Writing and Solving Inequalities

Apply the skill to decisions and designs

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

QUICK REVIEW

A real-number solution is not always a possible count. For $n < 4$, at most 3 whole items fit. Apply every constraint and check the boundary or its neighboring values before deciding.

Worked example

A reel has 24 m of cord unwound. Rewind 3 m per turn. Which whole turns leave 9 to 15 m unwound, inclusive?

1. After t turns the remaining cord must satisfy $9 \le 24 - 3t \le 15$.
2. The lower length limit gives $t \le 5$. The upper length limit gives $t \ge 3$.
3. Three turns leave 15 m and five leave 9 m, so both endpoints count.
Answer: $3, 4, 5$ turns.

Practice Problems

Show your thinking.

1. Plan A charges $18 + 2k$ dollars for k kits; plan B charges $6 + 4k$ dollars. For what whole counts is A strictly cheaper?

2. A lift holds at most 125 kg. A 38 kg cart carries 12 kg crates. Find the maximum count and unused capacity.

3. A fundraiser starts at $\$47$ and gains $\$8$ per sale. It needs more than $\$95$. Find the fewest sales. Would a refund then miss the goal?

4. A battery starts with 84 Wh and uses 9 Wh per hour. It must keep at least 30 Wh. Which shifts work: $5.5, 6, 6.5$ hours?

5. A stack starts with 11 pages and gains 4 per minute. It can be packed with at least 27 but fewer than 41 pages. List the whole minutes that work.

6. Cut two equal pieces from 28 cm of ribbon. Each piece must be at least 7 cm; more than 11 cm must remain. List possible whole-centimeter piece lengths.

7. At depth d meters a sensor reads $2.5d + 4$ kPa. It alerts above 19 kPa. Adding 5 kPa to every reading changes the rule. Give both alert depth rules and the boundary shift.

8. A film club charges $\$5$ plus $\$3$ per screening. A dollar credit C reduces the bill. Find the smallest credit that makes eight screenings fit a $\$26$ budget.

9. Cart A starts with 6 boxes and gains 2 per stop. Cart B starts with 14 and loses 2 per stop. After how many stops do both hold at least 10 boxes?

10. A recipe needs 1 g of spice for the base and 2 g per portion. With 17 g, find the greatest even portion count. What if only 16 g is available?

Answer Key

1. $18 + 2k < 6 + 4k$; 7 or more kits.
2. 7 crates; 3 kg unused.
3. 7 sales; yes, one refund leaves $\$95$.
4. 5.5 and 6 hours.
5. $4, 5, 6, 7$ minutes.
6. 7 cm or 8 cm per piece.
7. Old: $d > 6$ m. New: $d > 4$ m. Boundary is 2 m shallower.
8. $C \geq 3$; the smallest credit is $\$3$.
9. Exactly 2 stops.
10. 8 portions with 17 g; 6 portions with 16 g.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. A is cheaper when $18 + 2k < 6 + 4k$.
2. Subtract $2k$ and 6: $12 < 2k$, so $k > 6$.
3. At six kits both cost $\$30$. At seven, A costs $\$32$ and B costs $\$34$.

Problem 2

1. With c crates, $38 + 12c \leq 125$.
2. $12c \leq 87$, so $c \leq \frac{29}{4}$. The greatest whole count is 7.
3. $38 + 12(7) = 122$ kg, leaving $125 - 122 = 3$ kg.

Problem 3

1. Let s be sales: $47 + 8s > 95$.
2. $8s > 48$, so $s > 6$. Seven sales give $47 + 8(7) = 103$ dollars.
3. One refund leaves $103 - 8 = 95$ dollars, which is not more than $\$95$.

Problem 4

1. For a shift of h hours, $84 - 9h \geq 30$.
2. $-9h \geq -54$, so $h \leq 6$ after reversing on division by -9.
3. The shifts leave $34.5, 30, 25.5$ Wh, respectively. Only the first two meet 30 Wh.

Problem 5

1. At minute t, require $27 \leq 11 + 4t < 41$.
2. Subtract 11: $16 \leq 4t < 30$. Divide by 4: $4 \leq t < 7.5$.
3. Minute 4 has 27 pages; minute 8 has 43 and is too late.

Problem 6

1. With piece length l, need $l \geq 7$ and $28 - 2l > 11$.
2. $-2l > -17$ gives $l < 8.5$ after reversing on division by -2.
3. $7 \leq l < 8.5$ allows 7 and 8 cm. At 9 cm only 10 cm remains.

Problem 7

1. Old rule: $2.5d + 4 > 19$, so $2.5d > 15$ and $d > 6$.
2. New rule: $2.5d + 9 > 19$, so $2.5d > 10$ and $d > 4$.
3. Both boundaries give exactly 19 kPa, not an alert. The boundary moves $6 - 4 = 2$ m shallower.

Problem 8

1. The bill must satisfy $5 + 3(8) - C \leq 26$.
2. $29 - C \leq 26$ gives $-C \leq -3$, so $C \geq 3$.
3. A $\$3$ credit leaves $\$26$ due; a $\$2$ credit leaves $\$27$.

Problem 9

1. A needs $6 + 2s \geq 10$, which gives $s \geq 2$.
2. B needs $14 - 2s \geq 10$, which gives $s \leq 2$.
3. Only $s = 2$ satisfies both. Then each cart holds 10 boxes.

Problem 10

1. $1 + 2p \leq 17$ gives $p \leq 8$. Eight portions use all 17 g.
2. $1 + 2p \leq 16$ gives $p \leq 7.5$. The greatest even count is 6.
3. Six portions use $1 + 2(6) = 13$ g; the next even count, 8, needs 17 g.

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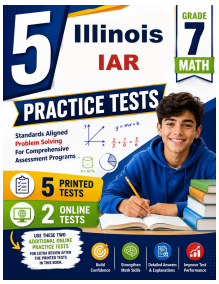

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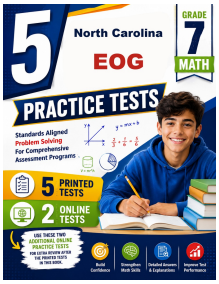

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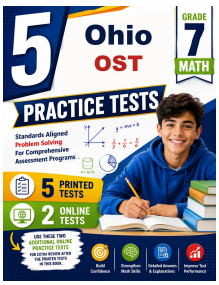

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