Math 2201 **Date:_____**

2.1 Exploring Parallel Lines

In Grade 7, you identified parallel and perpendicular lines and used various strategies to draw a line segment that was perpendicular or parallel to a given line segment .

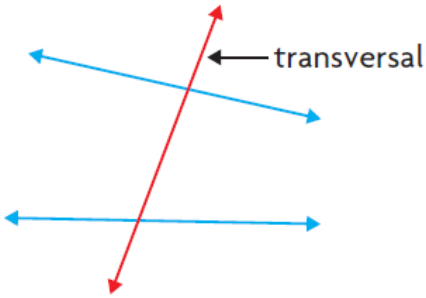
Where in real-life do you see parallel lines?

Roads. Rail lines.

Provide an example of a situation where it is important for lines to be parallel. What would happen if they were not parallel?

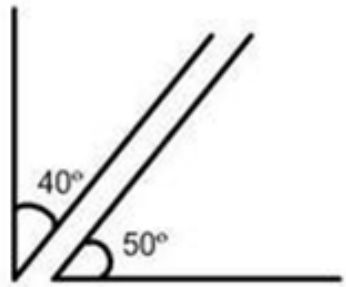
Rail lines. Train would derail.

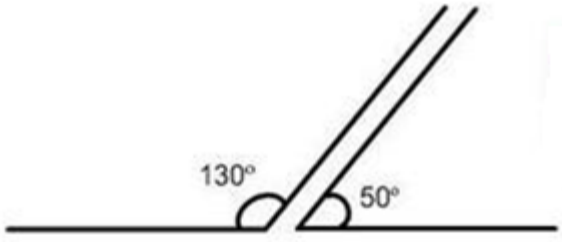
A **transversal** is a line that intersects two or more other lines at distinct points.



Complementary and Supplementary Angles

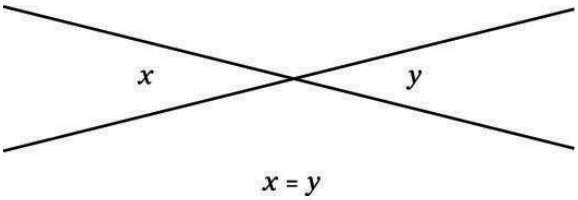
Complementary angles are angle pairs that have a sum of 90°. They do not have to be adjacent. Any two angles that add up to 90°, like the angles to the right, are complementary.





Supplementary angles are angle pairs that have a sum of 180°. They do not have to be adjacent. Any two angles that add up to 180°, like the angles to the left, are supplementary.

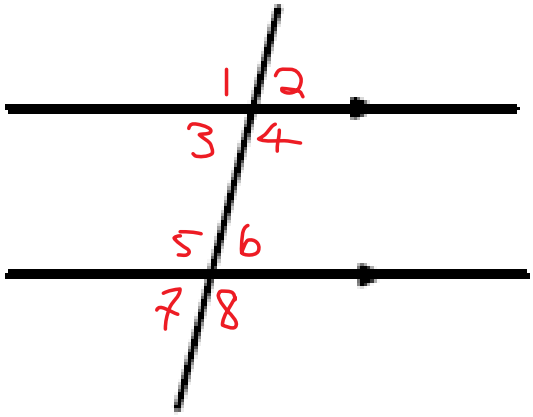
Vertically Opposite Angles
Angles that are formed at the intersection of two lines, and are directly opposite to each other. These angles are equal.



Transversals of Parallel Lines
When a transversal intersects two parallel lines, there are properties that remain consistent.

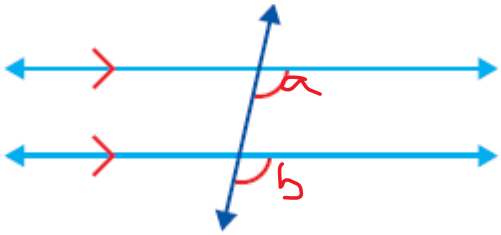
Example 1:
How many angles are formed when a transversal intersects two parallel lines?

8 angles.



Corresponding Angles
One interior angle and one exterior angle that are non-adjacent and on the same side of a transversal.

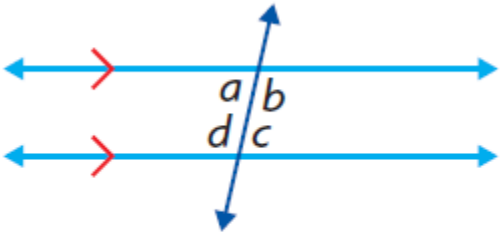
$a = b$



Interior Angles
Any angles formed by a transversal and two parallel lines that lie inside the parallel lines.

$a + b = 180°$ $\quad a = c$

$d + c = 180°$ $\quad b = d$

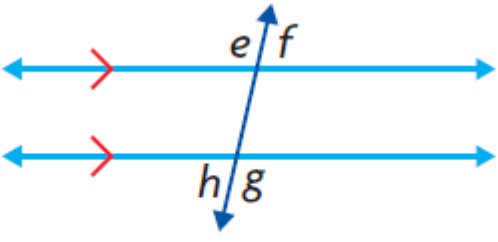


a, *b*, *c*, and *d* are interior angles.

Exterior Angles
Any angles formed by a transversal and two parallel lines that lie outside the parallel lines.

$e + f = 180°$ $\quad e = g$

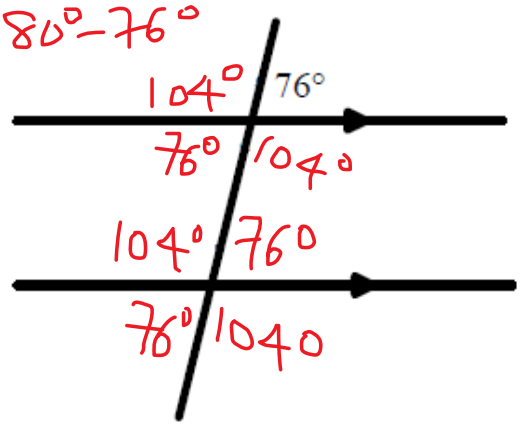
$h + g = 180°$ $\quad f = h$



e, *f*, *g*, and *h* are exterior angles.

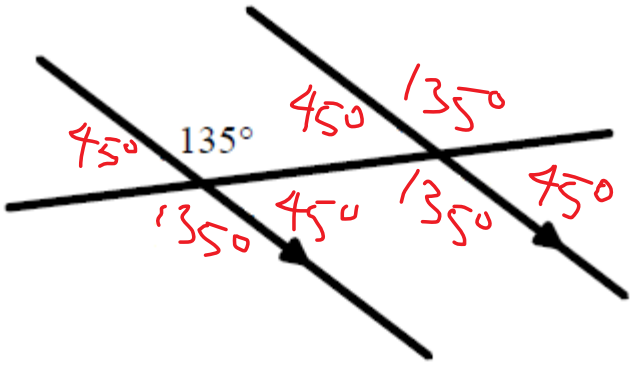
Example 2:
Find all the missing angles:

(A)



$180° - 135° = 45°$

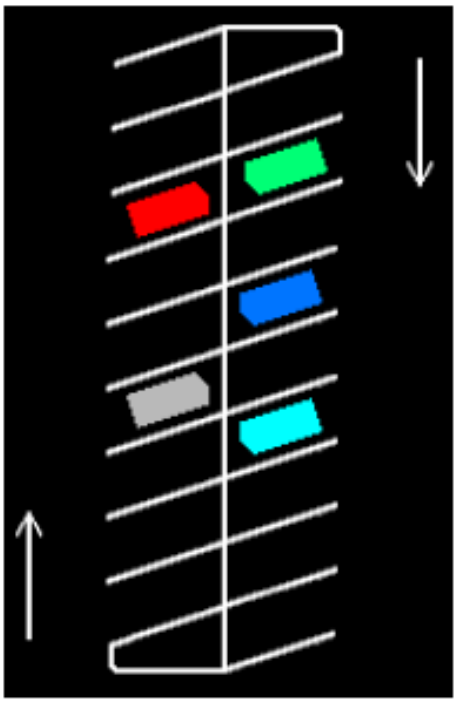
(B)



When workers paint lines for a parking lot, they aim to paint lines that are parallel to each other. The lines in a parking lot, therefore, provide an ideal illustration of the relationship between angles created by parallel lines and a transversal

Why would a parking lot have parallel lines that intersect at non-right angles?

To save space.



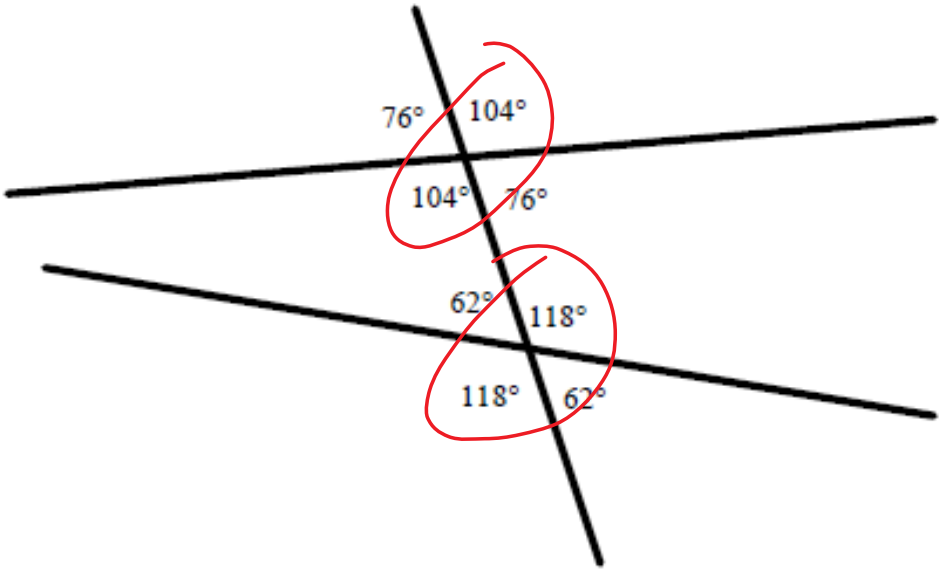
Why would a parking lot have one way traffic?

To make accessability in a small parking lot easier.

In Summary, when a transversal cuts two parallel lines:

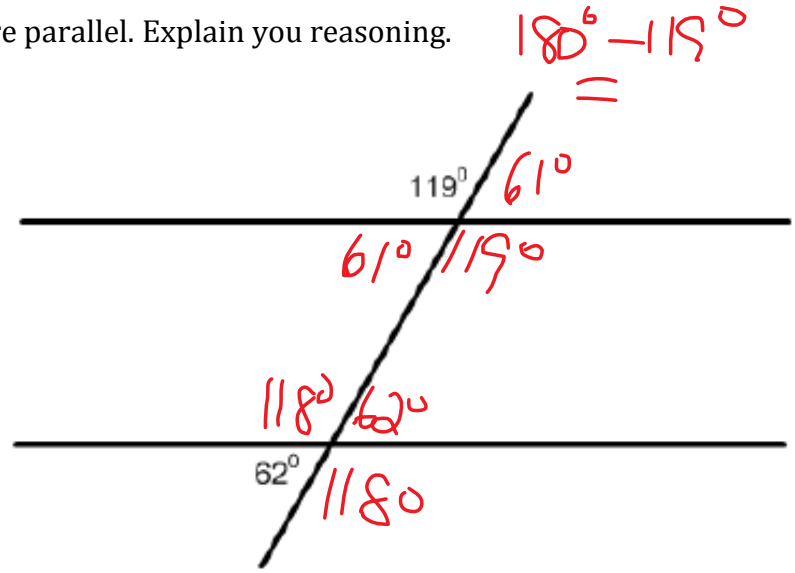
- Corresponding angles are equal.
- Vertically opposite angles are equal.
- Interior angles on the same side of the transversal are supplementary.

Transversals of Non-Parallel Lines
Do the conjectures about angle measures holds true if a transversal intersects a pair of non-parallel lines? As we can see by the following diagram, not all angle properties apply in this case. In fact, only **vertically opposite** angles remain equal.



Example 3:
Determine if the lines shown below are parallel. Explain you reasoning.

Lines are not parallel because complementary angles are not equal.



Textbook Questions: page 72 #2, 4, 5, 6