



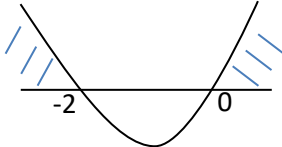
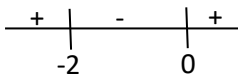
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SEPTEMBER 2015 MATHEMATICS P1 MEMORANDUM

GENERAL GUIDELINES FOR MARKING

- If a learner makes more than one attempt at answering a question and does not cancel any of them out, only the first attempt will be marked irrespective of which of the attempt(s) may be the correct answer.
- Consistent Accuracy(CA) marking regarding calculations will be followed in the following cases:
 - Sub-question to sub-question: When a certain variable is incorrectly calculated in one sub-question and needs to be substituted into another sub-question full marks can be awarded for the subsequent sub-questions provided the methods used are correct and the calculations are correct.
- Assuming values/answers in order to solve a problem is unacceptable.

QUESTION/VRAAG 1

Q#	SUGGESTED ANSWER(S)	DESCRIPTOR(S)	
1.1.1	$x(x + 2) = 0$ $x = 0$ OR/OF $x = -2$	$\checkmark x = 0$ $\checkmark x = -2$	(2)
1.1.2	$x^2 + 2x \geq 0$ $x(x + 2) \geq 0$  OR/OF  $\therefore x > 0$	$\checkmark x^2 + 2x \geq 0$ $\checkmark$ graph/grafiek/ critical pts $\checkmark x > 0$ If $x \geq 0$ only 1 mark Indien $x \geq 0$ slegs 1 punt	(3)
1.2	$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-7)}}{2(2)}$ $= \frac{3 \pm \sqrt{65}}{4}$ $x = 2,77$ OR/OF $x = -1,27$	$\checkmark$ substitution into correct formula/ <i>substitusie in korrekte formule</i> $\checkmark$ simplify $\checkmark 2,77$ $\checkmark -1,27$ If left in surd form only 2 marks. Indien in wortelvorm, slegs 2 punte.	(4)
1.3.1	$k^2 + 5k - 14 = 0$ $(k - 2)(k + 7) = 0$ $k = 2$ or $k = -7$	$\checkmark$ multiplying $\checkmark$ factorising $\checkmark$ both solutions	(3)
1.3.2	$\sqrt{x+5} = 2$ or $\sqrt{x+5} = -7$ $x+5 = 4$ or invalid/ no solution $x = -1$	$\checkmark$ substitution $\checkmark$ identifying invalid $\checkmark$ value of x	(3)

1.4	$x - 2y - 3 = 0 \dots\dots (1)$ $4x^2 - 5xy + y^2 = 0 \dots\dots (2)$ From eq (1): $x = 2y + 3 \dots(3)$ Subst. (3) into (2): $\therefore 4(2y + 3)^2 - 5y(2y + 3) + y^2 = 0$ $\therefore 4(4y^2 + 12y + 9) - 5y(2y + 3) + y^2 = 0$ $\therefore 16y^2 + 48y + 36 - 10y^2 - 15y + y^2 = 0$ $\therefore 7y^2 + 33y + 36 = 0$ $\therefore (7y + 12)(y + 3) = 0$ $\therefore y = \frac{-12}{7} \text{ or } y = -3$ $\therefore x = \frac{-3}{7} \text{ or } x = -3$	✓ equation (3) ✓ substitution ✓ simplification ✓ standard form ✓ factors ✓ both y values ✓ both x-values	(7)
1.5	For real roots : $4 - 20k \geq 0$ $\therefore -20k \geq -4$ $\therefore k \leq \frac{1}{5}$	✓ $4 - 20k \geq 0$ ✓ Answer	(2)
			[24]

QUESTION/ VRAAG 2

2.1.1	$3 + (n - 1)(2) = 71$ $2n - 2 = 68$ $2n = 70$ $n = 35$ The 35 th term is equal to 71/Die 35ste term is gelyk aan 71	✓ $a = 3$ en/and $d = 2$ ✓ 35	(2)
2.1.2	$S_{40} = \frac{40}{2} [2(3) + 39(2)] = 1680$	✓ substitusie/ substitution ✓ 1680	(2)
2.2	$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots \cdot 19$ terme/terms MR/GS: $a = \frac{1}{2}; r = \frac{1}{2}; n = 19$ $S_{19} = \frac{\frac{1}{2} \left(1 - \frac{1}{2}^{19}\right)}{1 - \frac{1}{2}} = \frac{\frac{1}{2} \left(1 - \frac{1}{524288}\right)}{\frac{1}{2}} = \frac{524287}{524288} < 1$ JA/YES all will fit into 1 st tank	✓ vorming van reeks/generating series ✓ $a = \frac{1}{2}; r = \frac{1}{2}; n = 19$ ✓ substitusie/substitution ✓ $\frac{524287}{524288}$ ✓ $\frac{524287}{524288} < 1$ JA/YES	(5)

2.3	$2^x + 2 \cdot 2^x + 3 \cdot 2^x + 4 \cdot 2^x \dots + 15 \cdot 2^x$ $a = 2^x$ en/and $d = 2^x$ $S_n = \frac{15}{2} [2^x + 15 \cdot 2^x]$ $\therefore S_n = \frac{15}{2} [16 \cdot 2^x]$ $\therefore S_n = 15[8 \cdot 2^x]$ $\therefore S_n = 15[2^3 \cdot 2^x]$ $\therefore S_n = 15 \cdot 2^{x+3}$	$\checkmark$ vorming van reeks/ generating series $\checkmark a = 2^x$ en/and $d = 2^x$ $\checkmark S_n = \frac{15}{2} [2^x + 15 \cdot 2^x]$ $\checkmark S_n = 15 \cdot 2^{x+3}$	(4)
			[13]

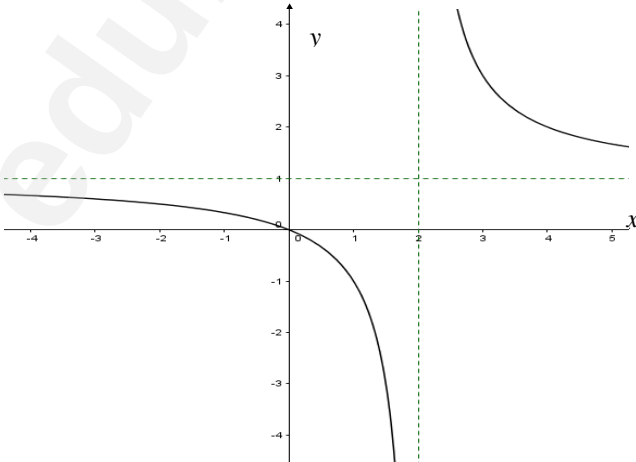
QUESTION/ VRAAG 3

3.1	$-3; 4; x; 30; \dots$ $7; x - 4; 30 - x$ (Eerste verskil/First difference) $x - 11; 34 - 2x$ (Tweede verskil/Second difference) $x - 11 = 34 - 2x$ $3x = 45$ $x = 15$	$\checkmark$ Eerste verskil/First difference $\checkmark$ Tweede verskil/Second difference $\checkmark x - 11 = 34 - 2x$ $\checkmark x = 15$	(4)
3.2.1	$r = \frac{x-1}{2}$ $-1 < \frac{x-1}{2} < 1$ $-2 < x - 1 < 2$ $-1 < x < 3$	$\checkmark r = \frac{x-1}{2}$ $\checkmark -1 < \frac{x-1}{2} < 1$ $\checkmark -1 < x < 3$	(3)
3.2.2	$a = \frac{3}{4}; r = \frac{x-1}{2} \therefore r = \frac{\frac{3}{4}-1}{2} \therefore r = -\frac{1}{8}$ $S_{\infty} = \frac{\frac{3}{4}}{1 - (-\frac{1}{8})} = \frac{2}{3}$	$\checkmark a = \frac{3}{4}$ $\checkmark r = -\frac{1}{8}$ $\checkmark S_{\infty} = \frac{\frac{3}{4}}{1 - (-\frac{1}{8})}$ $\checkmark S_{\infty} = \frac{2}{3}$	(4)
			[11]

QUESTION/ VRAAG 4

4.1	$R(-2; 4)$	✓ -2 ✓ 4	(2)
4.2	$B(-4; 0)$ through symmetry $\therefore AB = 4$ units OR roots: $(x+2)^2 = 4$ OR $-x^2 - 4x = 0$ $\therefore x + 2 = \pm 2$ $x(x+4) = 0$ $\therefore x = 0$ or -4 $\therefore AB = 4$ units	✓ -4 ✓ 4 units	(2)
4.3	$m = -2$ eqn: $y = -2x$	✓ $m = -2$ ✓ eqn	(2)
4.4	$x < -2$ OR $x > 0$	✓ $x < -2$ ✓ $x > 0$	(2)
4.5	$h(x) = f(-x) = -(-x + 2)^2 + 4$ sym- axis: $x = 2$	✓ $h(x)$ ✓ $x = 2$ Answer Only = FULL marks	(2)
4.6	$p(x) = -f(x) = (x + 2)^2 - 4$ range: $y \geq -4; y \in R$ OR $[-4; \infty)$	✓ $p(x)$ ✓ $y \geq -4$ Answer Only = FULL marks	(2)
			[12]

QUESTION/ VRAAG 5

5.1	$x = 2$; $y = 1$	✓ $x = 2$ ✓ $y = 1$	(2)
5.2	y-int: $y = 0$; x-int: $\frac{2}{x-2} = -1$ $\therefore x - 2 = -2$ $\therefore x = 0$	✓ $y = 0$ ✓ $\frac{2}{x-2} = -1$ ✓ $x = 0$	(3)
5.3		✓ asymptotes ✓ x/y intercept ✓ shape	(3)
5.4	$x \in R; x \neq 2$	✓ $x \in R$ ✓ $x \neq 2$	(2)

5.5	Graph shifts(translate) 3 units to the left	✓ 3 units to the left	(2)
5.6	$y = -x + c$ subst. (2; 1): $1 = -2 + c \Rightarrow c = 3$ $\therefore y = -x + 3$	✓ $m = -1$ ✓ $c = 3$	(2)
			[14]

QUESTION/ VRAAG 6

6.1.1	A(0; 1)	✓ Answer	(1)
6.1.2	$f^{-1}: y = \log_3 x$	✓ $y = \log_3 x$	(1)
6.1.3	$0 < x \leq 1$	✓ endpoints ✓ notation	(2)
6.1.4	$y = 0$	✓ $y = 0$	(1)
6.2.1	$f(x) = \sqrt{\frac{x}{a}}$ OR $f^{-1}(x) = ax^2$ (8; 2): $2 = \sqrt{\frac{8}{a}} \Rightarrow a = 2$ $\therefore f(x) = \sqrt{\frac{x}{2}}$ $\therefore f^{-1}(x) = 2x^2$ $f(x): x = 2y^2$ $y = \sqrt{\frac{x}{2}}$	✓ $a = 2$ ✓ eqn	(2)
6.2.2	$f^{-1}(x) = ax^2$ (2; 8): $8 = a(2)^2 \Rightarrow a = 2$ $\therefore f^{-1}(x) = 2x^2$	✓ eqn	(1)
6.2.3	(-3; -1)	✓ each value	(2)
			[10]

QUESTION/VRAAG 7

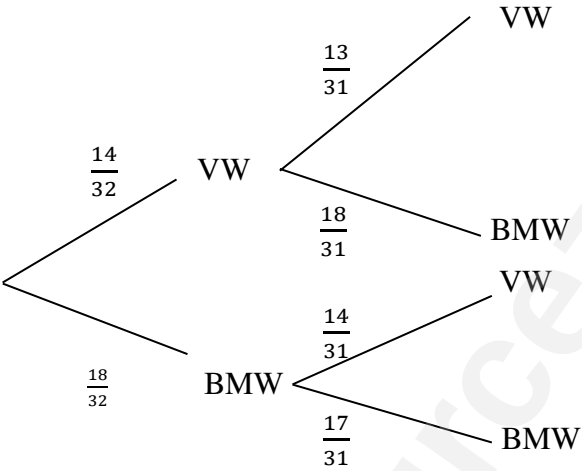
7.1	$A = P(1 + i)^n$ $30\,440 = 12\,500 \left(1 + \frac{0,09}{4}\right)^{4k}$ $\frac{1522}{625} = \left(\frac{409}{400}\right)^{4k}$ OR $2,4352 = (1,0225)^{4k}$ $\therefore 4k = \log_{1,0225} 2,4352$ $\therefore 4k = 40,0002 \dots$ $\therefore k = 10 \text{ years}$	✓ substitution into correct formula/substitusie in korrekte formule(A and/en P) ✓ $i = \frac{0,09}{4}$ OR $\frac{9}{400}$ ✓ $\therefore 4k = \log_{1,0225} 2,4352$ ✓ answer/antwoord	(4)
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7.2.1	$1 + i^{eff} = (1 + \frac{i^n}{n})^n$ $i^{eff} = (1 + \frac{0,18}{12})^{12} - 1$ $i^{eff} = 1,195618.... - 1$ $= 0,195618...$ $i^{eff} = 19,56\%$	✓ substitution into correct formula/substitusie in korrekte formule ✓ $i = \frac{0,18}{12}$ ✓ answer/antwoord	(3)
7.2.2	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $500\,000 = \frac{x \left[1 - \left(1 + \frac{0,18}{12} \right)^{-60} \right]}{\frac{0,18}{12}}$ $x = R12\,696,71$	✓ substitution into correct formula/substitusie in korrekte formule ✓ $P = 500\,000$ ✓ $-n = -60$ ✓ answer/antwoord	(4)
7.2.3	balance / saldo = $500\,000(1 + \frac{0,18}{12})^{24} - \frac{12700[(1 + \frac{0,18}{12})^{24} - 1]}{\frac{0,18}{12}}$ = 714 751,406 – 363 645,7142 = R351105,69 OR/OF $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $= \frac{12700 \left[1 - \left(1 + \frac{0,18}{12} \right)^{-36} \right]}{\frac{0,18}{12}}$ = R351290,69	✓ substitute into correct formula/substitusie in korrekte formule ✓ $n = 24$ or/of $n = -36$ ✓ $\frac{0,18}{12}$ ✓ answer/antwoord	(4)
7.2.4	$500\,000(1 - i)^2 = 304\,200$ $(1 - i)^2 = 0,6094$ $i = 22\%$	✓ substitute into correct formula/substitusie in korrekte formule ✓ answer/antwoord	(2)
			[17]

QUESTION/ VRAAG 8

8.1	$f(x) = -2x^2$ $f(x + h) = -2(x + h)^2$ $f(x + h) - f(x) = -2(x + h)^2 - (-2x^2)$ $= -4xh - 2h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{-4xh - 2h^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-2h(2x - h)}{h}$ $f'(x) = \lim_{h \rightarrow 0} -4x + 2h$ $f'(x) = -4x$ OR $f'(x) = \lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-2(x + h)^2 - (-2x^2)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-4xh - 2h^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} -4x + 2h$ $f'(x) = -4x$	✓ substitution $(x + h)$ ✓ simplification ✓subst into formula ✓ simplification ✓ answer ✓ substitution $(x + h)$ ✓subst into formula ✓ simplification ✓ simplification ✓ answer	(5)	
8.2.1	$y = \frac{2x^2}{x^{\frac{1}{2}}} - \frac{1}{x^{\frac{1}{2}}}$ $y = 2x^{\frac{3}{2}} - x^{-\frac{1}{2}}$ $\frac{dy}{dx} = 3x^{\frac{1}{2}} + \frac{1}{2}x^{-\frac{3}{2}}$	note: notation error penalise 1 mark candidates do NOT have to give their answers with positive exponents	✓ $y = 2x^{\frac{3}{2}} - x^{-\frac{1}{2}}$ ✓ $3x^{\frac{1}{2}}$ ✓ $+\frac{1}{2}x^{-\frac{3}{2}}$	(3)
8.2.2	$D_x[(3x - 2)^2]$ OR chain rule: $D_x = 2(3x - 2) \cdot 3$ $= D_x[9x^2 - 12x + 4]$ $= 18x - 12$	✓ simplify ✓ $18x$ ✓ -12	(3)	
8.3	$y = x^{-2}$ $\frac{dy}{dx} = -2x^{-3}$ for $x > 0$ $\therefore x^3 > 0$ $\frac{-2}{x^3} < 0$ $\therefore$ gradient of tangent is < 0 if $x > 0$	✓ $-2x^{-3}$ ✓ $x^3 > 0$ ✓ $\therefore \frac{-2}{x^3} < 0$	(3)	
			[14]	

QUESTION/ VRAAG 11

11.1.1	$P(A \text{ or } B) = \frac{3}{8} + \frac{1}{4} = \frac{5}{8}$	$\checkmark \frac{5}{8}$	(1)
11.1.2	$P(A \text{ and } B) = \frac{3}{8} \times \frac{1}{4} = \frac{3}{32}$ $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = \frac{3}{8} + \frac{1}{4} - \frac{3}{32} = \frac{17}{32}$	$\checkmark P(A \cap B) \text{ or } P(A \text{ and } B) = \frac{3}{32}$ $\checkmark P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $\checkmark \frac{17}{32}$	(3)
11.2.1	 $P(\text{both BMW}) = \frac{18}{32} \times \frac{17}{31} = \frac{153}{496} \approx 0,31$	$\checkmark \checkmark$ Boomdiagram/Tree diagram $\checkmark \frac{18}{32} \times \frac{17}{31}$ $\checkmark \frac{153}{496} \approx 0,31$	(4)
11.2.1	$P(\text{BMW ... VW}) = \frac{18}{32} \times \frac{14}{31} = \frac{63}{248} \approx 0,25$	$\checkmark \frac{18}{32} \times \frac{14}{31}$ $\checkmark \frac{63}{248} \approx 0,25$	(2)
11.3.1	$n(E) = 7.13! .6$ $n(S) = 15!$ $P(E) = \frac{n(E)}{n(S)} = \frac{7.13! .6}{15!} = \frac{1}{5}$	$\checkmark n(E) = 7.13! .6$ $\checkmark n(S) = 15!$ $\checkmark \frac{1}{5}$	(3)
11.3.2	$n(E) = 8! 7!$ $n(S) = 15!$ $P(E) = \frac{n(E)}{n(S)} = \frac{8! 7!}{15!} = \frac{1}{6435}$	$\checkmark n(E) = 8! 7!$ $\checkmark P(E) = \frac{n(E)}{n(S)} = \frac{8! 7!}{15!}$ $\checkmark \frac{1}{6435}$	(3)
			[16]

TOTAL: 150