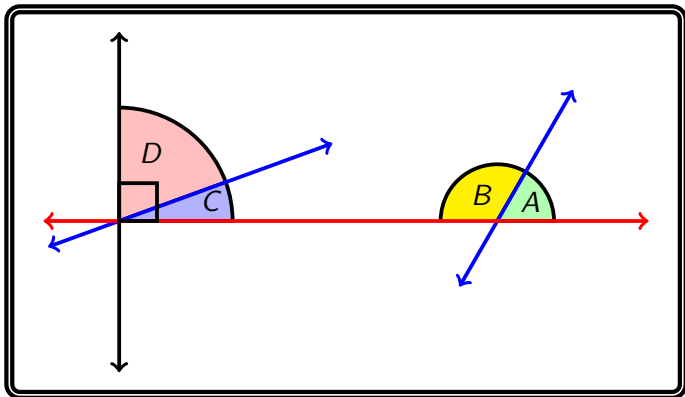


How to Do Word Problems

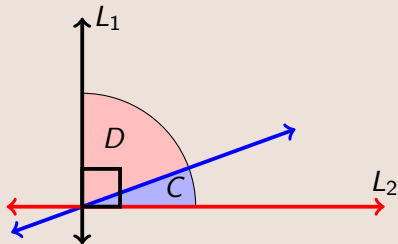


Complementary & Supplementary Angles

In this chapter, we are going to look at angles that have a sum of 90° and 180° .

When two angles have a sum of 90° , they are called

Complementary Angles.

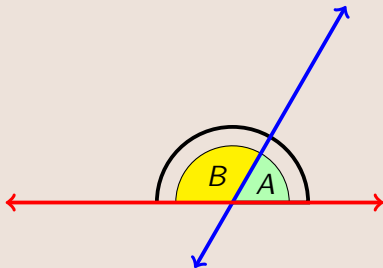


When we assume that $L_1 \perp L_2$, they form a 90° angle. Therefore

$$m\angle C + m\angle D = 90^\circ.$$

Angles C and D are called complementary angles.

When two angles have a sum of 180° , they are called **Supplementary Angles**.



When we split a straight angle which has a measure of 180° into two angles A and B ,

therefore

$$m\angle A + m\angle B = 180^\circ.$$

Angles A and B are called supplementary angles.

When two angles are **Complementary Angles**, they are **Complement** of each other.

When two angles are **Supplementary Angles**, they are **Supplement** of each other.

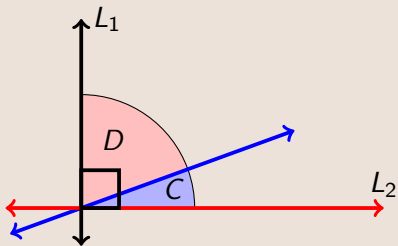
Type	First Angle	Second Angle
Complementary Angles	x°	$(90 - x)^\circ$
Supplementary Angles	x°	$(180 - x)^\circ$

Example:

Find two complementary angles such that one of them is 20° more than its complement.

Solution:

Let x be the measure of one of the angles, then its complement has to be $90 - x$.



When we assume that $L_1 \perp L_2$, they form a 90° angle.

$$m\angle C = x^\circ,$$

$$m\angle D = (90 - x)^\circ,$$

$$m\angle D = m\angle C + 20^\circ$$

Solution(continued):

$$m\angle D = m\angle C + 20^\circ \quad (\text{Given Information})$$

$$90 - x = x + 20 \quad (\text{Substitution})$$

$$90 - x - x - 90 = x + 20 - x - 90 \quad (\text{Subtraction Property})$$

$$-2x + 0 = -70 + 0 \quad (\text{Inverse \& Simplify})$$

$$-2x = -70 \quad (\text{Identity})$$

$$x = 35 \quad (\text{Division Property})$$

So the angle is 35° , and its complement is $90 - 35 = 55^\circ$.

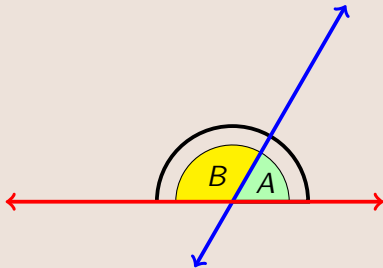
35° and 55°

Example:

Find two supplementary angles such that one of them is 30° less than 4 times its supplement.

Solution:

Let x be the measure of one of the angles, then its supplement has to be $180 - x$.



$$m\angle A = x^\circ$$

$$m\angle B = (180 - x)^\circ$$

$$m\angle A = 4 \cdot m\angle B - 30$$

Solution(continued):

$$m\angle A = 4 \cdot m\angle C - 30^\circ \quad (\text{Given Information})$$

$$x = 4(180 - x) - 30 \quad (\text{Substitution})$$

$$x = 720 - 4x - 30 \quad (\text{Distribution Property})$$

$$x = 690 - 4x \quad (\text{Simplify})$$

$$x + 4x = 690 - 4x + 4x \quad (\text{Addition Property})$$

$$5x = 690 \quad (\text{Inverse \& Simplify})$$

$$x = 138 \quad (\text{Division Property})$$

So the angle is 138° , and its supplement is $180 - 138 = 42^\circ$.

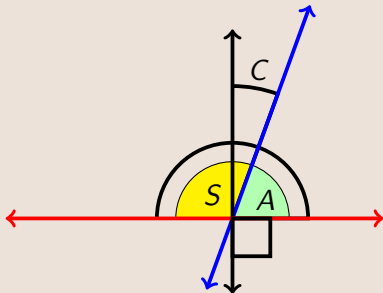
42° and 138°

Example:

Find the measure of an angle such that the sum of its complement and its supplement is 130° .

Solution:

Let x be the measure of one of the angles, then its supplement has to be $180 - x$.



$$m\angle A = x^\circ$$

$$m\angle C = (90 - x)^\circ$$

$$m\angle S = (180 - x)^\circ$$

$$m\angle C + m\angle S = 130^\circ$$

Solution(continued):

$$m\angle C + m\angle S = 130^\circ \quad (\text{Given Information})$$

$$90 - x + 180 - x = 130 \quad (\text{Substitution})$$

$$270 - 2x = 130 \quad (\text{Simplify})$$

$$270 - 2x - 270 = 130 - 270 \quad (\text{Subtraction Property})$$

$$-2x + 0 = -140 \quad (\text{Inverse \& Simplify})$$

$$-2x = -140 \quad (\text{Identity})$$

$$x = 70 \quad (\text{Division Property})$$

So the angle is 70° .

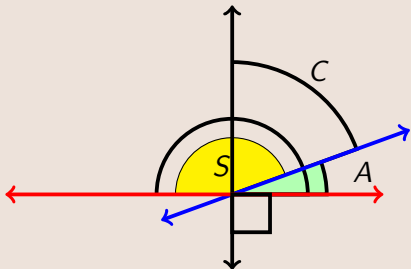
The angle is 70°

Example:

Find the measure of an angle such that the difference of twice its supplement and three times its complement is 110° .

Solution:

Let x be the measure of one of the angles, then its supplement has to be $180 - x$.



$$m\angle A = x^\circ$$

$$m\angle C = (90 - x)^\circ$$

$$m\angle S = (180 - x)^\circ$$

$$2 \cdot m\angle S - 3 \cdot m\angle C = 110^\circ$$

Solution(continued):

$$2 \cdot m\angle S - 3 \cdot m\angle C = 110^\circ \quad (\text{Given Information})$$

$$2(180 - x) - 3(90 - x) = 110 \quad (\text{Substitution})$$

$$360 - 2x - 270 + 3x = 110 \quad (\text{Distribution Property})$$

$$x + 90 = 110 \quad (\text{Simplify})$$

$$x + 90 - 90 = 110 - 90 \quad (\text{Subtraction Property})$$

$$x + 0 = 20 \quad (\text{Inverse \& Simplify})$$

$$x = 20 \quad (\text{Identity})$$

So the angle is 20° .

The angle is 20°