Pre-Algebra Workbook Solutions

Fractions

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FRACTIONS

■ 1. What is the denominator of the fraction $3/5$?

Solution:

5

■ 2. How would we write $40\,\%$ as a fraction?

Solution:

Percents are always expressed with a denominator of 100, so we'd write $40\,\%$ as

$$\frac{40}{100}$$

■ 3. How would we write $75\,\%$ as a fraction?

Solution:

Percents are always expressed with a denominator of 100, so we'd write $75\,\%$ as

$$\frac{75}{100}$$

■ 4. If a pizza is cut into 6 equal pieces and Ben eats 2 of them, what fraction of the pizza did Ben eat?

Solution:

Because Ben ate 2 of the 6 total pieces, he ate $2/6$ of the pizza.

■ 5. Hazel is cleaning out her closet. She has 8 sweaters and 2 of them are blue. What fraction of her sweaters are blue?

Solution:

Because 2 of her 8 sweaters are blue, the fraction of Hazel's sweaters that are blue is

$$\frac{2}{8}$$

■ 6. Joey cuts a pie into 10 equal slices and eats 1 slice. What fraction of the pie did he eat?

Solution:

Because Joey ate 1 of the 10 total slices, he ate $1/10$ of the pizza.

SIMPLIFYING FRACTIONS AND EQUIVALENT FRACTIONS

■ 1. Write $20/50$ as a simplified fraction.

Solution:

The greatest common factor of the numerator and denominator is 10, so we'll divide both the numerator and denominator by 10.

$$\frac{20 \div 10}{50 \div 10} = \frac{2}{5}$$

■ 2. Write the fraction $4/5$ in terms of 20ths.

Solution:

We have to multiply the denominator 5 by 4 in order to get 20, which means we'll multiply the fraction by $4/4$.

$$\frac{4}{5} \cdot \frac{4}{4} = \frac{4 \cdot 4}{5 \cdot 4} = \frac{16}{20}$$

■ 3. Write $110/154$ as a simplified fraction.

Solution:

It might be a difficult to quickly see the greatest common factor of 110 and 154, but we know both the numerator and denominator are even, so let's start by dividing both of them by 2.

$$\frac{110 \div 2}{154 \div 2} = \frac{55}{77}$$

From here, it's easier to see that the greatest common factor of 55 and 77 is 11, so we'll divide both the numerator and denominator by 11.

$$\frac{55 \div 11}{77 \div 11} = \frac{5}{7}$$

■ 4. Are the fractions $3/15$ and $6/36$ equivalent?

Solution:

No. To see if fractions are equivalent, both fractions need to be simplified. The fraction $3/15$ simplifies to $1/5$, and $6/36$ simplifies to $1/6$. Since they simplify to different fractions, the original fractions are not equivalent.

■ 5. Are the fractions $2/16$ and $4/32$ equivalent?

Solution:

Yes. To see if fractions are equivalent, both fractions need to be simplified. The fraction $2/16$ simplifies to $1/8$, and the fraction $4/32$ simplifies to $1/8$. Since they both simplify to the same fractions, the original fractions are equivalent.

■ 6. When using prime factorization to reduce fractions, we're looking for the numbers in the numerator and denominator that are the _____ prime number.

Solution:

same

DIVISION OF ZERO

■ 1. The fraction $0/7$ means _____ divided by _____.

Solution:

0, 7

■ 2. The number _____ can never be the denominator of a fraction.

Solution:

0

■ 3. The fraction $0/8$ has a value of _____.

Solution:

0

■ 4. True or false? $5/0$ has a value of 0.

Solution:

False. It's impossible to divide by 0, so $5/0$ isn't 0, it's undefined.

■ 5. Complete the statement.

$6 \cdot 0 = 0$ and $0 \div 6 =$ _____.

Solution:

0

■ 6. Complete the statement of why we can't divide by 0.

$7 \div 0$ means that that something times 0 has a value equal to 7. But there's nothing times 0 that will ever equal 7 because anything times 0 will always equal _____. Therefore, it's impossible to divide by 0.

Solution:

0

ADDING AND SUBTRACTING FRACTIONS

■ 1. When we add or subtract fractions, we'll add or subtract the _____ and the _____ will stay the same.

Solution:

numerators, denominators

■ 2. Find the sum.

$$\frac{1}{9}+\frac{3}{9}$$

Solution:

Because the fractions have the same denominator, we can add them directly by adding the numerators, while keeping the denominator the same.

$$\frac{1}{9}+\frac{3}{9}=\frac{1+3}{9}=\frac{4}{9}$$

■ 3. Find the difference.

$$\frac{7}{12} - \frac{2}{6}$$

Solution:

We need to make the denominators equivalent, which we can do by multiplying the second fraction by $2/2$.

$$\frac{7}{12} - \frac{2}{6}\left(\frac{2}{2}\right)$$

$$\frac{7}{12} - \frac{4}{12}$$

Now that the fractions have the same denominator, we can add them directly by adding the numerators, while keeping the denominator the same.

$$\frac{7}{12} - \frac{4}{12} = \frac{7-4}{12} = \frac{3}{12}$$

Because the numerator and denominator have a common factor of 3, we'll divide both the numerator and denominator of this result by 3 in order to simplify the fraction.

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

■ 4. Find the sum.

$$\frac{1}{16}+\frac{3}{4}+\frac{5}{8}$$

Solution:

We need to make the denominators equivalent, which we can do by multiplying the second fraction by $4/4$ and the third fraction by $2/2$.

$$\frac{1}{16}+\frac{3}{4}\left(\frac{4}{4}\right)+\frac{5}{8}\left(\frac{2}{2}\right)$$

$$\frac{1}{16}+\frac{12}{16}+\frac{10}{16}$$

Now that the fractions have the same denominator, we can add them directly by adding the numerators, while keeping the denominator the same.

$$\frac{1+12+10}{16}$$

$$\frac{23}{16}$$

5. Simplify the expression.

$$\frac{7}{10}-\frac{1}{10}+\frac{2}{5}$$

Solution:

We need to make the denominators equivalent, which we can do by multiplying the third fraction by $2/2$.

$$\frac{7}{10}-\frac{1}{10}+\frac{2}{5}\left(\frac{2}{2}\right)$$

$$\frac{7}{10}-\frac{1}{10}+\frac{4}{10}$$

Now that the fractions have the same denominator, we can combine them directly by combining the numerators, while keeping the denominator the same.

$$\frac{7-1+4}{10}$$

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

$$1$$

6. Simplify the expression.

$$\frac{2}{15}+\frac{1}{5}-\frac{1}{30}$$

Solution:

We need to make the denominators equivalent, which we can do by multiplying the first fraction by $2/2$ and the second fraction by $6/6$.

$$\frac{2}{15}\left(\frac{2}{2}\right)+\frac{1}{5}\left(\frac{6}{6}\right)-\frac{1}{30}$$

$$\frac{4}{30}+\frac{6}{30}-\frac{1}{30}$$

Now that the fractions have the same denominator, we can combine them directly by combining the numerators, while keeping the denominator the same.

$$\frac{4+6-1}{30}$$

$$\frac{9}{30}$$

$$\frac{3}{10}$$

MULTIPLYING AND DIVIDING FRACTIONS

■ 1. When we're dividing fractions, we need to flip the _____ fraction.

Solution:

second

■ 2. Simplify the expression.

$$\frac{4}{7} \cdot \frac{2}{9}$$

Solution:

To multiply fractions, we multiply the numerators to find the new numerator, and multiply the denominators to find the new denominator.

$$\frac{4 \cdot 2}{7 \cdot 9}$$

$$\frac{8}{63}$$

■ 3. Simplify the expression.

$$\frac{5}{8} \div \frac{1}{12}$$

Solution:

To divide fractions, we start by flipping the second fraction, while changing the division to multiplication.

$$\frac{5}{8} \cdot \frac{12}{1}$$

To multiply fractions, we multiply the numerators to find the new numerator, and multiply the denominators to find the new denominator.

$$\frac{5 \cdot 12}{8 \cdot 1}$$

$$\frac{60}{8}$$

$$\frac{15}{2}$$

■ 4. Simplify the expression.

$$\frac{2}{9} \div \frac{1}{15}$$

Solution:

To divide fractions, we start by flipping the second fraction, while changing the division to multiplication.

$$\frac{2}{9} \cdot \frac{15}{1}$$

To multiply fractions, we multiply the numerators to find the new numerator, and multiply the denominators to find the new denominator.

$$\frac{2 \cdot 15}{9 \cdot 1}$$

$$\frac{30}{9}$$

$$\frac{10}{3}$$

■ 5. Simplify the expression.

$$\frac{1}{10} \cdot \frac{2}{5} \div \frac{1}{4}$$

Solution:

Start by multiplying the first two fractions. To multiply fractions, we multiply the numerators to find the new numerator, and multiply the denominators to find the new denominator.

$$\frac{1 \cdot 2}{10 \cdot 5} \div \frac{1}{4}$$

$$\frac{2}{50} \div \frac{1}{4}$$

To divide fractions, we start by flipping the second fraction, while changing the division to multiplication.

$$\frac{2}{50} \cdot \frac{4}{1}$$

$$\frac{2 \cdot 4}{50 \cdot 1}$$

$$\frac{8}{50}$$

$$\frac{4}{25}$$

■ 6. Simplify the expression.

$$\frac{3}{5} \div \frac{1}{6} \cdot \frac{4}{9}$$

Solution:

Start by dividing the first two fractions. To divide fractions, we start by flipping the second fraction, while changing the division to multiplication.

$$\frac{3}{5} \cdot \frac{6}{1} \cdot \frac{4}{9}$$

To multiply fractions, we multiply the numerators to find the new numerator, and multiply the denominators to find the new denominator.

$$\frac{3 \cdot 6}{5 \cdot 1} \cdot \frac{4}{9}$$

$$\frac{18}{5} \cdot \frac{4}{9}$$

$$\frac{18 \cdot 4}{5 \cdot 9}$$

$$\frac{72}{45}$$

$$\frac{8}{5}$$

SIGNS OF FRACTIONS

■ 1. Is the statement true or false?

$$-\frac{1}{6} \text{ is equivalent to } \frac{-6}{1}.$$

Solution:

The statement is false. The fractions aren't equivalent because we switched the 6 and the 1. Regardless of the signs of the fraction, we can't swap the values in the numerator and denominator and keep the fraction's value the same, unless the values in the numerator and denominator are equal.

■ 2. Is the statement true or false?

$$-\frac{3}{4} \text{ is equivalent to } \frac{3}{-4}.$$

Solution:

The statement is true. We can change exactly two signs of the fraction, and the fraction's value will stay the same. In this case, we changed the sign of the denominator, and the sign of the fraction itself, while keeping

the sign of the numerator the same. Since we changed exactly two signs, the fractions are equivalent.

■ 3. Simplify the expression.

$$\frac{2}{11} \cdot -\frac{1}{4}$$

Solution:

To multiply fractions, we multiply the numerators to find the new numerator, and we multiply the denominators to find the new denominator. The negative sign on the second fraction can remain out in front of the result.

$$-\frac{2 \cdot 1}{11 \cdot 4}$$

$$-\frac{2}{44}$$

$$-\frac{1}{22}$$

■ 4. Simplify the expression.

$$-\frac{3}{20} \cdot -\frac{2}{13}$$

Solution:

To multiply fractions, we multiply the numerators to find the new numerator, and we multiply the denominators to find the new denominator. The negative signs on the two fractions will cancel each other out.

$$\frac{3 \cdot 2}{20 \cdot 13}$$

$$\frac{6}{260}$$

$$\frac{3}{130}$$

■ 5. Simplify the expression.

$$\frac{4}{7} \div -\frac{3}{11}$$

Solution:

To divide fractions, we start by flipping the second fraction, while changing the division to multiplication.

$$\frac{4}{7} \cdot -\frac{11}{3}$$

To multiply fractions, we multiply the numerators to find the new numerator, and we multiply the denominators to find the new denominator. The negative sign on the second fraction can remain out in front of the result.

$$-\frac{4 \cdot 11}{7 \cdot 3}$$

$$-\frac{44}{21}$$

■ 6. If the numerator and the denominator are both negative, the fraction will be _____.

Solution:

positive

RECIPROCALS

■ 1. A reciprocal is what we get when we _____ the fraction.

Solution:

flip, or invert

■ 2. What is the reciprocal of $-1/2$?

Solution:

We change the places of the numerator and denominator to get the reciprocal, $-2/1$. The negative sign doesn't affect the value of the reciprocal. We can then simplify $-2/1$ to just -2.

■ 3. What is the reciprocal of 3?

Solution:

We remember that 3 is the same as $3/1$, and then we change the places of the numerator and denominator to get the reciprocal, $1/3$.

■ 4. What is the reciprocal of $-1/4$?

Solution:

We change the places of the numerator and denominator to get the reciprocal, $-4/1$. The negative sign doesn't affect the value of the reciprocal. We can then simplify $-4/1$ to just -4.

■ 5. The only number that does not have a reciprocal is _____.

Solution:

0. The number 0 doesn't have a reciprocal, since we would find its reciprocal be rewriting 0 as $0/1$, and then changing the places of the numerator and denominator to get $1/0$. But we can't divide by 0, so this reciprocal would be undefined.

■ 6. When we multiply two numbers that are reciprocals of one another, the result is always _____.

Solution:

1. For example, think about the reciprocals $3/4$ and $4/3$. If we multiply them together, we get 1.

$$\frac{3}{4} \cdot \frac{4}{3}$$

$$\frac{3 \cdot 4}{4 \cdot 3}$$

$$\frac{12}{12}$$

$$1$$

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