7

Mathematics

Quarter 4- Week 8 - Module 8

Measures of Central Tendency and Variability: Analyzing, Interpreting, and Drawing Conclusions

AIRs - LM

Mathematics 7
Quarter 4 - Week 8: Module 8 - **Measures of Central Tendency and Variability: Analyzing, Interpreting, and Drawing Conclusions**

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Development Team of the Module

Authors: MARGIE N. ACOSTA and MARC VINCENT PACIO
Editor: SDO La Union, Learning Resource Quality Assurance Team
Illustrator: Ernesto F. Ramos Jr., *P II*

Management Team:

Atty. Donato D. Balderas, Jr.
Schools Division Superintendent

Vivian Luz S. Pagatpatan, PhD
Assistant Schools Division Superintendent

German E. Flora, PhD, *CID Chief*

Virgilio C. Boado, PhD, *EPS in Charge of LRMS*

Erlinda M. Dela Peña, EdD, *EPS in Charge of Mathematics*

Michael Jason D. Morales, *PDO II*

Claire P. Toluyen, *Librarian II*

Target

This module was designed and written with you in mind. It is here to help you master your skills in using appropriate statistical measures in analyzing and interpreting statistical data; and draws conclusions from graphic and tabular data and measures of central tendency and variability. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course.

After going through this module, you are expected to:

Learning Competencies:

- use appropriate statistical measures in analyzing and interpreting statistical data (**M7SP-IVj-1**)
- draw conclusions from graphic and tabular data and measures of central tendency and variability (**M7SP-IVj-2**)

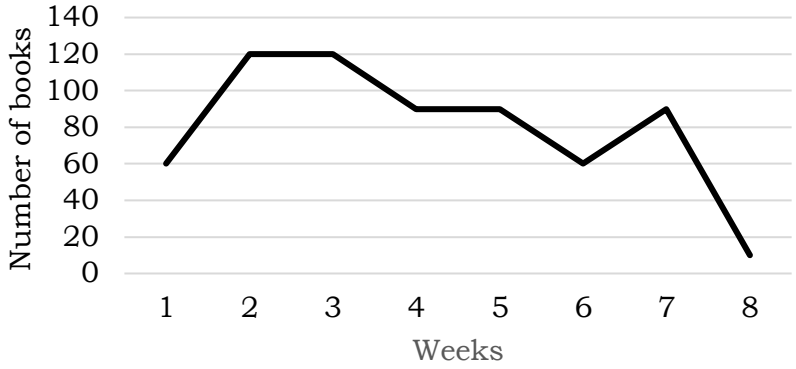
Before going on, check how much you know about this topic.

PRE-TEST

Directions: Read and understand the questions below. Select the best answer to each item then write your choice on your answer sheet.

For items 1 – 8: Refer to the graph below.

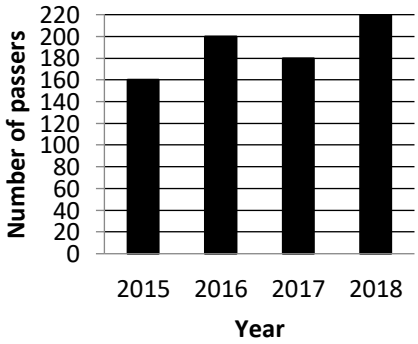
A bookshop made a line graph of the number of books it sold per week during a certain period. Use the information to answer the questions.



1. How many books were sold in week 2?
   A. 90 B. 100 C. 110 D. 120
2. What week have the greatest number of books sold?
   A. week 1 and 2 B. week 2 and 3 C. week 3 and 4 D. week 4 and 5
3. How many books were sold in week 3 and 4?
   A. 190 B. 200 C. 210 D. 220
4. In week 5, 6, and 7, how many books were sold?
   A. 225 B. 230 C. 235 D. 240
5. What week have the least number of books sold?
   A. week 5 B. week 6 C. week 7 D. week 8
6. In all 8 weeks, how many books were sold?
   A. 620 B. 630 C. 640 D. 650
7. How many books were sold in week 7 than 8?
   A. 80 B. 90 C. 100 D. 110
8. What was the average number of books that were sold each week?
   A. 40 B. 60 C. 80 D. 100

For items 9 – 12: Refer to figure on the right.

The vertical bar graph shows the number of passers in the NAT examination at St. Joseph Academy from the years 2015 to 2018.



9. What is the total number of passers from 2015 to 2018?
   A. 750 B. 755 C. 760 D. 765
10. What is the increase of the number of passers from 2017 to 2018?
    A. 10 B. 20 C. 30 D. 40
11. What is the decrease of the number of passers from 2016 to 2017?
    A. 10 B. 20 C. 30 D. 40
12. What is your interpretation with the results in the number of passers in the NAT examination at St. Joseph Academy from the years 2015 to 2018?
    I. The highest number of passers was in the year 2018.

II. Same number of increase of passers is shown from 2015 to 2016 and from 2017 to 2018.

III. The lowest number of passers was in the year 2015.

A. I only B. II only C. I and II D. I, II, and III

For items 13 – 14: Refer to the table.

Scores in Mathematics Quiz of three students

Student A	Student B	Student C
97	94	95
92	94	94
96	92	93
95	94	96
90	96	92

13. What is your comparison about the average scores of student A and student C?

A. Student A's average score is greater than Student C.

B. Student A's average score is lower than Student C.

C. Student A's average score is equal to Student C.

D. Student A's average score is not equal to Student C.

14. Why Student B has the most consistent scores?

A. The mode of the scores of student B is unique.

B. The average score of student B is the largest among them.

C. The median score of student B is the lowest among them.

D. The standard deviation of the scores of student B is the least among them.

15. The standard deviation (SD) is most commonly used to get a sense of how far the typical score of a distribution differs from the mean. In computing the SD, why is it necessary to square the deviations from the mean for each score?

A. Squaring numbers is fun.

B. The deviations are too small to have a variance without being squared.

C. There is no variability in the deviations of the scores prior to squaring.

D. The mean of the deviations balances out to zero due to negative and positive values.

Jumpstart

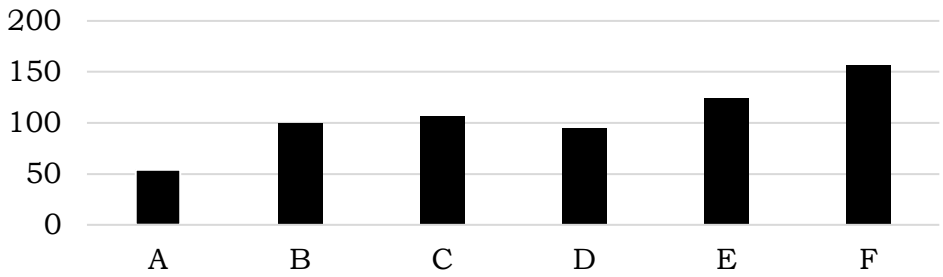
Let us begin this lesson by remembering the different concepts on statistical measures and graphs in presenting data previously studied from your mathematics modules. The knowledge and mathematical skill mentioned will help you to use appropriate statistical measures in analyzing and interpreting statistical data; and draws conclusions from graphic and tabular data and measures of central tendency and variability.

Activity 1: Go Away Air Pollution!
Directions: Study the following data and answer the questions that follow.

Air Pollution in the Cities

City	Air Pollution
Cebu	106
Manila	156
Zamboanga	100
Pasay City	124
Tacloban	54
Iligan	95

Air Pollution in the Cities



1. In the graphical presentation, what city is represented by A? B? C? D? E? F?
2. Which city is the most polluted? _____, the least? _____
3. If 100 is considered an acceptable level of air pollution, which cities have acceptable air?

Activity 2: Do you remember me?

Directions: Based from the given below, answer the following questions. Write only the letter of the correct answer.

Consider the scores of top 10 qualifiers for a scholarship: 92, 93, 95, 90, 89, 92, 94, 95, 91, 96.

1. What is the range of the scores?

A. -7 B. 7 C. 89 D. 96

2. What is the median score?

A. 91.25 B. 92 C. 92.5 D. 93

3. What is the mean score?

A. 92.5 B. 92.7 C. 93.5 D. 95

4. What is the mean of the modal scores?

A. 92 B. 93.5 C. 95 D. 94.25

You did it! Congratulations!

Discover

Below are some important matters that we need to discuss in order for you to understand how to use appropriate statistical measures in analyzing and interpreting statistical data; and draw conclusions from graphic and tabular data and measures of central tendency and variability. Read carefully and understand all salient points written in this part of the module.

Data is a collection of information about a study under investigation. It may be a number (quantitative), or a word (qualitative).

Any set of information or data collected for study should be organized and analyzed systematically for easier and faster interpretation. To do this, collected data may be presented in any of the following forms.

The *textual form* is used when data to be presented are few.

The *tabular* and *graphical forms* are used when more detailed information is to be presented.

Using tables and graphs has the following advantages.

a. Data is presented in a more practical and convenient way.
   Instead of writing text on the information gathered, items can be enumerated in tabular form or shown in graphical form.

b. Data can be compared easily.
   Reading tables and graphs can be done more easily because the needed information can be seen at a glance.

c. Data can be analyzed comparatively.
   Tables and graphs enable a thorough analysis of data because all needed information is clearly shown.

Analyzing, Interpreting, and Drawing Conclusions from Graphics and Tabular Data and Measures of Central Tendency and Variability

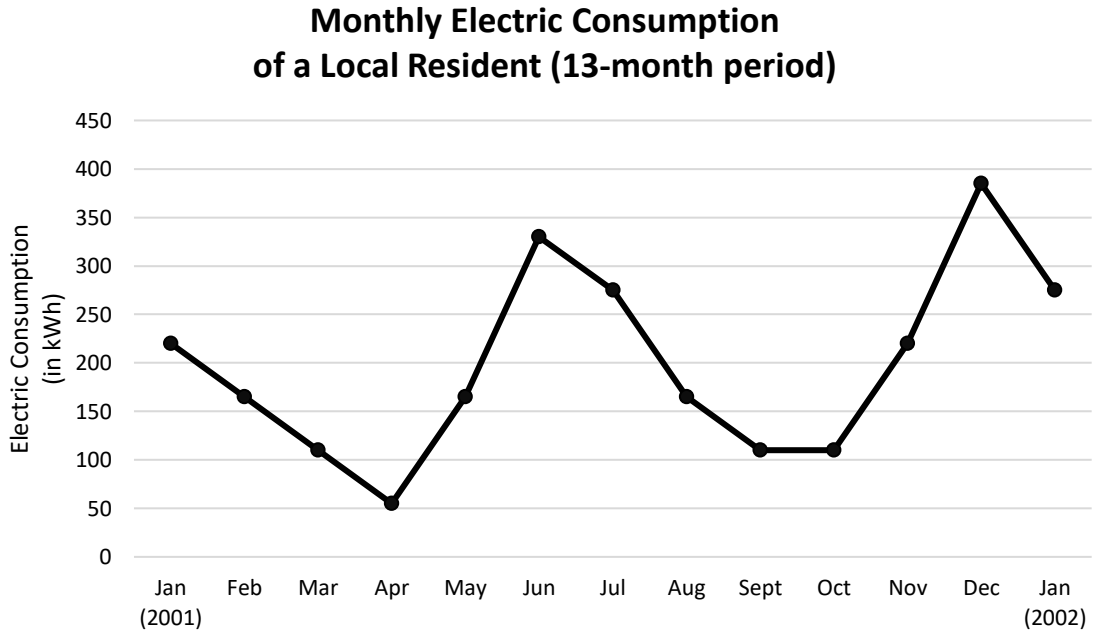
Illustrative Examples

1. The table below shows the data on the population of the Philippines by Regions in thousands.

Region	Population	Region	Population
Region 1	4 174	Region 9	3 045
Region 2	2 756	Region 10	2 276
Region 3	7 794	Region 11	2 601
Region 4	11 321	Region 12	2 494
Region 5	4 629	Region 13	2 076
Region 6	6 147	NCR	10 492
Region 7	5 404	ARMM	2 192
Region 8	3 589	CAR	1 352

a. Which region has the biggest population?
*The region that has the biggest population is **Region 4**.*
b. Which region has the smallest population?
*The region that has the smallest population is **CAR**.*
c. By how many thousands do their population differ?
11,321 – 1,352 = 9, 969
*Their population differ by **9,969** in thousands.*

2. The graph below indicates the trend of electric consumption over a period of 13 months, from January 2001 to January 2002.



a. What two quantities are being considered in the line graph?
*The two quantities that are being considered in the line graph are **Electric Consumption (in kWh)** and **13-month period** from Jan 2001 to Jan 2002.*

b. When did the highest consumption occur? the lowest consumption?
*The **highest consumption** occurred in **December** while the **lowest consumption** occurred in **April**.*

c. Which months show the same amount of electric consumption?

The months that show the same amount of electric consumption are:

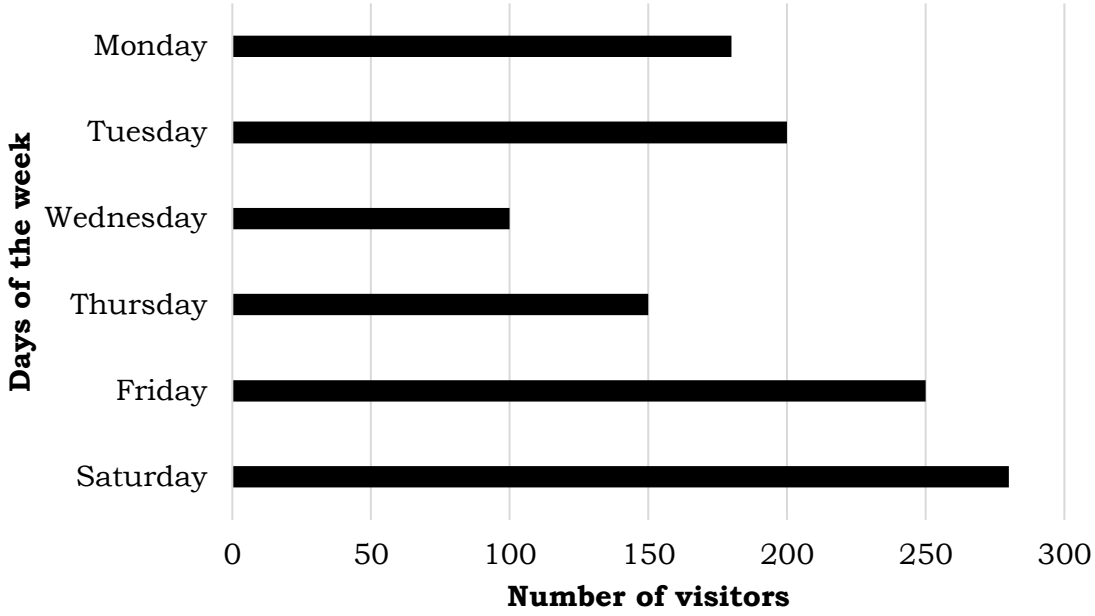
- *January 2001 and November*
- *February, May, and August*
- *March, September, and October*
- *July and January 2002*

d. Between which two months was the increase/decrease in consumption greatest?

*From **May to June** and **November to December**, there is a gradual increase in the electric consumption.*

*From **July to August** and **December to January** 2002, there is a gradual decrease in the electric consumption.*

3. An amusement park recorded the number of visitors for one week. The graph below shows the result of their collected data.



a. On which day did the amusement park receive the most visitors?

*The day on which the amusement park received the most visitors is **Saturday**.*

b. Approximately, how many visitors came to the amusement park on that day?

*There were approximately **280** visitors who came to the amusement park on that day.*

c. Why do you think that day had the most visitors?

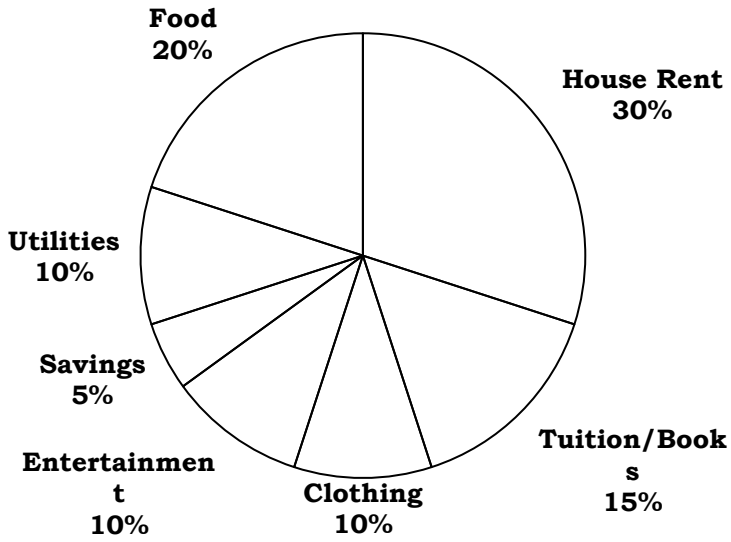
Most visitors have their free time on Saturday. They are free from work. This could be one of the possible reasons.

d. Describe the pattern you see in the number of visitors from Wednesday to Saturday.

*There is a **relative increase** of the number of visitors from Wednesday to Saturday.*

4. A college student has totaled his expenses for the last school year and represented his findings in a circle graph.

A COLLEGE STUDENT'S BUDGET



Observe the graph and answer the following questions.

a. Which two items account for the greatest expenses?

*The two items that account for the greatest expenses are **House Rent** and **Food**.*

b. What percent of the budget is spent for food?

*Twenty percent (**20%**) of the budget is spent for food.*

c. What percent of the budget is saved?

*Five percent (**5%**) of the budget is saved.*

d. Which three items incur the same expenses?

***Entertainment**, **Clothing**, and **Utilities** incur the same expenses.*

e. If the yearly allowance amounts to Php 80,000.00, how much is spent for each item?

House Rent** = 30% of 80,000 = 0.30(80,000) = **Php 24,000.00

Food** = 20% of 80,000 = 0.20(80,000) = **Php 16,000.00

Tuition/Books** = 15% of 80,000 = 0.15(80,000) = **Php 12,000.00

***Entertainment/Clothing/Utilities** = 10% of 80,000*
*= 0.10(80,000) = **Php 8,000.00***

Savings** = 5% of 80,000 = 0.05(80,000) = **Php 4,000.00

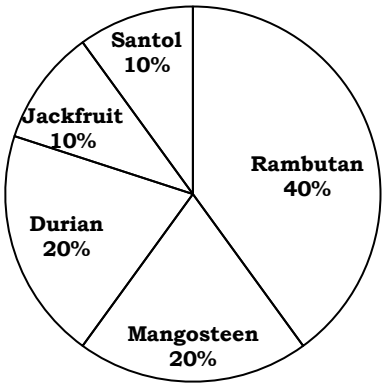
Explore

Work on the following enrichment activities for you to apply your understanding on this lesson.

Activity 3: Let's compare and analyze!
Directions: Study the pie chart below and answer the questions that follow.

The Municipal Agriculturist made a survey of fruit trees available in the orchard. He made a chart that shows the distribution of types of fruit trees planted.

Number of Fruit Trees



a. How do the number of Durian and Rambutan trees compare?
b. What is the most common fruit tree?
c. What fraction of the fruit trees is Santol?
d. If there are 150 fruit trees altogether, how many are Mangosteen trees? Jackfruit trees?

How did you find the activity? What mathematical concepts did you use?

Now, here is another activity that lets you apply what you have learned.

Activity 4: It's survey time!
Directions: Study the table below and answer the questions that follow.

A randomly selected sample of adults was asked to name the newspaper section that they preferred to read. The table shows the result.

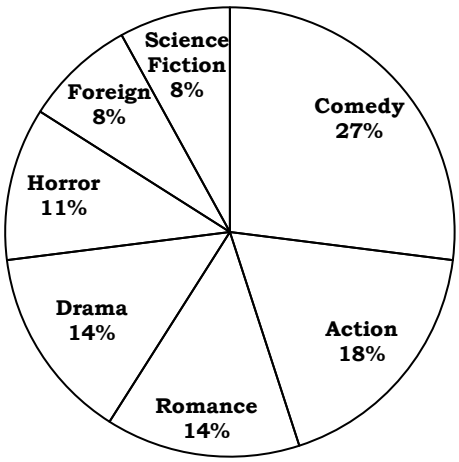
SECTOR	PERCENTAGE
Comics	40%
Entertainment	45%
Sports	25%
Local news	64%
Business news	5%
Classified	23%

a. Which newspaper section is most preferred by readers?
b. What percentage of those surveyed matched the sports section?
c. What percentage of those surveyed read the classified adds page?
d. Why is the circle graph could not be made of the data above?

Deepen

Activity 5: Knowledge is Power!

Directions: Study the pie chart below that shows the kinds of books owned by a local library:



a. What type of book does the library have the most number of compared to any other type in its collection?
b. If there are 850 books in the collection, how many books are there of each type? What is the "average" number of books per type?

Activity 6: Which tastes better?

Directions: Read the situation below and answer the questions that follow.

A housewife surveyed canned ham for a special family affair. She picked 5 cans each from two boxes packed by company A and comp any B. Both boxes have the same weight. Consider the following weights in kilograms of the canned Ham packed by the two companies (sample A and sample B).

Sample A:	0.97	1.00	0.94	1.03	1.11
Sample B:	1.06	1.01	0.88	0.90	1.14

Help the housewife choose the best sample by doing the following procedure.

a. Arrange the weights in numerical order.
b. Find the mean weight of each sample.
c. Analyze the spread of the weights of each sample from the mean.
d. Which sample has weights closer to the mean?
e. If you are to choose from these two samples, which would you prefer? Why?
f. Was your choice affected by the weight or the taste? Explain.

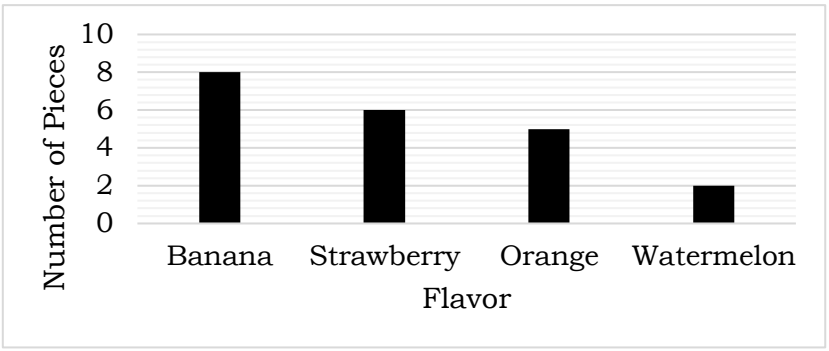
Nice work! Now you're up for the final challenge of this module.

Gauge

POST-TEST

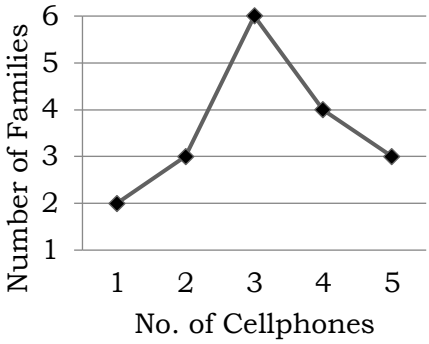
Directions: Read and understand the questions below. Select the best answer to each item then write your choice on your answer sheet.

For items 1 – 7: Refer to the graph below.
Maddox bought a jumbo bag of Fruit-o candy. Before chewing down, he decided to see how many pieces of each flavor were there. Use his graph below to answer the questions.



1. How many pieces were banana?
   A. 2 B. 5 C. 6 D. 8
2. Which flavor had exactly 5 pieces in the bag?
   A. Banana B. Orange C. Strawberry D. Watermelon
3. What is the difference in the number of watermelon pieces and the number of strawberry pieces?
   A. 2 B. 3 C. 4 D. 5
4. What is the combined number of strawberry and watermelon pieces?
   A. 8 B. 10 C. 12 D. 14
5. Which flavor had the most number of pieces in the bag?
   A. Banana B. Orange C. Strawberry D. Watermelon
6. Which flavor had the fewest number of pieces in the bag?
   A. Banana B. Orange C. Strawberry D. Watermelon
7. How many fewer watermelon pieces were there than banana pieces?
   A. 2 B. 4 C. 6 D. 8

For items 8 – 11: Refer to the graph on the right that shows the number of cell phones used by each family.



8. How many families were surveyed?
   A. 10 B. 12 C. 15 D. 18
9. How many families have less than 3 phones?
   A. 2 B. 3 C. 5 D. 6
10. How many families have at least 2 phones?
    A. 10 B. 12 C. 14 D. 16
11. How many families have at most 4 phones?
    A. 15 B. 16 C. 17 D. 18

For items 12 – 15: Refer to the data below.

The data below show the score of 40 students in the 2010 Division Achievement Test (DAT).

35	16	28	43	21	17	15	16
20	18	25	22	33	18	32	38
23	32	18	25	35	18	20	22
36	22	17	22	16	23	24	15
15	23	22	20	14	39	22	38

12. What score appears to be the median?
    A. 22 B. 24 C. 26 D. 28
13. How many students fall below that score in number 12?
    A. 16 B. 17 C. 18 D. 19
14. Which score frequently appears?
    A. 20 B. 21 C. 22 D. 23
15. What is the average score of the students in the achievement test?
    A. 20.25 B. 21.45 C. 22.75 D. 23.95

References

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Links:

- https://statistics.laerd.com/statistical-guides/measures-central-tendency-mean-mode-median.php
- https://statisticsbyjim.com/basics/measures-central-tendency-mean-median-mode/
- https://online.stat.psu.edu/stat500/lesson/1/1.5/1.5.3
- https://statisticsbyjim.com/basics/variability-range-interquartile-variance-standard-deviation/
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