JINDAL SCHOOL

BASIC MATHEMATICS (241)

CLASS -10 Pre-Board-2026

SECTION-A

1. (C) 26
2. (C) -36
3. (b) 15^{0}
4. (d) ± 3
5. (a) 2
6. (c) Infinitely many solutions
7. (b) 8
8. (d) 28
9. (b) $\sqrt{41}$
10. (C) 6.4cm
11. (d) $1/\sqrt{2}$
12. (b) -1
13. (d) 22 cm
14. (C) 44 cm
15. (b) $R_1^2 + R_2^2 = R^2$
16. (a) a cone and a cylinder
17. (b) 4:3
18. (a) 3 median = mode + 2 mean
19. (a)
20. (d)

Section-B

21. no of students in section-A = 48 and in Section-B = 36

Prime factorisation method

$48 = 2^4 \times 3$ and $36 = 2^2 \times 3^2$

$\text{lcm}(48, 36) = 2^4 \times 3^2 = 144$

Hence minimum no. of books required are 144.

22.(A) In an A.P. First term $(a) = -3$

Common difference $(d) = 2^{nd}$ term $- 1^{st}$ term

$= 4 - (-3)$

$= 7$

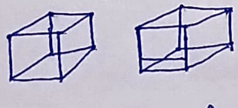
So 36^{th} term $(T_{36}) = a + (36-1)d$

$= -3 + 35(7)$

$= -3 + 245$

$= 242$

23. Two dice are thrown together.



Sample space $(S) = \{(1,1), (1,2), \ldots, (6,6)\}$

$n(S) = 6 \times 6 = 36$

E = product of the numbers is 6 in top

$= \cancel{\{(1,1), (1,2), 2,} = \{(1,6), (6,1), (2,3), (3,2)\}$

$n(E) = 4$

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{4}{36} = \frac{1}{9}$

Hence probability of getting product of two dice 6 is $\frac{1}{9}$.

22-(B) Given A.P.: $\sqrt{26}, \sqrt{48}, \sqrt{75}, \ldots$

1^{st} term $(a) = \sqrt{26}$

~~Com~~ For A.P. Common difference should be same.

i.e., $\sqrt{48} - \sqrt{26} = \sqrt{75} - \sqrt{48}$

$\Rightarrow 2\sqrt{48} = \sqrt{75} + \sqrt{26}$

$\Rightarrow 4(48) = 75 + 26 + 2\sqrt{75}\sqrt{26}$

$\Rightarrow 101 + 2 \times 5\sqrt{3}\sqrt{26} - 192 = 0$

$\Rightarrow 10\sqrt{78} - 91 = 0$

$\Rightarrow 100(78) = 91^2 = 8281$

$\Rightarrow 7800 = 8281$ (not possible)

Error in the above question

N.B. Grace '2' those has attained it.

24. $A = 30^\circ$ and $B = 60^\circ$

LHS: $\tan(B-A) = \tan(60^\circ - 30^\circ)$

$= \tan 30^\circ = 1/\sqrt{3}$

RHS: $\dfrac{\tan B - \tan A}{1 + \tan B \cdot \tan A} = \dfrac{\tan 60^\circ - \tan 30^\circ}{1 + \tan 60^\circ \cdot \tan 30^\circ}$

$= \dfrac{\sqrt{3} - 1/\sqrt{3}}{1 + \sqrt{3} \cdot 1/\sqrt{3}}$

$= \dfrac{\frac{3-1}{\sqrt{3}}}{2}$

$= 1/\sqrt{3}$

Hence LHS = RHS.

25.(A) Let $R = (x_0, y_0)$ be a point which divide the line segment joining of $(-1, 7)$ and $(4, -3)$. in 2 : 3 ratio.

By Section formula

$$x_0 = \frac{2(4) + 3(-1)}{2 + 3} = \frac{5}{5} = 1$$

and $$y_0 = \frac{2(-3) + 3(7)}{2 + 3} = \frac{15}{5} = 3$$

Hence $R(x_0, y_0) = (1, 3)$.

25.(B) Given points $A = (3, 1)$; $B = (6, 4)$ and $C = (8, 6)$.

(using distance formula)

$$AB = \sqrt{(6-3)^2 + (4-1)^2} = 3\sqrt{2}$$

$$AC = \sqrt{(8-3)^2 + (6-1)^2} = 5\sqrt{2}$$

$$BC = \sqrt{(8-6)^2 + (6-4)^2} = 2\sqrt{2}$$

Since $AB + BC = 3\sqrt{2} + 2\sqrt{2} = 5\sqrt{2} = AC$

Hence A, B and C are collinear.

Section - C

26. Suppose that $\sqrt{2} + \sqrt{3}$ is rational

then $\sqrt{2} + \sqrt{3} = \frac{p}{q}$; $HCF(p, q) = 1$

$$\Rightarrow 2 + 3 + 2\sqrt{6} = \frac{p^2}{q^2}$$

$$\Rightarrow \sqrt{6} = \frac{p^2 - 5q^2}{2q^2} \quad \text{———— (i)}$$

Again suppose $\sqrt{6}$ is irrational

$\Rightarrow \sqrt{6} = \frac{a}{b}$; $HCF(a, b) = 1$

$\Rightarrow 6 = \frac{a^2}{b^2}$

$\Rightarrow b^2 = \frac{a^2}{6}$ ——— (ii)

$\Rightarrow 6 \mid a^2$

$\Rightarrow 6 \mid a$ ——— (iii)

$\Rightarrow a = 6m$

From (ii) $6b^2 = 36m^2$

$\Rightarrow b^2 = 6m^2$

$\Rightarrow 6 \mid b^2$

$\Rightarrow 6 \mid b$ ——— (iv)

~~$\Rightarrow b = 6$~~

From (iii) & (iv) HCF $(a, b) \geq 6$

Which is contradict to our assumption.

so $\sqrt{6}$ is irrational

~~Which contradi~~ from (i) $\sqrt{6}$ irrational & $\frac{p^2 - 5q^2}{2q^2}$ is rational

Which is a contradiction.

Hence $\sqrt{2} + \sqrt{3}$ is irrational.

27.

$x - y + 1 = 0$ ——— (i)

$3x + 2y - 12 = 0$ ——— (ii)

Eqn (i) $\times 2$: $2x - 2y + 2 = 0$

Eqn (i) $\times 1$: $3x + 2y - 12 = 0$

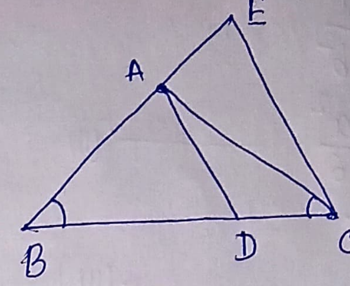
$\Rightarrow 5x - 10 = 0$

$\Rightarrow \boxed{x = 2}$

From (i) $y = x + 1$

$\Rightarrow y = 2 + 1 \Rightarrow \boxed{3 = y}$

28.(A) Given $\angle ABD = \angle ACD$



$\Rightarrow$ In ΔABD

$AB = AC$

Again $\frac{BC}{BD} = \frac{BE}{AC}$ (given)

$\Rightarrow \frac{BC}{BD} = \frac{BE}{BA}$

$\Rightarrow AD \parallel CE$ and $\angle B$ is common.

$\therefore \Delta ABD \sim \Delta EBC$

28(B) (i) Given ΔABC and ΔAED are Right angle triangle with $\angle ABC = \angle AED = 90°$

$\angle A$ is common

$\therefore$ By AA similarity criterion

$\Delta ABC \sim \Delta AED$

(ii) Corresponding sides are similar

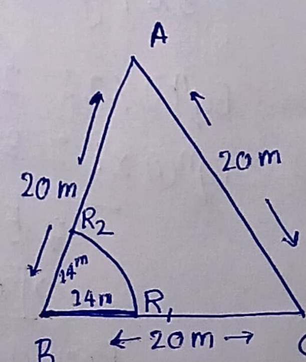
$\frac{AB}{AE} = \frac{AC}{AD}$

$\Rightarrow \boxed{AB \times AD = AC \times AE}$

29.(A)

A horse is tide with B corner.

r = length of rope = 14 m.



area of the Sector BR_1R_2

$= \frac{\theta}{360°} \times \pi r^2$

$= \frac{60°}{360°} \times \frac{22}{7} \times 14^2$

$= \frac{1}{6} \times 22 \times 14 \times 2$

$= \frac{1}{3} \times 22 \times 14 = \frac{1}{3} \times 308$

≈ 102.67 Sq.m.

ΔABC area $= \frac{1}{2} \times AB \times BC \times \sin A$

$= \frac{1}{2} \times 20 \times 20 \times \sin 60^\circ$

$= 20 \times 20 \times \frac{\sqrt{3}}{2}$

$= 100\sqrt{3}$

$\approx 100 \times 1.73$

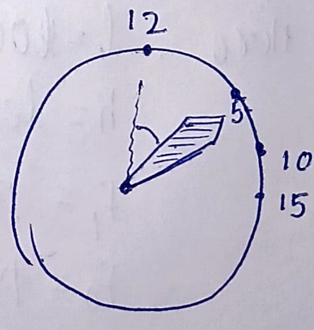
$= 173$ Sq.m.

$\therefore$ Area not gaze by horse $= ar(\Delta ABC) - ar(\text{Sector } BR_1R_2)$

$= 173 - 102.67$

$= 70.33$ Sq.m.

29.(B)



Angle make by minute hand in between 8:00 am to 8:05 am is $5 \times 6^\circ = 30^\circ$

Length of minute hand $(r) = 14$ cm

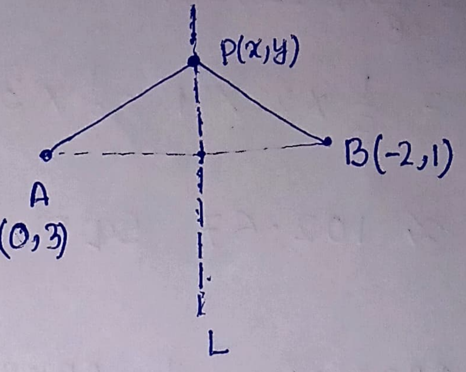
So, area swept by minute hand

$= \frac{\theta}{360^\circ} \times \pi r^2 = \frac{30^\circ}{360^\circ} \times \frac{22}{7} \pi \times 14^2$

$= \frac{30^\circ}{2^\circ} \times 14 \times 14 = 30 \times 7 \times 14$

$= 98 \times 30 = 2940$ Sq.cm

30. $P(x,y)$ any point on the line L such that $PA = PB$.



$\Rightarrow PA^2 = PB^2$

$\Rightarrow (x-0)^2 + (y-3)^2 = (x+2)^2 + (y-1)^2$

$\Rightarrow x^2 + y^2 + 9 - 6y = x^2 + y^2 + 5 + 4x - 2y$

$\Rightarrow 4x + 2y = 4$

$\Rightarrow \boxed{2x + y = 2}$

31.

marks (I)	0-20	20-40	40-60	60-80	80-100
No. of students(f)	21	25	30	24	10

The above grouped frequency distribution is inclusive

Highest frequency = 30

median class : 40-60

Here l = lower limit of the median class = 40

h = length of median class = 20

f_1 = frequency of the median class = 30

f_0 = preceeding frequency of the median class = 25

f_2 = Succeeding frequency of the median class = 24

$$\text{median} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

$$= 40 + \frac{30-25}{2 \times 30 - 25 - 24} \times 20$$

$= 40 + \frac{5}{11} \times 20$

$= 40 + \frac{100}{11}$

$\approx 40 + 9.09$

$= 49.09$

Section-D

$\boxed{32.(A)}$ Let uniform speed $= x$ km/h and time taken to cover 480 km is t hr.

Since distance = speed × time

i.e. $S = xt$

$\Rightarrow \boxed{480 = xt}$ —— (i)

ACQ $(x-8)(t+3) = 480$ —— (ii)

$\Rightarrow 3x - 8t + xt - 24 = 480$

$\Rightarrow 3x - 8t = 24$

$\cancel{\Rightarrow x = \frac{1}{3}(24+8t)} \Rightarrow \boxed{\frac{1}{8}(3x-24) = t}$

(6)

From (i) $x \cdot \frac{1}{8}(3x-24) = 480$

$\Rightarrow 3x^2 - 24x = 3840$

$\Rightarrow x^2 - 8x = 1280$

$\Rightarrow x(x-8) = 40 \times 32$

$\Rightarrow \boxed{x = 40}$ km/h. and reduced speed = 32 km/h.

(B)

$$x^3-4x^2+3x+1 = (x-2)^3$$

$$= x^3-3\times x^2\times 2+3\times x\times 2^2-2^3$$

$$\Rightarrow \boxed{2x^2-9x+9=0}$$

$$\Rightarrow 2x^2-6x-3x+9=0$$

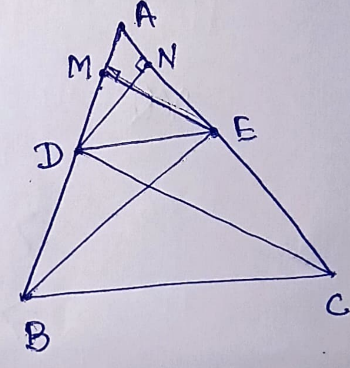
$$\Rightarrow 2x(x-3)-3(x-3)=0$$

$$\Rightarrow (2x-3)(x-3)=0$$

$$\Rightarrow \boxed{x=3/2} \text{ or } \boxed{x=3}$$

33. (Basic proportionality theorem)

If a line is drawn parallel to one side of a triangle intersecting the other sides in distinct points, then it divides the other sides in the same ratio.



Given DE ∥ BC in ΔABC.

Join CD, EB.

Draw EM ⊥ AD and DN ⊥ AE

Since $ar(\Delta ADE) = \frac{1}{2} \times AD \times EM$ —(i)

$ar(\Delta ADE) = \frac{1}{2} \times AE \times DN$ —(ii)

ΔBDE and ΔCED having same base DE and lies in between DE and BC with BC∥DE.

So $ar(\Delta BDE) = ar(\Delta CED)$

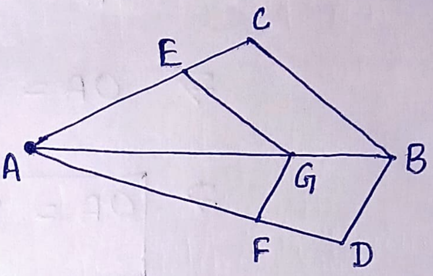
where $ar(\Delta BDE) = \frac{1}{2} \times BD \times EM$ —(iii)

$ar(\Delta CED) = \frac{1}{2} \times CE \times DN$ —(iv)

Consider $\dfrac{ar(\triangle ADE)}{ar(\triangle BDE)} = \dfrac{ar(\triangle ADE)}{ar(\triangle CED)}$

$\Rightarrow \dfrac{\frac{1}{2} \times AD \times EM}{\frac{1}{2} \times BD \times EM} = \dfrac{\frac{1}{2} \times AE \times DN}{\frac{1}{2} \times CE \times DN}$

$\Rightarrow \boxed{\dfrac{AD}{BD} = \dfrac{AE}{CE}}$



In this figure

$EG \parallel CB$ in $\triangle ACB$

By BPT, $\dfrac{AE}{EC} = \dfrac{AG}{GB}$ ——— (i)

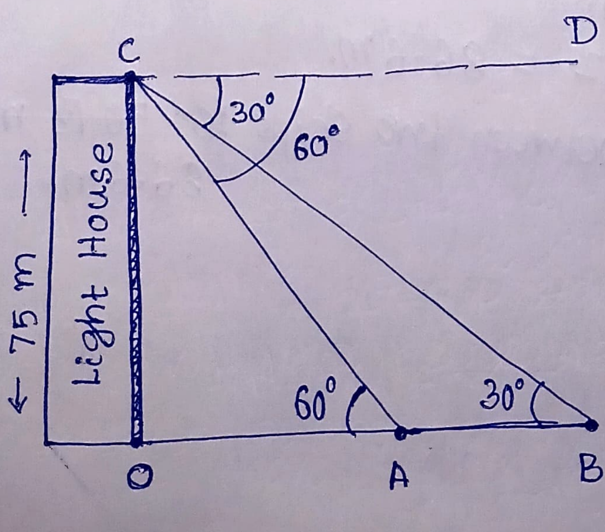
Again $FG \parallel DB$ in $\triangle ABD$

By BPT, $\dfrac{AF}{FD} = \dfrac{AG}{GB}$ ——— (ii)

From (i) and (ii)

$\dfrac{AE}{EC} = \dfrac{AF}{FD}$

34.



The angle of depression with two ships are respectively 60° and 30° as shown in the figure.

OC = Height of the light house = 75 m.

$CD \parallel OB$.

So, $\angle OBC = \angle DCB = 30^\circ$

$\angle OAC = \angle DCA = 60^\circ$

In ΔOAC, $\frac{OC}{OA} = \tan 60^\circ$

$\Rightarrow OA = \frac{75}{\sqrt{3}}$ m.

$\Rightarrow \boxed{OA = \cancel{225}\ \frac{75}{3}\sqrt{3} \text{ m.}}$

In ΔOBC, $\frac{OC}{OB} = \tan 30^\circ$

$\Rightarrow \boxed{OB = \frac{75}{1/\sqrt{3}} = 75\sqrt{3} \text{ m}}$

$\therefore AB = OB - OA$

$= 75\sqrt{3} - \frac{75}{3}\sqrt{3} = 75\sqrt{3} - 25\sqrt{3}$

$= 50\sqrt{3}$ m

$\approx 50 \times 1.732 = 86.6$ m.

Hence distance between two ships ~~is~~ ~~$50\sqrt{3}$ m.~~ 86.6 m.

Section-D

35.(A)

Life time (hr) (I)	No. of lamps (f)	x	$x-a$	$u=\frac{x-a}{h}$	uf
1500-2000	14	1750	-1000	-2	-28
2000-2500	56	2250	-500	-1	-56
2500-3000	60	2750	0	0	0
3000-3500	86	3250	500	1	86
3500-4000	74	3750	1000	2	148
4000-4500	62	4250	1500	3	186
4500-5000	48	4750	2000	4	192

Let assumed mean (a) = 2750

h = length of interval = 500

$\therefore \Sigma uf = -28 - 56 + 0 + 86 + 148 + 186 + 192$

$= 528$

$\Sigma f = 14 + 56 + 60 + 86 + 74 + 62 + 48$

$= 400$

$\therefore$ By step-deviation method

$$\text{mean } (\bar{x}) = a + \frac{\Sigma uf}{\Sigma f} \times h$$

$$= 2750 + \frac{528}{400} \times 500$$

$$= 2750 + 132 \times 5 = 2750 + 660$$

$$= 3410$$

35.(B)

Given data

Age (in years)	No. of policy holders (f)	cumulative Frequency (cf)
15-20	2	2
20-25	4	6
25-30	18	24
30-35	21	45
35-40	33	78 ←
40-45	11	89
45-50	3	92
50-55	6	98
55-60	2	100

Here $N = \Sigma f = 100 \Rightarrow \frac{N}{2} = 50$

$\Rightarrow$ Median class: $\left(\frac{N}{2}\right)^{th}$ cumulative frequency correspond

: 35-40

l = lower limit of the median class = 35

f = frequency of the median class = 33

c_f = preceding cumulative frequency of the ~~medih~~ class = 45

h = length of the median class = 5

$\therefore$ median $= l + \frac{\frac{N}{2} - c_f}{f} \times h$

$= 35 + \frac{50-45}{33} \times 5$

$= 35 + \frac{25}{33}$

$\approx 35 + 0.75$

$= 35.75$

Section-E

$\boxed{36.}$ Houses are numbered from 1 to 49.

(i) No. of housed on "maplewood Avenue" is 49.

(ii) First term of the A.P(a) = 1
common difference (d) = 1

(iii) (A) Sum of all house numbers

$S_{49} = \frac{49}{2}[2a + (49-1)d]$

$= \frac{49}{2}[2(1) + 48(1)]$

$= 49 \times 25$

$= 1225$

(iii) (B) House numbers between 15 and 30 are

16, 17, 18, ..., 29.

Sum of its $= S_{29} - S_{16}$

$= \frac{29}{2}[2a + 28d] - \frac{16}{2}[2a + 15d]$

$= \frac{29}{2}[2 + 28] - \frac{16}{2}[2 + 15]$

$= 29 \times 15 - 8 \times 17$

$= 435 - 136$

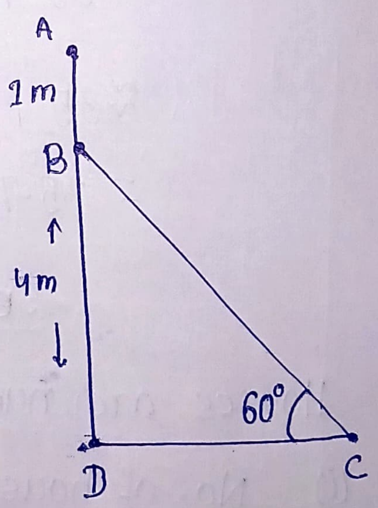
$= 299$

37. Height of the pole $= AB = 5m$

$BD = 4m$.

Angle between ladder and land

$= \angle DCB = 60°$



(i) $\sin 60° = \frac{BD}{BC}$

$\Rightarrow BC = \frac{4}{\sqrt{3}/2} = \frac{8}{\sqrt{3}}$

$\therefore$ length of the ladder is $\frac{8}{\sqrt{3}}$ m.

(ii) (A) $\tan 60^\circ = \frac{BD}{CD}$

$\Rightarrow CD = \cancel{4\times}\frac{BD}{\tan 60^\circ} = \frac{4}{\sqrt{3}}$

Hence Distance between foot of the ladder & foot of the pole $= 4/\sqrt{3}$ m.

(B) If $DC = 4m$, $DB = 4m$

then $BC = \sqrt{DC^2 + DB^2}$

$= \sqrt{4^2 + 4^2}$

$= 4\sqrt{2}$ m

Hence length of the ladder should be $4\sqrt{2}$ m.

38. Given no of buses $(\Sigma f) = 50$ (Inclusive Data)

(i)

Distance (x)	No. of Buses (f)	cf
100-120	12	12
120-140	14	26
140-160	8	34
160-180	6	40
180-200	10	50

Here $N = \Sigma f = 50$

$\frac{N}{2} = 25$

Here median class: 120-140

l = lower limit of the median class = 120

h = length of the interval = 20

c_f = cumulative frequency of the preceding median class = 12

f = frequency of the median class = 14

(ii) Highest frequency = 14

$\therefore$ modal class: 120-140

(ii) (A) median $= l + \dfrac{\frac{N}{2} - C_f}{f} \times h$

$= 120 + \dfrac{25-12}{14} \times 20$

$= 120 + \dfrac{13}{7} \times 10$

$\approx 120 + 18.57$

$= 138.57$

(B)

I	f	x	x-a	$u=\frac{x-a}{h}$	uf
100-120	12	110	-40	-2	-24
120-140	14	130	-20	-1	-14
140-160	8	150	0	0	0
160-180	6	170	20	1	6
180-200	10	190	40	2	20

assumed mean (a) = 150

h = length of interval = 20

$\Sigma uf = -24 - 14 + 0 + 6 + 20 = -12$

$\Sigma f = 50$

$\therefore \bar{x} = a + \dfrac{\Sigma uf}{\Sigma f} \times h = 150 + \dfrac{-12}{50} \times 20$

$= 150 - \dfrac{24}{5} = 150 - 4.8 = 145.2$