Get out homework from yesterday and Warm Up on the problems below. Target Check on multiplying and dividing fractions tomorrow.

Classwork - Dividing Fractions and Mixed Numbers

Warm Up: Multiply

A) $-\frac{3}{8} \cdot \frac{6}{7}$

B) $-\frac{1}{6} \cdot -15$

C) $2\frac{1}{4} \cdot 10\frac{2}{3}$

Multiply. Write in simplest form. SHOW WORK

1. $\frac{3}{5} \times \frac{1}{2}$

$\frac{3}{10}$

2. $\frac{3}{2} \times \frac{2}{7}$

$\frac{3}{14}$

3. $\frac{10}{1} \times \frac{1}{3} = \frac{10}{3}$

$3\frac{1}{3}$

4. $-\frac{5}{8} \times \frac{7}{1}$

$-\frac{35}{8} = -4\frac{3}{8}$

5. $\frac{1}{1} \times \frac{1}{9}$

$\frac{1}{9}$

6. $-\frac{1}{11} \times \left(-\frac{1}{1}\right)$

$\frac{1}{11}$

7. $-\frac{1}{4} \times \frac{9}{5}$

$-\frac{9}{20}$

8. $\frac{1}{1} \times \frac{3}{8}$

$\frac{3}{8}$

9. $3\frac{1}{5} \times \frac{3}{8}$

$\frac{2}{5} \cdot \frac{3}{8_1} = \frac{6}{5}$

$= 1\frac{1}{5}$

10. $\frac{2}{3} \times \left(-4\frac{1}{3}\right)$

$\frac{2}{3} \cdot -\frac{13}{3}$

$-\frac{26}{9} = -2\frac{8}{9}$

11. $\frac{15}{1} \times 2\frac{2}{5}$

$\frac{3}{1} \cdot \frac{12}{8_1}$

36

12. $5\frac{1}{2} \times 4$

$\frac{11}{1} \cdot \frac{4^2}{1}$

22

13. $5\frac{1}{4} \times \left(-4\frac{2}{3}\right)$

$\frac{7}{2}\frac{21}{4} \cdot -\frac{14}{3}\frac{7}{1}$

$\frac{-49}{2} = -24\frac{1}{2}$

14. $2\frac{2}{7} \times 1\frac{1}{8}$

$\frac{2}{7}\frac{16}{7} \cdot \frac{9}{8_1} = \frac{18}{7} = 2\frac{4}{7}$

15. one fourth of two thirds

$\frac{1}{4} \cdot \frac{2}{3}$

$\frac{1}{6}$

16. three fifths of one sixth

$\frac{3}{5} \cdot \frac{1}{6}$

$\frac{1}{10}$

17. two fifths of one half

$\frac{2}{5} \cdot \frac{1}{2}$

$\frac{1}{5}$

18. **GASOLINE** Jamal filled his gas tank and then used $\frac{7}{16}$ of the tank for traveling to visit his grandfather. He then used $\frac{1}{3}$ of the remaining gas in the tank to run errands around town. What fraction of the tank is filled with gasoline?

$\frac{7}{16} \cdot \frac{1}{3} = \frac{7}{48}$

$\frac{16}{16} - \frac{7}{16} = \frac{9}{16} \cdot \frac{1}{3_1} = \frac{3}{16}$

19. **HIKING** A hiker averages $6\frac{3}{8}$ kilometers per hour. If he hikes for $5\frac{1}{3}$ hours, how many kilometers does he hike?

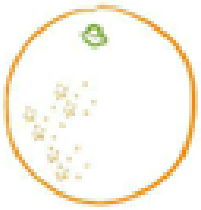
$\frac{17}{\cancel{51}} \cdot \frac{\cancel{16}^{2}}{\cancel{3}_{1}} = \frac{34}{1}$

34 km

Real-World Link

Oranges Deandre has three oranges and each orange is divided evenly into fourths. Complete the steps below to find $3 \div \frac{1}{4}$.

Step 1 Draw three oranges. The first one is drawn for you.



Step 2 Imagine you cut each orange into fourths. Draw the slices for each orange.

So $3 \div \frac{1}{4} = 12$. Deandre will have ☐ orange slices.

1. Find $3 \div \frac{1}{2}$. Use a diagram. _____

2. What is true about $3 \div \frac{1}{2}$ and 3×2? _____

Divide Fractions

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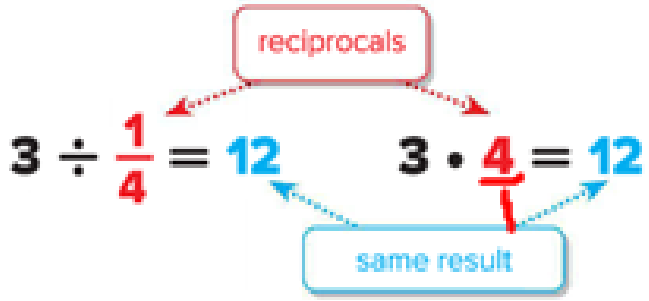
Words To divide by a fraction, multiply by its multiplicative inverse, or reciprocal.

Examples

Numbers: $\frac{7}{8} \div \frac{3}{4} = \frac{7}{8} \cdot \frac{4}{3}$

Algebra: $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}$, where $b, c, d \neq 0$

Dividing 3 by $\frac{1}{4}$ is the same as multiplying 3 by the reciprocal of $\frac{1}{4}$, which is 4.



Is this pattern true for any division expression?

Consider $\frac{7}{8} \div \frac{3}{4}$, which can be rewritten as $\frac{\frac{7}{8}}{\frac{3}{4}}$.

$$\frac{\frac{7}{8}}{\frac{3}{4}} = \frac{\frac{7}{8} \times \frac{4}{3}}{\frac{3}{4} \times \frac{4}{3}}$$

Multiply the numerator and denominator by the reciprocal of $\frac{3}{4}$, which is $\frac{4}{3}$.

$$= \frac{\frac{7}{8} \times \frac{4}{3}}{1}$$

$\frac{3}{4} \times \frac{4}{3} = 1$

$$= \frac{7}{8} \times \frac{4}{3}$$

So, $\frac{7}{8} \div \frac{3}{4} = \frac{7}{8} \times \frac{4}{3}$. The pattern is true in this case.

Examples

Same-Change-Flip

$\frac{1}{3} \to \frac{1}{5} \to \frac{1}{15}$

1. Find $\frac{1}{3} \div 5$.

$\frac{1}{3} \div 5 = \frac{1}{3} \div \frac{5}{1}$ A whole number can be written as a fraction over 1.

$= \frac{1}{3} \times \frac{1}{5}$ Multiply by the reciprocal of $\frac{5}{1}$, which is $\frac{1}{5}$.

$= \frac{1}{15}$ Multiply.

S-C-F

2. Find $\frac{3}{4} \div \left(-\frac{1}{2}\right)$. Write in simplest form.

Estimate $1 \div \left(-\frac{1}{2}\right) = \square$

$\frac{3}{4} \div \left(-\frac{1}{2}\right) = \frac{3}{4} \cdot \left(-\frac{2}{1}\right)$ Multiply by the reciprocal of $-\frac{1}{2}$, which is $-\frac{2}{1}$.

$= \frac{3}{\cancel{4}_{2}} \cdot \left(-\frac{\cancel{2}^{1}}{1}\right)$ Divide 4 and 2 by their GCF, 2.

$= -\frac{3}{2}$ or $-1\frac{1}{2}$ Multiply.

Check for Reasonableness $-1\frac{1}{2} \approx -2$ ✓

Got it? Do these problems to find out.

Divide. Write in simplest form.

a. $\frac{3}{4} \div \frac{1}{4}$

$\frac{3}{1\cancel{4}} \cdot \frac{\cancel{4}^{1}}{1} = \frac{3}{1} = 3$

b. $-\frac{4}{5} \div \frac{8}{9}$

$-\frac{1}{\cancel{5}} \cdot \frac{9}{\cancel{8}_{2}} = -\frac{9}{10}$

c. $-\frac{5}{6} \div \left(-\frac{2}{3}\right)$

$-\frac{5}{\cancel{6}_{2}} \cdot -\frac{\cancel{3}^{1}}{2} = \frac{5}{4} = 1\frac{1}{4}$

Divide Mixed Numbers

To divide by a mixed number, first rename the mixed number as a fraction greater than one. Then multiply the first fraction by the reciprocal, or multiplicative inverse, of the second fraction.

Example

3. **Find $\frac{2}{3} \div 3\frac{1}{3}$. Write in simplest form.**

$\frac{2}{3} \div 3\frac{1}{3} = \frac{2}{3} \div \frac{10}{3}$ Rename $3\frac{1}{3}$ a fraction greater than one.

$= \frac{2}{3} \cdot \frac{3}{10}$ Multiply by the reciprocal of $\frac{10}{3}$, which is $\frac{3}{10}$.

$= \frac{\cancel{2}^{1}}{\cancel{3}_{1}} \cdot \frac{\cancel{3}^{1}}{\cancel{10}_{5}}$ Divide out common factors.

$= \frac{1}{5}$ Multiply.

Got it? Do these problems to find out.

Divide. Write in simplest form.

d. $5 \div 1\frac{1}{3}$

$\frac{5}{1} \div \frac{4}{3}$

$\frac{5}{1} \cdot \frac{3}{4} = \frac{15}{4}$

$\frac{15}{4} = 3\frac{3}{4}$

e. $-\frac{3}{4} \div 1\frac{1}{2}$

$-\frac{3}{4} \div \frac{3}{2}$

$-\frac{1}{2} \cdot \frac{2}{3} = -\frac{1}{2}$

f. $2\frac{1}{3} \div 5$

$\frac{7}{3} \div \frac{5}{1}$

$\frac{7}{3} \cdot \frac{1}{5} = \frac{7}{15}$

Example

4. **The side pieces of a butterfly house are $8\frac{1}{4}$ inches long. How many side pieces can be cut from a board measuring $49\frac{1}{2}$ inches long?**

To find how many side pieces can be cut, divide $49\frac{1}{2}$ by $8\frac{1}{4}$.

Estimate Use compatible numbers. $48 \div 8 = 6$

$49\frac{1}{2} \div 8\frac{1}{4} = \frac{99}{2} \div \frac{33}{4}$ Rename the mixed numbers as fractions greater than one.

$= \frac{99}{2} \cdot \frac{4}{33}$ Multiply by the reciprocal of $\frac{33}{4}$, which is $\frac{4}{33}$.

$= \frac{\overset{3}{\cancel{99}}}{\underset{1}{\cancel{2}}} \cdot \frac{\overset{2}{\cancel{4}}}{\underset{1}{\cancel{33}}}$ Divide out common factors.

$= \frac{6}{1}$ or 6 Multiply.

So, 6 side pieces can be cut.

$3\frac{1}{2} = \frac{7}{2}$

$\left(\frac{21}{2} \div \frac{7}{2}\right) \cdot \frac{5}{7} = \frac{15}{2} = 2\frac{1}{2}$ mph

Do Guided Practice #4 for Got It?

4. On Saturday, Lindsay walked $3\frac{1}{2}$ miles in $1\frac{2}{5}$ hours. What was her walking pace in miles per hour? Write in simplest form. (Example 4)

$3\frac{1}{2} \div 1\frac{2}{5}$

$\frac{12}{5} = \frac{7}{5}$