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Province of the
EASTERN CAPE
EDUCATION

# NATIONAL SENIOR CERTIFICATE

## GRADE 11

## NOVEMBER 2023

# MATHEMATICS P1

**MARKS:** **150**

**TIME:** **3 hours**

This question paper consists of 10 pages including an information sheet.

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**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.

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**QUESTION 1**

1.1 Solve for $x$ in the following:

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

1.1.2 $x(3x+1) = 5$ (4)

1.1.3 $2x^2 - 5x + 3 < 0$ (3)

1.1.4 $2\sqrt{x+2} = x - 1$ (5)

1.2 Solve for $x$ and $y$ simultaneously:

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

1.3 Given: $(x-3)^2 = p^2 - 4$

Determine the value(s) of $p$ for which the roots will be non-real. (5)

**[25]**

**QUESTION 2**

2.1 Simplify fully, **without using a calculator**: $\dfrac{2^{n+1} - 8.2^{n-3}}{2^{n-2}}$ (4)

2.2 Solve for $x$:

2.2.1 $\sqrt[x]{27} = 2187$ (4)

2.2.2 $4^x - 16 = 6.2^x$ (5)

2.3 Given that $x = \sqrt{3} - 2$, simplify $\dfrac{x^2+1}{x^2-5}$ **without using a calculator**.

(Give your answer in simplest surd form.) (5)

**[18]**

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**QUESTION 3**

3.1 Given the linear number pattern: $17\ ;\ 14\ ;\ 11\ ;\ ...\ ;\ -247$

3.1.1 Write down the fourth and fifth terms of the number pattern. (2)

3.1.2 Determine the general term $T_n$, of the number pattern. (2)

3.1.3 Calculate the value of $T_{17}$. (2)

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

3.2 In a linear number pattern, the first term is $2x+11$, the second term is 2 and the fourth term is $2x-4$. Calculate the value of $x$. (5)

**[13]**

**QUESTION 4**

4.1 Given the quadratic number pattern: $94\ ;\ 90\ ;\ 82\ ;\ 70\ ;\ ...$

4.1.1 Determine the next two terms of the number pattern. (2)

4.1.2 Determine $T_n$, the general term of the number pattern. (4)

4.1.3 Calculate two consecutive terms whose first difference is $-136$. (4)

4.2 A quadratic number pattern has a general term $T_n = an^2 + bn - 15$.
$T_2 - T_1 = 3$ and $T_3 - T_2 = 7$. Determine the values of $a$ and $b$. (5)

**[15]**

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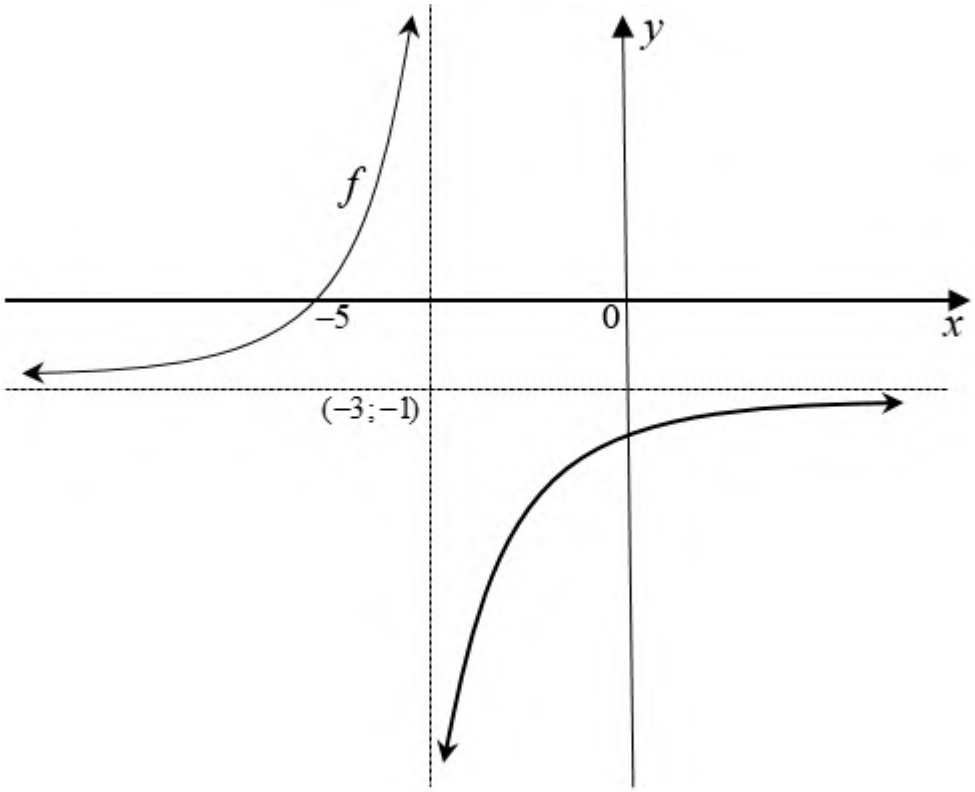
**QUESTION 5**

The diagram below shows the graph of $f(x)=\frac{a}{x+p}+q$. The asymptotes of $f$ intersect at $(-3;-1)$ and $f$ cuts the $x$-axis at $x=-5$.




5.1 Write down the values of $p$ and $q$. (2)

5.2 Determine the value of $a$. (3)

5.3 Hence, or otherwise calculate the $y$-intercept of $f$. (2)

5.4 Write down the domain of $f$. (2)

5.5 Determine the line of symmetry of $f$ with a negative gradient in the form $y=mx+c$. (2)

5.6 For which values of $x$ is $f(x)\geq 0$? (2)

5.7 Describe the transformation of $f$ to $g$, given that $g(x)=\frac{2}{x-1}+1$ (4)

**[17]**

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**QUESTION 6**

Given: $f(x) = 2(3^x) + 1$

6.1 Write down the coordinates of the *y*-intercept of $f$. (1)

6.2 Write down the equation of asymptote of $f$. (2)

6.3 Draw a sketch of $f$, showing clearly the asymptote and intercept(s) with the axes. (3)

6.4 Write down the range of $h$, if $h(x) = 2(3^{x+1}) - 5$. (2)

**[8]**

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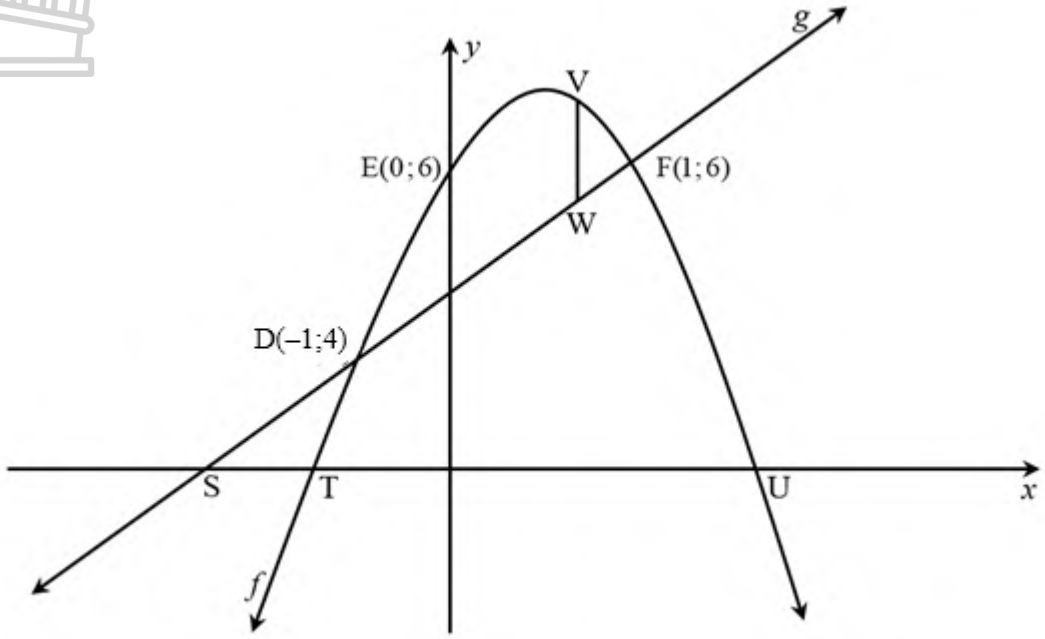
**QUESTION 7**

The diagram below shows the graphs of $f(x) = ax^2 + bx + c$ and $g(x) = mx + q$. D$(-1;4)$ and F(1;6) are points of intersection of $f$ and $g$. T and U are the $x$-intercepts of $f$, E(0;6) the $y$-intercept of $f$ and S is the $x$-intercept of $g$. VW is a straight line drawn parallel to the $y$-axis.




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

7.2 For which values of $x$ is $f$ decreasing? (1)

7.3 Calculate the average gradient of $f$ between D and E. (2)

7.4 Determine the equation of $g$. (3)

7.5 Show that $f(x) = -x^2 + x + 6$. (4)

7.6 Calculate the length of SU. (5)

7.7 Determine the values of $x$ for which $f(x) - g(x) \leq 0$. (2)

7.8 Calculate the maximum length of VW. (3)

**[21]**

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## QUESTION 8

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

8.2 A school buys a bus that costs R312 000 at the start of 2023. The average inflation over the next 5 years is 6,91%. Calculate the cost of replacing the school bus at the end of 5 years. (3)

8.3 Lwandi made an initial deposit of R23 000 into an investment account that paid an interest rate of 9,25% compounded quarterly. After 3 years since the start of his investment, he deposited R13 500 and the interest rate changed to 8,2% p.a. compounded monthly. Exactly 5 years after his initial deposit, Lwandi withdrew R9 000.

8.3.1 Calculate the total value of the investment in Lwandi's account at the end of the $5^{th}$ year. (5)

8.3.2 At the end of 8 years after the initial deposit, Lwandi decided to withdraw and use the money.
Calculate the annual interest rate of the investment in the final 3 years if his final balance was R64 487,24 and the interest was compounded monthly. (4)

**[15]**

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## QUESTION 9

9.1 For any two events A and B, it is given that $P(\text{A}) = 0,35$ and $P(\text{A or B}) = 0,61$. Determine $P(\text{B})$ if:

9.1.1 A and B are mutually exclusive. (3)

9.1.2 A and B are independent. (4)

9.2 A cellphone distribution company investigated the number of defective phones that they obtain from two suppliers, Axis Phones and Direct Phones. They recorded their findings in a contingency table.

| | **Axis Phones** | **Direct Phones** | **Total** |
|---|---|---|---|
| Defective | 58 | *a* | *b* |
| Not Defective | 326 | 188 | 514 |
| Total | 384 | *c* | 600 |

9.2.1 Determine the values of $a$, $b$ and $c$. (3)

9.2.2 Calculate the probability that a cellphone chosen at random is supplied by Direct Phones. (1)

9.2.3 Calculate the probability that a cellphone chosen at random is Not Defective **OR** it is from Axis Phones and Defective. (3)

**[14]**

## QUESTION 10

A bag contains $x$ balls of which 5 are red and the rest are green. One ball is taken out of the bag randomly and it is not replaced. A second ball is taken out of the bag. The probability of picking both green balls is $\frac{3}{11}$. Show that the probability of picking both green balls can be represented by the equation: $4x^2 - 59x + 165 = 0$. **[4]**

**TOTAL: 150**

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# INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

In $\Delta$ABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$ $\qquad a^2 = b^2 + c^2 - 2bc.\cos A$ $\qquad area\,\Delta ABC = \dfrac{1}{2}ab.\sin C$

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

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

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

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

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

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

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# ERRATUM

**TO:** **ALL PRINCIPALS OF SCHOOLS IN THE FET BAND AND DISTRICT HEADS OF EXAMINATIONS**

**FROM:** **MRS P. JAPHTA**
**(a) CES: ASSESSMENTS INSTRUMENT DEVELOPMENT AND ITEM BANK MANAGEMENT SUBDIRECTORATE**

**SUBJECT:** **MATHEMATICS P1 GR11 EXAMINATIONS ERRATUM**

**DATE:** **20 NOVEMBER 2023**

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The Mathematics P1 Grade 11 for the November Examinations 2023 was written on Friday, the 10 November 2023. We were made aware of errors and omissions that was discovered during the marking process.

The amendment with regards to the marking was prepared in conjunction with the examiner and the moderator of the paper. This amendment addresses the errors and omissions and also ensures that learners are not disadvantaged. The following standardised approach to marking must be adopted across the Province.

| | | |
|---|---|---|
| 2.2.2 | For trial and error method (award 3/5) | |

| | | |
|---|---|---|
| 5.3 | $f(x)=\frac{a}{x+p}+q$<br>$=\frac{-2}{x+3}-1$<br>$y=\frac{-2}{0+3}-1$<br>$=-\frac{5}{3}$ ← typo | ✓ substituting $x = 0$<br>*vervang* $x = 0$<br>✓ answer / *antwoord*<br>(2) |



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| | | |
|---|---|---|
| 7.6 | $g(x) = x+5$<br>$0 = x+5$<br>$\therefore x = -5$ typo<br>$S(-5;0)$<br>$f(x) = -x^2 + x + 6$<br>$0 = -x^2 + x + 6$<br>$x^2 - x - 6 = 0$<br>$(x-3)(x+2) = 0$<br>$\therefore x = -2$ or / *of* $x = 3$<br>$\therefore U(3;0)$<br>$\therefore SU = 3-(-5)$ correction<br>$= 8$ units/*eenhede* | ✓ substitution / *vervanging*<br>correction<br>✓ S(– 5 ; 0)<br>✓ factors / *faktore*<br>✓ both *x*-intercepts<br>*beide x-afsnitte*<br>✓ answer / *antwoord*<br>(5) |

| | | |
|---|---|---|
| 7.8 | $y_V - y_W = f(x) - g(x)$<br>$= (-x^2 + x + 6) - (x+5)$<br>$= -x^2 + x + 6 - x - 5$<br>$= -x^2 + 1$ typo<br>$\therefore$ Max.length of VW is 1 unit | ✓ $f(x) - g(x)$<br>✓ answer / *antwoord*<br>✓ interpretation / *interpretasie*<br>(3) |



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**8.3.1**

$$A = \left(23000\left(1+\frac{0,0925}{4}\right)^{12}+13500\right)\left(1+\frac{0,082}{12}\right)^{24}$$

$$= R51\,530,18$$

correction

**NOTE**

[***Accept R42 530,18 if R51 530,18 is not shown – candidate already deducted R9 000,00 which is relevant for 8.3.2***]

✓ $i = \frac{0,0925}{4}$ & $n = 12$

✓ $i = \frac{0,082}{12}$ & $n = 24$

✓ $\left(23000\left(1+\frac{0,0925}{4}\right)^{12}+13500\right)$

✓ $\left(1+\frac{0,082}{12}\right)^{24}$

✓ $R51530,18$ (answer / *antwoord*)

(5)

**OR/*OF***

$$A = \left(23000\left(1+\frac{0,0925}{4}\right)^{12}+13500\right)$$

$$= R43760,23$$

$$A = R43760,23\left(1+\frac{0,082}{12}\right)^{24}$$

$$= R51530,18$$

✓ $i = \frac{0,0925}{4}$ & $n = 12$

✓ $i = \frac{0,082}{12}$ & $n = 24$

✓ $R43760,23$

✓ $R43760,23\left(1+\frac{0,082}{12}\right)^{24}$

✓ $R51530,18$ (answer / *antwoord*)

(5)

**8.3.2**

$$P = R51530,18 - R9000,00$$

$$= R42530,18$$

correction

✓ $P = R42530,18$

$$A = P(1+i)^n$$

$$64\,487,24 = 42\,530,18\left(1+\frac{i}{12}\right)^{36}$$

✓ $\frac{i}{12}$ & $n = 36$

✓ substituting into correct formula

*vervanging in korrekte formule*

$$\therefore i = \left(\sqrt[36]{\frac{64\,487,24}{42\,530,18}}-1\right)\times 12$$

$$= 0,13955640672$$

rate/*koers* $= 13,96\%$

correction

✓ answer / *antwoord*

(4)



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We request that this must be brought to the attention of all educators marking these papers and sincerely apologise for the inconvenience.

Yours in education.

20 November 2023

**MRS P.E. JAPHTHA**
**(a) CES: ASSESSMENTS INSTRUMENT DEVELOPMENT AND ITEM BANK MANAGEMENT SUBDIRECTORATE**

**DATE**



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# NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIORSERTIFIKAAT*

## GRADE/*GRAAD* 11

## NOVEMBER 2023

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

**MARKS/*PUNTE*:** **150**

This marking guideline consists of 15 pages./
*Hierdie nasienriglyn bestaan uit 15 bladsye.*

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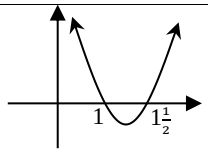
**NOTE/*LET WEL*:**

- 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 (CA) applies in ALL aspects of the marking guideline.
  *Volgehoue akkuraatheid (VA) 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 | $x^2-3x=0$<br>$x(x-3)=0$<br>$\therefore x=0$ or / *of* $x=3$ | ✓ factorisation / *faktorisering*<br>✓ answers / *antwoorde*<br>(2) |
| 1.1.2 | $x(3x+1)=5$<br>$3x^2+x-5=0$<br>$x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$<br>$=\dfrac{-1\pm\sqrt{1^2-4(3)(-5)}}{2(3)}$<br>$=\dfrac{-1\pm\sqrt{61}}{6}$<br>$=1{,}14$ or / *of* $-1{,}47$ | ✓ standard form / *standaardvorm*<br>✓ substitution / *vervanging*<br>✓✓ answers / *antwoorde*<br>(4) |
| 1.1.3 | $2x^2-5x+3<0$<br>$(2x-3)(x-1)<0$<br>$\therefore 1<x<1\frac{1}{2}$<br>  | ✓ factors / *faktore*<br>✓ ✓ answer / *antwoord* (A)<br>(3) |
| 1.1.4 | $2\sqrt{x+2}=x-1$<br>$\left(2\sqrt{x+2}\right)^2=(x-1)^2$<br>$4(x+2)=x^2-2x+1$<br>$4x+8=x^2-2x+1$<br>$x^2-6x-7=0$<br>$(x-7)(x+1)=0$<br>$\therefore x=7$ or / *of* $x\neq -1$ | ✓ squaring / *kwadreer*<br>✓ standard form / *standaardvorm*<br>✓ factors / *faktore*<br>✓ both answers / *beide antwoorde*<br>✓ selection / *seleksie*<br>(5) |

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| | | |
|---|---|---|
| 1.2 | $x+3y=2 \quad (1)$<br>$x^2-3xy=4 \quad (2)$<br><br>$x=2-3y \quad (3)$<br>$(2-3y)^2-3y(2-3y)=4$<br>$4-12y+9y^2-6y+9y^2=4$<br>$18y^2-18y=0$<br>$18y(y-1)=0$<br>$\therefore y=0$ or / *of* $y=1$<br><br>$\therefore x=2-3(0)$ or / *of* $x=2-3(1)$<br>$=2$ $x=-1$<br><br>**OR/*OF***<br><br>$x+3y=2 \quad (1)$<br>$x^2-3xy=4 \quad (2)$<br><br>$y=\frac{2-x}{3} \quad (3)$<br>$x^2-3x\left(\frac{2-x}{3}\right)=4$<br>$x^2-x(2-x)=4$<br>$x^2-2x+x^2-4=0$<br>$2x^2-2x-4=0$<br>$x^2-x-2=0$<br>$(x-2)(x+1)=0$<br>$\therefore x=2$ or / *of* $x=-1$<br><br>$\therefore y=\frac{2-2}{3}$ or / *of* $y=\frac{2-(-1)}{3}$<br>$=0$ $=1$ | ✓ $x=2-3y$<br>✓ substitution / *vervanging*<br><br>✓ standard form / *standaardvorm*<br>✓ method/factors / *metode/faktore*<br>✓ both *y*-values / *beide y-waardes*<br><br>✓ both *x*-values / *beide x-waardes*<br><br>**OR/*OF***<br><br>✓ $y=\frac{2-x}{3}$<br><br>✓ substitution / *vervanging*<br><br>✓ standard form / *standaardvorm*<br><br>✓ factors / *faktore*<br>✓ both *x*-values / *beide x-waardes*<br><br>✓ both *y*-values / *beide y-waardes* (6) |

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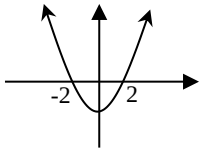
| | | |
|---|---|---|
| 1.3 | $(x-3)^2 = p^2-4$<br>$\sqrt{(x-3)^2} = \pm\sqrt{p^2-4}$<br>$\therefore \quad x-3 = \pm\sqrt{p^2-4}$<br>$\therefore x = 3 \pm \sqrt{p^2-4}$<br>For non-real roots:<br>*Vir nie - reële wortels*:<br>  <br><br>$p^2-4<0$<br>$(p-2)(p+2)<0$<br>$\therefore -2 < p < 2$<br><br>**OR/*OF***<br><br>$(x-3)^2 = p^2-4$<br>$x^2-6x+9 = p^2-4$<br>$x^2-6x+13-p^2 = 0$<br>For non-real roots: *Vir nie - reële wortels*<br>$b^2-4ac<0$<br>$(-6)^2-4(1)(13-p^2)<0$<br>$36-52+4p^2<0$<br>$\therefore 4p^2-16<0$<br>$(2p+4)(2p-4)<0$<br>$\therefore -2 < p < 2$ | ✓ square root / *vierkantswortel*<br><br>✓ $x = 3 \pm \sqrt{p^2-4}$<br><br>✓ $p^2-4<0$<br>✓ factors / *faktore*<br>✓ answer / *antwoord*<br><br>**OR/*OF***<br><br>✓ expansion / *uitbreiding*<br>✓ standard form / *standaardvorm*<br><br>✓ $b^2-4ac<0$<br><br>✓ factors / *faktore*<br>✓ answer / *antwoord*<br><br>(5) |
| | | **[25]** |

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**QUESTION 2/*VRAAG 2***

| | | |
|---|---|---|
| 2.1 | $\frac{2^{n+1}-8.2^{n-3}}{2^{n-2}} = \frac{2^n.2-8.2^n.2^{-3}}{2^n.2^{-2}}$<br>$= \frac{2^n(2-8.2^{-3})}{2^n.2^{-2}}$<br>$= \frac{2-1}{2^{-2}}$<br>$= 4$ | ✓ numerator / *teller*<br>✓ denominator / *noemer*<br>✓ factorisation / *faktoriseering*<br>✓ answer / *antwoord*<br>(4) |
| 2.2.1 | $\sqrt[x]{27} = 2187$<br>$27^{\frac{1}{x}} = 2187$<br>$\left(3^3\right)^{\frac{1}{x}} = 3^7$ **OR/*OF*** $27^{x^{-1}} = 3^7$<br>$3^{\frac{3}{x}} = 3^7$ $3^{3x^{-1}} = 3^7$<br>$\therefore \frac{3}{x} = 7$ $\therefore 3x^{-1} = 7$<br>$\Rightarrow x = \frac{3}{7}$ $x^{-1} = \frac{7}{3}$<br>$\Rightarrow x = \frac{3}{7}$ | ✓ $27^{\frac{1}{x}} = 2187$<br>✓ $\left(3^3\right)^{\frac{1}{x}} = 3^7$ **OR/*OF*** $27^{x^{-1}} = 3^7$<br>✓ equating exponents<br>*gelyk stel van eksponente*<br>✓ answer / *antwoord*<br>(4) |
| 2.2.2 | $4^x - 16 = 6.2^x$<br>$\left(2^x\right)^2 - 6.2^x - 16 = 0$<br>$(2^x - 8)(2^x + 2) = 0$<br>$\therefore 2^x = 8$ or / *of* $2^x \neq -2$<br>$\therefore 2^x = 2^3$<br>$\therefore x = 3$<br>**OR/*OF***<br>$4^x - 16 = 6.2^x$<br>$(2^x)^2 = 6.2^x - 16 = 0$<br>Let/*Laat* $k = 2^x$,<br>$\therefore k^2 - 6k - 16 = 0$<br>$(k - 8)(k + 2) = 0$<br>$\therefore k = 8$ or/*of* $k = -2$<br>$\therefore 2^x = 8$ or/*of* $2^x \neq -2$<br>$2^x = 2^3$<br>$\therefore x = 3$ | ✓ standard form / *standaardvorm*<br>✓ factors / *faktore*<br>✓ selection / *seleksie*<br>✓ $2^x = 2^3$<br>✓ answer / *antwoord*<br>**OR/*OF***<br>✓ standard form / *standaardvorm*<br>✓ factors / *faktore*<br>✓ selection / *seleksie*<br>✓ $2^x = 2^3$<br>✓ answer / *antwoord*<br>(5) |

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| | | |
|---|---|---|
| 2.3 | $\frac{x^2+1}{x^2-5}=\frac{\left(\sqrt{3}-2\right)^2+1}{\left(\sqrt{3}-2\right)^2-5}$<br>$=\frac{3-4\sqrt{3}+4+1}{3-4\sqrt{3}+4-5}$<br>$=\frac{8-4\sqrt{3}}{2-4\sqrt{3}}$<br>$=\frac{\left(8-4\sqrt{3}\right)\left(2+4\sqrt{3}\right)}{\left(2-4\sqrt{3}\right)\left(2+4\sqrt{3}\right)}$<br>$=\frac{16+32\sqrt{3}-8\sqrt{3}-16.3}{4-16.3}$<br>$=\frac{24\sqrt{3}-32}{-44}$<br>$=\frac{8-6\sqrt{3}}{11}$ | ✓ substitution / *vervanging*<br>✓ $\frac{8-4\sqrt{3}}{2-4\sqrt{3}}$<br>✓ rationalisation / *rasionalisering*<br>✓ simplification / *vereenvoudiging*<br>✓ answer / *antwoord*<br>(5) |
| | | **[18]** |

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**QUESTION 3/*VRAAG 3***

| | | |
|---|---|---|
| 3.1.1 | $17\ ;\ 14\ ;\ 11\ ;\ ...\ ;\ -247$<br>**8 ; 5** | ✓ 8 ✓ 5<br>(2) |
| 3.1.2 | $T_n = 20 - 3n$ | ✓ 20 ✓ $-3n$<br>(2) |
| 3.1.3 | $T_n = 20 - 3n$<br>$\therefore T_{17} = 20 - 3(17)$<br>$= -31$ | ✓ substitution / *vervanging*<br>✓ answer / *antwoord*<br>(2) |
| 3.1.4 | $T_n = 20 - 3n$<br>$-247 = 20 - 3n$<br>$-267 = -3n$<br>$\therefore n = 89$ | ✓ $T_n = -247$<br>✓ answer / *antwoord*<br>(2) |
| 3.2 | $2x+11\ ;\ 2\ ;\ T_3\ ;\ 2x-4$<br>$T_3 = \frac{2x-4-2}{2} + 2$ **OR / *OF*** $T_3 = \frac{2+2x-4}{2}$<br>$= \frac{2x-6}{2} + 2$ $= \frac{2x-2}{2}$<br>$= x-3+2$ $= x-1$<br>$= x-1$<br><br>$\therefore 2-(2x+11) = (x-1)-2$<br>$-2x-9 = x-3$<br>$-3x = 6$<br>$\therefore x = -2$<br><br>**OR/*OF***<br><br>$d = 2-(2x+11)$<br>$= -2x-9$<br><br>$2d = 2x-4-2$<br>$d = x-3$<br><br>$\therefore\ -2x-9 = x-3$<br>$-3x = 6$<br>$x = -2$ | ✓ method / *metode*<br>✓ simplifying / *vereenvoudiging*<br>✓ $T_3 = x-1$<br>✓ equating / *gelykstel*<br>✓ answer / *antwoord*<br><br>**OR/*OF***<br><br>✓ $d = -2x-9$<br>✓ $2d = 2x-4-2$<br>✓ $d = x-3$<br>✓ equating / *gelykstel*<br>✓ answer / *antwoord*<br>(5) |
| | | **[13]** |

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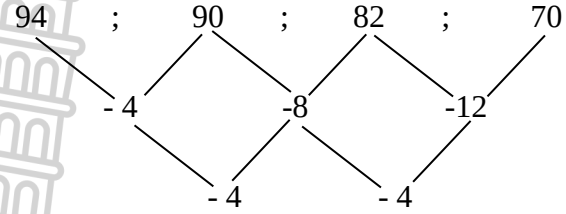
**QUESTION 4/*VRAAG 4***

| | | |
|---|---|---|
| 4.1.1 |  <br>54 ; 34 | 54 ✓ and/*en* 34 ✓<br>(2) |
| 4.1.2 | $2a=-4$ $3a+b=-4$ $a+b+c=94$<br>$\therefore a=-2$ $3(-2)+b=-4$ $2-2+c=94$<br>$b=2$ $c=94$<br>$\therefore T_n=-2n^2+2n+94$ | ✓ $a=-2$<br>✓ $b=2$<br>✓ $c=94$<br>✓ $T_n=-2n^2+2n+94$<br>(4) |
| 4.1.3 | First differences / *Eerste verskille*:<br>$t_n=-4n$<br>$\therefore -136=-4n$<br>$\therefore n=34$<br>$\therefore T_n=-2n^2+2n+94$<br>$T_{34}=-2(34)^2+2(34)+94$<br>$=-2150$<br>$\therefore T_{35}=-2(35)^2+2(35)+94$<br>$=-2286$<br>**OR/*OF***<br>$T_{n+1}-T_n=-136$<br>$-2(n+1)^2+2(n+1)+94-(-2n^2+2n+94)=-136$<br>$-2(n^2+2n+1)+2n+2+94+2n^2-2n-94=-136$<br>$-2n^2-4n-2+2n+2+94+2n^2-2n-94=-136$<br>$\therefore -4n=-136$<br>$n=34$<br>$n+1=35$<br>$\therefore T_n=-2n^2+2n+94$<br>$T_{34}=-2(34)^2+2(34)+94$<br>$=-2150$<br>$\therefore T_{35}=-2(35)^2+2(35)+94$<br>$=-2286$ | ✓ method / *metode*<br>✓ $n=34$<br>✓ $T_{34}=-2150$<br>✓ $T_{35}=-2286$<br>**OR/*OF***<br>✓ method / *metode*<br>✓ $n=34$<br>✓ $T_{34}=-2150$<br>✓ $T_{35}=-2286$<br>(4) |

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| | | |
|---|---|---|
| 4.2 | $T_n = an^2 + bn - 15$<br>$T_1 = a + b - 15$<br>$T_2 = 4a + 2b - 15$<br>$\therefore T_2 - T_1 = 3a + b = 3$<br>$T_3 = 9a + 3b - 15$<br>$T_3 - T_2 = 5a + b = 7$<br>$\therefore 5a + b = 7$<br>$3a + b = 3$<br>$2a = 4$<br>$\therefore a = 2$<br>$b = -3$ | ✓ $T_1$ and/*en* $T_2$ and/*en* $T_3$<br>✓ $3a + b = 3$<br>✓ $5a + b = 7$<br>✓ value for $a$ / *waarde van a*<br>✓ value for $b$ / *waarde van b*<br>(5) |
| | | **[15]** |

**QUESTION 5/*VRAAG 5***

| | | |
|---|---|---|
| 5.1 | $p = 3$<br>$q = -1$ | ✓ $p = 3$<br>✓ $q = -1$<br>(2) |
| 5.2 | $f(x) = \frac{a}{x+p} + q$<br>$= \frac{a}{x+3} - 1$<br>$0 = \frac{a}{-5+3} - 1$<br>$1 = \frac{a}{-2}$<br>$\therefore a = -2$ | ✓ substituting for $p$ and $q$<br>*vervanging vir p en q*<br>✓ substituting for $x$ and $y$<br>*vervanging vir x en y*<br>✓ answer / *antwoord*<br>(3) |
| 5.3 | $f(x) = \frac{a}{x+p} + q$<br>$= \frac{-2}{x+3} - 1$<br>$y = \frac{-2}{0+3} - 1$<br>$= -\frac{5}{2}$ | ✓ substituting $x = 0$<br>*vervang x = 0*<br>✓ answer / *antwoord*<br>(2) |
| 5.4 | $x \in \mathbb{R}$, but/*maar* $x \neq$ -3 | ✓ $x \in \mathbb{R}$ ✓ $x \neq -3$<br>(2) |
| 5.5 | $y = -(x+3) - 1$<br>$= -x - 3 - 1$<br>$= -x - 4$ | ✓ $y = -(x+3) - 1$<br>✓ answer / *antwoord*<br>(2) |
| 5.6 | $-5 \leq x < -3$ | ✓✓ answer / *antwoord* (A)<br>(2) |

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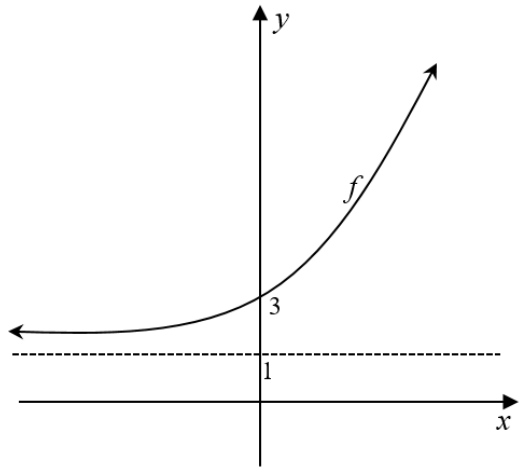
| | | |
|---|---|---|
| 5.7 | $f$ is reflected in the $x$-axis and then shifted 4 units to the right.<br>*$f$ is gereflekteer in die $x$-as en dan 4 eenhede na regs geskuif.* | ✓ reflected / *gereflekteer*<br>✓ $x$-axis / *$x$-as*<br>✓ 4 units / 4 *eenhede*<br>✓ right / *regs*<br>(4) |
| | | **[17]** |

**QUESTION 6/*VRAAG 6***

| | | |
|---|---|---|
| 6.1 | $(0;3)$ | ✓ answer / *antwoord*<br>(1) |
| 6.2 | $y=1$ | ✓✓ answer / *antwoord*<br>(2) |
| 6.3 |  | ✓ $y$-intercept / *$y$-afsnit*<br>✓ asymptote / *asimptoot*<br>✓ shape (must be increasing)<br>*vorm (moet stygend wees)*<br>(3) |
| 6.4 | $y>-5$ | ✓✓answer / *antwoord* (A)<br>(2) |
| | | **[8]** |

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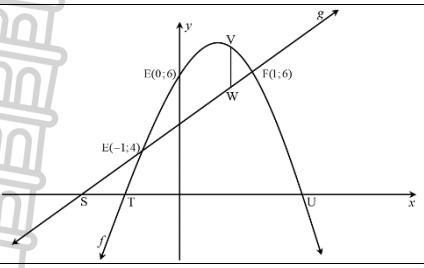
**QUESTION 7/*VRAAG 7***

| | | |
|---|---|---|
| |  | |
| 7.1 | $x = \frac{1}{2}$ | ✓ answer / *antwoord*<br>(1) |
| 7.2 | $x > \frac{1}{2}$ | ✓ answer / *antwoord*<br>(1) |
| 7.3 | Average gradient / *Gemiddelde gradiënt*<br>$= \frac{4-6}{-1-0}$<br>$= 2$ | ✓ method / *metode*<br>✓ answer / *antwoord*<br>(2) |
| 7.4 | $g(x) = mx + q$<br>$m = \frac{y_2 - y_1}{x_2 - x_1}$<br>$= \frac{6-4}{1-(-1)}$<br>$= 1$<br>$\therefore y = x + q$<br>$6 = 1 + q$ or / *of* $4 = -1 + q$<br>$\therefore q = 5$<br>$\therefore g(x) = x + 5$ | ✓ $m = 1$<br>✓ substituting a point<br>*vervanging van 'n punt*<br>✓ $q = 5$<br>(3) |
| 7.5 | $f(x) = ax^2 + bx + c$<br>$c = 6$<br>$\therefore f(x) = ax^2 + bx + 6$<br>$4 = a(-1)^2 + b(-1) + 6$<br>$6 = a(1)^2 + b(1) + 6$<br>$-2 = a - b$<br>$0 = a + b$<br>$2a = -2$<br>$\therefore a = -1$<br>$b = 1$<br>$\therefore f(x) = -x^2 + x + 6$ | ✓ $c = 6$<br>✓ both substitutions /<br>*beide vervangings*<br>✓ method / *metode*<br>✓ values of *a* and *b*<br>*waardes van a en b*<br>(4) |

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| | | |
|---|---|---|
| 7.6 | $g(x) = x + 5$<br>$0 = x + 5$<br>$\therefore x = -4$<br>$S(0;-4)$<br>$f(x) = -x^2 + x + 6$<br>$0 = -x^2 + x + 6$<br>$x^2 - x - 6 = 0$<br>$(x-3)(x+2) = 0$<br>$\therefore x = -2$ or / *of* $x = 3$<br>$\therefore U(3;0)$<br>$\therefore SU = 3 - (-4)$<br>$= 7$ units/*eenhede* | ✓ substitution / *vervanging*<br>✓ S(0 ; –4)<br>✓ factors / *faktore*<br>✓ both *x*-intercepts<br>*beide x-afsnitte*<br>✓ answer / *antwoord*<br>(5) |
| 7.7 | $x \leq -1$ or / *of* $x \geq 1$ | ✓ $x \leq -1$ ✓ $x \geq 1$<br>(2) |
| 7.8 | $y_V - y_W = f(x) - g(x)$<br>$= (-x^2 + x + 6) - (x + 5)$<br>$= -x^2 + x + 5 - x - 5$<br>$= -x^2 + 1$<br>$\therefore$ Max. length of VW is 1 unit<br>*Maks. lengte van VW is 1 eenheid* | ✓ $f(x) - g(x)$<br>✓ answer / *antwoord*<br>✓ interpretation / *interpretasie*<br>(3) |
| | | **[21]** |

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**QUESTION 8/*VRAAG 8***

| | | |
|---|---|---|
| 8.1 | $i_{eff}+1=\left(1+\frac{i_{nom}}{m}\right)^{m}$<br>$=\left(1+\frac{0,093}{12}\right)^{12}-1$<br>$=0,09707$<br>$=9,71\%$ | ✓ formula / *formule*<br>✓ substitution / *vervanging*<br>✓ answer / *antwoord*<br>(3) |
| 8.2 | $A=P(1+i)^{n}$<br>$=R312000(1+0,0691)^{5}$<br>$=R435\ 758,88$ | ✓ $n=5$ ✓substitution / *vervanging*<br>✓ answer / *antwoord*<br>(3) |
| 8.3.1 | $A=\left(23000\left(1+\frac{0,0925}{4}\right)^{12}+13500\right)\left(1+\frac{0,082}{12}\right)^{24}$<br>$=R51\ 530,18$<br>**OR/*OF***<br>$A=\left(23000\left(1+\frac{0,0925}{4}\right)^{12}+13500\right)$<br>$=R43760,23$<br>$A=R43760,23\left(1+\frac{0,082}{12}\right)^{24}$<br>$=R51530,18$ | ✓$i=\frac{0,0925}{4}$ and/*en* $n=12$<br>✓$i=\frac{0,082}{12}$ and/*en* $n=24$<br>✓ $\left(23000\left(1+\frac{0,0925}{4}\right)^{12}+13500\right)$<br>✓ $\left(1+\frac{0,082}{12}\right)^{24}$<br>✓ answer / *antwoord*<br>(5)<br>**OR/*OF***<br>✓ $i=\frac{0,0925}{4}$ and/*en* $n=12$<br>✓ $i=\frac{0,082}{12}$ and/*en* $n=24$<br>✓ $R51530,18$<br>✓ $R43760,23\left(1+\frac{0,082}{12}\right)^{24}$<br>✓ answer / *antwoord*<br>(5) |
| 8.3.2 | $A=P(1+i)^{n}$<br>$64\,487,24=51530,18\left(1+\frac{i}{12}\right)^{36}$<br>$\therefore i=\left(\sqrt[36]{\frac{64\,487,24}{51530,18}}-1\right)\times 12$<br>$=0,075$<br>rate/*koers* $=7,5\%$ | ✓ $\frac{i}{12}$ and/*en* $n=36$<br>✓ substituting / *vervang*<br>$A=R64\,487,24$<br>✓ substituting into correct formula<br>*vervanging in korrekte formule*<br>✓ answer / *antwoord*<br>(4) |
| | | **[15]** |

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**QUESTION 9/*VRAAG 9***

| | | |
|---|---|---|
| 9.1.1 | For mutually exclusive events:<br>*Vir onderling uitsluitende gebeurtenisse*:<br><br>$P(\text{A or B}) = P(\text{A}) + P(\text{B})$<br>$0,61 = 0,35 + P(\text{B})$<br>$\therefore P(B) = 0,61 - 0,35$<br>$= 0,26$ | ✓formula / *formule*<br>✓ substitution / *vervanging*<br><br>✓ answer / *antwoord*<br>(3) |
| 9.1.2 | For independent events:<br>*Vir onafhanklike gebeurtenisse*:<br><br>$P(\text{A or/}of\text{ B}) = P(\text{A}) + P(\text{B}) - P(\text{A and/}en\text{ B})$<br>$0,61 = 0,35 + P(\text{B}) - P(\text{A}).P(\text{B})$<br>$0,61 = 0,35 + P(\text{B}) - 0,35 \times P(\text{B})$<br>$0,61 = 0,35 + 0,65 \times P(\text{B})$<br>$\therefore 0,65 \times P(\text{B}) = 0,26$<br>$\therefore P(\text{B}) = \frac{0,26}{0,65}$<br>$= 0,4$ | ✓ formula / *formule*<br>✓ substitution / *vervanging*<br>✓ $0,61 = 0,35 + P(\text{B}) - 0,35 \times P(\text{B})$<br><br>✓ answer / *antwoord*<br>(4) |
| | <table><tr><td></td><td>Axis Phones</td><td>Direct Phones</td><td>Total</td></tr><tr><td>Defective</td><td>58</td><td>*a*</td><td>*b*</td></tr><tr><td>Not Defective</td><td>326</td><td>188</td><td>514</td></tr><tr><td>Total</td><td>384</td><td>*c*</td><td>600</td></tr></table> | |
| 9.2.1 | $a = 28,\ b = 86,\ c = 216$ | ✓ $a = 28$ ✓ $b = 86$ ✓ $c = 216$<br>(3) |
| 9.2.2 | $\frac{216}{600} = \frac{9}{25}$ or / *of* $0,36$ | ✓ answer / *antwoord*<br>(1) |
| 9.2.3 | P(not defective) + P(Axisphones and defective)<br>P*(nie foutief)* + *P(Axis Phones en foutief)*<br><br>$= \frac{514}{600} + \frac{58}{600}$<br><br>$= \frac{572}{600} = \frac{143}{150}$ or/*of* $0,95$ | ✓ $\frac{514}{600}$ ✓ $+\frac{58}{600}$<br><br>✓ answer / *antwoord*<br>(3) |
| | | **[14]** |

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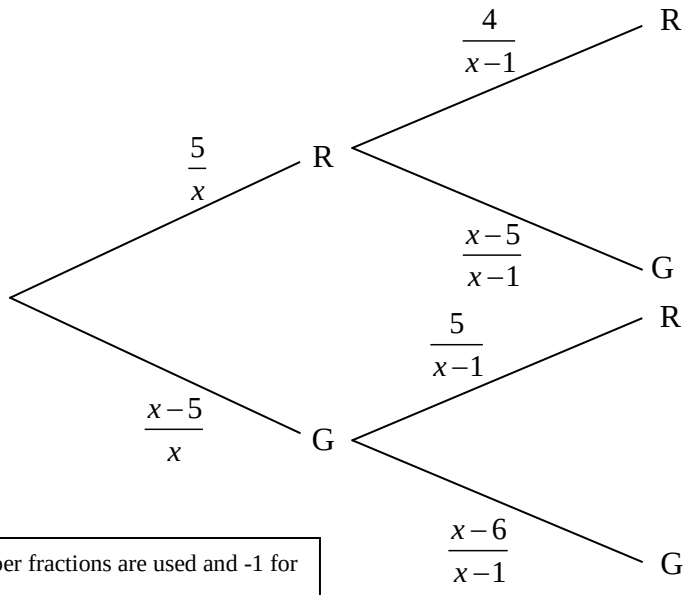
**QUESTION 10/*VRAAG 10***

10.1




CA only if proper fractions are used and -1 for 2nd pick

*VA slegs as egte breuke gebruik word en –1 vir tweede keuse.*

$$P(\text{GG}) = P(\text{G}) \times P(\text{G})$$
$$= \frac{x-5}{x} \times \frac{x-6}{x-1}$$
$$\therefore \frac{x-5}{x} \times \frac{x-6}{x-1} = \frac{3}{11}$$
$$11(x-5)(x-6) = 3x(x-1)$$
$$11(x^2 - 11x + 30) = 3x^2 - 3x$$
$$11x^2 - 121x + 330 = 3x^2 - 3x$$
$$8x^2 - 118x + 330 = 0$$
$$4x^2 - 59x + 165 = 0$$

✓ $\frac{x-5}{x} \times \frac{x-6}{x-1}$

✓ equating to $\frac{3}{11}$ / *stel gelyk aan* $\frac{3}{11}$

✓ getting rid of fractions
*raak ontslae van breuke*

✓ standard form / *standaardvorm*

**[4]**

**TOTAL/*TOTAAL*: 150**

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