Contents:

1. Triangle Basics & Classification

- Types of Triangles (by sides)
    - **Scalene** – no congruent sides
    - **Isosceles** – at least two congruent sides
    - **Equilateral** – all three sides congruent
- Types of Triangles (by angles)
    - **Acute** – all angles < 90°
    - **Right** – one 90° angle
    - **Obtuse** – one angle > 90°
    - **Equiangular** – all angles congruent (always 60° each)

2. Triangle Angle-Sum & Exterior Angle Theorems

- **Triangle Angle-Sum Theorem (Th 3-12)**
    - The **interior angles of a triangle add up to 180°**
- **Exterior Angle Theorem (Th 3-13)**
    - An **exterior angle** equals the **sum of the two remote interior angles**
- Example: If two angles are known, subtract from 180° to find the third.

3. Congruent Figures & Corresponding Parts

- **Congruent polygons** – same shape and size
- **Corresponding sides/angles/vertices** – matching parts of congruent figures

Important Rule (Th 4-1)

- If two angles of one triangle are congruent to two angles of another triangle, the triangles are **similar**, **not necessarily congruent.**

4. Triangle Congruence Shortcuts

- To prove triangles congruent
    - **SSS (Side-Side-Side)**
        - All three corresponding sides are congruent**Postulate 4-1 (SSS)**
    - **SAS (Side-Angle-Side)**
        - Two sides and the included angle congruent**Postulate 4-2 (SAS)**
    - **ASA (Angle-Side-Angle)**
        - Two angles and included side congruent**Postulate 4-3 (ASA)**
    - **HL Theorem (SAS)**
        - Two angles and a non-included side
        - **Can only be used in proving Right Triangles Congruent!**

5. CPCTC

- **CPCTC = Corresponding Parts of Congruent Triangles are Congruent**
- Once two triangles are proven congruent, you can conclude:
    - Corresponding sides are equal
    - Corresponding angles are equal

6. Congruence in Right Triangles

- **HL (Hypotenuse-Leg) Theorem**
    - Applies **only to right triangles**
        - Hypotenuse $\cong$ Hypotenuse
        - One leg $\cong$ one leg
        - Angle $\cong$ Angle (Already given because it's a right triangle) Then you can prove triangles congruent

7. Isosceles & Equilateral Triangle Theorems

- **Isosceles Triangle Theorem**
    - If two sides are congruent $\rightarrow$ base angles are congruent (Th 4-3)

- **Converse of Isosceles Triangle Theorem**
  - If base angles are congruent → sides are congruent (Th 4-4)
- The vertex angle bisector is also the:
  - Median
  - Altitude
  - Perpendicular bisector (Th 4-5)

- **Equilateral Triangle Facts**
  - All sides congruent
  - All angles congruent (each 60°)
  - Equilateral ⇒ equiangular
  - Equiangular ⇒ equilateral (corollaries)

8. Inequalities in Triangles

- **Exterior Angle Inequality**
  - An exterior angle is **greater than either remote interior angle**
- **Longer Side–Larger Angle Relationship Th 5-10**
  - Larger side ⇨ larger opposite angle
- **Larger Angle-Longer Side Th 5-11 (Converse)**
  - Larger angle ⇨ longer opposite side
- **Triangle Inequality Theorem (Th 5-12)**
  - Sum of any two sides must be **greater than the third side**
  - Examples:
    - $a + b > c$
    - $a + c > b$
    - $b + c > a$

9. Bisectors in Triangles

- **Perpendicular Bisector Theorem (Th 5-2)**
  - A point on a perpendicular bisector is **equidistant from endpoints**
- **Converse of Perpendicular Bisector Theorem (Th 5-3)**
  - If a point is equidistant from the endpoints → it lies on the perpendicular bisector

- **Angle Bisector Theorem (Th 5-4)**
  - Point on an angle bisector is **equidistant from the sides of the angle**
- **Converse of Angle Bisector Theorem (Th 5-5)**
  - If a point is equidistant from the sides of the angles → It lies on the angle bisector

10. Special Triangle Lines
- **Medians**
  - Connect a **vertex to the midpoint of the opposite side**
- **Altitudes**
  - A **perpendicular segment** from a vertex to the opposite side

Centers of a Triangle

Center	Definition
Circumcenter	Intersection of perpendicular bisectors
Incenter	Intersection of angle bisectors
Centroid	Intersection of medians
Orthocenter	Intersection of altitudes

- **Concurrency Theorems**
  - Perpendicular bisectors meet at circumcenter (Th 5-6)
  - Angle bisectors meet at incenter (Th 5-7)
  - Medians meet at centroid (Th 5-8) and are in a **2:1 ratio** from vertex
  - Altitudes meet at orthocenter (Th 5-9)

11. Constructions (Compass & Straightedge)
- You should be able to construct:
  - Congruent segments
  - Congruent angles
  - Perpendicular bisectors
  - Angle bisectors
  - Parallel and perpendicular lines