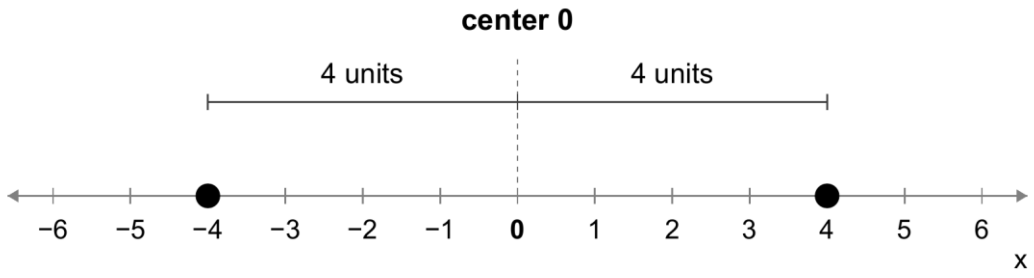
Absolute value and distance from zero

Absolute value means distance from zero.

The vertical bars | | mean absolute value. Let x be a number. Read |x| as “the absolute value of x.”



Same distance on opposite sides

$$|-4| = 4 \quad |4| = 4$$

Both numbers are 4 units from 0.

$$|0| = 0$$

At the center, the distance is zero.

$$|x| = |x - 0|$$

Subtracting 0 leaves x unchanged. Writing x − 0 makes the center 0 visible.

Calculate inside the bars first

$$|6 - 10| = |-4| = 4$$

First calculate 6 − 10. Then find the distance of −4 from zero.

Your turn Find each absolute value

For a subtraction, show the result inside the bars before giving the distance.

1. $|-3| =$ _____
2. $|3| =$ _____
3. $|0| =$ _____
4. $|7 - 10| = |$_____$| =$ _____
5. $|10 - 7| = |$_____$| =$ _____
6. $|6 - 6| = |$_____$| =$ _____

Explain Why do −3 and 3 have the same absolute value?

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LEARNING PAPER EVIDENCE

Change the center then choose the distance

An absolute value expression measures distance. An equation or inequality tells which distances are allowed.

The number line always shows values of x. The dashed guide marks the center; it is not a solution dot.

1 Exactly 4 units from 0

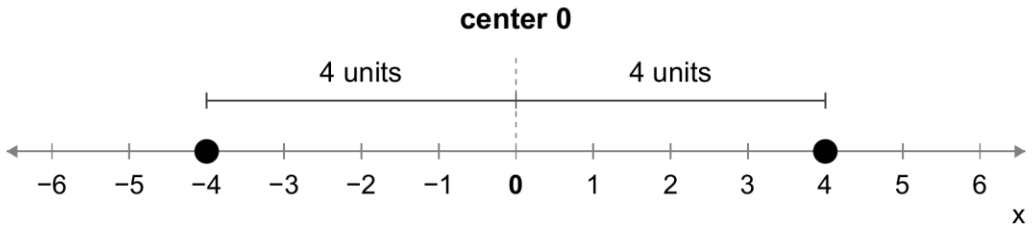
$$|x| = 4$$

The same condition: $|x - 0| = 4$

The center is 0. Go 4 units each way.

$$x = -4 \quad or \quad x = 4$$

Exactly 4 away selects two points.



2 Move the center to 40

In |x − 40|, 40 is the center because 40 − 40 = 0. At the center, the distance is zero.

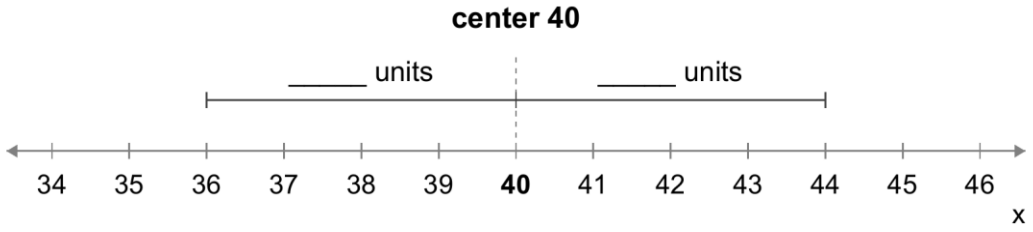
Subtracting 40 finds the difference. Absolute value gives its distance from zero—how far x is from 40.

$$|x - 40| = 4$$

Exactly 4 units from 40.

$$40 - 4 = ____ \quad 40 + 4 = ____$$

Plot both answers as filled points.
Fill in the two distance labels.



Same distance on opposite sides: |36 − 40| = |−4| = 4 and |44 − 40| = |4| = 4.

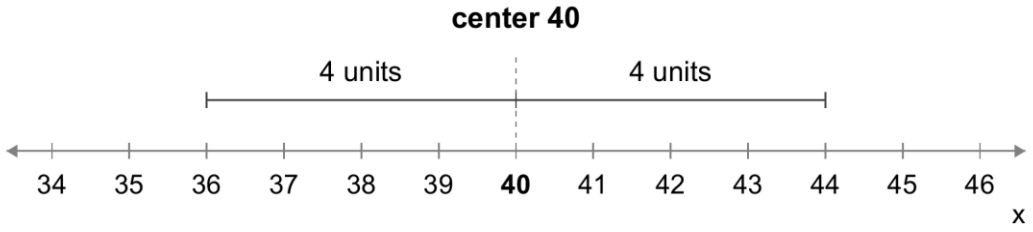
3 Allow every distance up to 4

$$|x - 40| \leq 4$$

No more than 4 units from 40.

$$____ \leq x \leq ____$$

Use filled circles at both boundaries.
Shade all solutions.



Does 40 belong to the last solution? Explain using |40 − 40|.

The center is 40. The boundaries are 4 units away, one on each side.