7 INEQUALITIES: CORE

SKILLS TO KNOW

- Flip the sign when multiplying/dividing by a negative
- How to graph inequalities on a number line
- How to "pluck points"

THE BASICS

Inequalities are **just like equations**—with one big exception. If you're multiplying or dividing both sides of the inequality by a negative number, you must "flip" the sign to the other direction:

$$-3x > 9 \quad \text{Divide by negative three}$$

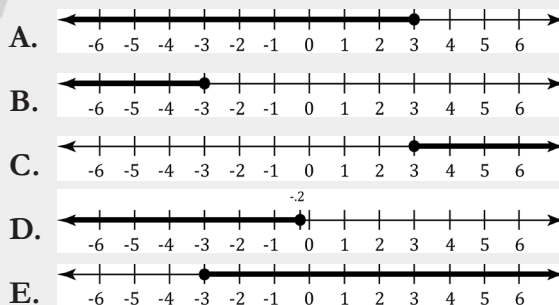$$-\frac{3x}{-3} < \frac{9}{-3} \quad \text{Flip the sign!}$$

$$x < -3 \quad \text{Simplify}$$

INEQUALITIES ON A NUMBER LINE

You'll need to know how to graph a basic inequality on a number line and properly shade. Remember **open circles** refer to **less than/greater than** and **closed circles** refer to **less than or equal to/ greater than or equal to.**

Which of the following number line graphs shows the solution set of
$$-6(x+2)+1 \ge 4-x\,?$$

$$-6(x+2)+1 \geq 4-x \quad \text{To simplify, distribute the multiplier, } -6$$

$$-6x-12+1 \geq 4-x \quad \text{Group like terms together}$$

$$-6x+x \geq 4+12-1 \quad \text{Simplify}$$

$$-5x \geq 15 \quad \text{Divide by negative five}$$

$$-\frac{5x}{-5} \leq \frac{15}{-5} \quad \text{Flip the sign!}$$

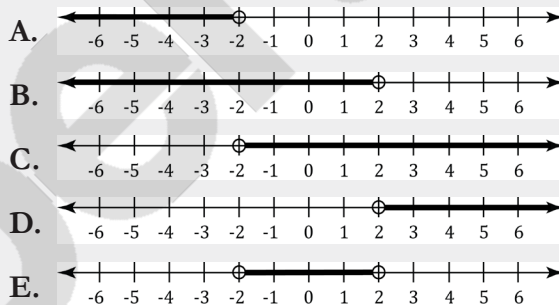$$x \leq -3 \quad \text{Simplify}$$

Answer: **B.**

WHEN IN DOUBT, PLUCK POINTS

If you're ever unsure of how to solve an inequalities problem, plucking points is a great way to solve if you have graphed answers on number lines. Take advantage of the fact that the ACT® is multiple choice!

Remember, every part of the shaded line must make the inequality statement true, so if more than one seems possible to you, find a point that is only on one of the two number lines in question and test that point. Then, use process of elimination.

Which of the following is a graph of $x^4 - 4 < 12$?

A.

```
+---+---+---+---+---+--o---+---+---+---+---+---+---+-->
-6  -5  -4  -3  -2  -1  0   1   2   3   4   5   6
```

B.

```
<--+---+---+---+---+---+---+---+--o---+---+---+---+-->
-6  -5  -4  -3  -2  -1  0   1   2   3   4   5   6
```

C.

```
<--+---+---+---+---+--o---+---+---+---+---+---+---+---
-6  -5  -4  -3  -2  -1  0   1   2   3   4   5   6
```

D.

```
<--+---+---+---+---+---+---+---+--o---+---+---+---+--
-6  -5  -4  -3  -2  -1  0   1   2   3   4   5   6
```

E.

```
<--+---+---+---+--o---+---+---+--o---+---+---+---+-->
-6  -5  -4  -3  -2  -1  0   1   2   3   4   5   6
```

As you can see, all the answer choices are some combination of an inequality that involves 2 or negative 2. To do the actual math on this problem is probably a waste of time: you're going to be comparing x to some version of 2 or -2. Instead, let's **pluck points** to find the answer.

Zero (0) is an answer to A, C, and E. Let's test that first, plugging in 0 for x.

$$0^4 - 4 < 12$$
$$-4 < 12 : \text{TRUE}$$

Because this statement is true, we can eliminate B and D. Now let's check 6, part of the solution for C.

$$6^4 - 4 < 12$$

At this point, I know the term on the left is going to be pretty big ($6 \times 6 \times 6 \times 6$ is 36 squared!). This won't be true.

Now let's check -6, part of the solution for choice A.

$$\left(-6\right)^4 - 4 < 12$$

This is going to give the same result as choice C. This will not be true, as the sign will go away when we take this number to the 4th power.

Only choice E remains. It is correct.

Answer: **E**.