

CHAPTER 6: INEQUALITIES IN GEOMETRY

SECTION 6.1: INEQUALITIES

Standards:

6.0: Students know and are able to use the triangle inequality theorem.

PROPERTIES OF INEQUALITY

- If $a > b$ and $c \geq d$, then $a + c > b + d$

Example:

$$4 > 2 \text{ and } 6 \geq 6, \text{ then } 4 + 6 > 2 + 6 \\ (10 > 8)$$

PROPERTIES OF INEQUALITY

- If $a > b$ and $c > 0$, then $ac > bc$ and $\frac{a}{c} > \frac{b}{c}$

Example:

$$6 > 4 \text{ and } c = 2, \text{ then } (6)(2) > (4)(2) \text{ and } \frac{6}{2} > \frac{4}{2} \\ (12 > 8) \qquad \qquad \qquad (3 > 2)$$

PROPERTIES OF INEQUALITY

- If $a > b$ and $c < 0$ then $ac < bc$ and $\frac{a}{c} < \frac{b}{c}$

Example:

$$9 > 3 \text{ and } c = -3, \text{ then } (9)(-3) < (3)(-3) \text{ and } \frac{9}{-3} < \frac{3}{-3} \\ (-27 < -9) \qquad \qquad \qquad (-3 < -1)$$

PROPERTIES OF INEQUALITY

- If $a > b$ and $b > c$, then $a > c$

Example:

$$12 > 7 \text{ and } 7 > 2, \text{ then } 12 > 2$$

PROPERTIES OF INEQUALITY

- If $a = b + c$ and $c > 0$ then $a > b$

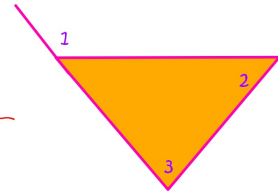
Example:

$$10 = 6 + 4 \text{ then } 10 > 6 \text{ (and } 10 > 4)$$

IN A PROOF: "A PROPERTY OF INEQUALITY"

THEOREM The Exterior Angle Inequality Theorem

The measure of an ext. angle of a triangle is greater than the measure of either remote interior angle.



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|--|--|
| <p>1. $\triangle ABC$ with ext $\angle 1$</p> <p>2. $m\angle 1 = m\angle 2 + m\angle 3$</p> <p>3. $m\angle 1 > m\angle 2$
$m\angle 1 > m\angle 3$</p> | <p>1. GIVEN</p> <p>2. The ext $\angle =$ sum of remote interior \angle's</p> <p>3. A Prop. of Inequality</p> |
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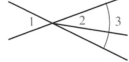
1-3: Complete each statement by writing $<$, $=$, or $>$.

- 1) (a) $XZ = XY + YZ$
 (b) $XZ > XY$
 (c) $XZ > YZ$



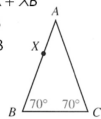
answer: →

- 2) (a) $m(\angle 1) = m(\angle 3)$
 (b) $m(\angle 2) < m(\angle 3)$
 (c) $m(\angle 1) > m(\angle 2)$



answer: →

- 3) (a) $AB = AC$
 (b) $AB = AX + XB$
 (c) $AB > XB$
 (d) $AC > XB$



answer: →

4-23: Classify each conditional as true or false.

- | | |
|---|--|
| 4) If $3a > 9$, then $a > 27$ False | 5) If $4b > 20$, then $b > 5$ True |
| 6) If $x > 4$, then $x+1 > 5$ True | 7) If $x+1 > 5$, then $x > 4$ True |

answer: →

4-23: Classify each conditional as true or false.

- | | |
|--|--|
| 8) If $c-5 > 45$, then $c > 48$ True | 9) If $a+b = n$ and $c > b$, then $a+c > n$ True |
| 10) If $y > 18$, then $y > 20$ False | 11) If $y > 20$, then $y > 18$ True |

answer: →

4-23: Classify each conditional as true or false.

- | | |
|---|--|
| 12) If $a > 5$ and $5 > b$, then $a > b$ True | 13) If $d > e$ and $f > e$, then $d > f$ False |
| 14) If $g > h$ and $j = h$, then $g > j$ True | 15) If $p = q+6$, then $p > q$ True |

answer: →

4-23: Classify each conditional as true or false.

16) If $c > d$ and $e = f$, then $c + e = d + f$ False	17) If $g > h$ and $i > j$, then $g + h > i + j$ False
18) If $k > l$ and $m > n$, then $k + m > l + n$ True	19) If $a > b$, then $100 - a > 100 - b$ False

answer:

4-23: Classify each conditional as true or false.

20) If $10 = y + 2$, then $y > 10$ False	21) If $XY = YZ + 5$, then $XY > YZ$ True
22) If $m(\angle A) = m(\angle B) + m(\angle C)$, then $m(\angle B) > m(\angle C)$ False	
23) If $m(\angle H) = m(\angle J) + m(\angle K)$, then $m(\angle K) > m(\angle H)$ False	

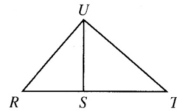
answer:

24)

Given: $m(\angle R) = m(\angle TUS)$

Prove: $m(\angle TUR) > m(\angle R)$

Proof:



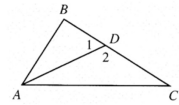
STATEMENTS	REASONS
$m(\angle R) = m(\angle TUS)$	1) Given
$m(\angle TUR) = m(\angle TUS) + m(\angle SUR)$	2) Angle Addition
$m(\angle TUR) = m(\angle R) + m(\angle SUR)$	3) Substitution
$m(\angle TUR) > m(\angle R)$	4) Prop. of Inequalities

25)

Given: $\angle 1$ is an exterior angle of $\triangle ACD$; $m(\angle B) > m(\angle 1)$

Prove: $m(\angle B) > m(\angle C)$

Proof:



STATEMENTS	REASONS
$\angle 1$ is an exterior angle of $\triangle ACD$; $m(\angle B) > m(\angle 1)$	1) Given
$m(\angle 1) > m(\angle C)$	2) Ext. Angle Inequality Thm.
$m(\angle B) > m(\angle C)$	3) A prop. of Inequalities

HOMWORK

Assignment # 6.1

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