basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

MATHEMATICS P1

NOVEMBER 2018

MARKS: 100

TIME: 2 hours

This question paper consists of 7 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

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

QUESTION 1

1.1 Factorise the following expressions fully:

1.1.1 $4x - x^3$ (2)

1.1.2 $x^2 + 15x - 54$ (2)

1.1.3 $y - xy + x - 1$ (3)

1.2 Simplify the following expressions fully:

1.2.1 $(x+2)(x^2 - x + 3)$ (2)

1.2.2 $\frac{5}{x+3} - \frac{3}{2-x}$ (3)

1.2.3 $\frac{25^{-x}.15^{x+1}}{3^x.5^{-x}}$ (3)

1.3 Determine the value of $(3p+q)^2$ if $9p^2 + q^2 = 12$ and $pq = -3$. (3)
[18]

QUESTION 2

2.1 Solve for x:

2.1.1 $px + qx = a$ (2)

2.1.2 $2x^2 - 5x + 2 = 0$ (3)

2.1.3 $\left(\frac{1}{2}\right)^{3x+1} = 32$ (3)

2.2 Given: $-11 \leq 3m - 8 < 4$

2.2.1 Solve for m. (2)

2.2.2 Hence, write down the number of integers that satisfy the inequality. (1)

2.3 Solve simultaneously for x and y if:

$5x + 4y = 21$ and $2x = 3 - y$ (4)
[15]

QUESTION 3

Consider the finite linear pattern: 20 ; 17 ; 14 ; ... ; –103

3.1 Write down the 4^{th} term of the pattern. (1)

3.2 Determine the expression for the n^{th} term. (2)

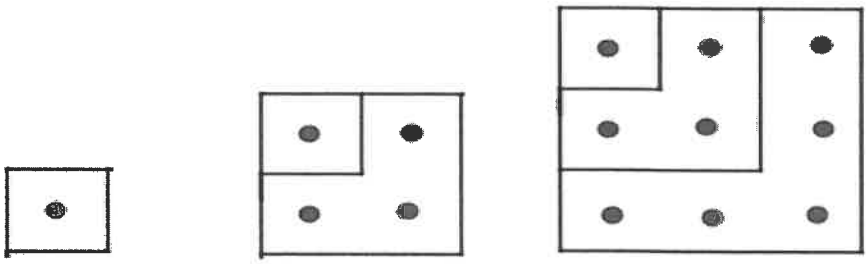
3.3 Calculate the number of terms in the sequence. (2)

3.4 Which term is the first to have a negative value? (3)

3.5 What is the value of the 19^{th} even-valued term in the sequence? (2)
[10]

QUESTION 4

Samantha is investigating a pattern of dots represented in the diagram below.



Pattern number:	1	2	3
Number of dots:	$1^2 = 1$	$1+3=2^2=4$	$1+3+5=3^2=9$

4.1 Write down:

4.1.1 The number of dots in the 4^{th} pattern (1)

4.1.2 The number of dots in the 13^{th} pattern (1)

4.1.3 A formula for the number of dots in the n^{th} pattern (1)

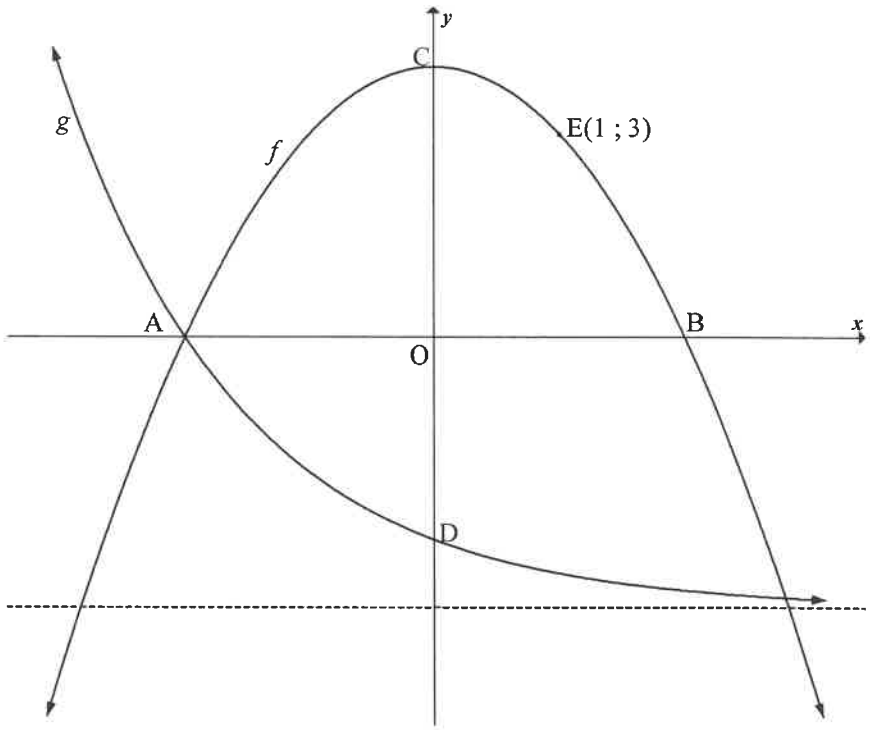
4.2 Hence, or otherwise, calculate the value of:

$1+3+5+...+43$ (3)
[6]

QUESTION 5

Sketched below are the graphs of $f(x) = ax^2 + q$ and $g(x) = \left(\frac{1}{2}\right)^x - 4$.

A and B are the x-intercepts of f. The graphs intersect at A and point E (1 ; 3) lies on f.
C is the turning point of f and D is the y-intercept of g.



5.1 Write down the:

5.1.1 Coordinates of D (2)

5.1.2 Range of g (1)

5.2 Calculate the:

5.2.1 Coordinates of A (2)

5.2.2 Values of a and q (4)

5.3 Determine the:

5.3.1 Length of CD (2)

5.3.2 Equation of a straight line through A and D (3)

5.4 For which values of x is:

5.4.1 $f(x) > 0$? (2)

5.4.2 f decreasing? (1)
[17]

QUESTION 6

The equation of the function $g(x)=\frac{a}{x}+q$ passes through the point $(3;2)$ and has a range of $y\in(-\infty;1)\cup(1;\infty)$.

6.1 Determine the:

6.1.1 Equation of g (3)

6.1.2 Equation of h, the axis of symmetry of g which has a positive gradient (2)

6.2 Sketch the graphs of g and h on the same system of axes. Clearly show ALL the asymptotes and intercepts with axes. (4)

6.3 Write the equations of the asymptotes of f if $f(x)=-g(x)+5$. (3)
[12]

QUESTION 7

Read the advertisement below.

Buy a Samsung J5 for only R229 per month.

You have 24 months to pay. No deposit is required.

7.1 Calculate the total amount to be paid over a period of 24 months. (1)

7.2 The monthly instalment, quoted in the advertisement, is calculated on a hire purchase agreement which charges interest of 7,5% p.a. on the cash price of the cellphone. Show that the price of the cellphone is R4 779,13. (2)

7.3 Calculate the total interest paid over a period of 24 months if the cellphone is bought with this hire purchase agreement. (1)

7.4 The cellphone is insured at 11,5% p.a of the cash price. The total insurance is calculated and then split up over 24 months. It is then added to the monthly instalment. Calculate the new monthly instalment if the customer wants to insure the cellphone. (3)

7.5 The cost of the cellphone is subject to inflation and increases to a cash price of R5 100,00 after 2 years. Calculate the annual inflation rate. (4)
[11]

QUESTION 8

8.1 In a random physical sciences experiment, A and B are two different events. It was found that:

$$P(A)=\frac{2}{5},\ P(B')=\frac{3}{8} \text{ and } P(A \text{ or } B)=\frac{5}{7}$$

8.1.1 Calculate:

(a) P(B) (2)

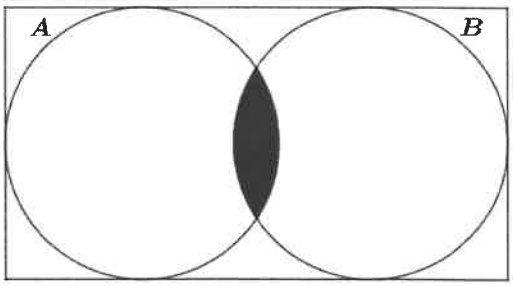
(b) P(A and B) (3)

8.1.2 Hence, determine whether events A and B are mutually exclusive. Motivate your answer. (2)

8.2 The Venn diagrams below represent different scenarios of events A and B.

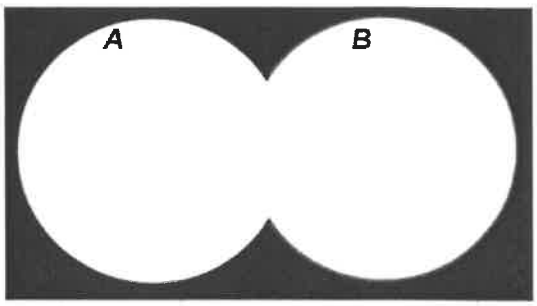
Write down the probability of the shaded region for EACH of the diagrams below.

8.2.1



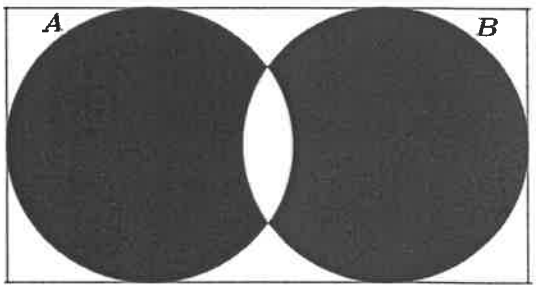
(1)

8.2.2



(1)

8.2.3



(1)

8.3 Which diagram(s) in QUESTIONS 8.2.1, 8.2.2 or 8.2.3 represent mutually exclusive events? (1)

[11]

TOTAL: 100

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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 10

MATHEMATICS P1/*WISKUNDE V1*

NOVEMBER 2018

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 100

These marking guidelines consist of 10 pages.
Hierdie nasienriglyne bestaan uit 10 bladsye.

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 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	$4x - x^3$ $= x(4 - x^2)$ $= x(2 - x)(2 + x)$	✓common factor/*gemeenskaplike faktor* ✓difference of two squares/*verskil van twee kwadrate* (2)
1.1.2	$x^2 + 15x - 54$ $= (x + 18)(x - 3)$	✓✓factors/*faktore* (2)
1.1.3	$y - xy + x - 1$ $= y(1 - x) - 1(1 - x)$ $= (y - 1)(1 - x)$	✓grouping/*groepering* ✓change of sign/*verandering van teken* ✓factors/*faktore* (3)
1.2.1	$(x + 2)(x^2 - x + 3)$ $= x^3 - x^2 + 3x + 2x^2 - 2x + 6$ $= x^3 + x^2 + x + 6$	✓simplification/ *vereenvoudiging* ✓answer/*antwoord* (2)
1.2.2	$\frac{5}{x+3} - \frac{3}{2-x}$ $= \frac{5}{(x+3)} + \frac{3}{(x-2)}$ $= \frac{5(x-2)+3(x+3)}{(x+3)(x-2)}$ $= \frac{5x-10+3x+9}{(x+3)(x-2)}$ $= \frac{8x-1}{(x+3)(x-2)}$ **OR**	✓LCD/*KGN* ✓numerator/*teller* ✓answer/*antwoord* (3)

	$\frac{5}{x+3}-\frac{3}{2-x}$ $=\frac{5(2-x)-3(x+3)}{(x+3)(2-x)}$ $=\frac{10-5x-3x-9}{(x+3)(2-x)}$ $=\frac{1-8x}{(x+3)(2-x)}$	✓LCD/*KGN* ✓numerator/*teller* ✓answer/*antwoord* (3)
1.2.3	$\frac{25^{-x}.15^{x+1}}{3^x.5^{-x}}$ $=\frac{5^{-2x}.3^{x+1}.5^{x+1}}{3^x.5^{-x}}$ $=5^{-2x+x+1+x}.3^{x+1-x}$ $=5^1.3^1$ $=15$	✓exponential law/*eksponensiaalwet* ✓simplification/ *vereenvoudiging* ✓answer/*antwoord* (3)
1.3	$(3p+q)^2$ $=9p^2+6pq+q^2$ $=9p^2+q^2+6pq$ $=12+6(-3)$ $=-6$	✓expansion/ *ontwikkeling* ✓subst./*verv.* ✓answer/*antwoord* (3)
		[18]

QUESTION/*VRAAG* 2		
2.1.1	$px + qx = a$ $x(p + q) = a$ $x = \frac{a}{p+q}$; $p \neq -q$	✓common factor/*gemeenskaplike faktor* ✓answer/*antwoord* No restriction, FULL marks/*Geen beperking nie/VOLPUNTE* (2)
2.1.2	$2x^2 - 5x + 2 = 0$ $(2x - 1)(x - 2) = 0$ $x = \frac{1}{2}$ or $x = 2$	✓factors/*faktore* ✓✓answer/*antwoord* (3)
2.1.3	$\left(\frac{1}{2}\right)^{3x+1} = 32$ $2^{-3x-1} = 2^5$ $-3x - 1 = 5$ $3x = -6$ $x = -2$	✓base 2/*grondtal* 2 ✓equating exponents/*gelykstelling van eksponente* ✓answer/*antwoord* (3)
2.2.1	$-11 \leq 3m - 8 < 4$ $-3 \leq 3m < 12$ $-1 \leq m < 4$	✓simplification/ *vereenvoudiging* ✓answer/*antwoord* (2)
2.2.2	5 integers/*heelgetalle*	✓answer/*antwoord* (1)

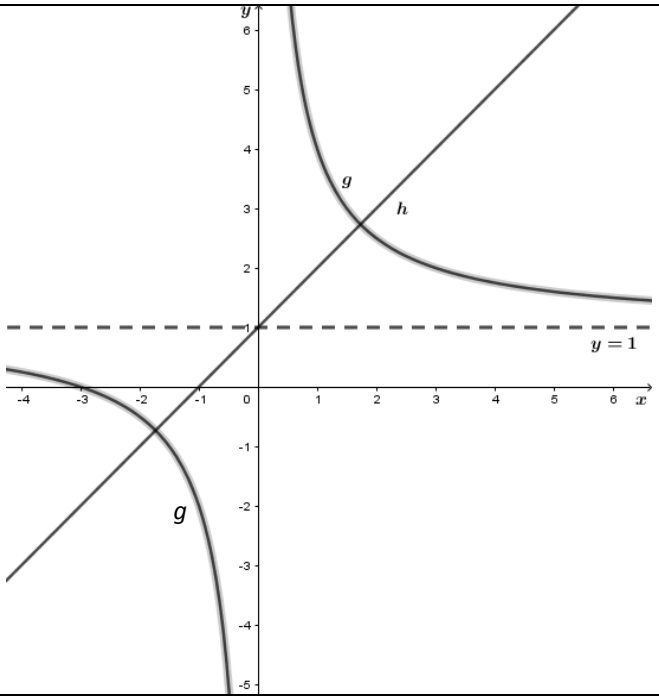
2.3	$5x + 4y = 21$.....(1) $2x = 3 - y$.....(2) $y = 3 - 2x$.....(3) sub (3) into (1) $5x + 4(3 - 2x) = 21$ $5x - 8x = 21 - 12$ $-3x = 9$ $x = -3$ $y = 3 - 2(-3)$ $y = 9$ **OR/*OF*** $5x + 4y = 21$.....(1) $\times 1$ $2x + y = 3$.....(2) $\times 4$ $5x + 4y = 21$.....(1) $8x + 4y = 12$.....(3) (3) – (1) : $3x = -9$ $x = -3$ Sub from (2) $y = 3 - 2(-3)$ $y = 9$	✓third equation/*derde vergelyking* ✓subst./*verv.* ✓*x* value/*x-waarde* ✓*y* value/*y-waarde* (4) **OR/*OF*** ✓third equation/*derde vergelyking* ✓subst./*verv.* ✓*x* value/*x-waarde* ✓*y* value/*y-waarde* (4)
		[15]

QUESTION/*VRAAG* 3		
3.1	$T_4 = 11$	✓answer/*antwoord* (1)
3.2	$T_n = pn + q$ $= -3n + q$ $14 = -3(3) + q$ $q = 23$ $T_n = -3n + 23$	✓subst./*verv.* ✓q value/*q*-waarde (2)
3.3	$T_n = -3n + 23$ $-3n + 23 = -103$ $3n = 126$ $n = 42$	✓equating to -103/*gelykstelling aan -103* ✓answer/*antwoord* (2)

3.4	$T_n < 0$ $-3n + 23 < 0$ $-3n < -23$ $n > \frac{23}{3}$ $\therefore \text{n} = 8$ $T_8 < 0$	✓ $T_n < 0$ ✓simplification/ *vereenvoudiging* ✓correct conclusion, i.e n = 8/*korrekte afleiding, m.a.w. n = 8* (3)
3.5	$T_n = -3n + 23$ $T_{39} = -3(37) + 23$ $T_{39} = -88$	✓ T_{39} ✓answer/*antwoord* (2)
		[10]

QUESTION/*VRAAG* 4		
4.1.1	$4^2 = 16$	✓answer/*antwoord* (1)
4.1.2	$13^2 = 169$	✓answer/*antwoord* (1)
4.1.3	$T_n = n^2$	✓answer/*antwoord* (1)
4.2	$T_n = 2n - 1$ $43 = 2n - 1$ $44 = 2n$ $n = 22$ $\text{Total dots} = n^2 = 22^2$ $= 484$	✓ $T_n = 2n - 1$ ✓ $n = 22$ ✓answer/*antwoord* (3)
		[6]

QUESTION/*VRAAG* 5		
5.1.1	D(0 ; –3)	✓*x* value/*x-waarde* ✓*y* value/*y-waarde* (2)
5.1.2	Range : $y > -4$	✓answer/*antwoord* (1)
5.2.1	$0 = \left(\frac{1}{2}\right)^x - 4$ $2^{-x} = 4$ $2^{-x} = 2^2$ $x = -2$ A(–2 ; 0)	✓equating to 0/ *gelykstelling aan 0* ✓answer/*antwoord* (2)
5.2.2	$f(x) = ax^2 + q$ $3 = a(1)^2 + q$ at E(1 ; 3) $3 = a + q$.....(1) $0 = a(-2)^2 + q$ at A(–2 ; 0) $0 = 4a + q$ $q = -4a$.....(2) $a = -1$ $q = 4$	✓subst./*verv.* ✓subst./*verv.* ✓*a* value/*a-waarde* ✓*q* value/*q-waarde* (4)
5.3.1	$CD = y_C - y_D$ $= 4 - (-3)$ = 7 units/*eenhede*	✓subst./*verv.* ✓answer/*antwoord* (2)
5.3.2	$y = mx + c$ $y = -\frac{3}{2}x + c$ $0 = -\frac{3}{2}(-2) + c$ $c = -3$ $y = -\frac{3}{2}x - 3$	✓*m* value/*m-waarde* ✓subst./*verv.* ✓equation/ *vergelyking* (3)
5.4.1	$-2 < x < 2$ OR $x \in (-2 ; 2)$	✓critical values/ *kritieke waardes* ✓notation/*notasie* (2)
5.4.2	$x > 0$ OR $x \in (0 ; \infty)$	✓answer/*antwoord* (1)
		[17]

QUESTION/*VRAAG* 6		
6.1.1	$g(x)=\frac{a}{x}+q$ $2=\frac{a}{3}+1$ $a=3$ $\therefore g(x)=\frac{3}{x}+1$	✓q = 1 ✓subst./*verv.* ✓answer/*antwoord* (3)
6.1.2	$h(x)=x+1$	✓positive gradient/*positiewe gradiënt* ✓answer/*antwoord* (2)
6.2		✓shape of *g*/ *vorm van g* ✓asymptotes/*asimptote* ✓positive gradient of *h*/*positiewe gradiënt van h* ✓*x* intercepts of *g* and *h* 6/ *x-afsnitte van g en h 6* (4)
6.4	$g(x)=-\left(\frac{3}{x}+1\right)+5$ $g(x)=-\frac{3}{x}+4$ $x=0$ $y=4$	✓equation of *g*/ *vergelyking van g* ✓*x* = 0 ✓*y* = 4 (3)
		[12]

QUESTION/*VRAAG* 7		
7.1	Total amount pai /*Totale bedrag betaal* $=R229 \times 24$ $=R5\ 496$	✓answer/*antwoord* (1)
7.2	$A = P(1+i.n)$ $R5496 = P(1+0{,}075\times 2)$ $P = R4779{,}13$	✓formula/*formule* ✓subst./*verv.* (2)
7.3	Interest/*Rente* $= R5496 - R4779{,}13$ $= R716{,}87$	✓answer/*antwoord* (1)
7.4	Insurance/*Versekering* $= \frac{R4779{,}13\times 0{,}115}{12}$ $= R45{,}80$ New monthly payments/*Nuwe maandelikse paaiement* $= R45{,}80 + R229$ $= R274{,}80$	✓insurance per month/*versekering per maand* ✓dividing by 12/ *deling deur 12* ✓answer/*antwoord* (3)
7.5	$A = P(1+i)^n$ $5100 = 4779{,}13(1+i)^2$ $i = \sqrt{1{,}067139835} - 1$ $i = 0{,}03302460526$ Inflation rate/*Inflasiekoers* = 3,30%	✓formula/*formule* ✓subst./*verv.* ✓simplification/ *vereenvoudiging* ✓answer/*antwoord* (4)
		[11]

QUESTION/*VRAAG* 8		
8.1.1 (a)	$P(B) = 1 - P(B')$ $= 1 - \frac{3}{8}$ $= \frac{5}{8}$	✓formula ✓answer/*antwoord* (2)
8.1.1(b)	$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $\frac{5}{7} = \frac{2}{5} + \frac{5}{8} - P(A \text{ and } B)$ $P(A \text{ and } B) = \frac{87}{280}$ $= 0,31$	✓identity ✓subst./*verv.* ✓answer/*antwoord* (3)
8.1.2	Not mutually exclusive events. $P(A \text{ and } B) \neq 0$	✓NOT/*NIE* ✓reason/*rede* (2)
8.2.1	$P(A \cap B)$ OR $P(A \text{ and } B)$	✓answer/*antwoord* (1)
8.2.2	$P(A \cup B)'$ OR $P(A \text{ or } B)'$	✓answer/*antwoord* (1)
8.2.3	$P(A \cap B)'$ OR $P(A \text{ and } B)'$	✓answer/*antwoord* (1)
8.3	8.2.3	✓answer/*antwoord* (1)
		[11]
	TOTAL/*TOTAAL*	**[100]**