Skills Practice

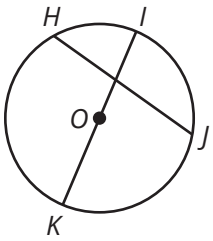
Name _____ Date _____

I. Using Circles to Make Conjectures

A. Identify the indicated part of each circle. Explain your answer.

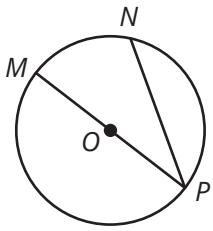
TEKS G.5A

1. O



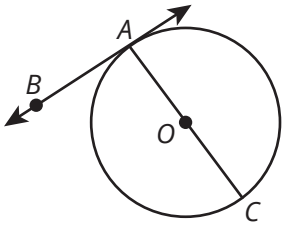
Point *O* is the center of the circle. It is a point that is the same distance from each point on the circle.

2. $\overline{NP}$



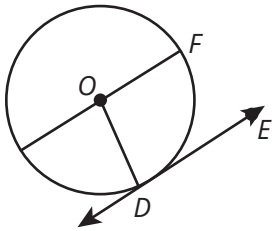
Segment *NP* is a chord. It is a line segment that connects two points, *N* and *P*, on the circle.

3. $\overleftrightarrow{AB}$



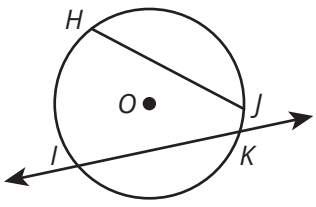
Line *AB* is a tangent. It is a line that intersects the circle at exactly one point, *A*.

4. D



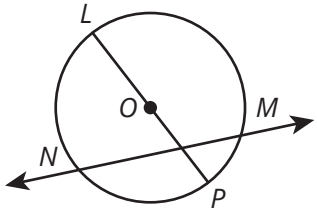
Point *D* is a point of tangency. It is the point at which the tangent $\overleftrightarrow{DE}$ intersects the circle.

5. $\overline{JH}$



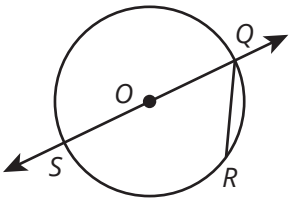
Segment *JH* is a chord. It is a line segment that connects two points, *J* and *H*, on the circle.

6. $\overleftrightarrow{MN}$



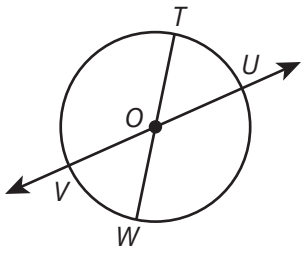
Line *MN* is a secant. It is a line that intersects the circle at two points, *M* and *N*.

7. ∠*SQR*



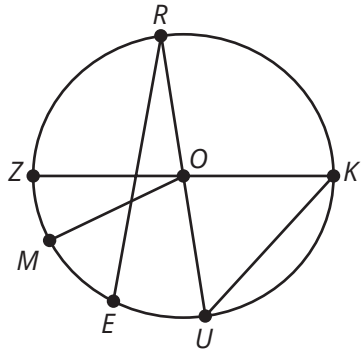
Angle ***SQR*** is an inscribed angle. It is an angle whose vertex, ***Q***, lies on the circle and whose sides contain chords, ***SQ*** and ***QR***, of the circle.

8. ∠*TOU*



Angle ***TOU*** is a central angle. It is an angle whose vertex, ***O***, is the center of the circle.

B. Identify each angle as an inscribed angle or a central angle.
TEKS G.5A



1. ∠*URE*

Angle ***URE*** is an inscribed angle.

2. ∠*ZOM*

Angle ***ZOM*** is central angle.

3. ∠*KOM*

Angle ***KOM*** is a central angle.

4. ∠*ZKU*

Angle ***ZKU*** is an inscribed angle.

5. ∠*MOU*

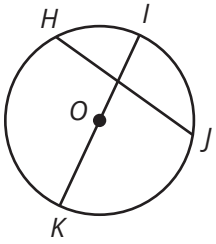
Angle ***MOU*** is a central angle.

6. ∠*ROK*

Angle ***ROK*** is a central angle.

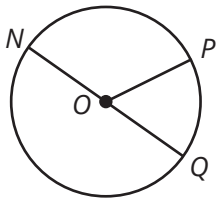
C. Classify each arc as a major arc, a minor arc, or a semicircle.
TEKS G.5A

1. $\overset{\frown}{HI}$



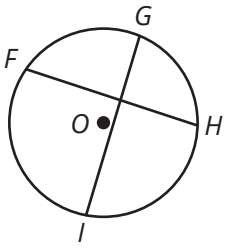
Arc *HI* is a minor arc.

2. $\overset{\frown}{NPQ}$



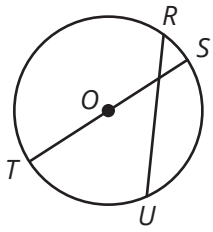
Arc *NPQ* is a semicircle.

3. $\overset{\frown}{FHI}$



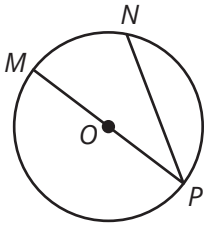
Arc *FHI* is a major arc.

4. $\overset{\frown}{TRS}$



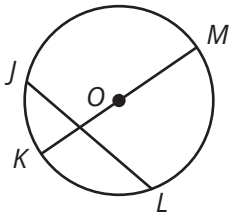
Arc *TRS* is a semicircle.

5. $\overset{\frown}{NP}$



Arc *NP* is a minor arc.

6. $\overset{\frown}{JML}$



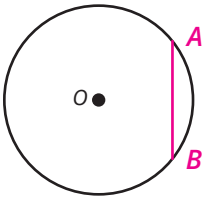
Arc *JML* is a major arc.

D. Draw the part of a circle that is described.

TEKS G.5A

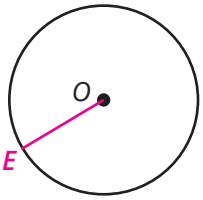
1. Draw chord $\overline{AB}$.

Answers will vary.



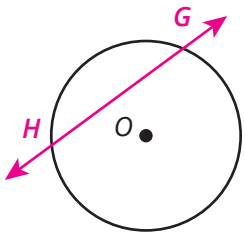
2. Draw radius $\overline{OE}$.

Answers will vary.



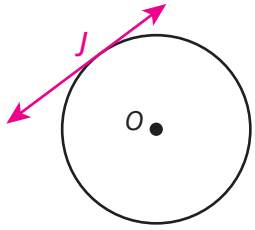
3. Draw secant $\overleftrightarrow{GH}$.

Answers will vary.



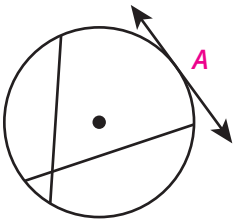
4. Draw a tangent at point *J*.

Answers will vary.



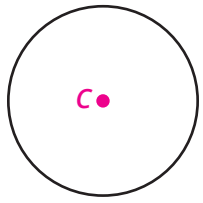
5. Label the point of tangency *A*.

Answers will vary.



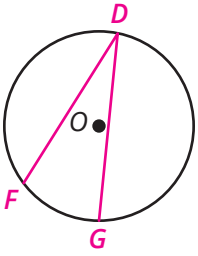
6. Label center *C*.

Answers will vary.



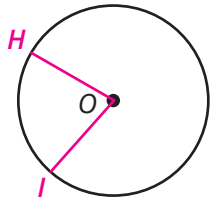
7. Draw inscribed angle $\angle FDG$.

Answers will vary.



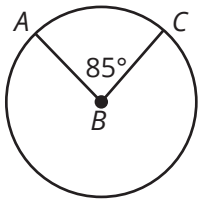
8. Draw central angle $\angle HOI$.

Answers will vary.

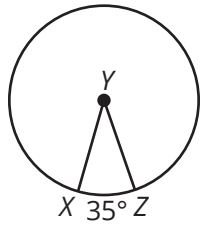


E. Determine the measure of the indicated central angle or arc.
TEKS G.12A

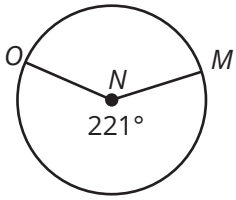
1. $m\overset{\frown}{AC}$ = **85°**



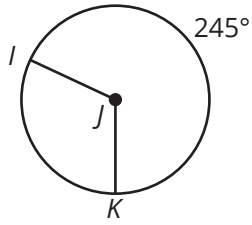
2. $m\angle XYZ$ = **35°**



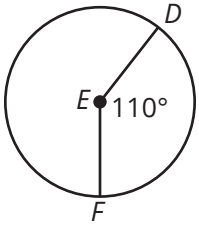
3. $m\overset{\frown}{MO}$ = **139°**



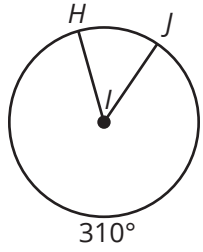
4. $m\angle IJK$ = **115°**



5. $m\overset{\frown}{DF}$ = **110°**



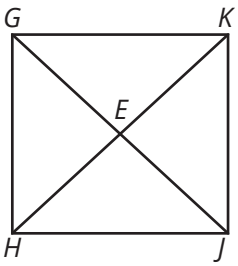
6. $m\angle HIJ$ = **50°**



II. Conjectures About Quadrilaterals

A. Complete each statement using the given diagram.
TEKS G.5A, G.6E

1. Complete each statement for square *GKJH*.



a. $\overline{GK} \cong$ ***KJ*** $\cong$ ***JH*** $\cong$ ***HG***

b. $\angle KGH \cong \angle$ ***GHJ*** $\cong \angle$ ***HJK*** $\cong \angle$ ***JKG*** $\cong \angle$ ***KEG*** $\cong \angle$ ***GEH*** $\cong \angle$ ***HEJ*** $\cong \angle$ ***JEK***

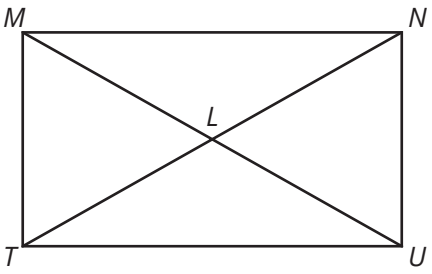
c. $\angle KEG$, $\angle$ ***GEH*** , $\angle$ ***HEJ*** , $\angle$ ***JEK*** , $\angle$ ***KGH*** , $\angle$ ***GHJ*** , $\angle$ ***HJK*** , and $\angle$ ***JKG*** are right angles.

d. $\overline{GK} \parallel$ ***HJ*** and $\overline{GH} \parallel$ ***KJ***

e. $\overline{GE} \cong$ ***JE*** $\cong$ ***HE*** $\cong$ ***KE***

f. $\angle KGE \cong \angle$ ***EGH*** $\cong \angle$ ***GHE*** $\cong \angle$ ***EHJ*** $\cong \angle$ ***HJE*** $\cong \angle$ ***EJK*** $\cong \angle$ ***JKE*** $\cong \angle$ ***EKG***

2. Complete each statement for rectangle *TMNU*.



a. $\overline{MN} \cong$ ***TU*** and $\overline{MT} \cong$ ***NU***

b. $\angle NMT \cong \angle$ ***MTU*** $\cong \angle$ ***TUN*** $\cong \angle$ ***UNM***

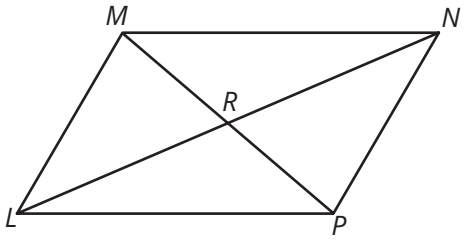
c. $\angle MTU$, $\angle$ ***TUN*** , $\angle$ ***UNM*** , and $\angle$ ***NMT*** are right angles.

d. $\overline{MN} \parallel$ ***TU*** and $\overline{MT} \parallel$ ***NU***

e. $\overline{MU} \cong$ ***NT***

f. $\overline{ML} \cong$ ***UL*** $\cong$ ***TL*** $\cong$ ***NL***

3. Complete each statement for parallelogram *MNPL*.



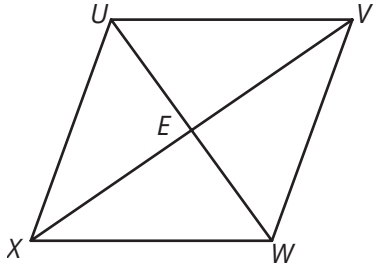
a. $\overline{MN} \cong$ ***LP*** and $\overline{ML} \cong$ ***NP***

b. $\angle NML \cong \angle$ ***NPL*** and $\angle MLP \cong \angle$ ***MNP***

c. $\overline{MN} \parallel$ ***LP*** and $\overline{ML} \parallel$ ***NP***

d. $\overline{MR} \cong$ ***PR*** and $\overline{LR} \cong$ ***NR***

4. Complete each statement for rhombus *UVWX*.



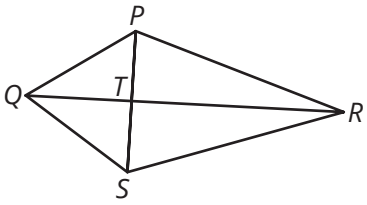
a. $\overline{UV} \cong$ ***VW*** $\cong$ ***WX*** $\cong$ ***XU***

b. $\angle UVW \cong \angle$ ***WXU*** and $\angle XUV \cong \angle$ ***VWX***

c. $\overline{UV} \parallel$ ***XW*** and $\overline{UX} \parallel$ ***VW***

d. $\overline{UE} \cong$ ***WE*** and $\overline{XE} \cong$ ***VE***

5. Complete each statement for kite *PRSQ*.



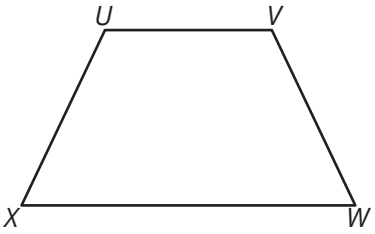
a. $\overline{PQ} \cong$ ***SQ*** and $\overline{PR} \cong$ ***SR***

b. $\angle QPR \cong \angle$ ***QSR***

c. $\overline{PT} \cong$ ***ST***

d. $\angle PQT \cong \angle$ ***SQT*** and $\angle PRT \cong \angle$ ***SRT***

6. Complete each statement for isosceles trapezoid *UVWX*.



a. The bases are ***UV*** and ***XW***.

b. The pairs of base angles are $\angle$ ***VUX*** and $\angle$ ***WVU***, and $\angle$ ***UXW*** and $\angle$ ***XWV***.

c. The legs are ***UX*** and ***VW***.

d. The vertices are ***V***, ***U***, ***X*** and ***W***.

B. List all of the quadrilaterals that have the given characteristic.
TEKS G.6E

1. all sides congruent

square and rhombus

2. diagonals congruent

rectangle, square, and isosceles trapezoid

3. no parallel sides

kite

4. diagonals bisect each other

parallelogram, rectangle, rhombus, and square

5. two pairs of parallel sides

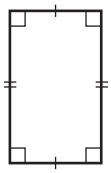
parallelogram, rectangle, rhombus, and square

6. all angles congruent

rectangle and square

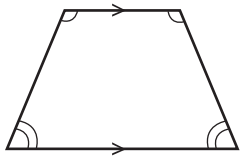
C. Name the type of quadrilateral that best describes each figure. Explain your answer.
TEKS G.6E

1.



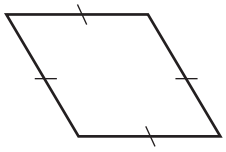
Rectangle. This quadrilateral has two pairs of parallel sides and four right angles, but the four sides are not all congruent.

2.



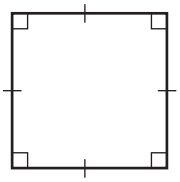
Isosceles trapezoid. This quadrilateral has exactly two parallel sides.

3.



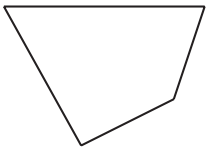
Rhombus. This quadrilateral has four congruent sides and two pairs of parallel sides, but it has no right angles.

4.



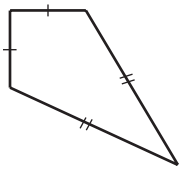
Square. This quadrilateral has two pairs of parallel sides, four right angles, and four congruent sides.

5.



Quadrilateral. This figure has no congruent sides or angles and no parallel sides.

6.



Kite. This quadrilateral has two pairs of adjacent, congruent sides, but no parallel sides.

D. Use the given information to answer each question. Explain your reasoning.
TEKS G.5A, G.6E

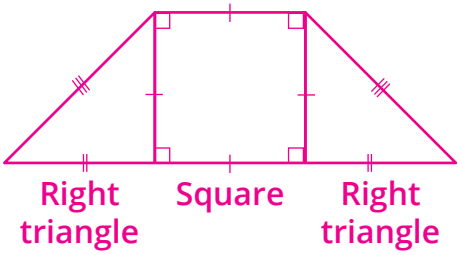
1. Tommy drew a quadrilateral. He used a protractor to measure all four angles of the quadrilateral. How many pairs of angles must be congruent for the quadrilateral to be a parallelogram?

Opposite angles are congruent in a parallelogram, so both pairs of opposite angles must be congruent.

2. Penny makes the following statement: "Every rhombus is a parallelogram." Do you agree?

All rhombi have the properties of a parallelogram, so every rhombus must be a parallelogram. Penny is correct.

3. Simon connected a square and two congruent right triangles together to form an isosceles trapezoid. Draw a diagram to represent the isosceles trapezoid.



4. Magda told Sam that an isosceles trapezoid must also be a parallelogram because there is a pair of parallel sides in an isosceles trapezoid. Is Magda correct? Explain.

Magda is incorrect. Parallelograms have two pairs of parallel sides. Trapezoids have exactly one pair of parallel sides. A trapezoid is not a parallelogram.

5. Khyree cut a quadrilateral out of a piece of cardstock but is not sure if the figure is a parallelogram or a rhombus. He measures the lengths of the opposite sides and determines them to be congruent. He measures the opposite angles of the quadrilateral and determines them also to be congruent. He measures one angle and is able to determine that the quadrilateral is a rhombus. What angle did he measure?

Khyree must have measured the angle that is formed by the diagonals. If that angle is a right angle, then the quadrilateral must be a rhombus.

6. Alice created a kite out of two sticks and some fabric. The sticks were 10 inches and 15 inches long. She tied the sticks together so they were perpendicular and attached the fabric. When she measured the kite, she noticed that the distance from where the sticks meet to the top of the kite was 5 inches. What is the area of the kite Alice created?

$$A = 2\left(\frac{1}{2}\right)(5)(5) + 2\left(\frac{1}{2}\right)\left(5\right)\left(10\right)$$

$$A = 25 + 50$$

$$A = 75$$

The area of kite is 75 square inches.

7. Sally plans to make the base of her sculpture in the shape of a rhombus. She cuts out four pieces of wood to create a mold for concrete. The pieces of wood are the following lengths: 5 inches, 5 inches, 3 inches, and 3 inches. Will the base of Sally's sculpture be a rhombus?

No. A rhombus has four congruent sides. If Sally makes the base of her sculpture with the four pieces of wood she has cut, all four sides of the quadrilateral will not be the same length.

8. Sylvia drew what she thought was an isosceles trapezoid. She measured the base angles and determined that they measured 81°, 79°, 101°, and 99°. Could her drawing be an isosceles trapezoid? Explain.

Sylvia's drawing could not be an isosceles trapezoid. The base angles of an isosceles trapezoid are congruent. The base angles of Sylvia's figure are not congruent.

9. Joanne constructed a kite with a perimeter of 38 centimeters so that the sum of the two shorter sides is 10 centimeters. What are the lengths of each of the two longer sides?

$38 - 10 = 28$

$28 \div 2 = 14$

Each of the longer sides is 14 centimeters.

10. Ronald has a picture in the shape of a quadrilateral that he cut out of a magazine. How could Ronald use a ruler to prove that the picture is a parallelogram?

He could measure the lengths of the four sides of the quadrilateral. If opposite sides are the same length, then the quadrilateral is a parallelogram.

11. Three angles of a parallelogram have the following measures: 58°, 122°, and 58°. What is the measure of the fourth angle?

Opposite angles are congruent in a parallelogram. Because there is already one pair of angles that each measure 58°, the other pair of angles must each measure 122°. The measure of the fourth angle is 122°.

12. Ilyssa constructed a kite that has side lengths of 8 inches and 5 inches. What are the lengths of the other two sides? Explain.

A kite has two pairs of congruent sides. The lengths of the other two sides must also be 8 inches and 5 inches.

E. Write a conjecture about the diagonals and interior angles of each quadrilateral. Draw examples to test your conjecture.
TEKS G.5A

1. Parallelogram that is not a rhombus or a rectangle

The diagonals of a parallelogram that is not a rhombus or rectangle bisect each other but are not congruent nor perpendicular. The consecutive angles of a parallelogram are supplementary.

See students' examples.

2. Rectangle

The diagonals of a rectangle bisect each other, are congruent, and the measure of each angle in a rectangle is 90°.

See students' examples.

3. Kite

The diagonals of a kite are perpendicular, and the longer diagonal bisects the shorter diagonal. One pair of opposite angles are congruent.

See students' examples.

4. Square

The diagonals of a square bisect each other, are perpendicular, congruent, and bisect the angles of the square, which are all right angles.

See students' examples.

5. Isosceles trapezoid

The diagonals of an isosceles trapezoid are congruent. The base angles are also congruent.

See students' examples.

6. Rhombus

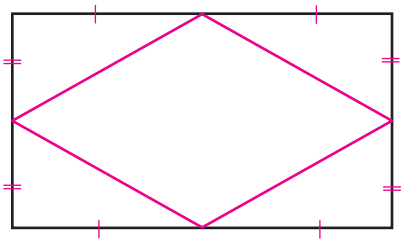
The diagonals of a rhombus bisect each other, are perpendicular, and bisect the angles of the rhombus. Opposite angles are congruent.

See students' examples.

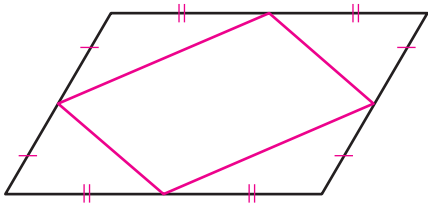
F. Draw the midsegments of each quadrilateral.

TEKS G.5A, G.6E

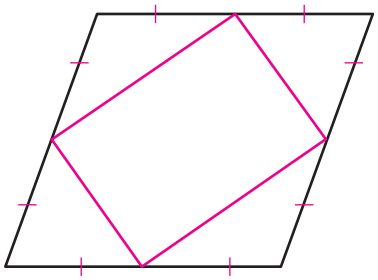
1. Rectangle



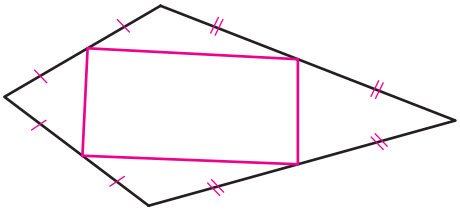
2. Parallelogram



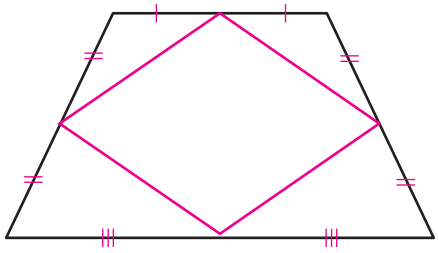
3. Rhombus



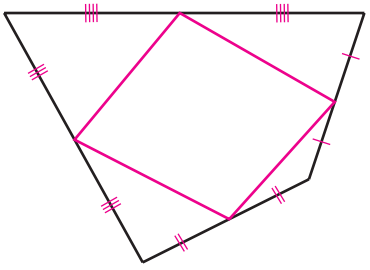
4. Kite



5. Trapezoid



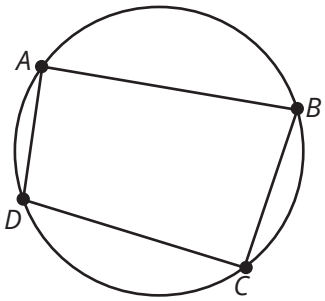
6. Quadrilateral



G. Determine the measure of the indicated angle.

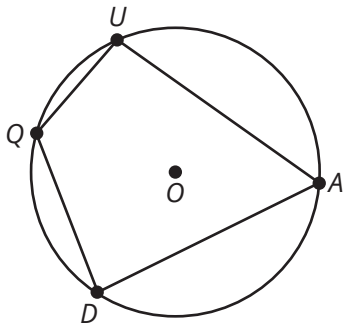
TEKS G.5A, G.6E

1. In quadrilateral *ABCD*, m∠*B* = 75°. Determine m∠*D*.



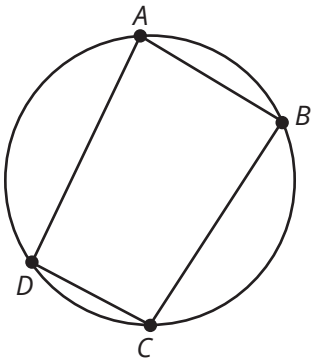
m∠*D* = **105°**

2. In quadrilateral *QUAD*, the m∠*A* = 62°. Determine the measure of m∠*Q*.



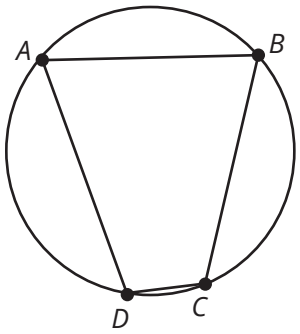
m∠*Q* = **118°**

3. In quadrilateral *ABCD*, m∠*A* = 81°. Determine m∠*C*.



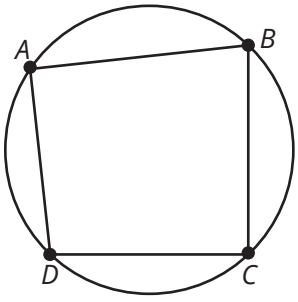
m∠*C* = **99°**

4. In quadrilateral *ABCD*, m∠*D* = 112°. Determine m∠*B*.



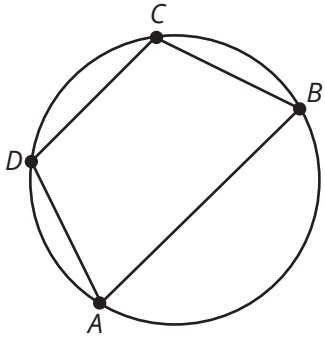
m∠*B* = **68°**

5. In quadrilateral *ABCD*, m∠*D* = 93°. Determine m∠*B*.



m∠*B* = **87°**

6. In quadrilateral *ABCD*, m∠*A* = 72°. Determine m∠*C*.



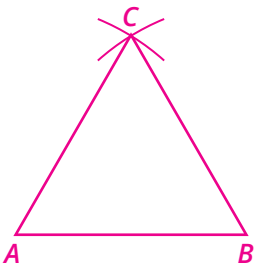
m∠*C* = **108°**

III. Constructing an Inscribed Regular Polygon

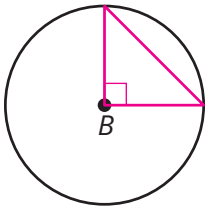
A. Construct each figure.

TEKS G.5B

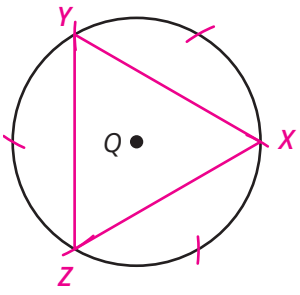
1. an equilateral triangle (not inscribed in a circle)



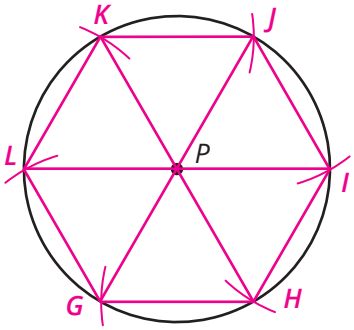
2. a right triangle inscribed in a circle



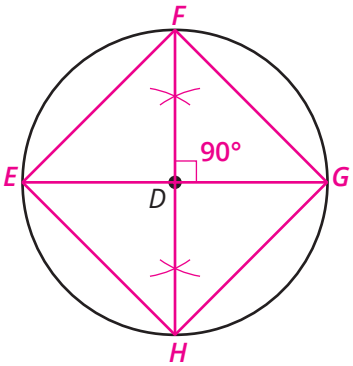
3. an equilateral triangle inscribed in a circle



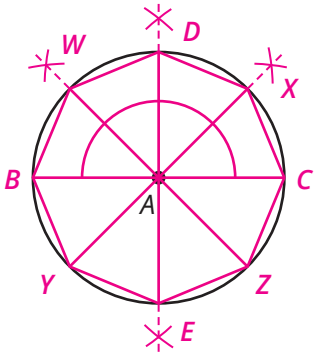
4. a regular hexagon inscribed in a circle



5. a square inscribed in a circle

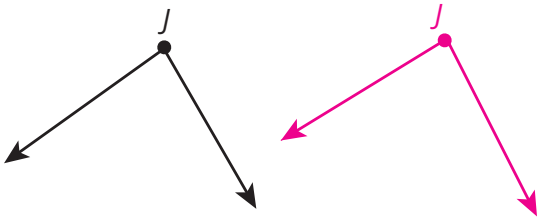


6. a regular octagon inscribed in a circle

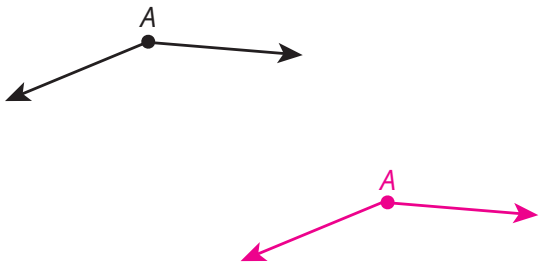


B. Using construction tools, duplicate each angle.
TEKS G.5B

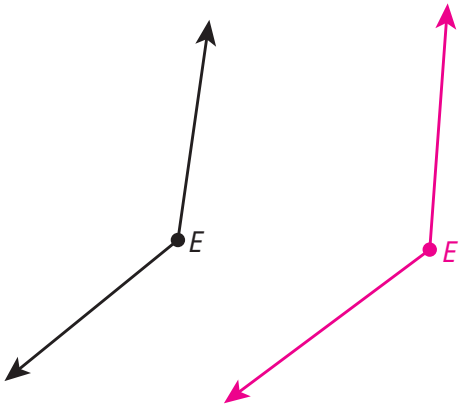
1.



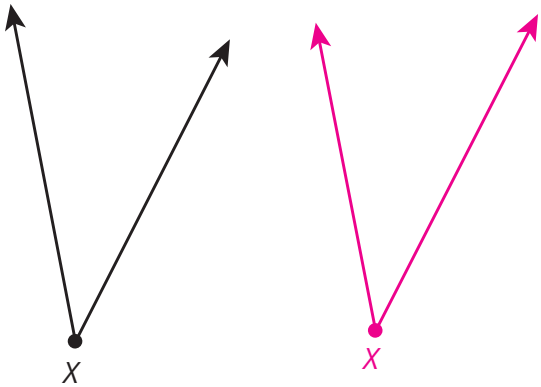
2.



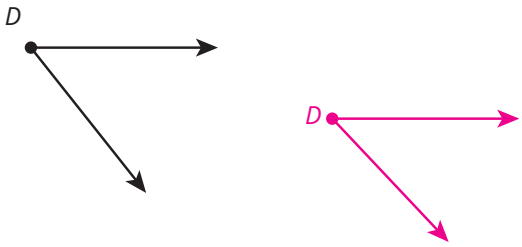
3.



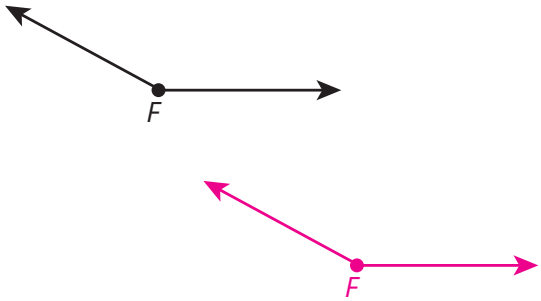
4.



5.



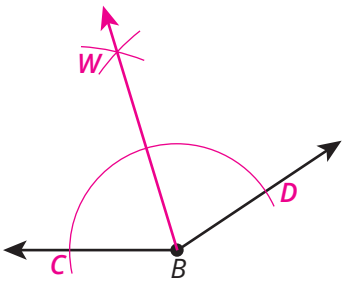
6.



C. Construct the angle bisector of each angle.

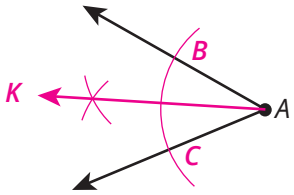
TEKS G.5B

1.



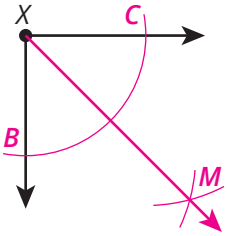
$\overrightarrow{BW}$ is the angle bisector of $\angle B$.

2.



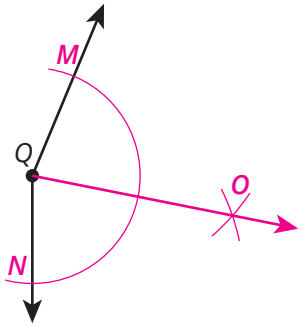
$\overrightarrow{AK}$ is the angle bisector of $\angle A$.

3.



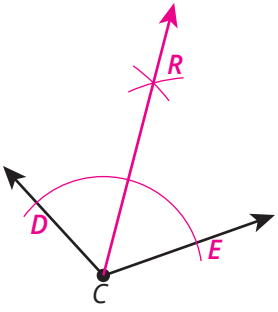
$\overrightarrow{XM}$ is the angle bisector of $\angle X$.

4.



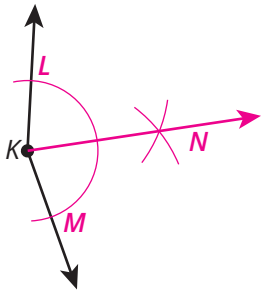
$\overrightarrow{QO}$ is the angle bisector of $\angle Q$.

5.



$\overrightarrow{CR}$ is the angle bisector of $\angle C$.

6.



$\overrightarrow{KN}$ is the angle bisector of $\angle K$.

IV. Conjectures About Triangles

A. Consider each conditional statement. Write the converse and determine if that statement is a biconditional statement.

TEKS G.4B, G.4C

1. If two segments are congruent, then they have the same length.

Converse statement: If two segments have the same length, then they are congruent.

The converse is true. Therefore, this is a biconditional statement.

2. If Sara lives in Miami, then she lives in Florida.

Converse statement: If Sara lives in Florida, then she lives in Miami.

The converse is false. Sara could live in a different city and still live in Florida. Therefore, this is not a biconditional statement.

3. If an angle is acute, then it has a measure of less than 90°.

Converse statement: If an angle has a measure of less than 90°, then it is acute.

The converse is true. Therefore, this is a biconditional statement.

4. If it is raining, then there are clouds in the sky.

Converse statement: If there are clouds in the sky, then it is raining.

The converse is false. It can be cloudy but not be raining. Therefore, this is not a biconditional statement.

5. If $x = 6$, then $x^2 = 36$.

Converse statement: If $x^2 = 36$, then $x = 6$.

The converse is false, x could also be -6. Therefore, this is not a biconditional statement.

6. If a quadrilateral is a square, all the sides are congruent.

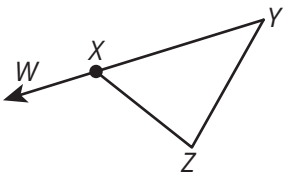
Converse statement: If all the sides are congruent, the quadrilateral is a square.

The converse is false. The quadrilateral could be a rhombus. Therefore, this is not a biconditional statement.

B. Identify the interior angle(s), the exterior angle(s), and the remote interior angle(s) of each triangle.

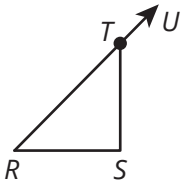
TEKS G.5A

1.



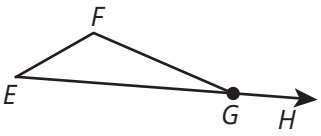
Interior angles: ∠*XYZ*, ∠*YZX*, ∠*ZXY*
Exterior angle: ∠*WXZ*
Remote interior angles: ∠*XYZ*, ∠*YZX*

2.



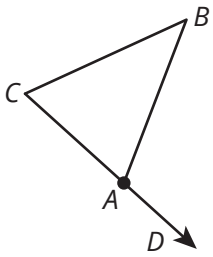
Interior angles: ∠*RTS*, ∠*TSR*, ∠*SRT*
Exterior angle: ∠*STU*
Remote interior angles: ∠*TSR*, ∠*SRT*

3.



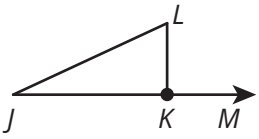
Interior angles: ∠*GFE*, ∠*FEG*, ∠*EGF*
Exterior angle: ∠*FGH*
Remote interior angles: ∠*GFE*, ∠*FEG*

4.



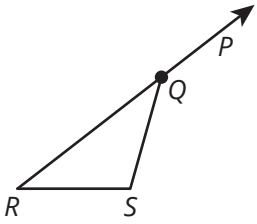
Interior angles: ∠*ABC*, ∠*BCA*, ∠*CAB*
Exterior angle: ∠*BAD*
Remote interior angles: ∠*ABC*, ∠*BCA*

5.



Interior angles: ∠*JKL*, ∠*KLJ*, ∠*LJK*
Exterior angle: ∠*LKM*
Remote interior angles: ∠*KLJ*, ∠*LJK*

6.

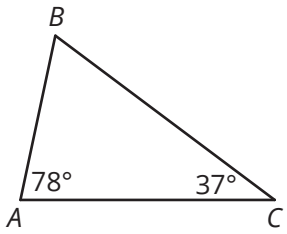


Interior angles: ∠*QRS*, ∠*RSQ*, ∠*SQR*
Exterior angle: ∠*PQS*
Remote interior angles: ∠*QRS*, ∠*RSQ*

C. Use a conjecture about the measures of the interior angles of a triangle to determine the unknown angle measure in each figure.

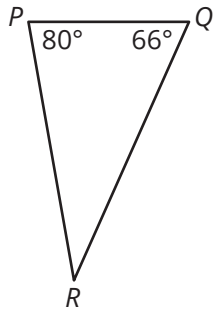
TEKS G.6D

1.



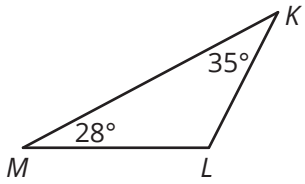
$m\angle B = 65°$

2.



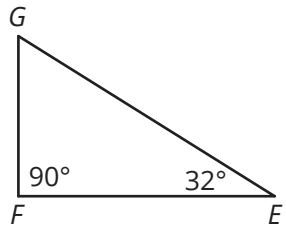
$m\angle R = 34°$

3.



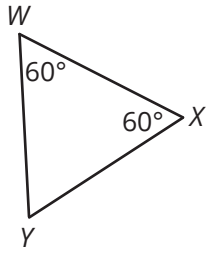
$m\angle L = 117°$

4.



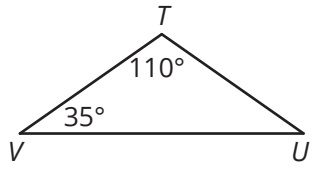
$m\angle G = 58°$

5.



$m\angle Y = 60°$

6.



$m\angle U = 35°$

D. Write a conjecture about each geometric object. Use constructions or draw examples to test your conjecture.
TEKS G.5A, G.5C, G.5D

1. base angles of an isosceles triangle

The base angles of an isosceles triangle are congruent.

See students' examples.

2. the sum of the measures of the interior angles of a triangle

The sum of the measures of the interior angles of a triangle is 180°.

See students' examples.

3. an exterior angle of a triangle

The measure of an exterior angle of a triangle is equal to the sum of the measures of the remote interior angles.

See students' examples

4. alternate interior angles

The alternate interior angles formed by a transversal line passing through two parallel lines are congruent.

See students' examples.

5. the side lengths of a triangle

The sum of two side lengths of a triangle is always greater than the third side length.

See students' examples.

6. a midsegment of a triangle

The midsegment of a triangle is always parallel to the third side of the triangle and is half the length of the third side.

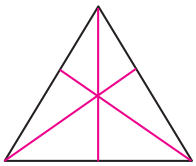
See students' examples.

V. Points of Concurrency

A. Construct the incenter of each triangle.

TEKS G.5B

1.



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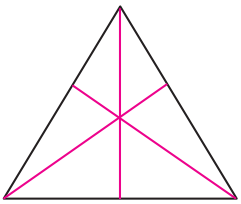

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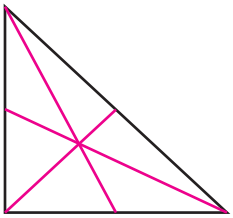

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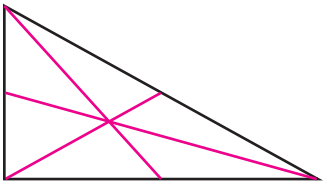

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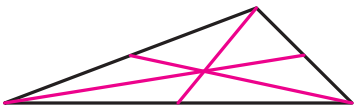

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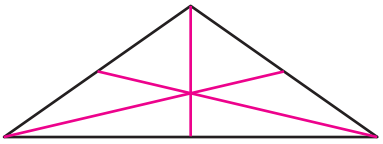
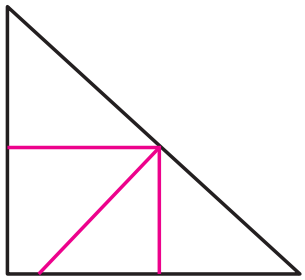


B. Construct the circumcenter of each triangle.
TEKS G.5B

1.



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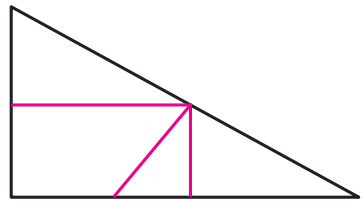

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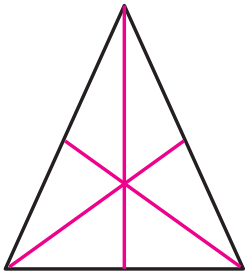

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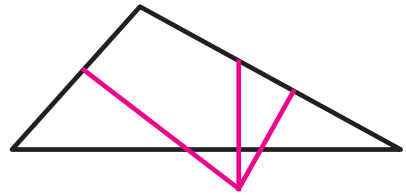

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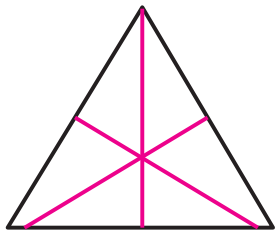

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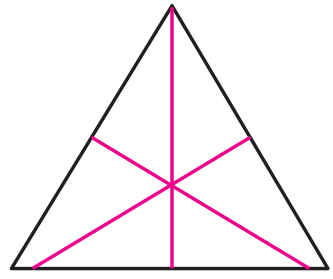
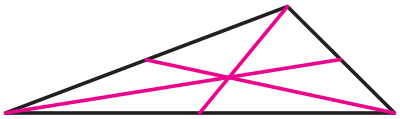


C. Construct the centroid of each triangle.

TEKS G.5B

1.



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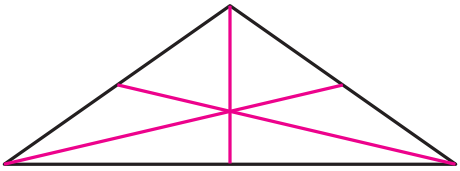

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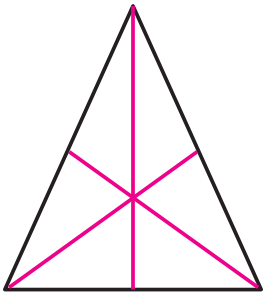

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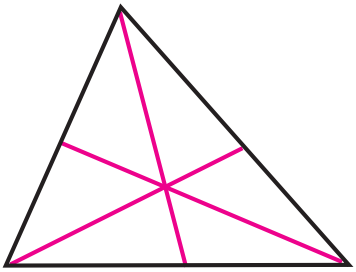

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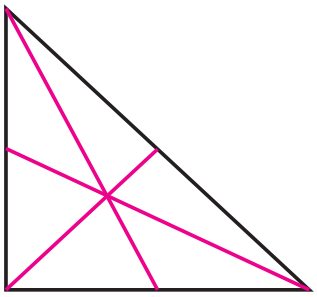

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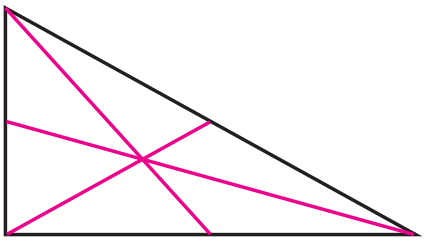
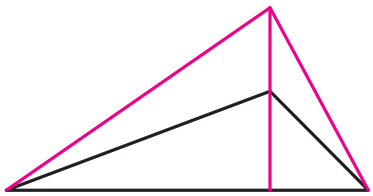


D. Construct the orthocenter of each triangle.
TEKS G.5B

1.



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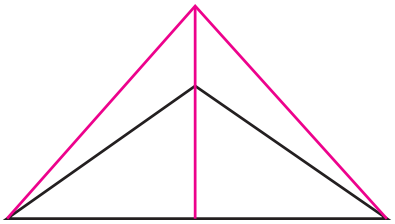

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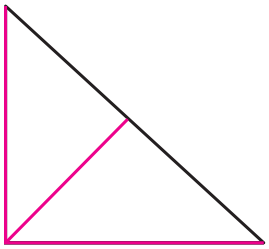

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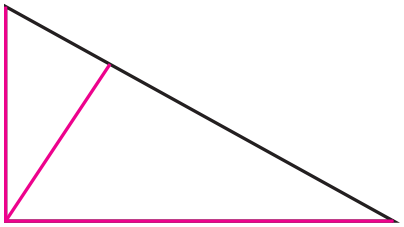

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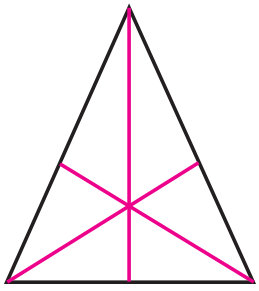

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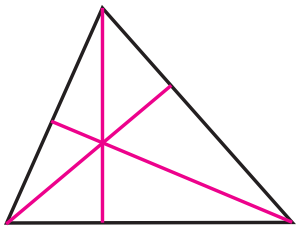
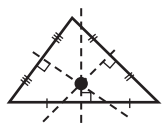
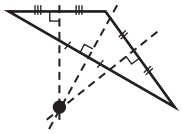
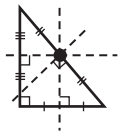
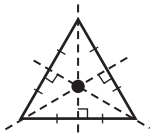
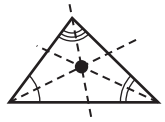
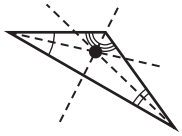
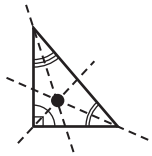
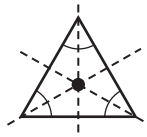
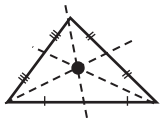
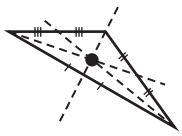
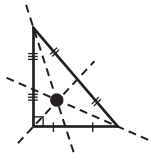
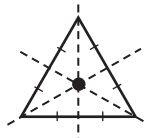
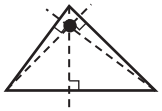
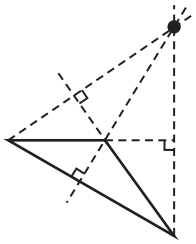
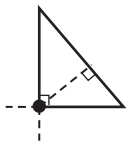
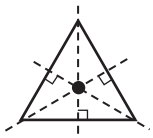


E. Describe the location of each point of concurrency by filling in the blank of each sentence.
TEKS G.5C

	Acute (not equilateral)	Obtuse	Right	Equilateral
Circumcenter				
Incenter				
Centroid				
Orthocenter				

1. The circumcenter of an obtuse triangle lies on the **exterior** of the triangle.
2. The centroid of a right triangle lies on the **interior** of the triangle.
3. The orthocenter of an acute triangle lies on the **interior** of the triangle.
4. The circumcenter of a right triangle lies on the **edge** of the triangle.
5. The orthocenter of a right triangle lies on the **vertex** of the triangle.
6. The incenter of an acute triangle lies on the **interior** of the triangle.
7. The centroid of a right triangle lies on the **interior** of the triangle.
8. The incenter of an equilateral triangle lies on the **interior** of the triangle.