The **topics** and **types of questions** examined in this Achievement Standard. Use this sheet to plan and organise your study so that you cover everything that is required.

2.9 TRIG EQUATIONS AS 90292

Solve straightforward trigonometric equations

2.9 1.Solve straightforward trigonometric equations A

- equations with only one transformation of trig function
- the domain is usual $0 \le x \le 360\ (2\pi)$

Solve the following trigonometric equations.

(a) $\sin x = 0.3, \quad 0° \le x \le 360°$

(b) $\cos x = 0.2, \quad 0° \le x \le 360°$

(c) $2\tan x = 3.6, \quad 0 \le x \le 2\pi$

(d) $\cos x + 2 = 2.9, \quad 0° \le x \le 360°$

(e) $\tan x + 1.58 = 1.3, \quad 0° \le x \le 360°$

(f) $4\sin x = 0.5\ , \quad 0 \le x \le 2\pi$

2.9 2. Solve trigonometric equations M

- equations with more than one transformation of trig function
- may include domains other than $0 \le x \le 360\ (2\pi)$

Solve the following trigonometric equations:

(a) $\cos 2x = 0.8, \quad 0° \le x \le 360°$

(b) $\tan(x + 70°) = -0.3, \quad -180° \le x \le 180°$

(c) $\tan 2x = 4, \quad 0 \le x \le 2\pi$

(d) $\sin\left(x - \frac{\pi}{2}\right) = 0.3, \quad -\pi \le x \le \pi$

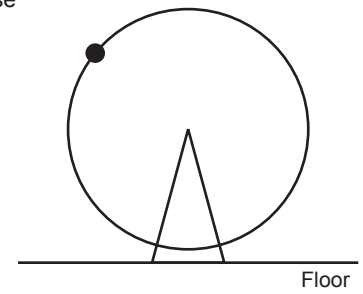
(e) $\cos(x + 45°) = -0.4, \quad 0° \le x \le 360°$

(f) $\sin 2x = 0.7, \quad 0 \le x \le \pi$

2.9 3. Solve trigonometric equations in context M

- solving of trig equations within a practical context

John has bought an exercise wheel for his pet mouse. The exercise wheel has a radius of 10 cm. There is a piece of coloured plastic on the edge of the wheel.



The height of the plastic above the floor of the cage can be modelled by the equation:

$H = 12 + 10\sin t$

where H = the height above the floor of the cage in centimetres and t = time after the wheel starts turning in seconds.

After how many seconds will the piece of plastic first be 20 cm above the floor of the cage?

The voltage V volts of an electrical supply is given by

$V = 240\sin 100\pi t$ at time t seconds.

What is the shortest time that elapses between the maximum and minimum voltages produced by the electrical supply?

Sarah and Scott are road bike training. They begin their training together, at the same time and place.

The distance between Sarah and Scott varies constantly in a regular manner. The distance that Sarah is ahead of Scott at any time, t, can be modelled by the function

$D = 5\sin\frac{\pi t}{30}$

where D is the distance in metres of Scott from Sarah, and t is in minutes.

After how many minutes will Sarah first be more than 2 metres ahead of Scott?

2.9 4. Solve multi-step trigonometric equations E

- problems could involve complex manipulations of trigonometric equations
- problems to be solved in context

A ship runs aground on a reef. The water depth above the reef can be modelled by the function:

$d = 8 - 2.5\cos\frac{\pi t}{6}$

where d = the water depth above the reef in metres and t = time in hours after low tide.

The ship can be refloated only when the depth of the water is at least 9.8 metres above the reef. The ship cannot be refloated until after the low tide at 8:30 am the next morning.

Between what times would it next be possible to refloat the ship?

The loudness of car alarms can be modelled by the equation:

$y = 110 - 15\cos(0.4\pi t)$

where y = the loudness of the alarm in decibels and t = time in seconds after the alarm sounds.

The alarm often goes off by accident. The owner knows that his ears will hurt when the noise level is over 120 decibels. It takes 15 seconds to turn off the alarm.

However, if, during that 15 seconds, there is a total of at least 6 seconds of loudness being over 120 decibels, then the owner cannot complete the task.

Will he be able to turn the alarm off in the 15 seconds needed? Justify your answer.