Trigonometry Graphs

- Graphs of the form y = a sin x°
- Graphs of the form y = a sin bx°
- Phase angle
- Solving Trig Equations
- Special trig relationships

Sine Graph

Learning Intention

1. To investigate graphs of the form

$y = a \sin x^\circ$

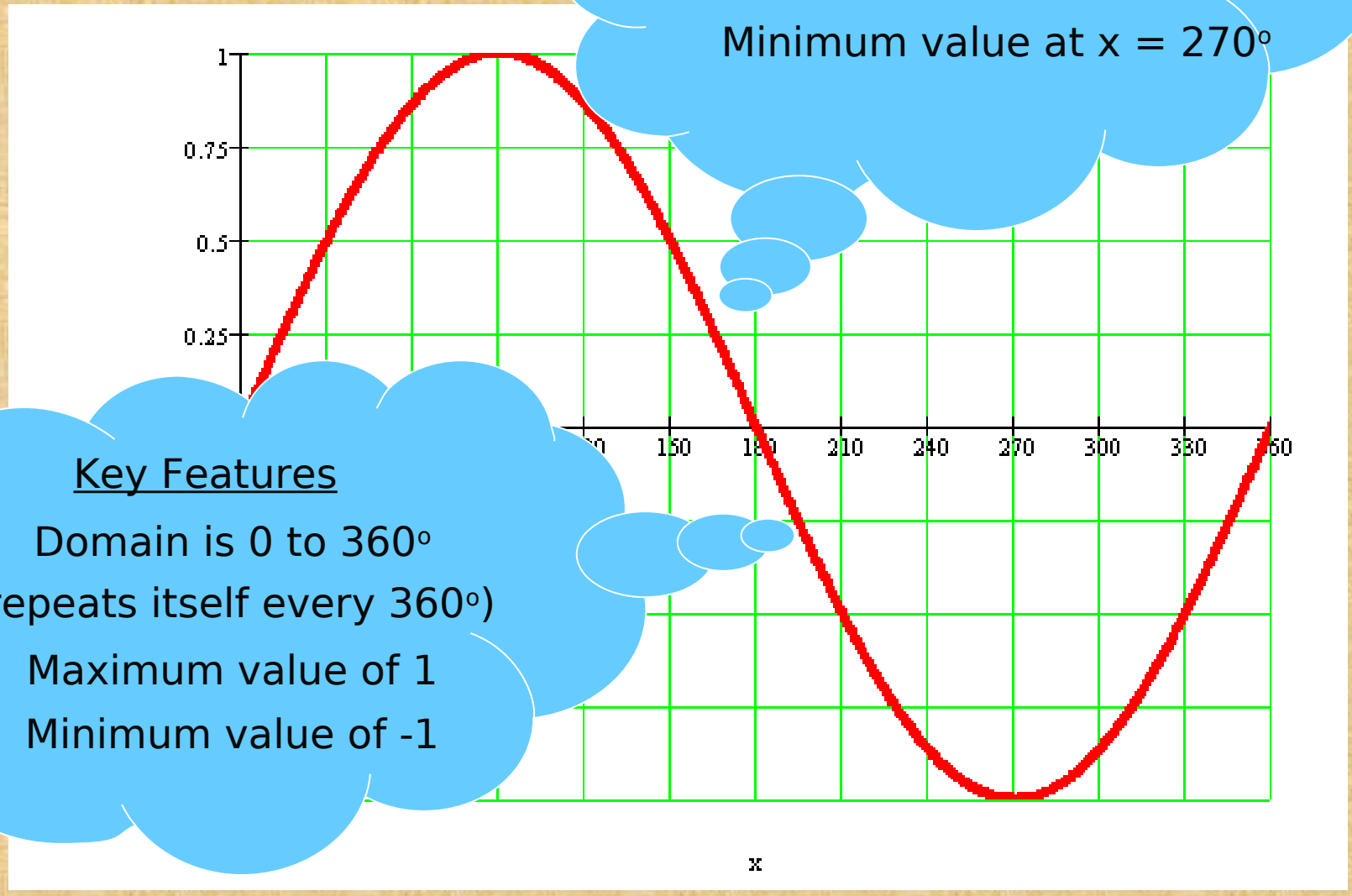
$y = a \cos x^\circ$

$y = \tan x^\circ$

Success Criteria

1. Identify the key points for various graphs.

Sine G



Key Features

Zeros at 0, 180° and 360°

Max value at x = 90°

Minimum value at x = 270°

Key Features

Domain is 0 to 360°

(repeats itself every 360°)

Maximum value of 1

Minimum value of -1

Sine Grap

What effect does the number at the front have on the graphs ?

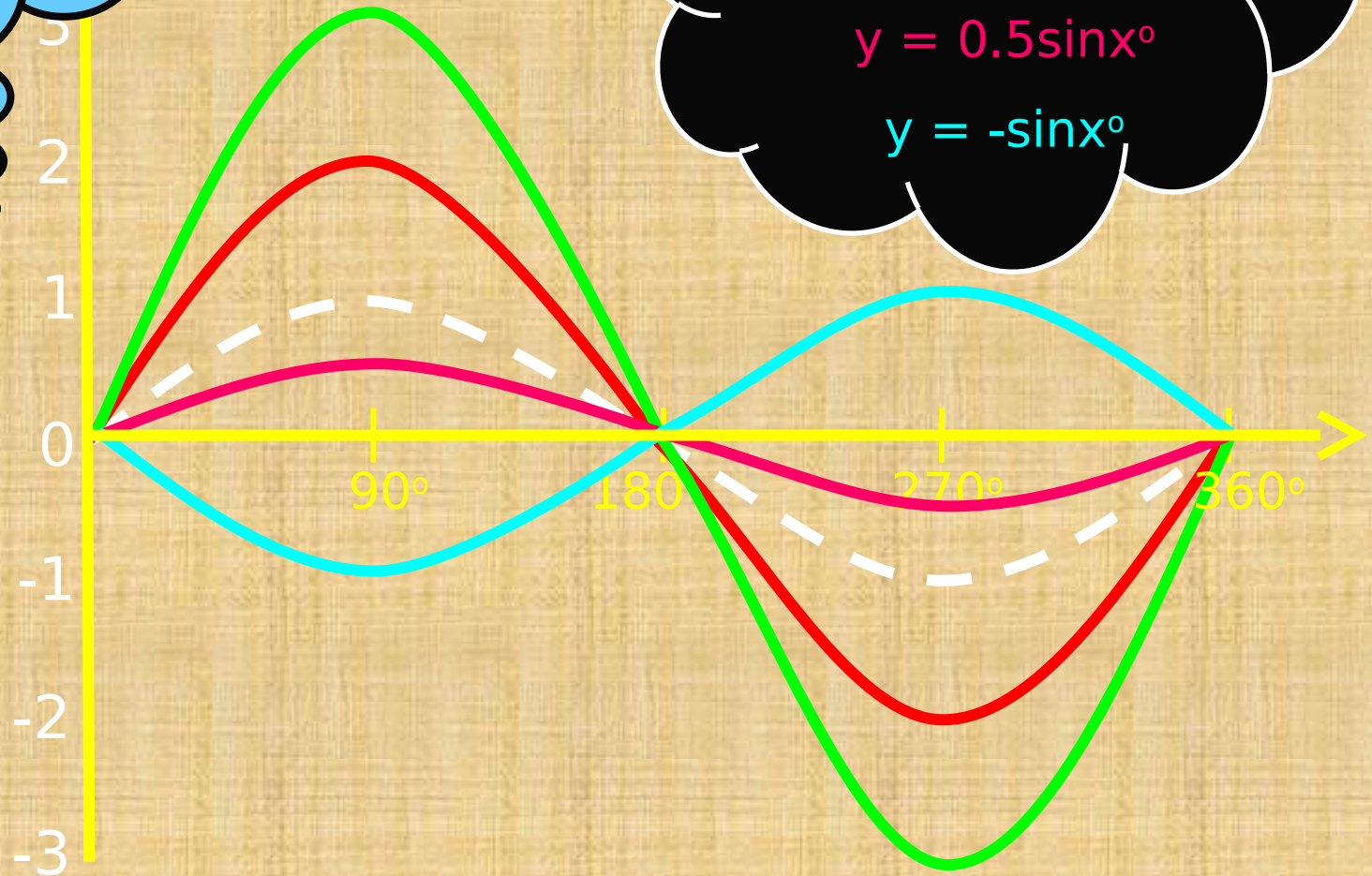
y = sinx°

y = 2sinx°

y = 3sinx°

y = 0.5sinx°

y = -sinx°



Sine Graph

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

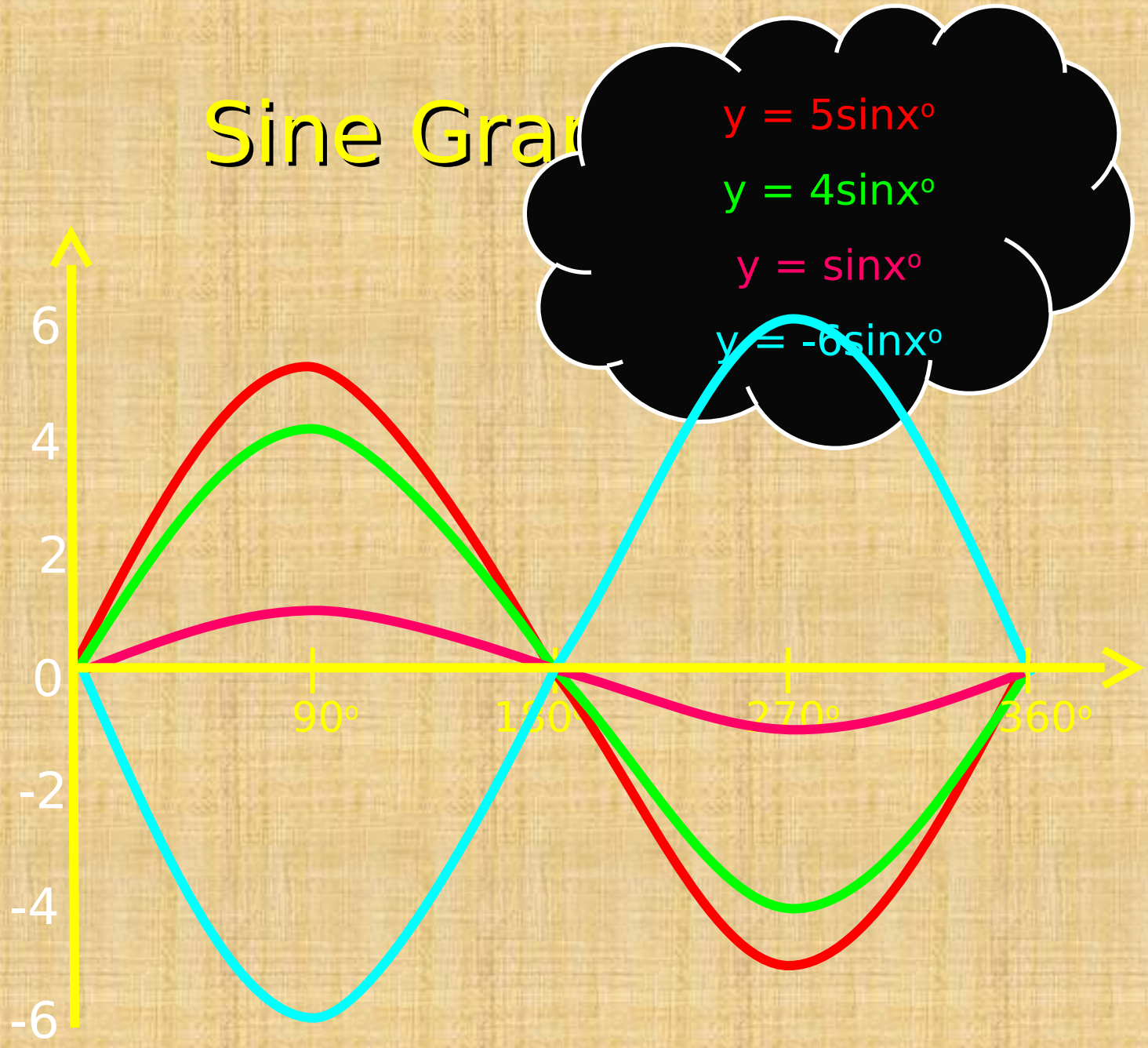


For a > 1 stretches graph in the y-axis direction

For a < 1 compresses graph in the y - axis directio

For a - negative flips graph in the x – axis.

Sine Gra



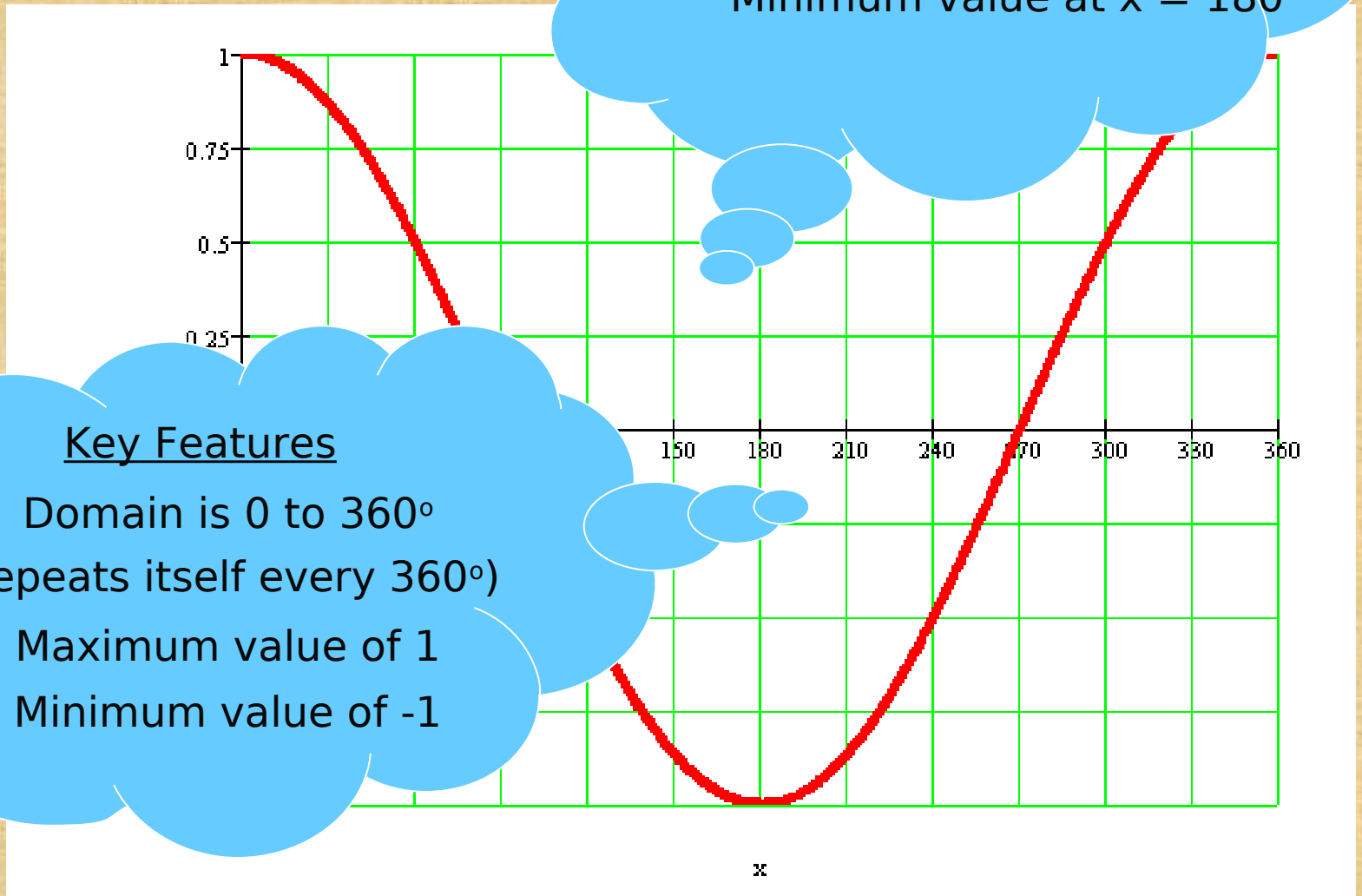
Cosine

<u>Key Features</u>

Zeros at 90° and 270°

Max value at x = 0° and 360°

Minimum value at x = 180°



<u>Key Features</u>

Domain is 0 to 360°

(repeats itself every 360°)

Maximum value of 1

Minimum value of -1

What effect does the number at the front have on the graphs ?

Co

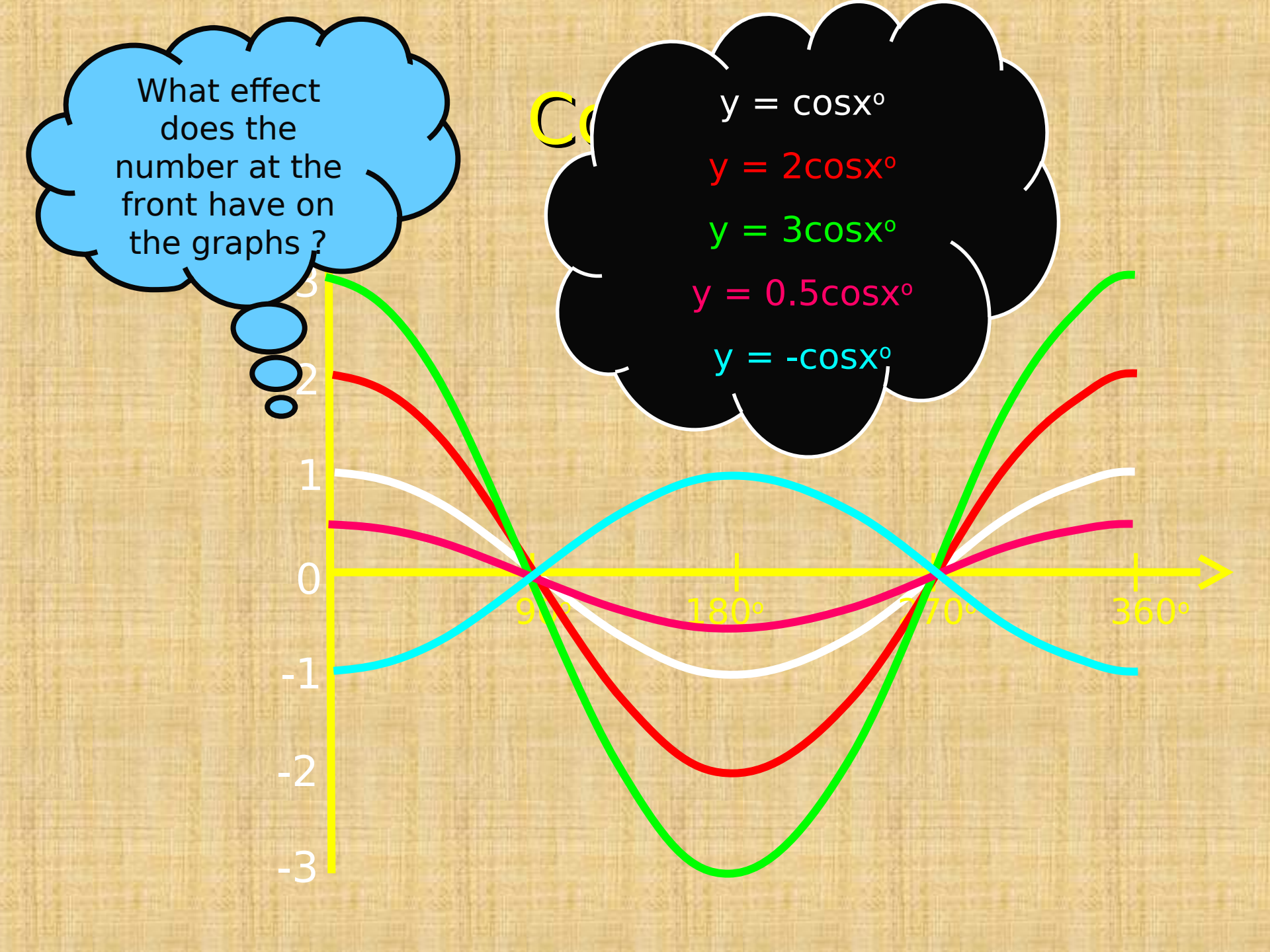
$y = \cos x^o$

$y = 2\cos x^o$

$y = 3\cos x^o$

$y = 0.5\cos x^o$

$y = -\cos x^o$



Cosin

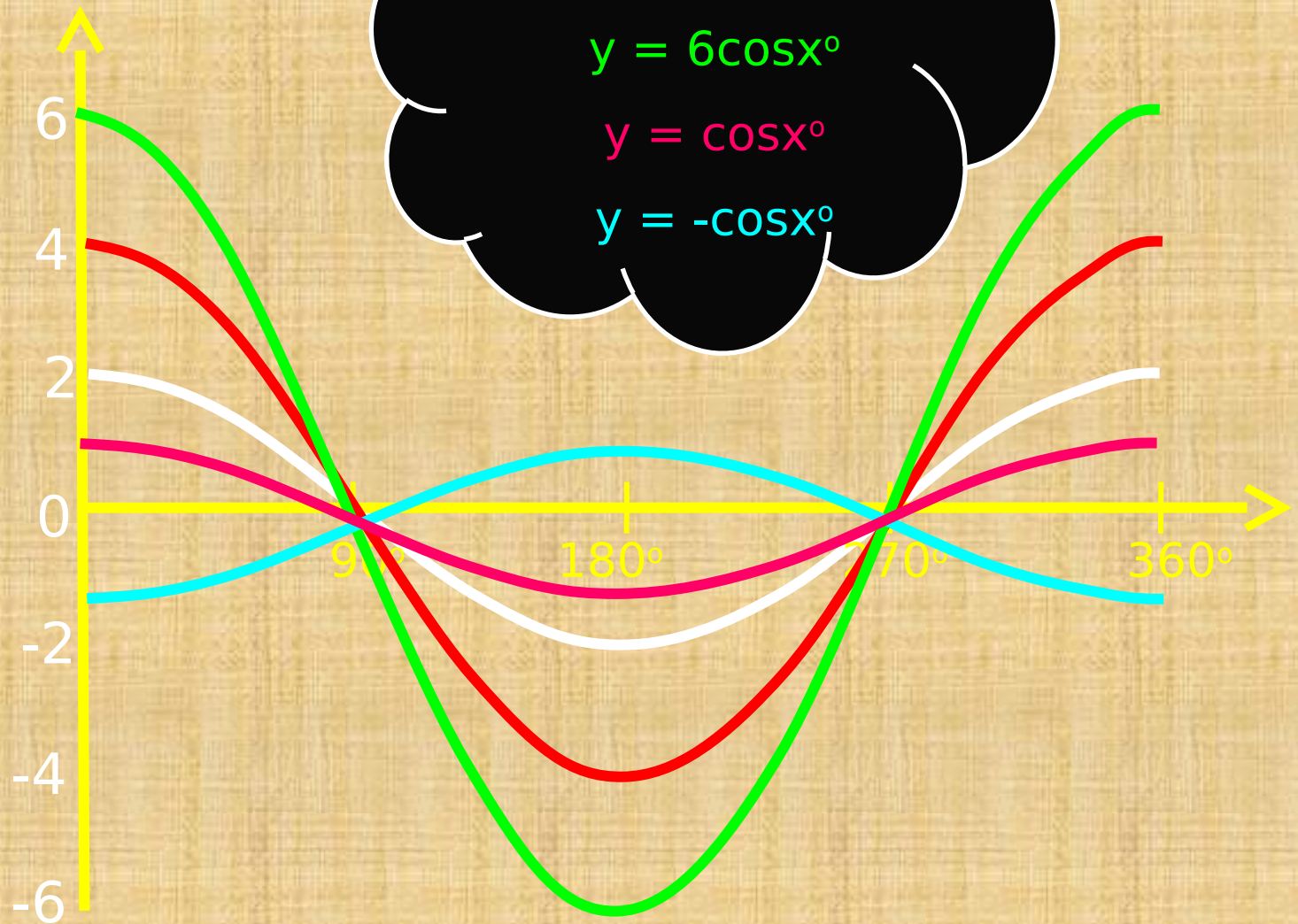
$y = \cos x^{o}$

$y = 4\cos x^{o}$

$y = 6\cos x^{o}$

$y = \cos x^{o}$

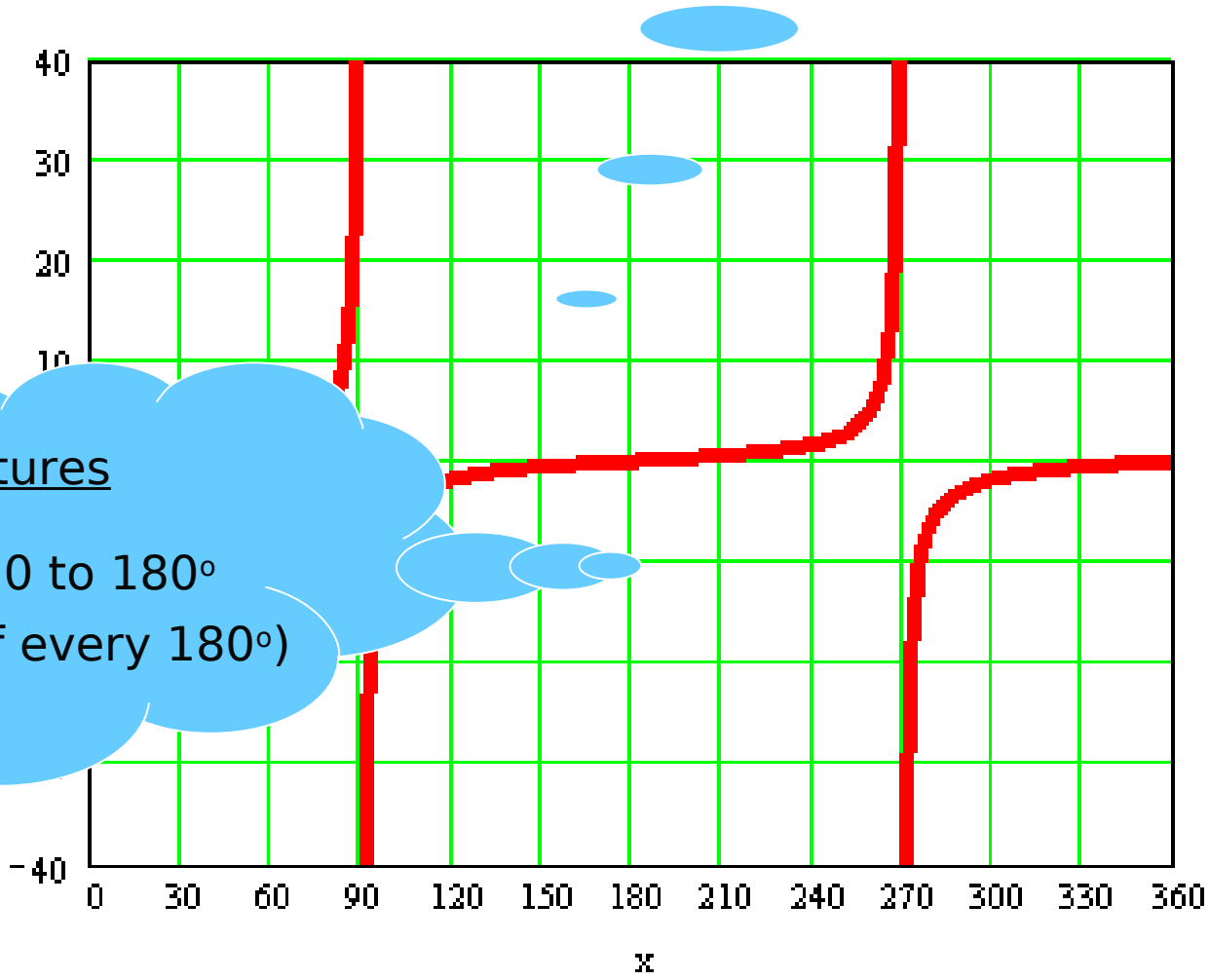
$y = -\cos x^{o}$



Tangent

Key Features

Zeros at 0 and 180°

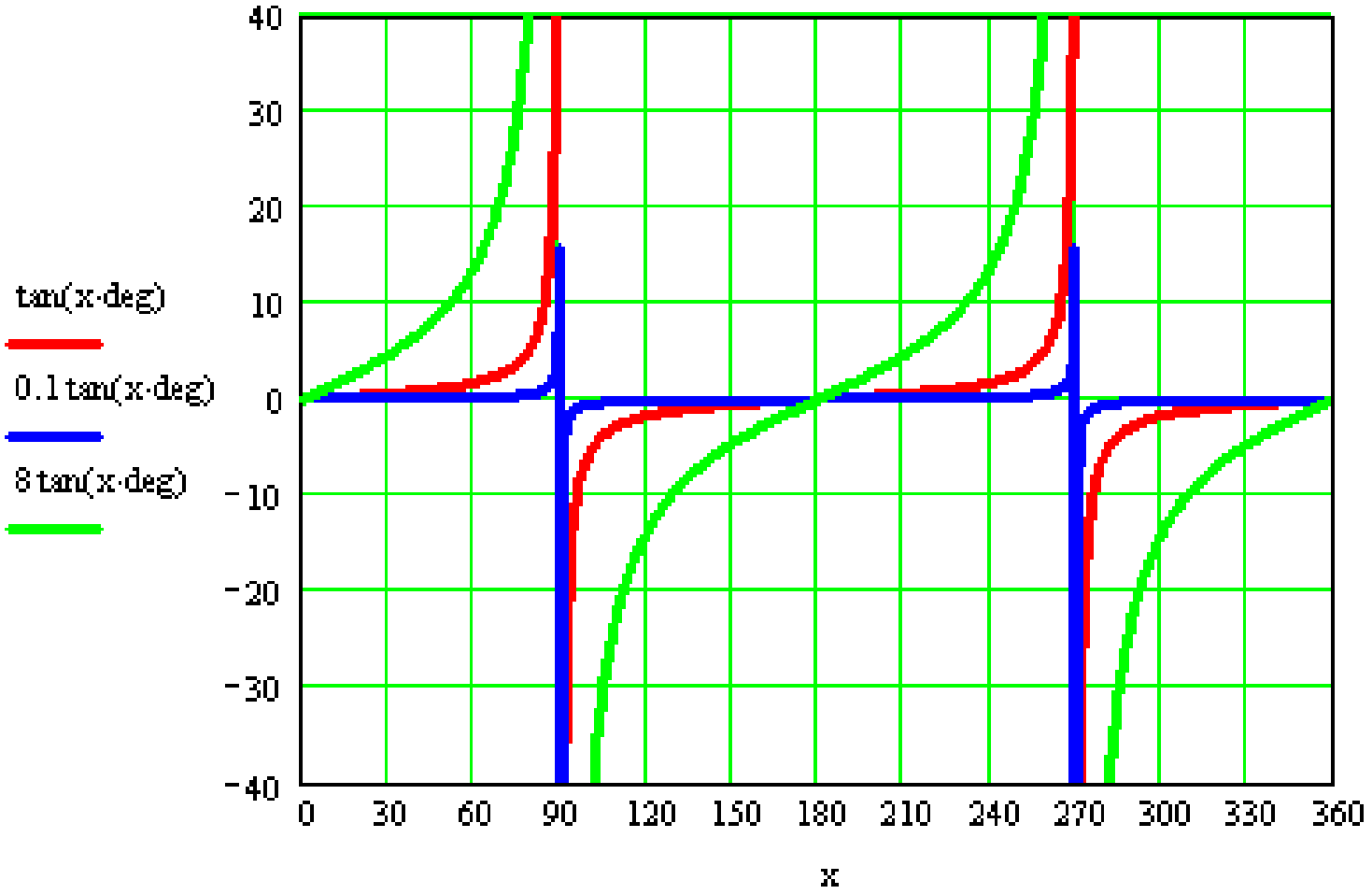


Key Features

Domain is 0 to 180°

(repeats itself every 180°)

Tangent Graphs



Tangent Graph

$$y = a \tan(x)$$



For a > 1 stretches graph in the y-axis direction

For a < 1 compresses graph in the y - axis directio

For a - negative flips graph in the x – axis.

Trig Graphs

Learning Intention

1. To investigate graphs of the form

   $y = a \sin bx^\circ$

   $y = a \cos bx^\circ$

   $y = \tan bx^\circ$

Success Criteria

1. Identify the key points for more complicated Trig graphs.

Period of a Function

When a pattern repeats itself over and over, it is said to be periodic.

Sine function has a period of 360°

Let's investigate the function

$$y = \sin bx$$

Sine Graph

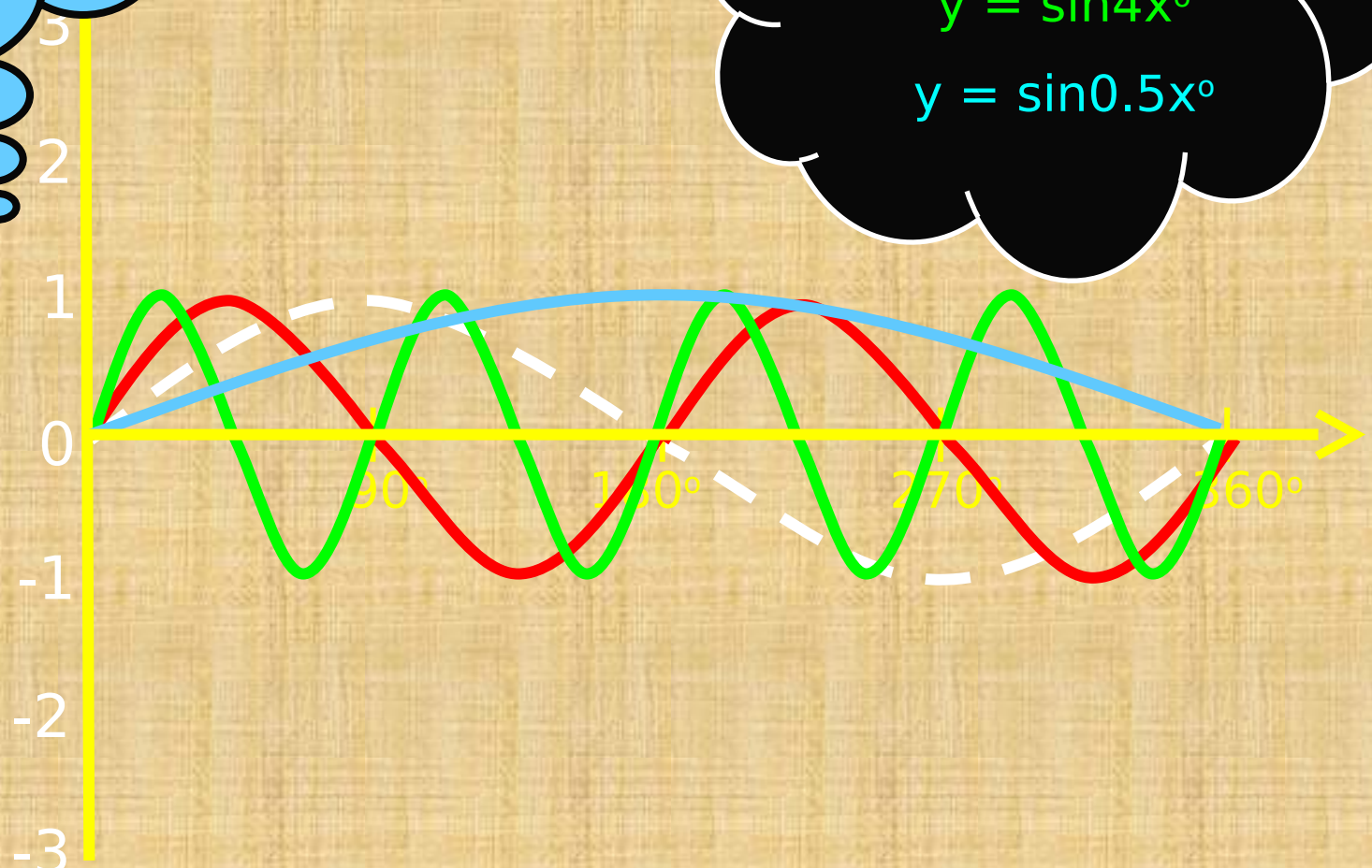
What effect does the number in front of x have on the graphs ?

$y = \sin x^o$

$y = \sin 2x^o$

$y = \sin 4x^o$

$y = \sin 0.5x^o$



Trigonometry Graphs

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

How many times it repeats itself in 360^{o}

For a > 1 stretches graph in the y-axis direction

For a < 1 compresses graph in the y - axis directio

For a - negative flips graph in the x – axis.

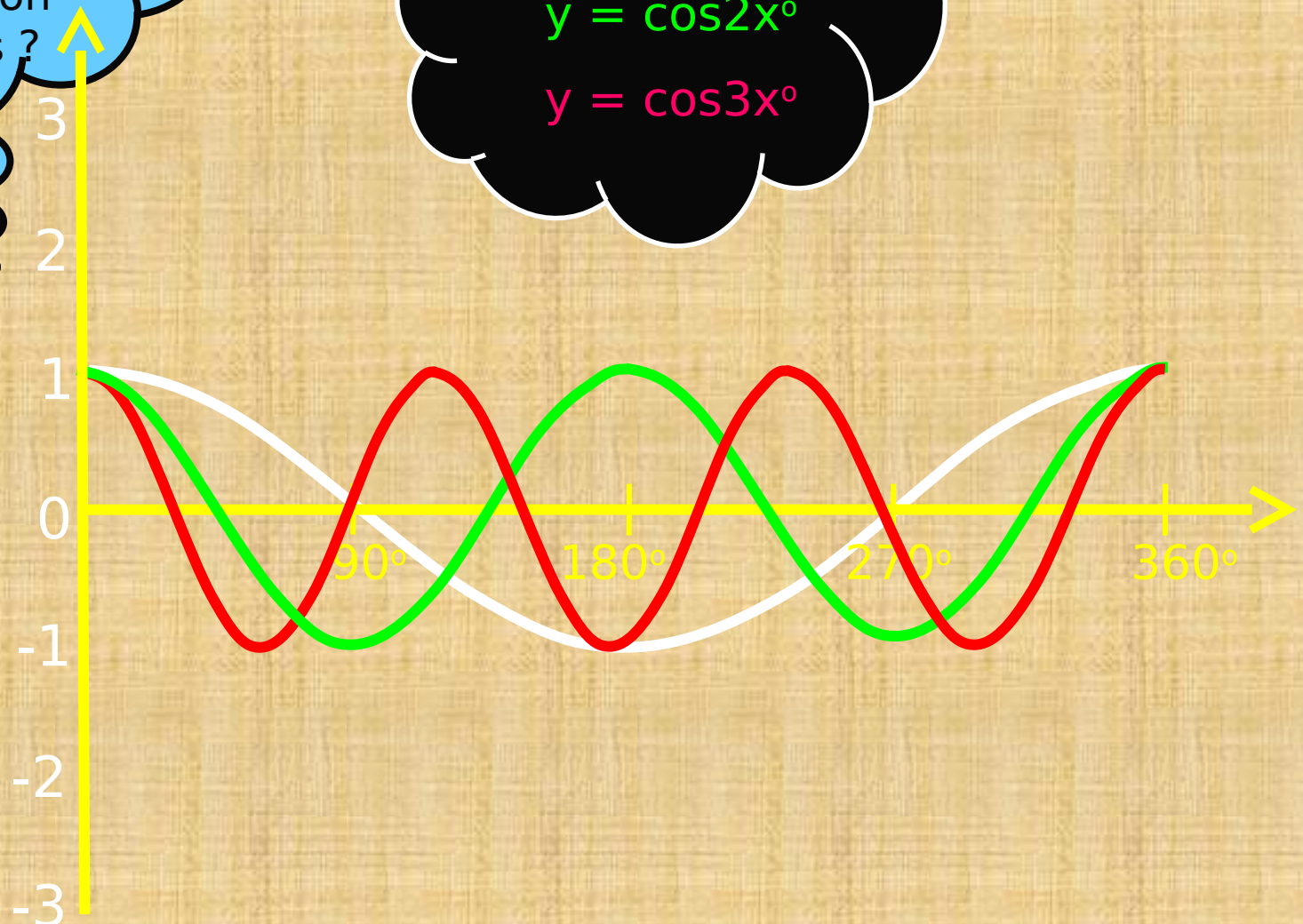
What effect does the number at the front have on the graphs ?

Co

$y = \cos x^{o}$

$y = \cos 2x^{o}$

$y = \cos 3x^{o}$



Trigonometry Graphs

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

How many times it repeats itself in 360^{o}

For a > 1 stretches graph in the y-axis direction

For a < 1 compresses graph in the y - axis directio

For a - negative flips graph in the x – axis.

Trigonometry Graphs

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

How many times it repeats itself in 180^{o}

For a > 1 stretches graph in the y-axis direction

For a < 1 compresses graph in the y - axis directio

For a - negative flips graph in the x – axis.

Trig Graph

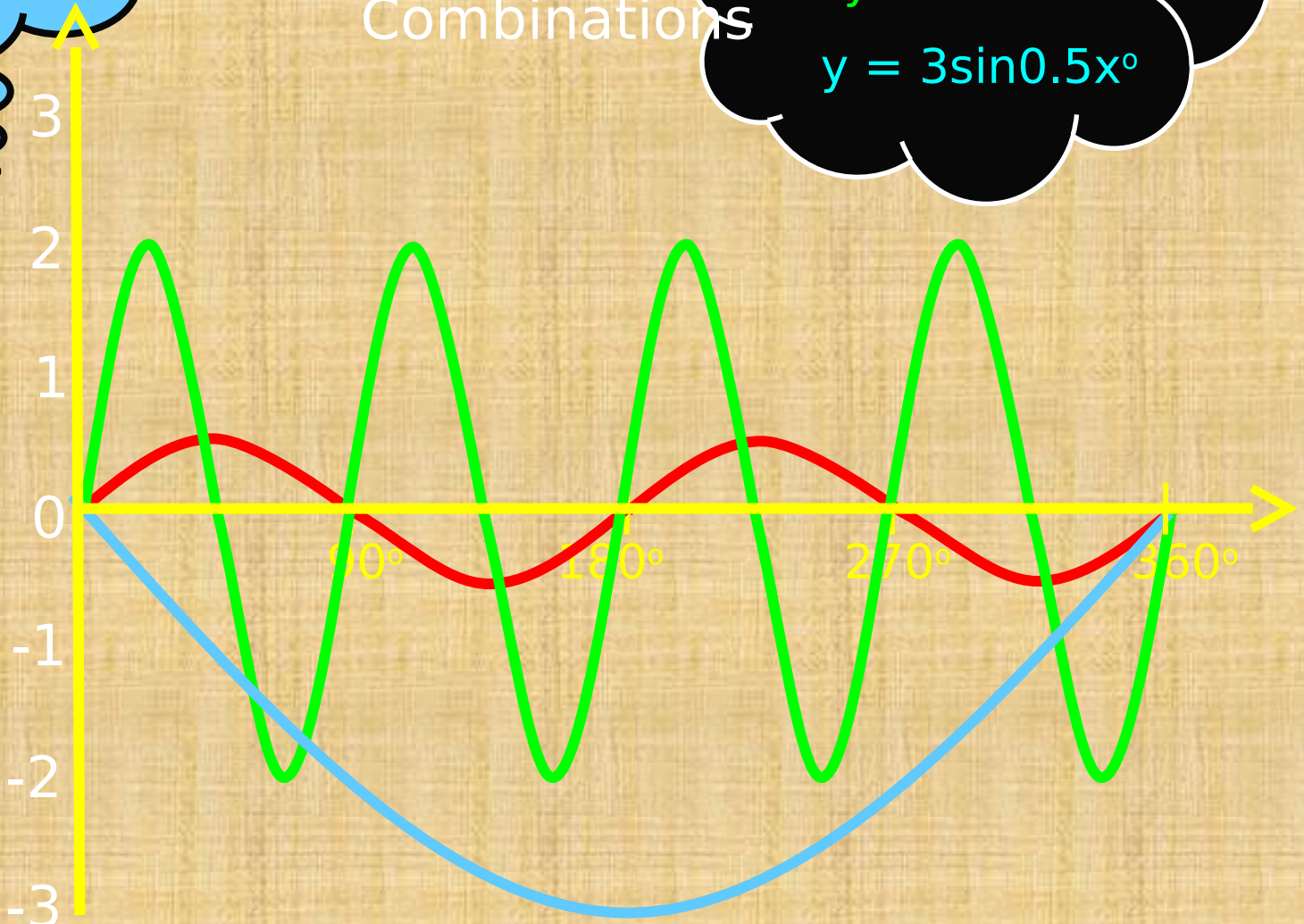
Combinations

Write down equations for graphs shown ?

$y = 0.5\sin 2x^{o}$

$y = 2\sin 4x^{o}$

$y = 3\sin 0.5x^{o}$



Cosine

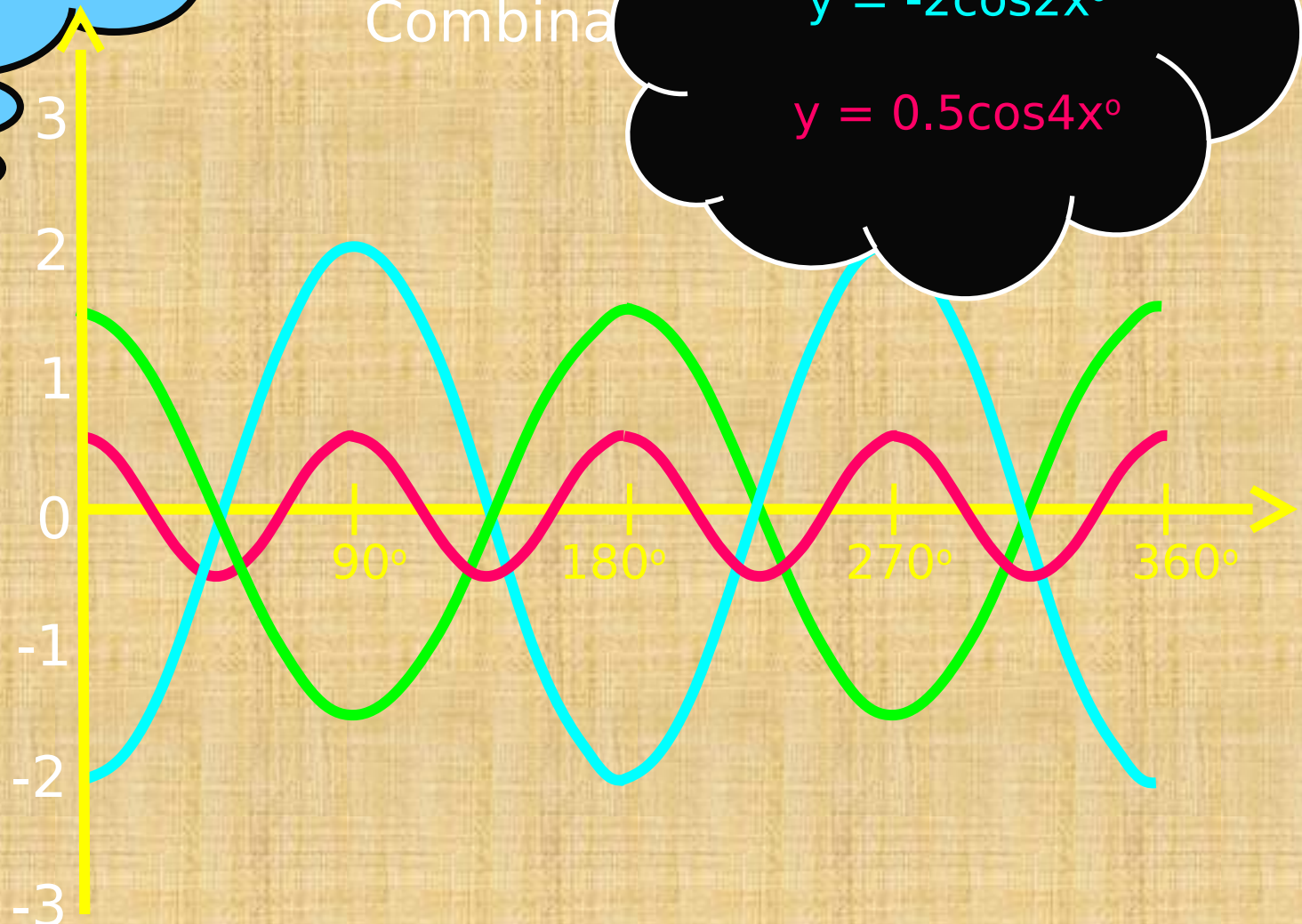
Combina

Write down equations for the graphs shown?

$y = 1.5\cos 2x^o$

$y = -2\cos 2x^o$

$y = 0.5\cos 4x^o$



Phase Angle

Learning Intention

1. To explain what phase angle / phase shift is using knowledge from quadratics.

Success Criteria

1. Understand the term phase angle / phase shift.

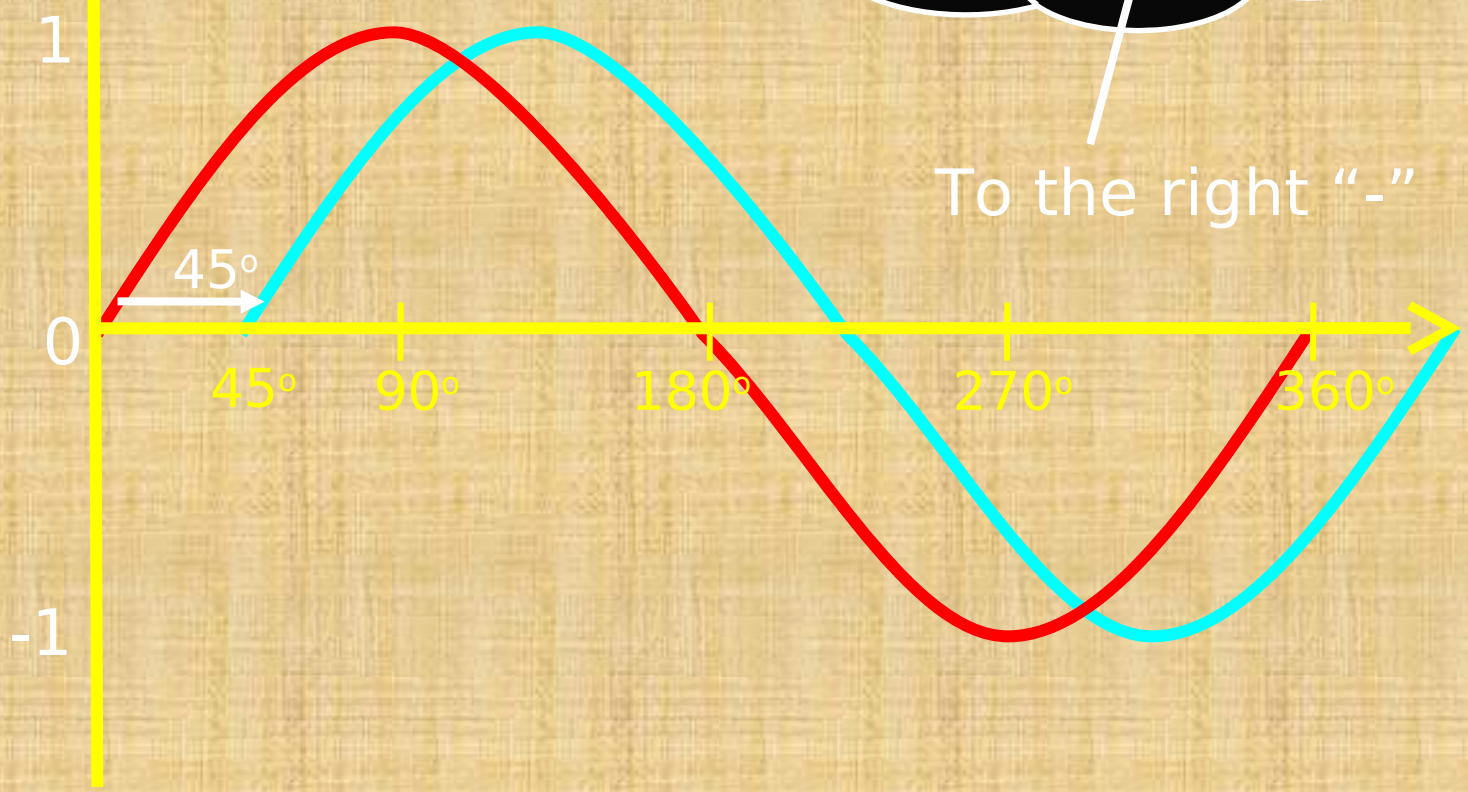
2. Read off the values for a and b for a graph of the form.

   $y = a \sin(x - c)^{o}$

raph

By how much do we have to move the standard sine curve so it fits on the other sine curve?

$y = \sin(x - 45)^\circ$

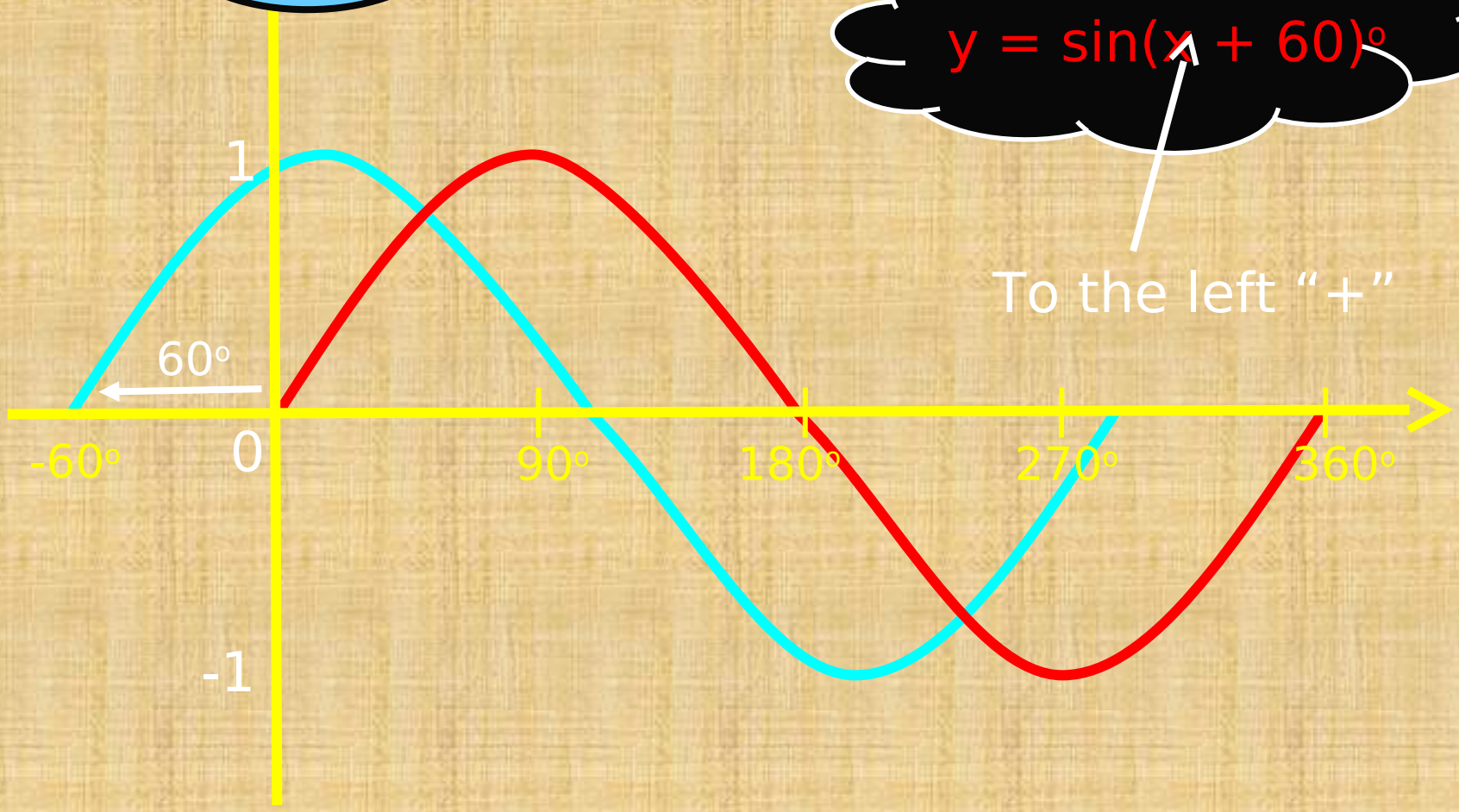


To the right "-"

raph

By how much do we have to move the standard sine curve so it fits on the other sine curve?

$y = \sin(x + 60)^\circ$



To the left "+"

Phase Angle

$$y = \sin(x - c)$$



Moves graph along x - axis

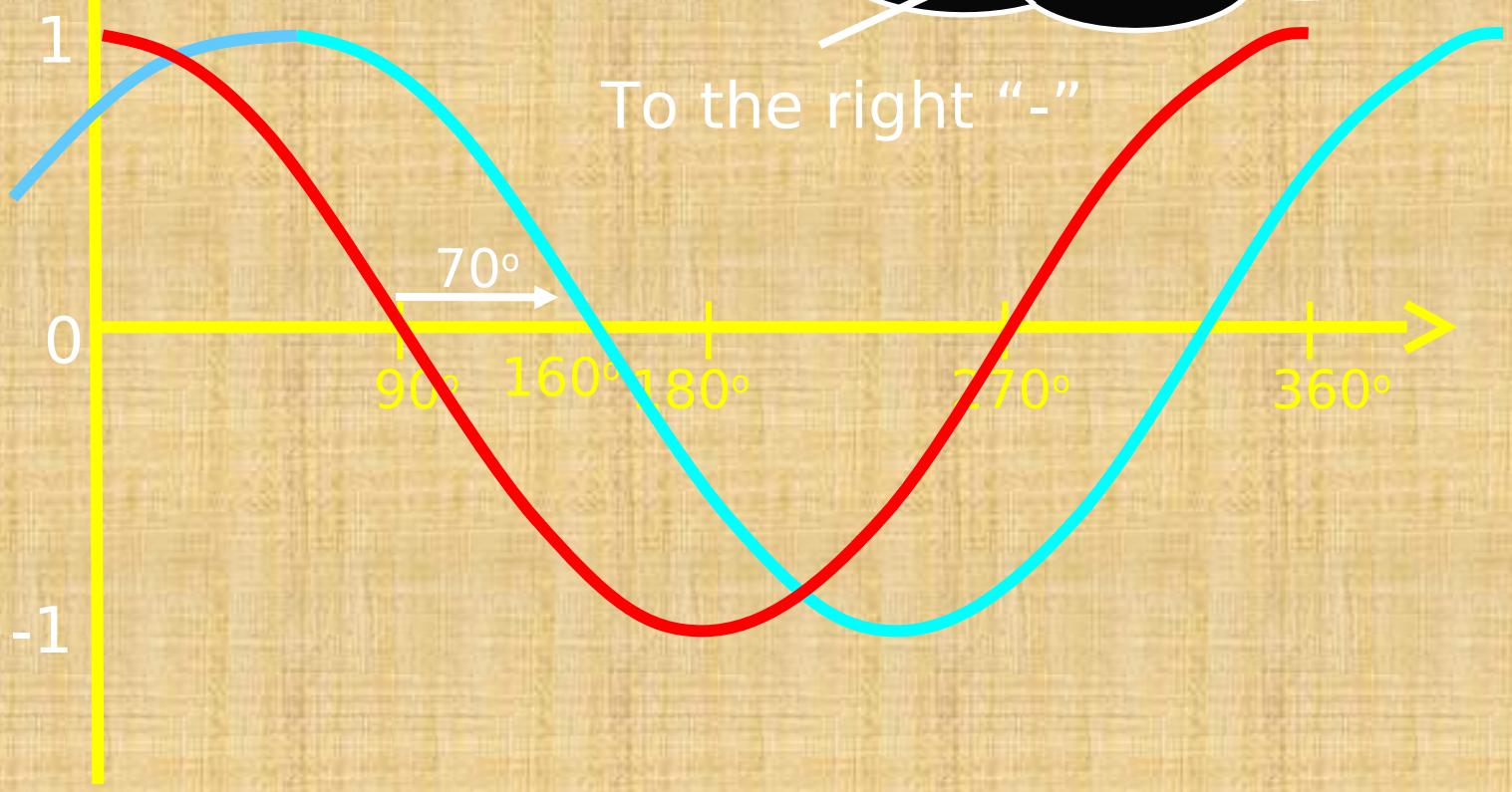
For $c > 0$ moves graph to the right along x – axis

For $c < 0$ moves graph to the left along x – axis

raph

By how much do we have to move the standard cosine curve so it fits on the other cosine curve?

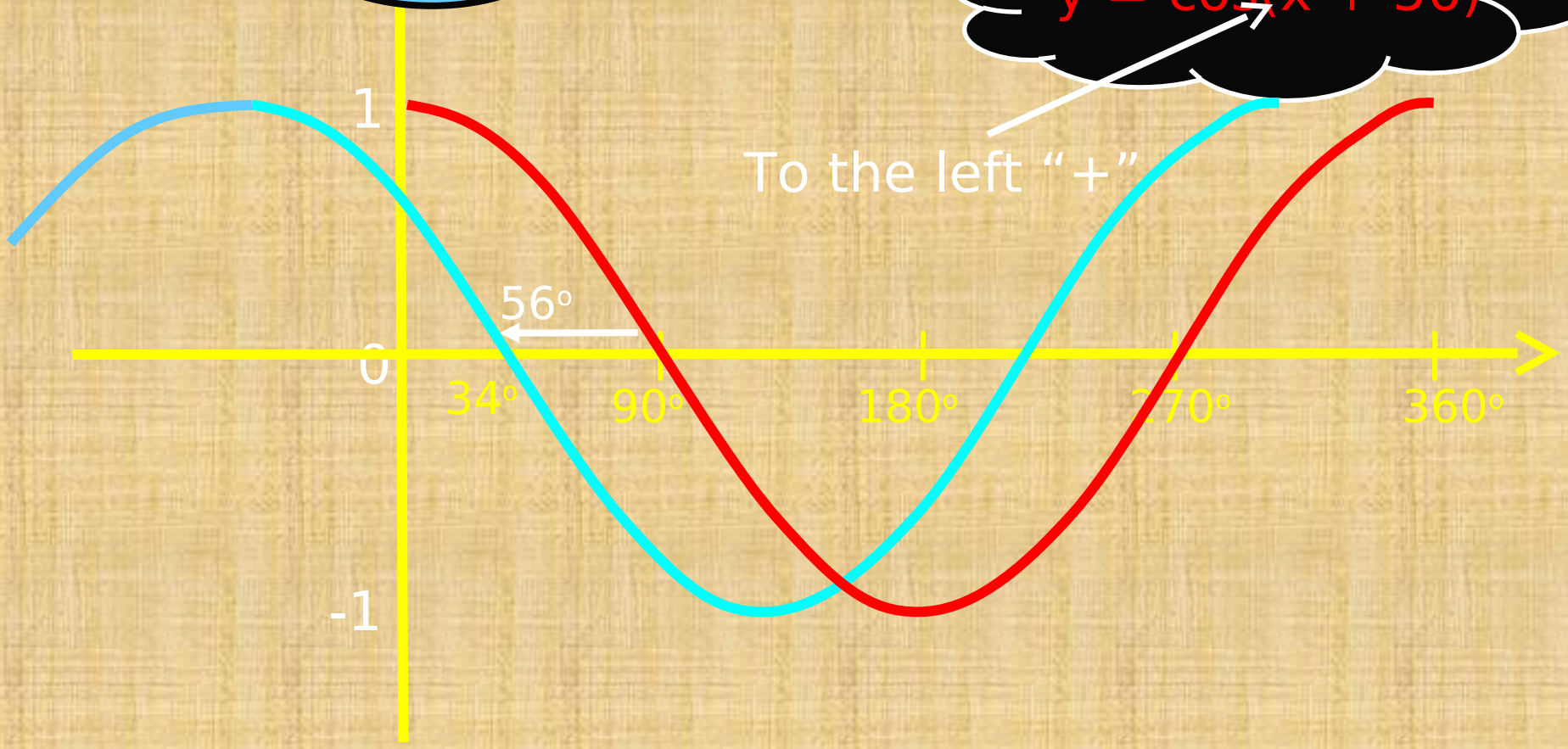
$y = \cos(x - 70)^o$



Graph

By how much do we have to move the standard cosine curve so it fits on the other cosine curve?

$y = \cos(x + 56)^o$



Summary of work So far

$$y = a \sin (x - b)$$

For a > 1 stretches graph in the y-axis direction

For a < 1 compresses graph in the y - axis direction

For a - negative flips graph in the x – axis.

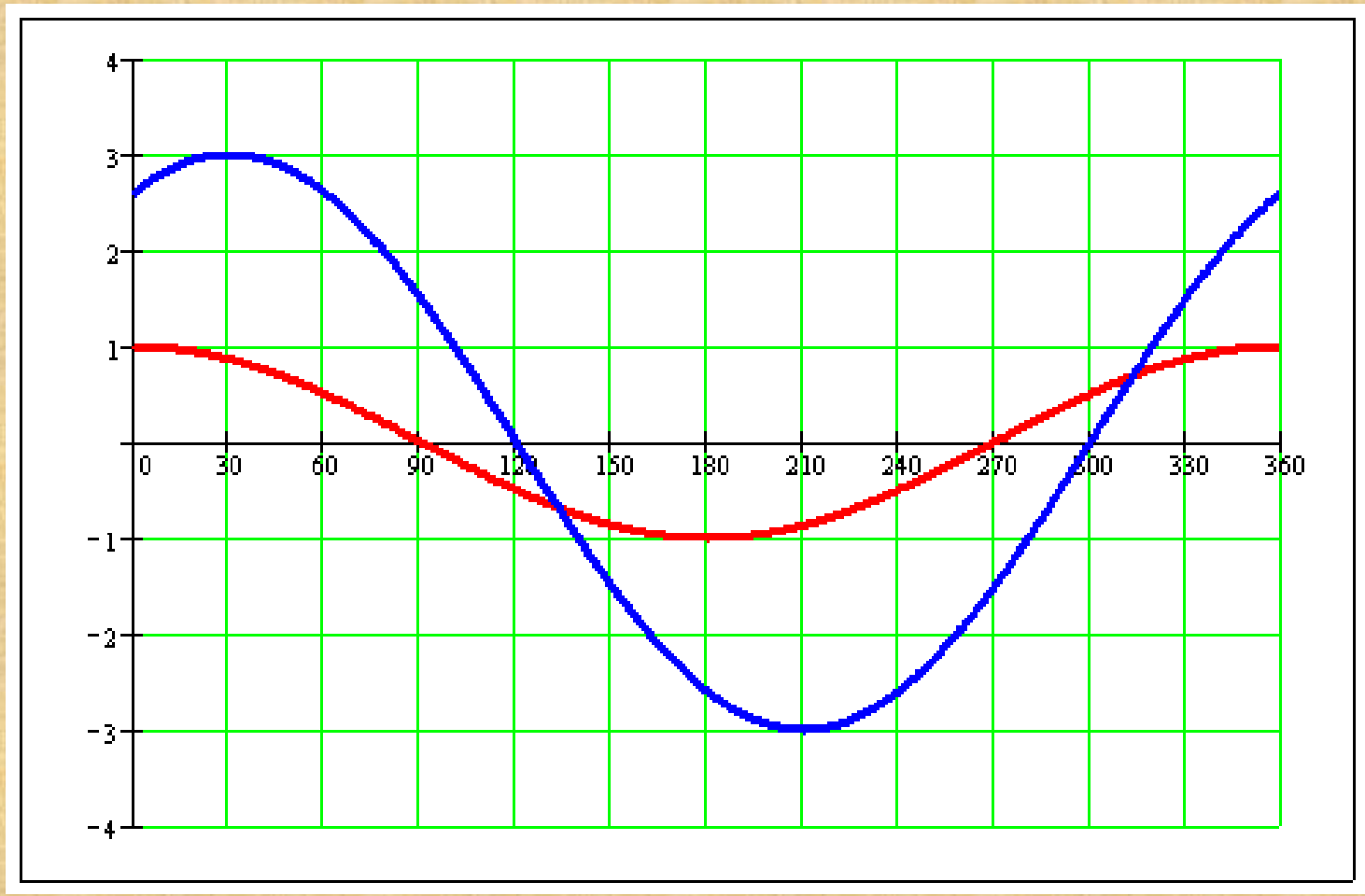
For b > 0 moves graph to the right along x – axis

For b < 0 moves graph to the left along x – axis

Sketch Graph

$y = a \cos (x - b)$

$a = 3$ $b = 30$ $y = 2 \cos (x - 30)$



Solving Trig Equations

Learning Intention

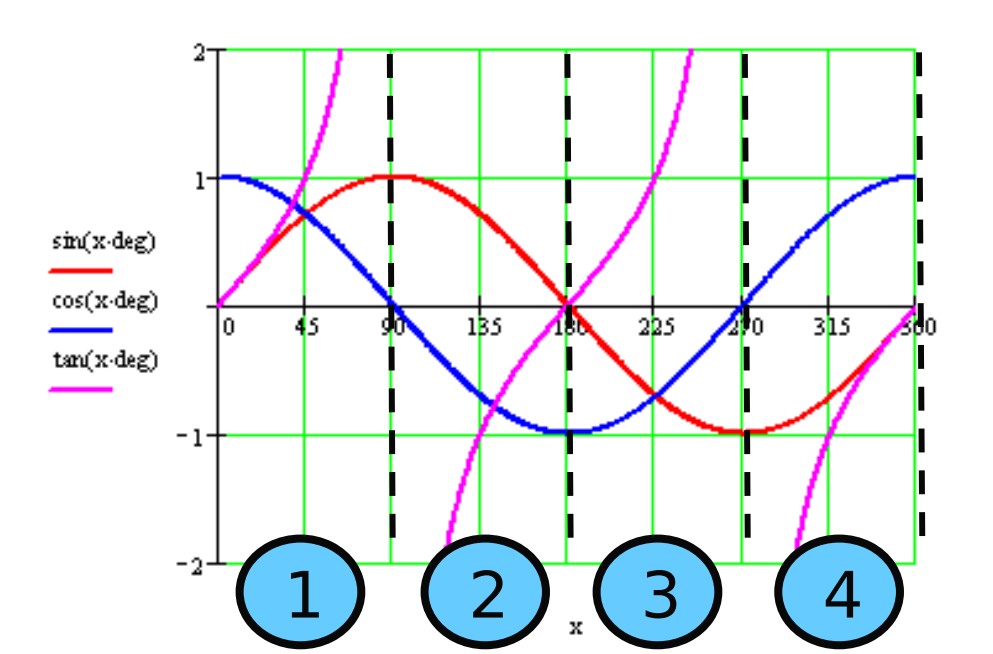
1. To explain how to solve trig equations of the form
   a $\sin x^{o} + 1 = 0$

Success Criteria

1. Use the rule for solving any ‘ normal ‘ equation

2. Realise that there are many solutions to trig equations depending on domain.

Solving Trig Equations



Sin +ve $180^o - x^o$	All +ve
$180^o + x^o$ Tan +ve	$360^o - x^o$ Cos +ve

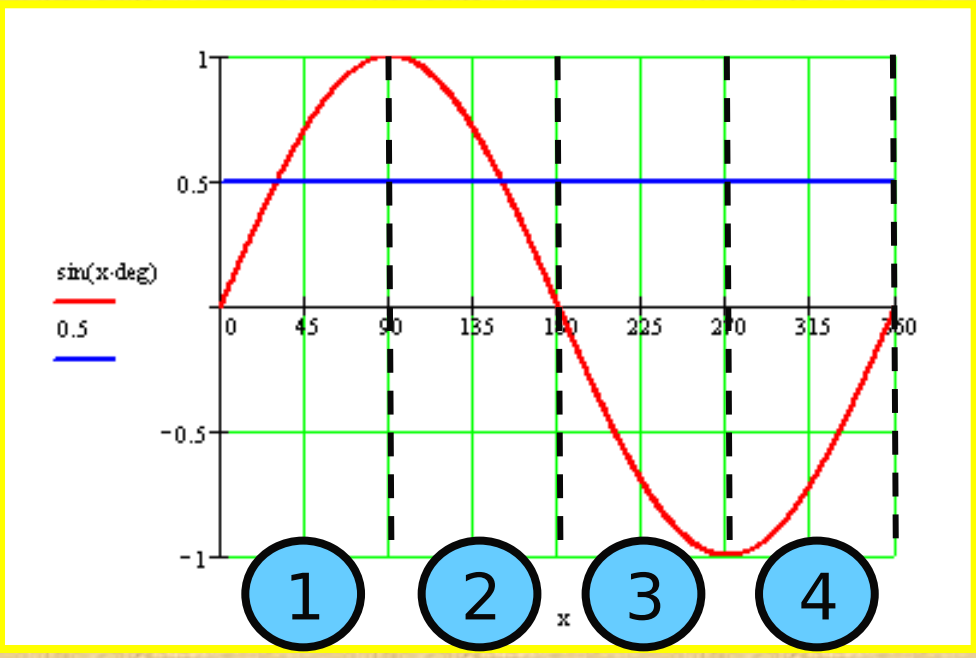
Solving Trig E

a sin x

Graphically what are we trying to solve

Example 1 :

Solving the equation sin $x^o = 0.5$ in the range 0^o to 360^o



$\sin x^o = (0.5)$

$x^o = \sin^{-1}(0.5)$

$x^o = 30^o$

There is another solution

$x^o = 150^o$

$(180^o - 30^o = 150^o)$

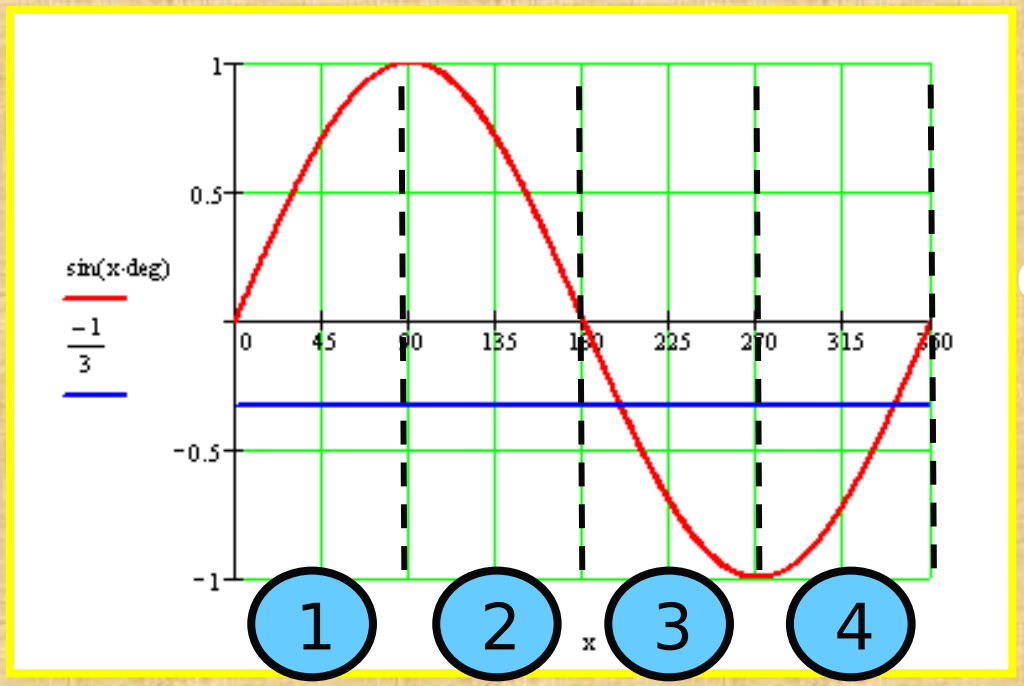
Solving Trig E

a sin x

Graphically what are we trying to solve

Example 1 :

Solving the equation $3\sin x^\circ + 1 = 0$ in the range 0° to 360°



$\sin x^\circ = -1/3$

Calculate first Quad value

$x^\circ = 19.5^\circ$

$x = 180^\circ + 19.5^\circ = 199.5^\circ$

There is another solution

($360^\circ - 19.5^\circ = 340.5^\circ$)

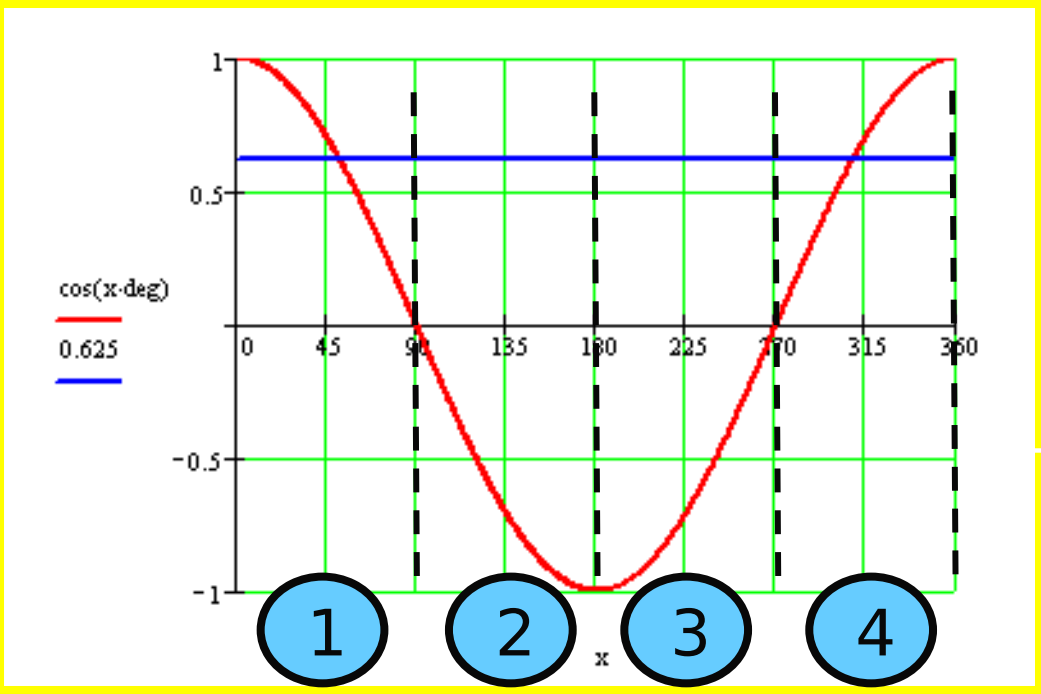
Solving Trig E

a cos x

Graphically what are we trying to solve

Example 1 :

Solving the equation cos x^o = 0.625 in the range 0^o to 360^o



cos x^o = 0.625

$x^o = \cos^{-1} 0.625$

x^o = 51.3^o

There is another solution

(360^o - 53.1^o = 308.7^o)

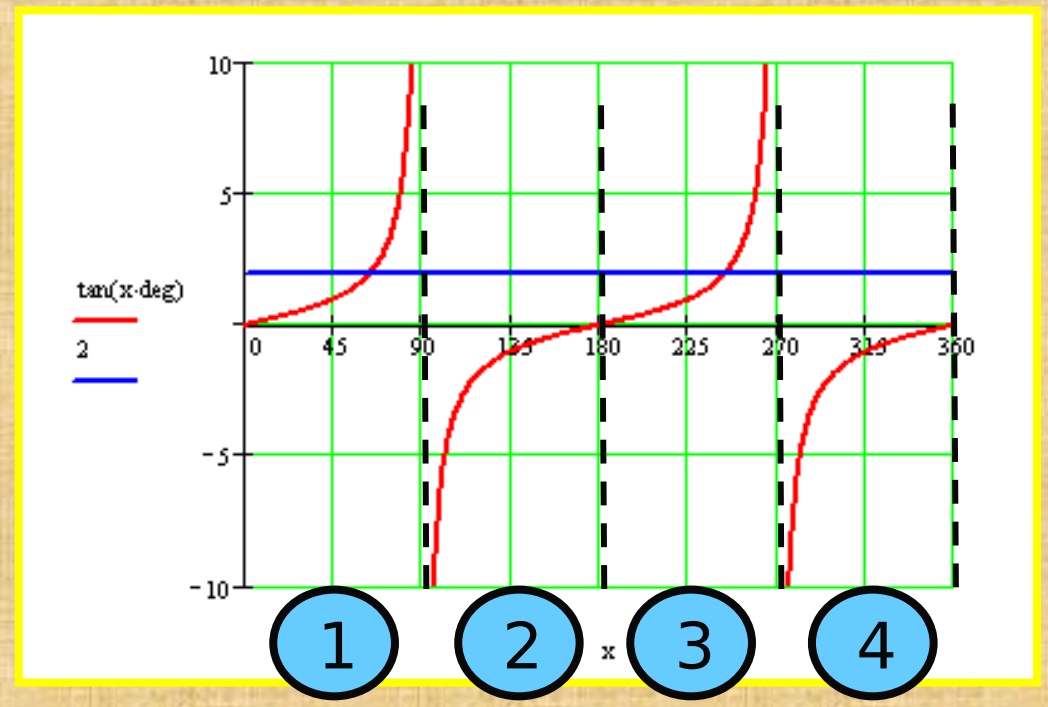
Solving Trig E

a tan x

Graphically what are we trying to solve

Example 1 :

Solving the equation tan $x^o = 2$ in the range 0^o to 360^o



$\tan x^o = 2$

$x^o = \tan^{-1}(2)$

$x^o = 63.4^o$

There is another solution

$x = 180^o + 63.4^o = 243.4^o$

Solving Trig Equations

Learning Intention

1. To explain some special trig relationships

$\sin^2 x^\circ + \cos^2 x^\circ = ?$

and

$\tan x^\circ$ and $\frac{\sin x}{\cos x}$

Success Criteria

1. Know and learn the two special trig relationships.

2. Apply them to solve problems.

Solving Trig Equations

Lets investigate

$\sin^2 x^\circ + \cos^2 x^\circ = ?$

Calculate value for x = 10, 20, 50, 250

$\sin^2 x^\circ + \cos^2 x^\circ = 1$

Learn !

Solving Trig Equations

Lets investigate

$\tan x^o$ and $\dfrac{\sin x^o}{\cos x^o}$

Calculate value for x = 10, 20, 50, 250

$\tan x^o = \dfrac{\sin x^o}{\cos x^o}$ Learn !