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# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**SENIOR CERTIFICATE EXAMINATIONS/  
SENIORSERTIFIKAAT-EKSAMEN  
NATIONAL SENIOR CERTIFICATE EXAMINATIONS/  
NASIONALE SENIORSERTIFIKAAT-EKSAMEN**

**MATHEMATICS P1/  
WISKUNDE VI**

**MARKING GUIDELINES/NASIENRIGLYNE**

**2021**

**MARKS: 150  
PUNTE: 150**

**These marking guidelines consist of 13 pages.  
*Hierdie nasienriglyne bestaan uit 13 bladsye.***

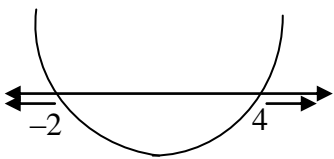
**NOTE:**

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent Accuracy applies in all aspects of the marking memorandum.

**LET WEL:**

- Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die EERSTE poging.
- Volgehoue akkuraatheid is DEURGAANS op ALLE aspekte van die memorandum van toepassing.

**QUESTION/VRAAG 1**

1.1.1	$x^2 - x - 20 = 0$ $(x-5)(x+4) = 0$ $x = 5 \quad \text{or} \quad x = -4$	✓ factors ✓ $x = 5$ ✓ $x = -4$ (3)
1.1.2	$3x^2 - 2x - 6 = 0$ $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(-6)}}{2(3)}$ $x = \frac{1 \pm \sqrt{19}}{3}$ $x = -1,12 \quad \text{or} \quad x = 1,79$	✓ substitution  ✓ simplification ✓ $x = -1,12$ ✓ $x = 1,79$ (4)
1.1.3	$(x-1)^2 > 9$ $x^2 - 2x - 8 > 0$ $(x-4)(x+2) > 0$  Critical values: $x = 4 \quad \text{or} \quad x = -2$    $x < -2 \quad \text{or} \quad x > 4$  <b>OR/OF</b> $(-\infty; -2) \quad \text{or} \quad (4; \infty)$  <b>OR/OF</b> $x - 1 > 3 \quad \text{or} \quad x - 1 < -3$ $x > 4 \quad \text{or} \quad x < -2$	✓ standard form   ✓ critical values    ✓✓ $x < -2 \quad \text{or} \quad x > 4$ (4)  <b>OR/OF</b> ✓✓ $(-\infty; -2) \quad \text{or} \quad (4; \infty)$   <b>OR/OF</b> ✓ $x - 1 > 3$ ✓ $x - 1 < -3$ ✓✓ $x > 4 \quad \text{or} \quad x < -2$ (4)

1.1.4	$2\sqrt{x+6} + 2 = x$ $2\sqrt{x+6} = x - 2$ $4(x+6) = (x-2)^2$ $4x + 24 = x^2 - 4x + 4$ $x^2 - 8x - 20 = 0$ $(x-10)(x+2) = 0$ $x = 10 \quad \text{or} \quad x \neq -2$	✓ isolating the surd  ✓ $4x + 24 = x^2 - 4x + 4$  ✓ $x = 10$ ✓ $x \neq -2$  (4)
1.2	$4x = 2 - y \quad . . . (1)$ $4x + y^2 = 8 \quad . . . (2)$ $\therefore 2 - y + y^2 = 8$ $y^2 - y - 6 = 0$ $(y-3)(y+2) = 0$ $y = 3 \quad \text{or} \quad y = -2$ $x = -\frac{1}{4} \quad \text{or} \quad x = 1$  <b>OR/OF</b> $y = -4x + 2 \quad . . . (1)$ $4x + y^2 = 8 \quad . . . (2)$ $4x + (-4x + 2)^2 = 8$ $4x + 16x^2 - 16x + 4 - 8 = 0$ $16x^2 - 12x - 4 = 0$ $4x^2 - 3x - 1 = 0$ $(4x+1)(x-1) = 0$ $x = -\frac{1}{4} \quad \text{or} \quad x = 1$ $y = 3 \quad \text{or} \quad y = -2$	✓ $4x = 2 - y$  ✓ substitution ✓ standard form  ✓ y-values ✓ x-values  (5)  <b>OR/OF</b> ✓ $y = -4x + 2$  ✓ substitution  ✓ standard form  ✓ x-values ✓ y-values  (5)
1.3	$2^x \times 3^y = (2^3 \times 3)^6$ $2^x \times 3^y = 2^{18} \times 3^6$ $2^x = 2^{18} \quad \text{and} \quad 3^y = 3^6$ $x = 18 \quad \text{and} \quad y = 6$ $\therefore x - y = 18 - 6$ $\therefore x - y = 12$	✓ $2^3 \times 3$  ✓ $2^{18} \text{ or } 3^6$ ✓ $x = 18 \text{ or } y = 6$  ✓ answer (A)  (4)
		<b>[24]</b>

**QUESTION/VRAAG 2**

2.1.1	$  \begin{array}{ccccccc}  72 & ; & 100 & ; & 120 & ; & 132 & ; & \dots \\  & \swarrow & & \searrow & & \swarrow & & \searrow & \\  & 28 & & 20 & & 12 & & & \\  & \swarrow & & \searrow & & \swarrow & & \searrow & \\  & & -8 & & -8 & & & &   \end{array}  $ $  \begin{aligned}  2a &= -8 \\  a &= -4 \\  3a + b &= 28 \\  b &= 40 \\  a + b + c &= 72 \\  c &= 36 \\  T_n &= -4n^2 + 40n + 36  \end{aligned}  $	$\checkmark$ second differences = $-8$ $\checkmark a = -4$ $\checkmark b = 40$ $\checkmark c = 36$ <div style="text-align: right;">(4)</div>
2.1.2	$  \begin{aligned}  T_{12} &= 36 - 8n = 36 - 8(12) = -60 \\  -4n^2 + 40n + 36 &= -60 \\  n^2 - 10n - 24 &= 0 \\  (n - 12)(n + 2) &= 0 \\  \therefore n &= 12  \end{aligned}  $	$\checkmark 36 - 8n$ $\checkmark -60$ $\checkmark$ standard form $\checkmark$ factors $\checkmark n = 12$ <div style="text-align: right;">(5)</div>
2.1.3	$  \begin{aligned}  T_n' &= -8n + 40 = 0 \\  n &= 5 \\  T_n &= -4(5)^2 + 40(5) + 36 = 136  \end{aligned}  $ <p><b>OR/OF</b></p> $  \begin{aligned}  \frac{-b}{2a} &= \frac{40}{8} = 5 \\  T_n &= -4(5)^2 + 40(5) + 36 \\  &= 136  \end{aligned}  $	$\checkmark -8n + 40$ $\checkmark n = 5$ $\checkmark 136$ <div style="text-align: right;">(3)</div> <p><b>OR/OF</b></p> $\checkmark$ substitution $\checkmark n = 5$ $\checkmark 136$ <div style="text-align: right;">(3)</div>
2.1.4	Maximum value = 41	$\checkmark$ value <div style="text-align: right;">(1)</div>
2.2	$  \begin{aligned}  2\sin 3x - (-11) &= 15 - 2\sin 3x \\  4\sin 3x &= 4 \\  \sin 3x &= 1 \\  3x &= 90^\circ \\  \therefore x &= 30^\circ  \end{aligned}  $	$\checkmark$ equating $\checkmark 4\sin 3x = 4$ $\checkmark \sin 3x = 1$ $\checkmark$ answer <div style="text-align: right;">(4)</div>
		<b>[17]</b>

**QUESTION/VRAAG 3**

3.1.1	$T_n = ar^{n-1} = 2000\left(\frac{1}{5}\right)^{n-1}$	✓ $2000\left(\frac{1}{5}\right)^{n-1}$ (1)
3.1.2	$T_7 = 2000\left(\frac{1}{5}\right)^{7-1} = \frac{16}{125}$	✓ $\frac{16}{125}$ (1)
3.1.3	$\frac{16}{15625} = 2000\left(\frac{1}{5}\right)^{n-1}$ $\frac{1}{1953125} = \left(\frac{1}{5}\right)^{n-1}$ $\left(\frac{1}{5}\right)^9 = \left(\frac{1}{5}\right)^{n-1} \quad \text{OR} \quad n-1 = \log_{\frac{1}{5}} \frac{1}{1953125}$ $n-1 = 9$ $n = 10$	✓ equating  ✓ same base / use of log  ✓ answer (3)
3.2	$S_\infty = 27 = \frac{a}{1-r}$ $S_3 = \frac{a(1-r^3)}{1-r} = 26$ $27(1-r^3) = 26$ $1-r^3 = \frac{26}{27}$ $r^3 = \frac{1}{27}$ $\therefore r = \frac{1}{3}$ <b>OR/OF</b> $S_\infty = 27 = \frac{a}{1-r}$ $a = 27(1-r)$ But $a + ar + ar^2 = 26$ $a(1+r+r^2) = 26$ $27(1-r)(1+r+r^2) = 26$ $(1-r)(1+r+r^2) = \frac{26}{27}$ $r^2 + r + 1 - r^3 - r^2 - r = \frac{26}{27}$ $-r^3 + 1 = \frac{26}{27}$ $r^3 = \frac{1}{27}$ $\therefore r = \frac{1}{3}$	✓ $S_\infty = 27 = \frac{a}{1-r}$ ✓ $S_3 = \frac{a(1-r^3)}{1-r} = 26$ ✓ substitution     ✓ $r = \frac{1}{3}$ (4)  <b>OR/OF</b>  ✓ $a = 27(1-r)$ ✓ $a + ar + ar^2 = 26$  ✓ substitution     ✓ $r = \frac{1}{3}$ (4)
		<b>[9]</b>



**QUESTION/VRAAG 5**

5.1	$-2x^2 + 4x + 16 = 0$ $x^2 - 2x - 8 = 0$ $(x-4)(x+2) = 0$ $x = 4$ or $x = -2$ $\therefore A(-2;0)$ and $B(4;0)$	$\checkmark$ factors $\checkmark x = -2$ $\checkmark x = 4$ (3)
5.2	$f(x) = -2x^2 + 4x + 16$ $-\frac{b}{2a} = -\frac{-4}{-2(2)} = 1$ $f(1) = -2(1)^2 + 4(1) + 16 = 18$ $\therefore C(1;18)$  <b>OR/OF</b> $f(x) = -2x^2 + 4x + 16$ $f'(x) = -4x + 4$ $-4x + 4 = 0$ $x = 1$ $f(1) = -2(1)^2 + 4(1) + 16 = 18$ $\therefore C(1;18)$	$\checkmark 1$ $\checkmark 18$ (2)  <b>OR/OF</b> $\checkmark 1$ $\checkmark 18$ (2)
5.3	$y \leq 18$  <b>OR/OF</b> $y \in (-\infty; 18]$	$\checkmark y \leq 18$ (1)  <b>OR/OF</b> $\checkmark y \in (-\infty; 18]$ (1)
5.4	TP (1 ; 18) for $f$ TP (2 ; 15) for $h$ $\therefore p = -1$ $q = -3$	$\checkmark$ TP for $h$ at (2 ; 15) $\checkmark p = -1$ $\checkmark q = -3$ (3)
5.5	$y = 2x + 4$ $x = 2y + 4$ $\therefore y = \frac{1}{2}x - 2$	$\checkmark$ swop $x$ and $y$ $\checkmark y = \frac{1}{2}x - 2$ (2)
5.6	$g(x) = 0$ or $g^{-1}(x) = 0$ $x = 4$ or $x = -2$ (product 0 at $x$ -intercepts)	$\checkmark x = 4$ $\checkmark x = -2$ (2)



5.7	$-2x^2 + 4x + 16 + k = 2x + 4$ $-2x^2 + 2x + 12 + k = 0$ $b^2 - 4ac < 0$ $(2)^2 - 4(-2)(12 + k) < 0$ $4 + 8(12 + k) < 0$ $100 + 8k < 0$ $k < -12,5$  <b>OR/OF</b>  $g'(x) = 2$ $f'(x) = -4x + 4 = 2$  $x = \frac{1}{2}$ $f\left(\frac{1}{2}\right) = 17,5$ $g\left(\frac{1}{2}\right) = 5$ $\therefore k < -12,5$	✓ equating ✓ standard form ✓ $b^2 - 4ac < 0$ ✓ substitution   ✓ answer  (5)  <b>OR/OF</b> ✓ $g'(x) = 2$ ✓ $f'(x) = -4x + 4$   ✓ $f\left(\frac{1}{2}\right) = 17,5$ ✓ $g\left(\frac{1}{2}\right) = 5$ ✓ answer  (5)
		[18]

**QUESTION/VRAAG 6**

6.1.1	$y = 3^x$ $x = 3^y$ $y = \log_3 x$	✓ swop $x$ and $y$  ✓ equation  (2)
6.1.2	$h(x) = 3^{x-4} + 2$ Transformation: 4 units left, 2 units down $P'(2;9)$	✓ $x = 2$ (A) ✓ $y = 9$ (A)  (2)
6.2	$f(x) = 2^{x+p} + q$ $q = -16$ $16 = 2^{p+3} - 16$ $2^{p+3} = 32$ $2^{p+3} = 2^5$ $\therefore p + 3 = 5$ $p = 2$	✓ $q = -16$  ✓ substitute (3 ; 16)  ✓ $2^{p+3} = 2^5$ or $p + 3 = \log_2 32$  ✓ $p = 2$  (4)
		[8]

**QUESTION/VRAAG 7**

7.1	$13\,080 = 10\,000 \left(1 + \frac{i}{4}\right)^{16}$ $\left(1 + \frac{i}{4}\right)^{16} = \frac{13080}{10000}$ $1 + \frac{i}{4} = \sqrt[16]{\frac{13080}{10000}}$ $\frac{i}{4} = 0,0169227\dots$ $i = 0,06769\dots$ $i = 6,77\%$	✓ substitution into correct formula ✓ $n = 16$  ✓ simplification   ✓ answer (A)
7.2.1	$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{9\,000 \left[ \left(1 + \frac{0,075}{12}\right)^{60} - 1 \right]}{\frac{0,075}{12}}$ $F = R\,652\,743,95$	✓ $\frac{0,075}{12}$  ✓ substitution into correct Formula  ✓ answer
7.2.2	$60 \times 9\,000 = R540\,000$ $A = P(1+i)^n$ $652\,743,95 \left(1 + \frac{0,075}{12}\right)^n = 190\,214,14 + 540\,000$ $730\,214,14 = 652\,743,95 \left(1 + \frac{0,075}{12}\right)^n$ $1,1186\dots = (1,00625)^n$ $n = \log_{1,00625}(1,1186)$ $\therefore n = 18 \text{ months}$	✓ $60 \times 9\,000 = R540\,000$   ✓ ✓ equation   ✓ simplification ✓ use of logs ✓ 18 months

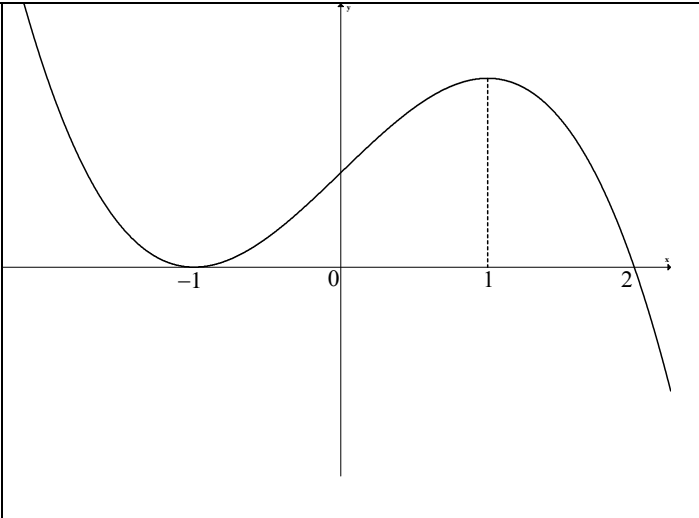
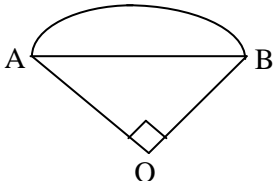
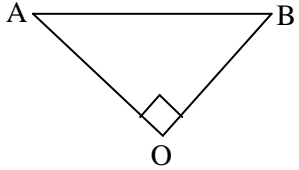


8.2.2	$g(x) = (\sqrt{x} + 3)(\sqrt{x} - 1)$ $g(x) = x + 2x^{\frac{1}{2}} - 3$ $g'(x) = 1 + x^{-\frac{1}{2}}$	$\checkmark x \quad \checkmark 2x^{\frac{1}{2}}$ $\checkmark 1 \quad \checkmark x^{-\frac{1}{2}}$ (4)
		[12]

**QUESTION/VRAAG 9**

9.1	$f'(x) = 6x^2 + 6x - 12$ $6x^2 + 6x - 12 = 0$ $x^2 + x - 2 = 0$ $(x + 2)(x - 1) = 0$ $x = -2 \quad \text{or} \quad x = 1$ $y = 20 \quad \text{or} \quad y = -7$ $\therefore A(-2 ; 20) \text{ and } B(1 ; -7)$	$\checkmark 6x^2 + 6x - 12$ $\checkmark = 0$ $\checkmark \text{factors}$ $\checkmark x \text{-values}$ $\checkmark y \text{-values}$ (5)
9.2	$f''(x) = 12x + 6$ $12x + 6 > 0$ $12x > -6$ $x > -\frac{1}{2}$ <b>OR/OF</b> $x = \frac{-2+1}{2} = -\frac{1}{2}$ $\therefore x > -\frac{1}{2}$	$\checkmark 12x + 6$ $\checkmark f''(x) > 0$ $\checkmark x > -\frac{1}{2}$ (3) <b>OR/OF</b> $\checkmark x = -\frac{1}{2}$ $\checkmark \checkmark x > -\frac{1}{2}$ (3)
9.3	$f'(2) = 24$ Equation of the tangent: $y - 4 = 24(x - 2)$ $y = 24x - 44$	$\checkmark f'(2)$ $\checkmark 24$ $\checkmark \text{equation}$ (3)
		[11]

**QUESTION/VRAAG 10**

10.1		<ul style="list-style-type: none"> <li>✓ <math>x = -1</math> and <math>x = 2</math></li> <li>✓ TP at <math>x = -1</math></li> <li>✓ TP at <math>x = 1</math></li> <li>✓ shape</li> </ul> <p style="text-align: right;">(4)</p>
10.2.1	 <p>Area of segment = <math>\frac{1}{4}</math> Area of big circle</p> $= \frac{1}{4} \pi (x - x^2)^2$  <p>Area triangle ABO counted</p> $= \text{Area } \Delta = \frac{1}{2} (x - x^2)^2$ <p>Area of shaded region</p> $= \frac{1}{4} \pi (x - x^2)^2 - \frac{1}{2} (x - x^2)^2$ $= \frac{\pi - 2}{4} (x - x^2)^2$ $= \left( \frac{\pi - 2}{4} \right) (x^2 - 2x^3 + x^4)$	<ul style="list-style-type: none"> <li>✓✓ <math>\frac{1}{4} \pi (x - x^2)^2</math></li> <li>✓ Area <math>\Delta = \frac{1}{2} (x - x^2)^2</math></li> <li>✓ subtract areas</li> <li>✓ common factor</li> </ul> <p style="text-align: right;">(5)</p>

10.2.2	<p>Area of shaded region</p> $= \frac{(\pi - 2)}{4}(x^4 - 2x^3 + x^2)$ $\frac{dA}{dx} = \left(\frac{\pi - 2}{4}\right)(4x^3 - 6x^2 + 2x)$ $4x^3 - 6x^2 + 2x = 0$ $x(2x^2 - 3x + 1) = 0$ $x(2x - 1)(x - 1) = 0$ $x \neq 0 \quad \text{or} \quad x = \frac{1}{2} \quad \text{or} \quad x \neq 1$	$\checkmark \left(\frac{\pi - 2}{4}\right)(4x^3 - 6x^2 + 2x)$ $\checkmark \text{ factors}$ $\checkmark x = 0; x = 1; x = \frac{1}{2}$ $\checkmark x = \frac{1}{2} \quad (4)$
		[13]

**QUESTION/VRAAG 11**

11.1	<p><math>P(A) = 1 - P(\text{not } A) = 0,6</math></p> <p><math>P(A \text{ and } B) = P(A) \times P(B)</math>  <math>= 0,6 \times 0,3</math>  <math>= \frac{9}{50}</math>  <math>= 0,18</math></p>	$\checkmark 0,6$ $\checkmark P(A \text{ and } B) = P(A) \times P(B)$ $\checkmark \text{ answer (A)}$ (3)
11.2.1	$a = \frac{15}{150} = 0,1$	$\checkmark \frac{15}{150} \text{ (A)}$ (1)
11.2.2	$m = 1 - 0,7 = 0,3$	$\checkmark 0,3 \text{ (A)}$ (1)
11.2.3	$0,24 + 0,14 + 0,02 + 0,12 + 0,1 + 2b = 0,7$ $2b = 0,08$ $b = 0,04$ $0,04 \times 150 = 6$	$\checkmark \text{ addition}$ $\checkmark \text{ simplification}$ $\checkmark b = 0,04$ $\checkmark 6$ (4)
11.3.1	$9 \times 9 \times 8 = 648$	$\checkmark 9 \quad \checkmark 9 \times 8$ (2)
11.3.2	$2 \times 8 \times 4 = 64$ $2 \times 8 \times 5 = 80$ $\text{Total number} = 64 + 80 = 144$	$\checkmark \checkmark 2 \times 8 \times 4$ $\checkmark 2 \times 8 \times 5$ $\checkmark 144 \text{ (A)}$ (4)
		[15]

**TOTAL/TOTAAL: 150**