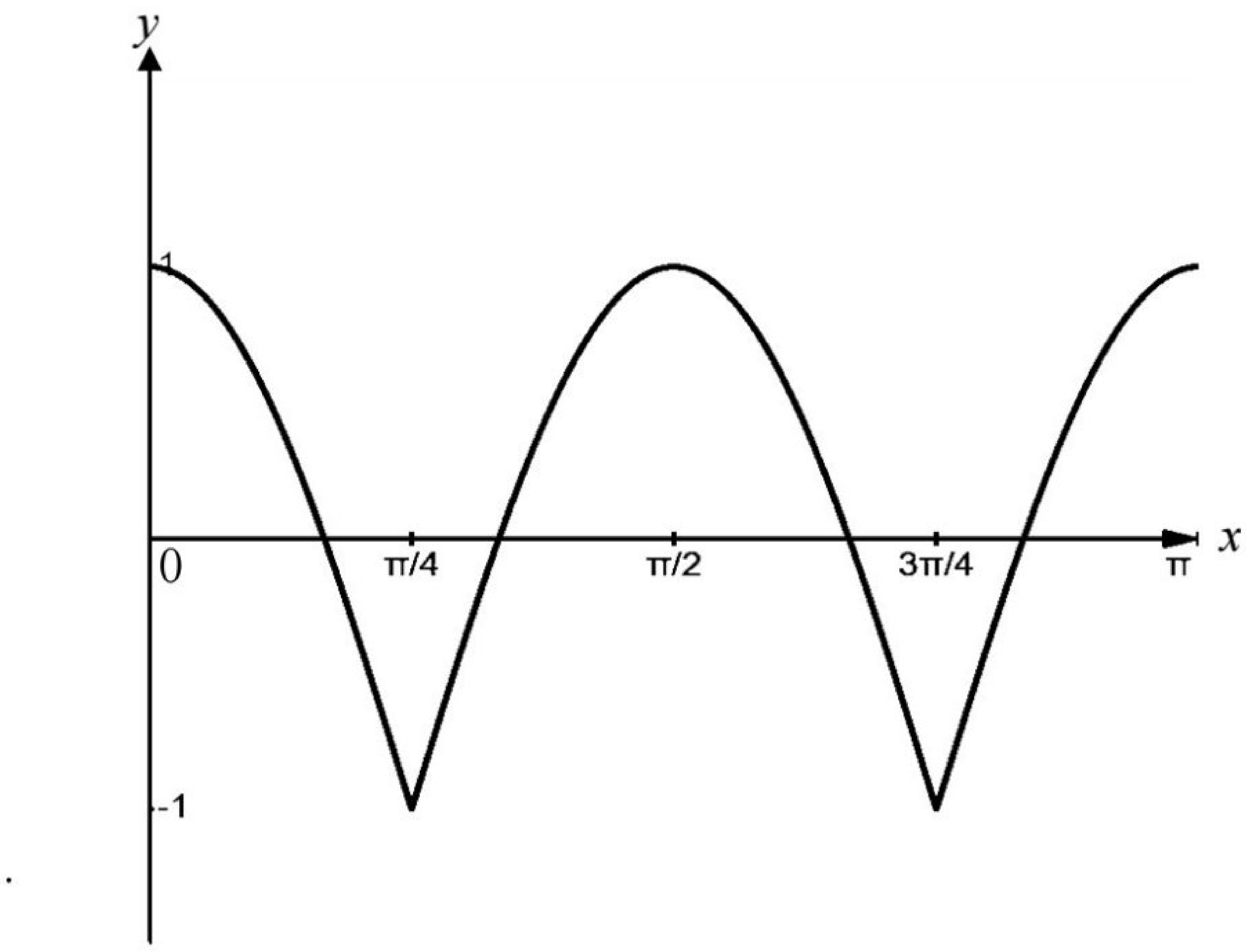
PERATURAN PEMARKAHAN
MATEMATIK TAMBAHAN 2
PEPERIKSAAN PERCUBAAN SPM 2023
SMK JALAN DAMAI

No.	Mark Scheme	Sub marks	Total marks
1(a)	This function has no inverse function because the inverse of the function does not map every element in the codomain to only one element in the domain	1 1	
1(b)	(i) $g(4x+2)=\frac{3x+1}{x+2}$ $\dfrac{3\left(\frac{y-2}{4}\right)+1}{\frac{y-2}{4}+2}$ Note : Accept any variable $\dfrac{3x-2}{x+6}$	1 1 1	
	(ii) $f^{-1}=\frac{x-2}{4}$ $\frac{p-2}{4}=p$ $p=-\frac{2}{3}$	1 1 1	8
2(a)	$f(x)=a(x-150)^2+200$ $300=a(-150)^2+200$ or $a=\frac{1}{225}$ $f(x)=\frac{1}{225}(x-150)^2+200$	1 1	
2(b)	$f(x)=\frac{1}{225}(200-150)^2+200$ or $f(x)=211.11$ or $221\frac{1}{9}$ $211.11-150$ $\dfrac{61.11}{20}$ 3	1 1 1 1	6
3	$x+y+z=245$ or $20x+30y+40z=775$ or $5x+5y+10z=1725$ or equivalent $x+y+z=245$ and $20x+30y+40z=775$ and $5x+5y+10z=1725$ or equivalent <u>Eliminate *x* or *y*</u> Eliminate *x* $y+2z=285$ or equivalent or Eliminate *y* $x-z=-40$ or equivalent $z=100$ $y=85$ $x=60$	1 1 1 1 1 1	6

4(a)	$\frac{\log_2 8}{\log_2 x}$	1	
	$\log_2 x - \frac{2\log_2 x}{3} = 1$	1	
	$\log_2 x = 3$ or $x = 2^3$	1	
	8	1	
4(b)	$r = \frac{1}{\sqrt{2}-1}$ or equivalent	1	
	$\pi\left(\frac{1}{\sqrt{2}-1}\right)^2(\sqrt{2}+1)$	1	
	$\frac{\pi(\sqrt{2}+1)}{3-2\sqrt{2}} \times \frac{3+2\sqrt{2}}{3+2\sqrt{2}}$	1	
	$\frac{(3\sqrt{2}+2(2)+3+2\sqrt{2})\pi}{9-4(2)}$ and $(5\sqrt{2}+7)\pi$	1	8
5(a)	$10 = -\frac{3}{2}(-10) + c$ and solve for the value of c	1	
	$(0, -5)$	1	
5(b)	Use $m_1 \times -\frac{3}{2} = -1$ or $m_2 = \frac{2}{3}$	1	
	Use $y - 10 = \frac{2}{3}(x - (-10))$ or $-10 = \frac{2}{3}(-10) + c$ and solve for the value of c	1	
	$y = \frac{2}{3}x + \frac{50}{3}$ or equivalent	1	
5(c)	$\frac{y-10}{x-(-10)}$ or $\frac{y-0}{x-2}$	1	
	$\left(\frac{y-10}{x-(-10)}\right)\left(\frac{y-0}{x-2}\right) = -1$	1	
	$x^2 + y^2 + 8x - 10y - 20 = 0$	1	8
6(a)	$84 \times \frac{\pi}{3}$	1	
	28π	1	
6(b)	$a = 5\pi$	1	
	$28\pi = 5\pi + (n-1)\pi$	1	
	24	1	
6(c)	$\frac{10}{2}[2(5\pi) + (10-1)\pi]$	1	
	95π	1	7

7(a)	$\cos(\theta+\theta)=\cos\theta\cos\theta-\sin\theta\sin\theta$ $\cos^2\theta-(1-\cos^2\theta)$ and $2\cos^2\theta-1$	1 1	
7(b)(i)			
	Shape of cosine graph Amplitude = 2 1 cycle for $0\le x\le\pi$ and absolute graph Shifted down 1 unit	1 1 1 1	
7(b)(ii)	$m=1$	1	7
8(a)(i) 8(a)(ii)	<u>Write triangle law for ΔPQR or ΔSPQ</u> $\overrightarrow{PR}=\overrightarrow{PQ}+\overrightarrow{QR}$ or $\overrightarrow{SQ}=\overrightarrow{SP}+\overrightarrow{PQ}$ $\overrightarrow{PR}=8\underset{\sim}{a}+4\underset{\sim}{b}$ $\overrightarrow{SQ}=8\underset{\sim}{a}-10\underset{\sim}{b}$	 1 1 1	
8(b)(i)	$\overrightarrow{PT}=8m\underset{\sim}{a}+4m\underset{\sim}{b}$	1	
8(b)(ii)	$\overrightarrow{PT}=\overrightarrow{PS}+\overrightarrow{ST}$ $8n\underset{\sim}{a}+(10-10n)\underset{\sim}{b}$	1 1	
8(c)	Compare and equate coefficient of vectors $\underset{\sim}{a}$ and $\underset{\sim}{b}$ involving *m* and *n*. $8m=8n$ and $4m=10-10n$ or equivalent Solve the first unknown $14n=10$ or $14m=10$ $n=\frac{5}{7}$ $m=\frac{5}{7}$	 1 1 1 1	10

9(a)	x^2: 1, 4, 9, 16, 25, 36 xy: 3.10, 4.60, 6.99, 9.40, 13.60, 18.00	1 1	
9(b)	Straight line graph xy against x^2 drawn [Correct axes and uniform scales At least one *point plotted correctly.] 6 *points plotted correctly Line of best fit [At least 5 *points plotted correctly]	1 1 1	
c(i)	$xy = 2px^2 + \frac{q}{5}$ Use $*m = 2p$ $\frac{18-4.6}{36-4} = 2p$ $2p = \frac{67}{160}$ $p = 0.2094$	1 1 1	
c(ii)	Use $* c = \frac{q}{5}$ $\frac{q}{5} = 2.9$ $q = 14.5$ Note : $2.8 \leq c \leq 3.0$	 1 1	10
10(a)(i)	${}^6C_3(0.4502)^3(0.5498)^3$ 0.3033	1 1	
(ii)	Write $P(X = 0) + (X = 1) + (X = 2) + \cdots (X = 5)$ or $1 - (X = 6)$ ${}^6C_0(0.4502)^0(0.5498)^6 + \cdots {}^6C_5(0.4502)^5(0.5498)^1$ or $1 - {}^6C_6(0.4502)^6(0.5498)^0$ 0.9917	1 1 1	
10(b)	Write $P\left(Z < \frac{164-165}{\sigma}\right) = 0.4502$ or $P\left(Z \geq \frac{164-165}{\sigma}\right) = 0.5498$ or $P\left(Z > \frac{167-165}{{}^*\sigma}\right)$ $\frac{164-165}{\sigma} = -0.125$ $\sigma = 8$ Write $P\left(Z > \frac{167-165}{{}^*8}\right)$ 0.4013	1 1 1 1 1	10

11(a)	$\frac{dy}{dx} = 2x$ and $2x = 2$ $(1, -8)$	1 1	
(b)	$x = 3$ Integrate $\int (x^2 - 9)\, dx$ or $\int (y+9)^{\frac{1}{2}}\, dy$ $A_1 = \frac{x^3}{3} - 9x$ or $A_2 = \frac{(y+9)^{\frac{3}{2}}}{\frac{3}{2}(1)}$ Use limit $\int_1^3$ into A_1 or $\int_{-8}^0$ into A_2 $\left[\frac{3^3}{3} - 9(3)\right] - \left[\frac{1^3}{3} - 9(1)\right]$ or $\left[\frac{(0+9)^{\frac{3}{2}}}{\frac{3}{2}(1)}\right] - \left[\frac{(-8+9)^{\frac{3}{2}}}{\frac{3}{2}(1)}\right]$ or Find the area of triangle or Area of trapezium $A_3 = \frac{1}{2} \times 4 \times 8$ or $A_4 = \frac{1}{2} \times (5+1) \times 8$ $A_3 - A_1$ or $A_4 - A_2$ $\left(16 - \frac{28}{3}\right)$ $\left(24 - \frac{52}{3}\right)$ $\frac{20}{3}$	1 1 1 1 1	
(c)	Integrate $\int \pi(y+9)\, dy$ $V = \pi\left(\frac{y^2}{2} + 9y\right)$ $\pi\left[0 - \left(\frac{h^2}{2} + 9h\right)\right] = 40$ $h = -8$	 1 1 1	10
12(a)(i)	$4.7^2 = 6.5^2 + 5^2 - 2(6.5)(5)\cos A$ $45.99°$	1 1	
(a)(ii)	$\frac{BD}{\sin 45.99°} = \frac{5}{\sin 88.02°}$ 3.598	1 1	

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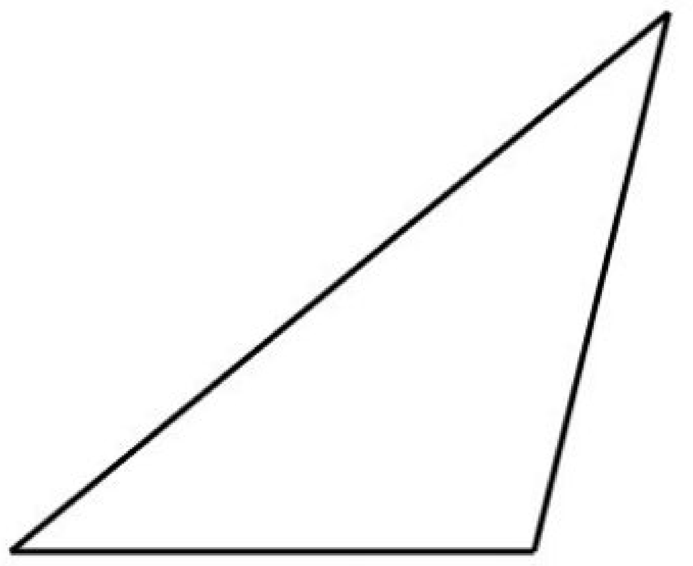
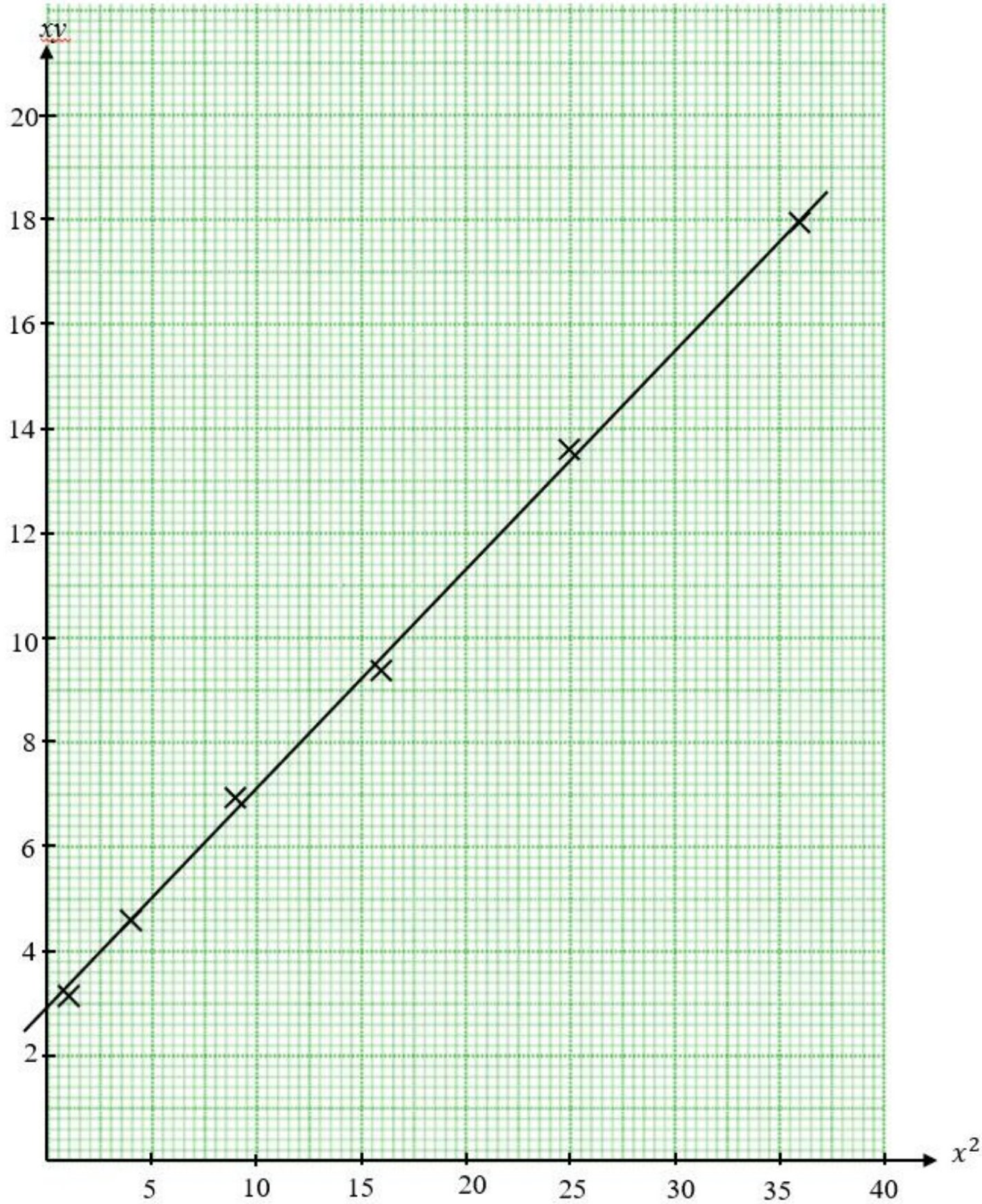
(b)		1	
(c)	$\frac{\sin \angle ABC}{6.5} = \frac{\sin 45.99°}{4.7}$ 84.08° $\angle A'C'B' = 38.09°$ $\frac{1}{2}(6.5)(4.7)\sin 38.09°$ 9.423	1 1 1 1 1	10
13(a)	$y \leq 2x$ $y - x \geq 100$ or equivalent $x + y \leq 750$	1 1 1	
(b)	Refer graph Draw correctly at least one straight line from the *inequalities involve x and y Draw correctly all straight lines Region shaded correctly	1 1 1	
(c)(i)	$300 \leq y \leq 400$	1	
(c)(ii)	(100,200) Substitute any point in *shaded region into $12(x + y)$ $12(100 + 200)$ 3600	1 1 1	10
14(a)(i)	$\frac{720}{Q_0} \times 100 = 120$ 600	1 1	
(a)(ii)	$126.3 = \frac{(120 \times 144) + (x \times 108) + (150 \times 72) + (108 \times 36)}{144 + 108 + 72 + 36}$ 125	1 1	
(b)	$I_{Food} = 108$ or $I_{Utilities} = 157.5$ $I_{\frac{22}{20}} = \frac{(108 \times 144) + (125 \times 108) + (*157.5 \times 72) + (108 \times 36)}{144 + 108 + 72 + 36}$ 123 The total expenses in the year 2022 have increased by 23% compared to the year 2021.	1 1 1 1	

(c)	$\frac{Q_1}{4000} \times 100 = 123$	1	
	4920	1	10
15(a)	Differentiate v_P with respect to *t* and equate with 0 $2t - 1 = 0$ $t = \frac{1}{2}$	 1	
	Substitute $t =* \frac{1}{2}$ into v_P $\left(\frac{1}{2}\right)^2 - \left(\frac{1}{2}\right) - 6$	 1	
	$-6\frac{1}{4}$ or $-\frac{25}{4}$ or -6.25	1	
(b)	$v_P = 0$ and solve the quadratic equation $t^2 - t - 6 = 0$ and $(t + 2)(t - 3) = 0$ $t = 3$	 1	
	Integrate v_P with respect to *t* and find s_P $s_P = \frac{t^3}{3} - \frac{t^2}{2} - 6t$	 1	
	Substitute $t = 3$ into s_P $s_P = \frac{3^3}{3} - \frac{3^2}{2} - 6(3)$	 1	
	$-13\frac{1}{2}$ or $-\frac{27}{2}$ or -13.5	1	
(c)	Integrate v_Q with respect to *t* ,$\int(-7)\,dt$ and find s_Q $s_Q = -7t$	 1	
	Substitute $t = 3$ into s_Q $s_Q = -7(3)$ -21	 1 1	
	$25 - 21 = 4$ and Ball *Q* is 4 m to the right of point *A*	 1	10

9(b)



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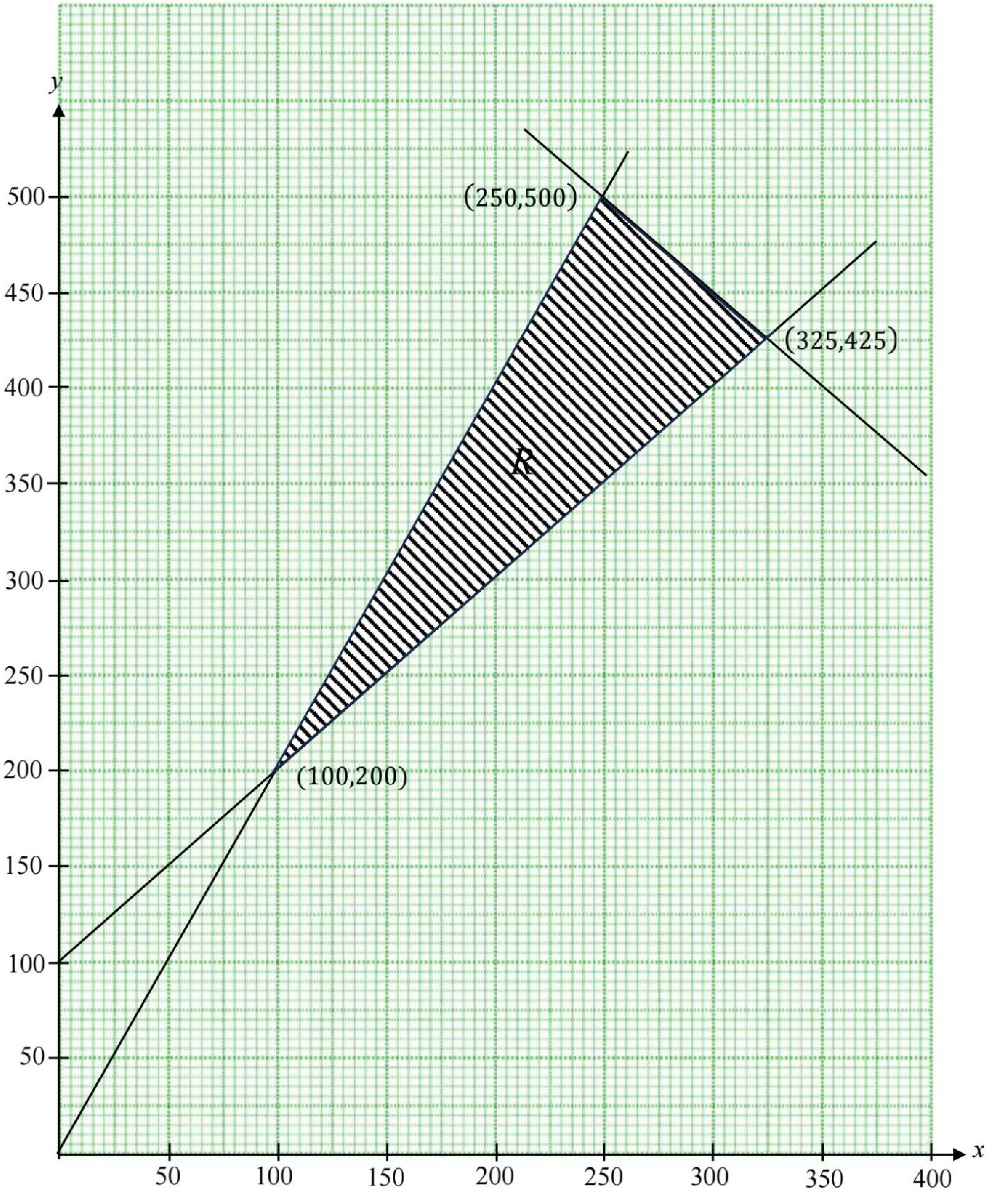
13(b)



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