Dividing Integers and Rational Numbers

Apply the skill to decisions and designs

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

QUICK REVIEW

Divide by a nonzero fraction by multiplying by its reciprocal. Equal signs give a positive quotient; different signs give a negative quotient. $(-3/4) \div (1/2) = (-3/4)(2) = -3/2$. Check quotient times divisor equals dividend.

Worked example

Evaluate $(-\frac{3}{2}) \div (\frac{1}{2})$. Show an exact fraction or integer.

1. Reciprocal of the divisor: $1/(\frac{1}{2}) = 2$.
2. $(-\frac{3}{2}) \div (\frac{1}{2}) = (-\frac{3}{2}) \times (2) = -3$.
3. Check: $(-3)(\frac{1}{2}) = -\frac{3}{2}$.
Answer: -3.

Practice Problems

Show your thinking.

1. Weather station: a signed model gives $(-\frac{7}{2}) \div (1)$ meters. Find the signed result and interpret a negative result as below the reference level.

2. Balance log: plan A changes a balance by $(\frac{5}{3}) \div (-\frac{9}{4})$ dollars; plan B changes it by $-\frac{74}{27}$ dollars. Which leaves a larger balance from the same start, and by how much?

3. Sensor calibration: an unknown first reading combined with (-1) by the operation $\div$ gives $\frac{3}{2}$. Recover the first reading.

4. Target design: choose x so that $[(4) \div (-\frac{4}{3})] + x = 0$. Determine x and verify the target.

5. Spending plan: the signed change is $(-1) \div (\frac{7}{4})$ dollars. Starting at $\frac{74}{7}$ dollars, find the final balance.

6. Snow-depth log: one day's signed change is $(1) \div (-3)$ cm. Find the total change over 3 identical days.

7. Water record: a signed volume change is $(-4) \div (\frac{5}{3})$ liters. Compare with a target change of $-\frac{7}{5}$ liters and find the gap.

8. Elevation log: two readings are 0 and $(3) \div (-\frac{3}{4})$ meters. Find the second reading and its distance from zero.

9. Freezer log: plan A changes a balance by $(-\frac{17}{5}) \div (\frac{11}{6})$ dollars; plan B changes it by $-\frac{212}{55}$ dollars. Which leaves a larger balance from the same start, and by how much?

10. Credit adjustment: choose x so that $[(\frac{19}{8}) \div (-\frac{7}{12})] + x = -\frac{15}{14}$. Determine x and verify the target.

Answer Key

1. $-\frac{7}{2}$ meters; below the reference level.
2. Plan A by 2 dollars.
3. $-\frac{3}{2}$.
4. $x = 3$.
5. 10 dollars.
6. -1 cm.
7. Signed change $-\frac{12}{5}$ liters; 1 liter below target.
8. Reading -4 m; distance 4 m.
9. Plan A by 2 dollars.
10. $x = 3$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Reciprocal of the divisor: $1/(1) = 1$.
2. $(-\frac{7}{2}) \div (1) = (-\frac{7}{2}) \times (1) = -\frac{7}{2}$.
3. Check: $(-\frac{7}{2})(1) = -\frac{7}{2}$.

Problem 2

1. Reciprocal of the divisor: $1/(-\frac{9}{4}) = -\frac{4}{9}$.
2. $(\frac{5}{3}) \div (-\frac{9}{4}) = (\frac{5}{3}) \times (-\frac{4}{9}) = -\frac{20}{27}$.
3. Check: $(-\frac{20}{27})(-\frac{9}{4}) = \frac{5}{3}$.
4. $-\frac{20}{27} - (-\frac{74}{27}) = 2$ dollars.

Problem 3

1. Multiply the quotient by the divisor.
2. The sign is negative because the factors have different signs.
3. $x = (\frac{3}{2}) \times (-1) = -\frac{3}{2}$.
4. Check in the original: $(-\frac{3}{2}) \div (-1) = \frac{3}{2}$.

Problem 4

1. Reciprocal of the divisor: $1/(-\frac{4}{3}) = -\frac{3}{4}$.
2. $(4) \div (-\frac{4}{3}) = (4) \times (-\frac{3}{4}) = -3$.
3. Check: $(-3)(-\frac{4}{3}) = 4$.
4. $x = 0 - (-3) = 3$; check $-3 + 3 = 0$.

Problem 5

1. Reciprocal of the divisor: $1/(\frac{7}{4}) = \frac{4}{7}$.
2. $(-1) \div (\frac{7}{4}) = (-1) \times (\frac{4}{7}) = -\frac{4}{7}$.
3. Check: $(-\frac{4}{7})(\frac{7}{4}) = -1$.
4. Final $= \frac{74}{7} + (-\frac{4}{7}) = 10$ dollars.

Problem 6

1. Reciprocal of the divisor: $1/(-3) = -\frac{1}{3}$.
2. $(1) \div (-3) = (1) \times (-\frac{1}{3}) = -\frac{1}{3}$.
3. Check: $(-\frac{1}{3})(-3) = 1$.
4. Three days: $3(-\frac{1}{3}) = -1$ cm.

Problem 7

1. Reciprocal of the divisor: $1/(\frac{5}{3}) = \frac{3}{5}$.
2. $(-4) \div (\frac{5}{3}) = (-4) \times (\frac{3}{5}) = -\frac{12}{5}$.
3. Check: $(-\frac{12}{5})(\frac{5}{3}) = -4$.
4. Gap: $-\frac{7}{5} - (-\frac{12}{5}) = 1$ liter.

Problem 8

1. Reciprocal of the divisor: $1/(-\frac{3}{4}) = -\frac{4}{3}$.
2. $(3) \div (-\frac{3}{4}) = (3) \times (-\frac{4}{3}) = -4$.
3. Check: $(-4)(-\frac{3}{4}) = 3$.
4. Distance $= |-4 - 0| = 4$ m.

Problem 9

1. Reciprocal of the divisor: $1/(\frac{11}{6}) = \frac{6}{11}$.
2. $(-\frac{17}{5}) \div (\frac{11}{6}) = (-\frac{17}{5}) \times (\frac{6}{11}) = -\frac{102}{55}$.
3. Check: $(-\frac{102}{55})(\frac{11}{6}) = -\frac{17}{5}$.
4. $-\frac{102}{55} - (-\frac{212}{55}) = 2$ dollars.

Problem 10

1. Reciprocal of the divisor: $1/(-\frac{7}{12}) = -\frac{12}{7}$.
2. $(\frac{19}{8}) \div (-\frac{7}{12}) = (\frac{19}{8}) \times (-\frac{12}{7}) = -\frac{57}{14}$.
3. Check: $(-\frac{57}{14})(-\frac{7}{12}) = \frac{19}{8}$.
4. $x = -\frac{15}{14} - (-\frac{57}{14}) = 3$; check $-\frac{57}{14} + 3 = -\frac{15}{14}$.

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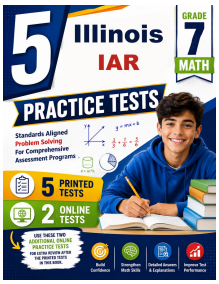

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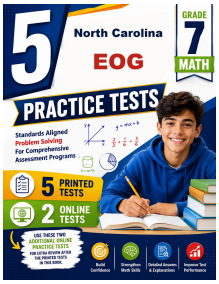

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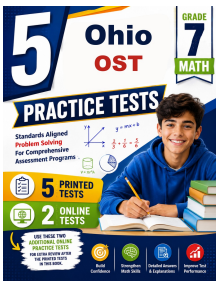

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