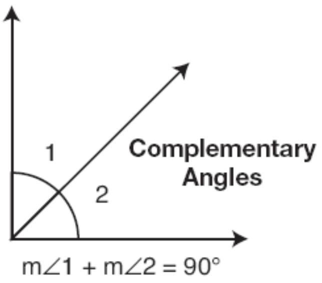
Angle Relationships

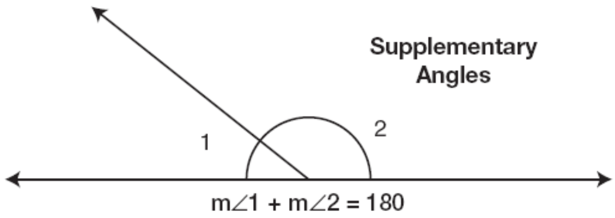
Complementary Angles

Two angles are **complementary** if the sum of their measures is 90°.

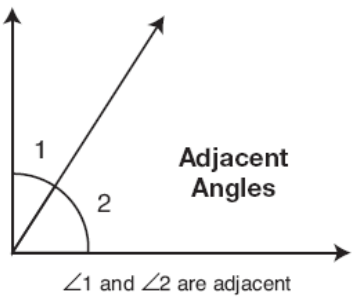


Supplementary Angles

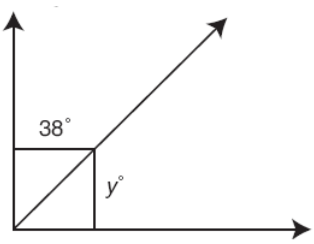
Two angles are **supplementary** if the sum of their measures is 180°.



Adjacent angles have the same vertex, share one side, and do not overlap.



Example 1: Which of the following must be the value of *y*?



a. 20

b. 52

c. 90

d. 142

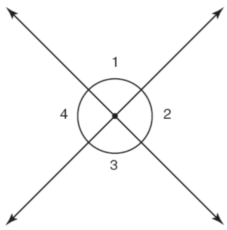
e. 180

Answer

b. The figure shows two complementary angles, which means the sum of the angles equals 90°. If one of the angles is 38°, then the other angle is (90° - 38°). Therefore, $y°$ = 90° - 38° = 52°, so y = 52.

Angles of Intersecting Lines

When two lines intersect, **vertical angles** are formed. In the figure below, ∠1 and ∠3 are vertical angles and ∠2 and ∠4 are vertical angles.



Vertical angles have equal measures:

m∠1 = m∠3

m∠2 = m∠4

Vertical angles are supplementary to adjacent angles. The sum of a vertical angle and its adjacent angle is 180°:

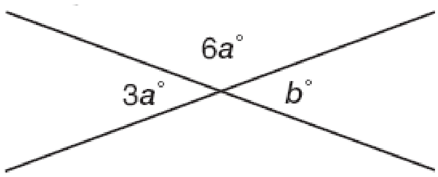
m∠1 + m∠2 = 180°

m∠2 + m∠3 = 180°

m∠3 + m∠4 = 180°

m∠1 + m∠4 = 180°

Example 2: What is the value of *b* in the figure above?



a. 20

b. 30

c. 45

d. 60

e. 120

Answer

d. The drawing shows angles formed by intersecting lines. The laws of intersecting lines tell us that $3a° = b°$ because they are the measures of opposite angles. We also know that $3a° + 6a° = 180°$ because $3a°$ and $6a°$ are measures of supplementary angles. Therefore, we can solve for a:

$3a + 6a = 180$

$9a = 180$

$a = 20$

Because $3a° = b°$, we can solve for b by substituting 20 for a:

$3a = b$

$3(20) = b$

$60 = b$