SSLC CLASS NOTES: STATISTICS

Chapter 6

STATISTICS

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SSLC CLASS NOTES: CHAPTER 6- STATISTICS

Standard Deviation

σ

Un grouped data			
Direct Method	**Actual Mean Method**	**Assumed Mean Method**	**Step-Deviation Method**
$\sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$	$\sqrt{\frac{\sum d^2}{n}}$	$\sqrt{\frac{\sum d^2}{n} - \left(\frac{\sum d}{n}\right)^2}$	$\sqrt{\frac{\sum d^2}{n} - \left(\frac{\sum d}{n}\right)^2}$ xC

Grouped Data			
Direct Method	**Actual Mean Method**	**Assumed Mean Method**	**Step-Deviation Method**
$\sqrt{\frac{\sum fx^2}{n} - \left(\frac{\sum fx}{n}\right)^2}$	$\sqrt{\frac{\sum fd^2}{n}}$	$\sqrt{\frac{\sum fd^2}{n} - \left(\frac{\sum fd}{n}\right)^2}$	$\sqrt{\frac{\sum fd^2}{n} - \left(\frac{\sum fd}{n}\right)^2}$ xc

Standard Deviation $= \sqrt{Variance}$

Coefficient of Variation(C.V) $= \frac{\sigma}{\bar{x}} x100$

Example problems

Example: 1 The number of saplings planted by 8 students during a year are 2, 6, 12, 5, 9, 10, 7, 4. Calculate the standard deviation for the data. [By Direct Method]

x	2	4	5	6	7	9	10	12
x^2	4	16	25	36	49	81	100	144

n = 8, $\sum x = 55$ and $\sum x^2 = 455$

$$\sigma = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2} = \sqrt{\frac{455}{8} - \left(\frac{55}{8}\right)^2}$$

$$\sigma = \sqrt{56.88 - (6.88)^2} = \sqrt{56.88 - 47.33} = \sqrt{9.55} \quad \Rightarrow \sigma = 3.09$$

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Example2: The number of children born in 10 different hospitals during a month are 9, 12, 15, 18, 20, 22, 23, 24, 26, 31 Calculate the standard deviation. **(By Actual Mean Method)**

x	d = x-$\bar{x}$	D^2
9	-11	121
12	-8	64
15	-5	25
18	-2	4
20	0	0
22	2	4
23	3	9
24	4	16
26	6	36
31	11	121
$\sum x = 200$		$\sum d^2 = 400$

Mean $(\bar{x}) = \frac{\sum x}{n} = \frac{200}{10} = 20$

Standard Deviation $(\sigma) = \sqrt{\frac{\sum d^2}{n}} = \sqrt{\frac{400}{10}}$

Standard Deviation $(\sigma) = \sqrt{40} = 6.32$

Example3: The number of sick people who were treated as outpatients in a hospital on each day during a week are given below:
50, 56, 59, 60, 63, 67, 68 Calculate the standard deviation**. [By Assumed Mean Method]**

x	d = x - A	d^2
50	-10	100
56	-4	16
59	-1	1
60	0	0
63	3	9
67	7	49
68	8	64
n=8	$\sum d = 3$	$\sum d^2 = 239$

Sol: Let Assumed mean be A = 60.

$\sigma = \sqrt{\frac{\sum d^2}{n} - \left(\frac{\sum d}{n}\right)^2} = \sqrt{\frac{239}{7} - \left(\frac{3}{7}\right)^2}$

$\sigma = \sqrt{34.14 - 0.18}$

$\sigma = \sqrt{33.96}$

$\sigma = 5.83$

Example 4: The number of books issued in a school library during the first ten days of the month are as follows:
20, 30, 40, 60, 80, 90, 110, 120, 130, 140 Calculate the standard deviation.
[By Step Deviation Method]

x	$d = \frac{x-A}{c}$	d^2
20	-7	49
30	-6	36
40	-5	25
60	-3	9
80	-1	1
90	0	0
110	2	4
120	3	9
130	4	16
140	5	25
n=10	$\sum d = -8$	$\sum d^2 = 174$

$\sigma = \sqrt{\frac{\sum d^2}{n} - \left(\frac{\sum d}{n}\right)^2}$ x10 $= \sqrt{\frac{174}{10} - \left(\frac{-8}{10}\right)^2}$ x 10

$\sigma = \sqrt{17.4 - 0.64}$ x10

$\sigma = \sqrt{16.76}$x10

$\sigma = 4.09x10$

$\sigma = 40.9$

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Example5: The rainfall recorded in various places of five districts for six days are given below:

Rainfall in mm	35	40	45	50	55
Number of places	6	8	12	5	9

Calculate the standard deviation [By All four Method]

1. Direct Method

x	f	fx	x^2	fx
35	6	210	1225	7350
40	8	320	1600	12800
45	12	540	2025	24300
50	5	250	2500	12500
55	9	495	3025	27225
	n = 40	$\sum fx = 1815$		$\sum fx^2 = 84175$

$$\text{S.D. } (\sigma) = \sqrt{\frac{\sum fx^2}{n} - \left(\frac{\sum fx}{n}\right)^2} = \sqrt{\frac{84175}{40} - \left(\frac{1815}{40}\right)^2}$$

$\sqrt{2104.38 - 2058.9} = \sqrt{45.48} = 6.7$

2. Actual Mean Method

x	f	fx	$d = x - \bar{x}$	d^2	fd^2
35	6	210	–10.4	108.2	649.2
40	8	320	–5.4	29.2	233.6
45	12	540	–0.4	1.6	19.2
50	5	250	4.6	21.2	106.0
55	9	495	9.6	92.2	829.8
	n = 40	$\Sigma fx = 1815$			$\Sigma fd^2 = 1837.8$

$$\sqrt{\frac{\sum fd^2}{n}} = \sqrt{\frac{1837.8}{40}} = \sqrt{45.95} = 6.7$$

3.Assumed Mean Method

x	f	d = x – A	fd	d^2	fd^2
35	6	–10	–60	100	600
40	8	–5	–40	25	200
45	12	0	0	0	0
50	5	+5	+25	25	125
55	9	+10	+90	100	900
	n = 40		$\Sigma fd = +15$		$\Sigma fd^2 = 1825$

$$\sqrt{\frac{1825}{40} - \left(\frac{15}{40}\right)^2} = \sqrt{\frac{\sum fd^2}{n} - \left(\frac{\sum fd}{n}\right)^2} = \sqrt{45.46} = 6.7$$

4. Step Deviation Method

x	f	$d=\frac{x-A}{c}$	$\mathbf{d^2}$	fd	$\mathbf{fd^2}$
35	6	-2	4	-12	24
40	8	-1	1	-8	8
45	12	0	0	0	0
50	5	1	1	5	5
55	9	2	4	18	36
	40			**3**	**73**

$$\sigma^2 = \sqrt{\frac{\sum fd^2}{n} - \left(\frac{\sum fd}{n}\right)^2} \text{ x } c$$

$$\sigma^2 = \sqrt{\frac{73}{40} - \left(\frac{3}{40}\right)^2} \text{ x } 10$$

$$\sigma^2 = \sqrt{1.825 - (0.075)^2}\text{x } 10 = \sqrt{1.825 - 0.005625}\text{x } 10 = \sqrt{1.82}\text{x } 10$$

S.D. $\sigma = 6.7$

EXAMPLE6: The time (in seconds) taken by a group of students to solve a problem in mathematics is given in the table below.

C-I	0-10	10-20	20-30	30-40	40-50
f	7	10	15	8	10

Calculate the standard deviation of the data.

C.I.	X	f	$d=\frac{x-A}{c}$	$\mathbf{d^2}$	fd	$\mathbf{fd^2}$
0-10	5	7	-2	4	-14	28
10-20	15	10	-1	1	-10	10
20-30	25	15	0	0	0	0
30-40	35	8	1	1	8	8
40-50	45	10	2	4	20	40
		50			+4	86

$$\sigma = \sqrt{\frac{\sum fd^2}{n} - \left(\frac{\sum fd}{n}\right)^2} \text{ x } c$$

$$\sigma = \sqrt{1.72 - (0.08)^2}\text{x } 10$$

$$\sigma = \sqrt{1.72 - 0.0064}\text{x } 10$$

$$\sigma = \sqrt{1.71}\text{x } 10$$

$$\sigma = 1.31\text{x } 10$$

$$\sigma = 13.1$$

ILLUSTRATIVE EXAMPLES

Example1: Find the variance and standard deviation of the following scores: 68, 72,80,84,92,100

x	$d=\frac{x-A}{c}$	$\mathbf{d^2}$
68	-4	16
72	-3	9
80	-1	1
84	0	0
92	2	4
100	4	16
	$\sum \mathbf{d} = -2$	$\sum \mathbf{d^2} = 46$

Variance:

$$\sigma^2 = \frac{\sum d^2}{n} - \left(\frac{\sum d}{n}\right)^2 \text{ x } C^2 = \frac{46}{6} - \left(\frac{-2}{6}\right)^2 \text{ x } 4^2$$

$$\sigma^2 = 7.7 - 0.1 \text{ x}16$$

$$\sigma^2 = 7.6\text{x}16$$

$$\sigma^2 = 121.6$$

Standard deviation: $\sigma = \sqrt{121.6} = 11.03$

Example2: The marks obtained by 60 students in a test are given as follows.

Marks	5-15	15-25	25-35	35-45	45-55	55-65
No.of students	8	12	20	10	7	3

Calculate the mean and standard deviation of the distribution. Also interpret the results.

C.I.	X	f	d $=\frac{x-A}{c}$	$\mathbf{d^2}$	fd	$\mathbf{fd^2}$
5-15	10	8	-2	4	-16	32
15-25	20	12	-1	1	-12	12
25-35	30	20	0	0	0	0
35-45	40	10	1	1	10	10
45-55	50	7	2	4	14	28
55-65	60	3	3	9	9	27
		60			**5**	**109**

$\bar{X} = A + \frac{\sum fd}{n} xc$

$\bar{X} = 30 + \frac{5}{60} x10$

$\bar{X} = 30 + 0.8$

$\mathbf{\bar{X} = 30.8}$

$\sigma = \sqrt{\frac{\sum fd^2}{n} - \left(\frac{\sum fd}{n}\right)^2} x\ c$

$\sigma = \sqrt{\frac{109}{60} - \left(\frac{5}{60}\right)^2} x\ 10$

$\sigma = \sqrt{1.82 - (0.08)^2} x\ 10$

$\sigma = \sqrt{1.82 - 0.0064} x\ 10 = \sqrt{1.81} x\ 10 = 1.34 x\ 10$

$\boldsymbol{\sigma = 13.4}$

This means, on an average each score deviates from the mean value 30.8 by 13.4.

Example 3: The mean of 30 scores is 18 and their standard deviation is 3. Find the sum of all the scores and also the sum of the squares of all the scores

Sol: $\bar{x} = \frac{\sum x}{n}$

$\Rightarrow 18 = \frac{\sum x}{30}$

$\Rightarrow \sum x = 540$ the sum of all the scores.

$\sigma^2 = \frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2$

$9 = \frac{\sum x^2}{30} - \left(\frac{540}{30}\right)^2$

$9 = \frac{\sum x^2}{30} - 324$

$\sum x^2 = (9 + 324)30 = 9990$

Exercise 6.1

Calculate the standard deviation for the following by step deviation.

1. Calculate the standard deviation of the following data.

x	**3**	**8**	**13**	**18**	**23**
f	7	10	15	10	8

x	f	$d=\frac{x-A}{c}$	d^2	fd	fd^2
3	7	-2	4	-14	28
8	10	-1	1	-10	10
13	15	0	0	0	0
18	10	1	1	10	10
23	8	2	4	16	32
	50			2	80

$$\sigma = \sqrt{\frac{\Sigma f d^2}{n} - \left(\frac{\Sigma f d}{n}\right)^2} \text{ x c}$$

$$\sigma = \sqrt{\frac{80}{50} - \left(\frac{2}{50}\right)^2} \text{ x } 5$$

$$\sigma = \sqrt{1.6 - (0.04)^2} \text{ x } 5$$

$$\sigma = \sqrt{1.6 - 0.0016} \text{x } 5$$

$$\sigma = \sqrt{1.5984} \text{x } 5$$

$$\sigma = 1.264 \text{x } 5 =$$

$$\boldsymbol{\sigma = 6.32}$$

2. The number of books bought by 200 students in a book exhibition is given below.

No. of Books (x)	**0**	**1**	**2**	**3**	**4**
No.of students (f)	35	64	68	18	15

Find the variance and standard deviation.

x	f	$d=\frac{x-A}{c}$	d^2	fd	fd^2
0	35	-2	4	-70	140
1	64	-1	1	-64	64
2	68	0	0	0	0
3	18	1	1	18	18
4	15	2	4	30	60
	200			-86	282

$$\sigma^2 = \left[\frac{\Sigma fd^2}{n} - \left(\frac{\Sigma fd}{n}\right)^2\right] \text{x c}$$

$$\sigma^2 = \left[\frac{282}{200} - \left(\frac{-86}{200}\right)^2\right] \text{x } 1$$

$$\sigma^2 = [1.41 - (-0.43)^2] \text{x } 1$$

$$\sigma^2 = [1.41 - 0.1849] \text{x } 1$$

$$\sigma^2 = [1.23] \text{x } 1$$

$$\textbf{Variance } \boldsymbol{\sigma^2 = 1.23}$$

$$\textbf{Standard Deviation } \boldsymbol{\sigma = 1.109}$$

3. The marks scored by 60 students in a science test are given below.

Marks(x)	10	20	30	40	50	60
No.of students(f)	8	12	20	10	7	3

Calculate the variance and standard deviation.

x	f	$d=\frac{x-A}{c}$	d^2	fd	fd^2
10	8	-2	4	-16	32
20	12	-1	1	-12	12
30	20	0	0	0	0
40	10	1	1	10	10
50	7	2	4	14	28
60	3	3	9	9	27
ವಿದ	60			5	109

$$\sigma^2 = \left[\frac{\sum fd^2}{n} - \left(\frac{\sum fd}{n}\right)^2\right] x\ c^2$$

$$\sigma^2 = \left[\frac{109}{60} - \left(\frac{5}{60}\right)^2\right] x\ 100$$

$$\sigma^2 = [1.8166 - (-0.083)^2] x\ 100$$

$$\sigma^2 = [1.8166 - 0.0069] x\ 100$$

$$\sigma^2 = [1.809] x\ 100$$

Variance $\sigma^2 = 180.9$

Standard deviation $\sigma = 13.45$

4. The daily wages of 40 workers of a factory are given in the following table.

Wages in (In Rs)	30-34	34-38	38-42	42-46	46-50	50-54
No. of workers	4	7	9	11	6	3

Calculate (i) Mean (ii) Variance and (iii) Standard deviation of wages and Interpret the findings.

C.I.	X	f	$d=\frac{x-A}{c}$	d^2	fd	fd^2
30-34	32	4	-3	9	-12	36
34-38	36	7	-2	4	-14	28
38-42	40	9	-1	1	-9	9
42-46	44	11	0	0	0	0
46-50	48	6	1	1	6	6
50-54	52	3	2	4	6	12
		40			-23	91

$$\bar{X} = A + \frac{\sum fd}{n} xc$$

$$\bar{X} = 44 + \frac{-23}{40} x4$$

$$\bar{X} = 42 - 2.3$$

$\bar{X} = 41.7$

$$\sigma^2 = \left[\frac{\sum fd^2}{n} - \left(\frac{\sum fd}{n}\right)^2\right] x\ c^2$$

$$\sigma^2 = \left[\frac{91}{40} - \left(\frac{-23}{40}\right)^2\right] x\ 4^2$$

$$\sigma^2 = [2.275 - (-0.575)^2] x\ 16$$

$$\sigma^2 = [2.275 - 0.3306] x\ 16$$

$$\sigma^2 = [1.944] x\ 16$$

Variance $\sigma^2 = 31.11$

Standard deviation $\sigma = 5.58$

This means, on an average each score deviates from the mean value 41.7 by 5.58.

5. Mean of 100 items is 48 and their standard deviation is 10. Find the sum of all the Items and the sum of the squares of all the items.

$\bar{X} = \frac{\sum x}{n}$

$48 = \frac{\sum x}{100}$

$\sum x = 48x100$

$\sum x = 4800$

$\sigma^2 = \left[\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2\right]$

$10^2 = \left[\frac{\sum x^2}{100} - (48)^2\right]$ $\left[\because \frac{\sum x}{n} = \bar{X}\right]$

$100 = \left[\frac{\sum x^2 - 230400}{100}\right]$

$10000 = \frac{\sum x^2 - 230400}{100}$

$\sum x^2 = 10000 + 230400 = 2{,}40{,}400$

6. In a study of diabetic patients in a village, the following observations were noted.

Age(in years)	10-20	20-30	30-40	40-50	50-60	60-70
No.of patients	2	5	12	19	9	3

Calculate the mean and standard deviation. Also interpret the results.

C.I.	X	f	$d = \frac{x-A}{c}$	d^2	fd	fd^2
10-20	15	2	-3	9	-6	18
20-30	25	5	-2	4	-10	20
30-40	35	12	-1	1	-12	12
40-50	45	19	0	0	0	0
50-60	55	9	1	1	9	9
60-70	65	3	2	4	6	12
		50			-13	71

$\bar{X} = A + \frac{\sum fd}{n} xc$

$\bar{X} = A + \frac{-13}{50} x10$

$\bar{X} = 45 - 2.6$

$\bar{X} = 42.4$

$\sigma = \sqrt{\frac{\sum fd^2}{n} - \left(\frac{\sum fd}{n}\right)^2} x\ c$

$\sigma = \sqrt{\frac{71}{50} - \left(\frac{-13}{50}\right)^2} x\ 10$

$\sigma = \sqrt{1.42 - (0.26)^2} x\ 10 = \sqrt{1.42 - 0.0676} x\ 10$

$\sigma = \sqrt{1.3524} x\ 10$

$\sigma = 1.163 x\ 10$

$\boldsymbol{\sigma = 11.63}$

This means, the average age of the patient is 42.4years and the age of the patients is deviated from the average age by 11.68

ILLUSTARTED EXAMPLES

Example1: The total runs scored by two cricket players Arun and Bharath in 15 matches are 1050 and 900 with standard deviation 4.2 and 3.0 respectively. Who is better run getter? Who is more consistent in performance?

Sol: Average score of Arun $= \frac{1050}{15} = 70$

Average score of Bharath $= \frac{900}{15} = 60$

Player	Average	S.D.	C.V.$=\frac{\sigma}{\bar{x}}$x100
Arun	70	4.2	$=\frac{4.2}{70} x100 = 6$
Bharath	60	3.0	$=\frac{3.0}{60} x100 = 5$

(i) The average score of Arun is greater than average score of Bharath, hence Arun is a better run getter
(ii) The coefficient of variation of Bharath is less than coefficient of variation of Arun, hence Bharath is more consistent.

Example2: Calculate the standard deviation and coefficient of variation for the following distribution.

x	10	20	30	40	50
f	4	3	6	5	2

x	f	fx	$d = x - \bar{x}$	d^2	fd^2
10	4	40	-19	361	1444
20	3	60	-9	81	243
30	6	180	1	1	6
40	5	200	11	121	605
50	2	100	21	441	882
	20	**580**			**3180**

$\bar{X} = \frac{\sum fx}{n} = \frac{580}{20} = 29$

$\sigma = \sqrt{\frac{\sum fd^2}{n}}$

$\sigma = \sqrt{\frac{3180}{20}} = \sqrt{159} = 12.61$

$\therefore C.V. = \frac{\sigma}{\bar{x}} x100$

$\Rightarrow C.V. = \frac{12.61}{29} x100 \Rightarrow 43.48$

Exercise 6.2

1. Calculate the coefficient of variation of the following data: 40, 36, 64, 48, and 52.

X	d=X-A	d^2
36	-12	144
40	-8	64
48	0	0
52	4	16
64	16	256
	0	480

$\bar{X} = A + \frac{\sum d}{n}$

$\bar{X} = 48 + 0$

$\bar{X} = 48$

$\sigma = \sqrt{\frac{\sum d^2}{n} - \left(\frac{\sum d}{n}\right)^2}$

$\sigma = \sqrt{\frac{480}{5} - (0)^2} = \sqrt{96 - 0} = \sqrt{96} = 9.798$

$C.V = \frac{\sigma}{\bar{X}} x100 \Rightarrow C.V = \frac{9.798}{48} x100 = 20.41$

2. If the coefficient of variation of a collection of data is 45 and its standard deviation is 2.5, then find the mean.

$C.V = \frac{\sigma}{\bar{X}} x100$

$45 = \frac{2.5}{\bar{X}} x100$

$\bar{X} = \frac{2.5}{45} x100$

$\bar{X} = 5.55$

3. A group of 100 candidates attending a physical test for recruitment have their average height as 163.8 cm with coefficient of variation 3.2. What is the standard deviation of their heights?

$C.V = \frac{\sigma}{\bar{X}} x100$

$3.2 = \frac{\sigma}{163.8} x100$

$\boldsymbol{\sigma} = \frac{3.2}{100} x163.8$

$\boldsymbol{\sigma} = 5.24$

4. If n = 10, $\bar{X}$ = 12 and $\sum x^2$ = 1530 then calculate the coefficient of variation.

$\sigma = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$

$\sigma = \sqrt{\frac{1530}{10} - (12)^2}$ $[\because \frac{\sum x}{n} = \bar{X}]$

$\sigma = \sqrt{153 - 144}$

$\sigma = \sqrt{9}$

$\boldsymbol{\sigma = 3}$

$\sigma = 9.798$

$C.V = \frac{\sigma}{\bar{X}} x100$

$C.V. = \frac{3}{12} x100$

$C.V. = 25$

5. The coefficient of variations of two series are 58 and 69. Their standard deviations are 21.2 and 51.6. What are their arithmetic means?

Grade	C.V.	S.D.	$\bar{X} = \frac{\sigma}{(C.V)} x100$
1	58	21.2	$\bar{X} = \frac{21.2}{58} x100 = 36.55$
2	69	51.6	$\bar{X} = \frac{51.6}{69} x100 = 74.78$

6. Batsman A gets an average of 64 runs per innings with standard deviation of 18 runs, while batsman B get an average score of 43 runs with standard deviation of 9 runs in an equal number of innings. Discuss the efficiency and consistency of both the batsmen.

Grade	Average	S.D.	$(C.V) = \frac{\sigma}{\bar{X}} x100$
A	64	18	$(C.V) = \frac{18}{64} x100 = 28.125$
B	43	9	$(C.V) = \frac{9}{43} x100 = 20.93$

The average of A is more. ∴ A is more efficient

The coefficient of variance of B is less. ∴B is more consistant player.

7. In two construction companies A and B, the average weekly wages in rupees and the standard deviations are as follows.

Company	Average of wages (in Rs)	S.D of wages in Rs
A	3450	6.21
B	2850	4.56

Determine which factory has greater variability in individual wages?

Company	Average of wages (in Rs)	S.D of wages in Rs	$(C.V)=\frac{\sigma}{\bar{x}}x100$
A	3450	6.21	$(C.V)=\frac{6.21}{3450}x100=0.18$
B	2850	4.56	$(C.V)=\frac{4.56}{2850}x100=0.16$

The coefficient of variance of the company A is more.∴A is greater variability.

Pie Chart

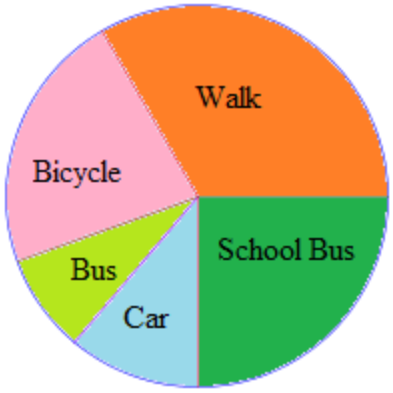
Example Questions

Example1: There are 36 students in a class. The following table shows how they usually come to school represent this data in a pie- chart.

Walk	Bicycle	Bus	Car	School Bus
12	8	3	4	9

Each student corresponds to $\frac{360}{36}=10^0$

Walk	12	$12x10=120^0$
Bicycle	8	$8x10=80^0$
Bus	3	$3x10=30^0$
Car	4	$4x10=40^0$
School Bus	9	$9x10=90^0$
Total	36	360^0

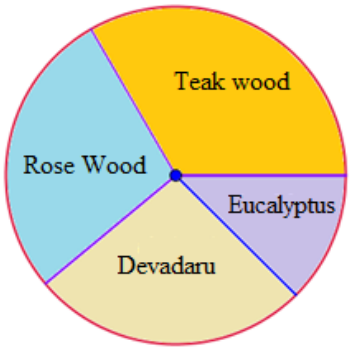


Example2: The four important types of trees found in one square kilometer of a forest area are given in the table. Draw a pie-chart.

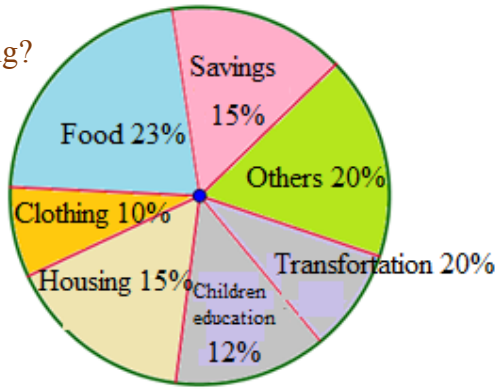
Teak wood	Rose wood	Devadaru	Eucalyptus
360	300	285	135

Each tree corresponds to $\frac{360}{36}=10^0=\frac{360}{1080}=\frac{1^0}{3}$

Teak wood	360	$360x\frac{1}{3}=\mathbf{120^0}$
Rose wood	300	$300x\frac{1}{3}=100^0$
Devadaru	285	$285x\frac{1}{3}=95^0$
Eucalyptus	135	$135x\frac{1}{3}=45^0$
	1080	$\mathbf{360^0}$



Example3: The pie chart given below shows the expenditure of a family on various items and its savings during a year.
Study the pie chart and answer the following questions
(i) If the total annual income of the family is Rs 75,000, what is the expenditure on children education?
(ii) What amount of income was spent on clothing?
(iii) How much of family's income is saved?
(iv) How much is the expenditure on food more than that on housing?
(v) What is the difference in the expenses on housing? and transport?
Sol:

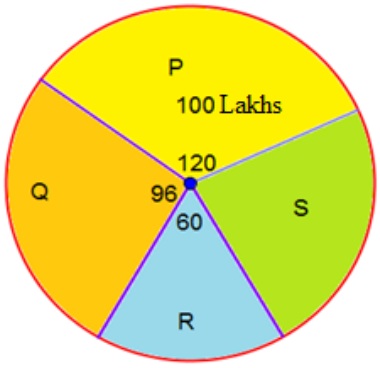


Expenditure	Percentage
Savings	15%
Food	23%
Clothing's	10%
Housing	15%
Children education	12%
Transfort	20%
others	20%

1. Expenditure on children education: $=\frac{12}{100}$x75000 = Rs9000
2. Expenditure on clothing = $\frac{10}{100}$x75000 = Rs7500
3. Given, 15% of income is saved $=\frac{15}{100}$x75000 = Rs11,250
4. More Expenditure on food than the expenditure on housing
= Expenditure on food - expenditure on housing
= $\frac{23}{100}$x75000 - $\frac{15}{100}$x75000 =17250 – 11250 =Rs 6000
5. Difference in the expenses on housing and transport is
$\frac{20}{100}$x75000 =$\frac{15}{100}$x75000 =15,000 – 11,250 =Rs 3,750

[In this problem we get the total of percentages = 115%. It is wrong, Still solve the problem according to given data]

Example4: A pie chart representing the population of four cities is shown below. Read the pie chart and find the population of S.



Sector of 84° corresponds represents the Population of city S
∴The population of city S = $\frac{120}{360}$ = 100
$\frac{84}{360}$ = ?
⇒$\frac{84}{360}$ x 100 x $\frac{360}{120}$ = 70Laks

Exercise 6.3

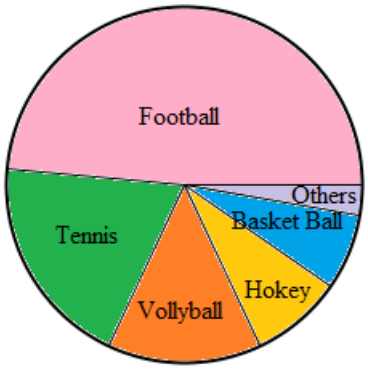
I. Draw pie charts to represent the following data

1. The number of students who are willing to join their favorite sports.

Name of the sport	Foot ball	Tennis	Volley ball	Hockey	Basket ball	Other
No. of students	35	14	10	6	5	2

Each student corresponds to $=\frac{360}{72} = 5^0$

Name of the sport	**No. of students**	**Angle corresponding to sectors**
Foot ball	35	$35x5= 175^0$
Tennis	14	$14x5= 70^0$
Volley ball	10	$10x5= 50^0$
Hockey	6	$6x5= 30^0$
Basket ball	5	$5x5= 25^0$
Other	2	$2x5= 10^0$

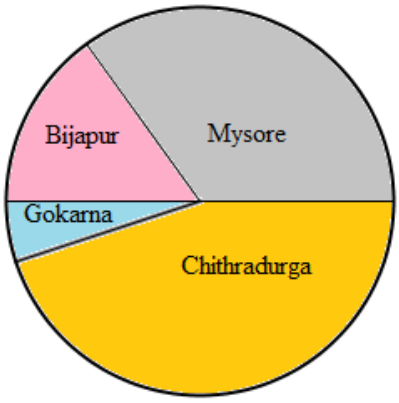


2. The survey carried out in the class regarding places of visit for excursion and the number of students who opted each place

Places	Mysore	Bijapur	Gokarna	Chitradurga
Number of students	14	6	2	18

Each student corresponds to $=\frac{360}{40} = 9^0$

Places	Number of students	Angle corresponding to sectors
Mysore	14	$14x9= 126^0$
Bijapur	6	$6x9= 54^0$
Gokarna	2	$2x9= 18^0$
Chitradurga	18	$18x9= 162^0$

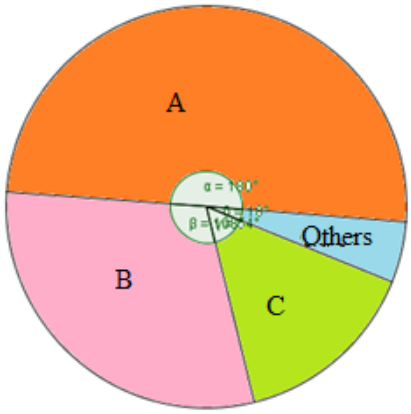


3. A survey was conducted to study the various brands of soaps used by people in a village.

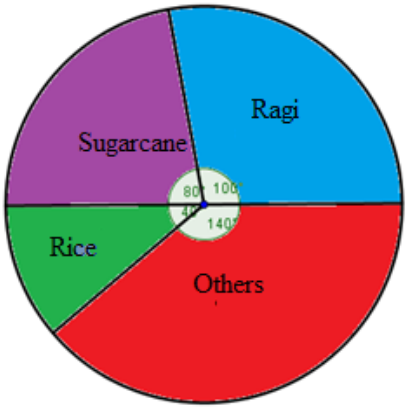
Brand of soap	**A**	**B**	**C**	**Others**
Percent of Villagers	50%	30%	15%	5%

Each Soap corresponds to $=\frac{360}{100} = 3.6^0$

Brand of soaps	Percent of Villagers	Angle corresponding to sectors
A	50%	$50x3.6= 180^0$
B	30%	$30x3.6= 108^0$
C	15%	$15x3.6= 54^0$
Others	5%	$5x3.6= 18^0$



II. **Study the pie charts given below and answer the questions in each case.**



1. The given pie chart shows the annual agricultural yield of a certain place. If the total production is 8100 tons. answer the questions

(i) What is the yield in tons of rice, ragi, sugarcane and others?

(ii) How much percentage do the production of rage exceeds that of rice?

(iii) If the yield of sugarcane on a different year was tons, find the yield of rice?

i. What is the yield in tons of rice, ragi, sugarcane and others?

Rice $=\frac{8100}{360}x40 =$ 900 Ton

Ragi $=\frac{8100}{360}x100 =$ 2,250 Ton

Sugarcane $=\frac{8100}{360}x80 =$ 1,800 Ton

Others $=\frac{8100}{360}x140 =$ 3,150 Ton

ii. How much percentage do the production of ragi exceeds that of rice?

Production of ragi = 2,250 ton

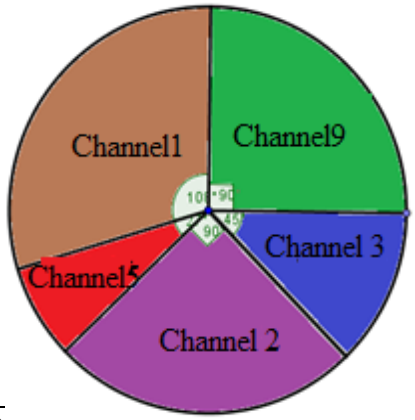
Production of rice = 900 ton

The total production of ragi exceeds rice = 2,250-900= 1350 ton

∴ The % of production of ragi exceeds rice $=\frac{1350}{8100}x100 = 16.66\%$

(iii) If the yield of sugarcane on a different year was tons, find the yield of rice?
If the production of sugarcane 1800 then the production of rice = 900ton
∴ If the yield of sugarcane is 2400 then the yield of rice = $\frac{2400}{1800}$x900 = 1200 ton

2. A group of people were interviewed and asked which T.V. Channel they liked the most. The results are shown in the pie chart.



Answer the questions
(i). What fraction of the people who were interviewed watched
(a) Channel 3 (b) Channel 5
(C) Channel 1 (d) Channel 2
(e) Channel 9
(ii) If there were 200 people, how many viewed Each of the Channels

(i). What fraction of the people who were interviewed watched

(a) Channel 3 = $\frac{45}{360}$x 1 = $\frac{1}{8}$ (b) Channel 5 = $\frac{27}{360}$x 1 = $\frac{3}{40}$

(c) Channel1 = $\frac{108}{360}$x 1 = $\frac{3}{10}$ (d) Channel 2 = $\frac{90}{360}$x 1 = $\frac{1}{4}$

(e) Channel 9 = $\frac{90}{360}$x 1 = $\frac{1}{4}$

(ii). If there were 200 people, how many viewed each of the Channels?

Channel 3 = $\frac{1}{8}$x200 = 25 Channel 5 = $\frac{3}{40}$x200 = 15

Channel 1 = $\frac{3}{10}$x200 = 60 Channel 2 = $\frac{1}{4}$x200 = 50

Channel 9 = $\frac{1}{4}$x200 = 50