Multiplying Fractions and Mixed Numbers

Name: _____	Date: _____	Score: _____ / 17

Good news—multiplying fractions is actually *easier* than adding them because you do not need a common denominator! Just multiply straight across: numerator times numerator, denominator times denominator, then simplify. The real time-saver is **cross-canceling** before you multiply—look for common factors diagonally and shrink the numbers first so the arithmetic stays small. If mixed numbers show up, convert them to improper fractions first, keep the same sign rules from Chapter 1, and you are all set.

Key Concepts & Quick Review

Fraction × Fraction: $\frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}$ **Cross-cancel** any common factor in a numerator and the opposite denominator before multiplying.

Mixed number: convert first. $2\frac{1}{3} = \frac{7}{3}$ (multiply whole number by denominator, add numerator)
Sign rule: same signs $\rightarrow +$; different signs $\rightarrow -$.

Examples

① Find $\frac{3}{4} \times \frac{8}{9}$. Use cross-cancelling.

Think It Through: Multiply straight across if you want, but cross-cancelling makes the work much easier. Look diagonally: 3 and 9 both divide by 3, and 8 and 4 both divide by 4. After cancelling, the fractions become much smaller: $\frac{\cancel{3}^{1}}{\cancel{4}^{1}} \times \frac{\cancel{8}^{2}}{\cancel{9}^{3}} = \frac{1 \times 2}{1 \times 3} = \frac{2}{3}$. Cancelling first saves time and helps prevent big-number mistakes.

Answer: $\frac{2}{3}$

② A hiking trail is $2\frac{1}{3}\ mi$ long. A hiker completes $\frac{3}{4}$ of the trail. How many miles did the hiker walk?

Think It Through: Start by converting the mixed number to an improper fraction: $2\frac{1}{3} = \frac{7}{3}$. Now multiply $\frac{7}{3} \times \frac{3}{4}$. The 3s cancel, which leaves $\frac{7}{4} = 1\frac{3}{4}$. So the hiker walked $1\frac{3}{4}\ mi$. This shows why mixed numbers should be converted before multiplying. Once everything is written as fractions, the work becomes much cleaner.

Answer: $1\frac{3}{4}\ mi$

Practice Problems

Multiply. Cross-cancel where possible and simplify.

1. $\frac{2}{3} \times \frac{3}{4} =$ _____
2. $\frac{5}{8} \times \frac{4}{5} =$ _____
3. $\frac{3}{7} \times \frac{7}{9} =$ _____
4. $\frac{2}{5} \times \frac{5}{6} =$ _____
5. $\frac{3}{4} \times \frac{8}{9} =$ _____
6. $\frac{5}{6} \times \frac{9}{10} =$ _____
7. $\left(-\frac{3}{4}\right) \times \frac{2}{9} =$ _____
8. $\left(-\frac{5}{8}\right) \times \left(-\frac{4}{5}\right) =$ _____
9. $\frac{7}{12} \times \frac{6}{7} =$ _____
10. $\left(-\frac{2}{3}\right) \times \left(-\frac{9}{10}\right) =$ _____
11. $1\frac{1}{2} \times \frac{2}{3} =$ _____
12. $2\frac{1}{4} \times \frac{4}{9} =$ _____
13. $1\frac{3}{4} \times \frac{4}{7} =$ _____
14. $2\frac{2}{3} \times \frac{3}{8} =$ _____
15. $1\frac{1}{4} \times 2\frac{2}{5} =$ _____

Study Tips

- ☞ **Always** convert mixed numbers to improper fractions *before* multiplying. Never multiply mixed numbers directly.
- ☞ Cross-cancel *before* you multiply — it keeps numbers small and avoids simplifying at the end.
- ☞ Determine the sign first (one step), then multiply the absolute values (second step). Keep them separate.

✍ Word Problems

16. A school garden has an area of $3\frac{1}{2}$ square meters. The garden is expanded so that its new length is $\frac{5}{4}$ times the original, but its width stays the same. Write a multiplication expression for the new area, convert any mixed numbers to improper fractions, and find the new area. By how many square meters did the garden grow?

_____

17. A scuba diver descends at a rate of $-2\frac{1}{4}$ feet per second. After $3\frac{1}{3}\ s$, what integer or fraction represents the diver's total change in depth? Show the full multiplication with improper fractions. What does the negative sign of your answer mean in context?

_____

Answer Keys

1) $\frac{1}{2}$
2) $\frac{1}{2}$
3) $\frac{1}{3}$
4) $\frac{1}{3}$
5) $\frac{3}{3}$
6) $\frac{3}{4}$
7) $-\frac{1}{6}$
8) $\frac{1}{2}$
9) $\frac{1}{2}$
10) $\frac{3}{5}$
11) 1
12) 1
13) 1
14) 1
15) 3
16) $4\frac{3}{8}\ sq\ m$; grew by $\frac{7}{8}\ sq\ m$
17) $-7\frac{1}{2}\ ft$; descended $7\frac{1}{2}$ feet

Step-by-Step Explanations

Strategy: For Multiplying Fractions and Mixed Numbers, convert mixed numbers first, cancel common factors when it helps, then multiply across. The size of the product should fit the size of the factors: less than, equal to, or greater than the starting amount.

Practice 1: $\frac{2}{3} \times \frac{3}{4} =$ **Answer:** $\frac{1}{2}$

At the beginning of the practice, change mixed numbers to improper fractions if needed, cancel friendly factors, and multiply across.

Practice 15: $1\frac{1}{4} \times 2\frac{2}{5} =$ **Answer:** 3

For the second model problem, change mixed numbers to improper fractions if needed, cancel friendly factors, and multiply across.

Word-problem notes:

16. Answer: $\frac{7}{2} \times \frac{5}{4} = \frac{35}{8} = 4\frac{3}{8}\ sq\ m$; grew by $\frac{7}{8}\ sq\ m$.

The new area is $\frac{5}{4}$ times the old area, so multiply the original $3\frac{1}{2}$ by $\frac{5}{4}$. First convert $3\frac{1}{2}$ to $\frac{7}{2}$. Then multiply: $\frac{7}{2} \times \frac{5}{4} = \frac{35}{8} = 4\frac{3}{8}$ square meters. To find how much the garden grew, subtract the old area from the new area: $4\frac{3}{8} - 3\frac{1}{2} = \frac{35}{8} - \frac{28}{8} = \frac{7}{8}$ square meter. The phrase “times as much” is the clue that tells us to multiply.

17. Answer: $-\frac{9}{4} \times \frac{10}{3} = -\frac{90}{12} = -\frac{15}{2} = -7\frac{1}{2}\ ft$; diver descended $7\frac{1}{2}$ feet.

Start by rewriting both mixed numbers as improper fractions: $-2\frac{1}{4} = -\frac{9}{4}$ and $3\frac{1}{3} = \frac{10}{3}$. Now multiply: negative times positive gives a negative answer, so the depth change will be negative. Compute the magnitude: $\frac{9}{4} \times \frac{10}{3} = \frac{90}{12} = \frac{15}{2} = 7\frac{1}{2}$. So the total change is $-7\frac{1}{2}$ feet. The negative sign does not mean the math is wrong. It tells us the diver moved downward.

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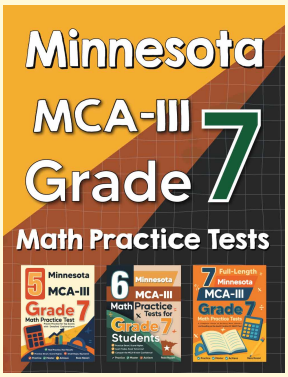

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