2. *Statistics II*

1

X	0	1	2	3	4	5
f	20	8	6	4	1	1
fx	0	8	12	12	4	5
fx^2	0	8	24	36	16	25

$\sum f = 40 \quad \sum fx = 41 \quad \sum fx^2 = 109$

$$s.d = \sqrt{\frac{109}{40} - \left(\frac{41}{40}\right)^2}$$

$$= \sqrt{2.725 - 1.050625}$$

$$= \sqrt{1.674375}$$

$$= 1.294$$

	M_1	fx
	M_1	fx^2
	M_1	
	A_1	Allow 1.293976429
	4	

1.

Mass kg	*Mid term x*	*F*	*d = x A*	*fd*	d^2	fd^2
50 - 54	*52*	*19*	*-15*	*-285*	*225*	*4275*
55 - 59	*57*	*23*	*-10*	*-230*	*100*	*2300*
60 - 64	*62*	*40*	*-5*	*-200*	*25*	*1000*
65 - 69	*67*	*28*	*0*	*0*	*0*	*0*
70 - 74	*72*	*17*	*5*	*85*	*25*	*425*
75 - 79	*77*	*9*	*10*	*90*	*100*	*900*
80 - 84	*82*	*4*	*15*	*60*	*225*	*900*
		∑f = 140		*∑fd = - 480*		*∑fd = 9800*

Marks awarded for √table as follows:-
∑f = 140 BI
Column for d B1
Column for fd B1
∑fd = - 480 B1
√Column for d^2 = 9800 B_1

∑fd = 9800B_1

x =A + ∑fd / ∑f

= 67.0 + - 480 / 140

= 67.0 – 3.43 = 63.57 …… M1

= 63.6 kg …… A1

Standard deviation = $\sqrt{\frac{\sum fd^2}{\sum f} - \frac{\sum fd}{\sum f}}$

$= \sqrt{\frac{9800}{140} - (3.43)^2}$

$= \sqrt{58.24} \quad = 7.631$

$= 7.6$

2. $= {}^{8}/_{150} + {}^{6}/_{150} + {}^{9}/_{300} + {}^{3}/_{300}$

$= {}^{40}/_{300} = {}^{2}/_{15}$

a) *Construction of AB B1*
Construction of BC B1
Construction of AC B1

b) Construction of bisect of AC B1
Construction of bisect BC B1
Radius 3.6 cm B1

c) Construction of bisect < CAB B1 OC B1
Construction of AD B1 AD = 12.8cm B1

3. *a)*

Class	*f*	*x*	*d = A – x*	*fd*	d^2	fd^2
41 – 50	*20*	*45.5*	*15*	*300*	*225*	*4500*
51 – 55	*60*	*53*	*7.5*	*450*	*56.25*	*3375*
56 – 65	*60*	*60.5*	*0*	*0*	*0*	*0*
66 – 70	*50*	*68*	*-7.5*	*-375*	*56.25*	*2812.50*
71 – 85	*15*	*73*	*-12.5*	*187.5*	*156.25*	*2343.75*
				$\sum fd$ 562.5		$\sum fd^2$ 13031.25

b) $S = \sqrt{\frac{\sum fd}{\sum f} - \left(\quad\right)^2}$

$S = \sqrt{\frac{13031.25}{205} - \left(\quad\right)^2}$

$= \sqrt{63.567 - 7.529}$

$= \sqrt{56.038}$

$= 7.486$

4. $15\,(ax)^4\,({}^{2}/_{x^2}) = 4860$

$60a^4 = 4860$

$a^4 = 81$

$a = 3$

5.

Marks(x)	Freq.(f)	fx	d=x-x	d^2	Fd^2
5.5	1	5.5	-40.45	1636	1636
15.5	6	99	-30.45	927.2	5563
25.5	10	255	-20.45	418.2	4182
35.5	20	710	-10.45	109.2	2184
45.5	15	682.5	-0.45	0.2025	3038
55.5	5	277.5	9.55	91.20	456
65.6	14	917	19.55	382.2	535
75.5	5	377.5	29.55	873.2	4366
85.5	3	256.5	39.55	1564	4692
95.5	1	95.5	49.55	2455	2455
	$\sum f=80$	$\sum f99x=3676$			$\sum fx^2 33,923$

$$Mean = \frac{\sum fx}{\sum f} = \frac{3676}{80}$$

$$= 45.95$$

$$(b)\ Q1 = 30.5 + \frac{3}{14} \times 10$$

$$= 62.64$$

$$S.I.R = \tfrac{1}{2}(62.64 - 32)$$

$$= 15.32$$

(c) Standard deciation

$$= \sqrt{\frac{\sum fd^2}{\sum f}} = \frac{33923}{80}$$

$$= 20.59$$

6. a) $x = 90 - (2 + 13 + 51 + 27 + 14 + 1)$

$= 90 - 84 = 6$

b) 15 – 19

c) i)

Class	x	f	D= x-A	fd	D^2	Fd^2
5-9	7	2	-15	-30	225	450
10-14	12	13	-10	-130	100	1300
15-19	17	31	-5	-155	25	775
20-24	22	23	0	0	0	0
25-29	27	14	5	70	350	4900
30-34	32	6	10	60	600	3600
35-39	37	1	15	15	225	225

$Ef = 90 \quad Efd = 170 \quad Efd^2 = 11250$

$$Mean = \frac{E + d}{Ef} + A$$

$$= \frac{-170}{90} + 22$$

$$= 22 - 1.888 = 20.11$$

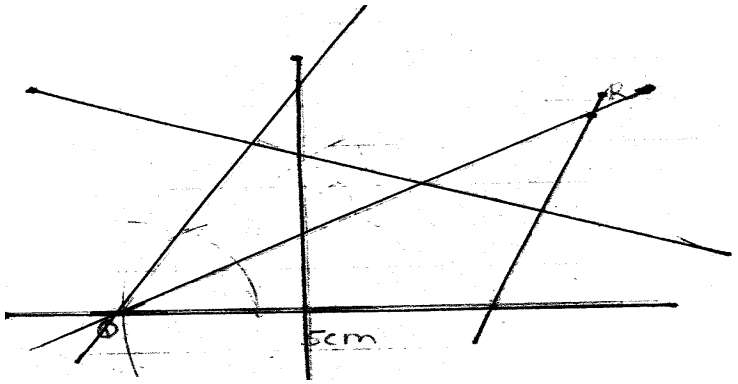
ii) $S.d = \sqrt{\frac{Efd}{Ef} - \left[\frac{Efd}{Ef}\right]^2}$

$= \sqrt{122 - (-1.888)^2}$

$= \sqrt{125 - 3.566} \quad = \sqrt{121.4}$

$= 11.02$

7.



$RQ = 7.5 \pm 0.1$

$< PRQ\ 40° \pm 1$

B1 circle through P, Q and R

d) $r = 4.1 \circ 0$

$A = \pi r^2$

$^{22}/_{7} \times 4.1 \times 4.1 = 52.83$

8.

Class limits	f	cf
-0.5 – 19.5	7	7
19.5- 39.5	21	28
39.5 – 59.5	38	66
59.5 – 79.5	27	93
79.5 -= 99.5	7	100

i) from the curve – median = 52. M1 A1

(ii) Inter quartile range = 66-38 = 28.

(iii) 7th 7/10 = 62.46marks

(iv) 60th percentile – 56.34

9. $25^2 + 24^2 + 22^2 + 23^2 + x^2 + 262 + 21^2 + 23^2 + 22^2 + 27^2 = 5154$

$5.625 + 576 + 2(484) + 2(529) + 676 + 441 + 729 + x2 = 5154$

$X^2 = 81$

$X = 9$

(ii) $X = \frac{222}{10} = 22.2$

$\Sigma(X - x)^2 = 2.8^2 + 1.8^2 + 0.22 + 0.8^2$

$13.2^2 + 3.8^2 + 1.22 + 0.8^2 + 0.2^2 + 4.8^2$

$(x-x)^2 = 7.84 + 3.24\ 2(0.04) + 2(0.64)$

$+174.24 + 14.44 + 1.44 + 23.04$

$= \frac{225.6}{10}$

s.d 22.56
= 4.75

(b) (i) New mean = 22.2 + 3
= 25.2
(ii) s.d = 4.75

10. a) i) $x = A + \frac{\sum fd}{\sum f}$
$= 45.6 + \frac{(-74)}{40}$
$= 43.75$

Class	*Mis-pt x*	*d = (x – A)*	*Frequency f*	*fd*	Fd^2
1 – 10	*5.5*	*-40.1*	*1*	*-40.1*	*1608.01*
11 – 20	*15.5*	*-30.1*	*3*	*-90.3*	*8154.05*
21 – 30	*25.5*	*-20.1*	*4*	*-80.4*	*6464.16*
31 – 40	*35.5*	*-10.1*	*7*	*-70.7*	*4998.49*
41 – 50	*45.5*	*-0.1*	*12*	*-1.2*	*1.44*
51 – 60	*55.5*	*9.9*	*9*	*89.1*	*7938.81*
61 – 70	*65.5*	*19.9*	*2*	*39.8*	*1584.04*
71 – 80	*75.5*	*29.9*	*1*	*29.9*	*894.01*
81 – 90	*85.5*	*39.9*	*0*	*0*	*0*
91 – 100	*95.5*	*49.9*	*1*	*49.9*	*2410.01*

i) Standard Deviation

$D = \sqrt{\frac{\sum fd^2}{\sum f} - \left(\quad\right)^2}$

$= 10\sqrt{\frac{34135.11}{40} - \left(\quad\right)^2}$

10 x 29.1531 = 29.1531

b) 30th student = 10th from bottom

$30.5 + \left(\quad\right)10$

= 30.5 + 2.9 = 33.4 marks.

11. a) Mean $45.5 + \frac{530}{60}$

$= 54.33$

(b) Median $= 50.5 + \left(\quad \right) 10$

$= 55.86$

(c) Standard deviation $= \sqrt{\left(\quad \right)^2 - \frac{530}{60}}$

$= 17.52$

(d) Modal class 51 – 60

12.

x	f	d	d2	fd	fd2
24.5	4	-30	900	-120	3600
34.5	26	-20	400	-520	10400
44.5	72	-10	100	-720	7200
54.5	53	0	0	0	0
64.5	25	10	100	250	2500
74.5	9	20	400	180	3600
84.5	11	30	900	330	9900
	200			-600	37200

(a) (i) Mean $= A + \frac{\Sigma fd}{\Sigma f}$

$= 54.5 - \frac{600}{200}$

$= 51.5$

(ii) Standard deviation

$= \sqrt{\frac{\Sigma fd^2}{\Sigma f} - \frac{\Sigma fd^2}{\Sigma f}}$

$= \sqrt{\frac{37200}{200} - (-3)^2}$

$= \sqrt{186 - 9}$

$= 13.30$

(b) $Q_1 = 39.5 + \frac{50 - 30}{72} \times 10$

$= 42.28$

$Q_3 = 49.5 + \frac{150-102}{53} \times 10$

$= 58.56$

$Q_3 - Q1 = 58.56 - 42.28$

$= 16.28$