The Order of Operations

1. Do all calculations within **grouping symbols**, including **P**arentheses, brackets, braces, and within numerators or denominators.
2. Evaluate all **Exponential** expressions.
3. Do all **Multiplication and Division** in order from left to right.
4. Do all **Addition and Subtraction** in order from left to right.

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E
MD
AS

1

Warm-up

1. $15 - (5 - 4) \times 3^2$
2. $3 - 3^3 + \left((-4)(-2)\right)^2$
3. $\frac{8-2\times3}{7-3^2}$

2

Unit 2
Simplify, Multiply, Divide Fractions

Math Essentials

3

Consider...

How are these related?

- Making rice
- Telling time
- Shopping
- Investing
- Not running out of gas
- Creating a winning fantasy football team

4

Fractions and the Real World

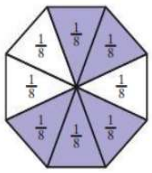
Fraction notation: $\frac{1}{2}, \frac{3}{4}, \frac{11}{5}, \frac{0}{8}$

Numerator- represents number of parts being considered (1 half of the pizza)

Denominator- represents total number of parts in one object (the pizza has two halves)

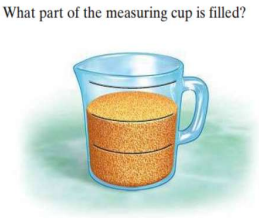
5

- What fraction is shaded?



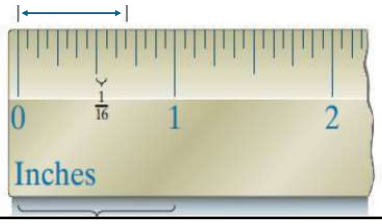
6

•What fraction?



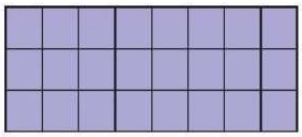
7

•What is the length?



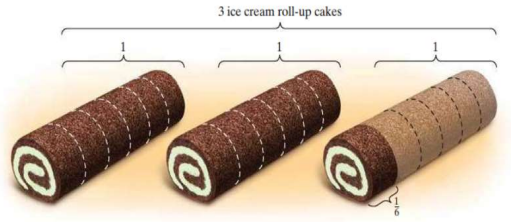
8

What fraction is shaded?



9

- What fraction is dark brown?



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Fractions and the Real World

Ratio- quotient of two quantities (comparison)

- In grocery shopping?
- Health monitoring?
- Population statistics?
- Construction?
- The Golden Ratio??

11

- How to Use the Golden Ratio to Create Gorgeous Graphic Designs (Company Folders)

12

What Is The Golden Ratio & How Can It Help Your Art? (Haydn Symons)

13

Practice 2.1

For the following set of animals, what is the ratio of:

1. puppies to the total number of animals?
2. puppies to kittens?
3. kittens to the total number of animals?
4. kittens to puppies

14

Practice 2.2

Simplify.

1. $\frac{3}{3} =$ ___
2. $\frac{3}{1} =$ ___
3. $\frac{0}{3} =$ ___
4. $\frac{3}{0} =$ ___

15

Dividing By Itself, 1, or 0

- $\frac{n}{n} = 1$ for any integer n that is not 0.
- $\frac{n}{1} = n$ Any integer divided by 1 is itself.
- $\frac{0}{n} = 0$ for any integer n that is not 0.
- $\frac{n}{0}$ is **undefined**.

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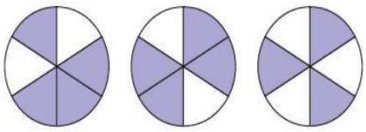
Practice 2.3

1. What fraction is shaded in the image at right?



2. Simplify the following.
   a) $\frac{4032}{0}$
   b) $\frac{0}{-2}$
   c) $\frac{-78}{78}$

17

Consider...

Try to simplify the following. Think about what multiplication means.

1. 4×2
2. $4 \times \frac{1}{2}$
3. $\frac{1}{4} \times \frac{1}{2}$

18

Multiplication using Fraction Notation

To multiply a fraction by a fraction,

a) multiply the numerators and

b) multiply the denominators.

$$\frac{9}{7}\cdot\frac{3}{4}=\frac{9\cdot 3}{7\cdot 4}=\frac{27}{28}$$

19

Practice 2.4

Multiply

$$\frac{8}{9}\times\frac{4}{5}$$

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Practice 2.5

Multiply

$$\frac{9}{10}\times\frac{2}{3}$$

ALEKS Topic

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Consider...

1. $\frac{3}{3} = \_\_\_$
2. $7 \cdot 1 = \_\_\_$
3. $7 \cdot \frac{3}{3} = \_\_\_$

22

Multiplying by 1

When we multiply a number by 1, we get the same number:

$$a = a \cdot 1 = a \cdot \frac{n}{n} = a$$

23

Practice 2.6

Fill in the blank.

1. $\frac{9}{8} = \frac{\_\_}{16}$
2. $\frac{2}{5} = \frac{\_\_}{-3}$
3. $\frac{7}{8} = \frac{\_\_}{32}$

24

Practice 2.7

True or false?

1. $\frac{1}{2} = \frac{5}{10}$
2. $\frac{2}{3} = \frac{4}{12}$
3. $\frac{1}{4} = \frac{20}{100}$

25

Practice 2.8

Simplify each of the following.

1. $\frac{8}{16}$
2. $-\frac{8}{20}$
3. $\frac{24}{42}$

26

Practice 2.5 (continued…)

Multiply AND simplify.

$$\frac{9}{10} \times \frac{2}{3}$$

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Practice 2.9

Simplify each of the following.

1. $\frac{2+3}{2}$
2. $\frac{4+1}{4+2}$
3. $\frac{15}{54}$

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BE CAREFUL!!

$\frac{2+3}{2} = 3;$ $\frac{4+1}{4+2} = \frac{1}{2};$ $\frac{15}{54} = \frac{1}{4}.$

Wrong! Wrong! Wrong!

The correct answers are

$\frac{2+3}{2} = \frac{5}{2};$ $\frac{4+1}{4+2} = \frac{5}{6};$ $\frac{15}{54} = \frac{3 \cdot 5}{3 \cdot 18} = \frac{3}{3} \cdot \frac{5}{18} = \frac{5}{18}.$

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A Test for Equality

True or false?

$$\frac{2}{3} = \frac{4}{6}$$

30

Cross Multiply

$$\frac{2}{3} \neq \frac{4}{6}$$

$$2 \times 6 = 3 \times 4$$

31

ONLY cross multiply over an… =

EQUAL SIGN!!!!!

32

Equivalent Fractions

To check if two fractions are equal, you can…

1. **Simplify** each fraction OR
2. Check if their **cross products** are equal.

33

Practice 2.7 (check again…)

True or false?

1. $\frac{1}{2} = \frac{5}{10}$
2. $\frac{2}{3} = \frac{4}{12}$
3. $\frac{1}{4} = \frac{20}{100}$

34

Timed Tables Practice

35

Consider…

What is a "factor"?

What are the factors in considering whether you will be able to go on vacation this year?

What do you need to "factor in" to decide whether you can get a dog?

36

Factors and Factorizations

Factorizations of 12

$$12 = 1 \times 12$$
$$12 = 2 \times 6$$
$$12 = 3 \times 4$$

List all the **factors** of 12

1, 2, 3, 4, 6, 12

37

GCF

- What are the factors of 45?
- What is the GREATEST common factor between 12 and 45?
- Now, simplify $\frac{12}{45}$.

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Practice 2.10

1. Simplify $\frac{3}{12}$
2. Simplify $\frac{105}{135}$
3. True or false? $\frac{-6}{15} = \frac{8}{-20}$

39

Practice 2.11

Multiply.

1. $6 \times \frac{1}{2}$
2. $6 \times \frac{4}{5}$

40

Multiplication by an Integer

To multiply a fraction by an integer,

a) multiply the top number (the numerator) by the integer and

b) keep the same denominator.

$$6 \cdot \frac{4}{5} = \frac{6 \cdot 4}{5} = \frac{24}{5}$$

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Practice 2.12

Multiply.

1. $5 \cdot \frac{3}{8}$
2. $\frac{2}{3} \times 24$
3. $\frac{4}{15} \times 18$

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Real Life Problems

The word "of" generally translates to multiply.

- Ex. Half of the 22 students were Taylor Swift fans.

$$\frac{1}{2} \times 22 = 11$$

- 11 students were fans.

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Practice 2.13

What is $\frac{1}{5}$ of 45?

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Practice 2.14

Multiply and simplify.

$$\frac{2}{5} \times \frac{3}{5} \times \frac{7}{8}$$

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Practice 2.15

Evaluate. Write your answer as a fraction in simplest form.

$$\left(\frac{1}{7}\right)^2$$

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46

Practice 2.16

At a certain school, $\frac{4}{7}$ of the students are girls. Today, $\frac{4}{5}$ of the girls brought their lunch. What fraction of the students are girls who brought their lunch today?

Write your answer in simplest form.

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47

Practice 2.17

There were 48 runners to start a race. In the first half of the race, $\frac{1}{3}$ of them dropped out. In the second half of the race, $\frac{3}{4}$ of the remaining runners dropped out. How many runners finished the race?

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48

Consider...

What goes in each blank?

1. $2 \times \_\_ = 1$
2. $\frac{1}{2} \times \_\_ = 1$
3. $\frac{2}{3} \times \_\_ = 1$

49

Practice 2.18

Find the reciprocal of each.

1. 8
2. $-\frac{4}{5}$
3. $\frac{1}{6}$
4. 0

50

Practice 2.19

Divide. Think about what division means.

1. $6 \div 1$
2. $6 \div 2$
3. $6 \div \frac{1}{2}$

51

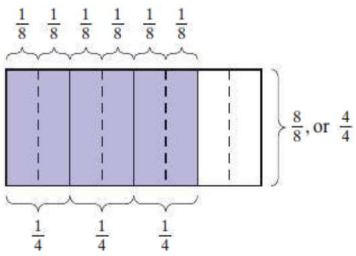
Practice 2.19

Divide. Think about what division means.

1. $6 \div 1$
2. $6 \div 2$ (also $\frac{1}{2}$ **of 6** $= \frac{1}{2} \times 6$)
3. $6 \div \frac{1}{2}$ (also 6×2)

52

Division



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

How many $\frac{1}{8}$'s are in $\frac{3}{4}$?

53

Division

- To divide a fraction, multiply by its reciprocal.

54

Practice 2.20

Divide and simplify.

$$\frac{5}{12} \div \frac{3}{8}$$

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55

Division

- To divide a fraction, multiply by its reciprocal.

Keep it, change it, flip it.

56

Practice 2.21

A bag of rare spice that weighs $\frac{2}{3}$ pounds will be split equally among 18 people. How much spice will each person get? Write your answer in simplest form.

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57

Practice 2.22

1. A recipe for oatmeal chocolate chip cookies calls for ¾ cup of rolled oats. Monica is making ½ of the recipe. How much oats should she use?
2. Divide and simplify $\frac{5}{6} \div \frac{7}{4}$

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