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Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 11

NOVEMBER 2022

MATHEMATICS P1/ *WISKUNDE V1* MARKING GUIDELINE/*NASIENRIGLYN*

MARKS/*PUNTE*: **150**

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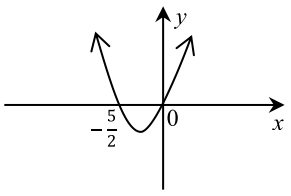
This marking guideline consists of 18 pages./
Hierdie nasienriglyn bestaan uit 18 bladsye.

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NOTE/*LET WEL*:

- If a candidate answers a question TWICE, mark the FIRST attempt ONLY.
  Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk SLEGS die EERSTE poging.
- Consistent accuracy applies in ALL aspects of the marking guideline.
  Volgehoue akkuraatheid geld deurgaans in ALLE aspekte van die nasienriglyn.
- If a candidate crossed out an attempt of a question and did not redo the question, mark the crossed-out attempt.
  Indien 'n kandidaat 'n poging vir 'n vraag deurgetrek het en nie die vraag weer beantwoord het nie, merk die poging wat deurgetrek is.
- The mark for substitution is awarded for substitution into the correct formula.
  Die punt vir substitusie word toegeken vir substitusie in die korrekte formule.

QUESTION 1/*VRAAG 1*

1.1.1	$x^2+5x-6=0$ $(x+6)(x-1)=0$ $\therefore x=-6$ or / *of* $x=1$	✓ factors / *faktore* ✓ ✓ answers / *antwoorde* (3)
1.1.2	$5x^2+x-3=0$ $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\dfrac{-1\pm\sqrt{1^2-4(5)(-3)}}{2(5)}$ $=\dfrac{-1\pm\sqrt{61}}{10}$ $=0,68$ or / *of* $-0,88$	✓ substitution / *vervanging* ✓ ✓ answers / *antwoorde* (3)
1.1.3	$(2x-1)(x+3)\geq -3$ $2x^2+5x-3\geq -3$ $2x^2+5x\geq 0$ $x(2x+5)\geq 0$ $\therefore x\leq -\frac{5}{2}$ or / *of* $x\geq 0$ 	✓ $2x^2+5x-3$ ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ ✓ answers / *antwoorde* (5)

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1.1.4	$\sqrt{x}-\sqrt{x-5}=1$ $\sqrt{x}-1=\sqrt{x-5}$ $(\sqrt{x}-1)^2=(\sqrt{x-5})^2$ $x-2\sqrt{x}+1=x-5$ $6=2\sqrt{x}$ $(6)^2=(2\sqrt{x})^2$ $\therefore 4x=36$ $x=9$	✓ $\sqrt{x}-1=\sqrt{x-5}$ ✓ squaring both sides *kwadreer beide kante* ✓ $x-5=x-2\sqrt{x}+1$ ✓ answer / *antwoord* (4)
1.2	$2x-y=1 \quad (1)$ $y^2-xy=x+7 \quad (2)$ $y=2x-1 \quad (3)$ Subst.(3) into 2 / *Verv.*(3)*in* (2) $(2x-1)^2-x(2x-1)=x+7$ $4x^2-4x+1-2x^2+x-x-7=0$ $2x^2-4x-6=0$ $x^2-2x-3=0$ $(x-3)(x+1)=0$ $\therefore x=3$ or / *of* $x=-1$ $y=2(3)-1$ or / *of* $y=2(-1)-1$ $\therefore y=5$ or / *of* $y=-3$ **OR/*OF*** $2x-y=1 \quad (1)$ $y^2-xy=x+7 \quad (2)$ $x=\frac{1+y}{2} \quad (3)$ Subst.(3) into 2 / *Verv.*(3)*in* (2) $y^2-y\left(\frac{1+y}{2}\right)=\left(\frac{1+y}{2}\right)+7$ $2y^2-y(1+y)=(1+y)+14$ $2y^2-y-y^2=1+y+14$ $y^2-2y-15=0$ $(y-5)(y+3)=0$ $\therefore y=5$ or / *of* $y=-3$ $x=\frac{1+5}{2}$ or / *of* $x=\frac{1-3}{2}$ $\therefore x=3$ or / *of* $x=-1$	✓ $y=2x-1$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ both *x*-values / *beide x-waardes* ✓ both *y*-values / *beide y-waardes* ✓ $x=\frac{1+y}{2}$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ both *y*-values / *beide y-waardes* ✓ both *x*-values / *beide x-waardes* (6)

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1.3	$\hat{C} = 90$ (angle in a semi-circle) / (*hoek in halwe sirkel*) $\therefore$ By Pythagoras's Theorem / *Stelling van Pythagoras*: $AB^2 = AC^2 + BC^2$ $= (x+3)^2 + (5-x)^2$ $= x^2 + 6x + 9 + 25 - 10x + x^2$ $= 2x^2 - 4x + 34$ $= 2(x^2 - 2x + 17)$ $= 2(x^2 - 2x + 1 - 1 + 17)$ $= 2(x-1)^2 + 32$ $\therefore x = 1$ **OR/*OF*** AB is minimum when AB^2 is minimum $AB^2 = (x+3)^2 + (5-x)^2$ $= x^2 + 6x + 9 + 25 - 10x + x^2$ $= 2x^2 - 4x + 34$ AB^2 is minimum at / AB^2 is 'n minimum by: $x = -\frac{b}{2a}$ $= \frac{-(-4)}{2(2)}$ $= 1$	✓ $\hat{C} = 90$ ✓ substitution / *vervanging* ✓ $2x^2 - 4x + 34$ ✓ completing the square / *vierkantsvoltooiing* ✓ answer / *antwoord* ✓ statement / stelling ✓ substitution / vervanging ✓ $2x^2 - 4x + 34$ ✓ $x = -\frac{b}{2a}$ ✓ answer / antwoord (5)
		[26]

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QUESTION 2/*VRAAG 2*

2.1	$\frac{2^{2x}-4^{x+1}}{4^x+2^{2x-1}}$ $=\frac{2^{2x}-2^{2x+2}}{2^{2x}+2^{2x-1}}$ $=\frac{2^{2x}-2^{2x}.2^2}{2^{2x}+2^{2x}.2^{-1}}$ $=\frac{2^{2x}\left(1-2^2\right)}{2^{2x}\left(1+2^{-1}\right)}$ or / *of* $\frac{2^{2x}(1-4)}{2^{2x}(1+\frac{1}{2})}$ $=\frac{-3}{\frac{3}{2}}$ $=-2$	✓ 2^{2x+2} and/*en* 2^{2x} ✓ inverse of exp. law *omgekeerde van eksp. wet* ✓ factorisation of numerator *faktorisering van teller* ✓ answer / *antwoord* (4)
2.2.1	$3x^{\frac{3}{2}}=81$ $x^{\frac{3}{2}}=27$ $\left(x^{\frac{3}{2}}\right)^{\frac{2}{3}}=(27)^{\frac{2}{3}}$ $\therefore x=9$	✓ $x^{\frac{3}{2}}=27$ ✓ $\left(x^{\frac{3}{2}}\right)^{\frac{2}{3}}=(27)^{\frac{2}{3}}$ ✓ answer / *antwoord* (3)
2.2.2	$2^x+5=3.2^{1-x}$ $2^x+5=3.2.2^{-x}$ $2^x+5=\frac{3.2}{2^x}$ $\left(2^x\right)^2+5.2^x-6=0$ $\left(2^x+6\right)\left(2^x-1\right)=0$ $\therefore 2^x\neq -6$ or / *of* $2^x=1$ $2^x=2^0$ $\therefore x=0$	✓ inverse of exp. law *omgekeerde van eksp. wet* ✓ multiplying by 2^x *maal met* 2^x ✓ factors / *faktore* ✓ both answers/*beide antwoorde* ✓ selection / *keuse* (5)

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2.3	$\frac{1+\sqrt{2}}{3+2\sqrt{2}}$ $=\frac{\left(1+\sqrt{2}\right)\left(3-2\sqrt{2}\right)}{\left(3+2\sqrt{2}\right)\left(3-2\sqrt{2}\right)}$ $=\frac{3-2\sqrt{2}+3\sqrt{2}-2.2}{3^2-\left(2\sqrt{2}\right)^2}$ $=\frac{\sqrt{2}-1}{9-8}$ $=\sqrt{2}-1$ $\therefore a=2, \quad b=-1$	✓ rationalising the denominator *rasionalisering van die noemer* ✓ simplification / *vereenvoudiging* ✓ $\sqrt{2}-1$ ✓ $a=2$ ✓ $b=-1$ (5)
		[17]

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QUESTION 3/*VRAAG 3*

3.1.1	$-2\ ;\ 3\ ;\ 8;\ \ldots$ $T_n = 5n - 7$	✓ $5n$ ✓ -7 (2)
3.1.2	$T_n = 5n - 7$ $T_{18} = 5(18) - 7$ $= 83$	✓ substitution / *vervanging* ✓ 83 (2)
3.1.3	$T_n = 5n - 7$ $473 = 5n - 7$ $480 = 5n$ $\therefore n = 96$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)

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3.2	$T_{11} = -19 \qquad T_{23} = 65$ $-19 \;;\; a \;;\; b \;;\; c \;;\; e \;;\ldots;\; 65$ $a-(-19) = b-a = c-b = \ldots. = d$ $\therefore$ There are 12 common differences / *Daar is 12 gemeenskalike verskille* $\therefore 12d = 65-(-19)$ $12d = 84$ $\therefore d = 7$ $\therefore T_n = 7n+b$ $-19 = 7(11)+b$ or / *of* $65 = 7(23)+b$ $\therefore b = -96$ $\therefore T_n = 7n-96$ For negative terms : $T_n < 0$ *Vir negatiewe terme* : $\therefore 7n-96 < 0$ $7n < 96$ $\therefore n < 13,71$ $\therefore$ Number of negative terms = 13 *Aantal negatiewe terme* **OR/*OF*** $12d = 65-(-19)$ $d = \frac{84}{12}$ $= 7$ But / *Maar* : T_1 to T_{11} are all negative / *almal negatief* $T_{12} = -19+7 = -12$ $T_{13} = -12+7 = -5$ $T_{14} = -5+12 = 2$ $\therefore$ There are 13 negative terms *Daar is 13 negatiewe terme*	✓ $12d = 65-(-19)$ ✓ $d = 7$ ✓ $T_n = 7n-96$ ✓ $7n-96 < 0$ ✓ $n = 13$ **OR/*OF*** ✓ $12d = 65-(-19)$ ✓ $d = 7$ ✓ T_1 to T_{11} are all negative / *is almal negatief* ✓ $T_{12} = -12$ & $T_{13} = -5$ ✓ answer / *antwoord* (5)
		[11]

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QUESTION 4/*VRAAG 4*

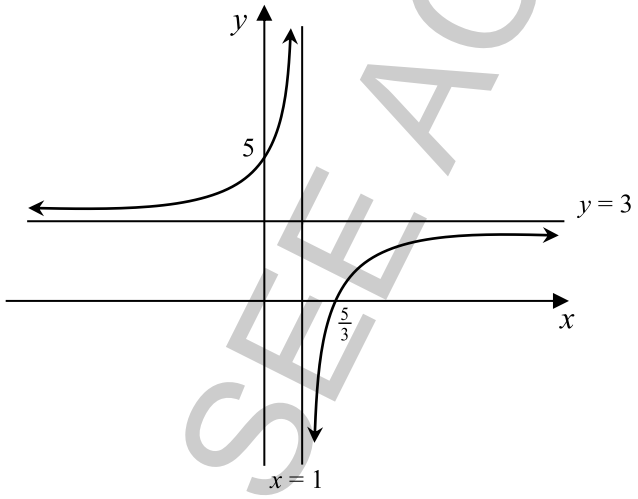
4.1	204 ; 176 ; 150 ; 126 -28 -26 -24 2 2 104 ; 84	✓ 104 ✓ 84 (2)
4.2	$2a=2$ $3a+b=-28$ $a+b+c=-12$ $\therefore a=1$ $3(1)+b=-28$ $1-31+c=204$ $b=-31$ $c=234$ $\therefore T_n=n^2-31n+234$	✓ $a=1$ ✓ $b=-31$ ✓ $c=234$ ✓ $T_n=n^2-31n+234$ (4)
4.3	$n^2-31n+234=36$ $n^2-31n+198=0$ $n=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ or / *of* $(n-9)(n-22)=0$ $=\frac{-(-31)\pm\sqrt{(-31)^2-4(1)(198)}}{2(1)}$ $=\frac{31\pm\sqrt{169}}{2}$ $\therefore n=9$ or / *of* $n=22$	✓ $n^2-31n+234=36$ ✓ subst. into formule / factors *verv. in formule / faktore* ✓ $n=9$ ✓ $n=22$ (4)
4.4	$n^2-31n+234=0$ or / *of* $(n-13)(n-18)=0$ $n=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-(-31)\pm\sqrt{(-31)^2-4(1)(234)}}{2(1)}$ $=\frac{31\pm\sqrt{25}}{2}$ $\therefore n=13$ or / *of* $n=18$ $\therefore T_{14}$ & $T_{17}=-4$ T_{15} & $T_{16}=-6$	✓ $T_n=0$ ✓ method / *metode* subst. into formule / factors *verv. in formule / faktore* ✓ $n=13$ and / *en* $n=18$ ✓ -4 ✓ -6 (5)
		[15]

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QUESTION 5/*VRAAG 5*

5.1	$x=1$ $y=3$	✓ $x=1$ ✓ $y=3$ (2)
5.2	$0=\frac{-2}{x-1}+3$ $\frac{2}{x-1}=3$ $3(x-1)=2$ $x=\frac{5}{3}$ $y=\frac{-2}{x-1}+3$ $=\frac{-2}{0-1}+3$ $=5$ ∴ Intercepts are at / *Afsnitte is by*: $\left(\frac{5}{3};0\right)$ and / *en* $(0;5)$	✓ $y=0$ ✓ $x=\frac{5}{3}$ ✓ $y=5$ (3)
5.3		✓ *x*-intercept / *x-afsnit* ✓ *y*-intercept / *y-afsnit* ✓ asymptotes / *asimptote* ✓ shape & quadrants *vorm & kwadrante* (4)
5.4	$y=-(x-1)+3$ $=-x+4$	✓✓ $y=-x+4$ (2)

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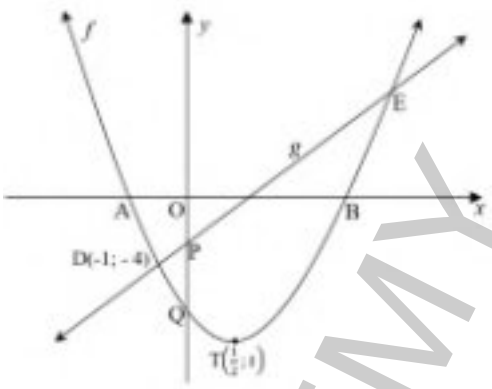
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5.5	$g(x) = -x + b$ $-2 = -(5) + b$ $\therefore b = 3$ $g(x) = -x + 3$ OR/*OF* $y - y_1 = m(x - x_1)$ $y + 2 = -1(x - 5)$ $\therefore y = g(x) = -x + 3$	✓ $a = -1$ ✓ substitution / *vervanging* ✓ $b = 3$ (3)
5.6	$f(x) = g(x)$ $\frac{-2}{x-1} + 3 = -x + 3$ $\frac{-2}{x-1} = -x$ $-x(x-1) = -2$ $-x^2 + x + 2 = 0$ $x^2 - x - 2 = 0$ $(x+1)(x-2) = 0$ $\therefore x = -1$ or / *of* $x = 2$ $\therefore y = -(-1) + 3$ or / *of* $y = -(2) + 3$ $= 4$ $= 1$ Points of intersection / *Snypunte by* : $(-1;4)$ and / *en* $(2;1)$ $\therefore d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(2-(-1))^2 + (1-4)^2}$ $= \sqrt{18} = 3\sqrt{2}$	✓ equating/*gelykstel*: $f(x) = g(x)$ ✓ standard form / *standaardvorm* ✓ both sets of coordinates *beide pare van koördinate* ✓ substitution into correct formula / *vervanging in die korrekte formule* ✓ answer / *antwoord* (5)
5.7	$h(x) = -f(x+3)$ $= \frac{2}{(x+3)-1} - 3$ $= \frac{2}{x+2} - 3$	✓ $a = +2$ & $q = -3$ (reflection/*refleksie*) ✓ $x + 2$ (2)
		[21]

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QUESTION 6/*VRAAG 6*



6.1

$f(x) = ax^2 + bx + c$

P is at/*by*: $(0;-2)$

Q is at/*by*: $(0;-6)$

$\therefore f(x) = ax^2 + bx - 6$

$-4 = (-1)^2 a + (-1)b - 6$

$2 = a - b \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$

At TP/*By DP*: $x = \dfrac{-b}{2a}$

$\dfrac{1}{2} = \dfrac{-b}{2a}$

$\therefore 2a = -2b$

$a = -b \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$

$\therefore 2 = -b - b$

$2 = -2b$

$b = -1$

$\therefore a = -(-1)$

$= 1$

✓ $c = -6$

✓ $a - b = 2$

✓ substitute for x / *vervang vir x*

✓ $a = -b$

✓ values of a and b.
waardes van a en b

(5)

6.2

$f(x) = x^2 - x - 6$

$= x^2 - x + \frac{1}{4} - \frac{1}{4} - 6$

$= \left(x - \frac{1}{2}\right)^2 - 6\frac{1}{4}$

$t = -6\frac{1}{4}$

OR/*OF*

$f(x) = x^2 - x - 6$

$\therefore y = \left(\frac{1}{2}\right)^2 - \left(\frac{1}{2}\right) - 6$

$= -6\frac{1}{4}$

$\therefore t = -6\frac{1}{4}$

✓ completing the square
vierkantsvoltooiing

✓ factorisation / *faktorisering*

✓ $t = -6\frac{1}{4}$

OR/*OF*

✓ $f\left(\frac{1}{2}\right)$

✓ $y = -6\frac{1}{4}$

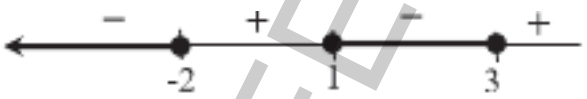
✓ $t = -6\frac{1}{4}$

(3)

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6.3	$f(x)=x^2-x-6$ $0=(x-3)(x+2)$ $\therefore x=3$ or / *of* $x=-2$ $\therefore$ A$(-2;0)$ and/*en* B$(3;0)$	✓ factors / *faktore* ✓ A$(-2;0)$ ✓ B$(3;0)$ (3)
6.4	$f(x)=g(x)$ $x^2-x-6=2x-2$ $x^2-3x-4=0$ $(x-4)(x+1)=0$ $\therefore x=4$ or / *of* $x=-1$ $y=2(4)-2$ $=6$ $\therefore E(4;6)$	✓ equating *f(x)* and *g(x)* *gelykstel van f(x) en g(x)* ✓ standard form / *standaardvorm* ✓ *x* –values / *x* –*waardes* ✓ coordinates of E *koördinate van* E (4)
6.5	$y\geq -6\frac{1}{4}$ or / *of* $y\geq t$ $y\in[-6\frac{1}{4};\infty)$ or / *of* $y\in[t;\infty)$	✓ ✓ answer / *antwoord* (2)
6.6	$g(x)=2x-2$ $\therefore 0=2x-2$ $\therefore x=1$ $x\leq -2$ or / *of* $1\leq x\leq 3$ **OR/*OF***  $\therefore x\leq -2$ *or* / *of* $1\leq x\leq 3$	✓ $x\leq -2$ ✓ $1\leq x\leq 3$ ✓ $x\leq -2$ ✓ $1\leq x\leq 3$ (2)
		[19]

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QUESTION 7/*VRAAG 7*

7.1	$f(x) = a^x + 1$ $9 = a^{-3} + 1$ $8 = a^{-3}$ $\therefore a^3 = \frac{1}{8}$ $\sqrt[3]{a^3} = \sqrt[3]{\frac{1}{8}}$ $\therefore a = \frac{1}{2}$	✓ substitution / *vervanging* ✓ $a^3 = \frac{1}{8}$ ✓ answer / *antwoord* (3)
7.2	$g(x) = -\left(\frac{1}{2}\right)^x + 1$	✓ $-\left(\frac{1}{2}\right)^x$ ✓ $+1$ (2)
		[5]

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QUESTION 8/*VRAAG 8*

8.1	$1+i_{eff}=\left(1+\frac{i_{nom}}{12}\right)^{12}$ $1+0,0992=\left(1+\frac{x}{12}\right)^{12}$ $\therefore \sqrt[12]{1,0992}=\sqrt[12]{\left(1+\frac{x}{12}\right)^{12}}$ $\therefore x=\left(\sqrt[12]{1,09992}-1\right)\times 12$ $=0,0950$ $\therefore$ The rate is 9,5% p.a. compounded monthly. *Die koers is 9,5% p.j. maandeliks saamgestel.*	✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (3)
8.2	$A=P(1-i)^n$ $28\,607,30=P(1-12\%)^7$ $P=\frac{A}{(1-i)^n}$ $=\frac{28\,607,30}{(1-12\%)}$ $=R70\,000,00$	✓ correct formula *korrekte formule* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)

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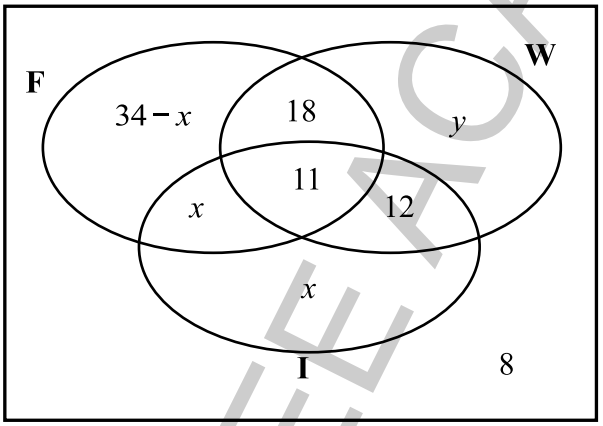
8.3.1	$A = P(1+i)^n$ $A = \left(\left(32\,000\left(1+\frac{0,086}{12}\right)^{36}\right)+23\,000\right)\left(1+\frac{0,086}{12}\right)^{12}$ $= R70\,141,04$ **OR/*OF*** $A = P(1+i)^n$ $= 32\,000\left(1+\frac{0,086}{12}\right)^{48}+23\,000\left(1+\frac{0,086}{12}\right)^{12}$ $= R70\,141,04$	✓ $i = \frac{0,082}{12}$ ✓ $\left(32\,000\left(1+\frac{0,086}{12}\right)^{36}\right)$ ✓ $+23\,000$ ✓ $\times\left(1+\frac{0,086}{12}\right)^{12}$ ✓ answer / *antwoord* ✓ $i = \frac{0,082}{12}$ ✓ $\left(32\,000\left(1+\frac{0,086}{12}\right)^{48}\right)$ ✓ $23\,000\left(1+\frac{0,086}{12}\right)^{12}$ ✓ adding / *optelling* ✓ answer / *antwoord* (5)
8.3.2	$A = P(1+i)^n$ $= 70141,04\left(1+\frac{0,105}{4}\right)^{8}$ $= R86\,297,36$ $\therefore$ Loan / *Lening* : $R220\,000 - R86\,297,36$ $= R133\,702,64$	✓ P = R70 141,04 ✓ substitution / *vervanging* ✓ $R86\,297,36$ ✓ answer / *antwoord* (4)
		[15]

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QUESTION 9/*VRAAG 9*

9.1.1	$P(\text{A and/}en\text{ B}) = 0$ $\therefore P(\text{A or / }of\text{ B}) = P(A) + P(B)$ $0,75 = 0,35 + P(B)$ $\therefore P(B) = 0,75 - 0,35$ $= 0,4$ or / *of* $\frac{2}{5}$	✓ correct formula / *korrekte formule* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
9.1.2	$P(\text{A and / }en\text{ B}) = P(A) \times P(B)$ $\therefore P(\text{A or/}of\text{ B}) = P(A) + P(B) - P(A).P(B)$ $0,75 = 0,35 + P(B) - 0,35P(B)$ $0,4 = 0,65P(B)$ $\therefore P(B) = \frac{0,4}{0,65}$ $= \frac{8}{13}$	✓ correct formula / *korrekte formule* ✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (4)
9.2.1		✓ 18, 12 and/*en x* (intersections) ✓ $34 - x$ ✓ x and/*en* y ✓ 8 and/*en* 11 (4)
9.2.2	$y + 12 + 11 + 18 = 81$ $y = 40$ $x + x + 11 + 12 + y + 18 + 34 - x + 8 = 130$ $x + 83 + 40 = 130$ $\therefore x = 7$	✓ y –value / y –*waarde* ✓ equation / *vergelyking* ✓ x –value / x –*waarde* (3)
9.2.3	$P(\text{only one/}slegs\ een) = \frac{34 - x}{130} + \frac{x}{130} + \frac{y}{130}$ $= \frac{27}{130} + \frac{7}{130} + \frac{40}{130}$ $= \frac{74}{130} = \frac{37}{65}$ 0,57	✓ method / *metode* ✓ answer / *antwoord* (2)
		[16]

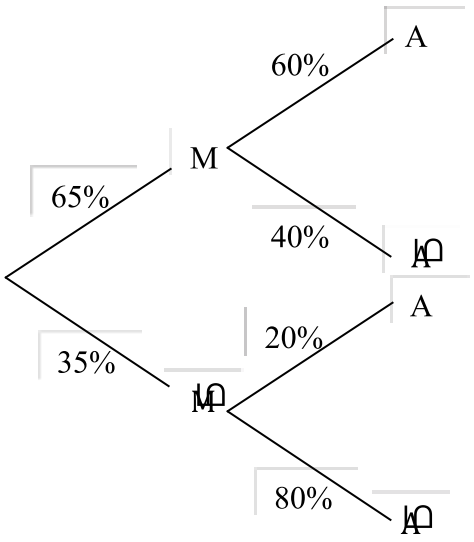
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QUESTION 10/*VRAAG 10*

10.



$$P(A) = P(MA) + P(\overline{M}A)$$
$$= (65\% \times 60\%) + (35\% \times 20\%)$$
$$= 46\%$$
$$= \frac{23}{50}$$

✓ $P(A) = P(MA) + P(\overline{M}A)$
✓ substitution / *vervanging*
✓ answer / *antwoord*

(5)

[5]

TOTAL / *TOTAAL*: 150

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