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7.2: Converse of Pythagorean Theorem Notes

Date : $\qquad$

- I can determine if side lengths form a triangle.
- I can find possible side lengths of a triangle
- I can classify a triangle as acute, obtuse, or right given side lengths.

| Theorem | Example |
| :--- | :--- | :--- |
| Triangle Inequality Theorem <br> The sum of any two sides of a triangle is <br> greater than the third side length. |  |

## Example 1: Find possible side lengths.

The lengths of two sides of a triangle are given. Describe the possible lengths of the third side.
a) 14 and 10
b) 23 and 17

## Converse of Pythagorean Theorem

Given three sides of a triangle, $a, b$, and $c$, where $c$ is the longest side, if $c^{2}=a^{2}+b^{2}$, then the triangle is a right triangle.


Given three sides of a triangle, $a, b, \quad$ Given three sides of a triangle, $a$, and $c$, where $c$ is the longest side, if $c^{2}<a^{2}+b^{2}$, then the triangle is an acute triangle.

$b$, and $c$, where $c$ is the longest
side, if $c^{2}>a^{2}+b^{2}$, then the triangle is an obtuse triangle.


Example 2: Classify triangles, if possible.
Determine if the given side lengths can form a triangle. If so, would the triangle be acute, right, or obtuse?
a) $4,7,9$
b) $10,13,16$
c) $5,14,20$
d) $3,5, \sqrt{34}$
$\qquad$
$\qquad$ Period: $\qquad$

Describe the possible lengths of the third side of the triangle given the lengths of the other two sides.

1. 6 in., 9 in .
2. $4 \mathrm{ft}, 12 \mathrm{ft}$
3. $21 \mathrm{yd}, 16 \mathrm{yd}$
4. Two airplanes leave the same airport heading in different directions. After 2 hours, one airplane has traveled 710 miles and the other has traveled 640 miles. Describe the range of distances that represents how far apart the two airplanes can be at this time.


Decide whether the numbers can represent the side lengths of a triangle. If they can, classify the triangle as right, acute, or obtuse.
5. $5,12,13$
6. $\sqrt{8}, 4,6$
7. $20,21,28$
8. $9,6,19$
9. $\sqrt{13}, 10,12$
10. $14,48,50$

Tell whether the triangle is a right triangle.
11.

12.

13.


In exercises 14 and 15, complete the statement with $<$, $>$, or $=$, if possible. If it is not possible, explain why.
14. $m / J$ $\qquad$ $m \angle R$
15. $m \angle K+m \angle L$ $\qquad$ $m \angle S+m \angle T$

16. The distances between three towns are given in the diagram.
a) Is the triangle $(\triangle A B C)$ formed by the three towns a right triangle?
b) Town $B$ is directly west of town $C$. Is town $A$ directly north of town $C$ ?


## Answer Key:

1. 3 in. $<x<15$ in.
2. $8 f t<x<16 f t$
3. $5 y d<x<37 y d$
4. The two airplanes are between 70 miles and 1350 miles apart.
5. yes; right
6. Yes; obtuse
7. Yes, acute
8. Not a triangle
9. Yes, obtuse
10. Yes, right
11. No
12. Yes
13. =
14. No
15. =
16. 
17. a) Yes
b) Yes
