

Fracturing Misconceptions in Fractions

NCTM National Conference

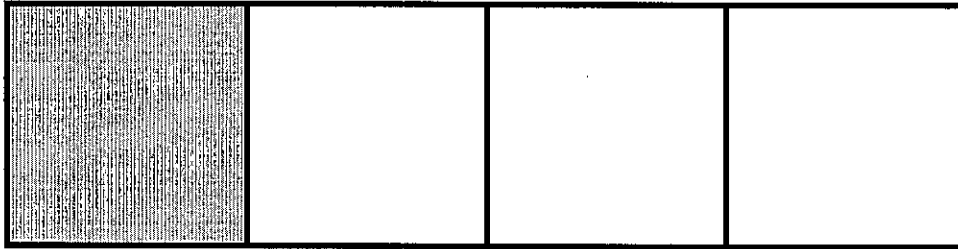
Denver, Colorado - 2013

Presented by Diane Fischer

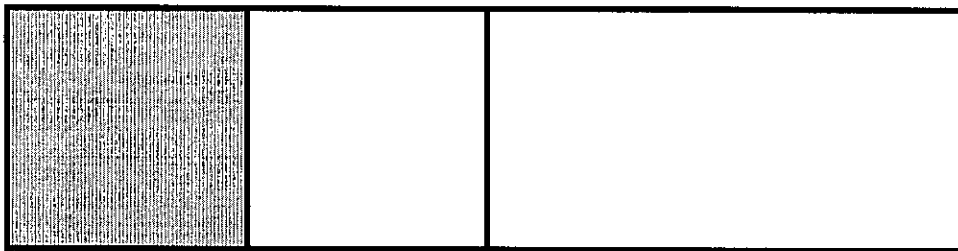
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What fraction of the rectangle is shaded?



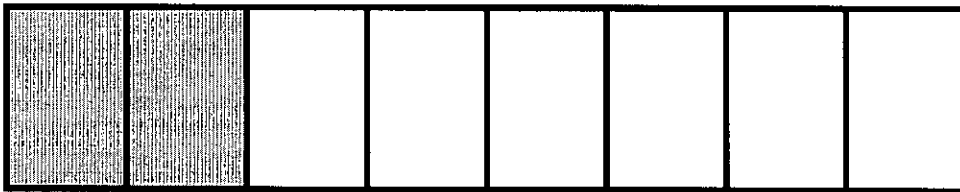
What fraction of the rectangle is shaded?



Name _____

Understanding Fractions

Joe said this is a picture of one half. The teacher said he was correct. How can this be true?



Madeline said this was a picture of 2. How can she be correct?

Jose said this was a picture of one fourth. How can he be correct?

Andre said this was a picture of 1. How can he be correct?

Name _____

Fraction Benchmarks

Compare each problem using the benchmarks 0 , $\frac{1}{2}$, 1 .

$$\frac{7}{12} \bigcirc \frac{2}{10}$$

$\frac{7}{12}$ is closer to _____. $\frac{2}{10}$ is closer to _____.

$$\frac{1}{8} \bigcirc \frac{4}{5}$$

$\frac{1}{8}$ is closer to _____. $\frac{4}{5}$ is closer to _____.

$$\frac{10}{12} \bigcirc \frac{4}{9}$$

$\frac{10}{12}$ is closer to _____. $\frac{4}{9}$ is closer to _____.

$$\frac{3}{6} \bigcirc \frac{6}{5}$$

$\frac{3}{6}$ is closer to _____. $\frac{6}{5}$ is closer to _____.

$$\frac{1}{2} \bigcirc \frac{2}{7}$$

$\frac{1}{2}$ is closer to _____. $\frac{2}{7}$ is closer to _____.

$$\frac{3}{6} \bigcirc \frac{5}{10}$$

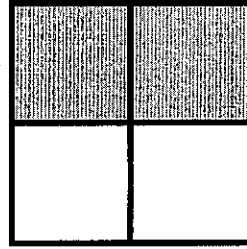
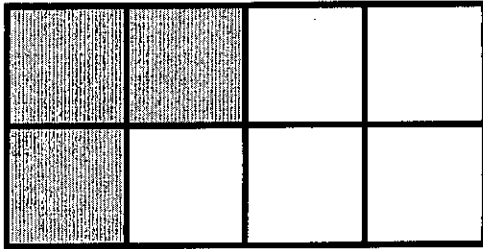
$\frac{3}{6}$ is closer to _____. $\frac{5}{10}$ is closer to _____.

How can you use benchmarks to compare fractions?

Name _____

Comparing Fractions

Amanda drew this picture and said $\frac{3}{8} > \frac{1}{2}$.



Do you agree or disagree? Why?

Name _____

Compare Fractions with One as a Benchmark

Compare the following fractions:

$$\frac{5}{8} \quad \bigcirc \quad \frac{7}{8}$$

$\frac{5}{8}$ is _____ away from one. $\frac{7}{8}$ is _____ away from one.

$$\frac{3}{4} \quad \bigcirc \quad \frac{2}{3}$$

$\frac{3}{4}$ is _____ away from one. $\frac{2}{3}$ is _____ away from one.

$$\frac{9}{10} \quad \bigcirc \quad \frac{7}{8}$$

$\frac{9}{10}$ is _____ away from one. $\frac{7}{8}$ is _____ away from one.

$$\frac{9}{10} \quad \bigcirc \quad \frac{5}{6}$$

$\frac{9}{10}$ is _____ away from one. $\frac{5}{6}$ is _____ away from one.

$$\frac{4}{5} \quad \bigcirc \quad \frac{5}{6}$$

$\frac{4}{5}$ is _____ away from one. $\frac{5}{6}$ is _____ away from one.

$$\frac{3}{4} \quad \bigcirc \quad \frac{4}{5}$$

$\frac{3}{4}$ is _____ away from one. $\frac{4}{5}$ is _____ away from one.

How can you compare two fractions that are both close to one?

Name _____

Comparing Fractions with Like Denominators

Compare the following fractions using your fraction pieces.

$$\frac{3}{5} \bigcirc \frac{4}{5}$$

$$\frac{5}{8} \bigcirc \frac{7}{8}$$

$$\frac{9}{10} \bigcirc \frac{7}{10}$$

$$\frac{5}{6} \bigcirc \frac{4}{6}$$

$$\frac{2}{5} \bigcirc \frac{4}{5}$$

$$\frac{2}{3} \bigcirc \frac{1}{3}$$

$$\frac{5}{10} \bigcirc \frac{7}{10}$$

$$\frac{5}{6} \bigcirc \frac{4}{6}$$

How can you compare two fractions that have the same denominators?

Name _____

Comparing Fractions with Like Numerators

Compare the following fractions using your fraction pieces.

$$\frac{2}{5} \bigcirc \frac{2}{4}$$

$$\frac{3}{4} \bigcirc \frac{3}{5}$$

$$\frac{2}{5} \bigcirc \frac{2}{4}$$

$$\frac{3}{4} \bigcirc \frac{3}{5}$$

$$\frac{5}{6} \bigcirc \frac{5}{8}$$

$$\frac{7}{9} \bigcirc \frac{7}{8}$$

$$\frac{9}{12} \bigcirc \frac{9}{10}$$

$$\frac{6}{8} \bigcirc \frac{6}{9}$$

$$\frac{7}{10} \bigcirc \frac{7}{8}$$

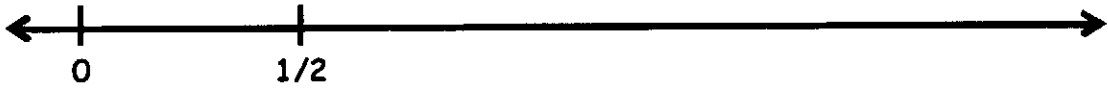
How can you compare two fractions that have the same numerators?

Fractions on a Number Line with Cuisenaire Rods

Mark 1 on the number line.



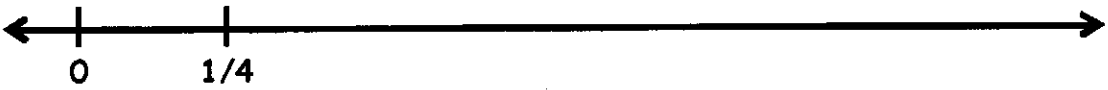
Mark 1 on the number line.



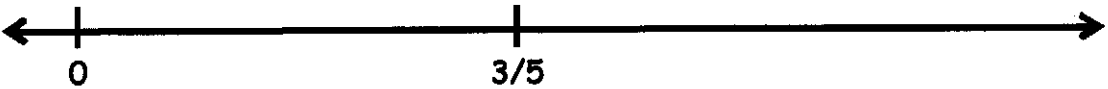
Mark 1 on the number line.



Mark 1 on the number line.



Mark 1 on the number line.



Mark 1 on the number line.



How do you know that the spots you marked as one are correct?

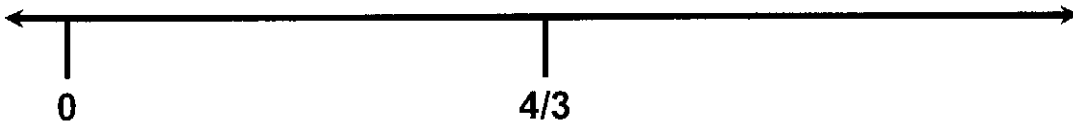
Name _____

Fractions on a Number Line

Mark 1 on the number line.



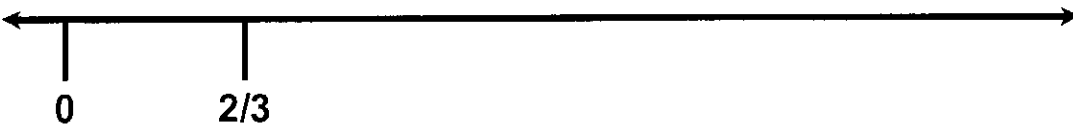
Mark 1 on the number line.



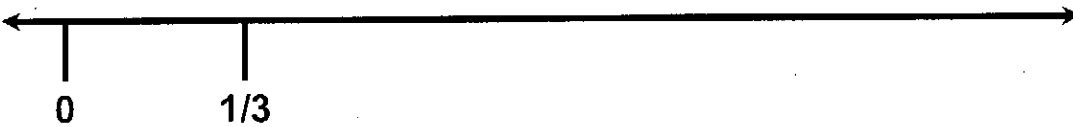
Mark 1 on the number line.



Mark 1 on the number line.



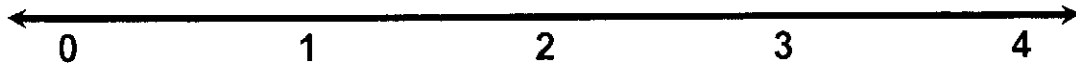
Mark 1/4 on the number line.



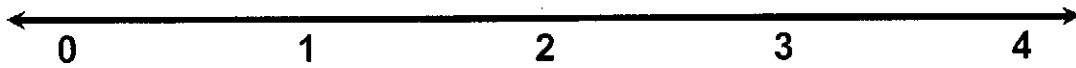
Name _____

Fractions on a Number Line

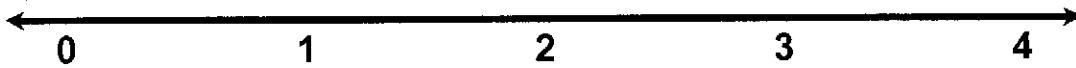
Mark $1\frac{3}{4}$ on the number line



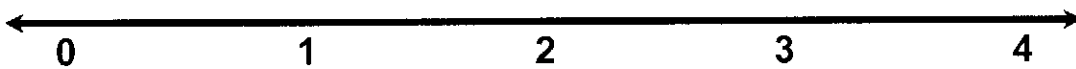
Mark $2\frac{1}{4}$ on the number line



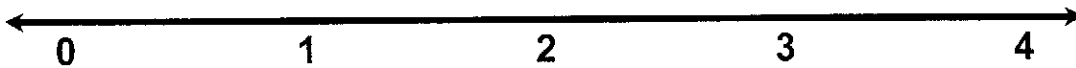
Mark $2\frac{5}{8}$ on the number line



Mark $6\frac{2}{3}$ on the number line



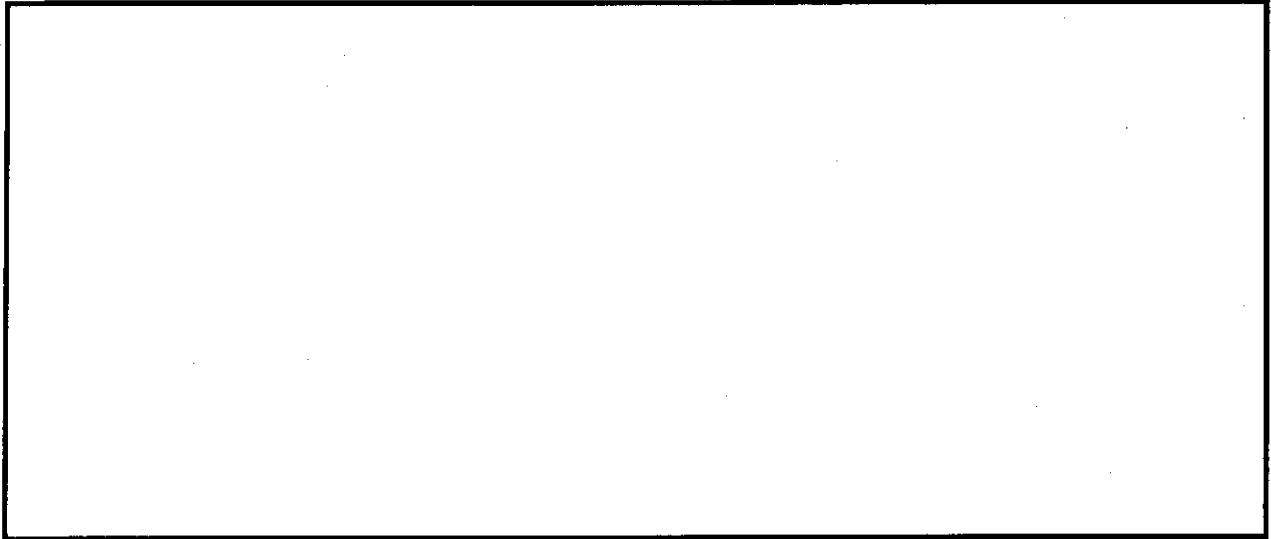
Mark $1\frac{4}{5}$ on the number line



Name _____

One Third

Find as many fractions as you can equal to $\frac{1}{3}$ as possible.



What patterns do you notice in these fractions?

What does this tell us about one third?

How can we tell if a fraction is close to or equal to one third?

Names _____

Making Sense of Addition of Fractions

Directions: Use your fraction pieces to decide if the following equations are true or false. If they are false, find the correct answer. Be prepared to explain how you found the correct answers.

1. $\frac{1}{2} + \frac{1}{4} = \frac{2}{6}$ True or False Correct Answer: _____

2. $\frac{1}{3} + \frac{1}{2} = \frac{5}{6}$ True or False Correct Answer: _____

3. $\frac{5}{8} + \frac{1}{4} = \frac{7}{8}$ True or False Correct Answer: _____

4. $\frac{1}{2} + \frac{5}{8} = \frac{6}{10}$ True or False Correct Answer: _____

5. $\frac{3}{4} + \frac{3}{8} = \frac{6}{12}$ True or False Correct Answer: _____

6. $\frac{3}{8} + \frac{1}{2} = \frac{7}{8}$ True or False Correct Answer: _____

Names _____

Making Sense of Addition of Fractions Revisited

Directions: Use your fraction pieces to decide if the following equations are true or false. If they are false, find the correct answer. Be prepared to explain how you found the correct answers.

1. $\frac{2}{3} + \frac{1}{5} = \frac{3}{8}$ True or False Correct Answer: _____

2. $\frac{1}{12} + \frac{2}{3} = \frac{9}{12}$ True or False Correct Answer: _____

3. $\frac{5}{8} + \frac{1}{4} = \frac{7}{8}$ True or False Correct Answer: _____

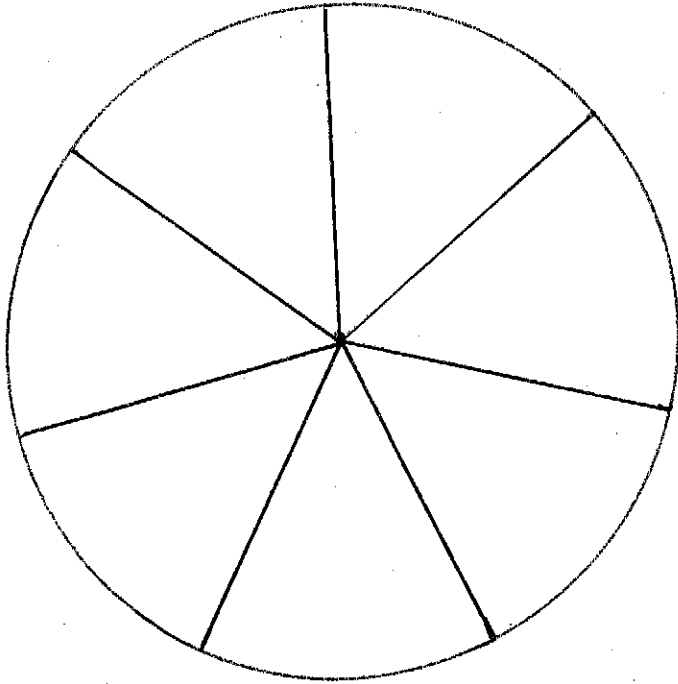
4. $\frac{1}{5} + \frac{7}{10} = \frac{8}{15}$ True or False Correct Answer: _____

5. $\frac{1}{6} + \frac{1}{3} = \frac{3}{6}$ True or False Correct Answer: _____

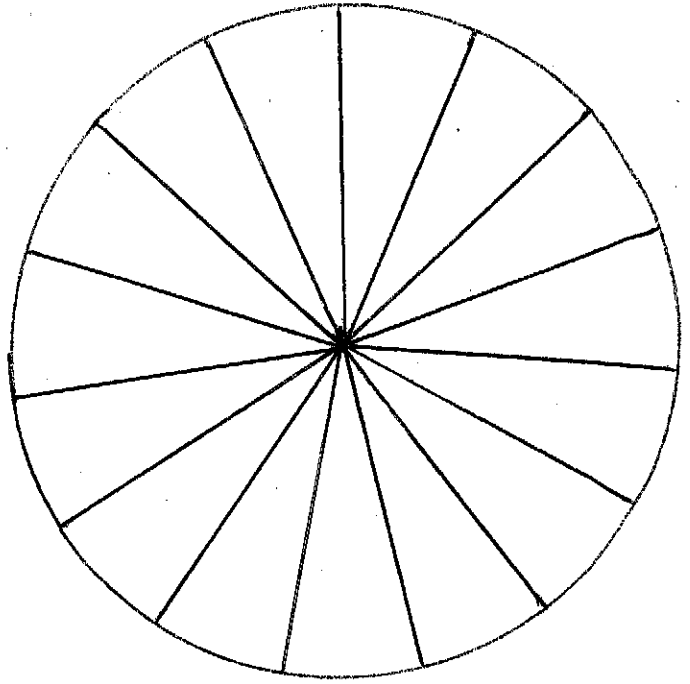
6. $\frac{3}{10} + \frac{2}{5} = \frac{5}{15}$ True or False Correct Answer: _____

These fractions circles are not perfectly drawn but do not need to reach the level of exact precision to get across the idea if more problems are needed. It also allows for some differentiation within the classroom. Give the more difficult problems to groups who can handle larger denominators.

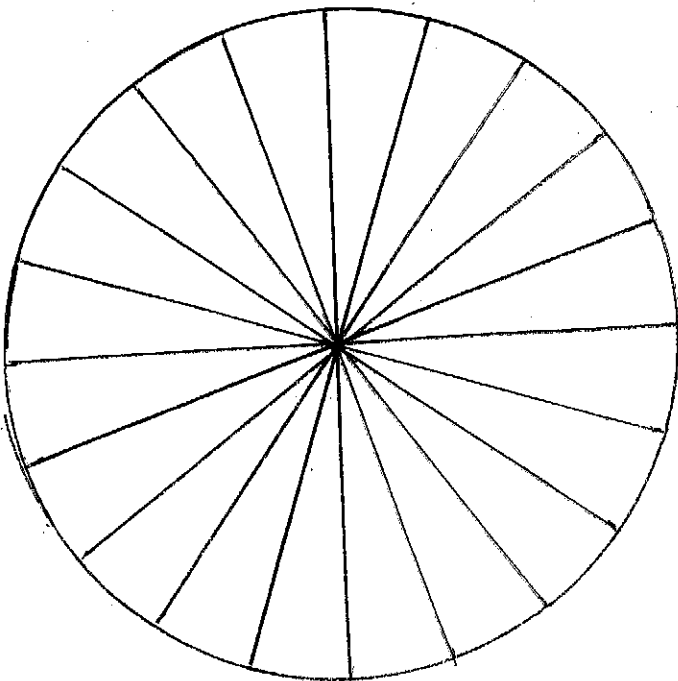
Sevenths



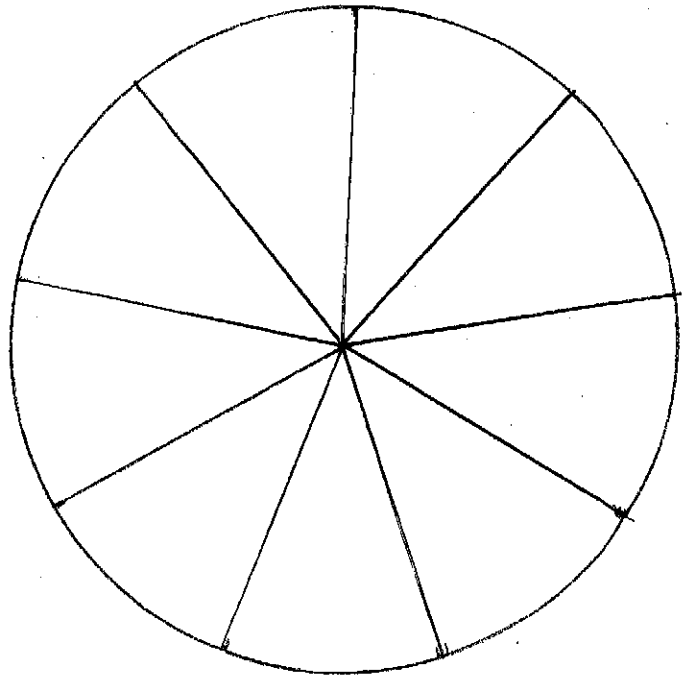
Fifteenths



Twentieths



Ninths



Name _____

Multiplying by fractions less than one and greater than one

Part 1: Decide if the product is greater than or less than one half.

1. $\frac{8}{9} \times \frac{1}{2} =$ _____ The product is _____ than $\frac{1}{2}$.

2. $\frac{7}{8} \times \frac{1}{2} =$ _____ The product is _____ than $\frac{1}{2}$.

3. $\frac{3}{5} \times \frac{1}{2} =$ _____ The product is _____ than $\frac{1}{2}$.

4. $\frac{1}{2} \times \frac{1}{2} =$ _____ The product is _____ than $\frac{1}{2}$.

5. $\frac{1}{3} \times \frac{1}{2} =$ _____ The product is _____ than $\frac{1}{2}$.

Part 2: Decide if the product is greater than or less than one half.

1. $1\frac{1}{3} \times \frac{1}{2} =$ _____ The product is _____ than $\frac{1}{2}$.

2. $1\frac{2}{5} \times \frac{1}{2} =$ _____ The product is _____ than $\frac{1}{2}$.

3. $1\frac{1}{4} \times \frac{1}{2} =$ _____ The product is _____ than $\frac{1}{2}$.

4. $1\frac{7}{8} \times \frac{1}{2} =$ _____ The product is _____ than $\frac{1}{2}$.

5. $1\frac{1}{2} \times \frac{1}{2} =$ _____ The product is _____ than $\frac{1}{2}$.

What conjectures can you make about multiplying by a fraction less than one? What conjectures can you make about multiplying by a fraction greater than one?
