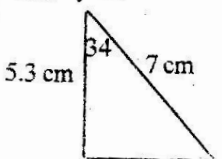
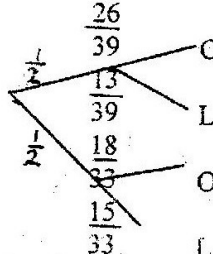


K.C.S.E 1995 MATHEMATICS PAPER 121/1 MARKING SCHEME

SOLUTION	MARKS	ALTERNATIVE
<p>1. $\sqrt{\frac{384.16 \times 0.0625}{96.04}}$</p> $\sqrt{\frac{2^4 \times 7^4 \times 10^2 \times 5^4 \times 10^4}{2^3 \times 7^4 \times 10^2}}$ $\sqrt{2^2 \times 5^4 \times 10^4}$ $2^2 \times 5^4 \times 10^4$ $= 0.5$	 ml ml A1 3 marks	<p>Alternative methods</p> 4×0.0625 ml 2×0.25 ml $= 0.5$ $\sqrt{\frac{24.01}{96.04}}$ ml $= \sqrt{0.25}$ ml $= 0.5$ A1 <p>Long method</p> $\sqrt{384.16} = 19.6$ $\sqrt{0.0625} = 0.25$ $\sqrt{96.04} = 9.8$ } ml 19.6×0.25 ml 9.8 $= 0.5$ A1 <p>Long checking method must be seen to score 1st mark</p>
<p>2. $\frac{2x-2}{6x^2-x-12} + \frac{x-1}{2x-3}$</p> $= \frac{2(x-1)}{(3x+4)(2x-3)} \times \frac{x(2x-3)}{x-1}$ $= \frac{2}{3x+4}$	ml ml A1 3 marks	For of question completely For cancellation
<p>3. Median = $\frac{7.5 + 5 \times 4}{8}$</p> $= 10$	ml A1 2 marks	Cumulative graph ml median = 10 A1 $\frac{7.5 + 5 \times 4}{8}$ m0 9.75 A0
<p>4. Manyatta</p>  <p>Bearing of Chamwe from Manyatta 169 ± 1</p> <p>5. $\frac{y-5}{x+8} = \frac{1}{4}$ $y = -\frac{1}{4}x + 3$</p>	S1 B1 B1 ml A1 2 marks	Appropriate scale Scale drawing (completely)

SOLUTION	MARKS	ALTERNATIVE METHOD
6. $\frac{1}{S_0^2} = \frac{3V+2}{2\pi r^3}$ $C = \frac{2\pi r^3}{3SV + 4\pi r^3 S}$ $C = \sqrt{\frac{2\pi}{3SV + 4\pi^3 S}}$	ml ml A1 3 marks	
7. $A = \left 2x^2 - \frac{1}{3}x^3 \right _1^4$ $= 8 - \frac{8}{3} - 2 + \frac{1}{3}$ $= \frac{32}{3}$	ml ml A1 3 marks	correct integration without limits Substitution of limits
8.  $P(O) = \left(\frac{1}{2} \times \frac{2}{3}\right) + \left(\frac{1}{2} \times \frac{6}{11}\right)$ $= \frac{20}{33}$ or $\frac{260}{429} = \frac{780}{1287}$	ml ml ml A1 4 marks	Tree diagram need not be drawn Or equivalent for addition Or equivalent for addition
9. $\frac{4}{3} \times \frac{22}{7} \times r^3 = \frac{1}{7} \times 22 \times 9 \times 9 \times 12$ $r^3 = 243 \times \frac{7}{7}$ $r = 6.24$ or equivalent $A = 4r^2 = 4 \times \frac{22}{7} \times 6.24 \times 6.24 = 489.5 \text{ cm}^2$	ml A1 4 marks	If A1 lost.
10. 10, 10 + 2d, 10 + 6d $\frac{10+2d}{10} = \frac{10+6d}{10+2d}$ $100 + 40d + 4d^2 = 100 + 60d$ $4d^2 - 20d = 0$ $d = 5$ or $d = 0$ Alternative $4d^2 = 20d \quad 4d^2 - 20d = 0$ $4d = 20 \quad 4d(d-5) = 0$ $d = 5 \quad d - 5 = 0$ or $4d = 0$ $d = 5$ or $d = 0$	B1 ml ml ml 4 marks	A.P. identified G.P. ratio equated Simplified quadratic equation $d=0$ must be disqualified

SOLUTION	MARKS	ALTERNATIVE METHOD
11. $\frac{4 \times 21 + 3 \times 42}{7} = 30$ $\frac{130 \times 30}{100} = 39$	ml A1 ml A1 4 marks	Accept $\frac{210 \times 130}{7 \times 100}$ m2 -39 A2
12. $\begin{pmatrix} 3 & 2 \\ 4 & 5 \end{pmatrix} \begin{pmatrix} S \\ T \end{pmatrix} = \begin{pmatrix} 840 \\ 1680 \end{pmatrix}$ Inverse $\frac{1}{7} \begin{pmatrix} 5 & -2 \\ -4 & 3 \end{pmatrix}$ $\frac{1}{7} \begin{pmatrix} 5 & -2 \\ -4 & 3 \end{pmatrix} \begin{pmatrix} 3 & 2 \\ 4 & 5 \end{pmatrix} \begin{pmatrix} S \\ T \end{pmatrix}$ $= \frac{1}{7} \begin{pmatrix} 5 & -2 \\ -4 & 3 \end{pmatrix} \begin{pmatrix} 840 \\ 1680 \end{pmatrix}$ $\begin{pmatrix} S \\ T \end{pmatrix} = \begin{pmatrix} 120 \\ 240 \end{pmatrix}$ Shirt Sh. 120, Trousers Sh. 240	B1 B1 B1 ml A1 4 marks	For mainly equation Or equivalent $\begin{pmatrix} S \\ T \end{pmatrix} = \begin{pmatrix} 1 & 5 & -2 \\ 7 & -4 & 3 \end{pmatrix} \begin{pmatrix} 840 \\ 1680 \end{pmatrix}$ If transposed used B0 B0
13. $\frac{27 \times 4 \times 60}{60 \times 30} = 3.6$ cm height = 23.6 cm	ml ml A1 3 marks	For division quantity through if log used
14. $\angle ACE = 60^\circ$ cyclic quadrilateral $\angle CDA = 100^\circ$ \angle sum of triangle or $\angle ABE = 100^\circ$ ext \angle equal $\angle FED = 40^\circ$	B1 B1 B1 3 marks	or $\angle DCE$ or $\angle BEA$ or $\angle EBC = 80^\circ$ or $\angle EDF = 80^\circ$ <i>40° must be worked for NOT just seen</i>
15. $2.5000 - 3750 = 21250$ Amount to pay $21250 + \frac{21250 \times 40 \times 2}{100}$ $= 38250$ One instalment = $\frac{38250}{24} = \text{Sh } 1,593,75$	ml A1 4 marks	Working 5.1 + 21250 From 5.1 from amount owing If A1, lost
16. $\frac{(2x + 30) \times 60}{195} = x - 20$ $x = 76$ km Actual distance = 182 km	B1 3 marks	
17. a) $10000 \times 1.2 = 12000$ $22000 \times 1.2 = 26400$ $36400 \times 1.2 = 43680$ b) $A = 43680 (1.2)^8$ No Log $43680 = 4.6403$ $1.2^8 = 0.0792 \times 8 = 0.6403$ $1.879 \times 10^5 = 5.2739$ $= \text{Sh. } 187900$ $\text{Sh. } 187900 - \text{Sh } 30000 = \text{Sh. } 157900$	ml ml ml A1 ml ml * A1 ml A1 8 marks	For logs and operations Follow through if logs used

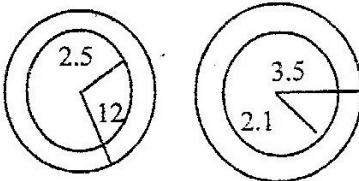
SOLUTION	MARKS	ALTERNATIVE METHOD																								
18. a) (i) $AV = AD + DV = a + c$ (ii) $BV = BA + AV = a + c - b$ b) $BO = \frac{1}{2} BD = \frac{1}{2}(a - b)$ $OV = OB + BV$ $= \frac{1}{2}(b - a) + a + c - b$ $= \frac{1}{2}a + c - \frac{1}{2}b$ $OM = \frac{3}{7} OV$ $= \frac{3}{7} \left(\frac{1}{2}a + c - \frac{1}{2}b \right)$ $BM = BO + OM$ $= \frac{1}{2}(a - b) + \frac{3}{7} \left(\frac{1}{2}a + c - \frac{1}{2}b \right)$ $= \frac{7a - 7b + 3a + 6c - 3b}{14}$ $= \frac{10a + 10b + 6c}{14}$ $= \frac{1}{7}(5a - 5b + 3c)$	B1 m1 A1 ml ml ml A1 8 marks	0w - 1 vector sign not used Follow the route or - $BV + Vm$ $= a + c - b + \frac{4}{7} - \frac{1}{2}a - c + \frac{1}{2}b$ $= \frac{10a - 10b + 6c}{14}$ $= \frac{1}{7}(5a - 5b + 3c)$ Accep $\frac{5a}{7} - \frac{5b}{7} + \frac{3c}{7}$																								
19. a) $\sin \frac{1}{2} \theta = 0.8$ $\frac{1}{2} \theta = 53.13^\circ$ $\theta = 106.26$ $= 106.3^\circ$ Area of segment = $\frac{253.7 \times 22}{360} \times \frac{5}{7} + \frac{1}{2} \times 5 \times 5 \sin 106.3^\circ$ $= 55.37 + 12$ $= 67.37 \text{ cm}^2$ b) $\frac{300}{60} \times 2\pi = 10\pi$ radians	ml A1 M1 ml ml ml ml A1 8 marks	Alternative $\frac{300 \times 360 \pi}{60 \times 180} = 10\pi$ Accept $A = r^2 - \frac{106.3 \times 22 \times 25}{360} - ml$ $= \frac{1}{2} \times 25 \sin 106.3$ ml $= 78.57 - (23.2 - 120)$ ml $= 78.57 - 11.2$ ml $= 67.37 \text{ cm}^2$ A1 If A1 lost																								
20. a) (i) $b - a = 35.1$(i) $7b - 490a = 39.9$ (ii) $a = 4.9$ $b = 40$ (ii) $5 = -4.9t^2 + 40t + 10$ <table border="1" style="width: 100%; text-align: center;"> <tr> <td>l</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td> </tr> <tr> <td>k</td><td>10</td><td>70.4</td><td>85.9</td><td>91.6</td><td>87.5</td><td>73.6</td><td></td><td>16.4</td><td>26.9</td><td></td><td></td> </tr> </table> b) i) Suitable scale Plotting Curve (ii) Tangent at $t = 5$ Velocity = $-9.0 \pm 0.5 \text{ m/s}$	l	0	1	2	3	4	5	6	7	8	9	10	k	10	70.4	85.9	91.6	87.5	73.6		16.4	26.9			ml A1 B1 S1 P1 C1 T1 B1 8 marks	If A1, lost If C1 lost or A1 lost
l	0	1	2	3	4	5	6	7	8	9	10															
k	10	70.4	85.9	91.6	87.5	73.6		16.4	26.9																	

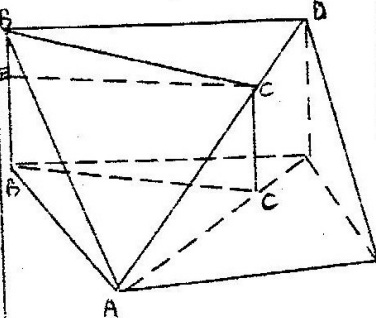
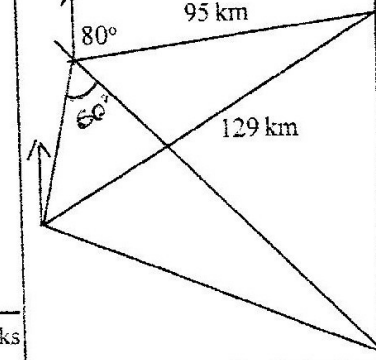
SOLUTION	MARKS	ALTERNATIVE METHOD
24. (a) Lat of B = 43.75° 43.45° (ii) $r = 6370 \cos 43.75^\circ$ angle between B and C = 60° $BC = \frac{60}{360} \times 2 \times \frac{22}{7} \times 6370 \cos 43.75^\circ$ $= \frac{60}{360} \times 2 \times \frac{22}{7} \times 6370 \times 0.7224$ $= 4820.816 \text{ km}$	B1 m1 B1 m1 m1 A1	Only when subtraction is done to 43.45 $37^\circ + 23^\circ = 60^\circ$ $\cos 43.75 = 1.8587$ Must be correct 0.7224 Either both B1 or one B1 lost Follow through logs
b) $\frac{60 \times 4}{60} = 4 \text{ hrs}$ local time at C in 2100 hours or 9.00 pm	A1 8 marks	

K.C.S.E 1995 MATHEMATICS PAPER 121/2 MARKING SCHEME

SOLUTION	MARKS	ALTERNATIVE METHOD
<p>1. $x \log x$</p> $(0.7284)^2 \cdot 2.8623 \times 2 = 3.7246$ $3\sqrt{0.06/195 \cdot 2.7921 + 34} = 1.5974$ $\Rightarrow \underline{\underline{2.1272}}$ $\Rightarrow 0x = 0.01341$	<p>ml M1 ml A1 4 marks</p>	<p>Apply Mt - 2 if a candidate was square root All two logs Multiplication & division of his log Subtraction of logs Alternative Accept standard form</p>
<p>2. $y = 2x - 3$</p> $x^2 - x(2x - 3) = -4$ $(x+1)(x-4) = 0$ $= x = -1 \text{ or } x = 4$ $\text{and } y = -5 \text{ or } y = 5$	<p>ml ml ml A1</p>	<p>Equation in one unknown Corect simplification and equation Factorization of this equation Substitution in the formula</p>
<p>3. $(65 + 50 + 50) : 3$ $(50 + 50 + 45) : 3, (50 + 45 + 45) : 3$ $(45 + 45 + 45) : 3, (45 + 45 + 40) \text{ and}$ $(45 + 40 + 40) : 3$ moving av 55, 48, 47, 45, 43, 42</p>	<p>ml ml A1 3 marks</p>	
<p>4. x- section area = $\frac{1}{2} \times 3 \times 3 \sin 60^\circ$</p> $\frac{1 \times 3 \times 3 \times 0.8660}{2}$ <p>Volume = $\frac{1}{2} \times 3 \times 3 \times 0.866 \times 0.25$</p> $= 97.43(97.425)$	<p>ml ml A1 3 marks</p>	<p>or $45(45 - 3)(45 - 3)(45 - 3)$ 3.875×25</p>
<p>5. $7^{2(x+1)} + 7^{2x} = 350$</p> $49 \times 7^{2x} + 7^{2x} = 350$ $50 \times 7^{2x} = 350$ $7^{2x} = 7$ $= 2x = 1$ $x = \frac{1}{2}$	<p>ml ml ml A1 4 marks</p>	<p>$49 \times 1 + 49x = 350$ $49 \times 49x + 49x = 350$ $50 \times 49x = 350$ $49x = 7$ $49x = 49^{1/2}$</p> <p>if logs used follow through</p>
<p>6. $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -1 \\ 2 \end{pmatrix} + \begin{pmatrix} 1 \\ 2 \end{pmatrix} = \begin{pmatrix} -2 \\ 0 \end{pmatrix}$</p> $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -3 \\ 3 \end{pmatrix} + \begin{pmatrix} -2 \\ 0 \end{pmatrix} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$ $= (x^1 y^1) = (-1, -3)$	<p>B1 B1 2 marks</p>	<p>Allow for sketch of the translation vector Do not accept final answer in sector form</p>
<p>7. $\sqrt[3]{S.F.} = 3^3 : 5^3 = 27.125$</p> <p>Vol of larger tank = $\frac{8.1 \times 125}{27}$</p> 37.5 m^3	<p>ml ml A1 3 marks</p>	

SOLUTION	MARKS	ALTERNATIVE METHOD
8. $\frac{3x^2 - 1 - (2x + 1)(x - 1)}{x^2 - 1}$ $= \frac{x^2 + x}{x^2 - 1}$ $= \frac{x(x + 1)}{(x - 1)(x + 1)} = \frac{x}{x - 1}$	ml ml A1 3 marks	Correct expression under one denominator
9. $\sin \theta = \frac{9}{27} = 0.333$ $\Rightarrow \theta = 19^\circ 28' (19.47^\circ)$ $= 19^\circ 28' + 90$ $= 109^\circ 28' (109.47^\circ)$	ml ml A1 3 marks	$\cos x = 0.333$ $= 70^\circ 32' (70.53^\circ)$ $180 - 70^\circ 32'$
10. $ar = 16, ar^4 = 2$ $\frac{ar}{ar^4} = \frac{2}{16} \Rightarrow r^3 = \frac{1}{8}$ $\Rightarrow r = 1/2$ and $a = 32$	ml A1 A1 3 marks	or $16 r^4 = 2$ $\frac{16}{r}$ Cao
11. $\angle PCB = 40^\circ$ or $\angle DCQ = 40^\circ$ or $\angle BCD = 140^\circ$ $\therefore \angle BAD = 40^\circ$	B1 B1 2 marks	Allow B1B1 for $\angle PCQ = 140^\circ$ $= \angle BAD = 40^\circ$
12. $BA = 3i + 4j - (8i - j) = -5i + 5j$ $CA = \frac{3}{5}(-5i + 5j) = -3i + 3j$ $DC = 2(-8i + j) = -16i + 2j$ $DA = 2(-8i + j) + (-3i + 2j)$ $= -19i + 5j$	ml ml ml A1 4 marks	or equivalent $BA = a - ab$ $CA = \frac{3}{5}(a - b)$ $DA = -2b + \frac{3}{5}a - \frac{3}{5}b$ $BA = a - b$ $CA = 3(a - b) = \frac{3}{5}a - \frac{3}{5}b$ $DC = -2b$ $DA = -2b + \frac{2}{5}a - \frac{3}{5}b$ ml $= \frac{12}{5}b + \frac{3}{5}a$ ml $= \frac{12}{5}(8i - j) + \frac{12}{5}(3i + 4j)$ ml $= -19i + 5j$ A1
13. $\log(x^3 \times 5x) = \log\left(\frac{2^5 \div 2}{5}\right)$ $x^3 \times 5x = \frac{2^5 \div 2}{5}$ $5x^4 - 80 \Rightarrow x^4 = 16$ $\Rightarrow x = 2$	ml ml A1 3 marks	$3 \log x + \log 5x = 5 \log 2 \log 2$ $4 \log 5$ ml $4 \log x + \log 2$ ml $x = 2$ ml

SOLUTION		MARKS	ALTERNATIVE METHOD																				
14. $\frac{4}{3} \times \frac{22}{7} \times r^3 = \frac{22}{7} \times 11^2 \times 50$ $r^3 = \frac{121 \times 50 \times 3}{4}$ $r = \sqrt[3]{4537.5} = 16.56$	ml A1 2 marks		Substitutions and equating																				
15. $500 = 16a = b/6 \Rightarrow 500 = 16a + 4b$ $800 = 25a + b, 25 \Rightarrow 800 = 25a + 5b$ $2500 - 80a + 20b$ $3200 - 100a + 20b$ $700 = 20a$ $= a = 35$ and $b = -15$ $= p = 35L - 15\sqrt{L}$	B1 B1 ml A1 B1 5 marks		Attempt to eliminate one variable from variation Must come from correct variations Given if A0 lost but ml must be correct.																				
16. Area = $2(8 + 6.5 + 5.6 + 6 + 6.4 + 4.7)$ $= 2(8 + 6.5 + 5.6 + 6 + 6.4 + 4.7) \times 25$ $= 2 \times 37.2 \times 25 \times 100$ or equivalent $= 186000$ ha	ml ml A1 4 marks		At least 4 reading within 10.1 For conversion to Km ² or km to hectares																				
17. a) Area of path = $\frac{22 \times 49^2}{7} - \frac{22 \times 35^2}{7}$ $= 3696\text{m}^2$ Area of slab = $\frac{22 \times 352 - 4 \times 4 \times 3}{7} = 3850 - 48 = 3802\text{m}^2$ Total cost = $3696 \times 300 + 3850 \times 400$ $= 2629600$ Amount not spent $\frac{20}{100} \times \frac{115}{100} \times 2629600$ $= 604808$ b) Actual expenditure $= \frac{80}{100} \times \frac{115}{100} \times 2629100 = 2419232$	mlA1 ml ml A1 B1 8 marks		 cao must not loose any of A above																				
18. <table border="1" data-bbox="308 1312 1193 1386"> <tr> <td>UCL</td> <td>19.5</td> <td>39.5</td> <td>59.5</td> <td>79.5</td> <td>99.5</td> <td>119.5</td> <td>139.5</td> <td>159.5</td> <td>179.5</td> </tr> <tr> <td>cf</td> <td>9</td> <td>28</td> <td>50</td> <td>68</td> <td>8</td> <td>8</td> <td>97</td> <td>99</td> <td>100</td> </tr> </table> a) Cumulative frequency Linear scale Plotting Smoothing & complete of CF curve b) (i) Upper quartile = 90 Lower quartile = 36 Range = 90 - 36 = 54 (ii) No. of days = 100 - 93 = 7	UCL	19.5	39.5	59.5	79.5	99.5	119.5	139.5	159.5	179.5	cf	9	28	50	68	8	8	97	99	100	B1 S1 P1 C1 B1 B1 B1 B1 8 marks		For cf all Must accommodate all date Reading within 1sq Must identify both quarterly Reading within 1 sq must be a CT curve
UCL	19.5	39.5	59.5	79.5	99.5	119.5	139.5	159.5	179.5														
cf	9	28	50	68	8	8	97	99	100														
19. P (both alive) = $0.7 \times 0.9 = 0.63$ P (neither alive) = $0.3 \times 0.1 = 0.03$ P (one alive) = $0.7 \times 0.1 + 0.9 \times 0.3 = 0.34$ P (at least one alive) = $0.7 \times 0.1 + 0.9 \times 0.3 + 0.7 \times 0.9$ $= 0.7 \times 0.1 + 0.9 \times 0.3 + 0.7 \times 0.9$ $= 0.07 + 0.27 + 0.63$	ml A1 ml A1 ml A1 ml ml A1 8 marks		or equivalent $1 - 0.08 = 0.97$ can be 1 p (neither)																				

SOLUTION	MARKS	ALTERNATIVE METHOD
<p>20. (a) $BB' = 800 \sin 30^\circ$ $= 800 \times 0.5$ $= 400$</p> <p>(b) (i) $AD = \frac{800}{\cos 60} = \frac{800}{0.5}$ $\therefore AC = \frac{3}{4} AD = \frac{3}{4} \times \frac{800}{0.5}$ $= 1200 \text{ m}$</p> <p>(ii) $CB^2 = 800^2 + 1200^2 - 2 \times 800 \times 1200 \cos 60^\circ$ $= 800^2 + 1200^2 - 2 \times 800 \times 1200 \times 0.5$ $= 640000 + 1440000 - 960000$ $\therefore CB = \sqrt{1120000} = 1058$</p> <p>(iii) $\frac{3}{4} BB' = EB' = \frac{3}{4} \times 400 = 300$ $\therefore \sin \theta = \frac{400 - 300}{1058} = 0.945$ $\Rightarrow \theta = 5^\circ 25' (5.42^\circ)$</p>	<p>m1 A1</p> <p>m1 A1</p> <p>m1 A1</p> <p>8 marks</p>	
<p>21. $\triangle ABD$ constructed $\triangle ABP$ constructed (i) $AD = 4.5 + 0.1 \text{ CM}$ Distance A to D = $4.5 \times 10 = 45 \text{ km}$ (ii) Bearing D from B = $241 + 1$ (iii) Bearing P from D = $123 + 2$ (iv) $DP = 12.9 + 0.2 \text{ CM}$ Distance D to P = $12.9 \times 10 = 129 \text{ km}$</p>	<p>B1 B1 B1 B1 B1 B1 B1 B1 B1</p> <p>8 marks</p>	
<p>22. $\angle ABC = 105^\circ$ or $\angle BAD = 75^\circ$ complete // gram constructed const. of locl : $AP < 6 \text{ cm}$ Area // gram = $7 \times 10 \sin 105^\circ$ $= 7 \times 10 \times 0.9659$ $= 67.61 \text{ cm}^2$</p> <p>Total area of sectors $\frac{75}{360} \times \frac{22}{7} \times 42^2 + \frac{105}{360} \times \frac{22}{7} \times 6^2$ $= 10.48 + 33 = 43.48$</p> <p>Required area = $67.61 - 43.48$ $= 24.13$</p>	<p>B1 B1 B1</p> <p>m1</p> <p>m1 A1</p> <p>8 marks</p>	<p>Construction marks must be seen $AB = 10 + 0.1 \text{ cm}$ & $BC = 7 + 0.1 \text{ cm}$ Must be drawn inside his // gram or $10 \times 6.7 + 0.1$ (from height measured) = 67</p> 