NATIONAL
SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2020

MATHEMATICS P1
EXEMPLAR

MARKS: 150

TIME: 3 hours

IMAT1

This question paper consists of 8 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1.   This question paper consists of TEN questions. Answer ALL the questions.

2.   Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answer.

3.   You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.

4.   Answers only will not necessarily be awarded full marks.

5.   If necessary, round off answers to TWO decimal places, unless stated otherwise.

6.   Diagrams are NOT necessarily drawn to scale.

7.   Number the answers correctly according to the numbering system used in this question paper.

8.   Write neatly and legibly.

QUESTION 1

1.1   Solve for x:

    1.1.1 $(3x+2)(x-5)=0$ (2)

    1.1.2 $3x^2-5x-1=0$ (correct to 2 decimal places) (3)

    1.1.3 $x=4-\sqrt{x-2}$ (5)

    1.1.4 $2x^2+5x\leq3$ (4)

1.2   Simplify the following, **without using a calculator**:
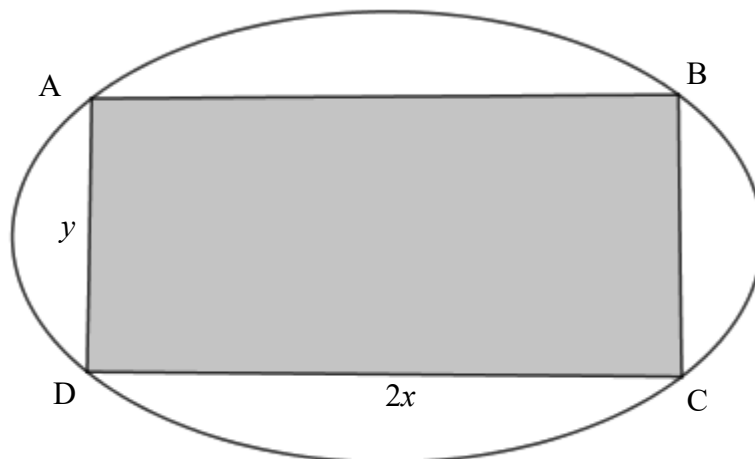
    1.2.1 $\left(\dfrac{8}{27}\right)^{\frac{2}{3}}$ (2)

    1.2.2 $\left(\sqrt{12}+2\right)\left(\sqrt{3}-1\right)$ (3)

1.3   Solve for x and y simultaneously:

    $5y-x=2$ and $x^2-3xy+4y=4$ (6)

1.4   The diagram below shows an oval piece of land that Eli acquired for his poultry project. He decides to use the biggest possible rectangular piece of land out of the entire piece. The rectangular piece will have a length of $2x$ metres and a breadth of y metres, as shown:

    1.4.1   Show that the area A, of the rectangle can be written as: $A=280x-4x^2$, given that the perimeter of the rectangle is 280 m. (3)

    1.4.2   Determine the maximum possible area that the rectangle can occupy. (3)

    [31]

QUESTION 2

2.1 Simplify:

$$\frac{3.2^{x+1} - 2.4^x}{3.2^x - 2^{2x}}$$ (4)

2.2 Solve for x:

2.2.1 $5x^{\frac{2}{5}} = 20$ (3)

2.2.2 $12^x.3^{x+1} = 648$ (4)

2.3 Given: $f(x) = \dfrac{3x - 2}{x^2 + 10x + 25}$,

Determine the values of x for which $f(x)$ is defined. (4)

[15]

QUESTION 3

3.1 Given the linear pattern: $9 ; 5 ; 1; \ldots ; -143$.

3.1.1 Determine the formula for the nth term of the pattern. (2)

3.1.2 Calculate the value of T_7. (2)

3.1.3 Determine the number of terms in the pattern. (2)

3.2 Given that, in a linear number pattern, the 16th term is 38 and the 41st term is 113. Which term is -1? (4)

[10]

QUESTION 4

Given the quadratic pattern: $-12; -8; 0; 12; \ldots$

4.1 Determine the next two terms of the pattern. (2)

4.2 Determine T_n, the general term of the pattern, in the form $T_n = an^2 + bn + c$. (4)

4.3 Between which **two** consecutive terms does the **first** difference of 192 lie? (3)

4.4 A new pattern, P_n, is formed. It is given that $P_n = T_n - 168$, determine the number of negative terms in the new pattern. (5)

4.5 Show that T_n is always an even number. (2)

[16]

QUESTION 5

Given: $f(x) = -x^2 + 6x + 7$

5.1   Determine the coordinates of the turning point of f.   (3)

5.2   Determine the x-intercepts of f.   (2)

5.3   Draw a neat sketch of f, clearly indicating all intercepts with the axes and the turning point.   (4)

5.4   Write down the equation of the axis of symmetry of f.   (1)

5.5   Determine the average gradient of f between $x = -3$ and $x = 1$.   (4)

5.6   The graph of f is shifted 4 units to the left and reflected in the x-axis to form h.
      Write down the equation of h in the form $h(x) = a(x + p)^2 + q$.   (2)

          [16]

QUESTION 6

The diagram below shows the graphs of $f(x) = \dfrac{a}{x + p} + q$ and $g(x) = bx + c$. The asymptotes of f are at $x = -3$ and at $y = 1$. f and g intersect at A, the x-intercept of f, and B, while C$(-2;6)$ is a point that lies on f. g passes through the point D$(-3;1)$, the point of intersection of the asymptotes of f.
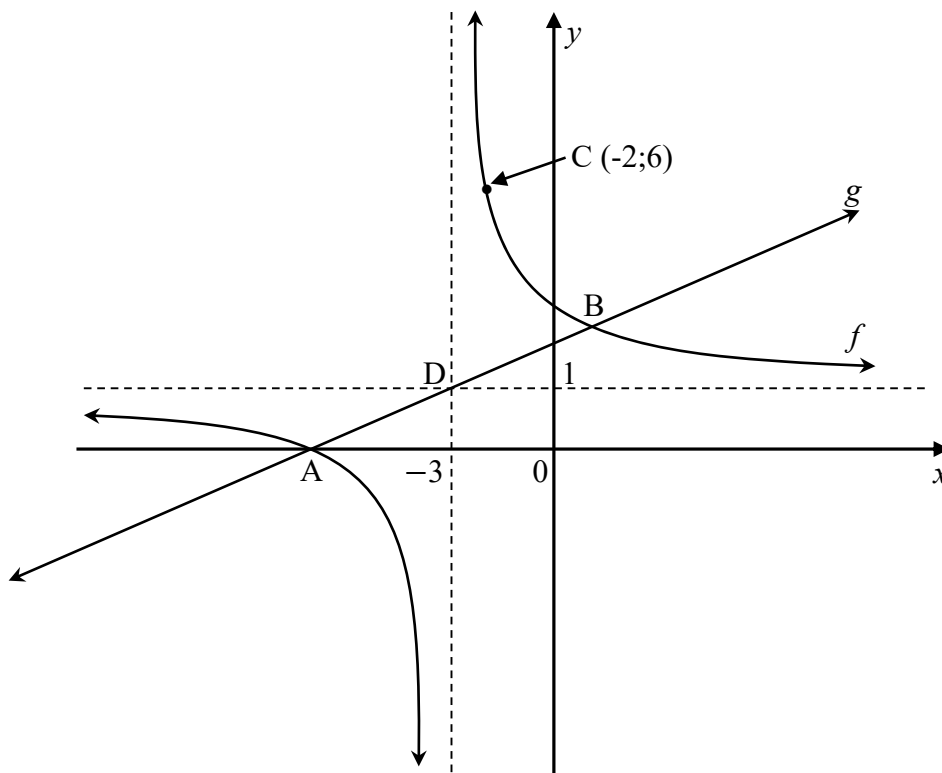
6.1 Write down the equation of f in terms of a. (2)

6.2 Determine the value of a. (2)

6.3 Determine the coordinates of the x-intercept of f. (2)

6.4 Determine the values of b and c and write down the equation of g. (4)

6.5 Write down the domain of f. (2)

6.6 Determine the coordinates of B. (4)

6.7 Determine the values of x for which $x.f(x) \geq 0$. (3)

[19]

QUESTION 7

7.1 Given: $g(x) = \left(\dfrac{1}{2}\right)^x - 4$

    7.1.1 Write down the equation of asymptote of g. (1)

    7.1.2 Write down the range of g. (1)

    7.1.3 Determine the coordinates of the x and y-intercepts of g. (3)

    7.1.4 Hence, write down the values of x for which $g(x) < 0$. (1)

7.2 Draw a neat sketch of the graph of $h(x) = a.b^x + q$ where
- $a = -1$
- $0 < b < 1$
- $q > 1$ (3)

[9]

QUESTION 8

8.1 Calculate the effective interest rate per annum if an investment earns 9,5% interest per annum, compounded monthly. (3)

8.2 The value of a house increased to R764 050,60 over a period of 5 years due to inflation. The price of the house increased at a rate of 5% p.a. compounded annually. Calculate the original price of the house. (3)

8.3 Kamvelihle invested R28 000 into a savings account that pays interest at 7,5% p.a. compounded monthly for the first 4 years and 11% p.a. compounded quarterly thereafter. At the end of the 4th year, he withdrew R7 300.

    8.3.1 Calculate his balance at the end of the 7th year of his investment. (5)

    8.3.2 Assuming that at the end of 7 years, his balance is R42 181, 59, Kamvelihle wants his investment to grow to R80 000 in another 5 years' time. How much must he deposit into the account immediately to achieve this goal if the bank offers 8% p.a. interest compounded monthly? Write your answer correct to the nearest rand. (5)

[16]

QUESTION 9

9.1 Two events A and B are such that:
- P(not A) = 0,45
- P(B) = 0,3
- P(A or B) = 0,685

Are events A and B independent? Justify your answer. (5)

9.2 A survey was done among a group of 75 learners to determine which sports they watch on television. They chose from athletics (A), netball (N) and rugby (R). Some of the information that was collected is as follows:
- 12 learners watch netball, rugby and athletics
- 25 learners watch rugby and athletics
- 22 learners watch netball and athletics
- 38 learners watch rugby
- 5 learners watch only netball and rugby
- 9 learners watch netball only
- 4 learners watch athletics only

The Venn diagram below shows the information:
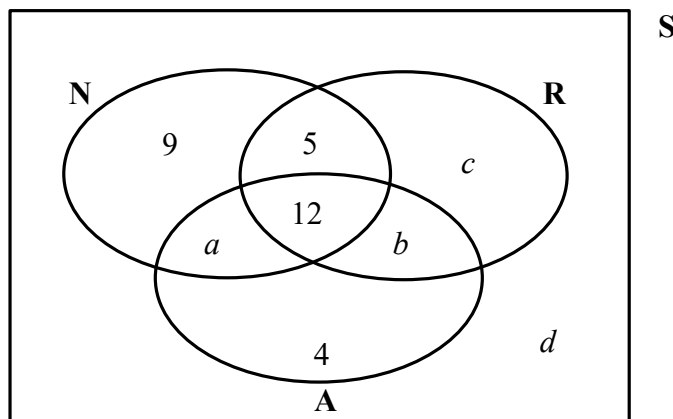
9.2.1 Determine the values of a, b, c and d. (4)

9.2.2 Calculate the probability that a learner selected at random watches athletics or both netball and rugby. (3)

[12]

QUESTION 10

A bag contains a certain number tennis balls that are the same in all respects except colour.
There are 5 green balls and the rest are blue.
Ncomi picks a ball, observes the colour and does **not** put it back in the bag.
He picks a second ball and observes the colour. The probability that both balls that Ncomi picks are green, is $\frac{5}{18}$. Determine the total number of balls in the bag.

[6]

TOTAL: 150

Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE/**
*NASIONALE
SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 11

NOVEMBER 2020

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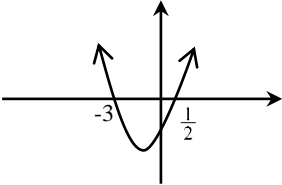MARKING GUIDELINE/*NASIENRIGLYN*
EXEMPLAR/*EKSEMPLAAR***

MARKS/*PUNTE*: 150

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	$(3x+2)(x-5)=0$ $\therefore x=-\dfrac{2}{3}$ or / *of* $x=5$	✓ ✓ answers / *antwoorde* (2)
1.1.2	$3x^2-5x-1=0$ $\therefore x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\dfrac{-(-5)\pm\sqrt{(-5)^2-4(3)(-1)}}{2(3)}$ $=\dfrac{5\pm\sqrt{37}}{6}$ $=-0,18$ or / *of* $1,85$	✓ substitution / *vervanging* ✓ ✓ answers / *antwoorde* (3)
1.1.3	$x=4-\sqrt{x-2}$ $\sqrt{x-2}=4-x$ $(x-2)=(4-x)^2$ $x-2=16-8x+x^2$ $x^2-9x+18=0$ $(x-6)(x-3)=0$ $\therefore x=3$ or / *of* $x\neq 6$	✓ squaring both sides/ *kwadreer beide kante* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ both x-values / *beide x-waardes* ✓ selection / *keuse* (5)
1.1.4	$2x^2+5x\leq 3$ $2x^2+5x-3\leq 0$ $(2x-1)(x+3)\leq 0$ $\therefore -3\leq x\leq \dfrac{1}{2}$	✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ ✓ $-3\leq x\leq \dfrac{1}{2}$ (4)

1.2.1	$\left(\dfrac{8}{27}\right)^{\frac{2}{3}} = \left(\sqrt[3]{\dfrac{8}{27}}\right)^2$	$\checkmark \left(\sqrt[3]{\dfrac{8}{27}}\right)^2$	
	$\qquad = \left(\dfrac{2}{3}\right)^2$		
	$\qquad = \dfrac{4}{9}$	$\checkmark$ answer / *antwoord*	(2)
		OR/*OF*	
	OR/*OF*		
	$\left[\left(\dfrac{2}{3}\right)^3\right]^{\frac{2}{3}}$	$\checkmark \left[\left(\dfrac{2}{3}\right)^3\right]^{\frac{2}{3}}$	
	$= \left(\dfrac{2}{3}\right)^2$		
	$= \dfrac{4}{9}$	$\checkmark$ answer / *antwoord*	(2)
1.2.2	$\left(\sqrt{12}+2\right)\left(\sqrt{3}-1\right) = \left(2\sqrt{3}+2\right)\left(\sqrt{3}-1\right)$	$\checkmark \ 2\sqrt{3}$ $\checkmark \ 4.3 - 2\sqrt{3} + 2\sqrt{3} - 2$	
	$\qquad\qquad = 2.3 - 2\sqrt{3} + 2\sqrt{3} - 2$	$\checkmark$ answer / *antwoord*	
	$\qquad\qquad = 6 - 2$		(3)
	$\qquad\qquad = 4$	**OR/*OF***	
	OR/*OF*	$\checkmark \ \sqrt{36}$	
	$\left(\sqrt{12}+2\right)\left(\sqrt{3}-1\right) = \sqrt{36} - \sqrt{12} + 2\sqrt{3} - 2$	$\checkmark \ 6 - 2\sqrt{3} + 2\sqrt{3} - 2$	
	$\qquad\qquad = 6 - 2\sqrt{3} + 2\sqrt{3} - 2$	$\checkmark$ answer / *antwoord*	
	$\qquad\qquad = 4$		(3)

1.3	$5y - x = 2$ ⟶ (1)	✓ $x = 5x - 2$
	$x^2 - 3xy + 4y = 4$ ⟶ (2)	
	$x = 5y - 2$ ⟶ (3)	✓ substitution / *vervanging*
	Subst./*Vervang* (3) into/*in* (2):	
	$\therefore (5y-2)^2 - 3y(5y-2) + 4y - 4 = 0$	✓ standard form / *standaardvorm*
	$25y^2 - 20y + 4 - 15y^2 + 6y + 4y - 4 = 0$	✓ method;factors / *metode;faktore*
	$10y^2 - 10y = 0$	✓ both x-values / *beide x-waardes*
	$10y(y-1) = 0$	
	$\therefore y = 0 \qquad$ or / *of* $\qquad y = 1$	
	$x = 5y - 2$	✓ both y-values / *beide y-waardes*
	$x = 5(0) - 2 \quad$ or / *of* $\quad x = 5(1) - 2$	(6)
	$\therefore x = -2 \qquad$ or / *of* $\qquad x = 3$	
	OR / *OF*	✓ $y = \frac{1}{5}(x+2)$
	$5y - x = 2$ ⟶ (1)	
	$x^2 - 3xy + 4y = 4$ ⟶ (2)	✓ substitution / *vervanging*
	$y = \dfrac{x+2}{5} = \dfrac{1}{5}(x+2)$ ⟶ (3)	
	Subst./*Vervang* (3) into/*in* (2),	
	$x^2 - 3x\left(\frac{1}{5}(x+2)\right) + 4\left(\frac{1}{5}(x+2)\right) = 4$	✓ standard form / *standaardvorm*
	$x^2 - \frac{3}{5}x(x+2) + \frac{4}{5}(x+2) = 4$	✓ factors / *faktore*
	$5x^2 - 3x^2 - 6x + 4x + 8 - 20 = 0$	✓ both y-values / *beide y-waardes*
	$2x^2 - 2x - 12 = 0$	
	$x^2 - x - 6 = 0$	✓ both x-values / *beide x-waardes*
	$(x-3)(x+2) = 0$	(6)
	$\therefore x = -2 \qquad$ or / *of* $\qquad x = 3$	
	$y = \frac{1}{5}(-2+2) \quad$ or / *of* $\quad y = \frac{1}{5}(3+2)$	
	$\therefore y = 0 \qquad$ or / *of* $\qquad y = 1$	
1.4.1	Perimeter/*Omtrek* $= 2l + 2b$	✓ substitution / *vervanging*
	$\qquad 280 = 2(2x) + 2y$	
	$\qquad 2y = 280 - 4x$	✓ simplification / *vereenvoudiging*
	$\qquad \therefore y = 140 - 2x$	
	Area/*Oppervlakte* $= lb$	
	$\qquad = 2x \times y$	✓ $A = 2x(140 - 2x)$
	$\qquad = 2x(140 - 2x)$	
	$\qquad = 280x - 4x^2$	(3)

| 1.4.2 | $A = 280x - 4x^2$

 $= -4(x^2 - 70x)$

 $= -4(x^2 - 70x + 1225 - 1225)$

 $= -4[(x - 35)^2 - 1225]$

 $= -4(x - 35)^2 + 4900$

 $\therefore$ The maximum area is $4900\,m^2$

 Die maksimum oppervlakte is $4900\,m^2$

 OR/OF

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

 $= \dfrac{-280}{2(-4)}$

 $= 35\,m$

 $\therefore A = 280(35) - 4(35)$

 $= 4900\,m^2$ | $\checkmark$ completing the square / *vierkantsvoltooiing*

 $\checkmark$ +4900
 $\checkmark$ correct conclusion / *korrekte gevolgtrekking*

(3)

 OR/OF

 $\checkmark$ method/*metode*

 $\checkmark$ 35 *m*

 $\checkmark$ answer / *antwoord*

(3)
 [31] |

QUESTION 2/*VRAAG 2*

| 2.1 | $\dfrac{3.2^{x+1} - 2.4^x}{3.2^x - 2^{2x}} = \dfrac{3.2^x.2 - 2.2^{2x}}{3.2^x - 2^{2x}}$

 $= \dfrac{2.2^x(3 - 2^x)}{2^x(3 - 2^x)}$

 $= 2$ | $\checkmark$ $3.2^x.2 - 2.2^{2x}$

 $\checkmark$ factorisation of numerator / *faktorisering van teller*
 $\checkmark$ factorisation of denominator / *faktorisering van noemer*
 $\checkmark$ answer / *antwoord*

(4) |
| 2.2.1 | $5x^{\frac{2}{5}} = 20$

 $x^{\frac{2}{5}} = 4$

 $\left(x^{\frac{2}{5}}\right)^{\frac{5}{2}} = 4$

 $\therefore x = \left(2^2\right)^{\frac{5}{2}}$

 $= 2^5$

 $= 32$ | $\checkmark$ $x^{\frac{2}{5}} = 4$

 $\checkmark$ $\left(x^{\frac{2}{5}}\right)^{\frac{5}{2}} = 4^{\frac{5}{2}}$

 $\checkmark$ answer / *antwoord*

(3) |

2.2.2	$12^x.3^{x+1} = 648$	
	$12^x.3^x.3 = 648$	✓ $12^x.3^x = 216$
	$12^x.3^x = 216$	
	$(12.3)^x = 216$	
	$36^x = 216$	✓ $6^{2x} = 6^3$
	$6^{2x} = 6^3$	✓ equating exponents / *gelykstel van eksponente*
	$2x = 3$	
	$x = \dfrac{3}{2}$	✓ answer / *antwoord*
		(4)
2.3	$f(x) = \dfrac{3x-2}{x^2+10x+25}$	
	f is undefined when : *f is ongedefinieer wanneer*	✓ $x^2 +10x+25 = 0$ for undefined / *vir ongedefinieerd*
	$x^2 + 10x + 25 = 0$	
	$(x+5)^2 = 0$	
	$x = -5$	✓ $x = -5$
	$\therefore f$ is defined *for* : $x \in \mathbb{R}$, but $x \neq -5$	✓ $x \in \mathbb{R}$ ✓ $x \neq -5$
	f *is gedefinieerd vir* : $x \in \mathbb{R}$, *maar* $x \neq -5$	(4)
		[15]

QUESTION 3/*VRAAG 3*

3.1.1	$9 ; 5 ; 1; \ldots; -143$	
	$T_n = 13 - 4n$	✓ 13 ✓ $-4n$
		(2)
3.1.2	$T_n = 13 - 4n$	
	$T_7 = 13 - 4(7)$	✓ substitution / *vervanging*
	$= -15$	✓ -15
		(2)
3.1.3	$T_n = 13 - 4n$	
	$-143 = 13 - 4n$	✓ substitution / *vervanging*
	$-156 = -4n$	
	$\therefore n = 39$	✓ answer / *antwoord*
		(2)

3.2	$T_n = an + b$		
	$16a + b = 38$ (1)		
	$41a + b = 113$ (2)	✓ $16a + b = 38$ and/*en* $41a + b = 113$	
	$25a = 75$	✓ method / *metode*	
	$\therefore a = 3$		
	$16(3) + b = 38$	✓ $T_n = 3n - 10$	
	$48 + b = 38$		
	$\therefore b = -10$		
	$T_n = 3n - 10$	✓ $n = 3$	
	$-1 = 3n - 10$		
	$9 = 3n$		
	$\therefore n = 3$		(4)
			[10]

QUESTION 4/*VRAAG 4*

4.1	-12 ; -8 ; 0 ; 12		
	4 8 12		
	4 4	✓ 28 ✓ 48	
	28 ; 48		(2)
4.2	$2a = 4$ $3a + b = 4$ $a + b + c = -12$	✓ $a = 2$	
	$\therefore a = 2$ $3(2) + b = 4$ $2 - 2 + c = -12$	✓ $b = -2$	
	$b = -2$ $c = -12$	✓ $c = -12$	
		✓ $T_n = 2n^2 - 2n - 12$	
	$\therefore T_n = 2n^2 - 2n - 12$		(4)

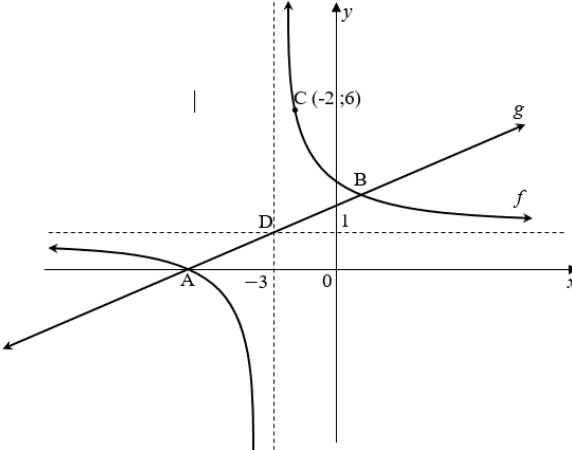
4.3	For first differences: / *Vir eerste verskille* $4;8;12; ...$ $$T_n = 4n$$ $$192 = 4n$$ $$\therefore n = 48$$ $\therefore 192$ lies between T_{48} and T_{49} 192 *lê tussen* T_{48} *en* T_{49} **OR/*OF*** $T_{n+1} - T_n = 192$ $2(n+1)^2 - 2(n+1) - 12 - (2n^2 - 2n - 12) = 192$ $2(n^2 + 2n + 1) - 2n - 2 - 12 - 2n^2 + 2n + 12 = 192$ $2n^2 + 4n + 2 - 2n - 2 - 12 - 2n^2 + 2n + 12 = 192$ $\therefore 4n = 192$ $\quad n = 48$ $\therefore 192$ lies between T_{48} and T_{49} $\quad 192$ *lê tussen* T_{48} *en* T_{49}	$\checkmark$ $T_n = 4n$ $\checkmark$ $n = 48$ $\checkmark$ answer / *antwoord* (3) **OR/*OF*** $\checkmark$ $2(n+1)^2 - 2(n+1) - 12 - (2n^2 - 2n - 12) = 192$ $\checkmark$ $4n = 192$ $\checkmark$ answer / *antwoord* (3)	
4.4	$P_n < 0 \Rightarrow T_n - 168 < 0$ $T_n < 168$ $2n^2 - 2n - 12 < 168$ $2n^2 - 2n - 180 < 0$ $n^2 - n - 90 < 0$ $(n-10)(n+9) < 0$ $-9 < n < 10$ but / *maar*: $n > 0$ $\therefore$ Number of terms $= 9$ $\quad$ *Aantal terme* $= 9$	$\checkmark$ $2n^2 - 2n - 12 < 168$ $\checkmark$ standard form / *standaardvorm* $\checkmark$ factorisation / *faktorisering* $\checkmark$ $-9 < n < 10$ $\checkmark$ answer / *antwoord* (5)	
4.5	$T_n = 2n^2 - 2n - 12$ $\quad = 2(n^2 - n - 6)$ $\therefore 2 \times$ any $n > 0$ is always even, so T_n will always be even $\quad 2 \times$ *enige* $n > 0$ *is altyd ewe, so* T_n *sal altyd ewe wees.*	$\checkmark$ $T_n = 2(n^2 - n - 6)$ $\checkmark$ explanation / *verduideliking* (2) **[16]**	

QUESTION 5/*VRAAG 5*

5.1	At TP/*By Draaipunt*: $x = -\dfrac{b}{2a}$ $= -\dfrac{6}{2(-1)}$ $= 3$ $\therefore y = -(3)^2 + 6(3) + 7$ $= 16$ **OR/*OF*** $f(x) = -x^2 + 6x + 7$ $= -(x^2 - 6x - 7)$ $= -[(x^2 - 6x + 9) - 9 - 7]$ $= -[(x-3)^2 - 16]$ $= -(x-3)^2 + 16$ $\therefore$ Turning point / *Draaipunt* : $(3;16)$	✓ method / *metode* ✓ *x*-coordinate / *x-koördinaat* ✓ *y*-coordinate / *y-koördinaat* (3) ✓ completing the square / *vierkantsvoltooiing* ✓ *x*-coordinate / *x-koördinaat* ✓ *y*-coordinate / *y-koördinaat* (3)
5.2	$-x^2 + 6x + 7 = 0$ $x^2 - 6x - 7 = 0$ $(x - 7)(x + 1) = 0$ $\therefore x = 7$ or / *of* $x = -1$	✓ $f(x) = 0$ ✓ answers / *antwoorde* (2)
5.3		✓ *y*-intercept / *y-afsnit* ✓ *x*-intercepts / *x-afsnitte* ✓ turning point / *draaipunt* ✓ shape / *vorm* (4)
5.4	$x = 3$	✓ answer / *antwoord* (1)

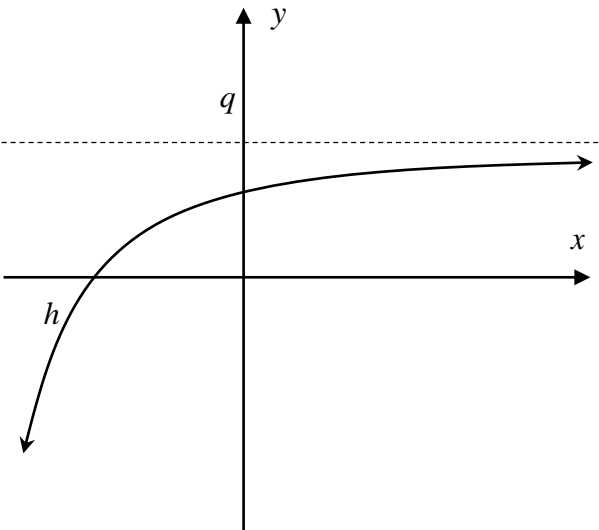| 5.5	$f(x) = -x^2 + 6x + 7$ $f(-3) = -(-3)^2 + 6(-3) + 7$ $\quad = -20$ $f(1) = -(1)^2 + 6(1) + 7$ $\quad = 12$ Average/*Gemiddelde* $m = \dfrac{12 - (-20)}{1 - (-3)}$ $\quad = \dfrac{32}{4}$ $\quad = 8$	✓ $f(-3) = -20$ ✓ $f(1) = 12$ ✓ substituting into gradient formula / *vervanging in gradiënt-formule* ✓ answer / *antwoord* (4)
5.6	$f(x) = -x^2 + 6x + 7$ $\quad = -(x-3)^2 + 16$ $\therefore h(x) = ((x-3)+4)^2 - 16$ $\quad = (x+1)^2 - 16$	✓ $a = 1$ and/*en* $q = -16$ ✓ $p = 1$ (2) **[16]**

QUESTION 6/*VRAAG 6*

6.1	$f(x) = \dfrac{a}{x+p} + q$ $\quad = \dfrac{a}{x+3} + 1$	✓ $p = 3$ ✓ $q = 1$ (2)
6.2	$f(x) = \dfrac{a}{x+3} + 1$ $6 = \dfrac{a}{-2+3} + 1$ $\therefore a = 5$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)

6.3	$f(x) = \dfrac{5}{x+3} + 1$ $0 = \dfrac{5}{x+3} + 1$ $-1 = \dfrac{5}{x+3}$ $-x - 3 = 5$ $x = -8$ $\therefore A(-8\,;0)$	$\checkmark$ $y = 0$ $\checkmark$ $x = -8$ (2)
6.4	$A(-8\,;0)$ and/*en* $D(-3\,;1)$ $m_{AD} = \dfrac{y_2 - y_1}{x_2 - x_1}$ $= \dfrac{1 - 0}{-3 - (-8)}$ $\therefore b = \dfrac{1}{5}$ $g(x) = bx + c$ $= \dfrac{1}{5}x + c$ $0 = \dfrac{1}{5}(-8) + c$ or / *of* $1 = \dfrac{1}{5}(-3) + c$ $\therefore c = \dfrac{8}{5}$ $g(x) = \dfrac{1}{5}x + \dfrac{8}{5}$	$\checkmark$ substitution / *vervanging* $\checkmark$ m_{AD} $\checkmark$ substitution / *vervanging* $\checkmark$ equation / *vergelyking* (4)
6.5	$x \in (-\infty\,;\infty)$ but / *maar* $x \neq -3$ **OR / *OF*** $x \in \mathbb{R},\ x \neq -3$	$\checkmark$ $x \in (-\infty\,;\infty)$ $\checkmark$ $x \neq -3$ (2) $\checkmark$ $x \in \mathbb{R}$ $\checkmark$ $x \neq -3$ (2)
6.6	$f(x) = g(x)$ $\dfrac{5}{x+3} + 1 = \dfrac{1}{5}x + \dfrac{8}{5}$ $25 + 5(x+3) = x(x+3) + 8(x+3)$ $25 + 5x + 15 = x^2 + 3x + 8x + 24$ $x^2 + 6x - 16 = 0$ $(x+8)(x-2) = 0$ $x = -8$ *or* $x = 2$ $y = \dfrac{5}{2+3} + 1$ $= 2$ $\therefore B(2\,;2)$	$\checkmark$ $\dfrac{5}{x+3} + 1 = \dfrac{1}{5}x + \dfrac{8}{5}$ $\checkmark$ standard form / *standaardvorm* $\checkmark$ x-values / *x-waardes* $\checkmark$ coordinates / *koördinate* (4)

| 6.7 | $-8 \leq x < -3$ or $x \geq 0$
 OR / *OF*
 $x \in \big[[-8;-3) \cup [0;\infty)\big]$ | $\checkmark\checkmark$ $-8 \leq x < -3$ $\checkmark$ $x \geq 0$
 OR / *OF*
 $x \in \big[[-8;\ -3)$ $\checkmark\checkmark$ $\cup\ [0;\infty)\big]$ $\checkmark$ (3)
 [19] |
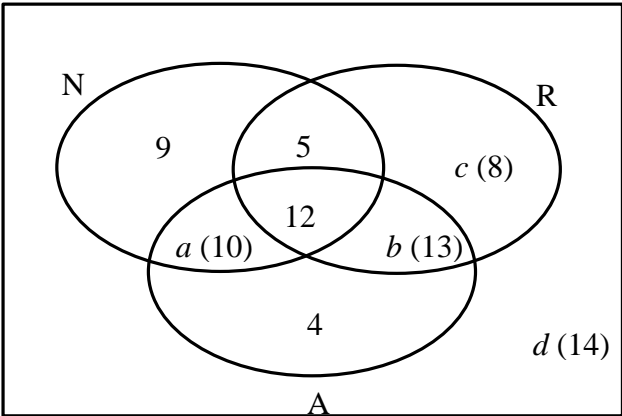
QUESTION 7/*VRAAG 7*

7.1.1	$y = -4$	$\checkmark$ answer / *antwoord* (1)
7.1.2	$y \in (-4;\infty)$ **OR / *OF*** $y > -4$	$\checkmark$ answer / *antwoord* (1) **OR / *OF*** $\checkmark$ answer / *antwoord* (1)
7.1.3	$$g(x) = \left(\frac{1}{2}\right)^x - 4$$ $$y = \left(\frac{1}{2}\right)^0 - 4$$ $$= -3$$ $$0 = \left(\frac{1}{2}\right)^x - 4$$ $$4 = \left(2^{-1}\right)^x$$ $$2^2 = 2^{-x}$$ $$\therefore 2 = -x$$ $$x = -2$$ Intercepts / *Afsnitte* : $(0;-3)$ and / *en* $(-2;0)$	$\checkmark$ *y*-value / *y-waarde* $\checkmark$ substitution / *vervanging* $\checkmark$ answer / *antwoord* (3)
7.1.4	$x > -2$	$\checkmark$ answer / *antwoord* (1)
7.2		$\checkmark$ asymptote above *x*-axis *asimptoot bo x-as* $\checkmark$ *y*-intercept positive *y-afsnit positief* $\checkmark$ shape / *vorm* (3) **[9]**

QUESTION 8/*VRAAG 8*

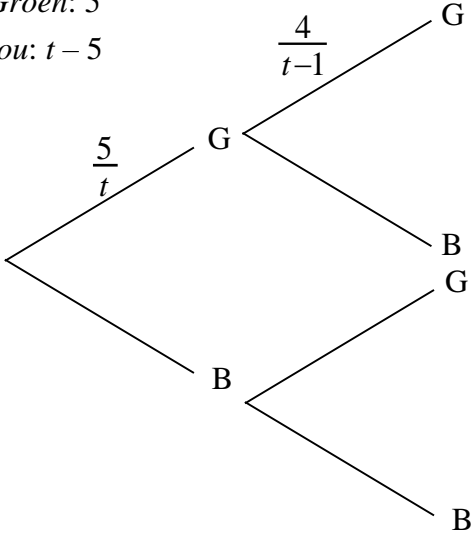|		
8.1	$i_{eff} = \left(1 + \dfrac{i_{nom}}{m}\right)^m - 1$ $= \left(1 + \dfrac{0.095}{12}\right)^{12} - 1$ $= 0{,}099247\ldots$ $\therefore r = 9{,}92\%$	✓ formula / *formule* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
8.2	$A = P(1+i)^n$ $R\,764\,050{,}60 = P(1+0{,}08)^5$ $P = \dfrac{764050{.}60}{(1+0.08)^5}$ $= R\,520\,000$	✓ $A = R764050{,}60$ ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
8.3.1	$A = \left[28\,000\left(1 + \dfrac{0{,}075}{12}\right)^{48} - R\,7\,300\right]\left(1 + \dfrac{0{,}11}{4}\right)^{12}$ $= (R\,37\,760{,}78 - R\,7\,300)\left(1 + \dfrac{0{,}11}{4}\right)^{12}$ $= R\,30\,460{,}78\left(1 + \dfrac{0{,}11}{4}\right)^{12}$ $= R\,42\,181{,}59$	✓ $28000\left(1 + \dfrac{0{,}075}{12}\right)^{48}$ ✓ $-R7\,300$ ✓ $\times\left(1 + \dfrac{0{,}11}{4}\right)^{12}$ ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (5)
8.3.2	$A = P(1+i)^n$ $A = R\,42\,181{,}59\left(1 + \dfrac{0{,}08}{12}\right)^{60}$ $= R\,62\,844{,}06$ $R\,80\,000 - R\,62\,844{,}06$ $= R\,17\,155{,}94$ $\therefore A = P(1+i)^n$ $R\,17\,155{,}94 = P\left(1 + \dfrac{0{,}08}{12}\right)^{60}$ $P = \dfrac{17155{,}94}{\left(1 + \dfrac{0{,}08}{12}\right)^{60}}$ $= R\,11\,515{,}25$ $\therefore$ He needs to deposit R11 515 / *Hy moet* R11 515 *deponeer*	✓ substitution into correct formula *vervanging in korrekte formule* ✓ R62 844,06 ✓ R17 155,964 ✓ method / *metode* ✓ answer / *antwoord* (5) **[16]**

QUESTION 9/*VRAAG 9*

9.1	If A and B are independent, then:
	 As A en B onafhanklik is, dan:
	
	 P(A and/*en* B) = P(A) × P(B)
	
	 P(A) = 1 – P(not/*nie* A)
	       = 1 – 0,45
	       = 0,55
	       $= \dfrac{11}{20}$
	
	 P(A or/*of* B) = P(A) + P(B) – P(A and/*en* B)
	     0,685 = 0,55 + 0,3 – P(A and/*en* B)
	     ∴P(A and/*en* B) = 0,165
	               $= \dfrac{33}{200}$
	
	 P(A) × P(B) = 0,55 × 0,3
	            = 0,165
	            $= \dfrac{33}{200}$
	
	 ∴ A and B are independent events. /
	    A *en* B *is onafhanklike gebeurtenisse*.
		✓ 0,55
		
		 ✓ substitution / *vervanging*
		
		 ✓ answer / *antwoord*
		
		 ✓ P(A) × P(B)
		
		 ✓ conclusion / *gevolgtrekking*
		 (5)

9.2.1	 $a = 10$; $b = 13$; $c = 8$; $d = 14$	✓ $a = 10$ ✓ $b = 13$ ✓ $c = 8$ ✓ $d = 14$ (4)

9.2.2	$P\big(A \text{ or}/of (N \text{ and}/en \text{ R})\big) = \dfrac{39}{75} + \dfrac{5}{75}$
	                      $= \dfrac{44}{75}$
	                      ≈ 0,59
		✓ $\dfrac{39}{75}$ ✓ $+ \dfrac{5}{75}$
		
		 ✓ answer / *antwoord*
		 (3)
		 [12]

QUESTION 10/*VRAAG 10*

| 10 | Let the total number of balls be *t*.
Laat die totale aantal balle t wees.

Green/*Groen*: 5
Blue/*Blou*: $t - 5$

$P(GG) = P(G) \times P(G)$

$\dfrac{5}{t} \times \dfrac{4}{t-1} = \dfrac{5}{18}$

$\dfrac{20}{t(t-1)} = \dfrac{5}{18}$

$5t^2 - 5t = 360$

$5t^2 - 5t - 360 = 0$

$t^2 - t - 72 = 0$

$(t-9)(t+8) = 0$

$\therefore t = 9 \ or \ t \neq -8$

$\therefore$ There are 9 balls.
  Daar is 9 balle. | ✓ $\dfrac{5}{t}$ ✓ and/*en* $\dfrac{4}{t-1}$

✓ equation / *vergelyking*

✓ standard form / *standaardvorm*

✓ factorisation / *faktorisering*

✓ $t = 9$

(6) |

TOTAL / TOTAAL: 150