

## Equivalent Fractions

Two fractions are *equivalent* when they name the same amount, even if the numbers look different.  $\frac{1}{2}$  and  $\frac{2}{4}$  both mean half of a whole.

### Equivalence Rule

Multiply (or divide) both the numerator AND the denominator by the same number.

The fraction changes form but not value:  $\frac{1}{2} = \frac{1 \times 2}{2 \times 2} = \frac{2}{4}$ .

### Key Concepts

- Two fractions are **equivalent** when they represent the same amount of the whole, even though they use different numbers.
- To make an equivalent fraction, multiply the top and the bottom by the same number. Whatever you do to the top, you must do to the bottom.
- You can also *divide* both top and bottom by the same number to find a simpler equivalent fraction.
- A fraction is *unchanged* when you multiply numerator and denominator by the same nonzero number, because that's just multiplying by 1 in disguise:  $\frac{2}{2} = 1$ .

### Worked Examples

① Find a fraction equivalent to  $\frac{1}{3}$  with denominator 6.

👉 The denominator needs to grow from 3 to 6, so multiply by 2. Whatever you do to the bottom, you must do to the top:  $1 \times 2 = 2$ . So  $\frac{1}{3} = \frac{2}{6}$ .

💡 **Answer:**  $\frac{2}{6}$

② Are  $\frac{2}{4}$  and  $\frac{3}{6}$  equivalent?

👉 Try to make them match.  $\frac{2}{4}$  simplifies: divide top and bottom by 2 to get  $\frac{1}{2}$ .  $\frac{3}{6}$  also simplifies: divide top and bottom by 3 to get  $\frac{1}{2}$ . Both reduce to  $\frac{1}{2}$ , so yes, they are equivalent.

💡 **Answer:** Yes

③ Write two fractions equivalent to  $\frac{3}{4}$ .

👉 Multiply top and bottom by the same number. Times 2:  $\frac{6}{8}$ . Times 3:  $\frac{9}{12}$ . So  $\frac{3}{4} = \frac{6}{8} = \frac{9}{12}$ . You could keep going: times 4 gives  $\frac{12}{16}$ , and so on.

💡 **Answer:**  $\frac{6}{8}, \frac{9}{12}$  (others possible)

### Practice Problems

Fill in the missing number to make equivalent fractions.

1.  $\frac{1}{2} = \frac{?}{4}$  \_\_\_\_\_

2.  $\frac{1}{3} = \frac{?}{6}$  \_\_\_\_\_

3.  $\frac{2}{3} = \frac{?}{6}$  \_\_\_\_\_

4.  $\frac{1}{4} = \frac{?}{8}$  \_\_\_\_\_

5.  $\frac{3}{4} = \frac{?}{8}$  \_\_\_\_\_

6.  $\frac{2}{4} = \frac{?}{2}$  \_\_\_\_\_

7.  $\frac{4}{6} = \frac{?}{3}$  \_\_\_\_\_

8.  $\frac{1}{2} = \frac{?}{8}$  \_\_\_\_\_

9.  $\frac{2}{8} = \frac{?}{4}$  \_\_\_\_\_

10.  $\frac{3}{6} = \frac{?}{2}$  \_\_\_\_\_

11.  $\frac{1}{4} = \frac{2}{?}$  \_\_\_\_\_

12.  $\frac{2}{3} = \frac{4}{?}$  \_\_\_\_\_

**Study Tips**

-  “Whatever you do to the top, do to the bottom.” That is the one rule of equivalence.
-  To go to a bigger denominator, multiply. To go to a smaller one, divide. Both work as long as the same number is used on top and bottom.
-  Always sanity-check on a fraction strip or number line: equivalent fractions land at the same spot, even if their tick marks differ.

** Word Problems**

1. Tom ate  $\frac{2}{4}$  of a pizza and Sara ate  $\frac{1}{2}$  of an identical pizza. Did they eat the same amount? Explain.

Answer: \_\_\_\_\_

2. A recipe calls for  $\frac{3}{4}$  cup of flour. Jenny only has a  $\frac{1}{8}$ -cup scoop. How many scoops does she need?

Answer: \_\_\_\_\_

### Answer Key — with Friendly Explanations

#### Practice Problems

1. Multiply top and bottom by 2:  $\frac{1 \times 2}{2 \times 2} = \frac{2}{4}$ .

 **Answer:** 2

2. Multiply by 2:  $\frac{2}{6}$ .

 **Answer:** 2

3. Multiply by 2:  $\frac{4}{6}$ .

 **Answer:** 4

4. Multiply by 2:  $\frac{2}{8}$ .

 **Answer:** 2

5. Multiply by 2:  $\frac{6}{8}$ .

 **Answer:** 6

6. Divide top and bottom by 2:  $\frac{1}{2}$ .

 **Answer:** 1

7. Divide by 2:  $\frac{2}{3}$ .

 **Answer:** 2

8. Multiply by 4:  $\frac{4}{8}$ .

 **Answer:** 4

9. Divide by 2:  $\frac{1}{4}$ .

 **Answer:** 1

10. Divide by 3:  $\frac{1}{2}$ .

 **Answer:** 1

11. To make 1 into 2, multiply by 2; do the same on the bottom:  $4 \times 2 = 8$ .

 **Answer:** 8

12. To make 2 into 4, multiply by 2; do the same to 3: 6.

 **Answer:** 6

#### Word Problems

1.  $\frac{2}{4} = \frac{1}{2}$ . They ate the same amount.

 **Answer:** *Yes*

2.  $\frac{3}{4} = \frac{6}{8}$ , so 6 of the  $\frac{1}{8}$ -cup scoops.

 **Answer:** 6 scoops

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