| N/10 | N/10 | N/10 | N/10 | N/10 | N/10 | N/10 | N/10 | N/10 | N/10 |

| D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | D9 |

| 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% |

Deciles :

Nine points which divide the distribution into ten equal parts are known as Deciles.

D1 – first Decile, D2 – second Decile, --------------- D9 – Ninth Decile

2N/10   8N/10

20%   D2   80%

6N/10   4N/10

60%   D6   40%

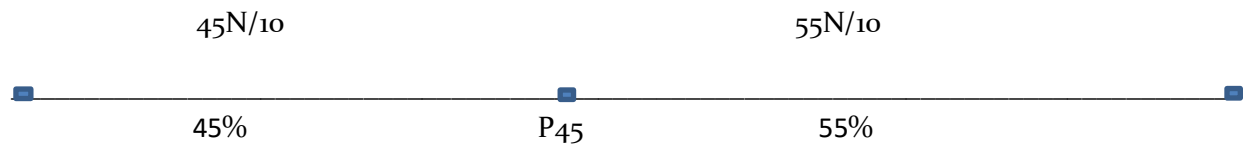# Deciles for ungrouped data:

Steps:

- Arrange the observations in ascending or descending order.

- D1 = value of $\frac{n}{10}$ th observation

- D2 = value of $\frac{2n}{10} = \frac{n}{5}$ th observation

- Di = value of $\frac{in}{10}$ th observation

    D5 =Median

Percentiles :

Ninety nine points which divide the distribution into hundred equal parts are known as Percentiles.

P_1 – first Decile, P_2 – second Decile, --------------- P_{99} – Ninety Ninth Percentile

28N/10   72N/10

28%   P28   72%

45N/10   55N/10

45%   P45   55%

69N/10   31N/10

69%   P69   31%

Q1. Calculate 3rd Decile and 65th percentile for following data

Ht in cms	No.of. Children	l.c.f.
110	6	6
111	16	22
112	20	42
113	25	67
114	20	87
115	13	100

$$D3 \; = \; \text{Value of} \; \frac{3N}{10}\text{th} = 30\text{th observation} \; = 112$$

$$P65 \; = \; \text{Value of} \; \frac{65N}{100}\text{th} = 65\text{th observation} \; = 113$$

Deciles for grouped data:

$$Di = l_1 + \frac{\left(\frac{iN}{10}-cf\right)*(l_2-l_1)}{f} \quad , \quad i= 1,2,3......9$$

Percentiles for grouped data:

$$Pi = l_1 + \frac{\left(\frac{iN}{100}-cf\right)*(l_2-l_1)}{f} \quad , \quad i= 1,2,3......99$$

Q2. Calculate 3rd quartile , 7th Decile , 35th Percentile for following data

Monthly Sale (thousands)	No. of. shops	l.c.f.
100-120	15	15
120 – 140	35	50
140 -160	50	100
160 - 180	60	160
180-200	30	190
200-220	10	200

N = 200

Q3 Class is the class containing $\frac{3N}{4}$ th $= \frac{3*200}{4} = 150^{th}$ observation   ie   160-180

$$Q3 = l_1 + \frac{\left(\frac{3N}{4}-cf\right)*(l_2-l_1)}{f}$$

$$= 160+ \frac{\left(\frac{3*200}{4}-100\right)*(180-160)}{60}$$

$$= 160+ \frac{(150-100)*(180-160)}{60}$$

$$= 160+ \frac{(50)*(20)}{60} = 160+ 16.66 = 176.66$$

D_7 Class is the class containing $\dfrac{7N}{10}$ th $= \dfrac{7*200}{10} = 140^{th}$ observation   ie   160-180

$$D_7 = l_1 + \dfrac{\left(\dfrac{7N}{10}-cf\right)*(l_2-l_1)}{f}$$

$$= 160 + \dfrac{\left(\dfrac{7*200}{10}-100\right)*(180-160)}{60}$$

$$= 160 + \dfrac{(140-100)*(180-160)}{60}$$

$$= 160 + \dfrac{(40)*(20)}{60} = 160 + 13.33 = 173.33$$

P_{35} Class is the class containing $\dfrac{35N}{100}$ th $= \dfrac{35*200}{100} = 70^{th}$ observation   ie   140-160

$$P_{35} = l_1 + \dfrac{\left(\dfrac{35N}{100}-cf\right)*(l_2-l_1)}{f}$$

$$= 140 + \dfrac{\left(\dfrac{35*200}{100}-50\right)*(160-140)}{50}$$

$$= 140 + \dfrac{(70-50)*(160-140)}{50}$$

$$= 140 + \dfrac{(20)*(20)}{50} = 140 + 8 = 148$$

Q2. Calculate 1st quartile , 4th Decile , 63rd Percentile for following data.

Weight in gms	No. of. balls	l.c.f.
0 – 25	6	6
25 – 50	15	21
50 – 75	21	42
75-100	15	57
100- 125	10	67
125 – 150	9	76
150 - 175	4	80

N = 80

Q1 Class is the class containing $\dfrac{N}{4}$ th $= \dfrac{80}{4} = 20^{th}$ observation   ie   25-50

$$Q_1 = l_1 + \frac{\left(\frac{N}{4}-cf\right)*(l_2-l_1)}{f}$$

$$= 25 + \frac{\left(\frac{80}{4}-6\right)*(50-25)}{15}$$

$$= 25 + \frac{(20-6)*(50-25)}{15}$$

$$= 25 + \frac{(14)*(25)}{15} = 25 + 23.33 = 48.33$$

D4 Class is the class containing $\dfrac{4N}{10}$ th $= \dfrac{4*80}{10} = 32^{th}$ observation   ie   50-75

$$D4 = l_1 + \frac{\left(\frac{4N}{10} - cf\right)*(l_2 - l_1)}{f}$$

$$= 50 + \frac{\left(\frac{4*80}{10} - 21\right)*(75-50)}{21}$$

$$= 50 + \frac{(32-21)*(75-50)}{21}$$

$$= 50 + \frac{(11)*(25)}{21} = 50 + 13.095 = 63.095$$

P63 Class is the class containing $\frac{63N}{100}$ th $= \frac{63*80}{100} = 50.4^{th}$ observation ie 75-100

$$P63 = l_1 + \frac{\left(\frac{63N}{100} - cf\right)*(l_2 - l_1)}{f}$$

$$= 75 + \frac{\left(\frac{63*80}{100} - 42\right)*(100-75)}{15}$$

$$= 75 + \frac{(50.4-42)*(100-75)}{15}$$

$$= 75 + \frac{(8.4)*(25)}{15} = 75 + 14 = 89$$

Q3. Calculate 2nd quartile , 3rd Decile , 87th Percentile for following data.

Age in yrs	No. of. members	l.c.f.
20 – 25	25	25
25 – 30	73	98
30 – 35	57	155
35-40	31	186
40- 45	8	194
45 – 50	6	200

N = 200

Q2 Class is the class containing $\dfrac{2N}{4}$ th $=\dfrac{2*200}{4}=100^{th}$ observation   ie   30-35

$$Q2 = l_1 + \frac{\left(\frac{N}{2}-cf\right)*(l_2-l_1)}{f}$$

$$= 30 + \frac{\left(\frac{200}{2}-98\right)*(35-30)}{57}$$

$$= 30 + \frac{(100-98)*(35-30)}{57}$$

$$= 30 + \frac{(2)*(5)}{57} = 30 + 0.175 = 30.175$$

D_3 Class is the class containing $\frac{3N}{10}$ th $=\frac{3*200}{10}= 60^{\text{th}}$ observation   ie   25-30

$$D_3 = l_1 + \frac{\left(\frac{3N}{10}-cf\right)*(l_2-l_1)}{f}$$

$$= 25 + \frac{\left(\frac{3*200}{10}-25\right)*(30-25)}{73}$$

$$= 25 + \frac{(60-25)*(30-25)}{73}$$

$$= 25 + \frac{(35)*(5)}{73} = 25+ 2.4 = 27.4$$

P_{87} Class is the class containing $\frac{87N}{100}$ th $=\frac{87*200}{100}= 174^{\text{th}}$ observation   ie   35-40

$$P_{87} = l_1 + \frac{\left(\frac{87N}{100}-cf\right)*(l_2-l_1)}{f}$$

$$= 35 + \frac{\left(\frac{87*200}{100}-155\right)*(40-35)}{31}$$

$$= 35 + \frac{(174-155)*(40-35)}{31}$$

$$= 35 + \frac{(19)*(5)}{31} = 35 + 3.06 = 38.06$$