Most recent update: March 11, 2020

RightStart™ Mathematics

Corrections and Updates for Level H/Grade 7 Lessons and Worksheets, second edition

LESSON/WORKSHEET/SOLUTIONS		CHANGE DATE	CORRECTION OR UPDATE
Worksheet 19	Solutions 19	12/27/2019	The image for Problem 4 has been changed. See attached **PDFs**.
Worksheet 21		12/27/2019	Two plaids are outlined in the new worksheet. Instructions are changed slightly. See attached **PDF**.
Worksheet 22-2		12/27/2019	For Problem 14, the instructions are changed to "Draw a **regualr** tessellation…" rather than "Draw a pure tessellation…"
	Solutions 36-1	12/27/2019	In the notes for the remaining six products, the final problem of 45 × 12 can have the following options: 15 × 36, 30 × 18, **20 × 27**, and **54 × 10**. The solution of 60 x 9 is an error.
Worksheet 39-3	Solutions 39-1	12/27/2019	For Problem 25, the instructions are changed to "Find p, t, and ***r***" and the value of r is removed from the graphics. See attached **PDF**. In the Solutions for Problem 25, when the calculated value for r is used in the third equation, it should be 5.4/**4.1**, not 5.4/4.0.
Worksheet 41	Solutions 41	12/27/2019	Two final questions are asked. See attached **PDF**s.
Worksheet 42-1		12/27/2019	The position and size of the starting rectangle has changed. See attached **PDF**.
	Solutions 42-2	12/27/2019	The measurements for Problems 2–7 are changed. See attached **PDF**.
Worksheet 45		12/27/2019	The position and size of the starting squares has changed. See attached **PDF**.
Worksheet 48-1		12/27/2019	Problem 5 has been updated with the size of the starting rectangle. See attached **PDF**.
	Solutions 48-2	12/27/2019	The first measurement for Problem 6 is **10.2**/6.3 = **1.6**, not 10.1/6.3 = 1.7
	Solutions 75-4	02/04/2020	The answer for Question 40 should be **A**, not B.
	Solutions 76-4	03/09/2020	The comment for Question 40 should say **600** cm^2, not 6 cm^2.
	Solutions 85-1	03/09/2020	The answer for Problem 14 needs convertion from centimeters to decimeters. It should be 63.63 cm **≈ 6.4 dm**.
Worksheet 91-2	Solutions 91-2	03/11/2020	Question 3 should read "**If no faces are regular**, how many different ways will the package fit into the box?"

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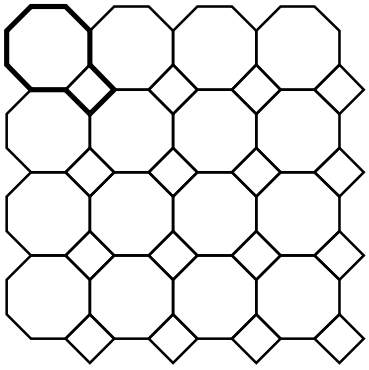
Find the basic unit for the three tessellations below. The first one is done for you.

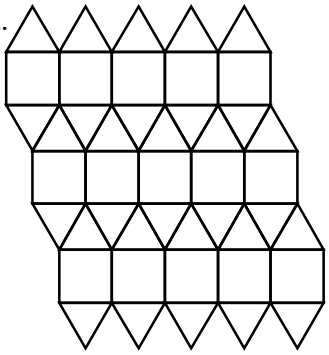
Fill in the table to describe how to construct the tessellations by translating the basic unit. Use millimeters.

Problem	To make first row	To make next rows
1		
2		
3		

1.



2.



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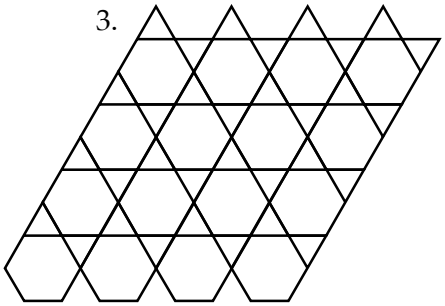
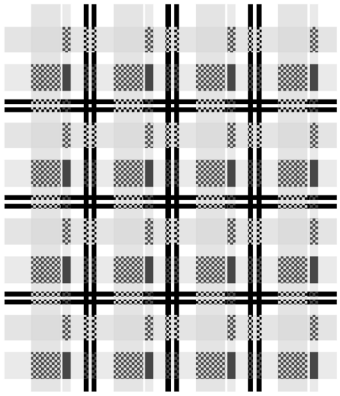
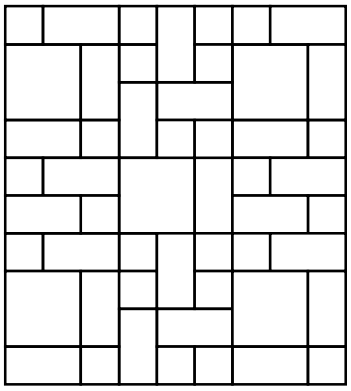


Find the basic unit.

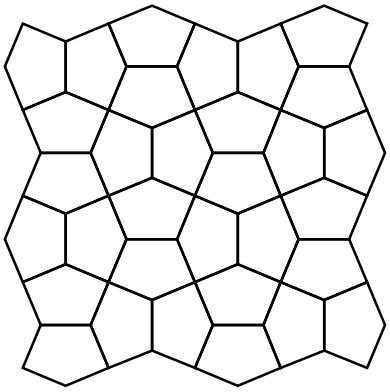
4.



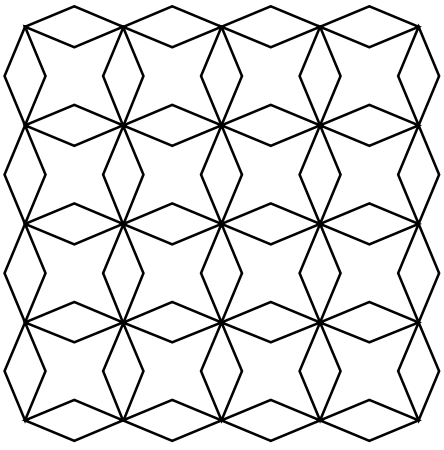
5.



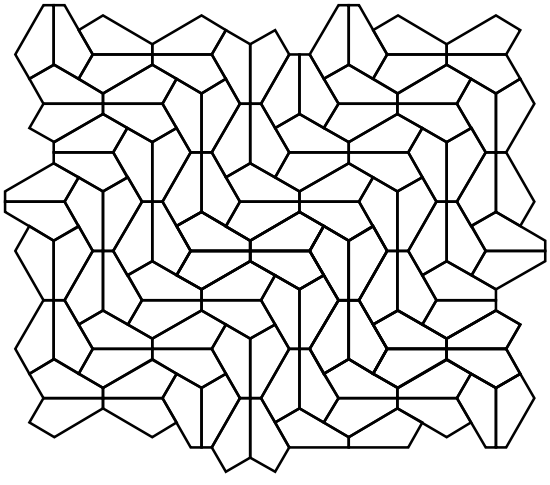
6.



7.



8.



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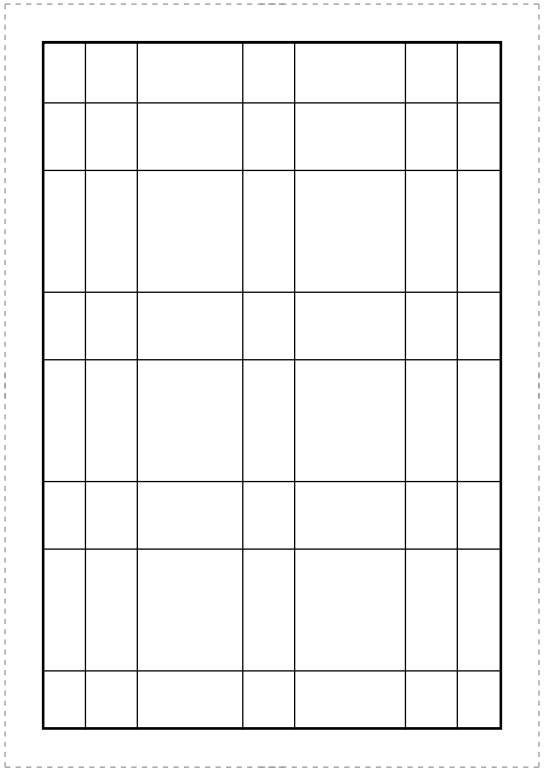
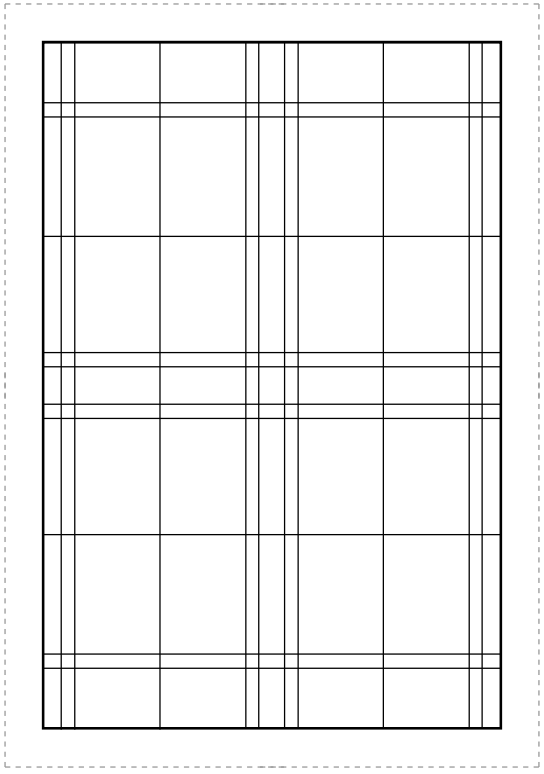
Worksheet 21, Tartan Plaids

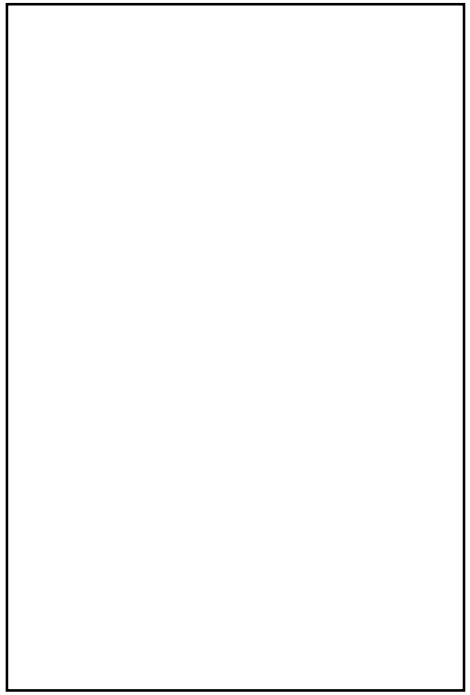
Fold and cut your tracing paper into three rectangles, each approximately the size of the dotted rectangles below.

For each rectangle, follow the instructions to design a plaid and color it.

1. Two plaids are outlined for you. Draw an outline for the third rectangle. Create a systematic design.
2. Center the tracing paper over a rectangle and tape the top in place.
3. On the tracing paper, systematically color each of the horizontal weft sections of the plaid all the way across.
4. Lift the tracing paper and color the vertical warp sections, all the way down.
5. Return the tracing paper to cover the rectangle and see each plaid design.







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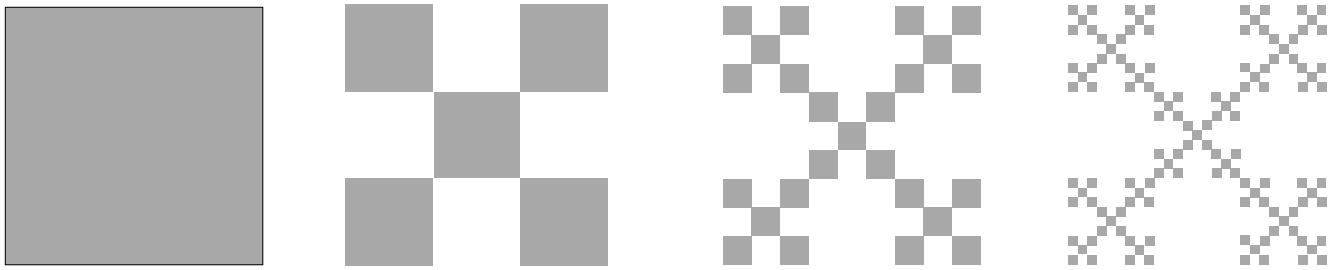


Iteration 0 Iteration 1 Iteration 2 Iteration 3

23. Using the Box Fractals above, complete the table below.

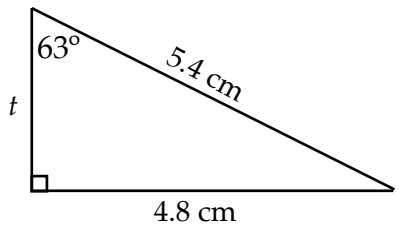
Iteration	Number of Squares (use multiplication)	Number of Squares (use exponent & numeric form)
0		$5^0 = 1$
1		
2		
3		
4		

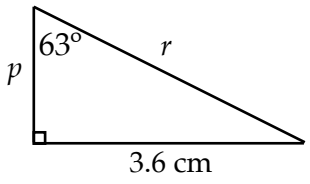
24. Solve these proportions. You may simplify the fraction before cross multiplying.

$\frac{p}{24} = \frac{5}{12}$ $\frac{7}{21} = \frac{r}{3}$ $\frac{1}{2} = \frac{e}{67}$

p = ____ r = ____ e = ____

25. Find p, t, and r. Round to the nearest tenth.





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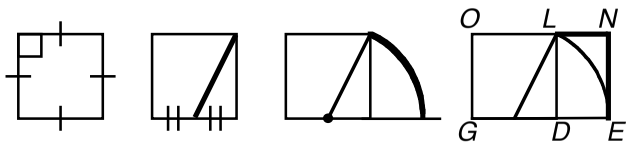
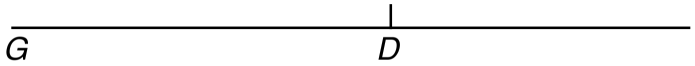
Worksheet 41, Golden Ratio

1. Construct a golden rectangle on the line below. Follow the instructions provided in the figures. Label the rectangles.





2–3. Measure and find the ratios of the longer side to the shorter side for both rectangles. Round to the nearest tenth.

$\frac{\overline{GE}}{\overline{OG}} =$

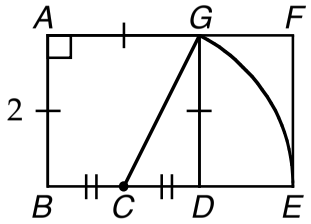
$\frac{\overline{NE}}{\overline{DE}} =$

4. Measure and find the ratios for the line segment $\overline{GE}$.

$\frac{\text{whole}}{\text{longer}} = \frac{\overline{GE}}{\overline{DG}} =$

$\frac{\text{longer}}{\text{shorter}} =$ ___

5. Use the lengths of $\overline{CD}$ and $\overline{DG}$ with the Pythagorean theorem to find $\overline{CG}$. Keep your answer in square root form.



6. Fill in the chart.

Lengths	In square root form	In decimal form to 6 decimal places
$\overline{CE}$		
$\overline{DE}$		
$\overline{BE}$		
$\overline{BE} : \overline{BD}$		
$\overline{BD} : \overline{DE}$		
$\overline{DE} : \overline{BD}$		

CONTINUE READING THE LESSON.

Compute your answers to six decimal places.

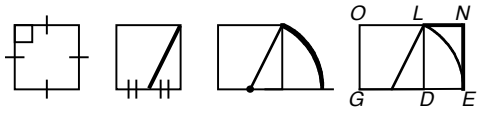
7. What is $\phi + 1$? _____ What is ϕ^2? _____

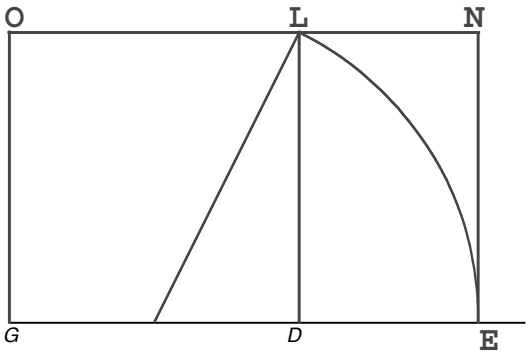
8. What is $\frac{1}{\phi}$? _____ What is $\phi - 1$? _____

9. Does $\phi + 1 = \phi^2$? _____

10. Does $\frac{1}{\phi} = \phi - 1$? _____

1. Construct a golden rectangle on the line below. Follow the instructions provided in the figures. Label the rectangles.





2–3. Measure and find the ratios of the longer side to the shorter side for both rectangles. Round to the nearest tenth.

$$\frac{\overline{GE}}{\overline{OG}} = \frac{8.1}{5} = 1.6$$

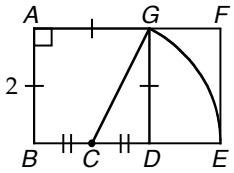
$$\frac{\overline{NE}}{\overline{DE}} = \frac{5}{3.1} = 1.6$$

4. Measure and find the ratios for the line segment $\overline{GE}$.

$$\frac{\text{whole}}{\text{longer}} = \frac{\overline{GE}}{\overline{DG}} = \frac{8.1}{5} = 1.6$$

$$\frac{\text{longer}}{\text{shorter}} = \frac{\overline{DG}}{\overline{DE}} \quad \frac{5}{3.1} = 1.6$$

5. Use the lengths of $\overline{CD}$ and $\overline{DG}$ with the Pythagorean theorem to find $\overline{CG}$. Keep your answer in square root form.



$$c^2 = a^2 + b^2$$
$$c^2 = 1^2 + 2^2$$
$$c^2 = 5$$
$$c = \sqrt{5} = \overline{CG}$$

6. Fill in the chart.

Lengths	In square root form	In decimal form to 6 decimal places
$\overline{CE}$	$\sqrt{5}$	
$\overline{DE}$	$\sqrt{5} - 1$	
$\overline{BE}$	$\sqrt{5} + 1$	
$\overline{BE} : \overline{BD}$	$\frac{\sqrt{5}+1}{2}$	1.618034
$\overline{BD} : \overline{DE}$	$\frac{2}{\sqrt{5}-1}$	1.618034
$\overline{DE} : \overline{BD}$	$\frac{\sqrt{5}-1}{2}$	0.618034

CONTINUE READING THE LESSON.

Compute your answers to six decimal places.

7. What is $\phi + 1$? 2.618034 What is ϕ^2? 2.618034

8. What is $\frac{1}{\phi}$? 0.618034 What is $\phi - 1$? 0.618034

9. Does $\phi + 1 = \phi^2$? yes

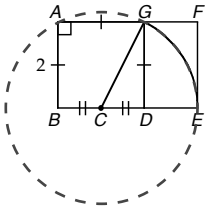
10. Does $\frac{1}{\phi} = \phi - 1$? yes

NOTES: For Problem 1, make sure the student draws a precise square first. If a square is not in place, calculations for 2 through 4 will not be accurate.

If the student is unfamiliar or unsure how to use the mmArc compass, there is a video online at RightStartMath.com/geometry under this lesson number.

When finding the ratios for Problems 2 through 4, watch that the comparisons are longer sides to shorter sides.

Problem 5 can also be calculated as $\overline{CG} = \sqrt{1^2 + 2^2} = \sqrt{5}$, because $c = \sqrt{a^2 + b^2}$, combining steps from the solution shown above. If the student does this, they are doing steps in their heads and is to be commended.



In Problem 6, both $\overline{CG}$ and $\overline{CE}$ are the radius for the arc on the right side of the drawing, therefore, $\overline{CG} = \overline{CE}$. Some students may benefit from continuing the arc to make the circle. This reminds the student that C is the center of the circle, therefore, any lines from the center to the circumference will be the radius, which will all measure the same. See the figure on the right.

To convert the square root form of the answers to decimal form for Problem 6, guide the student to the note in the Extras section of the lesson. When calculating $\overline{BD} : \overline{DE}$, make sure the student realizes 2 is being divided by $(\sqrt{5} - 1)$, not 2 divided by $\sqrt{5}$, which is 0.894, then minus 1 for a total of -0.106. These are two different equations with two very different answers.

DICTIONARY TERMS: golden rectangle, golden ratio, phi, ϕ

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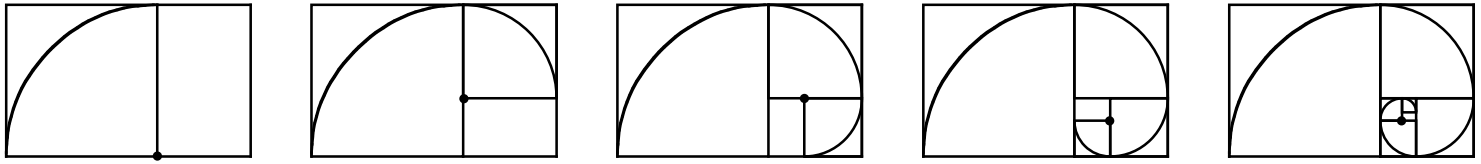
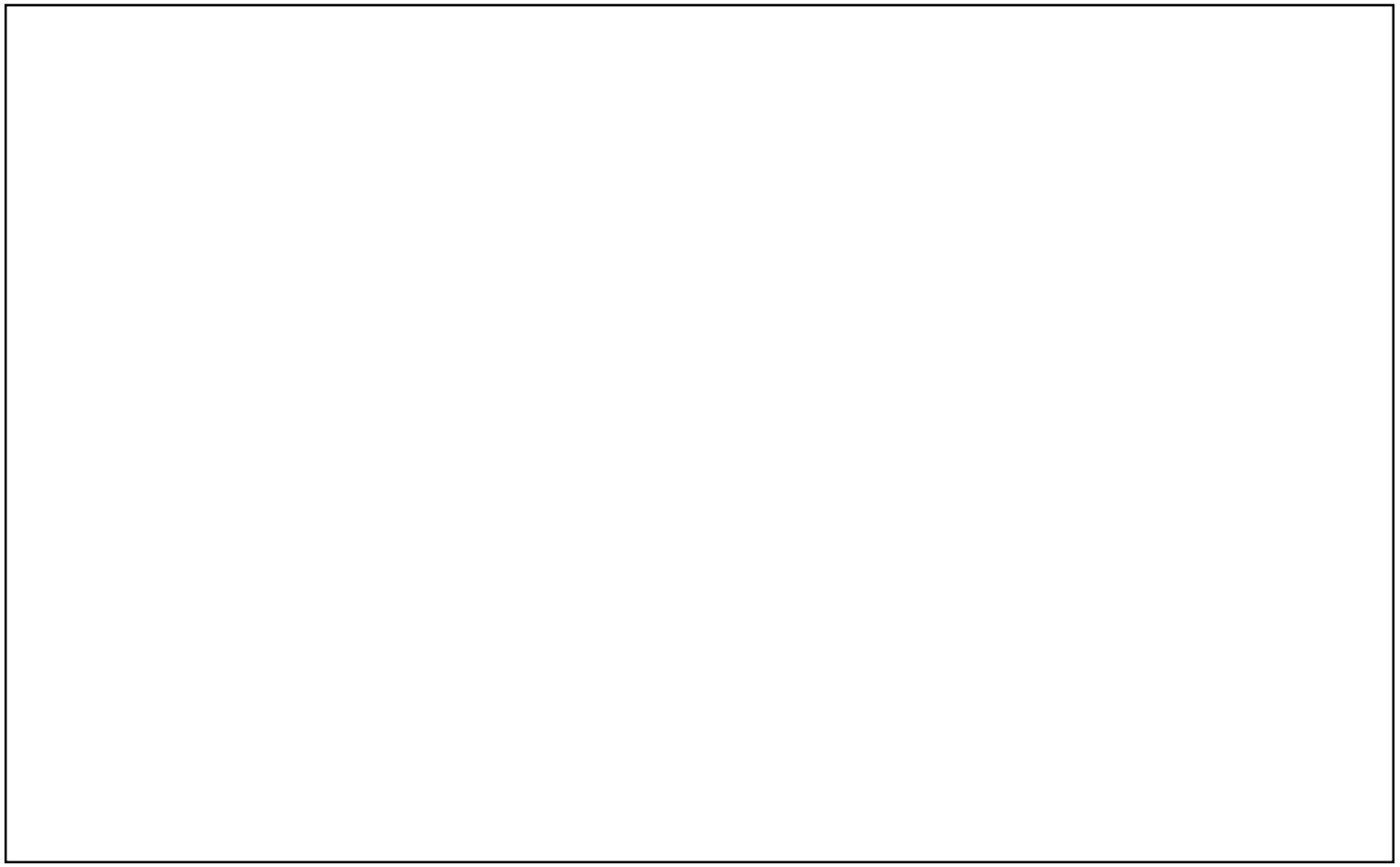
Worksheet 42-1, More Golden Goodies

1. Construct golden rectangles within the golden rectangle by constructing squares. Be as precise as you can as you will need these measurements on the next worksheet. Then draw the spiral.





2–7. Measure the sides of the six largest squares you drew on Worksheet 42-1 to the nearest tenth of a centimeter. Find the ratio of the sides of the largest square to the second largest square. Then find the ratio of the sides of the second largest square to the third largest square. Continue for five ratios.

$\frac{12.3}{7.6} = 1.6$

$\frac{7.6}{4.7} = 1.6$ $\quad$ $\frac{2.9}{1.8} = 1.6$

$\frac{4.7}{2.9} = 1.6$ $\quad$ $\frac{1.8}{1.1} = 1.6$

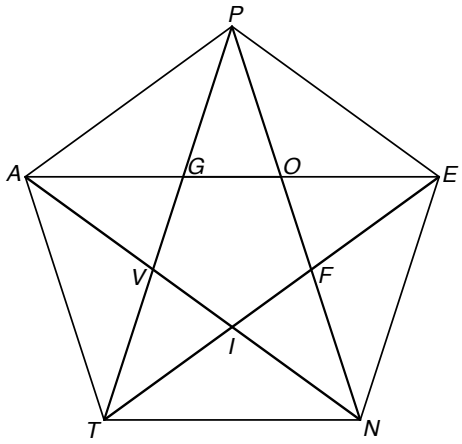
CONTINUE READING THE LESSON.

8–11. Fill in the chart using the regular pentagon above on the right. Find your ratios to 3 decimal places. Use the measurements given on the right.

$\overline{PG} = 6.1803$
$\overline{GO} = 3.8196$
$\overline{AP} = 10.0000$
$\overline{AE} = 16.1803$

Triangle	Longest side/ Shortest side	Ratio	Golden Triangle? (yes or no)
ΔPGO	$\frac{\overline{PG}}{\overline{GO}} = \frac{6.1803}{3.8196}$	1.618	yes
ΔPAE	$\frac{\overline{AE}}{\overline{AP}} = \frac{16.1803}{10.0000}$	1.618	yes
ΔPAG	$\frac{\overline{PA}}{\overline{PG}} = \frac{10.0000}{6.1803}$	1.618	yes
ΔPGE	$\frac{\overline{PE}}{\overline{PG}} = \frac{10.0000}{6.1803}$	1.618	yes

[TRIANGLE SIDES MAY VARY, HOWEVER RATIOS WILL BE THE SAME.]



12. What is $\angle APE$? 108°

13. What is $\angle GPO$? 36°

14. What is $\angle APG$? 36°

15. Circle the triangles that are similar to ΔEOF.

ΔPAG ΔPAT (ΔPTN) (ΔPGE) (ΔPGO)

16. Circle the triangles that are similar to ΔTIN.

(ΔPAG) (ΔPAT) ΔPTN ΔPGE (ΔPTF)

17. How many golden triangles are in the figure above? 35

18. Would you call *APET* a golden trapezoid? Explain. yes
The 3 shorter sides are equal.
The longer:shorter ratio = ϕ.

NOTES: When working on the chart for Problems 8 to 11, some students find it beneficial to identify the triangles, then consider which side is the longest and which is the shortest. Although the chart identifies the line segment as well as the measurements, it is not necessary for the student to write both. They will need to use the measurements given and notice which line segments are congruent in the figure to find the measurement of the line segments not given.

For Question 12, when finding the measurement of $\angle APE$, remind the student that to find the interior angles of a pentagon, divide it into three triangles (Lesson 6). The total angles of the pentagon is 180×3, which is 540º. Therefore, each of the five angles is $540 \div 5$ or 108º.

Question 13 is simpling dividing the angle of the pentagon by the three triangles; $108 \div 3$. Some students may wonder how they would know that the three angles are equal. Because this is a regular pentagon, the interior pentagon, *GOFIV*, drawn with symmetrical lines, is also a regular pentagon. The angles on a regular pentagon are 108º. The vertical angle, $\angle PGA$, will also be 108º. Because ΔPGA is an isosceles triangle, the two other angles will be equal; $180 - 108 = 72$ and $72 \div 2 = 36$º. This means $\angle P$ is $108 - 36 - 36$, which is 36º!

For Question 18, Bailey Hodson, age 13, answered, "Probably. Maybe. Kinda. Yes, because it looks like it has the right amount of proportion." Although that's not a mathematical answer, Bailey was able to recognize the ratios! Her brother, Seth Hodson said, "Yes, because it is made of golden triangles."

DICTIONARY TERMS: golden triangle

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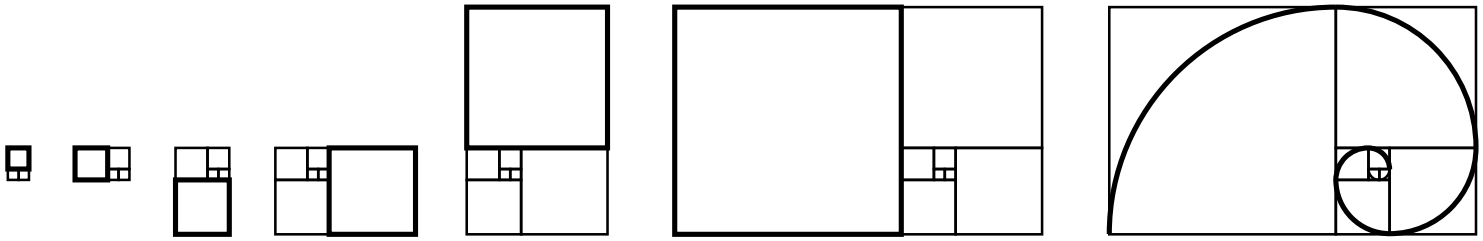
Worksheet 45, Fibonacci Spiral

Construct the Fibonacci spiral as shown in the steps below. Write the Fibonacci number in each square.



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Write the correct term for the following definitions.

1. A set of quantities in some type of order is called? _____

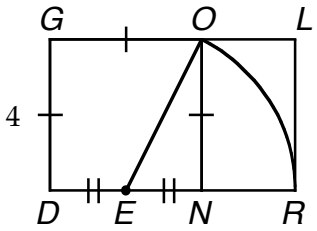
2. The Greek symbol for the golden ratio, 1.618034? _____

3. What is the missing part of the formula for the golden ratio?

$$\frac{\text{whole}}{\text{longer part}} = \frac{\text{\_\_\_\_\_}}{\text{shorter part}}$$

a. equal part
b. upper part
c. longer part

4. Use the lengths of $\overline{EN}$ and $\overline{NO}$ with the Pythagorean Theorem to find $\overline{EO}$. Keep your answer in square root form. So now, what is the length of $\overline{ER}$?



5. Construct golden rectangles within the golden rectangle by constructing squares and then draw the spiral.