GRADE 7 · UNIT 10 · LESSON 4

Solving One-Step Inequalities Using Multiplication and Division

MA.7.AR.2.1

I can solve one-step inequalities with fraction and decimal coefficients of either sign, graph the solutions, and answer a word problem with them.

Warm-Up

1. Solve: $-4x \geq 28$
2. Solve: $4.5 + y < 2$
3. Find the value: $\frac{3}{4} \times (-8)$
4. Find the value: $6 \div \frac{2}{3}$

Warm-Up

1. Solve: $-4x \geq 28$ **$x \leq -7$**
2. Solve: $4.5 + y < 2$ **$y < -2.5$**
3. Find the value: $\frac{3}{4} \times (-8)$ **-6**
4. Find the value: $6 \div \frac{2}{3}$ **9**

Vocabulary

reciprocal

the number to multiply by to get 1: the reciprocal of 2/3 is 3/2, and of –3/4 is –4/3

at most

no more than: at most 50 means ≤ 50

at least

no less than: at least 380 means ≥ 380

Notes

I. Fraction and decimal coefficients: the same two rules

A positive coefficient: the symbol stays. A negative one: it reverses.

$\frac{2}{3}x \geq 8$: multiply both sides by $\frac{3}{2}$: $x \geq 12$

$-0.4y < 2$: divide both sides by -0.4, and reverse: $y > -5$

Notes

II. The variable subtracted

$5 - x > 2$

Subtract 5 from both sides: $-x > -3$

$-x$ is -1 times x: divide by -1, and reverse: $x < 3$

Check 0: $5 - 0 > 2$ is true.

Notes

III. In a story: at most, at least — and a whole-number answer

At most 50: 50 or less, ≤. At least 50: 50 or more, ≥.

A count of tickets, buses or people is a whole number.

$t \leq 6.8$: 6, 5, 4, … all work. The greatest is 6.

$v \geq 4.2$: 5, 6, 7, … all work. The least is 5 — 4 is not a solution.

Example 1

$$-\frac{3}{4}m \geq 6$$

Solve it, then check a number on the arrow.

Example 1

$$-\frac{3}{4}m \geq 6$$

Multiply both sides by −4/3, the reciprocal of −3/4, and reverse.

6 × (−4/3) = −8, so $m \leq -8$.

Graph: a closed circle at −8, the arrow to the left.

Check −12: −3/4 × (−12) = 9, and $9 \geq 6$ is true.

Answer: $m \leq -8$

Your Turn

$$-\frac{2}{5}n < 4$$

Solve it, then check a number on the arrow.

Your Turn

$$-\frac{2}{5}n < 4$$

Solve it, then check a number on the arrow.

Multiply both sides by $-\frac{5}{2}$, and reverse: $4 \times \left(-\frac{5}{2}\right) = -10$

$n > -10$

Check 0: $-\frac{2}{5} \times 0 = 0$, and $0 < 4$ is true

Answer: $n > -10$

Example 2

Tickets cost $7.50 each, and Ava has $50 to spend.

How many tickets can she buy? Write and solve an inequality.

Example 2

At most 50 dollars: $7.50t \le 50$.

Divide both sides by 7.50, a positive: $t \le 50 \div 7.50$, about 6.7.

Tickets are whole: the greatest whole number that works is 6.

Check: $6 \times 7.50 = 45$ is under 50; $7 \times 7.50 = 52.50$ is over.

Answer: At most 6 tickets

Your Turn

Pens cost $1.25 each, and Leo has $9.

How many pens can he buy? Write and solve an inequality.

Your Turn

Pens cost $1.25 each, and Leo has $9.

How many pens can he buy? Write and solve an inequality.

At most 9 dollars: $1.25p \le 9$

Divide by 1.25: $9 \div 1.25 = 7.2$, so $p \le 7.2$

Pens are whole: the greatest whole number that works is 7

Answer: At most 7 pens

Whiteboards · Question 1 of 9

$\frac{1}{2}x > 3$

Solve it.

Answer it.

Whiteboards · Question 1 of 9

$\frac{1}{2}x > 3$

Solve it.

Multiply both sides by 2, a positive: $3 \times 2 = 6$

$x > 6$

Answer: $x > 6$

Whiteboards · Question 2 of 9

$$-\frac{1}{2}x > 3$$

Solve it.

Answer it.

Whiteboards · Question 2 of 9

$-\frac{1}{2}x > 3$

Solve it.

Multiply both sides by −2, and reverse: $3 \times (-2) = -6$

$x < -6$

Answer: $x < -6$

Whiteboards · Question 3 of 9

$-0.6w \leq 1.8$

Solve it.

A. $w \geq 3$

B. $w \geq -3$

C. $w \leq -3$

D. $w \geq -1.08$

Answer it.

Whiteboards · Question 3 of 9

$-0.6w \leq 1.8$

Solve it.

Divide both sides by −0.6, and reverse: $1.8 \div (-0.6) = -3$

$w \geq -3$

Answer: B — $w \geq -3$

Whiteboards · Question 4 of 9

$$\frac{k}{4} \leq -3.5$$

Solve it.

Answer it.

Whiteboards · Question 4 of 9

$\frac{k}{4} \leq -3.5$

Solve it.

Multiply both sides by 4, a positive: $-3.5 \times 4 = -14$

$k \leq -14$

Answer: $k \leq -14$

Whiteboards · Question 5 of 9

$\frac{3}{5}y < -9$

Solve it.

Answer it.

Whiteboards · Question 5 of 9

$\frac{3}{5}y < -9$

Solve it.

Multiply both sides by $\frac{5}{3}$, a positive: $-9 \times \frac{5}{3} = -15$

$y < -15$: the coefficient is positive, so the symbol stays

Answer: $y < -15$

Whiteboards · Question 6 of 9

$8 - x \geq 3$

Solve it.

Answer it.

Whiteboards · Question 6 of 9

$8 - x \geq 3$

Solve it.

Subtract 8 from both sides: $3 - 8 = -5$, so $-x \geq -5$

Divide by –1, and reverse: $x \leq 5$

Answer: $x \leq 5$

Whiteboards · Question 7 of 9

$9 \geq -1.5z$

Solve it.

A. $z \geq -13.5$

B. $z \geq 6$

C. $z \geq -6$

D. $z \leq -6$

Answer it.

Whiteboards · Question 7 of 9

$9 \geq -1.5z$

Solve it.

Divide both sides by −1.5, and reverse: $9 \div (-1.5) = -6$, so $-6 \leq z$

Read it from the variable: $z \geq -6$

Answer: C — $z \geq -6$

Whiteboards · Question 8 of 9

A trip needs at least 380 bus seats, and each bus seats 52 and costs $250.

How many buses are needed?

Answer it.

Whiteboards · Question 8 of 9

A trip needs at least 380 bus seats, and each bus seats 52 and costs $250.

How many buses are needed?

At least 380: $52b \geq 380$

Divide by 52: $380 \div 52 \approx 7.3$

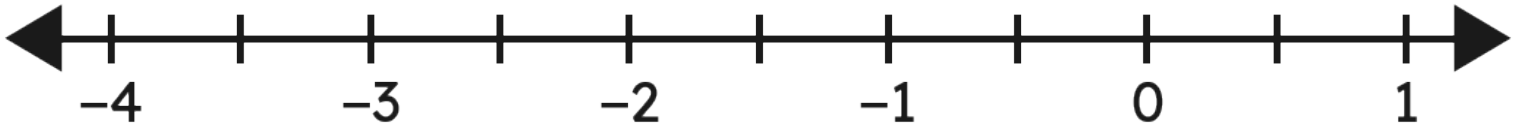
The least whole number that works: 8 — 7 buses seat only 364

Answer: 8 buses

Whiteboards · Question 9 of 9

Kayla solved $-3x \leq 4.5$ and got $x \leq -1.5$.

What is her mistake? Solve it, and graph it.



Write your answer in sentences.

Whiteboards · Question 9 of 9

Kayla solved $-3x \leq 4.5$ and got $x \leq -1.5$.

What is her mistake? Solve it, and graph it.



Dividing by −3 reverses the symbol: $4.5 \div (-3) = -1.5$, so $x \geq -1.5$

Graph: a closed circle at −1.5, the arrow to the right

Answer: She did not reverse: $x \geq -1.5$

Independent Practice

1. Solve: $\frac{x}{6} > -2$
2. Solve: $-\frac{x}{6} > -2$
3. Solve: $2.5n \leq -10$
4. Solve: $-1.2m < 6$
5. Solve: $4 - y > 9$
6. Texts cost $0.15 each, and Mia will spend at most $5. How many texts can she send? Write and solve an inequality.

Before You Go

A negative coefficient reverses the symbol — fraction, decimal or whole number.

$-x$ is -1 times x: divide by -1, and reverse.

Tomorrow: two-step equations.

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 60. Due by the Unit 10 test.

Today's skills — all required

Solve one-step multiplication and division inequalities (E9Q)
Solve and graph one-step multiplication and division inequalities (PFK)
One-step multiplication and division inequalities: word problems (JDA)
Solve one-step inequalities (QWH)
Graph solutions to one-step inequalities (TFK)