Dot Paper Equivalencies

Based on Activity 16.14, p. 309

Grade Level: Third or fourth grade.

Mathematics Goals

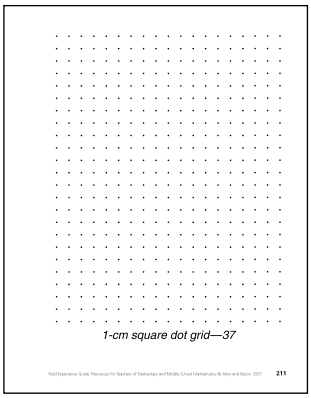
- To develop a conceptual understanding of equivalent fractions; the same quantity can have different fraction names.
- To look for patterns in equivalent fractions.

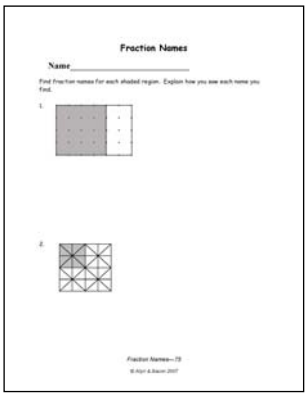
Thinking About the Students

Students should have a good understanding of what the top and bottom numbers (numerator and denominator) in a fraction stand for. Although this is an early activity in developing equivalent fraction concepts, it is probably not the best first activity. "Different Fillers" (Activity 16.13) is a better first activity for equivalent fractions.

Materials Preparation:

- A transparency of a centimeter dot grid (Blackline Master 37, "1-cm square dot grid").
- Copies of the "Fraction Names" worksheet for each student (Blackline Master 75, "Fraction Names") plus a transparency for use in the after portion of the lesson.


1-cm square dot grid—37


Fraction Names

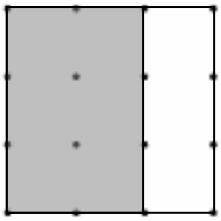
Name_____

LESSON

BEFORE

Begin with a simpler version of the task:

- On the dot transparency, outline a 3 by 3 rectangle and shade in 2/3 of it as shown here.



- Tell this story:

  "Two students looked at this picture. Each saw a different fraction. Kyle saw 6/9, but Terri said she saw 2/3. How can they see the same drawing and yet each see different fractions? Which one is right? Why?"

- Have students come to the front and offer explanations for how Kyle saw the picture and how Terri saw it. When students in the class agree on and also understand a correct explanation, draw the corresponding unit fraction to aid in understanding. For example, Terri saw a column of three squares as 1/3. (Draw a column of 3 squares to the side of the rectangle.) If a column of 3 squares is 1/3, then there are two columns shaded. Therefore, the shaded portion is 2/3. Point out that the 1/3 piece is called a *unit fractional part* or *unit fraction*. (A unit fraction is a single fractional part. The fractions ⅓ and ⅛ are unit fractions.)

- Similarly, be sure that students can tell why the shaded portion can be called 6/9.

The Task

- For each outlined region on the worksheet, find as many fraction names as possible.

Establish Expectations:

- For each fraction name, draw and label a picture of the unit fractional part that was used.
- Use words to tell how you found that fraction name for the shaded portion.

DURING

- For students who are having difficulty getting started, draw a fractional part for them. For example, for 1, draw a two-square rectangle. "How many rectangles like this make up the whole?" Try not to give more assistance than is absolutely necessary to get students on track.
- Students who do not seem to understand counting the fractional parts may need more development of the meaning of top and bottom numbers.
- For students who seem to have finished quickly, make sure first that their explanations are reflective of their capabilities. Then, challenge them to find even more names for the shaded portions. If they've not yet done so, suggest in part 1 that the small squares can be subdivided even further. As a greater challenge, what name will the shaded portion in part 1 have if 3 small squares (1/8) or 6 small squares (1/4) are used to name the fraction? (The shaded portion is $\frac{5\frac{1}{3}}{8}$ and $\frac{3\frac{2}{3}}{4}$.)

AFTER

- Use a transparency of the worksheet to help students share their ideas. For each drawing, first make a list of all of the fraction names that students have found for the shaded region. Record these on the board without comment even if some are incorrect. Then have students explain how they got the fractions by drawing on the transparency. Let one student explain one fraction, not all of them. Be sure students all agree and understand. For some explanations, other students may have used a differently shaped unit fraction.

For example, in the first drawing, four squares make 1/6 and can be used to name the shaded region as 4/6. Some students may have used a column of four squares and others a 2-by-2 arrangement of four squares. While completely the same, students should be allowed to discuss this.

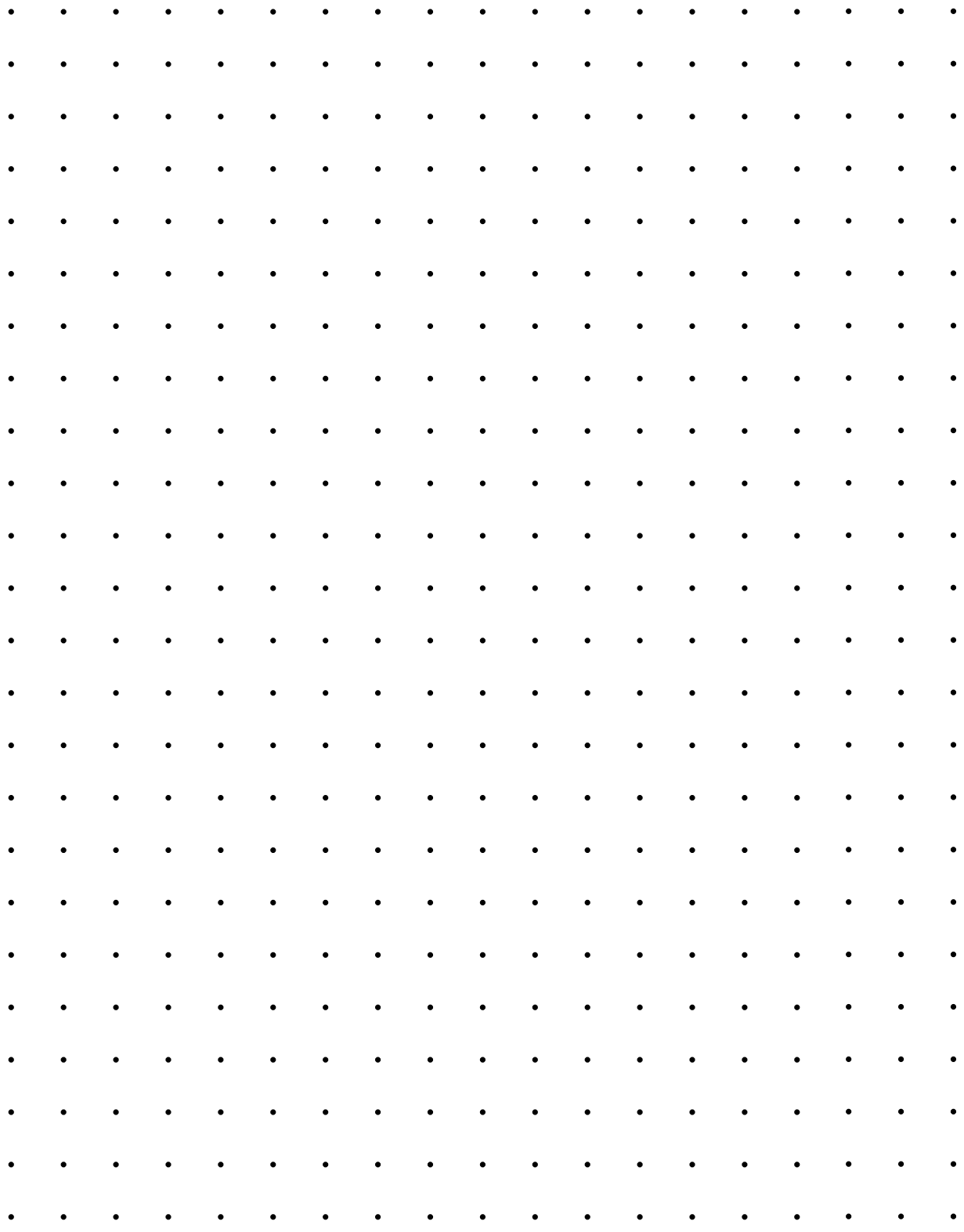
- The first region can be named 2/3, 4/6, 8/12, and 16/24. Of course a 1-by-1 square could be halved to produce 32/48 and subdivided further for even greater denominators. As mentioned in the "during" section, three squares is 1/8 of the whole. Some will say that the region cannot be named with eighths. A few may be ready to suggest the fractional numerator. Be careful not to get too entangled in this discussion if a large portion of the class is not following it.
- The last region also has lots of names from 1/4 to 8/32, and even more if the sections are subdivided further.
- If time permits, you may want to focus attention on all of the names for one region and discuss any patterns that students may observe.

ASSESSMENT NOTES

- The issue of greatest concern will be the students who, even after marking off an appropriate unit fraction, cannot correctly name the shaded portion. For example, in the second figure, if the full shaded region is used as the unit (fourths), some students may write 1/3 (1 region to 3 regions) or in other ways still not know how to name the fraction. These students will need further foundation work with fraction concepts.
- Do not be concerned if students do not find all of the fraction names that are possible. The goal is not to exhaust the possibilities but to develop the understanding that a given

quantity can have multiple names. At the same time, a few students may find that continued halving of the smallest unit results in doubling of the numerator and denominator, a precursor to the equivalent fraction algorithm.

- For students who seem to find this activity easy, see if they can generate other fraction names for these regions by looking at the fractions they have already found and seeing if they can discover a rule for generating more.

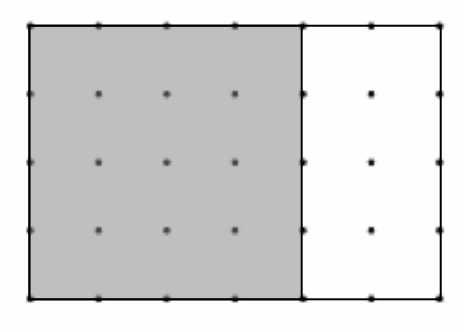


1-cm square dot grid—37

Fraction Names

Name_____

Find fraction names for each shaded region. Explain how you saw each name you find.

1. 

2.