

To determine an approximate value of the product, decide whether each fraction is closer to 0, $\frac{1}{2}$, or 1.

$$\frac{8}{15} \approx \frac{1}{2} \quad \frac{5}{6} \approx 1$$

Then estimate the product.

$$\begin{aligned} \frac{8}{15} \times \frac{5}{6} &\approx \frac{1}{2} \times 1 \\ &\approx \frac{1}{2} \end{aligned}$$

Would the product of two proper fractions be greater or less than each factor?

The answer $\frac{4}{9}$ seems reasonable because it is close to the estimate of $\frac{1}{2}$.

Show You Know

Calculate each product. How do you know your answer is reasonable?

a) $\frac{4}{7} \times \frac{2}{5}$

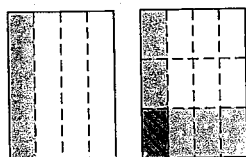
b) $\frac{5}{6} \times \frac{3}{4}$



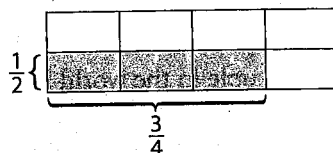
Connect and Reflect

Key Ideas

- You can use an area model to multiply two proper fractions. This can be done by using
 - paper folding
 - diagrams



$$\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$$



$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

- A rule for multiplying two proper fractions is to multiply the numerators and multiply the denominators.
- You can estimate the product of two proper fractions by first deciding whether each fraction is closer to 0, $\frac{1}{2}$, or 1.

Practise

For help with #1 and #2, refer to Examples 1 and 2 on pages 145–146.

1. Determine each product using paper folding or diagrams.

a) $\frac{5}{6} \times \frac{1}{2}$

b) $\frac{3}{4} \times \frac{5}{6}$

2. Use paper folding or diagrams to determine each product.

a) $\frac{1}{4} \times \frac{2}{3}$

b) $\frac{7}{10} \times \frac{1}{2}$

For help with #3 and #4, refer to Example 3 on pages 146–147.

3. Calculate each product. Use estimation to determine if your answer is reasonable. Express your answer in lowest terms.

a) $\frac{3}{8} \times \frac{2}{3}$

b) $\frac{3}{7} \times \frac{1}{6}$

c) $\frac{3}{4} \times \frac{3}{4}$

d) $\frac{1}{10} \times \frac{11}{100}$

4. Calculate each product. Use estimation to determine if your answer is reasonable. Express your answer in lowest terms.

a) $\frac{2}{5} \times \frac{4}{5}$

b) $\frac{7}{8} \times \frac{4}{5}$

c) $\frac{3}{4} \times \frac{4}{9}$

d) $\frac{1}{2} \times \frac{3}{16}$

Apply

5. Brendan calculates $\frac{3}{5} \times \frac{2}{5}$ as follows:

$$\frac{3}{5} \times \frac{2}{5} = \frac{6}{5}$$

- a) How could you use estimation to determine if Brendan made a mistake?
 b) If he calculated the product incorrectly, what is the correct answer?

6. Marius spends $\frac{1}{3}$ of his time sleeping. While he is asleep, he dreams for $\frac{1}{4}$ of the time.

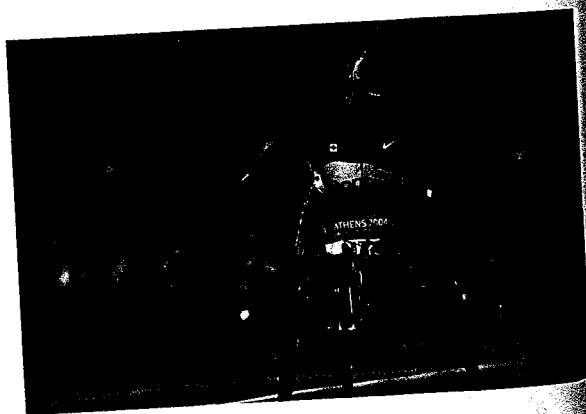
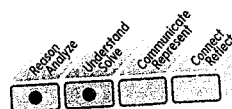
- a) For what fraction of his time is Marius dreaming?
 b) For how many hours a day is Marius dreaming?

7. About $\frac{1}{20}$ of the people in the world live in Canada or the United States. Of the people who live in Canada or the United States, about $\frac{1}{10}$ live in Canada. What fraction of the people in the world live in Canada?


8. At the age of four, the average person is about $\frac{3}{5}$ as tall as they will be as an adult. At birth, the average person is about $\frac{1}{2}$ as tall as they will be at the age of four. For the average person, what fraction of their height at birth is their height as an adult?

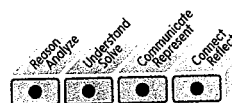
9. When the Summer Olympic and Paralympic Games were held in Athens, Greece, Paralympic athletes won $\frac{6}{7}$ of Canada's total medals. Of the medals that Canadian Paralympic athletes won, $\frac{7}{18}$ were gold medals.

- a) What fraction of Canada's total medals were gold medals won by Paralympic athletes?
 b) Canada won a total of 84 medals. How many gold medals did Canadian Paralympic athletes win?



10. Student council held a dance as a fundraiser for building schools overseas. They determined that $\frac{2}{3}$ of the money raised came from admissions and $\frac{1}{5}$ from donations. What fraction of the total money raised came from admissions or donations?

11.  **Competency Check** Write a word problem that involves solving the expression $\frac{7}{8} \times \frac{1}{2}$. Model and solve your problem.



12. The area of British Columbia is about $\frac{1}{10}$ of the area of Canada. The Pacific Maritime ecozone covers about $\frac{1}{5}$ of the area of British Columbia. What fraction of the area of Canada does the Pacific Maritime ecozone cover?

Extend

13. For a standard deck of 52 playing cards, the probability of randomly drawing a red card is $\frac{1}{2}$. The probability of randomly drawing a face card (jack, queen, or king) is $\frac{12}{52}$. What is the probability of randomly drawing a face card that is red?

14. Calculate. Express the product in lowest terms.

a) $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$

b) $\frac{2}{3} \times \frac{1}{4} \times \frac{2}{5}$

c) $\frac{3}{4} \times \frac{3}{4} \times \frac{2}{9}$

d) $\frac{3}{5} \times \frac{5}{9} \times \frac{3}{7} \times \frac{7}{8}$

15. Copy each multiplication statement. Complete it using a fraction in lowest terms.

a) $\frac{\blacksquare}{\blacksquare} \times \frac{1}{2} = \frac{5}{16}$

b) $\frac{\blacksquare}{\blacksquare} \times \frac{3}{7} = \frac{1}{3}$

c) $\frac{2}{3} \times \frac{\blacksquare}{\blacksquare} = \frac{1}{2}$

d) $\frac{3}{4} \times \frac{\blacksquare}{\blacksquare} = \frac{5}{8}$

16. Use the sum and the product of two fractions to identify the fractions.

a) sum $\frac{1}{2}$; product $\frac{1}{16}$

b) sum $\frac{5}{6}$; product $\frac{1}{6}$

c) sum $\frac{2}{3}$; product $\frac{1}{12}$

