basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

MATHEMATICS P1

NOVEMBER 2016

NATIONAL SENIOR CERTIFICATE

GRADE 10

MARKS: 100

TIME: 2 hours

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 8 questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, et cetera 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 $x^2 - x$ (1)

1.1.2 $3x^2 + 3px - 2mx - 2mp$ (3)

1.1.3 $2p^2 - 2p - 12$ (3)

1.2 Simplify the following:

1.2.1 $\dfrac{2^{a+1} - 2^{a-1}}{2^a}$ (3)

1.2.2 $\dfrac{x^2 - x + 1}{x^3 + 1} \div \dfrac{2x}{2x + 2}$ (4)
[14]

QUESTION 2

2.1 Solve for x:

2.1.1 $x(x - 1) = 20$ (4)

2.1.2 $\dfrac{3x - 2}{2} = x + 1$ (3)

2.2 Given: $-4 \leq -\dfrac{1}{2}m < 5$ where $m \in R$

2.2.1 Solve for m. (3)

2.2.2 Write the answer to QUESTION 2.2.1 in interval notation. (1)

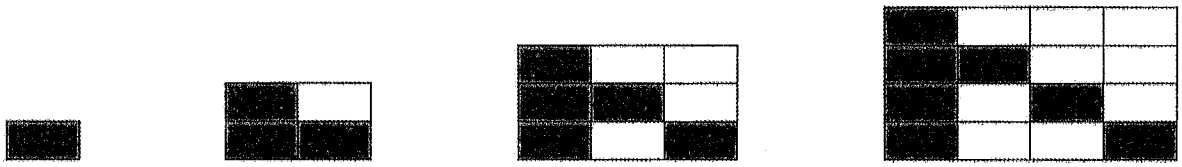
2.3 Given: $4x^2 - y^2 = 171$ and $2x - y = 9$

2.3.1 Calculate the value of $2x + y$. (2)

2.3.2 Solve simultaneously for x and y. (3)
[16]

QUESTION 3

Dark tiles (D) and light tiles (L) are used to create patterns on a floor. The first four patterns are shown below. For the patterns that follow the tiles are arranged in a similar manner.



Pattern 1 **Pattern 2** **Pattern 3** **Pattern 4**

3.1 How many dark tiles were used in pattern 5? (1)

3.2 How many light tiles were used in pattern 6? (1)

3.3 Write down the general term (D_n) for the number of dark floor tiles used in each pattern. (2)

3.4 Write down the general term (L_n) for the number of light floor tiles used in each pattern. (2)

3.5 Which pattern will have exactly 64 light floor tiles? (3)

3.6 Each dark tile is 0,3 m wide and 0,6 m long. Calculate the total area covered by all the dark tiles in the first 100 patterns. (3)
[12]

QUESTION 4

4.1 Mary wants to buy a fridge that costs R15 550. She has to pay a deposit of 15% of the cost and the balance by means of a hire-purchase agreement. The rate of interest on the loan is 16,25% p.a. simple interest. The repayment period of the loan is 54 months. In addition to the hire-purchase agreement, an annual insurance premium of 1,5% of the total cost of the fridge should be added. The annual insurance premium should be paid in monthly instalments.

4.1.1 Calculate the value of the loan that Mary will take. (2)

4.1.2 Calculate the total amount that must be repaid on the hire-purchase agreement. (3)

4.1.3 Calculate the monthly repayment, which includes the monthly insurance premium. (3)

4.2 The table below shows the rand equivalent of one British pound and one US dollar.

COUNTRY	CURRENCY	RATE OF EXCHANGE OF THE RAND
Britain (United Kingdom)	Pound (£)	21,41
United States of America	Dollar ($)	13,45

A South African nurse works in the United States of America.

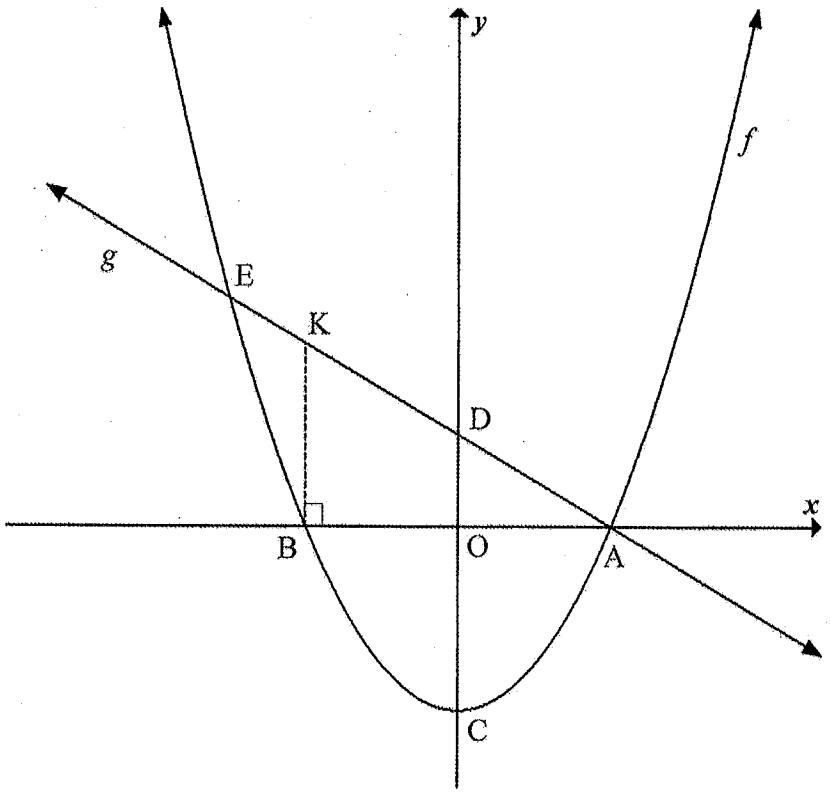
4.2.1 The nurse saves the equivalent of R4 800 per month. Calculate the amount, in US (American) dollars, that she saves per month. (2)

4.2.2 She ordered a book from the United Kingdom (Britain) and paid $85 for it. Calculate the price of the book in pounds (£). (3)

4.3 A sum of money doubles in 5 years when the interest is compounded annually. Calculate the rate of interest. (3)
[16]

QUESTION 5

The graphs of $f(x)=x^2-4$ and $g(x)=-x+2$ are sketched below. A and B are the x-intercepts of f. C and D are the y-intercepts of f and g respectively. K is a point on g such that BK $\|$ x-axis. f and g intersect at A and E.



5.1 Write down the coordinates of C. (1)

5.2 Write down the coordinates of D. (1)

5.3 Determine the length of CD. (1)

5.4 Calculate the coordinates of B. (3)

5.5 Determine the coordinates of E, a point of intersection of f and g. (4)

5.6 For which values of x will:

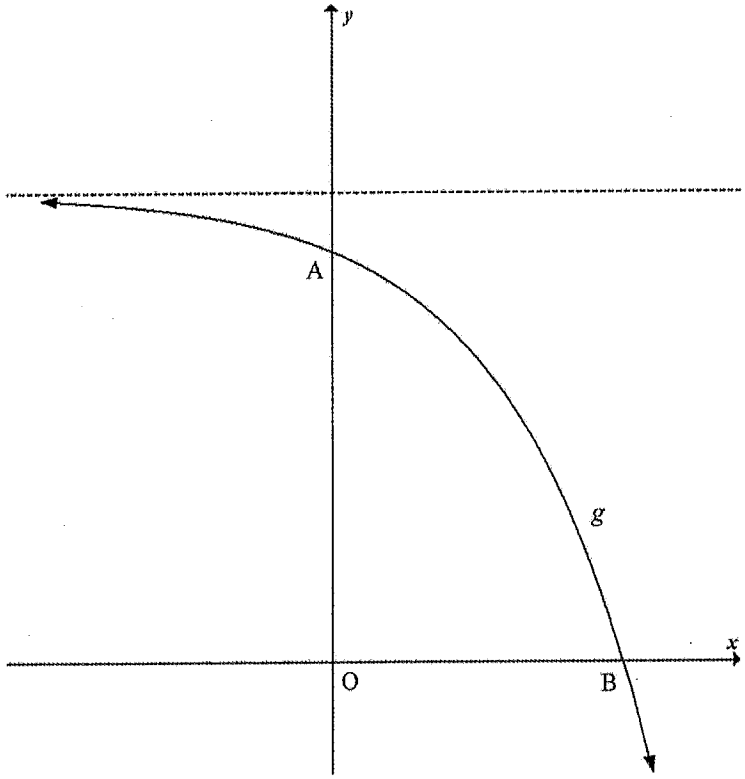
5.6.1 $f(x)<g(x)$ (2)

5.6.2 $f(x).g(x)\geq 0$ (2)

5.7 Calculate the length of AK. (4)
[18]

QUESTION 6

The graph of $g(x) = -2^x + 8$ is sketched below. A and B are the y- and x-intercepts respectively of g.



6.1 Write down the range of g. (1)

6.2 Determine the coordinates of B. (3)

6.3 If g is reflected over the x-axis to form a new graph h, determine the equation of h. (2)

6.4 Explain why the x-intercepts of g and h are both at B. (2)
[8]

QUESTION 7

A hyperbola, h, is described with the following characteristics:

- The equation of the vertical asymptote is $x = 0$
- The range of h is $(-\infty ; 3) \cup (3 ; \infty)$
- The x-intercept of h is $(2 ; 0)$

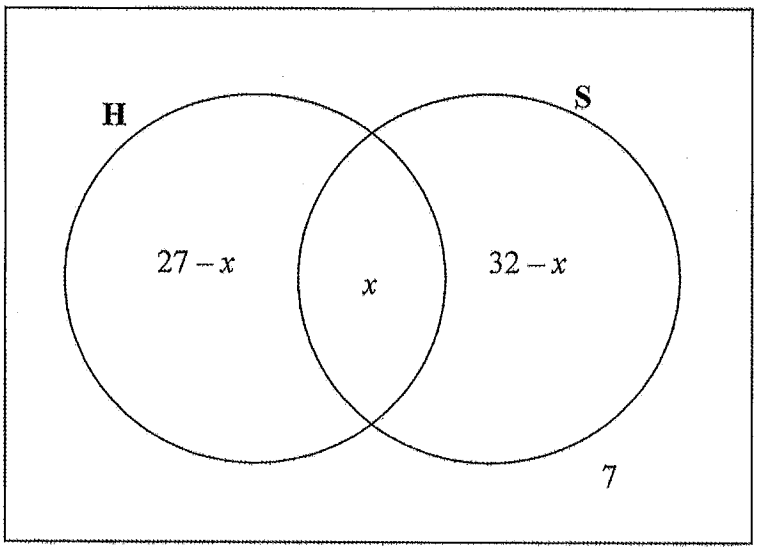
Determine the equation of h. **[4]**

QUESTION 8

8.1 In a certain class of 42 boys:

- 27 play hockey (H)
- 32 play soccer (S)
- 7 do not play hockey or soccer
- An unknown number (x) play both hockey and soccer

The information is represented in the Venn diagram below.



8.1.1 Calculate the value of x. (2)

8.1.2 If a boy from the class is chosen at random, calculate the probability that he:

(a) Does not play hockey or soccer (1)

(b) Plays only soccer (2)

8.2 A bag contains 3 blue balls and x yellow balls.

8.2.1 Write down the total number of balls in the bag. (1)

8.2.2 If a ball is drawn from the bag, write down the probability that it is blue. (2)

8.3 8.3.1 Complete the following statement:

If A and B are two mutually exclusive events, then
P (A and B) = ... (1)

8.3.2 Given that A and B are mutually exclusive events. The probability that event A occurs is 0,55. The probability that event B does not occur is 0,7.

Calculate P (A or B). (3)
[12]

TOTAL: 100

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 memorandum.
- 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 deurgehaaldeantwoord na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing.*
- *Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.*

QUESTION 1/*VRAAG* 1		
1.1.1	$x^2 - x$ $= x(x-1)$	✓ answer/*antwoord* (1)
1.1.2	$3x^2 + 3px - 2mx - 2mp$ $= 3x(x+p) - 2m(x+p)$ $= (3x-2m)(x+p)$ **OR/*OF*** $3x^2 - 2mx + 3px - 2mp$ $= x(3x-2m) + p(3x-2m)$ $= (3x-2m)(x+p)$	✓ $3x(x+p)$ ✓ $-2m(x+p)$ ✓ answer/*antwoord* (3) ✓ $x(3x-2m)$ ✓ $p(3x-2m)$ ✓ answer/*antwoord* (3)
1.1.3	$2p^2 - 2p - 12$ $= 2(p^2 - p - 6)$ $= 2(p-3)(p+2)$ **OR/*OF*** $2p^2 - 2p - 12$ $= (2p-6)(p+2)$ $= 2(p-3)(p+2)$	✓ taking out com. fact correctly/*korrek gem. faktors* ✓✓ answer/*antwoord* (3) ✓✓ factors/*gem. faktors* ✓answer/*antwoord* (3) CA apply for maximum of 2 marks DA-*maksimum van 2 punte* Answer ONLY full marks *Antwoord ALLEENLIK-vol punte*

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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 10

MATHEMATICS P1/*WISKUNDE V1*

NOVEMBER 2016

MEMORANDUM

MARKS/*PUNTE*: 100

This memorandum consists of 11 pages.
Hierdie memorandum bestaan uit 11 bladsye.

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P1 + P2

QUESTION 2/*VRAAG 2*

2.1.1

$x(x-1)=20$
$x^2-x-20=0$
$(x-5)(x+4)=0$
$x=5$ or/of $x=-4$

✓removing brackets/*verw.hakkies*
✓stand.form/*stand. vorm*
✓fact/*fak*
✓answer/*antwoord*
(4)

2.1.2

$\frac{3x-2}{2}=(x+1)$
$3x-2=2(x+1)$
$3x-2=2x+2$
$x=4$

✓ multipl./*maal*
✓ simpl/*simp.*
✓answer/*ant*woord
(3)

OR/*OF*

$\frac{3x-2}{2}-(x+1)=0$
$\frac{3x-2-2(x+1)}{2}=0$
$\frac{3x-2-2x-2}{2}=0$
$\frac{x-4}{2}=0$
$x=4$

✓ writing the LHS as a single fraction./ *skryf LK as n enkel breuk*
✓simplification/ *simpl.*
✓answer/*antwoord*
(3)

OR/*OF*

$\frac{3x}{2}-1=x+1$
$\frac{3x}{2}-x=2$
$\frac{x}{2}=2$
$x=4$

1.2.1

$\frac{2^{x+1}-2^{x-1}}{2^x}$
$=\frac{2^x(2-2^{-1})}{2^x}$
$=2-\frac{1}{2}$
$=\frac{3}{2}$

✓ com. fact/*gem. fak*
✓$(2-2^{-1})$
✓ answer/*antwoord*
(3)

1.2.2

$\frac{x^2-x+1}{x^3+1}\div\frac{2x}{2x+2}$
$=\frac{x^2-x+1}{(x+1)(x^2-x+1)}\times\frac{2(x+1)}{2x}$
$=\frac{1}{x}$

✓ fact.of cube/*fak van vierkant*
✓ invert and multiply /*inv. en maal*
✓ factorise/ *fak.* $2(x+1)$
✓answer/*antwoord*
(4)
[14]

2.2.1	$-4 \le -\frac{1}{2}m < 5$ $-8 \le -m < 10$ $8 \ge m > -10$ $-10 < m \le 8$ **OR/*OF*** $-4 \le -\frac{1}{2}m$ and/*en* $-\frac{1}{2}m < 5$ $-8 \le -m$ and/*en* $-m < 10$ $-10 < m \le 8$	✓ multipl/*maal* by 2 ✓ critical values/*krit. waarde* ✓ corr.notat/*korr. not.* (3) ✓ multipl/*maal* by 2 ✓ m – values/*waardes* ✓ corr notat./*korr. not* (3)
2.2.2	$(-10 ; 8]$	✓ ans/*ant* (1)
2.3.1	Given/*Gegee* $4x^2 - y^2 = 171$ $2x - y = 9$ $(2x-y)(2x+y) = 171$ $9(2x+y) = 171$ $2x + y = 19$	✓ factors/*fak* ✓ answer/*ant* (2)
2.3.2	$2x - y = 9$ $2x + y = 19$ $4x = 28$ $x = 7$ $y = 5$ **OR/*OF*** $2x - y = 9$ $y = 2x - 9$ $2x + y = 19$ $2x - (2x - 9) = 19$ $4x = 28$ $x = 7$ $y = 5$	✓ method/*methode* ✓ x-value/*waarde* ✓ y – value/*waarde* (3) ✓ method/*methode* ✓ x-value/*waarde* ✓ y – value/*waarde* (3) **[16]**

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QUESTION 3/*VRAAG* 3		
3.1	9	✓ ans/*ant* (1)
3.2	25	✓ ans/*ant* (1)
3.3	$D_n = 2n - 1$	✓2n ✓–2 (2)
3.4	$L_n = (n-1)^2$	✓✓ ans/*ant* (2)
3.5	$L_n = (n-1)^2$ $(n-1)^2 = 64$ $n^2 - 2n + 1 = 64$ $n^2 - 2n - 63 = 0$ $(n-9)(n+7) = 0$ $n = 9$ or/ of $n = -7$ n/a	✓equating/ *vergelyk* $L_n = 64$ ✓factors/*faktore* ✓answer/*antwoord* (3)
3.6	Number of dark tiles/*Getal donker teëls* $= 1 + 3 + 5 + ... + 99 + 101 + ... + 195 + 197 + 199$ $= 50(200) = 10\,000$ Total area covered/*Totale oppervlakte gedek* $= 10\,000(0{,}3 \times 0{,}6)$ $= 1800\ m^2$	✓✓10 000 dark tiles/*donker teëls* ✓ans/*ant* (3) **[12]**

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QUESTION 4/*VRAAG 4*

4.1.1

The cash deposit/*Kontantdeposito*
$= 0{,}15 \times R15550$
$= R2332{,}50$ ✓deposit/*deposito*

The value of loan/*Waarde van lening*
$= R15550 - R2332{,}50$
$= R13217{,}50$ ✓ans/*ant*

OR/ *OF*

The value of loan/*Waarde van lening*
= 85% of 15550 ✓85% of loan/*85% van lening*
$= R13217{,}50$ ✓ans/*ant* (2)

4.1.2

$A = P(1+i.n)$
$= 13217{,}50\left(1 + 0{,}1625 \times \frac{54}{12}\right)$
$= R22882{,}80$

✓ $A = P(1+i.n)$
✓ correct sub into correct formula/*vervang in korrek formule.*
✓ans/*ant*

OR/ *OF*

$SI = Pi.n$
$= 13217{,}50(0{,}1625)(4{,}5)$
$= R9665{,}30$
$A = SI + P$
$= R9665{,}30 + R13217{,}50$
$= R22882{,}80$

✓ $SI = R9665{,}30$.
✓ $A = Pin + P$
✓ans/*ant* (3)

4.1.3

Annual Insurance premium/*Per jaar versekeringspremie*
$= 0{,}015 \times 15550$
$= R233{,}25$ per annum/per jaar
Monthly payments/ Maandelikse paaiement
$= \frac{22882{,}80}{54} + \frac{233{,}25}{12}$
$= R443{,}19$

✓ instalment per Month/*paaiement per maand*
✓ insurance per month/*versekering per maand*
✓ans/*ant*

OR/ *OF*

$AIP = 233{,}25 \times 4{,}5$
$= R1049{,}63$
Monthly payments/ Maandelikse paaiement
$= \frac{22882{,}80 + 1049{,}63}{54}$
$= R443{,}19$

✓ insurance for/*versekering vir* 4,5 years/ *jaar*
✓ Instalment per month /*paaiement per maand*
✓ans/*ant* (3)

Please turn over/*Blaai om asseblief*

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4.2.1

$\$1 = R13{,}45$
$\$x = R4\,800$
$\$x = \frac{4800}{13{,}45}$
$= \$356{,}88$

✓ division by/ *deel deur* 13,45
✓ answer/ *antwoord* (2)

4.2.2

$\$1 = R13{,}45$
$\$85 = R1143{,}25$
$1£ = 21{,}41$
$£x = R1143{,}25$
$x£ = \frac{1143{,}25}{21{,}41}$
$= £53{,}40$

✓1143,25
✓ $1£ = 21{,}41$
✓ans/*ant* (3)

OR/ *OF*

$x£ = \frac{13{,}45}{21{,}41} \times 85$
$= £53{,}40$

✓ $\frac{13{,}45}{21{,}41}$ ✓ ×85
✓ans/*ant* (3)

OR/ *OF*

$x£ = \frac{21{,}41}{13{,}45} \times 85$
$= £53{,}40$

✓ $\frac{21{,}41}{13{,}45}$ ✓ ×85
✓ans/*ant* (3)

4.3

$A = P(1+i)^n$
$2P = P(1+i)^5$
$2 = (1+i)^5$
$\sqrt[5]{2} = 1+i$
$i = \sqrt[5]{2} - 1$
$i = 0{,}148698 \times 100$
$r = 14{,}87\%$ p.a/per jaar

✓ $2P = P(1+i)^5$
✓ $\sqrt[5]{2} = 1+i$
✓ $r = 14{,}87\%$ p.a /*pj* (3)
[16]

Please turn over/*Blaai om asseblief*

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QUESTION 5/ *VRAAG 5*		
5.1	C(0 ; –4)	✓ans/*ant* (1)
5.2	D(0 ; 2)	✓ ans/*ant* (1)
5.3	CD = 2 – (–4) CD = 6 units/*eenhede*	✓ ans/*ant* (1)
5.4	$x^2 - 4 = 0$ $(x-2)(x+2)=0$ $x=2 \quad x=-2$ B(–2 ; 0)	✓ $y=0$ ✓ factors/*faktore* ✓ ans/*ant* (3)
5.5	$x^2 - 4 = -x + 2$ $x^2 + x - 6 = 0$ $(x-2)(x+3)=0$ $x=2 \quad x=-3$ E(–3 ; 5)	✓ $f(x) = g(x)$: equating/*vergelyk* ✓ factors/*faktore* ✓x-answer/*antwoord* ✓y-answer/*antwoord* (4)
5.6.1	$-3 < x < 2$ **OR/*OF*** $(-3 ; 2)$	✓ values/*waardes* ✓ notation/*notasie* (2)
5.6.2	$x \leq -2$ or $x = 2$ **OR/ *OF*** $(-\infty ; -2] \cup \{2\}$	✓$x \leq -2$ ✓2 ✓$(-\infty ; -2]$ ✓2 (2)
5.7	K(–2 ; 4) BK = 4 units/*eenhede* AB = 4 units/*eenhede* $AK = \sqrt{4^2 + 4^2}$ (Pythagoras) $= 5{,}66$ or $\sqrt{32}$ or $4\sqrt{2}$ units/*eenhede*	✓ BK ✓ AB ✓ method/*methode* ✓ answer/*antwoord* (4)
		[18]

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QUESTION 6/*VRAAG 6*		
6.1	$y < 8$	✓ answer/*antwoord* (1)
6.2	$-2^x + 8 = 0$ $2^x = 8$ $2^x = 2^3$ $x = 3$ B(3 ; 0)	✓ equating to 0/*vergelyk met 0* ✓ simpli/*vereenv.* ✓x-answer/*antwoord* (3)
6.3	$h(x) = 2^x - 8$	✓✓ answer/*antwoord* (2)
6.4	Reflecting the graph of g over the x-axis only changes the sign of the y-values. This means that both g and h will have the same x-intercept at B. *Grafiek g oor die x-as gereflekteer om h te vorm. As y = 0, sal die oplossing dieselfde wees vir albei funksies.Beide g en h sal n x-afsnit by B hê.*	✓ reflection over x-axis/*reflek oor x-as* ✓ explanation/*verduideliking* (2) **[8]**

QUESTION 7/*VRAAG 7*		
	$h(x) = \frac{a}{x} + 3$ $0 = \frac{a}{2} + 3$ $a = -6$ $h(x) = \frac{-6}{x} + 3$	✓ +3 ✓ subst. of/ *sub van (2 ; 0)* ✓ value of *a/ waarde van a* ✓ answer/*antwoord* (4) **[4]**

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QUESTION 8/*VRAAG 8*		
8.1.1	$27-x+x+32-x+7=42$ $-x=42-66$ $x=24$	✓equation/*vergelyking* ✓answer/*antwoord* (2)
8.1.2 (a)	P(does not play hockey or soccer/*speel nie hokkie of sokker)* $=\frac{7}{42}$ **OR/ *OF*** $=\frac{1}{6}$	✓answer/*antwoord* (1)
8.1.2 (b)	P(soccer only/*slegs sokker*) $=\frac{8}{42}$ OR $=\frac{4}{21}$ **OR/*OF*** P(soccer only/*slegs sokker*) $=1-\left(\frac{3+24+7}{42}\right)$ $=\frac{8}{42}$ $=\frac{4}{21}$	✓✓answer/*antwoord* (2) ✓✓answer/*antwoord* (2)
8.2.1	$x+3$	✓answer/*antwoord* (1)
8.2.2	$P(\text{blue/blou})=\frac{3}{x+3}$	✓✓ answer/*antwoord* (2)
8.3.1	P(A and/*en* B) = 0	✓ answer/*antwoord* (1)
8.3.2	$P(B)=1-P(B')$ $=1-0,7$ $=0,3$ $P(A \text{ or/of } B)=P(A)+P(B)$ $=0,55+0,3$ $=0,85$	✓$P(B)=0.3$ ✓subst./*vervang* ✓answer/*antwoord* (3)
TOTAL/*TOTAAL*: 100		**[12]**

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