

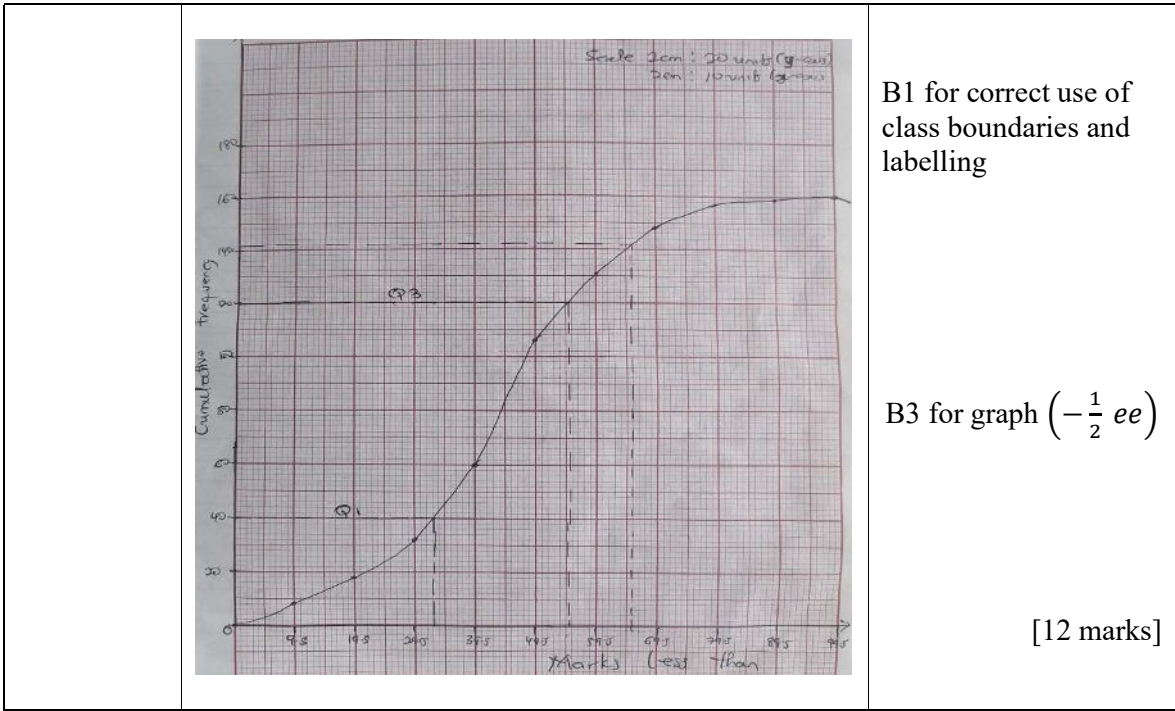
**MARKING SCHEME – CORE MATHEMATICS (MOCK)**

1. C	11. B	21. A	31. D	41. C
2. B	12. C	22. B	32. B	42. B
3. A	13. C	23. C	33. A	43. A
4. C	14. B	24. C	34. C	44. B
5. C	15. C	25. B	35. C	45. D
6. D	16. D	26. B	36. B	46. C
7. B	17. B	27. D	37. C	47. C
8. B	18. A	28. D	38. B	48. D
9. C	19. A	29. C	39. B	49. D
10. A	20. D	30. B	40. B	50. A

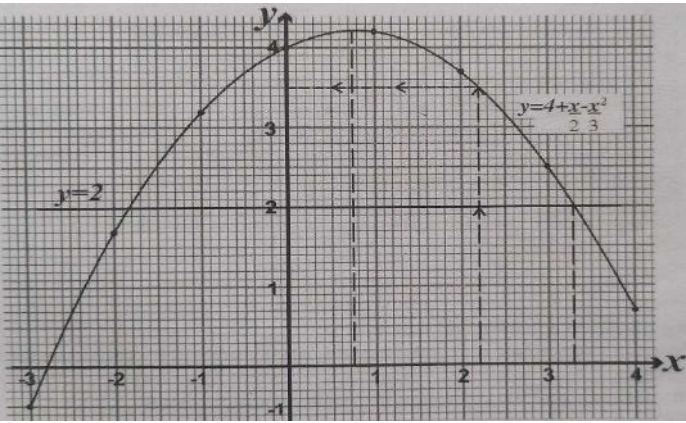
QUESTION NUMBER	SOLUTION	MARKS
1. (a)	$\frac{567 \times 10^{-3} \times 15 \times 10^{-4}}{5 \times 10^{-4} \times 189 \times 10^{-4}}$ $\frac{3 \times 3 \times 10^{-3}}{1 \times 10^{-8}}$ $\frac{9 \times 10^{-3+4}}{9 \times 10^1}$	M1 for any two correct  M1 M1 A1
b)	$5(5y - x) = 1(8y + 3x)$ $25y - 5x = 8y + 3x$ $25y - 8y = 3x + 5x$ $17y = 8x$ $\frac{17}{8} = \frac{x}{y}$ $\frac{x}{y} = 2.13$	M1 for clearing fraction  M1  M1  A1 for 2.13 (3s.f) [8 Marks]
2. a)		
i)	$m = \left(\frac{px - p^2xy}{y}\right)^{-\frac{3}{2}}$ $m = \left(\frac{y}{px - p^2xy}\right)^{\frac{3}{2}}$ $m^{\frac{2}{3}} = \frac{y}{px - p^2xy}$ $x(p - p^2y) = \frac{y}{m^{\frac{2}{3}}}$ $\frac{x(p - p^2y)}{(p - p^2y)} = \frac{y}{m^{\frac{2}{3}}} \times \frac{1}{(p - p^2y)}$ $x = \frac{y}{m^{\frac{2}{3}}(p - p^2y)}$	M1  M1 M1 for factoring x  M1 for dividing  A1

ii)	$x = \frac{1}{(-8)^{\frac{2}{3}} (3 - (3)^2 \times 1)}$ $x = \frac{1}{4(3 - 9)}$ $x = -\frac{1}{24}$	M1 for substitution M1 A1 [8 marks]
3. a)	$\frac{p - q}{pq} = \frac{\tan 30^\circ - \tan 45^\circ}{\tan 30^\circ \times \tan 45^\circ}$ $= \frac{\frac{\sqrt{3}}{3} - 1}{\frac{\sqrt{3}}{3} \times 1}$ $= \frac{\sqrt{3} - 3}{3} \times \frac{3}{\sqrt{3}}$ $= \frac{\sqrt{3} - 3}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ $= \frac{\sqrt{3}(\sqrt{3} - 3)}{3}$ $= 1 - \sqrt{3}$	M1 for substitution M1 M1 A1 M1 A1 for all correct M1 for any factor correct A1 for all correct [8marks]
b)	$\frac{9x + 3}{x + 2} = x + 3$ $(x + 2)(x + 3) = 9x + 3$ $x^2 - 4x + 3 = 0$ $(x - 1)(x - 3) = 0$ $\{x : x = 1, 3\}$	M1 A1 for all correct M1 for any factor correct A1 for all correct [8marks]
4. a)	$2y + 10 + 2x + 40 = 180^\circ$ $x + y = 65 \dots\dots (1)$ $5x - 35 = 2(2y + 10)$ $5x - 4y = 55 \dots\dots (2)$ $x = 65 - y$ $5(65 - y) - 4y = 55$ $325 - 5y - 4y = 55$ $270 = 9y$ $y = 30^\circ$ $x = 65 - 30$ $x = 35^\circ$	M1 for any equation correct M1 M1 for solving A1 for 30° A1 for 35°
b)	Interest = Amount - Principal = 500 - 312.50 = GH¢ 187.50 $187.50 = \frac{312.50 \times 4 \times T}{100}$	M1 M1

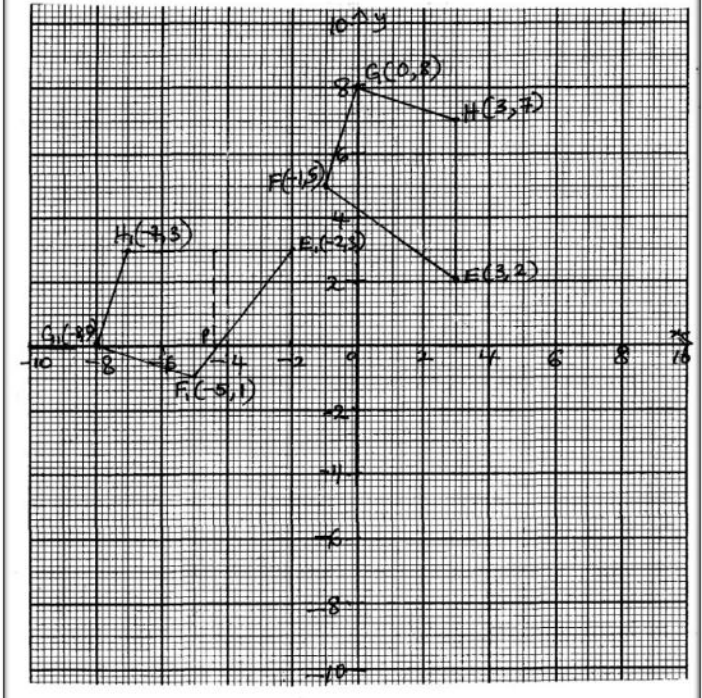
	$187.50 = 1250T$ $T = 15\text{years}$				A1 [8 marks]																																												
5. i)	$U_5 = 3U_1$ $(a + 4d) = 3a \dots\dots\dots (1)$ $\frac{1}{4}U_5 = 9$ $\frac{1}{4}(a + 4d) = 9\dots\dots\dots (2)$ $\frac{1}{4}(3a) = 9$ $3a = 36$ $a = 12$ $a + 4d = 3a$ $4d = 2a$ $4d = 2(12)$ $4d = 24$ $d = 6$				M1 for any equation correct  M1 A1 for $a = 12$  M1 for substituting  A1																																												
ii)	$S_8 = \frac{8}{2}[2(12) + (8 - 1)(6)]$ $S_8 = 4(66)$ $S_8 = 264$				M1 M1 A1 for 264 [8 marks]																																												
6. a)	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Marks</th> <th>Frequency</th> <th>Cum. freq</th> <th>Marks less than</th> </tr> </thead> <tbody> <tr><td>0 - 9</td><td>8</td><td>8</td><td>9.5</td></tr> <tr><td>10 - 19</td><td>10</td><td>18</td><td>19.5</td></tr> <tr><td>20 - 29</td><td>14</td><td>32</td><td>29.5</td></tr> <tr><td>30 - 39</td><td>28</td><td>60</td><td>39.5</td></tr> <tr><td>40 - 49</td><td>46</td><td>106</td><td>49.5</td></tr> <tr><td>50 - 59</td><td>25</td><td>131</td><td>59.5</td></tr> <tr><td>60 - 69</td><td>17</td><td>148</td><td>69.5</td></tr> <tr><td>70 - 79</td><td>9</td><td>157</td><td>79.5</td></tr> <tr><td>80 - 89</td><td>2</td><td>159</td><td>89.5</td></tr> <tr><td>90 - 99</td><td>1</td><td>160</td><td>99.5</td></tr> </tbody> </table>				Marks	Frequency	Cum. freq	Marks less than	0 - 9	8	8	9.5	10 - 19	10	18	19.5	20 - 29	14	32	29.5	30 - 39	28	60	39.5	40 - 49	46	106	49.5	50 - 59	25	131	59.5	60 - 69	17	148	69.5	70 - 79	9	157	79.5	80 - 89	2	159	89.5	90 - 99	1	160	99.5	M1 for lst 3 correct (cumulative freq.)  A1 for all correct $(-\frac{1}{2} ee)$  B1 for marks less than
Marks	Frequency	Cum. freq	Marks less than																																														
0 - 9	8	8	9.5																																														
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90 - 99	1	160	99.5																																														
b)	i. $Q_3 = 54$ $Q_1 = 32.5$ Inter-quartile range = $Q_3 - Q_1$ = $54 - 32.5$ = $21.5 (\pm 1)$				M1 for any correct  M1 A1																																												
	ii. Percentage = $\frac{160-141}{160} \times 100\%$  = 11.875%				M1  A1																																												

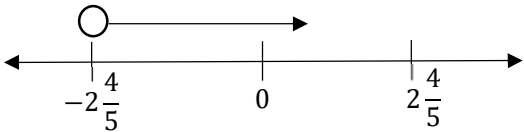


<p>7. a)</p> <p>i)</p> <p>ii)</p> <p>b)</p>	$y - x = k + k_1x$ $5 = k + 3k_1 \quad \dots\dots\dots (1)$ $7 = k + 5k_1 \quad \dots\dots\dots (2)$ <p>Eqn (2) - eqn (1)</p> $2 = 2k_1$ $k_1 = 1$ $7 = k + 5(1)$ $k = 2, \quad k_1 = 1$ $y = 2 + 2x$ $20 = 2 + 2x$ $18 = 2x$ $x = 9$ <p>Volume of cube = volume of cone</p> $\text{Volume of cube} = l^3 = (8)^3 = 512\text{cm}^3$ $512 = \frac{1}{3} \times \frac{22}{7} \times (4)^2 \times h$ $10752 = 352h$ $h = 30.5\text{cm}$	<p>B1</p> <p>M1 for any equation correct</p> <p>M1</p> <p>M1</p> <p>B1 for any <math>k</math> correct</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>A1 for 30.5cm (1dp)</p> <p>[12 marks]</p>
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<p>8. a)</p>	$P(W)' = \frac{1}{4}$ $P(W) = 1 - \frac{1}{4} = \frac{3}{4}$ <p>P(winning only the second race) = <math>\frac{1}{4} \times \frac{3}{4} \times \frac{1}{4} = \frac{3}{64}</math></p> <p>P(winning all the three races) = <math>\frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} = \frac{27}{64}</math></p> <p>P(winning only two of the race) = <math>\left[\frac{3}{4} \times \frac{3}{4} \times \frac{1}{4}\right] + \left[\frac{3}{4} \times \frac{1}{4} \times \frac{3}{4}\right] + \left[\frac{1}{4} \times \frac{3}{4} \times \frac{3}{4}\right] = \frac{27}{64}</math></p>	<p>B1</p> <p>M1A1</p> <p>M1A1</p> <p>M1A1</p>																		
<p>b)</p>	$42^\circ + 38^\circ + 57^\circ + x^\circ + (x + y)^\circ + (2x - 15)^\circ + (3x - y)^\circ = 360^\circ$ $122^\circ + 7x = 360^\circ$ $7x = 238^\circ$ $x = 34^\circ$ $x = y - 7$ $34 = y - 7$ $y = 41^\circ$	<p>M1 for summing</p> <p>A1 for equating to 360°</p> <p>M1 for solving</p> <p>A1 for 34°</p> <p>A1</p> <p>[12 marks]</p>																		
<p>9. a)</p>	$y = m^2 + nx + r$ $y = m(0)^2 + n(0) + r$ $r = 4 \dots\dots(1)$ $\frac{5}{3} = m(-2)^2 + n(-2) + r$ $12m - 6n = -7 \dots\dots (2)$ <p>When <math>x = 4, y = \frac{2}{3}</math></p> $48m + 12n = -10 \dots\dots (3)$ $m = -\frac{1}{3}, \quad n = \frac{1}{2}, \quad r = 4$ $y = -\frac{1}{3}x^2 + \frac{1}{2}x + 4$ <table border="1" data-bbox="414 1375 1112 1449"> <tbody> <tr> <td>x</td> <td>-3.0</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>y</td> <td>-0.5</td> <td>1.67</td> <td>3.17</td> <td>4</td> <td>4.17</td> <td>3.67</td> <td>2.5</td> <td>0.67</td> </tr> </tbody> </table>	x	-3.0	-2	-1	0	1	2	3	4	y	-0.5	1.67	3.17	4	4.17	3.67	2.5	0.67	<p>M1 for any equation correct</p> <p>M1 for any one correct</p> <p>A1 for all correct</p> <p>B2 for table (<math>-\frac{1}{2} ee</math>)</p>
x	-3.0	-2	-1	0	1	2	3	4												
y	-0.5	1.67	3.17	4	4.17	3.67	2.5	0.67												
<p>b)</p>		<p>Graph</p> <p>B3 (<math>-\frac{1}{2} ee</math>)</p>																		

c)	<p>i. <math>x = 2.2, p = 3.5</math></p> <p>ii. Equation of axis of symmetry is <math>x = 0.75</math></p> <p>iii. <math>y = 2</math></p> <p>Truth set is <math>\{x: x = -1.8, 3.3\}</math></p>	<p>A1 for <math>p = 3.5 (\pm 1)</math></p> <p>A1 for 0.75</p> <p>M1 A1</p> <p>[12 marks]</p>
10. a)	<p>Sylvester : Bentil : Dereck  <math>15,000 : 25,000 : 30,000</math>  <math>3 : 5 : 6</math></p> <p>Tax paid = <math>\frac{45}{100} \times 16,800</math>  <math>= GH\text{¢ } 7,560.00</math></p> <p>Net profit = <math>16,800 - 7560</math>  <math>= GH\text{¢ } 9,240.00</math></p> <p>40% of net profit = <math>\frac{40}{100} \times 9240</math>  <math>= GH\text{¢ } 3,696.00</math></p> <p>Sylvester's share = <math>\frac{3}{14} \times GH\text{¢ } 3696.00</math>  <math>= GH\text{¢ } 792.00</math></p> <p>Bentil's share = <math>\frac{5}{14} \times GH\text{¢ } 3696.00</math>  <math>= GH\text{¢ } 1320.00</math></p> <p>Dereck's share = <math>\frac{6}{14} \times GH\text{¢ } 3696.00</math>  <math>= GH\text{¢ } 1584.00</math></p> <p>Interest = <math>\frac{1584 \times 8 \times 12}{100}</math>  <math>= GH\text{¢ } 1520.64</math></p> <p>Percentage = <math>\frac{1584.00 + 1520.64}{30000} \times 100\%</math>  <math>= 10.35\%</math></p>	<p>B1 for ratio</p> <p>M1 for tax paid M1 A1 for GH¢ 9,240.00</p> <p>B1 for GH¢ 3,696.00</p> <p>M1 A1</p> <p>A1 for all correct</p> <p>M1</p> <p>A1</p> <p>M1 A1</p> <p>[12 marks]</p>
11. a)	<p><math>\sin 45^\circ = \frac{ BD }{9}</math></p> <p><math> BD  = \frac{9\sqrt{2}}{2}</math></p> <p>Perimeter = length of AB +  OA  +  OD  +  BD </p> <p>Length of AB = <math>\frac{135^\circ}{360} \times 2 \times \frac{22}{7} \times 9 = 21.2143\text{cm}</math></p> <p><math> OD  = \sqrt{9^2 - \left(\frac{9\sqrt{2}}{2}\right)^2} = \frac{9\sqrt{2}}{2}</math></p> <p> OA  = 9cm</p> <p>Perimeter = <math>21.2143 + 9 + \frac{9\sqrt{2}}{2} + \frac{9\sqrt{2}}{2}</math>  <math>= 42.9422\text{cm}</math></p> <p>Area of unshaded = Area of semi-circle - Area of sector - Area of triangle</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>M1 A1</p>

<p>b)</p>	<p>Area of semi-circle = <math>\frac{1}{2} \times \frac{22}{7} \times 9^2 = 127.2857cm^2</math></p> <p>Area of sector = <math>\frac{135^\circ}{360} \times \frac{22}{7} \times 9^2 = 95.4643cm^2</math></p> <p>Area of triangle = <math>\frac{1}{2} \times \frac{9\sqrt{2}}{2} \times \frac{9\sqrt{2}}{2} = 20.25cm^2</math></p> <p>Area of unshaded = <math>127.2857 - 95.4643 - 20.25</math>  <math>= 11.5714cm^2</math></p> <p><math>x^2 + x - 6 = 0</math>  <math>(x - 2)(x + 3) = 0</math>  <math>x = 2, x = -3</math></p>	<p>B1</p> <p>B1</p> <p>M1 A1</p> <p>M1 M1 A1</p>
[12 marks]		
<p>12. b)</p> <p>c)</p>	<p><math>\begin{pmatrix} -1 \\ 5 \end{pmatrix} + \begin{pmatrix} 1 \\ 3 \end{pmatrix} = \overrightarrow{OG}</math>  <math>\begin{pmatrix} 0 \\ 8 \end{pmatrix} = \overrightarrow{OG}, G(0, 8)</math>  <math>\begin{pmatrix} 3 \\ -1 \end{pmatrix} + \begin{pmatrix} 0 \\ 8 \end{pmatrix} = \overrightarrow{OH}</math>  <math>\begin{pmatrix} 3 \\ 7 \end{pmatrix} = \overrightarrow{OH}, H(3, 7)</math></p> <p>ii) <math>E(3, 2) \rightarrow E_1(-2, 3)</math>  <math>F(-1, 5) \rightarrow F_1(-5, -1)</math>  <math>G(0, 8) \rightarrow G_1(-8, 0)</math>  <math>H(3, 7) \rightarrow H_1(-7, 3)</math></p>  <p>B1 for labelling <math>y</math> - axis and scale  B1 for labelling <math>x</math> - axis and scale</p>	<p>B1</p> <p>B1</p> <p>B2 for <math>EFGH</math>  <math>(-\frac{1}{2} ee)</math></p> <p>B3 <math>E_1F_1G_1H_1</math>  indicating clearly  all vertices and their  coordinates</p>

d)	$P = 2.8$ $\text{Area of } E_1H_1G_1P = \frac{1}{2}(4.8 + 3.7) \times 2.8$ $= 11.9 \text{ square units}$	B1 for P M1 A1 [12 marks]																									
13. a)	$x\Delta y = 9 = 2xy \pmod{11}$ <table border="1" data-bbox="435 495 966 676"> <tr><td><math>\Delta</math></td><td>5</td><td>7</td><td>9</td><td>10</td></tr> <tr><td>5</td><td>3</td><td>5</td><td>7</td><td>8</td></tr> <tr><td>7</td><td>5</td><td>10</td><td>4</td><td>1</td></tr> <tr><td>9</td><td>7</td><td>4</td><td>1</td><td>5</td></tr> <tr><td>10</td><td>8</td><td>1</td><td>5</td><td>7</td></tr> </table> <p>ii) <math>\alpha) n \Delta (n + 2) = n</math>  <math>5\Delta(5 + 2) = 5</math>  <math>\{n: n = 5\}</math></p> <p><math>\beta) n \Delta n = 1</math>  <math>9 \Delta 9 = 1</math>  <math>\{n: n = 9\}</math></p> <p>b)</p> $\frac{1}{2}x - \frac{1}{3}(x + 3) < x + 1\frac{1}{3}$ $3x - 2(x + 3) < 6x + 8$ $3x - 2x - 6 < 6x + 8$ $x - 6x < 8 + 6$ $x > -\frac{14}{5}$ $\left\{x: x > -2\frac{4}{5}\right\}$ 	$\Delta$	5	7	9	10	5	3	5	7	8	7	5	10	4	1	9	7	4	1	5	10	8	1	5	7	B3 $\left(-\frac{1}{2} ee\right)$ M1 A1 M1 A1 -1 for omission of { } M1 for clearing fraction M1 (any 3 terms correct) M1 for solving A1 -1 for omission of { } B1 [12 marks]
$\Delta$	5	7	9	10																							
5	3	5	7	8																							
7	5	10	4	1																							
9	7	4	1	5																							
10	8	1	5	7																							