basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE

GRADE 10

MATHEMATICS P1

NOVEMBER 2019

MARKS: 100

TIME: 2 hours

This question paper consists of 7 pages.

KWAZULU-NATAL

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1.   This question paper consists of SEVEN 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.   Round off answers 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.

　　　　　　　　　　　　　　　　　　　　　　　　　　　　Please turn over

KWAZULU-NATAL

QUESTION 1

1.1   Factorise the following expressions fully:

   1.1.1 $3y^2 + y$ (1)

   1.1.2 $x^2 - 10x - 24$ (2)

   1.1.3 $9x^2 - y^2 + 10y - 25$ (3)

1.2   Simplify the following expressions fully:

   1.2.1 $\left(4 + \dfrac{1}{x}\right)\left(2 - \dfrac{3}{x}\right)$ (2)

   1.2.2 $\dfrac{5x - 5}{5x}$ (2)

   1.2.3 $\dfrac{3^{x+1} + 3^x}{27 \cdot 3^{-1+x}}$ (3)

[13]

QUESTION 2

2.1   Solve for x:

   2.1.1 $2x^2 - 10x = 0$ (2)

   2.1.2 $px - kx = k - p$ (3)

   2.1.3 $2^{\frac{x}{3}} = \dfrac{1}{128}$ (3)

2.2   Given: $\dfrac{x + 5}{2} > -2$

   2.2.1   Solve for x.   (2)

   2.2.2   If $x \in R$, represent the solution to QUESTION 2.2.1 on a number line.   (1)

2.3   Solve simultaneously for x and y if:

   $x(x - 3) + y(3 - x) = 0$ (4)

2.4   During a fundraising event, only R10, R20 and R50 notes were collected. In the final count, there were twice as many R20 notes as there were R50 notes, and 15 more R10 notes than R50 notes.

   If R10 150 was collected in total, determine the number of R10, R20 and R50 notes that were collected.   (4)

[19]

QUESTION 3

3.1   Given the linear pattern: $2x+1$; $3x+3$; $4x+5$; ...

      3.1.1   Write down the next term in the pattern. (1)

      3.1.2   Write, in terms of x, the formula for T_n, the general term of the pattern. (3)

      3.1.3   If the value of the 13th term of the pattern is 95, calculate the value of x. (2)

      3.1.4   If $x = 5$, determine the largest value of n for which $T_n < 158$. (3)

3.2   An air-traffic control tower is constructed at an airport. The front view of the tower is shown in the diagram below. AB, the first horizontal support from the bottom, is 7,9 m long and is secured to the ground. Additional horizontal supports are secured parallel to AB and are 50 cm apart. Each additional support above is 10 cm shorter than the one below it. CD is the 45th horizontal support. AD and BC are lateral supports on which the horizontal supports are secured.
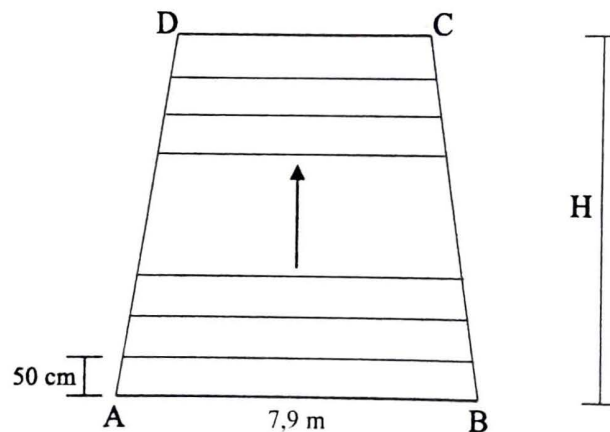
      3.2.1   Calculate the height (H), in cm, of the tower. (1)

      3.2.2   Calculate the length, in metres, of the 45th horizontal support. (3)

      3.2.3   Calculate the area, in square metres, enclosed by supports AB, BC, CD and AD. (3)

                                                   [16]

Mathematics/P1   DBE/November 2019

CAPS – Grade 10

QUESTION 4

4.1   Peter wants to buy a computer costing R7 950, on a hire-purchase agreement. The conditions of the agreement are:

- Peter must pay a deposit of 25% of the purchase price.
- Interest is charged at 15% per annum simple interest on the balance.
- He must also pay a compulsory monthly insurance premium of R70,75.
- The balance is to be settled in monthly instalments.

4.1.1   Calculate the balance after Peter pays the deposit.   (2)

4.1.2   If the balance is to be paid off in 24 months, calculate Peter's total monthly instalment.   (4)

4.2   The table below shows the cost of one British pound and one US dollar in South African rand.

COUNTRY	UNIT	EXCHANGE RATE
England	Pound (£)	R23,43
USA	Dollar ($)	R14,58

4.2.1   It costs £55 to fill a car with 80 litres of petrol in England. How much will it cost to fill up with the same quantity of petrol if you were paying in South African rand?   (1)

4.2.2   An English visitor to the USA notices a car on sale for $5 500. A similar vehicle in England costs £3 500. In which country is the car more expensive? Justify your answer with relevant calculations.   (3)
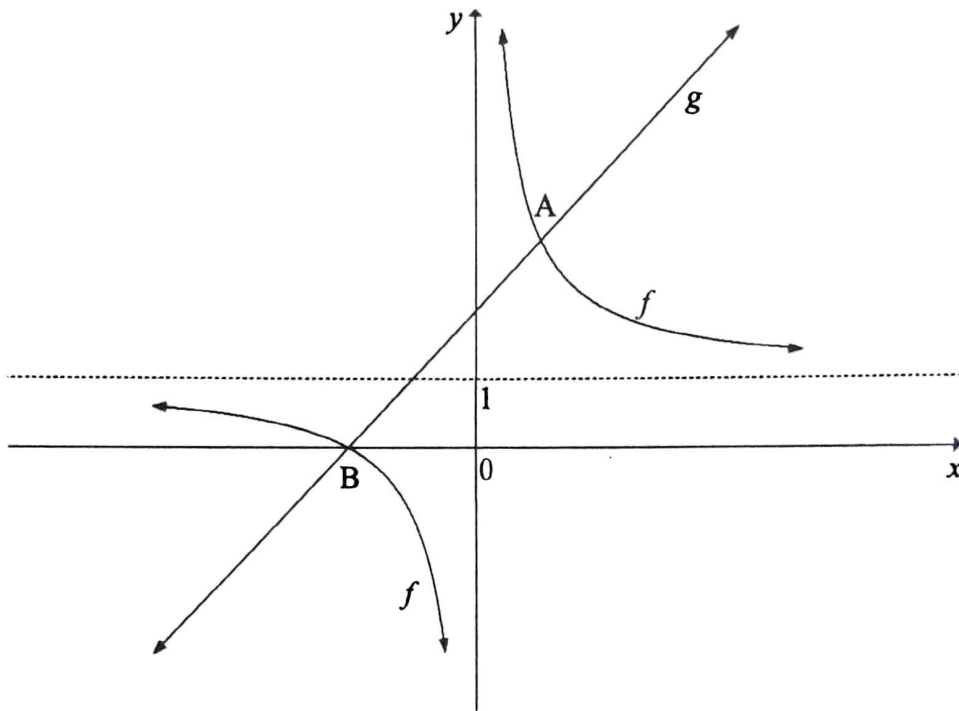
    [10]

QUESTION 5

Sketched below are the graphs of $f(x) = \dfrac{k}{x} + q$ and $g(x) = x + 2$.

- The equation of the horizontal asymptote of f is $y = 1$.
- Graph g cuts the x-axis at B.
- Graphs f and g intersect at A and B.

5.1 Write down the:

    5.1.1 Value of q (1)

    5.1.2 Domain of f (2)

5.2 Determine the:

    5.2.1 Equation of the line of symmetry of f that has a negative gradient (2)

    5.2.2 Equation of f (4)

    5.2.3 Coordinates of A, a point of intersection of f and g (5)

[14]

QUESTION 6

The graphs defined as $g(x) = ax^2 + q$ and $f(x) = k^x - 4$ both pass through $(-2 ; 0)$ on the x-axis. The y-intercept of g is $(0 ; -5)$.

6.1   Write down the:

  6.1.1 Equation of the asymptote of f (1)

  6.1.2 Value of q (1)

  6.1.3 Coordinates of the other x-intercept of g (1)

6.2   Determine the equation of:

  6.2.1 g (2)

  6.2.2 f (3)

6.3   Calculate the y-intercept of f.   (2)

6.4   On the same system of axes, sketch the graphs of g and f. Show ALL the intercepts with the axes and asymptote(s).   (6)

    [16]

QUESTION 7

7.1   For two events A and B, it is given that
  P(A) = 0,30 ; P(B) = 0,65 and P(A or B) = 0,74.

  7.1.1 Calculate P(A and B).   (2)

  7.1.2 Hence, represent the above information in a Venn diagram.   (4)

  7.1.3 Are the events A and B mutually exclusive? Give a reason.   (2)

7.2   A circular spinner is divided into 12 equal sectors. Each sector is numbered from 1 to 12. When spun, the spinner has an equal chance of stopping at any of the numbers 1 to 12.

  7.2.1 For any random spin, what is the probability that the spinner will stop at a square number?   (1)

  7.2.2 The number that the spinner stopped at after the first spin was recorded. The number that the spinner stopped at after the second spin was also recorded. Calculate the probability that the sum of the two numbers at which the spinner stopped is greater than 2.   (3)

    [12]

    TOTAL: 100

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NASIONALE
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GRADE/*GRAAD* 10

MATHEMATICS P1/*WISKUNDE V1*

NOVEMBER 2019

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 100

These marking guidelines consist of 11 pages./
Hierdie nasienriglyne bestaan uit 11 bladsye.

NOTE:
- If a candidate answered a *QUESTION/VRAAG* 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/answer in order to solve a problem is unacceptable.
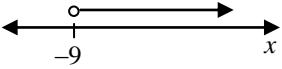
LET WEL:
- *As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyne van toepassing.*
- *Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.*

QUESTION/*VRAAG* 1

1.1.1	$3y^2 + y$ $= y(3y+1)$	✓answer/*antwoord* (1)
1.1.2	$x^2 - 10x - 24$ $= (x-12)(x+2)$	✓$(x-12)$ ✓ $(x+2)$ (2)
1.1.3	$9x^2 - y^2 + 10y - 25$ $= 9x^2 - (y^2 - 10y + 25)$ $= 9y^2 - (y-5)^2$ $= (3x+y-5)(3x-y+5)$	✓grouping/*groepering* ✓factorising/*faktorisering* ✓answer/*antwoord* (3)
1.2.1	$\left(4+\dfrac{1}{x}\right)\left(2-\dfrac{3}{x}\right)$ $= 8 - \dfrac{10}{x} - \dfrac{3}{x^2}$	✓✓ answer/*antwoord* (2)
1.2.2	$\dfrac{5x-5}{5x}$ $= \dfrac{5(x-1)}{5x}$ $= \dfrac{x-1}{x}$ **OR/OF** $\dfrac{5x}{5x} - \dfrac{5}{5x}$ $= 1 - \dfrac{1}{x}$	 ✓factorising/*faktorisering* ✓answer/*antwoord* (2) ✓separation/*skeiding* ✓answer/*antwoord* (2)

1.2.3	$\dfrac{3^{x+1}+3^x}{27.3^{-1+x}}$	
	$=\dfrac{3^x.3+3^x}{27.3^{-1}.3^x}$	✓ separating bases/*skei basisse*
	$=\dfrac{3^x(3+1)}{3^x.\dfrac{27}{3}}$	✓common factor/ *gemeenskalike faktor*
	$=\dfrac{4}{9}$	✓answer/*antwoord* (3)
	OR/OF	
	$\dfrac{3^{x+1}+3^x}{27.3^{-1+x}}$	
	$=\dfrac{3^x.3+3^x}{27.3^{-1}.3^x}$	✓ separating bases/*skei basiss*
	$=\dfrac{4.3^x}{3^x.\dfrac{27}{3}}$	✓addition/*optelling*
	$=\dfrac{4}{9}$	✓answer/*antwoord* (3)
		[13]

QUESTION/*VRAAG* 2

2.1.1	$2x^2 - 10x = 0$ $2x(x-5) = 0$ $x = 0$ or $x = 5$	✓common factor/ *gemeenskaplike faktor* ✓both values of/*beide waardes van x* (2)
2.1.2	$px - kx = k - p$ $x(p-k) = k - p$ $x = -\dfrac{k-p}{k-p}$ $x = -1$	✓common factor/ *gemeenskaplike faktor* ✓change of sign/*verander teken* ✓ answer/*antwoord* (3)
2.1.3	$2^{\frac{x}{3}} = \dfrac{1}{128}$ $2^{\frac{x}{3}} = 2^{-7}$ $\dfrac{x}{3} = -7$ $x = -21$	✓ $\dfrac{1}{2^7}$ or/*of* 2^{-7} ✓equating exponents/ *gelykstelling van eksponente* ✓answer/*antwoord* (3)
2.2.1	$\dfrac{x+5}{2} > -2$ $x + 5 > -4$ $x > -9$	✓simplification/ *vereenvoudiging* ✓answer/*antwoord* (2)
2.2.2		✓number line/*getallelyn* (1)
2.3	$x(x-3) + y(3-x) = 0$ $x(x-3) - y(x-3) = 0$ $(x-3)(x-y) = 0$ $x = 3$ or $y = x = 3$	✓change of sign/*verander teken* ✓common factor/ *gemeenskaplike faktor* ✓x-value/*-waarde* ✓y-value/*-waarde* (4)
2.4	Let the number of R50 notes be x/ *Laat die getal R50-note x wees.* <table><tr><td></td><td>Number of notes *Getal note*</td><td>Total value of money/*Totale warade van geld*</td></tr><tr><td>R10</td><td>$x + 15$</td><td>$10(x+15)$</td></tr><tr><td>R20</td><td>$2x$</td><td>$20(2x)$</td></tr><tr><td>R50</td><td>x</td><td>$50(x)$</td></tr></table> $10(x+15) + 20(2x) + 50x = 10150$ $100x = 10000$ $x = 100$ $R10$ Notes: $100 + 15 = 115$ $R20$ Notes: $2(100) = 200$ $R50$ Notes: $100 = 100$	✓setting up equation/*vergelyking*/ *opstel van vergelyking* ✓simplification/ *vereenvoudiging* ✓x-value/*-waarde* ✓answer/*antwoord* R10 notes = 115 R20 notes = 200 R50 notes = 100 (4)
2.1.1		**[19]**

QUESTION/*VRAAG* 3

3.1.1	$5x + 7$	✓ answer/*antwoord* (1)
3.1.2	$T_n = mn + c$ $T_n = (x+2)n + q$ $4x + 5 = xn + 2n + q$ $4x + 5 = 3x + 6 + q$ $x - 1 = q$ $\therefore T_n = (x+2)n + (x-1)$ $T_n = xn + 2n + x - 1$	✓ substitution/*vervanging/ vervanging* ✓ simplification/ *vereenvoudiging* ✓ answer/*antwoord* (3)
	OR/*OF* For $n = 1$: $(1+1) + (2(1) - 1)$ $n = 2$: $(2+1) + (2(2) - 1)$ $n = 3$: $(3+1) + (2(3) - 1)$ $Tn = (n+1)x + (2n - 1)$ $T_n = xn + 2n + x - 1$	✓✓ investigating/*ondersoek* ✓ answer/*antwoord* (3)
3.1.3	$T_{13} = 95$ $95 = 13x + 2(13) + x - 1$ $95 = 13x + 26 + x - 1$ $14x = 70$ $x = 5$	✓ substitution/*vervanging/ vervanging* ✓ answer/*antwoord* (2)
3.1.4	$T_n = 5n + 2n + 5 - 1$ $T_n = 7n + 4$ $7n + 4 < 158$ $7n < 154$ $n < 22$ $\therefore T_{21}$ is the first term less than 158./*is die eerste term minder as 158*	✓ $7n + 4 < 158$ ✓ $n < 22$ ✓ conclusion/*gevolg-trekking* (3)

3.2.1	Height/*Hoogte* $= 50 \times 44$	$\checkmark$ answer/*antwoord* (1)
	$\qquad\qquad = 2200 \text{ cm}$	
3.2.2	$T_n = -0{,}1n + c$	
	$T_1 = 7{,}9$	$\checkmark$ constant difference/ *konstante verskil*
	$7{,}9 = -0{,}1 + c$	
	$\therefore c = 8$	$\checkmark$ T_n
	$T_n = -0{,}1n + 8$	
	$T_{45} = -0{,}1(45) + 8$	
	$T_{45} = 3{,}5m$	$\checkmark$ answer/*antwoord* (3)
	OR/*OF*	
	$7{,}9\;;\;7{,}8\;;\;7{,}7\;;....$	
	$7{,}9 = -0{,}1 \times 1 + 8 ....(1)$	
	$7{,}8 = -0{,}1 \times 2 + 8 ....(2)$	
	$7{,}7 = -0{,}1 \times 3 + 8 ....(3)$	
	$T_n = -0{,}1 \times n + 8$	$\checkmark$ equation/*vergelykings*
	$T_n = -0{,}1n + 8$	
	$T_{45} = -0{,}1 \times 45 + 8$	$\checkmark$ substitution/*vervanging*
	$T_{45} = 3{,}5m$	$\checkmark$ answer/*antwoord* (3)
3.2.3	*Area of Trapezium* / *Oppervlakte van trapesium* $= \frac{1}{2}(AB + CD)H$	$\checkmark$ formula/*formule*
	$= \frac{1}{2}(3{,}5 + 7{,}9)22$	$\checkmark$ substitution/*vervanging*
	$= 125{,}4 \text{ m}^2$	$\checkmark$ answer/*antwoord* (3)
		[16]

QUESTION/*VRAAG* 4

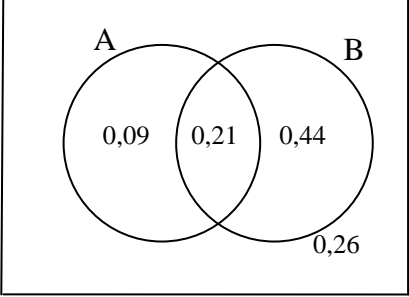| 4.1.1	$\text{Deposit} = \dfrac{25}{100} \times R\,7950 = R1987{,}50$ $\text{Balance} = R7950 - R1987{,}50$ $\qquad = R5962{,}50$ **OR/OF** $\text{Balance} = \dfrac{75}{100} \times R\,7950 = R5962{,}50$	✓deposit/*deposito* ✓balance/*balans* (2) ✓75% ✓ answer/*antwoord* ¶(2)
4.1.2	$A = P(1 + in)$ $A = R5962{,}50\left(1 + \dfrac{15}{100} \times 2\right)$ $A = R7751{,}25$ $\text{Monthly payment} = \dfrac{R7751{,}25}{24} + R70{,}75$ $\qquad\qquad\qquad = R393{,}72$	✓substitution/*vervanging* ✓dividing by/*deel deur* 24 ✓adding insurance/*voeg versekering by* ✓answer/*antwoord* (4)
4.2.1	$£55 \times R23{,}43$ $= R1288{,}65$	✓answer/*antwoord* (1)
4.2.2	$\text{Cost of a car/}Koste\ van\ 'n\ motor = \dfrac{5\,500}{23{,}43} \times 14{,}58$ $\qquad\qquad\qquad = £3\,422{,}54$ ∴ Car is more expensive in England /*Motor is duurder in Engeland* **OR/OF** $\text{Cost of a car/}Koste\ van\ motor = \dfrac{23{,}43}{14{,}58} \times 3500$ $\qquad\qquad\qquad = \$5624{,}49$ ∴ Car is more expensive in England /*Motor is duurder in Engeland*	✓$\dfrac{5\,500}{23{,}43} \times 14{,}58$ ✓£3 422,54 ✓conclusion/*gevolgtrekking* ✓$\dfrac{23{,}43}{14{,}58} \times 3500$ ✓ \$5624,49 ✓conclusion/ *gevolgtrekking* (3)
		[10]

QUESTION/*VRAAG* 5

5.1.1	$q = 1$	✓answer/*antwoord* (1)
5.1.2	$x \in \Re \,;\, x \neq 0$ **OR/OF** $x \in (-\infty;0) \cup (0;\infty)$	✓$x \in \Re$ ✓$x \neq 0$ (2) ✓✓answer/*antwoord* (2)
5.2.1	$y = -x + 1$	✓negative gradient/ *negatiewe gradiënt* ✓the value of/*die waarde van* c (2)
5.2.2	$x + 2 = 0$ $x = -2$ $0 = \dfrac{k}{-2} + 1$ $k = 2$ $\therefore f(x) = \dfrac{2}{x} + 1$	✓$x = -2$ ✓substitution $(-2\,;0)$ ✓$k = 2$ ✓equation/*vergelyking* (4)
5.2.3	$f(x) = g(x)$ $\dfrac{2}{x} + 1 = x + 2$ $2 + x = x^2 + 2x$ $x^2 + x - 2 = 0$ $(x + 2)(x - 1) = 0$ $\therefore x = -2 \ \text{or} \ x = 1$ at A : $x = 1\,;\, y = 3$ A$(1\,;3)$	✓equating/*vergelyking* ✓standard form/ *standaardvorm* ✓*factorising/ faktorisering* ✓*x*-values/-*waardes* ✓answer/*antwoord* (5)
		[14]

QUESTION/*VRAAG* 6

6.1.1	$y = -4$	✓answer/*antwoord* (1)
6.1.2	$q = -5$	✓answer/*antwoord* (1)
6.1.3	$(2\,;0)$	✓answer/*antwoord* (1)
6.2.1	$g(x) = ax^2 - 5$ $(-2\,;0) : 0 = a(-2)^2 - 5$ $0 = 4a - 5$ $a = \dfrac{5}{4}$ $\therefore g(x) = \dfrac{5}{4}x^2 - 5$	✓value of a ✓equation/*vergelyking/ waarde van 'n vergelyking* (2)
6.2.2	$f(x) = k^x - 4$ $(-2\,;0) : 0 = k^{-2} - 4$ $0 = \dfrac{1}{k^2} - 4$ $4k^2 = 1$ $k^2 = \dfrac{1}{4}$ $k = \dfrac{1}{2}$ $\therefore f(x) = \left(\dfrac{1}{2}\right)^x - 4$	✓ substitution $(-2\,;0)$ ✓value of/*waarde van* k ✓equation/*vergelyking* (3)
6.3	$y = \left(\dfrac{1}{2}\right)^0 - 4$ $y = -3$	✓substitution/*vervanging* ✓answer/*antwoord* (2)

6.4		*f:* ✓asymptotes of/*asimptote van f* ✓*y*-intercept of/*y-afsnitte van f* ✓ shape of/*vorm van f* *g:* ✓*x*-intercepts/*x-afsnitte* ✓turning point of/*draaipunt van g* ✓shape of/*vorm van g* (6)
		[16]

QUESTION/*VRAAG* 7

7.1.1	$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $0,74 = 0,30 + 0,65 - P(A \text{ and } B)$ $P(A \text{ and } B) = 0,21$	✓substitution/*vervanging* ✓answer/*antwoord* (2)
7.1.2		✓0,09 ✓0,21 ✓0,44 ✓0,26 (4)
7.1.3	No ; $P(A \text{ and } B) \neq 0$. **OR/OF** No. There is an intesection	✓No/*Nee* ✓reason/*rede* (2)
7.2.1	$n(S) = 12$ $n(square\,no.) = 3 \ (i.e\,1\,;4\,;9)$ $P(square\,no.) = \dfrac{3}{12}$ $= \dfrac{1}{4}$	✓answer/*antwoord* (1)
7.2.2	$P(\text{sum of the 2 numbers} = 2) = \dfrac{1}{144}$ $P(\text{sum of the 2 numbers greater than 2}) = 1 - \dfrac{1}{144}$ $= \dfrac{143}{144}$ $= 0,99$	✓$\dfrac{1}{144}$ ✓Complementary rule/ *Komplementêre reël* ✓answer/*antwoord* (3)
		[12]
	TOTAL/*TOTAAL*:	**[100]**