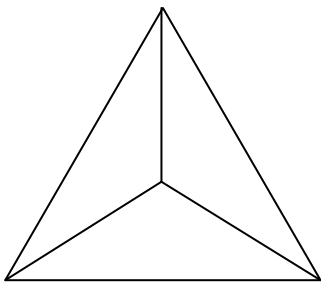## Extension Trigonometry #1

1. The highest viewing platform of the Eiffel tower is 276.13 m above the ground level. If a tourist uses a pair of viewing binoculars which only depress (go down) 30° below the horizontal, can that tourist see a person standing 350m from the base of the tower?

2. A boatie sets out to go fishing and motors 10 km north. His motor then cuts out, and he drifts 5 km NW with the wind and tide while he tries to fix it. At this point he realises he is in big trouble as he starts to sink. What range must his mobile phone have to reach the repeater station in the harbour at the starting point?
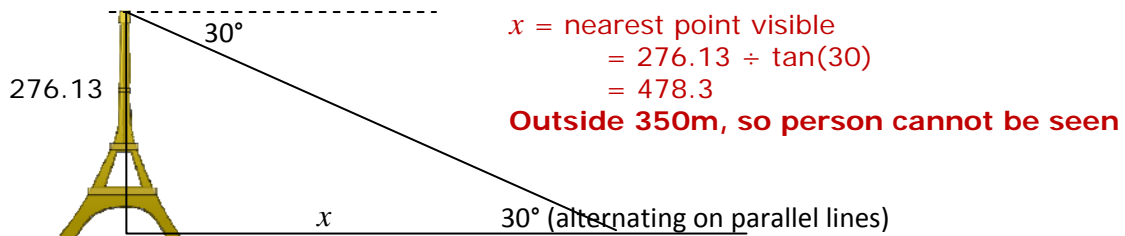
3. A triangular badge, below, has rotational symmetry of three. Calculate its area, if the length of each of the internal lines is 5 cm.
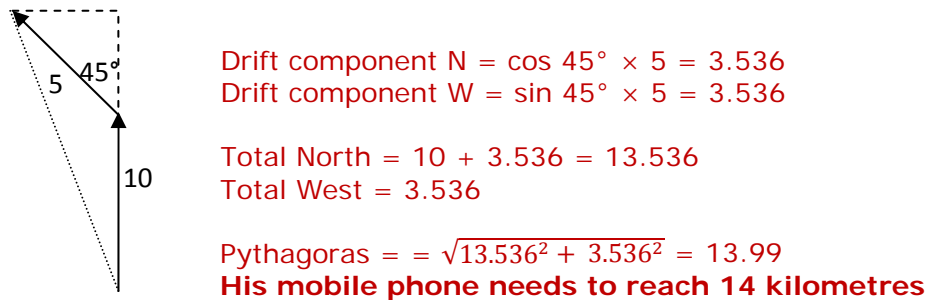

4. An architect is a bit concerned that an old and wobbly tree at the edge of a cliff above the house he wishes to build is likely to fall down. He measures the distance to the base of the cliff as 40m (to the nearest point of building). He measures the angle from that point to the base of the tree as 30° and to the top of the tree as 50°. How tall is the tree?
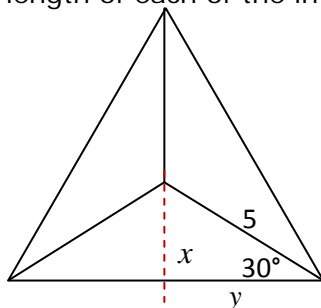
Answers: Extension Trigonometry #1

1. The highest viewing platform of the Eiffel tower is 276.13 m above the ground level. If a tourist uses a pair of viewing binoculars which only depress (go down) 30° below the horizontal, can that tourist see a person standing 350m from the base of the tower?

x = nearest point visible
= 276.13 ÷ tan(30)
= 478.3
Outside 350m, so person cannot be seen

30° (alternating on parallel lines)

2. A boatie sets out to go fishing and motors 10 km north. His motor then cuts out, and he drifts 5 km NW with the wind and tide while he tries to fix it. At this point he realises he is in big trouble as he starts to sink. What range must his mobile phone have to reach the repeater station in the harbour at the starting point?

Drift component N = cos 45° × 5 = 3.536
Drift component W = sin 45° × 5 = 3.536

Total North = 10 + 3.536 = 13.536
Total West = 3.536

Pythagoras = = $\sqrt{13.536^2 + 3.536^2}$ = 13.99
His mobile phone needs to reach 14 kilometres

3. A triangular badge, below, has rotational symmetry of three. Calculate its area, if the length of each of the internal lines is 5 cm.

Equilateral triangle = 60°, so half of that = 30°
x = sin 30 × 5 = 2.5
y = cos 30 × 5 = 4.33
Triangle area = ½ b h
= ½ × (2 × 4.33) × (2.5 + 5)
= **32.475**

4. An architect is a bit concerned that an old and wobbly tree at the edge of a cliff above the house he wishes to build is likely to fall down. He measures the distance to the base of the cliff as 40m (to the nearest point of building). He measures the angle from that point to the base of the tree as 30° and to the top of the tree as 50°. How tall is the tree?

To top of cliff is: tan 30 × 40 = 23.094
To top of tree is: tan 50 × 40 = 47.67

Tree is 47.67 – 23.09 = **24.58 m tall**