WAKISSHA

MARKING GUIDE

Uganda Advanced Certificate of Education

Mathematics P425/2

 1

QUESTION 1

Let F be 4 and $\bar{F}$ be other faces

x	0	1	2	3
P(X = x)	$\frac{27}{64}$	$\frac{27}{64}$	$\frac{9}{64}$	$\frac{1}{64}$

B1

B1

$E(X) = \sum xP(X = x)$

$= 0\left(\frac{27}{64}\right) + 1\left(\frac{27}{64}\right) + 2\left(\frac{9}{64}\right) + 3\left(\frac{1}{64}\right)$ M1

$= \frac{48}{64}$ or $\frac{3}{4}$ or 0.75

$E(X^2) = \sum x^2P(X = x)$

 1

Procedure

$= 0^2\left(\frac{27}{64}\right) + 1^2\left(\frac{27}{64}\right) + 2^2\left(\frac{9}{64}\right) + 3^2\left(\frac{1}{64}\right)$

$= \frac{72}{64}$ or $\frac{9}{8}$ or 1.125

$\sigma = \sqrt{\left(\frac{72}{64} - \left(\frac{48}{64}\right)^2\right)}$ M1

$= \frac{3}{4} = 0.75$ A1

05

 2

Procedure

Identify the interval where y lies.

0.209	0.252	0.311
7.6348	y	4.3131

B1

$\frac{y - 7.6348}{0.252 - 0.209} = \frac{4.3131 - 7.6348}{0.311 - 0.209}$ M1

$y = 6.2345$ A1

0.209	0.311	x
7.6348	4.3131	2.1473

 3

Procedure

$\frac{x - 0.209}{2.1473 - 7.6348} = \frac{0.311 - 0.209}{4.3131 - 7.6348}$ M1

$x = 0.37\cancel{8}5$ A1

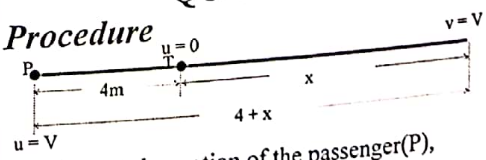
$\simeq 0.378$

05

 4

QUESTION 3

Procedure



Considering the motion of the passenger(P),

Let u = V = constant, a = 0, s = x + 4 and t = T

Using the equation $s = ut + \frac{1}{2}at^2$,

$x + 4 = vT + \frac{1}{2}(0)T^2$

$x + 4 = vT$ .... (i) B1

 5

Procedure

For motion of the taxi, $u = 0$, $a = 1ms^{-2}$, $s = x$, $t = T$.

From $\quad s = ut + \frac{1}{2}at^2,$

$$x = (0)T + \frac{1}{2}(1)T^2$$

$2x = T^2$ .... (ii) **B1**

Also from $v^2 = u^2 + 2as,$

$$v^2 = 0^2 + 2(1)x$$

$v^2 = 2x$ .... (iii) **B1**

From (ii) and (iii),

$$2x = v^2 = T^2$$

$$v = T$$

6

Procedure

$$x + 4 = vT$$

$4 + \frac{1}{2}v^2 = v(v)$ **M1**

$$v^2 = 8$$

$v = 2\sqrt{2}ms^{-1}$ **A1**

05

7.

Qn 4 *Procedure*

Given $E(X) = 13$ and $\sigma = \frac{7}{\sqrt{3}}$

$\Rightarrow \quad 13 = \frac{a+b}{2}$ **B1**

$a + b = 26$ .... (i)

$\left(\frac{7}{\sqrt{3}}\right) = \sqrt{\left(\frac{(b-a)^2}{12}\right)}$ **B1**

$$\left(\frac{7}{\sqrt{3}}\right)^2 = \left(\sqrt{\left(\frac{(b-a)^2}{12}\right)}\right)^2$$

8

Procedure

$$\frac{49}{3} = \frac{(b-a)^2}{12}$$

$$196 = (b-a)^2$$

$b - a = 14$ .... (ii)

(i) + (ii)

$$(a+b) + (b-a) = 26 + 14$$

$$2b = 40$$

$b = 20$ **B1**

9

Procedure

$$20 - a = 14$$

$$a = 6$$

$$f(x) = \begin{cases} \frac{1}{14} & ; 6 \le x \le 20, \\ 0 & ; \text{Otherwise.} \end{cases}$$

$P(8 < X < 14) = \int_8^{14} \frac{1}{14}\, dx$

$= \frac{1}{14}x \Big|_8^{14}$ **M1**

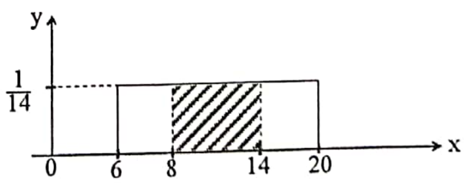
$= \frac{1}{14}(14 - 8)$ **A1**

$= \frac{3}{7}$

10 **05**

Procedure

Alternatively, a graph would have been used.



$P(8 < X < 14) = \frac{1}{14}(14 - 8)$ **M1**

$= \frac{3}{7}$ **A1**

11 **05**

Qn 5 *Procedure*

Copy and complete the table below.

EFN	W	BASE	NP	
A21B – 03	32,000	640	31360	B1
D69R – 11	270,000	44,750	225,250	B1
P48M – 47	84,000	1,930	82,070	B1
R29N – 14	50,000	1,250	48,750	B1
L75Q – 80	100,000	2,250	97,750	B1

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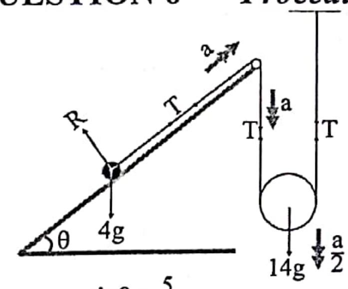
QUESTION 6 *Procedure*



$\sin\theta = \frac{5}{6}$

B1

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Procedure

$(\nearrow)$ $T - 4(9.8)\sin\theta = 4a$

$T - (4)(9.8)\left(\frac{5}{6}\right) = 4a$ B1

$3T - 98 = 12a$ .... (i)

$(\downarrow)$ $14(9.8) - 2T = 14\left(\frac{a}{2}\right)$ B1

$137.2 - 2T = 7a$ .... (ii)

$2(3T - 98) + 3(137.2 - 2T) = 24a + 21a$ M1

$a = 4.7911 ms^{-2}$

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Procedure

From

$3T - 98 = 12a,$

$3T = 12(4.791111) + 98$

$T = 51.8311\ N$ A1

Acceleration of 14kg mass $= \frac{4.7911}{2}$

$= 2.3956 ms^{-2}.$ A1

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QUESTION 7
Procedure

$P(\bar{A}/B) = \frac{P(\bar{A} \cap B)}{P(B)}$

$P(\bar{A} \cap B) = P(B)P(\bar{A}/B)$

$= \left(\frac{7}{20}\right)\left(\frac{3}{7}\right)$ M1

$= \frac{3}{20}$ A1

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Procedure

Draw a contingency table

1	$P(B) = \frac{7}{20}$	$P(\bar{B}) = \frac{13}{20}$
$P(A) = \frac{7}{20}$	$P(A \cap B) = \frac{4}{20}$	$P(A \cap \bar{B}) = \frac{3}{20}$
$P(\bar{A}) = \frac{13}{20}$	$P(\bar{A} \cap B) = \frac{3}{20}$	$P(\bar{A} \cap \bar{B}) = \frac{10}{20}$

$P(B) = P(A \cap B) + P(\bar{A} \cap B)$

$\frac{7}{20} = P(A \cap B) + \frac{3}{20}$

$P(A \cap B) = \frac{4}{20}$ or $\frac{1}{5}$ or 0.2 A1 17

Procedure

$$P(A) = P(A \cap B) + P(A \cap \bar{B})$$

But

$$2P(A) = 3P(A \cap \bar{B})$$

$$\Rightarrow \quad P(A \cap \bar{B}) = \frac{2}{3}P(A)$$

$$\therefore \quad P(A) = P(A \cap B) + \frac{2}{3}P(A) \qquad \text{M1}$$

$$\frac{1}{3}P(A) = P(A \cap B) = \frac{1}{5}$$

$$P(A) = \frac{3}{5} \qquad \text{A1}$$

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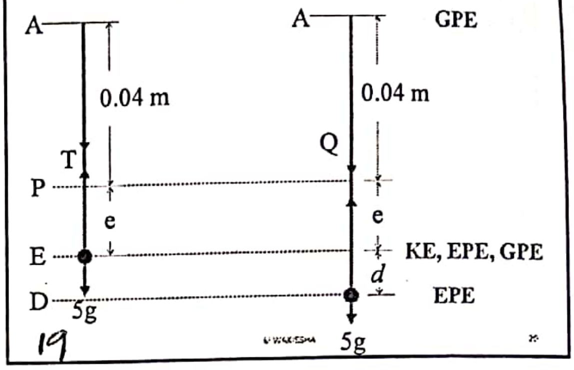
QUESTION 8

Procedure

At equilibrium point. After pulling to new point.



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Procedure

At equilibrium point,

$$T = \frac{\lambda e}{l}$$

$$\Rightarrow \quad 0.5(9.8) = \frac{19.6e}{0.04}$$

$$e = 0.01\text{m} \qquad \text{B1}$$

At point D, the energy is purely EPE.

$$EPE = \frac{\lambda(e+d)^2}{2l}$$

$$= \frac{19.6(0.01+d)2}{2(0.04)}$$

At point A, the energy is purely GPE.

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Procedure

$$GPE = 0.5(9.8)(d + e + 0.04)$$

$$= 4.9(d + 0.01 + 0.04)$$

$$= 4.9(d + 0.05)$$

Total energy at D = total energy at A

$$\frac{19.6(0.01+d)^2}{2(0.04)} = 4.9(d+0.05) \qquad \text{M1}$$

$$9950d^2 + 3d - 8.805 = 0$$

$$d = \frac{-3 \pm \sqrt{3^2 - 4(9950)(-8.805)}}{2(9950)}$$

$$d = 0.029597, \; d = -0.029899$$

$$d = 0.03\text{m} \qquad \text{A1}$$

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Procedure

Sum of energies at E = KE + EPE + GPE

$$= KE + \frac{19.6(0.01)^2}{2(0.04)} + 0.5(9.8)(0.029597)$$

$$= 0.16953 + KE$$

Sum of energy at D = EPE

$$= \frac{19.6(0.01 + 0.029597)^2}{2(0.04)}$$

$$= 0.38414$$

Sum of energies at E = Sum of energy at D

$$0.16953 + KE = 0.38414 \qquad \text{M1}$$

$$KE = 0.215\text{J}. \qquad \text{A1}$$

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QUESTION 9

Procedure

Let $y = x^3 + 4x^2 - 16$

x	-3	-2	-1	0	1	2	3	4
y	-7	-8	-13	-16	-11	8	47	112

B1

$f(1)f(2) = (-11)(8)$ M1

$= -88.$ B1

Since $f(1)f(2) < 0$, a root exists between $x = 1$ and $x = 2$. A1

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Procedure

$f(x) = x^3 + 4x^2 - 16 = 0$

$f'(x) = 3x^2 + 8x$ **B1**

$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$

$= x_n - \frac{(x_n^3 + 4x_n^2 - 16)}{(3x_n^2 + 8x_n)}$ **M1**

Let $x_0 = \frac{1+2}{2}$ **B1**

$= 1.5$

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Procedure

$x_1 = 1.5 - \frac{(1.53 + 4(1.5)^2 - 16)}{(3(1.5)^2 + 8(1.5))}$ **M1**

$= 1.693333$

$x_2 = 1.693333 - \frac{((1.693333)^3 + 4(1.693333)^2 - 16)}{(3(1.693333)^2 + 8(1.693333))}$ **M1**

$= 1.678663$

$x_3 = 1.678663 - \frac{((1.678663)^3 + 4(1.678663)^2 - 16)}{(3(1.678663)^2 + 8(1.678663))}$ **A1**

$= 1.678574$

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Procedure

$x_4 = 1.678574 - \frac{((1.678574)^3 + 4(1.678574)^2 - 16)}{(3(1.678574)^2 + 8(1.678574))}$

$= 1.678574$ **M1**

root = 1.6786 (4D) **A1**

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QUESTION 10 — Procedure

This a binomial probability distribution problem with $n = 25$, $p = 0.4$ and $q = 0.6$

$\mu = np$

$= (25)(0.4)$ **B1**

$= 10$

$\sigma = \sqrt{npq}$

$= \sqrt{((25)(0.4)(0.6))}$ **B1**

$= \sqrt{6}$

$P(X = 8) = P(7 < X < 9)$

The range $7 < X < 9$ can be considered as a class.

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Procedure

$P(X = 8) = P(7.5 \le Y \le 8.5)$

Standardising,

$P(X = 8) = P(7.5 \le Y \le 8.5)$

$= P\left(\frac{7.5 - 10}{\sqrt{6}} \le Z \le \frac{8.5 - 10}{\sqrt{6}}\right)$ **M1 B1**

$= P(-1.021 \le z \le -0.612)$

$P(X = 8) = 0.34637 - 0.22973$ **B1**

$= 0.11664$ **A1**

P(between 9 and 15 times inclusive) $= P(9 \le X \le 15)$

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Procedure

$P(9 \le X \le 15) = P(8.5 \le Y \le 15.5)$

$= P\left(\frac{8.5 - 10}{\sqrt{6}} \le Z \le \frac{15.5 - 10}{\sqrt{6}}\right)$ **M1 B1**

$= P(-0.612 \le Z \le 2.245)$

$= 0.22973 + 0.48762$

$= 0.71735$ **A1**

$P(49 < \bar{X} < 50.5) = P\left(\frac{7.5 - 10}{3/\sqrt{20}} \le Z \le \frac{8.5 - 10}{3/\sqrt{20}}\right)$ **M1 B1**

$= P(-1.491 < Z < 0.745)$

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Procedure

$P(49 < \bar{X} < 50.5) = 0.43202 + 0.27186$

$= 0.70388$ A1

12

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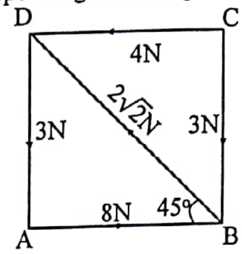
QUESTION 11 *Procedure*

The corresponding force diagram becomes.



B1

$(\rightarrow)$ $X = 8 - 4 - 2\sqrt{2}(\cos 45°)$ B1

$= 2N$

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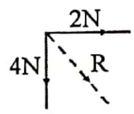
Procedure

$(\uparrow)$ $Y = -3 - 3 + 2\sqrt{2}(\sin 45°)$ B1

$= -4N$



The resultant R has a negative gradient.

Let m be the gradient B1

$m = -\frac{4}{2}$

$= -2$

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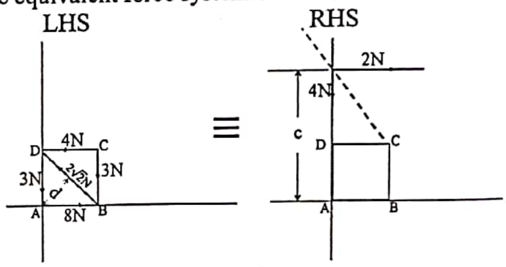
Procedure

The equivalent force system becomes



Perpendicular distance $d = 4\sin 45°$ B1

$= 2\sqrt{2}m$

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Procedure

A) LHS moment $= -3(4) + 4(4) + 2\sqrt{2}(2\sqrt{2})$ B1

$= 12$

A) RHS moment $= -c(2)$

$= -2c$

LHS moment = RHS moment

$12 = -2c$

$c = -6$ B1

The equation of line of action is of the form

$y = mx + c$ M1

$m = -2$ and $c = -6$ B1

Hence $y = -2x - 6$

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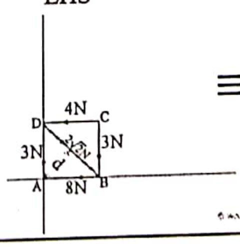
Procedure

When $y = 0$,

$0 = 2x - 6$

$x = -3m$ (3m on BA produced.) B1

Alternative



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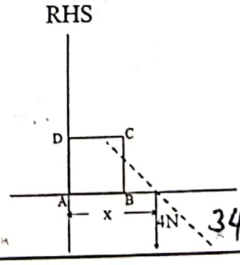

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Procedure

A) LHS moment = $-3(4) + 4(4) + 2\sqrt{2}(2\sqrt{2})$

$= 12$

A) RHS moment = $-4x$

Equating moments,

$12 = -4x$

$x = -3m$

3m on BA produced.

When a couple M is added to the system, its effect is simply to displace the resultant force.

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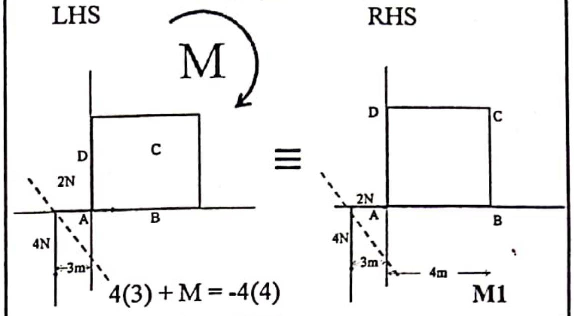
Procedure



$4(3) + M = -4(4)$ **M1**

$M = -28Nm$ **A1**

Direction ADCB.

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QUESTION 12 Procedure

Class	f	x	fρ	xf	x^2f	CF
$20 \le x < 30$	4	25	0.4	100	2500	4
$30 \le x < 45$	3	37.5	0.2	112.5	4218.75	7
$45 \le x < 50$	9	47.5	1.8	427.5	20306.25	16
$50 \le x < 65$	21	57.5	1.4	1207.5	69431.25	37
$65 \le x < 75$	3	70	0.3	210	14700	40
$75 \le x < 80$	5	77.5	1.0	387.5	30031.25	45
$80 \le x < 100$	14	90	0.7	1260	113400	59

B1

$\Sigma f = 59$, $\Sigma xf = 3705$, $\Sigma x^2 f = 254587.5$ **B1**

B1

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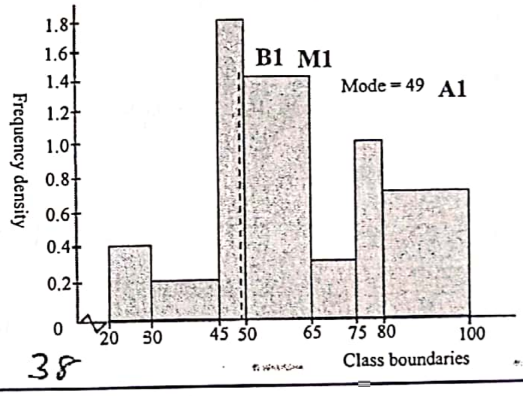
Procedure



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Procedure

$\bar{X} = \frac{\Sigma xf}{\Sigma f}$

$= \frac{3705}{59}$ **M1**

$= 62.7966$ **A1**

$S = \sqrt{\left(\frac{254587.5}{59} - \left(\frac{3705}{59}\right)^2\right)}$ **M1**

$= 19.278$ **A1**

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Procedure

Position of median $= \frac{59}{2} = 29.5$

Let m ne the median,

50	m	65
16	29.5	37

$\frac{m - 50}{65 - 50} = \frac{29.5 - 16}{37 - 16}$ **M1**

$m = 59.6$ **A1**

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QUESTION 13

Procedure

Min. value $= \frac{a - E_A}{b + E_B}$

Max. value $= \frac{a + E_A}{b - EB}$

Error $(E_C) = \frac{1}{2}(\text{Max. value} - \text{Min. value})$

$= \frac{1}{2}\left(\frac{a + E_A}{b - E_B} - \frac{a - E_A}{b + E_B}\right)$ **M1**

$= \frac{1}{2}\left(\frac{(a + E_A)(b + E_B) - (a - E_A)(b - E_B)}{(b - E_B)(b + E_B)}\right)$

$= \frac{1}{2}\left(\frac{(ab+b(EA)+a(EB) +(EA)(EB)\ -ab+b(E_A)+a(E_B) -(E_A)(E_B))}{(b - E_B)(b + E_B)}\right)$

For small E_A and E_B, $(E_A)(E_B) \approx 0$ and $(E_B)(E_B) \approx 0$

$E_C = \frac{1}{2b^2}(2a(E_B) + 2b(E_A))$ **B1**

$= \frac{1}{b^2}(a(E_B) + b(E_A))$

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Procedure

$|E_C| \le \left(\left|\frac{a(EB) + b(EA)}{b^2}\right|\right)$ **M1**

$\left|\frac{b}{a}\right| |E_C| \le \left|\frac{b}{a}\right| \left(\left|\frac{a(EB) + b(EA)}{b^2}\right|\right)$

$\le \left(\left|\frac{E_A}{a}\right| + \left|\frac{E_B}{b}\right|\right)$

$|E_C| \le \left|\frac{a}{b}\right| \left(\left|\frac{E_A}{a}\right| + \left|\frac{E_B}{b}\right|\right)$

Absolute error $= \left|\frac{a}{b}\right| \left(\left|\frac{E_A}{a}\right| + \left|\frac{E_B}{b}\right|\right)$ **A1**

$\frac{A - B}{C} \equiv \frac{P}{C}$

$A - B = P$

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Procedure

$E_P = E_{(A-B)}$

$= |E_A| + |E_B|$

Error in $\frac{P}{C} = \left|\frac{P}{C}\right| \left(\left|\frac{E_P}{P}\right| + \left|\frac{E_C}{C}\right|\right)$

But

$p = a - b$

Error $= \left|\frac{a - b}{c}\right| \left(\frac{|E_A| + |E_B|}{|a - b|} + \frac{|E_C|}{|C|}\right)$ **B1**

For $a = 4.314$, $b = 18.92$ and $c = 15.0214$,

$E_A = 0.0005$, $E_B = 0.005$ and $E_C = 0.00005$ **B1**

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Procedure

Error $= \left|\frac{4.314 - 18.92}{15.0214}\right| \left(\frac{|0.0005| + |0.005|}{|4.314 - 18.92|} + \frac{|0.00005|}{|15.0214|}\right)$ **M1**

$= 0.00037$ **A1**

Working value $= \frac{4.314 - 18.92}{15.0214}$ **M1**

$= -0.97235$

Lower limit $= -0.97235 - 0.00037$

$= -0.9727$ **M1**

Upper limit $= -0.97235 + 0.00037$

$= -0.9720$ **M1**

Range of values is $[-0.9727, -0.9720]$ **A1**

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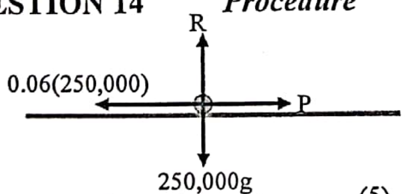
QUESTION 14

Procedure



B1

Given that $u = 0$, $v = 40ms^{-1}$ and $t = 60 \times \left(\frac{5}{3}\right) = 100s$,

From $v = u + at$,

$40 = 0 + 100a$

$a = 0.4ms^{-2}$.

$(\rightarrow)$ $P - 0.06(250{,}000) = 250{,}000(0.4)$ **B1**

$P = 115{,}000N$

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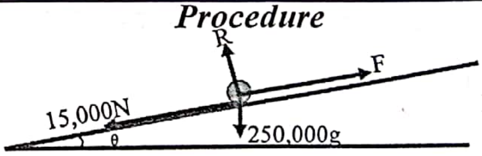
Procedure



B1

$\sin\theta = \frac{1}{200}$

At constant speed, acceleration = 0

$(\rightarrow)$ $F - 15000 - 250000(9.8)\sin\theta = 0$ **M1**

$F - 15000 - 250000(9.8)\left(\frac{1}{200}\right) = 0$

$F = 27250N$ **A1**

Power $= 27250(15)$ **M1**

$= 408750W$ **A1**

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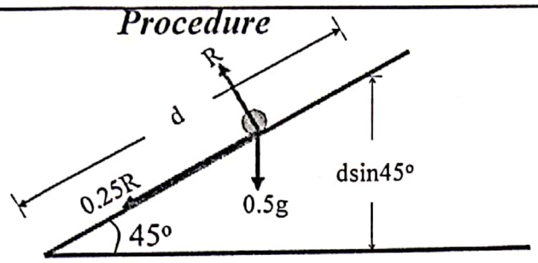
Procedure



Work done = (work done against frictional force) + (work done against gravity)

$= 0.25R(d) + 0.5(9.8)(d\sin 45^\circ)$ **M1**

(↖) $R - 0.5(9.8)\cos 45^\circ = 0$ **B1**

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Procedure

$R = \dfrac{4.9}{\sqrt{2}}$

Work done $= 0.25\left(\dfrac{4.9}{\sqrt{2}}\right)(d) + 0.5(9.8)(d)\left(\dfrac{1}{\sqrt{2}}\right)$ **B1**

$= \left(\dfrac{6.125}{\sqrt{2}}\right)(d)$

Also

Work done = change in energy

$= 750$

$750 = \left(\dfrac{6.125}{\sqrt{2}}\right)(d)$ **M1**

$d = 173.169\text{m}$ **A1**

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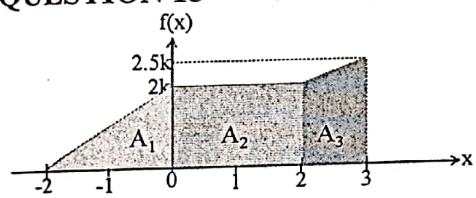
QUESTION 15 Procedure



$1 = A_1 + A_2 + A_3.$

$1 = \frac{1}{2}(2k)(0+2) + 2(2k) + \frac{1}{2}(2k + 2.5k)$

$k = \dfrac{4}{33}$ **B1**

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Procedure

For $x \le 2$, $f(x) = 0$ also for $x \ge 3$ $f(x) = 0$

For $-2 \le x \le 0$,

$m = \dfrac{2k - 0}{0 - -2}$

$= k$

For any other point $(x, f(x))$,

$m = \dfrac{f(x) - 0}{x - -2}$

$\therefore \dfrac{f(x) - 0}{x - -2} = k$ **M1**

$f(x) = k(2 + x)$

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Procedure

For $0 \le x \le 2$,

$m = 0$

Also for any point $(x, f(x))$,

$m = \dfrac{f(x) - 2k}{x - 0}$

$\therefore \dfrac{f(x) - 2k}{x - 0} = 0$

$f(x) = 2k$ For $2 \le x \le 3$, **B1**

$m = \dfrac{2.5k - 2k}{3 - 2}$ **M1**

$= 0.5k$

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Procedure

For any point $(x, f(x))$

$m = \dfrac{f(x) - 2k}{x - 2}$

Hence

$0.5k = \dfrac{f(x) - 2k}{x - 2}$

$f(x) = \frac{k}{2}(2 + x)$

$$f(x) = \begin{cases} k(2+x) & ; -2 \le x \le 0, \\ 2k & ; 0 \le x \le 2, \\ \frac{k}{2}(2+x) & ; 2 \le x \le 3, \\ 0 & ; \text{Otherwise} \end{cases}$$ **A1**

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Procedure

For $P((X>-1)/(-1.5<X<1))$, let $X > -1$ be A and $-1.5<X<1$ be B

Then

$$P((X>-1)/(-1.5<X<1)) = \frac{P((X>-1)\cap(-1.5<X<1))}{P(-1.5<X<1)}$$

$$= \frac{P(-1<X<1)}{P(-1.5<X<1)} \qquad \text{B1}$$

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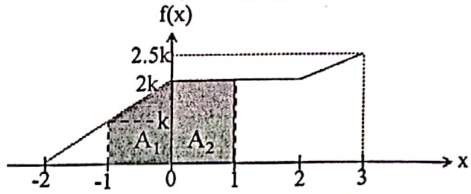
Procedure



$$P((X>-1)\cap(-1.5<X<1)) = \frac{3k}{2} + 2k$$

$$= \frac{7}{2}\left(\frac{4}{33}\right) \qquad \text{M1}$$

$$= \frac{14}{33}$$

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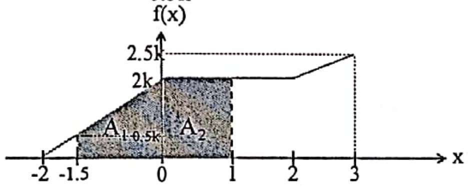
Procedure

For $x = -1.5$,

$f(x) = k(2 - 1.5)$

$= 0.5k$



$$A_1 = \frac{1}{2}(0 - -1.5)(0.5k + 2k)$$

$$= \frac{15k}{8}$$

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Procedure

$$A_2 = (1-0)(2k)$$

$$= 2k$$

$$P(-1.5<X<1) = A_1 + A_2$$

$$= \frac{15k}{8} + 2k$$

$$= \left(\frac{4}{33}\right)\left(\frac{15}{8} + 2\right) \qquad \text{M1}$$

$$= \frac{31}{66}$$

$$P((X>-1)/(-1.5<X<1)) = \left(\frac{14}{33}\right) \div \left(\frac{31}{66}\right) \qquad \text{M1}$$

$$= \frac{28}{31} \qquad \text{A1}$$

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Procedure

$E(X) = \int x f(x)\, dx$

$$= \int_{-2}^{0} kx(2+x)dx + \int_{0}^{2} 2kx\, dx + \int_{2}^{3} kx(2+x)dx$$

$$= k(x^2 + \tfrac{1}{3}x^3)\Big|_{-2}^{0} + k(x^2)\Big|_{0}^{2} + k(x^2 + \tfrac{1}{3}x^3)\Big|_{2}^{3} \qquad \text{M1}$$

$$= \left(\frac{4}{33}\right)\left((0)^2 + \tfrac{1}{3}(0)^3\right) - \left((-2)^2 + \tfrac{1}{3}(-2)^3\right)$$

$$+ \left(\frac{4}{33}\right)(2)^2 - \left(\frac{4}{33}\right)(0)^2 + \left(\frac{4}{33}\right)\left((3)^2 + \tfrac{1}{3}(3)^3\right)$$

$$- \left(\frac{4}{33}\right)\left((2)^2 + \tfrac{1}{3}(2)^3\right)$$

$$= \frac{100}{99} \qquad \text{A1}$$

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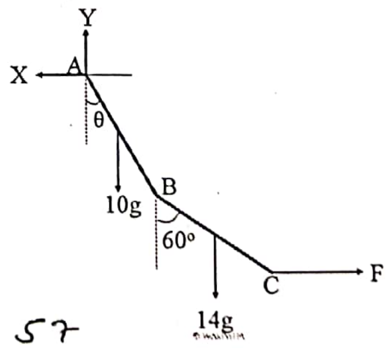
QUESTION 15 — Procedure

Forces acting on the rods.



B1

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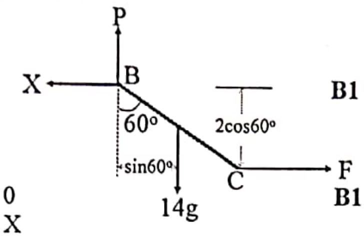
Procedure

Forces acting on the rod BC.



B1

$(\rightarrow)$ $F - X = 0$ B1

$F = X$

$(\uparrow)$ $P - 14(9.8) = 0$ B1

$P = 137.2N$

$\circlearrowleft B$ $F(2\cos60^\circ) - 14(9.8)\sin60^\circ = 0$ M1

$F = 118.8187N$ A1

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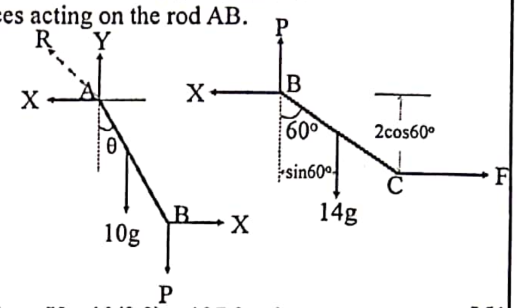
Procedure

Forces acting on the rod AB.



$(\uparrow)$ $Y - 10(9.8) - 137.2 = 0$ M1

$Y = 235.2N$ A1

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Procedure

$R = \sqrt{(X^2 + Y^2)}$

$= \sqrt{((118.81869)^2 + (235.2)^2)}$ M1

$= 263.5089N$ A1

$\circlearrowleft A$ $118.8187(2\cos\theta) - 137.2(2\sin\theta) - 10(9.8)\sin\theta = 0$

$\tan\theta = \dfrac{237.63674}{372.4}$ M1

$\theta = 32.54^\circ.$ A1

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