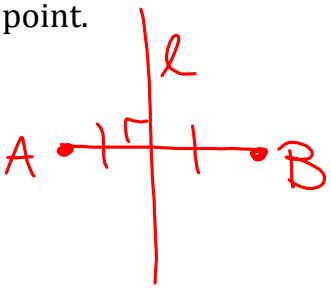
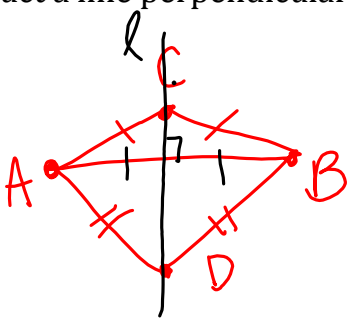
6.1 – Line Symmetry

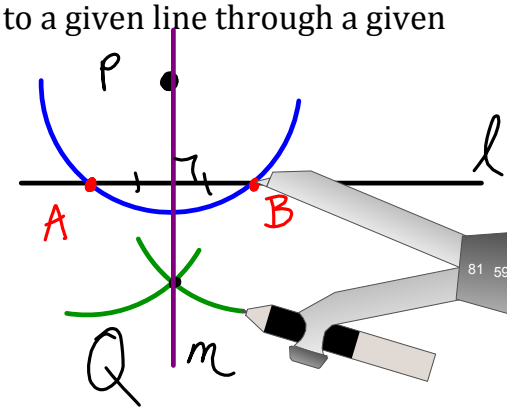
Def: Two points are symmetric with respect to a line iff the line is the perpendicular bisector of the line segment connecting the two points.

Theorem 16: In a plane, two points each equidistant from the endpoints of a line segment determine the perpendicular bisector of the line segment.

Construction 6: To construct a line perpendicular to a given line through a given point.



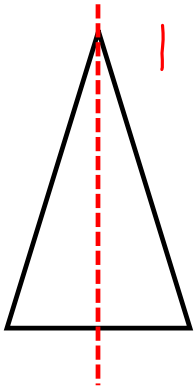




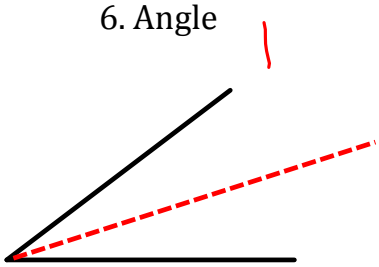
$m \perp \ell$

Sketch the lines of symmetry.

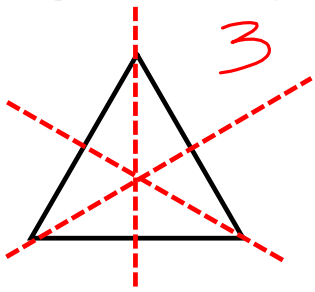
5. Isosceles triangle



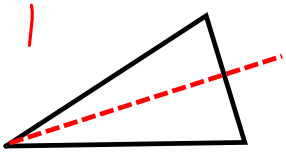
6. Angle



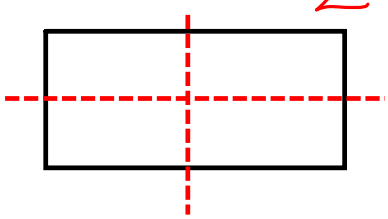
7. Equilateral triangle



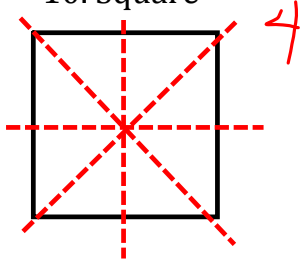
8. Isosceles triangle



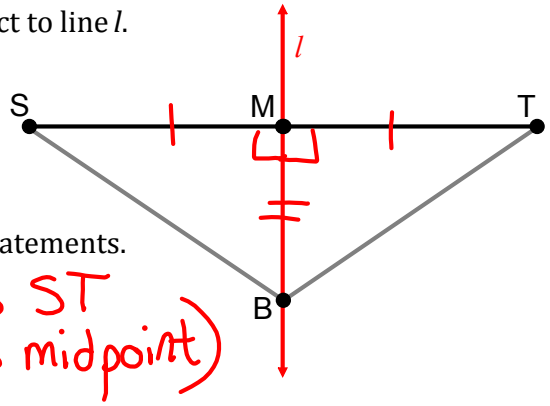
9. Rectangle



10. Square



Points S and T are symmetric with respect to line *l*.



21. What can you conclude about line *l*?

l is a perpendicular bisector of ST

Give a reason for each of the following statements.

22. SM=MT bisector divides ST into 2 equal parts (M is midpoint)

23. ∠BMS and ∠BMT are right angles

perpendicular lines form right angles

24. ∠BMS=∠BMT

All right angles are equal

25. MB=MB

Reflexivity

26. ΔBMS≅ΔBMT

SAS

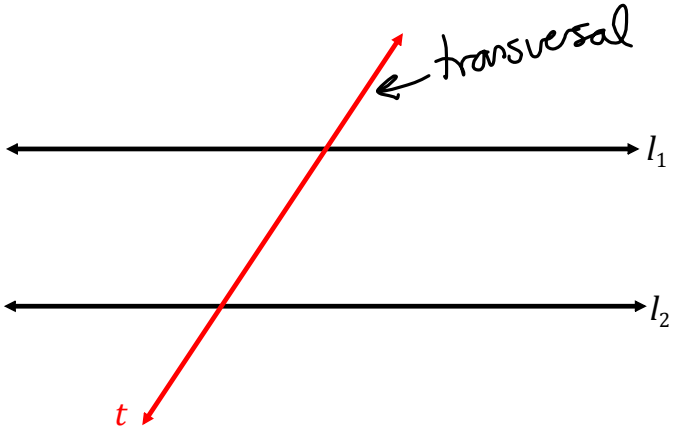
27. BS=BT

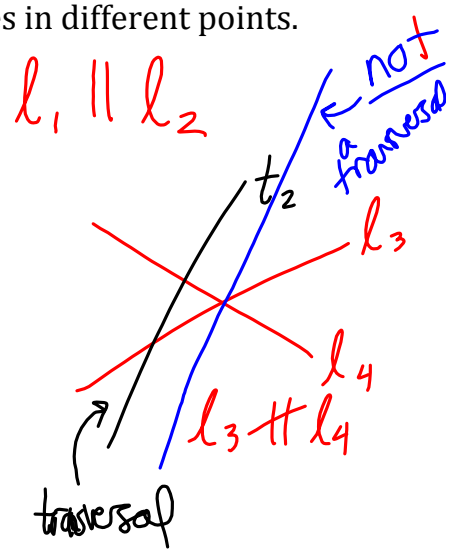
Corresponding parts of congruent triangles are equal

6.2 – Proving Lines Parallel

Def: Two lines are parallel iff they lie in the same plane and do not intersect.

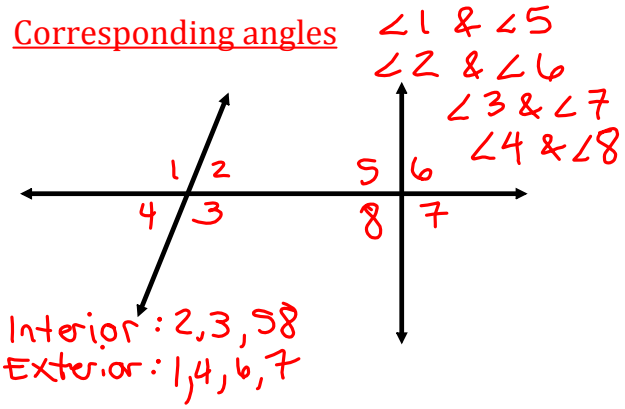
A transversal is a line that intersects two or more lines in different points.



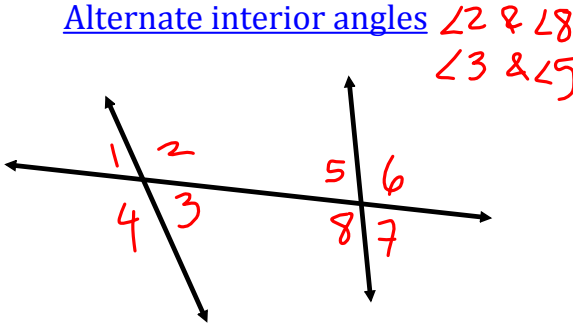


When a transversal intersects two lines that lie in the same plane, it forms pairs of angles that are given special names:

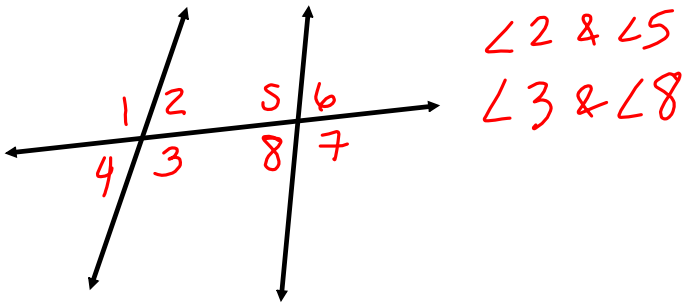
Corresponding angles



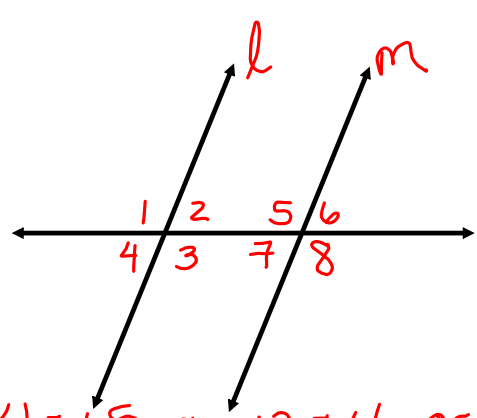
Alternate interior angles

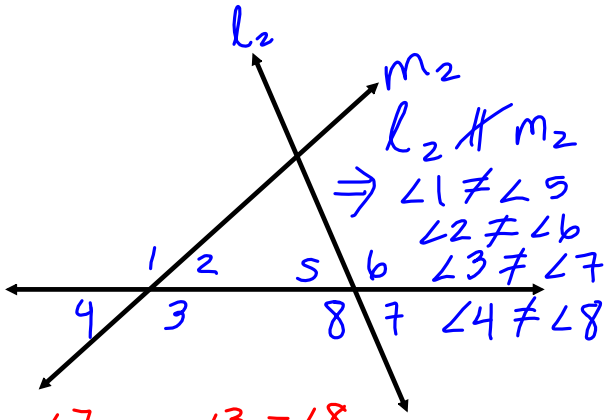


Interior angles on the same side of the transversal



Theorem 17: Equal corresponding angles mean that lines are parallel.





If ∠1 = ∠5 or ∠2 = ∠6 or ∠4 = ∠7 or ∠3 = ∠8, then ℓ ∥ m

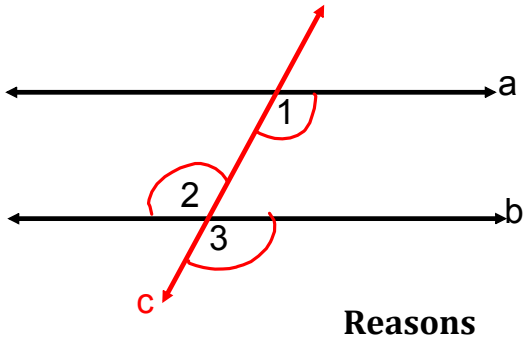
Corollary 1: Equal alternate interior angles mean that lines are parallel.

Corollary 2: Supplementary interior angles on the same side of a transversal mean that lines are parallel.

Corollary 3: In a plane, two lines perpendicular to a third line are parallel.

<u>Corollary 1</u>: Equal alternate interior angles mean that lines are parallel.

Given: ∠1=∠2
Prove: a||b



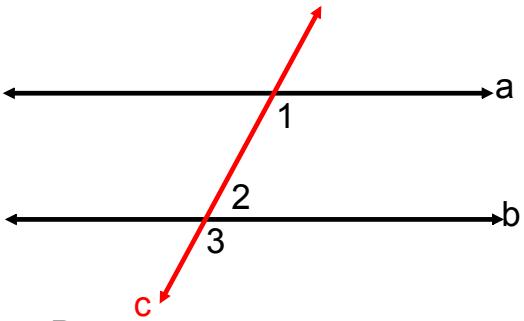
Proof:

Statements	**Reasons**
1. ∠1=∠2	Given
2. ∠2=∠3	Vertical angles are equal
3. ∠1=∠3	Substitution
4. a ∥ b	Equal corresponding angles mean that lines are parallel.

<u>Corollary 2</u>: Supplementary interior angles on the same side of a transversal mean that lines are parallel.

Given: ∠1 and ∠2 are supplementary

Prove: a||b



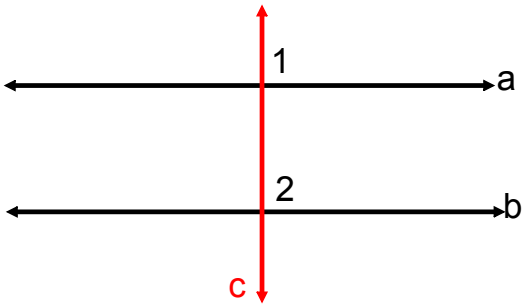
Proof:

Statements	**Reasons**
1. ∠1 and ∠2 are supplementary	Given
1.5 ∠2 & ∠3 for a linear pair	def.
2. ∠2 and ∠3 are supplementary	The angles in a linear pair are supplementary
3. ∠1=∠3	Supplements of the same angle are equal
4. a ∥ b	Equal corresponding angles mean that lines are parallel.

<u>Corollary 3</u>: In a plane, two lines perpendicular to a third line are parallel.

Given: a c and b c

Prove: a||b

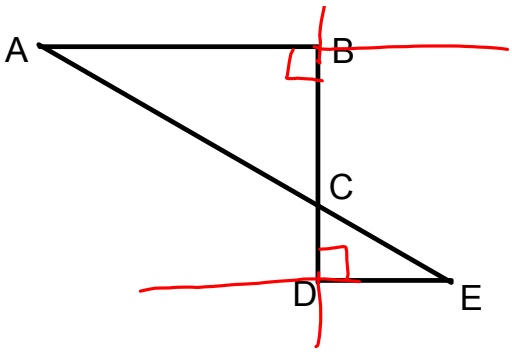


Proof:

Statements	**Reasons**
1. a⊥c & b⊥c	Given
2. ∠1 & ∠2 are both right angles	Perpendicular lines form right angles
3. ∠1=∠2	All right angles are equal
4. a || b	Equal corresponding angles mean that lines are parallel.

Given: ABD and BDE are right angles

Prove:AB||DE



29. Proof:

Statements	**Reasons**
1. ∠ABD and ∠BDE are right angles	Given
2. AB BD and BD DE	Lines meeting @ right ∠'s are perpendicular
3. AB||DE	2 lines perpendicular to the same line are parallel to each other

30. Proof:

Statements	**Reasons**
1. ∠ABD and ∠BDE are right angles	Given
2. ∠ABD=∠BDE	All right ∠'s are equal
3. AB||DE	Equal alternate interior ∠'s mean lines are parallel