

**METRO EAST
EDUCATION DISTRICT/
METRO OOS
ONDERWYSDISTRIK**

**GEMEENSKAPLIKE VRAESTEL/
COMMON PAPER**

GRAAD/GRADE 12

**WISKUNDE V1 / MATHEMATICS P1
MEMORANDUM**

SEPTEMBER 2018

PUNTE/MARKS: 150

- ACCEPT ALL MATHEMATICALLY VALID ALTERNATIVES
- ONLY PENALISE FOR ROUNDING IN 1.1.1

VRAAG 1 / QUESTION 1

QUESTION		SOLUTION	DESCRIPTORS	MARKS/ LEVELS
	1.1.1	$x^2 - 10x - 3 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(1)(-3)}}{2(1)}$ $x = \frac{10 \pm \sqrt{112}}{2}$ $x = 10,29 \text{ or } x = -0,29$	<p>Incorrect formula : No marks</p> <p>✓ <i>subst into correct formula</i></p> <p>✓ $x = 10,29$ ✓ $x = -0,29$</p> <p>-1 rounding</p> <p>Only penalise for rounding at this question</p>	(3) K
	1.1.2	$(x + 2)(x - 9) = 0$ $x = -2 \text{ of/or } x = 9$ <p>OR</p> $x^2 - 7x - 18 = 0$ $(x - 9)(x + 2) = 0$ $x = 9 \text{ or } x = -2$	<p>✓✓ each factor ✓ answers CA</p> <p>✓ <i>standard form</i></p> <p>✓ <i>factors</i></p> <p>✓ answers CA</p>	(3)R
	1.1.3	$3^x(3^x - 9) = 0$ $3^x(3^x - 9) = 0$ $3^x \neq 0 ; 3^x = 9$ $\therefore x = 2$	<p>✓ $3^x \neq 0$</p> <p>✓ $x = 2$</p>	(2)K
1.2	1.2.1	$16 - 4k \geq 0$ $4k \leq 16$ $k \leq 4$	<p>✓ $16 - 4k \geq 0$</p> <p>✓ <i>answer</i></p>	(2)K/R
	1.2.2	$k = -5 \text{ or } 3 \text{ or } 0 \text{ or } 4 \text{ (any one)}$	✓ <i>answer</i>	(1)K

QUES	SOLUTION	DESCRIPTORS	MARKS/ LEVELS	
1.3	$x(x - y + 1) = 0 \dots\dots\dots (1)$ <i>en</i> $2x + y - 2 = 0$ $y = -2x + 2 \dots\dots\dots (2)$ <i>stel (2) in (1)</i> $x[x - (-2x + 2) + 1] = 0$ $x(x + 2x - 2 + 1) = 0$ $x(3x - 1) = 0$ $x = 0$ <i>of</i> $x = \frac{1}{3}$ $y = 2$ $y = 1\frac{1}{3}$	<p style="text-align: center;">OR</p> $x = -\frac{1}{2}y + 1 \dots\dots (2)$ $(-\frac{1}{2}y + 1)[-\frac{1}{2}y + 1 - y + 1] = 0$ $(-\frac{1}{2}y + 1)[-1\frac{1}{2}y + 2] = 0$ $y = 2 ; 1\frac{1}{3}$ $x = 0 ; \frac{1}{3}$	<ul style="list-style-type: none"> ✓ $y = -2x + 2$ ✓ <i>substitution into (1)</i> ✓ <i>factors</i> ✓ <i>values of x</i> ✓ $y = 2$ ✓ $y = 1\frac{1}{3}$ 	(6)R
1.4	<p>1.4.1 $(x - 1)(x + 2) < 0$ $-2 < x < 1$</p>	<ul style="list-style-type: none"> ✓ $(x - 1)(x + 2) < 0$ ✓ <i>critical values</i> ✓ <i>notation</i> 	(3)R/K	
	<p>1.4.2 $\sqrt{(x - 1)(x + 2)} = 2$ $(x - 1)(x + 2) = 4$ $x^2 + x - 2 = 4$ $x^2 + x - 6 = 0$ $(x + 3)(x - 2) = 0$ $x = -3$ <i>or</i> $x = 2$ Both solutions valid</p>	<ul style="list-style-type: none"> ✓ $g'(x) = 2$ ✓ <i>squaring both sides</i> ✓ <i>standard form</i> ✓ <i>factors</i> ✓ <i>answers</i> 	(5)C	
			[25]	

VRAAG 2 / QUESTION 2

QUES	SOLUTION		DESCRIPTORS	MARKS/ LEVELS
2.1	$S_n = a + (a + d) + \dots + a + (n - 2)d + a + (n - 1)d$ $S_n = a + (n - 1)d + a + (n - 2)d + \dots + (a + d) + a$ <hr/> $2S_n = 2a + (n - 1)d \dots \text{for } n \text{ terms}$ $\therefore S_n = \frac{n}{2} [2a + (n - 1)d]$ <p>OR</p> $S_n = a + (a + d) + \dots + (l - d) + l$ $S_n = l + (l - d) + \dots + (a + d) + a$ <hr/> $2S_n = a + l + a + l \dots \text{for } n \text{ terms}$ $2S_n = n(a + l)$ $S_n = \frac{n}{2} [a + l]$ <p>but $l = a + (n - 1)d$</p> $\therefore S_n = \frac{n}{2} [2a + (n - 1)d]$		<p>✓ step 1 ✓ step 2</p> <p>✓ step 3</p> <p>✓ step 4</p> <p>NO CA</p> <p>✓ step 1 ✓ step 2</p> <p>✓ step 3</p> <p>✓ step 4</p> <p>NO CA</p>	(4)K
2.2	2.2.1	$T_n = a + (n - 1)d$ $35 = -5 + (n - 1)4$ $44 = 4n$ $n = 11$	<p>OR</p> $T_n = 4n - 9 = 35$ <p>✓ substitution ✓ simplification ✓ answer</p>	(3)R
	2.2.2	$S_{11} = \frac{11}{2} [2(-5) + 10(4)]$ $= \frac{11}{2} (30)$ $= 165$	<p>✓ substitution</p> <p>✓ answer</p>	(2)R

QUESTION		SOLUTION	DESCRIPTORS	MARKS/ LEVELS
2.3	2.3.1	$S_1 = 2(1) - 1^2$ $= 1$ $\therefore T_1 = 1$	\checkmark <i>sub</i> \checkmark <i>answer</i> T_1	(2)C
	2.3.2	$S_{15} - S_{12}$ $= [2(15) - 15^2] - [2(12) - 12^2]$ $= -195 - (-120)$ $= -75$	\checkmark $M - S_{15}$ \checkmark $M - S_{12}$ \checkmark <i>answer</i>	(3)P
2.4	<p><i>aantal stawe/number of steel bars</i> : 3;7;11</p> <p>$n = \frac{75}{5} = 15$ (ryoppervak/driving surface)</p> <p> $T_{15} = 3 + (14)(4)$ OR $T_{15} = 15 \times 3 + 15 - 1$ </p> <p>$= 59$</p>		\checkmark $a = 3$ and $d = 4$ \checkmark $n = 15$ \checkmark <i>answer</i>	(3)P
				[17]

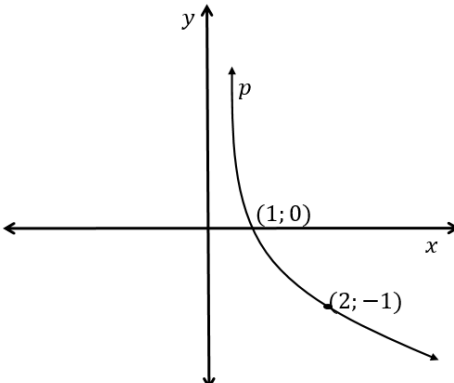
VRAAG 3 / QUESTION 3

QUES	SOLUTION		DESCRIPTORS	MARKS/ LEVELS
3.1	3.1.1	19; 7; -1; -5	✓✓ <i>answer</i> (1mark per 2 terms)	(2)K
	3.1.2	$2a = 4$ $3a + b = -12$ $a + b + c = 19$ $a = 2$ $3(2) + b = -12$ $2 - 18 + c = 19$ $b = -18$ $c = 35$	✓ $a = 2$ ✓ $b = -18$ ✓ $c = 35$	(3)C
3.2	3.2.1	$-1 < \frac{p}{4} < 1$ $-4 < p < 4$	✓ $-1 < r < 1$ ✓ / <i>answer</i>	(2)R/K
	3.2.2	$S_{\infty} = \frac{4}{1-\frac{p}{4}} = 3$ OR $4 = 3 - \frac{3p}{4}$ $\frac{16}{4-p} = 3$ $1 = -\frac{3p}{4}$ $16 = 12 - 3p$ $-4 = 3p$ $\frac{-4}{3} = p$	✓ <i>substitution into correct formula</i> ✓ simplification ✓ <i>answer</i>	(3)C
				[10]

VRAAG 4 / QUESTION 4

QUES	SOLUTION	DESCRIPTORS	MARKS/ LEVELS
4.1	$h(x) = -x + c$ <i>subs</i> (2; 3): $3 = -(2) + c$ $5 = c$ $\therefore h(x) = -x + 5$	\checkmark <i>subst</i> (2; 3) into <i>correct equation</i> $\checkmark h(x) = -x + 5$	(2)R
4.2	<i>sub</i> $y = 4$: $4 = -x + 5$ $x = 1$ $\therefore B(1; 4)$	\checkmark <i>subst</i> $y = 4$ CA $\checkmark x = 1$	(2)R
4.3	$f(x) = a(x + p)^2 + q$ $f(x) = a(x - 1)^2 + 4$ <i>subst</i> (2; 3): $3 = a(2 - 1)^2 + 4$ $-1 = a$ $\therefore f(x) = -(x - 1)^2 + 4$ $f(x) = -(x^2 - 2x + 1) + 4$ $\therefore f(x) = -x^2 + 2x + 3$	$\checkmark f(x) = a(x - 1)^2 + 4$ \checkmark <i>substitution</i> $\checkmark a = -1$ $\checkmark x^2 - 2x + 1$	(4)R
4.4	Eqn of g : $g(x) = \frac{k}{x-1} + 4$ through (0;3) $3 = \frac{k}{-1} + 4$ $-1 = \frac{k}{-1}$ $\therefore k = 1$ $g(x) = \frac{1}{x-1} + 4$	\checkmark <i>substituting asymptotes</i> \checkmark <i>value of k</i> \checkmark <i>answer</i>	(3)R
4.5	$x = 0 ; y = 4$	$\checkmark x = 0 \quad \checkmark y = 4$	(2)K
4.6	$x > 1$	$\checkmark\checkmark$ <i>answer</i> <i>only 1 mark $x \geq 1$</i>	(2)C
			[15]

VRAAG 5 / QUESTION 5

QUES	SOLUTION	DESCRIPTORS	MARKS/ LEVELS
5.1	A (1;0)	✓ 1 ✓ 0	(2)K
5.2	$g^{-1} : x = \log_2 y$ $y = 2^x$	✓ swop x and y ✓ answer or ✓✓ answer only	(2)R
5.3		✓ x – intercept (1; 0) ✓ coordinates of any other point	(2)R
5.4	$\log_{1/2} x \geq 0$ $-\log_2 x \geq 0$ $0 < x \leq 1$	✓ values ✓ notation	(2)P
			[8]

VRAAG 6 / QUESTION 6

Gegee $f(x) = \frac{k}{x+p} + q$			
QUES	SOLUTION	DESCRIPTORS	MARKS/ LEVELS
	<p>The graph shows a hyperbola with a vertical asymptote at $x = -1$ and a horizontal asymptote at $y = 2$. The x-intercept is at $(-\frac{1}{2}; 0)$ and the y-intercept is at $(0; 1)$. The curve is in the second and fourth quadrants relative to the asymptotes.</p>	<ul style="list-style-type: none"> ✓ correct quadrants ✓ x – intercept ✓ y – intercept ✓ asymptotes ✓ shape 	(5)K
			[5]

VRAAG 7 / QUESTION 7

QUES	SOLUTION	DESCRIPTORS	MARKS/ LEVELS
7.1	$A = P(1 - i)^n$ $48\,000 = 85\,000 \left(1 - \frac{13,4}{100}\right)^n$ $\frac{48}{85} = (0,866)^n$ $n = \log_{0,866} \frac{48}{85}$ $n = 3,97 \text{ years/jaar}$ <p>Accept 4 years</p>	✓ <i>subst into correct formula</i> ✓ <i>simplification</i> ✓ <i>using of logs</i> ✓ <i>answer</i>	(4)R
7.2	7.2.1 $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $600\,000 = \frac{x[1 - \left(1 + \frac{0,11}{12}\right)^{-20 \times 12}]}{\frac{0,11}{12}}$ $x = 6193,13$	✓ $n = -240$ ✓ $\frac{0,11}{12}$ ✓ <i>subst into correct formula</i> ✓ <i>answer</i>	(4)R
	7.2.2 $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $P = \frac{6193,13[1 - \left(1 + \frac{0,11}{12}\right)^{-6 \times 12}]}{\frac{0,11}{12}}$ $P = 325\,370,62$ <p>OR</p> $P =$ $600\,000 \left(1 + \frac{0,11}{12}\right)^{168} - \frac{6193,13 \left[\left(1 + \frac{0,11}{12}\right)^{168} - 1\right]}{\frac{0,11}{12}}$ $= R325\,370,77$	✓ $n = -72$ ✓ <i>subst into correct formula</i> CA from 8.2.1 ✓ <i>answer</i>	(3)C
	7.2.3 $A = P(1 + i)^n$ $= 125\,370,77 \left(1 + \frac{0,11}{12}\right)^3$ $= 128\,850,17$	✓ $n = 3$ ✓ <i>subst into correct formula</i> ✓ <i>answer</i>	(3) R
			[14]

VRAAG 8 / QUESTION 8

QUES	SOLUTION	DESCRIPTORS	MARKS/ LEVELS
8.1.1	$f(x) = 3 - x^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{[3 - (x+h)^2] - [3 - x^2]}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{[3 - (x^2 + 2xh + h^2) - 3 + x^2]}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{3 - x^2 - 2xh - h^2 - 3 + x^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-2xh - h^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{h(-2x - h)}{h}$ $f'(x) = -2x$	<p>✓ <i>formule</i></p> <p>✓ $(x^2 + 2xh + h^2)$</p> <p>✓ $-2xh - h^2$</p> <p>✓ $\lim_{h \rightarrow 0} \frac{h(-2x-h)}{h}$</p> <p>✓ <i>answer</i> -1 for incorrect notation</p>	(5)R
8.1.2	$f'(-1) = -2(-1)$ $= 2$	<p>✓ <i>subst</i></p> <p>✓ <i>answer</i></p>	(2) R
8.2	<p>8.2.1</p> $f(x) = -3x^3 - 2\sqrt{x}$ $f(x) = -3x^3 - 2x^{\frac{1}{2}}$ $f'(x) = -9x^2 - x^{-\frac{1}{2}}$	<p>✓ $x^{\frac{1}{2}}$</p> <p>✓ <i>each derivative</i></p> <p>✓</p>	(3)R
	<p>8.2.2</p> $xy = \left(x - \frac{1}{x^2}\right) \left(x + \frac{1}{x^2}\right)$ $xy = x^2 - \frac{1}{x^4}$ $y = x - \frac{1}{x^5}$ $y = x - 1x^{-5}$ $\frac{dy}{dx} = 1 + 5x^{-6}$	<p>✓ <i>simplification</i></p> <p>✓ <i>y subject of formula</i></p> <p>✓ 1</p> <p>✓ $5x^{-6}$</p>	(4)C

QUES	SOLUTION		DESCRIPTORS	MARKS/ LEVELS
8.3	8.3.1	$h(x) = kx^{-1}$ $h'(x) = -kx^{-2}$	✓ kx^{-1} ✓ <i>answer</i>	(2)C
	8.3.2	$h'(x) = -k$ $3 = -kx^{-2} \dots\dots(1)$ $h(x) = g(x)$ $\frac{k}{x} = 3x + 6$ $k = 3x^2 + 6x \dots (2)$ <i>subst (2) in (1):</i> $3 = -(3x^2 + 6x) \cdot x^{-2}$ $3 = -3 - 6x^{-1}$ $3x = -3x - 6$ $6x = -6$ $x = -1$ <i>subst into (2):</i> $k = 3(-1)^2 + 6(-1)$ $k = -3$	✓ equation (1) ✓ equation (2) ✓ <i>subst</i> ✓ <i>value of x</i> ✓ <i>answer</i>	(5)P
8.4	8.4.1	$p'(x) = 3x^2 + 2bx + 24$ <i>subst A(2; 0)</i> $0 = 3(2)^2 + 2b(2) + 24$ $-36 = 4b$ $-9 = b$	✓ $p'(x)$ ✓ <i>subst</i> ✓ <i>answer</i>	(3)C
	8.4.2	$p'(x) = 0$ $3x^2 - 18x + 24 = 0$ $x^2 - 6x + 8 = 0$ $(x - 2)(x - 4) = 0$ $x = 2 ; x = 4$ $C(4; 0)$	✓ $p'(x) = 0$ ✓ <i>factors</i> ✓ $C(4; 0)$	(3)R
	8.4.3	<i>p increase : $p'(x) > 0$.</i> $x < 2 \text{ or } x > 4$	✓ $p'(x) > 0$ ✓ $x < 2$ ✓ $x > 4$ CA from 8.4.2	(3)C
	8.4.4	<i>p concave up : $p''(x) > 0$</i> $x > 3$	✓ $p''(x) > 0$ ✓ $x > 3$ CA from 8.4.2 (middle of 2 x – <i>intercepts</i>)	(2)C

QUES	8.4.5	SOLUTION	DESCRIPTORS	MARKS/ LEVELS
			<ul style="list-style-type: none"> ✓ (2; 0) ✓ <i>infl</i> $x = 3$ ✓ TP $x = 4$ ✓ <i>shape</i> 	
				(4)C
				[36]

QUESTION 9/VRAAG 9

QUES	SOLUTION	DESCRIPTORS	MARKS/ LEVELS
9.1	$h(t) = -10t^2 + 300t + 9750$ $h(0) = -10(0)^2 + 300(0) + 9750$ $= 9750 \text{ meters}$	$\checkmark t = 0$ $\checkmark 9750$ OR $\checkmark\checkmark \text{ answer only}$	(2)K
9.2	$h'(t) = -20t + 300$ $h'(t) = 0$ $-20t + 300 = 0$ $-20t = -300$ $t = 15 \text{ sec}$	$\checkmark -20t + 300$ $\checkmark h'(t) = 0$ $\checkmark \text{ answer}$	(3)R
9.3	$h(t) = -10t^2 + 300t + 9750$ $9750 = -10t^2 + 300t + 9750$ $-10t^2 + 300t = 0$ $-10t(t - 30) = 0$ $t = 30 \text{ sec}$ OR $t = 15 \times 2 = 30 \text{ sec}$	$\checkmark h = 9750$ $\checkmark 30$ OR $\checkmark\checkmark \text{ answer only}$	(2)C
			[7]

QUESTION 10/VRAAG 10

QUES	SOLUTION	DESCRIPTORS	MARKS/ LEVELS
10.1	$P(\text{not Vanilla}) = 1 - P(\text{Vanilla})$ $= 1 - 0,23$ $0,77$	✓ formula ✓ $23\% = 0,23$ ✓ answer	(3)R
10.2	$P(D \text{ of } R) = P(D) + P(R) - P(D \text{ en } R)$ $P(D \text{ of } R) = \frac{13}{39} + \frac{20}{39} - 0$ $P(D \text{ of } R) = \frac{33}{39} = \frac{11}{13} = 0,85 = 84,62\%$	✓ $\frac{13}{39}$ and $\frac{20}{39}$ ✓ 0 ✓ answer	(3)C
10.3	$7! \times 2!$ $= 5040 \times 2$ $= 10080$	✓ $7! \times 2!$ ✓ answer	(2)C
10.4	CAPETOWN		
	10.4.1	$\text{Number of arrangements} = 8!$ $= 40\,320$	✓ $8!$ ✓ answer (2)R
	10.4.2	$C \text{ _ _ _ _ _ } N$ $P(C - N) = \frac{6!}{40320}$ $= 0,02$	✓ numerator ✓ denominator ✓ answer (3)C
			[13]

TOTAL = 150