



Dr. Bbosa Science

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Mean, median, mode, range

The "mean" is the "average" you're used to, where you add up all the numbers and then divide by the number of numbers.

The "median" is the "middle" value in the list of numbers.

To find the median, your numbers have to be listed in numerical order from smallest to largest, so you may have to rewrite your list before you can find the median.

The "mode" is the value that occurs most often. If no number in the list is repeated, then there is no mode for the list.

Range is the difference between the highest and lowest value

Example1

Find the mean, median, mode, and range for the following list of values:

**12, 18, 12, 14, 12, 16, 14, 21, 13**

(i) The mean is the usual average, so I'll add and then divide:

$$(12 + 18 + 12 + 14 + 12 + 16 + 14 + 21 + 13) \div 9 = 15$$

Note that the mean, in this case, isn't a value from the original list. This is a common result. You should not assume that your mean will be one of your original numbers.

(ii) The median is the middle value, so first I'll have to rewrite the list in numerical order:

12, 12, 12, 13, 14, 14, 18, 19, 21

There are nine numbers in the list, so the middle one will be the  $(9 + 1) \div 2 = 10 \div 2 = 5$ th number:

12, 12, 12, 13, 14, 14, 18, 19, 21

So the median is 14.

(iii) The mode is the number that is repeated more often than any other, so 12 is the mode.

The largest value in the list is 21, and the smallest is 12, so the range is  $21 - 12 = 9$ .

**mean: 15**

**median: 14**

**mode: 12**

**range: 9**

Note: The formula for the place to find the median is " $([\text{the number of data points}] + 1) \div 2$ ", but you don't have to use this formula. You can just count in from both ends of the list until you meet in the middle, if you prefer, especially if your list is short. Either way will work.

Example 2

Find the median, mean, mode and range of the following numbers: 0, 6, 2, 5, 1, 9, 5, 1, 6, 5,

(i) Arrange the number in increasing order: 0, 1, 1, 2, 5, 5, 5, 6, 6, 9

The median is the middle number =  $\frac{5+5}{2} = 5$

(ii) The mean =  $\frac{0+1+1+2+5+5+5+6+6+9}{10} = \frac{40}{10} = 4$

(iii) Mode is the most common number = 5

(iv) Range is the difference between highest and lowest numbers =  $9 - 0 = 9$

## Revision questions

Use the following information to answer questions 1 and 2

In primary school football competition. Owino primary school scored as follows. 3, 9, 3, 0, 1, 8, 6 and 2

1. What was the mean score?

2. Find the median score

Use the following information to answer questions 3 and 4.

In the district Primary School football competition, 6 schools participated and scored goals as follows; 3,2,6,4,2,5

3. What is the range of goals scored?

4. What is the median score?

5. The height of 9 children are; 103cm, 106cm, 103cm, 108cm, 112cm, 105cm, 103cm 118cm, and 103cm. What is the mode of the height of the children?

6. Kidoko Secondary School has a students' population of 688. There are 16 classes in the school. Find the average Number of students per class.
7. At a Children's clinic, the age of each child was recorded. The first seven children to arrive had their ages recorded as follows: 3, 1, 4, 5, 2, 5, 6, years. Find the median age of these children.
8. The average weight of 5 boys is 48kg. When a sixth boy joins them average weight becomes 45kg. What is the weight of the sixth boy?
9. Find the median of 6, 3, 7, 0, 1, 4
10. The average length of three strings is 38cm. Two of the strings measure 44cm each. Find the length of the third string.

11. The table below shows the goals scored by football teams in different seasons. Use it to answer the questions that follow.

Goals scored	0	1	2	3	4	5	6	7
Teams scoring the	2	5	10	8	5	4	3	1

a) How many teams participated altogether?

b).Find the mode of the goals scored.

c). Work out the mean score.

12. Juliet, Edwin, Sylvia and Joan are 11, 9, 15, 16 years respectively. Find the range of their ages.

13. Find the median of the following numbers: 0, 9,1,7, 5.

14. A P7 class was given a Mathematics test that was marked out of 20. The table below shows the marks scored in the test,

(a). Complete the table.

Mark scored	Number of pupils	Total marks
3	4	12
11.25	4	45
6	<b>14</b>	84
8	8	<b>64</b>
15	8	75

b). What was the modal mark?

c). Find the number of pupils in this class.

d). Work out the average mark scored.

15. Bbosa scored the following marks in her homework exercises:

2, 5, 7, 3, 10, 4, 7, 11, 8, 3.

a) Find her median mark.

b) Find the mean mark.

c) Find the probability that Bbosa scored a mark above his mean mark.

16. A P7 class was given a Mathematics test that was marked out of 20. The table below shows the marks scored in the test,

(a). Complete the table.

Mark scored	Number of pupils	Total marks
3	4	12
11.25	4	45
6	.....	84
8	8	.....
15	.....	75

b). What was the modal mark?

Modal mark is the most common = 6 (scored by 14 pupils)

c). Find the number of pupils in this class.

Total number of pupils =  $4 + 4 + 14 + 8 + 5 = 35$

d). Work out the average total mark scored.

17. Mugisha scored the following marks in science tests: 5, 6, 7, 9, 8, 6, 4.

What was his modal mark?

18. The mean of the scores: 8,7,6,5,  $\{a - 5\}$  is 6.

a) Find the value of a.

b) Find the range of the scores.

19. The average height of Peter, James and John is 51 cm. If the height of Peter is 53 cm and that of James is 46 cm, find the height of John.

20. Mary kept the following record of rainfall in centimeters: 4, 3, 6, 5, 2, 3, 0. Find the mode.

21. Akello kept the following daily record of the number of the people who visited their home in a week: 3, 5, 3, 2, 0, 3, 5. Find the mean.



22. A string is 3m long. How many pieces of string, each measuring 20cm long can be cut from that string?

23. Find the range of the following numbers: 5, 1, 4, 6, 9, 3, 8, 2.

24. The average height of 4 girls, Mary, Jane, Mariam and Agnes is 120cm. Mary is 100 cm tall and Jane is 130 cm tall. Find the height of Mariam if Jane is as tall as Agnes.

25. A pupil scored the following marks in mathematics tests 46, 71, 30, 65, 40, 50, 69. Find the median mark.

26. Find the median of the following numbers: 3,0, 5,4, 2,

27. A primary seven pupil got the following marks in daily mental work exercises for a week: 7, 6, 6, 7, 2, 6, 8.

28. The mean of the score 8, 9, 6, 4 and x is 6

(a) Find the value of x (3marks)

(b)What is the median score? (1mark)

(c) Find the probability that score picked at random below the mean (2marks)

29. Five pupils scored the following marks in a mathematics test: 55, 72, 61, 93, and 60. Find the median mark.

30. A teacher recorded marks of P.7 pupils in mathematics test as shown in the table below. Study it carefully and use it to answer the question that follow.

<b>Marks</b>	72	85	90	95	96
<b>Number of pupils</b>	4	12	1	4	5

(a) Find the range of the marks (1 marks)

(b) What is modal mark? (1 mark)

(c) Work out the mean of the pupils who scored above 85. (3 marks)

31. Find the median of the numbers: 8, 10, 4, 1, 6 and 9.

32. In a poultry farm, eggs are packed into boxes into boxes which hold 144 eggs. How many boxes of the same size are needed to pack 1,008 eggs?

33. A fruit seller sold the following number of mangoes in six days.

60, 35, 40, 28, 42, and 35.

(a) What is the modal number of mangoes sold? (01marks)

(b) Work out the mean number of mangoes sold (02marks)

(c) By the end of the seventh day, the mean number of mangoes sold was 44. How many mangoes were sold on the seventh day? (02 marks)

34. A wire of length 161 meters was shared by some boys. The average length of the wire each boy got was 23 meters. Find the number of boys who shared the wire.

35. The following heights of six children were recorded at a health center;

53 cm, 64 cm, 59 cm, 51 cm, 63cm and 61cm.

Find the median height of the children.

36. The average weight of four boys is 56kg. The two other boys join the group, the average weight becomes 53kg. The sixth boy is 8kg heavier than the sixth boy. Find the weight of the sixth boy. (06 marks).

## Suggested answers

Use the following information to answer questions 1 and 2

In primary school football competition. Owino primary school scored as follows. 3, 9, 3, 0, 1, 8, 6 and 2

1. What was the mean score?

$$\text{mean} = \frac{\text{sum of items}}{\text{number of items}} = \frac{3+9+3+0+1+8+6+2}{8} = \frac{32}{8} = 4$$

2. Find the median score

Rearrange the score in ascending order:

0, 1, 2, 3, 3, 6, 8, 9

$$\text{Find the average of the middle numbers} = \frac{3+3}{2} = 3$$

Use the following information to answer questions 3 and 4.

In the district Primary School football competition, 6 schools participated and scored goals as follows; 3, 2, 6, 4, 2, 5

3. What is the range of goals scored?

Range = highest value – smallest value

$$= 6 - 2$$

$$= 4$$

4. What is the median score?

Arrange the values in order : 2, 2, 3, 4, 5, 6

$$\text{Median is the middle number} = \frac{3+4}{2} = 3\frac{1}{2}$$

5. The height of 9 children are; 103cm, 106cm, 103cm, 108cm, 112cm, 105cm, 103cm 118cm, and 103cm. What is the mode of the height of the children?

Mode is the value that appears most = 103cm

6. Kidoko Secondary School has a students' population of 688. There are 16 classes in the school.  
Find the average Number of students per class.

$$\text{Average} = \frac{\text{total population}}{\text{number of classes}} = \frac{688}{16} = 43$$

7. At a Children's clinic, the age of each child was recorded. The first seven children to arrive had their ages recorded as follows: 3, 1, 4, 5, 2, 5, 6, years. Find the median age of these children.

Rearrange in ascending order: 1, 2, 3, 4, 5, 5, 6

Median or middle number = 4

8. The average weight of 5 boys is 48kg. When a sixth boy joins them average weight becomes 45kg. What is the weight of the sixth boy?

$$\text{Total weight of 5 boys} = 48 \times 5 = 240 \text{ kg}$$

$$\text{Total weight of six boys} = 45 \times 6 = 270 \text{ kg}$$

$$\text{Weight of sixth boy} = 270 - 240 = 30\text{kg}$$

9. Find the median of 6, 3, 7, 0, 1, 4

Arrange the numbers in order from the smallest

0, 1, 3, 4, 6, 7

The median is the middle number  $= \frac{3+4}{2} = 3.5$

10. The average length of three strings is 38cm. Two of the strings measure 44cm each. Find the length of the third string.

$$\text{Total length of the string} = 38 \times 3 = 44 + 44 + x$$

$$\text{The length of the third string, } x = 114 - (88)$$

$$= 26$$

11. The table below shows the goals scored by football teams in different seasons. Use it to answer the questions that follow.

Goals scored	0	1	2	3	4	5	6	7
Teams scoring the	2	5	10	8	5	4	3	1

b) How many teams participated altogether?

$$= 2 + 5 + 10 + 8 + 5 + 4 + 3 + 1$$

$$= 38$$

b). Find the mode of the goals scored.

2 (was scored by highest number of teams)

c). Work out the mean score.

$$= \frac{0 \times 2 + 1 \times 5 + 2 \times 10 + 3 \times 8 + 4 \times 5 + 6 \times 3 + 1 \times 1}{38}$$

$$= \frac{0 + 5 + 20 + 24 + 20 + 18 + 1}{38}$$

$$= \frac{114}{38} = 3 \text{ goals}$$

12. Juliet, Edwin, Sylvia and Joan are 11, 9, 15, 16 years respectively. Find the range of their ages.

$$\text{Range} = \text{highest value} - \text{lowest value}$$

$$= 16 - 9 = 7 \text{ years}$$

13. Find the median of the following numbers: 0, 9, 1, 7, 5.

Arrange the numbers in ascending order: 0, 1, 5, 7, 9

The median is the middle number = 5

14. A P7 class was given a Mathematics test that was marked out of 20. The table below shows the marks scored in the test,

(a). Complete the table.



Mark scored	Number of pupils	Total marks
3	4	12
11.25	4	45
6	<b>14</b>	84
8	8	<b>64</b>
15	8	75

b). What was the modal mark?

Modal mark is the most common = 6 (scored by 14 pupils)

c). Find the number of pupils in this class.

Total number of pupils = 4 + 4 + 14 + 8 + 8 = 38

d). Work out the average mark scored.

Total mark scores = 12 + 45 + 84 + 64 + 75 = 280

Average mark =  $\frac{280}{38} = 7.4$

15. Bbosa scored the following marks in her homework exercises:

**2, 5, 7, 3, 10, 4, 7, 11, 8, 3.**

d) Find her median mark.

Arrange the numbers in ascending order

2, 3, 3, 4, **5, 7**, 7, 8, 10, 11

The median mark is the middle number or average of two middle number

$$= \frac{5+7}{2} = \frac{12}{2} = 6$$

e) Find the mean mark.

$$\text{Mean or average} = \frac{\text{sum of numbers}}{\text{number of items}} = \frac{2+3+3+4+5+7+7+8+10+11}{10}$$

$$= \frac{60}{10} = 6$$

f) Find the probability that Bbosa scored a mark above his mean mark.

$$\text{Probability} = \frac{\text{sample space}}{\text{total}} = \frac{5}{10} = \frac{1}{2}$$

16. A P7 class was given a Mathematics test that was marked out of 20. The table below shows the marks scored in the test,

(a). Complete the table.

Mark scored	Number of pupils	Total marks
3	4	12
11.25	4	45
6	.....	84
8	8	.....
15	.....	75

b). What was the modal mark?

Modal mark is the most common = 6 (scored by 14 pupils)

c). Find the number of pupils in this class.

$$\text{Total number of pupils} = 4 + 4 + 14 + 8 + 5 = 35$$

d). Work out the average total mark scored.

Total mark scores = 12 + 45 + 84 + 64 + 75 = 280

Average mark =  $\frac{280}{35} = 8$

17. Mugisha scored the following marks in science tests: 5, 6, 7, 9, 8, 6, 4.

What was his modal mark?

The modal mark is the most common mark = 6

18. The mean of the scores: 8,7,6,5, {a - 5} is 6.

c) Find the value of a.

$$\text{Average} = \frac{\text{sum of items}}{\text{number of items}}$$

$$6 = \frac{8+7+6+5+(a-5)}{5}$$

$$30 = 21 + a$$

$$a = 9$$

d) Find the range of the scores.

$$\text{Range} = \text{highest value} - \text{lowest value}$$

$$= 9 - 5 = 4$$

19. The average height of Peter, James and John is 51 cm. If the height of Peter is 53 cm and that of James is 46 cm, find the height of John.

$$\text{Average} = \frac{\text{sum}}{\text{number}}$$

Let John's height be x

$$153 = 99 + x$$

$$51 = \frac{53+46+x}{3}$$

$$x = 54$$

$$(51 \times 3) = 99 + x$$

20. Mary kept the following record of rainfall in centimeters: 4, 3, 6, 5, 2, 3, 0. Find the mode.

The mode is the most common figure = 3

21. Akello kept the following daily record of the number of the people who visited their home in a week: 3, 5, 3, 2, 0, 3, 5. Find the mean.

$$\text{Mean} = \frac{\text{sum of items}}{\text{number of items}}$$

$$= \frac{3+5+3+2+0+3+5}{7}$$

$$= \frac{21}{7} = 3$$

22. A string is 3m long. How many pieces of string, each measuring 20cm long can be cut from that string?

Convert 3m to cm

$$1\text{m} = 100\text{cm}$$

$$3\text{m} = 3 \times 100 = 300\text{cm}$$

To get the number of pieces; divide 3m by 20cm

$$\text{Number of pieces} = \frac{300}{20} = 15 \text{ pieces}$$

23. Find the range of the following numbers: 5, 1, 4, 6, 9, 3, 8, 2.

Arrange the numbers in order starting from the smallest: 1, 2, 3, 4, 5, 6, 8, 9.

Range = the biggest value – smallest value

$$= 9 - 1$$

$$= 8$$

24. The average height of 4 girls, Mary, Jane, Mariam and Agnes is 120cm. Mary is 100 cm tall and Jane is 130 cm tall. Find the height of Mariam if Jane is as tall as Agnes.

Let the height of Agnes be x

$$\text{Average} = \frac{\text{sum of items}}{\text{number of items}} = \frac{100+130+130+x}{4} = 120$$

$$100 + 130 + 130 + x = 120 \times 4$$

$$360 + x = 480$$

$$x = 480 - 360$$

$$x = 120$$

25. A pupil scored the following marks in mathematics tests 46, 71, 30, 65, 40, 50, 69. Find the median mark.

Arrange the score in order

30, 40, 46, 50, 65, 69, 79

The median is the middle number = 50

26. Find the median of the following numbers: 3, 0, 5, 4, 2,

Arrange in order: 0, 2, 3, 4, 5

The median is the middle number = 3

27. A primary seven pupil got the following marks in daily mental work exercises for a week: 7, 6, 6, 7, 2, 6, 8.

What was the pupil's modal mark?

**Arrange the numbers from the smallest: 2, 6, 6, 6, 7, 7, 8**

**The modal mark that appear most often = 6**

28. The mean of the score 8, 9, 6, 4 and x is 6

(a) Find the value of x (3marks)

$$\text{mean} = \frac{\text{sum}}{\text{number of item}}$$

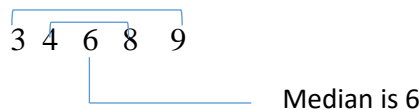
$$\frac{8+9+6+4+x}{5} = 6$$

$$27 + x = 30$$

$$x = 3$$

(b) What is the median score? (1mark)

Median = middle score in order of size



(c) Find the probability that score picked at random below the mean (2marks)

$$\text{Mean} = 6$$

$$\text{Below mean} = \{3,4\}$$

$$\text{Probability} = \frac{2}{5}$$

29. Five pupils scored the following marks in a mathematics test: 55, 72, 61, 93, and 60. Find the median mark.

Arrange the figures in order: 55, 60, 61, 72, 93

The median is the middle number = 61

30. A teacher recorded marks of P.7 pupils in mathematics test as shown in the table below. Study it carefully and use it to answer the question that follow.

<b>Marks</b>	72	85	90	95	96
<b>Number of pupils</b>	4	12	1	4	5

(d) Find the range of the marks (1 marks)

$$\text{Range} = \text{highest} - \text{lowest} = (96 - 72) = 24$$

(e) What is modal mark? (1 mark)

Modal mark is the most gotten mark = 85

(f) Work out the mean of the pupils who scored above 85.

(3 marks)

$$\text{The mean} = \frac{(90 \times 1) + (95 \times 4) + (96 \times 5)}{(1 + 4 + 5)} = 95$$

31. Find the median of the numbers: 8, 10, 4, 1, 6 and 9.

Arrange the number in order starting with the smallest

1, 4, 6, 8, 9, 10

since the total number is even, the average middle numbers 6 and 8 give the median

$$\therefore \text{the median} = \frac{6+8}{2} = 7$$

32. In a poultry farm, eggs are packed into boxes into boxes which hold 144 eggs. How many boxes of the same size are needed to pack 1,008 eggs?

$$\begin{aligned} \text{The number of packs} &= \frac{\text{total number of eggs}}{\text{the number of eggs per pack}} \\ &= \frac{1,008}{144} \\ &= 7 \text{ packs} \end{aligned}$$

33. A fruit seller sold the following number of mangoes in six days.

60, 35, 40, 28, 42, and 35.

(d) What is the modal number of mangoes sold? (01marks)

The modal number is the most common number = 35

(e) Work out the mean number of mangoes sold (02marks)

$$\begin{aligned} \text{the mean} &= \frac{\text{sum of the number}}{\text{number of items}} \\ &= \frac{60+ 35+ 40+28+42+ 35}{6} = 40 \end{aligned}$$

(f) By the end of the seventh day, the mean number of mangoes sold was 44. How many mangoes were sold on the seventh day? (02 marks)

Let the number of mangoes sold on Sunday be Q

$$44 = \frac{40 \times 6 + Q}{7}$$

Q = 68 mangoes

34. A wire of length 161 meters was shared by some boys. The average length of the wire each boy got was 23 meters. Find the number of boys who shared the wire.

$$\begin{aligned} \text{Number of boys} &= \frac{\text{Total length}}{\text{average length}} \\ &= \frac{161}{23} = 7 \end{aligned}$$

35. The following heights of six children were recorded at a health center; 53 cm, 64 cm, 59 cm, 51 cm, 63cm and 61cm.

Find the median height of the children.

Arrange the heights in ascending order

51, 53, 59, 61, 63, 64

Median is the middle number =  $\frac{59+61}{2} = 60$

36. T s join the group, the average weight becomes 53kg. The sixth boy is 8kg heavier than the sixth boy. Find the weight of the

sixth boy. (06 marks).

Let the mass of 6<sup>th</sup> boy be  $x$

The mass of the 5<sup>th</sup> boy =  $(x-8)$

Total mass of six children =  $(56 \times 4) + x + x - 8$

$$53 \times 6 = 224 + 2x - 8$$

$$318 = 224 - 8 + 2x$$

$$2x = 102$$

$$x = 51$$

Thanks