Def: A parallelogram is a quadrilateral whose opposite sides are parallel.
Theorem 25: The opposite sides and angles of a parallelogram are equal.
Theorem 26: The diagonals of a parallelogram bisect each other.
Theorem 27: A quadrilateral is a parallelogram, if its opposite sides are equal.
Theorem 28: A quadrilateral is a parallelogram if its opposite angles are equal.
Theorem 29: A quadrilateral is a parallelogram if two opposite sides are both parallel and equal.
Theorem 30: A quadrilateral is a parallelogram if its diagonals bisect each other.

7.4 – Rectangles, Rhombuses, and Squares

HW due Mon. 01/30 proof of Thm 35 (base ∠'s of isoc. △ are =)

Def: A square is a quadrilateral all of whose sides and angles are equal.
Every square is a rhombus.
Def: A rhombus is a quadrilateral all of whose sides are equal.
Theorem 31: All rectangles are parallelograms.
Theorem 32: All rhombuses are parallelograms.
Theorem 33: The diagonals of a rectangle are equal.
Theorem 34: The diagonals of a rhombus are perpendicular.

Quiz this week on Trapezoids; Test #4 - Feb 6-8-ish?

7.5 – Trapezoids

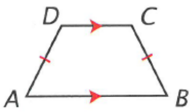
Def: A trapezoid is a quadrilateral that has exactly one pair of parallel sides.

The parallel sides are called the bases of the trapezoid, and the non-parallel sides are called its legs. The pairs of angles that include each base are called base angles.

Def: An isosceles trapezoid is a trapezoid whose legs are equal.

Theorem 35: The base angles of an isosceles trapezoid are equal.
Theorem 36 : The diagonals of an isosceles trapezoid are equal.
If a quadrilateral is a trapezoid, then its diagonals cannot bisect each other.

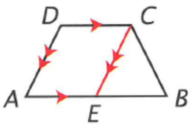
Theorem 35. The base angles of an isosceles trapezoid are equal.



Given: ABCD is an isosceles trapezoid with bases AB and DC.
Prove: ∠A = ∠B and ∠D = ∠C.

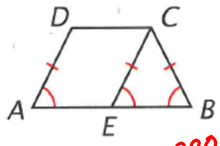
Proof

16. Because AB and DC are the bases of trapezoid ABCD, AB ∥ DC. Why?



17. Through C, why can we draw CE ∥ DA? Parallel Postulate

18. AECD is a parallelogram. Why? both pairs of opp. sides are parallel



19. So DA = CE. Why? opposite sides of a parallelogram are =

20. Because ABCD is isosceles, DA = CB. Why? legs of isoc. trapezoid are =

21. So CE = CB. Why? Subst. 19 into 20

22. Therefore, ∠CEB = ∠B. Why? If 2 sides of a △ are = sides opp. them are =

23. Because CE ∥ DA, ∠A = ∠CEB. Why? Parallel lines form = corresponding ∠'s

24. So ∠A = ∠B. Why? Subst.

25. ∠D and ∠A are supplementary and ∠C and ∠B are supplementary. Why? parallel lines form supp. Int. ∠'s on same side of transversal

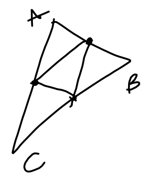
26. ∠D + ∠A = 180° and ∠C + ∠B = 180°. Why? suppl. ∠'s sum to 180°

27. ∠D + ∠A = ∠C + ∠B. Why? Subst.

28. ∠D = ∠C. Why? Subst. & subtr.

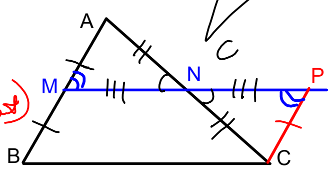
7.6 – The Midsegment Theorem

Def: A midsegment of a triangle is a line segment that connects the midpoints of two of its sides.



Theorem 37 : The Midsegment Theorem – A midsegment of a triangle is parallel to the third side and half as long.

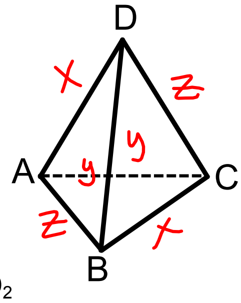
Given: MN is a midsegment of ΔABC.
Prove: MN∥BC and MN=(1/2)BC.



Proof:

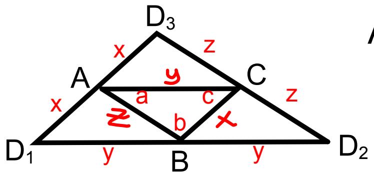
1. BM=MA, AN=NC (def. of midseg ment)
2. choose P on MN s.t. MN=NP (Ruler Postulate)
3. Draw CP (2 pts define a line)
4. ∠ANM=∠CNP (vertical ∠'s are =)
5. △ANM≅△CNP (SAS congruence)
6. PC = AM ∠AMN = ∠CPN (corresponding parts of ≅△'s are =)
7. PC = MB (substitution)
8. BM ∥ CP equal alternate interior ∠'s mean lines are parallel
9. BMPC is a parallelogram one pair of opposite sides is both parallel & equal
10. MN ∥ BC opposite sides of parallelogram are parallel
11. MP = BC " are equal
12. MP = MN + NP Betweenness of Pts.
13. BC = MN + MN double substitution
14. BC = 2MN Simpl.
15. $\frac{1}{2}$BC = MN division

An edition of Euclid's Elements published in London in 1570 featured little paper models attached to the pages that could be folded up to form three-dimensional figures. One pattern consisted of a triangle and its three midsegments. It could be folded to form a tetrahedron, which is a polyhedron with four triangular faces.



38. What must be true about the four triangles in each figure?

congruent (SSS)



Two edges of a tetrahedron that do not intersect are called opposite edges; for example, AC and BD are opposite edges.

40. What do you notice about the opposite edges of the tetrahedron?

Same length

41. What is the sum of the three angles at each vertex of the tetrahedron?