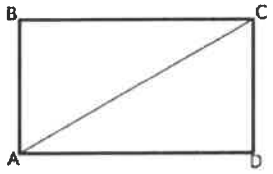
GEOMETRY BEST INSTRUCTIONAL ITEMS (FROM ITEM SPECS) 2023-2024

1

Instructional Items

Instructional Item 1

Use rectangle $ABCD$ to fill in the blanks.



In a rectangle opposite sides are _____ which means $\overline{\quad} \cong \overline{\quad}$. Triangles ABC and CDA can be proven congruent by Hypotenuse-Leg because _____ is the hypotenuse for both triangles.

2

Instructional Items

part A

Instructional Item 1

What value of x will make M the midpoint of $\overline{PQ}$ if $PM = 3x - 1$ and $PQ = 5x + 3$?

part B

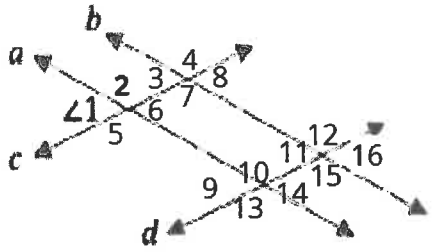
Instructional Item 2

Two lines intersect at point P. If the measures of a pair of vertical angles are $(2x - 7)^\circ$ and $(x + 13)^\circ$, determine x and the measures of the other two angles?

part C

Instructional Item 3

Based on the figure below, complete a proof to prove that $\angle 1 \cong 16$ given that $a \parallel b$ and $c \parallel d$.



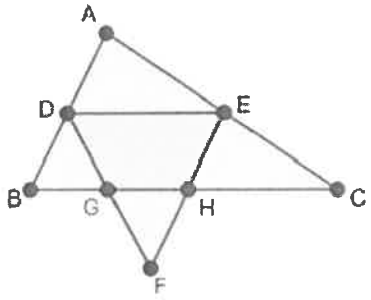
STATEMENTS	REASONS
1) Line A is parallel to Line B and Line C is parallel to Line D	1)
2) <1 $\cong$ <9	2)
3) <9 $\cong$ <14	3)
4) <14 $\cong$ <16	4)
5)	5)

3

Instructional Items

Instructional Item 1

$\overline{GH}$ is a midsegment of triangle DEF and $\overline{DE}$ is a midsegment of triangle ABC. If $GH = 1.5$ cm, what is the length of segment BC?



4

Instructional Items

Instructional Item 1

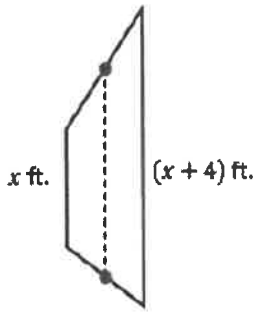
Given parallelogram $WXYZ$, where $WX = 2x + 15$, $XY = x + 27$ and $YZ = 4x - 21$, determine the length of ZW, in inches.

5

Instructional Items

structional Item 1

Tulips should be planted three inches apart to give a full look. The Starlings have a trapezoidal plot for a flower garden, as shown in the figure. They are going to put tulips along the parallel sides of the garden. The midsegment to the garden is 10 feet long. Tulips are sold in bags of 25 bulbs.



Part A. What are the lengths of the parallel sides of the garden?

Part B. How many tulips are needed to line the parallel sides?

Part C. What is the minimum number of bags the Starlings need to purchase to have enough bulbs to line the parallel sides of the garden?

6

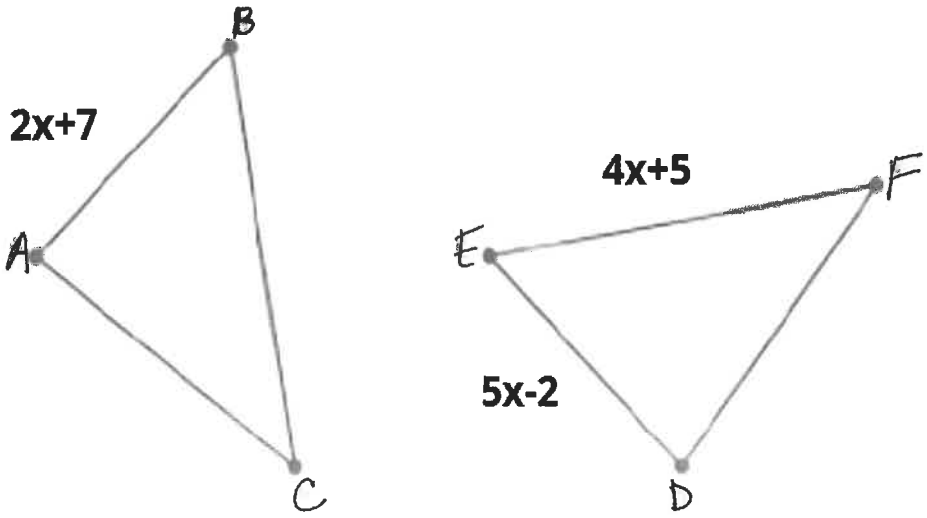
Instructional Items

Instructional Item 1

Triangles ABC and DEF are shown where $\angle A \cong \angle D$, $\angle C \cong \angle F$ and $\overline{AC} \cong \overline{DF}$,

Part A. Determine whether the triangles are congruent.

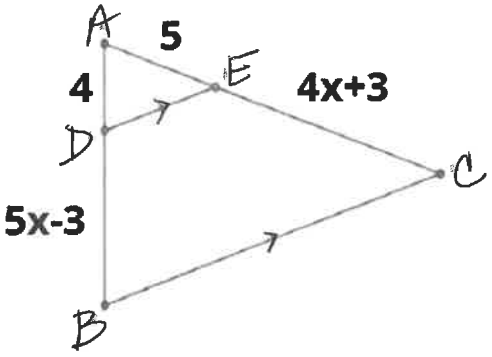
Part B. If the triangles are congruent, find EF, in units.



7

Instructional Item 2

If ΔADE and ΔABC are similar, what is the length of $\overline{AC}$, in units?



8

Instructional Items

Instructional Item 1

A triangle whose vertices are located at $\left(\frac{2}{7}, -1\right)$. $\left(-4, -\frac{14}{5}\right)$ and $(3,1)$ is shifted to the right 2 units.

Part A. What are the coordinates of the triangle after the translation?

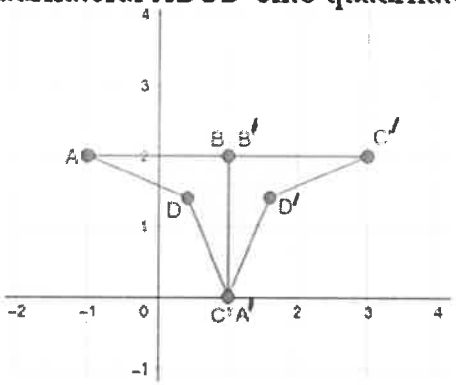
Part B. Describe the transformation that would map the preimage to the image algebraically.

9

Instructional Items

Instructional Item 1

A single rotation mapped quadrilateral $ABCD$ onto quadrilateral $A'B'C'D'$.



Part A. What is the center of the rotation?

Part B. If the rotation is counterclockwise, how many degrees is the rotation?

Part C. Describe another transformation that maps quadrilateral $ABCD$ onto quadrilateral $A'B'C'D'$.

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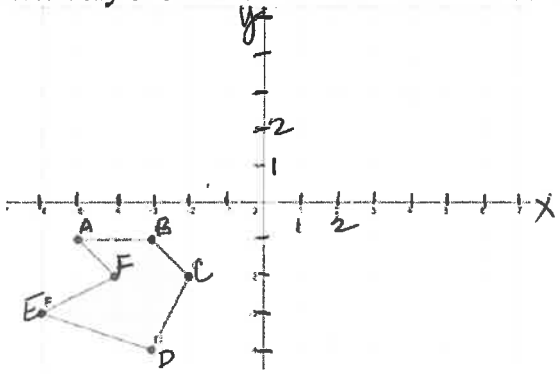
Instructional Items

Instructional Item 1

Perform the following sequence of transformations on the polygon $ABCDEF$ on the coordinate plane.

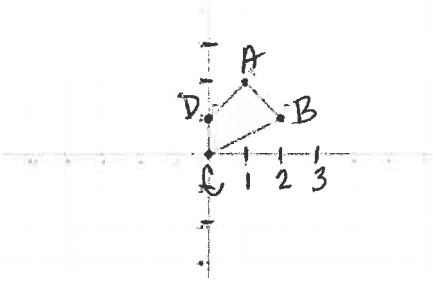
- Rotate 180° counterclockwise about the origin.
- Then, translate horizontally 2 units to the left and vertically 3 units down.



11

Instructional Item 2

Draw the resulting figure after quadrilateral $ABCD$ is transformed using $(x, y) \rightarrow (-x, y-3)$

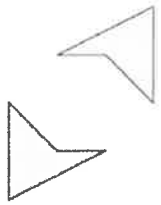


12

Instructional Items

Instructional Item 1

Describe the sequence of transformations that could be used to prove that the two quadrilaterals shown are congruent.

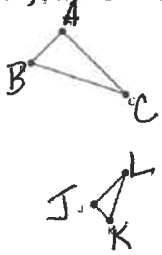


13

Instructional Items

Instructional Item 1

In triangles ABD and JKL, $m\angle A = m\angle J$, $m\angle C = m\angle L$, and $\overline{AC} = 2\overline{JL}$.



Part A. Describe a sequence of transformations that maps ΔABC onto ΔJKL.

Part B. Based on the transformations chosen, determine whether ΔABC is congruent or similar to ΔJKL.

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Instructional Items

Instructional Item 1

What point on the number line is $\frac{7}{9}$ the way from the point -3.6 to the point 10?

15

Instructional Items

Instructional Item 1

Points A (0,2) and B (2,0) are endpoints of segment AB, the side of quadrilateral $ABCD$. List possible coordinates for points C and D if quadrilateral $ABCD$ is a rhombus, not a square.

16

Instructional Item 2

Given quadrilateral $ABCD$ with vertices $(-3,-4)$, $(1,5)$, $(5,3)$, and $(5,-8)$, respectively, classify the type of quadrilateral.

17

Instructional Items

Instructional Item 1

Given J $(-4,2)$ and $(2,1)$, find the coordinates of point M on $\overline{JK}$ that partitions the segment into the ratio 1: 2.

18

Instructional Items

Instructional Item 1

Which of the following polygons are cross-sections that are parallel or perpendicular to the base of a regular pentagonal pyramid? Select all that apply.

a. Triangle
b. Parallelogram
c. Trapezoid
d. Pentagon
e. Hexagon
f. Octagon

19 Mike is having a graduation party and wants to make sure he has enough pizza. Which option would provide more pizza for his guests: one 12-inch pizza or three 6-inch pizzas?

20 The perfume Eau de Matimatica is packaged in a triangular prism bottle. The dimensions of the travel size are $\frac{1}{3}$ the dimensions of the standard bottle. How does the volume of the standard bottle compare to the travel size?

21

Instructional Items

Instructional Item 1

Which real-world object could be used describe the figure generated by rotating a rectangle about a line that is parallel to a side but not touching the rectangle?

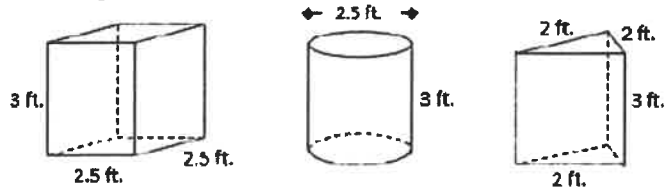
a. A doughnut
b. A piece of plastic tubing
c. An ice cream cone
d. A shoebox
e. An egg

22

Instructional Items

Instructional Item 1

Kristin and Rachel are hosting an art show where they will showcase local artists' sculptures. They are painting pedestals upon which the sculptures will be placed. Pictures of the pedestals they will be using are below. One gallon of paint can cover 400 square feet.



Part A. How many gallons of paint will they need to purchase to cover at least 4 of each type of pedestal? Assume that the base of each will not be painted.

Part B. If there is any paint left over, determine how many of which shape pedestals could be painted.

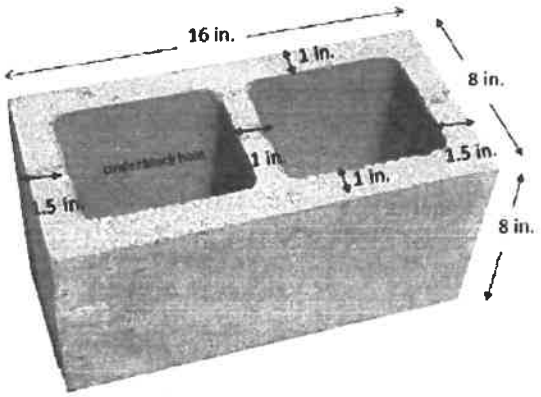
23

A cylindrical swimming pool is filled with water and has a diameter of 10 feet and height of 4 feet. If water weighs 62.4 pounds per cubic foot, what is the total weight of the water in a full tank to the nearest pound?

24

Instructional Item 1

Joshua is going to create a garden border around three sides of his backyard deck using cinder blocks. He is going to plant a flower in each hole of the cinder block. The dimensions of the cinder blocks are 8 inches by 16 inches by 8 inches. Each hole needs to be completely filled with potting soil before the flowers can be planted. Potting soil is sold in 1 cubic foot bags.



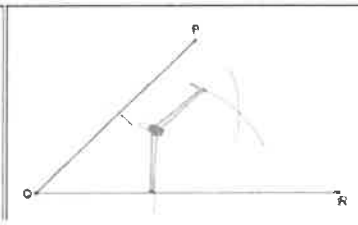
Part A. What are the dimensions of a cinder block hole?

Part B. The patio is a square with a side length of 8 feet. One of the sides of the square patio is adjacent to an exterior wall of the house. If Joshua puts blocks around the other three sides of the patio, how many bags will Joshua need to purchase to fill the blocks?

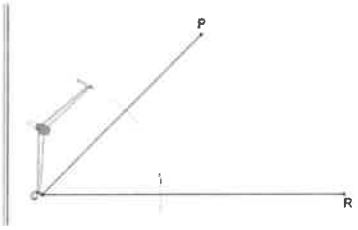
25

Which construction is shown? Number the correct order of the construction #1-6.

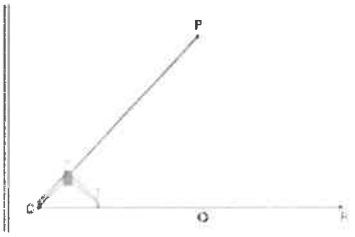
Without changing the compasses setting repeat for the other leg so that the two arcs cross.



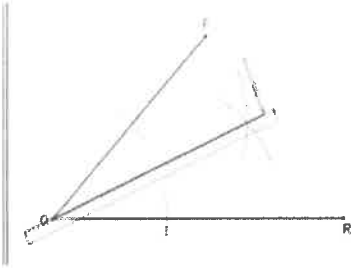
Without changing the compasses' width, draw an arc across each leg of the angle.



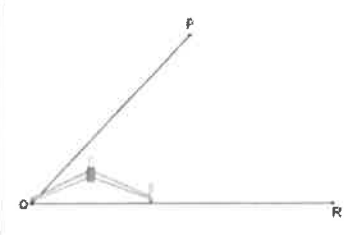
Place the compasses' point on the angle's vertex Q.



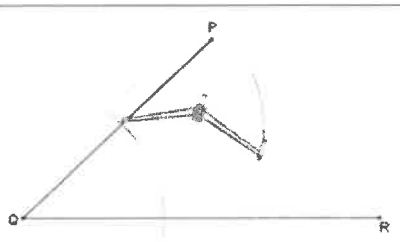
Using a straightedge or ruler, draw a line from the vertex to the point where the arcs cross



Adjust the compasses to a medium wide setting. The exact width is not important.



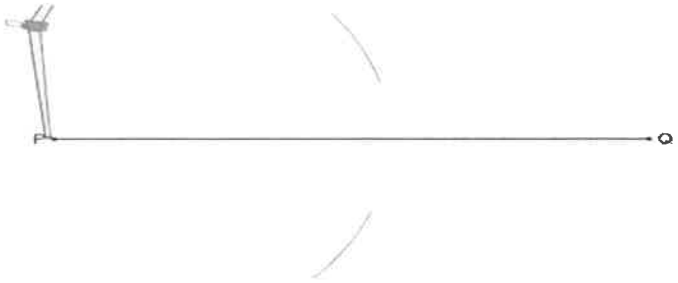
Place the compasses on the point where one arc crosses a leg and draw an arc in the interior of the angle.



26

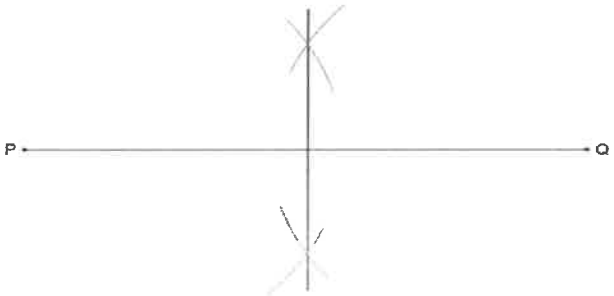
Which construction is shown? Number the correct order of the construction #1-5.

☐ Without changing the compasses' width, draw an arc above and below the line.



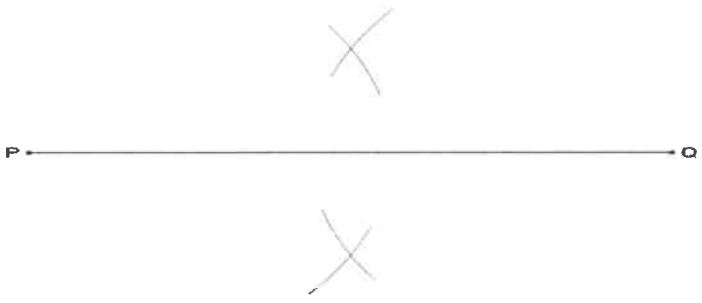
☐ Place the compasses on one end of the line segment.

☐ Using a straightedge, draw a line between the points where the arcs intersect.



☐ Set the compasses' width to a approximately two thirds the line length. The actual width does not matter.

☐ Again without changing the compasses' width, place the compasses' point on the the other end of the line. Draw an arc above and below the line so that the arcs cross the first two.



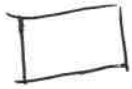
(27) Name the construction: (what is being contructed) _____

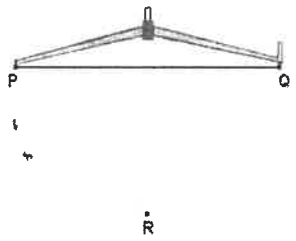
Write the step # in each box that follows the correct order

☆ Step 1

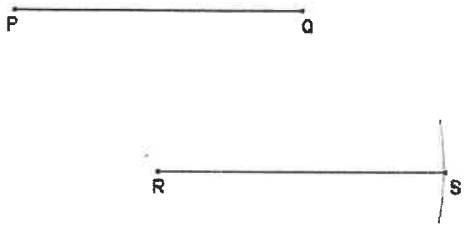
After doing this	Your work should look like this
Start with a line segment PQ that we will copy.	

Adjust the compasses' width to the point Q. The compasses' width is now equal to the length of the line segment PQ.

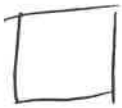


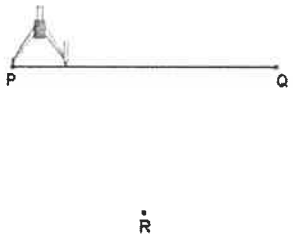


Draw a line from R to S.

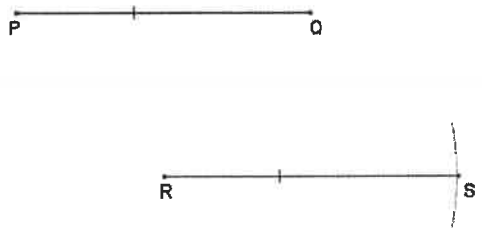


Set the compasses' point on the point P of the line segment to be copied.

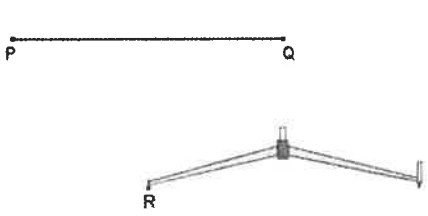




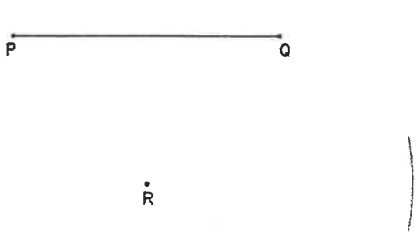
Done. The line segment RS is equal in length (congruent to) the line segment PQ.



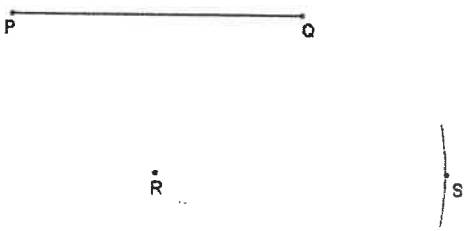
Without changing the compasses' width, place the compasses' point on the the point R on the line you drew in step 1



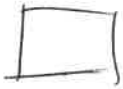
Without changing the compasses' width. Draw an arc roughly where the other endpoint will be.

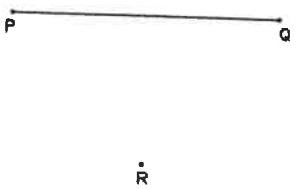


Pick a point S on the arc that will be the other endpoint of the new line segment.



Mark a point R that will be one endpoint of the new line segment.

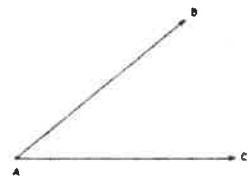
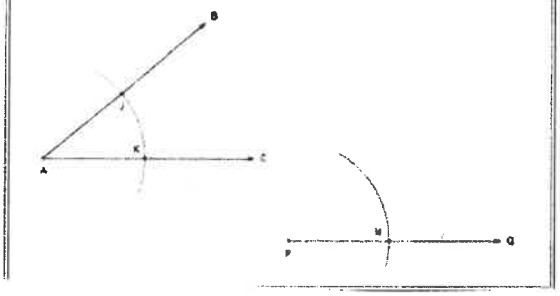
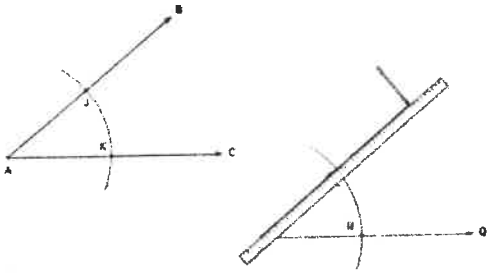
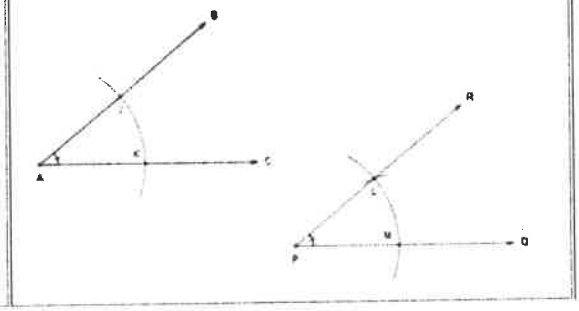
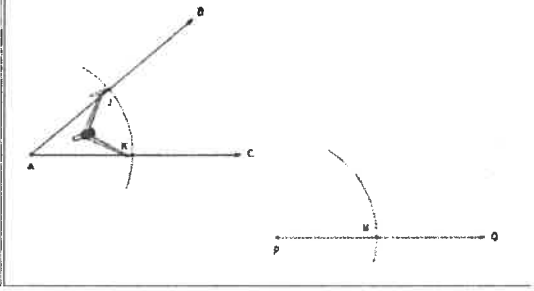
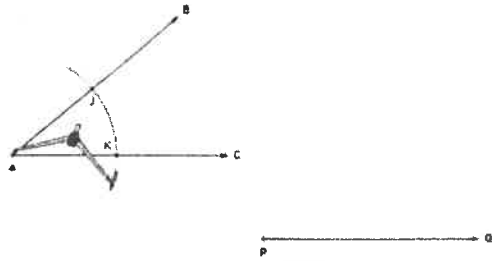
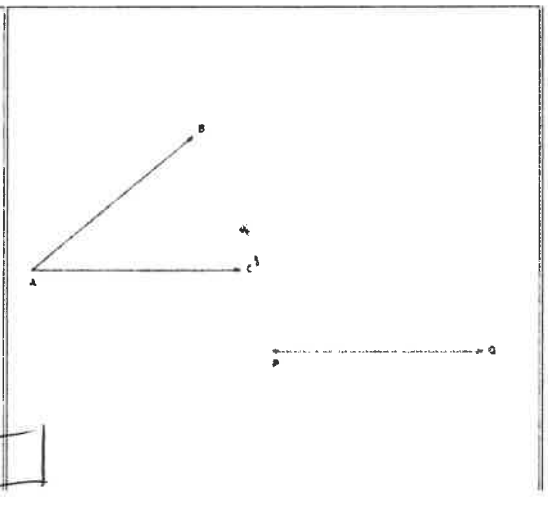
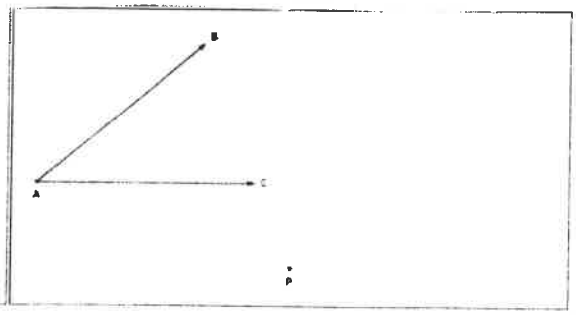
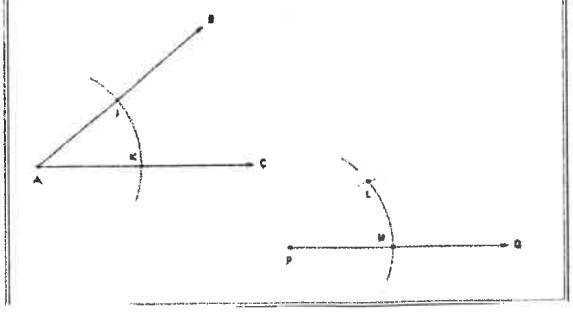
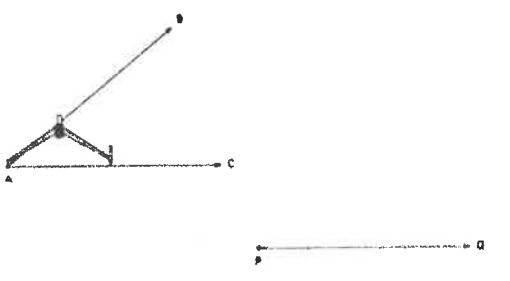




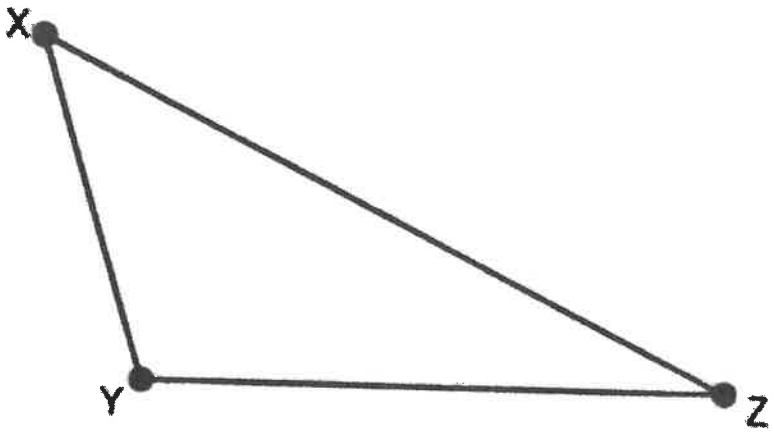
28

Name the construction: _____

Write the step # in each box that follows the correct order!

After doing this	Your work should look like this
Start with a angle BAC that we will copy. Step 1	
Without changing the compasses' width, place the compasses' point on P and draw a similar arc there, creating point M as shown.	
Draw a ray PR from P through L and onwards a little further. The exact length is not important.	
The angle ∠RPQ is congruent (equal in measure) to angle ∠BAC.	
Set the compasses on K and adjust its width to point J.	
Draw an arc across both sides of the angle, creating the points J and K as shown.	
From P, draw a ray PQ. This will become one side of the new angle. • This ray can go off in any direction. • It does not have to be parallel to anything else. • It does not have to be the same length as AC or AB.	
Make a point P that will be the vertex of the new angle.	
Without changing the compasses' width, move the compasses to M and draw an arc across the first one, creating point L where they cross.	
Place the compasses on point A, set to any convenient width.	

29 Construct the circle that is circumscribed about ΔXYZ.

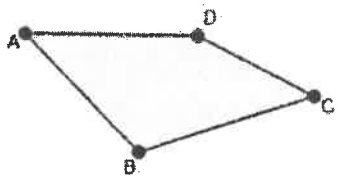


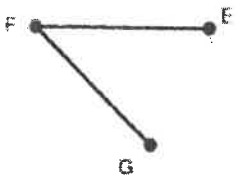
30 An image is provided below.

Part A. Construct the bisector of angle D.
Part B. Construct the midpoint of segment DB.

31

Construct the necessary segments and angles to construct quadrilateral $EFGH$ so that it is congruent to quadrilateral $DABC$. Assume $\angle DAB \cong \angle EFG$, $\overline{DA} \cong \overline{EF}$ and $\overline{AB} \cong \overline{FG}$.



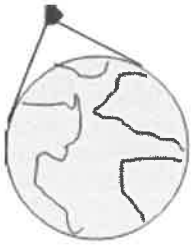


32

Instructional Items

Instructional Item 1

The International Space Station (ISS) passes over the earth 248 miles above the earth's surface. The angle formed between the two tangents formed from the ISS and the earth measures 140.4°. What is the measure of the arc of the earth that could have a view of the ISS passing overhead?

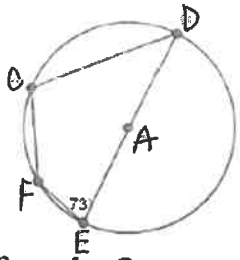


33

Instructional Items

Instructional Item 1

In circle A, segment DE is a diameter.



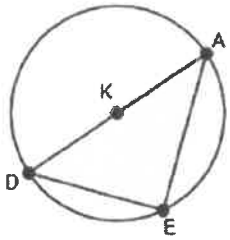
Part A. Determine the measure of angle C.

Part B. If the measure of arc CF is 50°, determine the measures of angle D and angle F.

34

Instructional Item 2

Triangle DAE is inscribed in Circle K.



Part A. Determine the value of x if the measure of angle E is $(2x + 30)°$.

Part B. Determine the measure of angle D if the measure of angle A is $(2x - 20)°$.

35

Instructional Items

Instructional Item 1

Given the equation $x^2 + 2x + y^2 - 4y + E = 0$, determine possible values of E such that the equation is an equation of a circle.

36

Instructional Item 2

What is the equation of a circle centered at $(-1, 2)$, with a diameter of 2 units?

37

Instructional Item 3

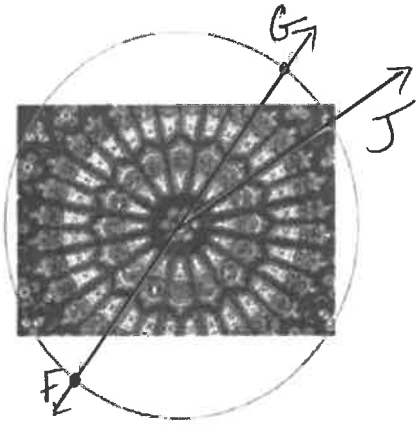
What is the equation of the circle centered at $(-2, -5)$ and passing through $(5, 0)$?

38

Instructional Items

Instructional Item 1

The North Rose Window in the Rouen Cathedral in France has a diameter of 23 feet. The stained glass design is equally spaced about the center of the circle. What is the area of the sector bounded by arc GJ?



39

Instructional Item 2

The equation of a circle is given.

$$x^2 + y^2 - 6x + 8y + 5 = 0$$

Part A Determine the center and the radius of the circle.

Part B Sketch the graph of the circle on the coordinate plane.

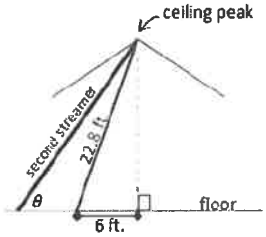
Part C What is the ordered pair that contains the maximum y-value of the circle?

40

Instructional Items

Instructional Item 1

Belle is hanging streamers for her brother's surprise birthday party. She secures two streamers of different lengths at the peak of the ceiling. The center of the floor is directly underneath the ceiling peak. The distance along the floor from the center of the room to where the first streamer is attached is 6 feet. The second streamer is attached to the floor further from the center of the floor than the first streamer.



The distance between the streamers is x feet and the length of the second streamer is y feet. The angle formed between the second streamer and the floor is θ. Select all of the equations that are true to the nearest tenth based on the diagram.

a. $\sin\theta = \frac{22.0}{y}$

b. $\sin\theta = \frac{22.8}{y}$

c. $\tan\theta = \frac{22.0}{6}$

d. $\cos\theta = \frac{x}{y}$

e. $\cos\theta = \frac{x+6}{22.8}$

f. $\tan\theta = \frac{22.0}{x+6}$

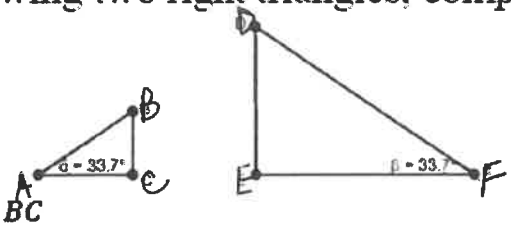
g. $\sin\theta = \frac{22.0}{22.8}$

h. $\tan\theta = \frac{22.8}{x}$

41

Instructional Item 2

Given the diagram below showing two right triangles, complete the following statement



$m\angle A = 33.7°$

$m\angle F = 33.7°$

Statement A. $\sin 33.7° = \frac{BC}{\square}$

Statement B. $\sin 33.7° = \frac{\square}{DF}$

Statement C. $\frac{BC}{AC} = \frac{\square}{\square}$

42

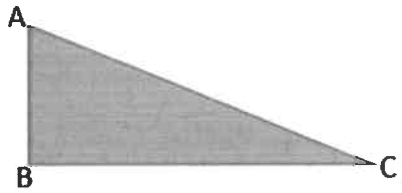
Instructional Items

Instructional Item 1

The logo of a local construction company contains an equilateral triangle. The height of the triangle is 10 units. What is the length of the measure of each side of the triangle?

43 *Instructional Item 2*

The right triangle ABC is shown. Angle B is the right angle and the length of AB is 1.5 centimeters and the length of BC is 3.1 centimeters.

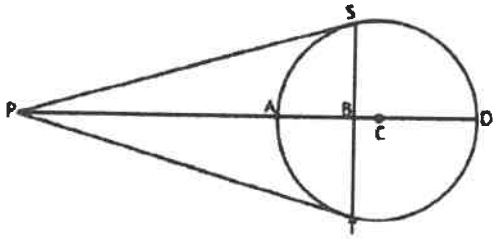


Part A. Determine the measure of angles A and C.

Part B. Determine the length of AC.

44

Draw markings on the figure below showing which segments are congruent. *Include tangents, secants, diameter, radius, and chord relationships.

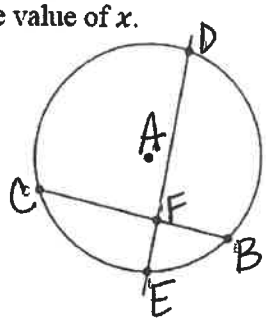


45

Instructional Items

Instructional Item 1

In Circle A, $\overline{DE}$ and $\overline{BC}$ intersect at point F. $FE = 1.3$ units, $BF = 1.9$ units, $FD = x + 1.3$ units and $CF = x$ units. Find the value of x.



46

Instructional Items

Instructional Item 1

Puaglo said the following statements are valid. Select all the statements that are invalid.

a. All quadrilaterals have four right angles.
b. A triangle is a polygon with three sides.
c. All circles are similar.
d. All equiangular quadrilaterals are congruent.
e. A trapezoid must have at least one obtuse angle.

(47) The line $x + 2y = 10$ is tangent to a circle whose center is located at (2, −1). Find the tangent point and a second tangent point of a line with the same slope as the given line.

(48) Given M (−4, 7) and N (12, −1), find the coordinates of point P on $\overline{MN}$ so that P partitions $\overline{MN}$ in the ratio 2: 3.

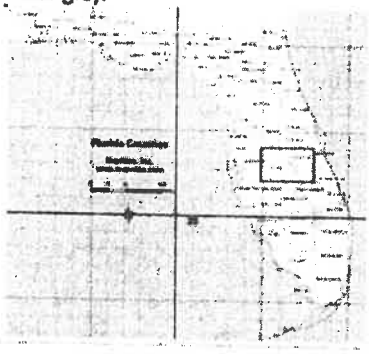
(49) Given J (−4,2) and K (2,1), find the coordinates of point M on $\overline{JK}$ that partitions the segment into the ratio 1: 2.

(50) A town has 23 city blocks, each of which has dimensions of 1 quarter mile by 1 quarter mile, and there are 4500 people in the town. What is the population density of the town?

(51) In 2019 the population for Siesta Key, FL, was 5,573 while Destin, FL, had a population of 13,702. Siesta Key is 3.475 square miles and Destin is 8.46 square miles. Which location has a smaller population density?

(52) A new community garden has four corners. Starting at the first corner and working counterclockwise, the second corner is 200 feet east, the third corner is 150 feet north of the second corner and the fourth corner is 100 feet west of the third corner. Represent the garden in the coordinate plane and determine how much fence is needed for the perimeter of the garden and determine the total area of the garden.

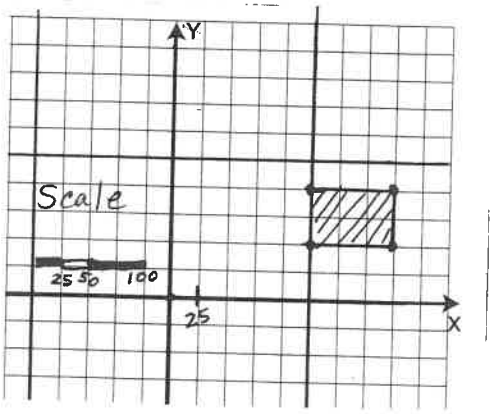
(53) The Move With Us Run Team is planning a run around the combined perimeter of Polk and Osceola counties (as shown by the green rectangle).



Part A. What are the coordinates of the four vertices that could be used to measure the run around the two counties? Use the scale provided on the map to determine the coordinates.

Part B. Using the coordinates found in Part A, what would be the total distance of the run, in miles?

Part C. Assume that the group runs a total of 10 miles every day, how many days would it take them to complete the distance around the two counties?



54 Given a triangle whose vertices have the coordinates (−3, 4), (2, 1.7) and (−0.4, −3). If this triangle is reflected across the y-axis the transformation can be described using coordinates as $(x, y) \rightarrow (-x, y)$ resulting in the image whose vertices have the coordinates (3, 4), (−2, 1.7) and (0.4, −3).

55 Circle the transformations that can be used when it is important to preserve angle measure.
Horizontal Translations
Reflections
Clockwise Rotations
Dilations
Vertical Translations
Counterclockwise Rotations

56 Circle the transformations that can be used when it is important to preserve distance.
Horizontal Translations
Reflections
Clockwise Rotations
Dilations
Vertical Translations
Counterclockwise Rotations

57 Write a transformation, or sequence of transformations, that preserves angle measure but does not preserve distance.

58 Given Triangle ABC has vertices located at (−2, 2), (3, 3) and (1, −3), respectively, classify the type of triangle ABC is based on its angle measures and side lengths.

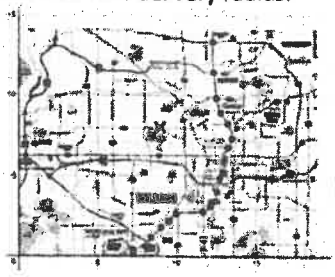
59 If a square has a diagonal with vertices (−1, 1) and (−4, −3), find the coordinate values of the vertices of the other diagonal and show that the two diagonals are perpendicular.

60 Points A (0,2) and B (2,0) are endpoints of segment AB, the side of quadrilateral $ABCD$. List possible coordinates for points C and D if quadrilateral $ABCD$ is a rhombus, not a square.

61 Given quadrilateral $ABCD$ with vertices (−3,−4), (1,5), (5,3), and (5, −8), respectively, classify the type of quadrilateral.

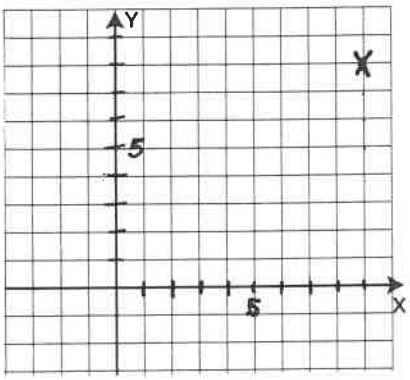
62

A florist serving the Orlando area located at (9,8) and marked with an X on the coordinate plane shown where each unit is 10 miles. The florist has a 50-mile delivery radius.



Part A. Write an equation that describes the delivery area.

Part B. Does any of the florist's delivery area include part of Seminole County?



63

Use the following statement to answer the questions.

A triangle is an equilateral triangle if and only if the triangle has three congruent sides.

Part A. Write the two "if...then" statements that can be written from the given statement.

Part B. Write the converse of one of the conditional statements created in Part A.