

## Grade: Geometry

### Enduring Skill 1:

**Students develop a formal understanding of similarity (and can apply similarity to solve problems.)**

#### Demonstrators:

1. Identify criteria for similarity of triangles. (G.SRT.2, G.SRT.3, G.SRT.4)
2. Use similarity to solve problems. (G.SRT.5, G.SRT.6, G.SRT.8, G.SRT.10, G.SRT.11)
3. Understand similarity in terms of transformation. (G.SRT.1, G.SRT.2, G.CO.2, G.CO.4)

#### Assessment Items:

1. **ES 1, Demonstrator 3, Standard (G.SRT.1, G.SRT.2, G.CO.2, G.CO.4)**

Triangle LMN has sides  $ML=12$  cm,  $LN=10$  cm and angle  $LMN=55$  degrees.  
Triangle OPQ has sides  $PO=8$  cm,  $PQ=4$  cm and angle  $OPQ=55$  degrees.  
What additional information is sufficient to show that  $\triangle LMN$  can be transformed and mapped onto  $\triangle OPQ$ ?

- A)  $OQ = 6$
- B)  $MN = 9$
- C)  $\angle LMN$  is congruent to  $\angle QOP$
- D)  $\angle NLM$  is congruent to  $\angle QOP$

**2. ES 1, Demonstrator 3, Standard (G.SRT.1, G.SRT.2, G.CO.2, G.CO.4)**

The vertices of triangle  $PQR$  are located at  $P(2, 5)$ ,  $Q(12, 20)$ , and  $R(12, 5)$ . The vertices of the triangle will undergo the transformation described by the rule  $(x, y) \rightarrow (x, \frac{1}{5}y)$ . Which statement about the image triangle is true?

- A) The perimeter of the image will be 5 times the perimeter of the pre-image.
- B) The area of the image will be 5 times the area of the pre-image.
- C) The perimeter of the image will be one-fifth the perimeter of the pre-image.
- D) The area of the image will be  $\frac{1}{5}$  the area of the pre-image.

**3. ES 1, Demonstrator 1, Standard (G.SRT.2, G.SRT.3, G.SRT.4)**

Given two right triangles,  $\triangle QRS$  and  $\triangle XYZ$  with  $m\angle R = m\angle Y = 90^\circ$ , which statement is *not* necessarily true?

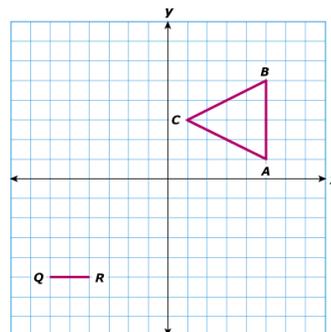
- A. If  $m\angle Q = m\angle X$ , then  $\triangle QRS \sim \triangle XYZ$
- B. If  $m\angle S = m\angle Z$ , then  $\triangle QRS \sim \triangle XYZ$
- C. If  $\frac{QR}{XY} = \frac{RS}{XZ}$ , then  $\triangle QRS \sim \triangle XYZ$
- D. If  $\frac{QS}{XZ} = \frac{RS}{YZ}$ , then  $\triangle QRS \sim \triangle XYZ$

**4. ES 1, Demonstrator 3, Standard (G.SRT.1, G.SRT.2, G.CO.2, G.CO.4)**

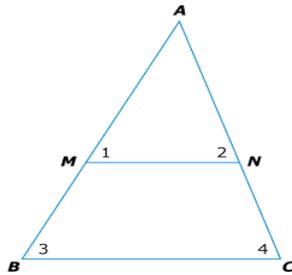
Given: Points  $A(5, 1)$ ,  $B(5, 5)$ ,  $C(1, 3)$ ,  $Q(-6, -5)$ , and  $R(-4, -5)$ .

Which coordinates for  $S$  would make  $\triangle ABC \sim \triangle QRS$ ?

- A.  $(-6, -3)$
- B.  $(-5, -4)$
- C.  $(-5, -3)$
- D.  $(-6, -2)$



5. ES 1, Demonstrator 1, Standard (G.SRT.2, G.SRT.3, G.SRT.4)



If  $\overline{MN} \parallel \overline{BC}$ , which statement is true?

- A.  $\triangle AMN \sim \triangle ACB$
- B.  $\triangle AMN \sim \triangle ABC$
- C.  $\triangle AMN \sim \triangle ANM$
- D.  $\triangle ABC \sim \triangle ACB$

6. ES 1, Demonstrator 1, Standard (G.SRT.2, G.SRT.3, G.SRT.4)

Which of the following statements is not true?

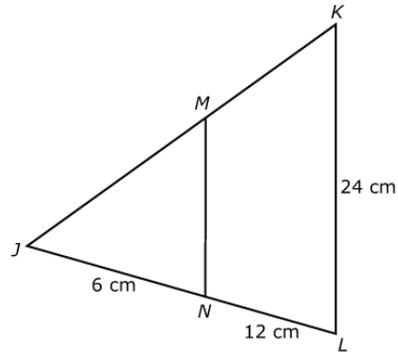
- A. If two triangles are similar, then they must be congruent.
- B. If two triangles are congruent, then they must be similar.
- C. All isosceles right triangles are similar.
- D. All equilateral triangles are similar.

7. ES 1, Demonstrator 2, Standard (G.SRT.5, G.SRT.6, G.SRT.8, G.SRT.10, G.SRT.11)

Yolanda has two coolers shaped like similar rectangular prisms. Each dimension of the larger cooler is 4 times the corresponding dimension of the smaller cooler. How does the volume of the smaller cooler compare to the volume of the larger cooler?

8. ES 1, Demonstrator 2, Standard (G.SRT.5, G.SRT.6, G.SRT.8, G.SRT.10, G.SRT.11)

In the diagram,  $\overline{MN} \parallel \overline{KL}$ .



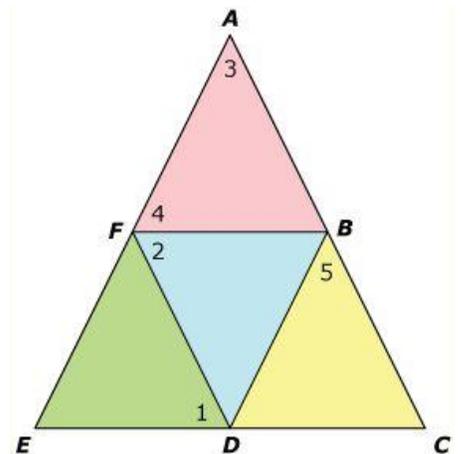
What is  $MN$ ?

- A. 6 cm
  - B. 8 cm
  - C. 12 cm
  - D. 18 cm
9. ES 1, Demonstrator 2, Standard (G.SRT.5, G.SRT.6, G.SRT.8, G.SRT.10, G.SRT.11)

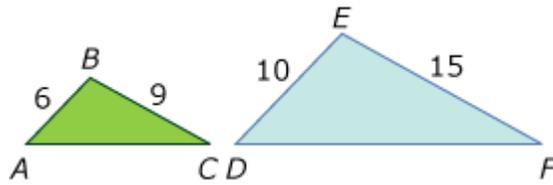
In the figure shown below,  $AE = AC$  and  $DF = DB$ .

If  $\overline{FB} \parallel \overline{EC}$  and  $m\angle 5 = 56^\circ$ , what is  $m\angle 2$  ?

- A.  $34^\circ$
- B.  $56^\circ$
- C.  $62^\circ$
- D.  $124^\circ$

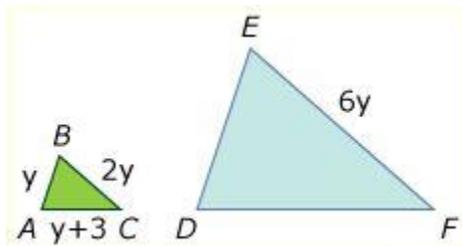


10. ES 1, Demonstrator 2, Standard (G.SRT.5, G.SRT.6, G.SRT.8, G.SRT.10, G.SRT.11)



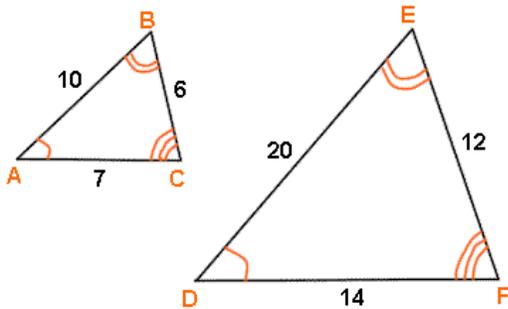
If  $\triangle ABC$  and  $\triangle DEF$  are similar, which could be the lengths of  $\overline{AC}$  and  $\overline{DF}$ ?

- A.  $AC = 3$  and  $DF = 4.5$
  - B.  $AC = 12$  and  $DF = 20$
  - C.  $AC = 20$  and  $DF = 12$
  - D.  $AC = 7.5$  and  $DF = 13.5$
11. ES 1, Demonstrator 2, Standard (G.SRT.5, G.SRT.6, G.SRT.8, G.SRT.10, G.SRT.11)



If  $\triangle ABC$  is similar to  $\triangle DEF$  and  $EF = 6y$ , which represents the length of  $\overline{DF}$ ?

- A.  $3y+3$
  - B.  $3y+9$
  - C.  $4y+7$
  - D.  $4y+16$
12. ES 1, Demonstrator 1, Standard (G.SRT.2, G.SRT.3, G.SRT.4)



Can you conclude that the triangles above are similar? Explain.

**13. ES 1, Demonstrator 3, Standard (G.SRT.1, G.SRT.2, G.CO.2, G.CO.4)**

Which transformation produces an image that is similar to but not congruent to the pre-image?

- A. Reflection across the x-axis
- B. Rotation of 90 degrees clockwise
- C. Translation down 6 units
- D. Dilation by a factor of 0.75

**14. ES 1, Demonstrator 3, Standard (G.SRT.1, G.SRT.2, G.CO.2, G.CO.4)**

A triangle has vertices  $P(2, -1)$ ,  $Q(2, 4)$ , and  $R(4, -1)$ . Determine the coordinates of the image  $\triangle P'Q'R'$  after a dilation with center  $P$  and scale factor of 3.

**15. ES 1, Demonstrator 3, Standard (G.SRT.1, G.SRT.2, G.CO.2, G.CO.4)**

Triangle  $JKL$  is dilated with a scale factor of 4 to form triangle  $RST$ . Which statement is true?

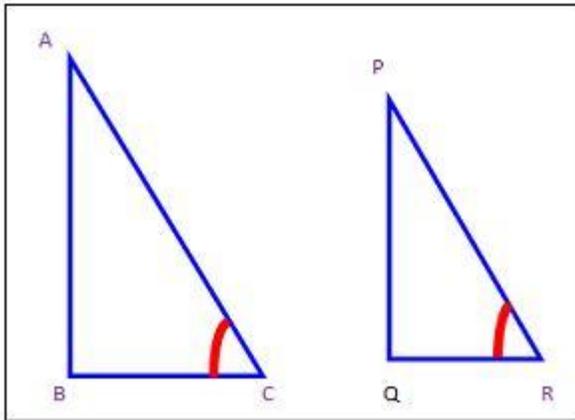
- A. The triangles are not similar because all the corresponding angles are not congruent and all the corresponding sides are not proportional.
- B. The triangles are similar because all the corresponding angles are congruent and all the corresponding sides are proportional.
- C. The triangles are similar because all the corresponding angles and sides are congruent.
- D. The triangles are not similar because the corresponding sides are not congruent.

**16. ES 1, Demonstrator 3, Standard (G.SRT.1, G.SRT.2, G.CO.2, G.CO.4)**

$\overline{PQ}$  has a length of 6 inches. If  $\overline{PQ}$  is dilated with a scale factor of  $\frac{2}{3}$  what is the length of the image?

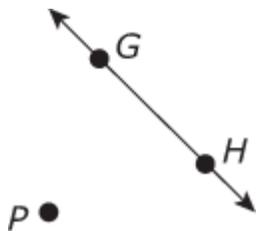
17. ES 1, Demonstrator 1, Standard (G.SRT.2, G.SRT.3, G.SRT.4)

What additional information is required to prove that  $\triangle ABC \sim \triangle PQR$ ?



18. ES 1, Demonstrator 3, Standard (G.SRT.1, G.SRT.2, G.CO.2, G.CO.4)

The image of  $\overline{GH}$  dilated with center  $P$  is  $\overline{G'H'}$

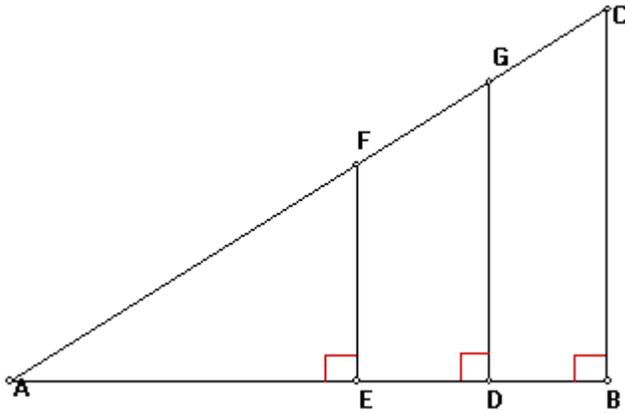


Which statement must be true?

- A.  $\overline{G'H'} \parallel \overline{GH}$
- B.  $\overline{G'H'}$  intersects point P
- C.  $\overline{G'H'} \perp \overline{GH}$
- D.  $\overline{G'H'}$  is farther from point P than  $\overline{GH}$ .

19. ES 1, Demonstrator 1, Standard (G.SRT.2, G.SRT.3, G.SRT.4)

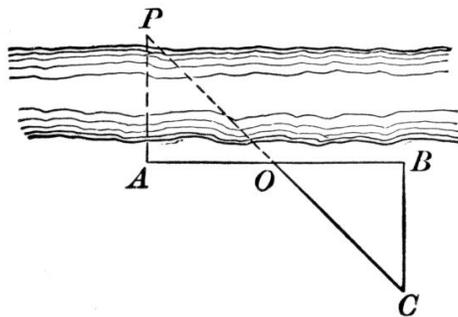
The three triangles in the figure below are similar by what postulate or theorem? Write an extended similarity statement showing the relationship between the three triangles.



20. ES 1, Demonstrator 2, Standard (G.SRT.5, G.SRT.6, G.SRT.8, G.SRT.10, G.SRT.11)

Jennifer places a flat mirror on the ground and backs up until she sees the top of the building in the mirror. At that point, Jennifer is 9 feet from the mirror and the mirror is 32 feet from the building. If Jennifer's eyes are 5 feet above the ground, how tall is the building to the nearest tenth of a foot?

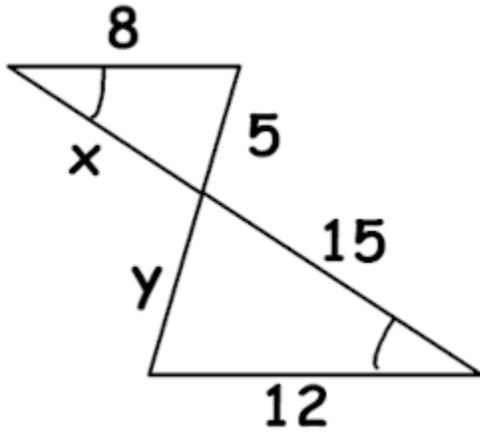
21. ES 1, Demonstrator 2, Standard (G.SRT.5, G.SRT.6, G.SRT.8, G.SRT.10, G.SRT.11)



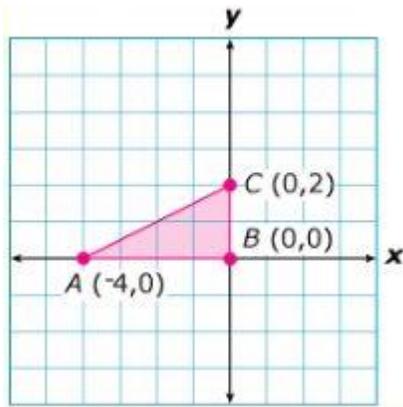
In the figure above, angles P and C are congruent.  $AO = 25$  yards,  $BC = 10$  yards, and  $OB = 7$  yards. Find the distance, PA, across the river?

22. ES 1, Demonstrator 2, Standard (G.SRT.5, G.SRT.6, G.SRT.8, G.SRT.10, G.SRT.11)

Solve for  $x$  and  $y$ .



23. ES 1, Demonstrator 1, Standard (G.SRT.2, G.SRT.3, G.SRT.4)

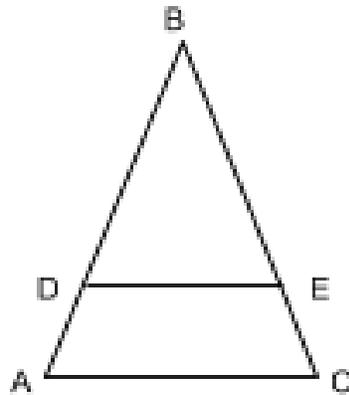


Which coordinates could be the vertices of a triangle similar to  $\triangle ABC$ ?

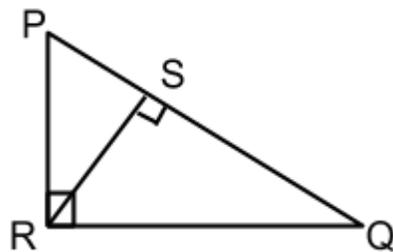
- A. (1,1), (1,3), (-5,1)
- B. (2,2), (2,4), (0,4)
- C. (0,0), (0,4), (-8,0)
- D. (2,2), (2,4), (-8,0)

24. ES 1, Demonstrator 1, Standard (G.SRT.2, G.SRT.3, G.SRT.4)

Given  $\overline{DE} \parallel \overline{AC}$ , prove  $\frac{BD}{AD} = \frac{BE}{EC}$ .



25. ES 1, Demonstrator 1, Standard (G.SRT.2, G.SRT.3, G.SRT.4)



For triangle PQR

- Write a similarity statement for the three similar triangles in the figure.
- Write two congruence statements for corresponding angles of similar triangles.
- Write two proportions for corresponding sides of similar triangles.

## Grade: Geometry

### Enduring Skill 2:

### Students develop understanding of congruence.

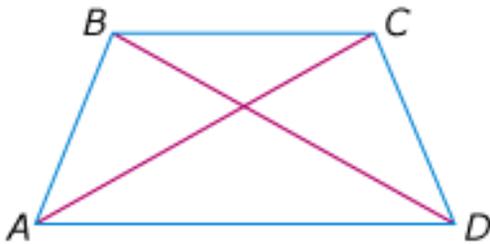
#### Demonstrators :

1. Students establish triangle congruence criteria. (G.CO.7, G.CO.8)
2. Use triangle congruence as a familiar foundation for the development of formal proof. (G.CO.10, G.CO.11, G.SRT.4)
3. Use congruence to solve problems. (G.SRT.5)

#### Assessment Items:

1. **ES 2, Demonstrator 2, Standards (G.CO.10, G.CO.11, G.SRT.4)**

Given:  $\overline{AD} \parallel \overline{CB}$ ,  $\overline{AB} \cong \overline{CD}$ , and  $\angle BAD \cong \angle ADC$



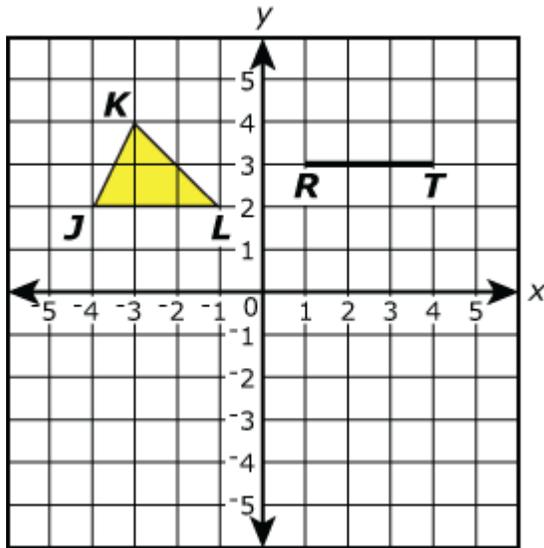
Statement	Reason
1. $\overline{AB} \cong \overline{CD}$	1. Given
2. $\overline{AD} \parallel \overline{CB}$	2. Given
3. $\angle BAD \cong \angle ADC$	3. Given
4. $\overline{AD} \cong \overline{AD}$	4. Reflexive Property
5. $\triangle ADC \cong \triangle DAB$	5. SAS Postulate
6. $\overline{AC} \cong \overline{DB}$	6. ?

In the proof shown above, which postulate or theorem justifies step 6?

- A. CPCTC
- B. SSS Postulate
- C. SAS Postulate
- D. Alternate Interior Angle Theorem

2. ES 2, Demonstrator 1, Standards (G.CO.7, G.CO.8)

$\triangle JKL$  and  $\overline{RT}$  are shown on the graph.

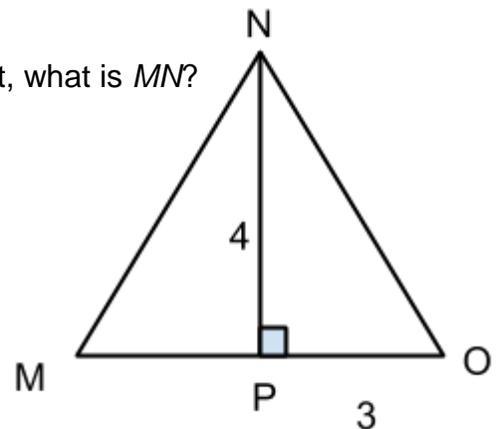


If  $\triangle JKL$  is congruent to  $\triangle RST$ , what is the maximum number of possible coordinates for point  $S$ ?

- A. 1
- B. 2
- C. 3
- D. 4

3. ES 2, Demonstrator 3, Standards (G.SRT.5)

Given that triangles  $\triangle MNP$  and  $\triangle ONP$  are congruent, what is  $MN$ ?



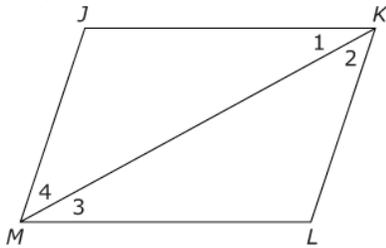
4. **ES 2, Demonstrator 1, Standards (G.CO.7, G.CO.8)**

If  $\triangle RST$  is congruent to  $\triangle WXY$  by the Angle-Side-Angle Theorem, which transformation would *not* map  $\triangle RST$  to  $\triangle WXY$ ?

- A. horizontal shift 4 units to left
- B. reflection across the y-axis
- C. dilation with a scale factor of 3
- D. rotation of 90 degrees around the origin

5. **ES 2, Demonstrator 2, Standards (G.CO.10, G.CO.11, G.SRT.4)**

Parallelogram  $JKLM$  is shown in the diagram.

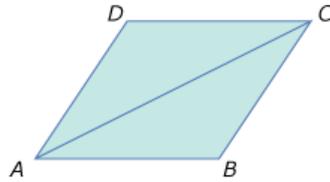


Which set of statements proves that the opposite sides of a parallelogram are congruent?

- A. Since  $\overline{JM} \parallel \overline{KL}$  and  $\overline{JK} \parallel \overline{LM}$ ,  $\angle 1 \cong \angle 2$ ,  $\angle 3 \cong \angle 4$ , and  $\overline{KM} \cong \overline{MK}$ , then  $\triangle JKM \cong \triangle LMK$  by the ASA Postulate. Therefore,  $\overline{JK} \cong \overline{LM}$  and  $\overline{JM} \cong \overline{LK}$ .
- B. Since  $\overline{JM} \parallel \overline{KL}$  and  $\overline{JK} \parallel \overline{LM}$ ,  $\angle 1 \cong \angle 3$ ,  $\angle 2 \cong \angle 4$ , and  $\overline{KM} \cong \overline{MK}$ , then  $\triangle JKM \cong \triangle LMK$  by the ASA Postulate. Therefore,  $\overline{JK} \cong \overline{LM}$  and  $\overline{JM} \cong \overline{LK}$ .
- C. Since  $\overline{JM} \parallel \overline{KL}$  and  $\overline{JK} \parallel \overline{LM}$ ,  $\overline{JK} \cong \overline{LM}$ ,  $\overline{JM} \cong \overline{LK}$ , and  $\overline{KM} \cong \overline{MK}$ , then  $\triangle JKM \cong \triangle LMK$  by the SSS Postulate. Therefore,  $\overline{JK} \cong \overline{LM}$  and  $\overline{JM} \cong \overline{LK}$ .
- D. Since  $\overline{JM} \parallel \overline{KL}$  and  $\overline{JK} \parallel \overline{LM}$ ,  $\angle 1 \cong \angle 2$ ,  $\overline{JM} \cong \overline{LK}$ , and  $\overline{KM} \cong \overline{MK}$ , then  $\triangle JKM \cong \triangle LMK$  by the SAS Postulate. Therefore,  $\overline{JK} \cong \overline{LM}$  and  $\overline{JM} \cong \overline{LK}$ .

6. ES 2, Demonstrator 2, Standards (G.CO.10, G.CO.11, G.SRT.4)

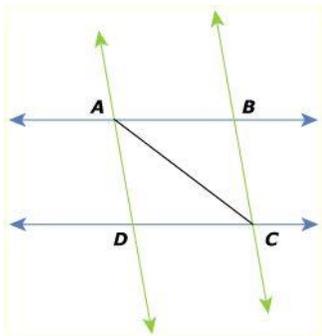
Rhombus  $ABCD$  is shown below.



Which step would not be used to prove  $\triangle ADC \cong \triangle ABC$ ?

- a)  $\angle DAB \cong \angle DCB$
- b)  $\overline{AD} \cong \overline{AB}$
- c)  $\overline{AC} \cong \overline{AC}$
- d)  $\angle DAC \cong \angle BAC$

7. ES 2, Demonstrator 2, Standards (G.CO.10, G.CO.11, G.SRT.4)



GIVEN:  $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$ ,  $\overleftrightarrow{AD} \parallel \overleftrightarrow{BC}$

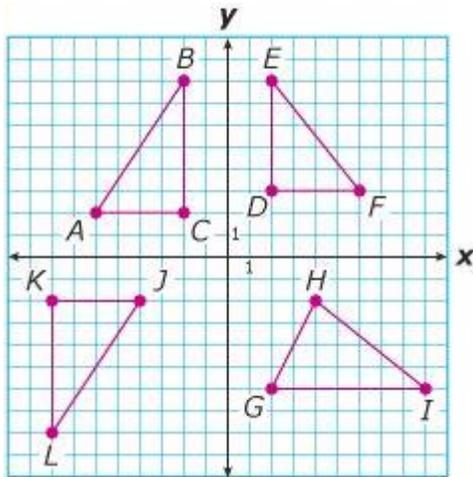
PROVE:  $\triangle ADC \cong \triangle CBA$

Statement	Reason
1. $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$ , $\overleftrightarrow{AD} \parallel \overleftrightarrow{BC}$	1. Given
2. $\angle DAC \cong \angle BCA$ , $\angle DAC \cong \angle BAC$	2. If 2 parallel lines are cut by a transversal, alternate interior angles are congruent.
3. $\overline{AC} \cong \overline{AC}$	3. Reflexive property
4. $\triangle ADC \cong \triangle CBA$	4. ???

Which reason would best justify Step 4?

- A. SSS Postulate
- B. SAS Postulate
- C. ASA Postulate
- D. AAS Theorem

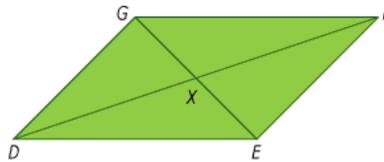
8. ES 2, Demonstrator 1, Standards (G.CO.7, G.CO.8)



Which pair of triangles drawn on the grid above is apparently congruent?

9. ES 2, Demonstrator 1, Standards (G.CO.7, G.CO.8)

$\triangle GXF$  is congruent to  $\triangle EXD$  as shown in parallelogram  $DEFG$  below.

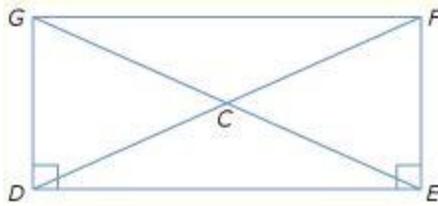


Which statement proves that the diagonals of parallelogram  $DEFG$  bisect each other?

- a)  $\angle GFX \cong \angle EXD$  and  $\overline{FX} \cong \overline{DX}$  because corresponding parts of congruent triangles are congruent.
- b)  $\overline{GF} \cong \overline{DE}$  and  $\overline{GX} \cong \overline{EX}$  because corresponding parts of congruent triangles are congruent.
- c)  $\overline{GF} \cong \overline{DE}$  and  $\overline{FX} \cong \overline{DX}$  because corresponding parts of congruent triangles are congruent.
- d)  $\overline{GX} \cong \overline{EX}$  and  $\overline{FX} \cong \overline{DX}$  because corresponding parts of congruent triangles are congruent.

**10. ES 2, Demonstrator 1, Standards (G.CO.7, G.CO.8)**

Rectangle  $DEFG$  is shown below.



Which two triangles could not be proved congruent?

- A. triangle DGE & triangle EFD
- B. triangle FED & triangle GDE
- C. triangle EFD & triangle DGE
- D. triangle GCF & triangle EFC

**11. ES 2, Demonstrator 3, Standards (G.SRT.5)**

Given: Quadrilateral  $ABCD$ ,  $\overline{AB} \cong \overline{CD}$  and  $\overline{AD} \cong \overline{BC}$

Statement	Reason
1. $\overline{AB} \cong \overline{CD}$	1. Given
2. $\overline{AD} \cong \overline{BC}$	2. Given
3. $\overline{AC} \cong \overline{AC}$	3. Reflexive Property
4. $\triangle ADC \cong \triangle CBA$	4. SSS Postulate
5. $\angle CAD \cong \angle ACB$	5. CPCTC
6. $\overline{AD} \parallel \overline{CB}$	6. ?
7. $\angle ACD \cong \angle CAB$	7. CPCTC
8. $\overline{AB} \parallel \overline{CD}$	8. ?
9. $ABCD$ is a parallelogram	9. Definition



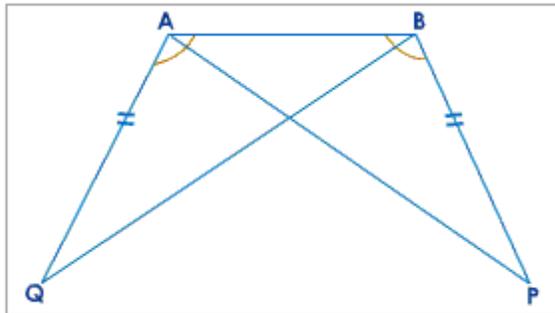
In the proof shown above, which postulate or theorem justifies steps 6 and 8?

- a) CPCTC
- b) Corresponding Angles Theorem
- c) Alternate Interior Angles Theorem
- d) Definition of Parallel Lines

**12. ES 2, Demonstrator 3, Standards (G.SRT.5)**

If triangle ABC is congruent to triangle XYZ and the measure of angle CBA is 56 degrees, which corresponding angle in triangle XYZ has a measurement of 56 degrees?

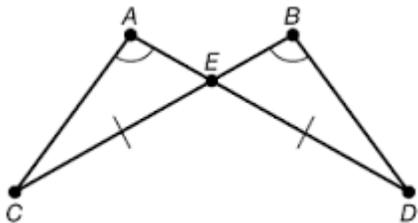
**13. ES 2, Demonstrator 2, Standards (G.CO.10, G.CO.11, G.SRT.4)**



Prove:  $\triangle QAB \cong \triangle PBA$

**14. ES 2, Demonstrator 2, Standards (G.CO.10, G.CO.11, G.SRT.4)**

Can you conclude that the triangles are congruent? Justify your answer.



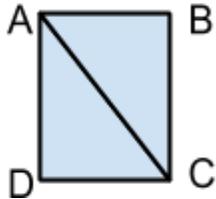
**15. ES 2, Demonstrator 1, Standards (G.CO.7, G.CO.8)**

If triangle ABC is a right triangle with angle A measuring 30 degrees and  $BC = 10$  inches and triangle JKL is a right triangle with angle L measuring 60 degrees and  $KL = 10$  inches, are the two triangles congruent? Why or why not?

16. ES 2, Demonstrator 1, Standards (G.CO.7, G.CO.8)

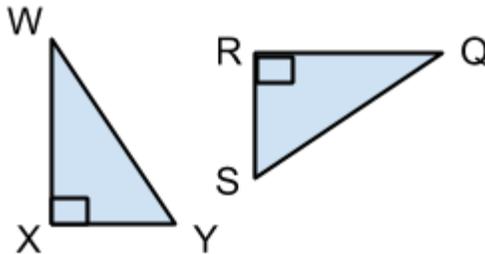
Given that  $\triangle QRS \cong \triangle GHI$ , list the corresponding sides and angles.

17. ES 2, Demonstrator 1, Standards (G.CO.7, G.CO.8)



Rectangle ABCD is cut by transversal  $\overline{AC}$ . Are  $\triangle ADC$  and  $\triangle ABC$  congruent? Justify your answer.

18. ES 2, Demonstrator 3, Standards (G.SRT.5)



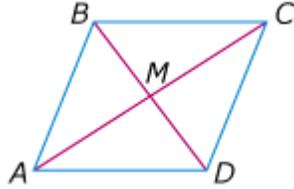
$\triangle WXY$  and  $\triangle QRS$  are congruent,  $WX = 7$  cm, and  $WY = 10$  cm. Find the measurements of  $XY$ ,  $QR$ ,  $RS$  and  $QS$ .

19. ES 2, Demonstrator 3, Standards (G.SRT.5)

$\triangle ABC \cong \triangle DEF$ . If  $m\angle A = x + 10$  and  $m\angle D = 2x$ , find  $x$ .

20. ES 2, Demonstrator 2, Standards (G.CO.10, G.CO.11, G.SRT.4)

Given: Rhombus  $ABCD$



Which procedure would prove  $\overline{CM}$  is an altitude of  $\triangle CBD$

- a) Prove  $\triangle ABD \cong \triangle CDB$ , and use *CPCTC* to show  $m\angle BMC = m\angle DMC$
- b) Prove  $\triangle ABC \cong \triangle CDA$ , and use *CPCTC* to show  $m\angle BMC = m\angle DMC$
- c) Prove  $\triangle BMC \cong \triangle DMC$ , and use *CPCTC* to show  $m\angle BMC = m\angle DMC$
- d) Prove  $\triangle CMD \cong \triangle AMD$ , and use *CPCTC* to show  $m\angle BMC = m\angle DMC$

21. ES 2, Demonstrator 2, Standards (G.CO.10, G.CO.11, G.SRT.4)

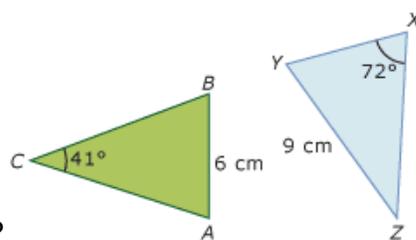
Given: Quadrilateral  $ABCD$ ,  $AB = CD$  and  $AD = BC$



Which procedure would prove  $\angle A \cong \angle C$ ?

- a) Draw  $\overline{AC}$ , prove  $\triangle ABC \cong \triangle CDA$ , and use *CPCTC*
- b) Draw  $\overline{BD}$ , prove  $\triangle ABD \cong \triangle CDB$ , and use *CPCTC*
- c) Draw  $\overline{AC}$ , prove  $\triangle ABC \cong \triangle ADC$ , and use *CPCTC*
- d) Draw  $\overline{BD}$ , prove  $\triangle ABD \cong \triangle CBD$ , and use *CPCTC*

22. ES 2, Demonstrator 3, Standards (G.SRT.5)

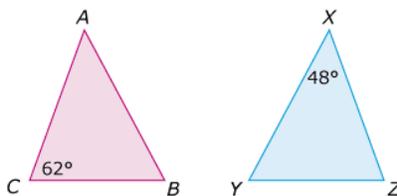


If  $\triangle ABC \cong \triangle XYZ$ , which statement is true?

- a)  $m\angle B = 72^\circ$
- b)  $m\angle Y = 41^\circ$
- c)  $m\angle A = 72^\circ$
- d)  $m\angle Z = 67^\circ$

23. ES 2, Demonstrator 3, Standards (G.SRT.5)

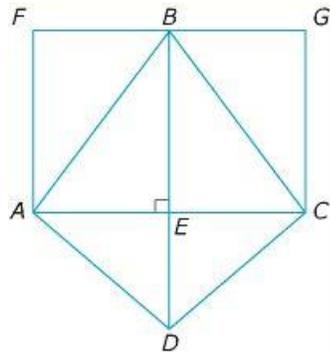
$\triangle ABC \cong \triangle XYZ$  with the measures shown below.



Which statement is true?

- a)  $m\angle Y = 62^\circ$
- b)  $m\angle Z = 70^\circ$
- c)  $m\angle A = 48^\circ$
- d)  $m\angle B = 80^\circ$

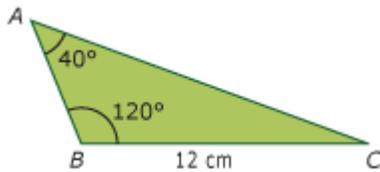
24. ES 2, Demonstrator 3, Standards (G.SRT.5)



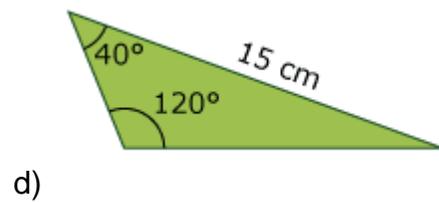
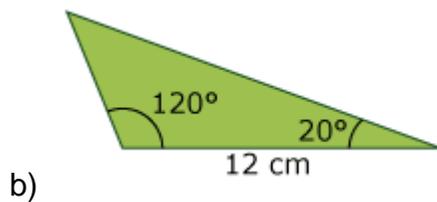
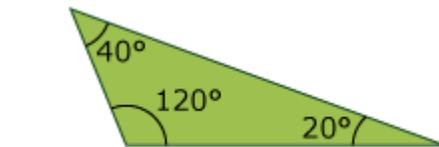
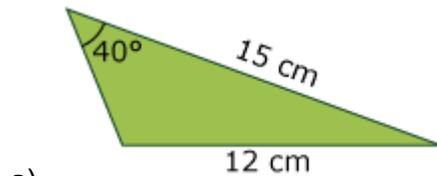
If  $\overline{AB} \cong \overline{CB}$  and  $m \angle BEA = 90^\circ$ , which statement cannot be proven?

- a)  $\triangle AFB \cong \triangle CGB$
- b)  $\triangle AED \cong \triangle CED$
- c)  $\triangle ABE \cong \triangle CBE$
- d)  $\triangle ABD \cong \triangle CBD$

25. ES 2, Demonstrator 3, Standards (G.SRT.5)



Which triangle must be congruent to triangle  $ABC$  shown above?



## **Grade: Geometry**

### **Enduring Skill 3:**

**Students develop deductive and inductive reasoning by proving theorems using a variety of formats.**

#### **Demonstrators:**

1. Prove theorems involving similarity. (G.SRT.3, G.SRT.4, G.SRT.10)
2. Prove theorems about lines and angles. (G.CO.9)
3. Prove theorems about two-dimensional figures. (G.CO.10, G.CO.11, G.C.1)
4. Use coordinates to prove simple geometric theorems algebraically. (G.GPE.1, G.GPE.4, G.GPE.5)

#### **Assessment Items:**

1. ES 3, Demonstrator 3, Standards (G.CO.10, G.CO.11, G.C.1)



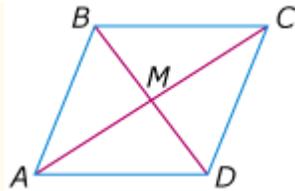
Statement	Reason
1. $\overline{AB} \cong \overline{CD}$	1. Given
2. $\overline{AD} \parallel \overline{CB}$	2. Given
3. $\angle BAD \cong \angle ADC$	3. Given
4. $\overline{AD} \cong \overline{AD}$	4. Reflexive Property
5. $\triangle ADC \cong \triangle DAB$	5. SAS Postulate
6. $\overline{AC} \cong \overline{DB}$	6. ?

In the proof shown above, which postulate or theorem justifies step 6?

- A. CPCTC
- B. SSS Postulate
- C. SAS Postulate
- D. Alternate Interior Angle Theorem

2. ES 3, Demonstrator 3, Standards (G.CO.10, G.CO.11, G.C.1)

Given: Rhombus  $ABCD$

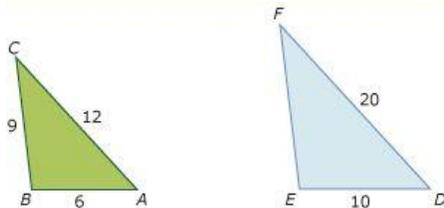


Which procedure would prove  $\overline{CM}$  is an altitude of  $\triangle CBD$ ?

- A) Prove  $\triangle ABD \cong \triangle CDB$ , and use CPCTC to show  $m\angle BMC = \angle DMC$
- B) Prove  $\triangle ABC \cong \triangle CDA$ , and use CPCTC to show  $m\angle BMC = \angle DMC$
- C) Prove  $\triangle BMC \cong \triangle DMC$ , and use CPCTC to show  $m\angle BMC = \angle DMC$
- D) Prove  $\triangle CMD \cong \triangle AMD$ , and use CPCTC to show  $m\angle BMC = \angle DMC$

3. ES 3, Demonstrator 1, Standards (G.SRT.3, G.SRT.4, G.SRT.10)

Which statement would be sufficient to prove  $\triangle ABC$  is similar to  $\triangle DEF$ ?



- a)  $EF = 15$
- b)  $EF = 12$
- c) Measure of angle C is equal to measure of angle D
- d) Measure of angle C is equal to measure of angle F

4. ES 3, Demonstrator 1, Standards (G.SRT.3, G.SRT.4, G.SRT.10)

Which of the following statements is not true?

- A) If two triangles are similar, then they must be congruent.
- B) If two triangles are congruent, then they must be similar.
- C) All isosceles right triangles are similar.
- D) All equilateral triangles are similar.

**5. ES 3, Demonstrator 4, Standards (G.GPE.1, G.GPE.4, G.GPE.5)**

The equation of a circle that is tangent to both the x-axis and the y-axis is given as  $(x - a)^2 + (y - b)^2 = c$ . What must always be true about the values of a, b, and c?

- A)  $a = b$  and  $a^2 + b^2 = c$
- B)  $a = b$  and  $c = a^2$
- C)  $|a| = |b|$  and  $a^2 + b^2 = c$
- D)  $|a| = |b|$  and  $c = a^2$

**6. ES 3, Demonstrator 4, Standards (G.GPE.1, G.GPE.4, G.GPE.5)**

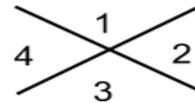
Which of the following is the equation of a line that is perpendicular to a line that goes through points at  $(-1, 5)$  and  $(1, -3)$ ?

- A)  $y = -4x - 5$
- B)  $y = 4x + 5$
- C)  $y = -\frac{1}{4}x + 5$
- D)  $y = \frac{1}{4}x - 5$

**7. ES 3, Demonstrator 2, Standards (G.CO.9)**

Four angles are marked on the diagram.

Which explanation proves vertical angles are congruent?



- A.  $\angle 1$  and  $\angle 2$  are supplementary, and  $\angle 3$  and  $\angle 2$  are supplementary since angles in a linear pair are supplementary.  $\angle 1$  is congruent to  $\angle 3$  because supplements of the same angle are congruent.
- B.  $\angle 1$  and  $\angle 2$  are complementary, and  $\angle 3$  and  $\angle 2$  are complementary since angles in a linear pair are complementary.  $\angle 1$  is congruent to  $\angle 3$  because complements of the same angle are congruent.
- C.  $\angle 1$  and  $\angle 2$  are supplementary, and  $\angle 3$  and  $\angle 4$  are supplementary since angles in a linear pair are supplementary.  $\angle 1$  is congruent to  $\angle 3$  because supplements of the same angle are congruent.
- D.  $\angle 1$  and  $\angle 2$  are supplementary, and  $\angle 3$  and  $\angle 4$  are supplementary since angles in a linear pair are supplementary.  $\angle 1$  is congruent to  $\angle 4$  because supplements of congruent angles are congruent.

**8. ES 3, Demonstrator 4, Standards (G.GPE.1, G.GPE.4, G.GPE.5)**

Which method could be used to prove a quadrilateral on a coordinate plane is a parallelogram?

- A. Apply the midpoint formula to show 2 pairs of adjacent sides have the same midpoint.
- B. Apply the distance formula to show both pairs of opposite sides are congruent.
- C. Apply the slope formula to show diagonals have slopes that are negative reciprocals.
- D. Apply the slope formula to show opposite sides have slopes that are negative reciprocals.

**9. ES 3, Demonstrator 4, Standards (G.GPE.1, G.GPE.4, G.GPE.5)**

Using the Pythagorean Theorem, what is the radius of the circle if the center is at (1,3) and one endpoint is at (4,7)?

**10. ES 3, Demonstrator 1, Standards (G.CO.10, G.CO.11, G.C.1)**

In right triangle ABC,  $m\angle ACB = 48^\circ$ ,  $AC = 17$  ft, and  $CB = 10$  ft. To the nearest tenth of a foot, what is AB?

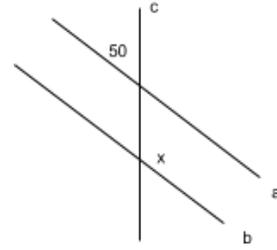
- A 12.7
- B 13.7
- C 19.7
- D 25.1

**11. ES 3, Demonstrator 1, Standards (G.SRT.3, G.SRT.4, G.SRT.10)**

Which of the following statements is not true?

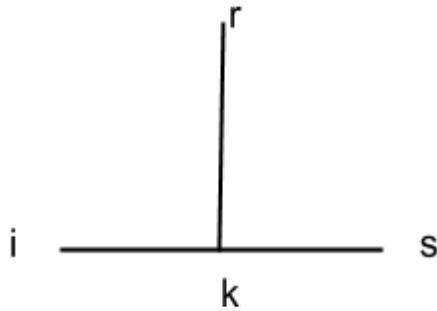
- A If two triangles are similar, then they must be congruent.
- B If two triangles are congruent, then they must be similar.
- C All isosceles right triangles are similar.
- D All equilateral triangles are similar.

12. ES 3, Demonstrator 2, Standards (G.CO.9)



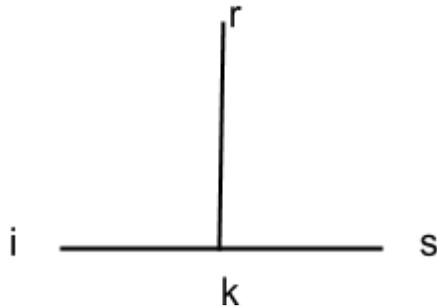
Using the above figure, given that line a is parallel to line b cut by transversal c, find the value of x.

13. ES 3, Demonstrator 2, Standards (G.CO.9)



Given that  $\overline{RK} \perp \overline{IS}$ , what is the measure of  $\angle RSK$ ?

14. ES 3, Demonstrator 2, Standards (G.CO.9)



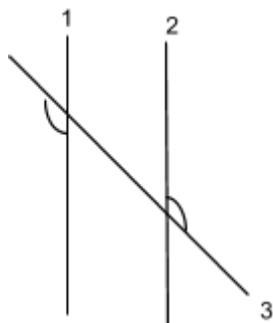
If  $\overline{IK} = \overline{KS}$  and the measure of angle  $RKS$  is  $90^\circ$ , which of the following best describes segment  $\overline{RK}$ ?

- A. bisector
- B. angle bisector
- C. perpendicular line
- D. perpendicular bisector

**15. ES 3, Demonstrator 2, Standards (G.CO.9)**

If lines  $m$  and  $n$  are cut by transversal  $t$  and alternate interior angles are congruent, what can you conclude about lines  $m$  and  $n$ ?

**16. ES 3, Demonstrator 2, Standards (G.CO.9)**



Given that the angles marked are congruent, which converse theorem states that line 1 is parallel to line 2?

**17. ES 3, Demonstrator 3, Standards (G.GPE.1, G.GPE.4, G.GPE.5)**

What are the measures of each angle of an equilateral triangle?

**18. ES 3, Demonstrator 3, Standards (G.GPE.1, G.GPE.4, G.GPE.5)**

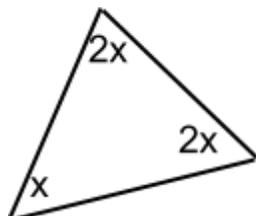
What are the measures of the base angles of a right isosceles triangle?

**19. ES 3, Demonstrator 3, Standards (G.GPE.1, G.GPE.4, G.GPE.5)**

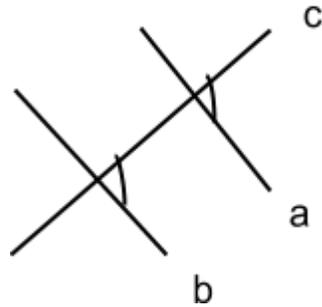
If you have a right triangle with one angle measuring 25 degrees, what is the measure of the missing angle?

**20. ES 3, Demonstrator 3, Standards (G.GPE.1, G.GPE.4, G.GPE.5)**

Find the value of  $x$  in the figure below.



**21. ES 3, Demonstrator 3, Standards (G.GPE.1, G.GPE.4, G.GPE.5)**



Which theorem states that the above angles are congruent if  $a \parallel b$  and cut by transversal  $c$ ?

**22. ES 3, Demonstrator 3, Standards (G.CO.10, G.CO.11, G.C.1)**

Which theorem states that if  $a^2+b^2=c^2$ , then the triangle must be a right triangle?

- a. Pythagorean Theorem
- b. Pythagorean Theorem Converse
- c. Triangle Sum Theorem
- d. Triangle Exterior Angle Theorem

**23. ES 3, Demonstrator 4, Standards (G.GPE.1, G.GPE.4, G.GPE.5)**

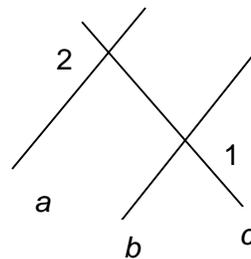
Determine if the lines are parallel, perpendicular or neither:  
 $y=2x+4$  and  $y=-2x-1$

**24. ES 3, Demonstrator 4, Standards (G.GPE.1, G.GPE.4, G.GPE.5)**

Given that a circle has a radius of 5 and passes through point (2, 6), determine the equation of the circle in standard form.

**25. ES 3, Demonstrator 2, Standards (G.CO.9)**

Transversals  $a$  and  $b$  are cut by transversal  $c$ .  
If  $\angle 1 \cong \angle 2$ , which converse theorem states that the lines  $a$  and  $b$  are parallel?



## Grade: Geometry

### Enduring Skill 4:

**Students continue to develop, extend and apply knowledge of two-dimensional shapes.**

#### Demonstrators :

1. Solve problems about triangles, quadrilaterals and other polygons  
(G.MG.1, G.GPE.7, G.GPE.4)
2. Extend knowledge of two-dimensional objects to three-dimensional objects.  
(G.GMD.1, G.GMD.3, G.GMD.4)

#### Assessment Items:

1. **ES 4, Demonstrator 1, Standards (G.MG.1, G.GPE.7, G.GPE.4)**

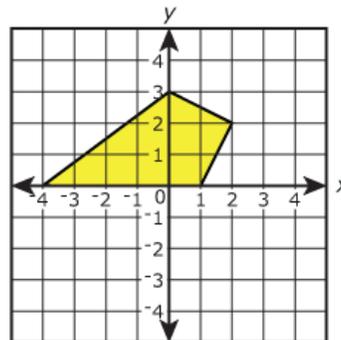
A circle has a radius of 9 with an endpoint located at  $(-7,8)$ , what is the location of the center of the circle?

2. **ES 4, Demonstrator 1, Standards (G.MG.1, G.GPE.7, G.GPE.4)**

A kite is graphed on the coordinate plane.

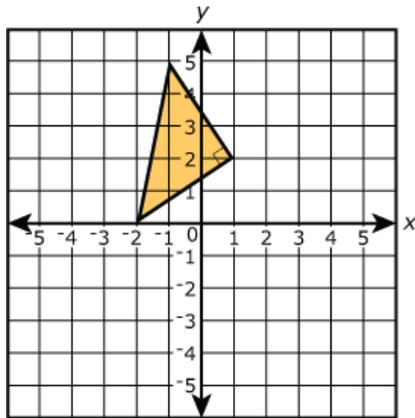
What is the perimeter of the kite?

- a. 16 units
- b. 18 units
- c.  $9 + \sqrt{17}$  units
- d.  $10 + 2\sqrt{5}$  units



3. **ES 4, Demonstrator 1, Standards (G.MG.1, G.GPE.7, G.GPE.4)**

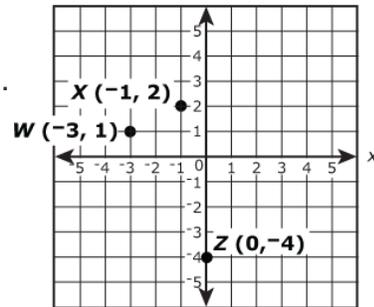
A triangle is graphed on the coordinate plane. Find the area of the triangle.



4. **ES 4, Demonstrator 1, Standards (G.MG.1, G.GPE.7, G.GPE.4)**

Three vertices of parallelogram  $WXYZ$  are shown.

What are the possible coordinates of vertex  $Y$ ?

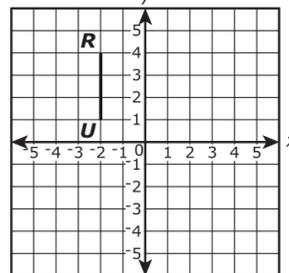


5. **ES 4, Demonstrator 1, Standards (G.MG.1, G.GPE.7, G.GPE.4)**

The area of rectangle  $RSTU$  is 15 square units. The coordinate of  $R$  is

$(-2, 4)$ , and the coordinate of  $U$  is  $(-2, 1)$ .

What could be the coordinate of  $S$ ?



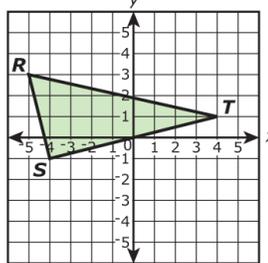
**6. ES 4, Demonstrator 1, Standards (G.MG.1, G.GPE.7, G.GPE.4)**

Which method could be used to prove a quadrilateral on a coordinate plane is a parallelogram?

- A. Apply the midpoint formula to show 2 pairs of adjacent sides have the same midpoint.
- B. Apply the distance formula to show both pairs of opposite sides are congruent.
- C. Apply the slope formula to show diagonals have slopes that are negative reciprocals.
- D. Apply the slope formula to show opposite sides have slopes that are negative reciprocals.

**7. ES 4, Demonstrator 1, Standards (G.MG.1, G.GPE.7, G.GPE.4)**

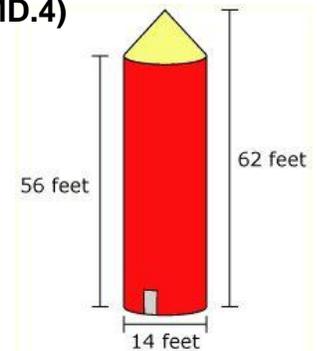
Right triangle  $RST$  has a right angle at  $S$ .  
Verify that triangle  $RST$  is a right triangle.



**8. ES 4, Demonstrator 2, Standards (G.GMD.1, G.GMD.3, G.GMD.4)**

A grain silo has the shape of a cylinder with a cone on top as represented below. Which is closest to the maximum amount of grain the silo will hold?

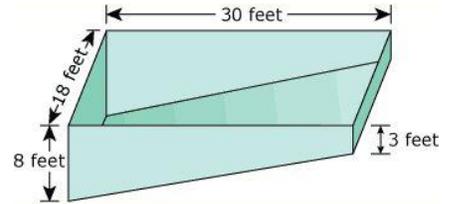
- a) 2,551.0 ft<sup>3</sup>
- b) 8,928.4 ft<sup>3</sup>
- c) 11,801.9 ft<sup>3</sup>
- d) 35,713.6 ft<sup>3</sup>



**9. ES 4, Demonstrator 2, Standards (G.GMD.1, G.GMD.3, G.GMD.4)**

Which is closest to the maximum cubic feet of water the swimming pool represented above can hold?

- a)  $2376 \text{ ft}^3$
- b)  $2970 \text{ ft}^3$
- c)  $4320 \text{ ft}^3$
- d)  $4950 \text{ ft}^3$



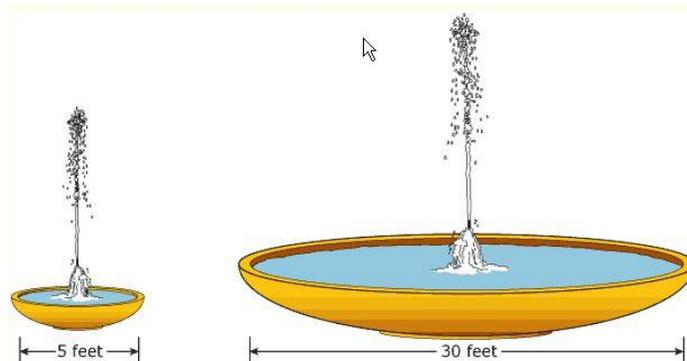
**10. ES 4, Demonstrator 2, Standards (G.GMD.1, G.GMD.3, G.GMD.4))**

If a pizza with a diameter of 20 inches is cut into 16 equal slices, which is closest to the area of one slice?

- a)  $3.9 \text{ in.}^2$
- b)  $7.9 \text{ in.}^2$
- c)  $19.6 \text{ in.}^2$
- d)  $78.5 \text{ in.}^2$

**11. ES 4, Demonstrator 2, Standards (G.GMD.1, G.GMD.3, G.GMD.4))**

Two circular fountains are represented below.



When filled, what is the ratio of the surface area of the water in the large fountain to the surface area of the water in the small fountain?

- A. 144:1
- B. 36:1
- C. 9:1
- D. 6:1

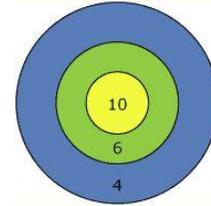
**12. ES 4, Demonstrator 2, Standards (G.GMD.1, G.GMD.3, G.GMD.4))**

A spherical ball has a diameter of 14 centimeters.

What volume of air does the ball hold if it is completely filled?

**13. ES 4, Demonstrator 2, Standards (G.GMD.1, G.GMD.3, G.GMD.4))**

The dartboard represented below has 3 circular areas with point values of 10, 6, and 4 points. The radii of the circles are 3 inches, 6 inches, and 9 inches. To the nearest tenth, what is the area of the region that is worth 4 points?



**14. ES 4, Demonstrator 2, Standards (G.GMD.1, G.GMD.3, G.GMD.4))**

A plane slices a right circular cone at an angle parallel to the base of the cone.

What is the shape of the two-dimensional cross-section?

**15. ES 4, Demonstrator 1, Standards (G.MG.1, G.GPE.7, G.GPE.4)**

Given that a quadrilateral has 4 congruent sides, what other information and what formula would you use to prove or disprove that the figure is a square?

**16. ES 4, Demonstrator 1, Standards (G.MG.1, G.GPE.7, G.GPE.4)**

Does the point (3, 4) lie on the circle with a radius of 5 and a center at the origin?

**17. ES 4, Demonstrator 1, Standards (G.MG.1, G.GPE.7, G.GPE.4)**

How would you prove that a quadrilateral in the coordinate plane is or is not a rhombus?

**18. ES 4, Demonstrator 1, Standards (G.MG.1, G.GPE.7, G.GPE.4)**

What is the perimeter of triangle ABC with vertices at A (0, 0), B (0, 4) and C (6, 0)?

**19. ES 4, Demonstrator 1, Standards (G.MG.1, G.GPE.7, G.GPE.4)**

If triangle ABC is an isosceles right triangle with A at (0, 5) and C at (5, 0), what are the coordinates for B?

**20. ES 4, Demonstrator 1, Standards (G.MG.1, G.GPE.7, G.GPE.4)**

What is the area of triangle DEF with vertices D (2, 1), E (-1, 1) and F (5, 0)?

**21. ES 4, Demonstrator 2, Standards (G.MG.1, G.GPE.7, G.GPE.4)**

A pizza has a diameter of 18 inches and is cut into 8 equal slices. What is the area of one of those slices?

**22. ES 4, Demonstrator 2, Standards (G.GMD.1, G.GMD.3, G.GMD.4)**

If the area of a circle is 72 square centimeters, what is the diameter of that circle?

**23. ES 4, Demonstrator 2, Standards (G.GMD.1, G.GMD.3, G.GMD.4))**

What is the volume of a cube with side measures of 2 meters?

**24. ES 4, Demonstrator 2, Standards (G.GMD.1, G.GMD.3, G.GMD.4))**

If a rectangular prism has a volume of 81 cubic inches and has a length of 3 inches and a depth of 9 inches, what is the width of the prism?

**25. ES 4, Demonstrator 2, Standards (G.GMD.1, G.GMD.3, G.GMD.4))**

Which is closest to the volume of a right circular cone with a radius of 3 centimeters and a height of 7 centimeters?

a.  $197.9 \text{ cm}^3$

b.  $131.9 \text{ cm}^3$

c.  $66.0 \text{ cm}^3$

d.  $63.0 \text{ cm}^3$