

A top-down illustration of a desk setup. In the top right, a portion of a silver laptop with a black keyboard is visible. Below it, a black smartphone lies horizontally. To the left of the phone is a white coffee cup filled with brown liquid, sitting on a matching saucer. Two black pens with orange and yellow accents are positioned diagonally in the lower right. The entire scene is set against a solid teal background.

A GIFT

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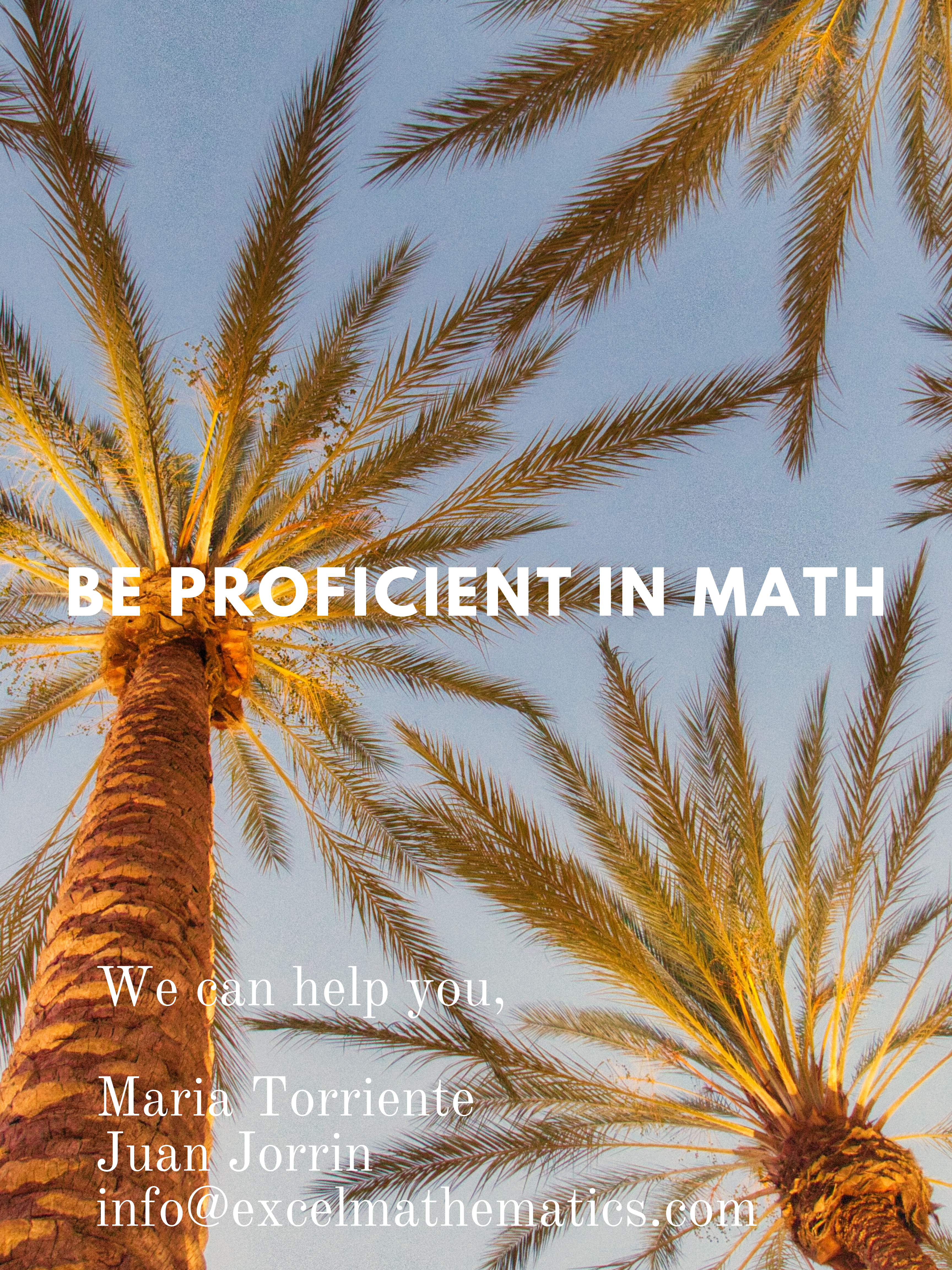
FRACTIONS #1

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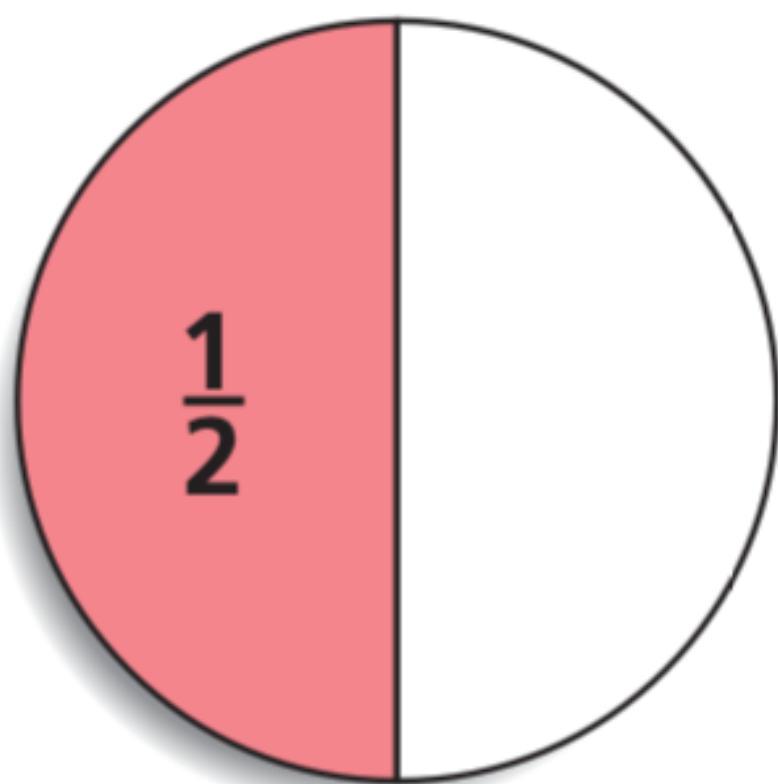
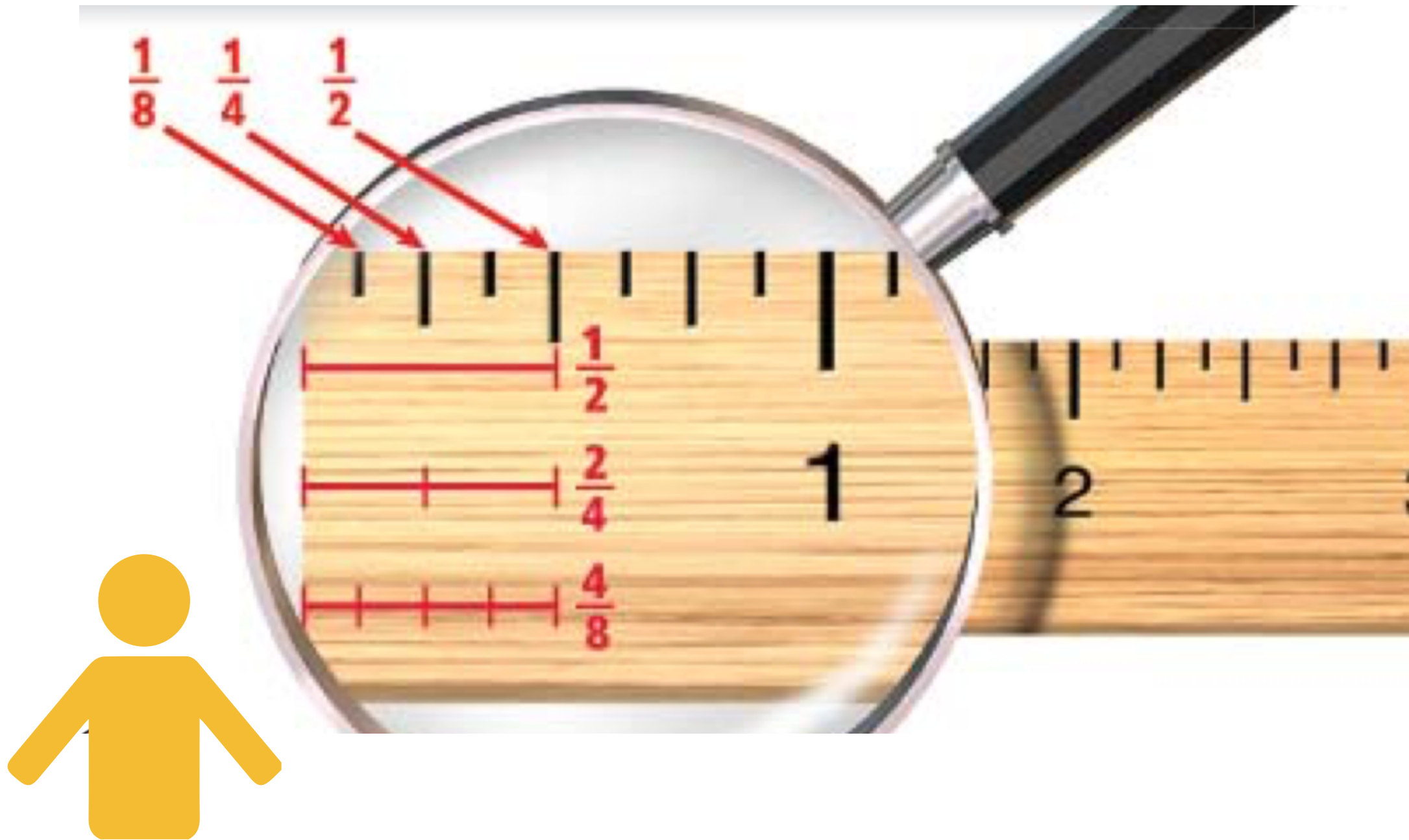
Equivalent Fractions



Vocabulary

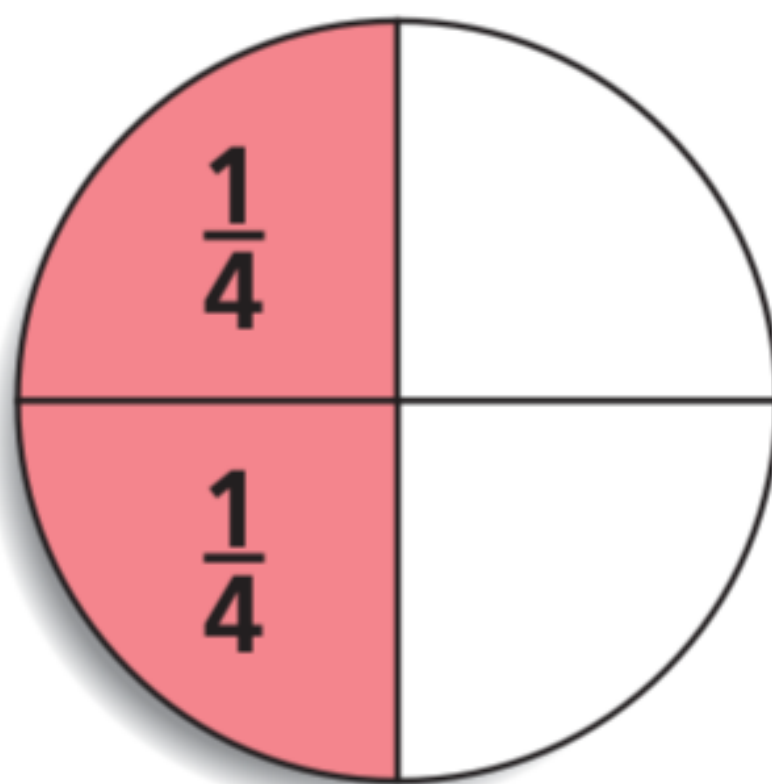
equivalent fractions

simplest form



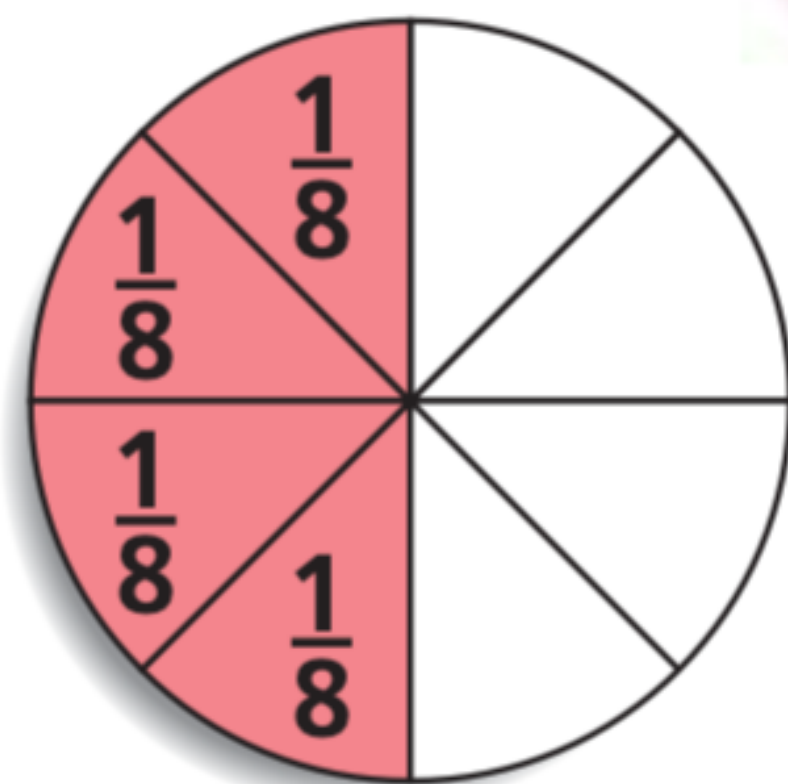
$\frac{1}{2}$

=



$\frac{2}{4}$

=



$\frac{4}{8}$

Rulers often have marks for inches, $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$ inches.

Notice that $\frac{1}{2}$ in., $\frac{2}{4}$ in., and $\frac{4}{8}$ in. all name the same length.

Fractions that represent the same value are **equivalent fractions**. So $\frac{1}{2}$, $\frac{2}{4}$, and $\frac{4}{8}$ are equivalent fractions.



FRACTIONS

Why Learn This?

Fractions are used to describe many things in the real world. For example, $\frac{9}{10}$ of orange juice produced in the United States is made from Florida oranges.

Orange World
Kissimmee



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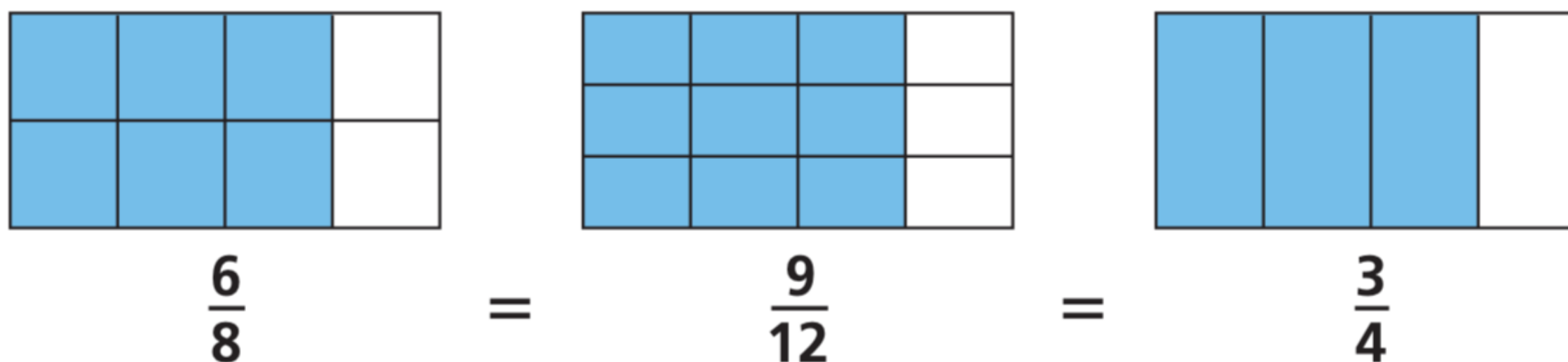


EXAMPLES



Finding Equivalent Fractions

Find two equivalent fractions for $\frac{6}{8}$.



The same area is shaded when the rectangle is divided into 8 parts, 12 parts, and 4 parts.

So $\frac{6}{8}$, $\frac{9}{12}$, and $\frac{3}{4}$ are all equivalent fractions.

Multiplying and Dividing to Find Equivalent Fractions

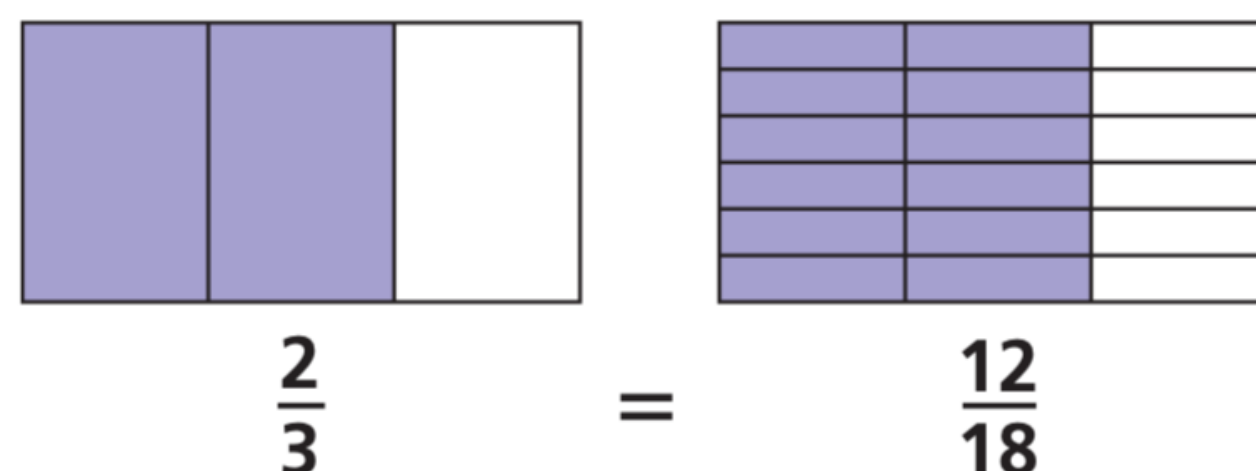
Find the missing number that makes the fractions equivalent.

A $\frac{2}{3} = \frac{\square}{18}$

$$\frac{2 \cdot 6}{3 \cdot 6} = \frac{12}{18}$$

*In the denominator, 3 is multiplied by 6 to get 18.
Multiply the numerator, 2, by the same number, 6.*

So $\frac{2}{3}$ is equivalent to $\frac{12}{18}$.



Find the missing number that makes the fractions equivalent.

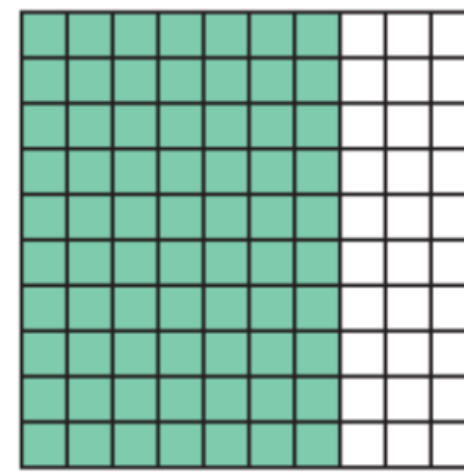


$$\frac{70}{100} = \frac{7}{\square}$$

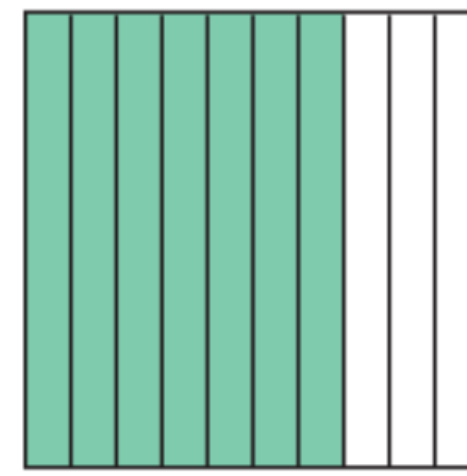
$$\frac{70 \div 10}{100 \div 10} = \frac{7}{10}$$

*In the numerator, 70 is divided by 10 to get 7.
Divide the denominator by the same number, 10.*

So $\frac{70}{100}$ is equivalent to $\frac{7}{10}$.



$$\frac{70}{100}$$

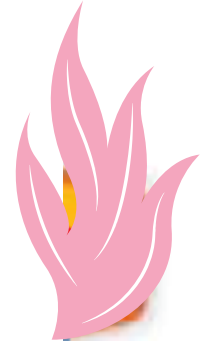


$$\frac{7}{10}$$

=

Every fraction has one equivalent fraction that is called the simplest form of the fraction. A fraction is in **simplest form** when the GCF of the numerator and the denominator is 1.

Example 3 shows two methods for writing a fraction in simplest form.



Writing Fractions in Simplest Form

Write each fraction in simplest form.

A $\frac{18}{24}$

The GCF of 18 and 24 is 6, so $\frac{18}{24}$ is not in simplest form.

Method 1: Use the GCF.

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

Divide 18 and 24 by their GCF, 6.

Method 2: Use prime factorization.

$$\frac{18}{24} = \frac{2 \cdot 3 \cdot 3}{2 \cdot 2 \cdot 2 \cdot 3} = \frac{3}{4}$$

Write the prime factors of 18 and 24. Simplify.

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

B $\frac{8}{9}$

The GCF of 8 and 9 is 1, so $\frac{8}{9}$ is already in simplest form.



Decimals and Fractions

Vocabulary

mixed number

terminating decimal

repeating decimal

Decimals and fractions can often be used to represent the same number.

For example, a baseball player's or baseball team's batting average can be represented as a fraction:

$$\frac{\text{number of hits}}{\text{number of times at bat}}$$



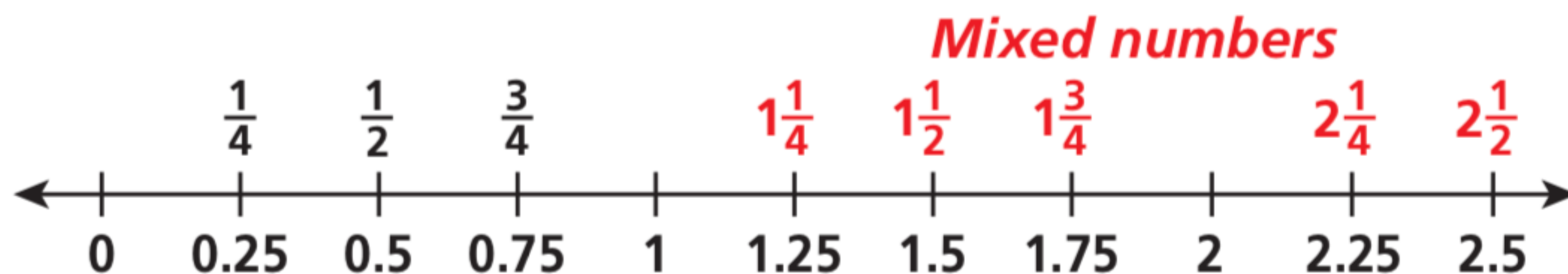
The Oregon State University baseball team won the College World Series in 2006 and 2007.

In 2007, the Oregon State University baseball team won its second College World Series title. During that season, the team had 659 hits and 2,297 at bats. The team's batting average was $\frac{659}{2,297}$.

$$659 \div 2,297 = 0.2868959512...$$

The 2007 batting average for the Oregon State baseball team is reported as .287.

Decimals can be written as fractions or mixed numbers. A number that contains both a whole number greater than 0 and a fraction, such as $1\frac{3}{4}$, is called a **mixed number**.



Writing Decimals as Fractions or Mixed Numbers

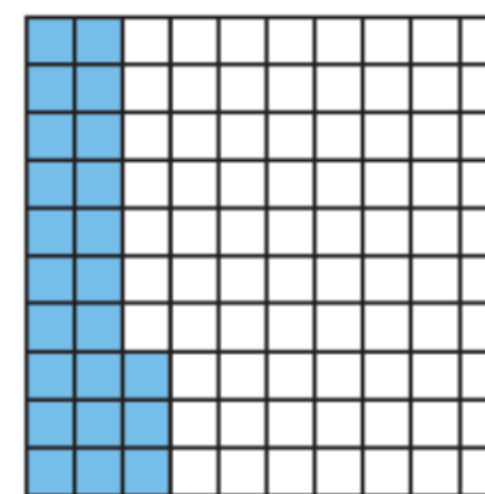
Write each decimal as a fraction or mixed number.

A 0.23

0.2³ Identify the place value of the digit farthest to the right.

$$\frac{23}{100}$$

The 3 is in the **hundredths** place, so use **100** as the denominator.

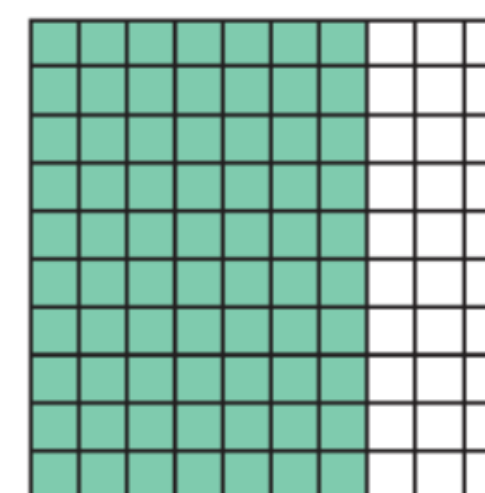
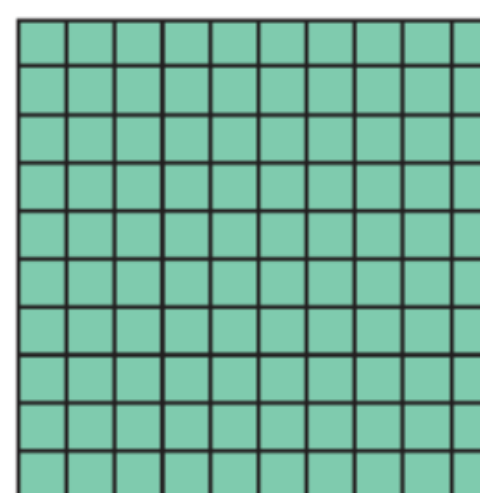


B 1.7

1.7 Identify the place value of the digit farthest to the right.

$$1\frac{7}{10}$$

Write the whole number, 1.
The 7 is in the **tenths** place, so use **10** as the denominator.



A **terminating decimal**, such as 0.75, has a finite number of decimal places. A **repeating decimal**, such as 0.666..., has a block of one or more digits that repeat without end.

Common Fractions and Equivalent Decimals								
$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{2}{5}$	$\frac{1}{2}$	$\frac{3}{5}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{4}{5}$
0.2	0.25	$0.\overline{3}$	0.4	0.5	0.6	$0.\overline{6}$	0.75	0.8

Writing Fractions as Decimals

Write each fraction or mixed number as a decimal.

A $\frac{3}{4}$

$$\begin{array}{r} 0.75 \\ 4 \overline{)3.00} \\ \underline{-28} \\ 20 \\ \underline{-20} \\ 0 \end{array}$$

Divide 3 by 4.
Add zeros after the decimal point.
The remainder is 0.

$$\frac{3}{4} = 0.75$$

B $5\frac{2}{3}$

$$\begin{array}{r} 0.666 \\ 3 \overline{)2.000} \\ \underline{-18} \\ 20 \\ \underline{-18} \\ 20 \\ \underline{-18} \\ 2 \end{array}$$

Divide 2 by 3.
Add zeros after the decimal point.
The 6 repeats in the quotient.

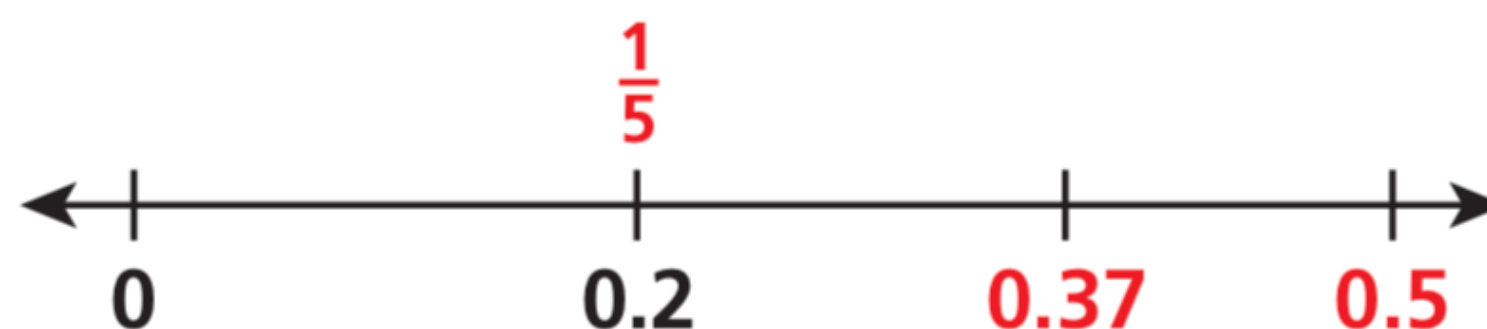
$$5\frac{2}{3} = 5.666\ldots = 5.\overline{6}$$

Comparing and Ordering Fractions and Decimals

Brigitte made the following measurements: 0.5 cm, $\frac{1}{5}$ cm, and 0.37 cm. Order the measurements from least to greatest.

First rewrite the fraction as a decimal. $\frac{1}{5} = 0.2$

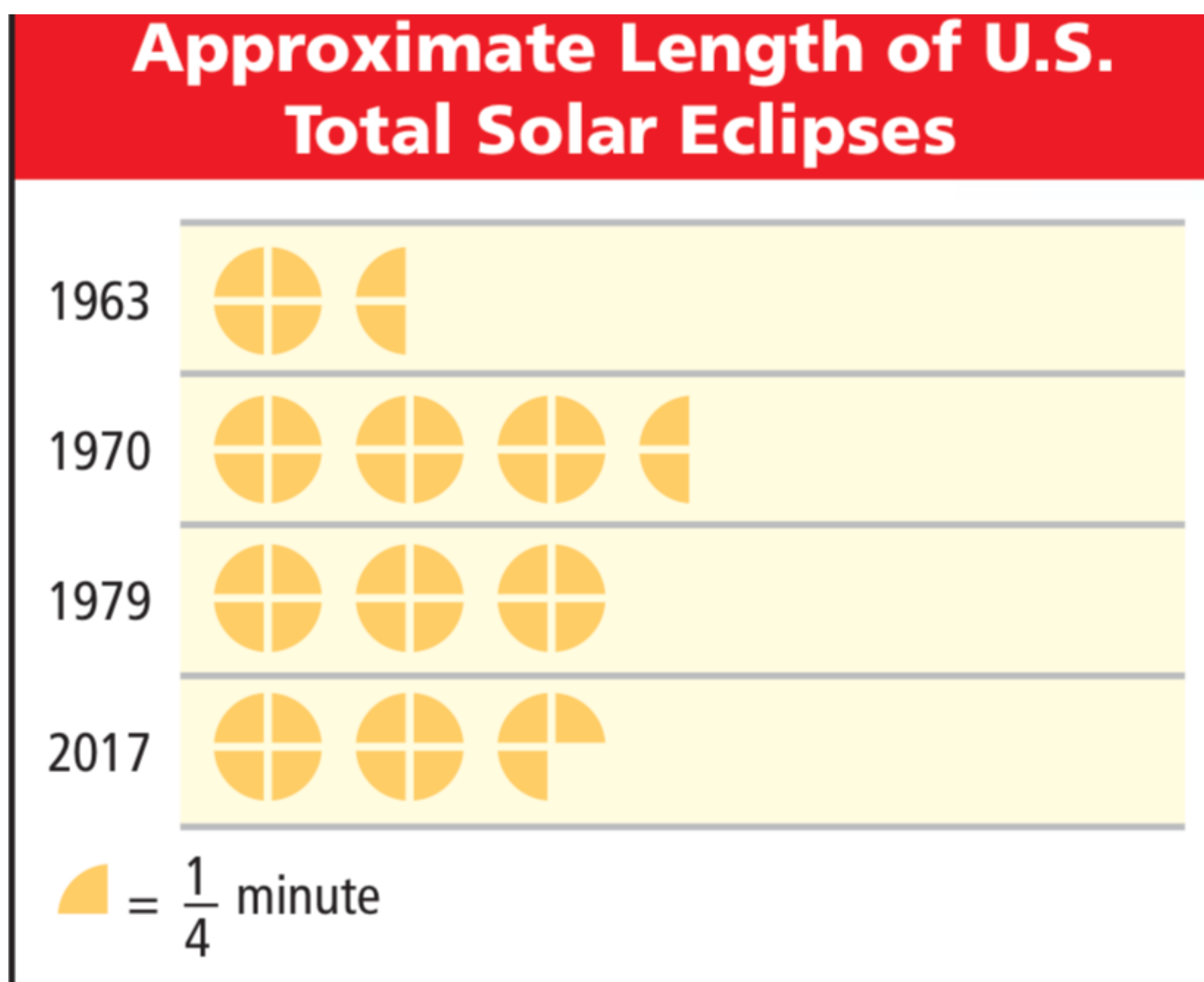
Order the three decimals.



The measurements from least to greatest are $\frac{1}{5}$ cm, 0.37 cm, and 0.5

Mixed Numbers and Improper Fractions

Have you ever witnessed a total eclipse of the sun? It occurs when the sun's light is completely blocked out. A total eclipse is rare—only three have been visible in the continental United States since 1963.



2017 will last $2\frac{3}{4}$ minutes. There are eleven $\frac{1}{4}$ -minute sections, so $2\frac{3}{4} = \frac{11}{4}$.

An **improper fraction** is a fraction in which the numerator is greater than or equal to the denominator, such as $\frac{11}{4}$.

Whole numbers can be written as improper fractions. The whole number is the numerator, and the denominator is 1. For example, $7 = \frac{7}{1}$.

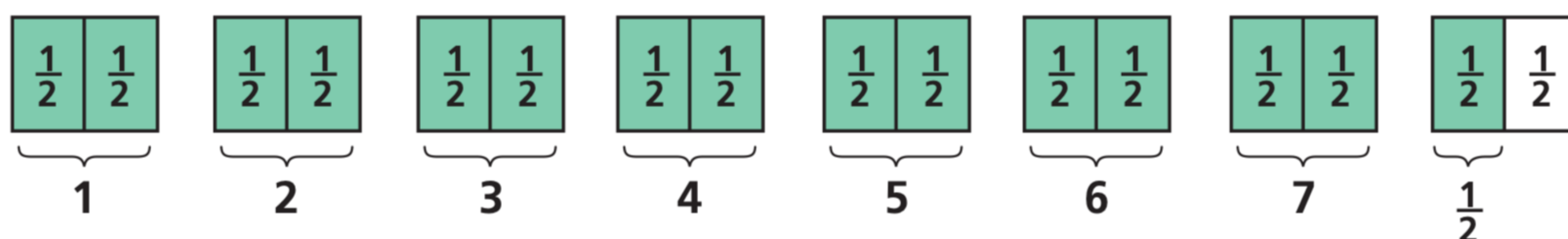
When the numerator is less than the denominator, the fraction is called a **proper fraction**.

Astronomy Application

The longest total solar eclipse in the next 200 years will take place in 2186. It will last about $\frac{15}{2}$ minutes. Write $\frac{15}{2}$ as a mixed number.

Method 1: Use a model.

Draw squares divided into half sections. Shade 15 of the half sections.



There are 7 whole squares and 1 half square, or $7\frac{1}{2}$ squares, shaded.

Improper and Proper Fractions

Improper Fractions

- Numerator equals denominator \rightarrow fraction is equal to 1 $\frac{3}{3} = 1$ $\frac{102}{102} = 1$
- Numerator greater than denominator \rightarrow fraction is greater than 1 $\frac{9}{5} > 1$ $\frac{13}{1} > 1$

Proper Fractions

- Numerator less than denominator \rightarrow fraction is less than 1 $\frac{2}{5} < 1$ $\frac{102}{351} < 1$

Method 2: Use division.

$$\begin{array}{r} 7\frac{1}{2} \\ 2 \overline{)15} \\ -14 \\ \hline 1 \end{array}$$

Divide the numerator by the denominator.

To form the fraction part of the quotient, use the remainder as the numerator and the divisor as the denominator.

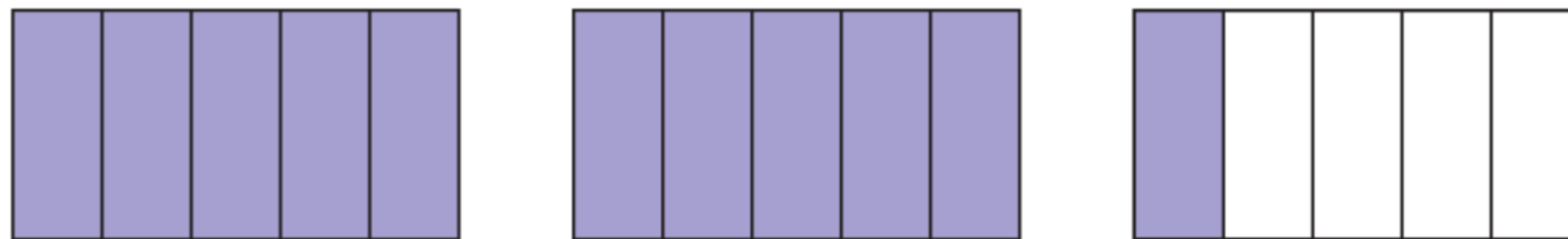
The 2186 eclipse will last about $7\frac{1}{2}$ minutes.

Mixed numbers can be written as improper fractions.

Write $2\frac{1}{5}$ as an improper fraction.

Method 1: Use a model.

You can draw a diagram to illustrate the whole and fractional parts.



There are 11 fifths, or $\frac{11}{5}$. *Count the fifths in the diagram.*

Method 2: Use multiplication and addition.

When you are changing a mixed number to an improper fraction, spiral clockwise as shown in the picture. The order of operations will help you remember to multiply before you add.

Then add.



$$\begin{aligned} 2\frac{1}{5} &= \frac{(5 \cdot 2) + 1}{5} \\ &= \frac{10 + 1}{5} \\ &= \frac{11}{5} \end{aligned}$$

Multiply the whole number by the denominator and add the numerator. Keep the same denominator.

First multiply.

QUIZ

Find two equivalent fractions for each fraction.

1. $\frac{4}{6}$

2. $\frac{3}{12}$

3. $\frac{3}{6}$

4. $\frac{6}{16}$

Find the missing numbers that make the fractions equivalent.

5. $\frac{2}{5} = \frac{10}{\square}$

6. $\frac{7}{21} = \frac{1}{\square}$

7. $\frac{3}{4} = \frac{\square}{28}$

8. $\frac{8}{12} = \frac{\square}{3}$

Write each fraction in simplest form.

9. $\frac{2}{10}$

10. $\frac{6}{18}$

11. $\frac{4}{16}$

12. $\frac{9}{15}$

Write each decimal as a fraction or mixed number.

1. 0.15

2. 1.25

3. 0.43

4. 2.6

Write each fraction or mixed number as a decimal.

5. $\frac{2}{5}$

6. $2\frac{7}{8}$

7. $\frac{1}{8}$

8. $4\frac{1}{10}$

1. The fifth largest meteorite found in the United States is named the Navajo. The Navajo weighs $\frac{12}{5}$ tons. Write $\frac{12}{5}$ as a mixed number.

Write each mixed number as an improper fraction.

2. $1\frac{1}{4}$

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

4. $1\frac{2}{7}$

5. $2\frac{2}{5}$

6. **Astronomy** Saturn is the sixth planet from the Sun. It takes Saturn $\frac{59}{2}$ years to revolve around the Sun. Write $\frac{59}{2}$ as a mixed number.
7. **Astronomy** Pluto has low surface gravity. A person who weighs 143 pounds on Earth weighs $\frac{43}{5}$ pounds on Pluto. Write $\frac{43}{5}$ as a mixed number.

WORKS CITED



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Mathematics

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