



PREPARATORY EXAMINATION VOORBEREIDENDE EKSAMEN

2021

MARKING GUIDELINES/ NASIENRIGLYNE

(10611)

MATHEMATICS (PAPER 1)/WISKUNDE (VRAESTEL 1)

INSTRUCTIONS AND INFORMATION/INSTRUKSIES EN INLIGTING

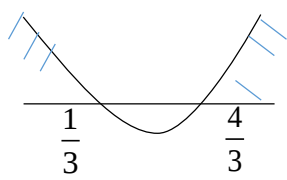
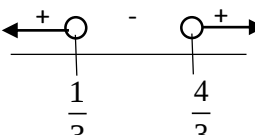
- **A** – ACCURACY /AKKURAAATHEID
- **CA** – CONSISTENT ACCURACY/VOLGEHOUE AKKURAAATHEID

NOTES:

- If a candidate answered a question 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/answers in order to solve a question is UNACCEPTABLE.

LET WEL:

- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord van 'n vraag DOODTREK en nie oordoen nie, sien die doodgetrekte poging na.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas.*
- *Aannames van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat NIE.*

QUESTION 1/ VRAAG 1		
1.1.1	$3x^2 - 4x = 0$ $x(3x - 4) = 0$ $x = 0$ or/of $x = \frac{4}{3}$	✓ factors/faktore ✓ both answers/albei antwoorde (2)
1.1.2	$3x^2 + 10x - 4 = 0$ $x = \frac{-10 \pm \sqrt{(10)^2 - 4(3)(-4)}}{2(3)}$ $x = -3,69$ or/of $x = 0,36$ NOTE: Penalise 1 mark for incorrect rounding-off in this question ONLY./Penaliseer 1 punt vir verkeerde afronding SLEGS in hierdie vraag.	✓ substitution into correct formula/ vervanging in korrekte formule ✓✓ answers/antwoorde (3)
1.1.3	$15x - 4 < 9x^2$ $-9x^2 + 15x - 4 < 0$ $9x^2 - 15x + 4 > 0$ $(3x - 1)(3x - 4) > 0$  OR/OF  $x < \frac{1}{3}$ or/of $x > \frac{4}{3}$ NOTE: OR must be present. If candidate writes AND penalise 1 mark/OF moet aangedui word. Indien kandidaat EN skryf, penaliseer met 1 punt.	✓ standard form/ standaardvorm (in either form/ in enige vorm) ✓ factors/faktore ✓ both answers correct/ albei antwoorde korrek (3)
1.1.4	$\sqrt{x^2 - 5} = 2\sqrt{x}$ $x^2 - 5 = 4x$ $x^2 - 4x - 5 = 0$ $(x - 5)(x + 1) = 0$ $x = 5$ or/of $x \neq 1$ NA/invalid/not a real solution/NvT/nie reële oplossing/ongeldig	✓ squaring both sides/ kwadreer albei kante ✓ standard form/ standaardvorm ✓ factors/faktore ✓ rejection/verwerp (4)

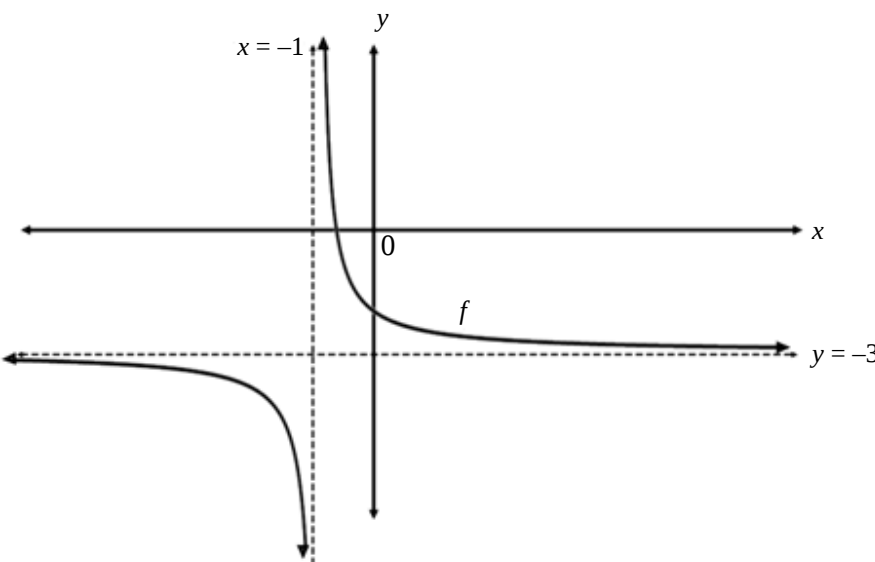
1.2	$(3x - y)^2 + (x - 5)^2 = 0$ $(3x - y)^2 = 0$ and/en $(x - 5)^2 = 0$ $3x - y = 0$ $x - 5 = 0$ $y = 3x$ $x = 5$ $\therefore y = 3(5)$ $y = 15$	✓ setting up both equations/stel beide vergelykings op ✓ value of x /waarde van x ✓ value of y /waarde van y (3)
1.3.1	$x - 2 = \frac{-4}{x - 2} - 4$ (1) and/en $y = x - 2$... (2) substitute/vervang (2) into/in (1) $y = \frac{-4}{y} - 4$ $y + 4 = \frac{-4}{y}$ $y^2 + 4y = -4$ $y^2 + 4y + 4 = 0$	✓ setting up new equation for y stel nuwe vergelyking op vir y ✓ simplification/vereenvoudiging (2)
1.3.2	$\Delta = b^2 - 4ac$ $= 4^2 - 4(1)(4)$ $= 16 - 16$ $= 0$ $\therefore$ the roots are real and equal/wortels is reël en gelyk OR/OF $y^2 + 4y + 4 = 0$. $(y + 2)^2 = 0$ $\therefore y = -2$ $\therefore$ the roots are real and equal/ wortels is reël en gelyk	✓ substitution into correct formula/vervanging in korrekte formule ✓ $\Delta = 0$ OR/OF ✓ factors/faktore ✓ value of y /waarde van y (2)

1.4	S will be a maximum if $(x^2 + 2)$ is a minimum. <i>S sal 'n maksimum wees indien $(x^2 + 2)$ 'n minimum is</i> The minimum of/die minimum van $(x^2 + 2)$ is 2. $\therefore$ maximum/maksimum: $S = \frac{6}{2}$ $S = 3$	✓deduction and correct minimum value of/ <i>aftrekking en korrekte minimum waarde van $(x^2 + 2)$</i> ✓answer/antwoord (2)
[21]		
QUESTION 2/ VRAAG 2		
2.1.1	$T_5 = 81$	✓answer /antwoord (1)
2.1.2	1 ; 9 ; 25 ; 49 $\vee$ $\vee$ $\vee$ 8 16 24 $\vee$ $\vee$ 8 8 $2a = 8$ $3a + b = 8$ $a + b + c = 1$ $a = 4$ $3(4) + b = 8$ $4 - 4 + c = 1$ $b = -4$ $c = 1$ $T_n = 4n^2 - 4n + 1$ $T_n = (2x - 1)(2x - 1)$ $T_n = (2x - 1)^2$	✓2nd difference/ 2^{de} verskil ✓$a = 4$ ✓$b = -4$ ✓$c = 1$ ✓factors/faktore (5)

2.1.3	$(2n-1)^2 = 10201$ $\sqrt{(2n-1)^2} = \sqrt{10201}$ $2n-1 = 101$ $2n = 102$ $n = 51$	✓equating/gelykstel ✓simplify/vereenvoudig ✓answer/antwoord (3)
2.2	$35 + 42 + 49 + \dots 196.$ Sum of natural numbers between 35 and 196, divisible by 7/ <i>Som van natuurlike getalle tussen 35 en 196, deelbaar deur 7</i> $S_n = \frac{n}{2}(a + l)$ $S_n = \frac{24}{2}(35 + 196)$ $S_n = 2772$ $n = 196 - 34$ $n = 162$ Sum of all natural numbers between 35 and 196/ <i>Som van alle natuurlike getalle tussen 35 en 196</i> $S_n = \frac{n}{2}(a + l)$ $S_{162} = \frac{162}{2}(35 + 196)$ $S_{162} = 18711$ $\therefore S_{\text{not divisible by 7}} = 18711 - 2772$ $S_{\text{not divisible by 7}} = 15939$	✓ $n = 24$ ✓ substitution into correct formula AND vervanging in korrekte formule EN $S_n = 2772$ ✓ $n = 162$ ✓ $S_{162} = 18711$ ✓answer/antwoord (5)
[14]		

QUESTION 3/ VRAAG 3		
3.1.1	$5(3x+1) + 5(3x+1)^2 + 5(3x+1)^3 \dots$ $r = 3x+1$ $-1 < r < 1$ $-1 < 3x+1 < 1$ $-2 < 3x < 0$ $-\frac{2}{3} < x < 0$	✓ value of r/waarde van r ✓ $-1 < r < 1$ ✓ answers/antwoorde (3)
3.1.2	$3x+1$ $= 3\left(-\frac{1}{6}\right) + 1$ $= \frac{1}{2}$ $\therefore r = \frac{1}{2}$ $a = 5\left(\frac{1}{2}\right)$ $a = \frac{5}{2}$ $S_{\infty} = \frac{a}{1-r}$ $S_{\infty} = \frac{\frac{5}{2}}{1-\frac{1}{2}}$ $S_{\infty} = 5$	✓ value of r/waarde van r ✓ value of a/waarde van a ✓ substitution into correct formula/ vervanging in korrekte formule ✓ answer/antwoord (4)

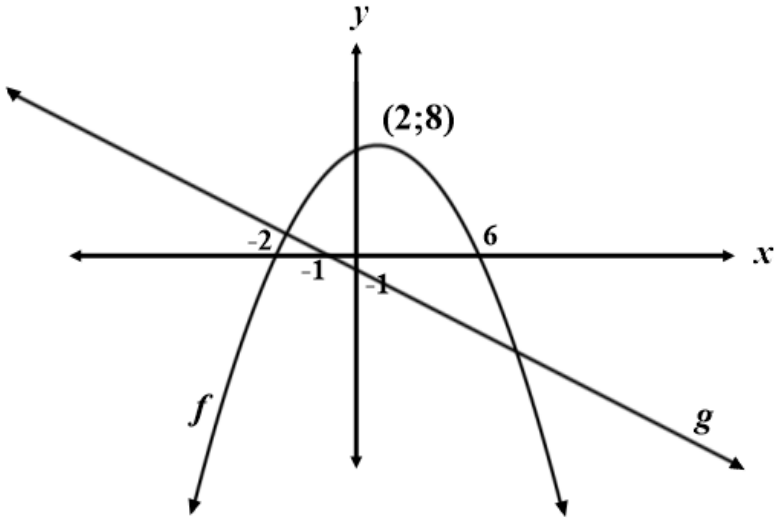
3.2	$T_1 = \frac{1}{8} \quad T_2 = \frac{1}{4} \quad T_3 = \frac{1}{2}$ $a = \frac{1}{8}$ and/en $r = 2$ $\frac{\frac{1}{8}(2^k - 1)}{2 - 1} > 30$ $2^k > 241$ $\log_2 241 < k$ $7,912.... < k$ $\therefore k = 8$	✓ values of/waarde van $T_1 \ T_2 \ T_3$ ✓ substitution into correct formula/vervanging in korrekte formule ✓ correct use of logs/korrekte gebruik van logs ✓ answer/antwoord (4)
[11]		
QUESTION 4/ VRAAG 4		
4.1.1	y-intercept: make $x = 0$ y-afsnit: stel $x = 0$ $\therefore y = \frac{2}{0+1} - 3$ $y = -1$ $\therefore (0 ; -1)$ NOTE: Must be in coordinate form. Answer only: full marks/ LET WEL: Moet in koördinaatvorm wees. Antwoord alleenlik: volpunte	✓ answer/antwoord (1)

4.1.2	x-intercept: make $y = 0$/ x-afsnit: stel $y = 0$ $0 = \frac{2}{x+1} - 3$ $3 = \frac{2}{x+1}$ $3(x+1) = 2$ $3x+3 = 2$ $3x = -1$ $x = -\frac{1}{3}$ $\left(-\frac{1}{3}; 0\right)$ NOTE: Answer does not need to be in coordinate form. LET WEL: Antwoord hoef nie in koördinaatvorm te wees nie.	✓ valid simplification/ geldige vereenvoudiging (either lines 3, 4 or 5/ óf lyne 3, 4 óf 5) ✓ answer/antwoord (2)
4.1.3		✓ shape/vorm ✓ asymptotes/asimptotes ✓ x-inter/afsnit. $\left(-\frac{1}{3}; 0\right)$ and/en y-inter/afsnit $(0; -1)$ (3)

4.1.4	$y = ax + q$ $-3 = -(-1) + q$ $q = -4$ $\therefore y = -x - 4$ OR/OF $y - y_1 = m(x - x_1)$ $y - (-3) = -1(x - (-1))$ $y + 3 = -(x + 1)$ $y + 3 = -x - 1$ $y = -x - 4$ OR/OF $y = -(x + 1) - 3$ $y = -x - 1 - 3$ $y = -x - 4$	✓ substitute/vervang $m = -1$ and point/en punt $(-1 ; -3)$ ✓ answer/antwoord OR/OF ✓ substitute/vervang $m = -1$ and point/en punt $(-1 ; -3)$ ✓ answer/antwoord OR/OF ✓ substitute/vervang $m = -1$ and point/en punt $(-1 ; -3)$ ✓ answer/antwoord (2)
4.2.1	$C(1 ; 0)$	✓ answer/antwoord (1)
4.2.2	Range/waardeversameling: $y \in R$ OR/OF $y \in (-\infty; \infty)$	✓ answer/antwoord (1)
4.2.3	$y = \log_a x$ $-1 = \log_a 5$ $a^{-1} = 5$ $a = \frac{1}{5}$	✓ correct log equation to exponential equation/ korrekte log vergelyking na eksponensiële vergelyking ✓ answer/antwoord (2)
4.2.4	$t: y = \log_{\frac{1}{5}} x$ $h: x = \log_{\frac{1}{5}} y$ $y = \left(\frac{1}{5}\right)^x$ OR/OF $y = 5^{-x}$	✓ interchange x and y / ruil x en y om ✓ answer/antwoord (2)

4.2.5	$x \in R$ OR/OF $x \in (-\infty; \infty)$	✓ answer/antwoord OR/OF ✓ answer/antwoord (1)
4.2.6	$y = 0$	✓ answer/antwoord (1)
[16]		
QUESTION 5/ VRAAG 5		
5.1	$f(x) = -ax^2 + bx + 6$ $f'(x) = -2ax + b$ $f'(-1) = -2a(-1) + b$ $f'(-1) = 2a + b$ $3 - 2a = b \dots (1)$ $f(x) = -ax^2 + bx + 6$ $\frac{7}{2} = -a(-1)^2 + b(-1) + 6$ $\frac{7}{2} = -a - b + 6$ $b = -a + \frac{5}{2} \dots (2)$ $(1) = (2)$ $3 - 2a = -a + \frac{5}{2}$ $a = \frac{1}{2}$ $\therefore b = 3 - 2\left(\frac{1}{2}\right)$ $b = 2$ OR/OF	✓ derivative/afgeleide ✓ equation/vergelijking (1) ✓ equation/vergelijking (2) ✓ equating/gelykstel ✓ substitution of a-value in any correct equation for b/vervanging van a-waarde in enige korrekte vergelijking om b te bepaal OR/OF

5.3	$f(x) = -\frac{1}{2}x^2 + 2x + 6$ $f'(x) = -x + 2$ $0 = -x + 2$ $x = 2$ $f(2) = -\frac{1}{2}(2)^2 + 2(2) + 6$ $f(2) = 8$ $\therefore \text{TP } (2;8)$ OR/OF $f(x) = -\frac{1}{2}x^2 + 2x + 6$ $x = \frac{-(2)}{2(-\frac{1}{2})}$ $x = 2$ $f(2) = -\frac{1}{2}(2)^2 + 2(2) + 6$ $f(2) = 8$ $\text{TP } (2;8)$ OR/OF $x = \frac{-2+6}{2}$ $x = 2$ $f(2) = -\frac{1}{2}(2)^2 + 2(2) + 6$ $f(2) = 8$ $\text{TP } (2;8)$ NOTE: Answer does not have to be in coordinate form./ LET WEL: Antwoord hoef nie in koördinaatvorm te wees nie	$\checkmark$ derivative = 0/ $\text{afgeleide} = 0$ $\checkmark$ x- value/x-waarde $\checkmark$ y- value/y-waarde OR/OF $\checkmark$ correct subst. into formula/korrekte vervanging in formule $\checkmark$ x-value/x-waarde $\checkmark$ y- value/y-waarde OR/OF $\checkmark$ midpoint between x-intercepts/middelpunt tussen x-afsnitte $\checkmark$ x- value/x-waarde $\checkmark$ y-value/y-waarde (3)
-----	---	--

5.4	 NOTE: Assessing parabola ONLY./ LET WEL: Assessee ALLEENLIK parabool.	✓ intercepts and turning point/afsnitte en draaipunt ✓ shape/vorm (2)
5.5	$0 < x < 4$	✓ answer/antwoord (1)
5.6	$y = -x - 1$ x – int/afsnit: $0 = -x - 1$ $x = -1$ y – int/afsnit: $y = 0 - 1$ $y = -1$ NOTE: Mark the sketch combined with Question 5.4. If candidate does NOT sketch the line but calculates x- and y-intercepts, award 1 mark./ LET WEL: Merk die gekombineerde skets by Vraag 5.4. Indien kandidaat NIE die reguitlyn geskets het nie, maar wel die x- en y-afsnitte bereken het, ken 1 punt toe.	✓ x-intercept/x-afsnit ✓ y-intercept/y-afsnit (2)
5.7	$f(x).g(x) \leq 0$ $\therefore x \leq -2$ or/of $-1 \leq x \leq 6$ NOTE: Accuracy marks. Candidate may write answers as separate inequalities./ LET WEL: Akkuraatheid punte. Kandidaat mag die antwoord skryf as aparte ongelykhede.	✓ answer/antwoord ✓ answer/antwoord (2)

[17]

QUESTION 6 VRAAG 6		
6.1.1	$\frac{10\%}{4}$ $= 2,5\%$	✓ answer/antwoord (1)
6.1.2	$A = P(1 + i)^n$ $A = R5\,000 \left(1 + \frac{0,1}{4}\right)^8$ $A = R6\,092,01$ OR/OF $A = P(1 + i)^n$ $= R5\,000 \left(1 + \frac{2,5}{100}\right)^{(2 \times 4)}$ $\approx R6\,092,01$	✓ $n = 8$ ✓ substitution into correct formula/ <i>vervanging in korrekte formule</i> ✓ answer/antwoord OR/OF ✓ $n = 8$ ✓ substitution into correct formula/ <i>vervanging in korrekte formule</i> ✓ answer/antwoord (3)
6.2.1	$P_v = \frac{x[1 - (1 + i)^{-n}]}{i}$ $800\,000 = \frac{10\,000[1 - \left(1 + \frac{0,14}{12}\right)^{-n}]}{\frac{0,14}{12}}$ $0,67 = \left(1 + \frac{0,14}{12}\right)^{-n}$ $\log_{\left(1 + \frac{0,14}{12}\right)} 0,066... = -n$ $-n = -233,469...$ $n = 233$ ∴ Sihle can make 233 withdrawals of R10 000 ∴ Sihle kan 233 onttrekkings van R10 000 maak NOTE: Accept 234 withdrawals./ LET WEL: Aanvaar 234 onttrekkings.	✓ $i = \frac{0,14}{12}$ ✓ correct subst. in correct formula/korrekte <i>vervanging in korrekte formule</i> ✓ simplification/vereenvoudiging ✓ use of logs/gebruik van logs ✓ answer/antwoord (5)

6.2.2(a)	$A = P(1 + i)^n$ $A = \text{R}8\,000\,000 \left(1 + \frac{0.14}{12}\right)^{48}$ $A = \text{R}1\,396\,005,54$ $F_v = \frac{x[(1+i)^n - 1]}{i}$ $F_v = \frac{\text{R}10\,000[(1 + \frac{0,14}{12})^{48} - 1]}{\frac{0,14}{12}}$ $F_v = \text{R}638\,577,36$ Remaining money/<i>Oorblywende geld</i> = $A - F_v$ $\text{R}1\,396\,005,54 - \text{R}638\,577,36$ $= \text{R}757\,428,18$ Sihle's deposit is/<i>Sihle se deposito is</i> $\text{R}757\,428$	✓ answer/<i>antwoord</i> (A) ✓ substitution into correct formula/ ✓ <i>vervanging in korrekte formule</i> ✓ answer/<i>antwoord</i> (F_v) ✓ answer/<i>antwoord</i> (4)
6.2.2(b)	Let purchase price = x/ <i>Gestel die aankoopprys</i> = x $30\% \times x = \text{R}757\,428$ $x = \text{R}2\,524\,760$	✓ answer/<i>antwoord</i> (1)
[14]		

QUESTION 7**VRAAG 7**

7.1.1	$f(x) = 1 - 4x^2$ $f(x+h) = 1 - 4(x+h)^2$ $= 1 - 4(x^2 + 2xh + h^2)$ $= 1 - 4x^2 - 8xh - 4h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{1 - 4x^2 - 8xh - 4h^2 - (1 - 4x^2)}{h}$ $= \lim_{h \rightarrow 0} \frac{1 - 4x^2 - 8xh - 4h^2 - 1 + 4x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{-8xh - 4h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-8x - 4h)}{h}$ $= \lim_{h \rightarrow 0} -8x - 4h$ $= -8x$	✓ $f(x+h)$ ✓ simplification/ vereenvoudiging ✓ common factor/ gemeenskaplike faktor ✓ answer/antwoord (4)
7.1.2	$f'(x) = -8x$ $f'(2) = -8(2)$ $f'(2) = -16$	✓ substitution/ vervanging ✓ answer/antwoord (2)
7.2	$f(x) = \sqrt[3]{x^2} + \frac{1}{4x^4}$ $f(x) = x^{\frac{2}{3}} + \frac{1}{4}x^{-4}$ $f'(x) = \frac{2}{3}x^{-\frac{1}{3}} - x^{-5}$	✓ simplification/ vereenvoudiging ✓ $\frac{2}{3}x^{-\frac{1}{3}}$ ✓ $-x^{-5}$ (3)

7.3	$h'(x) = 2ax$ $h'(4) = 8a$ $y = ax^2 \quad ; \quad x > 0$ $\therefore \text{inverse/omgekeerde}$ $x = ay^2 \quad ; \quad y > 0$ $y = \sqrt{\frac{x}{a}}$ $h^{-1}(8) = \sqrt{\frac{8}{a}}$ $\therefore \sqrt{\frac{8}{a}} = 8a$ $\frac{8}{a} = 64a^2$ $\frac{1}{8} = a^3$ $a = \frac{1}{2}$	✓ derivative/afgeleide ✓ $h'(4) = 8a$ ✓ $h^{-1}(x) = \sqrt{\frac{8}{a}}$ ✓ equating/gelykstel ✓ simplification/ vereenvoudiging ✓ answer/antwoord (6)
[15]		

QUESTION 8**VRAAG 8**

8.1	$g(x) = x^3 - 3x^2$ $g'(x) = 3x^2 - 6x$ $g''(x) = 6x - 6$ $g''(x) = 0$ $\therefore 6x - 6 = 0$ $\therefore x = 1$ $\therefore g(1) = -2$ point of inflection/ <i>infleksiepunt</i> : (1;-2) $h(x) = -\frac{2}{3}x - \frac{4}{3}$ $h(1) = -2$ The graph of h DOES INTERSECT with the point of inflection of g ./ <i>Die grafiek van h SNY die grafiek van g by die infleksiepunt.</i> NOTE: The conclusion mark can only be awarded if the candidate supports this with an appropriate calculation./ LET WEL: Die punt vir die gevolgtrekking kan alleenlik toegeken word indien die kandidaat dit ondersteun met die nodige berekeninge.	✓ 1 st derivative/ 1 ^{ste} afgeleide ✓ 2 nd derivative/ 2 ^{de} afgeleide ✓ $x = 1$ ✓ $g(1) = -2$ ✓ $h(1) = -2$ ✓ conclusion/ gevolgtrekking (6)
8.2	$y = g'(x) = 3x^2 - 6x$ $\frac{dy}{dx} = 0 \quad \therefore 6x - 6 = 0$ $x = 1$ $g'(1) = 3(1)^2 - 6(1)$ $g'(1) = -3$ $\therefore (1; -3)$ $y = 3x^2 - 6x$ is a positive parabola/ <i>is 'n positiewe parabool</i> $\therefore$ TP(1; -3) is a MINIMUM/ <i>is 'n MINIMUM</i>	✓ derivative = 0/ afgeleide = 0 ✓ value of x / <i>waarde van x</i> ✓ value of y / <i>waarde van y</i> ✓ conclusion / gevolgtrekking (4)

8.3.1	$g(x) = x^3 - 3x^2$ $g'(x) = 6x - 6$ $g'(x) < 0$ $\therefore 6x - 6 < 0$ $\therefore x < 1$	✓ answer/antwoord (1)
8.3.2	Point of inflection/Infleksiepunt $g''(x) = 0$ $\therefore x = 1$ $m = g'(x) = 3x^2 - 6x$ $g'(1) = 3(1)^2 - 6(1)$ $g'(1) = 3(1)^2 - 6(1)$ $g'(1) = -3$ $\therefore m = -3$ $\therefore$ the gradient of the point of inflection is -3 $\therefore$ die gradiënt van die infleksiepunt is -3	✓ substitution/ vervanging ✓ answer/antwoord (2)
8.3.3	$g'(x) = 3x^2 - 6x$ $= 3(x^2 - 2x)$ $= 3(x^2 - 2x + 1 - 1)$ $= 3(x - 1)^2 - 3$ $g'(x)$ has a minimum value of -3 . The student is correct./ $g'(x)$ het 'n minimum waarde van -3 . Die student is korrek OR/OF $g'(x) = 3x^2 - 6x$ $g''(x) = 6x - 6$ $0 = 6x - 6$ $x = 1$ $g'(1) = 3(1)^2 - 6(1)$ $g'(1) = -3$ $g'(x)$ has a minimum value of -3 / $g'(x)$ het 'n minimum waarde van -3 . The student is correct./ Die student is korrek. NOTE: The conclusion mark can only be awarded if the candidate supports this with an appropriate calculation./ LET WEL: Die punt vir die gevolgtrekking kan alleenlik toegeken word indien die kandidaat dit ondersteun met die nodige berekeninge.	✓ writing $g'(x)$ in terms of/skryf $g'(x)$ in terme van $y = a(x - p)^2 + q$ ✓ conclusion/gevolgtrekking OR/OF ✓ calculate pt/bereken punt.(1 ; -3) ✓ conclusion/gevolgtrekking (2)

QUESTION 9**VRAAG 9**

9.1	$\pi r^2 h = 6$ $h = \frac{6}{\pi r^2}$	✓ answer/antwoord (1)
9.2	$S = 10(2\pi r^2 + 2\pi rh) + 10(4\pi r^2)$ $= 10(2\pi r^2 + 2\pi rh + 4\pi r^2)$ $= 10(6\pi r^2 + 2\pi rh)$ $= 60\pi r^2 + 20\pi r \cdot \frac{6}{\pi r^2}$ $= 60\pi r^2 + \frac{120}{r}$ OR/OF $S = 10(2\pi r^2 + 2\pi r + 4\pi r^2)$ $= 10(2\pi rh + 6\pi r^2)$ $= 20\pi rh + 60\pi r^2$ $= 20\pi r \left(\frac{6}{\pi r^2} \right) + 60\pi r^2$ $= 60\pi r^2 + \frac{120}{r}$	✓ area of 10 spheres/oppv. van 10 sferes ✓ area of 10 cylinders/ oppv. van 10 silinders ✓ simplification/vereenvoudiging ✓ substitution h/vervang h OR/OF ✓✓ combined areas of spheres and cylinders/ gekombineerde oppervlaktes van sferes en silinders ✓ simplification/vereenvoudiging ✓ substitution h/vervang h (4)
9.3	$S' = 120\pi r - 120r^{-2}$ $120\pi r - \frac{120}{r^2} = 0$ $120\pi r^3 - 120 = 0$ $r^3 = \frac{120}{120\pi}$ $r = \frac{1}{\pi^{\frac{1}{3}}}$ $= 0,68\text{cm}$ NOTE: Derivative = 0 must be stated NOT implied./ LET WEL: Afgeleide = 0 moet aangedui word en nie net geïmpliseer word nie.	✓ derivative = 0/afgeleide = 0 ✓ r^3 as subject/ r^3 as onderwerp ✓ answer/antwoord (3)
[8]		

QUESTION 10 VRAAG 10		
10.1	$P(A \cap B) \neq 0$ $\therefore$ NO, A and B are NOT mutually exclusive $\therefore$ NEE, A en B is NIE onderling uitsluitend nie NOTE: Candidate concludes ONLY, award 0 marks./ LET WEL: Indien kandidaat SLEGS afleiding gee, gee 0 punte.	$\checkmark P(A \cap B) \neq 0$ $\checkmark$ conclusion/gevolgtrekking (2)
10.2	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $P(A \cup B) = 0,38 + 0,42 - 0,1596$ $P(A \cup B) = 0,6404$ $P(A \cup B) = 0,64$	$\checkmark$ formula/formule OR/OF $\checkmark$ correct substitution/korrekte vervanging (1)
10.3	$0,38 \times n(S) = 456$ $\therefore n(S) = \frac{456}{0,38}$ $\therefore n(S) = 1200$	$\checkmark$ setting up any valid equation for $n(S)$ /stel enige geldige vergelyking op vir $n(S)$ $\checkmark$ answer/antwoord (2)
10.4	$P(C') = 1 - P(C)$ $P(C') = 1 - 0,28$ $P(C') = 0,72$ $n(C') = 0,72 \times n(S)$ $n(C') = 0,72 \times 1200$ $n(C') = 864$	$\checkmark P(C')$ $\checkmark$ answer/antwoord (2)
[7]		

QUESTION 11**VRAAG 11**

11.1.1	If repeated digits are considered IDENTICAL(i.e., treated as ONE digit):/<i>Indien getalle herhaal word, word dit as IDENTIES gereken (m.a.w word dit as EEN getal gereken):</i> $1 \times 4! \times 1$ $= 4!$ $= 24 \text{ ways/moontlikhede}$ OR/OF If repeated digits are NOT considered identical:/<i>Indien herhalende getalle NIE as identies gereken word NIE:</i> $2! \times 4!$ $= 2 \times 24$ $= 48 \text{ ways/moontlikhede}$	$\checkmark 4! \text{ or/of}$ $24 \text{ ways/moontlikhede}$ OR/OF $\checkmark 2! \cdot 4! \text{ or/of}$ $48 \text{ ways/moontlikhede (1)}$
11.1.2	If repeated digits are considered IDENTICAL:/<i>Indien herhalende getalle as IDENTIES gereken word:</i> Total number of 6-digit numbers/ <i>Totale aantal 6-getal nommers</i> $= \frac{6!}{2!}$ $= 360$ $P(112347 \text{ or } 743211) = \frac{2}{360}$ $= \frac{1}{180} \text{ or/of } 0,01$ OR/OF If repeated digits are NOT considered identical:/ <i>Indien herhalende getalle NIE as identies gereken word NIE:</i> Total number of 6-digit numbers <i>Totale aantal 6 - getal nommers</i> $= 6!$ $= 720$ $P(112347 \text{ or } 743211) = \frac{4}{720}$ $= \frac{1}{180} \text{ or/of } 0,01$	$\checkmark \frac{6!}{2!}$ $\checkmark 360$ $\checkmark \frac{2}{360}$ $\checkmark \text{ answer/antwoord}$ OR/OF $\checkmark 6!$ $\checkmark 720$ $\checkmark \frac{4}{720}$ $\checkmark \text{ answer/antwoord}$ (4)

11.2	Total number of arrangements of n people = $n!$/ <i>Totale aantal rangskikkings van n persone = $n!$</i> Number of arrangements of persons 1 and 2 = $2!$/ <i>Aantal rangskikkings van persone 1 en 2 = $2!$</i> $\therefore$ Number of arrangements of n people if 1 and 2 are grouped/ $\therefore$ <i>Aantal rangskikkings van n persone indien 1 en 2 saam gegroepeer word:</i> $= (n - 1)!$ $\therefore 2! \times (n - 1)!$ Number of ways that 1 and 2 are NOT next to each other/ <i>Aantal maniere wat 1 en 2 NIE langs mekaar staan NIE</i> $\therefore n! - 2!(n - 1)!$	$\checkmark n!$ $\checkmark 2!(n-1)!$ $\checkmark$ answer/antwoord (3)
[8]		
TOTAL: 150		
TOTAAL: 150		