1 USING THE SINE AND COSINE RULES

If we are given a problem involving a triangle, we must first decide which rule to use.

If the triangle is right angled, then the trigonometric ratios or Pythagoras' theorem can be used. For some problems we can add an extra line or two to the diagram to create a right angled triangle.

If we do not have a right angled triangle and we have to choose between the sine and cosine rules, the following checklist may be helpful:

Use the **cosine rule** when given:

- three sides
- two sides and an included angle.

Use the **sine rule** when given:

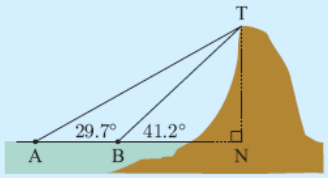
- one side and two angles
- two sides and a non-included angle.

Ex.

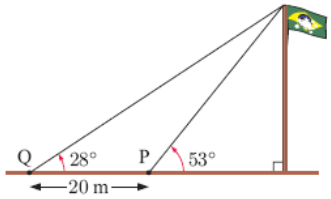
The angles of elevation to the top of a mountain are measured from two beacons A and B at sea.

These angles are as shown on the diagram.

If the beacons are 1473 m apart, how high is the mountain?



1 Rodrigo takes a sighting to the top of the flagpole from point P. He then moves 20 metres further away from the flagpole to point Q and takes a second sighting. The information is shown in the diagram. How high is the flagpole?



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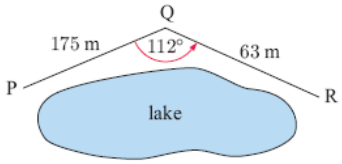
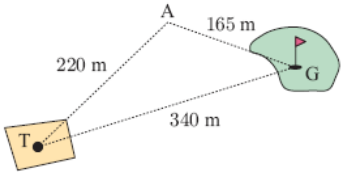


A park ranger walks along a trail from P to Q and then to R.

What is the distance in a straight line from P to R?

3 A golfer played his tee shot 220 m to point A. His ball was then 165 m from the green. The distance from tee to green is 340 m. Determine the number of degrees the golfer was off line with his tee shot.



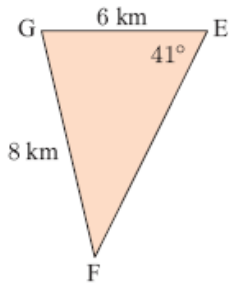
4 Two yachts P and Q are anchored at different locations at sea. A beacon at B determines that P and Q are 24 km and 21 km away respectively. The yacht at Q measures B and P to be 53° apart. What angle would the yacht at P measure between B and Q?

6 A tower 42 metres high stands on top of a hill. From a point some distance from the base of the hill, the angle of elevation to the top of the tower is 13.2° and the angle of elevation to the bottom of the tower is 8.3°. Find the height of the hill.

7 A large property needs to be sprayed with insecticide prior to being used for agriculture. An incomplete sketch of the property is shown.

a Calculate angle EFG.

b Determine the cost of spraying the property if insecticide costs £400 per square kilometre.



8 From the foot of a building I have to look upwards at an angle of 22° to sight the top of a tree. From the top of the building, 150 metres above ground level, I have to look down at an angle of 50° below the horizontal to sight the tree top.

a How high is the tree?

b How far from the building is this tree?

11 Thabo and Palesa start at point A. They each walk in a straight line at an angle of 120° to each other. Thabo walks at 6 km h^{-1} and Palesa walks at 8 km h^{-1}. How far apart are they after 45 minutes?