Maths Solution

[Sec-B]

25) $3x^2 - x - 4$

-12 : -4, $+3$

$p(x) = 3x^2 - x - 4 = 0$

$\therefore 3x^2 - 4x + 3x - 4 = 0$

$x(3x-4) + 1(3x-4) = 0$

$\therefore (3x-4)(x+1) = 0$

$\therefore 3x - 4 = 0$ $\quad\quad$ $\therefore x + 1 = 0$

$\therefore 3x = 4$ $\quad\quad$ $\boxed{x = -1}$

$\boxed{x = \frac{4}{3}}$

$\Rightarrow$ The zeroes of $p(x)$ are $\frac{4}{3}$ & -1

26) $\frac{-8}{3}$ & $\frac{4}{3}$

Let α & β are the zeroes of $p(x)$

$\alpha + \beta = \frac{-b}{a} = \frac{-8}{3}$

$\alpha \cdot \beta = \frac{c}{a} = \frac{4}{3}$

Let, K be any non-zero real number.

$a = 3K$, $b = 8K$, $c = 4K$

$p(x) = ax^2 + bx + c$

$= 3Kx^2 + 8Kx + 4K$

$\boxed{= K(3x^2 + 8x + 4)}$

27) $6x^2 - x - 2 = 0$

$$\underset{-4\ \ +3}{-12}$$

$p(x) = 6x^2 - x - 2 = 0$

$\therefore 6x^2 - 4x + 3x - 2 = 0$

$\therefore 2x(3x-2) + 1(3x-2) = 0$

$\therefore (3x-2)(2x+1) = 0$

$\therefore 3x - 2 = 0$ $\therefore 2x + 1 = 0$

$3x = 2$ $2x = -1$

$\boxed{\therefore x = \frac{2}{3}}$ $\boxed{x = \frac{-1}{2}}$

28) 11^{th} term of AP : $-3, -\frac{1}{2}, 2, \ldots$

$a = -3$

$d = \frac{-1}{2} + 3 = \frac{-1+6}{2} = \frac{5}{2}$

$n = 11$

n^{th} term:

$a_n = a + (n-1)d$

$a_{11} = -3 + (11-1)(5/2)$

$= -3 + \cancel{10}^{5} \times \frac{5}{\cancel{2}}$

$= -3 + 25$

$\boxed{= 22}$

29) Odd number between 0 & 50

AP : 1, 3, 5, ... 49.

$a = 1$

$d = 3 - 1 = 2$ $\qquad a_n = 49$

$S_n = ?$

n^{th} term is given by,

$a_n = a + (n-1)d$

$\therefore 49 = 1 + (n-1)2$

$\therefore 49 - 1 = (n-1)2$

$48 = (n-1)2$

$\therefore \frac{48}{2} = n - 1$

$24 = n - 1$

$24 + 1 = n$

$\boxed{n = 25}$

$S_n = \frac{n}{2}[a + a_n]$

$S_{25} = \frac{25}{2}[1 + 49]$

$= \frac{25}{\cancel{2}}[\cancel{50}^{25}]$

$= 25 \times 25$

$\boxed{= 625}$

30) $A(-5, 7)$ & $B(-1, 3)$

$A(x_1, y_1) = A(-5, 7)$

$B(x_2, y_2) = B(-1, 3)$

<u>Distance</u> <u>Formula</u>

$$AB = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

$$= \sqrt{(-5+1)^2 + (7-3)^2}$$

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

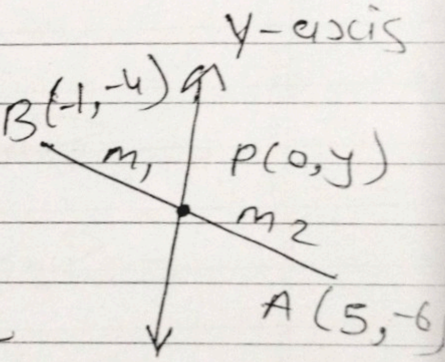
$$= \sqrt{16+16}$$

$$= \sqrt{32}$$

$$= \sqrt{2 \times 16}$$

$$\boxed{AB = 4\sqrt{2}}$$

31) $A(x_1, y_1) = A(5, -6)$
$B(x_2, y_2) = B(-1, -4)$
$P(x, y) = P(0, y)$



Let m_1 & m_2 be the ratio, in which y-axis divides AB.

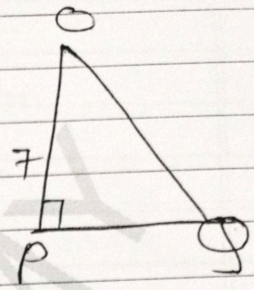
$$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}$$

$$\therefore 0 = \frac{m_1(-1) + m_2(5)}{m_1 + m_2}$$

$$0 = m_1(-1) + m_2(5)$$
$$0 = -m_1 + 5m_2$$
$$m_1 = 5m_2$$

$$\therefore \frac{m_1}{m_2} = \frac{5}{1}$$
$$\therefore m_1 : m_2 = 5:1$$

32) ΔOPQ,
right angled at P
$OP = 7\,cm$
$OQ - PQ = 1\,cm$ ---- (i)
$\sin Q$ & $\cos Q$



$\Rightarrow \sin Q = \frac{OP}{OQ} = \frac{7}{OQ}$

$\Rightarrow \cos Q = \frac{PQ}{OQ}$

$\sin^2 Q + \cos^2 Q = 1$

$\left(\frac{7}{OQ}\right)^2 + \left(\frac{PQ}{OQ}\right)^2 = 1$

$\frac{49}{OQ^2} + \frac{PQ^2}{OQ^2} = 1$

$\frac{49 + PQ^2}{OQ^2} = 1$

$49 + PQ^2 = OQ^2$
$49 = OQ^2 - PQ^2$
$49 = (OQ - PQ)(OQ + PQ)$
$49 = 1(OQ + PQ)$
$\therefore OQ + PQ = 49$ ---- (ii)

$OQ - \cancel{PQ} = 1$
$OQ + \cancel{PQ} = 49$

$2OQ = 50$
$OQ = \frac{50}{2}$

$\boxed{\therefore OQ = 25}$

$$= 1$$

$$\Rightarrow OQ - PQ = 1$$

$$25 - PQ = 1$$

$$25 - 1 = PQ$$

$$\boxed{PQ = 24}$$

$$\sin Q = \frac{7}{OQ} \boxed{= \frac{7}{25}}$$

$$\cos Q = \frac{PQ}{OQ} \boxed{= \frac{24}{25}}$$

33) $$RHS = \sin 60 \cdot \cos 30 - \cos 60 \cdot \sin 30$$

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

$$= \frac{3}{4} - \frac{1}{4} = \frac{3-1}{4} = \frac{2}{\cancel{4}}$$

$$\sin 2x \boxed{= \frac{1}{2}}$$

$$\Rightarrow \sin 30^\circ = \frac{1}{2}$$

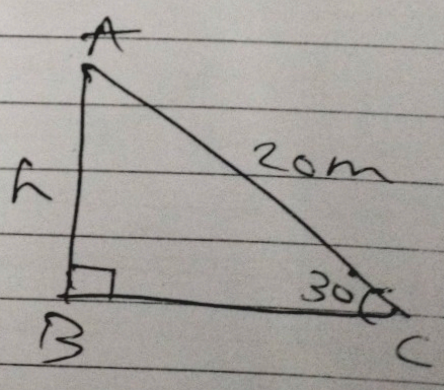
So, $2x = 30$

$$x = \frac{30}{2} \boxed{= 15}$$

34) AC = 20m = length of rope

$AB = h$

$\angle C = 30^\circ$



$$\Rightarrow \sin C = \frac{AB}{AC}$$

$$\sin 30^\circ = h$$

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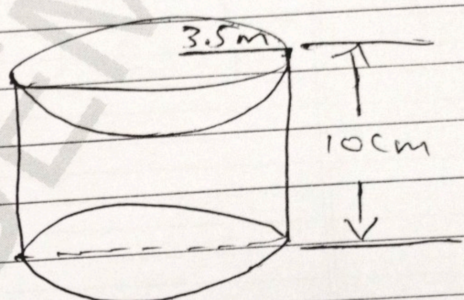
$\therefore \frac{1}{2} = \frac{h}{20}$

$\therefore \frac{20}{2} = h$

$10 = h$

$\boxed{h = 10m}$

35) Cylinder



$r = 3.5cm$

$h = 10cm$

Hemi-Sphere

$r = 3.5cm$

T.S.A of article

$= C.S.A$ of cylinder $+ 2 \times C.S.A$ of Hemi-Sphere

$= 2\pi rh + 2 \times 2\pi r^2$

$= 2\pi r (h + 2r)$

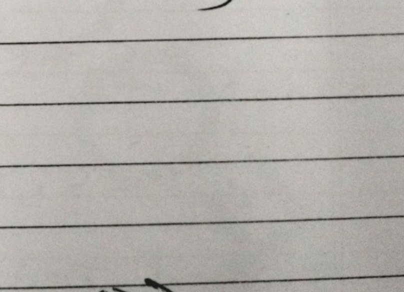
$= \cancel{2} \times \frac{22}{\cancel{7}} \times \cancel{3.5}^{0.5} (10 + 2 \times 3.5)$

$= 22 (10 + 7)$

$= 22 (17)$

$\boxed{T.S.A = 374 cm^2}$

36) Cylinder



$h = 2.1m$

$d = 4m$

$r = 2m$

Cone $\cancel{r = 2m}$

$L = 2.8m$

10th

$\Rightarrow$ Area of Canvas = C.S.A of Cylinder + C.S.A of Cone

$= 2\pi rh + \pi rl$

$= \pi r(2h + l)$

$= \frac{22}{7} \times 2\,(2 \times 2.1 + 2.8)$

$= \frac{22 \times 2}{7}\,(4.2 + 2.8)$

$= \frac{22 \times 2}{\cancel{7}} \times \cancel{7}0$

$= 44 m^2$

25.

37) $\bar{x} = 25.857$

$\Sigma f_i d_i = 120$

$\Sigma f_i = 140$

$a = ?$

$\bar{x} = a + \frac{\Sigma f_i d_i}{\Sigma f_i}$

$\therefore 25.857 = a + \frac{\cancel{120}^{6}}{\cancel{140}_{7}}$

$25.857 = a + \frac{6}{7}$

$\therefore 25.857 - \frac{6}{7} = a$

$\therefore 180.999 - 6 = a$

$\therefore \frac{181 - 6}{7} = a$

$\frac{175}{7} = a$

$\therefore a = 25$

Sec-C

38)

$$x + 2y - 4 = 0 \quad \text{--- (i)}$$
$$2x + 4y - 12 = 0 \quad \text{--- (ii)}$$

$a_1 = 1 \qquad b_1 = 2 \qquad c_1 = -4$

$a_2 = 2 \qquad b_2 = 4 \qquad c_2 = -12$

$$\frac{a_1}{a_2} = \frac{1}{2}$$

$$\frac{b_1}{b_2} = \frac{\cancel{2}}{\cancel{4}} = \frac{1}{2}$$

$$\frac{c_1}{c_2} = \frac{\cancel{-4}}{\cancel{-12}} = \frac{1}{3}$$

$$\therefore \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

$\therefore$ Two lines are parallel.

$\Rightarrow$ The rail tracks will not cross each other.

39) Let, the cost of 1 bat be x ₹ & 1 ball be y ₹

$$7x + 6y = 3800 \quad \text{--- (i)} \quad \times 5$$
$$3x + 5y = 1750 \quad \text{--- (ii)} \quad \times 6$$

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$$35x + 30y = 19000$$
$$\underline{\overset{-}{18x} + \overset{-}{30y} = \overset{-}{10500}}$$
$$17x = 8500$$

$$x = \frac{8500}{17}$$ $$\boxed{x = 500 ₹}$$

Eq.(i) $7x + 6y = 3800$

$\therefore 7(500) + 6y = 3800$

$3500 + 6y = 3800$

$6y = 3800 - 3500$

$6y = 300$

$y = \frac{300}{6}$

$\boxed{y = 50 ₹}$

Bat is 500 ₹

Ball is 50 ₹

40) ~~AP~~ 24, 21, 18 . . . . is 78?

$n = ?$ $S_n = 78$

$a = 24$

$d = 21 - 24 = -3$

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

$$78 = \frac{n}{2}(2(24) + (n-1)(-3)]$$

$$78 \times 2 = n\,[48 - 3n + 3]$$

$$156 = n\,[51 - 3n]$$

$\therefore 156 = 51n - 3n^2$

$3n^2 - 51n + 156 = 0$

$n^2 = 17n + 52 = 0$

$\therefore n(n-13) - 4(n-13) = 0$

$(n-13) \quad (n-4) = 0$

52

-12 -4

$n - 13 = 0$ $\quad$ $n - 4 = 0$

$\boxed{n = 13}$ $\quad$ $\boxed{n = 4}$

41) $A(x_1 y_1) = A(-2, -2)$

$B(x_2 y_2) = B(2, -4)$

$P(x, y) = ?$

$A(x_1 y_1) \quad P(x, y) \quad B(x_2 y_2)$

$AP = \frac{3}{7} AB$

$\frac{AP}{AB} = \frac{3}{7}$

$\frac{AP}{AP + PB} = \frac{3}{7}$

$\frac{AP + PB}{AP} = \frac{7}{3}$

$\cancel{\frac{AP}{AP}} + \frac{PB}{AP} = \frac{7}{3}$

$\frac{PB}{AP} = \frac{7}{3} - 1$

$\frac{PB}{AP} = \frac{7-3}{3}$

$= \frac{4}{3}$

$\frac{AP}{PB} = \frac{3}{4}$ $\quad \therefore m_1 : m_2 = 3 : 4$

$$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}$$

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

$$= \frac{6-8}{7}$$

$$\boxed{x = \frac{-2}{7}}$$

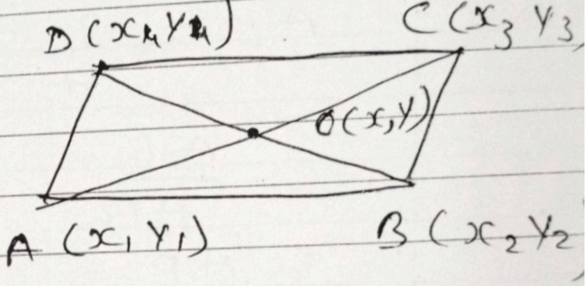
$$y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$$

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

$$= \frac{-12-8}{7}$$

$$\boxed{y = \frac{-20}{7}}$$

42) $A(x_1\ y_1) = A(1,2)$
$B(x_2\ y_2) = B(2,4)$
$C(x_3\ y_3) = C(5,9)$
$D(x_4, y_4) = ?$



O is a mid-point of AC

$$x = \frac{x_1 + x_3}{2} = \frac{1+5}{2} = \frac{6}{2} = 3$$

$$y = \frac{y_1 + y_3}{2} = \frac{2+9}{2} = \frac{11}{2}$$

$O(x, y) = O(3, 11/2)$

Also, O is mid-point of BD.

$$x = \frac{x_2 + x_4}{2}$$

$$3 = \frac{2 + x_4}{2}$$

$$6 = 2 + x_4$$

$$6 - 2 = x_4$$

$$4 = x_4$$

$$y = \frac{y_2 + y_4}{2}$$

$$\frac{11}{2} = \frac{4 + y_4}{2}$$

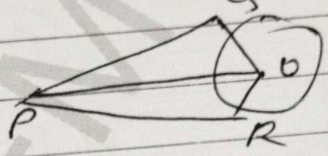
$$\frac{11}{\cancel{2}} \times \cancel{2} = 4 + y_4$$

$$\therefore 11 - 4 = y_4$$

$$7 = y_4 \quad \boxed{y_4 = 7}$$

43) **Given** : P is a point lying in the exterior of a circle with centre O. tangents from P to the circle touch the circle at Q & R

prove : PQ = PR



proof : join OP, OQ & OR

According to theorem 10.1, ∠PQO & ∠PRO are right angles as they are the angles formed by tangents & radii through points of contacts.

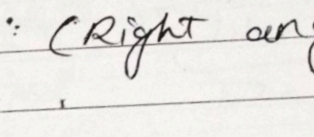
In △PQO & △PRO
PO = PO (Common side)
QO = RO (Radii of same circle)
∠PQO = ∠PRO = 90° (Right angles)

By RHS
△PQO ≅ △PRO.

$\boxed{PQ = PR}$ (CPCT)

Hence proved

44) AO = 13cm
OP = 12cm
AB = chord of bigger circle.



⇒ △APO is a right angle triangle. where ∠P = 90°.

Applying Pythagoras Theorem

$AD^2 = AP^2 + OP^2$

$(13)^2 = AP^2 + (12)^2$

$169 = AP^2 + 144$

$169 - 144 = AP^2$

$25 = AP^2$

$\boxed{AP = 5\,cm}$

$AB = 2 \times AP$

$= 2 \times 5$

$\boxed{AB = 10\,cm}$

45)

Class	Frequency
5-15	2
15-25	3
25-35	~~f~~ f_0
35-45	7 f_1
45-55	4 f_2
55-65	2
65-75	2

Modal class : 35-45

$l = 35$

$h = 10$

$$Z = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

$$\therefore 39 = 35 + \left(\frac{7 - f}{2(7) - f - 4}\right) \times 10$$

$$39 - 35 = \left(\frac{7 - f}{14 - f - 4}\right) \times 10$$

$$4 = \frac{70 - 10f}{10 - f}$$

$4(10 - f) = 70 - 10f$

$40 - 4f = 70 - 10f$

$10f - 4f = 70 - 40$

$6f = 30$

$f = 30/6$

$\boxed{f = 5}$

46) Outcomes $= 2^n = 2^3 = 8$

possible $= [H,H,H]\ (H,H,T]\ (H,T,T]$
$[T,T,T]\ [T,T,H]\ [T,H,H]$
$[H,T,H]\ (T,H,T]$

1) p(At least two heads)

$p(A)\ \frac{\text{No. of outcomes}}{\text{total no. of outcomes}} = \frac{4}{8}\ \boxed{= \frac{1}{2}}$

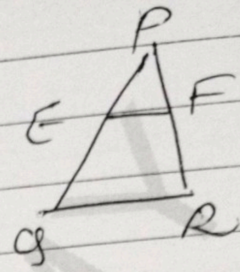
2) p(Exactly two heads)

$p(B) = \frac{\text{No. of outcomes}}{\text{Total no. of outcomes}}\ \boxed{= \frac{3}{8}}$

3) p (At most one head)

$p(C) = \frac{\text{No. of outcomes}}{\text{total no. of outcomes}} = \cancel{\frac{4}{8}}\ \boxed{= \frac{1}{2}}$.

Sec-D



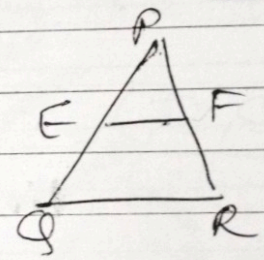
47) (i) $PE = 3.9$ cm,
$EQ = 3$ cm
$PF = 3.6$ cm &
$FR = 2.4$ cm

$\frac{PE}{EQ} = \frac{3.9}{3} = 1.3$

$\frac{PF}{FR} = \frac{\cancel{3.6}^{0.3}}{\cancel{2.4}_{0.2}} = \frac{3}{2} = 1.5$

$\frac{PE}{EQ} \neq \frac{PF}{FR}$ Hence proved

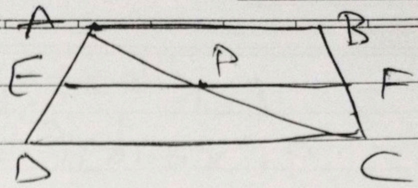
(ii) $PQ = 1.28$ cm,
$PR = 2.56$ cm
$PE = 0.18$ cm &
$PF = 0.36$ cm



$\frac{PE}{PQ} = \frac{0.18}{1.28} = \frac{\cancel{18}^{9}}{\cancel{128}_{64}} = \frac{9}{64}$

$\frac{PF}{PR} = \frac{0.36}{2.56} = \frac{\cancel{36}}{\cancel{256}} = \frac{9}{64}$

$\frac{PE}{PQ} = \frac{PF}{PR}$.



48) given : □ABCD is a trapezium
AB || CD
EF || AB.

To prove : $\frac{AE}{ED} = \frac{BF}{FC}$

Proof : join AC, which intersect EF at P.

In △ADC.
⇒ EF || AB & AB || CD
∈
According to BPT, $\frac{AE}{ED} = \frac{AP}{PC}$ — (i)

In △ABC,
EF || AB (given)
PF || AB
⇒ According to BPT, $\frac{FC}{BF} = \frac{PC}{AP}$

$\therefore \frac{BF}{FC} = \frac{AP}{PC}$ — (ii)

From eq.(i) & (ii)

$\frac{AF}{ED} = \frac{BF}{FC}$ / Hence proved

49) Let Dhyey scored x marks

$9(x+10) = x^2$

$9x + 90 = x^2$

$0 = x^2 - 9x - 90$

$\therefore x^2 - 15x + 6x - 90 = 0$

$(x-15)(x+6) = 0$

-90: -15, $+6$

$\therefore x - 15 = 0$ $\quad$ $x + 6 = 0$

$\boxed{x = 15}$ $\quad$ $\boxed{x = -6}$

50) $S_7 = 49$ & $S_{17} = 289$

$S_n = ?$

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

$S_7 = \frac{7}{2}[2a + (7-1)d]$

$\frac{\cancel{49}^{7} \times 2}{\cancel{7}} = 2a + 6d.$

$7 \times 2 = 2(a + 3d)$

$\frac{7 \times \cancel{2}}{\cancel{2}} = a + 3d$

$7 = a + 3d$

$a + 3d = 7$ --- (i)

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

$S_{17} = \frac{17}{2}[2a + (17-1)d]$

$289 = \frac{17}{2}[2a + 16d]$

$\frac{\cancel{289}^{17} \times 2}{\cancel{17}} = 2a + 16d.$

$\therefore 17 \times 2 = 2(a+8d)$

$\frac{17 \times \cancel{2}}{\cancel{2}} = a + 8d$

$17 = a + 8d$

$\therefore a + 8d = 17$ ---- (ii)

$\cancel{a} + 8d = 17$
$\cancel{a} \pm 3d \mp 7$

$5d = 10$

$d = \frac{10}{5}$

$\boxed{d = 2}$

Eq(i) $a + 3d = 7$

$a + 3(2) = 7$

$a + 6 = 7$

$a = 7 - 6$

$\boxed{a = 1}$

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

$= \frac{n}{2}[2(1) + (n-1)2]$

$= \frac{n}{2}[\cancel{2} + 2n - \cancel{2}]$

$= \frac{n}{\cancel{2}} \cancel{2}n$

$\boxed{S_n = n^2}$

51)

No.of days	fi	xi	di	fidi
0-6	11	3	-14	-154
6-10	10	8	-9	-90
10-14	7	12	-5	-35
14-20	4	17 = a	0	0
20-28	4	24	7	28
28-38	3	33	16	48
38-40	1	39	22	22
	40			-181

$$\bar{x} = a + \frac{\Sigma f_i d_i}{\Sigma f_i}$$

$$= 17 + \left(\frac{-181}{40}\right)$$

$$= 17 - 4.525$$

$$= 12.475$$

$$\boxed{\simeq 12.48}$$

52)

weight (in Kg)	fi	cf
40-45	2	2
45-50	3	5
50-55	8	13 cf
55-60	16 f	19
60-65	6	25
65-70	3	28
70-75	2	30

$n = 30$

$\frac{n}{2} = 15$

$l = 55 \quad , \quad h = 5$

$= l + \left(\frac{\frac{n}{2} - cf}{f} \right) \times h$

$= 55 + \left(\frac{15 - 13}{6} \right) \times 5$

$= 55 + \left(\frac{2}{\cancel{6}_3} \right) \times 5$

$= 55 + \frac{5}{3}$

$= 55 + 1.67$

$\boxed{M = 56.67 kg}$

53) (a) Total $= 100$

No. of good trousers $= 73$

Minor defects $= 12$

Major defects $= 15$

(1) $P(A) = P($trousers acceptable to Nityaraj$)$

$= \frac{\text{No. of good trousers}}{\text{Total no. of trousers}}$

$= \frac{73}{100}$ $\boxed{= 0.73}$

(2) $P(B) = P($trousers acceptable to Gopal$)$

$= \frac{\text{No. of trousers which do not have major defects}}{\text{Total no. of trousers.}}$

$= \frac{73 + 12}{100} = \frac{85}{100}$ $\boxed{= \frac{17}{20}}$

53) b $p(A) = p$ (vrunda winning the match)
$= 0.62$

$p(\bar{A}) = p$ (vida winning the match)
$= 1 - p(A)$
$= 1 - 0.62$
$= 0.38$

54) No. of triangles $= 8$
No. of blue triangles $= 3$
Red triangles $= 8 - 3 = 5$

No. of squares $= 10$
No. of blue squares $= 6$
red squares $= 10 - 6 = 4$

Total no. of pieces $= 8 + 10 = 18$.

1) $p(\text{triangle}) = \dfrac{\text{No. of triangles}}{\text{total no. of pieces}}$

$= \dfrac{\cancel{8}}{\cancel{18}} = \boxed{\dfrac{4}{9}}$

2) $P(\text{Square}) = \dfrac{\text{No. of Square}}{\text{total no. of pieces}}$

$= \dfrac{\cancel{10}}{\cancel{18}} = \boxed{\dfrac{5}{9}}$.

3) $P(\text{blue square}) = \dfrac{\text{No. of blue squares}}{\text{total no. of pieces}}$

$= \dfrac{\cancel{6}}{\cancel{18}} = \boxed{\dfrac{1}{3}}$

(4) $p(\text{red triangles}) = \dfrac{\text{No. of red triangles}}{\text{total no. of pieces}}$

$$\boxed{= \frac{5}{18}}$$