

**K.C.S.E 2001 MATHEMATICS PAPER 121/1 MARKING SCHEME**

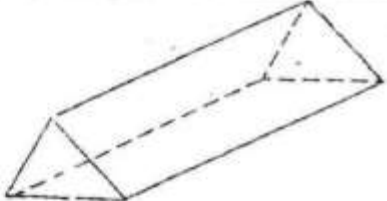
SOLUTION	MARKS]	ALTERNATIVE METHOD
<p>20 a) i) <math>\angle CBD = 90^\circ - 42^\circ = 48^\circ</math> Subtended by diameter</p> <p>ii) <math>\angle BOD = 180^\circ - 42^\circ = 138^\circ</math> cyclic quadrilateral</p> <p>Reflex <math>\angle BOD = 360^\circ - 138^\circ = 222^\circ</math></p> <p>b) In <math>\triangle AOB</math>  <math>\angle BAD = x</math>, <math>\angle AOB = 138^\circ</math>  <math>\angle ADB = 180^\circ - 42^\circ = 138^\circ</math>  <math>= 180^\circ - 111^\circ</math>  <math>= 69^\circ</math></p>	<p>BI BI</p> <p>BI BI</p> <p>BI</p> <p>BI BI BI</p> <p>8 marks</p>	<p><math>\angle BPD = 138^\circ</math>  <math>\angle AOB</math>  <math>= 360^\circ - (138^\circ + 84^\circ)</math>  <math>= 360^\circ - 222^\circ</math>  <math>= 138^\circ</math></p>
<p>21. <math>y = \frac{2}{3}x^2 - 5x + c</math></p> <p><math>y = \frac{2}{3}x^2 - 5x + c</math></p> <p><math>3 - 2x^2 = 5x + c</math></p> <p><math>C = \frac{7}{3}</math> or <math>\frac{23}{3}</math></p> <p><math>y = \frac{2}{3}x^2 - 5x + \frac{7}{3}</math></p>	<p>MI</p> <p>MI</p> <p>AI</p> <p>3 marks</p>	<p>—</p>

SOLUTION	M.A.R.K.S	ALTERNATIVE METHOD
<p>21. <math>\int (2e^t + e^{-t}) dt = \frac{2t^2}{4} + \frac{1}{3} - t + C</math></p> <p><math>a - \&amp; - \ll - [ \frac{3}{4} \# \frac{1}{3} ] [ \frac{2}{4} ]</math></p> <p><math>( \frac{1}{3} )</math></p> <p><math>-4 \frac{1}{6}</math></p> <p><math>= \frac{462}{5}</math></p>	<p>MI</p> <p>MI</p> <p>MI</p> <p>AI</p> <p>8 marks</p>	<p><math>2t^2 + 1e^{-t}</math></p> <p><math>[\frac{2}{4}t^2 + \frac{1}{3}t^3 - t]</math></p>
<p>22 (a)</p> <p>b) <math>0.2 \times 0.3 \times 0.15 = 0.009</math></p> <p>(i) <math>0.2 \times 0.7 \times 0.85 = 0.119</math>  <math>0.8 \times 0.3 \times 0.85 = 0.204</math>  <math>0.8 \times 0.7 \times 0.15 = 0.084</math>  <u>7.017</u></p> <p>(ii) <math>HMH 0.2 \times 0.3 \times 0.85 = 0.051</math>  <math>HMH 0.2 \times 0.7 \times 0.15 = 0.021</math>  <math>MHH 0.8 \times 0.3 \times 0.15 = 0.036</math>  <math>HHH 0.2 \times 0.3 \times 0.15 = 0.009</math>  <u>0.117</u></p>	<p>MI</p> <p>AI</p> <p>MI</p> <p>AI</p> <p>8 marks</p>	<p><math>1 - (0.407 + 0.476)</math>  <math>= 1 - 0.883</math>  <math>= 0.117</math></p>



K.C.S.E 2001 MATHEMATICS 121/2 MARKING SCHEME

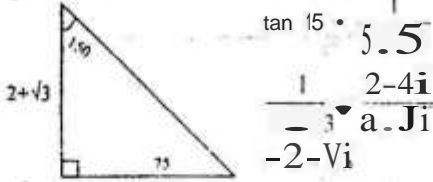
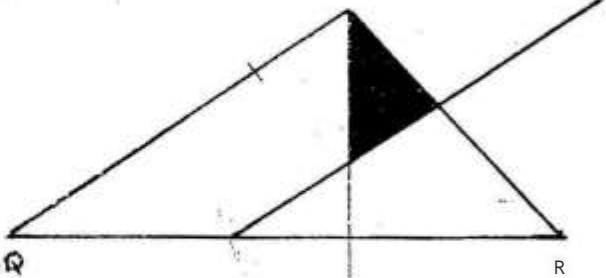
SECTION I (52 MARKS)

$\frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$ $\frac{1}{3} - \frac{1}{4} = \frac{4}{12} - \frac{3}{12} = \frac{1}{12}$ $= -\frac{11}{7} \text{ or } -1\frac{4}{7}$	<p>MI AI</p> <p>2marks</p>	<p>All multiplication Simplified to lowest form</p>
<p>2</p> $(x-5) + 5(x+4) = 2x$ $x = 1$	<p>MI MI 3</p> <p>3 marks</p>	<p>Mark for writing correct powers of 2 Mark for rushing power from above</p>
<p>J.</p> $\frac{3}{8} \times \frac{2}{3} = \frac{1}{4} x$ $x = \frac{4}{3} \times \frac{1}{4} = \frac{1}{3}$ $\frac{5}{12} x = 4000$ $x = 24000$	<p>BI</p> <p>MI</p> <p>AI</p> <p>3 marks</p>	<p>Or <math>\frac{5}{12}</math></p> <p>10000 <math>\frac{12}{2}</math></p> <p>do not award for 60</p>
<p>4.</p> $A = mB + n$ $3 = 9m + 3n$ $15 = 14m + n$ $420 = 126m + 42n$ $14 = 126m + 33.68n$ $276 = 832n$ $n = 3317$ $9m = 30 - 9951 = -69.51$ $m = 7.723$ $278.0 + 199.0$	<p>MI</p> <p>MI</p> <p>AI</p> <p>4 marks</p>	<p>Mark for at least one equation</p> <p>Mark for attempt to solve equation</p> <p>Mark for substitution of pupils constants</p>
<p>5. a)</p>  <p>b) Four (4) planes of Symmetry</p>	<p>12</p> <p>BI</p>	<p>BI If dotted lines omitted or fully drawn</p> <p>Accept either (lines to be dotted)</p>
<p>6.</p> $Kshs (4320 - 3760 + 2080) = 9660$ $\text{Total bill} = 960 \cdot \frac{115}{100}$	<p>MI</p> <p>AI</p> <p>3 marks</p>	<p>Mark for substitution</p>



<p>7. <math>\begin{pmatrix} 5 \\ -4 \end{pmatrix} - \begin{pmatrix} 3 \\ 2 \end{pmatrix} = \begin{pmatrix} 2 \\ -6 \end{pmatrix}</math></p> <p><math>OQ = \begin{pmatrix} 2 \\ 5 \end{pmatrix} + \begin{pmatrix} 2 \\ -6 \end{pmatrix} = \begin{pmatrix} 4 \\ -1 \end{pmatrix}</math></p> <p><math>\therefore PQ = \begin{pmatrix} 4 \\ -1 \end{pmatrix} - \begin{pmatrix} 5 \\ -4 \end{pmatrix} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}</math></p> <p><math> PQ  = \sqrt{(-1)^2 + 3^2}</math></p> <p><math>= \sqrt{10}</math></p>	<p>BI</p> <p>MI</p> <p>AI</p> <p>3 marks</p>	<p><b>OR</b> <math>\sqrt{(4-5)^2 + (-1+4)^2}</math></p>
<p>8. <math>\log_3 \frac{x+24}{-3-x} = \log(9-2)</math></p> <p><math>\frac{x+24}{9} = 9-2x</math></p> <p><math>19x = 57</math></p> <p><math>x=3</math></p>	<p>MI</p> <p>AI</p> <p>3 marks</p>	
<p>● <b>Moving average of order 3</b></p> <p><math>= 33183 - 670 = 323</math></p> <p><math>y = \frac{323 + 343 + 350}{3} = 338 \frac{1}{3}</math></p>	<p>2</p> <p>BI</p> <p>BI</p> <p>3 marks</p>	
<p>10. <math>(2+x)^n = 2^n + 2^n \times 10x + 2^n \times 10^2 x^2 + \dots</math></p> <p><math>= 32 + 80x + 80^2 + 40^2</math></p> <p><math>(2.03)^n = 32 + 80 \times 0.03 + 80 \times (0.03)^2 + 40 \times (0.03)^3</math></p> <p><math>= 32 + 24 + 0.0072 + 0.00108</math></p> <p><math>= 34.47308</math></p> <p><math>\approx 3447</math> (4 significant figures)</p>		
<p>11. (a) <math>\frac{dy}{dx} = 15x^2 - 14x + 3</math></p> <p><b>Grad. <math>-15x^2 - 14x + 3 = 0</math></b></p> <p>(b) <math>\frac{y-3}{x-1} = 4</math></p>	<p>MI</p> <p>AI</p> <p>MI</p> <p>AI</p> <p>4 marks</p>	<p><b>QR</b> <math>y=4x-1</math></p>
<p>12. Area of pentagons</p> <p><math>= \frac{1}{2} \times 4.254 \times 2.25 \sin 72^\circ \approx 52</math></p> <p><math>= \frac{1}{2} \times 4.254 \times 2.50951 \times 5</math></p> <p><math>= 18.06 \times 0.9511 \times 5</math></p> <p><math>= 85.88</math> <b>QR</b> (85.9)</p> <p>Area of rectangle faces</p> <p><math>= 5 \times 125 = 300</math></p> <p>Total area</p> <p><math>= 300 + 85.88</math></p> <p><math>= 1838</math></p>	<p>MI</p> <p>AI</p> <p>MI</p> <p>AI</p> <p>4 marks</p>	<p>Allow from area of one pentagon</p> <p>H = 1181 - 343</p> <p>Area = 1181 - 343</p> <p><math>= 850</math></p> <p>Area = 468.257e</p>

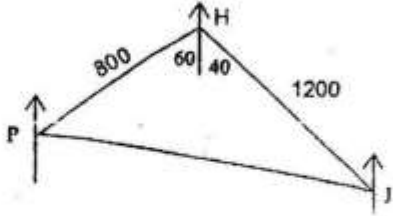


<p>13.</p> 	<p>BI MI AI</p>	
3 marks		
<p>14.</p> 	<p>BI BI BI</p>	<p>Angle bisector ! bisector (mediator) fp mak (un shadug .g: on</p>
3 marks		
<p>15.</p> $4(1 - \cos 8) + 4 \cos \theta = 5$ $4 \cos 2\theta - 4 \cos \theta + 1$ $(2 \cos \theta - 1)(2 \cos \theta + 1) = 0$ $\cos \theta = \frac{1}{2}$ $\theta = 60^\circ, 300^\circ$	<p>MI MI AI</p>	
3 marks		
<p>16.</p>	<p>BI BI BI BI</p>	<p>Mark for shading Mark for labeling the region</p>
4 marks		





1.



a) i)  $PJ^2 = 800^2 + 1200^2 - 2 \times 800 \times 1200 \cos 100$   
 $= 640,000 + 1,440,000 + 2 \times 960,000 \times 0.1736$   
 $= 2413312$  (2413000)  
 $= PJ = 1553 \text{ km}$

n)  $\frac{\sin 60}{800} = \frac{\sin 10}{1553}$   $\sin 10 = \frac{800 \times 0.9848}{1553}$   
 $= 0.5075$   $9 = 30'' 29' (0'' 30')$   
 $= 289'' 31' (289 30') \text{ OR } 289 31''$

b) Time for jet =  $\frac{1553}{1035} = 1.501 \text{ h}$   
 Time for helicopter =  $1.501 + 0.2$   
 $= \text{Speed} = \frac{800}{1.701} = 470.6$

MI ii) ALT.  
 MI rem scale drawing  
 MI Bearing dist PH-BI  
 AI bearing dist HJ - BI  
 AI PJ measured converted BI  
 (15.5 ± 0.1 QR 775 ± 0.2)

MI in)  $\angle HJP = 30 + 1''$   
 MI Bearing =  $360 - (40 + 30)$   
 AL =  $290''$

MI  
 AI  
 8 marks

18. a)  $225 + 1196 + 144 = 169 + P^2 + 256 + 121 + 169 + 144 + 1289 = 1794$   
 $P^2 + 1713 = 1794$   
 $P^2 = 81$   
 $P = 9$

a (ii) **Standard deviation**  
 Mean =  $(9 \times 15 + 14 \times 14 + 2 \times 13 + 9 \times 16 + 11 \times 13 + 12 \times 12 + 17 \times 10) / 10 = 132$

X	15	14	12	13	9	16	11	13	12	17
X - $\bar{X}$	1.8	0.8	-1.2	-0.2	-4.2	2.8	-2.2	-0.2	-1.2	3.8
(X - $\bar{X}$ ) <sup>2</sup>	3.24	0.64	1.44	0.04	17.74	7.84	4.84	0.04	1.44	14.44

$2(x-8) = 516$   
 s.d =  $\sqrt{\frac{516}{10}}$  OR  $\sqrt{\frac{1794}{10} - (13.2)^2}$   
 $= 2.272$  OR  $2.28$

b (i) New mean = 16.2  
 b (ii) New S.d = 2.272

MI Mark for all values added  
 AI Mark for correct value of P  
 MI Or equivalent  
 AI

M Mark for at least (X -  $\bar{X}$ )  
 A  
 BI  
 BI

8 marks

a) 5, 7, 9, 1  
 b)  $s - t + c - o - val = 2700$

B2 OR  
 MI  $505 = 250 + 3$   
 AI



$0) s = \frac{1}{2} (2xs + (-12))$ $= \frac{1}{2} (8 + 2n)$ $= 4n + n^2$ $n^2 + 4n < 725$ $n^2 + 4n - 725 < 0$ $(n + 27) (n - 25) < 0$ $\therefore n = 24$	BI  AMI AI AI AI 8 marks	Mark for following working  Allow if = used For n = 25
20.a) $RA = \frac{30}{\tan 26}$ or $= RA \ 30 \tan 64^\circ$ $= \frac{30}{0.4877}$ $= 61.51 \ (61.5)$ $RB = \frac{30}{\tan 32}$ or $= 30 \tan 58^\circ$ $= \frac{30}{0.6249}$ or $30 \times 1.600$ $= 48.01 \ (48)$ $AB = \sqrt{61.51^2 + 48.01^2}$ $= \sqrt{3783 + 2305} = \sqrt{6088}$ $= 78.03$ b) $\tan \theta = \frac{48.01}{61.51}$ $= 0.7805$ $\theta = 37^\circ 58'$ bearing $= 360 - 37^\circ 58'$ $= 322^\circ 2.03'$	iii AI  MI AI MI  AI  MI  AI 8 marks	          on site $= \frac{48.01}{78.03}$



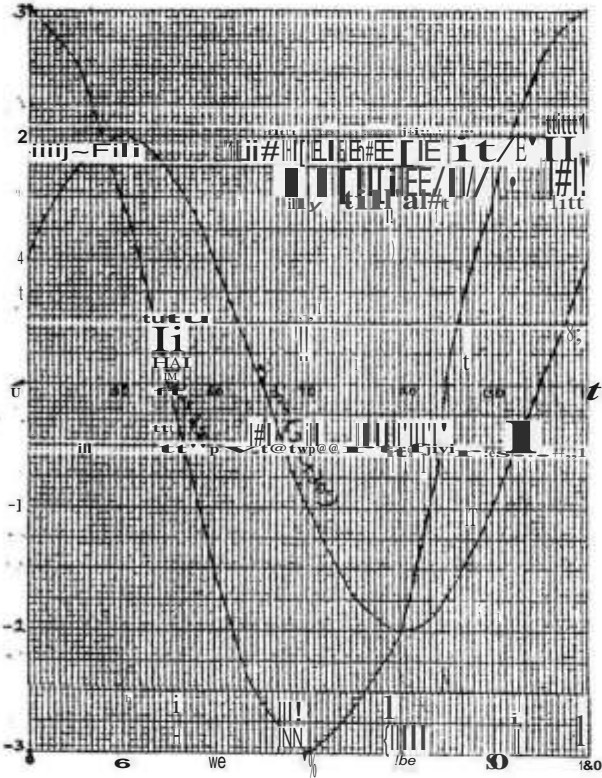


21

$$x^\circ \quad 1s'' \quad 75'' \quad 150'' \quad 16''$$

$$3\cos 2^\circ \quad -2.598 \quad 1.5 \quad 0$$

$$2\sin(2x + 30) \quad 1.732 \quad 0$$



BI

BI

SI

Mark for scale used

PI

1 pt for 101 A1 points

PI

CI

Mark for 11 points

bi

Mark for 101 solution curves

BI

8 marks

Mark for 2'' 16'' stated Accept (24, 27) From his graphs read within 1'' Mark for 25 < X < 116

22

a)  $\frac{dx}{dt} = 3t^2 - 4t$

Velocity =  $3 \times 2 - 4 \times 2 = 4 \text{ m/s}$

b)  $3t - 4t = 0 \Rightarrow t(3t - 4) = 0$

$t = \frac{4}{3}$

$x = \left( \frac{4}{3} \right)^2 + 6$

$\frac{64}{27} - \frac{32}{9} + 6 = \frac{64 - 96}{27} + 6$

$= 4\frac{22}{27} \quad (4.815)$

(i)  $\frac{d^2x}{dt^2} = 6t - 4$

$\therefore a = 6 \times \frac{4}{3} - 4 = 4 \text{ m/s}^2$

$= 4 \text{ m/s}^2$

M

MI

A1

MI

Mark for one term correct

MI

A1

MI

A1

5 marks





23

a) i) Vol. cylindrical part

$$= \frac{22}{7} \times 0.7 \times 0.7 \times 1$$

$$= 1.54 \text{ m}^3$$

ii) X-Section =  $\frac{1}{2} \times 0.4 \times \sin 60^\circ \times 6$

$$= \frac{1}{2} \times 0.4 \times 0.5196 \times 6$$

$$= 0.41568 \text{ (0.4157)}$$

$$\text{Vol hexagonal part} = 0.41568 \times 4$$

$$= 1.66272 \text{ (1.663)}$$

b) Volume of pillar =  $(1.54 + 1.66272) \times 0.25 \times 8$

$$= 3.20272 \times 0.25 \times 8 = 6.40544 \text{ (6.41)}$$

c) Mass =  $6.40544 \times 2400$

$$= 15373.056 \text{ kg (15373 kg)}$$

MI

A/  
MI

MI

AI

MI

MI

AI

8 marks

24. a)  $800x + 1600y \leq 8000(x + 2y + 210)$   
 $4x + 7y \leq 4$   
 $x \geq 2$  and  $y \geq 2$

BI

BI

BI

BI

Mark for each line draw and shaded

BI

BI

Mark for type A = 3 & type B = 4

BI

Mark for numbers of  
 "ltors 3 x " + 4 7 = 40

h