

Geometry - Lines

Geometry is basically the study of different properties of point, line and plane.

Angle

Right angle: An angle of 90° is called a right angle.

Acute angle: An angle of less than 90° is called an acute angle.

Obtuse angle: An angle of greater than 90° is called an obtuse angle.

Reflex angle: An angle of greater than 180° is called reflex angle.

Complementary angles: If the sum of the two angles is 90° , then they are called complementary angles.

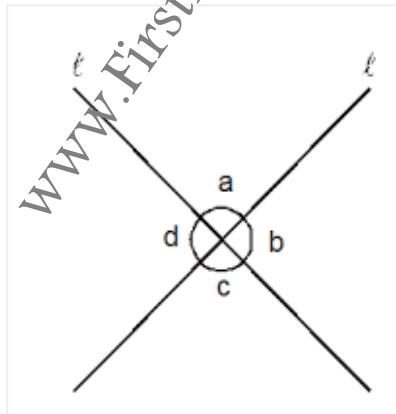
Supplementary angles: If the sum of the two angles is 180° , then they are called supplementary angles.

Angle Relations:

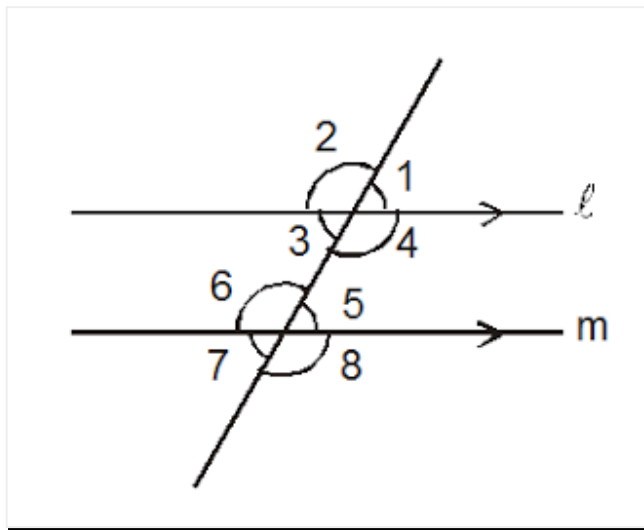
Vertically opposite angles: If two lines intersect each other, then the vertically opposite angles are equal.

$$\angle a = \angle c \text{ and } \angle b = \angle d$$

a, c and b, d are vertically opposite angles.



Angles in parallel lines: If a transversal intersects two parallel lines:



a. each pair of consecutive interior angles are supplementary.

$$\angle 4 + \angle 5 = 180^\circ$$

$$\angle 3 + \angle 6 = 180^\circ$$

b. each pair of alternate interior angles are equal.

$$\angle 5 = \angle 3, \angle 6 = \angle 4$$

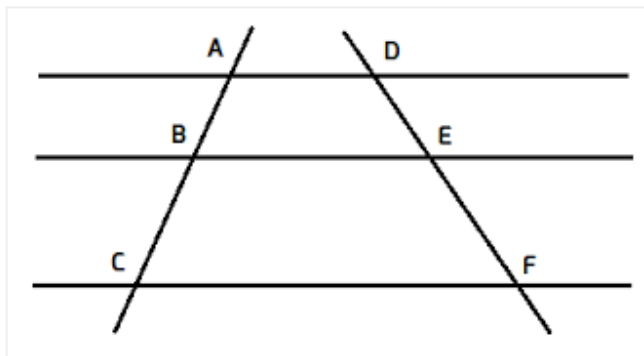
$$\angle 5 = \angle 3 = \angle 1 = \angle 7$$

$$\angle 6 = \angle 4 = \angle 2 = \angle 8$$

Collinear: Three or more than three points are said to be collinear, if there is a line which contains them all.

Concurrent: Three or more than three lines are said to be concurrent, if there is a point which lies on them all.

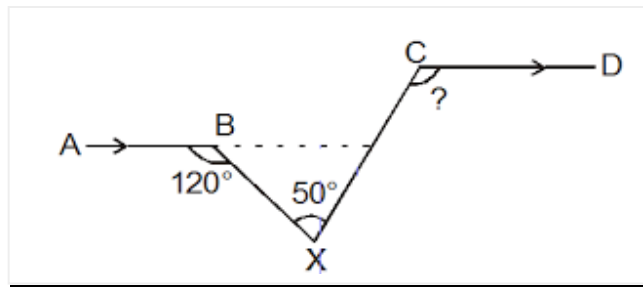
Proportionality Theorem:



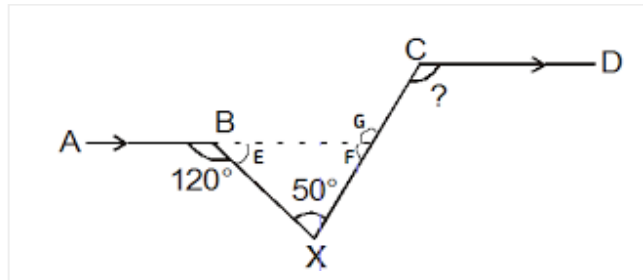
In the above diagram, $\frac{AB}{BC} = \frac{DE}{EF}$ or $\frac{AC}{BC} = \frac{DF}{EF}$

Solved Examples:

1. In the adjoining figure, find $\angle C$. If $AB \parallel CD$



Sol: $\angle E = 180 - 120 = 60$



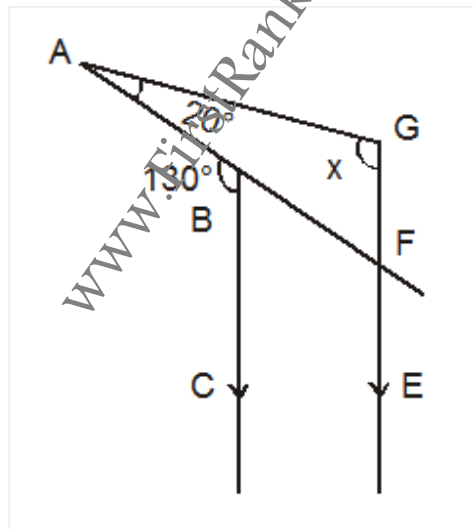
$$\angle E + \angle X + \angle F = 180 \Rightarrow 60 + 50 + F = 180 \Rightarrow F = 70$$

Now $\angle G = 180 - F = 110$.

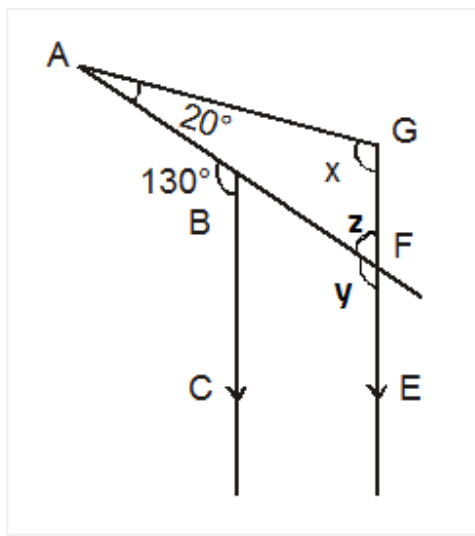
As $AB \parallel CD$, $\angle G = \angle C$

So $\angle C = 110$

2. Find the value of x in following figure.



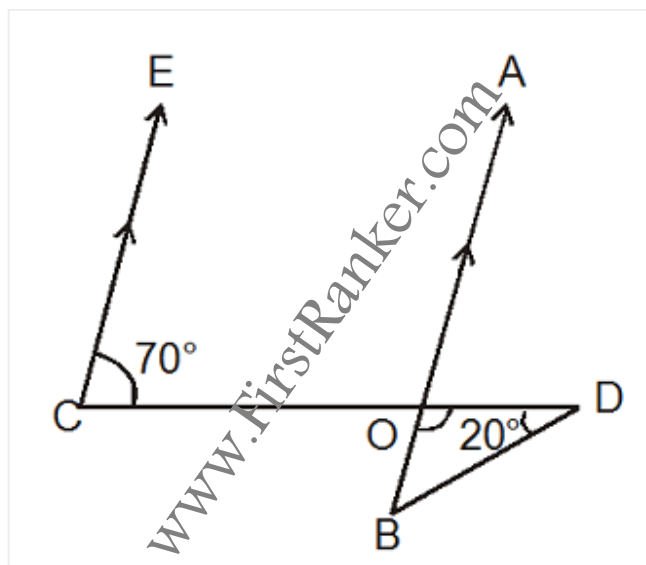
Sol: As $C \parallel E$, $\angle B = \angle Y$



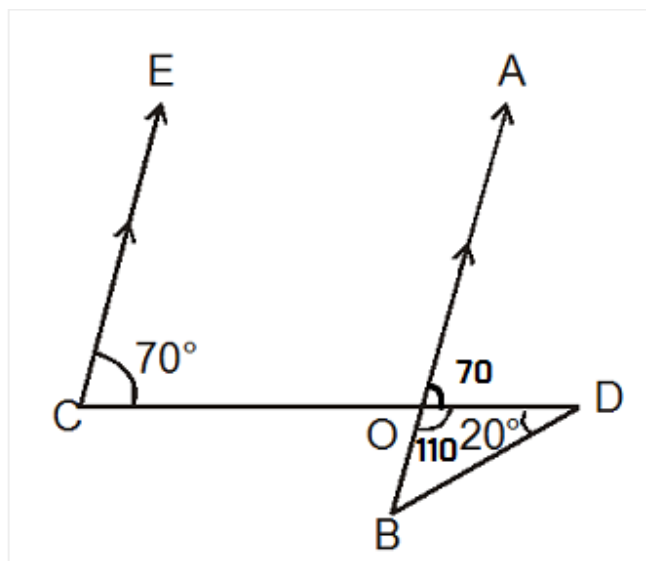
Also $\angle Y + \angle Z = 180 \Rightarrow \angle Z = 180 - 130 = 50$

Now in $\triangle AGF$, $\angle A + \angle Z + \angle X = 180 \Rightarrow \angle X = 180 - 20 - 50 = 110$

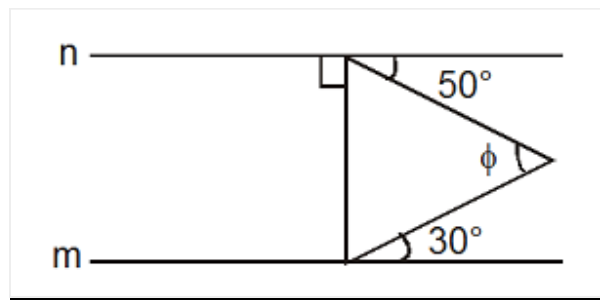
3. Find $\angle OBD$ in the given figure. It is given that $EC \parallel AO$.



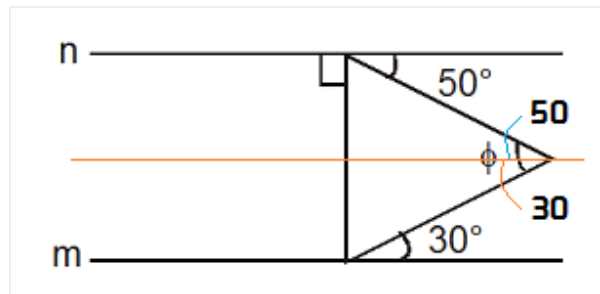
Sol: From the diagram, in $\triangle OBD$, $110 + 20 + \angle B = 180 \Rightarrow \angle B = 50$



4. If the two lines n and m are parallel, then find the value of ϕ in the given figure.



Sol: Draw a parallel to n . Now from the diagram $\phi = 50 + 30 = 80$ (Alternate interior angles are equal)



Alternate method: you can also solve this problem by calculating interior angles of the triangle.

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