Probability & Stats.

Section-A :-

Q.1 (c) mid-points of classes
Q.2 (a) 70
Q.3 (c) 30
Q.4 (b) 12
Q.5 [redacted] = 25/36 (d)
Q.6 (c) 3/23.
Q.7 (a) 0.0001
Q.8 [redacted] (C) 30
Q.9 (d) A is false, R is true
Q.10 ~~My answer~~ (c) A is true, R is false

Section-B -

Q.11(a) $P(\text{Blue}) = \frac{1}{5}$ $P(\text{Black}) = \frac{1}{4}$ Green = 11

Total = ?

$P(\text{Elementary}) = 1$

$P(\text{Blue}) + P(\text{Black}) + P(\text{Green}) = 1$

$\frac{1}{5} + \frac{1}{4} + P(G) = 1$

$\frac{4+5}{20} + P(G) = 1$

$P(G) = \frac{1}{1} - \frac{9}{20}$

$P(G) = \frac{20-9}{20}$

$\left[P(G) = \frac{11}{20}\right]$

$P(G) = \frac{\text{no of green marbles}}{\text{total marbles}}$

$\frac{11}{20} = \frac{11}{\text{total}}$

$11 \text{ total} = 11 \times 20$

$\text{total} = \frac{11 \times 20}{11}$

[total = 20 marbles]

(OR)

(b) (i) $P(\text{having sum less than } 7) = \frac{\text{no. of fav outcomes}}{\text{no of total outcomes}}$

Fav outcomes = (1,1) (1,2) (1,3) (1,4) (1,5) (2,1) (2,2) (2,3) (2,4) (3,1) (3,2) (3,3) (4,1) (4,2) (5,1)

total = 36

$P = \frac{15}{36}$

(ii) Total outcomes = 36 = $6^n = 6^2 = 36$., Fav = 23

$P = \frac{23}{36}$

(iii) Total outcomes = 36

Fav outcomes = (1,1) (3,3) (5,5) = 3

$P = \frac{3}{36} \quad \frac{1}{12}$

Q.12) 9 - Black balls

12 - white balls

Fav outcomes = 9

total outcomes = 9+12 = 21

$P(\text{drawing black ball}) = \frac{\text{no. of fav outcomes}}{\text{total outcomes}}$

$P = \frac{9}{21} \quad \frac{3}{7}$

Q.15) (i) x/12

(ii) X=3

Q.13)(a)

CI	f_i	x_i	$x_i f_i$
0-6	7	3	21
6-12	5	8	40
12-18	10	15	150
18-24	12	21	252
24-30	6	27	162
	40		625

Using direct mean method

$$\text{Mean} = \frac{\Sigma x_i f_i}{\Sigma f_i}$$

$$= \frac{625}{40} \quad 125 \quad 8$$

$$= 15.62$$

(b) (or)

[mode = ?]

Age (in yrs)	(f)	new Age	new (f)	
Less than 10	3	0-10	3	
Less than 20	10	10-20	7	
Less than 30	22	20-30	12	f_0
Less than 40	40	30-40	18	f_1
Less than 50	54	40-50	14	f_2
Less than 60	71	50-60	17	

$l = 30$

$f_1 = 18$

$f_0 = 12$

$f_2 = 14$

$h = 10$

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

$$\text{Mode} = 30 + \left(\frac{18 - 12}{2 \times 18 - 12 - 14}\right) \times 10$$

$$\text{Mode} = 30 + \left(\frac{6}{10}\right) \times 10$$

Mode = 36 yr.

Q.14) (a)

class	f_i	
40-50	5	
50-60	x	f_0
60-70	15	f_1
70-80	12	f_2
80-90	7	

Mode = 67 [$l = 60$, $h = 10$]

$x = ?$

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

$$\text{Mode} = 60 + \left(\frac{15 - x}{2 \times 15 - x - 12}\right) \times 10$$

$$\text{Mode} = 60 + \left(\frac{15 - x}{18 - x}\right) \times 10$$

$67 - 60 =$ " "

$$\frac{7}{10} = \frac{15 - x}{18 - x}$$

$$126 - 7x = 150 - 10x$$

$$3x = 24$$

$$x = 8$$

(OR)

(b)

Class	f_i	x_i	d_i	w_i	$w_i f_i$
0-10	5	5	-20	-2	-10
10-20	18	15	-10	-1	-18
20-30	15	$a=25$	$h=0$	0	0
30-40	f	35	10	1	f
40-50	6	45	20	2	12
	44+f				-28+12+f
					-16+f

Mean = 25 (h = 10)

f = ?

$$\text{Mean} = \bar{X} = a + \frac{\Sigma w_i f_i}{\Sigma f_i} \times h$$

$$25 = 25 + \left(\frac{f-16}{f+44}\right) \times 10$$

$$25 - 25 = 10\left(\frac{f-16}{f+44}\right)$$

$$\frac{0}{10} = \frac{f-16}{f+44}$$

$$0 = 10f - 160$$

$$160 = 10f$$

$$\boxed{16 = f}$$

Q16 (i) $r_1 = 7\text{cm}$ (with 100 points)

Ar (innermost circle) $= \pi r^2 = \pi(7)^2 = 49\pi\ \text{cm}^2$

$r_4 = ?$ (with 25 points)

width $= 7\text{cm}$

$r_4 = 7 + 21 = 28\text{ cm}$

Ar. $= \pi r^2 = \pi(28)^2 = 784\pi\ \text{cm}^2$ [total]

(a) $P(\text{100 score}) = \dfrac{\text{ar (100 points)}}{\text{ar (outermost) total}} = \dfrac{49\pi}{784\pi} = \dfrac{1}{16}$

(OR)

(b) Ar. (total) $= 784\pi\ \text{cm}^2$

Ar. (25 points) $= \pi r_4^2 - \pi r_3^2 = \pi(28)^2 - \pi(21)^2$ [$R = 28$]

$= 784\pi - 441\pi$

$= 343\pi\ \text{cm}^2$

$P = \dfrac{343\pi}{784\pi} \times \dfrac{1}{16}$

(ii) Ar. $= \pi r^2$

$R_2 = 14\text{cm}$

$Ar_2 = \pi r_2^2 - \pi r_1^2 = \pi(14)^2 - \pi(7)^2 = 196\pi - 49\pi = 147\pi\ \text{cm}^2$

total area $= 784\pi\ \text{cm}^2$

$P = \dfrac{147}{784} = \dfrac{3 \times 49}{16 \times 49} = \dfrac{3}{16}$

(iii) $A_4 = 343\pi\ \text{cm}^2$

Total $= 784\pi\ \text{cm}^2$

$P = \dfrac{343\pi}{784\pi} = \dfrac{1}{16}$

Q.17)

C.f	Age Group	(f_i)	x_i	d_i	u_i	$u_i f_i$
8	15-25	8	20	-20	-2	-16
18	25-35	10	30	-10	-1	-10
33	35-45	15	40	0	0	0
58	45-55	25	50	+10	1	25
98	55-65	40	60	+20	2	80
122	65-75	24	70	+30	3	72
140	75-85	18	80	+40	4	72
		140 = n				223

$a = 40$, $h = 10$

$-16 - 10 = -26$

$25 + 80 + 72 + 72 = 249$

(i) Median $= l + \left(\frac{n/2 - c.f^*}{f}\right) \times h$

$= 45 + \left(\frac{70 - 33}{25}\right) \times 5$

$= 45 + \frac{37}{5}$

$= 45 + 7.4$

$= 52.4$ yr.

(ii) $65-75\ ] + x = 58$

$24 + x = 58$

$x = 58 - 24$

$\boxed{x = 34}$

Q.15)(a) Median = 32.5

$\frac{N}{2} = \frac{40}{2}$

$h = 10$

Class	(f_i)	C.F
0-10	f_1	f_1
10-20	5	f_1+5
20-30	9	f_1+14
Median class 30-40	12	f_1+26
40-50	f_2	f_1+f_2+26
50-60	3	f_1+f_2+29
60-70	2	f_1+f_2+31
	$40=N$	

(b)

$\Rightarrow f_1+5+9+12+f_2+3+2 = 40$

$\Rightarrow 31+f_1+f_2 = 40$

$\Rightarrow f_1+f_2 = 40-31$

$\Rightarrow [f_1+f_2 = 9] \quad (1)$

$$\text{Median} = l + \left(\frac{20-(f_1+14)}{12}\right)\times 10^{5}$$

$$\text{Median} = 30 + \left(\frac{20-f_1-14}{6}\right)\times 5$$

$$32.5-30 = \left(\frac{6-f_1}{6}\right)\times 5$$

$$\frac{2.5}{5} = \frac{6-f_1}{6}$$

$$15 = 30-5f_1$$

$$15-30 = -5f_1$$

$$-15 = -5f_1$$

$$[f_1 = 3]$$ Put in eq. (1)

$3 + f_2 = 9$

$f_2 = 9 - 3$

$\boxed{f_2 = 6}$

(OR)

(b) Mean = 145

Class	fi	x_i	d_i	u_i	$w_i f_i$	
100-120	10	110	-40	-20	-200	$-200 - f_1$
120-140	f_1	130	-20	-1	$-f_1$	
140-160	f_2	150	0	0	0	
160-180	15	170	20	1	15	115
180-200	5	190	40	20	100	
	180					$115 - 200 - f_1$
						$-85 - f_1$

$10 + f_1 + f_2 + 15 + 5 = 180$

$30 + f_1 + f_2 = 180$

$[f_1 + f_2 = 180]$ — (1)

$$\text{Mean} = a + \frac{\Sigma w_i f_i}{\Sigma f_i} \times h$$

$$145 = 150 + \left(\frac{-85 - f_1}{180}\right) \times 20$$

$$\frac{-5}{1} = \frac{-85 - f_1}{9}$$

$-45 = -85 - f_1$

$-45 + 85 = -f_1$

$40 = -f_1$

$[f_1 = -40]$ Put in eq. (1)

$-40 + f_2 = 180$

$f_2 = 180 + 40$

$\boxed{f_2 = 220}$

Q.19)

Age	fi	Age	f
Below 20	2	15-20	2
Below 25	6	20-25	4
Below 30	24	25-30	18
Below 35	45	30-35	21
Below 40	78	35-40	33 ← cf
Below 45	89	40-45	11
Below 50	92	45-50	3
Below 55	98	50-55	6
Below 60	100	55-60	2
			100 = n

$l = 35$

$\frac{n}{2} = \frac{100}{2} = 50$

$h = 5$

$f = 33$

$c.f = 21$

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

$$= 35 + \left(\frac{50 - 21}{33}\right) \times 5$$

$$= 35 + \left(\frac{29}{33}\right) \times 5$$

$$= 35 \times 5 \times 4.39$$

$$= 175 \times 4.39$$

$$= 768.25 \text{ yr.}$$

4.39

33) 145

132

130

99

310

297

130

4

175

439

5