Answers

Exercise 1

Section A

1. (c)	**2.** (b)	**3.** (a)	**4.** (d)	**5.** (a)
6. (b)	**7.** (c)	**8.** (a)	**9.** (b)	**10.** (c)

Exercise 2.1

1. A discrete distribution of 'number of children' in 50 families

Number of children (x)	0	1	2	3	Total
Number of families (f)	6	16	21	7	50

2. The exclusive contincous frequency distribution showing ages (in full years) for 60 employees

Age (years)	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	Total
No. of employees	3	8	10	11	12	7	6	3	60

3. An inclusive continuous frequency distribution of 'number of mobile phones produced' in a factory during 60 days

Number of mobile phones	100 - 199	200 -299	300 -399	400 -499	500 -599	600 -699	700 -799	800 -899	900 -999	1000 -1099	Total
Number of days	2	4	9	7	10	8	9	4	3	4	60

'less than' type cumulative frequency distribution

Number of mobile phones	99.5	199.5	299.5	399.5	499.5	599.5	699.5	799.5	899.5	999.5	1099.5
Number of days	0	2	6	15	22	32	40	49	53	56	60

'more than' type cumulative frequency distribution

Number of mobile phones more than or equal to	99.5	199.5	299.5	399.5	499.5	599.5	699.5	799.5	899.5	999.5	1099.5
Cumulative Frequency	60	58	54	45	38	28	20	11	7	4	0

4.

Class	0 - 99	100 - 299	300 - 499	500 - 749	750 - 899	900 - 999
Mid value	49.5	199.5	399.5	624.5	824.5	949.5
Class length	100	200	200	250	150	100
Frequency	10	12	14	16	8	10

5. 'less than' type cumulative frequency distribution

x or less errors	0	1	2	3
Cumulative Frequency	140	250	370	400

'more than' type cumulative frequency distribution

x or more errors	0	1	2	3
Cumulative Frequency	400	260	150	30

6. Inclusive continuous frequency distribution

Class	45 - 49	50 - 54	55 - 59	60 - 64	65 - 69	70 - 74	75 - 79	Total
Frequency	30	80	100	50	150	80	10	500

7. Exclusive continuous frequency distribution

Class	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	Total
Frequency	17	8	15	8	6	3	2	1	60

8.

Class	0 - 50	50 - 160	160 - 300	300 - 500	500 - 800	800 - 1000	Total
Frequency	10	30	40	60	80	30	250

9.

Class	7 - 16	17 - 26	27 - 36	37 - 46	47 - 56	Total
Frequency	160	120	43	40	2	365

10.

Class	0.9875 - 1.4875	1.4875 - 1.9875	1.9875 - 2.4875	2.4875 - 2.9875	2.9875 - 3.4875	3.4875 - 3.9875	Total
Frequency	5	10	20	20	10	5	70

1. Classification of college students according to their gender and year of study

| Year of study | Gender | | Total |
	Boys	Girls	
First	330	220	550
Second	225	225	450
Third	300	100	400
Total	855	545	1400

2. C

| Marital status | Gender | | Total |
	Men	Women	
Married	715	485	1200
Unmarried	205	195	400
Total	920	680	1600

3. A table showing designation, gender and marital status of the applicants of job at bank

| Designation | Married | | | Unmarried | | | Total | | |
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Manager									
Clerk									
Cashier									
Peon									
Total									

4. Classification of number of women according to their work experience, residence area and marital status

| Residence area | Married | | | Unmarried | | | Total | | |
	Experienced	Inexperienced	Total	Experienced	Inexperienced	Total	Experienced	Inexperienced	Total
Labour Area	250	93	343	163	43	206	413	136	549
Other Area	87	400	487	14	800	814	101	1200	1301
Total	337	493	830	177	843	1020	514	1336	1850

5. **A table showing number of skilled and unskilled workers in a comapny during year 2011 to 2014**

Year	Skilled			Unskilled			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
2011	1170	80	1250	260	140	400	1430	220	1650
2012	1300	175	1475	200	50	250	1500	225	1725
2013	1460	240	1700	40	10	50	1500	250	1750
2014	1670	290	1960	30	10	40	1700	300	2000

Exercise 2

Section A

1.	(d)	2.	(d)	3.	(b)	4.	(a)	5.	(c)
6.	(a)	7.	(b)	8.	(a)	9.	(c)	10.	(d)
11.	(c)	12.	(a)	13.	(c)	14.	(b)	15.	(b)

Section C

7.   4.5, 17, 37, 62, 87.5   8.   10, 15, 25, 25, 26

9. **'less than' discrete cumulative frequency distribution**

Observation or less than that	10	20	30	40	50
Cumulative Frequency	10	40	70	90	100

10. **A table showing demand of an item during a year**

Demand	Good	Moderate	Weak	Total
Number of weeks	12	22	18	52

11.

Year	Attribute A			Attribute B			Total		
	Sub data-1	Sub data-2	Total	Sub data-1	Sub data-2	Total	Sub data-1	Sub data-2	Total
2014	200	100	300	100	100	200	300	200	500
2015	150	400	550	150	300	450	300	700	1000

Section D

8.

Class	200 - 300	300 - 400	400 - 500	500 - 600	600 - 700	700 - 800	Total
Frequency	20	80	80	40	60	20	300

9. A table showing marital status of 40 employees

Gender	Married	Unmarried	Total
Male	8	8	16
Female	15	9	24
Total	23	17	40

10. An inclusive continuous frequency distribution of 'monthly income' of workers

Monthly Income (₹)	2400 - 2900	2900 - 3400	3400 - 3900	3900 - 4400	4400 - 4900	4900 - 5400	5400 - 5900	5900 - 6400	Total
No. of workers	3	9	18	25	23	10	7	5	100

11. An inclusive continuous frequency distribution of 'marks' of 200 students

Marks	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100	Total
No. of students	20	40	50	35	25	22	6	1	1	200

12.

Class	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50
Frequency	12	18	16	22	14	10	6	2

13. A table showing use of buses as public transport in Ahmedabad city

Type of transport	Types of bus		Total
	Air-conditioned	Non Air-conditioned	
BRTS	250	100	350
AMTS	150	500	650
Total	400	600	1000

14. Classification of college students according to their gender and stream.

Stream	Gender		Total
	Boys	Girls	
Science	250	350	600
Commerce	650	250	900
Total	900	600	1500

19. Multiple bar diagram.

21. Circle diagram.

1. An inclusive continuous distribution of 'number of mangoes' on different mango trees during 30 days

No. of mangoes	90 – 94	95 – 99	100 – 104	105 – 109	110 – 114	115 – 119	120 – 124	125 – 129	Total
No. of days	2	3	6	4	4	4	4	3	30

2. An inclusive continuous distribution of 'daily income' of 40 rickshaw drivers of a city

Daily income (₹)	200 - 219	220 - 239	240 - 259	260 - 279	280 - 299	300 - 319	320 - 339	340 - 359	Total
No. of rickshaw drivers	4	6	4	6	4	5	6	5	40

3. An exclusive continuous distribution of 'water consumption' of 50 residence of an area

Water consumption	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	Total
Number of houses	2	10	9	7	10	5	3	4	50

4. An exclusive continuous distribution of 'price' of 50 shops

Price of an item	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 - 90	Total
No. of shops	5	11	11	11	7	5	50

5. 'less than' type cumulative frequency distribution

Upper boundary point	24.5	29.5	34.5	39.5	44.5	49.5	54.5	59.5
Cumulative Frequency	0	3	11	21	26	41	49	50

'more than' type cumulative frequency distribution

Lower boundary point and above	24.5	29.5	34.5	39.5	44.5	49.5	54.5	59.5
Cumulative Frequency	50	47	39	29	24	9	1	0

6. A discrete frequency distribution of 'absence of workers' in a factory during 30 days.

No. of absent workers	0	1	2	3	4	5	6	Total
No. of days	5	7	5	6	4	2	1	30

'less than' type cumulative frequency distribution

Number of absent workers or less than that	0	1	2	3	4	5	6
Number of days	5	12	17	23	27	29	30

7. A table showing classification of 850 students of a school according to their gender and class

Class	Gender		Total
	Boys	**Girls**	
10	255	145	400
11	125	125	250
12	150	50	200
Total	530	320	850

8. A classification of students, according to their gender and residence from the year 2013 to 2015

Year	Residing in hostel			Not residing in hostel			Total		
	Boys	**Girls**	**Total**	**Boys**	**Girls**	**Total**	**Boys**	**Girls**	**Total**
2013	600	350	950	200	50	250	800	400	1200
2014	700	420	1120	260	100	360	960	520	1480
2015	840	520	1360	260	100	360	1100	620	1720

9. Classification of applicants according to their qualification, gender and marital status

Education	Male			Female			Total		
	Married	Unmarried	Total	Married	Unmarried	Total	Married	Unmarried	Total
Graduate	150	450	600	160	240	400	310	690	1000
Post graduate	192	288	480	160	160	320	352	448	800
Other professional	70	70	140	36	24	60	106	94	200
Total	412	808	1220	356	424	780	768	1232	2000

10. (1) increase of 50%

(2) 20%

(3) Male increase by 53.33% and female by 40%

Section F

1. An exclusive continuous frequency distribution of 'thickness of lenses'

Thickness of lenses	1.505 - 1.510	1.510 - 1.515	1.515 - 1.520	1.520 - 1.525	1.525 - 1.530	Total
No. of lenses	5	3	6	7	4	25

Percentage of defective lenses = 36 %

2. An exclusive continuous frequency distribution of 'variation in a price of a share' in stock market during 30 days

Price of share (₹)	10.5 - 12.5	12.5 - 14.5	14.5 - 16.5	16.5 - 18.5	18.5 - 20.5	20.5 - 22.5	Total
No. of days	2	6	8	4	8	2	30

(i) ₹ 17.5 (ii) 16 days (iii) 6 days

3. An exclusive continuous frequency distribution of 'deviation in production of mixers' during 40 days

Deviation in number of mixers produced	−12 to −6	−6 to 0	0 to 6	6 to 12	12 to 18	18 to 24	Total
No. of Days	2	5	12	10	6	5	40

'less than' type cumulative frequency distribution.

Upper boundary point	−12	−6	0	6	12	18	24
Cumulative Frequency	0	2	7	19	29	35	40

'more than' type cumulative frequency distribution.

Lower boundary point	−12	−6	0	6	12	18	24
Cumulative Frequency	40	38	33	21	11	5	0

4. An inclusive continuous frequency distribution of 'height' of 30 students.

Height (cm)	140 - 144	145 - 149	150 - 154	155 - 159	160 - 164	165 - 169	Total
No. of students	2	8	8	4	6	2	30

'less than' type cumulative frequency distribution.

Upper boundary point	139.5	144.5	149.5	154.5	159.5	164.5	169.5
Cumulative Frequency	0	2	10	18	22	28	30

'more than' type cumulative frequency distribution

Lower boundary point	139.5	144.5	149.5	154.5	159.5	164.5	169.5
Cumulative Frequency	30	28	20	12	8	2	0

(i) 8 students   (ii) 12 students (iii) 149 cm.

5. A table showing classification of students according to their stream and gender

Stream	Boys	Girls	Total
Engineering	7750	3150	10,900
Doctor	6000	4000	10,000
Science	7000	1000	8000
Arts	2800	6800	9600
Commerce	450	1050	1500
Total	24,000	16,000	40,000

●

Exercise 3.1

(1) Mean = 1.78 cm

(2) corrected mean = 24.5 years, can participate

(3) Mean = 41 mm

(4) Mean = 35.36 marks

(5) Mean = 7.49 min

(6) Mean = ₹ 18.76 lakh

(7) Mean = 40 units

Exercise 3.2

(1) Combined mean = ₹ 198.75

(2) Weighted mean = 118.09 percent change

(3) Weighted mean = ₹ 506.67

(4) mean = 82 marks

Exercise 3.3

(1) Geometric mean = 2.61 books

(2) Average depreciation = 6.05% (Geometric mean)

(3) Geometric mean = 61.73 km

Exercise 3.4

1. Quartiles Q_1 = 4 marks, Q_2 = 6 marks, Q_3 = 7 marks

2. Median = 229.17 km. The travelling on 50 % days will be 229.17 km or less.

   Q_3 = 291.67 km. The maximum distance in the least travelled 75 % days will be 291.67 km.

   D_8 = 314.29 km. The maximum distance in the least travelled 80 % days will be 314.29 km.

   P_{62} = 259.17 km. The maximum distance in the least travelled 62 % days will be 259.17 km.

3. Median = 19 years. Age of 50 % students will be 19 years or less.

   Q_1 = 18 years, Age of 25 % students will be 18 years or less.

   D_4 = 19 years, Age of 40 % students will be 19 years or less.

   P_{32} = 18.92 years, Age of 32 % students will be 18.92 years or less.

4. Median = ₹ 21.78 thousand, Lower limit of the richest 20 % employees is ₹ 26.84 thousand

5. Median = ₹ 495

6. Median from raw data= 4 days

   Median from grouped data = 4.17 days

   Both the values are almost same.

Exercise 3.5

1. Mode = 138

2. Mode = 13 cakes

3. For empirical formula, Mean = 68.85 years, Median = 67.11 years and hence Mode = 63.63 years

4. Mode cannot be found using its definition but it can be found using empirical formula.

5. Mode using formula = 152.35 gm

   Mode using graph = 153 gm

6. Mode = ₹ 22 thousand

Exercise 3

Section A

1.	(a)	2.	(d)	3.	(b)	4.	(c)	5.	(a)
6.	(b)	7.	(c)	8.	(d)	9.	(c)	10.	(b)
11.	(a)	12.	(b)	13.	(c)	14.	(b)	15.	(d)

Section B

2. Weighted mean

4. $M_o = 3M - 2\bar{x}$

7. Karl Pearson

8. Median = 55

9. mean = 13

10. Mode = 10

11. Second number = 4

12. Q_1 = 4

13. Median

14. P_{75} = 25.75

15. Median = 150

7. Median = 5.8   **8.** Second number = 16   **9.** mean = 293

10. $a = 10$ **11.** Combined mean = 81 marks   **12.** Median = 2 vehicles

13. Weighted mean = 1090

Section D

7. Average growth rate = 2.87 % Geomatric mean

8. D_7 = 8 phones. Sale of phones will be 8 or less on 70% days.

   P_{15} = 6 phone. Sale of phones will be 6 or less on 15% days.

9. mean = 30.07 ml. Machine is working properly.

10. mean = 61.62 marks

11. New mean = 34.69

12. Median = 54 marks

13. mean = 138.9 units. Sales have increased after advertisement.

Section E

1. Median = 362.5 unit   **2.** Mode = ₹ 2.86 thousand

3. Q_1 = 34.21 marks, D_4 = 36.69 marks   **4.** mean = 164.97 cm

5. Median = ₹ 15.2 thousand   **6.** Mode = 23 thousand

7. mean = 24.46 marks   **8.** Q_1 = 6.66 hours, Q_3 = 7.64 hours

Section F

1. (i) D_3 = 25, Maximum marks among failing students is 25 hence 26 marks would be required for passing.

   (ii) P_{95} = 60.83, Minimum marks among the highest scoring 5% students is 61.

2. Mean for A = 22.33 km.

   Mean for B = 23.5 km.

   ∴ Brand B tyres are better.

3. For empirical formula, Mean = 16.71 cars,   Median = 16.72 cars

   Hence Mode = 16.74 cars

4. Mean = 35.93 quintals

   Median = 35.11 quintals

5. Mode = 34 years

6. Mode = 72.5 units. Value of mode has increased.

7. Median for x = 13.26 tins

   Median for y = 10.7 tins

   Company x has higher sale.

8. Mode = 25.5 years

●

1. Range = 40 cm, Coefficient of range = 0.12   **2.** Range = 35, Coefficient of range = 0.90
3. Range = 60 marks, Coefficient of range = 0.6 **4.** Range = ₹ 29 thousand, Coefficient of range = 0.74

Exercise 4.2

1. Q_d = 7.88 mm, Coefficient of quartile deviation = 0.29
2. Q_d = 10 marks, Coefficient of quartile deviation = 0.33
3. Q_d = ₹ 38.54, Coefficient of quartile deviation = 0.32

Exercise 4.3

1. Mean Deviation = 5 cm
2. Mean Deviation = 2.8 bearings, Coefficient of mean deviation = 0.35
3. Mean Deviation = 3.33 minutes, Coefficient of mean deviation = 0.46
4. Mean Deviation = 15 TV, Coefficient of quartile deviation = 0.25
5. Mean Deviation = 13.18 boxes

Exercise 4.4

1. s = 2.67 marks   **2.** s = 2.65 cars
3. s = 6.71 units, Coefficient of standard deviation = 0.35   **4.** s = 12.89 (Lakh ₹)
5. s = 19.76 years, Coefficient of standard deviation = 0.56

Exercise 4.5

1. For share A : $\bar{x}$ = ₹ 321, s = ₹ 2.65 Coefficient of Variation = 0.83 %

   For share B : $\bar{x}$ = ₹ 140, s = ₹ 7.14 Coefficient of Variation = 5.1 %. Price of share B has more variation

2. Coefficient of variation of company A and B are 5 % and 4 %. Company B is more stable
3. The means of two series are 50 and 36 respectively.

Exercise 4.6

1. $\bar{x}_c$ = 53.45 marks, s_c = 12.64 marks   **2.** $\bar{x}_c$ = 21 min, s_c = 5.22 min

Exercise 4

Section A

| 1. (b) | 2. (a) | 3. (d) | 4. (c) | 5. (a) | 6. (c) |
| 7. (a) | 8. (c) | 9. (b) | 10. (c) | 11. (a) | 12. (a) |

Section B

3. Relative Measures   **4.** Standard Deviation   **5.** (Centimeter)^2
6. Range = 100 cm   **7.** Q_d = 15.91   **8.** s = 0
9. Mean Deviation = 2

Section C

4. Mean Deviation and Standard Deviation   **5.** Range = 14, Coefficient of range = 1.75
6. Q_d = 6, Coefficient of quartile deviation = 0.67 **7.** Mean Deviation = 2.4
8. Variance = 25   **9.** s = 1.41
10. Coefficient of Variation of A = 20 %, Coefficient of Variation of B = 25 %. Factory A is stable with respect to production.
11. Coefficient of quartile deviation = 0.29

9. Q_d = 3 flowers
10. Mean Deviation = 0.75 Goals
11. $\bar{x}$ = 4.25, s = 1.63, Coefficient of Variation = 38.35 %
12. s_c = 7.43
13. $\bar{x}$ = 8, s = 4, Coefficient of Variation = 50 %

1. $\bar{x}$ = 25.17 marks, Mean Deviation = 3.81 marks
2. Q_1 = ₹ 16.5 thousand, Q_3 = ₹ 43.75 thousand, Q_d = ₹ 13.63 thousand
3. s = 15.94 runs
4. Q_1 = 14.5 marks, Q_3 = 34.5 marks, Q_d = 10 marks
5. For team A : $\bar{x}$ = 1.45 goals, s = 1.48 goals,
    Coefficient of Variation = 102.07 %
    For team B : $\bar{x}$ = 1.07 goals, s = 1.33 goals
    Coefficient of Variation = 124.3 %
    Team A is more consistent
6. Corrected Mean = 39.3
    Corrected standard deviation = 10.24
7. For total cost y : Range = 150, Quartile deviation = 15, Mean deviation = 24 and
    Standard deviation = 30

1. Range = 32 visits, Coefficient of Variation = 0.84
    Quartile deviation = 6 visits, Coefficient of quartile deviation = 0.33
    Mean deviation = 5.91 visits, Coefficient of mean deviation = 0.33
2. $\bar{x}$ = 15.54 days, s = 1.45 days, $\bar{x} \pm s$ = 14.09 days to 16.99 days, 55 %
3. Q_d is an appropriate measure, Q_1 = 17.5 marks, Q_3 = 29 marks, Q_d = 5.75 marks,
    Coefficient of quartile deviation = 0.25
4. s = ₹ 14.84 thousand
5. $\bar{x}$ = ₹ 42.6, Mean deviation = ₹ 14.99
6. $\bar{x}$ = ₹ 404.35, s = ₹ 172.58, Coefficient of Variation = 42.68 %
7. For student A : $\bar{x}$ = 62 marks, s = 11.49 marks
            Coefficient of Variation = 18.53 %
    For student B : $\bar{x}$ = 60.5 marks, s = 8.62 marks
            Coefficient of Variation = 14.25 %
    Student B is more consistent.
8. For group A : $\bar{x}$ = 46.29 kg, s = 11.57 kg
            Coefficient of Variation = 25 %
    For group B : $\bar{x}$ = 46.43 kg, s = 10.93 kg
            Coefficient of Variation = 23.54 %
    Group A has greater relative variation.

Exercise 5.1

1. $\bar{x}$ = 4.27 packets of milk; M_o = 4 packets of milk; s = 1.65 packets of milk; j = 0.16
2. $\bar{x}$ = 14.01 inches; M = 14 inches; s = 0.87 inches, j = 0.03, Positive skewness
3. $\bar{x}$ = 14.22 min.; M_o = 12.28 min; s = 5.33 min., j = 0.36, Positive skewness
4. $\bar{x}$ = ₹ 9.92 lakh; M_o = ₹ 9.8 lakh; s = ₹ 2.37 lakh; j = 0.05, Positive skewness
5. $\bar{x}$ = ₹ 20.12 lakh; M = ₹ 21.5 lakh; s = ₹ 7.98 lakh; S_k = ₹ –4.14 lakh, j = –0.52, Negative skewness
6. $\bar{x}$ = 10.31 thousand bales; M = 9.86 thousand bales; S_k = 1.35 thousand bales, s = 6.33 thousand bales; j = 0.21, Positive skewness
7. $\bar{x}$ = 9.5 Celsius; M = 8.6 Celsius; s = 7.27 Celsius; S_k = ₹ 2.7 Celsius, j = 0.37, Positive skewness

Exercise 5.2

1. Q_1 = 20 years; M = 22 years; Q_3 = 25 years; j = 0.2, Positive skewness
2. Q_1 = ₹ 335 lakh; M = ₹ 490 lakh; Q_3 = ₹ 912.5 lakh; S_k = ₹ 267.5 lakh; j = 0.46, Positive skewness
3. Q_1 = 40 thousand tonnes; M = 48 thousand tonnes; Q_3 = 68.75 thousand tonnes; S_k = 12.75 thousand tonnes, j = 0.44, Positive skewness
4. Q_1 = ₹ 18.27 thousand; M = ₹ 20.53 thousand; Q_3 = ₹ 22.44 thousand; j = – 0.08

Exercise 5

Section A

1. (c)   2. (b)   3. (c)   4. (c)   5. (a)   6. (d)   7. (c)
8. (d)   9. (a)   10. (b)   11. (c)   12. (a)   13. (d)   14. (b)

Section B

13. Negative skewness   14. Negative skewness
15. Negative skewness   16. Symmetric distribution
17. Symmetric distribution

Section C

5. $\bar{x}$ = 46   6. M = 69   7. M = 32.50
8. s = 12   9. j = 0.33   10. j = – 0.15
11. M = 42, j = –0.4   13. j = –0.24
14. s = 4, s^2 = 16   15. M_o = 38; j = 0.5

Section D

5. coefficient of skewness for group A : j = –0.17; coefficient of skewness for group B : j = –0.40 Group A is closer to symmetry.

6. For group A, Q_1 = 36; M = 48; Q_3 = 72; j for group A = 0.33; j for group B = 0.39; Group B is more skewed than group A.

7. S_k = 1.6; j = 0.07   8. s = 8; j = – 0.025

9. $\bar{x}$ = 32; s = 4, j = – 0.15   10. M_o = 66; M = 62

11. s = 12; M_o = 56; M = 61.33; C.V. = 18.75   12. j = – 0.75

13. $\bar{x}$ = 36; M_o = 24; M = 32; j = 0.19 by Karl Pearson's method; j = –0.4 by Bowley's method

6. Firm A : Coefficient of skewness : Karl Pearson's method $j = 0.69$; Bowley's method $j = -0.25$
   Firm B : Coefficient of skewness : Karl Pearson's method $j = 1.58$; Bowley's method $j = 0.5$

   The data for firm B has more skewness than firm A in Karl Pearson's method. Firm B is more skewed than firm A in Bowley's method.

7. $\bar{x} = 18.9$ dozen; $M = 18$ dozen; $s = 4.44$ dozen; $j = 0.61$

8. $\bar{x} = 21.14$ staplers; $M_o = 20$ staplers; $s = 1.65$ staplers; $j = 0.69$

9. $\bar{x} = 240$, $s = 7.5$; $j = -2.4$, Negative skewness

1. $Q_1 = 2$ hours; $M = 3$ hours; $Q_3 = 4$ hours; $j = 0$; Bowley's; $j = 0$

2. $\bar{x} = 14.89$ Celsius; $M = 15.12$ Celsius; $s = 7.95$ Celsius; $j = -0.09$, Negative skewness

3. $\bar{x} = 31.42$ marks; $M = 31.32$ marks; $s = 11.68$ marks; $j = 0.026$, Positive skewness

4. $Q_1 = ₹ 17.5$ lakh; $Q_3 = ₹ 34.38$ lakh; $M = ₹ 26$ lakh; $j = -0.007$ Negative skewness

5. $\bar{x} = 9.28$ units; $M = 8$ units; $s = 6.66$ units; $S_k = 3.84$, $j = 0.58$

6. $Q_1 = 4.19$ mm; $Q_3 = 4.46$ mm; $M = 4.32$ mm; $j = 0.037$ Positive skewness

7. $\bar{x} = 9.23$ packets; $M = 4.75$ packets; $s = 10.22$ packets; $j = 1.32$, Positive skewness

8. $Q_1 = 2.95$ sq. m; $Q_3 = 5.95$ sq. m; $M = 4.55$ sq. m; $j = -0.067$; Negative skewness

9. $\bar{x} = 180$ sq. m; $M_o = 180$ sq. m; $s = 41.63$ sq.m.; $j = 0$. Symmetric distribution

10. $Q_1 = 23.75$ units; $Q_3 = 35.63$ units; $M = 30.5$ units; $j = -0.14$

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Exercise 6.1

1. (1) 720   (2) 2450   (3) 40,320   (4) 3,62,880

2. $n = 11$ 3. $r = 4$ 4. $n = 7$ 5. 24   6. 600

7. 2880   8. 576   9. 72   10. 24

11. (1) 50400   (2) 151200   (3) 90720   12. 2:1   13. 9072

14. (1) 49   (2) 12   (3) 83   (4) 93

15. 240   16. 720

Exercise 6.2

1. (1) 330   (2) 1   (3) 300   (4) 1

2. (1) $n = 8$ (2) $r = 8$ or $r = 5$ (3) $n = 6$ (4) $n = 10$

3. 28   4. 10   5. 120   6. 2184

7. (1) 11   (2) 15   8. (1) 78   (2) 16

9. (1) 56   (2) 20   10. 55   11. 63

12. (1) 35   (2) 21   13. 127   14. 560, 126

15. $n = 8$ 16. $r = 4$

1. (1) $27a^3 + 108a^2b + 144ab^2 + 64b^3$

   (2) $1 + 7x + 21x^2 + 35x^3 + 35x^4 + 21x^5 + 7x^6 + x^7$

   (3) $\dfrac{81}{x^4} - \dfrac{144}{x^2} + 96 - \dfrac{256x^2}{9} + \dfrac{256x^4}{81}$

   (4) $\dfrac{x^3}{729} + \dfrac{2x^2}{27} + \dfrac{5x}{3} + 20 + \dfrac{135}{x} + \dfrac{486}{x^2} + \dfrac{729}{x^3}$

   (5) $\dfrac{a^5}{32} - \dfrac{5a^4b}{48} + \dfrac{5a^3b^2}{36} - \dfrac{5a^2b^3}{54} + \dfrac{5ab^4}{162} - \dfrac{b^5}{243}$

2. (1)   352   (2) 198   (3) 248

Exercise 6

Section A

1. (d)   2. (a)   3. (b)   4. (d)   5. (b)   6. (c)

7. (b)   8. (a)   9. (d)   10. (a)   11. (d)

Section B

5. 1,6,15,20,15,6,1

7. 60   8. 6   9. 7   10. 5039   11. 60   12. 120

Section C

2. 720   3. 144   4. 12441600   5. 96   6. 12   7. 72

8. 18   9. 1:1   10. 6   11. 12   12. 5200

13. $8x^3 + 36x^2y + 54xy^2 + 27y^3$

14. $x^3 - 3x + \dfrac{3}{x} - \dfrac{1}{x^3}$

15. $y^5 + 5y^4k + 10y^3k^2 + 10y^2k^3 + 5yk^4 + k^5$

Section D

1. (1) 120 (2) 72 (3) 24   2. 1152   3. (1) 48 (2) 12 (3) 36

4. 4370   5. (1) 4   (2) 16 (3) 12   6. (1) 9 (2) 12 (3) 6

7. (1) 1 (2) 36 (3) 12   8. (1) 34 (2) 50   9. 44   10. 416

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Exercise 7

Section A

1. (d)   2. (b)   3. (b)   4. (a)   5. (c)   6. (c)   7. (a)

Section B

1. (1) False   (2) False   (3) True   (4)   True

   (5) True   (6) False   (7) True

2. Sampling   3. Stratified   4. Systematic   5. Tippett   6. Population survey

For Examples 13 to 17, random sample other than the one in the answer can be obtained.

13. 018, 096, 027, 007, 012

14. 27, 32, 59, 66, 32, 48, 25

15. With replacement : 170, 111, 002, 203, 111, 233, 300

      Without replacement : 170, 111, 002, 203, 233, 300, 250

16. First years : 158, 092, 009, 200

      Second years : 019, 131, 057, 006

      Third years : 027, 070, 198, 200

17. Wheat producing farmers : 12, 18, 20, 11, 03, 10

      Rice producing farmers : 04, 11, 08, 13

19. $N = 20$, $n = 4$, $k = N/n = 20/4 = 5$

      Sample 1 : 1, 6, 11, 16   Sample 4 : 4, 9, 14, 19

      Sample 2 : 2, 7, 12, 17   Sample 5 : 5, 10, 15, 20

      Sample 3 : 3, 8, 13, 18

20. $N = 30$, $n = 10$, $k = N/n = 30/10 = 3$

      Sample 1 : 1, 4, 7, 10, 13, 16, 19, 22, 25, 28

      Sample 2 : 2, 5, 8, 11, 14, 17, 20, 23, 26, 29

      Sample 3 : 3, 6, 9, 12, 15, 18, 21, 24, 27, 30

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Exercise 8

Section A

1. (a)   **2.** (a)   **3.** (b)   **4.** (b)   **5.** (c)   **6.** (c)   **7.** (b)   **8.** (c)

Section B

1. Domain A and co-domain B should be non-empty.   **2.** Yes   **3.** No

7. No. Domains of two functions are different   **8.** Many-one   **9.** one-one

Section C

4. $R_f = \{3, 4, 5\}$ **5.** Many-one   **6.** One-one   **7.** $D_f = \{\frac{1}{2},\ 1,\ \frac{3}{2}\}$

8. 0   **9.** $R_f = \{-\frac{3}{4},\ 0,\ \frac{3}{10}\}$ **10.** 27   **11.** Many-one

12. $x = 2$ **13.** One-one   **14.** 14   **15.** 0

Section D

1. $D_f = \{10, 20, 30\}$, $B = \{18, 48, 98, 128, 148\}$, $R_f = \{48, 98, 148\}$

2. $D_f = \{-\frac{1}{2},\ 1,\ \frac{1}{2},\ \frac{3}{2}\}$, $B = \{-\frac{1}{5},\ 1,\ \frac{1}{3},\ 3\}$, $R_f = \{-\frac{1}{5},\ 1,\ \frac{1}{3},\ 3\}$

3. $f(-1) = -1, f(-2) = -\dfrac{5}{4}, f\left(\dfrac{1}{2}\right) = 5$ **4.** $D_f = \{3, 4, 5, 7\}$ **5.** $x = \pm\dfrac{1}{2}$

6. $R_f = \{2, 5, 10, 17\}$ **7.** 5   **8.** $\{0, 3\}$

9. Unequal functions   **10.** Many-one   **12.** $\dfrac{14}{27}$

13. 36   **14.** $\dfrac{58}{11}$ **15.** 40, 1300

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Chapter 9

Section A

1. (d)   **2.** (a)   **3.** (a)   **4.** (b)   **5.** (c)
6. (b)   **7.** (d)   **8.** (c)   **9.** (a)   **10.** (c)

Section B

1. ar^n **2.** 0.1   **3.** 140   **4.** 2   **5.** $\dfrac{1}{4}$

6. −1   **7.** 4   **8.** True   **9.** True

Section C

3. $a = 3$ **4.** $r = 5$ **5.** 80   **6.** Fifth   **7.** 1

8. 16   **9.** (1) 6250   (2) $\dfrac{25}{16}$ (3) $\dfrac{128}{6561}$ (4) 8

Section D

1. ± 135 **2.** $T_5 = \dfrac{1}{3}$ and $S_4 = \dfrac{65}{16}$ **3.** $\dfrac{1}{16}$ **4.** 120

5. 12.4   **6.** 4, 16, 64....   **7.** $m = \pm 10, t = \pm 40$

8. $n = 4$ **9.** $n = 5$ **10.** $\dfrac{16}{3}$ **11.** $8(3^n)$

12. 125   **13.** 6   **14.** $a = 4$ and $n = 5$

15. (1) 340   (2) $\dfrac{211}{8}$ (3) 124.96   (4) $\dfrac{1023}{1024}$

Section E

1. $k = 5$ **2.** $n = 6$ **3.** $n = 11$
4. 81   **5.** $r = \pm 3$ **6.** $r = \pm 2$
7. 1, 5, 25 or 25, 5, 1   **8.** 2, −4, 8 or 8, −4, 2   **9.** $S_{10} = ₹\ 1,02,30,000$
10. 248 notes   **11.** 6095   **12.** ₹ 2,65,720.50

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