MF

UCE UMTA MOCK 2022

MATHEMATICS PAPER 2

MARKING GUIDE

QTNS	SOLUTION	MARKS	COMMENTS
1	A (3 ,1) , B(6,9)		
	$OP = 2OA + \frac{2}{3}OB$	M1	Correct Substitution
	$OP = 2\begin{pmatrix}-3\\1\end{pmatrix} + \frac{2}{3}\begin{pmatrix}6\\9\end{pmatrix}$	M1	—
	$OP = \begin{pmatrix}-6\\2\end{pmatrix} + \begin{pmatrix}4\\6\end{pmatrix}$	~~M1~~ A1	
	$OP = \begin{pmatrix}-2\\8\end{pmatrix}$		
	$\therefore P = (-2,8)$	~~A1~~ B1	
		04	
2	6kg cost shs 90,000		
	1 kg costs $\frac{90,000}{6}$	M1	
	= shs. 15,000		
	If the cost is increased by 20%		
	New cost $= \frac{120}{100} \times 15,000$	M1	
	= shs. 18,000		
	$\therefore Number\ of\ Kgs = \frac{90,000}{18,000}$	M1	
	= 5kg	A1	
		04	
3	$32^{x-3} \times 8^{x+4} = \frac{64}{2^x}$		
	$(2^5)^{x-3} \times (2^3)^{x+4} = \frac{2^6}{2^x}$	M1	*For putting to same base*
	$2^{5x-15} \times 2^{3x+12} = 2^{6-x}$	M1	*For multiplying powers and subtracting on R.H.S*
	$2^{5x-15+3x+12} = 2^{6-x}$		
	$8x - 3 = 6 - x$	M1	

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	$9x = 9$ $x = 1$	A1	*For equating the powers*
		04	
4	$\frac{4\sqrt{3}}{2\sqrt{3}-\sqrt{6}}$ $= \frac{4\sqrt{3}\,(2\sqrt{3}+\sqrt{6})}{(2\sqrt{3}-\sqrt{6})\,(2\sqrt{3}+\sqrt{6})}$ $= \frac{24+4\sqrt{18}}{12-6}$ $= \frac{24+4\times 3\sqrt{2}}{6}$ $= \frac{24+12\sqrt{2}}{6}$	M1 M1 A1	*For correct rationalization* *for Simplifying*
	$4 + 2\sqrt{2}$, compare with $a + b\sqrt{2}$ a = 4 and b = 2	A1 B1	*For* $4 + 2\sqrt{2}$
		04	
5	Taxi time = 20 minutes $= \frac{20}{60} = \frac{1}{3}$ hrs speed = 120km / hr $\therefore D = S \times t$ $= 120 \times \frac{1}{3}$ = 40km Speed by a bus = 100km / hr D = 40km $T = \frac{D}{S}$ $= \frac{40}{100}$ hrs $= \frac{2}{5}$ hrs or 24 minutes	M1 A1 M1 A1	*For both correct values of a and b* *Accept* $\frac{2}{5}$ *hrs* *For 24 min*
		04	

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6	Point (4, -2), line $4x + 3y = 6$ $4x + 3y = 6$ $3y = -4x + 6$ $y = \frac{-4}{3}x + 2$ $\therefore m_1 = \frac{-4}{3}$ from $m_1m_2 = -1$ $-\frac{4}{3}M_2 = -1$ $M_2 = 3/4$ $y = mx + c$ $-2 = \frac{3}{4}x 4 + C$ $-2 = 3 + c$ $c = -5$ $\therefore$ *Equation is* $y = \frac{3}{4}x - 5$	B1 M1 M1 A1	Making y the Subject for M_2 for Substituting M_1 in $M_1M_2 = -1$
7	1 tray costs shs 9000 90 trays cost 90× 9000 = shs 810,000 Ushs 3600 ⟶ 1 Ush 1 ⟶ $\frac{1}{3600}$ Ushs 810,000 ⟶ $\frac{810,000}{3600}$ = 225 $\therefore$ *Otim got 225 dollars*	M1 A1 M1 A1	
8	$V \propto \frac{1}{r^3}$ $V = \frac{K}{r^3}$ $K = Vr^3$ V = 24, r = 2	B1	1

3

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	$K = 24 \times 2^3$ $K = 192$ $\therefore V = \frac{192}{r^3}$ $R = 4$ $V = \frac{192}{4^3}$ $V = \frac{192}{64}$ $V = 3$	M1 M1 A1	
9	$A.S.F = \frac{48}{27} = \frac{16}{9}$ $L.S.F = \sqrt{A.S.F}$ $= \sqrt{\frac{16}{9}}$ $= \frac{4}{3}$ $V.S.F = (L.S.F)^3$ $= (\frac{4}{3})^3 = \frac{64}{27}$ $V.S.F = \frac{X.of\ big\ cylinder}{volm\ of\ smaller\ cylinder}$ Volm of small = Volm of big × V.S.F $= 128 \times \frac{27}{64}$ $= 54$ $\therefore$ *The volume of the smaller cylinder is* $54cm^3$	04 B1 M1 M1 A1	
10	Juma Jane Sarah X $\frac{3}{2}X$ 3X $X + \frac{3}{2}X + 3X = 143,000$ $2X + 3X\ 6X = 286,000$	B1 M1	

14

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	$11X = 286{,}000$ $X = 26{,}000$ Sarah's share is 3X $= 3 \times 26{,}000$ $= 78{,}000/=$	M1 A1	
11	$P(r) = \log_{10}(3r-2)$ $h(r) = 2r-6$		
(i)	$P(4) = \log_{10}(3\times 4) - 2$ $= \log_{10} 10$ $= 1$	M1 A1	for Substitution
(ii)	$h^{-1}(2)$ h(r) = 2r -6 Let $y = 2r-6$ $2r = \frac{y+6}{2}$ $\therefore h^{-1}(2) = \frac{r+6}{2}$ $\therefore h^{-1}(2) = \frac{2+6}{2}$ $= 4$	M1 M1 A1	$2r-6 = 2$ M1 $2r = 2+6$ $r = \frac{8}{2}$ M1 $= 4$ A1 $h^{-1}(2) = 4$.
(b)	$f(x) = 2x+1$ $g(x) = x^2 - 2$ $fg(x) = f(x^2-2)$ $= 2(x^2-2)+1$ $= 2x^2 - 4 + 1$ $= 2x^2 - 3$ $gf(x) = g(2x+1)$ $= (2x+1)^2 - 2$ $= 4x^2 + 4x + 12 - 2$	M1 B1 M1	

S 1

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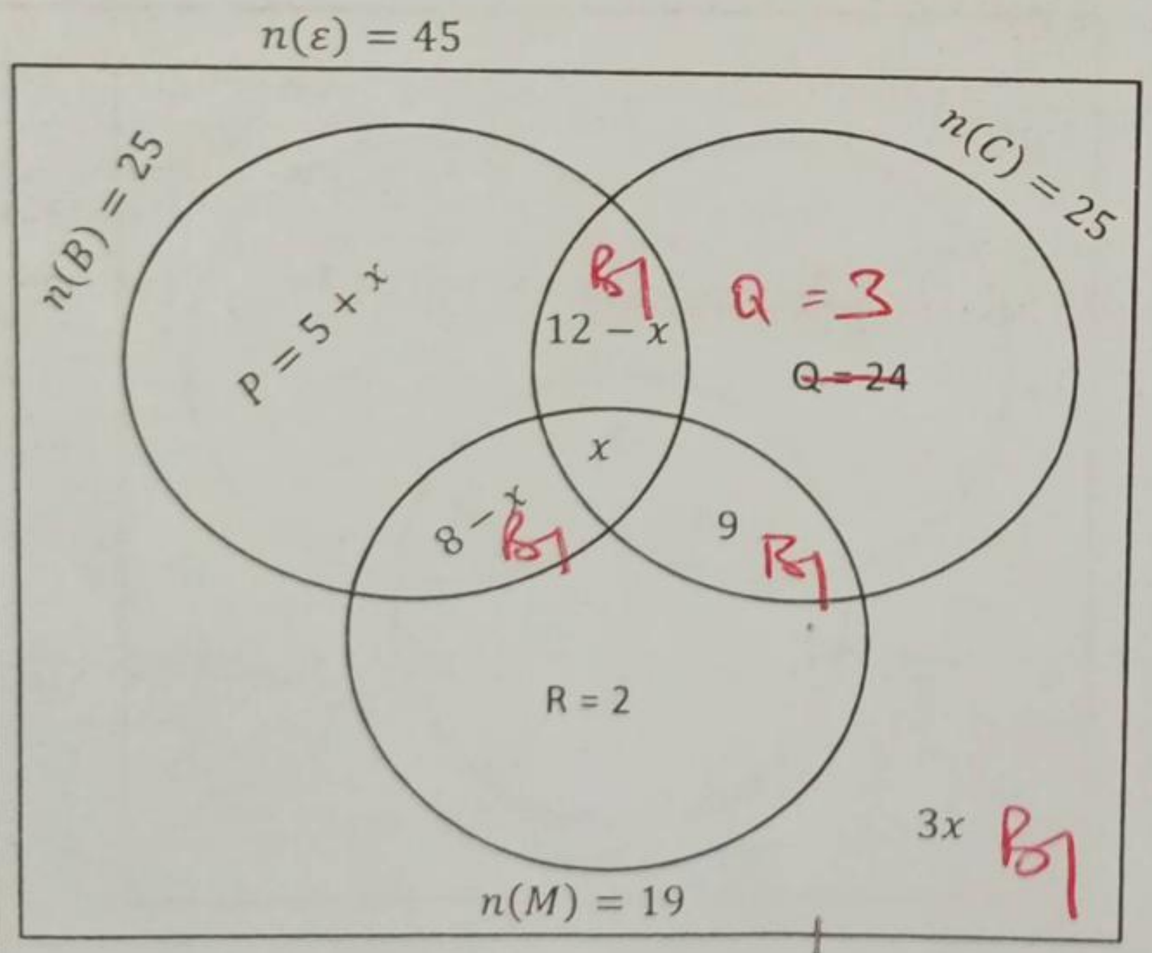
	$= 4x^2 + 4x - 1$ $= 4x^2 + 4x - 1 = 2x^2 - 3$ $4x^2 + 4x - 1 = 2x^2 + 3 = 0$ $2x^2 + 4x + 2 = 0$ $x^2 + 2x + 1 = 0$ $x^2 + x + x + 1 = 0$ $x(x+1) + 1(x+1) = 0$ $(x+1)(x+1) = 0$ $x + 1 = 0$ $x = -1.$ $\therefore$ *The value of* $x = -1$	B1 M1 M1 A1	
12	 P = 25 – (12 – x + x + 8 – x)	B1 B1 B1 B1 B1	

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$$= 25 - 20 + x$$

$$= 5 + x$$

B1

$$Q = 24 - (12 - x + x + 9)$$

$= 24\text{-}21$

$= 3$

$Q = 3$ B1

$$R = 19 - (8 - x + x + 9)$$

$$R = 19 - 17$$

$= 2$

$R = 2$ B1

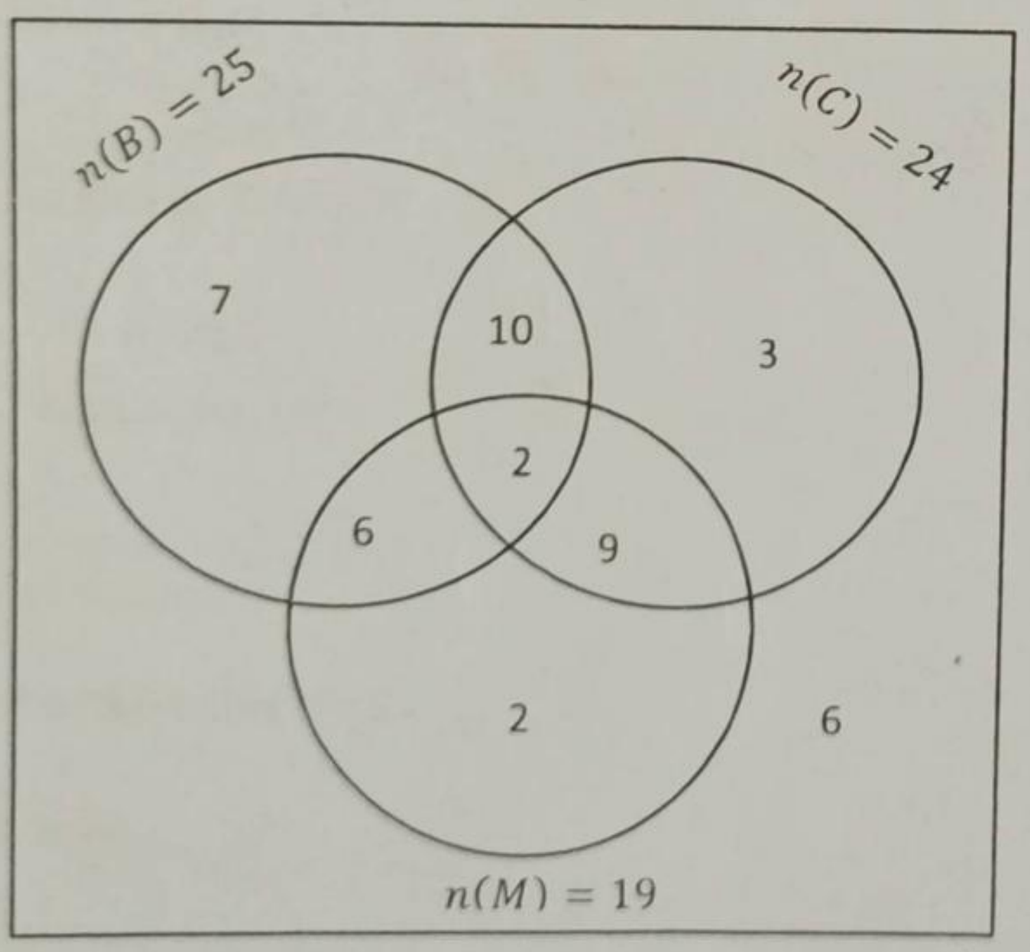
$\therefore 5 + x + 12 - x + x + 8 - x + 3 + 9 + 2 + 3x = 45$ M1

$$39 + 3x = 45$$

$$3x = 6$$

$$x = 2$$

A1



The number of students offering all the subjects is 2

n(at least two subjects) = 10 +6 + 9+ 2 B1

1

7

1

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	$= 27$ $Prob = \frac{27}{45}$ or $\frac{3}{5}$	B1 M1A1	
13	$T \propto N$, $T \propto I$ $T = KN$, $T = RI$ $T = KN + RI$ ***Using time in minutes*** $N = 40,\ I = 5,\ T = 70\ min$ $40K + 5R = 70$ ……(i) $N = 60,\ I = 4,\ T = 98\ min$ $60K + 4R = 98$ ……(ii) $5[60K + 4R = 98]$ $4[40K + 5R = 70]$ $300K + 20R = 490$ $-160K + 20R = 280$ $140K = 210$ $K = \frac{210}{140}$ $K = \frac{3}{2}$ $40K + 5R = 70$ $40 \times \frac{3}{2} + 5R = 70$ $60 + 5R = 70$ $5R = 10$ $R = 2$ $\therefore$ *Expression is* $T = \frac{3}{2}N + 2I$	B1 B1 M1 A1 M1 A1 B1	
(a)	T = ?, I = 10, N = 50 $T = \frac{3}{2} \times 50 + 2 \times 10$ T = 75 + 20 T = 95 minutes Or 1hr 35 minutes	M1 A1	
(b)	N = ?, T = 75minutes, I = 9 $T = \frac{3}{2}N + 2I$ $75 = \frac{3}{2}N + 2 \times 9$ $75 = \frac{3}{2}N + 18$ $\frac{3}{2}N = 57$	M1	

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	$N = \frac{57 \times 2}{3}$ $N = 38$ $\therefore$ *There were 38 members*	A1	
		12	
	Alternative: Using time in hours $T = KN + RI$ $40K + 5R = \frac{7}{6}$ $240K + 30R = 7 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (i)$ $60K + 4R = \frac{49}{30}$ $1800K + 120R = 49 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (ii)$ $1800K + 120R = 49$ $4(240K + 30R = 7)$	B1 B1 B1 M1	
	$960K + 120R = 28$ $840K = 21$ $K = \frac{21}{840}$ $K = \frac{1}{40}$ 0.25 $240K + 30R = 7$ $240K + 30R = 7$ $240 \times \frac{1}{40} + 30R = 7$ $6 + 30R = 7$ $30R = 1$ $R = \frac{1}{30}$	$1800K + 120R = 49$ $- \ 960K + 120R = 28$ A1 M1 A1	1

1 9

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	$\therefore Expression\ is\ T = \frac{1}{40}N + \frac{1}{30}I$	B1	
(a)	N = 50, I =10 $T = \frac{1}{40} \times 50 + \frac{1}{30} \times 10$ $T = \frac{5}{4} + \frac{1}{3}$ $T = \frac{15+4}{12}$ $T = \frac{19}{12}$ $= 1\frac{7}{12}$ hrs or 1hr 35 min	M1 A1	
(b)	$T = 1\frac{1}{4}$ hrs, I = 9, N =? $T = \frac{1}{40}N + \frac{1}{30}I$ $\frac{N}{40} = \frac{5}{4} - \frac{9}{30}$ $\frac{N}{40} = \frac{114}{120}$ $120N = 4560$ $N = \frac{4568}{120}$ $N = 38$ $\therefore There\ were\ 38\ members$	M1 A1	
		12	
14	Scale 4 cm : 1hour 2 cm : 10km See graph. Lorry, $T = \frac{D}{S} = \frac{100}{25}$ $\therefore Time\ taken = 4hrs$	 B1	

10

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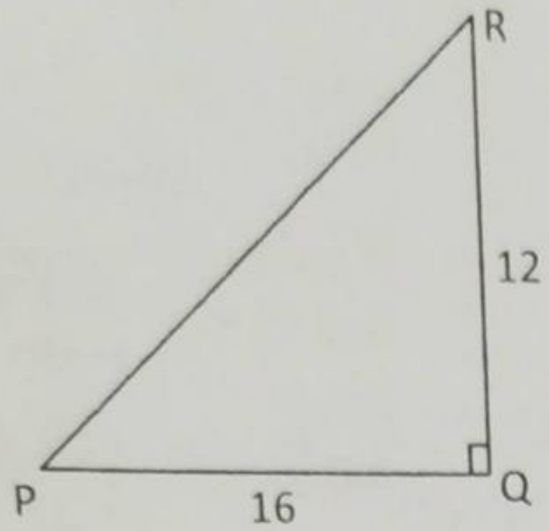
(i)



B1

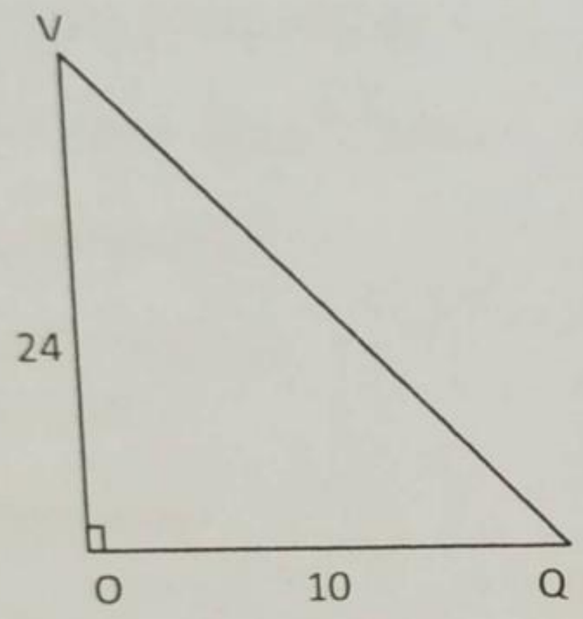
$PR = \sqrt{16^2 + 12^2}$

$= \sqrt{400} = 20\text{cm}$

M1

A1

(ii)



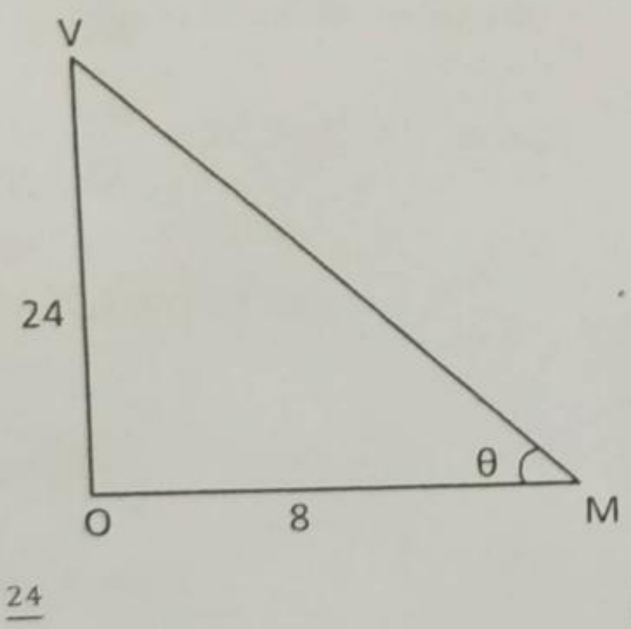
B1

$VQ = \sqrt{10^2 + 24^2} = \sqrt{676} = 26\text{ cm}$

M1A1

~~(iii)~~

IV



B1

M1

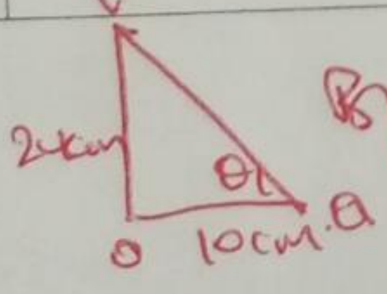
$\tan\theta = \frac{24}{8}$

$= 3$

$\theta = 71.56$

A1

(iii)



B1

$\tan\theta = \frac{24}{10}$ M1

$\theta = \tan^{-1}\left(\frac{24}{10}\right)$ $\theta = 67.38°$ A1

12

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	$\theta = \tan^{-1} 3 \quad \theta = 71.565^0$	A1	
16	Total allowance monthly	12	
	= 48,000		
	Housing = $\frac{960,000}{12}$ = 80,000	B1	for housing or Medical
	60,000		
	Medical = $\frac{600,000}{12}$ = + 50,000		
	Marriage = $\frac{1}{20} \times 650,000$ = 32,500		
	Children = 2 × 12,000 + 7800 = 31,800	B1	family
	Total allowance = shs. 302,300	M1A1	
	Taxable income = Gross Income - total allowances		
	~~Income - Allowances~~		
	= 650,000 - 302,300 = shs 347,700	M1A1	for T.A
	Taxable income tax		
	30,000 = 0		
	50,000 $\frac{18}{100} \times 50,000$ = 9000	B1	for bank
	70,000 $\frac{25.4}{100} \times 70,000$ = 17,780		
	100,000 $\frac{30.2}{100} \times 100,000$ = 30,200	B1	
	97,700 $\frac{40.0}{100} \times 97,700$ = 39,080		
	Total Income tax = 9000 + 17,780 + 30,200 + 39,080 = 96,060	M1A1	
	Percentage = $\frac{96,060}{650,000} \times 100\%$	M1A1	
	= 14.778%	M1	
			12

13

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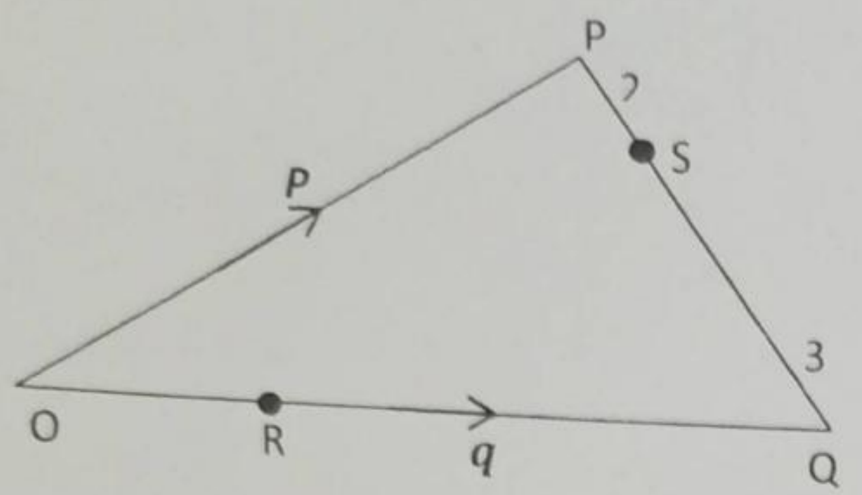

(a)

(i)

QP.

QP = QO + OP

= q + P

= P - q

B1

(ii)

B1

QS

2QS = 3SP

$\frac{2}{3} = \frac{SP}{QS}$

SP : QS = 2 : 3

$\therefore QS = \frac{3}{5} QP$

B1 B1

(ii)

$= \frac{3}{5}(P - q)$

B1

$OS = OQ + QS$

B1

$= q + \frac{3}{5}(p - q)$

B1

$= \frac{1}{5}(5q + 3p - 3q)$

$= \frac{1}{5}(3P + 2q)$

B1

(iv)

$RS = RQ + QS$

B1

From OR : RQ = 2:3

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RQ $= \frac{3}{5} OQ$

$= \frac{3}{5} q$

$\therefore RS = \frac{3}{5} q + \frac{3}{5}(p - q)$

$= \frac{3}{5} q + \frac{3}{5} P - \frac{3}{5} q$

$RS = \frac{3}{5} p$

$\therefore RS = \frac{3}{5} OP$

Since RS $= \frac{3}{5} OP$,
RS is parallel to OP

B1

B1

B1

12

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