

Solving Inequalities: practice solutions, Grade 7 – download the PDF

Written solutions to the chapter problems. Check each step, then correct yourself.

1 Words to symbols



- a. “Less than” gives $y < 9$.
- b. “At most” means 12 is allowed and nothing larger: $n \leq 12$.
- c. “More than” gives $p > 3$.
- d. “No less than” means -2 is allowed or anything larger: $t \geq -2$.

2 True or false?



- a. True: 3 is left of 7.
- b. False: -4 is left of -1 , so $-4 < -1$.
- c. True: the symbol $\leq$ allows equality.
- d. True: 0 is right of -2 .
- e. False: -8 is right of -9 , so $-8 > -9$.

3 Is it a solution?



Substitute each value.

- $x = 5$: $9 > 10$ is false, so not a solution.
- $x = 6$: $10 > 10$ is false, so not a solution (the sign is strict).
- $x = 7$: $11 > 10$ is true, so a solution.
- $x = 12$: $16 > 10$ is true, so a solution.

The full solution set is $x > 6$.

4 One-step with addition



- Subtract 5: $x > 7$.
- Add 3: $x \leq 7$.
- Subtract 1: $5 \leq x$, which is the same as $x \geq 5$.

5 One-step with multiplication



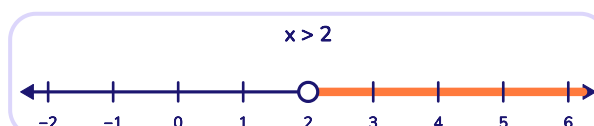
Each time we multiply or divide by a positive number, so the sign stays.

- Divide by 3: $x < 6$.
- Multiply by 4: $x \geq 8$.
- Divide by 5: $x > -4$.

6 Graph it



The boundary is 2. The symbol $>$ is strict, so 2 is not included: use an **open circle**. The solutions are greater than 2, so shade to the **right**.



7 Read the graph



The circle at -1 is closed and the shading goes left, so the inequality is $x \leq -1$.

Solutions: -1 and -4 . Not a solution: 2 (it is to the right of -1).

8 Two-step inequalities



a. $2x > 8$, so $x > 4$.

b. $5x \leq 25$, so $x \leq 5$.

c. $4x < -12$, so $x < -3$.

9 Dividing by a negative



a. Divide by -2 and flip: $x > -5$.

b. Divide by -3 and flip: $x \leq -4$.

c. Multiply by -5 and flip: $x < -10$.

10 Bike rental budget



Total cost: $6 + 2.5h$. It must be at most 21: $6 + 2.5h \leq 21$.

Subtract 6: $2.5h \leq 15$. Divide by 2.5: $h \leq 6$.

Lena can rent the bike for at most 6 hours (6 hours costs exactly 21 dollars).

11 Find the mistake



With $x = 0$: $-4(0) = 0 > 20$ is false, yet 0 satisfies $x > -5$. So his answer is wrong.

Error: he divided by -4 without reversing the sign. Correct: $x < -5$.

Check $x = -10$: $-4(-10) = 40 > 20$ is true, and $-10 < -5$. Correct solution set: $x < -5$.

12 Negative coefficient first



a. Subtract 7: $-2x > -6$. Divide by -2 and flip: $x < 3$.

b. Subtract 10: $-x \leq -6$. Divide by -1 and flip: $x \geq 6$.

13 Elevator limit



$150 + 45n \leq 1200$. Subtract 150: $45n \leq 1050$. Divide by 45: $n \leq 23.\bar{3}$, about 23.33.

The number of boxes must be a whole number, so the greatest is 23 boxes. Check:

$150 + 45(23) = 1185 \leq 1200$, but 24 boxes give 1,230 pounds, which is too heavy.

14 Saving for a laptop



$85 + 12w \geq 200$. Subtract 85: $12w \geq 115$. Divide by 12: $w \geq 9.58\dots$

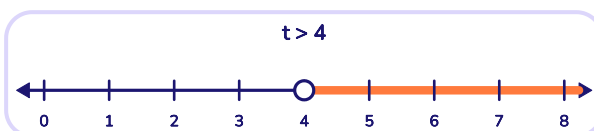
Weeks are counted whole, so Mia needs 10 weeks. Check: after 9 weeks she has 193 dollars (not enough); after 10 weeks she has 205 dollars.

15 Warming a pool



$70 + 2t > 78$, so $2t > 8$ and $t > 4$.

The water is warmer than 78°F only after more than 4 hours (at exactly 4 hours it is 78°F , which is not above 78°F). Open circle at 4, shade right.



16 Distribute first



a. Distribute: $3x - 6 + 5 < 20$, so $3x - 1 < 20$. Add 1: $3x < 21$. Divide by 3: $x < 7$.

b. Distribute: $8 - 2x \geq 14$. Subtract 8: $-2x \geq 6$. Divide by -2 and flip: $x \leq -3$.

17 Fractions in inequalities



a. Add 4: $\frac{2}{3}x \geq 10$. Multiply by $\frac{3}{2}$ (positive): $x \geq 15$.

b. Subtract 3: $-\frac{1}{2}x < -4$. Multiply by -2 and flip: $x > 8$.

18 Variables on both sides



a. Subtract $3x$: $2x + 2 > 10$. Subtract 2: $2x > 8$. So $x > 4$.

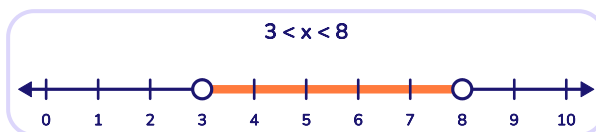
b. Subtract $4x$: $3x - 4 \leq 11$. Add 4: $3x \leq 15$. So $x \leq 5$.

19 Two conditions at once

★★★

$2x - 1 > 5$ gives $2x > 6$, so $x > 3$. Together with $x < 8$: $3 < x < 8$.

Both ends are open circles with the segment shaded between them.



Whole numbers: 4, 5, 6, 7.

20 Food truck profit

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Profit per meal: $8 - 3 = 5$. Profit for the day: $5n - 240$. We need $5n - 240 > 0$, so $5n > 240$ and $n > 48$.

At exactly 48 meals the profit is 0, which is not a profit. The truck must sell at least 49 meals. Check: $5(49) - 240 = 5$ dollars.

21 Draining a tank

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Water left: $90 - 6m$. We need $90 - 6m < 30$. Subtract 90: $-6m < -60$. Divide by -6 and flip: $m > 10$.

It must drain for more than 10 minutes. At exactly 10 minutes there are 30 gallons left, which is not fewer than 30. At 11 minutes, 24 gallons remain.

22 Always, sometimes, never

★★★

- Subtract x from both sides: $1 > 0$, which is true. So it holds for **every** number.
- Subtract x : $0 > 1$, which is false. So it holds for **no** number.
- Subtract x : $x > 0$. It holds for **some** numbers (the positive ones). Test: $x = 3$ gives $6 > 3$, true; $x = -3$ gives $-6 > -3$, false.



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