Chapter 16 : Data Handling

ANSWER KEYS

EXERCISE 16.1

1. Arranging the data in ascending order :

10, 11, 11, 11, 11, 11, 12, 12, 12, 12, 12, 12, 12, 13, 13, 13, 13, 13, 13, 13, 14, 14, 14, 14.

Ages	Tally Marks	Frequency
10	|	1
11	𝍸	5
12	𝍸|	7
13	𝍸||	8
14	||||	4

2. Arranging the marks in ascending order :

0, 0, 1, 2, 2, 2, 2, 3, 3, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 6, 6, 6, 7, 7, 7, 8, 8, 9, 9, 9

Marks	Tally Marks	Frequency
0	||	2
1	|	1
2	||||	4
3	𝍸	5
4	||||	4
5	|||	3
6	|||	3
7	|||	3
8	||	2
9	|||	3

(*i*) If the passing marks is 4, then the number of students passed = 4 + 3 + 3 + 3 + 2 + 3 = 18.

(*ii*) Number of failed students = 2 + 1 + 4 + 5 = 12.

(*iii*) Number of students who secured more than 8 marks = 3.

(*iv*) Number of students secured the highest marks = 3.

3. Arranging the marks in ascending order :

11, 12, 12, 16, 16, 16, 20, 20, 22, 22, 22, 22, 22, 27, 27, 27, 29, 29, 29, 29, 31, 31, 31, 35, 35, 35, 40, 40, 40, 47

Marks	Tally Marks	Frequency
11	|	1
12	||	2
16	|||	3
20	||	2
22	𝍸	5
27	|||	3
29	||||	4
31	|||	3
35	|||	3
40	|||	3
47	|	1

4. Arranging the marks in ascending order :

39, 39, 44, 44, 48, 48, 55, 55, 55, 55, 58, 58, 58, 58, 58, 58, 60, 60, 60, 60, 60, 60, 62, 62, 62, 62, 78, 78, 78, 78, 78, 90, 90, 90, 98, 98

Marks	Tally Marks	No. of students
39	||	2
44	||	2
48	||	2
55	||||	4
58	𝍸|	6
60	𝍸|	6
62	||||	4
78	𝍸	5
90	|||	3
98	||	2

(*i*) The lowest score is 39.

(*ii*) The highest score is 98.

(*iii*) If 45 is the passing marks, then the number of failed students = 2 + 2 = 4.

(*iv*) Number of students who have scored less than 60 marks = 2 + 2 + 2 + 4 + 6 = 16.

5. Arranging the given data in descending order:

10, 9, 9, 9, 9, 8, 8, 7, 7, 7, 7, 7, 7, 6, 6, 6, 6, 6, 6, 5, 5, 5, 5, 4, 4

Numbers	Tally Marks	Frequency
4	||	2
5	||||	4
6	𝍸|	6
7	𝍸|	6
8	||	2
9	||||	4
10	|	1

6. Arranging the marks in ascending order :

4, 4, 5, 5, 5, 5, 6, 6, 6, 6, 6, 6, 7, 7, 7, 7, 7, 7, 8, 8, 9, 9, 9, 9, 10.

Marks	Tally Marks	No. of students
8	|	1
9	|||	3
10	||	2
12	||	2
13	||	2
16	|	1
17	||	2
18	||	2
19	𝍸|	6
20	||	2
25	||	2

(*i*) The lowest marks is 8.

(*ii*) The highest marks is 25.

(*iii*) Mark 19 is occurring more frequently.

EXERCISE 16.2

1. First five prime numbers are 2, 3, 5, 7, 11.

$$\text{Mean} = \frac{\text{Sum of all observations}}{\text{No. of observations}}$$

$$= \frac{2+3+5+7+11}{5}$$

$$= \frac{28}{5} = 5.6$$

Hence, mean is 5.6.

(*ii*) First six multiples of 3 are 3, 6, 9, 12, 15, 18.

$$\text{Mean} = \frac{\text{Sum of all observations}}{\text{No. of observations}}$$

$$= \frac{3+6+9+12+15+18}{6}$$

$$= \frac{63}{6} = 10.5$$

Hence, mean is 10.5.

(*iii*) First five whole numbers are 0, 1, 2, 3, 4.

$$\text{Mean} = \frac{\text{Sum of all observations}}{\text{No. of observations}}$$

$$= \frac{0+1+2+3+4}{5} = \frac{10}{5} = 2$$

Hence, mean is 2.

2. Runs scored by a cricketer in eight innings:

73, 52, 41, 36, 0, 25, 45, 24

$$\text{Mean score} = \frac{\text{Sum of runs scored in 8 innings}}{\text{Number of innings}}$$

$$= \frac{73+52+41+36+0+25+45+24}{8}$$

$$= \frac{296}{8} = 37$$

Hence, mean score is 37 runs.

3. Arranging the heights (in cm) of 12 boys in ascending order : 128, 133, 135, 136, 138, 139, 141, 142, 145, 145, 147, 151

(*i*) The height of the shortest boy is 128 cm.

(*ii*) The height of the tallest boy is 151 cm.

(*iii*) The range of heights = height of the tallest boy – height of the shortest boy

= 151 cm – 128 cm = 23 cm

Thus, the range of their heights is 23 cm.

(*iv*) $\text{Mean height} = \frac{\text{Sum of heights (in cm)}}{\text{Number of boys}}$

$$= \frac{128+133+135+136+138+139+141+142+145+145+147+151}{12}$$

$$= \frac{1680}{12} = 140 \text{ cm}$$

Thus, the mean height of the boys is 140 cm.

(*v*) 6 boys have heights more than the mean height.

4. The mean of 10 observations = 35

$\therefore$ Sum of 10 observations = 10 × 35

($\because$ Sum of observations = Mean × No. of observations)

= 350

Since, 32 was measured as 23.

The correct sum = 350 – 23 + 32

= 359

Thus, correct mean $= \frac{\text{Sum of observations}}{\text{Number of observations}}$

$$= \frac{359}{10} = 35.9$$

Hence, the correct mean is 35.9.

5. All even numbers between 89 and 101 are 90, 92, 94, 96, 98, 100.

$\therefore$ There are 6 even numbers between 89 and 101.

$$\therefore \quad \text{Mean} = \frac{\text{Sum of all observations}}{\text{No. of observations}}$$

$$= \frac{90 + 92 + 94 + 96 + 98 + 100}{6}$$

$$= \frac{570}{6} = 95$$

Hence, the mean is 95.

6. The mean of 50 observations = 250

Sum of observations = Mean × No. of observations

$$= 250 \times 50$$

$$= 12500$$

Since, the number 152 was wrongly copied as 102.

Therefore,

the correct sum of observations = 12500 – 102 + 152

$$= 12550$$

$$\text{Thus, correct mean} = \frac{\text{Sum of observations}}{\text{No. of observations}}$$

$$= \frac{12550}{50}$$

$$= 251$$

Hence, the correct mean is 251.

7. All the factors of 12 are 1, 2, 3, 4, 6, 12.

$$\text{Mean} = \frac{\text{Sum of all observations}}{\text{No. of observations}}$$

$$= \frac{1 + 2 + 3 + 4 + 6 + 12}{6}$$

$$= \frac{28}{6} = 4.66$$

Hence, the mean of all factors of 12 is 4.66.

8. Mean score in 8 innings = 45

Total runs scored = 45 × 8 = 360

($\because$ Sum of observations = Mean × No. of observations)

Let the required runs to be scored in 9th inning be x.

Then,

$$\text{New mean} = \frac{360 + x}{9}$$

$$\Rightarrow \quad 50 = \frac{360 + x}{9}$$

$$\Rightarrow \quad 360 + x = 450$$

$$\Rightarrow \quad x = 450 - 360$$

$$\Rightarrow \quad x = 90$$

Hence, the cricketer needs to score 90 runs in 9th inning to raise the mean score to 50.

9. $\because$ Mean = 18.75

$$\text{Mean} = \frac{\text{Sum of all observations}}{\text{No. of observations}}$$

$$\Rightarrow \quad 18.75 = \frac{26 + 14 + x + 25 + 15 + 13 + 27 + 18}{8}$$

$$\Rightarrow \quad 18.75 = \frac{138 + x}{8}$$

$$\Rightarrow \quad 138 + x = 150$$

$$\Rightarrow \quad x = 150 - 138$$

$$\Rightarrow \quad x = 12$$

Hence, the value of x is 12.

10. Mean of 6 numbers = 30

Let the six numbers be $x_1, x_2, x_3, x_4, x_5, x_6$.

$$\text{Now,} \quad \text{Mean} = \frac{\text{Sum of all numbers}}{\text{Total numbers}}$$

$$\therefore \quad 30 = \frac{x_1 + x_2 + x_3 + x_4 + x_5 + x_6}{6}$$

$$\Rightarrow \quad x_1 + x_2 + x_3 + x_4 + x_5 + x_6 = 180 \qquad ...(i)$$

If one number is excluded, then the mean becomes 29.

Let the excluded number be x_1.

Therefore,

$$\text{New mean} = \frac{x_2 + x_3 + x_4 + x_5 + x_6}{5}$$

$$\Rightarrow \quad 29 = \frac{x_2 + x_3 + x_4 + x_5 + x_6}{5}$$

$$\Rightarrow \quad x_2 + x_3 + x_4 + x_5 + x_6 = 145 \qquad ...(ii)$$

Putting the value from eq. (ii) in eq. (i), we get

$$x_1 + (x_2 + x_3 + x_4 + x_5 + x_6) = 180$$

$$\Rightarrow \quad x_1 + 145 = 180$$

$$\Rightarrow \quad x_1 = 180 - 145$$

$$\Rightarrow \quad x_1 = 35$$

Hence, the excluded number is 35.

11. The mean of 45 numbers = 25

Sum of the numbers = Mean × Total numbers

$$= 25 \times 45 = 1125$$

If each number is multiplied by 3,

new sum of the numbers = 3 × 1125 = 3375

$$\text{Thus,} \quad \text{New mean} = \frac{\text{New sum of numbers}}{\text{Total numbers}}$$

$$= \frac{3375}{45} = 75$$

Hence, the new mean is 75.

12. The daily temperature (in °C) during the first week of May, 2011:

42, 42.5, 40.5, 41, 43.5, 40.5, 44

$$\text{The mean temperature} = \frac{\text{Sum of temperatures (in °C)}}{\text{No. of days}}$$

$$= \frac{42 + 42.5 + 40.5 + 41 + 43.5 + 40.5 + 44}{7}$$

$$= \frac{294}{7}$$

$$= 42°C$$

Hence, the mean temperature is 42°C.

13. (*i*) Squares of the first five natural numbers are 1^2, 2^2, 3^2, 4^2, 5^2 *i.e.*, 1, 4, 9, 16, 25.

$$\text{Mean} = \frac{\text{Sum of all observations}}{\text{No. of observations}}$$

$$= \frac{1 + 4 + 9 + 16 + 25}{5}$$

$$= \frac{55}{5} = 11$$

Hence, the required mean is 11.

(*ii*) Cube of the first four natural numbers are 1^3, 2^3, 3^3, 4^3 *i.e.*, 1, 8, 27, 64.

$$\text{Mean} = \frac{\text{Sum of all observations}}{\text{No. of observations}}$$

$$= \frac{1 + 8 + 27 + 64}{4} = \frac{100}{4} = 25$$

Hence, the required mean is 25.

EXERCISE 16.3

1.

Weight (in kg) (x)	No. of workers (f)	$f \times x$
60	5	60 × 5 = 300
62	4	62 × 4 = 248
63	2	63 × 2 = 126
64	3	64 × 3 = 192
66	3	66 × 3 = 198
70	1	70 × 1 = 70
Total	**Σf = 18**	**Σfx = 1134**

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{1134}{18} = 63$$

Hence, the mean weight is 63 kg.

2.

x	f	$f \times x$
5	2	5 × 2 = 10
15	2	15 × 2 = 30
16	3	16 × 3 = 48
18	4	18 × 4 = 72
20	4	20 × 4 = 80
Total	**Σf = 15**	**Σfx = 240**

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{240}{15} = 16$$

Hence, the mean is 16.

3.

Marks (x)	No. of students (f)	$f \times x$
6	2	6 × 2 = 12
12	3	12 × 3 = 36
14	4	14 × 4 = 56
15	2	15 × 2 = 30
10	3	10 × 3 = 30
8	5	8 × 5 = 40
16	1	16 × 1 = 16
Total	**Σf = 20**	**Σfx = 220**

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{220}{20} = 11$$

Hence, the mean of the marks is 11.

4.

Score (x)	Tally marks	f	$f \times x$
1	𝍸	5	5 × 1 = 5
2	𝍸	5	5 × 2 = 10
3	𝍸	4	4 × 3 = 12
4	𝍸	3	3 × 4 = 12
5	𝍸	4	4 × 5 = 20
6	𝍸	4	4 × 6 = 24
Total		Σf = 25	Σfx = 83

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{83}{25} = 3.32$$

Hence, mean is 3.32.

5.

Ages (in years) (x)	Tally marks	No. of students (f)	$f \times x$
12	𝍸	4	12 × 4 = 48
13	𝍸 𝍸 𝍸	13	13 × 13 = 169
14	𝍸 𝍸	8	14 × 8 = 112
15	𝍸	2	15 × 2 = 30
16	𝍸	2	16 × 2 = 32
17	𝍸	1	17 × 1 = 17
Total		**Σf = 30**	**Σfx = 408**

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{408}{30} = 13.6$$

Hence, the mean age is 13.6 years.

6.

x	f	$f \times x$
10	3	3 × 10 = 30
15	10	10 × 15 = 150
20	25	25 × 20 = 500
25	7	7 × 25 = 175
34	5	5 × 34 = 170
Total	**Σf = 50**	**Σfx = 1025**

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{1025}{50}$$

$$= 20.5$$

Hence, mean is 20.5.

7.

x	f	$f \times x$
3	3	3 × 3 = 9
6	4	4 × 6 = 24
10	2	2 × 10 = 20
12	8	8 × 12 = 96
7	13	13 × 7 = 91
15	10	10 × 15 = 150
Total	**Σf = 40**	**Σfx = 390**

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{390}{40} = 9.75$$

Hence, mean is 9.75.

EXERCISE 16.4

1. Arranging the marks in ascending order, we get

20, 20, 35, 35, 38, 38, 38, 39, 39, 39, 39, 40, 40, 41, 41, 42, 42, 42, 43, 48

Number of observations (n) = 20 (even)

$$\text{Median} = \frac{1}{2}\left[\left(\frac{n}{2}\right)^{\text{th}} \text{term} + \left(\frac{n}{2}+1\right)^{\text{th}} \text{term}\right]$$

$$= \frac{1}{2}\left[\left(\frac{20}{2}\right)^{\text{th}} \text{term} + \left(\frac{20}{2}+1\right)^{\text{th}} \text{term}\right]$$

$$= \frac{1}{2}[10^{\text{th}} \text{ term} + 11^{\text{th}} \text{ term}]$$

$$= \frac{1}{2}[39 + 39]$$

$$= \frac{1}{2} \times 78$$

$$= 39$$

Hence, the median is 39.

Since, the marks 39 is repeating maximum number of times *i.e.*, 4 times.

Hence, the mode is 39.

2. Sizes of the shirt are 34, 38, 37, 35, 38, 33, 32, 38, 30, 35, 32, 38, 36, 30, 31, 34, 39.

Arranging in ascending order :

30, 30, 31, 32, 32, 33, 34, 34, 35, 35, 36, 37, 38, 38, 38, 38, 39

Since, the size 38 of the shirt is repeating maximum number of times *i.e.*, 4.

Hence the mode is 38.

3. The marks obtained by 10 students in mathematics are 36, 43, 36, 34, 43, 43, 38, 40, 43, 38.

Arranging the marks in ascending order :

34, 36, 36, 38, 38, 40, 43, 43, 43, 43

Since, the marks 43 is repeating maximum number of times *i.e.*, 4 times.

Hence, the mode is 43.

4. Arranging the monthly salary (in ₹) in ascending order:

7500, 7900, 8300, 8700, 9200, 10320, 11000, 12350, 12800, 13000

Number of terms, n = 10 (even)

$$\text{Median} = \frac{1}{2}\left[\left(\frac{n}{2}\right)^{\text{th}} \text{term} + \left(\frac{n}{2}+1\right)^{\text{th}} \text{term}\right]$$

$$= \frac{1}{2}\left[\left(\frac{10}{2}\right)^{\text{th}} \text{term} + \left(\frac{10}{2}+1\right)^{\text{th}} \text{term}\right]$$

$$= \frac{1}{2}[5^{\text{th}} \text{ term} + 6^{\text{th}} \text{ term}]$$

$$= \frac{1}{2} \times (9200 + 10320)$$

$$= \frac{1}{2} \times 19520$$

$$= 9760$$

Hence, the median salary is ₹ 9760.

5. The first 10 prime numbers are

2, 3, 5, 7, 11, 13, 17, 19, 23, 29.

Number of terms, n = 10 (even)

$$\text{Median} = \frac{1}{2}\left[\left(\frac{n}{2}\right)^{\text{th}} \text{term} + \left(\frac{n}{2}+1\right)^{\text{th}} \text{term}\right]$$

$$= \frac{1}{2}\left[\left(\frac{10}{2}\right)^{\text{th}} \text{term} + \left(\frac{10}{2}+1\right)^{\text{th}} \text{term}\right]$$

$$= \frac{1}{2}[5^{\text{th}} \text{ term} + 6^{\text{th}} \text{ term}]$$

$$= \frac{1}{2} \times (11 + 13)$$

$$= \frac{1}{2} \times 24$$

$$= 12$$

Hence, the median is 12.

6. Arranging the given data in ascending order:

14, 22, 32, 41, 42, 53, 55, 62, 83, 92

Number of terms, n = 10 (even)

$$\text{Median} = \frac{1}{2}\left[\left(\frac{n}{2}\right)^{\text{th}} \text{term} + \left(\frac{n}{2}+1\right)^{\text{th}} \text{term}\right]$$

$$= \frac{1}{2}\left[\left(\frac{10}{2}\right)^{\text{th}} \text{term} + \left(\frac{10}{2}+1\right)^{\text{th}} \text{term}\right]$$

$$= \frac{1}{2}[5^{\text{th}} \text{ term} + 6^{\text{th}} \text{ term}]$$

$$= \frac{1}{2} \times (42 + 53)$$

$$= \frac{1}{2} \times 95 = 47.5$$

Hence, median is 47.5.

7. Arranging the given data in ascending order:

5, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19

Number of terms, n = 11 (odd)

$$\text{Median} = \left(\frac{n+1}{2}\right)^{\text{th}} \text{term}$$

$$= \left(\frac{11+1}{2}\right)^{\text{th}} \text{term}$$

$$= \left(\frac{12}{2}\right)^{\text{th}} \text{term}$$

$$= 6^{\text{th}} \text{ term}$$

$$= 13$$

Hence, the median is 13.

8. Arranging the weight (in kg) of 8 persons in ascending order:

47, 49, 58, 59, 60, 63, 80, 82

Number of terms, n = 8(even)

$$\text{Median} = \frac{1}{2}\left[\left(\frac{n}{2}\right)^{\text{th}} \text{term} + \left(\frac{n}{2}+1\right)^{\text{th}} \text{term}\right]$$

$$= \frac{1}{2}\left[\left(\frac{8}{2}\right)^{\text{th}} \text{term} + \left(\frac{8}{2}+1\right)^{\text{th}} \text{term}\right]$$

$$= \frac{1}{2}(4^{\text{th}} \text{ term} + 5^{\text{th}} \text{ term})$$

$$= \frac{1}{2} \times (59 + 60)$$

$$= \frac{1}{2} \times 119$$

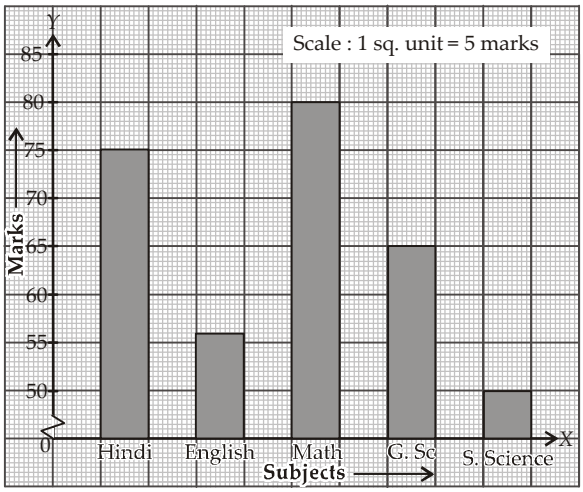
$$= 59.5$$

Hence, the median is 59.5.

EXERCISE 16.5

1. Working steps:

(*i*) We draw two lines perpendicular to each other on a graph paper and mark them as *OX* and *OY* horizontal and vertical axis respectively.



(*ii*) Along *OX* line we mark subjects and along *OY* line, we mark marks obtained by students in various subjects.

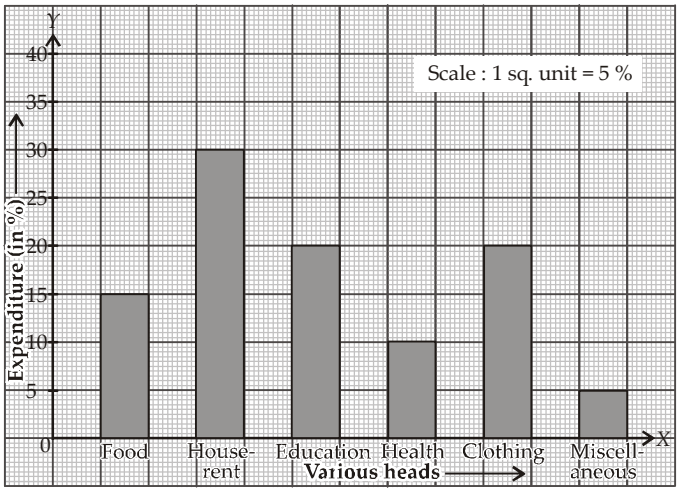
(*iii*) We choose a suitable scale to determine the heights of the bars.

Here, we choose 1 sq. unit = 5 marks.

(*iv*) We draw the bars leaving uniform space between bars as shown.

2. Working steps:

(*i*) We draw two lines *OX* and *OY* perpendicular to each other.



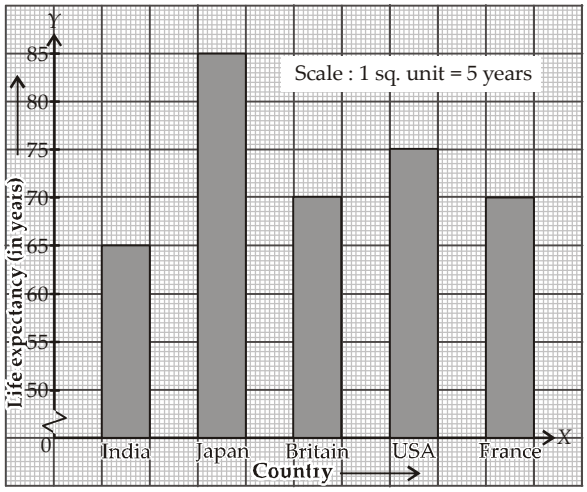
(*ii*) Along *OX* axis, we mark various heads and along *OY* axis, we mark expenditure (in %).

(*iii*) We choose a suitable scale. Here, we choose

1 sq. unit = 5 %

(*iv*) We draw bars leaving equal space between bars.

3.



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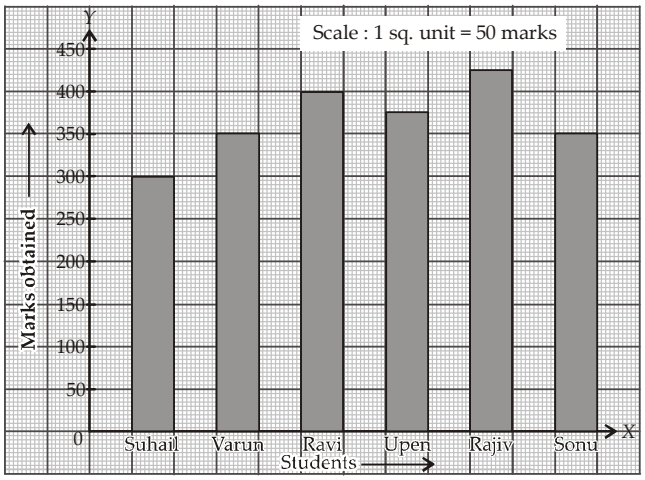

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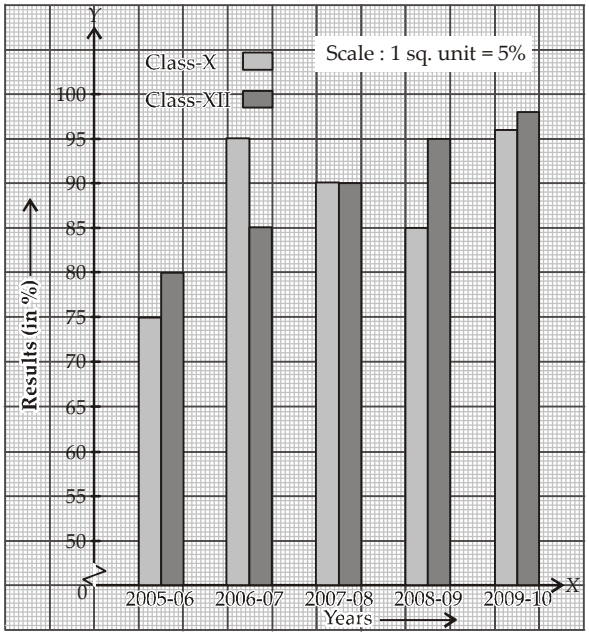

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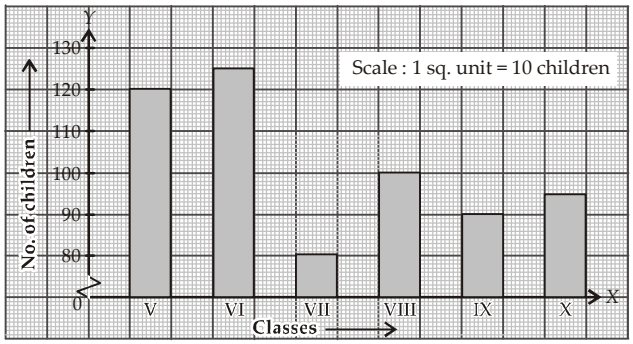

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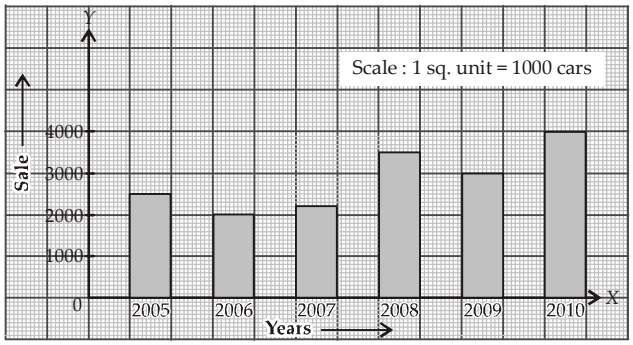

EXERCISE 16.6

1. If a coin is tossed twice, then, the possible outcomes are two heads, two tails, head on first throw and tail on second, tail on first throw and head on second.

$\therefore$ Sample space = {HH, TT, HT, TH}

2. Total possible outcomes = 100

(*i*) Since, number of favourable outcomes (for head) = 52

$\therefore$ Probability of getting a head

$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}}$$

$$= \frac{52}{100} = 0.52$$

(*ii*) Number of favourable outcomes for tail

$= 100 - 52 = 48.$

Thus,

Probability of getting a tail

$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}}$$

$$= \frac{48}{100} = 0.48$$

3. A dice is thrown there are 6 possible outcomes: 1, 2, 3, 4, 5, 6 *i.e.*, 6 in number.

(*i*) Favourable outcomes = 1

Probability of getting a number 5

$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{1}{6}$$

(*ii*) The favourable outcomes are 1, 3, 5 which are 3 in number.

Probability of getting an odd number

$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}}$$

$$= \frac{3}{6} = \frac{1}{2}$$

4. The prime numbers from 1 to 10 are 2, 3, 5 and 7.

Total possible outcomes = 10

Number of favourable outcomes = 4

Probability of getting a prime number from 1 to 10

$$= \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$= \frac{4}{10} = \frac{2}{5}$$

5. Number of total possible outcomes = 100

Number of favourable outcomes = 5

Probability of winning a prize

$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}}$$

$$= \frac{5}{100} = \frac{1}{20} = 0.05$$

6. Total number of students = 13

Number of boys = 6

$\therefore$ Number of girls = 13 – 6 = 7

Probability of selecting a girl student

$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}}$$

$$= \frac{7}{13}$$

7. A dice is thrown once, then there are six possible outcomes are 1, 2, 3, 4, 5, 6.

(*i*) The favourable outcomes are 2, 4, 6 which is 3 in number.

The probability of getting an even number

$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}}$$

$$= \frac{3}{6} = \frac{1}{2}$$

(*ii*) The favourable outcomes are 1, 3, 5 which are 3 in number.

The probability of getting an odd number

$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}}$$

$$= \frac{3}{6} = \frac{1}{2}$$

(*iii*) The favourable outcomes are 4, 5, 6 which are 3 in number

$\therefore$ Number of favourable outcomes = 3

The probability of getting a number greater than 3

$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}}$$

$$= \frac{3}{6} = \frac{1}{2}$$

8. Number of red balls = 6

Number of black balls = 5

Total number of balls in the bag = 6 + 5 = 11

Now, Probability of getting a black ball = $\frac{5}{11}$

9. Two coins are tossed simultaneously.

Therefore, the total sample space: HH, TT, HT, TH

i.e., Total possible outcomes = 4

(*i*) Number of favourable outcome = 1 (TT)

The probability of getting two tails

$$= \frac{\text{Number of favourable outcome}}{\text{Total possible outcomes}} = \frac{1}{4}$$

(*ii*) Number of favourable outcome = 1 (HH)

The probability of getting no tail = $\frac{1}{4}$.

10. Total possible outcomes are

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 *i.e.,* 12 in number.

Favourable outcomes (multiples of 3) are: 3, 6, 9, 12 *i.e.,* 4 in number.

Therefore,

The probability of getting a multiple of 3

$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}}$$

$$= \frac{4}{12} = \frac{1}{3}$$

11. A die is thrown once. The total outcomes are 1, 2, 3, 4, 5, 6 *i.e.,* 6 in number.

(*i*) A number ≥ 4 *i.e.,* 4, 5, 6 which are 3 in number.

$\therefore$ Number of favourable outcomes = 3

Thus, probability (getting a number ≥ 4)

$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{3}{6} = \frac{1}{2}$$

(*ii*) A number ≤ 3 *i.e.,* 1, 2, 3 which are 3 in number.

$\therefore$ Number of favourable outcomes = 3

Thus, probability (getting a number ≤ 3)

$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{3}{6} = \frac{1}{2}$$

(*iii*) Favourable number of outcome = 1

Probability of getting number 5 = $\frac{1}{6}$

MULTIPLE CHOICE QUESTIONS

1. Arranging the number of goals in ascending order:
1, 2, 2, 3, 3, 3, 3, 4, 4, 5

Number of terms(n) = 10 (even)

$$\text{Median} = \frac{1}{2}\left[\left(\frac{n}{2}\right)^{\text{th}} \text{term} + \left(\frac{n}{2}+1\right)^{\text{th}} \text{term}\right]$$

$$= \frac{1}{2}\left[\left(\frac{10}{2}\right)^{\text{th}} \text{term} + \left(\frac{10}{2}+1\right)^{\text{th}} \text{term}\right]$$

$$= \frac{1}{2}[5^{\text{th}} \text{ term} + 6^{\text{th}} \text{ term}]$$

$$= \frac{1}{2} \times (3 + 3) = \frac{1}{2} \times 6 = 3$$

Hence, option (*b*) is correct.

2. Arranging the number of goals in ascending order :
1, 1, 1, 2, 2, 3, 3, 4, 4, 5

Since, the observation 1 is repeated maximum number of times *i.e.,* 3 times.

Thus, the mode is 1.

Hence, option (*c*) is correct.

3. The number of goals are 3, 4, 5, 6, 2, 3, 4, 4, 5, 4.

$$\text{Mean} = \frac{\text{Sum of all observations}}{\text{Number of observations}}$$

$$= \frac{3+4+5+6+2+3+4+4+5+4}{10}$$

$$= \frac{40}{10} = 4$$

Hence, option (*b*) is correct.

4. Lowest term = 10

Highest term = 90

$\therefore$ Range = highest term – lowest term
= 90 – 10 = 80

Hence, option (*a*) is correct.

5. First five prime numbers are 2, 3, 5, 7, 11.

$$\text{Mean} = \frac{\text{Sum of all observations}}{\text{Number of observations}}$$

$$= \frac{2+3+5+7+11}{5} = \frac{28}{5} = 5.6$$

Hence, option (*c*) is correct.

6. $\text{Mean} = \frac{\text{Sum of all observations}}{\text{Number of observations}}$

$$15 = \frac{5+10+x+15+15+15}{6} \quad (\because \text{ Mean} = 15)$$

$$\Rightarrow \quad 15 = \frac{60+x}{6}$$

$$\Rightarrow \quad 60 + x = 90$$

$$\Rightarrow \quad x = 90 - 60$$

$$\Rightarrow \quad x = 30$$

Hence, option (*b*) is correct.

7. The probability of an event cannot be more than 1.

Hence, option (*b*) is correct.

8. A common dice has six faces.

Hence, option (*c*) is correct

9. The sum of probabilities of all possible outcomes is always equal to 1.

Hence, option (*d*) is correct.

10. The probability of the occurrence of an event = $\frac{1}{2}$

The probability of non-occurrence of an event

$$= 1 - \frac{1}{2} = \frac{1}{2}$$

Hence, option (*c*) is correct.

MENTAL MATHS CORNER

Fill in the blanks:

1. In a bar graph, width of all the drawn rectangles are **equal**.

2. The data 9, 8, 12, 3, 4, 6, 9, 13 has mean **8**.

$\because$ $\text{Mean} = \frac{\text{Sum of all observations}}{\text{Number of observations}}$

$$= \frac{9+8+12+3+4+6+9+13}{8}$$

$$= \frac{64}{8} = 8$$

3. Median refers to the value which lies **in the middle** of the data, when arranged in ascending or descending order.

4. The mode is the observation that occurs **most often**.

5. A coin is tossed 100 times and 57 times head was got. The probability of getting a head is **0.57**.

Number of favourable outcomes = 57

Total possible outcomes = 100

$$\text{Probability of getting a head} = \frac{57}{100}$$

$$= 0.57.$$

6. There are 6 marbles in a box with numbers from 1 to 6 marked on each of them. The probability of drawing a marble with number 5 is $\mathbf{\frac{1}{6}}$.

Number of favourable outcome = 1

Possible outcomes are 1, 2, 3, 4, 5 and 6 which are 6 in number.

$\therefore$ Total possible outcomes = 6

Therefore, required probability = $\frac{1}{6}$.

REVIEW EXERCISE

1. Arranging the marks obtained by 17 students in a mathematics test in ascending order :

45, 46, 56, 63, 64, 65, 69, 72, 76, 79, 79, 82, 82, 87, 90, 100, 100.

Lowest term = 45

Highest term = 100

Range = Highest term – Lowest term

= 100 – 45

= 55

2. Total number of terms(n) = 9 (odd)

Median = 25

$\because$ Median = $\left(\frac{n+1}{2}\right)^{\text{th}}$ term

$\Rightarrow$ $25 = \left(\frac{9+1}{2}\right)^{\text{th}}$ term

$\Rightarrow$ $25 = 5^{\text{th}}$ term

$\Rightarrow$ $25 = 2x + 1$

$\Rightarrow$ $2x = 25 - 1$

$\Rightarrow$ $x = \frac{24}{2} = 12$

Hence, the value of x is 12.

3. Number of observations = 6

$\therefore$ Mean = $\frac{\text{Sum of all observations}}{\text{Number of observations}}$

$= \frac{9 + 89 + 19 + 79 + 29 + 69}{6}$

$= \frac{294}{6} = 49$

Hence, mean is 49.

4. First six multiples of 6 are 6, 12, 18, 24, 30, 36.

Mean = $\frac{6 + 12 + 18 + 24 + 30 + 36}{6}$

$= \frac{126}{6} = 21$

Hence, mean is 21.

5. The given observations are 2, 5, 8, x, 5, 6.

Mean = 6

$\because$ Mean = $\frac{\text{Sum of all observations}}{\text{Number of observations}}$

$6 = \frac{2 + 5 + 8 + x + 5 + 6}{6}$

$\Rightarrow$ $6 = \frac{26 + x}{6}$

$\Rightarrow$ $26 + x = 36$

$\Rightarrow$ $x = 36 - 26$

$\Rightarrow$ $x = 10$

Hence, the value of x is 10.

6. The mean of 72 items = 63

Sum of all items = Mean × Number of items

= 63 × 72 = 4536

If two of the items were misread as 27 and 9 instead of 72 and 90, then

Correct sum of all items = 4536 – 27 – 9 + 72 + 90

= 4662

Thus, Correct mean = $\frac{\text{Correct sum of items}}{\text{Number of items}}$

$= \frac{4662}{72} = 64.75$

Hence, the correct mean is 64.75.

7. Arranging the terms in ascending order:

23, 35, 38, 54, 54, 55, 69, 77, 83

Total number of terms, n = 9 (odd)

$\therefore$ Median = $\left(\frac{n+1}{2}\right)^{\text{th}}$ term

$= \left(\frac{9+1}{2}\right)^{\text{th}}$ term

$= \left(\frac{10}{2}\right)^{\text{th}}$ term

= 5^{th} term

= 54

Hence, median is 54.

8. Number of boys in a group = 3

Number of girls in a group = 4

Total number of children = 3 + 4 = 7

Therefore,

Number of favourable outcomes (being a girl) = 4

The probability of the child being a girl

= $\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}}$

= $\frac{4}{7}$

9. Since, a coin is tossed 200 times.

$\therefore$ Total possible outcomes = 200

$\therefore$ Tail occured 125 times.

$\therefore$ Favourable outcomes of getting a tail = 125

The probability of getting a tail

$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}}$$

$$= \frac{125}{200} = \frac{5}{8}$$

10.

Mark obtained (x)	Frequency (f)	$f \times x$
30	10	10 × 30 = 300
25	2	2 × 25 = 50
27	5	5 × 27 = 135
40	4	4 × 40 = 160
30	11	11 × 30 = 330
35	8	8 × 35 = 280
Total	$\Sigma f = 40$	$\Sigma fx = 1255$

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{1255}{40}$$

$$= 31.375$$

Hence, the mean marks is 31.375.

HOTS QUESTIONS

1. The mean of 82 numbers = 38

Sum of all numbers = 38 × 82 = 3116

($\because$ Sum of all numbers = Mean × Total numbers)

If each number is multiplied by 4, then

New sum of all numbers = 4 × 3116 = 12464

Thus, new mean = $\frac{12464}{82}$ = 152

Hence, new mean is 152.

2. Arranging the given data in ascending order:

42, 45, 51, 52, 53, 57, 76, 78

Total number of terms, n = 8 (even)

$$\text{Median} = \frac{1}{2}\left[\left(\frac{n}{2}\right)^{\text{th}} \text{term} + \left(\frac{n}{2}+1\right)^{\text{th}} \text{term}\right]$$

$$= \frac{1}{2}\left[\left(\frac{8}{2}\right)^{\text{th}} \text{term} + \left(\frac{8}{2}+1\right)^{\text{th}} \text{term}\right]$$

$$= \frac{1}{2}[4^{\text{th}} \text{ term} + 5^{\text{th}} \text{ term}]$$

$$= \frac{1}{2} \times (52 + 53)$$

$$= \frac{1}{2} \times 105$$

Median = 52.5

Hence, the median is 52.5.

3. One card is drawn from a pack of 52 cards

Total number of possible outcomes = 52.

Number of favourable outcomes that the card drawn is black and a queen = 2 (as there are 2 black queens).

Therefore, probability that the card drawn is black and a queen = $\frac{2}{52} = \frac{1}{26}$.