

SOL G.5

The student, given information concerning the lengths of sides and/or measures of angles in triangles, will a) order the sides by length, given the angle measures; b) order the angles by degree measure, given the side lengths; c) determine whether a triangle exists; and d) determine the range in which the length of the third side must lie. These concepts will be considered in the context of real-world situations.

Hints and Notes

**Triangle Inequality Theorem:** The sum of the lengths of any two sides of a triangle is greater than the length of the third side.

**To determine whether a triangle can exist:**

Add the 2 smallest sides and that must be greater than the third side

**To determine the range of a third side:**

The 3<sup>rd</sup> side must be greater than the 2<sup>nd</sup> side - 1<sup>st</sup> side OR less than the 1<sup>st</sup> side + 2<sup>nd</sup> side

**Comparing sides and angles of a triangle:**

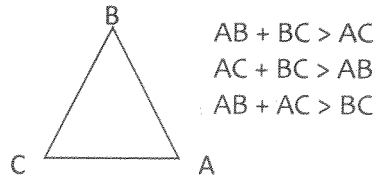
If one side of a triangle is longer than another side, then the angle opposite the longer side is larger than the angle opposite the shorter side and vice-versa.

**\*\*Remember\*\*** Biggest angle is opposite the longest side and the smallest angle is opposite the shortest side.

**Make sure that you read what the question is asking for!**

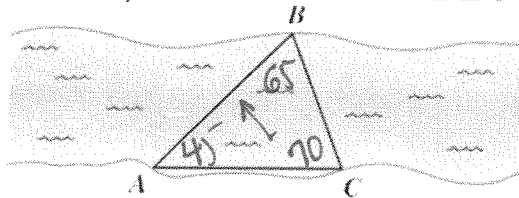
It might say to list in order from greatest to least or least to greatest!

**Hinge Theorem** - if two sides of one triangle are congruent to two sides of another triangle, and the included angle of the first is larger than the included angle of the second, then the third side of the first triangle is longer than the third side of the second triangle



PRACTICE G.5

1. On the shores of a river, surveyors marked locations A, B, and C. The measure of  $\angle ACB = 70^\circ$ , and the measure of  $\angle ABC = 65^\circ$



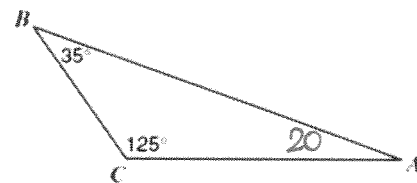
Which lists the distances between these locations in order, greatest to least?

- A A to B, B to C, A to C
- B B to C, A to B, A to C
- C A to B, A to C, B to C
- D A to C, A to B, B to C

2. Which of the following could be lengths of the sides of  $\triangle ABC$  ?

- A ~~AB=12, BC=15, CA=2~~
  - B ~~AB=9, BC=15, CA=4~~
  - C ~~AB=150, BC=100, CA=50~~
  - D AB=10, BC=8, CA=12
- Handwritten notes: 14 > 15, 13 > 15, 150 > 150, 18 > 12*

3. In the drawing, the measure of  $\angle C = 125^\circ$  and the measure of  $\angle B = 35^\circ$ .

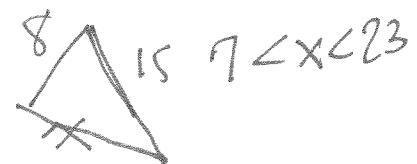


Which is the shortest side of the triangle?

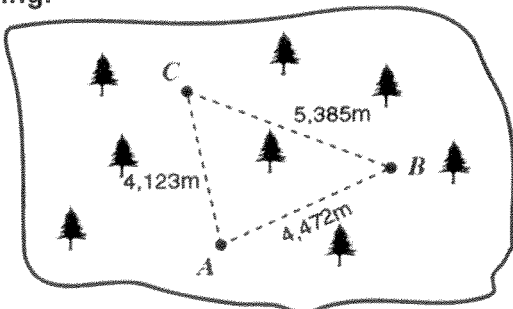
- A  $\overline{AC}$
- B  $\overline{AB}$
- C  $\overline{EB}$
- D  $\overline{BC}$

4. Sara is building a triangular pen for her pet rabbit. If two of the sides measure 8 feet and 15 feet, the length of the third side could be

- A 13 ft.
- B 23 ft.
- C 7 ft.
- D 3 ft.



5. Three lookout towers are located at points  $A$ ,  $B$ , and  $C$  on the section of the park in the drawing.



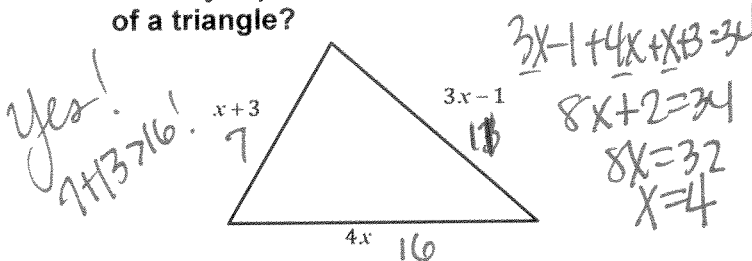
Which of the following statements is true concerning  $\triangle ABC$  formed by the towers?

- A  $m\angle A$  is least  
 B  $m\angle A$  is greatest  
 C  $m\angle C$  is least  
 D  $m\angle C$  is greatest

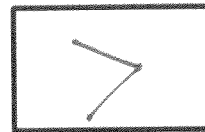
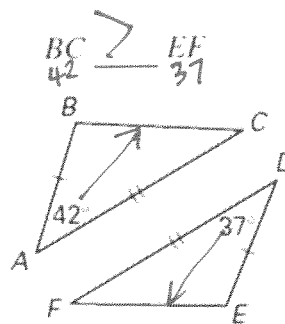
6. In any  $\triangle XYZ$ , which statement is always true?

- A  $XY + YZ < XZ$   
 B  $XY + YZ > XZ$   
 C  $m\angle X + m\angle Y < 90^\circ$   
 D  $m\angle X + m\angle Y = 90^\circ$

7. The plot of land illustrated in the accompanying diagram has a perimeter of 34 yards. Find the length, in yards, of each side of the figure. Could these measures actually represent the measures of the sides of a triangle?

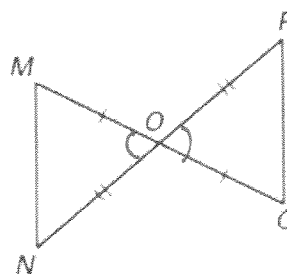


8. Complete with  $<$ ,  $>$ , or  $=$

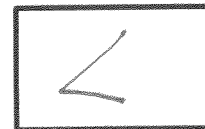
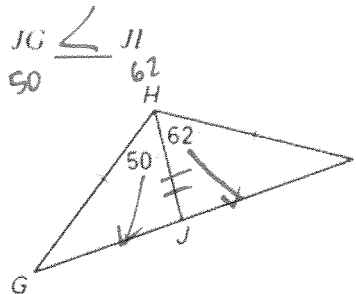


9. Complete with  $<$ ,  $>$ , or  $=$

$MN$        $QP$



10. Complete with  $<$ ,  $>$ , or  $=$



**SOL G.6**

The student, given information in the form of a figure or statement, will prove two triangles are congruent, using algebraic and coordinate methods as well as deductive proofs.

**SOL G.7**

The student, given information in the form of a figure or statement, will prove two triangles are similar, using algebraic and coordinate methods as well as deductive proof.

**HINTS AND NOTES**

To prove triangles congruent:

- SSS (Side-Side-Side)
- SAS (Side-Angle-Side)
- ASA (Angle-Side-Angle)
- AAS (Angle-Angle-Side)
- HL (Hypotenuse-Leg)

To prove triangles are similar:

- SAS Similarity
- SSS Similarity
- AA Similarity

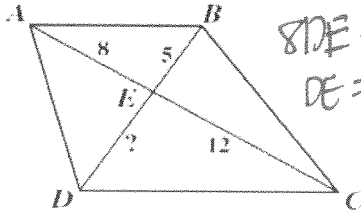
Reflexive Property:

- If 2 triangles share a side
- Vertical angles always congruent.
- CPCTC – Corresponding Parts of Congruent Triangles are Congruent

**PRACTICE G.6 and G.7**

1. In the figure,  $AE = 8$ ,  $CE = 12$ , and  $BE = 5$ . What value for the measure of  $DE$  would make  $\triangle ABE$  similar to  $\triangle CDE$ ?

$$\frac{AB}{CD} = \frac{BE}{DE} = \frac{AE}{CE} \quad \frac{5}{DE} = \frac{8}{12}$$

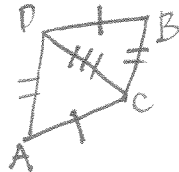


$8DE = 60$   
 $DE = 7.5$

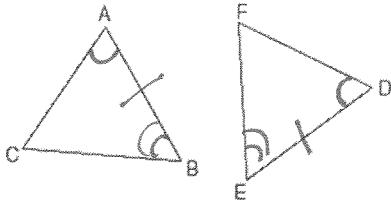
- A 15
- B 8
- C 7.5**
- D 3.3

2. Given:  $\overline{AC} \cong \overline{BD}$  and  $\overline{AD} \cong \overline{BC}$ . Which could be used to prove  $\triangle DCA \cong \triangle CDB$ ?

- A SSS**
- B SAS
- C ASA
- D AAS



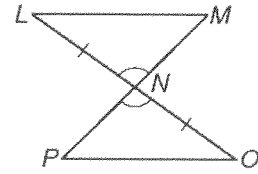
3. In the diagram of  $\triangle ABC$  and  $\triangle DEF$  below,  $\overline{AB} \cong \overline{DE}$ ,  $\angle A \cong \angle D$ , and  $\angle B \cong \angle E$ .



Which method can be used to prove  $\triangle ABC \cong \triangle DEF$ ?

- A SSS
- B SAS
- C ASA**
- D HL

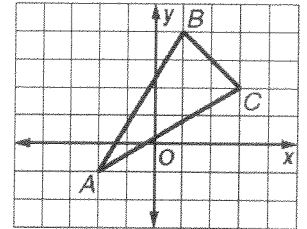
4. What additional information cannot be used to prove that  $\triangle MNL \cong \triangle PNO$ ?



- A  $\overline{MN} \cong \overline{PN}$  SAS
- B  $\overline{LM} \cong \overline{OP}$  SSA**
- C  $\angle M \cong \angle P$  AAS
- D  $\angle L \cong \angle O$  ASA

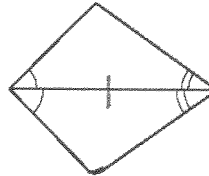
5. What are the vertices of a triangle congruent to the triangle in the figure?

- A**  $X(4, -3), Y(-1, 0), Z(1, 2)$
- B  $D(5, 0), E(1, 3), F(-1, -2)$
- C  $G(-4, 3), H(-1, 2), I(1, 0)$
- D  $P(3, 8), Q(8, 5), R(6, 9)$



\* See last page!

6. Which postulate or theorem shows that the triangles shown below are congruent?

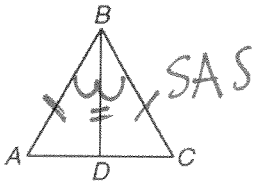


- A SSS
- B SAS
- C ASA**
- D HL

**Click and Drag.** These questions give you the choices for your answer or answers. You must click on each correct answer and drag it to the appropriate box. You must get all of them correct to get the answer correct. For our purposes, just write the correct answers in the boxes.

7. Determine the reason to justify each statement. You may choose from the Definitions, Theorems, and Postulates listed in the 2-column table.

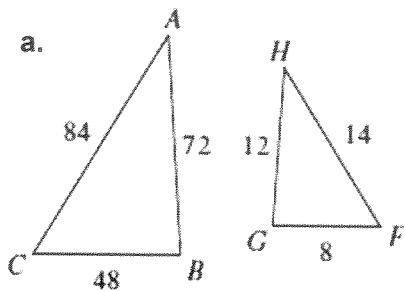
Given:  $\overline{BD}$  bisects  $\angle ABC$ .  
 $\triangle ABC$  is isosceles with base  $\overline{AC}$ .  
 Prove:  $\triangle ABD \cong \triangle CBD$



Statements	Reasons
1. $\overline{BD}$ bisects $\angle ABC$ .	1. Given
2. $\overline{BD} \cong \overline{BD}$	2. Reflexive Prop.
3. $\angle ABD \cong \angle CBD$	3. Def. of bisector
4. $\overline{AB} \cong \overline{CB}$	4. Def. isos. $\triangle$
5. $\triangle ABD \cong \triangle CBD$	5. SAS

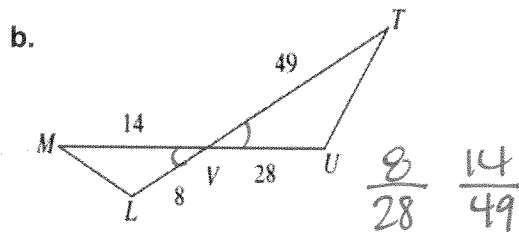
Given	AAS
Transitive Property of Congruence	SAS
Reflexive Property of Congruence	ASA
Symmetric Property of Congruence	SSA
If 2 sides of a triangle are congruent, then the angles opposite them are congruent	Substitution Property of Equality
Definition of Angle Bisector	Definition of Congruency
Definition of Isosceles Triangle	Reflexive Property of Equality
A Kite has 2 congruent sides	Symmetric Property of Equality

8. Determine if the pair of triangles is similar. If similar, highlight the similarity theorem to the box next to the triangle pairs. If not, then highlight "Not Similar".



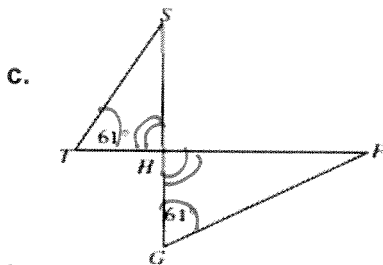
$$\frac{48}{8} \quad \frac{72}{12} \quad \frac{84}{14} = \boxed{6:1}$$

Not Similar	AA Similarity	SAS Similarity	<b>SSS Similarity</b>
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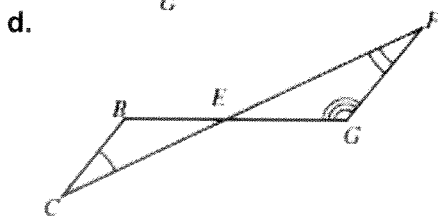


$$\frac{8}{28} \quad \frac{14}{49} = \boxed{2:7}$$

Not Similar	AA Similarity	<b>SAS Similarity</b>	SSS Similarity
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Not Similar	<b>AA Similarity</b>	SAS Similarity	SSS Similarity
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<b>Not Similar</b>	AA Similarity	SAS Similarity	SSS Similarity
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SOL G.8

The student will solve real-world problems involving right triangles by using the Pythagorean Theorem and its converse, properties of special right triangles, and right triangle trigonometry.

HINTS and NOTES

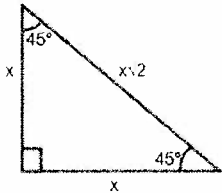
**Pythagorean Theorem: ONLY FOR RIGHT TRIANGLES!**

$a^2 + b^2 = c^2$ , where  $c$  is the hypotenuse and  $a$  and  $b$  are legs

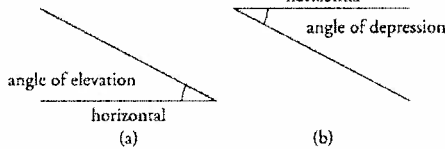
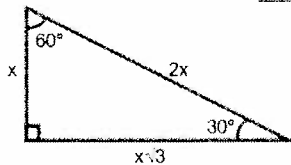
If  $a^2 + b^2 = c^2$ , then  $\triangle ABC$  is a right triangle.

**Special Right Triangles:**

**45°-45°-90°**



**30°-60°-90°**



**Trigonometric Ratios: SOH-CAH-TOA**

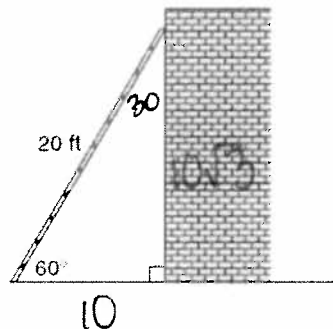
$\sin A = \frac{\text{Opposite}}{\text{Hypotenuse}}$	Where $A$ represents the angle of reference and $A$ is never the right angle
$\cos A = \frac{\text{Adjacent}}{\text{Hypotenuse}}$	
$\tan A = \frac{\text{Opposite}}{\text{Adjacent}}$	

Use  $\sin^{-1}$ ,  $\cos^{-1}$ ,  $\tan^{-1}$  to find angle measures!

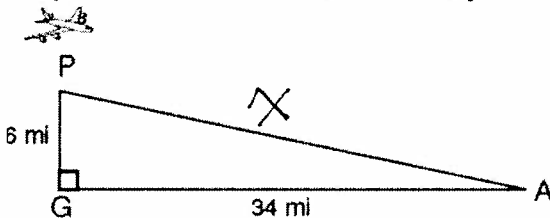
**PRACTICE G.8**

- A 20 foot ladder leaning against a building makes an angle of  $60^\circ$  with the ground. How far from the base of the building is the foot of the ladder?

- A 17.3 ft.
- B 10 ft.**
- C 8.2 ft.
- D 5 ft.



- An airplane is 34 ground miles from the end of a runway ( $GA$ ) and 6 miles high ( $PG$ ) when it begins approach to the airport. To the nearest mile, what is the distance ( $PA$ ) from the airplane to the end of the runway?

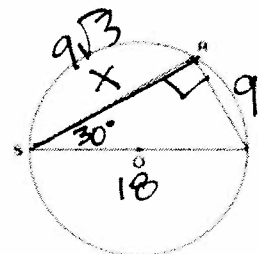


- A 35 miles**
- B 37 miles
- C 39 miles
- D 41 miles

Handwritten work for problem 2:  
 $6^2 + 34^2 = x^2$   
 $\sqrt{1192} = x$   
 34.5

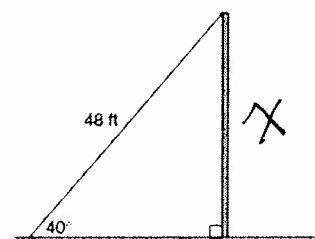
- In circle  $O$ ,  $\angle RST$  formed by chord  $RS$  and diameter  $ST$  has a measure of  $30^\circ$ . If the diameter is 18 centimeters, what is the length of chord  $SR$ ?

- A  $18\sqrt{3}$
- B  $18\sqrt{2}$
- C  $9\sqrt{3}$**
- D  $9\sqrt{2}$



- A cable 48 feet long stretches from the top of a pole to the ground. If the cable forms a  $40^\circ$  angle with the ground. Which is closest to the height of the pole?

- A 40.3 ft
- B 36.8 ft
- C 30.9 ft**
- D 26.4 ft

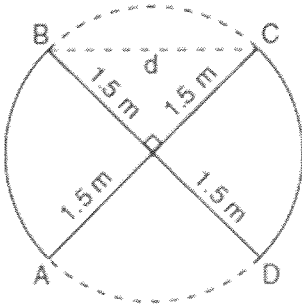


Handwritten work for problem 4:  
 $\sin 40 = \frac{x}{48}$   
 $48 \sin 40 = x$   
 30.85

5. Which set of numbers does not represent the sides of a right triangle?

- A 6, 8, 10 ✓
- B 8, 15, 17 ✓  $64 + 15^2 = 17^2$   $289 = 289$
- C 8, 24, 25  $640 \quad 625$
- D 15, 36, 39  $15^2 + 36^2 = 1521$

6. An overhead view of a revolving door is shown in the accompanying diagram. Each panel is 1.5 meters wide.



$$1.5^2 + 1.5^2 = d^2$$

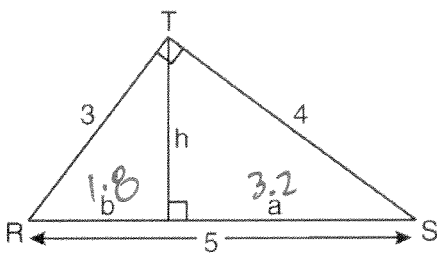
$$4.5 = d^2$$

$$2.12$$

What is the approximate width of  $d$ , the opening from  $B$  to  $C$ ?

- A 1.50 meters
- B 1.73 meters
- C 3.00 meters
- D 2.12 meters

7. In the diagram below  $\triangle RST$  is a right triangle. The altitude,  $h$ , to the hypotenuse has been drawn. Determine the length of  $h$ .



2.4

$$\frac{b}{3} = \frac{3}{5}$$

$$5b = 9$$

$$b = 1.8$$

$$1.8^2 + h^2 = 3^2$$

$$h^2 = 5.76$$

$$h = 2.4$$

$$\text{or } \frac{1.8}{h} = \frac{h}{3.2}$$

8. Determine whether a triangle with side lengths 7, 24, and 29 is right, acute or obtuse

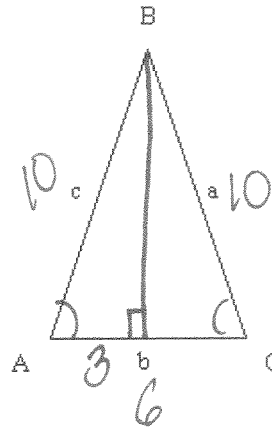
$$29^2 \quad 7^2 + 24^2$$

$$841 > 625$$

obtuse

9. In the isosceles triangle above,  $a = 10, c = 10$ , and  $b = 6$ .

Find the measures of angles  $A, B$ , and  $C$ .



or 73

$$m\angle A = 72.5^\circ$$

$$m\angle B = 35^\circ$$

$$m\angle C = 72.5^\circ$$

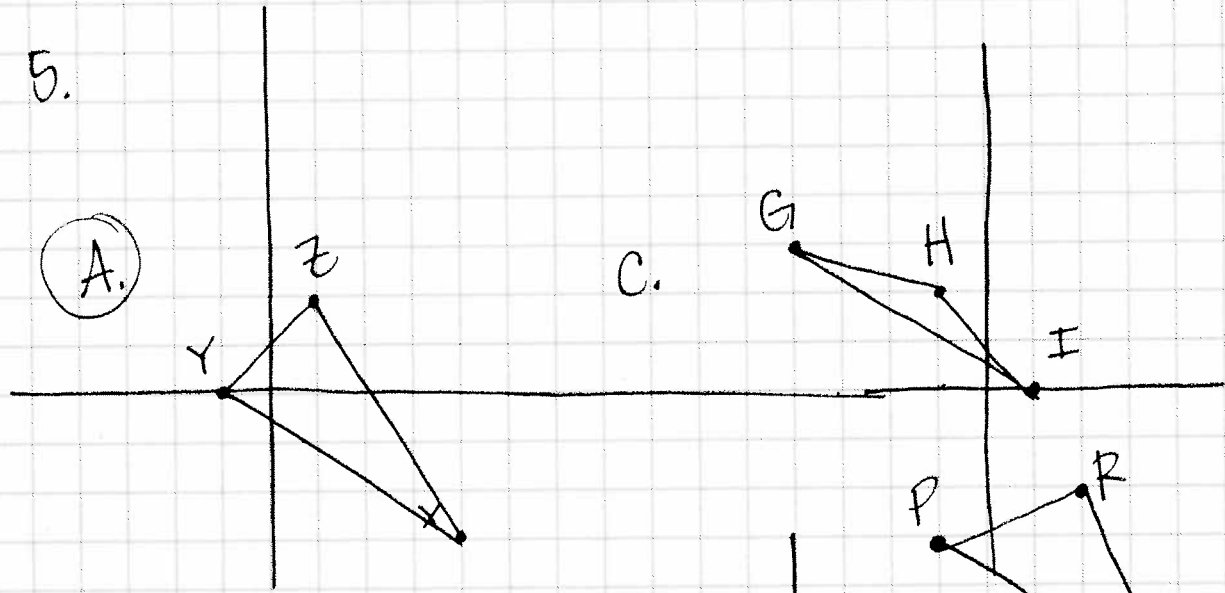
73

$$\cos A = \frac{3}{10}$$

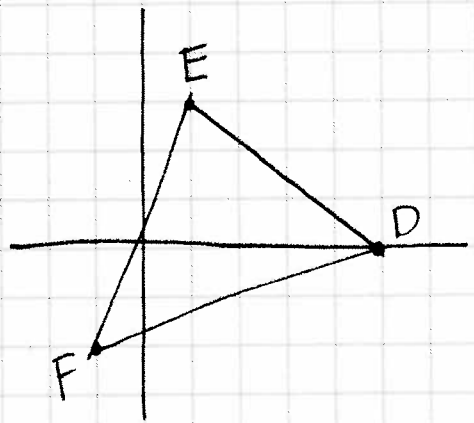
$$A = 72.5$$

5.

(A.)



B.



D.

