

First Quartile $Q_1 = P_{25}$

First Decile $D_1 = P_{10}$

Second Quartile $Q_2 = P_{50}$

Second Decile $D_2 = P_{20}$

Third Quartile $Q_3 = P_{75}$

Fifth Decile $D_5 = P_{50}$ and so on

Second Quartile = Fifth Decile = 50th Percentile = Median

$$Q_2 = D_5 = P_{50} = \text{Median}$$

Time taken (min)	8 -- 10	11 -- 13	14 -- 16	17 -- 19	20 -- 22	23 -- 25
Frequencies	2	4	6	4	3	1

x	f	Class Boundaries	$c.f$
8 – 10	2	7.5 – 10.5	2
11 – 13	4	10.5 – 13.5	6
14 – 16	6	13.5 – 16.5	12
17 – 19	4	16.5 – 19.5	16
20 – 22	3	19.5 – 22.5	19
23 – 25	1	22.5 – 25.5	20
	20		

$$Q_i = l + \frac{h}{f} \left(\frac{iN}{4} - c \right); i = 1, 2, 3$$

Where:

l = lower boundary of Quartile group

h = Width of Quartile group

f = Frequency of Quartile group

N = Total number of observations i.e. sum of the frequencies

c = Cumulative frequency preceding Quartile group

$$Q_i = \frac{i(N)}{4} \text{ th value} \quad \text{Since } 10^{\text{th}} \text{ value is in the interval } (13.5 - 16.5)$$

$$Q_2 = \frac{2(20)}{4} \text{ th value} \quad \text{Therefore Group of } Q_2 \text{ is } (13.5 - 16.5)$$

$$Q_2 = 10 \text{ th value}$$

$$Q_i = l + \frac{h}{f} \left(\frac{iN}{4} - c \right)$$

$$Q_2 = 13.5 + \frac{3}{6} \left(\frac{2(20)}{4} - 6 \right)$$

$$Q_2 = 13.5 + 2$$

$$Q_2 = 15.50$$

$$D_i = l + \frac{h}{f} \left(\frac{iN}{10} - c \right); i = 1, 2, 3, \dots, 9$$

Where:

l = lower boundary of Deciles group

h = Width of Deciles group

f = Frequency of Deciles group

N = Total number of observations i.e. sum of the frequencies

c = Cumulative frequency preceding Deciles group

$$D_i = \frac{i(N)}{10} \text{ th value} \quad \text{Since } 10^{\text{th}} \text{ value is in the interval } (13.5 - 16.5)$$

$$D_5 = \frac{5(20)}{10} \text{ th value} \quad \text{Therefore Group of } D_2 \text{ is } (13.5 - 16.5)$$

$$D_5 = 10^{\text{th}} \text{ value}$$

$$Di = l + \frac{h}{f} \left(\frac{iN}{10} - c \right)$$

$$D_5 = 13.5 + \frac{3}{6} \left(\frac{5(20)}{10} - 6 \right)$$

$$D_5 = 13.5 + 2$$

$$D_5 = 15.5$$

$$Pi = l + \frac{h}{f} \left(\frac{iN}{100} - c \right); i = 1, 2, 3, \dots, 99$$

Where:

l = lower boundary of Percentile group

h = Width of Percentile group

f = Frequency of Percentile group

N = Total number of observations i.e. sum of the frequencies

c = Cumulative frequency preceding Percentile group

$$P_i = \frac{i(N)}{100} \text{ th value} \quad \text{Since } 10^{\text{th}} \text{ value is in the interval } (13.5 - 16.5)$$

$$P_{50} = \frac{50(20)}{100} \text{ th value} \quad \text{Therefore Group of } P_{50} \text{ is } (13.5 - 16.5)$$

$$P_{50} = \frac{1000}{100} \text{ th value}$$

$$P_{50} = 10 \text{ th value}$$

$$Pi = l + \frac{h}{f} \left(\frac{iN}{100} - c \right)$$

$$P_{50} = 13.5 + \frac{3}{6} \left(\frac{50(20)}{100} - 6 \right)$$

$$P_{50} = 13.5 + 2$$

$$P_{50} = 15.50$$

$$\text{Median} = l + \frac{h}{f} \left(\frac{N}{2} - c \right)$$

Where:

l = lower class boundary of the median class

h = Size of the median class interval

f = Frequency corresponding to the median class

N = Total number of observations i.e. sum of the frequencies

c = Cumulative frequency preceding median class.

Median = Size of $\frac{N}{2}$ th value *10th value lies in the interval 13.5 – 16.5*

Median = Size of $\frac{20}{2} = 10$ th value *Therefore 13.5 – 16.5 is called median class*

$$\text{Median} = l + \frac{h}{f} \left(\frac{N}{2} - c \right)$$

$$\text{Median} = 13.5 + \frac{3}{6} \left(\frac{20}{2} - 6 \right)$$

$$\text{Median} = 13.5 + 2$$

$$\text{Median} = 15.50$$