrt{3}}{2} = 0{,}87$	**[7]**

QUESTION/*VRAAG* 10

10.1		8 values need to be placed in correct position: 2 or 3 correct: 1 mark 4 or 5 correct: 2 marks 6 or 7 correct: 3 marks 8 correct: 4 marks (4)
10.2	$(49-x)+x+8+4+5+2+(60-x)+14=100$ $-x+142=100$ $x=42$	✓ setting up equation ✓ answer (2)
10.3	P (use only one application) $=\frac{7+2+18}{100}$ $=\frac{27}{100}$ or 27%	✓ $\frac{7+2+18}{100}$ ✓answer (2) **[8]**

QUESTION/*VRAAG* 11

11.1	5 x 5 x 10 x 9 = 2250	✓ 5 x 5 ✓ 10 x 9 ✓ 2250 (3)
11.2	<table><tr><th>No of digits used</th><th>Letters</th><th>Digits</th><th>Total</th></tr><tr><td>1</td><td>5 x 5</td><td>10</td><td>250</td></tr><tr><td>2</td><td>5 x 5</td><td>10 x 9</td><td>2 250</td></tr><tr><td>3</td><td>5 x 5</td><td>10 x 9 x 8</td><td>18 000</td></tr><tr><td>4</td><td>5 x 5</td><td>10 x 9 x 8 x7</td><td>126 000</td></tr><tr><td>5</td><td>5 x 5</td><td>10 x 9 x 8 x7 x 6</td><td>756 000</td></tr></table> Codes of two letters and five digits will ensure unique numbers for 700 000 clients.	✓ 5 x 5 x 10 x 9 x 8 x 7 x 6 ✓✓ five digits (3) **[6]**

TOTAL/*TOTAAL*: 150