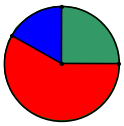
Day 29: Fraction Puzzles – Differentiated Instruction with Centres — Grade 7



Description

- Explore/review fractional parts of geometric shapes.
- Order fractions.

Materials

- pattern blocks
- overhead pattern blocks
- word wall templates
- BLM 29.1-29.5
- 2 or 3 large Imperial socket wrench sets

Assessment Opportunities

Minds On…

Whole Class → Introducing Vocabulary

Students work in pairs to complete one word wall template. (*Think Literacy: Cross-Curricular Approaches–Mathematics*). They use their textbook, dictionary, personal knowledge, and other resources to complete it.

Students share their word and the components of the template. Post all words on the classroom math word wall.

TIPS: Section 2 – Fractions, p. 3 teaching fraction concepts.

Virtual pattern blocks are available at http://arcytech.org/java/patterns/patterns_j.shtml.

Action!

Small Groups → Centres

Group students according to their diagnostic results. Students work at the indicated centre for the action portion of the lesson. (See next page for description of centres.)

While students work at the centres, give selected individuals BLM 29.3 and an Imperial socket wrench set that has been mixed up. Ask them to explain why they placed a certain socket between two others.

Learning Skills & Curriculum Expectations/Observation/Anecdotal:
Circulate while students are working to assess prior knowledge of fractions. Ask students to explain how they know their solution to a question is correct.

Briefly review the meaning of *parallelogram* (blue or beige block) and *trapezoid* (red block).

Some methods students may use include: physical size of each socket, ordering of the sockets using equivalent fractions, converting to decimals, measuring in millimetres.

Consolidate Debrief

Whole Class → Sharing/Discussion

Ask students to share what they learned at their centre. Students interested in exploring the mathematics at their centres should be encouraged to do so either as a homework task or as an additional exploration day.

Discuss the various methods discovered by students to solve the socket set problem.

Concept Practice

Home Activity or Further Classroom Consolidation

Write a summary of your current understanding of fractions. It can be a mind map, a written paragraph, diagrams or any other appropriate format.

Refer students to the virtual pattern block website listed above.

Assign related questions from the textbook or BLM 29.9 based on the centre the students worked at.

Differentiated Instruction: Centres-Based Day 29

Following the administration of the diagnostic, students should be grouped according to their readiness to proceed. The centres are somewhat progressive, so students who complete one centre could move to the next. It is not the intention that all students complete all centres.

Group A: students who were unable to answer most or all of the assessment correctly and who demonstrated little fractional understanding in their mind map and dialogue.

Group B: students who were able to answer only question 1 of the assessment correctly and who demonstrated little fractional understanding in their mind map and dialogue.

Group C: students who were able to answer most or all of the assessment correctly and who demonstrated grade-level fractional understanding in their mind map and dialogue.

Group D: students who were able to answer most or all of the assessment correctly and who demonstrated above grade-level fractional understanding in their mind map and dialogue.

Description of Centres

The first centre, **Fraction Puzzles**, provides students with an opportunity to explore equivalent fractions and compare fractional values using the concrete manipulative, fraction circle pieces. Students record their work on BLM 29.4. Questioning students about their reasoning and any conclusions they may be drawing aids in deepening their understanding of fractions.

The second centre, **Virtual Manipulatives: Fraction Circles**, engages students as they explore equivalent fractions and compare fractional values using virtual fraction circles. This centre requires comfort with technology as students turn shapes to fit into a whole. Students are prompted to draw conclusions about the relationships they are exploring. (See BLM 29.5.)

The third centre, **Pattern Block Area Fraction Puzzles**, is the original Day 29 activity. Students who encounter difficulty are provided with hint cards (BLM 29.10). The hint cards should be photocopied on card stock, labelled on the back with the question number and hint number and cut into separate cards. Students are encouraged to access one or more hints as they see appropriate.

The fourth centre, **Explorations**, consists of extension questions for students who finish the third centre quickly. BLM 29.6 and 29.7 could be photocopied on cardstock and laminated, so students can work on the card using non-permanent overhead markers. BLM 29.8 could be separated into single cards and laminated. BLM 29.9 may be considered for a home activity for selected students or included in the centre. Students should have a choice of question that they work on following the completion of the centre.

Group Assignments

Activity	Fraction Puzzles	Virtual Manipulatives: Fraction Circles	Pattern Block Area Fraction Puzzles	Explorations
Materials	• fraction circles • one copy of BLM 29.4 per student	• computer with Internet access • one copy of BLM 29.5 per student	• pattern blocks • one copy of BLM 29.1 and 29.2 per student • one set of Hint Cards (BLM 29.10)	• copies of BLM 29.6, 29.7, 29.8, 29.9 as required (see note above) • graph paper • manipulatives
Group A	✓			
Group B		✓		
Group C			✓	
Group D			✓	✓

29.1: Pattern Block Area Fraction Puzzles

Name:
Date:

Use pattern blocks to solve each of the area fraction puzzles below. Draw each solution on pattern block paper. Label each colour with its fraction of the whole shape.

1. Build a parallelogram with an area that is one-third green, one-third blue, and one-third red.

2. Build a parallelogram with an area that is one-eighth green, one-half yellow, one-eighth red, and one-quarter blue.

3. Build a trapezoid with an area that is one-tenth green and nine-tenths red.

4. Rebuild each of the puzzles above in a different way.

5. Explain why it is not possible to build a parallelogram with an area that is one-half yellow, one-third green and one-quarter blue.

29.1: Pattern Block Area Fraction Puzzles

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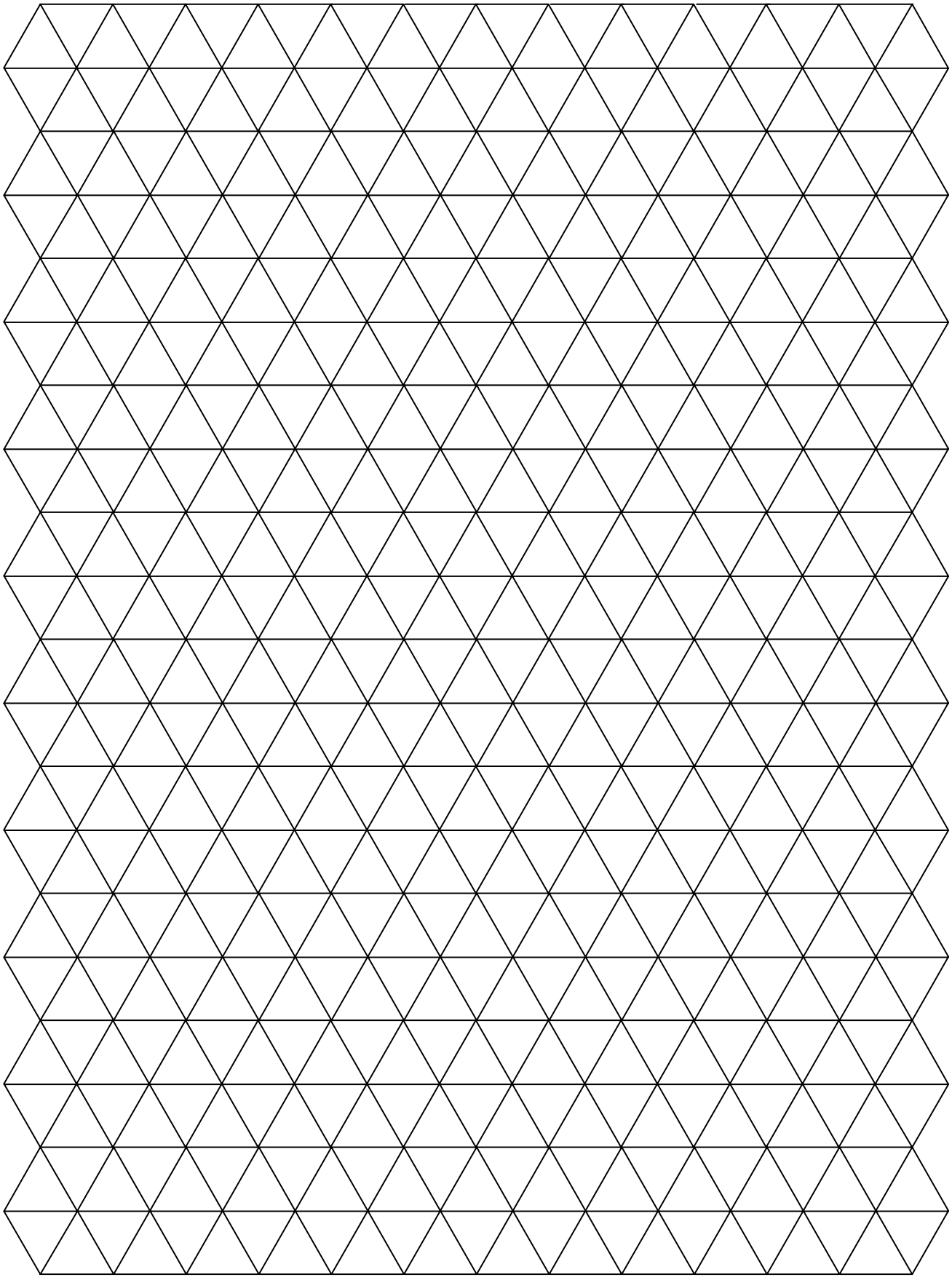
4. Rebuild each of the puzzles above in a different way.

5. Explain why it is not possible to build a parallelogram with an area that is one-half yellow, one-third green and one-quarter blue.

29.2: Pattern Block Paper



29.3: Socket To You!

Name:
Date:

1. $\frac{20}{32}$ is an equivalent fraction for $\frac{5}{8}$. Write two more equivalent fractions for $\frac{5}{8}$.

2. Write two equivalent fractions for $\frac{3}{4}$.

3. Circle which is larger: $\frac{3}{8}$ or $\frac{3}{16}$.

4. Circle which is smaller: $\frac{7}{16}$ or $\frac{9}{16}$.

5. Circle the fraction that falls between $\frac{7}{16}$ and $\frac{9}{16}$.

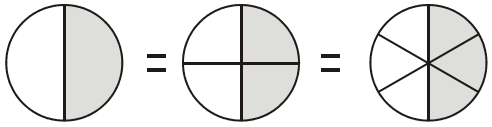
   $\frac{13}{32}, \frac{1}{4}, \frac{3}{8}, \frac{1}{2}, \frac{5}{8}, \frac{3}{4}, \frac{19}{32}$

6. Often mechanics use socket wrench sets with openings measured in fractions of an inch. These fractions are stamped on the fronts of the sockets.
   Think about how to restock the socket wrench set in the correct order in the case. Explain how you decided on the order you chose to the teacher.

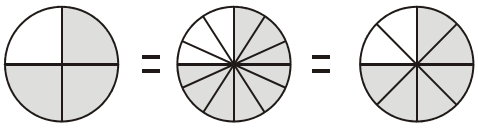
29.4: Fraction Puzzles

1. Review the following fraction sentences that identify equivalent fractions:

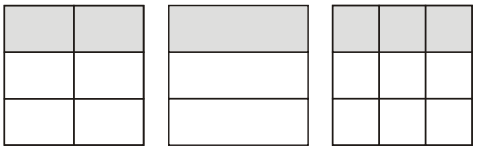
a) $\frac{1}{2} = \frac{2}{4} = \frac{3}{6}$



b) $\frac{3}{4} = \frac{9}{12} = \frac{6}{8}$



c) $\frac{2}{6} = \frac{1}{3} = \frac{3}{9}$



2. Represent the following fractions using FRACTION CIRCLES or FRACTION TILES.

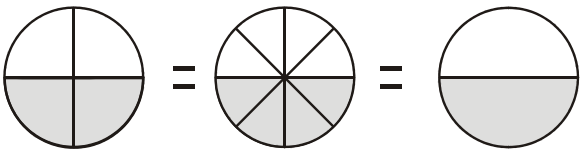
a) $\frac{3}{4} = \frac{6}{8}$

b) $\frac{2}{3} = \frac{6}{9}$

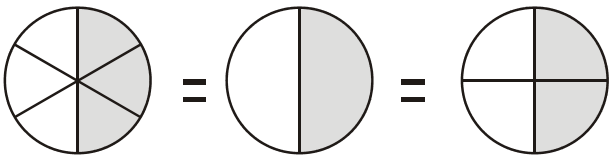
c) $\frac{4}{5} = \frac{8}{10}$

3. Write fraction sentences to represent the following illustrations. Use your fraction circles to recreate the illustration if necessary.

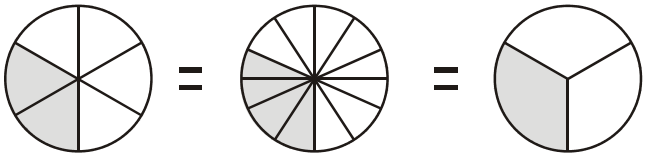
a)



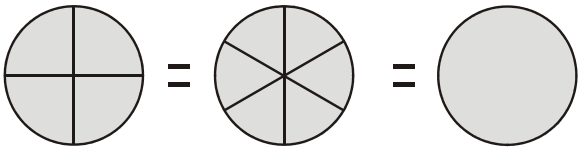
b)



c)



d)



29.4: Fraction Puzzles (continued)

4. State whether the following statements are TRUE or FALSE.
   Use your fraction circles or tiles to recreate the diagrams to compare.

   a) $\frac{4}{10} = \frac{2}{5}$

   b) $\frac{3}{4} = \frac{6}{10}$

   c) $\frac{2}{3} = \frac{2}{5}$

   d) $\frac{3}{5} = \frac{2}{5}$

5. Identify the following as GREATER THAN (>) or LESS THAN (<) or EQUAL TO (=).
   Use your fraction circles or tiles to create a diagram, if necessary.

   a) $\frac{7}{10} \quad \frac{5}{6}$

   b) $\frac{2}{8} \quad \frac{3}{8}$

   c) $\frac{2}{5} \quad \frac{2}{4}$

   d) $\frac{1}{3} \quad \frac{4}{12}$

6. How many $\frac{1}{10}$ tiles does it take to cover four $\frac{1}{5}$ tiles? Find two ways to determine this.

29.5: Virtual Manipulatives: Fraction Circles

Use the virtual fraction circles at
http://matti.usu.edu/nlvm/nav/frames_asid_274_g_3_t_1.html?open=activities

Investigating Filling a Whole

1. a. Select a coloured piece.
   Colour: _____
   b. Click on the piece to move it into your work area. Then, click and drag it into the whole shape.
   c. Repeat using the same coloured piece until you have filled the whole shape.
   It takes _____ *pieces to fill a whole shape.*

   Click on **Show Labels**. Point at each piece.

2. a. Select a different coloured piece.
   Colour: _____
   b. Repeat the instructions from #1 to fill the whole shape with these pieces.
   It takes _____ *pieces to fill a whole shape.*

   Click on **Show Labels**. Point at each piece.

   It is _____ of the whole shape.

3. a. Select a different coloured piece.
   Colour: _____
   b. Repeat the instructions from #1 to fill the whole shape with these pieces.
   It takes _____ *pieces to fill a whole shape.*

   Click on **Show Labels**. Point at each piece.

   It is _____ *of the whole shape.*

4. Identify any relationships you notice between the number of pieces required to fill the whole and the denominator.

29.5: Virtual Manipulatives: Fraction Circles (continued)

Investigating Fractional Relationships

5. a. State the fractional value of a yellow piece.

   b. State the fractional value of a black piece.

   c. Determine how many black pieces fill one yellow piece.

6. a. State the fractional value of a purple piece.
   b. Determine what other colour pieces will completely fill one purple piece.

   Example: 3 blues ($\frac{3}{9}$) will completely fill one purple piece ($\frac{1}{3}$)

7. Find other pieces that will completely cover one piece.
   Draw these equivalent fractions and record the fractional values.

8. Find a fraction that is equivalent to $\frac{2}{12}$ (two orange pieces).

   An equivalent fraction is

29.5: Virtual Manipulatives: Fraction Circles continued

Ordering Fractions

9. Use the fraction circle pieces and your knowledge about fractions to determine which fraction is larger, $\frac{1}{6}$ *or* $\frac{1}{9}$. Explain your thinking.

10. Identify the colour and value of the largest fraction piece.

11. Identify the colour and value of the smallest fraction piece.

12. Use the fraction circle pieces and your knowledge about fractions to determine which fraction is larger. Circle the larger fraction.

a. $\frac{1}{5}$ $\frac{1}{3}$ b. $\frac{2}{5}$ $\frac{2}{3}$ c. $\frac{3}{9}$ $\frac{1}{2}$

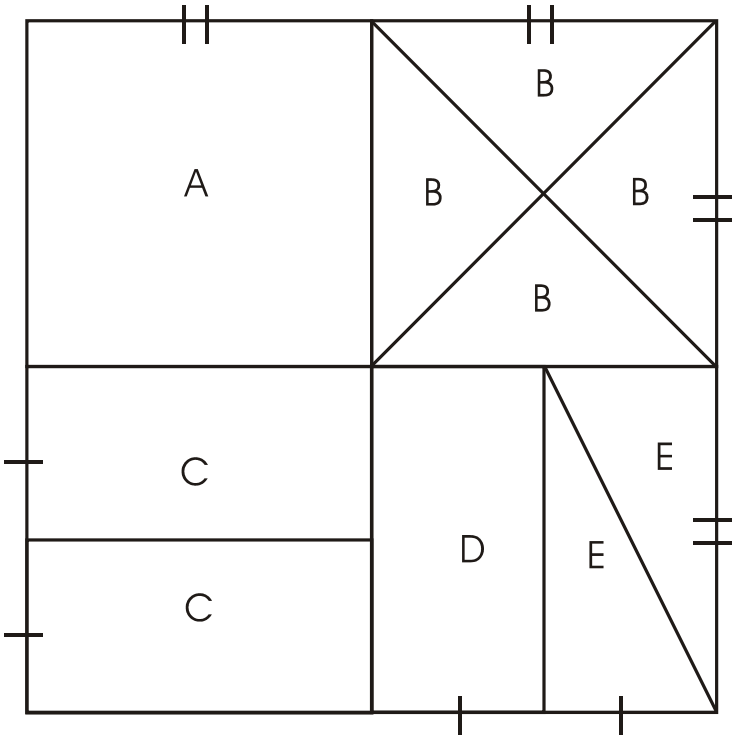
13. Using the information above and your knowledge about fractions, identify ways that you can tell the size of a fraction from the fraction.

14. Put the following fractions in order from the largest to the smallest. Explain your thinking.

$\frac{1}{3}$ $\frac{1}{5}$ $\frac{1}{2}$ $\frac{1}{10}$ $\frac{1}{4}$

29.6: Fractional Names

The large outer square represents 1 whole unit. It is partitioned into pieces. Each piece is identified with a letter.



1. Decide what fraction of the whole square each piece is and write it on the shape.

2. Explain how you know the fractional name for each of the following pieces:
   A

   C

   D

   E

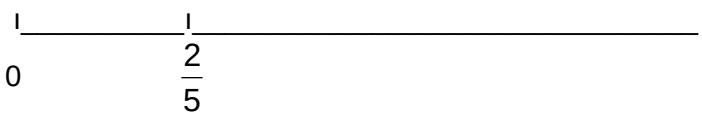
3. What piece or collection of pieces from the square will give you an amount close to:
   a) $\frac{1}{5}$

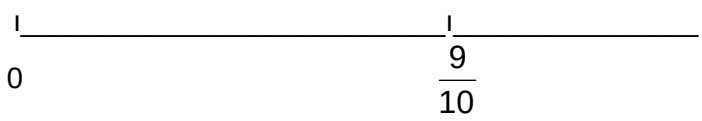
   b) $\frac{2}{3}$

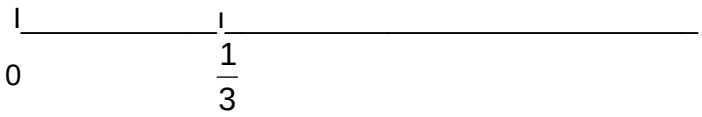
4. Pose your own fraction questions using the above diagram.

29.7: Fractional Sense

1. Estimate and mark where the numeral 1 would be.

a) 

b) 

c) 

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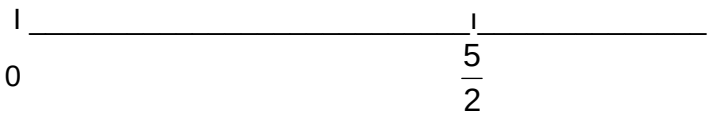
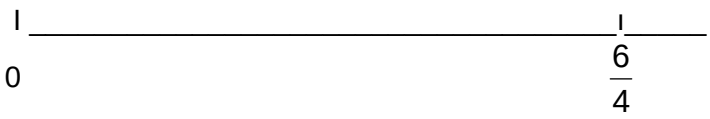
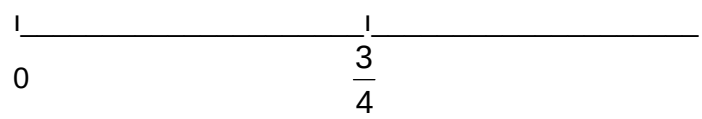
e) 

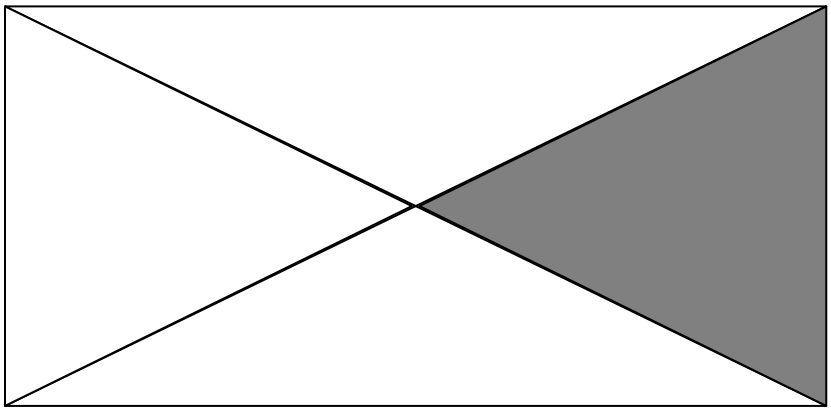
f) 

g) 

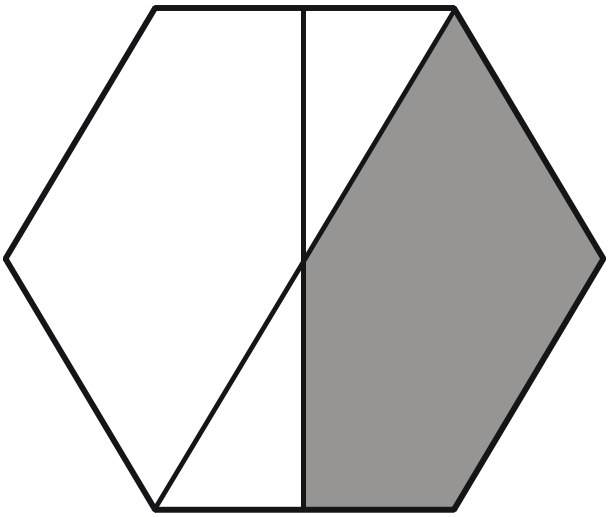
2. Explain how you estimated the position of 1.

29.8: Exploring Some Fractional Relationships

1. Determine what fraction of the area of the rectangle is shaded.

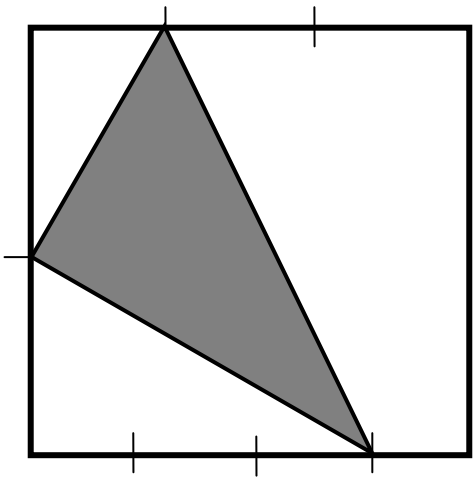


2. Determine what fraction of area of the hexagon is shaded.
   (Leave your answer as the simplest possible fraction.)



29.8: Exploring Some Fractional Relationships (continued)

3. The sides of a square were divided into different numbers of equal sections. As the diagram shows, three divider points are connected. Determine the fraction of the square that is represented by the shaded triangle.



4. Arrange these fractions from smallest to largest.

$$\frac{3}{8} \quad \frac{(3+1)}{(8+1)} \quad \frac{(3+2)}{(8+2)} \quad \frac{(3+12)}{(8+12)} \quad \frac{(3-2)}{(8-2)}$$

5. Suppose *x, y*, and *z* represent whole numbers different from 0. Suppose that $x > y > z$. If possible, tell which fraction is larger. Justify your thinking.

a. $\frac{x}{z}$ *or* $\frac{y}{z}$

b. $\frac{x}{y}$ *or* $\frac{y}{y}$

c. $\frac{x}{y}$ *or* $\frac{x}{z}$

29.9: Working with "Nice" Fractions

Sometimes we round off a fraction to a "nice" fraction, such as $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{2}{3}$, *or* $\frac{3}{4}$, that is more easily understood.

For example:

Chin made 4 out of 15 free throws.

$\frac{4}{15}$ *is close to* $\frac{4}{16}$, *and* $\frac{4}{16}$ *equals* $\frac{1}{4}$.

Thus she made about $\frac{1}{4}$ *of her shots.*

Represent each of these with a nice fraction.

1. Matthew took 26 shots and scored 8 baskets.

2. Sandra was at bat 73 times and made 24 base hits.

3. Jason completed 22 out of his 41 passes.

4. Cindy was at bat 73 times and made 15 base hits.

5. Luciano took 17 shots and scored 8 baskets.

6. Daniel was at bat 35 times and made 12 hits.

7. Percival took 35 shots on goal and scored 6 goals.

29.10: Hint Cards

Question 1 **Hint #1** You will need 11 blocks.	**Question 1** **Hint #2** The green piece is 1 unit.
Question 1 **Hint #3** The blue piece is 2 units.	**Question 1** **Hint #4** The red piece is 3 units.
Question 2 **Hint #1** You will need nine blocks.	**Question 2** **Hint #2** Begin by constructing the yellow area.
Question 2 **Hint #3** The green area is equal to the red area.	**Question 3** **Hint #1** You will need twelve red blocks.
Question 3 **Hint #2** You will use more than one green block.	