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 \( h = 8.6 + 1.2 \sin \left( \frac{\pi}{6} t \right) \), 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]