

Name _____

Date _____

16.1 Mode, median and range — worked answers

Find the mode, the median and the range of a set of data, and know what each of them describes. · 61 questions

A · Fluency — Mode, median and range from a list.

- 1 Find the **mode** of this set of data:

3, 7, 7, 2, 9, 5, 7

Answer: 7

The mode is the value that appears most often. 7 appears 3 times, more than any other.

- 2 Find the **mode** of this set of data:

12, 15, 11, 15, 18, 15, 20

Answer: 15

The mode is the value that appears most often. 15 appears 3 times, more than any other.

- 3 Find the **mode** of this set of data:

4, 8, 6, 8, 10, 2, 8

Answer: 8

The mode is the value that appears most often. 8 appears 3 times, more than any other.

- 4 Find the **mode** of this set of data:

21, 25, 23, 25, 30, 25, 19

Answer: 25

The mode is the value that appears most often. 25 appears 3 times, more than any other.

- 5 Find the **mode** of this set of data:

1, 5, 3, 5, 9, 5, 7

Answer: 5

The mode is the value that appears most often. 5 appears 3 times, more than any other.

- 6 Find the **mode** of this set of data:

14, 10, 14, 18, 14, 6, 22

Answer: 14

The mode is the value that appears most often. 14 appears 3 times, more than any other.

- 7 Find the **mode** of this set of data:

33, 37, 35, 37, 40, 37, 30

Answer: 37

The mode is the value that appears most often. 37 appears 3 times, more than any other.

- 8** Find the **mode** of this set of data:

8, 6, 8, 12, 8, 4, 10

Answer: 8

The mode is the value that appears most often. 8 appears 3 times, more than any other.

- 9** Find the **median** of this set of data:

3, 7, 7, 2, 9, 5, 7

Answer: 7

Put them in order first: 2, 3, 5, 7, 7, 7, 9. There are 7 values, so the middle one is the 4th, which is 7.

- 10** Find the **median** of this set of data:

12, 15, 11, 15, 18, 15, 20

Answer: 15

Put them in order first: 11, 12, 15, 15, 15, 18, 20. There are 7 values, so the middle one is the 4th, which is 15.

- 11** Find the **median** of this set of data:

4, 8, 6, 8, 10, 2, 8

Answer: 8

Put them in order first: 2, 4, 6, 8, 8, 8, 10. There are 7 values, so the middle one is the 4th, which is 8.

- 12** Find the **median** of this set of data:

21, 25, 23, 25, 30, 25, 19

Answer: 25

Put them in order first: 19, 21, 23, 25, 25, 25, 30. There are 7 values, so the middle one is the 4th, which is 25.

- 13** Find the **median** of this set of data:

1, 5, 3, 5, 9, 5, 7

Answer: 5

Put them in order first: 1, 3, 5, 5, 5, 7, 9. There are 7 values, so the middle one is the 4th, which is 5.

- 14** Find the **median** of this set of data:

14, 10, 14, 18, 14, 6, 22

Answer: 14

Put them in order first: 6, 10, 14, 14, 14, 18, 22. There are 7 values, so the middle one is the 4th, which is 14.

- 15** Find the **median** of this set of data:

33, 37, 35, 37, 40, 37, 30

Answer: 37

Put them in order first: 30, 33, 35, 37, 37, 37, 40. There are 7 values, so the middle one is the 4th, which is 37.

- 16** Find the **median** of this set of data:

8, 6, 8, 12, 8, 4, 10

Answer: 8

Put them in order first: 4, 6, 8, 8, 8, 10, 12. There are 7 values, so the middle one is the 4th, which is 8.

- 17** Find the **median** of this set of data:

4, 6, 9, 11, 6, 8

Answer: 7

In order: 4, 6, 6, 8, 9, 11. There are 6 values — an even number — so there is no single middle. Take the two in the middle, 6 and 8, and find the value halfway between them: $6 + 8 = 14$, then $14 \div 2 = 7$.

- 18** Find the **median** of this set of data:

10, 14, 12, 18, 14, 16

Answer: 14

In order: 10, 12, 14, 14, 16, 18. There are 6 values — an even number — so there is no single middle. Take the two in the middle, 14 and 14, and find the value halfway between them: $14 + 14 = 28$, then $28 \div 2 = 14$.

- 19** Find the **median** of this set of data:

2, 5, 7, 9, 5, 8

Answer: 6

In order: 2, 5, 5, 7, 8, 9. There are 6 values — an even number — so there is no single middle. Take the two in the middle, 5 and 7, and find the value halfway between them: $5 + 7 = 12$, then $12 \div 2 = 6$.

- 20** Find the **median** of this set of data:

20, 26, 22, 28, 26, 24

Answer: 25

In order: 20, 22, 24, 26, 26, 28. There are 6 values — an even number — so there is no single middle. Take the two in the middle, 24 and 26, and find the value halfway between them: $24 + 26 = 50$, then $50 \div 2 = 25$.

- 21** Find the **median** of this set of data:

15, 19, 17, 21, 19, 23

Answer: 19

In order: 15, 17, 19, 19, 21, 23. There are 6 values — an even number — so there is no single middle. Take the two in the middle, 19 and 19, and find the value halfway between them: $19 + 19 = 38$, then $38 \div 2 = 19$.

- 22** Find the **median** of this set of data:

30, 34, 32, 38, 34, 36

Answer: 34

In order: 30, 32, 34, 34, 36, 38. There are 6 values — an even number — so there is no single middle. Take the two in the middle, 34 and 34, and find the value halfway between them: $34 + 34 = 68$, then $68 \div 2 = 34$.

- 23** Find the **range** of this set of data:

3, 7, 7, 2, 9, 5, 7

Answer: 7

The range is the largest minus the smallest: $9 - 2 = 7$.

- 24** Find the **range** of this set of data:

12, 15, 11, 15, 18, 15, 20

Answer: 9

The range is the largest minus the smallest: $20 - 11 = 9$.

- 25** Find the **range** of this set of data:

4, 8, 6, 8, 10, 2, 8

Answer: 8

The range is the largest minus the smallest: $10 - 2 = 8$.

- 26** Find the **range** of this set of data:

21, 25, 23, 25, 30, 25, 19

Answer: 11

The range is the largest minus the smallest: $30 - 19 = 11$.

- 27** Find the **range** of this set of data:

1, 5, 3, 5, 9, 5, 7

Answer: 8

The range is the largest minus the smallest: $9 - 1 = 8$.

- 28** Find the **range** of this set of data:

14, 10, 14, 18, 14, 6, 22

Answer: 16

The range is the largest minus the smallest: $22 - 6 = 16$.

- 29** Find the **range** of this set of data:

33, 37, 35, 37, 40, 37, 30

Answer: 10

The range is the largest minus the smallest: $40 - 30 = 10$.

- 30** Find the **range** of this set of data:

8, 6, 8, 12, 8, 4, 10

Answer: 8

The range is the largest minus the smallest: $12 - 4 = 8$.

- 31** Find the **range** of this set of data:

4, 6, 9, 11, 6, 8

Answer: 7

$11 - 4 = 7$.

- 32** Find the **range** of this set of data:

10, 14, 12, 18, 14, 16

Answer: 8

$18 - 10 = 8$.

- 33** Find the **range** of this set of data:

2, 5, 7, 9, 5, 8

Answer: 7

$9 - 2 = 7$.

- 34** Find the **range** of this set of data:

20, 26, 22, 28, 26, 24

Answer: 8

$28 - 20 = 8$.

- 35** Find the **range** of this set of data:

15, 19, 17, 21, 19, 23

Answer: 8

$23 - 15 = 8$.

- 36** Find the **range** of this set of data:

30, 34, 32, 38, 34, 36

Answer: 8

$38 - 30 = 8$.

B · Reasoning — What each one measures, and where the traps are.

- 37** What does the **mode** tell you?

- ☐ The middle value
- ☐ The most common value
- ☐ The total
- ☐ The spread

Answer: The most common value

It is the only average that works for words as well as numbers — you can have a modal eye colour, but not a mean one.

- 38** What does the **median** tell you?

- ☐ The most common value
- ☐ The middle value when they are in order
- ☐ The total ÷ how many
- ☐ The largest minus the smallest

Answer: The middle value when they are in order

In order is the part people forget.

- 39** What does the **range** tell you?

- ☐ An average
- ☐ How spread out the data is
- ☐ The most common value
- ☐ The middle

Answer: How spread out the data is

It is not an average at all. Two sets can share a mean and have quite different ranges.

- 40** Must the median be one of the values in the data?

- ☐ Yes
- ☐ No

Answer: No

With an even number of values it is halfway between the middle two, and that may be a value that never occurs.

- 41** Must the mode be one of the values in the data?

- ☐ Yes
- ☐ No

Answer: Yes

It is one of them by definition — the one that occurs most often.

42 Why must you put the data in order before finding the median?

- ☐ It looks tidier
- ☐ Because the median is defined by position, and position only means something once it is sorted
- ☐ It is not necessary
- ☐ To find the mode

Answer: Because the median is defined by position, and position only means something once it is sorted

Forgetting to sort is the single commonest error in this section.

43 A set has 9 values. Which one is the median?

- ☐ the 4th
- ☐ the 5th
- ☐ the 4th and 5th
- ☐ the 9th

Answer: the 5th

$9 + 1 = 10$, and $10 \div 2 = 5$. Four values sit below it and four above.

44 A set has 10 values. Where is the median?

- ☐ the 5th
- ☐ the 6th
- ☐ halfway between the 5th and the 6th
- ☐ there is none

Answer: halfway between the 5th and the 6th

With an even count no single value is in the middle.

45 A data set has no value repeated. What is its mode?

- ☐ The first value
- ☐ The largest
- ☐ There is no mode
- ☐ The median

Answer: There is no mode

Say so — it is a legitimate answer, and better than inventing one.

46 Can two different data sets have the same range?

- ☐ Yes
- ☐ No

Answer: Yes

1, 2, 9 and 1, 8, 9 both have range 8, yet they look nothing alike. The range only sees the two ends.

C · Challenge — Working backwards to a missing value.

47 The mode of 4, 7, x, 7, 2 is 7 and the range is 6. If x is the largest of the five values, what is x?

Answer: 8

With x largest, the smallest is 2, so a range of 6 makes $x = 2 + 6 = 8$. And 8 leaves the mode at 7.

Without the word *largest* the question would have a second answer: $x = 1$ also gives a range of 6, from 1 to 7.

- 48** Five numbers have a median of 12. Four of them are 8, 10, 15 and 20. What is the fifth?

Answer: 12

With five values the median is the 3rd in order. The four given values already run 8, 10, 15, 20, so the new value must slot in third — anywhere above 10 and below 15. Since the 3rd value has to be 12, the missing number is 12 itself.

- 49** Seven numbers are 5, 9, 4, 9, 12, 3, 9. What is the difference between the mode and the median?

Answer: 0

The mode is 9. In order they are 3, 4, 5, 9, 9, 9, 12, so the 4th value, 9, is the median. The difference is $9 - 9 = 0$.

- 50** A set of six numbers has median 11. Five of them are 6, 8, 10, 14 and 16. What is the sixth, if it lies between 10 and 14?

Answer: 12

With six values the median is halfway between the 3rd and 4th. Adding x between 10 and 14 gives the order 6, 8, 10, x , 14, 16, so the median is halfway between 10 and x . For that to be 11, $10 + x = 22$, so $x = 12$.

- 51** The range of a set is 15 and the largest value is 42. What is the smallest?

Answer: 27

$42 - 15 = 27$.

- 52** Nine numbers are in order. Which position is the median?

Answer: 5

$9 + 1 = 10$, and $10 \div 2 = 5$, so the 5th.

- 53** Four numbers have a median of 7. Three of them are 4, 6 and 12. What is the fourth?

Answer: 8

With four values the median is halfway between the 2nd and 3rd. Placing the new value between 6 and 12 gives the order 4, 6, x , 12, so the middle two are 6 and x . Halfway between them is 7, so $6 + x = 14$ and $x = 8$.

D · Word problems — Tests, temperatures, shoes and houses.

- 54** Seven learners score 6, 8, 9, 8, 10, 7, 8 in a test. What is the modal score?

Answer: 8

8 appears three times, more than any other score.

- 55** Seven learners score 6, 8, 9, 8, 10, 7, 8. What is the median score?

Answer: 8

In order: 6, 7, 8, 8, 8, 9, 10. The 4th value is 8.

- 56** Daily temperatures were 14, 17, 12, 19, 15, 21, 16 °C. What was the range, in degrees?

Answer: 9

$21 - 12 = 9$ °C.

- 57** Shoe sizes sold in a day were 6, 7, 7, 8, 7, 9, 6. Which size should the shop restock most of?

Answer: 7

The mode is 7 — it sold three times. For stock decisions the mode is the useful average, because you cannot sell half a size.

- 58** Six houses on a street sold for, in thousands: 180, 200, 210, 220, 240, 950. What is the range, in thousands?

Answer: 770

$950 - 180 = 770$. That one very large value stretches the range enormously.

- 59** Six houses sold for, in thousands: 180, 200, 210, 220, 240, 950. What is the median, in thousands?

Answer: 215

In order they already are. The middle two are 210 and 220: $210 + 220 = 430$, and $430 \div 2 = 215$.

- 60** A bus arrives 2, 5, 1, 8, 2, 3, 2 minutes late over a week. What is the modal lateness, in minutes?

Answer: 2

2 occurs three times.

- 61** Rainfall over five days was 4, 0, 12, 3, 6 mm. What is the range, in millimetres?

Answer: 12

$12 - 0 = 12$ mm. A day with no rain still counts as a reading.