Lesson Activity 1

1. line n
2. 8
3. Sample: $\angle 2$ and $\angle 6$
4. Sample: $\angle 3$ and $\angle 6$
5. Sample: $\angle 2$ and $\angle 7$
6. Sample: $\angle 4$ and $\angle 6$
7. One will increase and the other will increase.
8. Main St.; Third and Second Aves.
9. Millie's Restaurant and Jake's Restaurant
10. same-side interior angles
11. corresponding angles
12. both are 70°
13. Their measures are the same.
14. 50°
15. Yes, it is equal to $m\angle 4$; They are a pair of alternate interior angles.
16. 105°
17. a. alternate interior angles
    b. $b = 16.2$
    c. 144°

Investigation Practice 1

a. alternate exterior

b. same-side interior

c. corresponding

d. alternate exterior

e. alternate interior

f. $\angle 2$ and $\angle 5$ or $\angle 3$ and $\angle 4$

g. Sample: $\angle 3$ and $\angle 9$

h. $\angle 6$ and $\angle 9$ or $\angle 5$ and $\angle 8$

i. c

j. The hill represents the transversal; the posts represent the two lines it intersects.

k. 45°; Same-side Interior Angles Theorem

l. both are 125°

m. yes; See student work.

Lesson Activity 2

1. right triangle
2. See student work.
   10-cm side
3. The one with a side representing the hypotenuse.
4. Yes; the sum of the areas of the two smaller squares equals the area of the largest square.
5. 36 cm^2, 64 cm^2, and 100 cm^2; Yes, it shows numerically that the sum of the areas of the two smaller squares equals the area of the largest square.
6. Sample: They show that when you square each side of a right triangle (to obtain the area of each square), the squares of the two legs will sum to the square of the hypotenuse.
7. 13
8. 12 cm
9. 10 feet

Investigation Practice 2

a. increases; stays the same; angle on constant leg increases and angle on lengthened leg decreases

b. 7 meters

c. 9 in.

d. Use the wall measurements as the legs and the diagonal of the floor as the hypotenuse.

e. 60 feet

Lesson Activity 3

1.

Regular Polygon	Triangle	Quadrilateral	Pentagon	Hexagon
Interior Angle Measure	60°	90°	108°	120°
Sum of Interior Angle Measures	180°	360°	540°	720°

2. If the number of sides in one regular polygon is greater than the number of sides in another regular polygon, then the interior angle measure of the first regular polygon is greater than that of the second regular polygon.

3. Since the number of sides is equal to the number of interior angles, the sum can be calculated by multiplying the measure of one interior angle by the number of sides of the polygon.

4. Answers may vary: There is an increase in the sum that is proportional to the increase in number of sides.

5. a. triangle: 60°; square: 90°; pentagon: 108°; hexagon: 120°

   b. Students should have the same or very similar values for each method.

6.

Regular Polygon	Triangle	Quadrilateral	Pentagon	Hexagon
Exterior Angle Measurements	120°	90°	72°	60°
Sum of Exterior Angle Measurements	360°	360°	360°	360°

7. The exterior angle measures will be the same for each vertex polygon.

8. If the number of sides in one regular polygon is greater than a different regular polygon, then the exterior angle measure of the first regular polygon is less than the second different regular polygon.

9. The sum of the exterior angle measures for each polygon is 360°.

10. a. triangle: 120°; square: 90°; pentagon: 72°; hexagon: 60°

    b. students should have the same or similar values for each method

11. See student work; See table below.

Regular Polygon	Triangle	Quadrilateral	Pentagon	Hexagon
Central Angle Measurements	120°	90°	72°	60°
Sum of Central Angle Measurements	360°	360°	360°	360°

12. The central angle measures will be the same for each polygon.

13. for each polygon, the central angles are equivalent; see student work

14. They are all 360°, the same.

15. triangle: 3; square: 4; pentagon: 5; hexagon: 6

16. number of sides equals number of central angles

17. a. triangle: 120°; square: 90°; pentagon: 72°; hexagon: 60°

    b. students should have the same or similar values for each method

    c. 162°

    d. 36°

    e. 12°

    f. no; irregular polygons are not equiangular

    g. no; it would not be possible for an angle's vertex to be at a center point in irregular polygons

Investigation Practice 3

a. increases; decreases; decreases

b. 135°

Lesson Activity 4

1. The third side becomes longer as the door is opened.
2. See student work.
3. The third sides are not congruent.
4. See student work.
5. See student work.
6. the angle measure corresponds to the length of the opposite side, so the larger angle is opposite the longer side.
7. See student work.
8. *BC* is the opposite $\angle BAC$ which is larger than $\angle DAE$, so it will be longer than *DE*.
9. The angle *a* is largest in the relaxed position and smallest in the writing position. The lengths opposite angle *a* in these positions are the largest and smallest, respectively.
10. $-2 < x < 7$

Investigation Practice 4

a. $XY > TV$

b. $m\angle G > m\angle L$

c. Sample: As the hood of a car is raised, the hood and the engine frame form two sides of a triangle. The support brace holding the hood up extends as the angle between the hood and the frame grows larger.

d. B

e. $3 < x < 21$

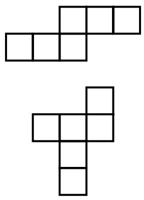
f. The door that opens a straight-line distance of 48 inches needs the larger sweep angle.

g. The larger angle of 47° will correspond to the longer swing distance, so Kelvin is swinging through the greatest distance.

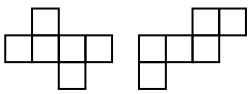
Investigation 5

Lesson Activity 5

1. 6 squares;



2. The first net has too few faces, and the second and third nets would have overlapping parts.

3. 

4. It is a pyramid; triangular pyramid

5. yes

6. Yes, the cube is a prism.

7. yes

8. yes

9. sample: Draw the base, then construct a congruent triangle extending from each edge of the base.

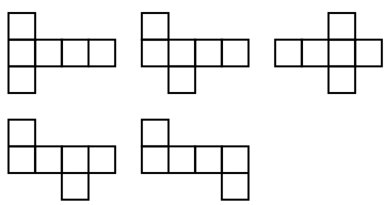
10. sample: Construct *n* congruent rectangles, where *n* is the number of sides of the base. Then construct the two bases extending from opposite ends of one rectangle.

11. no; a regular polyhedron must have all congruent sides. None of the figures listed have faces that are all of the same shape.

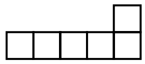
Investigation Practice 5

a. 3 nets; One possible pattern is to choose a face to hold fixed, and the other faces can disassemble from it in one, two, or three directions.

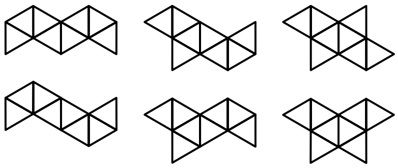
b. Sample:



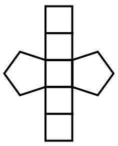
c. Sample:



d.



e.

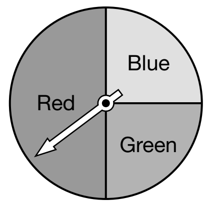


Lesson Activity 6

1. 180°; 72°; 108°
2. 50% of the time; It makes up exactly half the area of the spinner.
3. approximately 20%, 30%, and 50%
4. See student work.
5. Students should observe that experimental probabilities trend toward theoretical probabilities as the number of trials increases.
6. See student work. Sample: The geometric probability approaches the theoretical probability of landing on any one color as the number of spins increases.
7. 40%
8. They tend to become closer and closer together.

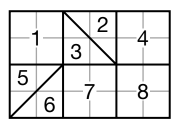
Investigation Practice 6

a. See student work; Sample:



b. experimental probabilities should approach $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{4}$

c. See student work; Sample:



d. See student work. Sample: What is the theoretical probability that a triangle will be drawn that is part of Shape 2 or Shape 3? $\frac{1}{6}$

e. both; experimental probabilities trend toward theoretical probabilities; In both experiments, theoretical probabilities were proportional to area.

Lesson Activity 7

1–4.

x	$\sin x$	$\cos x$	$\tan x$
0°	0	1	0
15°	≈ 0.26	≈ 0.97	≈ 0.27
30°	$\frac{1}{2} = 0.5$	$\frac{\sqrt{3}}{2} \approx 0.87$	$\frac{\sqrt{3}}{3} \approx 0.58$
45°	$\frac{\sqrt{2}}{2} \approx 0.71$	$\frac{\sqrt{2}}{2} \approx 0.71$	1
60°	$\frac{\sqrt{3}}{2} \approx 0.87$	$\frac{1}{2} = 0.5$	$\sqrt{3} \approx 1.73$
75°	≈ 0.97	$\approx .26$	≈ 3.73
90°	1	0	undefined

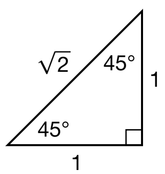
5. The sine and cosine of the 30° and 60° rows are switched.
6. They are equal; If x and y are complementary angles, then $\sin x = \cos y$.
7. $0 \leq \sin x \leq 1$, $0 \leq \cos x \leq 1$
8. 1; no
9. It is always 1.
10. $\tan x > 0$; The two legs can have any positive measures, so the ratio of their lengths can be any value greater than 0.

Investigation Practice 7

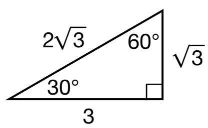
a. m$\angle F = 45°$; $DE = DF$;
$DE = \sqrt{2}$; 1; $DF = \frac{1}{\sqrt{2}}$,
$\sin 45° = \frac{1}{\sqrt{2}}$,
$\tan 45° = 1$

b. $HJ = 2GH$; $GH = \sqrt{3}$,
$HJ = 2\sqrt{3}$; $\sin 60° = \frac{\sqrt{3}}{2}$,
$\cos 60° = \frac{1}{2}$,
$\tan 60° = \sqrt{3}$

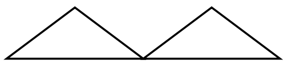
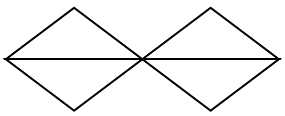
c.



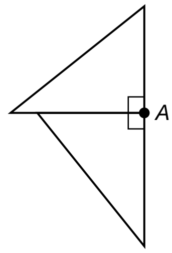
d.



Lesson Activity 8

1. 4
2. no
3. 
4. 
5. yes; 2
6. yes; 2
7. reflection
8. no
9. yes; 1
10. 6
11. 10; 15; 21
12. $L_n = L_{n-1} + (n - 1)$
13. 1275; 5050

Investigation Practice 8

a. 

b. 4; no

c. rhombus

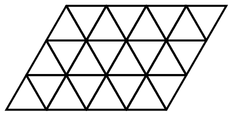
d. yes; yes

e. $x = n^2$

f. 900

Lesson Activity 9

1. yes;



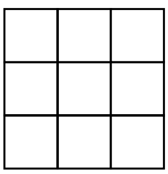
2. 6 triangles; each angle measure = 60°; total angle measure = 360°

3. It will tessellate if its interior angle measure is a divisor of 360°.

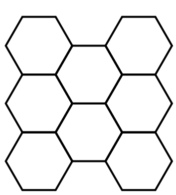
4. 90°, 108°, 120°, ≈128.57°

5. The square and the hexagon can tessellate.

6. square tessell



reg. hex. tessell

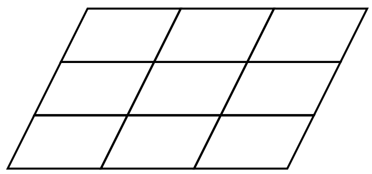


7. no; Polygons with more than 8 sides have interior angle measures greater than 120°. The only other divisor of 360° is 180°, but a polygon cannot have interior angles that measure 180°.

8. tessellation of regular/equiangular △*s*; tessellation of regular quadrilaterals (squares); tessellation of regular hexagons

9. 3; 360°

10.



11. yes; The vertex of the tessellation contains one of each of the parallelogram's angles. Since the parallelogram is a quadrilateral, its angles sum to 360°.

12. yes; The sum of the angles of any quadrilateral is 360°.

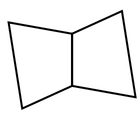
13. **C**; The tessellation consists of congruent regular hexagons and congruent equilateral triangles, and there are two hexagons and two triangles at each vertex.

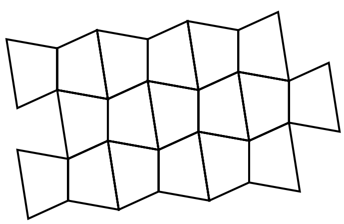
14. **B** and **C**; 90° and 180°

15. **A** and **C**

Investigation Practice 9

a. yes

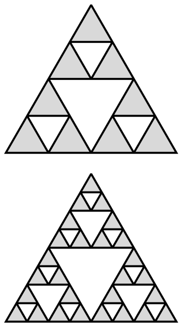
b. 

c. 

d. yes; 180°

e. no

Lesson Activity 10

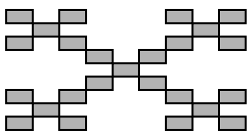
1. 

2. yes

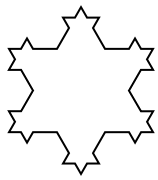
3. triangle; midpoints; sides; triangle

4. Sample: Dilate the triangle to half its size and translate it so the midpoint of its base is intersected by the original triangle's vertex and is perpendicular to the original triangle's altitude from that vertex.

5. B

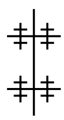
6. 

7. Sample: Dilate the equilateral triangle and rotate it such that its base lies in the middle of one side of the original triangle. Repeat for each side of the original triangle.

8. 

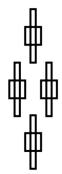
9. equilateral triangle; segments; 60°

Investigation Practice 10

a. 

b. C

c. Sample: The segment is dilated, then rotated and translated to the ends of the original segment. Two copies of the segment are produced and transformed in this way.

d. 

Lesson Activity 11

1. $\frac{\sqrt{5}-1}{2}$

2. $\frac{5-\sqrt{5}}{2}$

3. $\sqrt{5}+1$

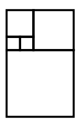
4. $a = bx$

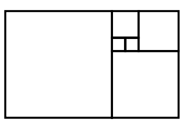
5. $x^2 - x - 1 = 0$

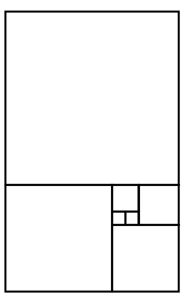
6. $\frac{1+\sqrt{5}}{2}$

7. $\frac{b+h}{b} = \frac{b}{h}$

8. $5 - \sqrt{5}$

9. 

10. 

11. 

Investigation Practice 11

a. 1, 1, 2, 3, 5, 8, 13, 21, 34, 55; 1, 2, 1.5, 1.6667,1.625, 1.6154, 1.6190, 1.6176

b. The ratios get closer and closer to ϕ, as the numbers increase.

c. $\frac{89}{55} \approx 1.61818$,
$\frac{144}{89} \approx 1.61798$,
$\frac{233}{144} \approx 1.61806$,
$\frac{377}{233} \approx 1.61803$,
$\frac{610}{377} \approx 1.61804$,
$\frac{987}{610} \approx 1.61803$,
$\frac{1{,}597}{987} \approx 1.61803$.

d. Their widths increase according to the Fibonacci sequence; the first two squares have lengths of 1, the next has a side length of 2, and so on.

Lesson Activity 12

1. $CB = 3(\cos 30°)$; 2.60

2. $x = r(\cos \theta)$

3. $y = r(\sin \theta)$

4. $r = \sqrt{(8)^2 + 6^2}$; $r = 10$

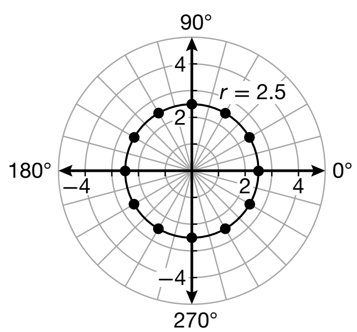
5. $\theta_2 = \tan^{-1}\left(\frac{6}{8}\right)$; 36.86°

6. $r = \sqrt{x^2 + y^2}$;

   $\theta_2 = \tan^{-1}\left(\left|\frac{y}{x}\right|\right)$

7. 143.13°; (10, 143.13°)

8. $\theta = 180° - \theta_2$;
   $\theta = 180° + \theta_2$;
   $\theta = 360° - \theta_2$

9. 

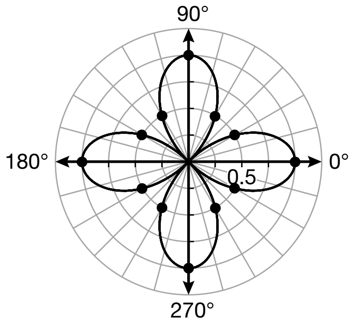
   circle centered at pole, with a radius of 2.5 units

10. $r = t$

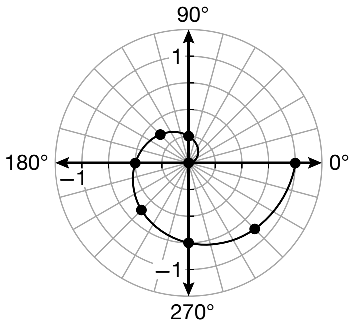
11.

θ	r
0°	1
15°	0.87
30°	0.5
45°	0
60°	−0.5
75°	−0.87
90°	−1
105°	−0.87
120°	−0.5
135°	0
150°	0.5
165°	0.87
180°	1
195°	0.87
210°	0.5
225°	0
240°	−0.5
255°	−0.87
270°	−1
285°	−0.87
300°	−0.5
315°	0
330°	0.5
345°	0.87°
360°	1

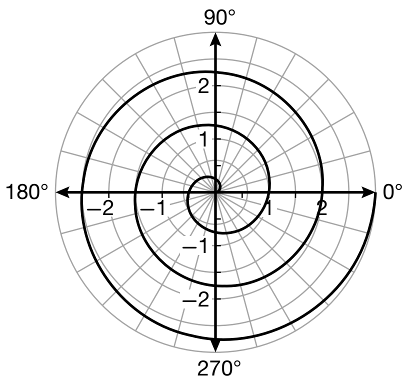
12.



13.



14.



Investigation Practice 12

a. **1.** $(-4, 0)$;

2. $(0, -1)$;

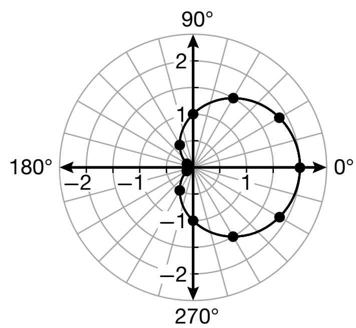
3. $(3, 0)$

b. **1.** $(3\sqrt{2}, 225°)$;

2. $(2, 90°)$;

3. $(\sqrt{13}, 326.3°)$

c. cardioid; The graph of $r = 1 + \cos\theta$ is a rotation of the graph of $r = 1 + \sin\theta$ clockwise about the pole by 90°.



d. cardioid; The graphs are 180°-rotations of each other.