

# **Probability & Statistical Modeling**

## **Quiz - 2**

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l)

Monthly Phone Plan Cost (RM)	Number of Students (f)	x	fx	$fx^2$
10 - 19	8	14.5	116	1682
20 - 29	16	24.5	392	9604
30 - 39	21	34.5	724.5	24995.25
40 - 49	11	44.5	489.5	21782.75
50 - 59	4	54.5	218	11881
	$\Sigma f = N = 60$		$\Sigma fx = 1940$	$\Sigma fx^2 = 69945$

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{\Sigma f}$$

$$= \frac{1940}{60}$$

$$= 32.33$$

So, the mean is 32.33

Now,

$$\text{Correction point} = \frac{20 - 19}{2}$$

$$= 1/2$$

$$= 0.5$$

II)

We have, corresponding class of highest frequency is, Mode class = 29.5 - 39.5

$$\text{Formula of mode} = L + \frac{D1}{D1 + D2} * C$$

From the class above, we have,

$$L = 29.5$$

$$D1 = f1 - f0$$

$$D2 = f1 - f2$$

$$C = 10$$

$$f1 = 21$$

$$f0 = 16$$

$$f2 = 11$$

$$\text{Therefore, } D1 = f1 - f0$$

$$= 21 - 16$$

$$= 5$$

$$D2 = f1 - f2$$

$$= 21 - 11$$

$$= 10$$

$$\text{Now, Mode} = 29.5 + \frac{5}{5 + 10} * 10$$

$$= 32.83$$

III) Now, the modified class interval with it's frequency can be written as,

Monthly Phone Plan Cost (RM) C.I.	Number of Students (f)	C.F	Class Midpoint (x)	$fx$	
9.5 - 19.5	8	8	14.5	116	13456
19.5 - 29.5	16	24	24.5	392	153664
29.5 - 39.5	21	45	34.5	724.5	524900.25
39.5 - 49.5	11	56	44.5	489.5	239610.25
49.5 - 59.5	4	60	54.5	218	47524
	$\Sigma f = N = 60$			$\Sigma fx = 1940$	

$$\text{Median Class} = \left( \frac{N}{2} \right) \text{th item}$$

$$= \frac{60}{2}$$

$$= 30\text{th item}$$

So, the corresponding class interval is 29.5 - 39.5

That means,  $L = 29.5$

$$\frac{N}{2} = 30$$

$$C.f = 24.5$$

$$f = 21$$

$$h = 10$$

Thus,

$$\text{Median} = L + \frac{(n/2) - C.f}{f} * h$$

$$= 29.5 + \frac{30 - 24.5}{21} * 10$$

$$= 31.12$$

Hence, the median is 31.12

IV)

Monthly Phone Plan Cost (RM) C.I	Number of Students (f)	Class Midpoint (x)	Mean ( $\bar{x}$ )	$x - \bar{x}$	$(x - \bar{x})^2$	$f(x - \bar{x})^2$
10 - 19	8	14.5	32.33	-17.83	317.9	2543.2
20 - 29	16	24.5	32.33	-7.83	61.3	500.8

Monthly Phone Plan Cost (RM) C.I	Number of Students (f)	Class Midpoint (x)	Mean ( $\bar{x}$ )	$x - \bar{x}$	$(x - \bar{x})^2$	$f(x - \bar{x})^2$
30 - 39	21	34.5	32.33	2.17	4.7	98.7
40 - 49	11	44.5	32.33	12.17	148.1	1629.1
50 - 59	4	54.5	32.33	22.17	491.5	1966
	$\Sigma f = N = 60$					$\Sigma f(x - \bar{x})^2 = 6737.8$

Standard Deviation ( $\sigma$ ) =

Ans

$$\begin{aligned}
 s &= \sqrt{\frac{\sum fx^2 - \frac{(\sum fx)^2}{\sum f}}{\sum f - 1}} \\
 &= \sqrt{\frac{69957 - \frac{(1940)^2}{60}}{60 - 1}} \\
 &= \sqrt{\frac{69957 - \frac{3763600}{60}}{59}} \\
 &= \sqrt{\frac{69957 - 62726.67}{59}}
 \end{aligned}$$

$$= \sqrt{\frac{7230.33}{59}}$$

$$= \sqrt{122.55}$$

$$= 11.07$$