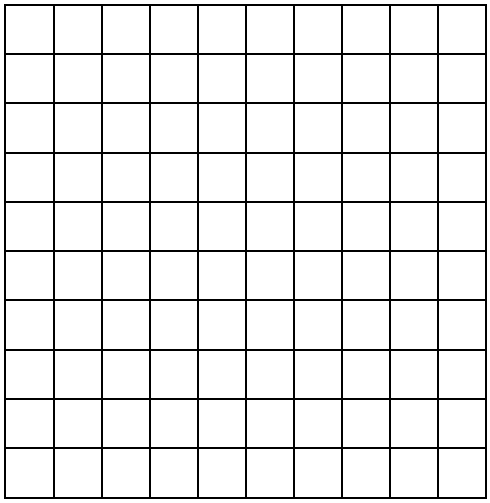
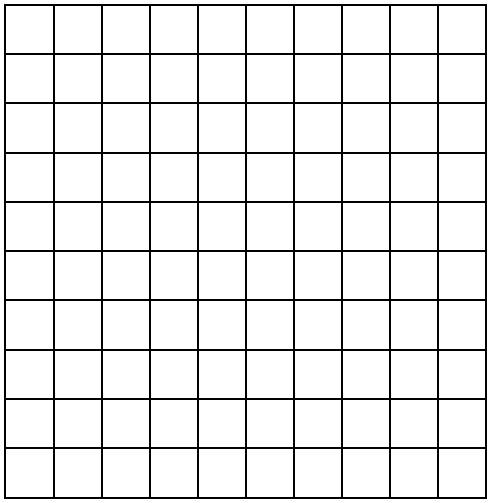
Understanding Decimals
A Closer Look at the Video

After watching the *Understanding Decimals* video, make sense of the mathematics by taking a closer look at the problem situation and solution. Use the questions and comments in bold to help you represent decimals and make sense of place value.

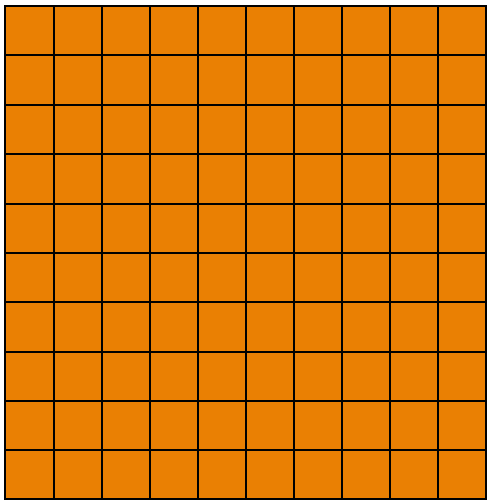
The tag on a diamond ring says 1.684 carats. That is the combined weight of all of the diamonds.

Each of the following 10-by-10 grids represents one carat. Shade the grids to show 1.684 carats.

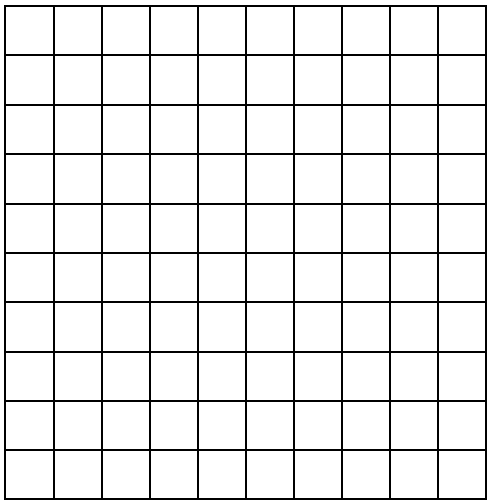




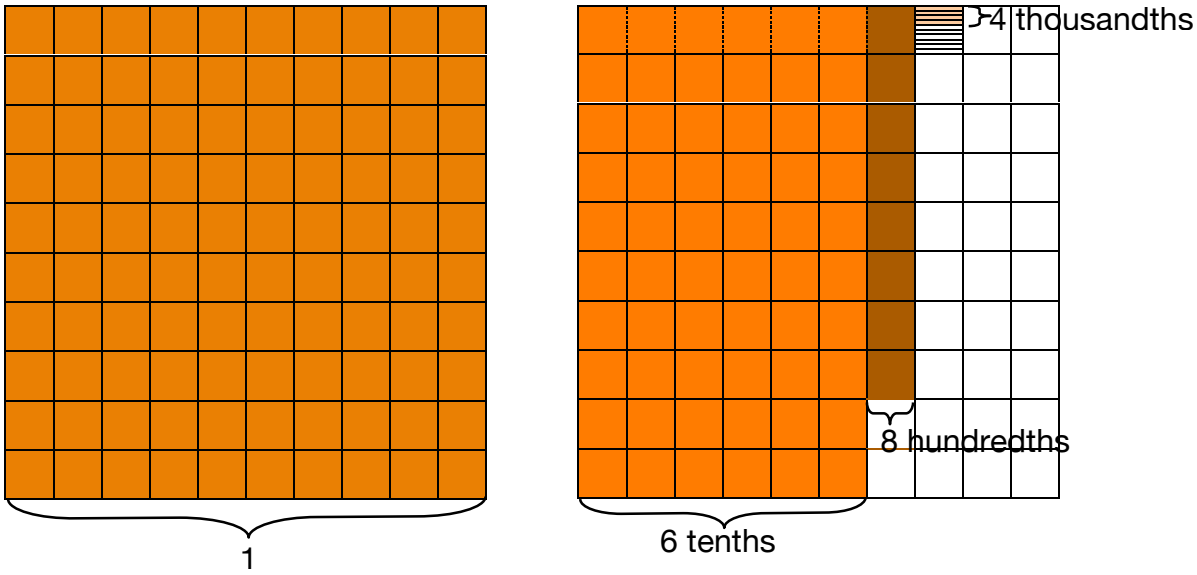
Start by shading one. One full grid to represents one carat.



1 carat



Now shade the decimal part of the number. Each grid is divided into 10 columns, so each column is one tenth of the grid. Six shaded columns represent six tenths (1.**6**84). Each tenth is divided into 10 equal parts, resulting in 100 small squares. Since the whole grid is divided into 100 small squares, one small square is equal to one hundredth of the grid. Eight small squares represent eight hundredths (1.6**8**4). Dividing each small square into 10 equal parts results in dividing the entire grid into 1000 equal parts. Each small part is one thousandth of the grid. Four of these small parts represent four thousandths (1.68**4**).



How are fractions and decimals alike? How are fractions and decimals different?
Fractions and decimals are two ways of representing the same amount. Both fractions and decimals consist of two parts, a numerator and a denominator. With a fraction, we see both the numerator and the denominator. With a decimal, we only see the numerator because the denominator is determined by place value.

	Fraction	Decimal
1 one	1	1
6 tenths	$\frac{6}{10}$	0.6
8 hundredths	$\frac{8}{100}$	0.08
4 thousandths	$\frac{4}{1000}$	0.004

Study the following place value chart. What patterns do you see? Discuss your ideas with another person.

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

Place values extend infinitely in both directions. You could extend the chart to the left with ten millions, hundred millions, billions, etc. You could extend the chart to the right with ten thousandths, hundred thousandths, millionths, etc.

Compare the places on the chart. Ten is 10 times as large as one, 100 is 10 times as large as 10, and 1000 is 10 times as large as 100. This pattern continues forever.

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

x 10 x 10 x 10 x 10 x 10 x 10

What is another way to describe this pattern? You can also describe this pattern with division. One thousand divided by 10 is 100, 100 divided by 10 is 10, and 10 divided by 10 is one. The pattern continues with numbers smaller than one. One divided by 10 is one tenth, one tenth divided by 10 is one hundredth, etc.

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

÷ 10 ÷ 10 ÷ 10

How is the place value chart symmetrical? The place value chart is symmetrical, but it is not symmetrical around the decimal point. The decimal point is not the center. The chart is symmetrical around the ones place. To the left of the ones place is the tens place and to the right of the ones place is the tenths place. To the left of the tens place is the hundreds place and to the right of the tenths place is the hundredths place. If the place value chart were symmetrical around the decimal point, there would be a "oneths" place to the right of the decimal point, but that isn't a place in the place value chart.

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

1.684 consists of one, six tenths, eight hundredths, and four thousandths. What is the correct way to read this number? The place value chart may help. The number is read, "one and six hundred eighty-four thousandths."

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
						1	**6**	**8**	**4**

Models and a place value chart can both help make sense of decimals. The 10-by-10 grid represents the relative size of each digit and the place value chart shows the value of each digit.