Answer on Question #63439 – Math – Statistics and Probability

The following data shows the different sizes of nails contained in a box bought by a customer.

length(mm)	Number of nails
10-14	10
15-19	12
20-24	18
25-29	16
30-34	4

Question

(a) Find the followings:
i. Mean
ii. Median
iii. Standard deviation

Solution

(a)

i. Mean

The "midpoint" of each class can be calculated as: Midpoint = (Lower class limit + Upper class limit) / 2 .

Class	Frequency (f)	Midpoint (x)	f*x	Upper end point	Cumu frequ.
10-14	10	12	120	14	10
15-19	12	17	204	19	22
20-24	18	22	396	24	40
25-29	16	27	432	29	56
30-34	4	32	128	34	60

$$\bar{x} = \frac{1}{f} * \sum f_i * x_i$$

Approximate mean = $\bar{x} = \frac{(12*10+17*12+22*18+27*16+32*4)}{60} = 21{,}33$

The mean is 21.33 mm

ii. Median

There are 60 in this data set. Theh 23th to 40t distances all lie in class interval [20–24] , and so the median also lies this class interval.

Now, the median is the $\frac{60+1}{2} = 30.5^{\text{th}}$ score

Median = $20 + \frac{30.5-22}{18} * 3 = 21.42$

The median is 21.42 mm.

iii. Standard deviation

Class	Midpoint (x)	Frequency (f)	$f * x$	$f(x-\bar{x})^2$
10-14	12	10	120	870.49
15-19	17	12	204	224.98
20-24	22	18	396	8.08
25-29	27	16	432	514.38
30-34	32	4	128	455.39
Totals		60	1280	2073,32

$\bar{x} = 21{,}33$

Standard deviation = $s = \sqrt{\frac{f(x-\bar{x})^2}{n-1}} = \sqrt{\frac{2073.32}{60-1}} \approx 5.93.$

Standard deviation is 5.93.

Question

(b) Calculate the Pearson's coefficient of skewness and explain the distribution.

Solution

Pearson's Coefficient of Skewness uses the median. The formula is:

$$Sk_2 = \frac{3(\bar{x} - Md)}{s}$$

$\bar{x} = 21{,}33$

s = 5.93

Md = 21.42

Pearson's coefficient of skewness = $Sk_2 = \frac{(\bar{x}-Md)}{s} = \frac{3*(21.33-21.42)}{5.93}$ = -0.045

Therefore the distribution is skewed left

Question

(c) Construct a cumulative frequency curve. From the cumulative frequency curve, determine:

i. The first quartile

ii. The third quartile

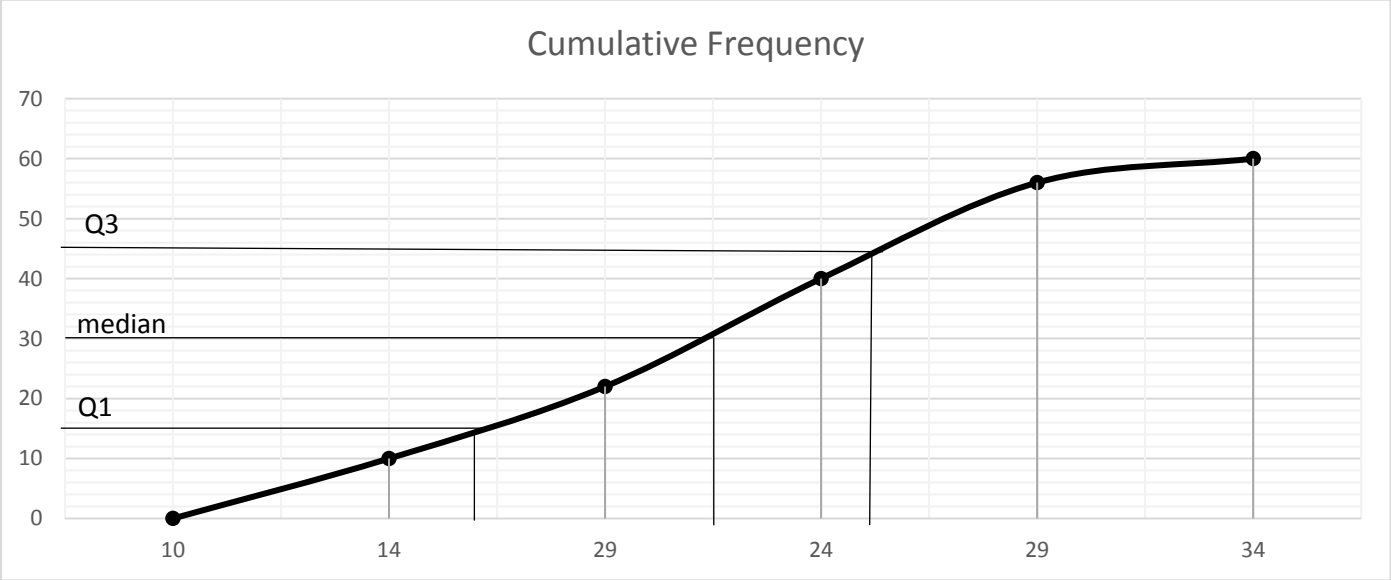
iii. The percentage of nails with length exceeding 22mm.

Solution

(c)
We need to add a class with 0 frequency before the first class and then find the upper boundary for each class interval.

Length (x mm)	Frequency	Upper Class Boundary	Length (x mm)	Cumulative Frequency
5-9	0	9.5	$x \leq 9.5$	0
10-14	10	14.5	$x \leq 14.5$	10
15-19	12	19.5	$x \leq 19.5$	22
20-24	18	24.5	$x \leq 24.5$	40
25-29	16	29.5	$x \leq 29.5$	56
30-34	4	34.5	$x \leq 34.5$	60

And then plot the cumulative frequency against the upper class boundary of each interval and join the points with a smooth curve.



From the cumulative frequency curve, determine:

According to curve:
i. The first quartile
Q1 = 21.11

ii. The third quartile
Q3 = 26.56

iii. The percentage of nails with length exceeding 22mm.
The percentage of nails with length exceeding 22mm = 51.67%.