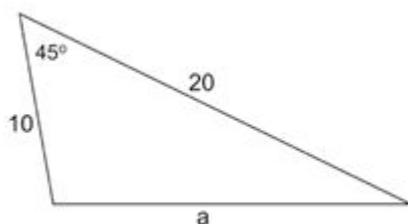
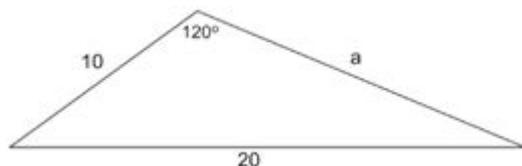


## Cosine Rule Copymaster 2

### The Cosine Rule II

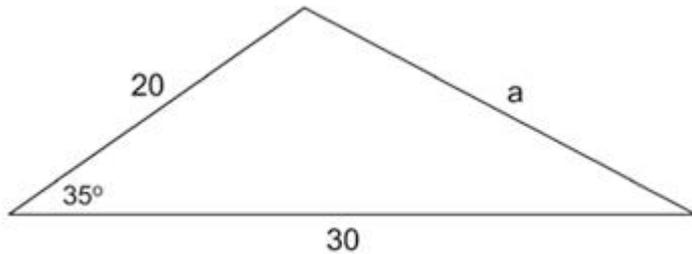
1. Find the unknown sides in the following triangles.



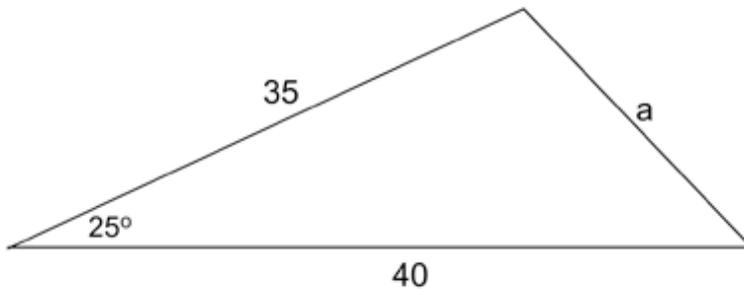
2. Find all of the angles in the triangles above.
3. Ouwata can see two flag poles from where he is standing. One is 20 metres away from him and the other is 30 metres away. In looking from one flag pole to the other, Ouwata has to rotate through  $35^\circ$ . How far apart are the flag poles?
4. Karen is working for a power company that needs to put a line between two pylons across a V-shaped gorge. From the point of the V to the first pylon is 35 metres and to the second pylon is 40 metres. The angle at the V is  $25^\circ$ . What is the minimum length of cable that Karen will need to go between the pylons?
5. Siyu has a triangular shaped section. Two of the sides are 50 metres and 65 metres long, respectively and one of the angles is  $120^\circ$ . What are the possible lengths of the other side?

### Answers to Copymaster 2

- $a^2 = 217.157$ , so  $a = 14.74$ ; (ii)  $a^2 - 20a \cos 120^\circ - 300 = 0$ , so  $a = 13.03$ .
- the angle opposite the side of length 10 is  $28.71^\circ$  and the other angle is  $106.29^\circ$ ;
  - the angle opposite the side of length is  $25.64^\circ$  and the other angle is  $34.36^\circ$ .
- Diagrams are essential in these problems. From the diagram below we see that  $a^2 = 400 + 900 - 1200 \cos 35^\circ$ . So  $a = 17.80\text{m}$ .

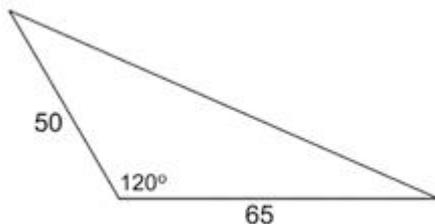
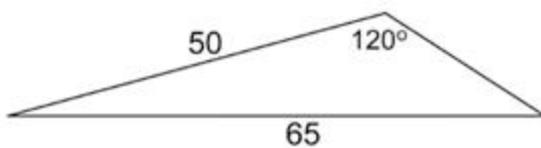


- From the diagram below we see that  $a^2 = 1225 + 1600 - 2800 \cos 25^\circ$ . So  $a = 16.95\text{m}$ .



- At first sight there appear to be three possible sections here depending on where the  $120^\circ$  angle is. But in fact the  $120^\circ$  angle can't be opposite the side of length 50. This is because in any triangle the largest angle is opposite the longest side. Since  $65 > 50$ , the angle opposite the side of length 65 would have to be bigger than  $120^\circ$ . But this is impossible since the angles in a triangle only add up to  $180^\circ$ .

We show the two possibilities in the diagram below.



In the first triangle above,  $a^2 = 2500 + 4225 - 6500 \cos 120^\circ$ . Hence  $a = 99.87\text{m}$ .

In the second triangle, the unknown side is  $23.48\text{m}$ .

