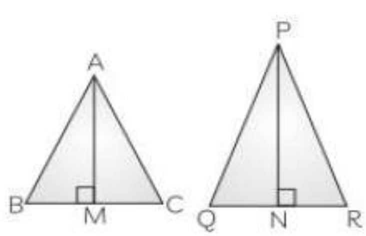
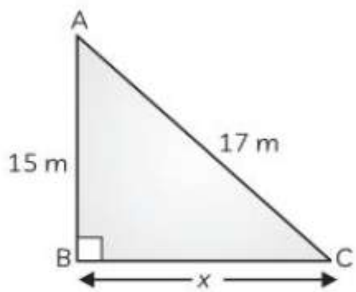
Sample Question Paper - 2 (TERM - I)

Solutions

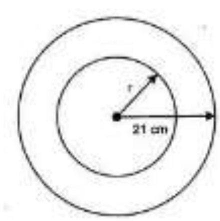
Section - A

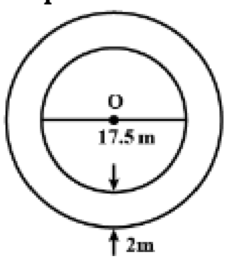
Ans. 1	(a) **Explanation:** The lines $5x + 6y = 3$ and $15x + 18y = k$ will coincide. If $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{C_1}{C_2}$ or. $\frac{5}{15} = \frac{6}{18} = \frac{(-3)}{-k}$ $\Rightarrow \frac{6}{18} = \frac{3}{k}$ $\Rightarrow k = 9$
Ans. 2	(c) **Explanation:** On tossing three fair coins, Total possible outcomes = {HHH, HHT, HTH, THH, TTH, THT, HTT, TTT.} ie. 8 Favourable outcomes (at most one head) = {TTH, THT, HTT, TTT} ie. 4. $\therefore$ P(At most one head) $= \frac{4}{8} = \frac{1}{2}$
Ans. 3	(d) **Explanation:** $\because \triangle ABC \sim \Delta PQR$ 

	$\therefore \dfrac{AB}{PQ} = \dfrac{BC}{QR} = \dfrac{AC}{PR} = \dfrac{AM}{PN}$ $\Rightarrow \frac{AB}{PQ} = \frac{AM}{PN} \Rightarrow \frac{AM}{PN} = \frac{2}{3}\left[\because \frac{AB^2}{PQ^2} = \frac{4}{9} \Rightarrow \frac{AB}{PQ} = \frac{2}{3}\right]$
Ans. 4	(b) **Explanation:** $4\sin^2\beta - 2\cos^2\beta = 4$ Then, $4\sin^2\beta - 2(1 - \sin^2\beta) = 4$ $6\sin^2\beta = 6$ or $\sin^2\beta = 1$ $\beta = 90°$
Ans. 5	(c) **Explanation:** $\because DE \parallel BC$ $\therefore \angle ADE = \angle ABC$[determinate pair of angles] ....(i) Now, in $\triangle$ ADE and $\triangle$ ABC, $\angle ADE = \angle ABC$ [Proved in (i)] $\angle A = \angle A$ [Common angle] $\therefore \triangle ADE \sim \triangle ABC$ [By AA similarity axiom] $\therefore \frac{AD}{AB} = \frac{DE}{BC}$ [$\because$ Corresponding sides of similar triangles are proportional] $\Rightarrow \dfrac{AD}{AD + BD} = \dfrac{DE}{BC}$ $\Rightarrow \dfrac{4}{4 + 7} = \dfrac{DE}{11}$ $\Rightarrow DE = 4$
Ans. 6	(a) **Explanation:** Dividing both numerator and denominator by $\cos\beta$, $\Rightarrow \dfrac{4\sin\beta - 3\cos\beta}{4\sin\beta + 3\cos\beta} = \dfrac{4\tan\beta - 3}{4\tan\beta + 3}$ $= \dfrac{3 - 3}{3 + 3} = 0$
Ans. 7	(a)

	Explanation: The word EPITOME has letters $= \{E, P, I, T, O, M\}$ $\therefore$ Total number of letters in the word EPITOME = 6 and we know that the total number of letters in English alphabets are = 26 $\therefore$ Required probability $= \frac{6}{26} = \frac{3}{13}$
Ans. 8	(a) 8 m **Explanation:** Use Pythagoras theorem, to find the distance of the foot of the ladder from the building.  $\therefore\ AC^2 = AB^2 + BC^2$ $\Rightarrow\ 17^2 = 15^2 + x^2$ $\Rightarrow x = \sqrt{17^2 - 15^2}$ $= \sqrt{289 - 225} = \sqrt{64}$ $= 8$
Ans. 9	(b) $\frac{5}{8}$ **Explanation:** Total number of balls in the bag = 8 Probability of not getting a red ball = 1 − Probability of getting a red ball $= 1 - \frac{3}{8}$ $= \frac{5}{8}$

Ans. 10	(b) **Explanation:** The probability that the ball is dropped in the basket by John $= \frac{4}{5} = 0.80$ The probability that the ball is dropped in the basket by Vasim $= 0.83$ The probability that the ball is dropped in the basket by Akash $= 58\% = \frac{58}{100} = 0.58$ $0.83 > 0.80 > 0.58$ ∴ Vasim has the greatest probability of success.
Ans. 11	(b) 45° **Explanation:** $\sin 2x = \sin 45^\circ \cos 45^\circ + \sin 30^\circ$ $\Rightarrow \sin 2x = \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + \frac{1}{2}$ $\Rightarrow \sin 2x = \frac{1}{2} + \frac{1}{2} = 1 = \sin 90^\circ$ $\Rightarrow 2x = 90^\circ \Rightarrow x = 45^\circ$
Ans. 12	(b) 24 **Explanation:** Here the jar contains red, blue and orange balls. Let the number of red balls be x. Let the number of blue balls be y. Number of orange balls $= 10$ Total number of balls $= x + y + 10$ Now, let P be the probability of drawing a ball from the jar $P(\text{ a red ball }) = x/(x + y + 10)$ $1/4 = x/(x + y + 10)$ $4x = x + y + 10$ $3x - y = 10 \ldots \ldots (i)$ Next $P(\text{a blue ball }) = y/(x + y + 10)$ $1/3 = y/(x + y + 10)$ $3y = x + y + 10$

	$2y - x = 10 \ldots \ldots (ii)$ Multiplying eq. (i) by 2 and adding to eq. (ii), we get $6x - 2y = 20$ $\underline{-x + 2y = 10}$ $5x \qquad = 30$ Subs. $x = 6$ in eq. (i), we get $y = 8$ Total number of balls $= x + y + 10 = 6 + 8 + 10 = 24$ Hence, total number of balls in the jar is 24 .
Ans. 13	(a) $\frac{1000}{9\pi}$ cm **Explanation:** Let radius of wheel $= r$ m Circumference of wheel $= (2\pi r)$m No. of revolutions $= 450$ Distance in 450 revolutions $= 450 \times 2\pi r = 900\pi r$ m Distance travelled $= 1000$ m $900\pi r = 1000$ $r = \frac{1000}{900\pi}$ $= \frac{10}{9\pi}$ m $= \frac{1000}{9\pi}$ cm radius $(r) = \frac{1000}{9\pi}$ cm
Ans. 14	(c) 14 cm **Explanation:**  Radius of outer circle $= 21$ cm Radius of inner circle $= r$

	Area between concentric circles = area of outer circle − area of inner circle $\Rightarrow 770 = \frac{22}{7}(21^2 - r^2)$ $\Rightarrow 21^2 - r^2 = 35 \times 7 = 245$ $\Rightarrow 441 - 245 = r^2$ $\Rightarrow r = \sqrt{196} = 14$ cm Radius of inner circle = 14 cm.
Ans. 15	(b) **Explanation:**  Diameter of the pond = 17.5 m Radius of the pond = 8.75 m Radius of the pond with the path = 8.75 + 2 = 10.75 m Area of the path = Area of the pond along with the path - area of the pond Area of the path = $\pi[(10.75)^2 - (8.75)^2]$ $= \pi[(2)(19.5)]$ $= 122.46\ m^2$ Cost of constructing the path = 25 × 122.46 = Rs 3061.5
Ans. 16	(c) $(\sin\alpha + \cos\alpha)\sqrt{(a^2 + b^2)}$ **Explanation:** The distance d between two points (x1, y1) and (x2, y2) is given by the formula. $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$ The two given points are $(a\sin\alpha, -b\cos\alpha)$ and $(-a\cos\alpha, b\sin\alpha)$ The distance between these two points is $d = \sqrt{(a\sin\alpha + a\cos\alpha)^2 + (-b\cos\alpha - b\sin\alpha)^2}$ $= \sqrt{a^2(\sin\alpha + \cos\alpha)^2 + b^2(-1)^2(\cos\alpha + \sin\alpha)}$

	$= \sqrt{a^2(\sin\alpha + \cos\alpha)^2 + b^2(\sin\alpha + \cos\alpha)}$ $= \sqrt{(a^2 + b^2)(\sin\alpha + \cos\alpha)}$ $d = (\sin\alpha + \cos\alpha)\sqrt{a^2 + b^2}$ Hence the distance is $(\sin\alpha + \cos\alpha)\sqrt{(a^2 + b^2)}$
Ans. 17	(a) 5 or -3 **Explanation:** The distance d between two points (x_1, y_1) and (x_2, y_2) is given by the formula $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$ The three given points are $P(6, -1), Q(1,3)$ and $R(x, 8)$. Now let us find the distance between ' P′ and ' Q '. $PQ = \sqrt{(6-1)^2 + (-1-3)^2}$ $= \sqrt{(5)^2 + (-4)^2}$ $= \sqrt{25 + 16}$ $PQ = \sqrt{41}$ Now, let us find the distance between ' Q ' and ' R '. $QR = \sqrt{(1-x)^2 + (3-8)^2}$ $QR = \sqrt{(1-x)^2 + (-5)^2}$ It is given that both these distances are equal. So, let us equate both the above equations, $PQ = QR$ $\sqrt{41} = \sqrt{(1-x)^2 + (-5)^2}$ Squaring on both sides of the equation we get, $41 = (1 - x^2) + (-5)^2$ $41 = 1 + x^2 - 2x + 25$ $15 = x^2 - 2x$ Now we have a quadratic equation. Solving for the roots of the equation we have, $x^2 - 2x - 15 = 0$ $x^2 - 5x + 3x - 15 = 0$

	$x(x-5)+3(x-5)=0$ $(x-5)(x+3)=0$ Thus the roots of the above equation are 5 and -3. Hence the values of ' x ' are 5 or -3,
Ans. 18	(b) $(0,-2)$ **Explanation:** The distance d between two points (x_1, y_1) and (x_2, y_2) is given by the formula $d=\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$ Here we are to find out a point on the y-axis which is equidistant from both the points A$(5,-2)$ and B$(-3,2)$ Let this point be denoted as C(x, y) Since the point lies on the y-axis the value of its ordinate will be 0. Or in other words, we have $x=0$. Now let us find out the distances from ' A ' and ' B′ to ' C′ $AC=\sqrt{(5-x)^2+(-2-y)^2}$ $=\sqrt{(5-0)^2+(-2-y)^2}$ $AC=\sqrt{(5)^2+(-2-y)^2}$ $BC=\sqrt{(-3-x)^2+(2-y)^2}$ $=\sqrt{(-3-0)^2+(2-y)^2}$ $BC=\sqrt{(-3)^2+(2-y)^2}$ We know that both these distances are the same. So equating both these we get, $AC=BC$ $\sqrt{(5)^2+(-2-y)^2}=\sqrt{(-3)^2+(2-y)^2}$ Squaring on both sides we have, $(5)^2+(-2-y)^2=(-3)^2+(2-y)^2$ $25+4+y^2+4y=9+4+y^2-4y$ $8y=-16$ $y=-2$

	Hence the point on the y-axis which lies at equal distances from the mentioned points is $(0, -2)$.
Ans. 19	(c) 8 **Explanation:** The maximum number of columns in which they can march = HCF (32,616) $32 = 2 \times 2 \times 2 \times 2 \times 2$ $616 = 2 \times 2 \times 2 \times 7 \times 11$ HCF of 32 and $616 = 2 \times 2 \times 2 = 8$ The maximum number of columns in which they can march is 8.
Ans. 20	(a) 18 **Explanation:** Number of cartons of coke cans = 144 Number of cartons of pepsi cans = 90 $\therefore$ The greatest number of cartons in one stock = HCF of 144 and 90 = 18 Hence the greatest number cartons in one stock = 18
Ans. 21	(c) 6 sq. units **Explanation:** $\therefore$ Required area = Area of $\triangle$ ACD $= \frac{1}{2} \times AD \times$ Distance of point C from y-axis $= \frac{1}{2} \times (4 - (-2)) \times 2$ $= \frac{1}{2} \times 6 \times 2 = 6$
Ans. 22	(d) 35 **Explanation:** Number of goats = 105 Number of donkeys = 140 Number of cows = 175 To find the largest possible number of animals, we will find the H.C.F of 105,140 and 175 .

	$105 = 3 \times 5 \times 7$ $140 = 2 \times 2 \times 5 \times 7$ $175 = 5 \times 5 \times 7$ HCF of 105,140 and 175 $= 5 \times 7 = 35$ Hence The number of animals went in each trip is 35
Ans. 23	(c) 30° **Explanation:** We know, $A = \frac{\theta}{360} \times$ Area of the circle ...(1) Let the area of the circle be Ar. Thus area of the sector $= \frac{1}{12}$Ar ...(2) From (1) and (2) we have $\frac{1}{12}\text{Ar} = \frac{\theta}{360} \times \text{Ar}$ $\Rightarrow \frac{360}{12} = \theta$ $\Rightarrow \theta = 30^\circ$
Ans. 24	(b) Rs 5887.50 **Explanation:** Since four semi-circular flower beds rounds the rectangular park. Then, diameters of semi-circular plots are $2r_1 = l$ and $2r_2 = w$ $r_1 = \frac{l}{2}$ $= \frac{100}{2}$ $= 50$ m Area of semi-circular plot at larger side of rectangle $= \frac{1}{2}\pi r^2$ $= \frac{1}{2} \times 3.14 \times 50 \times 50$ $= 3925 \text{ m}^2$ And the radius of semicircle at smaller side of rectangle $r_2 = \frac{w}{2}$

	$= \frac{50}{2}$ $= 25\text{m}$ Area of semicircluar plot at smaller side of rectangle $= \frac{1}{2}\pi r^2$ $= \frac{1}{2} \times 3.14 \times 25 \times 25$ $= 981.25\ \text{m}^2$ Now, the total area of semi-circular plot is sum of area of four semi-circular plots. Total Area of plot $= 2 \times 3925 + 2 \times 981.25$ $= 7850 + 192.5\ \text{m}^2$ $= 9812.5\ \text{m}^2$ Since, The cost of levelling semi-circular flower bed per square meter = Rs 0. 60 So, The cost of levelling 9812.5 square meter flower bed = Rs 0.60×9812.5 = Rs 5887.50
Ans. 25	(c) $\frac{-2}{a}$ **Explanation:** $f(x) = ax^2 + bx + c$ $\alpha + \beta = \left(-\frac{b}{a}\right)$ $\alpha\beta = \frac{c}{a}$ since $\alpha + \beta$ are the roots (or) zeroes of the given polynomials then , $\frac{\beta}{a\alpha + b} + \frac{\alpha}{a\beta + b}$ $= \frac{\beta(a\beta + b) + \alpha(a\alpha + b)}{(a\alpha + b)(a\beta + b)}$ $= \frac{a\beta^2 + b\beta + a\alpha^2 + b\alpha}{a^2\alpha\beta + ab\alpha + ab\beta + b^2}$ $= \frac{a\alpha^2 + a\beta^2 + b\beta + b\alpha}{a^2 \times \frac{c}{a} + ab(\alpha + \beta) + b^2}$

	$= \dfrac{a(\alpha^2+\beta^2)+b(\alpha+\beta)}{ac+ab\left(-\dfrac{b}{a}\right)+b^2}$ $= \dfrac{a[(\alpha+\beta)^2-2\alpha\beta]+b\times-\dfrac{b}{a}}{ac-b^2+b^2}$ $= \dfrac{a\left[\left(-\dfrac{b}{a}\right)^2-2\left(\dfrac{c}{a}\right)\right]-\dfrac{b^2}{a}}{ac}$ $= \dfrac{\dfrac{b^2}{a}-(2c)-\dfrac{b^2}{a}}{ac}$ $= \dfrac{-2c}{ac}$ $= \dfrac{-2}{a}$

Section – B	
Ans. 26	(a) $x = 4, y = 9$ **Explanation:** $\frac{2}{\sqrt{x}} + \frac{3}{\sqrt{y}} = 2$, $\frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = -1$ Let $\frac{1}{\sqrt{x}} = p$ and $\frac{1}{\sqrt{y}} = q$ The given equations reduce to: $2p + 3q = 2 \ldots\ldots\ldots.(1)$ $4p - 9q = -1 \ldots\ldots.\ldots(2)$ Multiplying equation (1) by (3), we obtain: $6p + 9q = 6 \ldots.(3)$ Adding equation (2) and (3) , we obtain: $10p = 5$ $p = \frac{1}{2}$ Putting the value of p in equation (1), we obtain: $2 \times \frac{1}{2} + 3q = 2$ $q = \frac{1}{3}$ $\therefore p = \frac{1}{\sqrt{x}} = \frac{1}{2}$ $\sqrt{x} = 2$ $x = 4$ $q = \frac{1}{\sqrt{y}} = \frac{1}{3}$ $\sqrt{y} = 3$ $y = 9$ $\therefore x = 4, y = 9$
Ans. 27	(b) 2 **Explanation:**

	It is given that: $\frac{x}{a}\cos\theta + \frac{y}{b}\sin\theta = 1$ ... (A) And , $\frac{x}{a}\sin\theta - \frac{y}{b}\cos\theta = 1$ .... (B) On squaring equation (A), we get $\frac{x^2}{a^2}\cos^2\theta + \frac{y^2}{b^2}\sin^2\theta + 2\frac{x}{a}\cdot\frac{y}{b}\sin\theta\cdot\cos\theta = 1$ ..... (C) On squaring equation (B), we get $\frac{x^2}{a^2}\sin^2\theta + \frac{y^2}{b^2}\cos^2\theta - 2\frac{x}{a}\cdot\frac{y}{b}\sin\theta\cdot\cos\theta = 1$ ... (D) Adding (C) and (D), we get, $\Rightarrow \frac{x^2}{a^2}\cos^2\theta + \frac{y^2}{b^2}\sin^2\theta + 2\frac{x}{a}\cdot\frac{y}{b}\sin\theta\cdot\cos\theta + \frac{x^2}{a^2}\sin^2\theta + \frac{y^2}{b^2}\cos^2\theta - 2\frac{x}{a}\cdot\frac{y}{b}\sin\theta\cdot\cos\theta = 1 + 1$ $\Rightarrow \frac{x^2}{a^2}(\sin^2\theta + \cos^2\theta) + \frac{y^2}{b^2}(\sin^2\theta + \cos^2\theta) = 2$ $\Rightarrow \frac{x^2}{a^2}\times 1 + \frac{y^2}{b^2}\times 1 = 2$ $\Rightarrow \frac{x^2}{a^2} + \frac{y^2}{b^2} = 2$
Ans. 28	(c) 10 **Explanation:** Given $3\cos\theta = 1$ We have to find the value of the expression $\frac{6\sin^2\theta + \tan^2\theta}{4\cos\theta}$ We have $3\cos\theta = 1$ $\Rightarrow \cos\theta = \frac{1}{3}$ $\sin\theta = \sqrt{1-\cos^2\theta} = \sqrt{1-\left(\frac{1}{3}\right)^3} = \frac{\sqrt{8}}{3}$

	$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\frac{\sqrt{8}}{3}}{\frac{1}{3}} = \sqrt{8}$ Therefore, $\frac{6\sin^2\theta + \tan^2\theta}{4\cos\theta} = \frac{6 \times \left(\frac{\sqrt{8}}{3}\right)^2 + (\sqrt{8})^2}{4 \times \frac{1}{3}}$ $= 10$ Hence, the value of the expression is 10 . The distance d between two points (x_1, y_1) and (x_2, y_2) is given by the formula $d = \sqrt{(x_1 - y_1)^2 + (y_1 - y_2)^2}$
Ans. 29	(a) $\left(-\frac{2}{7}, -\frac{20}{7}\right)$ **Explanation:** The coordinates of point A and B are $(-2, -2)$ and $(2, -4)$ respectively. Since $AP = \frac{3}{7}AB$ Therefore, $AP: PB = 3: 4$ Point P divides the line segment AB in the ratio 3: 4. Coordinates of $P = \left(\frac{3\times2+4\times(-2)}{3+4}, \frac{3\times(-4)+4\times(-2)}{3+4}\right)$ $= \left(\frac{6-8}{7}, \frac{-12-8}{7}\right)$ $= \left(-\frac{2}{7}, -\frac{20}{7}\right)$
Ans. 30	(d) 7: 5. **Explanation:** Let y-axis divides the line of (7,3) and $(-5, -12)$ in the ratio 1: n. $\Rightarrow x -$ coordinate will be $\frac{-5+7n}{1+n}$. as y axis divides the line joining (7,3) and $(-5, -12)$ it's $x -$ coordinate is zero.

	$\frac{-5+7n}{1+n}=0$ $-5+7n=0$ $n=\frac{5}{7}$ Hence, Y - axis divides given points in the ratio $1:\frac{5}{7}$ i.e. $7:5$.
Ans. 31	(c) cost of each bat = Rs 500 and cost of each balls = Rs 50 **Explanation:** Let cost of each bat = Rs x Cost of each ball = Rs y Given that coach of a cricket team buys 7 bats and 6 balls for Rs 3800 . $7x+6y=3800$ $6y=3800-7x$ Dividing by 6, we get $y=(3800-7x)/6 \ldots$ (i) Given that she buys 3 bats and 5 balls for Rs 1750 later. $3x+5y=1750$ Putting the value of y $3x+5((3800-7x)/6)=1750$ Multiplying by 6, we get $18x+19000-35x=10500$ $-17x=10500-19000$ $-17x=-8500$ $x=-8500/-17$ $x=500$ Putting this value in equation (i) we get $y=(3800-7\times 500)/6$ $y=300/6$ $y=50$ Hence cost of each bat = Rs 500 and cost of each balls = Rs 50

Ans. 32	(a) $x = 3$ and $y = 2$ **Explanation:** $kx - 5y = 2$ $6x + 2y = 7$ Condition for system of equations having no solution $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $\Rightarrow \frac{k}{6} = \frac{-5}{2} \neq \frac{2}{7}$ $\Rightarrow 2k = -30$ $\Rightarrow k = -15$
Ans. 33	(b) $\frac{1}{2}$ **Explanation:** It is given that, $\sin\theta - \cos\theta = 0$ $\Rightarrow \sin\theta = \cos\theta$ $\Rightarrow \frac{\sin\theta}{\cos\theta} = 1$ $\Rightarrow \tan\theta = 1$ $\Rightarrow \tan\theta = \tan 45^\circ$ $\Rightarrow \theta = 45^\circ$ $\therefore \sin^4\theta + \cos^4\theta$ $= \sin^4 45^\circ + \cos^4 45^\circ$ $= \left(\frac{1}{\sqrt{2}}\right)^4 + \left(\frac{1}{\sqrt{2}}\right)^4$ $= \frac{1}{4} + \frac{1}{4}$ $= \frac{1}{2}$

Ans. 34	(c) 1 **Explanation:** $\cos A + \cos^2 A = 1$ $\Rightarrow 1 - \cos^2 A = \cos A$ So, $\sin^2 A + \sin^4 A$ $= \sin^2 A + \sin^2 A \sin^2 A$ $= \sin^2 A + (1 - \cos^2 A)(1 - \cos^2 A)$ $= \sin^2 A + \cos A \cos A$ $= \sin^2 A + \cos^2 A = 1$
Ans. 35	(c) 60° **Explanation:** θ = angle subtended at centre (degrees) Length of Arc $= \frac{\theta}{360^\circ} \times 2\pi r$ m But arc length $= \frac{5\pi}{3}$ cm $\therefore \frac{\theta}{360^\circ} \times 2\pi \times 5 = \frac{5\pi}{3}$ $\theta = \frac{360^\circ \times \pi}{3 \times 2\pi} = 60^\circ$ $\therefore$ Angle subtended at centre $= 60^\circ$
Ans. 36	(b) 138 **Explanation:** To find the largest number which exactly divides 280 and 1245 leaving remainders 4 and 3 respectively, we subtract 4 and 3 from 280 and 1245 . $280 - 4 = 276$ $1245 - 3 = 1242$ $276 = 2 \times 2 \times 3 \times 23$ $1242 = 2 \times 3 \times 3 \times 3 \times 23$ $\text{HCF} = 2 \times 3 \times 23 = 138$

	Therefore, the largest number which exactly divides 280 and 1245 leaving remainders 4 and 3 respectively is 138 .
Ans. 37	(b) 4290 **Explanation:** GIVEN: A rectangular yard is 18 m 72 cm long and 13 m 20 cm broad .It is to be paved with square tiles of the same size. TO FIND: Least possible number of such tiles. Length of the yard $= 18$ m 72 cm $= 1800$ cm $+ 72$ cm $= 1872$ cm ($\because$ 1 m $=$ 100 cm) Breadth of the yard $= 13$ m 20 cm $= 1300$ cm $+ 20$ cm $= 1320$ cm The size of the square tile of same size needed to the pave the rectangular yard is equal the HCF of the length and breadth of the rectangular yard. Prime factorisation of $1872 = 2^4 \times 3^2 \times 13$ Prime factorisation of $1320 = 2^3 \times 3 \times 5 \times 11$ HCF of 1872 and $1320 = 2^3 \times 3 = 24$ $\therefore$ Length of side of the square tile $= 24$ cm Number of tiles required = $\frac{\text{Area of the courtyard}}{\text{Area of each tile}} = \frac{\text{Lenght } \times \text{ Breadth}}{(\text{ Side })^2} = \frac{1872 \text{ cm} \times 1320 \text{ cm}}{(24 \text{ cm})^2}$ $= 4290$ Thus, the least possible number of tiles required is 4290 .
Ans. 38	(b) shorter side = 90 cm , larger side = 120 **Explanation:** Let the shorter side of the rectangle be x m. Then, larger side of the rectangle $= (x + 30)$m Diagonal of rectangle $= \sqrt{x^2 + (x + 30)^2}$ It is given that the diagonal of the rectangle $= (x + 60)m$

	$\therefore \sqrt{x^2 + (x+30)^2} = x + 60$ $\Rightarrow x^2 + (x+30)^2 = (x+60)^2$ $\Rightarrow x^2 + x^2 + 900 + 60x = x^2 + 3600 + 120x$ $\Rightarrow x^2 - 60x - 2700 = 0$ $\Rightarrow x^2 - 90x + 30x - 2700 = 0$ $\Rightarrow x(x-90) + 30(x-90)$ $\Rightarrow (x-90)(x+30) = 0$ $\Rightarrow x = 90, -30$ However, side cannot be negative. Therefore, the length of the shorter side will be 90 m. Hence, length of the larger side will be $(90 + 30)\text{m} = 120$ m.
Ans. 39	(d) 2.74 cm **Explanation:** Radius (r_1) of sphere = 4.2 cm Radius (r_2) of cylinder = 6 cm Let the height of the cylinder be h. The object formed by recasting the sphere will be the same in volume. Volume of sphere = Volume of cylinder $\frac{4}{3}\pi r_1^3 = \pi r_2^2 h$ $\frac{4}{3}\pi(4.2)^3 = \pi(6)^2 h$ $\frac{4}{3} \times \frac{4.2 \times 4.2 \times 4.2}{36} = h$ $h = (1.4)^3 = 2.74$ cm Hence, the height of the cylinder so formed will be 2.74 cm.
Ans. 40	(b) $\frac{3}{7}$ **Explanation:** Let the numerator and denominator of the fraction be x and y respectively. Then the fraction is $\frac{x}{y}$ The numerator of the fraction is 4 less the denominator. Thus, we have $x = y - 4$

	$\Rightarrow x - y = -4$ If the numerator is decreased by 2 and denominator is increased by 1, then the denominator is 8 times the numerator. Thus, we have $y + 1 = 8(x - 2)$ $\Rightarrow y + 1 = 8x - 16$ $\Rightarrow 8x - y = 1 + 16$ $\Rightarrow 8x - y = 17$ So, we have two equations $x - y = -4$ $8x - y = 17$ Here x and y are unknowns. We have to solve the above equations for x and y. Subtracting the second equation from the first equation, we get $(x - y) - (8x - y) = -4 - 17$ $\Rightarrow x - y - 8x + y = -21$ $\Rightarrow -7x = -21$ $\Rightarrow 7x = 21$ $\Rightarrow x = \frac{21}{7}$ $\Rightarrow x = 3$ Substituting the value of x in the first equation, we have $3 - y = -4$ $\Rightarrow y = 3 + 4$ $\Rightarrow y = 7$ Hence, the fraction is $\frac{3}{7}$
Ans. 41	Speed of boat in upstream $= (x - y)$km/hr and speed of boat in downstream $= (x + y)$km/hr **(a):** 1^{st} situation can be represented algebraically as $\frac{24}{x-y} + \frac{36}{x+y} = 6$
Ans. 42	Speed of boat in upstream $= (x - y)$km/hr and speed of boat in downstream $= (x + y)$km/hr

	(b): 2[nd] situation can be represented algebraically as $\frac{36}{x-y}+\frac{24}{x+y}=\frac{13}{2}$
Ans. 43	**(c):** Putting $\frac{1}{x-y}=u$ and $\frac{1}{x+y}=v$ we get, $24u+36v=6$ and $36u+24v=13/2$ Solving the above equations, we get $u=\frac{1}{8}, v=\frac{1}{12}$
Ans. 44	(**d**): $\because u=\frac{1}{8}=\frac{1}{x-y}\Rightarrow x-y=8$ .... (i) and $v=\frac{1}{12}=\frac{1}{x+y}\Rightarrow x+y=12$........ (ii) Adding equations (i) from (ii), we get $2x=20\Rightarrow x=10$ $\therefore$ Speed of boat in still water = 10 km/hr.
Ans. 45	**(c):** From equation (i), $10-y=8\Rightarrow y=2$
Ans. 46	**(c):** In $\triangle$ OPQ, we have $\tan 60^\circ=\frac{PQ}{PO}$ $\Rightarrow \sqrt{3}=\frac{20}{PO}$ $\Rightarrow PO=\frac{20}{\sqrt{3}}$ m
Ans. 47	**(b):** In ΔORS, we have $\tan 30^\circ=\frac{RS}{OR}\Rightarrow\frac{1}{\sqrt{3}}=\frac{20}{OR}\Rightarrow OR=20\sqrt{3}$ m
Ans. 48	**(d):** Clearly, width of the road = PR

	$= \text{PO} + \text{OR} = \left(\frac{20}{\sqrt{3}} + 20\sqrt{3}\right) \text{m}$ $= 20\left(\frac{4}{\sqrt{3}}\right) \text{m} = \frac{80}{\sqrt{3}} \text{ m} = 46.24 \text{ m}$
Ans. 49	**(a)** In $\triangle$ OPQ, if $\angle \text{POQ} = 45°$, then $\tan 45° = \frac{\text{PQ}}{\text{PO}} \Rightarrow 1 = \frac{20}{\text{PO}} \Rightarrow \text{PO} = 20 \text{ m}$
Ans. 50	**(b)**