

Law of Sines

Let $\triangle ABC$ be any triangle with a , b , and c representing the measures of sides opposite angles with measures A , B , and C , respectively. Then,

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}.$$

Finding the measures of all the angles and sides of a triangle is called **solving the triangle**. The Law of Sines can be used to solve a triangle in the following cases.

Case 1. You know the measures of two angles and any side of a triangle.

Remember that if you know the measure of two angles, you can find the measure of the third angle.

Case 2. You know the measures of two sides and an angle opposite one of these sides of the triangle.

Examples of this case:

- (1) knowing the measures of two sides and an angle opposite one of the sides
- (2) knowing the measures of two angles and a side opposite one of the angles
- (3) knowing the measures of two sides and an angle opposite one of the sides

Practice

Draw $\triangle EPR$ and mark it with the given information. Write an equation that could be used to find each unknown value. Then find the value to the nearest tenth.

10. If $m\angle P = 45$, $m\angle E = 63$, and $p = 22$, find e .
11. If $r = 9$, $e = 13$, and $m\angle E = 47$, find $m\angle R$.
12. If $e = 3.2$, $m\angle P = 52$, and $m\angle E = 70$, find p .
13. If $e = 48$, $r = 10$, and $m\angle E = 96$, find $m\angle R$.
14. If $m\angle P = 62$, $m\angle E = 26$, and $r = 2.6$, find p .
15. If $m\angle R = 59$, $p = 8.3$, and $r = 14.8$, find $m\angle P$.

Solve each $\triangle DFR$ described below. Round measures to the nearest tenth.

16. $m\angle R = 71$, $r = 7.4$, $m\angle F = 41$
17. $f = 9.1$, $r = 20.1$, $m\angle R = 107$
18. $m\angle F = 25$, $m\angle D = 52$, $r = 15.6$
19. $m\angle R = 34$, $f = 9.1$, $r = 27$
20. $m\angle D = 38$, $m\angle R = 115$, $d = 8.5$
21. $m\angle D = 43$, $m\angle R = 77$, $d = 0.8$
22. $d = 30$, $r = 9.5$, $m\angle D = 107$
23. $f = 16$, $d = 21$, $m\angle D = 88$
24. $f = 23$, $m\angle F = 45$, $m\angle D = 51$
25. An isosceles triangle has a base of 22 centimeters and a vertex angle of 36° . Find the perimeter.