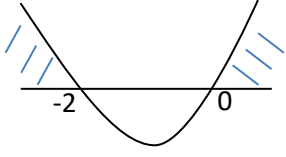
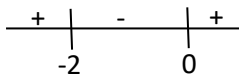


SEPTEMBER 2015 MATHEMATICS P1 MEMORANDUM

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	$x - 2y - 3 = 0 \dots\dots (1)$ $4x^2 - 5xy + y^2 = 0 \dots (2)$ From eq (1): $x = 2y + 3 \dots(3)$ Subst. (3) into (2): $\therefore 4(2y + 3)^2 - 5y(2y + 3) + y^2 = 0$ $\therefore 4(4y^2 + 12y + 9) - 5y(2y + 3) + y^2 = 0$ $\therefore 16y^2 + 48y + 36 - 10y^2 - 15y + y^2 = 0$ $\therefore 7y^2 + 33y + 36 = 0$ $\therefore (7y + 12)(y + 3) = 0$ $\therefore y = \frac{-12}{7}$ or $y = -3$ $\therefore x = \frac{-3}{7}$ 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	$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$ 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 $d = 2^x$ $S_n = \frac{15}{2} [2^x + 15 \cdot 2^x]$ $\therefore S_n = \frac{15}{2} [16 \cdot 2^x]$ $\therefore S_n = 15[8 \cdot 2^x]$ $\therefore S_n = 15[2^3 \cdot 2^x]$ $\therefore S_n = 15 \cdot 2^{x+3}$	✓ vorming van reeks/ generating series ✓ $a = 2^x$ en/and $d = 2^x$ ✓ $S_n = \frac{15}{2} [2^x + 15 \cdot 2^x]$ ✓ $S_n = 15 \cdot 2^{x+3}$	(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) $x - 11 = 34 - 2x$ $3x = 45$ $x = 15$	✓ Eerste verskil/First difference ✓ Tweede verskil/Second difference ✓ $x - 11 = 34 - 2x$ ✓ $x = 15$	(4)
3.2.1	$r = \frac{x-1}{2}$ $-1 < \frac{x-1}{2} < 1$ $-2 < x - 1 < 2$ $-1 < x < 3$	✓ $r = \frac{x-1}{2}$ ✓ $-1 < \frac{x-1}{2} < 1$ ✓ $-1 < x < 3$	(3)
3.2.2	$a = \frac{3}{4}; r = \frac{x-1}{2} \therefore r = \frac{\frac{3}{4}-1}{2} \therefore r = -\frac{1}{8}$ $S_\infty = \frac{\frac{3}{4}}{1 - (-\frac{1}{8})} = \frac{2}{3}$	✓ $a = \frac{3}{4}$ ✓ $r = -\frac{1}{8}$ ✓ $S_\infty = \frac{\frac{3}{4}}{1 - (-\frac{1}{8})}$ ✓ $S_\infty = \frac{2}{3}$	(4)
			[11]

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): $2 = \sqrt{\frac{8}{a}} \Rightarrow a = 2$ (2; 8): $8 = a(2)^2 \Rightarrow a = 2$ $\therefore f(x) = \sqrt{\frac{x}{2}}$ $\therefore f^{-1}(x) = 2x^2$ $f(x): x = 2y^2$ $y = \sqrt{\frac{x}{2}}$	✓ $a = 2$ ✓ 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

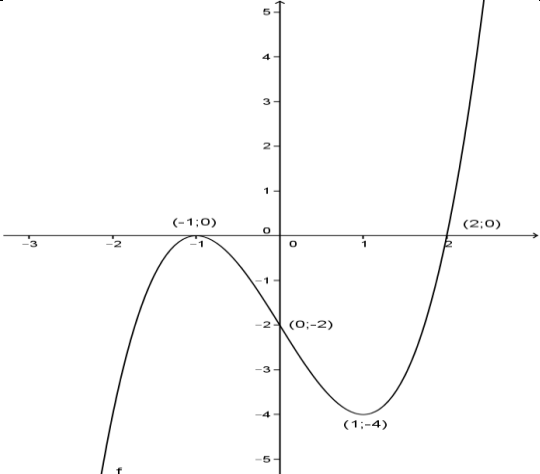
7.1	$A = P(1 + i)^n$ $30\,440 = 12\,500 \left(1 + \frac{0,09}{4}\right)^{4k}$ $\frac{1522}{625} = \left(\frac{409}{400}\right)^{4k}$ OR $2,4352 = (1,0225)^{4k}$ $\therefore 4k = \log_{1,0225} 2,4352$ $\therefore 4k = 40,0002 \dots$ $\therefore k = 10 \text{ years}$	✓ substitution into correct formula/substitutie 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	$1 + i^{eff} = \left(1 + \frac{i^n}{n}\right)^n$ $i^{eff} = \left(1 + \frac{0,18}{12}\right)^{12} - 1$ $i^{eff} = 1,195618\dots - 1$ $= 0,195618\dots$ $i^{eff} = 19,56\%$	✓ 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	$\text{balance / saldo} = 500\,000\left(1 + \frac{0,18}{12}\right)^{24} - \frac{12700\left[\left(1 + \frac{0,18}{12}\right)^{24} - 1\right]}{\frac{0,18}{12}}$ $= 714\,751,406 - 363\,645,7142$ $= R351\,105,69$ <p>OR/OF</p> $P = \frac{x[1 - (1+i)^{-n}]}{i}$ $= \frac{12700 \left[1 - \left(1 + \frac{0,18}{12}\right)^{-36}\right]}{\frac{0,18}{12}}$ $= R351\,290,69$	✓ substitute into correct formula/substitusie in korrekte formule $n = 24 \text{ or/of } n = -36$ $i = \frac{0,18}{12}$ ✓ 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]

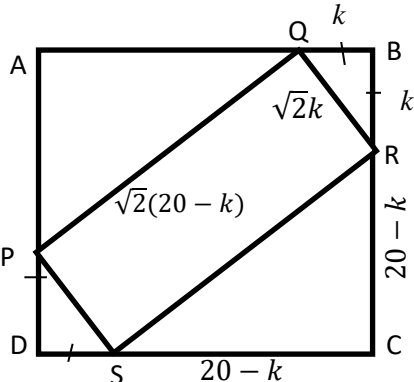
QUESTION/ VRAAG 8

<p>8.1</p>	$f(x) = -2x^2$ $f(x+h) = -2(x+h)^2$ $f(x+h) - f(x) = -2(x+h)^2 - (-2x^2)$ $= -4xh - 2h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{-4xh - 2h^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-2h(2x-h)}{h}$ $f'(x) = \lim_{h \rightarrow 0} -4x + 2h$ $f'(x) = -4x$ <p style="text-align: center;">OR</p> $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-2(x+h)^2 - (-2x^2)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-4xh - 2h^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} -4x + 2h$ $f'(x) = -4x$	<ul style="list-style-type: none"> ✓ substitution ($x+h$) ✓ simplification ✓ subst into formula ✓ simplification ✓ answer ✓ substitution ($x+h$) ✓ subst into formula ✓ simplification ✓ simplification ✓ answer 	<p>(5)</p>
<p>8.2.1</p>	$y = \frac{2x^2}{x^{\frac{1}{2}}} - \frac{1}{x^{\frac{1}{2}}}$ $y = 2x^{\frac{3}{2}} - x^{-\frac{1}{2}}$ $\frac{dy}{dx} = 3x^{\frac{1}{2}} + \frac{1}{2}x^{-\frac{3}{2}}$ <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>note: notation error penalise 1 mark</p> <p>candidates do NOT have to give their answers with positive exponents</p> </div>	<ul style="list-style-type: none"> ✓ $y = 2x^{\frac{3}{2}} - x^{-\frac{1}{2}}$ ✓ $3x^{\frac{1}{2}}$ ✓ $+\frac{1}{2}x^{-\frac{3}{2}}$ 	<p>(3)</p>
<p>8.2.2</p>	$D_x[(3x-2)^2] \quad \text{OR chain rule: } D_x = 2(3x-2) \cdot 3$ $= D_x[9x^2 - 12x + 4] \quad = 18x - 12$ $= 18x - 12$	<ul style="list-style-type: none"> ✓ simplify ✓ $18x$ ✓ -12 	<p>(3)</p>
<p>8.3</p>	$y = x^{-2}$ $\frac{dy}{dx} = -2x^{-3}$ <p>for $x > 0$</p> <p>∴ $x^3 > 0$</p> $\frac{-2}{x^3} < 0$ <p>∴ gradient of tangent is < 0 if $x > 0$</p>	<ul style="list-style-type: none"> ✓ $-2x^{-3}$ ✓ $x^3 > 0$ ✓ ∴ $\frac{-2}{x^3} < 0$ 	<p>(3)</p>
			<p>[14]</p>

QUESTION 9

9.1		<ul style="list-style-type: none"> ✓ (-1; 0) ✓ (2; 0) ✓ (0; -2) ✓ (1; -4) ✓ shape 	(5)
9.2	$-1 < x < 1$	<ul style="list-style-type: none"> ✓ endpoints ✓ notation 	(2)
9.3	Pt. of inflection: “halfway” between turning points(x-values) $\therefore x = \frac{-1 + 1}{2}$ $\therefore x = 0$	<ul style="list-style-type: none"> ✓ $x = \frac{-1+1}{2}$ ✓ $x = 0$ 	(2)
9.4	$f''(x) > 0$ $\therefore x > 0$	<ul style="list-style-type: none"> ✓ $f''(x) > 0$ ✓ $x > 0$ 	(2)
			[11]

QUESTION/ VRAAG 10

			
10.1	$QR = \sqrt{2}k$ <i>Pythagoras</i> $SR = \sqrt{2}(20 - k)$ <i>Pythagoras</i> $Area\ PQRS = \sqrt{2}k[\sqrt{2}(20 - k)]$ $\qquad\qquad\qquad = 2k(20 - k) = 40k - 2k^2$	<ul style="list-style-type: none"> ✓ $QR = \sqrt{2}k$ ✓ $SR = \sqrt{2}(20 - k)$ ✓ $Area\ PQRS = \sqrt{2}k[\sqrt{2}(20 - k)]$ 	(4)
10.2	$A = -2k^2 + 40k$ $\frac{dA}{dk} = -4k + 40 = 0$ $k = 10$	<ul style="list-style-type: none"> ✓ $-4k + 40$ ✓ ✓ $= 0$ ✓ 10 	(4)
			[8]

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>$P(\text{both BMW}) = \frac{18}{32} \times \frac{17}{31} = \frac{153}{496} \approx 0,31$</p>	$\checkmark \checkmark$ 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	$n(E) = 7 \cdot 13! \cdot 6$ $n(S) = 15!$ $P(E) = \frac{n(E)}{n(S)} = \frac{7 \cdot 13! \cdot 6}{15!} = \frac{1}{5}$	$\checkmark n(E) = 7 \cdot 13! \cdot 6$ $\checkmark n(S) = 15!$ $\checkmark \frac{1}{5}$	(3)
11.3.2	$n(E) = 8! \cdot 7!$ $n(S) = 15!$ $P(E) = \frac{n(E)}{n(S)} = \frac{8! \cdot 7!}{15!} = \frac{1}{6435}$	$\checkmark n(E) = 8! \cdot 7!$ $\checkmark P(E) = \frac{n(E)}{n(S)} = \frac{8! \cdot 7!}{15!}$ $\checkmark \frac{1}{6435}$	(3)
			[16]

TOTAL: 150