

Plan, Solve, Show

Model situations with two-step equations and inequalities.

GRADE 7 • TEKS 7.10

7.10 "Expressions, equations, and relationships. The student applies mathematical process standards to use one-variable equations and inequalities to represent situations. The student is expected to: write one-variable..."

NAME _____

DATE _____

SOLVE AND REPRESENT

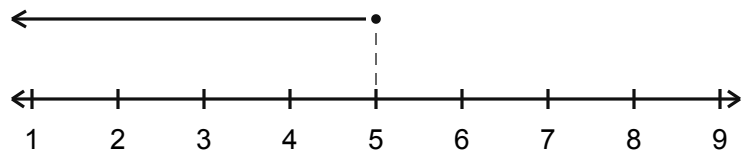
Show both solving steps. Undo operations to isolate x . Each linear equation on this sheet has one solution point. An inequality uses an open dot for $<$ or $>$, a closed dot for $\leq$ or $\geq$, and a ray toward all solutions. Reverse the inequality when multiplying or dividing by a negative number.

WORKED EXAMPLE

Solve and graph $3x + 2 \leq 17$ over the real numbers.

1. Subtract 2: $3x \leq 15$. Divide by 3: $x \leq 5$.
2. The dot and ray lie above the scale; the dashed guide lines up the endpoint with 5.

Draw the solution above the scale

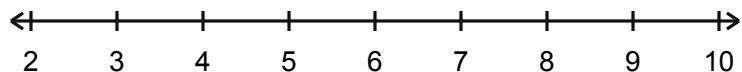


Answer: $x \leq 5$: closed dot at 5, ray left.

PRACTICE 4 problems

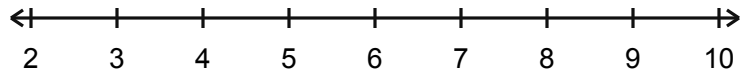
- 1** A fair charges \$4 entry and \$3 per ride. You spend exactly \$22. Define x , write an equation, solve it, and state the feasible number of rides. Graph the solution.

Draw the solution above the scale



- 2** A delivery costs \$5 plus \$2 per kilogram. The charge must be less than \$17. Let x be mass in kilograms. Write and solve an inequality. Graph its real-number solution, then state which solutions make sense for mass.

Draw the solution above the scale



- 3** Write a real-world situation modeled by $8x - 3 = 29$. Define x and explain both $8x$ and -3 . Then solve.

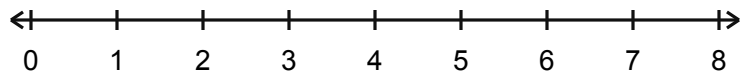
- 4** A fundraiser earns \$4 per ticket and pays a \$2 setup fee. It needs more than \$30 in profit. Let x be tickets. Write and solve an inequality. Give the least feasible ticket count and check it.

APPLY IT Show your work

A tank starts with 20 liters and drains 2 liters per minute. At what times does it have at least 8 liters?

- 1** Let x be minutes elapsed. Write and solve the inequality. Graph the algebraic solution and explain the physically possible times.

Draw the solution above the scale



- 2** The inequality $9x + 11 < 65$ models a cost. Write a situation, define x and its units, and solve. Explain why the boundary value is excluded.

CHALLENGE One step up

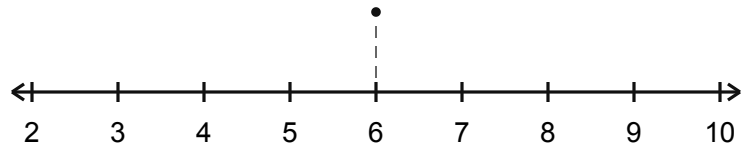
A band has at most 44 minutes. It warms up for 8 minutes, then plays complete 6-minute blocks. A student writes $6(x + 8) \leq 44$. Correct the model, find the most complete blocks, and explain the error.

Graphing tasks explicitly request the algebraic real-number solution first, then the context domain. The ray may include negative numbers even when a final physical interpretation excludes them. Student-created situations must match every term and the comparison sign.

PRACTICE 1

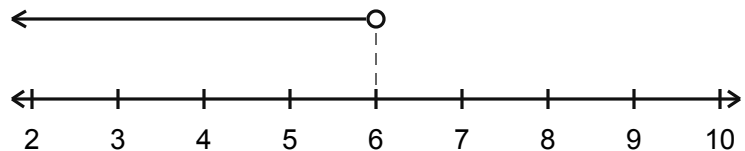
Draw the solution above the scale

x is rides. $3x + 4 = 22$; $3x = 18$; $x = 6$ rides. Plot one closed dot at 6.

**PRACTICE 2**

Draw the solution above the scale

$2x + 5 < 17$; $2x < 12$; $x < 6$. Open dot at 6, ray left. Mass cannot be negative: $0 \leq x < 6$ kg.

**PRACTICE 3**

Sample: A player earns 8 points per round and loses 3 penalty points, finishing with 29. x is rounds; $8x$ is earned points, -3 is the penalty. $8x = 32$; $x = 4$ rounds.

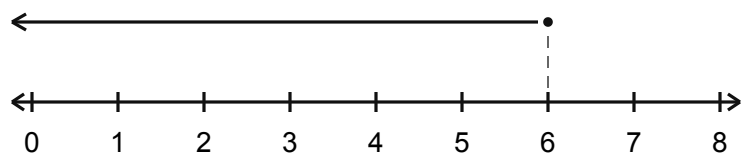
PRACTICE 4

$4x - 2 > 30$; $4x > 32$; $x > 8$. Least whole count: 9 tickets. Profit is $4(9) - 2 = \$34$, greater than \$30.

APPLY IT 1

Draw the solution above the scale

$20 - 2x \geq 8$; $-2x \geq -12$; $x \leq 6$ (reverse when dividing by -2). Closed dot at 6, ray left. Feasible times: $0 \leq x \leq 6$ minutes. Check that the representation and explanation agree with the given quantities.



APPLY IT 2

Sample: A studio costs \$11 plus \$9 per hour; the total must be below \$65. x is hours. $9x < 54$; $x < 6$. At 6 hours the cost is \$65, so 6 is excluded. Feasible hours satisfy $0 \leq x < 6$.

Check that the representation and explanation agree with the given quantities.

CHALLENGE

Correct: $6x + 8 \leq 44$. Then $6x \leq 36$ and $x \leq 6$; at most 6 complete blocks. The 8-minute warm-up happens once, not inside every 6-minute block.