Analytic Geometry January 14, 2016

Proving Theorems About Angles in Parallel Lines Cut by Transversals

EQ: How do angle relationships work together in a set of parallel lines intersected by a transversal?

MCC9-12.G.CO.9 Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

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HOMEWORK ANSWERS:

1. <AFD and <DFE; <BDE and <FDE
2. <ACF and <CAF; <DAF and <DFA; <DFE and <DBE <FAD and <ABF
3. <AFC and <AFE; <FDA and <FDB
4. <CFA and <ADF or <FDB; <AFE and <ADF or <FDB
5. 90° 6. 45° 7. 135° 8. 35°
9. 155° 10. 25° 11. 120° 12. 60°
13. 85° 14. 60° and 120° 15. 32° and 58°
16. 69° and 111° 17. 72° and 108° 18. 127°

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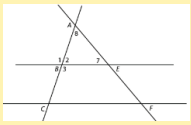
Warm-up:

City planners use geometry when building roads. Below is a portion of a city street map. In the diagram, ΔBAE ~ΔCAF. Use what you know about similar triangles and angle relationships to answer the questions that follow.



1) If m<8 = 30 and m<7=80, find m<2. Justify your reasoning.

By the third angle theorem, <2 = 70

2) Using the angle measures from problem 1, find the rest of the angle measures and state what angle relationship you used to find each angle measure. Use the following table to help organize the information.

Angle	Measure	Angle relationship used to determine measure
1	110	<1 and <2 form a linear pair = 180
2	70	Third angle theorem
3	110	<1 and <3 are vertical angles, congruent

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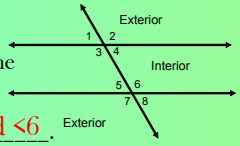
Key Concepts:

A _transversal_ is a line that intersects two or more lines. In the following diagram, line k is the transversal.



The _interior_ angles lie between the parallel lines.

The interior angles are: _<3, <4, <5,and <6_.

The _exterior_ angles lie outside the pair of parallel lines. The exterior angles are: _<1, <2, <7, and <8_.

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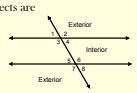
Congruent Angles

in parallel lines

Angles in the same relative position with respect to the transversal and the intersecting lines are corresponding angles

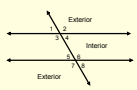
If the lines that the transversal intersects are parallel, then corresponding angles are congruent.



The corresponding angles are <1 and <5; <2 and <6; <3 and <7; <4 and <8

Alternate Interior angles are angles that are on opposite sides of the transversal and lie on the interior of the two lines that the transversal intersects.

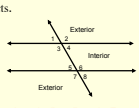
If the two lines that the transversal intersects are parallel, then alternate interior angles are congruent.



The alternate interior angles are <3 and <6; < 4 and <5

Alternate Exterior angles are angles that are on opposite sides of the transversal and lie on the exterior (outside) of the two lines that the transversal intersects.

If the two lines that the transversal are parallel, then alternate exterior angles are congruent.



The alternate exterior angles are Congruent

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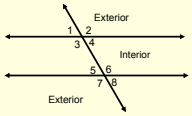
Supplementary Angles

in parallel lines

Same-side Interior angles, also called _____ are angles that lie on the same side of the transversal and are in between the lines that the transversal intersects.

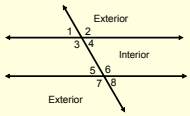
If the lines that the transversal intersects are parallel, then same-side interior angles are supplementary.



The consecutive interior angles are _____.

Same-side Exterior angles, also called _____ are angles that lie on the same side of the transversal and are outside the lines that the transversal intersects.

If the lines that the transversal intersects are parallel, then same-side exterior angles are supplementary.



The consecutive exterior angles are _____.

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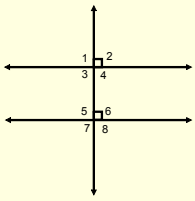
Special Case!

When the lines that the transversal intersects are parallel and perpendicular to the transversal, then all the interior and exterior angles are _____right angles_____.



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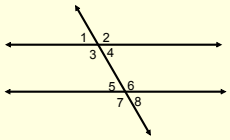
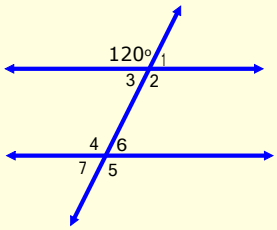
EXAMPLES:

Name the relationship between the two angles.

1. <2 and <7 alternate exterior
2. <2 and <8 consecutive exterior
3. <1 and <5 corresponding
4. <5 and <4 alternate interior
5. <3 and <5 consecutive interior



6. Find the measures of all the missing angles.



< 1 = 60°
< 2 = 120°
< 3 = 60°
< 4 = 120°
< 5 = 120°
< 6 = 60°
< 7 = 60°

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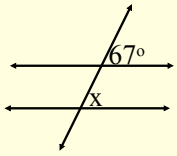
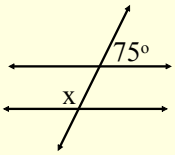
Identify the angle relationship (if there is one) and then find the value of x if the lines are parallel.

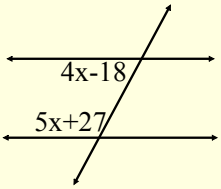
7. x = 67



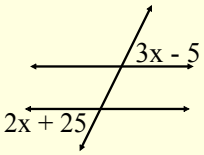
8. x = 105



9. x = 19



10. x = 30



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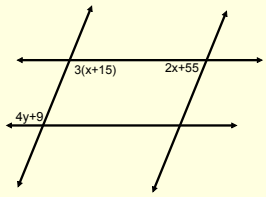
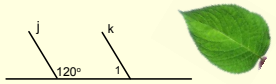
11. Find x and y.

x = 16

y = 20.5



12. Some plants are classified by the arrangement of the veins in their leaves. In the diagram $j \parallel k$. What is the m<1?



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HOMEWORK:
worksheet

On-line and textbook help references: pp. 67, 72 - 76
- http://www.mathsisfun.com/geometry/parallel-lines.html
- http://www.regentsprep.org/Regents/math/geometry/GP8/Lparallel.htm
- http://www.khanacademy.org/math/basic-geo/basic-geo-angles/basic-geo-angle-relationships/v/angles-formed-by-parallel-lines-and-transversals

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