Multiplying Integers and Rational Numbers

Spot mistakes, reason, and work backward

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

QUICK REVIEW

Equal signs give a positive product; different signs give a negative product. Multiply fraction numerators and denominators, then reduce: $(-2/3)(9/4) = -18/12 = -3/2$. Zero times any number is zero.

Worked example

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

1. The sign is negative because the factors have different signs.

2. Multiply numerator and denominator: $\frac{(-3)(1)}{2(2)} = \frac{-3}{4}$.

3. Reduce to $-\frac{3}{4}$; check $-\frac{3}{4} \div (\frac{1}{2}) = -\frac{3}{2}$.

Answer: $-\frac{3}{4}$.

Practice Problems

Show your thinking.

1. Morgan claims $(-\frac{7}{2}) \times (1) = \frac{7}{2}$. Locate the sign error and give the correct value.

2. For $(\frac{5}{3}) \times (-\frac{9}{4})$, a student adds magnitudes and writes $\frac{47}{12}$. Correct the operation as well as the value.

3. Reconstruct x from $x \times (-1) = \frac{3}{2}$. Check by substitution.

4. Test whether $((4) \times (-\frac{4}{3})) + (\frac{16}{3}) = 0$. Show the numerical cancellation.

5. Find $(-1) \times (\frac{7}{4})$. Is the result strictly between -2 and 2?

6. In $[(1) \times (-3)] - (1)$, a student skips the brackets and reports -3. Finish the missing subtraction.

7. Find x if $-x = (-4) \times (\frac{5}{3})$. Explain why the final sign must change.

8. Compare $2[(3) \times (-\frac{3}{4})]$ with $(3) \times (-\frac{3}{4})$. Find both and state their difference.

9. In $[(-\frac{17}{5}) \times (\frac{11}{6})] - (-\frac{17}{5})$, a student skips the brackets and reports $-\frac{187}{30}$. Finish the missing subtraction.

10. Find x if $-x = (\frac{19}{8}) \times (-\frac{7}{12})$. Explain why the final sign must change.

Answer Key

1. $-\frac{7}{2}$, not $\frac{7}{2}$.
2. $-\frac{15}{4}$.
3. $x = -\frac{3}{2}$.
4. Yes; the sum is 0.
5. $-\frac{7}{4}$; yes.
6. -4.
7. $x = \frac{20}{3}$.
8. $-\frac{9}{2}$ and $-\frac{9}{4}$; first minus second $-\frac{9}{4}$.
9. $-\frac{17}{6}$.
10. $x = \frac{133}{96}$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The sign is negative because the factors have different signs.
2. Multiply numerator and denominator: $\frac{(-7)(1)}{2(1)} = \frac{-7}{2}$.
3. Reduce to $-\frac{7}{2}$; check $-\frac{7}{2} \div (1) = -\frac{7}{2}$.
4. The claim $\frac{7}{2}$ differs from the computed value $-\frac{7}{2}$, so its sign is not correct.

Problem 2

1. The sign is negative because the factors have different signs.
2. Multiply numerator and denominator: $\frac{(5)(-9)}{3(4)} = \frac{-45}{12}$.
3. Reduce to $-\frac{15}{4}$; check $-\frac{15}{4} \div (-\frac{9}{4}) = \frac{5}{3}$.

Problem 3

1. Divide the product by the known factor.
2. Reciprocal of the divisor: $1/(-1) = -1$.
3. $x = (\frac{3}{2}) \div (-1) = -\frac{3}{2}$.
4. Check in the original: $(-\frac{3}{2}) \times (-1) = \frac{3}{2}$.

Problem 4

1. The sign is negative because the factors have different signs.
2. Multiply numerator and denominator: $\frac{(4)(-4)}{1(3)} = \frac{-16}{3}$.
3. Reduce to $-\frac{16}{3}$; check $-\frac{16}{3} \div (-\frac{4}{3}) = 4$.
4. $-\frac{16}{3} + (\frac{16}{3}) = 0$.

Problem 5

1. The sign is negative because the factors have different signs.
2. Multiply numerator and denominator: $\frac{(-1)(7)}{1(4)} = \frac{-7}{4}$.
3. Reduce to $-\frac{7}{4}$; check $-\frac{7}{4} \div (\frac{7}{4}) = -1$.
4. Its magnitude is $\frac{7}{4} < 2$, so $-2 < -\frac{7}{4} < 2$.

Problem 6

1. The sign is negative because the factors have different signs.
2. Multiply numerator and denominator: $\frac{(1)(-3)}{1(1)} = \frac{-3}{1}$.
3. Reduce to -3; check $-3 \div (-3) = 1$.
4. The omitted step is $-3 - (1) = -4$.

Problem 7

1. The sign is negative because the factors have different signs.
2. Multiply numerator and denominator: $\frac{(-4)(5)}{1(3)} = \frac{-20}{3}$.
3. Reduce to $-\frac{20}{3}$; check $-\frac{20}{3} \div (\frac{5}{3}) = -4$.
4. $-x = -\frac{20}{3}$ gives $x = \frac{20}{3}$; check $-(\frac{20}{3}) = -\frac{20}{3}$.

Problem 8

1. The sign is negative because the factors have different signs.
2. Multiply numerator and denominator: $\frac{(3)(-3)}{1(4)} = \frac{-9}{4}$.
3. Reduce to $-\frac{9}{4}$; check $-\frac{9}{4} \div (-\frac{3}{4}) = 3$.
4. Double is $2(-\frac{9}{4}) = -\frac{9}{2}$; difference $-\frac{9}{2} - (-\frac{9}{4}) = -\frac{9}{4}$.

Problem 9

1. The sign is negative because the factors have different signs.
2. Multiply numerator and denominator: $\frac{(-17)(11)}{5(6)} = \frac{-187}{30}$.
3. Reduce to $-\frac{187}{30}$; check $-\frac{187}{30} \div (\frac{11}{6}) = -\frac{17}{5}$.
4. The omitted step is $-\frac{187}{30} - (-\frac{17}{5}) = -\frac{17}{6}$.

Problem 10

1. The sign is negative because the factors have different signs.
2. Multiply numerator and denominator: $\frac{(19)(-7)}{8(12)} = \frac{-133}{96}$.
3. Reduce to $-\frac{133}{96}$; check $-\frac{133}{96} \div (-\frac{7}{12}) = \frac{19}{8}$.
4. $-x = -\frac{133}{96}$ gives $x = \frac{133}{96}$; check $-(\frac{133}{96}) = -\frac{133}{96}$.

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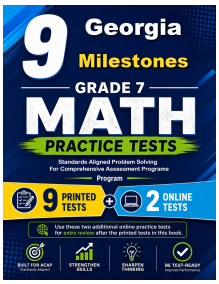

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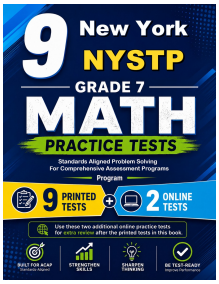

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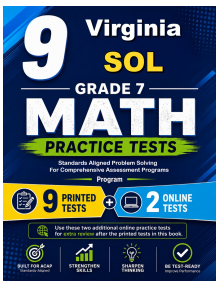

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