

→ Frequency dist:

The arrangement of data into diff classes with respect to its freq. per class is called freq dist.

1 → Range = Max - Min

2 → No. of classes =  $c = \sqrt{n}$  OR  $c = 1 + 3.3 \log(n)$

$$3 \rightarrow h = \frac{\text{Range}}{c}$$

4  $\rightarrow$  Make classes

5  $\rightarrow$  Put data into diff. class in the form of tally marks

6  $\rightarrow$  find frequency

$\Rightarrow$  Example:

The height (in cms) of 30 students measured at the time of registration is given by.

91, 89, 88, 87, 89, 91, 87, 92, 90, 98, 95, 97,  
96, 100, 101, 96, 98, 99, 98, 100, 102, 99, 101, 105,  
103, 107, 105, 106, 107, 112.

$$1) R = 112 - 87 = 25$$

$$2) c = \sqrt{30} = 5.48 \approx 6 = 1 + 3.3 \log(30)$$

$$3) h = \frac{25}{6} = 4.167 \approx 5$$

Classes	C.B	Mid Point	Tally	freq
86-90	85.5-90.5	88		6
91-95	90.5-95.5	93		4
96-100	96.5-100.5	98		10
101-105	100.5-105.5	103		6
106-110	105.5-110.5	108		3
111-115	110.5-115.5	113		1
				<u>30</u>

Freq. dist. with relative freq.

r.f

$$6/30 = 0.200$$

$$4/30 = 0.133$$

$$10/30 = 0.333$$

$$6/30 = 0.200$$

$$3/30 = 0.100$$

$$1/30 = 0.033$$

Relative Cumulative freq dist

C.F

c.r.f

6

$$6/30 = 0.200$$

6+4=10

$$10/30 = 0.333$$

10+10=20

$$20/30 = 0.667$$

20+6=26

$$26/30 = 0.867$$

26+3=29

$$29/30 = 0.967$$

29+1=30

$$30/30 = 1.000$$

## ⇒ Discrete Data:

### ⇒ Example:

The observations about the number of rotten potatoes from twenty equal sized samples taken from a store are available as follows:

1, 2, 4, 3, 0, 1, 2, 3, 1, 1, 0, 2, 1, 0, 2, 3, 0, 0, 1, 3

No. of  
rotten

Potatoes	Tally	f	r.f	CF	c.r.f
0		5	5/20	5	5/20
1		6	6/20	5+6=11	11/20
2		4	4/20	11+4=15	15/20
3		4	4/20	15+4=19	19/20
4		1	1/20	19+1=20	20/20
		<u>20</u>			

⇒ Example :

$x$  = No. of hours worked in a day by a person in a  
 $x$  -  $f$  locality of 265 people.

$x$	$f$	r. f	c. f	c. r. f
6	24	24/265	24	24/265
7	66	66/265	90	90/265
8	80	80/265	170	170/265
9	48	48/265	218	218/265
10	28	28/265	246	246/265
11	14	14/265	260	260/265
12	4	4/265	264	264/265
13	1	1/265	265	265/265
	<u>265</u>			

⇒ Example:

Make a grouped freq dist from the following data, relating to the weight recorded to the nearest grams of 60 apples picked out at random from a consignment.

106	107	76	82	109	107	115	93
187	95	123	125	111	92	86	70
126	68	130	129	139	119	115	128
100	186	84	99	113	204	111	141
136	123	90	115	98	110	78	185
162	178	140	152	173	146	158	194
148	90	107	181	131	75	184	104
110	80	118	82				

$$\Rightarrow R = 204 - 68 = 136$$

$$c = \sqrt{60} = 7.74 \quad \text{or} \quad 1 + 3.3 \log(60) = 6.8 \quad \text{so,}$$
$$c \approx 7$$

$$h = \frac{136}{7} = 19.47 \approx 20$$

Classes	C.B	Tally	f	r.f	C.F	c.r.f
65-84	64.5-84.5		9	9/60	9	9/60
85-104	84.5-104.5		10	10/60	19	19/60
105-124	104.5-124.5		17	17/60	36	36/60
125-144	124.5-144.5		10	10/60	46	46/60
145-164	144.5-164.5		5	5/60	51	51/60
165-184	164.5-184.5		4	4/60	55	55/60
185-204	184.5-204.5		5	5/60	60	60/60

⇒ Example :

A survey of 50 retail establishments had assistants, excluding proprietors, as follows :

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

no. of Assistants                      Tally                      f (no. of Establishments)                      cf                      c.f. cf

no. of Assistants	Tally	f (no. of Establishments)	cf	c.f. cf
0		3	3/50	3
1		4	4/50	7
2		6	6/50	13
3		7	7/50	20
4		10	10/50	30
5		6	6/50	36
6		5	5/50	41
7		5	5/50	46
8		3	3/50	49
9		1	1/50	50
		<u>50</u>		50/50



⇒ Example i

Make a grouped freq dist from the following data, relating to the weight recorded to the nearest grams of 60 apples picked out at random from a consignment.

106	107	76	82	109	107	115	93
187	95	123	125	111	92	86	70
126	68	130	129	139	119	115	128
100	186	84	99	113	204	111	141
136	123	90	115	98	110	78	185
162	178	140	152	173	146	158	194
148	90	107	181	131	75	184	104
110	80	118	82				

$$\Rightarrow R = 204 - 68 = 136$$

$$c = \sqrt{60} = 7.74 \quad \text{or} \quad 1 + 3.3 \log(60) = 6.8 \quad \text{so,}$$

$$c \approx 7$$

$$h = \frac{136}{7} = 19.47 \approx 20$$

Classes	C.B	Tally	f	r.f	C.F	c.r.f
65-84	64.5-84.5		9	9/60	9	9/60
85-104	84.5-104.5		10	10/60	19	19/60
105-124	104.5-124.5		17	17/60	36	36/60
125-144	124.5-144.5		10	10/60	46	46/60
145-164	144.5-164.5		5	5/60	51	51/60
165-184	164.5-184.5		4	4/60	55	55/60
185-204	184.5-204.5		5	5/6	60	60/60

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**Example 2.2:** *The following data shows the ages of 50 cancer patients admitted in Shaukat Khanum Memorial Hospital, Lahore :*

48	29	39	32	54	33	44	36	38	31
46	30	20	44	47	39	42	35	33	47
31	35	34	42	41	42	43	35	32	35
43	36	37	45	46	41	25	27	26	40
38	41	44	47	45	45	52	43	44	43

Ages (Class limits)	Tally	$f$	Class boundaries
20 – 24	/	1	19.5 – 24.5
25 – 29	////	4	24.5 – 29.5
30 – 34	#### III	8	29.5 – 34.5
35 – 39	#### #### I	11	34.5 – 39.5
40 – 44	#### #####	15	39.5 – 44.5
45 – 49	#### ////	9	44.5 – 49.5
50 – 54	//	2	49.5 – 54.5
$\Sigma$	----	50	----

**Example 2.3:** Make a cumulative frequency distribution. Also find relative frequency & cumulative relative frequency for the following data:

Ages	$f$
20 – 24	1
25 – 29	4
30 – 34	8
35 – 39	11
40 – 44	15
45 – 49	9
50 – 54	2

**Solution:**

Ages	$f$	Class boundaries	Cumulative frequency (c.f)	Relative frequency $r.f = \frac{f}{\Sigma f}$	c.r.f $= \frac{c.f}{\Sigma f}$
20 – 24	1	19.5 – 24.5	1	0.02	0.02
25 – 29	4	24.5 – 29.5	1 + 4 = 5	0.08	0.10
30 – 34	8	29.5 – 34.5	5 + 8 = 13	0.16	0.26
35 – 39	11	34.5 – 39.5	13 + 11 = 24	0.22	0.48
40 – 44	15	39.5 – 44.5	24 + 15 = 39	0.30	0.78
45 – 49	9	44.5 – 49.5	39 + 9 = 48	0.18	0.96
50 – 54	2	49.5 – 54.5	48 + 2 = 50	0.04	1.00
$\Sigma$	50	----	----	1.00	---

**Example 2.1:** *The following data shows the number of children in different families of a small locality:*

**1, 2, 4, 3, 0, 1, 2, 3, 1, 1, 0, 2, 1, 0, 2, 3, 0, 0, 1, 3.**

**Make a frequency distribution. Also find relative frequencies.**

**Solution:**

The number of children	Tally	The number of families ( $f$ )	Relative frequency $r.f = \frac{f}{\Sigma f}$
0	////	5	$5/20 = 0.25$
1	//// /	6	$6/20 = 0.30$
2	////	4	$4/20 = 0.20$
3	////	4	$4/20 = 0.20$
4	/	1	$1/20 = 0.05$
$\Sigma$	-----	20	1.00

The following data gives the life time in minutes, recorded nearest tenth of a minutes.

1.2	2.2	0.7	3.9	1.7	1.9	1.4	1.8	2.0	4.3
2.5	0.9	3.4	2.8	3.7	3.5	0.4	2.8	1.1	0.2
3.9	6.3	2.5	2.1	1.3	2.1	0.3	0.4	2.4	2.1
3.5	2.9	1.2	5.3	1.7	2.7	1.8	4.8	3.2	1.6
2.6	1.8	2.3	1.3	3.1	1.5	2.6	5.9	2.0	2.3

Using 8 intervals with the lowest starting at 0.1.

- i) Form a frequency distribution and a cumulative frequency distribution.



Classes	Tally	$f$	C.B	$C.f$
0.1 – 0.8	###	5	0.05 – 0.85	5
0.9 – 1.6	### ////	9	0.85 – 1.65	14
1.7 – 2.4	### ### ###	15	1.65 – 2.45	29
2.5 – 3.2	### ###	10	2.45 – 3.25	39
3.3 – 4.0	### /	6	3.25 – 4.05	45
4.1 – 4.8	//	2	4.05 – 4.85	47
4.9 – 5.6	/	1	4.85 – 5.65	48
5.7 – 6.4	//	2	5.65 – 6.45	50
$\Sigma$	-----	50	-----	-----