

2.1 Comparing Fractions

GOAL

Compare and order fractions using benchmarks and equivalent fractions.

1. Multiply the numerator and denominator by the same number to get equivalent fractions. The first one is done for you.

a) $\frac{3}{8} \times \frac{2}{2} = \frac{6}{16}$

c) $\frac{9}{11} \times \frac{\square}{\square} = \frac{\square}{\square}$

b) $\frac{4}{7} \times \frac{\square}{\square} = \frac{\square}{\square}$

d) $\frac{5}{6} \times \frac{\square}{\square} = \frac{\square}{\square}$

2. Divide the numerator and denominator by the same number to rewrite the fraction in lowest terms. The first one is done for you.

a) $\frac{9}{12} \div \frac{3}{3} = \frac{3}{4}$

c) $\frac{20}{25} \div \frac{\square}{\square} = \frac{\square}{\square}$

b) $\frac{8}{24} \div \frac{\square}{\square} = \frac{\square}{\square}$

d) $\frac{12}{26} \div \frac{\square}{\square} = \frac{\square}{\square}$

3. Write each fraction with a common denominator of 24.

a) $\frac{1}{6} = \frac{\square}{\square}$

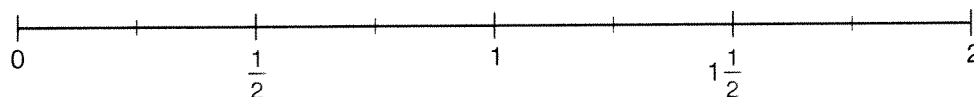
b) $\frac{3}{12} = \frac{\square}{\square}$

c) $\frac{3}{8} = \frac{\square}{\square}$

d) $\frac{4}{6} = \frac{\square}{\square}$

4. Arrange the fractions from question 3 in order from least to greatest.

5. a) Estimate to place each fraction on the number line: $1\frac{2}{3}$, $\frac{10}{5}$, $\frac{3}{8}$, $\frac{6}{4}$, $\frac{4}{6}$.



- b) List the fractions in order from least to greatest.

At-Home Help

Equivalent fractions are fractions that are equal in value. For example, $\frac{1}{2}$ and $\frac{2}{4}$ are equivalent fractions.

The **lowest term** of a fraction is an equivalent fraction with a numerator and denominator that have no common factors other than 1.

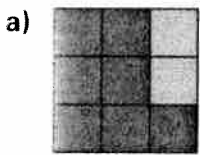
For example, rewriting $\frac{12}{16}$ in lowest terms gives you $\frac{3}{4}$, since $\frac{3}{4} = \frac{12}{16}$ and 3 and 4 have no common factors other than 1.

2.2 Exploring Adding and Subtracting Fractions with the Same Denominator

GOAL

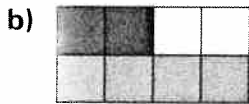
Describe fraction addition and subtraction models with equations.

1. Write a fraction addition sentence and a fraction subtraction sentence for each grid.



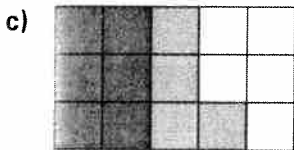
$$\underline{\quad} + \underline{\quad} = \underline{\quad}$$

$$\underline{\quad} - \underline{\quad} = \underline{\quad}$$



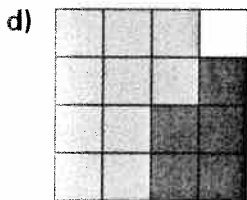
$$\underline{\quad} + \underline{\quad} = \underline{\quad}$$

$$\underline{\quad} - \underline{\quad} = \underline{\quad}$$



$$\underline{\quad} + \underline{\quad} = \underline{\quad}$$

$$\underline{\quad} - \underline{\quad} = \underline{\quad}$$



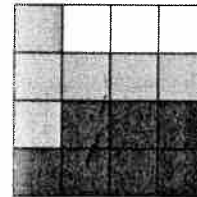
$$\underline{\quad} + \underline{\quad} = \underline{\quad}$$

$$\underline{\quad} - \underline{\quad} = \underline{\quad}$$

At-Home Help

You can use a grid to help you add and subtract fractions.

For example,



This grid has 16 squares.

7 squares are shaded darkly to represent $\frac{7}{16}$.

6 squares are shaded lightly to represent $\frac{6}{16}$.

This grid shows that

$$\frac{7}{16} + \frac{6}{16} = \frac{13}{16}$$

It also shows that

$$\frac{13}{16} - \frac{7}{16} = \frac{6}{16}$$

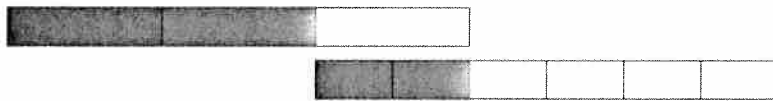
2.3 Adding Fractions with Fraction Strips

GOAL

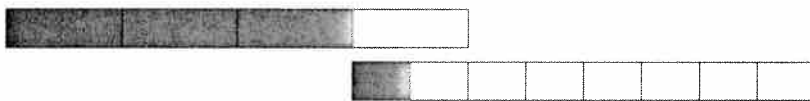
Add fractions less than 1 using fraction strips.

1. Write the addition sentence modelled by each set of fraction strips.

a) _____ + _____



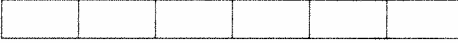


b) _____ + _____

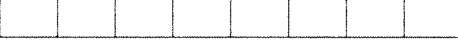


2. Calculate. Use the fraction strips.

a) $\frac{2}{3} + \frac{1}{3} =$ _____ 

b) $\frac{1}{2} + \frac{2}{6} =$ _____ 



c) $\frac{3}{4} + \frac{1}{8} =$ _____ 



3. Denis had $\frac{4}{5}$ of a can of white paint, and $\frac{1}{6}$ of a can of cream paint. He combined the two cans. Jacob told Denis, "I think you have about $\frac{29}{30}$ of a can of paint now."

Do you agree with Jacob's estimate? Explain why or why not.

At-Home Help

Fraction strips can help you add fractions with different denominators. Each fraction strip is the same length. Each fraction strip is divided into equal parts.

For example, calculate $\frac{1}{3} + \frac{1}{4}$.



$$\frac{1}{3} + \frac{1}{4} = \frac{7}{12}$$

2.4 Subtracting Fractions with Fraction Strips

GOAL

Subtract fractions less than 1 using fraction strips.

1. Calculate. Use the fraction strips.

a) $\frac{2}{3} - \frac{1}{3} =$ _____

b) $\frac{3}{4} - \frac{3}{8} =$ _____

2. Calculate.

a) $\frac{5}{6} - \frac{2}{6}$

d) $\frac{5}{3} + \frac{2}{6}$

b) $\frac{5}{4} + \frac{1}{2}$

e) $\frac{4}{5} - \frac{2}{10}$

c) $\frac{9}{10} - \frac{4}{5}$

f) $\frac{8}{6} - \frac{2}{3}$

3. Rosa read $\frac{3}{10}$ of her book on Monday and $\frac{1}{5}$ of her book on Tuesday.

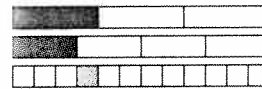
a) How much of her book has Rosa read?

b) What fraction of the book is left to read?

At-Home Help

You can also use fraction strips to subtract fractions.

For example, calculate $\frac{1}{3} - \frac{1}{4}$.



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

2.5 Exploring Fraction Addition on Grids

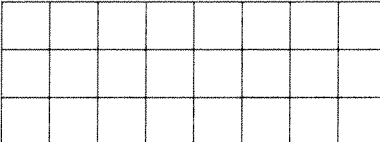
GOAL

Add fractions with grids and counters.

You will need grid paper and pennies or dimes to use as counters.

1. Calculate. Record your answers on the grids.

a) $\frac{1}{5} + \frac{1}{2} =$ _____ 

b) $\frac{1}{3} + \frac{1}{8} =$ _____ 

c) $\frac{5}{8} + \frac{1}{4} =$ _____ 

d) $\frac{2}{3} + \frac{2}{6} =$ _____ 

2. Calculate. Use grids and counters. Sketch your answer.

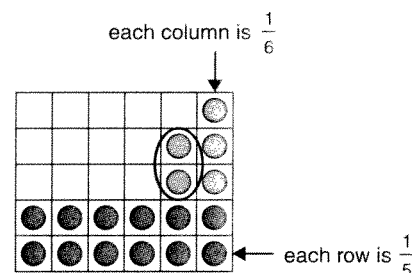
a) $\frac{2}{5} + \frac{2}{8} =$ _____ c) $\frac{2}{5} + \frac{3}{6} =$ _____

b) $\frac{3}{8} + \frac{1}{6} =$ _____ d) $\frac{3}{4} + \frac{2}{8} =$ _____

At-Home Help

You can use grids and counters to help you add fractions with different denominators.

For example, calculate $\frac{2}{5} + \frac{1}{6}$.



First, I placed counters in two rows to represent $\frac{2}{5}$.

Then, I placed counters in one column to represent $\frac{1}{6}$. Since the column overlapped the row, I moved the two overlapping counters to another place in the grid (circled).

I counted all the counters to find the sum of 17. Since there are 30 spaces in the grid, the answer is $\frac{17}{30}$.

$$\frac{2}{5} + \frac{1}{6} = \frac{17}{30}$$

2.6 Subtracting Fractions with Grids

GOAL

Subtract fractions concretely.

You will need grid paper and pennies or dimes to use as counters.

1. Calculate. Use grids and counters. Record your answers.

a) $\frac{5}{6} - \frac{2}{4} = \underline{\hspace{2cm}}$

d) $\frac{3}{4} - \frac{3}{5} = \underline{\hspace{2cm}}$

b) $\frac{7}{8} - \frac{1}{2} = \underline{\hspace{2cm}}$

e) $\frac{6}{9} - \frac{2}{3} = \underline{\hspace{2cm}}$

c) $\frac{3}{4} - \frac{5}{8} = \underline{\hspace{2cm}}$

f) $\frac{7}{8} - \frac{3}{5} = \underline{\hspace{2cm}}$

2. Oshana made cookies, and ate $\frac{2}{5}$ of them over several days. Ryan ate another $\frac{1}{6}$ of them.

a) What fraction of cookies were eaten?

b) What fraction of cookies were left?

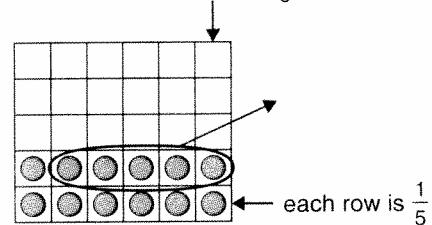
3. During a sale, a music store sold $\frac{7}{8}$ of its CDs. The next day, customers brought back some CDs. The store ended up with $\frac{7}{24}$ of its original CDs. What fraction of the CDs did the store actually sell?

At-Home Help

You can use grids to help you subtract fractions with different denominators.

For example, calculate $\frac{2}{5} - \frac{1}{6}$.

each column is $\frac{1}{6}$



First, I placed counters on two rows to represent $\frac{2}{5}$.

I need to subtract one column to represent $\frac{1}{6}$. There are five counters in one column, so I took away five counters (circled on the grid).

There are seven counters left, out of 30 spaces in total.

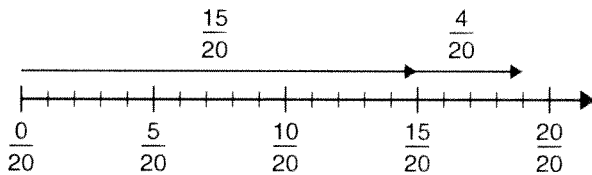
$$\frac{2}{5} - \frac{1}{6} = \frac{7}{30}$$

2.7 Adding and Subtracting Fractions with Number Lines

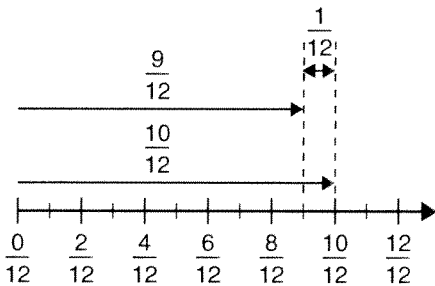
GOAL

Add and subtract fractions using a pictorial model.

1. a) What fraction addition is shown by this number line?



- b) What fraction subtraction is shown by this number line?



At-Home Help

You can use number lines to help you add and subtract fractions.

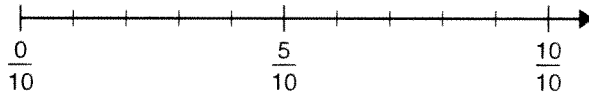
- To add fractions using a number line, rename the fractions being added so that they share a common denominator. Then, model the fractions on a common number line. (See question 1a) for an example.)
- To subtract fractions using a number line, rename the fractions being subtracted so that they share a common denominator. Model the first fraction on the number line, and then subtract the second. (See question 1b) for an example.)

2. Calculate. Use the number line.

a) $\frac{2}{3} + \frac{1}{4} =$ _____



b) $\frac{9}{10} - \frac{3}{5} =$ _____



3. Calculate. Use the blank number line.

a) $\frac{5}{6} + \frac{8}{12} =$ _____

c) $\frac{7}{9} - \frac{1}{3} =$ _____

b) $\frac{2}{5} + \frac{2}{8} =$ _____

d) $\frac{5}{6} - \frac{1}{12} =$ _____



2.8 Exploring Fraction Patterns

GOAL

Investigate fraction patterns that involve addition and subtraction.

1. Describe each addition pattern.

a) $\frac{1}{1} + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}$

b) $\frac{1}{2} + \frac{2}{4} + \frac{3}{6} + \frac{4}{8} + \frac{5}{10}$

c) $\frac{2}{3} + \frac{2}{9} + \frac{2}{27} + \frac{2}{81}$

At-Home Help

When describing a fraction pattern, look at the pattern made by the numerators, and then look at the pattern made by the denominators. Describe both patterns, even if one of them does not change.

For example, describe this pattern:

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

The numerator is always 1.

The denominator starts at 1 and increases by 2 each time.

2. Describe each subtraction pattern.

a) $\frac{1}{3} - \frac{1}{9} - \frac{1}{27} - \frac{1}{81}$

b) $\frac{1}{2} - \frac{1}{3} - \frac{1}{4} - \frac{1}{5} - \frac{1}{6}$

c) $\frac{1}{2} - \frac{1}{6} - \frac{1}{18} - \frac{1}{54}$

3. Continue each pattern.

a) $\frac{1}{2} - \frac{1}{4} - \frac{1}{8} - \underline{\hspace{1cm}} - \underline{\hspace{1cm}} - \underline{\hspace{1cm}}$

b) $\frac{1}{3} + \frac{1}{6} + \frac{1}{9} + \underline{\hspace{1cm}} + \underline{\hspace{1cm}} + \underline{\hspace{1cm}}$

c) $1 - \frac{1}{2} - \frac{1}{3} - \frac{1}{4} - \underline{\hspace{1cm}} - \underline{\hspace{1cm}} - \underline{\hspace{1cm}}$

2.9 Adding and Subtracting Fractions

GOAL

Add and subtract fractions less than 1 symbolically.

1. Identify a common denominator for each set of fractions.

a) $\frac{4}{5}$ and $\frac{8}{10}$ _____

d) $\frac{4}{10}$ and $\frac{6}{8}$ _____

b) $\frac{3}{4}$ and $\frac{1}{6}$ _____

e) $\frac{3}{5}$ and $\frac{4}{6}$ _____

c) $\frac{4}{6}$ and $\frac{7}{8}$ _____

f) $\frac{9}{12}$ and $\frac{5}{8}$ _____

2. Calculate

a) $\frac{5}{6} + \frac{4}{12}$

d) $\frac{7}{9} + \frac{1}{3}$

b) $\frac{4}{5} + \frac{3}{8}$

e) $\frac{3}{6} + \frac{4}{12}$

c) $\frac{4}{18} + \frac{1}{6}$

f) $\frac{2}{4} + \frac{3}{8}$

3. Calculate.

a) $\frac{5}{6} - \frac{2}{12}$

d) $\frac{8}{9} - \frac{2}{3}$

b) $\frac{4}{5} - \frac{2}{8}$

e) $\frac{7}{6} - \frac{2}{3}$

c) $\frac{13}{18} - \frac{3}{6}$

f) $\frac{7}{8} - \frac{1}{3}$

4. In a class, $\frac{11}{16}$ of the students prefer hot dogs to pizza. $\frac{1}{8}$ of the students prefer pizza to hot dogs. Nestor calculated that $\frac{9}{16}$ more of the class prefers hot dogs to pizza. Jessica calculated that $\frac{18}{32}$ more of the class prefers hot dogs to pizza. Are both students correct? How do you know?

At-Home Help

Follow these steps to add and subtract fractions without using a model:

Step 1: Identify the common denominator.

Step 2: Rename each fraction as an equivalent fraction with the common denominator.

Step 3: Add or subtract the fractions.

For example, calculate $\frac{2}{5} + \frac{1}{3}$.

The common denominator is 15.

$$\frac{2}{5} = \frac{6}{15}, \text{ and } \frac{1}{3} = \frac{5}{15}.$$

$$\frac{6}{15} + \frac{5}{15} = \frac{11}{15}$$

2.10 Adding and Subtracting Mixed Numbers

GOAL

Solve problems by adding or subtracting mixed numbers and fractions.

1. Calculate.

a) $3\frac{2}{5} + 6\frac{1}{5}$

d) $5\frac{3}{9} + 2\frac{1}{3}$

b) $4\frac{2}{5} + \frac{1}{10}$

e) $7\frac{5}{6} + 3\frac{1}{18}$

c) $2\frac{3}{12} + 2\frac{3}{6}$

f) $5\frac{3}{4} + 7\frac{2}{6}$

2. Calculate.

a) $3 - 1\frac{8}{12}$

d) $5\frac{7}{9} - 2\frac{1}{3}$

b) $5 - \frac{2}{8}$

e) $4\frac{5}{6} - 1\frac{1}{12}$

c) $2\frac{5}{8} - 1\frac{1}{8}$

f) $3\frac{3}{4} - \frac{12}{9}$

3. Gail competed in a triathlon.

She completed the swim in $\frac{1}{2}$ h.

She completed the run in $\frac{1}{8}$ h.

She completed the cycling in $1\frac{1}{6}$ h.

a) How much longer did it take Gail to complete the swim than the run?

b) How long did it take Gail to complete the triathlon?

At-Home Help

- When adding mixed numbers, you can add the whole numbers and the fractions separately.

For example, $1\frac{1}{3} + 2\frac{1}{4}$ is the same as $(1 + 2)$ plus

$(\frac{1}{3} + \frac{1}{4})$. The sum is 3 plus

$\frac{4}{12} + \frac{3}{12}$, or $3\frac{7}{12}$.

- When subtracting a mixed number from a whole number, ask, "How much do I need to add to the mixed number to get to the whole number?"

For example, calculate $4 - 2\frac{1}{3}$.

I need to add $\frac{2}{3}$ and 1 to the mixed number to get to 4.

So, the difference is $1\frac{2}{3}$.

2.11 Communicate about Estimation Strategies

GOAL

Explain how to estimate sums and differences of fractions and mixed numbers.

1. The dance-a-thon at the school is 8 h long. So far, Jacob has danced for $5\frac{5}{6}$ h. Nick says that Jacob has about 3 h left to dance. Is Nick correct? Explain your answer.
2. Ryan has $1\frac{2}{3}$ cups of flour. Oshana has $1\frac{4}{5}$ cups of flour. Do they have enough flour to bake a cake that needs about 3 cups of flour? Explain your answer.
3. Sarah finished $\frac{3}{5}$ of her homework. Denis finished $\frac{11}{15}$ of his homework. Which person finished more of his or her homework? Use a model to solve the problem, and then explain your model and your answer.

At-Home | *Help*

Communication Checklist

- Did you show all the necessary steps?
- Were your steps clear?
- Did you include words to describe your model, as well as pictures?
- Did your words support your use of the models?