## Trigonometric Graphs and Equations

1) A man is hanging from a bridge over a river by a rubber rope, bouncing up and down so that his height above the water at a time t seconds is given by $h=10+8\cos(60t°)$.
(a) Copy and complete the following table and plot a graph of h against t.

| t | 0 | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| h | 18 | | 14 | | | | | | | | | | |

(b) Estimate from your graph for how many seconds the man is less than 5m above the water.
(c) What is the period of the man's motion (ie how long does it take him for 1 complete oscillation)?
(d) Use the equation for h to calculate, to 2dp, after how many seconds the man first reaches a height of 12m above the water.

2) The amount of beach (d metres) which is visible (ie not under water) at Sandy Bay is given by the formula $d=25+25\sin(30t°)$, where t is the number of hours since midnight.
(a) Draw up a table of values for t and d, for $0 \leq t \leq 24$, and plot a graph of d against t. At what times is low tide?
(b) The first 20m of beach is all shingle, and the remaining 30m is sand, so that Sandy Bay only lives up to its name when at least 20m of beach is visible. Use your graph to estimate for how many hours of daylight Sandy Bay is sandy.
(c) Surfing is safe at Sandy Bay when 40 or more metres of beach is visible. Using the equation for d, find at what time in the afternoon (to the nearest minute) the lifeguards should raise the green flag to permit surfing.

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