basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS P1

NOVEMBER 2018

MARKS: 150

TIME: 3 hours

This question paper consists of 8 pages.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of NINE questions.
2. Answer ALL the questions.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.
5. Answers only will not necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. Round off answers to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. Write neatly and legibly.

QUESTION 1

1.1 Solve for x in each of the following:

1.1.1 $x(2x+1)=0$ (2)

1.1.2 $5x^2+2x-6=0$ (correct to TWO decimal places) (3)

1.1.3 $2x^2-2 \geq 3x$ (4)

1.1.4 $\sqrt{2x+5}-\frac{3}{\sqrt{2x+5}}=-2$ (6)

1.2 Solve for x and y simultaneously:

$y+x=2$ and $x^2+3xy+8=0$ (6)

1.3 The roots of the equation $f(x)=0$ are $x=\frac{4\pm\sqrt{16-4m(-m+5)}}{2m}$

Determine the values of m for which the roots will be non-real. (4)

1.4 Show that the maximum value of $\sqrt{-x^2+4x+12}$ is 4. (4)
[29]

QUESTION 2

2.1 Simplify fully, WITHOUT using a calculator: $\frac{2^{x-3}-3.2^{x+1}}{2^{x-2}}$ (4)

2.2 Solve for x:

2.2.1 $2-16x^{-\frac{3}{2}}=0$ (3)

2.2.2 $4^x+8=9.2^x$ (4)

2.2.3 $\sqrt[x]{9}=243$ (3)

2.3 Simplify fully:

$$\frac{\sqrt{p^2-q^2}\times(p+q)^{\frac{5}{2}}}{(p-q)^{\frac{1}{2}}} \quad \text{if } p \neq q$$

(3)
[17]

QUESTION 3

3.1 Given the linear pattern: $7 ; 2 ; -3 ; \ldots$

3.1.1 Determine the general term, T_n, of the linear pattern. (2)

3.1.2 Calculate the value of T_{20}. (2)

3.1.3 Which term in the pattern has a value of -138? (2)

3.2 $6 ; 2x+1$ and $3x-3$ are the first three terms of a linear pattern.

Calculate the value of x. (3)
[9]

QUESTION 4

The quadratic number pattern: $4 ; p ; 11 ; q ; 22 ; \ldots$ has a constant second difference of 1.

4.1 Show that $p = 7$ and $q = 16$. (3)

4.2 Determine the general term, T_n, of the quadratic pattern. (4)

4.3 Determine the value of n if $T_n = 232$. (4)

4.4 If the sum of two consecutive terms in the pattern is 1 227, calculate the difference between these two terms. (5)
[16]

QUESTION 5

Given: $f(x)=\frac{4}{x-3}+2$ and $g(x)=x+2$

5.1 Write down the equations of the asymptotes of f. (2)

5.2 Determine the x-intercept of f. (3)

5.3 Determine the y-intercept of f. (2)

5.4 Sketch the graphs of f and g on the same system of axes. Show clearly ALL the intercepts with the axes and any asymptotes. (5)

5.5 Calculate the x-coordinates of the points of intersection of f and g. (4)

5.6 If $x<3$, determine the values of x for which $\frac{4}{x-3}+2<x+2$. (2)

5.7 The line $y=x-1$ cuts f at P(1 ; 0) and Q. Write down the coordinates of Q. (3)
[21]

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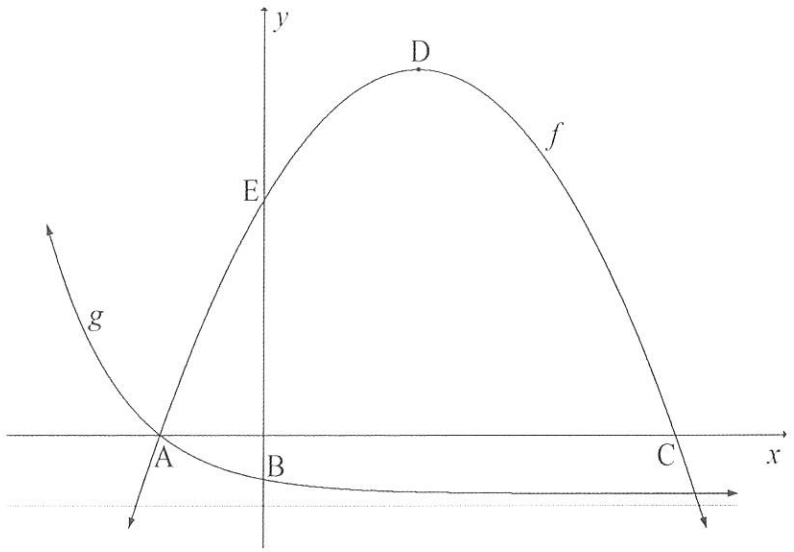
KWAZULU-NATAL

QUESTION 6

The diagram below shows the graphs of $f(x) = -(x-3)^2 + 25$ and $g(x) = 2\left(\frac{1}{2}\right)^{x+1} - 4$.

Graph f cuts the x-axis at A and C, the y-axis at E and has a turning point at D.
Graph g cuts the x-axis at A and the y-axis at B.



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

6.2 Write down the coordinates of D. (2)

6.3 Write down the range of f. (1)

6.4 Calculate the length of EB. (4)

6.5 Determine the values of x for which f is decreasing. (2)

6.6 Calculate the average gradient between points A and B. (5)

6.7 Graph t is obtained by reflecting g about the x-axis. Write down the range of t. (2)

6.8 If $p(x) = f(x) + 2$, write down the coordinates of the turning point of p. (2)

6.9 Determine the value of k for which the straight line $y = 2x + k$ will be a tangent to f. (4)

[23]

QUESTION 7

7.1 Calculate the effective interest rate per annum if an investment earns interest at a rate of 11,5% p.a., compounded monthly. (3)

7.2 Karabo bought a computer for R4 700. The value of the computer depreciated at a rate of 18% p.a. Using the reducing-balance method, calculate the book value of the computer 4 years after it was bought. (3)

7.3 Nhlanhla made an initial deposit of R20 000 into an investment account that paid interest at the rate of 7,2% p.a., compounded quarterly. After 2 years the interest rate changed to 7,8% p.a., compounded monthly. Four years after his initial deposit, Nhlanhla withdrew R2 500 from his investment.

7.3.1 Calculate how much Nhlanhla had in this investment account 2 years after the initial deposit was made. (3)

7.3.2 How much will the investment be worth 7 years after the initial deposit was made? (4)

[13]

QUESTION 8

A bag contains 6 red balls, 8 green balls and an unknown number of yellow balls. The probability of randomly choosing a green ball from the bag is 25%.

8.1 Show that there are 32 balls in the bag. (1)

8.2 A ball is drawn from the bag, the colour is recorded and it is not returned to the bag. Thereafter another ball is drawn from the bag, the colour is recorded and it is also not returned to the bag.

Draw a tree diagram to represent ALL the possible ways in which the two balls could have been drawn from the bag. Show the probabilities associated with EACH branch, as well as the outcomes. (4)

8.3 Calculate the probability that the two balls drawn from the bag will have the same colour. (4)

[9]

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QUESTION 9

9.1 On a flight, passengers could choose between a vegetarian snack and a chicken snack. The snacks selected by the passengers were recorded. The results are shown in the table below.

SNACK	MALE	FEMALE	TOTAL
Vegetarian	12	20	32
Chicken	55	63	118
TOTAL	67	83	150

Was the choice of snack on this flight independent of gender? Motivate your answer with the necessary calculations. (5)

9.2 For any two events, A and B, it is given that P(A and B) = 0,12, P(A or B) = 0,83 and P(B) = 4 P(A).

9.2.1 Are events A and B mutually exclusive? Justify your answer. (2)

9.2.2 Calculate P(B). (4)

9.2.3 Calculate P(not A). (2)
[13]

TOTAL: 150

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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 11

MATHEMATICS P1/*WISKUNDE V1*

NOVEMBER 2018

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

Memo discussion conducted on 20/11/2018 [11:55 - 13:15]
Lect Theate
[LP, RD, ADS, DC, SM]
DC - help in marking / mod & checking

These marking guidelines consist of 18 pages.
Hierdie nasienriglyne bestaan uit 18 bladsye.

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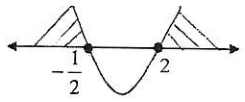
2018-11-18

NOTE:
- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking marking guidelines.
- Assuming values/answers in order to solve a problem is unacceptable.

LET WEL:
- *As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyne van toepassing.*
- *Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.*

QUESTION/*VRAAG* 1

1.1.1	$x(2x+1)=0$ $x=0$ or/*of* $x=-\frac{1}{2}$ Ignore N/A if learner rejects soln	✓ $x=0$ A ✓ $x=-\frac{1}{2}$ A (2)
1.1.2	$5x^2+2x-6=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-(2)\pm\sqrt{(2)^2-4(5)(-6)}}{2(5)}$ $=\frac{5\pm\sqrt{124}}{10}$ $x=0{,}91$ or/*of* $x=-1{,}31$ accept following formula $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $\frac{-b\pm\sqrt{b^2+4ac}}{2a}$ $\frac{b\pm\sqrt{b^2-4ac}}{2a}$	-1 for Incorrect Rounding A ✓ substitution into correct formula/ *vervanging in korrekte formule* CA ✓ answer/*antw.* ✓ answer/*antw.* CA (3)
1.1.3	$2x^2-2\geq 3x$ $2x^2-3x-2\geq 0$ $(2x+1)(x-2)\geq 0$ If Equation → MAX 2 marks  $x\leq -\frac{1}{2}$ or/*of* $x\geq 2$ DEPARTMENT OF BASIC EDUCATION PRIVATE BAG X895, PRETORIA 0001 2018 -11- 18 APPROVED MARKING GUIDELINE PUBLIC EXAMINATION	✓std form/*stand. vorm* A ✓factors or using formula/ *faktore of gebruik formule* A Combination marks ✓✓ $x\leq -\frac{1}{2}$ or/*of* $x\geq 2$ (4)

1.1.4

$\sqrt{2x+5}-\dfrac{3}{\sqrt{2x+5}}=-2$

Let $\sqrt{2x+5}=k$

$k-\dfrac{3}{k}=-2$

$k^2-3=-2k$

$k^2+2k-3=0$

$(k+3)(k-1)=0$

$k=-3$ or/*of* $k=1$

✓changing to quadratic/ *verander na kwadraties*
✓factors or using formula/ *faktore of gebruik formule*
✓$k=3$ or/*of* $k=1$

$\sqrt{2x+5}=-3$ *no solution* or/*of* $\sqrt{2x+5}=1$

$2x+5=1$

$2x=-4$

$x=-2$

✓no solution/ *geen oplossing*
✓square both sides/ *kwadreer beide kante*
✓ $x=-2$

OR/*OF*

$\sqrt{2x+5}-\dfrac{3}{\sqrt{2x+5}}=-2$

$\left(\sqrt{2x+5}\right)^2-3=-2\sqrt{2x+5}$

$\left(\sqrt{2x+5}\right)^2+2\left(\sqrt{2x+5}\right)-3=0$

$\left(\sqrt{2x+5}+3\right)\left(\sqrt{2x+5}-1\right)=0$

$\sqrt{2x+5}=-3$ or $\sqrt{2x+5}=1$

$\sqrt{2x+5}=-3$ *no solution* or/of $\sqrt{2x+5}=1$

$2x+5=1$

$2x=-4$

$x=-2$

✓changing to quadratic/ *verander na kwadraties*
✓factors/*fakt.*
✓$\sqrt{2x+5}=-3$ or/*of* $\sqrt{2x+5}=1$
✓ no solution/ *geen oplossing*
✓square both sides/ *kwadreer beide kante*
✓ $x=-2$

(6)

OR/OF

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$\sqrt{2x+5}-\dfrac{3}{\sqrt{2x+5}}=-2$

$2x+5-3=-2\sqrt{2x+5}$

$2x+2=-2\sqrt{2x+5}$

$(2x+2)^2=\left(-2\sqrt{2x+5}\right)^2$

$4x^2+8x+4=4(2x+5)$

$4x^2+8x+4=8x+20$

$4x^2-16=0$

$x^2-4=0$

$(x+2)(x-2)=0$

$x=-2$ *or / of* $x\neq 2$

✓Multiplying by/ *Vermenigv. met* $\sqrt{2x+5}$ /
✓square both sides/ *kwadreer beide kante*
✓std form/ *vorm*
✓factors/*fakt.*
✓ $x\neq 2$
✓ $x=-2$

(6)

1.2

$y+x=2$ and/en $x^2+3xy+8=0$

$\therefore\ y=2-x$

$x^2+3x(2-x)+8=0$

$x^2+6x-3x^2+8=0$

$-2x^2+6x+8=0$

$x^2-3x-4=0$

$(x-4)(x+1)=0$

$x=4$ or $x=-1$

$y=2-4$ or / *of* $y=2-(-1)$

$y=-2$ $y=3$

✓ $y=2-x$
✓substitution/*verv.*
✓std form/*stand. vorm*
✓factors or using formula/ *faktore of gebruik formule*
✓both x-values/*wrdes*
✓both y-values/*wrdes*

(6)

OR/*OF*

$y+x=2$ and $x^2+3xy+8=0$

$\therefore\ x=2-y$

$(2-y)^2+3(2-y)y+8=0$

$4-4y+y^2+6y-3y^2+8=0$

$-2y^2+2y+12=0$

$y^2-y-6=0$

$(y-3)(y+2)=0$

$y=3$ or $y=-2$

$x=2-3$ or $x=2-(-2)$

$x=-1$ or $x=4$

✓ $x=2-y$
✓substitution/*verv.*
✓std form/*stand. vorm*
✓factors or using formula/ *faktore of gebruik formule*
✓both y-values/*wrdes*
✓both x-values/*wrdes*

(6)

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1.3

$$x=\frac{4\pm\sqrt{16-4m(-m+5)}}{2m}$$

For non-real roots/Vir nie-reële wortels: $16-4m(-m+5)<0$

$$16+4m^2-20m<0$$
$$m^2-5m+4<0$$
$$(m-4)(m-1)<0$$
$$1<m<4$$

$m>1$ and $m<4$

✓$16-4m(-m+5)<0$

✓factors or using formula/ *faktore of gebruik formule*

✓✓$1<m<4$ (4)

1.4

$$-x^2+4x+12$$
$$=-1(x^2-4x-12)$$
$$=-1(x^2-4x+4-4-12)$$
$$=-1(x-2)^2+16$$

The maximum value of/*Die maksimum waarde van* $-x^2+4x+12$ is 16

$\therefore$ max value of $\sqrt{-x^2+4x+12}$ is 4

OR/*OF*

$$\sqrt{-x^2+4x+12}$$

max when $x=\frac{-b}{2a}$

$$=\frac{-4}{2(-1)}$$
$$=2$$

max value $y=-(2)^2+4(2)+12$
$=16$

The maximum value of/*Die maksimum waarde van* $-x^2+4x+12$ is 16

$\therefore$ max value of $\sqrt{-x^2+4x+12}$ is 4

✓$-1(x^2-4x-12)$

✓$-1(x^2-4x+4-4-12)$

✓$-1(x-2)^2+16$

✓$\sqrt{16}=4$

OR/*OF*

✓subst/*verv.*

✓x-value/*waarde*

✓y-value/*waarde*

✓ $\sqrt{16}=4$ (4)

[29]

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QUESTION/*VRAAG* 2

2.1

$$\frac{2^{x-3}-3.2^{x+1}}{2^{x-2}}$$
$$=\frac{2^x.2^{-3}-3.2^x.2^1}{2^x.2^{-2}}$$
$$=\frac{2^x(2^{-3}-3.2)}{2^x.2^{-2}}$$
$$=\frac{\frac{1}{8}-6}{\frac{4}{1}}$$
$$=-\frac{47}{2}$$

✓separate bases/*aparte basisse*

✓common factor/*gemene fakt.*

✓$(2^{-3}-3.2)$

✓answer/*antw.* (4)

2.2.1

$$16x^{-\frac{3}{2}}=2$$
$$x^{-\frac{3}{2}}=\frac{1}{8}$$
$$\left(x^{-\frac{3}{2}}\right)^{-\frac{2}{3}}=\left(2^{-3}\right)^{-\frac{2}{3}}$$
$$x=4$$

OR/*OF*

$$2-16x^{-\frac{3}{2}}=0$$
$$2=2^4.x^{-\frac{3}{2}}$$
$$2^{-3}=x^{-\frac{3}{2}}$$
$$x=2^{-3\times-\frac{2}{3}}$$
$$x=4$$

✓isolating/*isoleer x*

✓raising both sides by/*verhef albei kante met* $-\frac{2}{3}$

✓answer/*antw.* (3)

✓prime base/*priembasis*

✓exp law/*eksp. wet*

✓answer/*antw.* (3)

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2.2.2	$4^x + 8 = 9.2^x$ $(2^2)^x - 9.2^x + 8 = 0$ $2^{2x} - 9.2^x + 8 = 0$ $(2^x - 8)(2^x - 1) = 0$ $2^x = 8$ or $2^x = 1$ $2^x = 2^3$ $2^x = 2^0$ $x = 3$ $x = 0$ **OR/*OF*** $4^x + 8 = 9.2^x$ $(2^2)^x - 9.2^x + 8 = 0$ $2^{2x} - 9.2^x + 8 = 0$ Let $2^x = k$ $k^2 - 9.k + 8 = 0$ $(k-8)(k-1) = 0$ $k = 8$ *or* $k = 1$ $2^x = 8$ $2^x = 2^0$ $2^x = 2^3$ $x = 0$ $x = 3$	✓standard form/*stand. vorm* ✓$2^x = 8$ or $2^x = 1$ ✓ $x = 3$ ✓ $x = 0$ (4) ✓standard form/*stand. vorm* ✓$2^x = 8$ or $2^x = 1$ ✓ $x = 3$ ✓ $x = 0$ (4)
2.2.3	$\sqrt[x]{9} = 243$ $3^{\frac{2}{x}} = 3^5$ $\frac{2}{x} = 5$ **OR/ OF** $x = \frac{2}{5}$ $\left(\sqrt[x]{3^2}\right)^x = (3^5)^x$ $3^2 = 3^{5x}$ $2 = 5x$ $x = \frac{2}{5}$	✓exp form/*eksp. vorm* ✓equating the exp/*gelykst van eks* ✓answer/*antw.* (3)
2.3	$\frac{\sqrt{p^2 - q^2} \times (p+q)^{\frac{5}{2}}}{(p-q)^{\frac{1}{2}}}$ $= \frac{\sqrt{(p-q)(p+q)} \times (p+q)^{\frac{5}{2}}}{(p-q)^{\frac{1}{2}}}$ $= \frac{(p-q)^{\frac{1}{2}}(p+q)^{\frac{1}{2}} \times (p+q)^{\frac{5}{2}}}{(p-q)^{\frac{1}{2}}}$ $= (p+q)^{\frac{1}{2}+\frac{5}{2}}$ $= (p+q)^3$ DEPARTMENT OF BASIC EDUCATION PRIVATE BAG X895, PRETORIA 0001 2018 -11- 18 APPROVED MARKING GUIDELINE PUBLIC EXAMINATION	✓difference of 2 squares *verskil van 2 kwadrate* ✓exponent law/*eksponentwet* ✓answer/*antw.* (3)

	OR/OF $\frac{\sqrt{p^2 - q^2} \times (p+q)^{\frac{5}{2}}}{(p-q)^{\frac{1}{2}}}$ $= \sqrt{\frac{(p-q)(p+q)(p+q)^5}{(p-q)}}$ $= \sqrt{(p+q)^6}$ $= (p+q)^3$	✓difference of 2 squares *verskil van 2 kwadrate* ✓exponent law/*eksponentwet* ✓answer/*antw.* (3) **[17]**

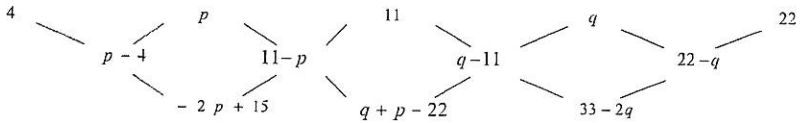
QUESTION/*VRAAG* 3

3.1.1	7 2 -3 -5 -5 $T_n = an + b$ $= -5n + 12$	✓$-5n$ ✓12 (2)
3.1.2	$T_{20} = -5(20) + 12$ $= -88$	✓substitution/*verv.* ✓answer/*antw.* (2)
3.1.3	$-5n + 12 = -138$ $-5n = -150$ $n = 30$ 30th term (T_{30})	✓substitution/*verv.* ✓answer/*antw.* (2)
3.2	6 $2x+1$ $3x-3$ $2x-5$ $x-4$ $2x - 5 = x - 4$ $x = 1$ A.M method DEPARTMENT OF BASIC EDUCATION PRIVATE BAG X895, PRETORIA 0001 2018 -11- 18 APPROVED MARKING GUIDELINE PUBLIC EXAMINATION	✓$2x - 5$ and/*en* $x - 4$ ✓equating/*verg.* ✓answer/*antw.* (3) **[9]**

$\frac{3x - 3 + 6}{2} = 2x + 1$

$x = 1$ → Full marks

QUESTION/*VRAAG* 4



4.1

1st difference/*1ste verskil*:
$p-4;\ 11-p;\ q-11;\ 22-q$
2nd difference/*2de verskil*:
$-2p+15;\ q+p-22;\ 33-2q$

✓ $p-4;\ 11-p;\ q-11;\ 22-q$ A
✓ $-2p+15;\ q+p-22;\ 33-2q$ A

$-2p+15=1$
$-2p=-14$
$p=7$
$33-2q=1$
$-2q=-32$
$q=16$

or/*of*

$q+p-22=1$
$q+7-22=1$
$q=16$

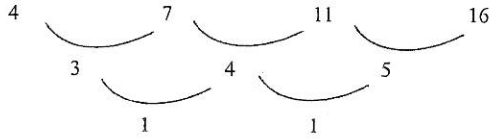
✓ $-2p+15=1$ and/*en* $33-2q=1$ A

(3)

OR/ OF

$-2p+15=1$
$-2p=-14$
$p=7$

✓ $p-4;\ 11-p$
✓ $-2p+15=1$



✓ subst. of p in pattern to find q/ *vervang p in patroon om q te vind*

(3)

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4.2

$2a=1$
$a=\frac{1}{2}$
$3a+b=3$
$3\left(\frac{1}{2}\right)+b=3$
$b=\frac{3}{2}$
$a+b+c=4$
$\frac{1}{2}+\frac{3}{2}+c=4$
$c=2$
$T_n=\frac{1}{2}n^2+\frac{3}{2}n+2$

✓ $a=\frac{1}{2}$ A
✓ $b=\frac{3}{2}$ CA
✓ $c=2$ CA
✓ $T_n=\frac{1}{2}n^2+\frac{3}{2}n+2$ CA

$T_n = 0{,}5n^2 + 1{,}5n + 2$

answer only (1/4 mark)

(4)

OR/OF

$T_0=c=2$
$2a=1$
$a=\frac{1}{2}$
$T_n=an^2+bn+c$
$4=\frac{1}{2}n^2+b(1)+2$
$b=\frac{3}{2}$

$T_n=\frac{1}{2}n^2+\frac{3}{2}n+2$

✓ $c=2$
✓ $a=\frac{1}{2}$
✓ $b=\frac{3}{2}$
✓ $T_n=\frac{1}{2}n^2+\frac{3}{2}n+2$

(4)

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4.3	$T_n = 232$ $\frac{1}{2}n^2 + \frac{3}{2}n + 2 = 232$ $\frac{1}{2}n^2 + \frac{3}{2}n - 230 = 0$ $n^2 + 3n - 460 = 0$ $(n+23)(n-20) = 0$ $n \neq -23$ *or* $n = 20$) $n \in \mathbb{N}$	CA ✓$\frac{1}{2}n^2 + \frac{3}{2}n + 2 = 232$ CA ✓standard form/*std. vorm* CA ✓factors/subst quad. eq. */faktore/ verv kwadr. verg* CA ✓selecting/*kies* $n = 20$ (4)
4.4	$\frac{1}{2}n^2 + \frac{3}{2}n + 2 + \frac{1}{2}(n+1)^2 + \frac{3}{2}(n+1) + 2 = 1227$ $\frac{1}{2}n^2 + \frac{3}{2}n + 2 + \frac{1}{2}(n^2 + 2n + 1) + \frac{3}{2}n + \frac{3}{2} + 2 = 1227$ $\frac{1}{2}n^2 + \frac{3}{2}n + 2 + \frac{1}{2}n^2 + n + \frac{1}{2} + \frac{3}{2}n + \frac{3}{2} + 2 = 1227$ $n^2 + 4n + 6 = 1227$ $n^2 + 4n - 1221 = 0$ $(n+37)(n-33) = 0$ $n \neq -37 \quad n = 33$ OR// Trial & Error approach Full marks $T_{34} - T_{33} = \frac{1}{2}(34)^2 + \frac{3}{2}(34) + 2 - \left(\frac{1}{2}(33)^2 + \frac{3}{2}(33) + 2\right)$ $T_{34} - T_{33} = 631 - 596$ $T_{34} - T_{33} = 35$ answer only 1 mark	CA ✓subst into/*verv. in* $T_n + T_{n+1} = 1227$ CA ✓expansion/*ontw.* CA ✓standard form/*std. vorm* CA ✓value of/*wrde van* n CA ✓answer/*antw.* (5) [16]

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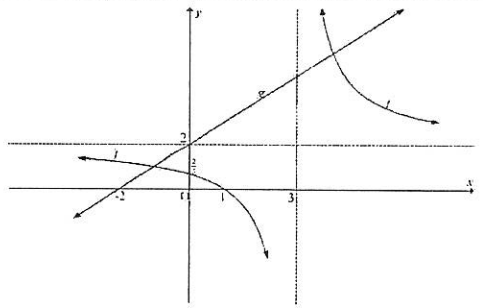
QUESTION/*VRAAG* 5

answer in terms of Cartesian plane
NO Marks for use of p ε/q variables

5.1	$x = 3$ $y = 2$	✓$x = 3$ A ✓$y = 2$ A (2)
5.2	$0 = \frac{4}{x-3} + 2$ $-2 = \frac{4}{x-3}$ $-2(x-3) = 4$ $-2x + 6 = 4$ $x = 1$ → no need for coord. fm answer only FULL MARKS answer only full marks if must be coordinate fm **OR/OF** $(1;0)$ Otherwise 2 marks or $x = 2$ answers DEPARTMENT OF BASIC EDUCATION PRIVATE BAG X895, PRETORIA 0001 2018 -11- 18 APPROVED MARKING GUIDELINE PUBLIC EXAMINATION	✓subst./*verv.* $y = 0$ A ✓simplification/*vereenv.* CA (applies to any step) ✓answer/*antw.* CA (3) ✓✓✓answer/*antw* (3)
5.3	$y = \frac{4}{0-3} + 2$ $= \frac{2}{3}$ **OR/OF** $\left(0; \frac{2}{3}\right)$ → must be in coordinate fm (full marks)	✓subst/*verv.* $x = 0$ A ✓answer/*antw.* CA (2) ✓✓answer/*antw* (2)
5.4		For/*Vir f* ✓asymptotes/*asimptote* CA ✓shape/*vorm* A ✓x- and y- int. */afsnit* CA For/*Vir g* ✓x-int./*afsnit* A ✓y-int./*afsnit* A (5)

5.5	$\frac{4}{x-3}+2=x+2$ $\frac{4}{x-3}=x+2-2$ $\frac{4}{x-3}=x$ $x(x-3)=4$ $x^2-3x-4=0$ $(x-4)(x+1)=0$ $x=4$ or $x=-1$	✓$\frac{4}{x-3}+2=x+2$ A ✓std vorm/*stand. vorm* CA ✓factors/*faktore* CA ✓answers/*antw.* CA (4)
5.6	$-1<x<3$ CA A	✓✓answer/*antwoord* (2)
5.7	$y=x+c$ $2=(3)+c$ $-1=c$ $\therefore y=x-1$ Is an axis of symmetry of/ *simmetrie-as van f* $Q(\sqrt{4}+3;\sqrt{4}+2)=Q(5;4)$ **OR/ OF** $x-1=\frac{4}{x-3}+2$ $x-3=\frac{4}{x-3}$ $(x-3)^2=4$ $x^2-6x+5=0$ $(x-5)(x-1)=0$ $x=5$ *or* $x=1$ $y=5-1=4$ $Q(5;4)$	✓$Q(\sqrt{4}+3;\sqrt{4}+2)$ A ✓5 CA ✓4 CA values for $x>3$ and $y>2$ (3) ✓equating / *vergelyk* ✓5 ✓4 (3) **[21]**

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QUESTION/*VRAAG* 6

6.1	$y=-4$	✓answer/*antwoord* A (1)
6.2	D(3;25)	✓3 A ✓25 A (2)
6.3	$y\leq 25$ *or* $y\in(-\infty;25]$	✓answer/*antwoord* A (1)
6.4	$f(0)=-(x-3)^2+25$ $=-(0-3)^2+25$ $=16$ E(0;16) $g(0)=2\left(\frac{1}{2}\right)^{0+1}-4$ $=-3$ B(0;−3) $EB=16-(-3)=19$ units/*eenhede*	✓substitute/*verv.* $x=0$ A ✓$f(0)=16$ CA ✓$g(0)=-3$ A ✓answer/*antwoord* CA (4)
6.5	$x>3$ or/ *of* $x\in(3;\infty)$ Accept/*Aanvaar* $x\geq 3$ or/*of* $x\in[3;\infty)$	✓✓answer/*antwoord* (2)

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6.6	$0=2\left(\frac{1}{2}\right)^{x+1}-4$ $4=2\left(\frac{1}{2}\right)^{x+1}$ $2=\left(\frac{1}{2}\right)^{x+1}$ $2=2^{-x-1}$ $1=-x-1$ $x=-2$ A(−2;0) B(0;−3) Ave gradient/Gemid gradiënt $=\frac{y_2-y_1}{x_2-x_1}$ $=\frac{-3-0}{0+2}$ $=-\frac{3}{2}$ **OR/ OF** $-(x-3)^2+25=0$ $(x-3)^2=25$ $x-3=5$ *or* $x-3=-5$ $x=8$ $x=-2$ A(−2;0) B(0;−3) Ave gradient/Gemid gradiënt $=\frac{y_2-y_1}{x_2-x_1}$ $=\frac{-3-0}{0+2}$ $=-\frac{3}{2}$	✓substitution/*verv.* ✓equating exponent/*gelykst. eksp.* ✓answer/*antwoord* ✓subst. into correct formula /*verv. in formule* ✓answer/*antwoord* (5) ✓substitution/*verv.* ✓factors or using formula/ *faktore of gebruik formule* ✓answer/*antwoord* ✓subst. into correct formula /*verv. in formule* ✓answer/*antwoord* (5)

6.7	$t(x)=-g(x)$ $=-\left(2\left(\frac{1}{2}\right)^{x+1}-4\right)$ $=-2\left(\frac{1}{2}\right)^{x+1}+4$ Range/*Waardeversameling*: $y<4$ or $y\in(-\infty;4)$	✓$-2\left(\frac{1}{2}\right)^{x+1}+4$ ✓$y<4$ or $y\in(-\infty;4)$ (2)
6.8	Turning point/ draaipunt ; (3;27)	✓3 ✓27 (2)
6.9	$f(x)=-(x-3)^2+25$ $=-x^2+6x+16$ $-x^2+6x+16=2x+k$ $-x^2+4x+16-k=0$ tangent has one point of intersection thus two equal roots/ raaklyn het een snypunt dus twee gelyke wortels $\Delta=(4)^2-4(-1)(16-k)=0$ $16+64-4k=0$ $80=4k$ $k=20$	✓$-x^2+6x+16$ ✓equating/*vergelyk* ✓$(4)^2-4(-1)(16-k)=0$ ✓answer/*antw.* (4) **[23]**

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QUESTION/*VRAAG* 7

Don't Penalize for incorrect Rounding

7.1	$1+i_{eff}=\left(1+\frac{i_{nom}}{m}\right)^{m}$ $1+i_{eff}=\left(1+\frac{0,115}{12}\right)^{12}$ $i_{eff}=\left(1+\frac{0,115}{12}\right)^{12}-1$ $i_{eff}=12,13\%$	✓formula/*form.* A ✓$i=\frac{0,115}{12}$ A ⇐ Figure formula but award mark. ✓answer/*antw.* CA (3)
7.2	$A=P(1-i)^{n}$ If $A=P(1+i)^{n}\Rightarrow$ B/D $=4\,700(1-0,18)^{4}$ $=R\,2124.97$	✓formula/*form.* A ✓substitution/*verv.* A ✓answer/*antw.* CA (3)
7.3.1	$A=P(1+i)^{n}$ If $A=P(1-i)^{n}\Rightarrow$ B/D $=20000\left(1+\frac{0,072}{4}\right)^{2\times4}$ $=R\,23\,068,12$	✓formula/*form.* A ✓substitution/*verv.* A ✓answer/*antw.* CA (3)
7.3.2	$A=P(1+i)^{n}$ $=23068,12\left(1+\frac{0,078}{12}\right)^{2\times12}$ $=R26\,949,12$ $R26\,949,12-R2\,500$ $=R24\,449,12$ $A=P(1+i)^{n}$ $=24\,449.12\left(1+\frac{0,078}{12}\right)^{3\times12}$ $=R30871,61$	any formula can be used ✓$\frac{0,078}{12}$ and $n=24$ A CA ✓A(after 2 years) − R2 500 ✓$n=36$ A ✓answer/*antw.* CA (4)
	OR/*OF* $A=23068,12\left(1+\frac{0,078}{12}\right)^{12\times5}-2500\left(1+\frac{0,078}{12}\right)^{12\times3}$ $=R30871,48$	any formula can be used ✓$i=\frac{0,078}{12}$ and $n=60$ A ✓✓ $-2500\left(1+\frac{0,078}{12}\right)^{12\times3}$ A CA ✓ answer/*antw.* A (4)
		[13]

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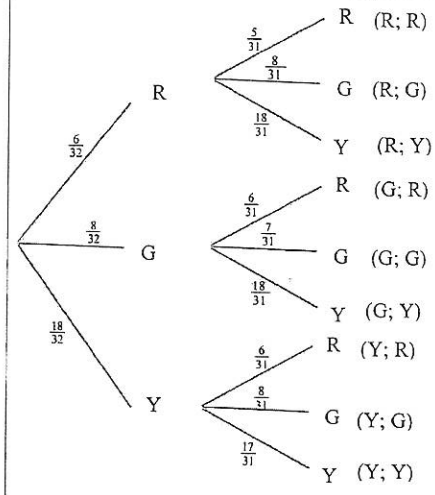
QUESTION/*VRAAG* 8

25% ≈ 8 balls ∴ 32 balls
75% ≈ 8×3 = 24 balls

8.1	Given/*Gegee*: P(G) = 0,25 Let x be the total number of balls $P(G)=\frac{8}{x}=\frac{1}{4}$ $x=32$ $n(S)=32$ **OR/OF** Let x be the number of yellow balls $\therefore x+14$ be the total number of balls $P(G)=\frac{8}{x+14}=\frac{1}{4}$ $x+14=32$ $n(S)=32$	✓ $\frac{8}{x}=\frac{1}{4}$ A (1) ✓ $\frac{8}{x+14}=\frac{1}{4}$ A (1)
8.2	 	Refer to addendum 2 marks only ✓18 (number of yellow balls/ *aantal geel balle*) A ✓branches/*takke* A ✓probabilities/*waarskynlikhede* A ✓outcomes/*uitkomste* A (4)
8.3	P(G,G) + P(R,R) + P(Y,Y) $=\left(\frac{8}{32}\times\frac{7}{31}\right)+\left(\frac{6}{32}\times\frac{5}{31}\right)+\left(\frac{18}{32}\times\frac{17}{31}\right)$ $=\frac{49}{124}$ → answer must be between 0 & 1 0,395 / 39,5%	✓$\left(\frac{8}{32}\times\frac{7}{31}\right)$ CA ✓$\left(\frac{6}{32}\times\frac{5}{31}\right)$ CA ✓$\left(\frac{18}{32}\times\frac{17}{31}\right)$ CA ✓answer/ *antw* CA (4)
		[9]

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QUESTION/*VRAAG* 9

9.1	Method 1 $P(V)\times P(M)$ $\frac{32}{150}\times\frac{67}{150}=0,095$ $P(V \text{ and/en } M)=\frac{12}{150}=0,08$ $P(V \text{ and/en } M)\neq P(V)\times P(M)$ The events are not independent/*Die gebeurtenisse is nie onafhanklik* **OR/*OF*** Method 2 $P(V)\times P(F)$ $\frac{32}{150}\times\frac{83}{150}=0,118$ $P(V \text{ and } F)=\frac{20}{150}=0,133$ $P(V \text{ and } F)\neq P(V)\times P(F)$ The events are not independent/*Die gebeurtenisse is nie onafhanklik*	✓ $\frac{32}{150}$ ✓ $\frac{67}{150}$ ✓ $P(V)\times P(M)=0,095$ ✓ $P(V \text{ and/en } M)=0,08$ ✓ conclusion/*gevolgtr.* (5) ✓ $\frac{32}{150}$ ✓ $\frac{83}{150}$ ✓ $P(V)\times P(F)=0,118$ ✓ $P(V \text{ and } F)=0,133$ ✓ conclusion/*gevolgtr.* (5)
9.2.1	$P(A \text{ and/en } B)=0,12\neq 0$ Events are not mutually exclusive/ *Gebeurtenisse nie onderling uitsluitend nie*	✓ $P(A \text{ and } B)\neq 0$ ✓ conclusion/*gevolgtr.* (2)
9.2.2	$P(A \text{ or } B)=P(A)+P(B)-P(A \text{ and } B)$ $0,83=P(A)+4P(A)-0,12$ $0,95=5P(A)$ $P(A)=0,19$ $P(B)=4(0,19)=0,76$	✓ formula/*formule* ✓ substitution/*verv.* ✓ $P(A)$ ✓ $P(B)$ (4)
9.2.3	$P(\text{not } A)=1-P(A)$ $=1-0,19$ $=0,81$	✓ $P(\text{not } A)=1-P(A)$ ✓ answer/*antw.* (2) **[13]**

TOTAL/*TOTAAL*: 150

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GRADE 11 MATHEMATICS
NOVEMBER 2018: PAPER 1
ADDENDUM TO THE MARKING GUIDELINES

These notes have been created to provide options that learners may use and the appropriate mark allocation for their answers.

1.1.2	• CA on x if incorrect formula. Only accept the following as incorrect formula: $\frac{b\pm\sqrt{b^2-4ac}}{2a}$, i.e. negative sign omitted before b or $\frac{-b\pm\sqrt{b^2+4ac}}{2a}$, i.e. incorrect sign under root. • $\frac{-b+\sqrt{b^2+4ac}}{2a}$: 1 mark for correct value of answer • Penalty -1 for incorrect rounding
1.1.3	• If NO factors shown, the factors marks can be awarded for the absolutely correct critical values in the answer. If NO factors shown, no marks for incorrect answer. • Final answer marks cannot be spilt into critical values and notation. It is a combination mark for reading the correct interval. • $x\leq -\frac{1}{2}$; $x\geq 2$ Accept as correct ; in the place of or: 4 marks • $x\leq -\frac{1}{2}$ *and* $x\geq 2$: maximum 2 marks • $x<-\frac{1}{2}$ *or* $x>2$: maximum 3 marks
1.1.4	• If no factors are shown, then award 2 marks for the correct values of k. • B/D if each term is squared independently
1.3	• $m<4$ *and* $m>1$ is correct and award 4 marks • $m<4$ *or* $m>1$ or $m<4$ $m>1$: award 3 marks
3.1.2	CA from 3.1.1 provided that T_n is linear.
3.1.3	• CA from 3.1.1 provided that T_n is linear. • If CA from 3.1.1 results in n not being an integral value and candidate goes on to reject this value of n, then award 2 marks.
3.1.4	If first differences are incorrect, then CA applies.
4.2	Answer only $T_n=\frac{1}{2}n^2+\frac{3}{2}n+2$: 1 mark for final answer only
4.3	• CA from 4.2 • Answer only $n=20$: 1 mark for final answer only
4.4	• CA from 4.2 • If Trial and error used and arrive at $T_{34}-T_{33}=35$: award 5 marks • Answer only 35: 1 mark for final answer only
5.2	• Simplification mark is awarded for any of the 2nd, 3rd or 4th line in the memo. • No penalty if answer not given in coordinate form • Answer only (1 ; 0): award 3 marks • Answer only $x=1$: award 2 marks
5.3	Answer only $\left(0;\frac{2}{3}\right)$: award 2 marks
5.4	Shape mark is awarded if 2 parts to hyperbola, a decreasing function and not touching asymptotes
5.6	CA from 5.1 and 5.5 for critical values

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6.5	CA from 6.2
6.6	• CA on B from 6.4 • If gradient formula is $\frac{x_2 - x_1}{y_2 - y_1}$, then B/D on average gradient
6.7	Answer only: 2 marks
7.1	The mark for $i = \frac{0{,}115}{12}$ is independent of the formula
7.2	B/D if growth formula is used
7.3.1	B/D if reduction formula is used
7.3.2	• CA from 7.3.1 • The first mark for i and n is independent of formula
8.2	If the tree diagram is drawn for 3 balls selected one after the other, then a maximum of 2 marks can be awarded
8.3	CA from 8.2
9.2.3	CA from 9.2.2

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