Pre-Algebra Workbook

NUMBER SETS

■ 1. The number 0 is included in all the number sets except _____ numbers.

■ 2. The numbers 0, 1, 2, 3 are considered _____ numbers.

■ 3. Positive and negative whole numbers are called _____.

■ 4. Fractions and decimals can be considered _____ numbers

■ 5. Given the odd number set $\{1,3,?,7\}$, what is the missing number?

■ 6. The number set $\{2,4,6,8\}$ shows a set of _____ numbers.

■ 7. What is the real number that's halfway between 1 and 2?

■ 8. The number sets that include negative numbers are _____,

_____, _____, and _____ numbers.

IDENTITY NUMBERS

■ 1. Find the sum.

$$4 + 0 =$$

■ 2. Find the product.

$$15 \cdot 1$$

■ 3. The identity number for addition is 0 because when you add 0 to a number the value does _____ change.

■ 4. The _____ number for multiplication is 1 because when you multiply a number by 1, the value does not change.

■ 5. Given the problem $10 + 0 = 10$, the 0 is the identity number for _____.

■ 6. Given the problem $20 \cdot 1 = 20$, the 1 is the identity number for _____.

■ 7. When you add 0 to a number, how would the point move on a number line (move to the left, move to the right, or stay the same)?

■ 8. When you look at the problem $8 \cdot 1 = 8$, this means that there are 8 items in _____ group(s).

OPPOSITE OF A NUMBER

■ 1. What is the opposite of -15?

■ 2. What is the opposite of 22?

■ 3. What is the opposite of $2/3$?

■ 4. Complete the statement.

Opposites are numbers that are equal distance from _____.

■ 5. What is the only number that is its own opposite?

■ 6. Complete the statement.

When looking at a number line, the negative numbers are to the _____ of 0 and the positive numbers are to the _____ of 0.

■ 7. Complete the statement.

We know 5 and -5 are opposite numbers because they are both _____ units away from 0.

■ 8. What is the opposite of -5.3?

ADDING AND SUBTRACTING SIGNED NUMBERS

■ 1. Simplify the expression.

$-4 + 2$

■ 2. Simplify the expression.

$-11 - 8$

■ 3. When you add two negative numbers, you'll always get a _____ number.

■ 4. Simplify the expression.

$-19 - 26$

MULTIPLYING SIGNED NUMBERS

■ 1. Complete the statement.

Multiplying two negative numbers will always result in a _____ number.

■ 2. Complete the statement.

Multiplying a negative and a positive number will always result in a _____ number.

■ 3. Complete the statement.

Multiplying two positive numbers will always result in a _____ number.

■ 4. $12 \cdot -5$

■ 5. $-8 \cdot -6$

■ 6. $-3 \cdot 5$

■ **7.** $25 \cdot 3$

DIVIDING SIGNED NUMBERS

■ 1. Complete the statement.

Dividing a negative number by a positive number will always result in a _____ number.

■ 2. Complete the statement.

Dividing a positive number by a positive number will always result in a _____ number.

■ 3. Complete the statement.

Dividing a negative number by a negative number will always result in a _____ number.

■ 4. Complete the statement.

Dividing a positive number by a negative number will always result in a _____ number.

■ 5. Simplify the expression.

$$-12 \div 2$$

■ 6. Simplify the expression.

$$45 \div 5$$

■ 7. Simplify the expression.

$$-64 \div -8$$

■ 8. Simplify the expression.

$$24 \div -6$$

■ 9. Simplify the expression.

$$-144 \div -12$$

ABSOLUTE VALUE

■ 1. Simplify the expression.

$$|-4|$$

■ 2. Simplify the expression.

$$|75|$$

■ 3. Simplify the expression.

$$|-6-5|$$

■ 4. Simplify the expression.

$$|-6|-|7|$$

■ 5. Simplify the expression.

$$|-5 \cdot 4|$$

■ 6. Simplify the expression.

$$|-5| \cdot |4|$$

■ 7. Simplify the expression.

$$|-11+3| \cdot |-9|$$

■ 8. Simplify the expression.

$$|-8-2| \cdot |-4-3|$$

DIVISIBILITY

■ 1. What are the whole numbers that divide into 49?

■ 2. What are the whole numbers that divide into both 45 and 50?

■ 3. How can you determine if a number is divisible by 5?

■ 4. "Divisibility" of whole numbers means we're looking at numbers that divide into a number _____.

■ 5. What is the smallest whole number that's divisible by both 3 and 5?

■ 6. What is the smallest whole number larger than 20 that can be divisible by 2 and 4?

■ 7. What is the smallest whole number larger than 50 that's divisible by both 3 and 5?

MULTIPLES

■ 1. List the first four multiples of 8.

■ 2. List the first five multiples of 40.

■ 3. Is 8 a multiple of 8? Why or why not?

■ 4. What are two common multiples of 2 and 3?

■ 5. What are two common multiples of 5 and 10?

■ 6. Complete the statement.

30 is a multiple of 5 because $5 \cdot$ _____ $= 30$.

■ 7. Complete the statement.

The concept of multiples is related to the concept of _____.

■ 8. Complete the statement.

56 is a multiple of 8 because $56 \div 8 =$ _____.

PRIME AND COMPOSITE

■ 1. Prime numbers are numbers that are only divisible by _____ and themselves.

■ 2. _____ numbers are numbers that are divisible by numbers other than 1 and themselves.

■ 3. Is 7 a prime or composite number?

■ 4. Is 15 a prime or composite number?

■ 5. 35 is a composite number because it's divisible by which numbers?

■ 6. 98 is a composite number because it's divisible by which numbers?

■ 7. By how many numbers will a prime number be divisible?

■ 8. Complete the statement.

We know that 16 is a composite number because not only is $16 \div 1 = 16$ and $16 \div 16 = 1$, we also know that $16 \div 4 = 4$, $16 \div 2 = 8$, and $16 \div 8 = $ _____.

PRIME FACTORIZATION AND PRODUCT OF PRIMES

■ 1. What is the prime factorization of 75?

■ 2. What is the prime factorization of 55?

■ 3. What is the prime factorization of 148?

■ 4. Fill in the missing value.

The prime factorization of 156 is $2 \cdot 2 \cdot 3 \cdot$ _____.

■ 5. Fill in the missing value.

The prime factorization of 63 is $3 \cdot 3 \cdot$ _____.

■ 6. Prime factorization is when you break down a composite number into its factors until every factor is a _____ number.

LEAST COMMON MULTIPLE

■ 1. Find the least common multiple of 3 and 15.

■ 2. Find the least common multiple of 16 and 40.

■ 3. Find the least common multiple of the set $\{36, 84\}$.

■ 4. Find the least common multiple of 12 and 20.

■ 5. If the prime factorization of one number is $2 \cdot 3 \cdot 5^2$, and the prime factorization of another is $2^3 \cdot 3$, what's the least common multiple of the two numbers?

■ 6. Is there only one possible pair of two numbers that can have a LCM of 20? Give examples to support your answer.

GREATEST COMMON FACTOR

■ 1. The greatest common factor of two numbers is the _____ number that divides evenly into both numbers.

■ 2. Find the greatest common factor of 110 and 48.

■ 3. Find the greatest common factor of 100 and 75.

■ 4. Find the greatest common factor of the set $\{124,\ 256\}$.

■ 5. Find the greatest common factor of the set $\{54,\ 162\}$.

■ 6. If one number has a prime factorization of $3 \cdot 5 \cdot 11$, while another has a prime factorization of $2 \cdot 3^2 \cdot 11^2$, what is their greatest common factor?

■ 7. If one number has a prime factorization of $2^4 \cdot 3 \cdot 11$, while another has a prime factorization of $2^3 \cdot 5$, What is their greatest common factor?

■ 8. Is there only one possible pair of two numbers that can have a GCF of 16? Give examples to support your answer.

FRACTIONS

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

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

■ 3. How would we write 40% as a fraction?

■ 4. How would we write 75% as a fraction?

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

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

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

SIMPLIFYING FRACTIONS AND CANCELLATION

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

■ 2. Write $21/49$ as a simplified fraction.

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

■ 4. A fraction is written with the prime factorizations of the numerator and denominator. Simplify the fraction.

$$\frac{2 \cdot 5 \cdot 7}{2 \cdot 5 \cdot 11}$$

■ 5. A fraction is written with the prime factorizations of the numerator and denominator. Simplify the fraction.

$$\frac{2 \cdot 5 \cdot 11}{3 \cdot 5 \cdot 11}$$

■ 6. Complete the statement.

When using prime factorization to reduce fractions, you're looking for the numbers in the numerator and denominator that are the _____ prime number.
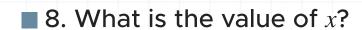
EQUIVALENT FRACTIONS

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

■ 2. Write the fraction 2/3 in terms of 9ths.

■ 3. Write the fraction 1/7 in terms of 49ths.

■ 4. Complete the statement.

Equivalent fractions are fractions that are _____ in value.

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

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

■ 7. Complete the statement.

Whenever the numerator and denominator of a fraction are equal, the fraction simplifies to _____.

■ 8. What is the value of x?

$$\frac{2}{10} = \frac{4}{x}$$

■ 9. What is the value of x?

$$\frac{5}{7} = \frac{x}{35}$$

DIVISION OF ZERO

■ 1. Complete the statement.

The fraction $2/7$ means _____ divided by _____.

■ 2. Complete the statement.

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

■ 3. Complete the statement.

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

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

■ 5. True or false? 10 times 0 has a value of 0.

■ 6. Complete the statement.

$8 \div 2 = 4$, $8 \div 4 = 2$, $2 \cdot 4 = 8$ and $4 \cdot$ _____ $= 8$

■ 7. Complete the statement.

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

■ 8. Complete the statement of why you can't divide by 0.

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

ADDING AND SUBTRACTING FRACTIONS

■ 1. Complete the statement.

When you're adding and subtracting fractions, you first have to find common _____.

■ 2. Complete the statement.

When finding a common denominator, you have to find the _____ of the two numbers.

■ 3. Complete the statement.

When you add or subtract fractions, you'll add or subtract the numerators and the _____ will stay the same.

■ 4. Find the sum.

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

■ 5. Find the sum.

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

■ 6. Find the difference.

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

■ 7. Find the difference.

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

■ 8. Find the sum.

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

■ 9. Simplify the expression.

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

■ 10. Simplify the expression.

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

MULTIPLYING AND DIVIDING FRACTIONS

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

■ 2. Simplify the expression.

$$\frac{3}{5} \cdot \frac{4}{6}$$
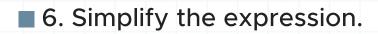
■ 3. Simplify the expression.

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

■ 4. Simplify the expression.

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

■ 5. Simplify the expression.

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

■ 6. Simplify the expression.

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

■ 7. Simplify the expression.

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

SIGNS OF FRACTIONS

■ 1. Every fraction has _____ signs (positive or negative signs).

■ 2. Is the statement true or false?

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

■ 3. Is the statement true or false?

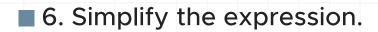$$-\frac{1}{6} \text{ is equivalent to } \frac{-6}{1}.$$

■ 4. Is the statement true or false?

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

■ 5. Simplify the expression.

$$-\frac{2}{7} \cdot \frac{1}{8}$$

■ 6. Simplify the expression.

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

■ 7. Simplify the expression.

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

■ 8. Simplify the expression.

$$-\frac{2}{3} \div \frac{3}{10}$$

■ 9. Simplify the expression.

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

■ 10. Simplify the expression.

$$-\frac{5}{16} \div -\frac{1}{2}$$

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

RECIPROCALS

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

■ 2. What is the reciprocal of $3/4$?

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

■ 4. What is the reciprocal of 3?

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

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

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

■ 8. The reciprocal of a negative fraction is _____.

MIXED NUMBERS AND IMPROPER FRACTIONS

■ 1. Complete the statement.

Improper fractions are fractions where the numerator is
_____ than or equal to the denominator.

■ 2. Complete the statement.

All improper fractions represent a fraction with a value greater than
_____.

■ 3. Complete the statement.

If we're looking at the fraction $8/3$, imagine taking a circle and
dividing it into thirds, there would be _____ of those size
pieces to represent this fraction.

■ 4. Mixed numbers are a representation of what operation (addition,
subtraction, multiplication, division)?

■ 5. Convert $15/4$ into a mixed number.

■ 6. Convert 20/3 into a mixed number.

■ 7. Convert 34/6 into a mixed number.

■ 8. Write 22/7 as a mixed number.

■ 9. Write 135/11 as a mixed number.

■ 10. Write 114/25 as a mixed number.

■ 11. Write the mixed number as an improper fraction.

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

■ 12. Convert the mixed number into an improper fraction.

$$2\frac{1}{6}$$

■ 13. Convert the mixed number into an improper fraction.

$$8\frac{4}{9}$$

■ 14. Convert the mixed number into an improper fraction.

$$5\frac{2}{7}$$

ADDING AND SUBTRACTING MIXED NUMBERS

■ 1. Simplify the expression.

$$2\frac{1}{2} + 3\frac{1}{6}$$

■ 2. Simplify the expression.

$$5\frac{2}{3} + 1\frac{1}{12}$$

■ 3. Simplify the expression.

$$10\frac{3}{7} + 12\frac{1}{8}$$

■ 4. Simplify the expression.

$$8\frac{7}{8} - 2\frac{1}{8}$$

■ 5. Simplify the expression.

$$7\frac{4}{5} - 6\frac{1}{15}$$

■ 6. Simplify the expression.

$$15\frac{1}{2} - 11\frac{1}{4}$$

■ 7. Joey and Alex are both solving the following problem.

$$2\frac{1}{3} + 1\frac{3}{5}$$

Joey takes $2 + 1 = 3$ and then takes

$$\frac{1}{3} + \frac{3}{5} = \frac{14}{15}$$

Then he adds them together to get

$$3\frac{14}{15}$$

Alex decides to change both into improper fractions before adding. He gets

$$2\frac{1}{3} = \frac{7}{3} \text{ and } 1\frac{3}{5} = \frac{8}{5}$$

Then she finds common denominators and adds them together to get

$$\frac{59}{15}$$

Who solved this problem correctly?

■ 8. Simplify the expression.

$$3\frac{2}{5} + \frac{3}{10} - 2\frac{3}{5}$$

MULTIPLYING AND DIVIDING MIXED NUMBERS

■ 1. Complete the statement.

When you multiply and divide mixed numbers, you need to change the mixed numbers into _____ fractions before you do the multiplication or division.

■ 2. Simplify the expression.

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

■ 3. Simplify the expression.

$$3\frac{3}{7} \cdot 1\frac{1}{7}$$

■ 4. Simplify the expression.

$$5\frac{1}{5} \cdot 2\frac{2}{3}$$

■ 5. Simplify the expression.

$$2\frac{3}{4} \div 5\frac{1}{8}$$

■ 6. Simplify the expression.

$$4\frac{5}{9} \div 2\frac{1}{4}$$

■ 7. Simplify the expression.

$$1\frac{4}{5} \div 3\frac{3}{8}$$

RELATIONSHIPS OF NUMBERS

■ 1. Which fraction is larger?

$$\frac{1}{8} \text{ or } \frac{1}{6}$$

■ 2. Which fraction is smaller?

$$\frac{3}{7} \text{ or } \frac{3}{8}$$

■ 3. Find the number that's halfway between -3 and 5.

■ 4. Find the number that's halfway between -5 and 2.

■ 5. Find the fraction halfway between $1/2$ and $2/5$.

■ 6. Find the fraction halfway between $1/10$ and $8/13$.

ADDING MIXED MEASURES

■ 1. Add the mixed measures.

4 seconds, 11 minutes, 3 hours, 35 minutes, 56 minutes, 35 seconds

■ 2. Add the mixed measures.

34 inches, 2 yards, 5 feet, 8 inches, 13 feet, 1 yard

■ 3. Add the mixed measures.

25 seconds, 1 hour, 15 minutes, 45 seconds, 22 minutes

■ 4. Add the mixed measures.

13 inches, 45 feet, 35 inches, 27 feet, 9 yards

■ 5. How many inches are in 5 feet?

■ 6. How many inches are in 2 yards?

■ 7. How much of a yard is 1 foot?

■ 8. How many seconds are in 1 hour?

■ 9. How much of an hour is 1 minute?

■ 10. How many seconds are in 5 minutes?

PLACE VALUE

■ 1. Identify the place value of the 4 in 12.8746.

■ 2. Identify the place value of the 2 in $4{,}562.387$.

■ 3. Identify the place value of the 0 in 307.119.

■ 4. What is the number in the hundredths place of 80.471?

■ 5. What is the number in the ten-thousandths place of $6{,}520.0019$?

■ 6. What is the number in the tenths place of 0.89104?

■ 7. Does "smaller" or "larger" complete the statement?

The further you move to the right of the decimal point, the _____ the value gets.

PLACE VALUE

■ 8. Does "smaller" or "larger" complete the statement?

The further you move to the left of the decimal point, the
_____ the value gets.

DECIMAL ARITHMETIC

■ 1. Find the sum.

$4.5 + 3.75$

■ 2. Find the difference.

$7.87 - 4.9876$

■ 3. Find the product.

$1.5 \cdot 8.8$

■ 4. Find the quotient.

$5.65 \div 0.02$

REPEATING DECIMALS

■ 1. A finite decimal number is a number that _____.

■ 2. Rewrite 0.888888 as a repeating decimal.

■ 3. Rewrite 0.1818181818 as a repeating decimal.

■ 4. Rewrite 1.333333333 as a repeating decimal.

■ 5. What is the next digit in $3.\overline{142857}$?

■ 6. What is the next digit in $0.41\overline{6}$?

■ 7. What is the next digit in $0.\overline{81}$?

■ 8. Name an example of a decimal number that does not end, but does not repeat.

ROUNDING

■ 1. Complete the statement.

If a number is less than _____, you round down.

■ 2. Complete the statement.

If a number is _____ or greater, you round up.

■ 3. Round 0.7865 to the nearest hundredth.

■ 4. Round 11.451 to the nearest tenth.

■ 5. Round 691.014 to the tens place.

■ 6. Round $11.\overline{6}$ to the nearest thousandth.

■ 7. Round $44.\overline{18}$ to the nearest tenth.

■ 8. Round $15.\overline{8}$ to five decimal places.

■ 9. Complete the statement.

When you round a number to the tenths place, look at the digit in the _____ place in order to determine which way to round the number.

■ 10. Complete the statement.

When you round a number to the thousandths place, look at the digit in the _____ place in order to determine which way to round the number.

■ 11. Judith types $2 \div 3$ into the calculator and gets the answer 0.66666666667. Judith tells her friend Andy that this is not a repeating decimal because there is a 7 at the end. Andy disagrees and says the calculator rounds the number and that is why there is a 7. Who is correct? Why?

RATIO AND PROPORTION

■ 1. Solve for the variable.

$$\frac{2}{5} = \frac{x}{20}$$

■ 2. Solve for the variable.

$$\frac{6}{10} = \frac{m}{15}$$

■ 3. Solve for the variable.

$$\frac{d}{7} = \frac{14}{49}$$

■ 4. Solve for the variable.

$$\frac{5}{v} = \frac{25}{40}$$

■ 5. Solve for the variable.

$$\frac{22}{30} = \frac{33}{t}$$

■ 6. Solve for the variable.

$$\frac{8}{12} = \frac{20}{x}$$

■ 7. Complete the statement.

The reason we multiply the left and right side by the same number when we cross multiply is because, when we're solving equations, we must keep both sides _____.

UNIT PRICE

■ 1. Complete the statement.

Unit price means _____ per _____.

■ 2. If we can purchase 2 oranges for $\$0.20$, how many oranges can we purchase for $\$2.00$?

■ 3. If we purchase 2 oranges for $\$0.20$, how much will it cost to purchase 5 oranges?

■ 4. Sally went to the candy store and bought 40 jelly beans for $\$0.50$. How much would 60 jelly beans cost her?

■ 5. Sally went to the candy store and bought 40 jelly beans for $\$0.50$. How many jelly beans can she buy for $\$1$?

■ 6. While Steven is at the grocery store, he's trying to determine which bag of popcorn is the better deal. The first bag is a 10-ounce bag of

popcorn for 1.59. The second bag is a 15-ounce bag of popcorn for 1.89. Which bag is the better deal? Why?

■ 7. Justine is comparing prices to determine where to buy hardwood flooring for her kitchen. The first store charges 15 for 2 square feet of flooring, while the second store charges 40 for 5 square feet of flooring. Which store is offering the better deal? Why?

■ 8. We can purchase 15 pencils for 4. If we want to find the price per pencil, we would divide _____ by _____.

■ 9. We can purchase 15 pencils for 4. If we want to find the number of pencils we can buy per dollar, we would divide _____ by _____.

UNIT MULTIPLIERS

■ 1. When we're setting up a unit multiplier, the units we want to keep need to be placed in the _____ of the fraction.

■ 2. Convert 5 feet into inches.

■ 3. Convert 8 yards to inches.

■ 4. Convert 4 square feet to square inches.

■ 5. Convert 144 square inches to square feet.

■ 6. Convert $4,320$ cubic inches to cubic feet.

■ 7. Jason is converting $4,536$ cubic feet to cubic yards. His work is shown below. Did he solve the problem correctly? Why or why not?

$$4,536 \text{ cubic feet} \cdot \frac{3 \text{ feet}}{1 \text{ yard}} \cdot \frac{3 \text{ feet}}{1 \text{ yard}} \cdot \frac{3 \text{ feet}}{1 \text{ yard}} = 122,472 \text{ cubic yards}$$

EXPONENTS

■ 1. Complete the statement.

An exponent tells you how many times to multiply the base by _____.

■ 2. Is 2^3 the same as 3^2? Why or why not?

■ 3. Find the sum.

$5^3 + 2^4$

■ 4. Write the number using exponents.

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

■ 5. Find the product.

$3^4 \cdot 3^3$

■ 6. Write the following number without an exponent.

1^6

■ 7. Write the number using exponents.

$10 \cdot 10 \cdot 10 \cdot 10 \cdot 10$

■ 8. Write the number without an exponent.

9^6

RULES OF EXPONENTS

■ 1. Find the sum.

$$2x^3 + x^3 + x^3 + 3x^3$$

■ 2. Find the product.

$$x^6 \cdot x^2 \cdot x^3$$

■ 3. Simplify the expression.

$$x \cdot x \cdot x$$

■ 4. Stephanie and Jimmy are trying to find a shortcut to simplify the expression below. Stephanie says that they should add the exponents $(3 + 5 = 8)$ and then raise 4 to that power. Jimmy says that since it's multiplication, they should multiply the exponents $(3 \cdot 5 = 15)$ and then raise 4 to that power. Who is correct and why?

$$4^3 \cdot 4^5$$

POWER RULE FOR EXPONENTS

■ 1. Complete the statement.

The power rule tells us that, when you raise a power to a power, you can _____ those powers together.

■ 2. Simplify the expression.

$(x^3)^3$

■ 3. Simplify the expression.

$(x^2)^{-4}$

■ 4. Simplify the expression.

$(2^m)^p$

QUOTIENT RULE FOR EXPONENTS

■ 1. Simplify the expression.

$$\frac{x^5}{x^6}$$

■ 2. Simplify the expression.

$$\frac{x^{2a}}{x^2}$$

■ 3. Simplify the expression.

$$\frac{(x^{2p})^3}{x^{3p}}$$

■ 4. Simplify the expression.

$$\frac{(x^{3a+4})^2}{x^{4a}}$$

RADICALS

■ 1. Complete the statement.

Radicals are the opposite of _____.

■ 2. $\sqrt{x}$ can also be written as _____.

■ 3. $\sqrt[4]{x}$ can also be written as _____.

■ 4. Find the value of $\sqrt{16}$.

■ 5. Find the value of $\sqrt{36}$.

■ 6. Complete the statement.

$x^{\frac{1}{3}}$ can also be written as _____.

■ 7. Find the value of $\sqrt{300}$.

■ 8. Find the value of $\sqrt{5{,}000}$.

ADDING AND SUBTRACTING RADICALS

■ 1. Find the value of $2\sqrt{3} + 5\sqrt{3}$.

■ 2. Find the value of $\sqrt{32} - \sqrt{2}$.

■ 3. Find the value of $\sqrt{3} + \sqrt{12}$.

■ 4. Find the value of $\sqrt{16} + \sqrt{25}$.

■ 5. Find the value of $4\sqrt{3} + 2\sqrt{2} - 2\sqrt{3} - \sqrt{2}$.

■ 6. Find the value of $3\sqrt{4} - 2\sqrt{9}$.

MULTIPLYING RADICALS

■ 1. Find the value of $\sqrt{20} \cdot \sqrt{4}$.

■ 2. Find the value of $\sqrt{13} \cdot \sqrt{7}$.

■ 3. Find the value of $8\sqrt{3} \cdot \sqrt{12}$.

■ 4. Find the value of $15\sqrt{2} \cdot \sqrt{16}$.

DIVIDING RADICALS

■ 1. Simplify the expression.

$$\sqrt{\frac{36}{6}}$$

■ 2. Simplify the expression.

$$\sqrt{\frac{45}{5}}$$

■ 3. Simplify the expression.

$$\frac{1 + \sqrt{5}}{\sqrt{5}}$$

■ 4. Simplify the expression.

$$\frac{\sqrt{25}}{\sqrt{5}}$$

RADICAL EXPRESSIONS

■ 1. Find the value of $\sqrt{45}$.

■ 2. Find the value of $\sqrt{80} - \sqrt{20}$.

■ 3. Find the value of $5\sqrt{24} \cdot \sqrt{15}$.

■ 4. Complete the statement.

$\sqrt{xy}$ can also be written as _____.

■ 5. Complete the statement.

$\sqrt{\dfrac{m}{n}}$ can also be written as _____.

■ 6. Complete the statement.

The square root of a number multiplied by the square root of the same number is equal to _____.

■ 7. Find the value of $\sqrt{2} + \sqrt{32} - \sqrt{50}$.

■ 8. Complete the statement.

To be able to add or subtract radicals, the roots must be

_____ when they are simplified.

■ 9. Roberta is trying to simplify the following radical expression,

$$\sqrt{4} + \sqrt{20} - 2\sqrt{5} + \sqrt{25}$$

and her work is shown below.

Step 1: $2 + \sqrt{20} - 2\sqrt{5} + 5$

Step 2: $2 + \sqrt{4 \cdot 5} - 2\sqrt{5} + 5$

Step 3: $2 + 4\sqrt{5} - 2\sqrt{5} + 5$

Step 4: $7 + 2\sqrt{5}$

In which step did she make a mistake? What should she have done differently, and what is the correct answer?

POWERS OF 10

■ 1. Complete the statement.

The power of 10 is the same as the number of _____ in the number.

■ 2. Complete the statement.

If you multiply a number by a power of 10, you can count the number of zeroes to know how many spaces to move the _____ to the _____.

■ 3. Find the product.

$45 \cdot 10,000$

■ 4. Complete the statement.

When we divide by a power of 10, we move the decimal point to the _____.

■ 5. Find the quotient.

$6.4 \div 100$

■ 6. Find the product.

3.5×10^4

■ 7. Find the product.

1.8×10^{-2}

■ 8. Find the quotient.

$420 \div 1,000$

SCIENTIFIC NOTATION

■ 1. Complete the statement.

   Scientific notation has 2 parts. The first part is the decimal number and the second part is the _____.

■ 2. Complete the statement.

   The decimal number of a number written in scientific notation must be between 1 and _____.

■ 3. Complete the statement.

   The decimal number in a number in scientific notation can be either positive or _____.

■ 4. Write the number in scientific notation.

   0.000000056

■ 5. Write the number in scientific notation.

   $670,000,000,000$

■ 6. Write the number in scientific notation.

0.00000000000012

■ 7. Write number in expanded form.

7.2×10^{12}

■ 8. Write number in expanded form.

4.9×10^{-7}

MULTIPLYING SCIENTIFIC NOTATION

■ 1. Complete the statement.

When multiplying two numbers in scientific notation, you'll first _____ the two decimal numbers.

■ 2. Complete the statement.

When you multiply two numbers that have the same base, you _____ the exponents.

■ 3. Write the product $(3.1 \times 10^5)(5.5 \times 10^{-7})$ in scientific notation.

■ 4. Write the product $(1.8 \times 10^4)(5.9 \times 10^6)$ in scientific notation.

■ 5. Write the product $(9.1 \times 10^{10})(1.45 \times 10^{-14})$ in scientific notation.

■ 6. Write the product $(8.8 \times 10^{-2})(7.85 \times 10^{-5})$ in scientific notation.

■ 7. Write the product $(1.3 \times 10^3)(2.6 \times 10^{-4})$ in scientific notation.

■ 8. If we're given 4.7×10^6 in scientific notation, will we get a smaller or larger number when we multiply it by a negative power of 10?

■ 9. If we're given 3.6×10^{-2} in scientific notation, will we get a smaller or larger number when we multiply it by a positive power of 10?

■ 10. Yvonne is asked to find the product of two numbers written in scientific notation:

$$(2.8 \times 10^4)(4.46 \times 10^{-6})$$

She solves the problem in three steps.

Step 1 $\qquad$ $2.8 \times 4.46 = 12.488$

Step 2 $\qquad$ $4 + (-6) = -2$

Step 3 $\qquad$ 12.488×10^{-2}

In what step did she make her mistake? What is the correct answer?

DIVIDING SCIENTIFIC NOTATION

■ 1. Complete the statement.

When dividing two numbers in scientific notation, you will first _____ the two decimal numbers.

■ 2. Complete the statement.

When you divide two numbers that have the same base, you _____ the exponents.

■ 3. Find the value of $(2.75 \times 10^4) \div (1.6 \times 10^8)$.

■ 4. Find the value of $(1.5 \times 10^8) \div (2.0 \times 10^{-3})$.

■ 5. Find the value of $(6.75 \times 10^3) \div (1.5 \times 10^9)$.

■ 6. Find the value of $(3.6 \times 10^3) \div (1.6 \times 10^6)$.

■ 7. Find the value of $(2.75 \times 10^{10}) \div (8.0 \times 10^8)$.

■ 8. Find the value of $(7.5 \times 10^4) \div (1.5 \times 10^{-4})$.

■ 9. If we're given 5.75×10^6 in scientific notation and we divide it by a negative power of 10, will we get a larger or smaller result?

MULTIPLYING AND DIVIDING SCIENTIFIC NOTATION

■ 1. Simplify the expression.

$$\frac{(4.5 \times 10^3)(1.4 \times 10^{-5})}{2.8 \times 10^{-1}}$$

■ 2. Simplify the expression.

$$\frac{(7.6 \times 10^5)(1.1 \times 10^{-7})}{5.1 \times 10^{-3}}$$

■ 3. Simplify the expression.

$$\frac{(9.7 \times 10^6)(2.4 \times 10^{-3})}{6.7 \times 10^{-3}}$$

■ 4. Simplify the expression.

$$\frac{(1.7 \times 10^{-3})(3.4 \times 10^{-4})}{(6.3 \times 10^{-3})(7.3 \times 10^{-2})}$$

■ 5. Simplify the expression.

$$\frac{(4.9 \times 10^4)(6.4 \times 10^{-4})}{(8.2 \times 10^{-3})(2 \times 10^3)}$$

■ 6. Simplify the expression.

$$\frac{(6.1 \times 10^6)(6.8 \times 10^{-4})}{(1.1 \times 10^{-5})(1.8 \times 10^5)}$$

■ 7. Complete the statement.

When solving a problem that involves multiplication and division of numbers in scientific notation, you can do _____ first or _____ first.

■ 8. Danny and Deacon are working on finding the quotient below. Danny decides to multiply out the numerator and gets $10,000$ for the powers of 10 portion. Then he divides it by 0.00061 to get $16,393,442.6$ or 1.63934426×10^7. Deacon decides he wants to divide, so he divides each number by 0.00061 and gets $819,672,131$ and 32.78689852. Then he multiplies those numbers to get 2.68745×10^{10}. Why are the answers different? Who is correct?

$$\frac{(5 \times 10^5)(2 \times 10^{-2})}{6.1 \times 10^{-4}}$$

ESTIMATING SCIENTIFIC NOTATION

■ 1. Estimate the value of 9.15×10^4.

■ 2. Estimate the value of 3.65×10^{-5}.

■ 3. Use scientific notation to estimate the value $(5.75 \times 10^6)(2.34 \times 10^{-1})$.

■ 4. Use scientific notation to estimate the value of $(2.456 \times 10^3)(1.67 \times 10^{-7})$.

■ 5. Use scientific notation to estimate the value of the expression.

$$\frac{1.62 \times 10^{-6}}{8.721 \times 10^2}$$

■ 6. Use scientific notation to estimate the value of the expression.

$$\frac{7.152 \times 10^2}{2.91 \times 10^2}$$

■ 7. Use scientific notation to estimate the value of the expression.

$$\frac{(6.2 \times 10^6)(6.4 \times 10^{-3})}{(4.25 \times 10^{-2})(2.9 \times 10^{-3})}$$

■ 8. Use scientific notation to estimate the value of the expression.

$$\frac{(1.7 \times 10^{-5})(2.6 \times 10^2)}{(3.334 \times 10^{-3})(2.5 \times 10^{-1})}$$