

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

| SOLUTION | MARKS] | ALTERNATIVE METHOD |
|---|--|--|
| <p>20 a) i) $\angle CBD = 90^\circ - 42^\circ = 48^\circ$ Subtended by diameter</p> <p>ii) $\angle BOD = 180^\circ - 42^\circ = 138^\circ$ cyclic quadrilateral</p> <p>Reflex $\angle BOD = 360^\circ - 130^\circ = 222^\circ$</p> <p>b) In $\triangle BAD$</p> <p>$\angle BAD = x$, $138^\circ = 6x$</p> <p>$\angle ADB = 180^\circ - 42^\circ + x$, 13</p> <p>$= 180^\circ - 111^\circ$</p> <p>$= 69^\circ$</p> | <p>BI</p> <p>BI</p> <p>BI</p> <p>BI</p> <p>BI</p> <p>BI</p> <p>BI</p> <p>BI</p> <p>8 marks</p> | <p>$\angle BPD = 138^\circ$</p> <p>$\angle AOB$</p> <p>$= 360^\circ - (138^\circ + 84^\circ)$</p> <p>$= 360^\circ - 222^\circ$</p> <p>$= 138^\circ$</p> |
| <p>21. a) $\frac{d}{3} = 2x - 5x + c$</p> <p>$\frac{y}{3} = 2x - 5x + c$</p> <p>$3 - 2x = 2 - 5x + c$</p> <p>$C = 7$ or 23</p> <p>$y = \frac{2}{5}x - 5x + 7$</p> | <p>MI</p> <p>MI</p> <p>AI</p> <p>3 marks</p> | <p>—</p> |

SOLUTION

AN ALTERNATIVE METHOD

$$21. \int (2e^t + e^{-t}) dt = 2t^4 + 1 - t^3$$

MI $2t^4 + 1e^{-t}$
4 3

$$a - \frac{1}{2} - \frac{1}{3} - \left[\frac{1}{4} - \frac{1}{5} \right]$$

MI

$$= \frac{462}{5}$$

AI
8 mar

22 (a)

H

b) $0.2 \times 0.3 \times 0.15 = 0.009$

MI

(i) $0.2 \times 0.7 \times 0.85 = 0.119$
 $0.8 \times 0.3 \times 0.85 = 0.204$
 $0.8 \times 0.7 \times 0.15 = 0.084$

AI

7.0i7

- (ii) HHM $0.2 \times 0.3 \times 0.85 = 0.051$
- HMH $0.2 \times 0.7 \times 0.15 = 0.021$
- MHH $0.8 \times 0.3 \times 0.15 = 0.036$
- HHH $0.2 \times 0.3 \times 0.15 = 0.009$

MI $1 - (0.407 + 0.476)$
 AI $1 - 0.883$
 $= 0.117$

| | |
|--|----------------|
| <p>7</p> | <p>Marks</p> |
| <p>MI</p> <p>$\left[\frac{2}{4}t^2 + \frac{1}{3}t^3 - t \right]_1^2$</p> | <p>Marks</p> |
| | <p>8 marks</p> |

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

SECTION I (52 MARKS)

1.

$$\frac{2x^2 - 7x + 1}{x^2 - 7x + 1}$$

$$\frac{2x^2 - 7x + 1}{x^2 - 7x + 1}$$

2.

$$\frac{3x^4 - 4x^3 + 7x^2 + 9x + 1}{x^4 - 7x^3 + 11x^2 - 4x + 1}$$

or -1

MI All multiplication
 AI Simplified to lowest form

2 marks

2.

$$(x-5) + 5(x+4) = 6x + 15$$

MI Mark for rating correct powers of 2
 MI 3 marks
 Mz 1 for rushing power from above

3.

$$\frac{3}{8} \times \frac{2}{3} \times \frac{1}{4} = \frac{1}{8}$$

$$\frac{3}{8} \times \frac{2}{3} \times \frac{1}{4} = \frac{1}{8}$$

BI Or $\frac{5}{12}$
 12

$$y^5 - 4y^0 = 40000$$

MI 10000
 2

$$\frac{40000}{12} = 3333.33$$

AI do not award for 60

$$x = 240000$$

4.

$$A = mB + n$$

$$3 = 9m + 3n$$

$$15 = 14m + n$$

b) Four (4) planes of Symmetry

$$420 = 126m + 42n$$

$$124 = 126m + 33.68n$$

$$276 = 83.2n$$

$$n = 3317$$

$$9m = 30 - 9951 = -69.51$$

$$m = 7723$$

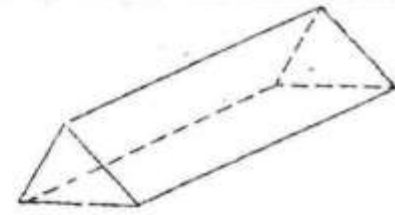
$$\frac{1}{2} \times 278.0 + 199.0$$

$$= 278.0 + 199.0$$

5.

a)

3 marks

| | | |
|--|--|--|
| <p>ML Mark for at least one equation</p> <p>MI Mark for attempt to solve equation</p> | <p>4 marks 12</p> | <p>Mark for substitution of pupils constants BI If dotted lines omitted or fully drawn</p> |
| | | <p>Accept either (lines to be dotted)</p> |
| <p>6. Kshs $(4320 - 3760 + 2080) = 9660$</p> <p>Total bill = 9650</p> <p>100 15 100</p> <p>oozy DR. ' ' ' fie</p> | <p>3 marks</p> | |
| <p>$A = mb + a$ $20 = 2b + a$ $10 = 3b + a$</p> <p>$10 = 3(20 - a) + a$ $10 = 60 - 3a + a$ $10 = 60 - 2a$ $2a = 50$ $a = 25$ $b = 20 - 2(25) = -30$ $b = -30$</p> <p>When $b = 0$, $A = 7.723 = 30 + 33.17 = 63.873 = 63.87$</p> | <p>3 marks</p> <p>AI</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>3. Four 3D pieces of geometry</p> | <p>3 marks</p> <p>BI</p> | <p>Mark for at least one equation</p> <p>BI If dotted lines omitted or fully drawn</p> <p>Accept either (lines to be dotted)</p> |
| <p>4. $200(200 - 200) = 200(0) = 0$</p> <p>Total bill = 110</p> <p>110</p> | <p>3 marks</p> <p>MI</p> <p>AI</p> <p>BI</p> | <p>Mark for substitution of pupils constants</p> <p>Mark for attempt to solve equation</p> |

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8 $\log_9 \frac{x+24}{-3} = \log_9 2$ 3 marks
 ~ 3 MI
 9 MI
 $19x = 57$
 $x = 3$ AI
3 marks
 \bullet
 $= 33183 - 670 = 323$ BI
 $y = \frac{323 + 343 + 350}{3} = 338 \frac{2}{3}$ BI
3 marks

10 $(2+x)^3 = 2^3 + 3 \cdot 2^2 \cdot x + 3 \cdot 2 \cdot x^2 + x^3$
 $= 32 + 80x + 80x^2 + 40x^3$
 $(2.03)^3 = 32 + 80 \cdot 0.03 + 80 \cdot (0.03)^2 + 40 \cdot (0.03)^3$
 $= 32 + 24 + 0.072 + 0.00108$
 $= 34.47308$
 ≈ 34.47 (4 significant figures)

11 (a) $\frac{dy}{dx} = 15x^2 - 14x + 3$ MI
 Grad. $-15 - 14 - 1 + 3 = -4$ AI
 (b) $\frac{y-3}{x-1} = 4$ MI **QR** $y = 4x - 1$

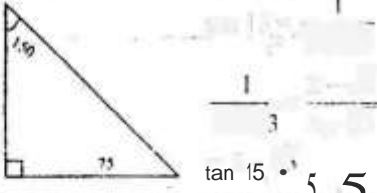
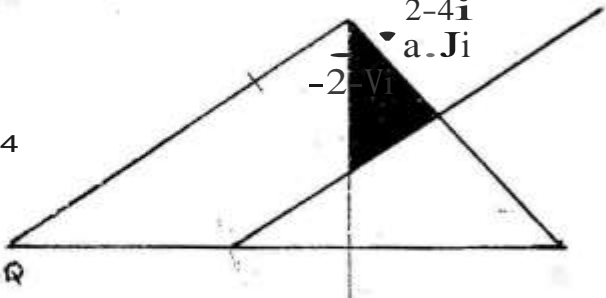
12. Area of pentagons
 $= \frac{1}{2} \times 4.254 \times 2.25 \sin 72^\circ \approx 5.2$
 $= \frac{1}{2} \times 4.254 \times 2.5 \times 0.9511 \approx 5.1$
 $= 18.06 \times 0.9511 \approx 17.2$
 $= 85.88$ **QR** (85.9) MI Allow from area of one pentagon
 Area of rectangle faces AI
 $= 5125 = 300$ MI
 Total area $= 300 + 85.88$ AI
 $= 385.88$
 ≈ 386

H = 1181-343
 Area = 35.54

| | | |
|--|--|---|
| <p>7. $\begin{pmatrix} 5 \\ -4 \end{pmatrix} - \begin{pmatrix} 3 \\ 2 \end{pmatrix} = \begin{pmatrix} 2 \\ -6 \end{pmatrix}$</p> <p>$OQ = \begin{pmatrix} 2 \\ 5 \end{pmatrix} + \begin{pmatrix} 2 \\ -6 \end{pmatrix} = \begin{pmatrix} 4 \\ -1 \end{pmatrix}$</p> <p>$\therefore PQ = \begin{pmatrix} 4 \\ -1 \end{pmatrix} - \begin{pmatrix} 5 \\ -4 \end{pmatrix} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$</p> <p>$PQ = \sqrt{(-1)^2 + 3^2}$</p> <p>$= \sqrt{10}$</p> | <p>BI</p> <p>M1</p> <p>4 marks</p> <p>AI</p> | <p>OR $\sqrt{(4-5)^2 + 8501+4)^2}$</p> <p>Area = $468.257e$</p> <p>Revision-K9CSE Maths 1995-2005</p> |
| <p>$x+24 = 9-2x$</p> | | |
| <p>Moving average of order 3</p> | | |
| <p>$21 \times 1^2 + 21 \times 2^2 + 21 \times 3^2 + \dots$</p> <p>$= 21 \times (1^2 + 2^2 + 3^2 + \dots)$</p> <p>$21 \times (1^2 + 2^2 + 3^2 + \dots) = 21 \times \frac{n(n+1)(2n+1)}{6}$</p> <p>$= 21 \times \frac{10 \times 11 \times 21}{6}$</p> <p>$= 21 \times 385$</p> <p>$= 8085$</p> | | |
| <p>$21 \times \frac{10}{10} = 21 \times 1 = 21$</p> <p>$21 \times \frac{10}{10} = 21 \times 1 = 21$</p> <p>$21 \times \frac{10}{10} = 21 \times 1 = 21$</p> <p>$21 \times \frac{10}{10} = 21 \times 1 = 21$</p> | <p>AI</p> <p>4 marks</p> | <p>$p=10-1$</p> |
| <p>Area of rectangle</p> <p>$= 10 \times 10 = 100$</p> <p>$= 10 \times 10 = 100$</p> <p>$= 10 \times 10 = 100$</p> <p>Area of triangle</p> <p>$= \frac{1}{2} \times 10 \times 10 = 50$</p> <p>Total area</p> <p>$= 100 + 50 = 150$</p> | | <p>Area of rectangle</p> <p>$= 10 \times 10 = 100$</p> <p>Area of triangle</p> <p>$= \frac{1}{2} \times 10 \times 10 = 50$</p> <p>Total area</p> <p>$= 100 + 50 = 150$</p> |

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| | | |
|---|---|--|
| <p>13.</p>  | <p>BI</p> | |
| <p>14.</p>  | <p>MI AI 3 marks BI</p> | <p>Angle bisector</p> |
| <p>R</p> | <p>3 marks</p> | <p>! bisector (mediator) fp mak for shading .g: on</p> |
| <p>15.</p> $4(1 - \cos 8) + 4 \cos \theta = 5$ $4 \cos 2\theta - 4 \cos 6 + 1$ $(2 \cos 9 - 1)(2 \cos 8 - 1) = 0$ $\cos \theta = \frac{1}{2}$ $\theta = 60^\circ, 300^\circ$ <p>16.</p> | <p>MI MI AI 3 marks BI BI 3 marks</p> | <p>Mark for shading</p> |

Bi Mark for labeling the region

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1.

$$= 640.000 + 1,440.000 + 2 \cdot 96,000 \quad \text{OR } 1736$$

$$= 2413312 \quad (2413000)$$

$$= \text{PJ} = 1553 \text{ km}$$

n) $\frac{\sin 6}{800} = \frac{\sin 10}{1553}$ $\sin 10 = \frac{800 \cdot 0.9848}{1553}$

$$= 0.5075 \quad \theta = 30'' 29' (0'' 30')$$

$$= 289'' 31' (289 30') \quad \text{OR } 289 \frac{1}{2}''$$

$$\text{Time for jet} = \frac{1553}{1035} = 1.501 \text{ h}$$

$$\text{Time for helicopter} = 1.501 + 0.2$$

$$= \text{Speed} = \frac{800}{1.701} = 470.6$$

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

a (ii) **Standard deviation**
 Mean = $(915 + 14 + 2 + 13 + 9 + 16 + 11 + 13 + 12 + 17) + 10 = 132$

| | | | | | | | | | | |
|---|----|----|----|----|---|----|----|----|----|----|
| X | 15 | 14 | 12 | 13 | 9 | 16 | 11 | 13 | 12 | 17 |
|---|----|----|----|----|---|----|----|----|----|----|

| | | | | | | | | | | |
|-----|-----|-----|------|------|------|-----|------|------|------|-----|
| X-X | 1.8 | 0.8 | -1.2 | -0.2 | -4.2 | 2.8 | -2.2 | -0.2 | -1.2 | 3.8 |
|-----|-----|-----|------|------|------|-----|------|------|------|-----|

| | | | | | | | | | | |
|--------------------|------|------|------|------|-------|------|------|------|------|-------|
| (X-X) ² | 3.24 | 0.64 | 1.44 | 0.04 | 17.74 | 7.84 | 4.84 | 0.04 | 1.44 | 14.44 |
|--------------------|------|------|------|------|-------|------|------|------|------|-------|

$$2(x-8) = 516$$

$$\text{s.d} = \sqrt{\frac{516}{10}} \quad \text{OR}$$

$$= 2.272 \quad \text{OR } 228$$

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

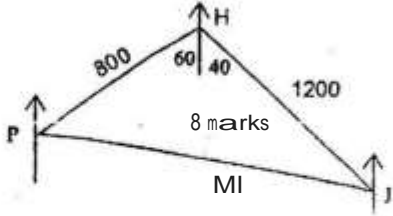
MI in) HJP - 30 + 1"
 Bearing = 360 - (40 + 30)
 - 290"

MI
 AI

MI

AI
 b

(j!
 a) 5,
 7, 9,
 1
 N e w m e a n = 16.2
 . 2
 b t
) N e w S . d = 2
 =
 2
 .272
 j!
 a) 5,
 7, 9,
 1
 | S.-
 S+CO-Val
 = 2700



a) i) $PJ^2 = 800^2 + 1200^2 - 2 \times 800 \times 1200 \cos 100$
 $= 640000 + 1440000 - 2 \times 800 \times 1200 \times (-0.1736)$
 $= 2080000 + 333120 = 2413120$
 $PJ = \sqrt{2413120} = 1553.4$

ii) $\frac{PH}{\sin J} = \frac{PJ}{\sin H}$
 $\frac{800}{\sin 30} = \frac{1553.4}{\sin 100}$
 $\sin 100 = \frac{1553.4 \times \sin 30}{800} = \frac{1553.4 \times 0.5}{800} = 0.970875$
 $100 = \sin^{-1}(0.970875) = 80.1$

b) $\frac{MI}{\sin 30} = \frac{1553.4}{\sin 100}$
 $MI = \frac{1553.4 \times \sin 30}{\sin 100} = \frac{1553.4 \times 0.5}{0.970875} = 796.5$

50 5 - 250+3

ALT.

Mark for all values added

Mark for correct value of P

OR
 equivalent

Mark for at least (X-X)

b) $\frac{MI}{\sin 30} = \frac{1553.4}{\sin 100}$

OR 05

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$$0) s = \frac{1}{2} (2xs + (-12))$$

$$= \frac{1}{2} (8 + 2n)$$

$$= 4n +$$

$$n' + 4n < 725$$

$$n + 4n < 725$$

$$5n < 725$$

$$\therefore n = 24$$

20.a) $RA = \frac{30}{\tan 26}$ or $= RA \cdot 30 \tan 64^\circ$

$$= \frac{30}{0.4877}$$

$$= 61.51 \text{ (61.5)}$$

$RB = \frac{30}{\tan 32}$ or $= 30 \tan 58^\circ$

$$= \frac{30}{0.6249}$$

$$= 48.01 \text{ (48)}$$

$$AB = \sqrt{61.5^2 + 48.01^2}$$

$$= \sqrt{3783 + 2305} = \sqrt{6088}$$

$$= 78.03$$

b) $\tan \theta = \frac{48.01}{61.51}$

$$= 0.7805$$

$$\theta = 37^\circ 58'$$

bearing $= 360 - 37^\circ 58'$
 $= 322^\circ 2'$ (22.03)

BI

Allow if used
Mark for following working

AMI

AI

marks

iii

AI

MI

AI

MI

AI

on $\frac{48.01}{78.03}$

$$78.03$$

MI

AI

8 marks

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21

$$\begin{matrix} x^\circ & 18^\circ & 75^\circ & 150^\circ & 16^\circ \\ 3\cos 2x^\circ & & -2.598 & 1.5 & \\ 2\sin (2x + 30) & 1.732 & & & 0 \end{matrix}$$

BI

BI

SI Mark for scale used

2 

PI

1 dt 101 A

oints

PI

C Mark for all points



bi iario souit curves

B_1

8 Mark for 2 marks 16" stated Accept (24 - 27)

From his graphs

read within !"

Mark for 25 < X < 116

h i III 1 . 1
H INN {IIII} i .1
e we % /be SO 1&0

22

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

M

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

AI

b) $3t^2 - 4t = 0 \Rightarrow t(3t - 4) = 0$

MI

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

MI

$5 \frac{74}{9} + 6$

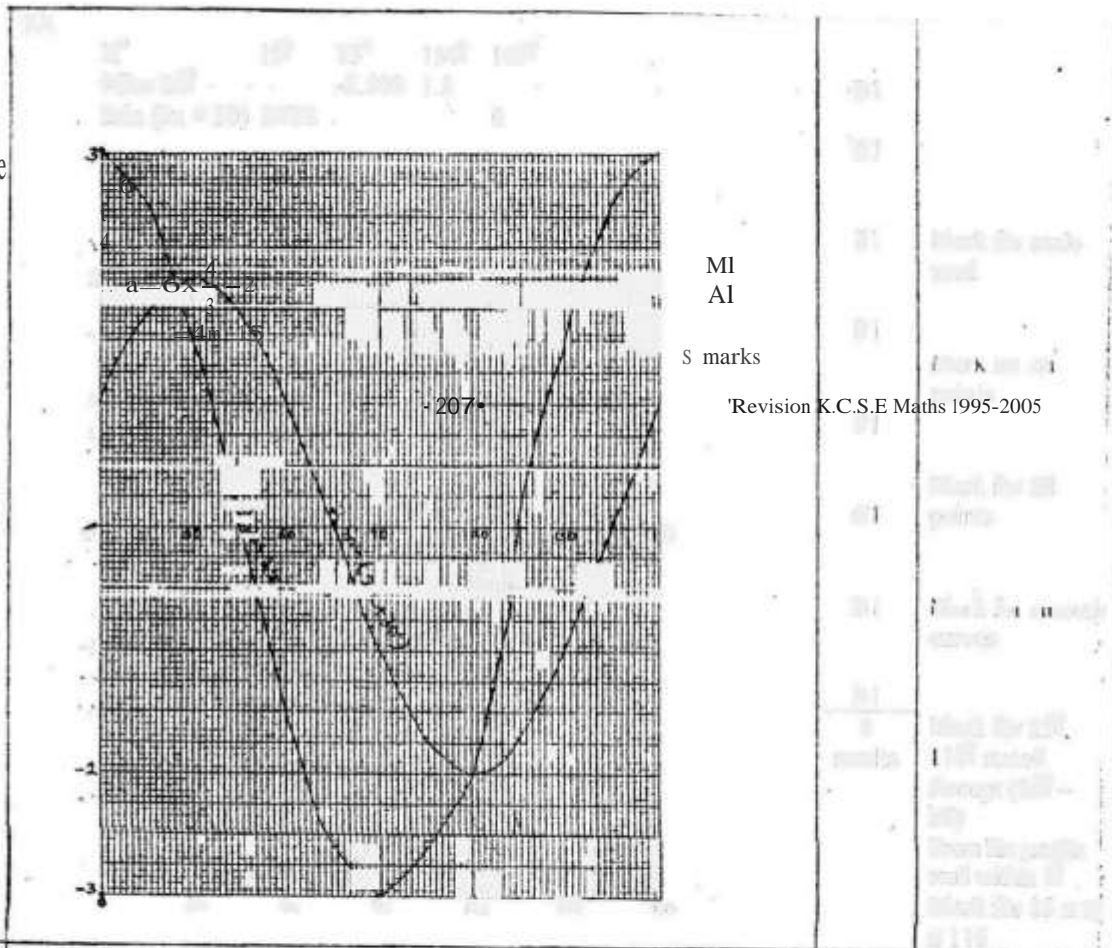
m $\frac{64}{27} - \frac{32}{9} + 6 = \frac{64 - 96 + 162}{27}$

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

AI

(i) d^2x

dre



MI
AI

S marks

Revision K.C.S.E Maths 1995-2005

$$\begin{aligned}
 & \frac{d}{dx} (x^2 - 2x) \\
 & = 2x - 2 \\
 & = 2(1) - 2 \\
 & = 0 \\
 & \therefore x = 1
 \end{aligned}$$

MI

Mark for one term correct

AI

AI

AI

AI

AI

AI

S marks

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23

a) i) Vol. cylindrical part

$$= \frac{2}{7} \times 2 \times 0.71 \quad \text{MI}$$

$$= 154 \text{m}^3 \quad \text{A/MI}$$

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

$$= \frac{1}{2} \times 0.1 \times 0.1 \times 0.866 \quad \text{MI}$$

$$= 0.41568 \quad (0.4157)$$

Vol hexagonal part = $0.41568 \times 4 \quad \text{A/MI}$

$$= 1.6628 \quad (1.663) \quad \text{MI}$$

b) Volume of pillar = $(54 + 1.6628) \times 0.25$

$$= 3.2028 \times 0.25 = 1.9528 \quad (1.953) \quad \text{MI}$$

c) Mass = $1.953 \times 2400 \quad \text{A/MI}$

$$= 4687.2 \text{kg} \quad (4687 \text{kg}) \quad \text{8 marks}$$

24. a) $800x + 1600y > 8000(x + 2y + 210)$ BI
 $4 + 7y < 4$ BI
 $x^2 > 2$ and $y > 2$ BI

BI Mark for each line draw and shaded

BI

BI Mark for type A=3 & type B=4

BI Mark for numbers of "ltors3" + 4 = 40

— . . —

h $\frac{0}{1} \frac{1}{1} \frac{1}{1} \frac{1}{1}$ L... — — — — —

| | | |
|---|---|--|
| <p>20. (i) The quadratic part</p> $= \frac{1}{2} \times 10^4 \times 0.1 \times 1$ $= 5000$ <p>(ii) The linear part = $\frac{1}{2} \times 10^4 \times 0.1 \times 0.1$</p> $= \frac{1}{2} \times 1000 = 500$ $= 0.1250 \times 10^4$ <p>The horizontal part = 0.1250×10^4</p> $= 1250 \text{ (1000)}$ <p>(iii) Volume of plate at 20 = $1.0000 - 0.0000$</p> $= 1.0000 - 0.0000 = 1.0000 \text{ (1.0000)}$ <p>(iv) Mass = 1.000×1000</p> $= 1000 \text{ (1000)}$ | <p>20</p> <p>21</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p> <p>26</p> <p>27</p> <p>28</p> <p>29</p> <p>30</p> <p>31</p> <p>32</p> <p>33</p> <p>34</p> <p>35</p> <p>36</p> <p>37</p> <p>38</p> <p>39</p> <p>40</p> | |
| <p>21. (i) The area of the plate = 1000×1000</p> <p>Mass of plate = 1000×1000</p> <p>Mass of plate = 1000×1000</p> | <p>41</p> <p>42</p> <p>43</p> <p>44</p> <p>45</p> <p>46</p> <p>47</p> <p>48</p> <p>49</p> <p>50</p> <p>51</p> <p>52</p> <p>53</p> <p>54</p> <p>55</p> <p>56</p> <p>57</p> <p>58</p> <p>59</p> <p>60</p> | <p>Mass of each the two end plates</p> <p>Mass of plate = 1000×1000</p> <p>Mass of plate = 1000×1000</p> |