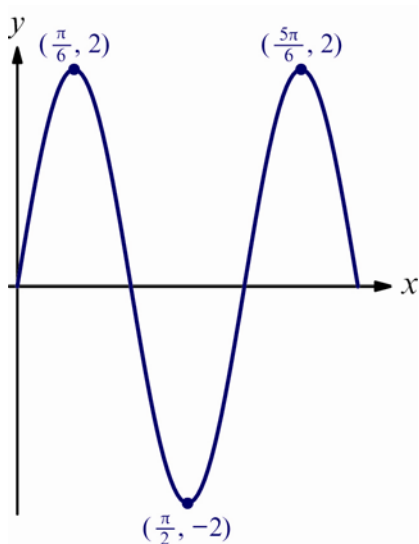


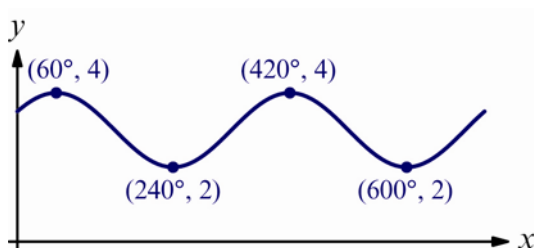
## Self-assessment: 9 Circular measure and trigonometric functions

1. Find the constants  $a, b, c, d$  in the equations of the two graphs below:

(a)  $y = a \sin (bx)$



(b)  $y = \cos(x^\circ - d^\circ) + c$



*(accessible to students on the path to grade 5 or 6) [7 marks]*

2. Find the exact period of the function  $f(x) = \sin 4x + \sin 6x$ .

*(accessible to students on the path to grade 3 or 4) [3 marks]*

3. The depth of water in a harbour varies with time as  $h = 8.6 + 1.2 \sin\left(\frac{\pi t}{6}\right)$ , where  $h$  is the depth measured in metres and  $t$  is time in hours after midnight.

- (a) Find the depth of the water at 2 p.m.
- (b) What is the least depth of the water?
- (c) At what times is the depth of the water 8.1 m?
- (d) A ship can enter the harbour when the water depth is above 9 m. Find the times when the ship can enter the harbour.

*(accessible to students on the path to grade 3 or 4) [8 marks]*

4. Do not use a calculator to answer this question.

Let  $f(x) = 3 \sin\left(x + \frac{\pi}{4}\right)$  for  $x \in [0, 2\pi]$ .

- (a) Find the exact value of  $f\left(\frac{\pi}{12}\right)$ .

*(accessible to students on the path to grade 5 or 6)*

- (b) Find the exact values of all the zeroes of  $f$ .
- (c) State the minimum value of  $5 - f(x)$ .

Another function is defined by  $g(x) = \tan\left(x - \frac{\pi}{4}\right)$  for  $x \in [0, 2\pi]$ .

*(accessible to students on the path to grade 3 or 4)*

- (d) Find the exact value of  $g\left(\frac{\pi}{2}\right)$ .

- (e) By sketching graphs, or otherwise, find the number of solutions of the equation  $f(x) = g(x)$ .

*(accessible to students on the path to grade 5 or 6)*

*[12 marks]*