SHORT GAME!

4 PICS, 1 WORD

4 PICS, 1 WORD

U E S M R E A

4 PICS, 1 WORD

MEASURE

4 PICS, 1 WORD

P I T S I O O N

4 PICS, 1 WORD

POSITION

DESCRIPTIVE MEASURES

Measures of RELATIVE POSITION

Learning Objectives

- Define Measures of Relative Position
- Explain the steps in calculating the value of quartiles, deciles, and percentile

QUARTILE

- A measure that pinpoints a location that divides the distribution into **four equal parts**.
- It is usually represented by Q_k.

Q1
Lower Quartile

Q2
Middle Quartile

Q3
Upper Quartile

QUARTILE (Ungrouped)

EXAMPLE 1: The scores of 7 students in a Mathematics seatwork are: 7, 4, 3, 6, 7, 4, 8

3	4	4	6	7	7	8

To find Q_1,Q_2 and Q_3

$$Q_k = \frac{k}{4}(n+1)$$

QUARTILE (Ungrouped)

EXAMPLE 1: The scores of 7 students in a Mathematics seatwork are: 7, 4, 3, 6, 7, 4, 8

3	4	4	6	7	7	8

$$Q_k = \frac{k}{4}(n+1) \qquad Q_k = \frac{k}{4}(n+1) \qquad Q_k = \frac{k}{4}(n+1)$$

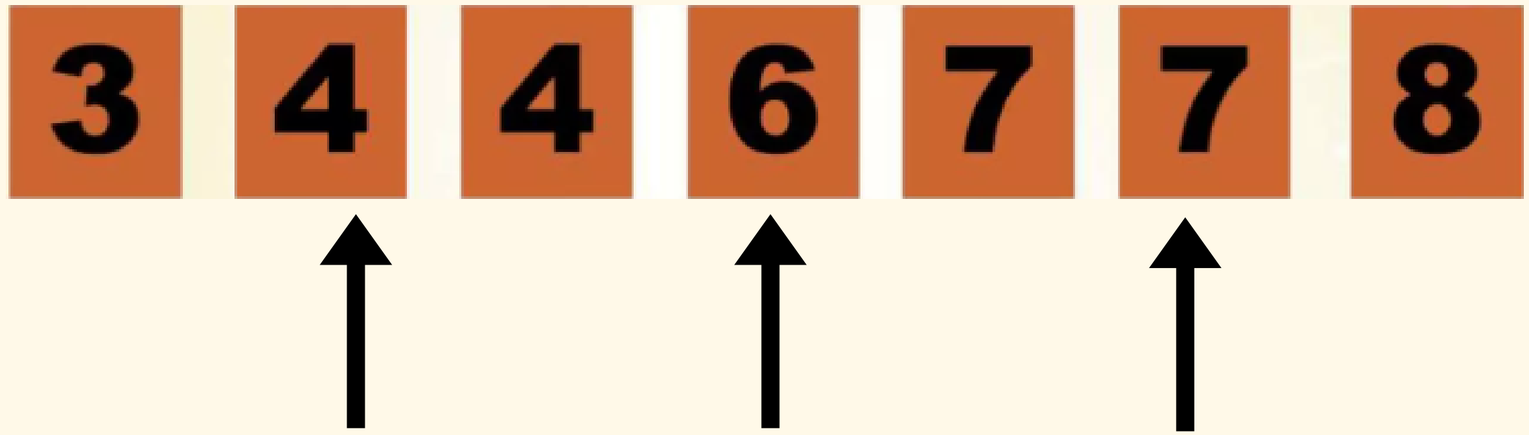
$$Q_1 = \frac{1}{4}(7+1) \qquad Q_2 = \frac{2}{4}(7+1) \qquad Q_3 = \frac{3}{4}(7+1)$$

$$Q_1 = 2^{nd} \qquad Q_2 = 4^{th} \qquad Q_3 = 6^{th}$$

Q_1 is 4 $\qquad$ Q_2 is 6 $\qquad$ Q_3 is 7

QUARTILE (Ungrouped)

EXAMPLE 1: The scores of 7 students in a Mathematics seatwork are: 7, 4, 3, 6, 7, 4, 8



Q1
Lower Quartile

25% of the score is lower than 4

Q2
Middle Quartile

50% of the score is lower than 6

Q3
Upper Quartile

75% of the score is lower than 7

QUARTILE (Ungrouped)

EXAMPLE 2: The scores of 9 students in their Mathematics activity are: 1, 27, 16, 7, 31, 7, 30, 3, 21
FIND Q1.

Step 1: Arrange the scores in ascending order:
1, 3, 7, 7, 16, 21, 27, 30, 31

Step 2: Locate the position of the score in the distribution.

$$Q_1 = \frac{1}{4}(n + 1)$$

$$= \frac{1}{4}(9 + 1)$$

$$Q_1 = 2.5 \text{ th}$$

QUARTILE (Ungrouped)

EXAMPLE 2: The scores of 9 students in their Mathematics activity are: 1, 27, 16, 7, 31, 7, 30, 3, 21
Find Q1.

Step 3: Since the result is in decimal number, proceed to linear interpolation.

Step 4: Find the difference between the two values where Q1 is situated.

Q1 is between the values 3 and 7, therefore

$= 7 - 3$

$= 4$

QUARTILE (Ungrouped)

EXAMPLE 2: The scores of 9 students in their Mathematics activity are: 1, 27, 16, 7, 31, 7, 30, 3, 21
Find Q1.

Step 5: Multiply the decimal part (obtained from step 2) and the difference (result from step 4).

$= 0.5(4)$

$= 2$

Step 6: Add the results in step 5 to the second or smaller number in step 4.

$= 3 + 2$

$= 5$

Therefore, the value of Q1 is 5.

lower value + (higher value - lower value)(decimal part)

QUARTILE (Grouped)

EXAMPLE 3: Find Q1 on below data.

CLASSES	f	<cf
21 – 25	2	2
26 – 30	9	11
31 – 35	13	24
36 – 40	11	35
41 – 45	10	45
46 – 50	5	50

Step 1: Identify the Q1 class

$$kn/4 = 50/4 = 12.5$$

Step 2: Solve for Q1.

$$Q_k = LCB + \frac{\left(\frac{kn}{4} - cf_b\right)c}{f}$$

$$Q_1 = 30.5 + \frac{\left(\frac{50}{4} - 11\right)(5)}{13}$$

Q1 = 31.08

DECILE

- A measure that pinpoints a location that divides the distribution into **ten equal parts**.

- Denoted as $D_1, D_2, D_3, D_4, D_5, \ldots D_9$

Illustration:

Formula: $D_k = \frac{k}{10}(n + 1)$

DECILE (Ungrouped)

EXAMPLE 4: Find the 3rd Decile or D3 of the following scores of a random 10 students.
35, 42, 40, 28, 15, 23, 33, 20, 18, 28

Step 1: Arrange the scores in ascending order:
15, 18, 20, 23, 28, 28, 33, 35, 40, 42

Step 2: To find its D_3 position, use the $D_k = \frac{k}{10}(n + 1)$ and round off to the nearest integer.

$$D_3 = \frac{3}{10}(n + 1) = \frac{3}{10}(10 + 1) = \frac{3}{10}(11) = 3.3 \approx 3$$

D_3 is the 3rd element

Therefore, 3rd decile is 20.

DECILE (Ungrouped)

EXAMPLE 5: Find the 5th Decile or D5 of the following set of data.
0, 1, 5, 6, 7, 8, 9, 10, 12, 12, 13, 14, 16, 19, 19

$$D_5 = \frac{5}{10}(15 + 1) = 8$$

D_5 is the 8th data

Therefore, 5th decile is 10.

DECILE (Grouped)

EXAMPLE 6: Find D6 on below data.

CLASSES	f	<cf
21 – 25	2	2
26 – 30	9	11
31 – 35	13	24
36 – 40	11	35
41 – 45	10	45
46 – 50	5	50

Step 1: Identify the D6 class

$$kn/10 = 300/10 = 30$$

Step 2: Solve for D6.

$$D_k = LCB + \frac{\left(\frac{kn}{10} - cf_b\right)c}{f}$$

$$D_6 = 35.5 + \frac{\left(\frac{300}{10} - 24\right)(5)}{11}$$

D6 = 38.23

PERCENTILE

- A measure that pinpoints a location that divides the distribution into **100 equal parts**.
- It is usually represented by P_k , that value which separates the bottom k% of the distribution from the top (100-k)%.

Example: P_{30} is the value that separates the bottom 30% of the distribution from the top 70%. Thus, we say that 30% of the total number of observations in the data set are said to be less than or equal to P_{30} while 70% have values greater than P_{30} .

PERCENTILE

EXAMPLE 7: If Juan got a score of 60 and ranked 9th in the class of 150 students, it means that 150 - 9 = 141 students below his rank.

If we get the percentage:

(141/150) x 100 = **94%**

This means that 94% of the class ranked below or got scores below Juan (below 60).

Then we can say that the percentile rank of Juan in the class is 94 which also implies that 94 out of 100 students got scores below Juan's score.

PERCENTILE

EXAMPLE 8: A teacher gives a 20-point test to 10 students. Find the percentile rank of a score of 12.
SCORES: 18, 15, 12 ,6, 8, 2, 3, 5, 20, 10

Sort in ascending order:

2, 3, 5, 6, 8, 10, 12, 15, 18, 20

6 values

$$Percentile = \frac{(\#\text{ of values below } X) + 0.5}{\text{total \# of values}} \cdot 100\%$$

$$= \frac{6 + 0.5}{10} \cdot 100\%$$

$$= 65\%$$

A student whose score was 12 did better than 65% of the class.

PERCENTILE (Ungrouped)

EXAMPLE 9: A teacher gives a 20-point test to 10 students. Find the value corresponding to the 25th percentile. 18, 15, 12, 6, 8, 2, 3, 5, 20, 10

Sort in ascending order:
2, 3, 5, 6, 8, 10, 12, 15, 18, 20

$$P_k = \frac{k}{100}(n+1)$$

$$P_{25} = \frac{25}{100}(10+1)$$

Position of P25 = 2.75

$$P_{25} = 3 + (5-3)(0.75)$$

$$\boldsymbol{P_{25} = 4.5}$$

PERCENTILE (Ungrouped)

EXAMPLE 10: Find the 30th percentile, given the scores of 9 students in their Mathematics Periodical Test.
45, 38, 35, 29, 54, 54, 43, 42, 38

Sort in ascending order:
29, 35, 38, 38, 42, 43, 45, 54, 54

$$P_k = \frac{k}{100}(n+1)$$

$$P_{30} = \frac{30}{100}(9+1)$$

Position of P30 = 3rd data

Therefore, 30th percentile is 38.

PERCENTILE (Grouped)

EXAMPLE 11: Find P80 on below data.

CLASSES	f	<cf
21 – 25	2	2
26 – 30	9	11
31 – 35	13	24
36 – 40	11	35
41 – 45	10	45
46 – 50	5	50

Step 1: Identify the P80 class

$$kn/100 = 4000/100 = 40$$

Step 2: Solve for P80.

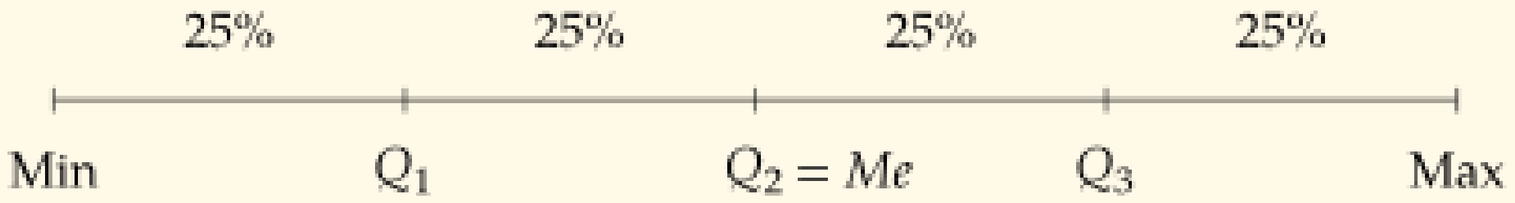
$$P_k = LCB + \frac{\left(\frac{kn}{100} - cf_b\right)c}{f}$$

$$P_{80} = 40.5 + \frac{\left(\frac{4000}{100} - 35\right)(5)}{10}$$

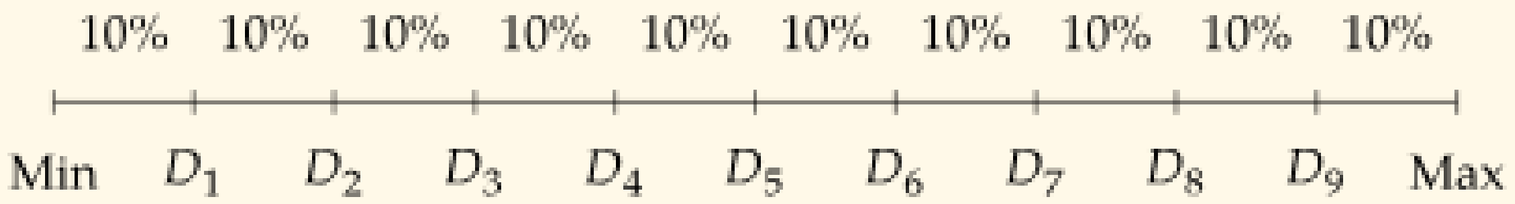
P80 = 43

RELATIVE POSITION

Quartiles



Deciles



Percentiles