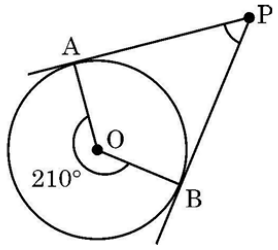
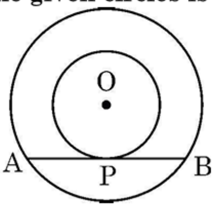
SOLUTIONS
MATHEMATICS (Subject Code–
041) (PAPER CODE: 30/5/3)

Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Marks
	SECTION A **This section consists of 20 multiple choice questions of 1 mark each.**	
1.	Which of the following statements is false ? (A) Infinite number of tangents can be drawn to a circle. (B) Infinite number of tangents can be drawn to a circle from a point outside the circle. (C) Infinite number of secants can be drawn to a circle from a point outside the circle. (D) Angle between tangent and diameter at point of contact is 90°.	
Sol.	(B) Infinite number of tangents can be drawn to a circle from a point outside the circle.	**1**
2.	In the adjoining figure, PA and PB are tangents to a circle with centre O. The measure of angle APB is  (A) 210° (B) 150° (C) 105° (D) 30°	
Sol.	(D) 30°	**1**
3.	The value of $(1 - 2\sin^2 60°)$ is same as that of (A) sin 30° (B) – sin 30° (C) cos 60° (D) – cos 30°	
Sol.	(B) – sin 30°	**1**
4.	An observer 1.8 m tall stands away from a chimney at a distance of 38.2 m along the ground. The angle of elevation of top of chimney from the eyes of observer is 45°. The height of chimney above the ground is (A) 38.2 m (B) 36.4 m (C) 40 m (D) $(38.2)\sqrt{2}$ m	
Sol.	(C) 40 m	**1**

5. In the adjoining figure, the sum of radii of two concentric circles is 16 cm. The length of chord AB which touches the inner circle at P is 16 cm. The difference of the radii of the given circles is



(A) 8 cm (B) 4 cm
(C) 2 cm (D) 3 cm

Sol. (B) 4 cm — **1**

6. A cone of height 12 cm and slant height 13 cm is surmounted on a hemisphere having radius equal to that of cone. The entire height of the solid is

(A) 17 cm (B) 18 cm
(C) 22 cm (D) 23 cm

Sol. (A) 17 cm — **1**

7. If x median + y mean = z mode; is the empirical relationship between mean, median and mode, then the value of $x + y + z$ is

(A) 6 (B) 3
(C) 2 (D) 1

Sol. (C) 2 — **1**

8. Following data shows the marks obtained by 100 students in a class test :

Marks obtained	20	29	28	33	42	38	43	25
Number of students	6	28	24	15	2	4	1	20

The median will be the average of which two observations ?

(A) 29 and 33 (B) 25 and 28
(C) 28 and 29 (D) 33 and 38

Sol. (C) 28 and 29 — **1**

9. The probability of getting a composite number greater than 3 on throwing a die is

(A) $\frac{1}{6}$ (B) $\frac{1}{3}$
(C) $\frac{1}{2}$ (D) $\frac{2}{3}$

Sol. (B) $\frac{1}{3}$ — **1**

10. $\left(\sqrt{3}+2\right)^2+\left(\sqrt{3}-2\right)^2$ is a/an

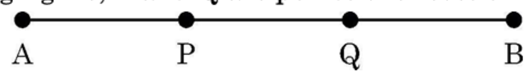
(A) positive rational number (B) negative rational number
(C) positive irrational number (D) negative irrational number

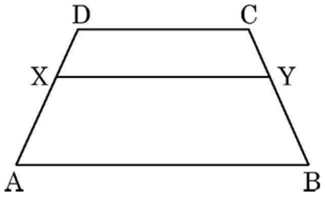
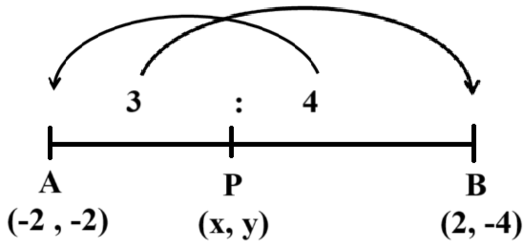
Sol. (A) positive rational number — **1**

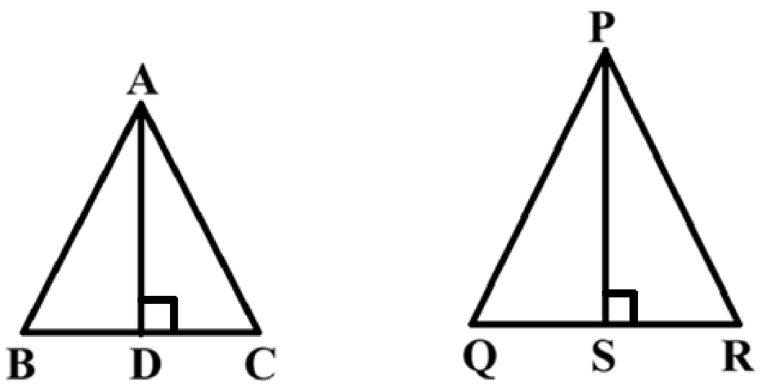
11. Let $p = x^2\, y^3\, z^n$ and $q = x^3\, y^m\, z^2$, where x, y, z are prime numbers. If LCM (p, q) = $x^3\, y^4\, z^3$, then the value of (2m + 3n) is

(A) 18 (B) 17
(C) 15 (D) 14

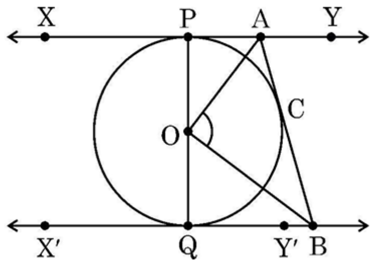
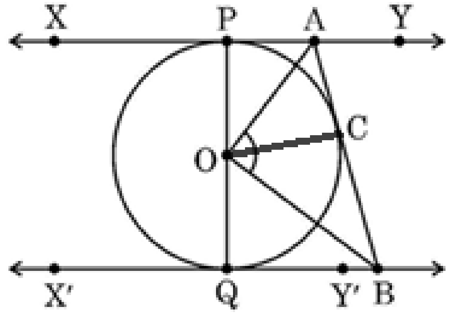
Sol. (B) 17 — **1**

12.	For any prime number p, if p divides a^2, where a is any real number then p also divides (A) a (B) $a^{\frac{1}{2}}$ (C) $a^{\frac{3}{2}}$ (D) $a^{\frac{1}{8}}$	
Sol.	(A) a	**1**
13.	Which of the following equation is a quadratic equation ? (A) $\left(x+\frac{1}{x}\right)^2 = 2$ (B) $(x-\sqrt{x})^2 + 2x\sqrt{x} = 0$ (C) $(x+1)^3 = (1-x)^3$ (D) $(\sqrt{x}+1)^2 = x^2$	
Sol.	(B) $\left(x-\sqrt{x}\right)^2 + 2x\sqrt{x} = 0$	**1**
14.	If $x^2 + bx + b = 0$ has two real and distinct roots, then the value of b can be (A) 0 (B) 4 (C) 3 (D) –3	
Sol.	(D) – 3	**1**
15.	In the following figure, P and Q are points of trisection of line segment AB :  the value of $\frac{AB}{PB}$ = (A) 1 (B) 1.5 (C) $\frac{2}{3}$ (D) 2	
Sol.	(B) 1.5	**1**
16.	A bag contains red coloured, blue coloured and green coloured balls in the ratio 2 : 3 : 4. A ball is drawn at random from the given bag. The probability that the ball so drawn being not of blue colour is (A) $\frac{1}{9}$ (B) $\frac{1}{3}$ (C) $\frac{2}{3}$ (D) $\frac{8}{9}$	
Sol.	(C) $\frac{2}{3}$	**1**
17.	Which of the following statements is false ? (A) Two right triangles are always similar. (B) Two squares are always similar. (C) Two equilateral triangles are always similar. (D) Two circles are always similar.	
Sol.	(A) Two right triangles are always similar.	**1**

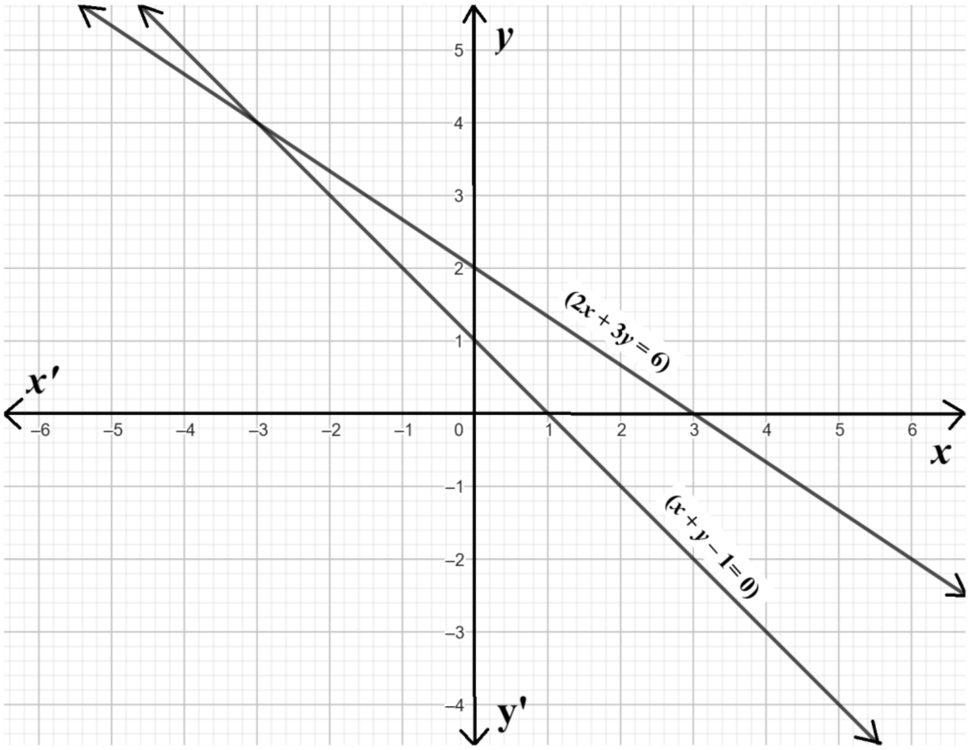
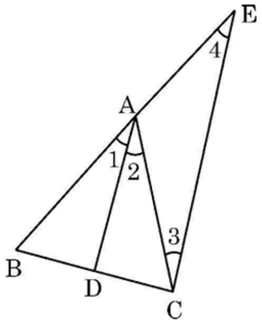
18.	In the adjoining figure, ABCD is a trapezium in which XY || AB || CD. If $AX = \frac{2}{3}AD$, then CY : YB =  (A) 2 : 3 (B) 3 : 2 (C) 1 : 3 (D) 1 : 2	
Sol.	(D) 1 : 2	**1**
	Directions : In Question Numbers **19** and **20**, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Choose the correct option from following : (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of (A). (C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.	
19.	**Assertion (A) :** For an acute angle θ, value of cosec θ cannot be $\frac{1}{\sqrt{2}}$. **Reason (R) :** $\text{cosec}\,\theta \geq 1$ for $0^\circ \leq \theta \leq 90^\circ$	
Sol.	(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).	**1**
20	**Assertion (A) :** For an A.P., 3,6,9, …, 198, 10^{th} term from the end is 168. **Reason (R) :** If 'a' and 'l' are the first term and last term of an A.P. with common difference 'd', then n^{th} term from the end of the given A.P. is $l - (n - 1)\,d$.	
Sol.	(D) Assertion (A) is false, but Reason (R) is true.	**1**
	SECTION B **This section has 5 very short answer type questions of 2 marks each.**	
21.	The coordinates of the end points of the line segment AB are A(–2, –2) and B(2, –4). P is the point on AB such that $BP = \frac{4}{7}AB$. Find the coordinates of point P.	
Sol.	 P (x, y) divides AB in the ratio 3: 4 $x = \frac{3 \times 2 + 4 \times (-2)}{4+3} \Longrightarrow x = -\frac{2}{7}$	½ ½

	$y = \frac{3 \times (-4) + 4 \times (-2)}{4+3} \Rightarrow y = -\frac{20}{7}$ $\therefore$ Coordinates of P are $\left(-\frac{2}{7}, -\frac{20}{7}\right)$	½ ½
22 (a)	It is given that sin (A – B) = sin A cos B – cos A sin B. Use it to find the value of sin 15°.	
Sol.	sin 15° = sin (45° – 30°) = sin 45° cos 30° – cos 45° sin 30° $= \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}} \times \frac{1}{2}$ $= \frac{\sqrt{3}-1}{2\sqrt{2}}$ or $\frac{\sqrt{6}-\sqrt{2}}{4}$	½ **1** ½
	OR	
22 (b)	If sin A = y, then express cos A and tan A in terms of y.	
Sol.	$\cos A = \sqrt{1 - \sin^2 A} = \sqrt{1 - y^2}$ $\tan A = \frac{\sin A}{\cos A} = \frac{y}{\sqrt{1-y^2}}$	**1** **1**
23.	In ΔABC and ΔPQR, AD and PS are altitudes such that ΔABD ~ ΔPQS and ΔACD ~ ΔPRS. Prove that ΔABC ~ ΔPQR.	
Sol.	Correct figure  Δ ABD ~ Δ PQS ⟹ ∠ B = ∠ Q --- ① Δ ACD ~ Δ PRS ⟹ ∠ C = ∠ R --- ② From ① & ②, we get Δ ABC ~ Δ PQR	½ ½ ½ ½
24.	From a pack of 52 cards, all aces and all kings are removed. A card is drawn at random from the remaining cards. Find the probability that the card so drawn is (i) a face card. (ii) a card of red colour.	
Sol.	Remaining cards = 52 – 8 = 44 (i) P (a face card) = $\frac{8}{44}$ or $\frac{2}{11}$	**1**

	(ii) P (a card of red colour) = $\frac{22}{44}$ or $\frac{1}{2}$	**1**
25 (a)	The cost of 2 kg apples and 1 kg of grapes on a day was found to be ₹ 320. The cost of 4 kg apples and 2 kg grapes was found to be ₹ 600. If cost of 1 kg of apples and 1 kg of grapes is ₹ x and ₹ y respectively, represent the given situation algebraically as a system of equations and check whether the system so obtained is consistent or not.	
Sol.	$2x + y = 320$ $4x + 2y = 600$ Here, $\frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}, \frac{b_1}{b_2} = \frac{1}{2}, \frac{c_1}{c_2} = \frac{320}{600} = \frac{8}{15}$ As $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ ∴ System of equations is not consistent.	½ ½ ½ ½
	OR	
25 (b)	Solve for x and y : $\sqrt{2}\,x + \sqrt{3}\,y = 5$ and $\sqrt{3}\,x - \sqrt{8}\,y = -\sqrt{6}$	
Sol.	$(\sqrt{2}\,x + \sqrt{3}y = 5) \times \sqrt{3} \Rightarrow \sqrt{6}\,x + 3y = 5\sqrt{3}$ $(\sqrt{3}\,x - \sqrt{8}y = -\sqrt{6}) \times \sqrt{2} \Rightarrow \sqrt{6}\,x - 4y = -2\sqrt{3}$ Solving the equations, we get $x = \sqrt{2}$ and $y = \sqrt{3}$	½ ½ ½ + ½
	SECTION C **This section has 6 short answer type questions of 3 marks each.**	
26	Find the zeroes of the polynomial $p(x) = 6x^2 - 5x - 1$. Hence, obtain a polynomial each of whose zeroes is three times the zeroes of $p(x)$.	
Sol.	$p(x) = 6x^2 - 5x - 1$ $= (x - 1)(6x + 1)$ ∴ Zeroes are 1, $-\frac{1}{6}$ New zeroes are 3, $-\frac{1}{2}$ Sum of new zeroes = $3 + \left(-\frac{1}{2}\right) = \frac{5}{2}$ Product of new zeroes = $3 \times \left(-\frac{1}{2}\right) = -\frac{3}{2}$ ∴ Required polynomial is $x^2 - \frac{5}{2}x - \frac{3}{2}$ or $2x^2 - 5x - 3$	 **1** ½ ½ ½ ½
27.	Find a relation between x and y such that P(x, y) is equidistant from the points A(3, 5) and B(7, 1). Hence, write the coordinates of the points on x-axis and y-axis which are equidistant from points A and B.	
Sol.	PA = PB ⟹ $PA^2 = PB^2$ $(x - 3)^2 + (y - 5)^2 = (x - 7)^2 + (y - 1)^2$ ⟹ $x - y = 2$ ∴ Required point on x-axis is (2, 0) & required point on y-axis is (0, – 2)	½ **1** ½ ½ ½

28 (a)	Prove the following trigonometric identity : $\frac{1 + \text{cosec A}}{\text{cosec A}} = \frac{\cos^2 A}{1 - \sin A}$	
Sol.	LHS = $\frac{1 + \frac{1}{\sin A}}{\frac{1}{\sin A}}$ $= \sin A + 1$ $= \frac{(\sin A + 1)(1 - \sin A)}{1 - \sin A}$ $= \frac{1 - \sin^2 A}{1 - \sin A}$ $= \frac{\cos^2 A}{1 - \sin A}$ = RHS	½ **1** ½ ½ ½
	OR	
28 (b)	Let 2A + B and A + 2B be acute angles such that $\sin(2A + B) = \frac{\sqrt{3}}{2}$ and tan(A + 2B) = 1. Find the value of cot(4A – 7B).	
Sol.	$\sin(2A + B) = \frac{\sqrt{3}}{2} \Longrightarrow 2A + B = 60°$ --- ① $\tan(A + 2B) = 1 \Longrightarrow A + 2B = 45°$ --- ② Solving ① & ②, we get A = 25° and B = 10° cot (4A – 7B) = cot 30° $= \sqrt{3}$	½ ½ ½ + ½ ½ ½
29.	In the adjoining figure, XY and X′Y′ are parallel tangents to a circle with centre O. Another tangent AB touches the circle at C intersecting XY at A and X′Y′ at B. Prove that AB subtends right angle at the centre of the circle; or ∠AOB = 90°.  	
Sol.	Join OC.  ΔPOA ≅ ΔCOA ∠POA = ∠COA	½ ½ ½

	Similarly, $\angle QOB = \angle COB$ $\angle POA + \angle QOB + \angle COA + \angle COB = 180°$ $\Rightarrow 2(\angle COA + \angle COB) = 180°$ $\Rightarrow \angle COA + \angle COB = 90°$ $\therefore \angle AOB = 90°$	½ ½ ½
30 (a)	Prove that $\sqrt{3}$ is an irrational number.	
Sol.	Let $\sqrt{3}$ be a rational number. $\therefore \sqrt{3} = \frac{p}{q}$, where $q \neq 0$ and let p & q be coprimes. $\Rightarrow 3q^2 = p^2$ $\Rightarrow p^2$ is divisible by 3. $\Rightarrow$ p is divisible by 3. ----- ① Let p = 3a, where 'a' is some integer $\therefore 9a^2 = 3q^2$ $\Rightarrow q^2 = 3a^2$ $\Rightarrow q^2$ is divisible by 3 $\Rightarrow$ q is divisible by 3 ----- ② $\therefore$ 3 divides both p & q. ① and ② leads to contradiction as p and q are coprimes. Hence, $\sqrt{3}$ is an irrational number.	 ½ **1** **1** ½
	OR	
30 (b)	State true or false for each of the following statements and justify in each case : (i) $2 \times 3 \times 5 \times 7 + 7$ is a composite number. (ii) $2 \times 3 \times 5 \times 7 + 1$ is a composite number.	
Sol.	(i) True, $\because 2 \times 3 \times 5 \times 7 + 7 = 7 \times (2 \times 3 \times 5 + 1)$ has more than two factors. (ii) False, $\because 2 \times 3 \times 5 \times 7 + 1 = 211$ has only two factors.	**1** ½ **1** ½

31.	Solve the following system of equations graphically : $2x + 3y = 6$ $x + y - 1 = 0$ Also, find the sum of ordinates of the points where given lines meet y axis.	
Sol.	Correct graph  Solution is (– 3, 4) or x = – 3, y = 4 Sum of ordinates of points where given lines meet y-axis = 1 + 2 = 3	**2** ½ ½
	SECTION D **This section has 4 long answer questions of 5 marks each.**	
32	State the basic proportionality theorem. Use the theorem to do the following : In △ABC, AD is the angle bisector of angle A. BA is produced to E such that CE‖AD. Prove that $\frac{BD}{DC} = \frac{BA}{AC}$.  	
Sol.	Correct statement of Basic Proportionality Theorem. As DA ‖ CE $\therefore \frac{BD}{DC} = \frac{BA}{AE}$ ---- ① ∠2 = ∠ 3 & ∠1 = ∠ 4 As ∠1 = ∠ 2 ∴ ∠3 = ∠ 4	**1** **1** ½ + ½ ½

	$\Rightarrow$ AC = AE ---- ② From ① & ② $\frac{BD}{DC} = \frac{BA}{AC}$	1 ½
33 (a)	From one of the faces of a solid wooden cube of side 14 cm, maximum number of hemispheres of diameter 1.4 cm are scooped out. Find the total number of hemispheres that can be scooped out. Also, find the total surface area of the remaining solid.	
Sol.	Total number of hemispheres = $\frac{14 \times 14}{1.4 \times 1.4}$ = 100 Total Surface Area of remaining solid = Surface Area of Cube + Curved Surface Area of 100 hemispheres – Area of 100 circles $= 6 \times 14 \times 14 + 100 \times 2 \times \frac{22}{7} \times 0.7 \times 0.7 - 100 \times \frac{22}{7} \times 0.7 \times 0.7$ = 1330 ∴ Total surface area of remaining solid is 1330 cm^2.	1 1 2 1
	OR	
33 (b)	From a solid cylinder of height 24 cm and radius 5 cm, two cones of height 12 cm and radius 5 cm are hollowed out. Find the volume and surface area of the remaining solid.	
Sol.	Volume of remaining solid = Volume of cylinder –Volume of two cones $= \frac{22}{7} \times 5 \times 5 \times 24 - 2 \times \frac{1}{3} \times \frac{22}{7} \times 5 \times 5 \times 12$ $= \frac{8800}{7}$ or 1257.14 cm^3 approx. $l = \sqrt{(12)^2 + (5)^2}$ = 13 cm Surface Area of remaining solid = Curved Surface Area of cylinder + Curved Surface Area of two cones $= 2 \times \frac{22}{7} \times 5 \times 24 + 2 \times \frac{22}{7} \times 5 \times 13$ $= \frac{8140}{7}$ or 1162.85 cm^2 approx.	 1 1 1 1 1

34.	The following table gives the daily income of 50 cab drivers of a particular city : Income (₹): 500 - 600, 600 - 700, 700 - 800, 800 - 900, 900 - 1000 No. of Drivers: 12, 14, 8, 6, 10 Find the mean income and the modal income.	

Income (₹)	500 - 600	600 - 700	700 - 800	800 - 900	900 - 1000
No. of Drivers	12	14	8	6	10

Sol.

Income (in ₹)	Number of Drivers (f_i)	x_i	$u_i = \frac{x_i - 750}{100}$	$f_i u_i$
500 – 600	12	550	– 2	– 24
600 – 700	14	650	– 1	– 14
700 – 800	8	750 = a	0	0
800 – 900	6	850	1	6
900 – 1000	10	950	2	20
Total	50			– 12

Correct table **1½**

Mean = $750 + \frac{(-12)}{50} \times 100$ **1**

= 726 **½**

∴ Mean income is ₹ 726

Modal Class is 600 – 700 **½**

Mode = $600 + \frac{14-12}{(2 \times 14 - 12 - 8)} \times 100$ **1**

= 625 **½**

∴ Modal income is ₹ 625.

35 (a) A 2-digit number is seven times the sum of its digits and two (2) more than 5 times the product of its digits. Find the number.

Sol.

Let digit at unit place be x
and digit at tens place be y
∴ number = 10y + x } **1**

ATQ

$10y + x = 7(x + y)$

⟹ $3y = 6x$ or $y = 2x$ --- ① **1**

Also, $10y + x = 5xy + 2$ --- ② **½**

from ① and ②, we get

$10x^2 - 21x + 2 = 0$ **1**

⟹ $(x - 2)(10x - 1) = 0$

∴ x = 2 **½**

So, y = 4 **½**

∴ Required number is 42. **½**

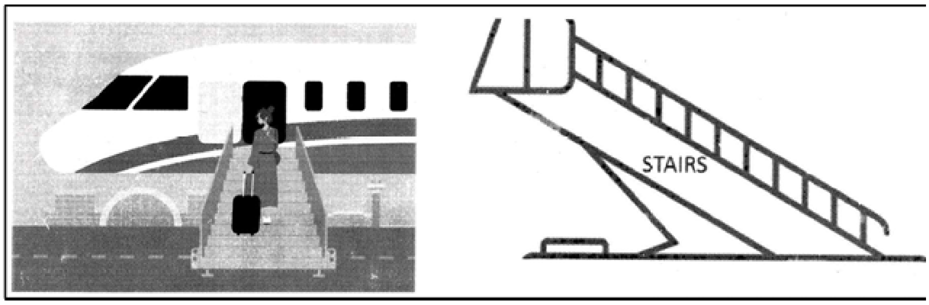
OR

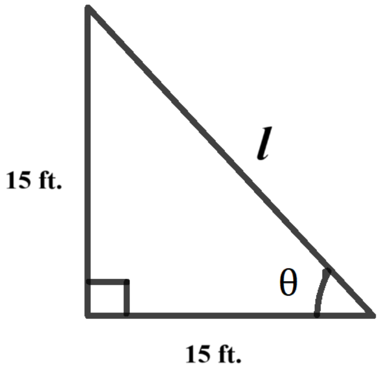
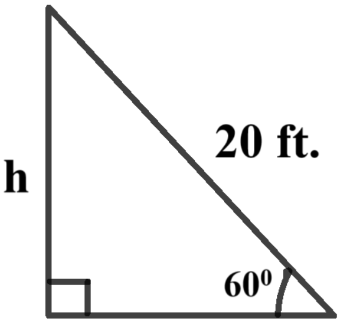
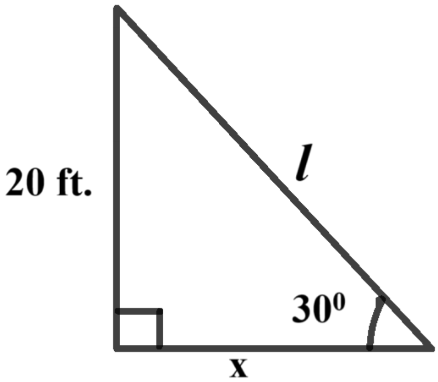
35 (b) Find the value(s) of p for which the quadratic equation given as $(p + 4)x^2 - (p + 1)x + 1 = 0$ has real and equal roots. Also, find the roots of the equation(s) so obtained.

Sol.

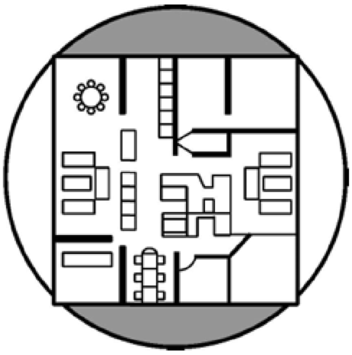
For real and equal roots, D = 0 **½**

∴ $[-(p + 1)]^2 - 4(p + 4) = 0$ **½**

	$\Rightarrow p^2 - 2p - 15 = 0$ $\Rightarrow (p - 5)(p + 3) = 0$ $\therefore p = 5, -3$ For p = 5, $9x^2 - 6x + 1 = 0$ $\Rightarrow (3x - 1)(3x - 1) = 0$ $\therefore x = \frac{1}{3}, \frac{1}{3}$ For p = – 3, $x^2 + 2x + 1 = 0$ $\Rightarrow (x + 1)(x + 1) = 0$ $\therefore x = -1, -1$ Hence roots are $\frac{1}{3}, \frac{1}{3}$ and – 1, – 1 for p = 5 and p = – 3 respectively.	 **1** **1** **1** **1**
	SECTION E **This section has 3 case study based questions of 4 marks each.**	
36.	Passenger boarding stairs, sometimes referred to as boarding ramps, stair cars or aircraft steps, provide a mobile means to travel between the aircraft doors and the ground. Larger aircraft have door sills 5 to 20 feet (1 foot = 30 cm) high. Stairs facilitate safe boarding and de-boarding.  An aircraft has a door sill at a height of 15 feet above the ground. A stair car is placed at a horizontal distance of 15 feet from the plane. Based on given information, answer the questions given in part (i) and (ii). (i) Find the angle at which stairs are inclined to reach the door sill 15 feet high above the ground. (ii) Find the length of stairs used to reach the door sill. Further, answer any **one** of the following questions : (iii) (a) If the 20 feet long stairs is inclined at an angle of 60° to reach the door sill, then find the height of the door sill above the ground. (use $\sqrt{3} = 1.732$) **OR** (iii) (b) What should be the shortest possible length of stairs to reach the door sill of the plane 20 feet above the ground, if the angle of elevation cannot exceed 30° ? Also, find the horizontal distance of base of stair car from the plane.	

Sol.		
	(i) $\tan\theta = \frac{15}{15} = 1$	½
	$\Rightarrow \theta = 45°$	½
	(ii) $\frac{15}{l} = \sin 45°$	½
	$\Rightarrow l = 15\sqrt{2}$ ft. or 21.21 ft. approx.	½
	(iii) (a)	
		
	$\frac{h}{20} = \sin 60° = \frac{\sqrt{3}}{2}$	**1**
	$\Rightarrow h = 10\sqrt{3}$	½
	$= 10 \times 1.732$	
	$= 17.32$ ft.	½
	OR	
	(iii) (b)	
		
	$\frac{20}{l} = \sin 30° = \frac{1}{2}$	½
	$\Rightarrow l = 40$ ft.	½
	$\frac{20}{x} = \tan 30° = \frac{1}{\sqrt{3}}$	½
	$\Rightarrow x = 20\sqrt{3}$ ft. or 34.64 ft. approx.	½

37. A farmer has a circular piece of land. He wishes to construct his house in the form of largest possible square within the land as shown below.



The radius of circular piece of land is 35 m.

Based on given information, answer the following questions :

(i) Find the length of wire needed to fence the entire land.

(ii) Find the length of each side of the square land on which house will be constructed.

(iii) (a) The farmer wishes to grow grass on the shaded region around the house. Find the cost of growing the grass at the rate of ₹ 50 per square metre.

OR

(iii) (b) Find the ratio of area of land on which house is built to remaining area of circular piece of land.

Sol.

(i) Length of wire = $2 \times \frac{22}{7} \times 35$ — ½

$= 220$ m — ½

(ii) Diagonal of square = 70 m — ½

Length of each side of the square land = $\frac{70}{\sqrt{2}}$ or $35\sqrt{2}$ m — ½

(iii) (a) Area on which grass is grown = Area of two segments

$= 2 \times \left[\frac{90}{360} \times \frac{22}{7} \times 35 \times 35 - \frac{1}{2} \times 35 \times 35\right]$ — **1**

$= 700$ m^2 — ½

Cost of growing the grass = 700 × 50 = ₹ 35000 — ½

OR

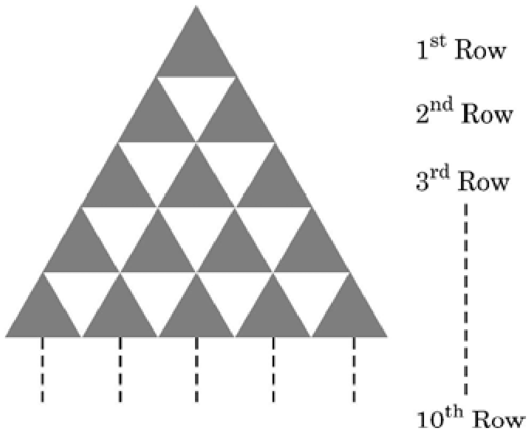
(iii) (b) Required ratio = $\frac{\text{area of square}}{\text{area of circle} - \text{area of square}}$

$= \frac{35\sqrt{2} \times 35\sqrt{2}}{\frac{22}{7} \times 35 \times 35 - 35\sqrt{2} \times 35\sqrt{2}}$ — **1½**

$= \frac{2450}{1400}$ or $\frac{7}{4}$ — ½

∴ Required ratio is 7 : 4

38. In an equilateral triangle of side 10 cm, equilateral triangles of side 1 cm are formed as shown in the figure below, such that there is one triangle in the first row, three triangles in the second row, five triangles in the third row and so on.



Based on given information, answer the following questions using Arithmetic Progression.

(i) How many triangles will be there in bottom most row ?

(ii) How many triangles will be there in fourth row from the bottom ?

(iii) (a) Find the total number of triangles of side 1 cm each till 8^{th} row.

OR

(iii) (b) How many more number of triangles are there from 5^{th} row to 10^{th} row than in first 4 rows ? Show working.

Sol. Given A.P. is 1, 3, 5, …

(i) $a_{10} = 1 + 9 \times 2 = 19$ **1**

(ii) a_4 (from bottom) $= 19 + 3 \times (-2) = 13$ **1**

(iii) (a) $S_8 = \frac{8}{2} \times [2 \times 1 + 7 \times 2]$ **1**

$= 64$ **1**

OR

(iii) (b) Number of triangles from 5^{th} row to 10^{th} row $= S_{10} - S_4$

$= \frac{10}{2} \times [2 \times 1 + 9 \times 2] - \frac{4}{2} \times [2 \times 1 + 3 \times 2]$

$= 84$ **1**

Number of triangles in first 4 rows, $S_4 = \frac{4}{2} \times [2 \times 1 + 3 \times 2]$

$= 16$ **½**

Required number of triangles $= 84 - 16 = 68$ **½**