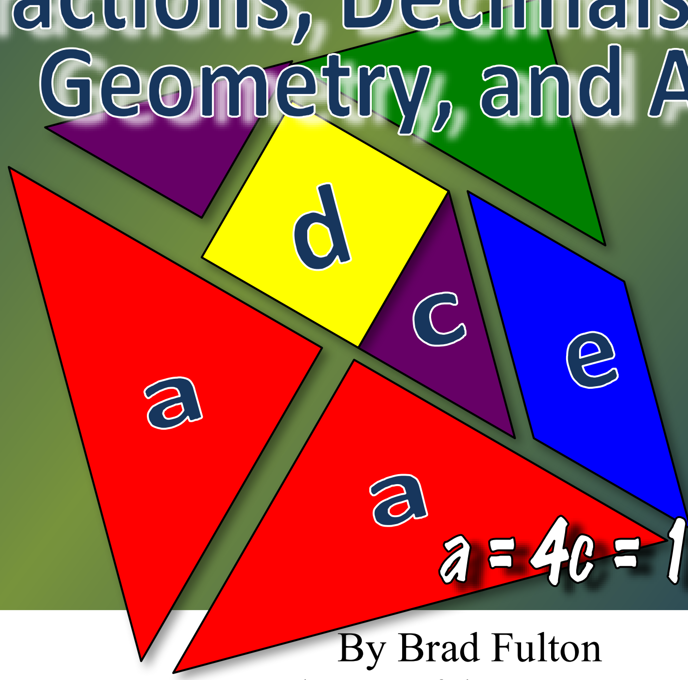
Tangram Math

Fractions, Decimals, Percent Geometry, and Algebra



$a = 4c = 1/4 = .25 = 25\%$

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Educator of the Year, 2005
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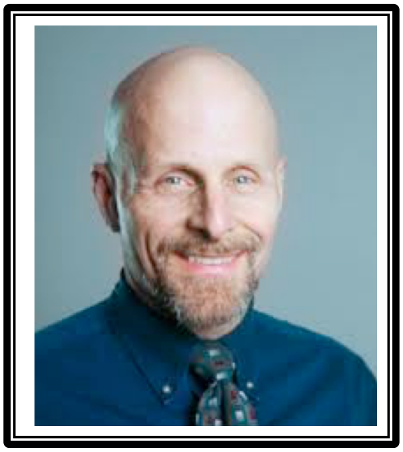

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Brad Fulton
Educator of the Year

- ♦ Consultant
- ♦ Educator
- ♦ Author
- ♦ Keynote presenter
- ♦ Teacher trainer
- ♦ Conference speaker

Known throughout the country for motivating and engaging teachers and students, Brad has co-authored over a dozen books that provide easy-to-teach yet mathematically rich activities for busy teachers while teaching full time for over 30 years. In addition, he has co-authored over 40 teacher training manuals full of activities and ideas that help teachers who believe mathematics must be both meaningful and powerful.

Seminar leader and trainer of mathematics teachers

- ♦ 2005 California League of Middle Schools Educator of the Year
- ♦ California Math Council and NCTM national featured presenter
- ♦ Lead trainer for summer teacher training institutes
- ♦ Trainer/consultant for district, county, regional, and national workshops

Author and co-author of mathematics curriculum

- ♦ Simply Great Math Activities series: six books covering all major strands
- ♦ Angle On Geometry Program: over 400 pages of research-based geometry instruction
- ♦ Math Discoveries series: bringing math alive for students in middle schools
- ♦ Teacher training seminar materials handbooks for elementary, middle, and secondary school

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All workshops provide participants with complete, ready-to-use activities that require minimal preparation and give clear and specific directions. Participants also receive journal prompts, homework suggestions, and ideas for extensions and assessment.

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References available upon request

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Tangram Math

Integrating Fractions, Decimals, Percent, Geometry, and Algebra

Overview:

In this powerfully engaging activity students of all skill levels will study standard and nonstandard tangrams to determine the values of the pieces. Students will compare the pieces to see how they relate to one another as fractions, decimals, percent, and areas. They will also develop geometric vocabulary and form an understanding of congruence and similarity. The best part is that the entire process will lead them seamlessly into algebraic thinking as they navigate among the pieces and their representations. The activity can also be used to help students learn probability, solve proportions and equations and understand algebraic properties!

Required Materials:

☒ Student copies of the tangrams

Optional Materials:

☐ Rulers

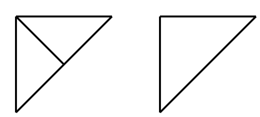
☐ Scissors

☐ Calculators

☐ Document camera or projection device

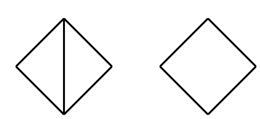
Procedure:

1 This activity works best when students work in groups of two to four. This fosters important dialogue that facilitates understanding. Display a copy of tangram 1. Students should have individual copies. You may wish to distribute scissors for this activity as some students find it helpful to cut the pieces for comparison.



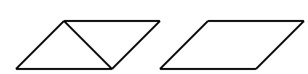
2c = b

2 Ask the students, "If the entire square tile has a value of 1, what is the value of the region *a*?" They can see that it is $^1/_4$ since four of the large triangles can fit in the square.



2c = d

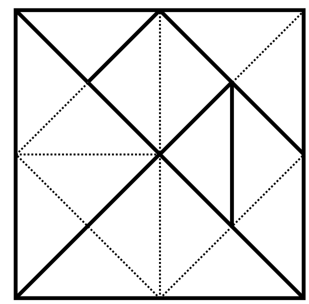
3 Next ask them to evaluate the medium-sized triangle, region b. Since two b's will fit into one a, b is $^1/_2$ of a, or $^1/_8$ of the whole. Another way to see this is by showing that the entire tile can be cut into eight b's.



2c = e

4 Ask the students to find the values of the other regions. When they find answers, ask them to justify them. They may do this verbally, by

rearranging pieces on their desks or on your projection device. They will see that the small triangle c is $^{1}/_{16}$ of the tile since two of them can fit into b. Since two small triangles also fit into the square, d is equal to b. Two c's also fit into the parallelogram e, so b, d, and e are all $^{1}/_{8}$. This is shown in the margin on the previous page.



5 Another way to show the relationships among the polygons is by drawing lines to subdivide the tangram into the smallest unit (in this case, triangle c) as shown here in the margin. It is then easy to see that c is $^{1}/_{16}$ of the tile. Regions b, d, and e are each $^{2}/_{16}$ or $^{1}/_{8}$ of the tile, and region a is $^{4}/_{16}$ or $^{1}/_{4}$ of the tile. This cut-up method will not work on all of the other tangram patterns however.

6 After the students have found the fractional values of each piece, they can add them together to check their work. Remember that there are two of shape a and two of shape c. Adding all of these pieces gives a total of $^{16}/_{16}$ or 1 (whole tangram).

7 If students are familiar with decimals, you can ask them to find the decimal values of each piece. They will find that a = 0.25. Ask them to explain their reasoning. They may say that in money a quarter is $.25.

8 When they try to find the value of b, students may give different answers. Beginning students fail to see that c, which is $^{1}/_{8}$, has a decimal representation of 0.125. They may think that 0.125 is greater than 0.25 since it has more places. I have seen students suggest that b = 0.12½. This may confuse some as it incorporates both decimal and common fractions, but essentially it is correct. We see these sorts of representations on gasoline prices: 2.99^{9}/_{10}$. By annexing a zero and writing the value of a as 0.250 instead of 0.25, many students are able to halve the 0.250 and get 0.125.

9 I have also seen students suggest that c has a value of 0.625. They annex a zero on b to get 0.1250 and then cut it in half without regard to the place value. These discrepancies will be discovered when students check their answers by adding all the decimals (keeping in mind that there are two a's and two c's). They should get a total value of 1.0000.

10 Next you can ask students to write these as percent representations. This should be much easier than it typically is since students are beginning to see the connections among the shapes and their other representations. In fact, they will see that half of 25% (a) is 12½% (b). Similarly, if they had written that c had a value of 0.625, they will think it has a percent value of 62.5%. This is a contradiction since they can see that it is not over half the total shape. However, by writing the correct answer of 0.0625, they can then convert that to 6¼%. Adding the percent values of the pieces yields 100%.

11 Students can also calculate the areas of the pieces. Have the students measure the base and height of large triangle a. They will see that the base is four inches long and the height is equal to two inches. Using the area formula for a triangle leads to:

$$A = \frac{4 \bullet 2}{2} = 4\ sq\ in.$$

The students may not need to use these formulas if they make connections with the values of the pieces. For example, since a has an area of 4 in^2, and b = ½ of a, it must have an area of 2 in^2.

12 Ask them to find the areas of the other triangular regions using the same formula. This will show that medium-sized triangle b has a base and height of two inches and an area of two square inches.

$$A = \frac{2 \bullet 2}{2} = 2\ sq.\ in.$$

The small triangle has a base of two inches, a height of one inch, and an area of one square inch.

$$A = \frac{2 \bullet 1}{2} = 1\ sq.\ in.$$

13 The students should now find the area of parallelogram e. They can see that it is composed of two small triangles (c), so its area must be two square inches. Measuring its base and height shows they are equal to two inches and one inch respectively. Multiplying these gives us the area:

$$A = 2 \bullet 1 = 2\ sq.\ in.$$

14 The square will be more difficult to solve. Measuring the side shows it to be approximately $1^3/_8$ inches. Squaring this shows that the area is $1^{57}/_{64}$ square inches. This is almost two square inches. The Pythagorean theorem is more accurate in this

case. The sides of the square will represent legs a and b of a right triangle. Since the sides are equal, we will use only the letter a. The diagonal of the square is the hypotenuse, c. Since measuring the hypotenuse shows that it is two inches long, the Pythagorean Theorem is written:

$$a^2 + b^2 = c^2$$
$$a^2 + a^2 = 2^2$$
$$2a^2 = 2^2$$
$$2a^2 = 4$$
$$a^2 = 2 \ (\textit{the area of the square})$$
$$a = \sqrt{2} \approx 1.414 \ in.$$

15 Students should also write the names of each shape. Younger students may want to label shape a with the name triangle. I have my middle school students use the full name: isosceles right triangle. Similarly, some students will say that shape d is a diamond. Others may opt for the more formal term, rhombus. However, the most specific name is square. The fact that it has been rotated from a familiar orientation causes many students to assume it is no longer a square. This is because most squares they have seen have a base parallel to the edges of their paper. When students change the name of a shape when it is rotated, it shows that they are not functioning at a high level of geometric thinking. They assume that shapes are defined by orientation instead of by their properties. Since the formal definition of a square is a quadrilateral with four congruent sides and four congruent angles, d is a square.

> Good Tip
>
> This activity even can be used as a formative assessment tool! When students talk about their thinking, their vocabulary will show the level of sophistication in their thinking as explained here.

Remind them that triangles are always described by their angles and their sides.
There are three classifications of each:

<u>angles</u>
acute – all three angles are less than 90º
right – one angle is exactly 90º
obtuse – one angle is more than 90º
<u>sides</u>
equilateral – all three sides are equal

isosceles – two sides are equal

scalene – no sides are equal

16 Notice that as students discuss their thinking in their group, they will be talking algebraically! You will hear statements such as, "Two c's is a d," and, "D is equal to b." These can then be written as algebraic equations: 2c = d and d = b. I require my students to write an equation for each shape. The equation must be correct and must contain the letter for that region. For example, these five equations could be used for Tangram 1:

Region	Equation
a	$4c = \mathbf{a}$
b	$\mathbf{b} = 2d$
c	$^{a}/_{4} = \mathbf{c}$
d	$\mathbf{d} = e$
e	$2a = b + 2c + d + \mathbf{e}$

17 If you want to explore proportions, assign a new value to the tangram. For example, if the entire tangram has a value of \$3.00, what is the value of a? Since a = ¼ of the total, it has a value of \$.75.

If b has a value of ½, what is the value of the entire tangram? Since 8 b's can fit in the tangram, the total value of the tangram is 8 • ½ = 4.

18 Advanced students can calculate the perimeters of the pieces. However, this will require the use of the Pythagorean theorem or very accurate measurement. Each tangram has a side length of 4 inches. Therefore the legs of triangle b are each 2" long. The Pythagorean theorem gives the length of the hypotenuse as:

$$a^2 + b^2 = c^2$$
$$2^2 + 2^2 = c^2$$
$$4 + 4 = c^2$$
$$8 = c^2$$
$$2.83 \approx c$$
$$\text{Perimeter} = a + b + c \approx 2 + 2 + 2.83 = 6.83$$

19 Have students explore the other tangram patterns. The first six involve fractions that are based on halves such as $^1/_4$, $^1/_8$, and $^1/_{16}$. Halves are easier to work with conceptually than thirds or fifths. For this reason, only the last two tangrams involve thirds or fifths. Also, in the first three tangrams, all areas use unit fractions; that is,

their numerators are one. This changes in tangrams four, five, and six where we start to see fractions such as $^3/_8$. Again this represents another conceptual step in part/whole thinking.

Journal Prompts:

Explain how polygons b, d, and e are alike and how they are different.

Why does the cut-up method only work on some tiles but not on others?

Homework:

You may wish to assign an unfinished tangram as homework.

Another option is to have students make a tile of their own and write fractions for each region. It should be made of at least seven sections using at least five different shapes. This should be drawn on a 4" or a 6" square. You may wish to pass out the included grid paper for this task.

Taking a Closer Look:

Assign a cost or value to various regions. If the medium-sized triangle of tangram one sells for $1.37, what is the cost of each region and the whole tile? If tangram two costs $5.64, what would each piece cost?

Explore probability. What is the probability of a dart randomly landing on c?

$P(c) = {}^1/_{16}$

What is the probability of a dart randomly hitting a quadrilateral?

$P(\text{quadrilateral}) = d + e = {}^1/_8 + {}^1/_8 = \frac{1}{4}$

Assessment:

By allowing students to work in groups and by asking them to rationalize their answers, you will be able to assess their levels of understanding. Listen to their discussions as mentioned previously. Are they using sophisticated reasoning and accurate vocabulary?

Homework can be assessed after collecting it using the enclosed answer keys, or you may wish to have students trade papers and solve each other's puzzles.

Answer Key

Tangram 1

Region	Name	Frac.	Dec.	%	Area
a	Isosceles right triangle	1/4	0.25	25	4 in^2
b	Isosceles right triangle	1/8	0.125	12.5	2 in^2
c	Isosceles right triangle	1/16	0.0625	6.25	1 in^2
d	Square	1/8	0.125	12.5	2 in^2
e	Parallelogram	1/8	0.125	12.5	2 in^2

Tangram 2

Region	Name	Frac.	Dec.	%	Area
a	Isosceles right triangle	1/4	0.25	25	4 in^2
b	Isosceles right triangle	1/16	0.0625	6.25	1 in^2
c	Isosceles right triangle	1/8	0.125	12.5	2 in^2
d	Rectangle	1/4	0.25	25	4 in^2
e	Scalene right triangle	1/16	0.0625	6.25	1 in^2
f	Obtuse isosceles triangle	1/8	0.125	12.5	2 in^2

Tangram 3

Region	Name	Frac.	Dec.	%	Area
a	Rectangle	1/8	0.125	12.5	2 in^2
b	Scalene right triangle	1/16	0.0625	6.25	1 in^2
c	Square	1/16	0.0625	6.25	1 in^2
d	Rectangle	1/32	0.03125	3.125	.5 in^2
e	Acute isosceles triangle	1/8	0.125	12.5	2 in^2
f	Rhombus	1/4	0.25	25	4 in^2
g	Obtuse isosceles triangle	1/32	0.03125	3.125	.5 in^2
h	Acute isosceles triangle	1/32	0.03125	3.125	.5 in^2

Tangram 4

Region	Name	Frac.	Dec.	%	Area
a	Isosceles right triangle	1/4	0.25	25	4 in^2
b	Isosceles right triangle	1/8	0.125	12.5	2 in^2
c	Right trapezoid	1/8	0.125	12.5	2 in^2
d	Isosceles right triangle	1/16	0.0625	6.25	1 in^2
e	Isosceles trapezoid	3/16	0.1875	18.75	3 in^2

Tangram 5

Region	Name	Frac.	Dec.	%	Area
a	Rectangle	1/8	0.125	12.5	2 in^2
b	Scalene right triangle	1/16	0.0625	6.25	1 in^2
c	Isosceles right triangle	1/16	0.0625	6.25	1 in^2
d	Isosceles right triangle	1/32	0.03125	3.125	.5 in^2
e	Isosceles trapezoid	3/32	0.09375	9.375	1.5 in^2
f	Right trapezoid	3/8	0.375	37.5	6 in^2

Tangram 6

Region	Name	Frac.	Dec.	%	Area
a	Rectangle	1/8	0.125	12.5	2 in^2
b	Acute isosceles triangle	1/16	0.0625	6.25	1 in^2
c	Acute right triangle	1/32	0.03125	3.125	.5 in^2
d	Rectangle	1/8	0.125	12.5	2 in^2
e	Isosceles trapezoid	3/16	0.1875	18.75	3 in^2
f	Scalene right triangle	1/16	0.0625	6.25	1 in^2
g	Acute isosceles triangle	1/8	0.125	12.5	2 in^2
h	Parallelogram	3/16	0.1875	18.75	3 in^2

Tangram 7

Region	Name	Frac.	Dec.	%	Area
a	Rectangle	1/3	$0.\overline{3}$	$33^1/_3$	$5^1/_3$ in^2
b	Obtuse isosceles triangle	1/6	$0.1\overline{6}$	$16^2/_3$	$2^2/_3$ in^2
c	Scalene right triangle	1/12	$0.08\overline{3}$	$8^1/_3$	$1^1/_3$ in^2
d	Rectangle	1/6	$0.1\overline{6}$	$16^2/_3$	$2^2/_3$ in^2
e	Rectangle	1/12	$0.08\overline{3}$	$8^1/_3$	$1^1/_3$ in^2
f	Scalene right triangle	1/24	$0.041\overline{6}$	$4^1/_6$	$^2/_3$ in^2

Tangram 8

Region	Name	Frac.	Dec.	%	Area
a	Rectangle	1/5	0.2	20	3.2 in^2
b	Scalene right triangle	1/10	0.1	10	1.6 in^2
c	Obtuse isosceles triangle	1/20	0.05	5	0.8 in^2
d	Acute isosceles triangle	1/20	0.05	5	0.8 in^2
e	Scalene right triangle	1/20	0.05	5	0.8 in^2
f	Parallelogram	1/10	0.1	10	1.6 in^2
g	Rectangle	1/20	0.05	5	0.8 in^2
h	Acute isosceles triangle	1/10	0.1	10	1.6 in^2
i	Concave pentagon	1/5	0.2	20	3.2 in^2

Look at all the Common Core Standards you can teach with tangrams!

4th grade:

CCSS.MATH.CONTENT.4.NF.A.1
Explain why a fraction *a*/*b* is equivalent to a fraction ($n \times a$)/($n \times b$) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

CCSS.MATH.CONTENT.4.NF.A.2
Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

CCSS.MATH.CONTENT.4.NF.B.3
Understand a fraction *a*/*b* with $a > 1$ as a sum of fractions 1/*b*.

CCSS.MATH.CONTENT.4.NF.B.3.A
Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

CCSS.MATH.CONTENT.4.NF.B.3.B
Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.*

CCSS.MATH.CONTENT.4.G.A.2
Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

5th grade:

CCSS.MATH.CONTENT.5.NBT.A.1
Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

CCSS.MATH.CONTENT.5.NBT.A.3
Read, write, and compare decimals to thousandths.

CCSS.MATH.CONTENT.5.NBT.A.3.A
Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.

CCSS.MATH.CONTENT.5.NBT.A.3.B
Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

CCSS.MATH.CONTENT.5.NF.A.1
Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*

CCSS.MATH.CONTENT.5.NF.A.2
Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.*

CCSS.MATH.CONTENT.5.G.B.3
Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.

6th grade:

CCSS.MATH.CONTENT.6.RP.A.1
Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*
CCSS.MATH.CONTENT.6.RP.A.3
Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

CCSS.MATH.CONTENT.6.RP.A.3.C
Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.

CCSS.MATH.CONTENT.6.RP.A.3.D
Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

CCSS.MATH.CONTENT.6.NS.C.6
Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

CCSS.MATH.CONTENT.6.EE.A.3
Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent*

expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.

CCSS.MATH.CONTENT.6.EE.A.4
Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.*

CCSS.MATH.CONTENT.6.EE.B.6
Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

CCSS.MATH.CONTENT.6.G.A.1
Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

7th grade:

CCSS.MATH.CONTENT.7.RP.A.2
Recognize and represent proportional relationships between quantities.

CCSS.MATH.CONTENT.7.RP.A.2.C
Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.*

CCSS.MATH.CONTENT.7.NS.A.2

Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

CCSS.MATH.CONTENT.7.NS.A.2.D
Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

CCSS.MATH.CONTENT.7.EE.B.4
Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

CCSS.MATH.CONTENT.7.G.B.6
Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

8th grade:

CCSS.MATH.CONTENT.8.NS.A.2
Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations*.

CCSS.MATH.CONTENT.8.NS.A.1
Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually

CCSS.MATH.CONTENT.8.EE.A.2
Use square root and cube root symbols to represent solutions to equations of the form$x^2 = p$ and x^3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.

CCSS.MATH.CONTENT.8.G.A.2
Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

CCSS.MATH.CONTENT.8.G.A.4
Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

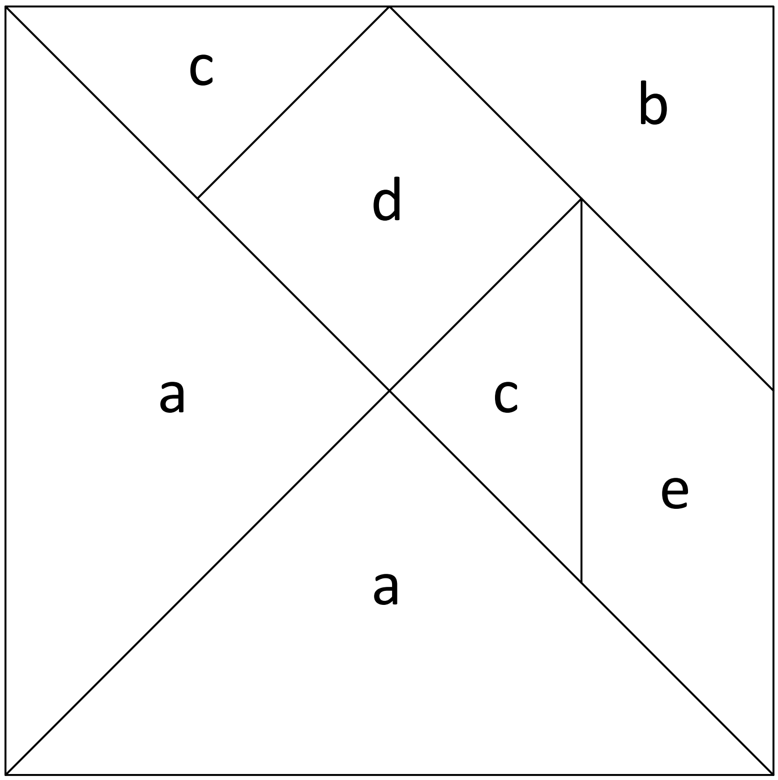
CCSS.MATH.CONTENT.8.G.A.5
Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so*.

CCSS.MATH.CONTENT.8.G.B.7
Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

Tangram 1

Name_______________________________

Date______________________ Class_____



Region	Name	Fraction	Decimal	Percent	Area	Formula
a	____________________________	________	________	________	________	____________
b	____________________________	________	________	________	________	____________
c	____________________________	________	________	________	________	____________
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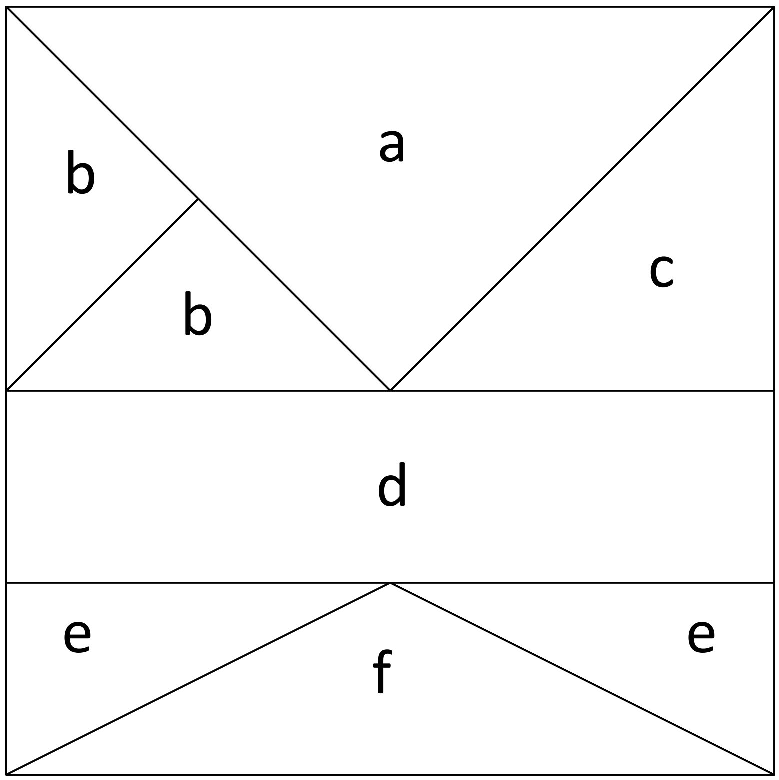
Tangram 2

Name________________________________

Date______________________ Class_____



Region	Name	Fraction	Decimal	Percent	Area	Formula
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b	____________________________	________	________	________	________	____________
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d	____________________________	________	________	________	________	____________
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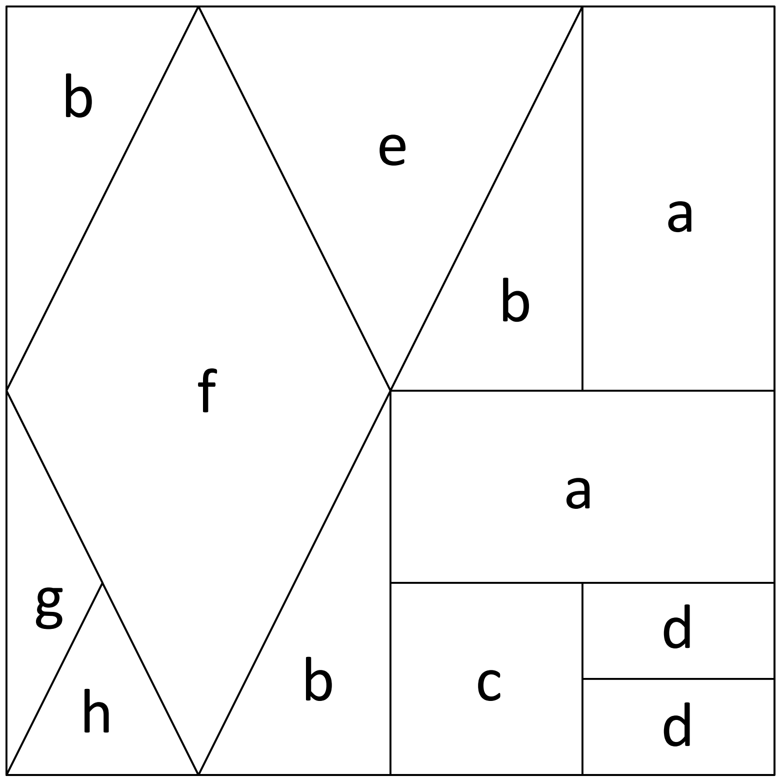
Tangram 3

Name________________________________

Date______________________ Class_____

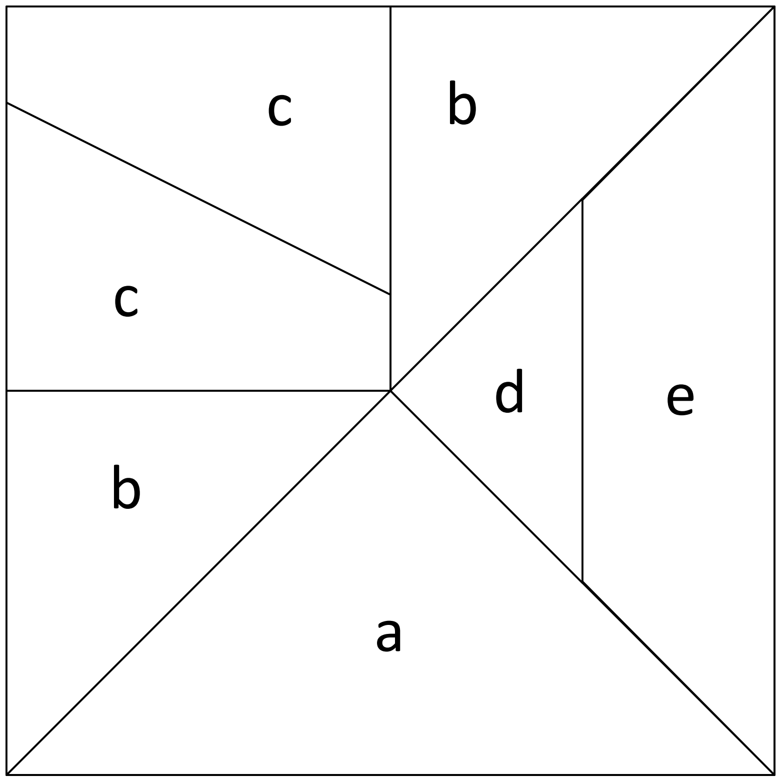


Region	Name	Fraction	Decimal	Percent	Area	Formula
a	___________	_____	_____	_____	_____	_______
b	___________	_____	_____	_____	_____	_______
c	___________	_____	_____	_____	_____	_______
d	___________	_____	_____	_____	_____	_______
e	___________	_____	_____	_____	_____	_______
f	___________	_____	_____	_____	_____	_______
g	___________	_____	_____	_____	_____	_______
h	___________	_____	_____	_____	_____	_______

Tangram 4

Name________________________________

Date______________________ Class_____



Region	Name	Fraction	Decimal	Percent	Area	Formula
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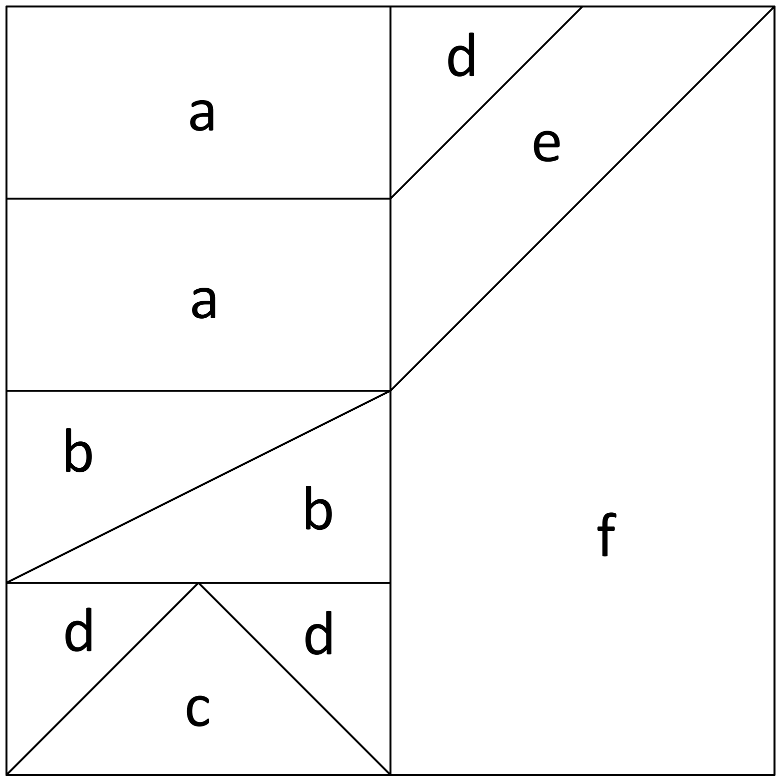
b	____________________________	________	________	________	________	____________
c	____________________________	________	________	________	________	____________
d	____________________________	________	________	________	________	____________
e	____________________________	________	________	________	________	____________

Tangram 5

Name________________________________

Date_____________________ Class_____

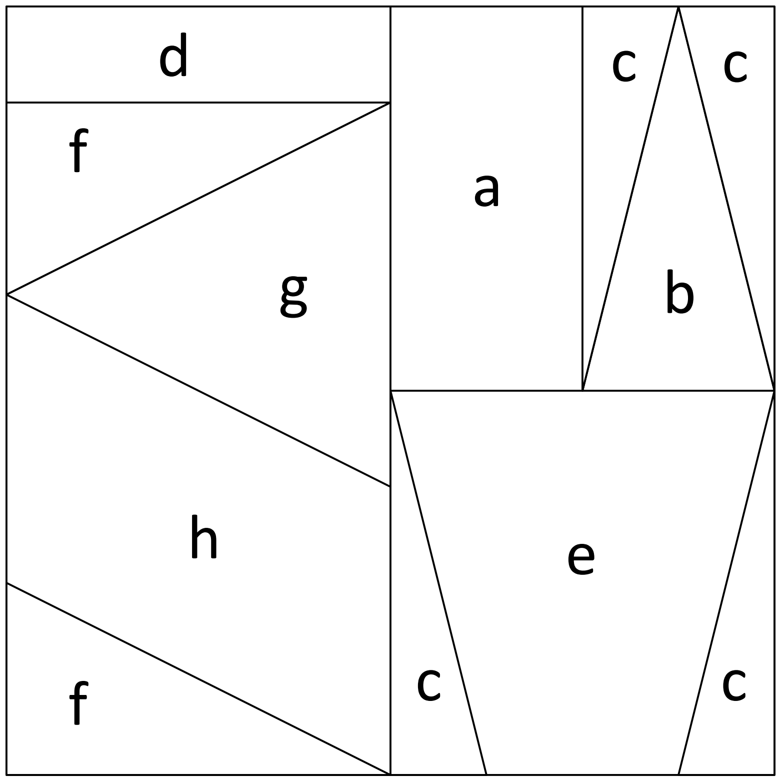


Region	Name	Fraction	Decimal	Percent	Area	Formula
a	______________________________	________	________	________	________	_____________
b	______________________________	________	________	________	________	_____________
c	______________________________	________	________	________	________	_____________
d	______________________________	________	________	________	________	_____________
e	______________________________	________	________	________	________	_____________
f	______________________________	________	________	________	________	_____________

Tangram 6

Name________________________________

Date______________________ Class_____

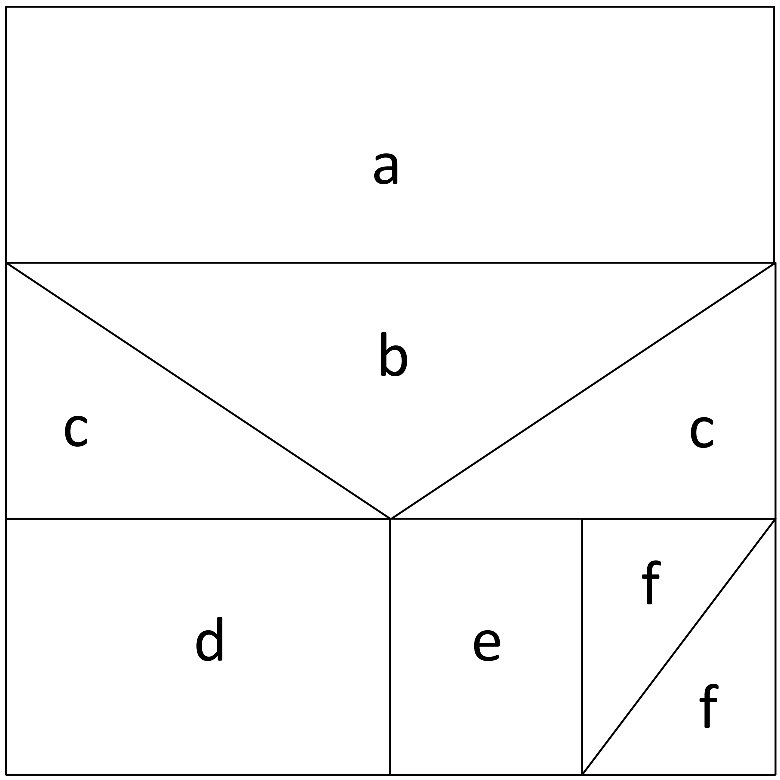


Region	Name	Fraction	Decimal	Percent	Area	Formula
a						
b						
c						
d						
e						
f						
g						
h						

Tangram 7

Name________________________________

Date______________________ Class_____

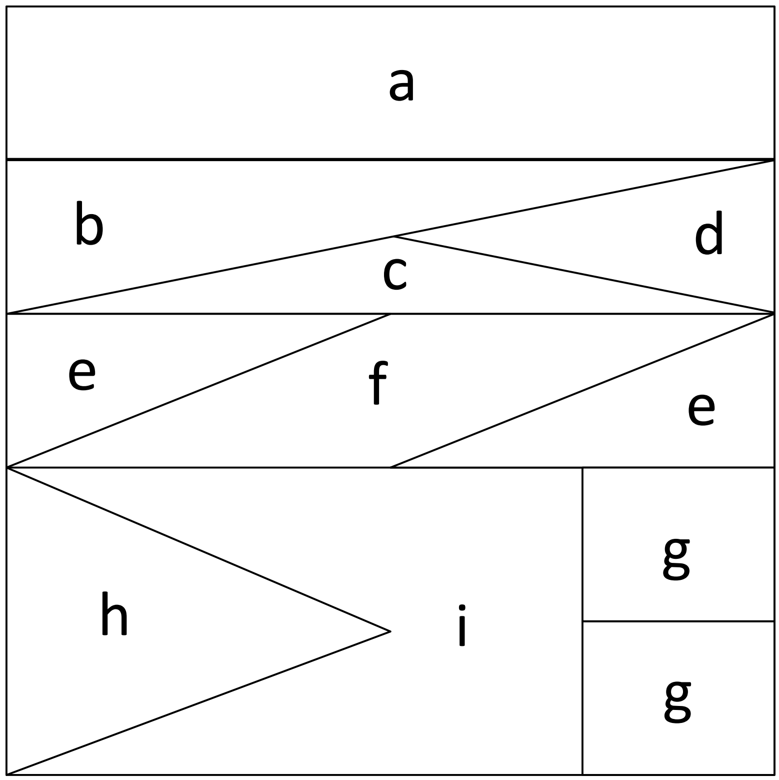


Region	Name	Fraction	Decimal	Percent	Area	Formula
a	____________________________	________	________	________	________	____________
b	____________________________	________	________	________	________	____________
c	____________________________	________	________	________	________	____________
d	____________________________	________	________	________	________	____________
e	____________________________	________	________	________	________	____________
f	____________________________	________	________	________	________	____________

Tangram 8

Name________________________________

Date_____________________ Class_____



Region	Name	Fraction	Decimal	Percent	Area	Formula
a						
b						
c						
d						
e						
f						
g						
h						
i						

My Personal Tangram

Name________________________________

Date__________________________ Class______

Create a tangram of your own design using at least five different shapes and seven different pieces as in Tangram 1. Use your creativity. Assign a value of 1 to your tangram, and then find the values of each piece.

Region	Name	Fraction	Decimal	Percent	Area	Formula
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____	________________________	_______	_______	_______	_______	__________
____	________________________	_______	_______	_______	_______	__________
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____	________________________	_______	_______	_______	_______	__________
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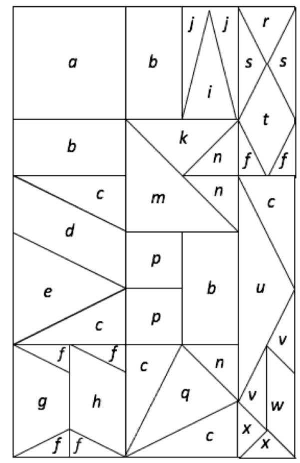
____	________________________	_______	_______	_______	_______	__________

If you liked this activity, you might also like some of the other character education lessons available in my TeachersPayTeachers store. Simply search for “Brad Fulton”.

You can also find many free and inexpensive resources on my personal website, www.tttpress.com. Be sure to subscribe to receive monthly newsletters, blogs, and activities.

Similar activities include:



Super Tangram

- ***Super Tangram**:* Foster interconnections among fractions, decimals, percent, geometry, and algebra in this challenging follow-up to Tangram Math. Students can even design their own project!
- ***Tangram Circles**:* A generous helping of pi awaits your students as they work with circles, fractions, decimals, percent, and area.
- ***Fast Facts and Fractions**:* Help your struggling students master their multiplication facts and all four fraction operations in just 5 minutes a day. Our most popular handout!
- ***Developing Proportional Reasoning**:* New ways to help students learn about proportions
- ***Building Number Sense**:* Simple and powerful strategies for helping students grow their fluency with whole numbers, fractions, and integers

Feel free to contact me if you have questions or comments or would like to discuss a staff development training or keynote address at your site.

Happy teaching,

Brad