

Unit 06: Exponents

Unit Objectives

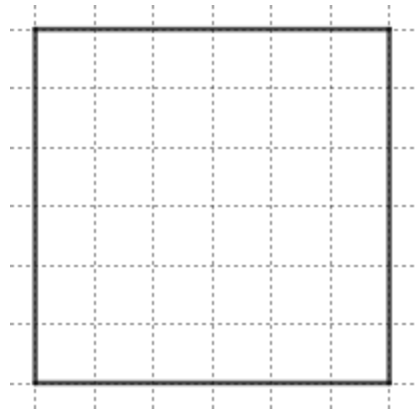
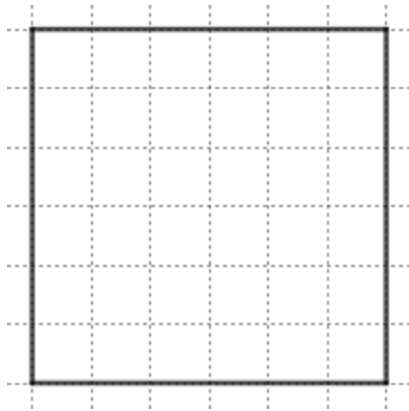
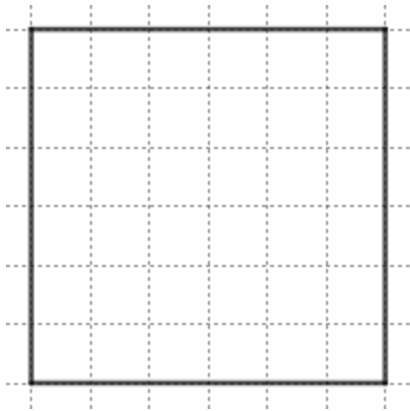
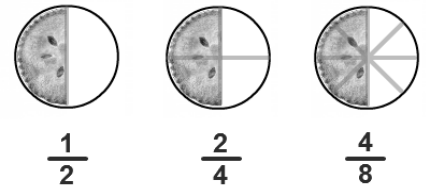
- Know how to simplify or manipulate in any algebraic situation

Unit 06 Lesson 01: Review Simplifying Fractions

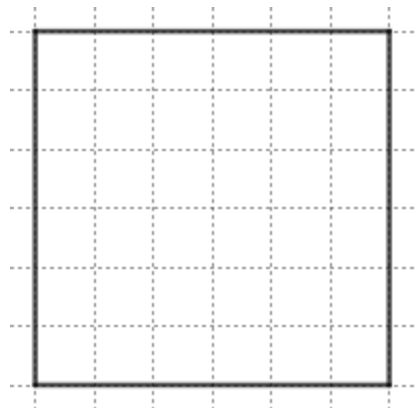
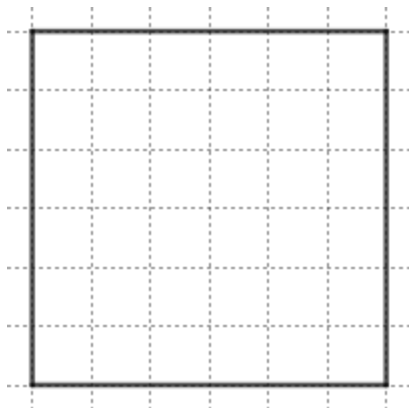
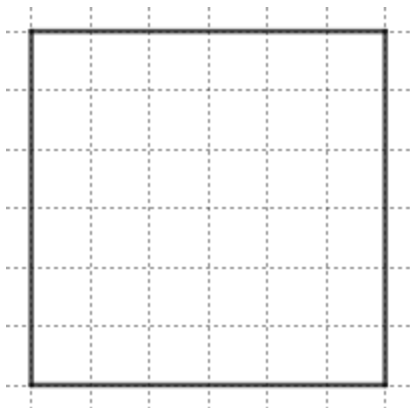
Lesson Objectives

- Express answers in their simplest form
1. Reduce the following fractions using only the factors 2, 3, or 5. Write the factor for each step. Write the new fraction and draw a picture

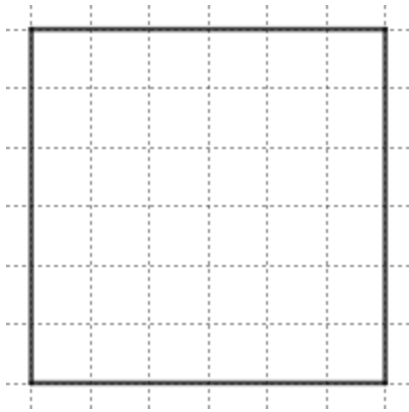
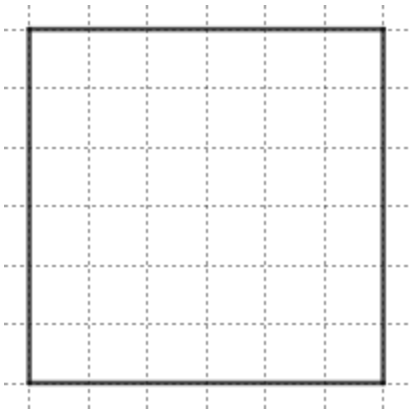
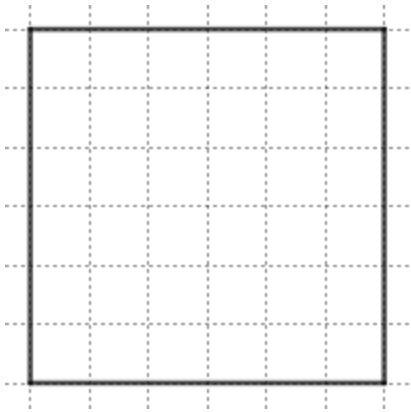
- a. Kyle has $\frac{3}{12}$ of an acre of land



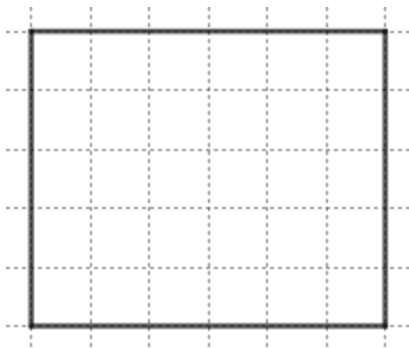
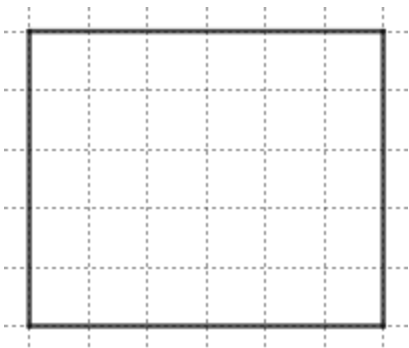
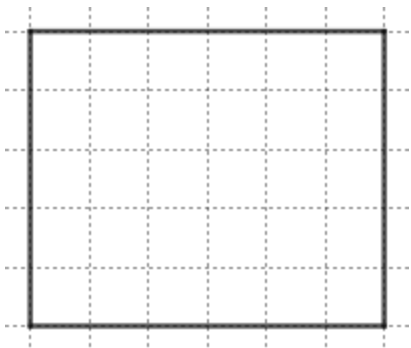
- b. Cenk has $\frac{6}{12}$ gallons of water



c. Ana has $\frac{12}{18}$ pounds of gold



d. Ben has $\frac{20}{30}$ cups of rice



2. Reduce the following fractions to their simplest form. Write the factor for each step.

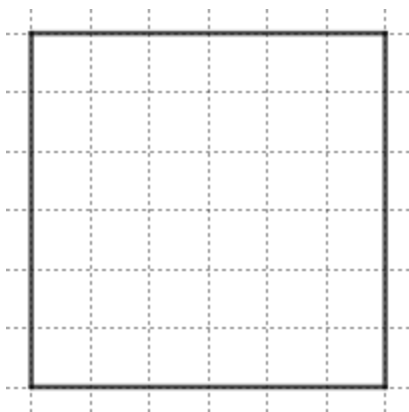
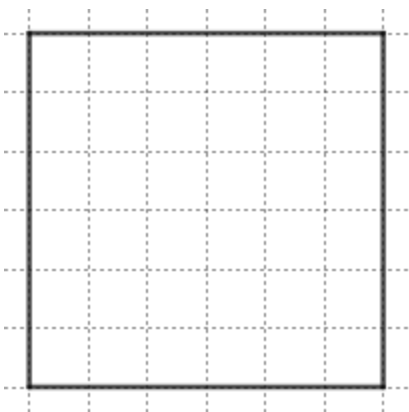
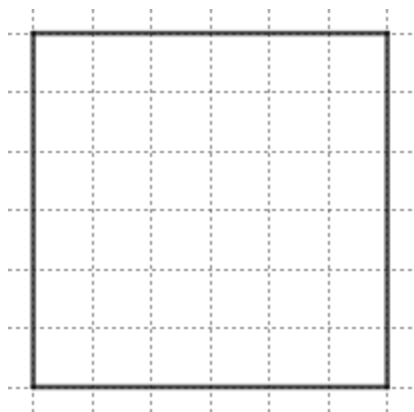
a. $\frac{10}{20}$

b. $\frac{16}{80}$

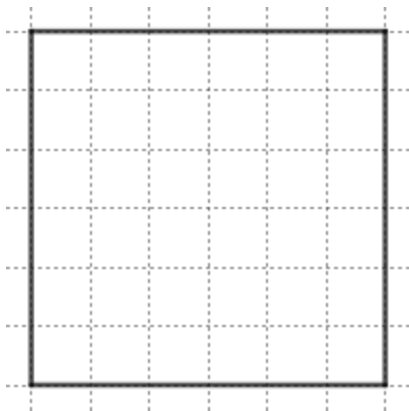
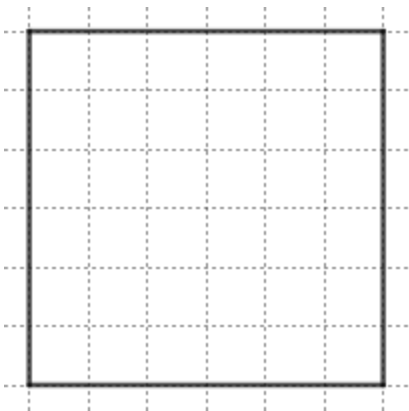
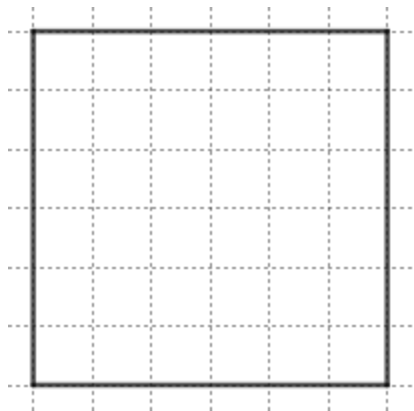
c. $\frac{5}{12}$

3. Reduce the following fractions using only the factors 2, 3, or 5. Write the factor for each step. Write the new fraction and draw a picture

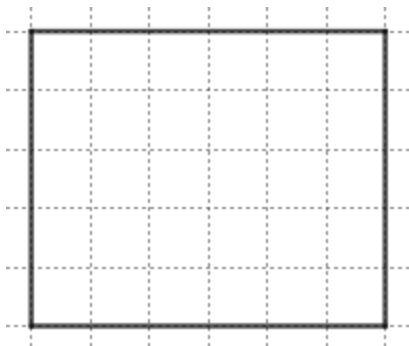
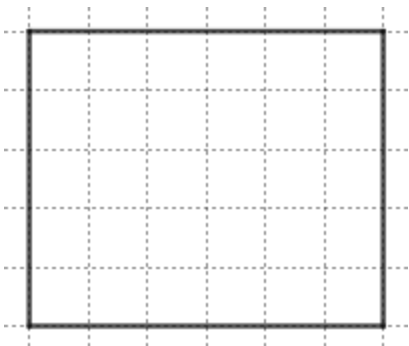
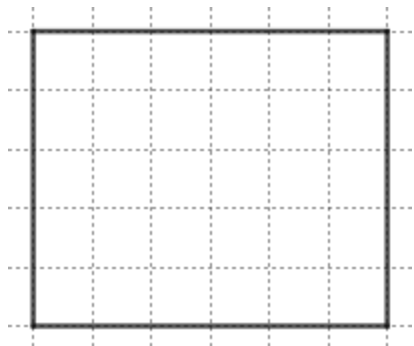
a. Ifan has $\frac{9}{12}$ ounces of cheese



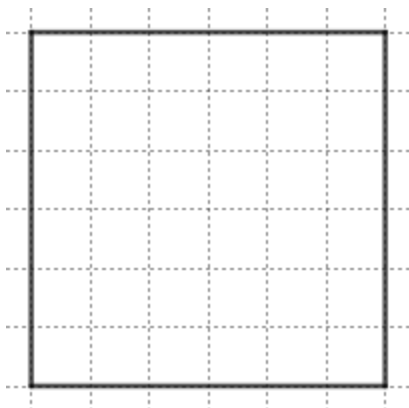
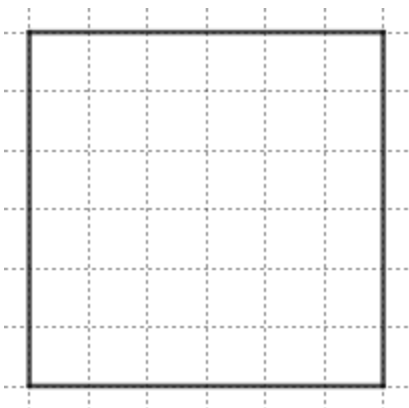
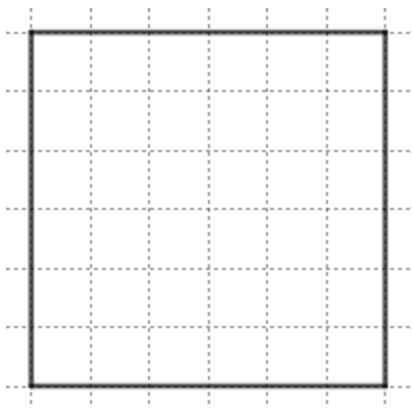
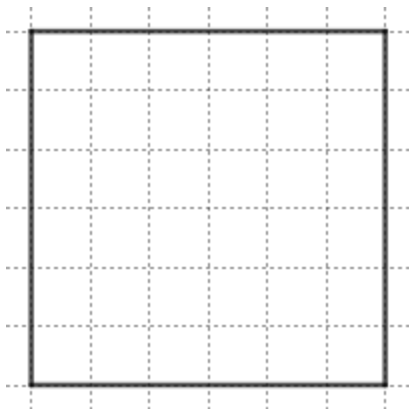
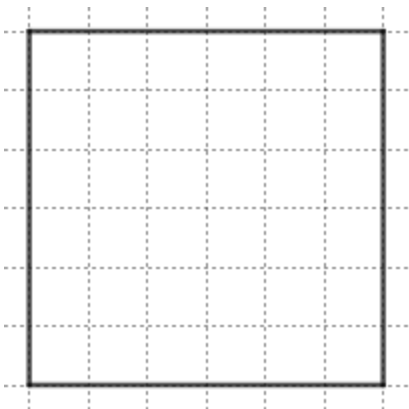
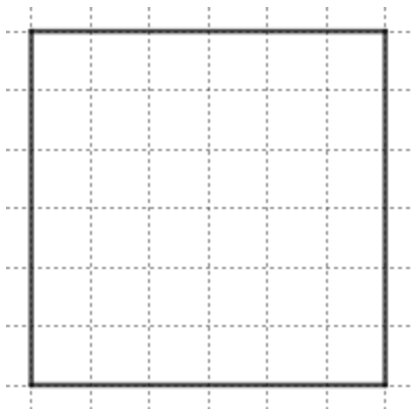
b. Lohse has $\frac{3}{9}$ pounds of chicken



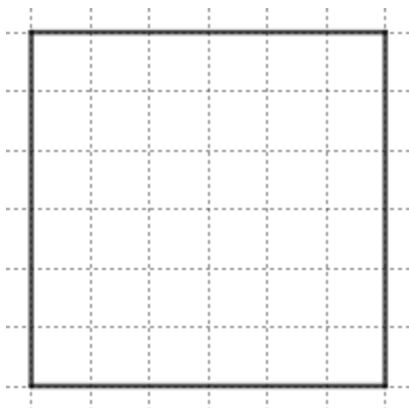
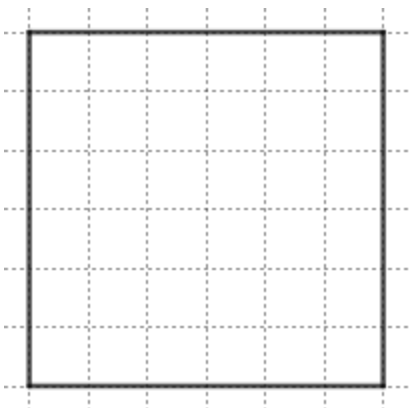
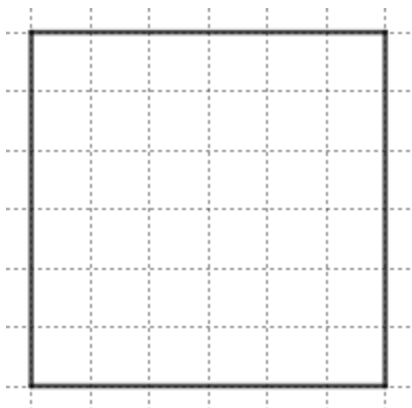
c. Sebille has $\frac{10}{30}$ pounds of ground beef



d. Josiah has $\frac{24}{36}$ cups of water



e. Cliven got a $\frac{6}{18}$ on his test



4. Reduce the following fractions to their simplest form. Write the factor for each step. (Hint, largest prime common factor will not be greater than 7. You're welcome)

a. $\frac{4}{18}$

b. $\frac{32}{80}$

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

d. $\frac{40}{48}$

e. $\frac{48}{54}$

f. $\frac{6}{9}$

g. $\frac{4}{20}$

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

i. $\frac{50}{100}$

j. $\frac{30}{40}$

1							
$\frac{1}{2}$				$\frac{1}{2}$			
$\frac{1}{3}$		$\frac{1}{3}$		$\frac{1}{3}$		$\frac{1}{3}$	
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$

(this is just a picture for your viewing pleasure)

k. $\frac{18}{24}$

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

m. $\frac{5}{35}$

n. $\frac{21}{35}$

o. $\frac{15}{35}$

p. $\frac{7}{14}$

- q. Mr. Rose calculated that he should run $\frac{21}{30}$ of a mile per day to achieve the weight loss he wanted. In order to visualize this more easily, he simplified. What was his answer?

- r. Max calculated that he needed $\frac{35}{40}$ cups of rice per day to achieve the weight loss he wanted. Measuring cups don't measure in 40ths, so he simplified. What was his answer?

Extra Credit

s. $\frac{84}{210}$

t. $\frac{150}{225}$

Unit 06 Lesson 02: Review Simplifying Fractions and Multiplication by a Whole Number

Lesson Objectives

- Express answers in their simplest form

Reduce the following fractions to their simplest form. This means no negatives in the numerator or denominator.

$$1) \frac{-2}{4} =$$

$$2) \frac{-6}{-9} =$$

$$3) \frac{7}{-8} =$$

$$4) \frac{14}{-28} =$$

$$5) \frac{-20}{-36} =$$

$$6) \frac{-24}{48} =$$

$$7) \frac{-40}{-48} =$$

$$8) \frac{-77}{88} =$$

$$10) \frac{4}{-8}(-5) =$$

$$11) (6)^{\frac{-4}{6}} =$$

$$12) -\frac{16}{20}(3) =$$

$$13) \frac{-12}{-36} \cdot -4 =$$

$$14) 7 \cdot \frac{30}{-32} =$$

$$15) -\frac{12}{16} \cdot (-8) =$$

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

Simplify the following expressions. Express as a whole number if possible. Express as a fraction if not.

1. $\frac{-4}{-6}(-5) =$

2. $-\frac{4}{6}(-8) =$

3. $-\frac{16}{6}(3) =$

4. $\frac{12}{16}(-4) =$

5. $\frac{5}{-3}(7) =$

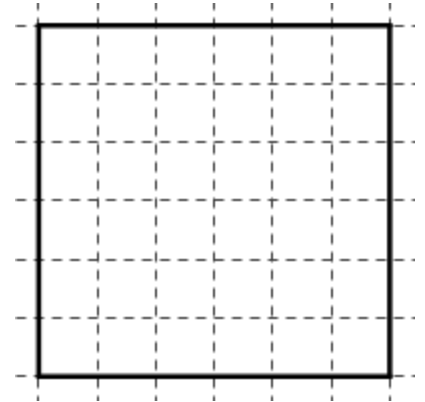
6. $-\frac{12}{96}(-8) =$

7. $\frac{-4}{20}(-10) =$

Unit 06 Lesson 03: Review Multiplying Fractions

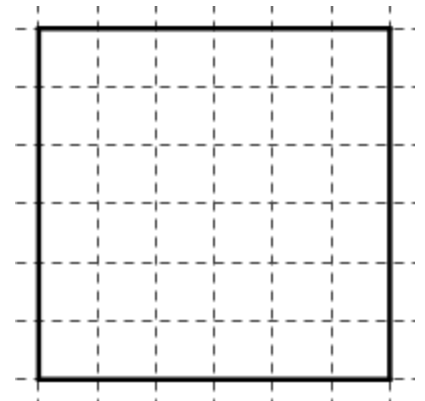
Lesson Objective: Calculate the results of multiplying fractions, and assess the reasonableness of answers.

1. Esha has $\frac{1}{3}$ of an acre of land. Alyssa has $\frac{3}{4}$ as much land as Esha.
 - a. How many acres of land does Alyssa have?
 - i. Justify with a picture (label names on sides).
 - ii. Justify with a calculation.



- b. Is Alyssa's multiplier bigger than 1? _____
 - c. Who has more land? _____

2. Ravneet has $\frac{2}{3}$ of a gallon of water. Nick has twice as much water as Ravneet.
 - a. How much water does Nick have?
 - i. Justify with a picture (label names on sides).
 - ii. Justify with a calculation.

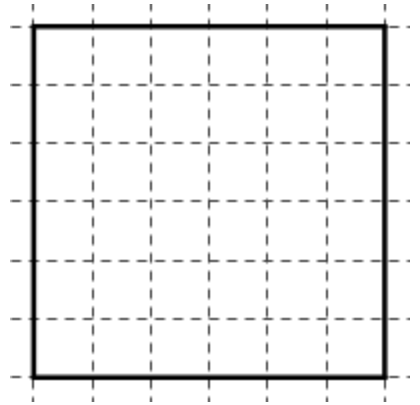


- b. Is Nick's multiplier bigger than 1? _____
 - c. Who has more water? _____

3. Braulio has half of a pound of gold. Manjot has $\frac{7}{6}$ as much gold as Braulio.

a. How much gold does Manjot have?

- i. Justify with a picture (label names on sides).
- ii. Justify with a calculation.



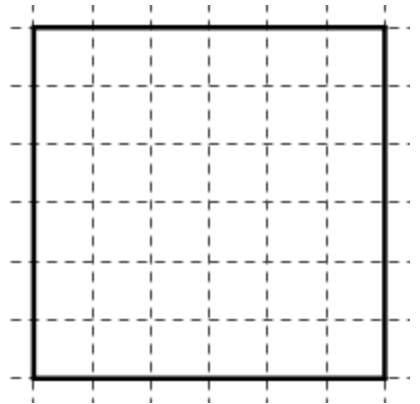
b. Is Manjot's multiplier bigger than 1? _____

c. Who has more gold? _____

4. Marisol has $\frac{2}{3}$ of a bar of chocolate. Tacina has $\frac{1}{3}$ as much chocolate as Marisol.

a. How much chocolate does Tacina have?

- i. Justify with a picture (label names on sides).
- ii. Justify with a calculation.

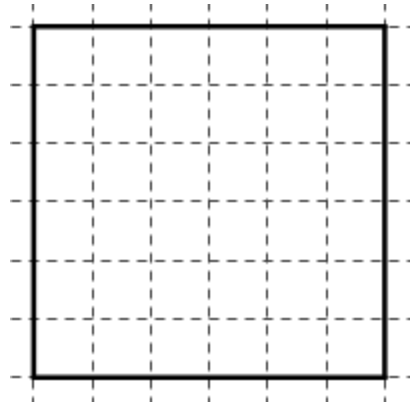


b. Is Tacina's multiplier bigger than 1? _____

c. Who has more chocolate? _____

5. Prabjot has 2 pounds of gold. Marisa has $\frac{1}{4}$ as much gold as Prabjot.

- a. How much gold does Marisa have?
 - i. Justify with a picture (label names on sides).
 - ii. Justify with a calculation.

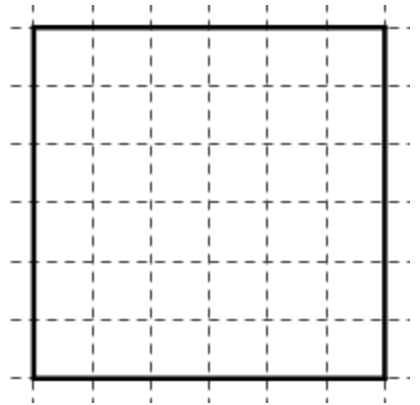


b. Is Marisa's multiplier bigger than 1? _____

c. Who has more gold? _____

6. Teresa has $\frac{4}{3}$ pounds of gold. Ivan has $\frac{1}{6}$ as much gold as Teresa.

- a. How much gold does Ivan have?
 - i. Justify with a picture (label names on sides).
 - ii. Justify with a calculation.



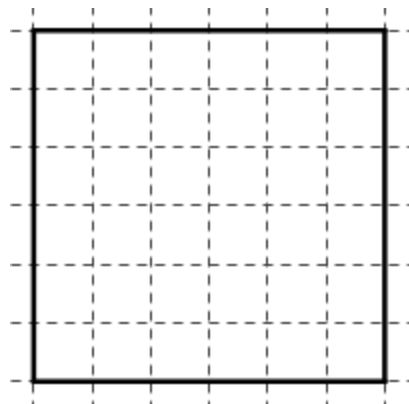
b. Is Ivan's multiplier bigger than 1? _____

c. Who has more gold? _____

7. Andrew has $\frac{1}{4}$ of a pound of gold. Juan has $\frac{1}{2}$ as much gold as Andrew.

a. How much gold does Juan have?

- i. Justify with a picture (label names on sides).
- ii. Justify with a calculation.



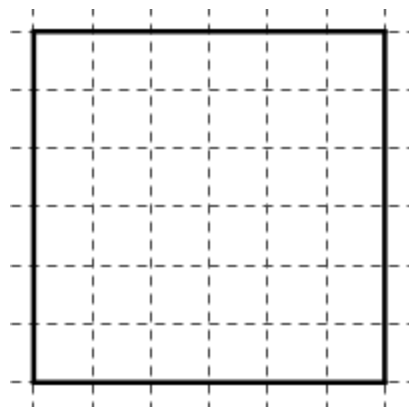
b. Is Juan's multiplier bigger than 1? _____

c. Who has more gold? _____

8. Steven has 3 pounds of gold. Monica has $\frac{2}{4}$ as much gold as Steven.

a. How much gold does Monica have?

- i. Justify with a picture (label names on sides).
- ii. Justify with a calculation.



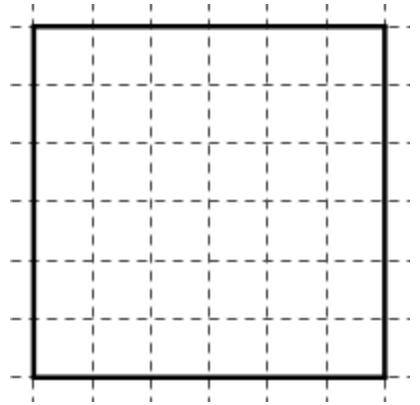
b. Is Monica's multiplier bigger than 1? _____

c. Who has more gold? _____

9. Karina has $\frac{10}{4}$ pounds of gold. Litzy has half as much gold as Karina.

a. How much gold does Litzy have?

- i. Justify with a picture (label names on sides).
- ii. Justify with a calculation.



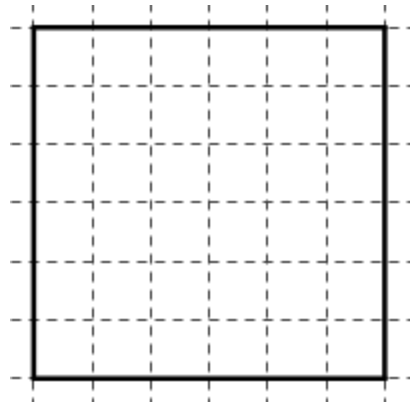
b. Is Litzy's multiplier bigger than 1? _____

c. Who has more gold? _____

10. Darius has $\frac{4}{3}$ of a pound of gold. Payton has $\frac{5}{4}$ as much gold as Darius.

a. How much gold does Payton have?

- i. Justify with a picture (label names on sides).
- ii. Justify with a calculation.



b. Is Payton's multiplier bigger than 1? _____

c. Who has more gold? _____

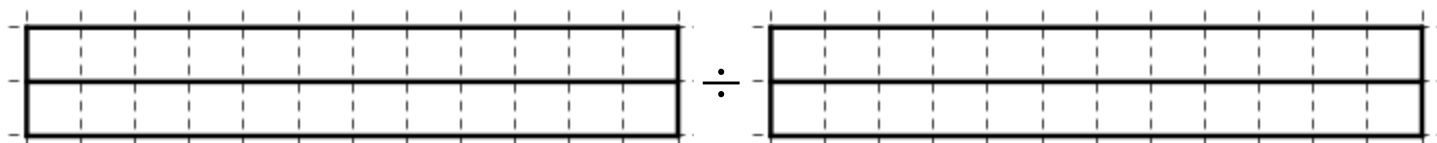
Unit 06 Lesson 04: Review Dividing Fractions

Lesson Objective:

1. Zach has $\frac{2}{3}$ of a pound of gold. He wants to divide his gold into groups that have $\frac{1}{6}$ of a pound each.

a. How many groups will Zach make?

i. Justify with a picture.



ii. Justify with a calculation.

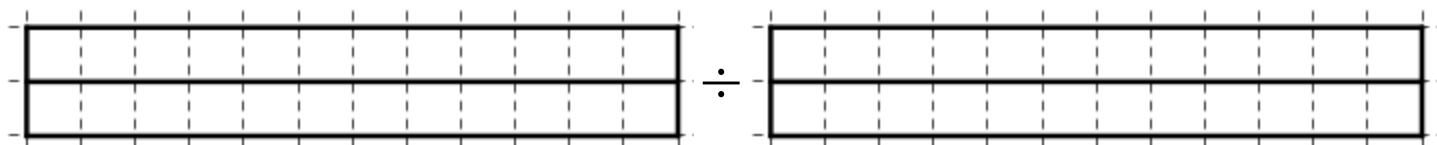
b. Is the amount per group bigger or smaller than 1? _____

c. Is the number of groups bigger or smaller than the initial amount of gold? _____

2. Gurleen has $\frac{2}{3}$ of a pound of gold. She wants to divide her gold into groups that have $\frac{1}{2}$ of a pound each.

a. How many groups will Gurleen make?

i. Justify with a picture.



ii. Justify with a calculation.

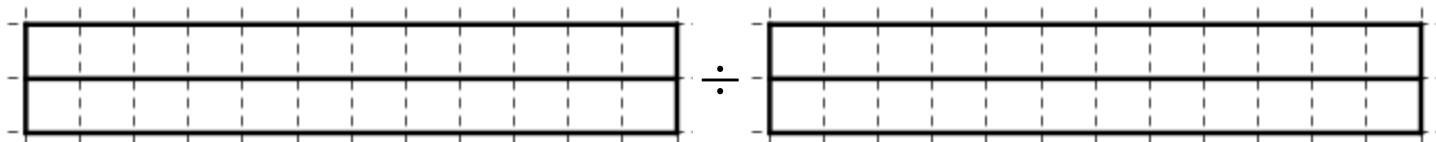
b. Is the amount per group bigger or smaller than 1? _____

c. Is the number of groups bigger or smaller than the initial amount of gold? _____

3. Ally has $\frac{1}{2}$ of a pound of gold. She wants to divide her gold into groups that have $\frac{3}{2}$ pounds each.

a. How many groups will Ally make?

i. Justify with a picture.



ii. Justify with a calculation.

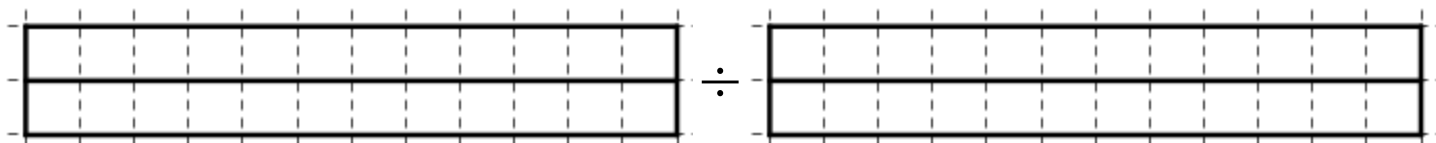
b. Is the amount per group bigger or smaller than 1? _____

c. Is the number of groups bigger or smaller than the initial amount of gold? _____

4. Harveen has $\frac{2}{3}$ of a pound of gold. She wants to divide her gold into groups that have 2 pounds each.

a. How many groups will Harveen make?

i. Justify with a picture.



ii. Justify with a calculation.

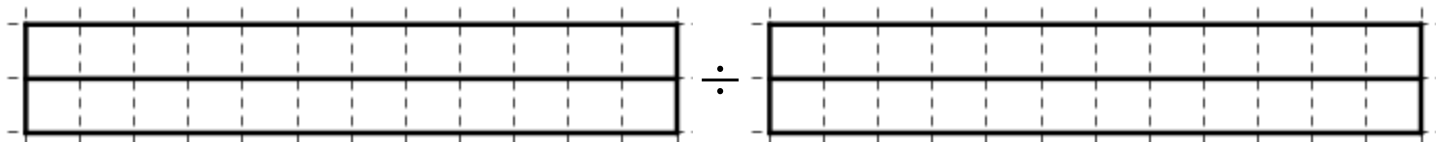
b. Is the amount per group bigger or smaller than 1? _____

c. Is the number of groups bigger or smaller than the initial amount of gold? _____

5. Sandra has $\frac{7}{4}$ of a pound of gold. She wants to divide her gold into groups that have $\frac{1}{4}$ of a pound each.

a. How many groups will Sandra make?

i. Justify with a picture.



ii. Justify with a calculation.

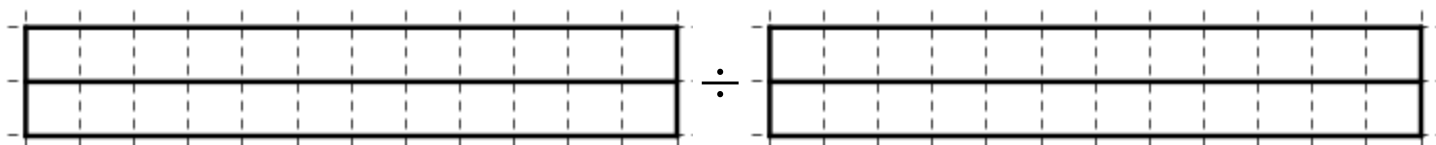
b. Is the amount per group bigger or smaller than 1? _____

c. Is the number of groups bigger or smaller than the initial amount of gold? _____

6. Jackie has 2 pounds of gold. She wants to divide her gold into groups that have $\frac{2}{3}$ of a pound each.

a. How many groups will Jackie make?

i. Justify with a picture.



ii. Justify with a calculation.

b. Is the amount per group bigger or smaller than 1? _____

c. Is the number of groups bigger or smaller than the initial amount of gold? _____

Multiplying and Dividing Fractions (A)

Find the value of each expression in lowest terms.

1. $\frac{1}{2} \times \frac{5}{4}$

6. $\frac{1}{4} \times \frac{5}{3}$

11. $\frac{10}{3} \times \frac{11}{6}$

2. $\frac{1}{6} \div \frac{8}{11}$

7. $\frac{11}{2} \div \frac{1}{2}$

12. $\frac{1}{2} \div \frac{1}{2}$

3. $\frac{1}{3} \div \frac{13}{9}$

8. $\frac{4}{3} \div \frac{11}{12}$

13. $\frac{14}{9} \times \frac{7}{10}$

4. $\frac{13}{4} \div \frac{1}{2}$

9. $\frac{1}{3} \times \frac{20}{9}$

14. $\frac{15}{8} \times \frac{7}{6}$

5. $\frac{17}{6} \div \frac{3}{5}$

10. $\frac{13}{7} \times \frac{14}{11}$

15. $\frac{3}{2} \div \frac{4}{9}$

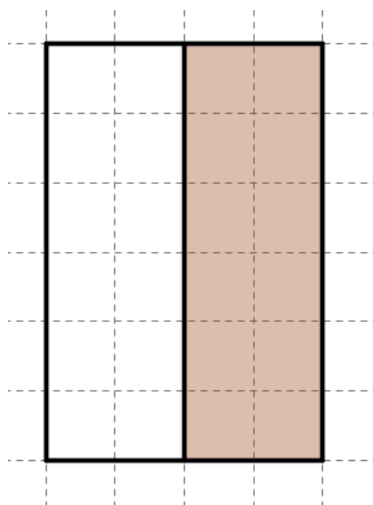
Unit 06 Lesson 05: Review Equivalent Fractions and Adding Fractions

Lesson Objective:

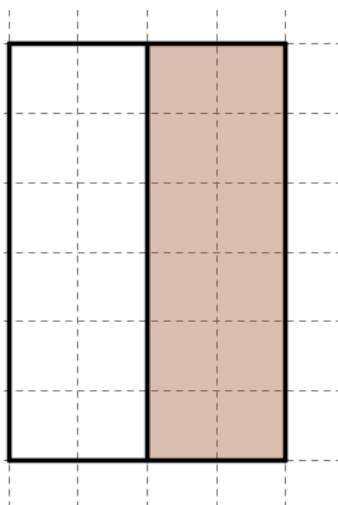
For exercises 1-9:

- Fill in the blanks
- Show work on the question statement
- Add cuts to the picture to justify your answer

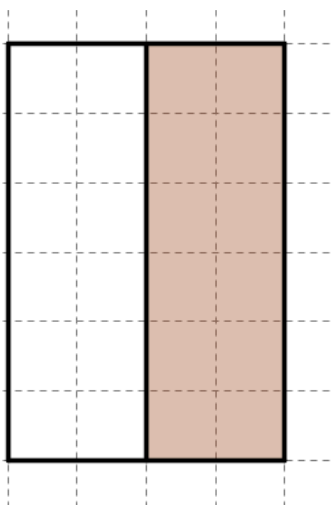
1. $\frac{\quad}{\quad} = \frac{\quad}{4}$



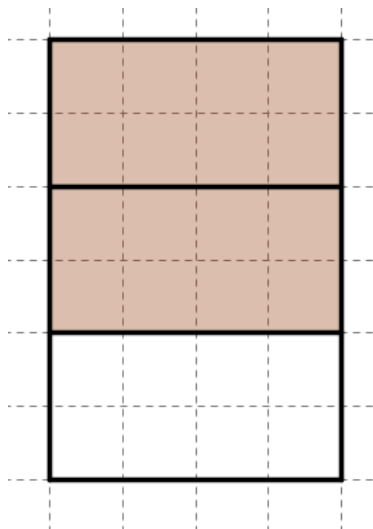
2. $\frac{\quad}{\quad} = \frac{\quad}{6}$



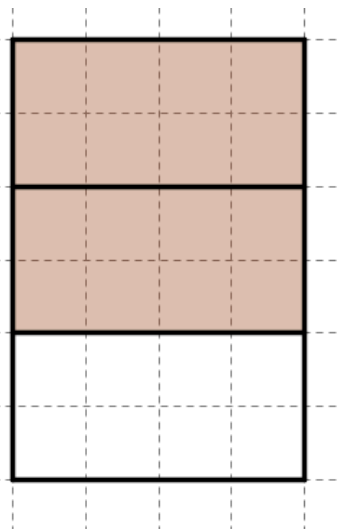
3. $\frac{\quad}{\quad} = \frac{\quad}{8}$



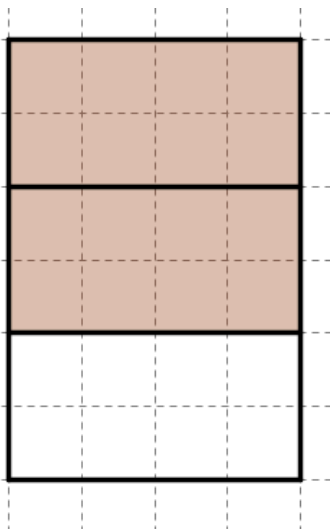
4. $\frac{\quad}{\quad} = \frac{\quad}{6}$



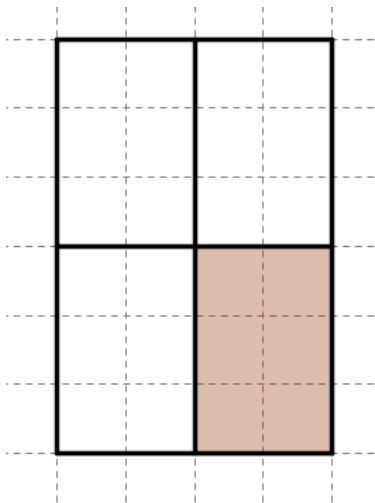
5. $\frac{\quad}{\quad} = \frac{\quad}{12}$



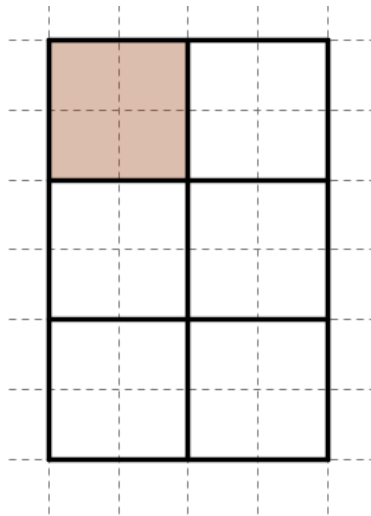
6. $\frac{\quad}{\quad} = \frac{\quad}{24}$



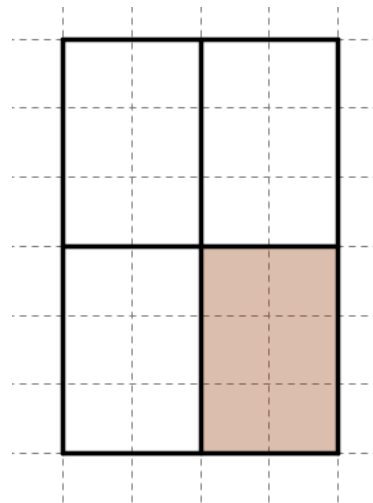
7. $\frac{\quad}{\quad} = \frac{\quad}{8}$



8. $\frac{\quad}{\quad} = \frac{\quad}{24}$



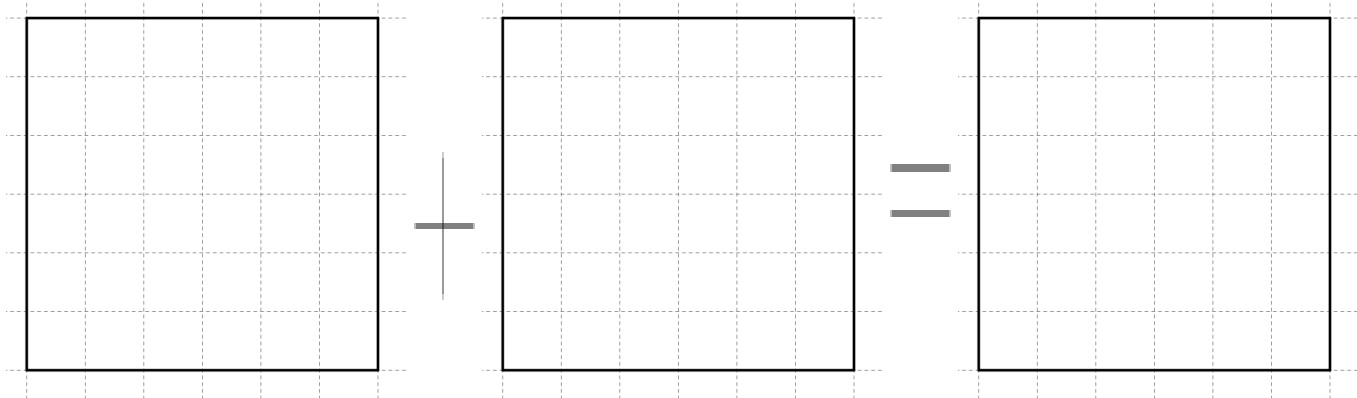
9. $\frac{\quad}{\quad} = \frac{\quad}{12}$



For questions 10-12

- Draw your initial cuts using a colored pencil (you may want to attempt with a regular pencil first, then color over with a colored pencil when you're sure you got it right)
- Shade in the given fractions
- Draw your LCD cuts using a regular pencil
- Complete the pictures and calculations

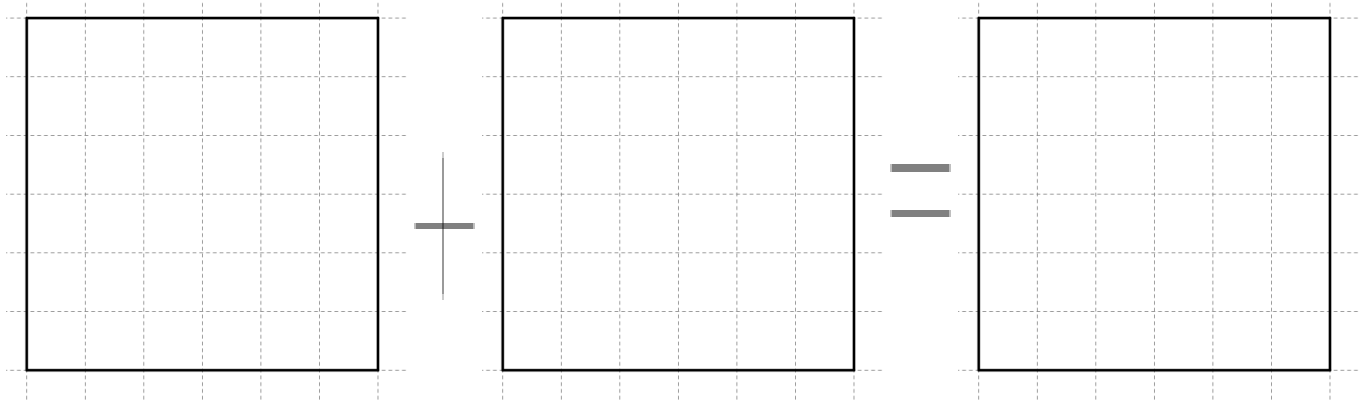
10. Periuijje has $\frac{1}{2}$ of a pound of gold. Ngurije has $\frac{1}{4}$ of a pound of gold. How much gold would they have together?



$\frac{\quad}{\quad} + \frac{\quad}{\quad}$

$\frac{\quad}{\quad} + \frac{\quad}{\quad} = \frac{\quad}{\quad}$

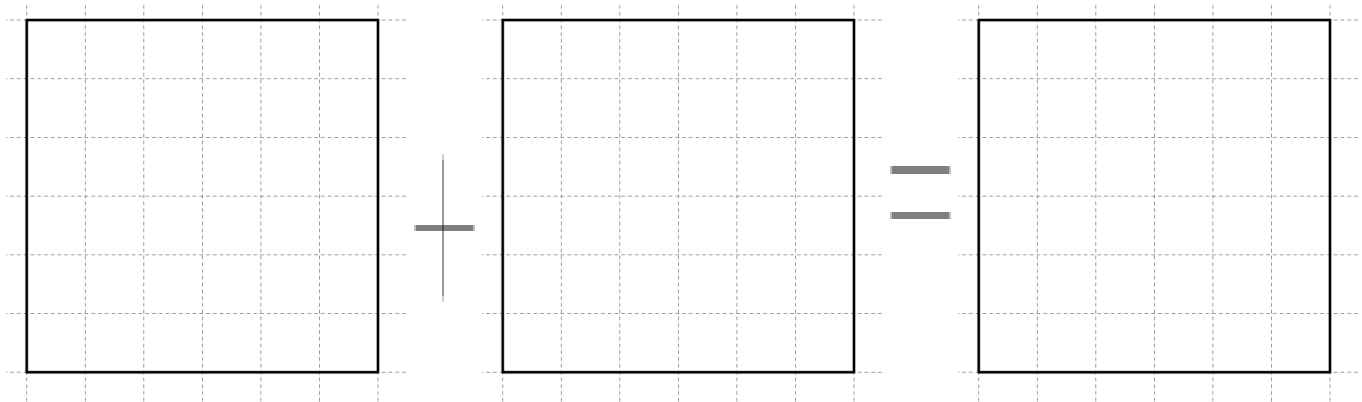
11. John has $\frac{1}{3}$ of a pound of gold. Bill has $\frac{1}{2}$ of a pound of gold. How much gold would they have together?



— + —

— + — = —

12. Steven has $\frac{2}{3}$ of a pound of gold. Ben has $\frac{1}{4}$ of a pound of gold. How much gold would they have together?



— + —

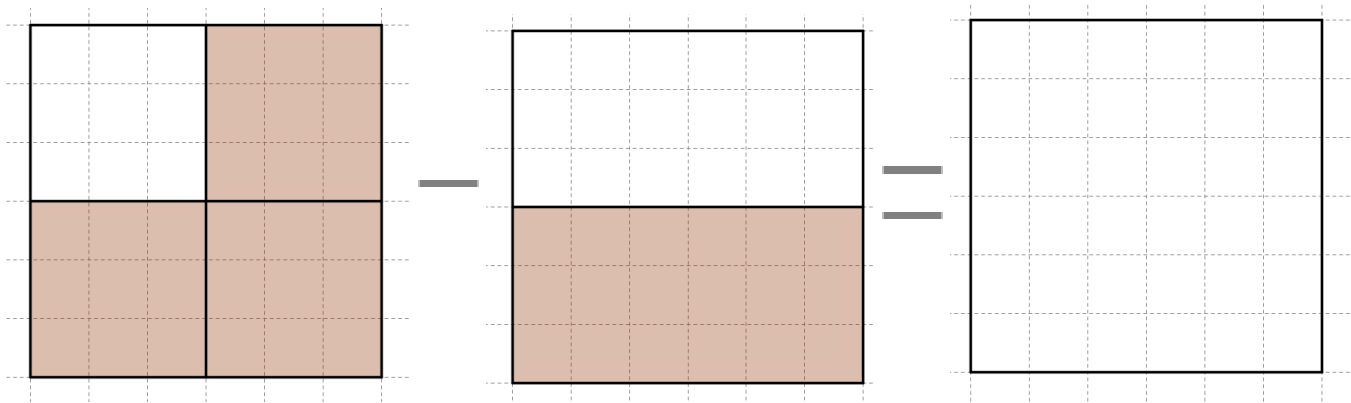
— + — = —

Unit 06 Lesson 06: Review Adding and Subtracting Fractions

Lesson Objective:

Add or subtract the following fractions as shown. Color the pictures to represent your work.

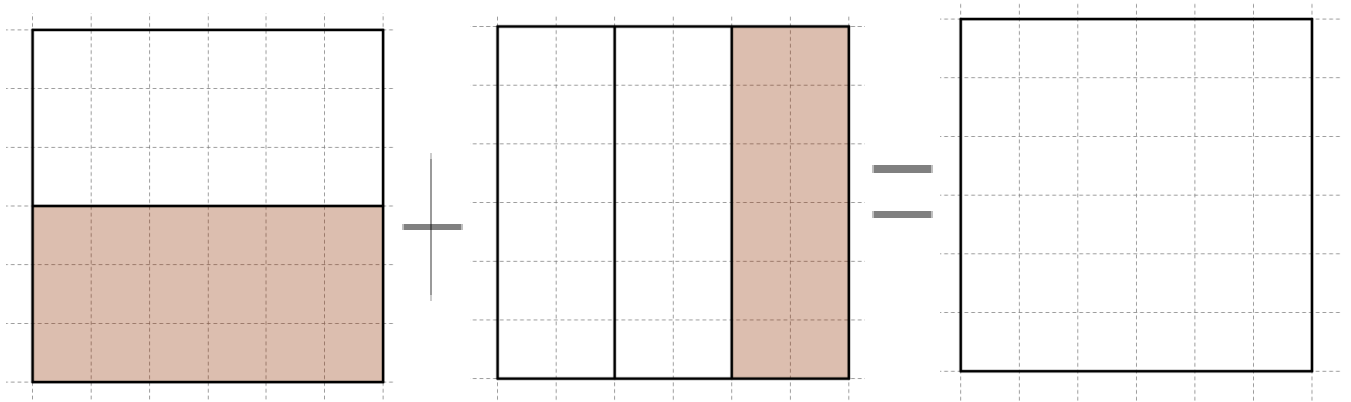
1.



— — —

— — — = $\frac{\quad}{4}$

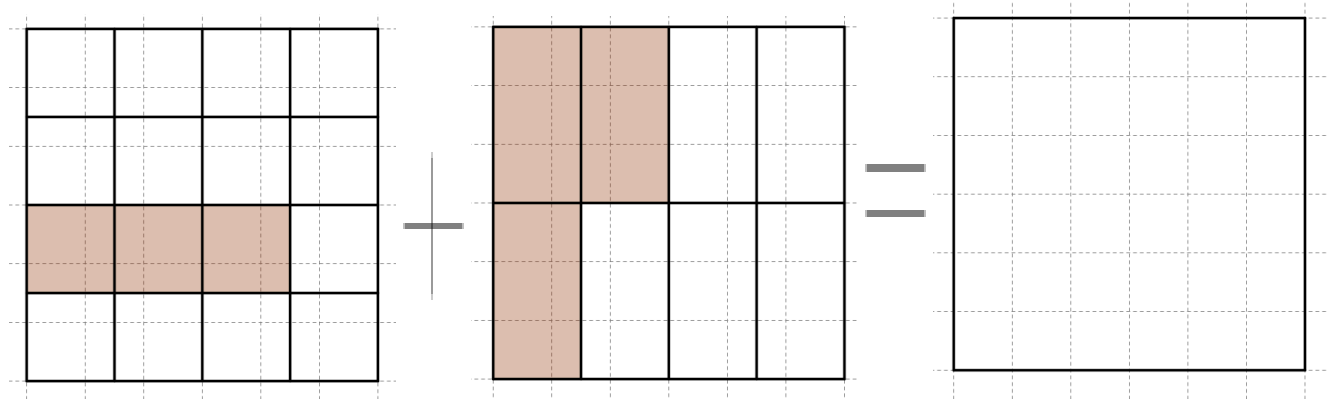
2.



— + —

— + — = $\frac{\quad}{6}$

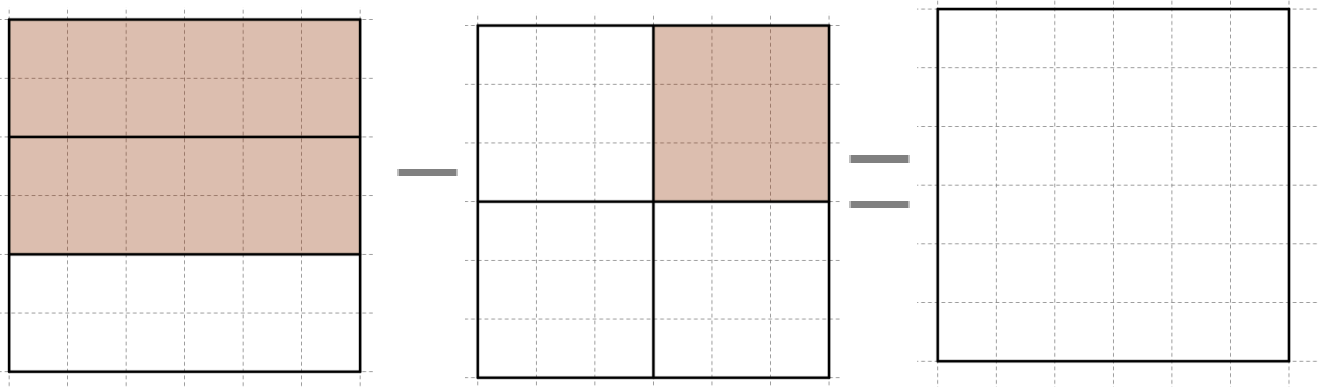
3.



— + —

— + — = $\frac{\quad}{16}$

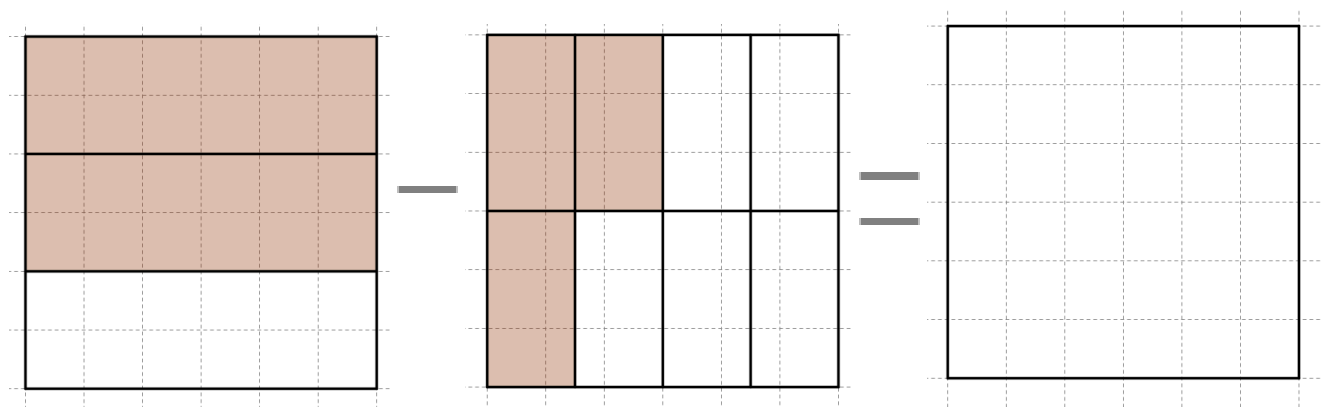
4.



— - —

— - — = $\frac{\quad}{12}$

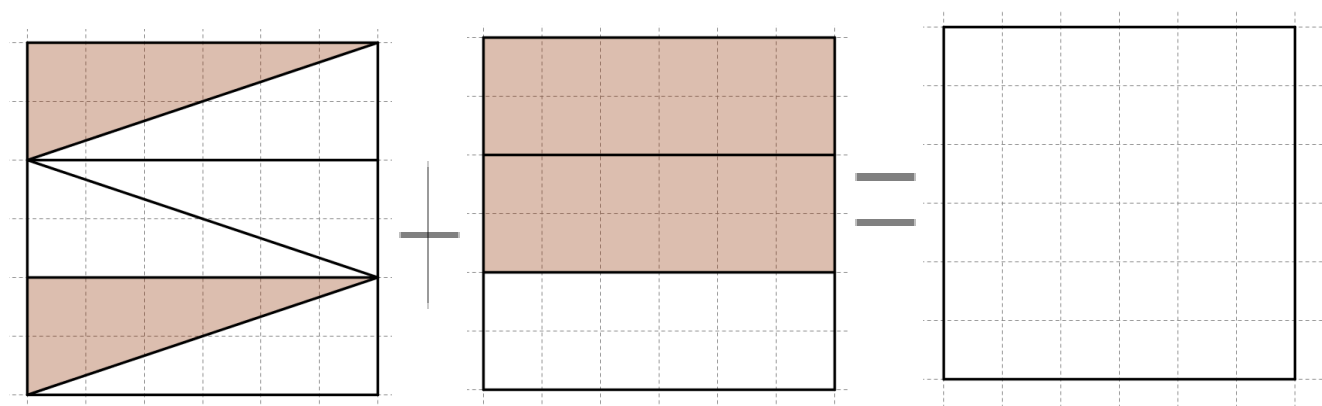
5.



$$\frac{\quad}{\quad} - \frac{\quad}{\quad}$$

$$\frac{\quad}{\quad} - \frac{\quad}{\quad} = \frac{\quad}{24}$$

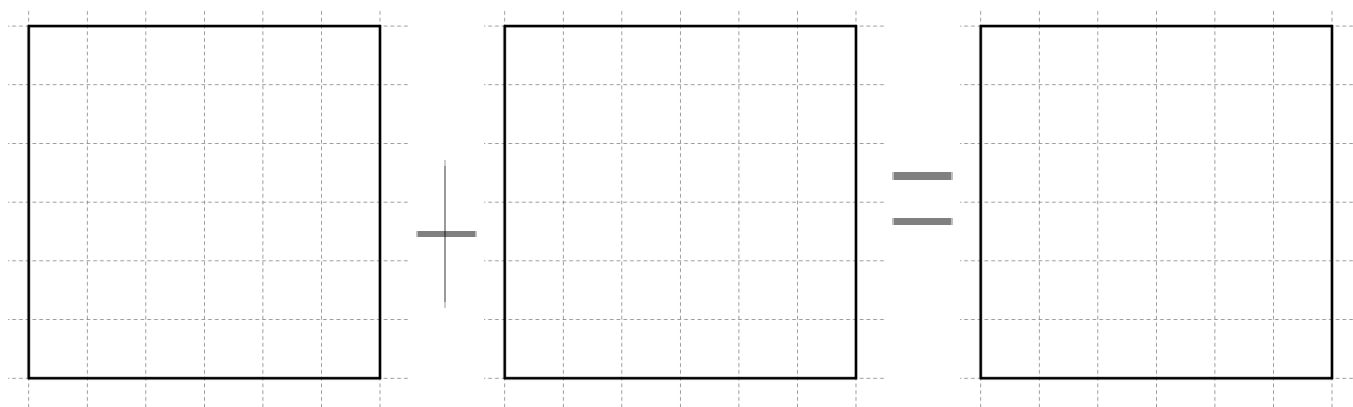
6.



$$\frac{\quad}{\quad} + \frac{\quad}{\quad}$$

$$\frac{\quad}{\quad} + \frac{\quad}{\quad} = \frac{\quad}{6}$$

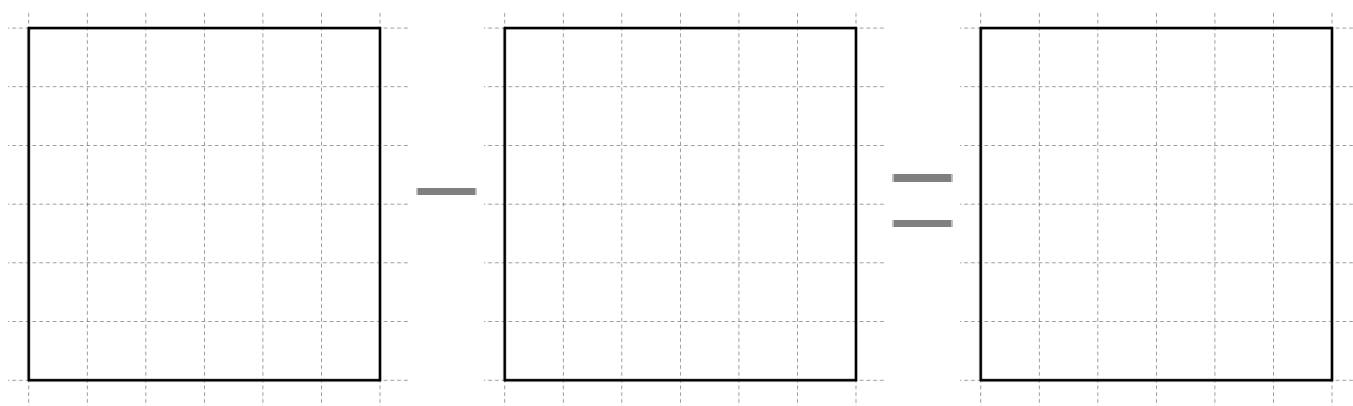
7.



$$\frac{1}{6} + \frac{2}{4}$$

$$\frac{\quad}{\quad} + \frac{\quad}{\quad} = \frac{\quad}{12}$$

8.



$$\frac{2}{4} - \frac{1}{6}$$

$$\frac{\quad}{\quad} - \frac{\quad}{\quad} = \frac{\quad}{12}$$

Unit 06 Lesson 07: Convert Between Standard Numbers and Scientific Notation

Lesson

1. Put the following numbers into scientific notation

a. 542

b. 70,860

c. 804,000

d. 20

e. 0.2

f. 0.02

g. 0.000004

h. 0.505

i. 0.00101

j. 700,000,000

k. 123,456,789,123

2. Put the following numbers in standard form. Make sure to include commas where they should be.

a. 2.3×10^4

b. $2.3 \bullet 10^4$

c. $2.3(10^4)$

d. 1.03×10^3

e. $2 \bullet 10^6$

f. $7.91(10^5)$

g. 1.1×10^6

h. $2.3 \bullet 10^{-4}$

i. $1.02(10^{-2})$

j. 2.3×10^{-1}

k. $2.3 \bullet 10^0$

l. $8.2(10^9)$

m. 1×10^{-6}

n. $2.003 \cdot 10^2$

o. $2.003(10^{-4})$

3. Put the following numbers into scientific notation

a. 23×10^4

b. $0.23 \cdot 10^4$

c. $200.3(10^{-4})$

d. 20.3×10^{-4}

e. $0.00203 \cdot 10^{-4}$

f. $230,000(10^4)$

Unit 06 Lesson 08: Multiply Powers

Lesson Objective: Multiply powers with the same base, i.e. $x^3 \cdot x^5$

For the following expressions

- Simplify but do not solve. Justify by expanding and contracting.
- Check your answer by solving the original expression and the simplified one. Show your steps.

1. $3^3 \cdot 3^5 =$

2. $6^2 \cdot 6^3 =$

3. $4^2 \cdot (-2)^3 \cdot (-2)^4 \cdot 4^4 =$

4. $3^2 \cdot (-4)^4 \cdot 3 \cdot (-4)^2 =$

5. $3^2 \cdot 5 \cdot 3^3 \cdot 2 =$

6. $(-3)^3 \cdot 5^2 \cdot 7 \cdot 5 =$

Simplify the following expressions. Justify by expanding and contracting.

7. $4x^4 \cdot 3x^5 \cdot 5x$

8. $4x^4 \cdot 3y^5 \cdot 5x$

9. $(4y^4)(-3y^5)(5x)$

10. $2x^5 \cdot (-3)y^2 \cdot z \cdot z^5 \cdot (-2)y$

11. A gram of water (about twenty drops, fyi) has $3.34 \cdot 10^{22}$ molecules of water in it. How many molecules of water are in 50 grams?

12. For important chemistry calculations, scientists measure using moles. A mole of a substance is $6.02(10^{23})$ molecules. If a liter of water contains about 56 moles, how many water molecules are in a liter of water?

13. A gram (g) of water has $3.34 \cdot 10^{22}$ molecules of water in it. A cubic meter (m^3) of water weighs about $9.98(10^5)\text{g}$. A liter of water weighs about 1000 grams. John's swimming pool holds 200 cubic meters of water. The 5 other houses on John's street have identical swimming pools. How many molecules of water are in John's swimming pool?

14. Biology: Hemoglobin is a protein in our red blood cells that allows our bodies to make use of the air we breathe in. If the human body has about 25 trillion red blood cells (aka $25 \cdot 10^{12}$), and each red blood cell has 270 million hemoglobin proteins (aka $270 \cdot 10^6$), how many hemoglobin proteins are in the human body?



15. For a typical person, each microliter (μl) of blood contains about $7(10^4)$ white blood cells. A 150-lb person has about $4.05(10^6)\mu\text{l}$ of blood in their body. How many white blood cells would a 150-lb person have in their body?

16. Light travels about $1.86(10^5)$ miles per second. If light takes about 8 minutes to travel from the sun to the Earth, how many miles from the Earth is the sun?

Unit 06 Lesson 09: Simplify Fractional Exponents

Lesson Objective: Simplify terms with fractional exponents, such as $16^{1/2}$

Investigation 1

1. $4^{1/2} \cdot 4^{1/2} =$

2. $9^{1/2} \cdot 9^{1/2} =$

3. $16^{1/2} \cdot 16^{1/2} =$

4. $25^{1/2} \cdot 25^{1/2} =$

5. $x^{1/2} \cdot x^{1/2} =$

~What did you learn in this investigation?~

Raising a number to the $\frac{1}{2}$ power is _____

Investigation 2

6. $8^{1/3} \cdot 8^{1/3} \cdot 8^{1/3} =$

7. $64^{1/3} \cdot 64^{1/3} \cdot 64^{1/3} =$

8. $27^{1/3} \cdot 27^{1/3} \cdot 27^{1/3} =$

9. $125^{1/3} \cdot 125^{1/3} \cdot 125^{1/3} =$

10. $x^{1/3} \cdot x^{1/3} \cdot x^{1/3} =$

What did you learn in this investigation?

Raising a number to the $\frac{1}{3}$ power is _____

Investigation 3: Expand into fractions with numerators of 1.

11. $8^{2/3} =$

12. $8^{3/3} =$

13. $8^{4/3} =$

14. $8^{5/3} =$

15. $x^{2/3} =$

What did you learn in this investigation?

To evaluate fractional powers, first _____

Evaluate the following expressions. Show three steps: rewrite without a fractional exponent, evaluate the denominator, then evaluate the numerator.

1. $27^{2/3}$

2. $100^{1/2}$

17. -3^2

18. $(-1)^{3/7}$

19. $-4^{3/2}$

20. $-(-8)^{2/3}$

Solve two ways a) as written and b) simplify the exponent first

21. $16^{2/4}$

a)

 b)

22. $16^{4/4}$

a)

 b)

23. $9^{4/2}$

a)

 b)

24. $8^{6/3}$

a)

 b)

25. $4^{3/1}$

a)

 b)

26. $4^{6/2}$

a)

 b)

Unit 06 Lesson 10: Simplify Fractional Exponents with Variables

Lesson Objective: Simplify terms with fractional exponents, such as $16^{1/2}$

For the following questions

a) convert from “fractional power” form to “radical and power” form

b) convert from “fractional power” form to a different “radical and power” form (if possible)

c) evaluate if possible

1. $27^{2/3}$ a) b) c)

2. $x^{2/3}$ a) b) c)

3. $16^{2/4}$ a) b) c)

4. $x^{5/3}$ a) b) c)

5. $4x^{1/2}$ a) b) c)

6. $(4x)^{1/2}$ a) b) c)

7. $(25x)^{1/2}$ a) b) c)

8. $64x^{1/2}$ a) b) c)

For the following questions

a) convert from “radical and power” form to “fractional power” form

b) convert from “radical and power” form to a different “fractional power” form (if possible)

c) evaluate if possible

1. $\sqrt[2]{x^3}$ a) b) c)

2. $(\sqrt[2]{x})^3$ a) b) c)

3. $(\sqrt[2]{4})^3$ a) b) c)

a)

b)

c)

- person's basal metabolic rate can be estimated using the equation $R = 132.4 \sqrt[4]{m^3}$.

- b. Estimate the basal metabolic rate of a person weighing 256 pounds

$$1. x^{1/2} \cdot x^{2/3}$$

2. $2x^{1/2} \cdot 3x^{3/2}$

3. $4x^{2/3} \cdot 3x^{1/4}$

4. $2x^{1/2} \cdot x$

Unit 06 Lesson 11: Raise a Power to a Power

Lesson Objective: Simplify terms with fractional exponents, such as $16^{1/2}$

Investigation

1. $(2^2)^3 = 2^?$

2. $(2^4)^2 = 2^?$

3. $(4^2)^{1/4} = 4^?$

4. $(8^{2/3})^{1/2} = 8^?$

Simplify the following expressions. Evaluate if possible.

1. $(x^4)^3$

2. $(x^3)^4$

3. $(x^{1/2})^{1/4}$

4. $(2y^2)^3$

5. $(8z^2)^{1/3}$

6. $(16z^{2/3})^{1/4}$

7. $(4y^{2/3})^{1/2}$

8. $(3x^3y^4)^2 \cdot 2x$

9. $(x^2)^{1/3} \cdot 2x^{1/2}$

10. $(2x^34y^2)^2 \cdot 3xy^{1/2}$

The volume of a sphere is given by the equation $V = 4.19r^3$. Use this equation to find the volumes of the following spheres.

1. All living things have carbon in them. An atom of carbon has a radius of $7(10^{-11})$ meters. What is the volume of an atom of carbon?
2. The earth has a radius of $3.96(10^3)$ miles. What is the volume of the earth?
3. The moon has a radius of $1.08(10^3)$ miles. What is the volume of the moon?
4. The sun has a radius of $4.32(10^5)$ miles. What is the volume of the sun?
5. An atom of gold has a radius of $1.35(10^{-10})$ meters. What is the volume of an atom of gold?

Putting it all together

1. $(x^5)^3$

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

3. $(16)^{3/2}$

4. $(-16)^{3/2}$

5. $(x^{1/2})^{1/3}$

6. $(2y^2)^3$

7. $(5k^4)^2$

8. $(3x^2y^{1/2})^3$

9. $(8p^5)^{1/3}$

10. $(16z^{1/3})^{1/2}$

11. $(4y^{2/3})^3$

12. $(4x^3)^{1/2} \cdot 3x^{1/2}$

13. $(3xy^{1/2})^2 \cdot 4x^{2/3}$

Unit 06 Lesson 12: Simplify Fractional Exponents with Remainders

Lesson Objective: Simplify terms with fractional exponents, such as $16^{1/2}$

1. $\sqrt{12}$

2. $\sqrt{75}$

3. $\sqrt{16}$

4. $\sqrt{72}$

5. $\sqrt{27}$

6. $\sqrt{36}$

7. $\sqrt{50}$

8. $\sqrt{24}$

9. $\sqrt{98}$

10. $\sqrt{48}$

11. $\sqrt{81}$

12. $\sqrt{96}$

13. $\sqrt{200}$

14. $\sqrt{180}$

15. $\sqrt{64}$

16. $\sqrt{50}$

17. $\sqrt{x^7}$

18. $\sqrt{40x^8}$

19. $\sqrt{a^2b^4}$

20. $\sqrt{32m^7n^{11}}$

21. $\sqrt{75x^8y^3}$

Unit 06 Lesson 13: Simplify Fractional Exponents with Remainders: More Practice

Lesson Objective: Simplify terms with fractional exponents, such as $16^{1/2}$

1. $\sqrt{18}$

2. $\sqrt{32}$

3. $\sqrt{400}$

4. $\sqrt{x^6}$

5. $\sqrt{16x^{16}}$

6. $\sqrt{9x^9}$

7. $\sqrt{25x^7}$

8. $\sqrt{12x^5}$

9. $\sqrt{49a^8x^{12}}$

10. $\sqrt{28x^9y^6}$

11. $\sqrt{20x^{10}y^5}$

12. $\sqrt{100ab^4}$

13. $\sqrt{98x^7y^5}$

Determine x^2

1. $x = 2\sqrt{3}$

2. $x = 2\sqrt{6}$

3. $x = 4\sqrt{3}$

4. $x = 2\sqrt{10}$

Determine c^2

1. $c = 5\sqrt{2}$

2. $c = 4\sqrt{3}$

3. $c = 3\sqrt{5}$

4. $c = 5\sqrt{3}$

5. $c = 4\sqrt{7}$

6. $c = 3\sqrt{4}$

7. $c = 5\sqrt{4}$

8. $c = 4\sqrt{6}$

9. $c = 3\sqrt{3}$

10. $c = 5\sqrt{5}$

11. $c = 4\sqrt{5}$

12. $c = 3\sqrt{2}$

13. $c = 5\sqrt{6}$

14. $c = 4\sqrt{4}$

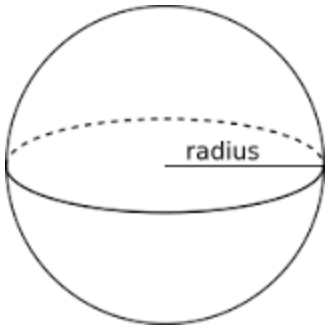
15. $c = 3\sqrt{1}$

16. $c = 5\sqrt{7}$

17. $c = 4\sqrt{2}$

18. $c = 3\sqrt{6}$

Solve for the radius of the following spheres using the formula $V = 4.19r^3$



5. A sphere with a volume of 33.52cm^3

6. A sphere with a volume of 523.75in^3

7. A sphere with a volume of 100ft^3

8. A sphere with a volume of 2m^3

Unit 06 Lesson 14: Divide Powers

Lesson Objective: Simplify terms with fractional exponents, such as $16^{1/2}$

Investigation: Solve a) by evaluating numerator and denominator separately, then simplifying and b) by reducing the fraction first

1. $\frac{5^5}{5^3}$

Solve a) by evaluating numerator and denominator separately, then simplifying and b) by reducing the fraction first

2. $\frac{2^3}{2^4}$

3. $\frac{x^7}{x^3}$

4. $\frac{x}{x^3}$

Simplify. Show your expansion step.

5. $\frac{x^4 y^3}{x^2}$

6. $\frac{x^4 y^3}{y^4}$

7. $\frac{a^4 b^3}{a^3 b^4}$

8. $\frac{8a^2 b^5}{2a^2 b^4}$

9. $\frac{12xy^3}{3x^2 y^6}$

10. $\left(\frac{y^3}{x^2}\right)^2$

11. $\left(\frac{y^3}{x^2}\right)^0$

12. $\left(\frac{3x^3}{2y^4}\right)^2$

13. $\left(\frac{2x^2}{3}\right)^3$

14. $\left(\frac{2x^2}{y}\right)^3$

15. $\left(\frac{2y^2}{5x^3}\right)^2$

Name : _____

Score : _____

Scientific Notation

Simplify and express in scientific notation:

Example 1

$$(6 \times 10^3) (2 \times 10^5)$$

$$\begin{aligned} (6 \times 10^3) (2 \times 10^5) &= 12 \times 10^3 \times 10^5 \\ &= 12 \times 10^8 \\ &= \mathbf{1.2 \times 10^9} \end{aligned}$$

Example 2

$$\frac{18 \times 10^6}{4 \times 10^4} = \frac{18}{4} \times 10^6 \times 10^{-4}$$

$$= \mathbf{4.5 \times 10^2}$$

Simplify each problem and express the answer in scientific notation.

1) $(7 \times 10^8) (9 \times 10^6)$

Answer : _____

2) $\frac{3 \times 10^4}{8 \times 10}$

Answer : _____

3) $\frac{4 \times 10^9}{5 \times 10^7}$

Answer : _____

4) $(2 \times 10^3) (3 \times 10^4)$

Answer : _____

5) $(3 \times 10^7) (9 \times 10^6)$

Answer : _____

6) $\frac{4 \times 10^5}{16 \times 10^2}$

Answer : _____

7) $\frac{9 \times 10^5}{10 \times 10^3}$

Answer : _____

8) $(11 \times 10^4) (7 \times 10^2)$

Answer : _____

Unit 06 Lesson 15: Simplify Negative Exponents

Lesson Objective: Simplify terms with fractional exponents, such as $16^{1/2}$

Investigation

$$1. \frac{x^5}{x^2}$$

$$2. x^5 \cdot x^{-2}$$

Therefore _____

Simplify such that no negative exponents remain

$$1. x^4 \cdot x^{-2}$$

$$2. x^2 \cdot x^{-4}$$

$$3. x^{-2} \cdot x^{-4}$$

$$4. 2^2 x^4 \cdot 2^{-3} x^{-3}$$

$$5. 2^2 x^4 \cdot 2 x^{-3}$$

6. $3x^4y^{-2} \cdot x^{-1}y^5$

7. $2^{-2}x^{-2}$

8. $(2x)^{-2}$

9. $(2x^3)^{-2}$

10. $x^{-1/2}$

11. $(3x^{-2}y^3)^{-3}$

12. $(2x^{-2}y^{-3})^2$

$$13. \left(\frac{a^2}{b^3} \right)^{-2}$$

$$14. \left(\frac{a^2}{b} \right)^{-2}$$

$$15. \left(\frac{3a}{b^3} \right)^{-2}$$

$$16. \left(\frac{2a^{1/2}}{b^3} \right)^{-2}$$

$$17. \left(\frac{2a^{1/2}}{b^{-1/3}} \right)^3$$

$$18. \left(\frac{2y^2}{5x^3} \right)^{-2}$$

Unit 06 Lesson 16: Review of Exponent Rules

Lesson Objective: Demonstrate mastery of all exponent rules

1. $x^6 \cdot x^3$

2. $x^{2/3} \cdot x^{1/4}$

3. $(x^4)^3$

4. $(x^{1/2})^6$

5. $(2x^2y^4)^3$

6. $\frac{x^5}{x^8}$

7. $\frac{m^7 n^4}{mn^3}$

8. $\left(\frac{2x^5}{3x^2}\right)^3$

9. $8^{2/3}$

10. $9^{3/2}$

11. $16^{3/4}$

12. $x^3y^4y^{-6}$

13. $\frac{a^{-2}}{a^3b}$

14. $\frac{a^2}{a^3b^{-1}}$

15. $\left(\frac{c^3}{2x^2}\right)^{-2}$

16. $\sqrt{24}$

17. $\sqrt{45}$

18. $\sqrt{x^6}$

19. $\sqrt{25x^5}$

20. $\sqrt{12x^4y^7}$