Angle Equation Paths

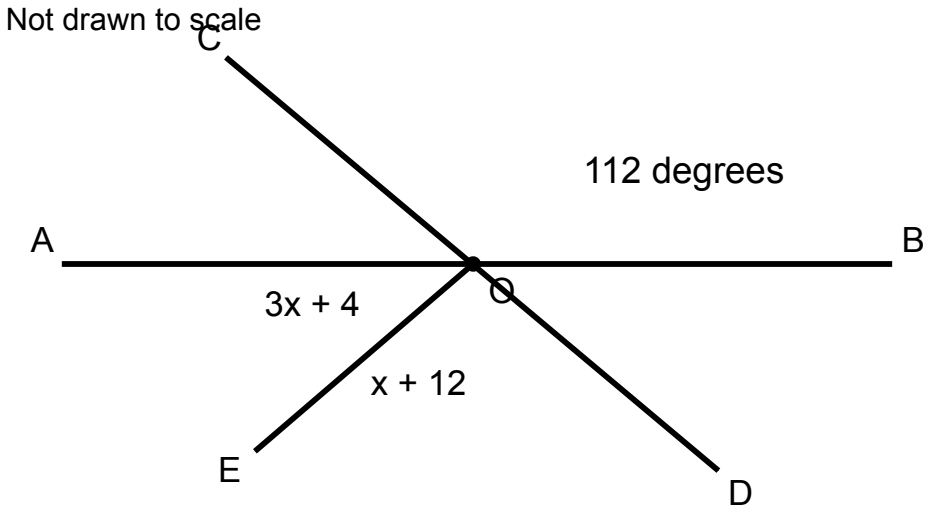
Use angle relationships to write and solve equations for unknown angles

Name: _____ Date: _____

Angle Equation Paths - 1

Angle facts: Vertical angles have equal measures. Adjacent angles on a straight line have a total of 180 degrees. In each figure, lines AB and CD intersect at O. Ray OE splits one angle.

1. Find x and the two split angle measures. The angle marked 112 degrees is vertical to the angle split by ray OE.



Write an equation. Solve it. Then give the measure of each angle labeled with an expression.

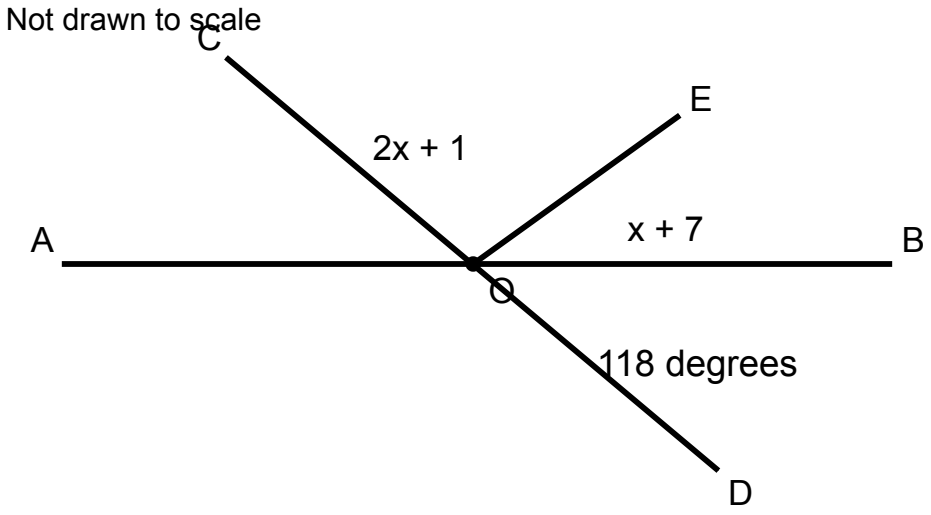
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Angle Equation Paths - 2

2. Find x and the two split angle measures. The 118-degree angle and the split angle form a linear pair. Their outside rays lie on straight line CD.



Write one equation that uses the straight angle. Solve it. Then give the measure of each angle labeled with an expression.

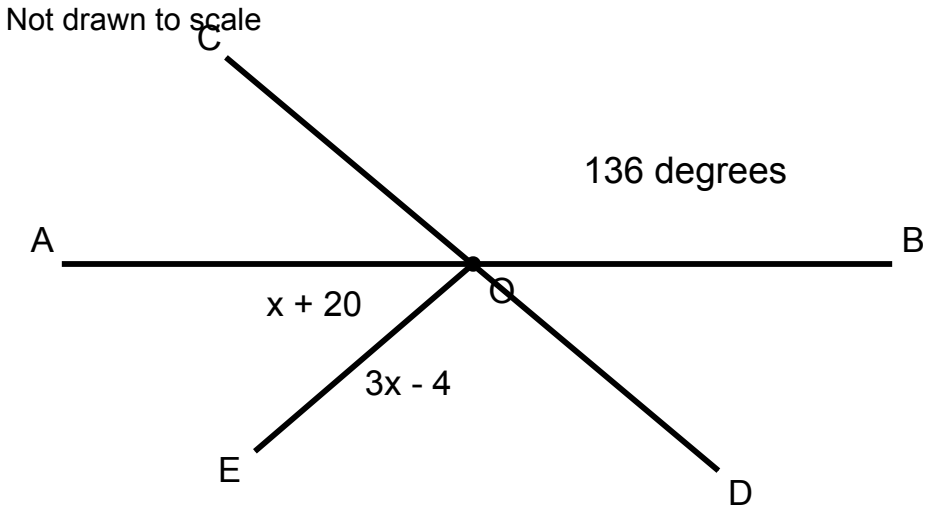
Angle Equation Paths

Use angle relationships to write and solve equations for unknown angles

Name: _____ Date: _____

Angle Equation Paths - 3

3. Find x and the two split angle measures. The 136-degree angle is vertical to the angle split by ray OE.



Write an equation. Show how vertical angles help you identify the total of the split angle. Solve for x, then find both labeled angle measures.

Angle Equation Paths

Use angle relationships to write and solve equations for unknown angles

Answer Key - Angle Equation Paths 1-2

1. Vertical angles are equal, so the entire split angle measures 112 degrees.

Equation: (3x + 4) + (x + 12) = 112
4x + 16 = 112
4x = 96
x = 24

Angle measures: 3x + 4 = 3(24) + 4 = 76 degrees; x + 12 = 24 + 12 = 36 degrees. Check: 76 + 36 = 112 degrees.

2. The split angle, ∠COB, and the 118-degree angle, ∠BOD, form a linear pair. Their outside rays OC and OD lie on straight line CD, so their total is 180 degrees.

Equation: (x + 7) + (2x + 1) + 118 = 180
3x + 126 = 180
3x = 54
x = 18

Angle measures: x + 7 = 18 + 7 = 25 degrees; 2x + 1 = 2(18) + 1 = 37 degrees. Check: 25 + 37 + 118 = 180 degrees.

Scoring: For each item, award credit for (a) identifying the correct total or relationship, (b) writing a matching equation, (c) solving x correctly, and (d) finding both requested angle measures. A correct equation with a minor arithmetic error earns partial credit.

Angle Equation Paths

Use angle relationships to write and solve equations for unknown angles

Answer Key and Teaching Notes

3. Vertical angles are equal, so the entire split angle measures 136 degrees.

Equation: (x + 20) + (3x - 4) = 136
4x + 16 = 136
4x = 120
x = 30

Angle measures: x + 20 = 50 degrees; 3x - 4 = 86 degrees. Check: 50 + 86 = 136 degrees.

Setup and materials: Print and supply all student pages, keeping teacher-key pages separate. Students need a pencil and eraser. The worksheet supplies the complete line-and-ray figures and algebra space; no protractors are needed because figures are not drawn to scale.

Teaching script: Say: “Do not estimate from the picture. First name the angle relationship. Then write an equation for the whole angle before you solve.” Say: “Vertical angles are opposite at an intersection. A linear pair consists of adjacent angles whose outside rays are opposite rays, so their total is 180 degrees.” For Item 1, ask: “Which whole angle matches 112 degrees?” For Item 2, ask: “Which rays are shared, and which outside rays make the straight line?” For Item 3, ask: “Which opposite angle has the same measure as 136 degrees?” Do not state the equations until students have attempted them.

Observation method: Circulate and make a quick mark for each student: V = correctly uses vertical angles, L = correctly identifies a linear pair and its straight line, E = writes an equation matching the figure. Confer with students who use a diagram's apparent size instead of an angle fact. Ask them to point to the rays that make the whole angle.

Source credit: Skill statement: NY-7.G.5, New York State Next Generation Mathematics Standards, https://lessonmakerpro.com/standards/ny-nextgen-math/ny-7-g-5