Writing and Solving Inequalities

Explore ideas and representations

Name _____ **Date** _____ **Score** _____ / 10

QUICK REVIEW

Translate at most as $\leq$ and more than as $>$. Undo operations on both sides. Dividing by a negative reverses the comparison: $-2x \geq 14$ gives $x \leq -7$.

Worked example

Multiply a signed number s by 4 and subtract 5. The result must be no less than 3. Model and solve.

1. No less than 3 includes 3: write $4s - 5 \geq 3$.
2. Add 5: $4s \geq 8$. Divide by 4: $s \geq 2$.
3. At $s = 2$, $4(2) - 5 = 3$, so the boundary is included.
Answer: $4s - 5 \geq 3$; $s \geq 2$.

Practice Problems

Show your thinking.

1. A swim pass costs $\$8$ plus $\$3$ per visit. Write and solve a rule for whole visits v on a $\$29$ budget.

2. A vine is 9 cm tall and grows at a constant 2 cm per week. Write and solve a rule for when it is taller than 21 cm.

3. A tank starts with 26 L and drains 4 L per minute. For what elapsed times t does at least 8 L remain? Write and solve.

4. Isolate x in $7 - 3x < -5$. Check the boundary and one value that works.

5. Solve $\frac{x}{3} + 2 \leq 1$. Does $x = -3$ belong to the solution?

6. A team has 14 points and earns 6 per win. Model a goal of at least 39 points. How many more wins are needed?

7. A rectangle has width 5 cm and perimeter under 34 cm. Write and solve for its possible lengths l.

8. Choose C so $4p + 3 \leq C$ has greatest real solution $p = 5$. Explain why $p = 6$ fails.

9. Em changes $2s - 9 > 5$ to $2s > 5$ by adding 9 to the left side only. Correct the solution and test $s = 4$.

10. A meter displays $5x + 2$ at settings $0, 1, 2, 3$. Write and solve a rule for a reading below 15. List the settings that work.

Answer Key

1. $3v + 8 \leq 29$; 0 to 7 visits.
2. $2w + 9 > 21$; more than 6 weeks.
3. $26 - 4t \geq 8$; $0 \leq t \leq 4.5$ minutes.
4. $x > 4$; 4 is excluded and 5 works.
5. $x \leq -3$; yes, -3 is included.
6. $14 + 6w \geq 39$; at least 5 more wins.
7. $2(l + 5) < 34$; $0 < l < 12$ cm.
8. $C = 23$; $p \leq 5$.
9. $s > 7$; $s = 4$ fails.
10. $5x + 2 < 15$; settings $0, 1, 2$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The cost in dollars must satisfy $3v + 8 \leq 29$.
2. Subtract 8: $3v \leq 21$. Divide by 3: $v \leq 7$.
3. Seven visits cost \$29; eight cost \$32 and exceed the budget.

Problem 2

1. After w weeks the height must satisfy $2w + 9 > 21$.
2. Subtract 9: $2w > 12$. Divide by 2: $w > 6$.
3. At 6 weeks the vine is exactly 21 cm tall, not taller.

Problem 3

1. The remaining volume in liters must satisfy $26 - 4t \geq 8$.
2. Subtract 26: $-4t \geq -18$. Divide by -4 and reverse: $t \leq 4.5$.
3. $t = 4.5$ gives $26 - 4(4.5) = 8$ L. Elapsed time also requires $t \geq 0$.

Problem 4

1. Subtract 7: $-3x < -12$.
2. Divide by -3 and reverse: $x > 4$.
3. $7 - 3(4) = -5$ is not below -5, but $7 - 3(5) = -8 < -5$.

Problem 5

1. Subtract 2: $\frac{x}{3} \leq -1$.
2. Multiply by positive 3: $x \leq -3$.
3. $(-3)/3 + 2 = 1$, and $1 \leq 1$ is true.

Problem 6

1. Let w be more wins: $14 + 6w \geq 39$.
2. Subtract 14 and divide by 6: $w \geq \frac{25}{6}$.
3. Four wins give 38 points; five give 44. The first whole count that works is 5.

Problem 7

1. Two widths and two lengths give $2(l + 5) < 34$.
2. Divide by 2: $l + 5 < 17$, so $l < 12$. Length must be positive.
3. At $l = 12$, the perimeter is $2(12 + 5) = 34$ cm, which is too large.

Problem 8

1. The greatest solution is the equality boundary: $C = 4(5) + 3 = 23$.
2. Now $4p + 3 \leq 23$ gives $4p \leq 20$, then $p \leq 5$.
3. At $p = 6$, $4(6) + 3 = 27 > 23$, so it fails.

Problem 9

1. Add 9 to both sides: $2s > 14$.
2. Divide by 2: $s > 7$.
3. $s = 4$ passes Em's $2s > 5$, but $2(4) - 9 = -1$ is not greater than 5.

Problem 10

1. Below 15 means $5x + 2 < 15$.
2. Subtract 2 and divide by 5: $x < \frac{13}{5}$.
3. The settings $0, 1, 2$ are below $13/5$. Setting 3 gives $5(3) + 2 = 17$.

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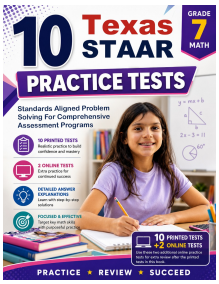

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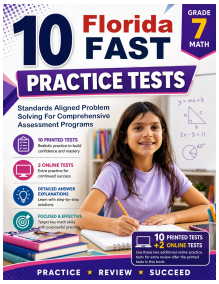

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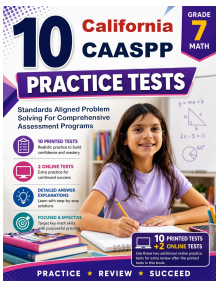

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