Rational Number Operations in Extended Contexts

Spot mistakes, reason, and work backward

Name _____ **Date** _____ **Score** _____ / 8

QUICK REVIEW

Choose signed values before calculating. Multiply repeated changes first, then combine with the start; use units throughout. Starting at 5.5 m with three changes of -0.5 m gives $5.5 + 3(-0.5) = 4$ m. Recover a start by subtracting the total signed change from the finish.

Worked example

Evaluate $(\frac{11}{2}) + (-\frac{3}{2})$. Show an exact fraction or integer.

1. Use denominator 2: $\frac{11}{2} = 11/2$ and $-\frac{3}{2} = -3/2$.
2. Combine the signed numerators: $11 + (-3) = 8$.
3. The value is $8/2 = 4$.
Answer: 4.

Practice Problems

Show your thinking.

1. Tank level ends at 3 L after 4 hours of $-\frac{3}{4}$ L per hour. Recover the starting reading. Finally subtract a separate $\frac{1}{2}$ L correction. Report the reading after this final correction too.

2. Account balance: a student adds 4 withdrawals of 1 dollars to a starting $\frac{13}{2}$. Repair the sign and compute the balance. Finally subtract a separate 1 dollars correction. Report the reading after this final correction too.

3. Temperature moves from 7 to 2 degrees C over 4 hours. Find the signed hourly change. Finally subtract a separate $\frac{3}{2}$ degrees C correction. Report the reading after this final correction too.

4. Trail elevation: the expression $(\frac{15}{2}) + (-\frac{3}{2})(4)$ is evaluated left to right by a student. Compute the product first and find the correct elevation. Finally subtract a separate 2 m correction. Report the reading after this final correction too.

5. Stock mass: final mass 1 kg; 4 packages each lost $\frac{7}{4}$ kg. Find original mass and verify. Finally subtract a separate $\frac{1}{2}$ kg correction. Report the reading after this final correction too.

6. Depth reading: $\frac{17}{2}$ m plus 4 signed changes ends at $\frac{1}{2}$ m. Determine each equal change, not its magnitude only. Finally subtract a separate 3 m correction. Report the reading after this final correction too.

7. Freezer temperature ends at $\frac{11}{2}$ degrees C after 5 equal changes of $-\frac{3}{5}$ degrees C. Recover the starting reading. Finally add a separate correction of $\frac{1}{4}$ degrees C; report the corrected reading too.

8. Storage balance ends at 8 kg after 4 equal changes of $-\frac{7}{8}$ kg. Recover the starting reading. Finally add a separate correction of $\frac{3}{4}$ kg; report the corrected reading too.

Answer Key

1. Start 6 L. Corrected $\frac{5}{2}$ L.
2. Total change -4 dollars; final $\frac{5}{2}$ dollars. Corrected $\frac{3}{2}$ dollars.
3. $-\frac{5}{4}$ degrees C per hour. Corrected $\frac{1}{2}$ degrees C.
4. Total change -6 m; final $\frac{3}{2}$ m. Corrected $-\frac{1}{2}$ m.
5. Start 8 kg. Corrected $\frac{1}{2}$ kg.
6. -2 m per stage. Corrected $-\frac{5}{2}$ m.
7. $\frac{17}{2}$ degrees C. Corrected $\frac{23}{4}$ degrees C.
8. $\frac{23}{2}$ kg. Corrected $\frac{35}{4}$ kg.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Total signed change: $(-\frac{3}{4})(4) = -3$ L.
2. Undo that change: start $3 - (-3) = 6$ L.
3. Check: $6 + (-3) = 3$ L, the given finish.
4. Final corrected reading: $3 - (\frac{1}{2}) = \frac{5}{2}$ L.

Problem 2

1. Total signed change: $(-1)(4) = -4$ dollars.
2. Final reading: $\frac{13}{2} + (-4) = \frac{5}{2}$ dollars.
3. Check backward: $\frac{5}{2} - (-4) = \frac{13}{2}$ dollars.
4. Final corrected reading: $\frac{5}{2} - (1) = \frac{3}{2}$ dollars.

Problem 3

1. Find the signed change from start to finish: $2 - 7 = -5$ degrees C.
2. Divide the change among 4 equal stages: $(-5) \div 4 = -\frac{5}{4}$ degrees C per hour.
3. Check: $7 + 4(-\frac{5}{4}) = 2$ degrees C.
4. Final corrected reading: $2 - (\frac{3}{2}) = \frac{1}{2}$ degrees C.

Problem 4

1. Total signed change: $(-\frac{3}{2})(4) = -6$ m.
2. Final reading: $\frac{15}{2} + (-6) = \frac{3}{2}$ m.
3. Check backward: $\frac{3}{2} - (-6) = \frac{15}{2}$ m.
4. Final corrected reading: $\frac{3}{2} - (2) = -\frac{1}{2}$ m.

Problem 5

1. Total signed change: $(-\frac{7}{4})(4) = -7$ kg.
2. Undo that change: start $1 - (-7) = 8$ kg.
3. Check: $8 + (-7) = 1$ kg, the given finish.
4. Final corrected reading: $1 - (\frac{1}{2}) = \frac{1}{2}$ kg.

Problem 6

1. Find the signed change from start to finish: $\frac{1}{2} - \frac{17}{2} = -8$ m.
2. Divide the change among 4 equal stages: $(-8) \div 4 = -2$ m per stage.
3. Check: $\frac{17}{2} + 4(-2) = \frac{1}{2}$ m.
4. Final corrected reading: $\frac{1}{2} - (3) = -\frac{5}{2}$ m.

Problem 7

1. Total change $= 5(-\frac{3}{5}) = -3$ degrees C.
2. Subtract that signed change from the given finish: $\frac{11}{2} - (-3) = \frac{17}{2}$ degrees C.
3. Check the recovered start: $\frac{17}{2} + (-3) = \frac{11}{2}$ degrees C.
4. Correction gives $\frac{11}{2} + \frac{1}{4} = \frac{23}{4}$ degrees C.

Problem 8

1. Total change $= 4(-\frac{7}{8}) = -\frac{7}{2}$ kg.
2. Subtract that signed change from the given finish: $8 - (-\frac{7}{2}) = \frac{23}{2}$ kg.
3. Check the recovered start: $\frac{23}{2} + (-\frac{7}{2}) = 8$ kg.
4. Correction gives $8 + \frac{3}{4} = \frac{35}{4}$ kg.

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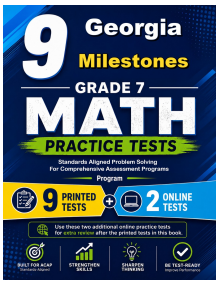

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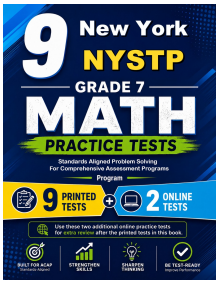

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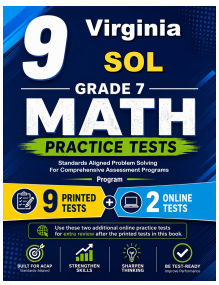

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