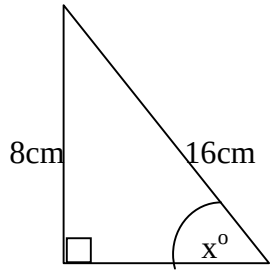
SOLVING TRIG EQUATIONS

A simple trigonometry equation would have arisen from this triangle:



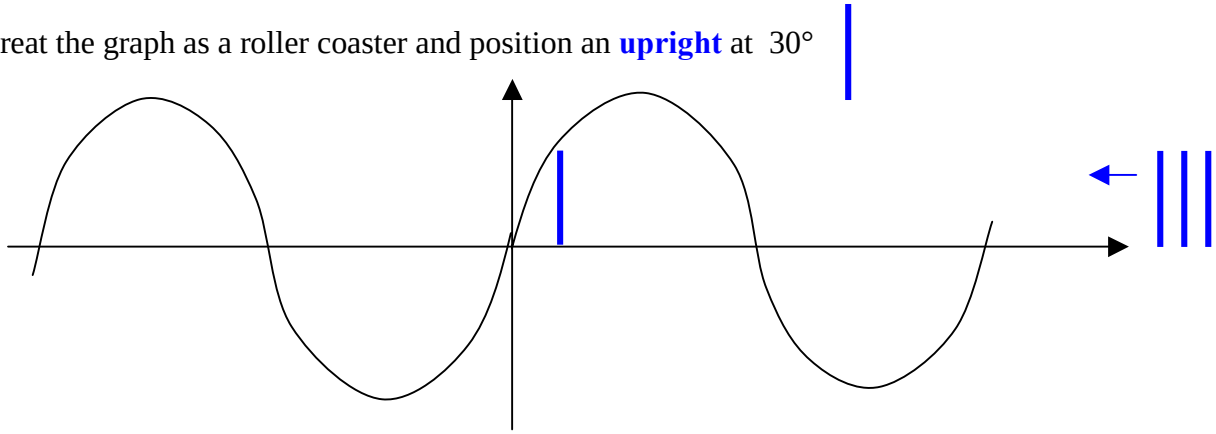
$\text{Sin } x = \frac{8}{16} = \frac{1}{2}$ $\quad x = \sin^{-1}\frac{1}{2} = 30$

The solution of $\text{Sin } x = \frac{1}{2}$ is $x = 30°$

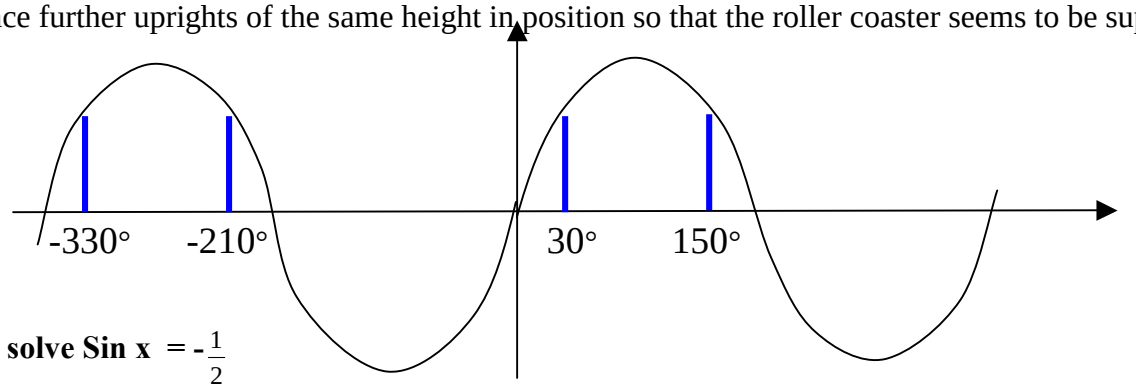
To solve $\text{Sin } x = \frac{1}{2}$ where all solutions in the range $-360° \leq x \leq 360°$ are required:

Solve the equation as above to get $x = 30°$ Sketch a good-sized sine graph.

Treat the graph as a roller coaster and position an **upright** at 30°

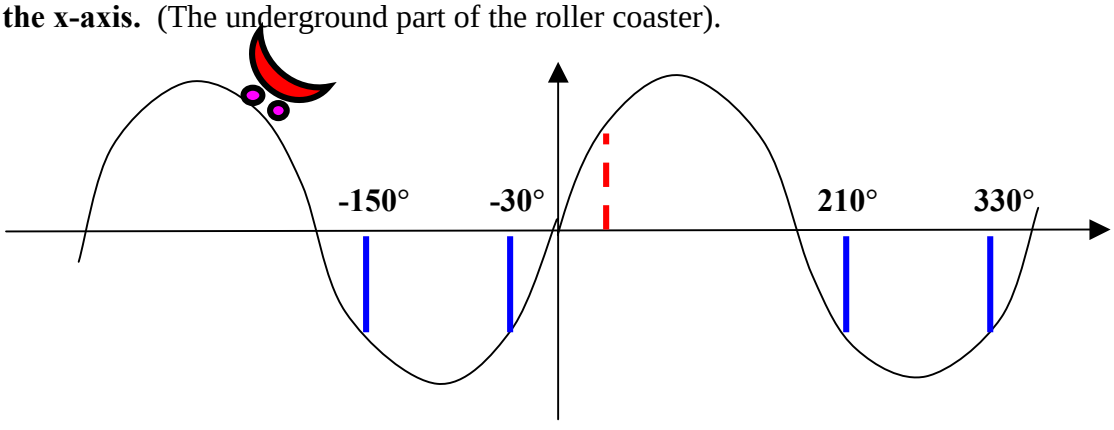


Place further uprights of the same height in position so that the roller coaster seems to be supported.



To solve Sin x $= -\frac{1}{2}$

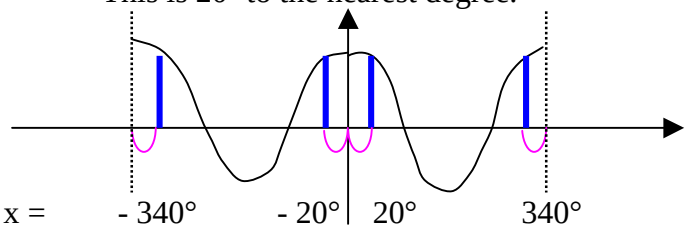
Ignore the negative sign, proceed as if you are solving **Sin x** $= \frac{1}{2}$ but position the uprights **below the x-axis.** (The underground part of the roller coaster).



To solve Cos x = 0.94 for $-360° \leq x \leq 360°$ Find $\cos^{-1}(0.94)$

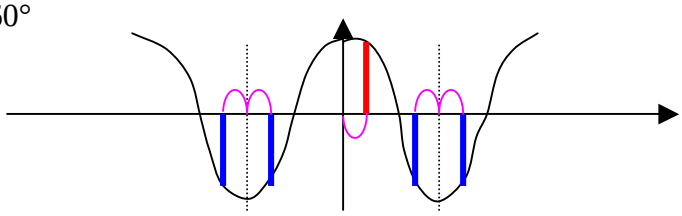
This is 20^o to the nearest degree.

- Sketch the graph if y = Cos x
- Position the first upright at 20°
- Position all other uprights
- Mark the angles where they occur.
- These are the solutions to the equation: x = - 340° - 20° 20° 340°



To solve Cos x = - 0.94 for $-360° \leq x \leq 360°$

- Sketch the graph if y = Cos x
- Position the first upright at 20°
- Position all other uprights below the x - axis
- Mark the angles where they occur.
- These are the solutions to the equation: x = - 200° - 160° 160° 200°

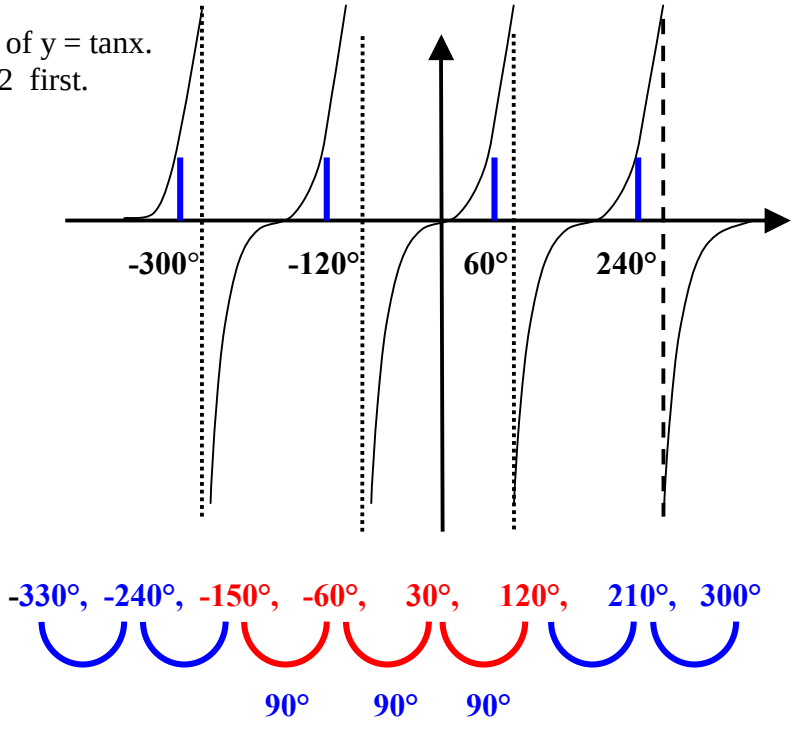


If the range for the solutions is different to $-360° \leq x \leq 360°$ and is perhaps **$-180° \leq x \leq 180°$**
Sketch the whole graph anyway but only quote answers in the required range. **x = -160°, 160°**

To solve tan(2x) = 1.732 We could always start by sketching the graph of tan(2x) .....

It is probably easier to sketch the graph of y = tanx.
Let the 2x = t and solve tan(t) = 1.732 first.

$\text{Tan}^{-1}(1.732) = 60°$
Put the other values in.
t = -300°, -120°, 60°, 240°
but t = 2x
2x = -300°, -120°, 60°, 240°
so
x = -150°, -60°, 30°, 120°
These values now fall within half the range; $-180° \leq x \leq 180°$
To give all answers within the original range simply continue the sequence of answers.



To solve 3cosx = 1: **Write the equation as cosx = ⅓ and proceed as above.**

To find maximum and minimum values sketch the graphs and read from your sketch.