

Chapter 6

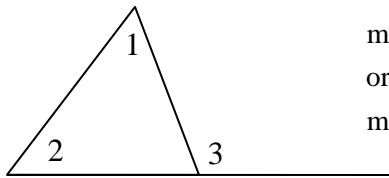
Inequalities in Geometry

6.1 Properties of inequality

- 1) $a > b$ and $c \geq d$, then $a + c \geq b + d$ (Addition property of Inequality)
- 2) $a > b$ and $c > 0$, then $ac > bc$ or $\frac{a}{c} > \frac{b}{c}$ (Multiplication or division property of Inequality)
- 3) $a > b$ and $c < 0$, then $ac < bc$ or $\frac{a}{c} < \frac{b}{c}$ (Multiplication or division property of Inequality with a negative)
- 4) $a > b$ and $b > c$, then $a > c$ (Transitive Property of Inequality)
- 5) $a = b + c$ and $c > 0$, then $a > b$ (If all numbers are positive, then a whole is greater than either of its parts)

Exterior angle inequality theorem

If an angle is an exterior angle of a triangle then its measure is greater than either of its remote interior angles.

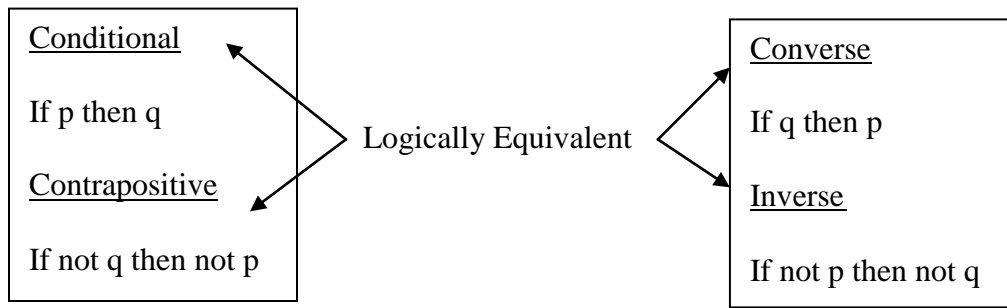


$$m\angle 3 > m\angle 2$$

or

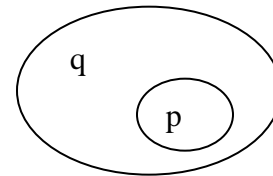
$$m\angle 3 > m\angle 1$$

6.2 Inverses and Contrapositives



Venn Diagram

A diagram using circles to represent sets, with the position and overlap of the circles indicating all of the possible mathematical or logical relationships between sets



6.3 Indirect Proof

Postulate of Contradiction

If a proposition contradicts a known true proposition or fact then it is false

Postulate of Elimination

If one of a given set of propositions must be true, and all but one of those propositions has been proved to be false, then this one remaining proposition must be true.

Indirect Proof

The method of proof that begins by assuming the opposite of the conclusion could be true, and then proceed to show that a contradiction of the given results because of the assumption. Therefore, the conclusion of the original theorem (or conditional) must be true.

Steps to write an indirect proof

- I. Assume temporarily that you have the not of the conclusion
- II. Reason logically until you reach a contradiction of the given you have or some known fact
- III. State the contradiction of the given
- IV. State the temporary conclusion is false
- V. State the original conclusion is true

6.4 Inequalities in a single triangle

If one side of a triangle is longer than a second side, then the angle opposite the first side is larger than the angle opposite the second side

If one angle of a triangle is larger than a second angle, then the side opposite the first angle is longer than the side opposite the second angle

The sum of the lengths of any two sides of a triangle is greater than the length of the third side

The perpendicular segment from a point to a line is the shortest segment from the point to the line

The perpendicular segment from a plane to a line is the shortest segment from the point to the plane

6.5 Inequalities for 2 triangles

SAS inequality theorem

If 2 sides of one triangle are congruent to 2 sides of another triangle* and the included angle of the 1st triangle is larger than the included angle of the 2nd triangle, then the 3rd side opposite the 1st angle ***is larger*** than the 3rd side opposite the 2nd angle

SSS inequality theorem

If 2 sides of one triangle are congruent to 2 sides of another triangle and the 3rd side of the 1st triangle is larger than the 3rd side of the 2nd triangle, then the angle opposite the 3rd side of the 1st triangle ***is larger*** than the angle opposite the 3rd side of the 2nd triangle