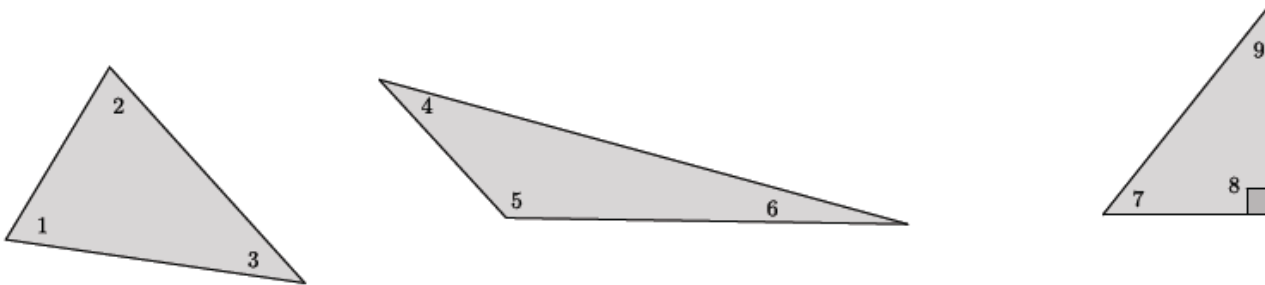


Lesson 13: Angle Sum of a Triangle

Classwork

Concept Development

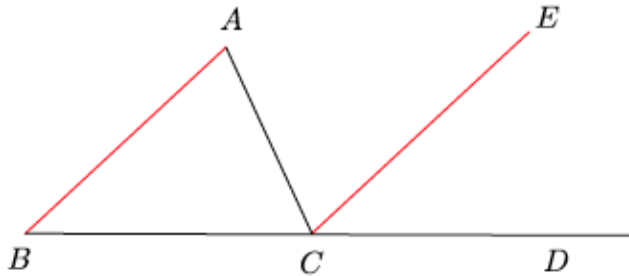


$$\angle 1 + \angle 2 + \angle 3 = \angle 4 + \angle 5 + \angle 6 = \angle 7 + \angle 8 + \angle 9 = 180$$

Note that the sum of angles 7 and 9 must equal 90° because of the known right angle in the right triangle.

Exploratory Challenge 1

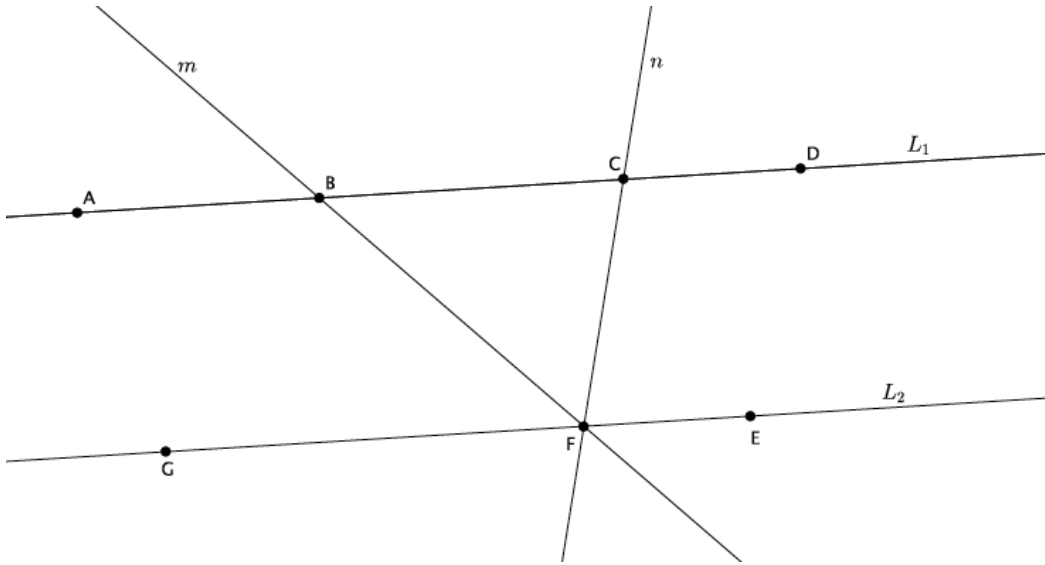
Let triangle ABC be given. On the ray from B to C , take a point D so that C is between B and D . Through point C , draw a line parallel to AB , as shown. Extend the parallel lines AB and CE . Line AC is the transversal that intersects the parallel lines.



- Name the three interior angles of triangle ABC .
- Name the straight angle.
- What kinds of angles are $\angle ABC$ and $\angle ECD$? What does that mean about their measures?
- What kinds of angles are $\angle BAC$ and $\angle ECA$? What does that mean about their measures?
- We know that $\angle BCD = \angle BCA + \angle ECA + \angle ECD = 180^\circ$. Use substitution to show that the three interior angles of the triangle have a sum of 180° .

Exploratory Challenge 2

The figure below shows parallel lines L_1 and L_2 . Let m and n be transversals that intersect L_1 at points B and C , respectively, and L_2 at point F , as shown. Let A be a point on L_1 to the left of B , D be a point on L_1 to the right of C , G be a point on L_2 to the left of F , and E be a point on L_2 to the right of F .



- a. Name the triangle in the figure.

- b. Name a straight angle that will be useful in proving that the sum of the interior angles of the triangle is 180° .

- c. Write your proof below.

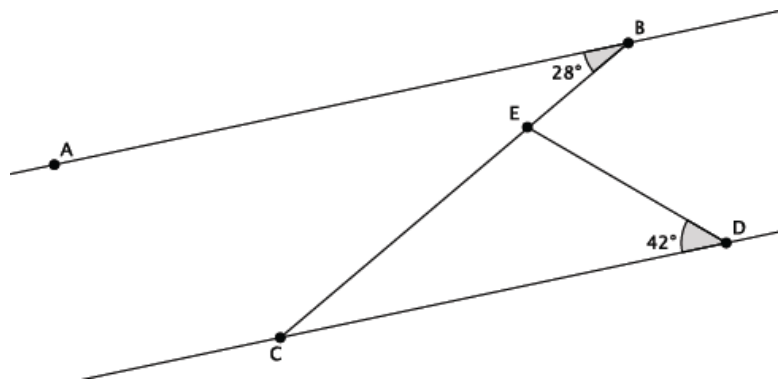
Lesson Summary

All triangles have a sum of interior angles equal to 180° .

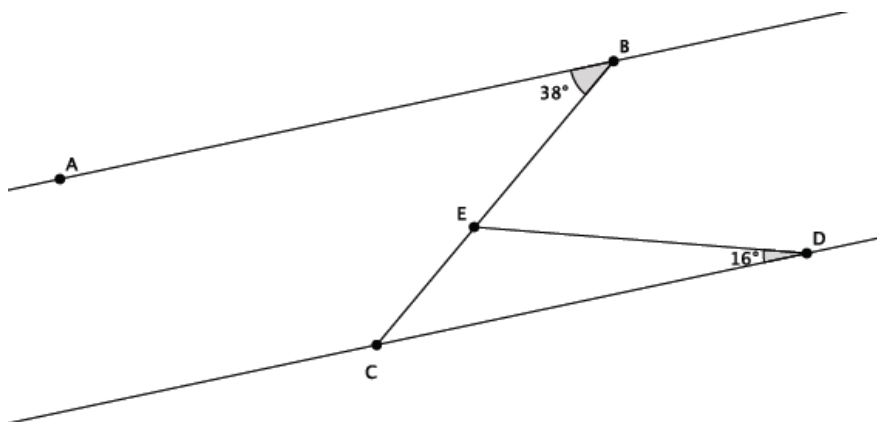
The proof that a triangle has a sum of interior angles equal to 180° is dependent upon the knowledge of straight angles and angle relationships of parallel lines cut by a transversal.

Problem Set

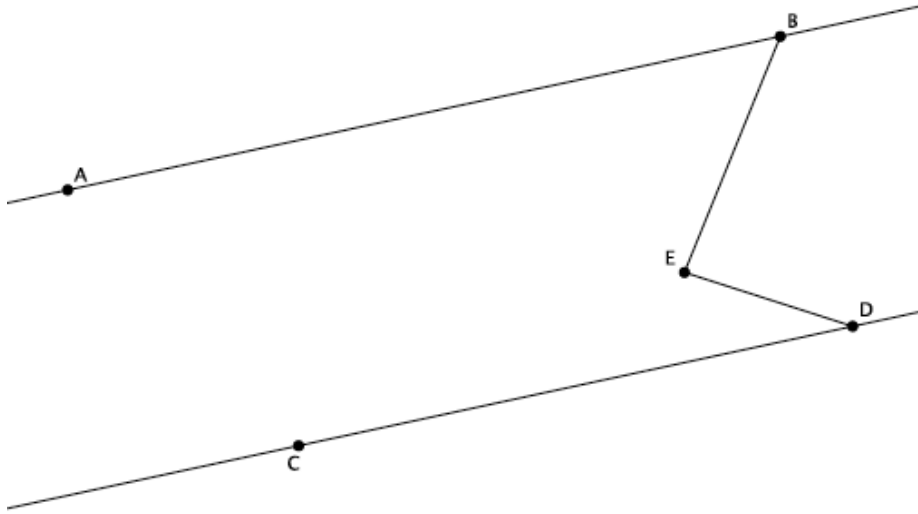
- In the diagram below, line AB is parallel to line CD , i.e., $L_{AB} \parallel L_{CD}$. The measure of angle $\angle ABC = 28^\circ$, and the measure of angle $\angle EDC = 42^\circ$. Find the measure of angle $\angle CED$. Explain why you are correct by presenting an informal argument that uses the angle sum of a triangle.



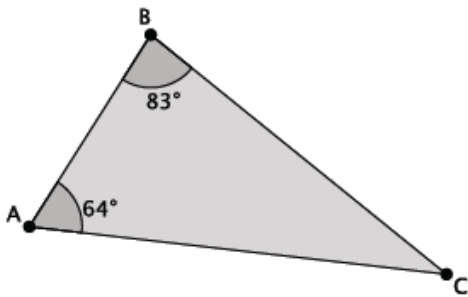
- In the diagram below, line AB is parallel to line CD , i.e., $L_{AB} \parallel L_{CD}$. The measure of angle $\angle ABE = 38^\circ$, and the measure of angle $\angle EDC = 16^\circ$. Find the measure of angle $\angle BED$. Explain why you are correct by presenting an informal argument that uses the angle sum of a triangle. (Hint: Find the measure of angle $\angle CED$ first, and then use that measure to find the measure of angle $\angle BED$.)



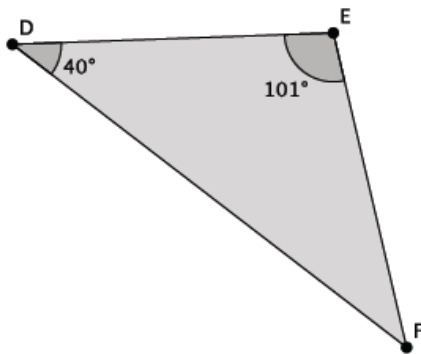
3. In the diagram below, line AB is parallel to line CD , i.e., $L_{AB} \parallel L_{CD}$. The measure of angle $\angle ABE = 56^\circ$, and the measure of angle $\angle EDC = 22^\circ$. Find the measure of angle $\angle BED$. Explain why you are correct by presenting an informal argument that uses the angle sum of a triangle. (Hint: Extend the segment BE so that it intersects line CD .)



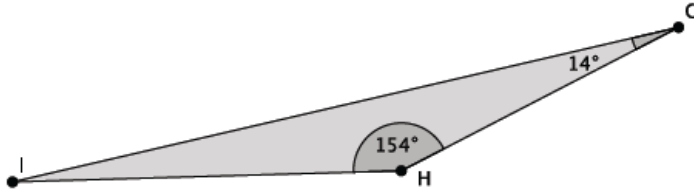
4. What is the measure of $\angle ACB$?



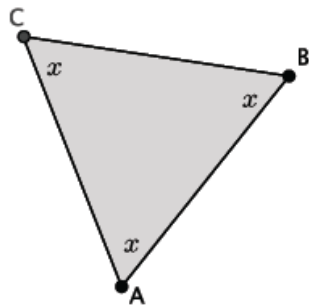
5. What is the measure of $\angle EFD$?



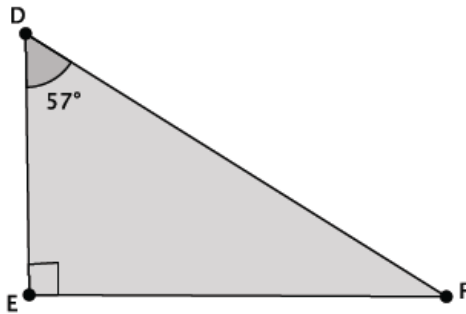
6. What is the measure of $\angle HIG$?



7. What is the measure of $\angle ABC$?



8. Triangle DEF is a right triangle. What is the measure of $\angle EFD$?



9. In the diagram below, lines L_1 and L_2 are parallel. Transversals r and s intersect both lines at the points shown below. Determine the measure of $\angle JMK$. Explain how you know you are correct.

