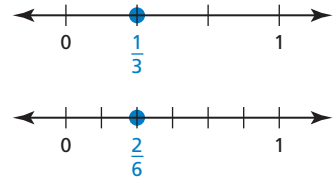


Equivalent Fractions and Simplifying Fractions

The number lines show the graphs of two fractions, $\frac{1}{3}$ and $\frac{2}{6}$. These fractions represent the same number. Two fractions that represent the same number are called **equivalent fractions**. To write equivalent fractions, you can multiply or divide the numerator and the denominator by the same nonzero number.



Example 1 Write two fractions that are equivalent to $\frac{8}{12}$.

Multiply the numerator and denominator by 2.

$$\frac{8}{12} = \frac{8 \cdot 2}{12 \cdot 2} = \frac{16}{24}$$

Divide the number and denominator by 2.

$$\frac{8}{12} = \frac{8 \div 2}{12 \div 2} = \frac{4}{6}$$

▶ Two equivalent fractions are $\frac{16}{24}$ and $\frac{4}{6}$.

A fraction is in **simplest form** when its numerator and its denominator have no common factors besides 1.

Example 2 Write the fraction $\frac{18}{24}$ in simplest form.

Divide the numerator and denominator by 6, the greatest common factor of 18 and 24.

$$\frac{18}{24} = \frac{18 \div 6}{24 \div 6} = \frac{3}{4}$$

▶ $\frac{18}{24}$ in simplest form is $\frac{3}{4}$.

Practice Exercises 1–8 and 22 are sample answers.

Check your answers at BigIdeasMath.com.

Write two fractions that are equivalent to the given fraction.

- | | | | |
|--|--|---|--|
| 1. $\frac{4}{10}$, $\frac{8}{20}$ and $\frac{2}{5}$ | 2. $\frac{3}{7}$, $\frac{6}{14}$ and $\frac{9}{21}$ | 3. $\frac{10}{15}$, $\frac{20}{30}$ and $\frac{2}{3}$ | 4. $\frac{16}{20}$, $\frac{32}{40}$ and $\frac{4}{5}$ |
| 5. $\frac{9}{30}$, $\frac{18}{60}$ and $\frac{3}{10}$ | 6. $\frac{1}{8}$, $\frac{2}{16}$ and $\frac{3}{24}$ | 7. $\frac{9}{16}$, $\frac{18}{32}$ and $\frac{27}{48}$ | 8. $\frac{12}{14}$, $\frac{24}{28}$ and $\frac{6}{7}$ |

Write the fraction in simplest form.

- | | | | |
|---------------------------------------|--------------------------------------|--------------------------------------|---|
| 9. $\frac{18}{27}$, $\frac{2}{3}$ | 10. $\frac{3}{18}$, $\frac{1}{6}$ | 11. $\frac{35}{50}$, $\frac{7}{10}$ | 12. $\frac{14}{32}$, $\frac{7}{16}$ |
| 13. $\frac{4}{36}$, $\frac{1}{9}$ | 14. $\frac{48}{80}$, $\frac{3}{5}$ | 15. $\frac{24}{63}$, $\frac{8}{21}$ | 16. $\frac{33}{88}$, $\frac{3}{8}$ |
| 17. $\frac{45}{100}$, $\frac{9}{20}$ | 18. $\frac{60}{150}$, $\frac{2}{5}$ | 19. $\frac{48}{96}$, $\frac{1}{2}$ | 20. $\frac{110}{170}$, $\frac{11}{17}$ |

21. Is the fraction $\frac{45}{61}$ in simplest form? Explain. **yes; It is a proper fraction with a denominator of 61, which is a prime number.**
22. Write five fractions that each simplify to one-ninth. $\frac{2}{18}, \frac{3}{27}, \frac{4}{36}, \frac{5}{45}, \frac{6}{54}$
23. **SLEEP** It is recommended that 10- to 17-year old students should sleep about 9 hours each night. What fraction of the day is this? Write your answer in simplest form. $\frac{3}{8}$