SECTION-A

1. (b)
2. (c)
3. (a)
4. (d)
5. (c)
6. (a)
7. (c)
8. (c)
9. (d)
10. (a)
11. (10)
12. $\frac{1}{9}$
13. $\sqrt{3}$ a
14. (2)
15. (1)

OR

(1)

16. $\tan\theta = \frac{1}{\sqrt{3}} \Rightarrow \theta = 30^\circ$
17. $\frac{r_1}{r_2} = \frac{3}{1}, \frac{h_1}{h_2} = \frac{1}{3}$

Ratio of volumes $= \dfrac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = 3:1$

18. $P(\text{ consonant }) = \frac{21}{26}$
19. P (number less than 3) $= \frac{2}{6}$ or $\frac{1}{3}$

OR

$P(\text{ losing }) = 1 - 0.07$

$= 0.93$

20. $\dfrac{\frac{n(n+1)}{2}}{n} = 15$

n = 29

SECTION – B

21. $(a^2 + b^2) - (a - b)^2 = 2ab$

$(a + b)^2 - (a^2 + b^2) = 2ab$

Common difference is same.

∴ given terms are in AP

22. In Fig. 2DE||AC and DC||AP. Prove that $\frac{BE}{EC} = \frac{BC}{CP}$.

$\triangle ABC, DE \| AC, \therefore \frac{BD}{DA} = \frac{BE}{EC}$ …….. (i)

In $\triangle ABP, DC \| AP, \therefore \frac{BD}{DA} = \frac{BC}{CP}$ ………. (ii)

From (i) & (ii), $\frac{BE}{EC} = \frac{BC}{CP}$

OR

Let $\angle OPQ = \theta$

$\angle TPQ = \angle TQP = 90^\circ - \theta$

In $\triangle TPQ, 2(90^\circ - \theta) + \angle PTQ = 180^\circ$

$\angle PTQ = 2\theta$

$= 2\angle OPQ$

23. $\frac{AC}{CD} = \sin\theta \Rightarrow \sin\theta = \frac{1}{2} \Rightarrow \theta = 30^\circ$

(i) $\tan\theta = \tan 30^\circ = \frac{1}{\sqrt{3}}$

(ii) $\sec\theta + \mathrm{cosec}\theta = \sec 30^\circ + \mathrm{cosec}30^\circ$

$= \dfrac{2}{\sqrt{3}} + 2$ or $\dfrac{2(3+\sqrt{3})}{3}$

24. $2 \times \frac{22}{7} \times 1 \times \frac{60^\circ}{360^\circ} = 22$

$\mathrm{r} = 21$ cm

25. Total number of outcomes $= 7$

Favourable outcomes are $-2, -1, 0, 1, 2$, i.e., 5

$P(x^2 \leq 4) = \dfrac{5}{7}$

26.

Classes	x_i	f_i	$f_i x_i$
$3-5$	4	5	20
$5-7$	6	10	60
$7-9$	8	10	80
$9-11$	10	7	70
$11-13$	12	8	96
Total		40	326

$\bar{x} = \dfrac{\sum f_i x_i}{\sum f_i} = \dfrac{326}{40} = 8.15$

OR

Modal class: 60-80

$\mathrm{Mode} = \ell + \dfrac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h = 60 + \dfrac{12-10}{24-10-6} \times 20$

$= 60 + 5 = 65$

SECTION - C

27. $f(x) = ax^2 + bx + c$

$\alpha + \beta = -\dfrac{b}{a}, \alpha\beta = \dfrac{c}{a}$

New sum of zeroes $= \frac{1}{\alpha} + \frac{1}{\beta} = -\frac{b}{c}$

New product of zeroes $= \frac{1}{\alpha} \times \frac{1}{\beta} = \frac{a}{c}$

Required quardratic polynomial $= x^2 + \frac{b}{c}x + \frac{a}{c}$ or $(cx^2 + bx + a)$

OR

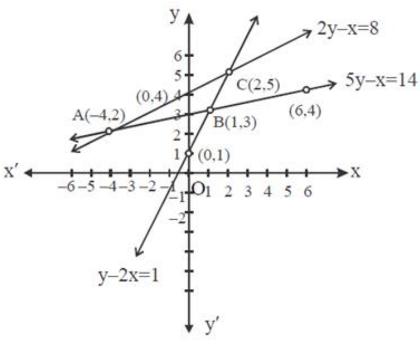
$$\begin{array}{r|l} -x^2+x-1 & -x^3+3x^2-3x+5 \;\big(\; x-2 \\ & \underline{\begin{array}{l}-x^3+x^2-x \\ + \quad - \quad + \end{array}} \\ & \quad 2x^2-2x+5 \\ & \quad \underline{\begin{array}{l}2x^2-2x+2 \\ - \quad + \quad - \end{array}} \\ & \qquad\qquad 3 \end{array}$$

Divisor $\times$ Quotient $+$ Remainder

$= (-x^2 + x - 1)(x-2) + 3$

$= -x^3 + 3x^2 - 3x + 5 =$ Dividend

28.



$2y-x=8$

x	0	2	-4
y	4	5	2

$5y-x=14$

x	1	6	-4
y	3	4	2

$y-2x=1$

x	1	2	0
y	3	5	1

Drawing 3 lines

Coordinates of the vertices of the triangle are

A$(-4,2)$, $B(1,3)$ and $C(2,5)$

OR

x − 4 is a factor of given polynomial

$$x-4\,\overline{)\,x^3-3x^2-10x+24\,}\,(x^2+x-6$$
$$\cancel{x^3}-4x^2$$
$$-\quad+$$
$$\cancel{x^2}-10x+24$$
$$\cancel{x^2}-4x$$
$$-\quad+$$
$$\cancel{-6x}+\cancel{24}$$
$$\cancel{-6x}+\cancel{24}$$
$$+\quad-$$
$$0$$

$x^2+x-6=(x+3)(x-2)$

Other than zeroes are -3 and 2.

29. Let the speed of aircraft be × km/hr

$\frac{600}{x-200}-\frac{600}{x}=\frac{30}{60}$

$\Rightarrow x^2-200x-240000=0$

$(x-600)(x+400)=0$

$x=600,-400$ (Rejected)

Speed of aircraft $=600$ km/hr

Duration of flight $=1$hr

30. ar(PQR) $=\frac{1}{2}[-5(-5-5)-4(5-7)+4(7+5)]$ sq. units

$=\frac{1}{2}[50+8+48]$ sq. units

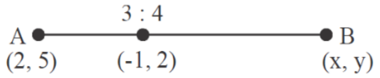
$=53$ sq. units

OR

Coordinates of C arc $\left(\frac{3x+8}{7},\frac{3y+20}{7}\right)=(-1,2)$

$\Rightarrow x=-5, y=-2$

$\therefore$ Coordinates of B are $(-5,-2)$



31. $\angle D = \angle E \Rightarrow AE = AD$

$\frac{AD}{DB} = \frac{AE}{EC} \Rightarrow DB = EC$

$\Rightarrow AD + DB = AE + EC$

$AB = AC$

Hence $\triangle$ BAC is an isosceles triangle.

32. Proof

Given: In a triangle $\triangle ABC$, let $c^2 = a^2 + b^2$, where c is the side opposite to $\angle C, a$ is opposite $\angle A$, and b is opposite $\angle B$.

To Prove: $\angle C$ is a right angle (90°).

Construction

1.Construct a second triangle, $\triangle PQR$, such that it is a right-angled triangle at Q.

2.Let the sides forming the right angle be $PQ = b$ and $QR = a$.

Comparing the Sides

1.In $\triangle PQR$ (by the Pythagorean Theorem):

$PR^2 = PQ^2 + QR^2$

$PR^2 = b^2 + a^2$

2.In $\triangle ABC$ (by the given condition):

$c^2 = a^2 + b^2$

3.Equating the two expressions for the square of the sides: Since PR^2 and c^2 are both equal to $a^2 + b^2$, we must have:

$PR^2 = c^2$

$PR = c$

Conclusion by Congruence

1.Now, compare the sides of $\triangle ABC$ and $\triangle PQR$:

$BC = QR$ (Both equal to a)

$AC = PQ$ (Both equal to b)

$\boldsymbol{AB} = PR$ (Both equal to c)

2.By the SSS (Side-Side-Side) Congruence Rule, $\triangle ABC$ is congruent to $\triangle PQR$ ($\triangle ABC \cong \triangle PQR$).

3.Since the triangles are congruent, their corresponding parts (angles) must be equal (CPCTC - Corresponding Parts of Congruent Triangles are Congruent).

$\angle C = \angle Q$

4.By construction, $\angle Q$ is a right angle ($\angle Q = 90°$).

5.Therefore,

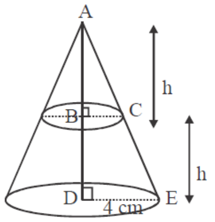
$\angle C = 90°$

33. $\sin\theta + \cos\theta = \sqrt{3} \Rightarrow (\sin\theta + \cos\theta)^2 = (\sqrt{3})^2$

$\sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = 3 \Rightarrow \sin\theta\cos\theta = 1$

L.H.S $= \tan\theta + \cot\theta = \frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta} = \frac{1}{\cos\theta\sin\theta} = 1 =$ R.H.S

34.



$\triangle$ ABC $\sim \triangle$ ADE, $\frac{h}{2h} = \frac{BC}{4}$

BC $= 2$ cm

Ratio of volumes of two parts

$$=\frac{\frac{1}{3}\pi\times 2^2\times h}{\frac{1}{3}\pi\times(2^2+4^2+2\times 4)\times h}$$

$=\frac{4}{28}=\frac{1}{7}$ or $1:7$ (accept $7:1$ also)

SECTION – D

35. Let a be any positive integer. Take $b=5$ as the divisor.

$a=5m+r, r=0,1,2,3,4$

Case-1 : $a=5m \Rightarrow a^2=25m^2=5(5m^2)=5q$

Case-2 : $a=5m+1 \Rightarrow a^2=5(5m^2+2m)+1=5q+1$

Case- 3: $a=5m+2 \Rightarrow a^2=5(5m^2+4m)+4=5q+4$

Case-4: $a=5m+3 \Rightarrow a^2=5(5m^2+6m+1)+4=5q+4$

Case-5 : $a=5m+4 \Rightarrow a^2=5(5m^2+8m+3)+1=5q+1$

Hence square of any positive integer cannot be of the form $(5q+2)$ or $(5q+3)$ for any integer q.

OR

Let n be any positive integer. Divide it by 3.

$n=3q+r, r=0,1,2$

Case-1: $n=3q$ (divisible by 3)

$n+1=3q+1, n+2=3q+2$

Case- 2: $n=3q+1 \Rightarrow n+1=3q+2, n+2=3q+3$ (divisible by 3)

Case- 3: $n=3q+2 \Rightarrow n+1=3q+3$ (divisible by 3), $n+2=3q+4$

36. Let four consecutive number be $a-3d, a-d, a+d, a+3d$

Sum $=32 \therefore 4a=32 \Rightarrow a=8$

$\frac{(a-3d)(a+3d)}{(a-d)(a+d)}=\frac{7}{15} \Rightarrow 15(64-9d^2)=7(64-d^2)$

$d^2=4 \Rightarrow d=\pm 2$

Four numbers are 2,6,10,14.

OR

$x=a_n=1+3n-3=3n-2$

$S_n=287 \Rightarrow \frac{n}{2}[1+3n-2]=287$

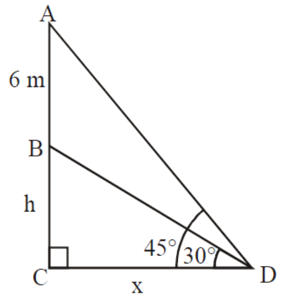
$3n^2-n-574=0$

$(n-14)(3n+41)=0 \Rightarrow n=14$

$x=3n-2=40$

37. Constructing the circles of radii 3 cm and 2 cm Constructing the tangents.

38.



$\frac{h}{x}=\tan 30^\circ$

$\Rightarrow x=h\sqrt{3}$

$\frac{6+h}{x}=\tan 45^\circ \Rightarrow 6+h=x$

$h=\frac{6}{\sqrt{3}-1}=3(\sqrt{3}+1)=3\times 2.73$ m

$=8.19$ m

39. Capacity of bucket $=\frac{1}{3}\pi\, h(r_1^2+r_2^2+r_1r_2)$

$=\frac{1}{3}\times\frac{22}{7}\times 30(10^2+20^2+10\times 20)\text{cm}^3$

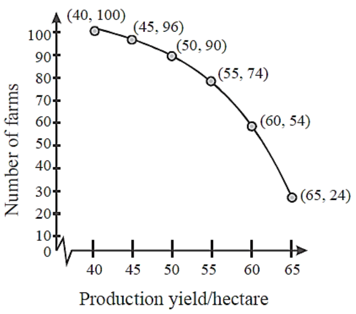
$=22000\ \text{cm}^3$

$=22l$

Cost of milk $=₹40\times 22=₹880$

40.

Production yield/hectare	**No. of forms**
More than or equal to 40	100
More than or equal to 45	96
More than or equal to 50	90
More than or equal to 55	74
More than or equal to 60	54
More than or equal to 65	24
Total	



OR

Classes	**Frequency**	**Cumulative frequency**	
0-100	2	2	
100-200	5	7	
200-300	x	7 + x	
300-400	12	19 + x	
400-500	17	36 + x	
500-600	20	56 + x	Median class
600-700	y	56 + x + y	
700-800	9	65 + x + y	
800-900	7	72 + x + y	
900-1000	4	76 + x + y	
Total	100		

$76+x+y=100 \Rightarrow x+y=24$

$500 - 600$ is the median class

$$\text{Median } = \ell + \frac{\frac{n}{2} - cf}{f} \times h$$

$$\Rightarrow 525 = 500 + \frac{50 - 36 - x}{20} \times 100$$

Solving we get, $x = 9$

From (i), $y = 15$