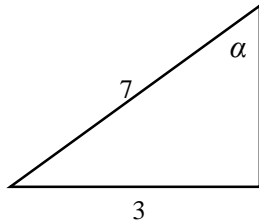## Section 1: Trigonometric functions and identities
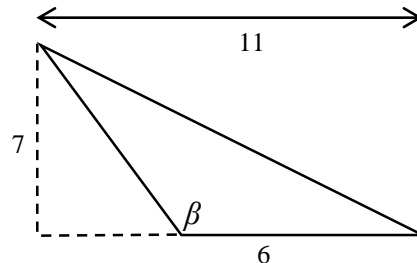
Exercise level 3 (Extension)

1. In the following diagrams, find the sine, cosine and tangent of the marked angles α, β and δ.
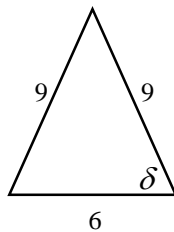
   (i)

   (ii)

   (iii)

2. [Make sure you use degree mode on your calculator throughout this question.]

   An engineer is testing a new design of spring component to be fitted in a sports car, in order to find its ability to withstand vibration. The component is fixed vertically in a position so that the end A of the spring is at the position given by $y = 0$.

   (i) Initially, the end A of the spring is forced to oscillate according to a function $y = 3\sin(10\theta)° - 1$, where θ is measured in seconds, and y is measured in millimetres. Sketch the graph of the position of end A during the first 50 seconds of the test.

   (ii) Find the times during the first 50 seconds of the test when the end A is displaced by exactly 1 mm from the point $y = 0$.

   (iii) In a second test, the engineer forces point A to oscillate according to the function $y = 2\sin^2(10\theta)°$. Again, sketch the graph of the position of end A during the first 50 seconds of the test.

   (iv) Find the times during the first 50 seconds of each test when the position of end A is exactly the same for both tests.