Daily Practice 9.6.2016

MARK

1. Solve algebraically the system of equations

$3x + 2y = 17$

$2x + 5y = 4.$ 3

MARK

2. Simplify $\frac{x^2 - 4x}{x^2 + x - 20}$. 3

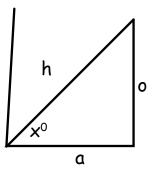
Today we will be learning how to draw the graphs of trigonometric functions.

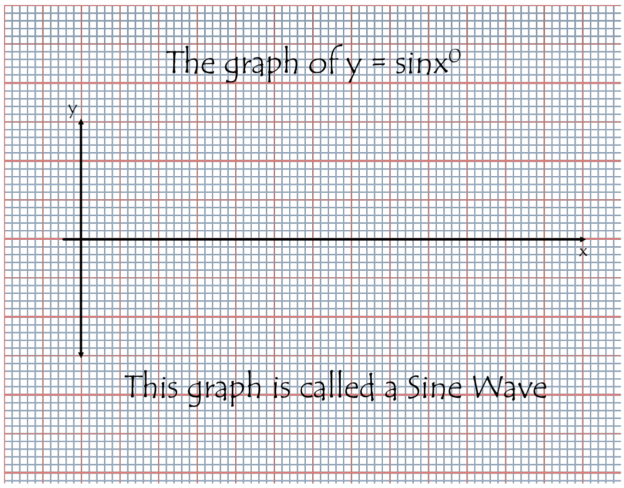
The graph of the Sine Function

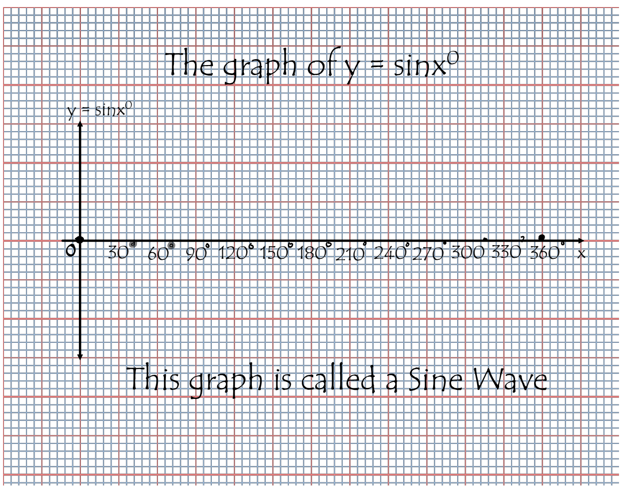
Like other functions, points created using trigonometric functions can also be plotted to form a graph.

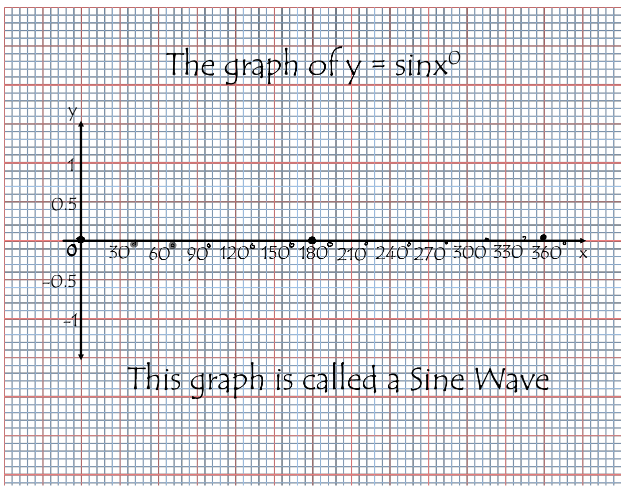
We can create a graph by using values along the x axis.

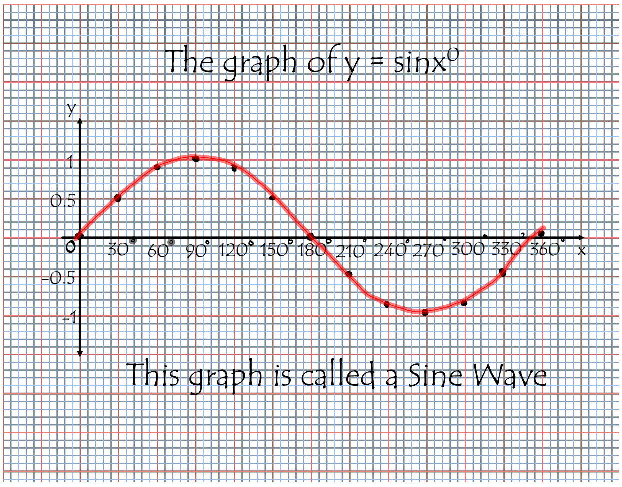
A typical Sine graph goes to 360° on the x - axis











Sketching the graph of the Sine Function

The graph of the Sine Function

Now draw a sketch of the graph y = 2 sinx

Daily Practice ▲ ▲ ▲ 10.6.2016

Q1. State the roots of the function $y = x^2 + 4x - 12$

Roots ⇒ $y = 0$ $\quad 0 = x^2 + 4x - 12$

$(x+6)(x-2) = 0$

$(-6,0)\ (2,0)$

$x = -6$ or $x = 2$

Q2. Calculate the gradient of the line joining (3, -1) and (7, 6)

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6-(-1)}{7-3} = \frac{7}{4}$

Q3. Factorise $81 - 100b^2$

$(9 + 10b)(9 - 10b)$

Q4. Calculate the volume of a sphere with diameter 10cm to 2 s.f.

$V = \frac{4}{3}\pi r^3 = \frac{4}{3} \times \pi \times 5^3 = 523.5 \rightarrow 520\text{cm}^3$

Q5. Rearrange $2t^2 + b = c^2$ such that t is the subject

$-b \quad -b$

$2t^2 = c^2 - b$

$\div 2 \quad \div 2$

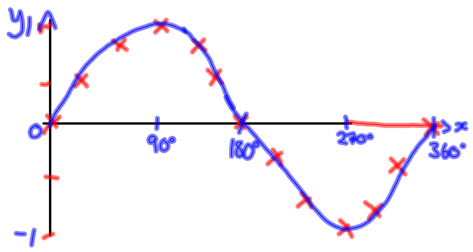
$t^2 = \frac{c^2 - b}{2}$

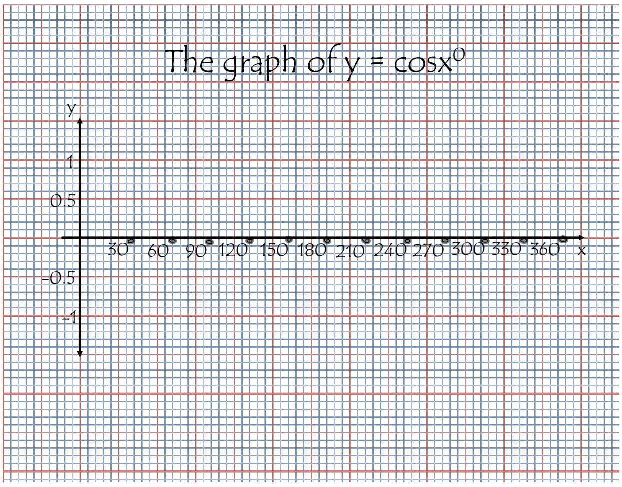
$t = \sqrt{\frac{c^2 - b}{2}}$

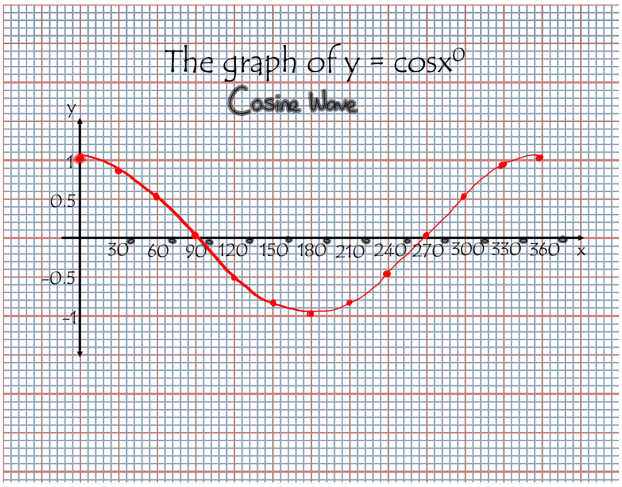
Today we will be continuing to draw the graphs of trigonometric functions.

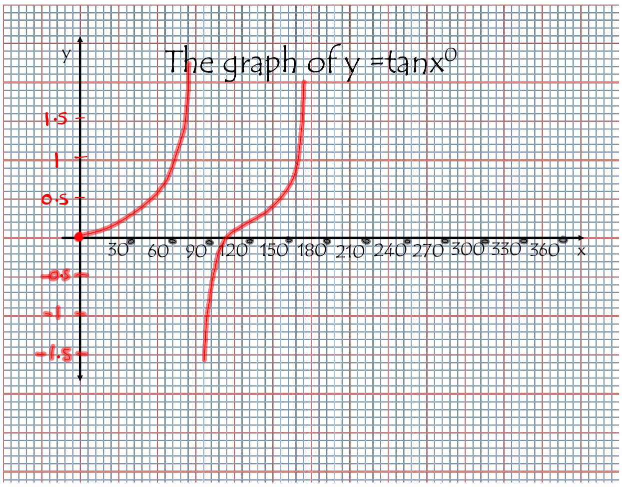
The graph of the Sine Function

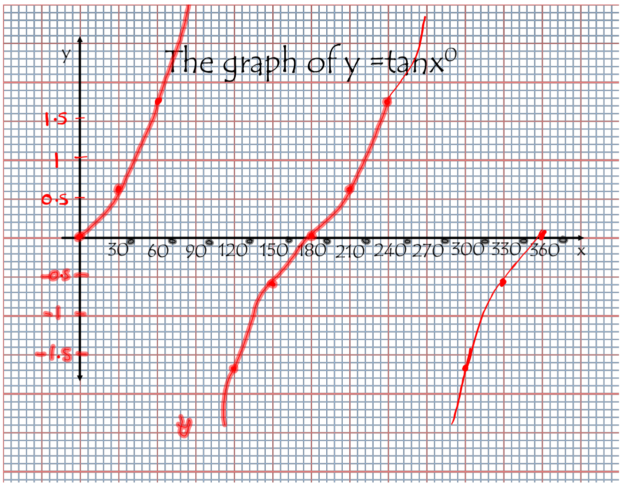
Can you remember what a sketch of a Sine graph looks like?

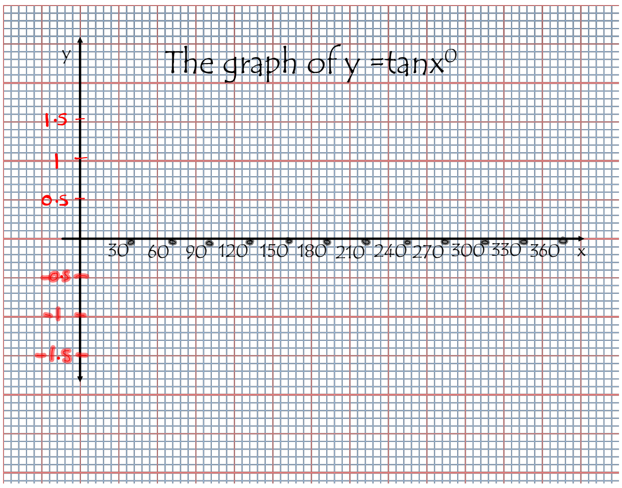












Daily Practice 13.6.2016

Q1. Calculate the height of a cylinder with radius 7cm and volume 14000cm^3

Q2. State the turning point and its nature for the function $y = -(x + 3)^2$

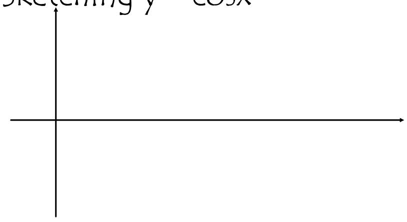
Q3. Multiply out and simplify $(m - 7)(2m^2 + 5m - 1)$

Q4. State the point where the line $2x + y = 12$ crosses the x - axis (remember $y = 0$, when a line crosses the x - axis)

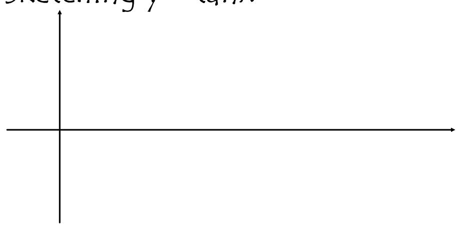
Q5. Factorise $2x^2 + 9x + 4$

Today we will be looking at the features of trigonometric graphs and looking at transformations of graphs.

Sketching y = cosx^0



Sketching y = tanx^0



Period and Amplitude

The period of a function is the length of a wave before it repeats itself.

The graphs of Sin and Cos have a period of 360^0 whereas Tan has a period of 180^0 .

The amplitude of a graph is half the height between the maximum and minimum turning points. The amplitude of the functions y = sinx^0 and y = cosx^0 is 1. We don't need to worry about the amplitude of tan.

Daily Practice **14.6.2016**

Q1. Factorise $6x^2 + 17x + 5$

$(2x+5)(3x+1)$

$15x$ $2x$

Q2. Simplify $3\sqrt{10} + \sqrt{900} - \sqrt{2500}$

$3\sqrt{10} + 30 - 50 = 3\sqrt{10} - 20$

Q3. What is the semi-interquarle range of the data below?

15 25 36 58 22 63 77 5

5 15 | 22 25 | 36 58 | 63 77

S.I.Q.R $= \frac{Q_3 - Q_1}{2} = \frac{60.5 - 18.5}{2} = 21$

$Q_1 = \frac{15+22}{2} = 18.5$ $Q_3 = \frac{58+63}{2} = 60.5$

Q4. State the equaon of the line joining (-3, 2) and (1, 8)

a, b

Give your answer in the form Ax + By + C = 0

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8-2}{1-(-3)} = \frac{6}{4} = \frac{3}{2}$

$y - b = m(x - a)$

$y - 8 = \frac{3}{2}(x - 1)$

$\times 2$ $\times 2$

$2y - 16 = 3x - 3$

$-3x+3$ $-3x+3$

$2y - 3x - 13 = 0$

$3x - 2y + 13 = 0$

Today we will be continuing to learn about graph transformations.

Graph transformations

The amplitude and period of a trig. function can change if the graph is transformed (stretched or compressed horizontally or vertically).

Desmos

Graph transformations

Given the functions $y = a\sin x^o$ or $y = a\cos x^o$, 'a' represents the amplitude of the function. '–a' means the graph is upside down.

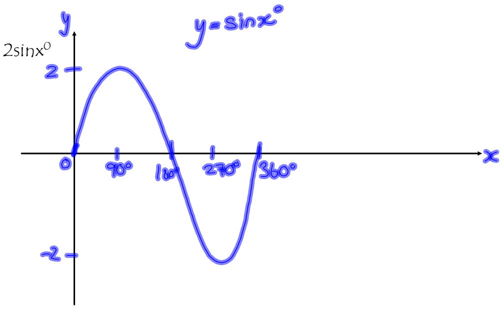
Given the functions $y = a\sin bx^o$ or $y = a\cos bx^o$, 'b' represents the number of times the graph repeats itself in 360^o ($360^o \div$ period). For $y = \tan bx^o$, it is how many times the graph repeats itself in 180^o ($180^o \div$ period).

We need to be able to identify and sketch these graphs.

Graph transformations

Examples: Sketch graphs of the following

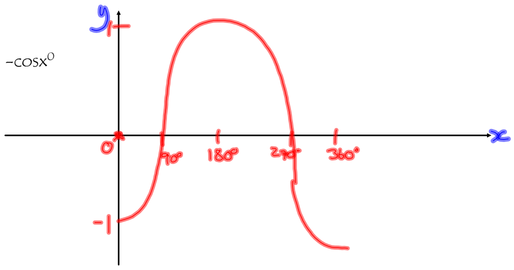
(a) $y = 2\sin x^o$



Graph transformations

Examples: Sketch graphs of the following

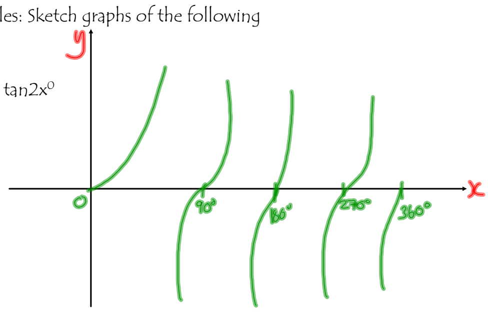
(b) $y = -\cos x^o$



Graph transformations

Examples: Sketch graphs of the following

(c) $y = \tan 2x^o$



Daily Practice 16.6.2016

Q1. Solve $6x - 2(5x + 4) = 0$

$6x - 10x - 8 = 0$
$-4x - 8 = 0$ (+8 +8)
$-4x = 8$
$x = -2$

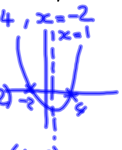
Q2. State the roots of the function $y = x^2 + 7x + 12$

$y = 0$ at roots
$x^2 + 7x + 12 = 0$
$(x + 3)(x + 4) = 0$
$x = -3$ or $x = -4$

Q3. State the turning point, nature and axis of symmetry of the function $y = (x - 4)(x + 2)$

$x^2 - 2x - 8$
$(x-1)^2 - 9$ T.P. $= (1, -9)$

Roots $x = 4$, $x = -2$
$x = 1$



$y = (1-4)(1+2)$
$y = (-3)(3)$
$y = -9$ $(1, -9)$
Minimum T.P.
Axis of symmetry: $x = 1$

Q4. Solve the equation $x^2 - 4x = 0$

$x(x - 4) = 0$
$x = 0$ or $x = 4$

~~$x^2 = 4x$~~
~~$x = 4$~~

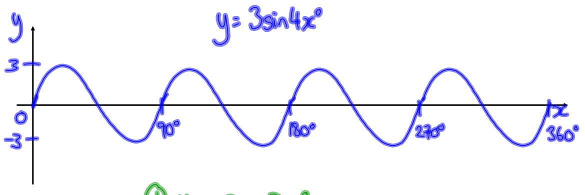
Today we will be continuing to learn how to draw and identify trigonometric graph transformations.

Homework Online due Thursday 23.6.2016

Graph transformations

Examples: Sketch graphs of the following

(c) $y = 3\sin 4x^o$



① $y = -2\sin 2x^\circ$

Graph transformations

Questions: Sketch graphs of the following

(a) $y = 4\sin x^o$

(b) $y = 2\cos x^o$

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

(d) $y = \sin 2x^o$

(e) $y = 2\cos 3x^o$

(f) $y = -2\sin 2x^o$

(g) $y = \tan 3x^o$

(h) $y = -\sin 3x^o$

Daily Practice **17.6.2016**

Q1. Factorise $x^2 - 4y^2$

$(x-2y)(x+2y)$

Q2. State the y – intercept, turning point and axis of symmetry of the function $f(x) = (x - 3)^2 + 2$

$y = (0-3)^2 + 2$
$y = 9 + 2 = 11$
$(0, 11)$

T.P. = $(3, 2)$ Axis of Sym. ⇒ $\underline{x = 3}$

Q3. Rearrange the formula $Y = 2ac^2 + b$ such that c is the subject

$Y - b = 2ac^2$

$\frac{Y-b}{2a} = c^2$

$c = \sqrt{\frac{Y-b}{2a}}$

ab

Q4. State the eqaution of the line joining (3, 5) and (-4, 1)

$m = \frac{1-5}{-4-3} = \frac{-4}{-7} = \frac{4}{7}$

$y - b = m(x - a)$

$y - 5 = \frac{4}{7}(x - 3)$

$7y - 35 = 4x - 12$

$\underline{7y = 4x + 23}$

L.I: Identifying the equation of a trig. function from its graph.

Homework due Thursday 23.6.16

Sketching graphs with multiple angles

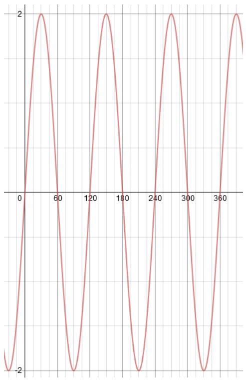
Feedback from looking at jotters:

- When sketching graphs such as $y = \sin 3x^o$, work out the period of the graph and use this to annotate the x – axis.
- Ensure that you have a maximum and minimum T.P.
- Label the axes after yu have sketched the curve.

Graph transformations

Example:

The graph below is of the form y = asinbx°, state the values of a and b



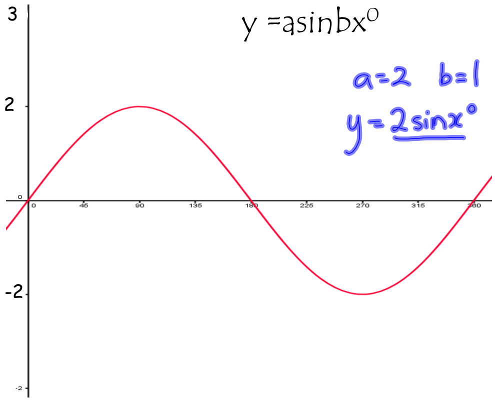
$y = a\sin bx°$

$a = 2$

$b = 3$

Write down the values of a and b for each

y =asinbx°

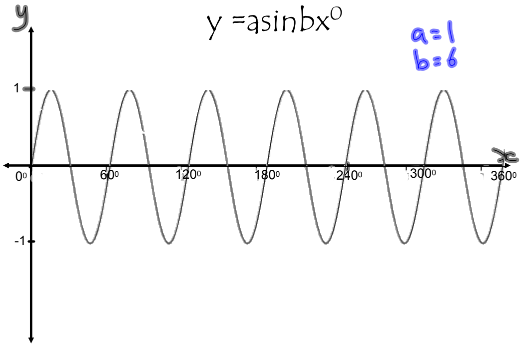


$a = 2 \quad b = 1$

$y = 2\sin x°$

Write down the values of a and b for each

y =asinbx°

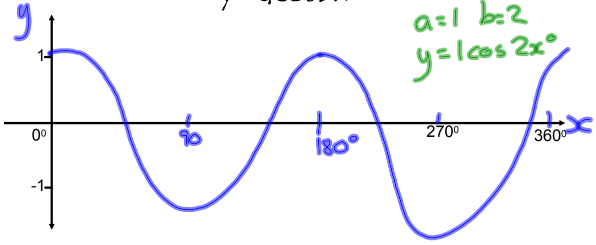


$a = 1$

$b = 6$

Write down the values of a and b for each

y =acosbx°

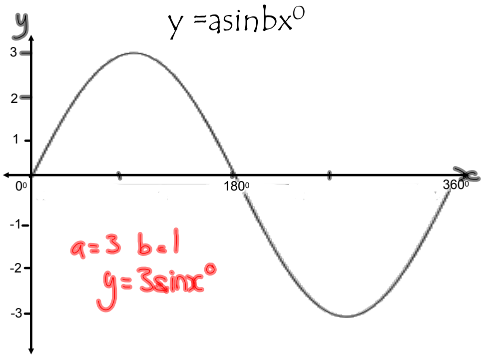


$a = 1 \quad b = 2$

$y = 1\cos 2x°$

Write down the values of a and b for each

y =asinbx°

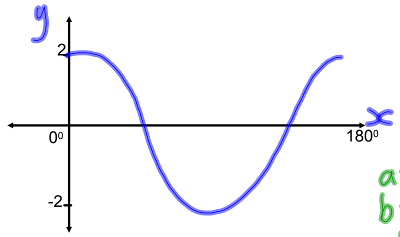


$a = 3 \quad b = 1$

$y = 3\sin x°$

Write down the values of a and b for each

y =acosbx°



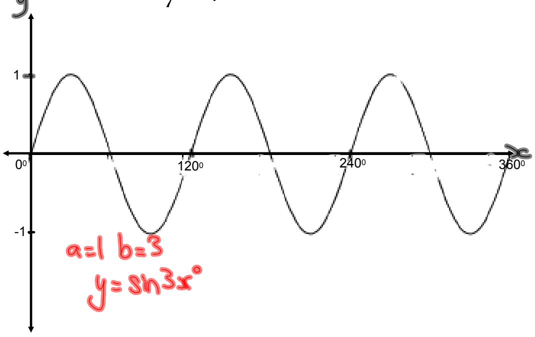
$a = 2$

$b = 2$

$y = 2\cos 2x°$

Write down the values of a and b for each

$y = a\sin bx^{o}$

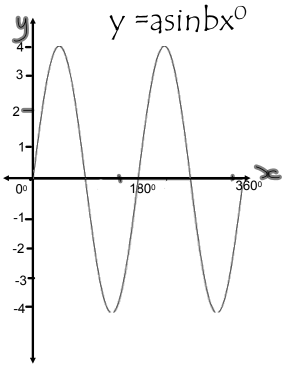


$a=1$ $b=3$

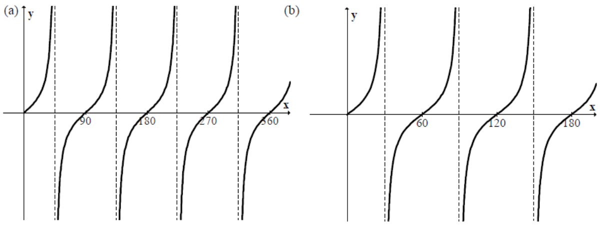
$y = \sin 3x^{\circ}$

Write down the values of a and b for each

$y = a\sin bx^{o}$



2. Each graph below is of the form $y = \tan bx$. Write down the value of b.



Graph transformations

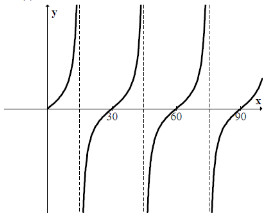
Task:

Draw a graph of a transformed trigonometric function.

Write down another trig. function.

Swap your jotter with the person beside you. Then

1. State the equation of the function they have drawn
2. Draw the function they have written down.



Daily Practice 20.6.2016

1. Evaluate $\frac{5}{12} \times 2\frac{2}{9}$.

Give the answer in simplest form. 2

$\frac{5}{12} \times \frac{20}{9} = \frac{100}{108} = \frac{25}{27}$

2. Screenwash is available in two different sized bottles, 'Mini' and 'Maxi'.
The bottles are mathematically similar.

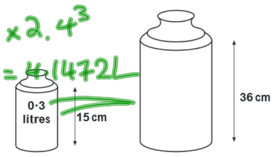
$S.f. = \frac{36}{15} = 2.4$

$V.s.f. = 2.4^3$

0.3×2.4^3

$= 4.1472L$

Volume Maxi bottle

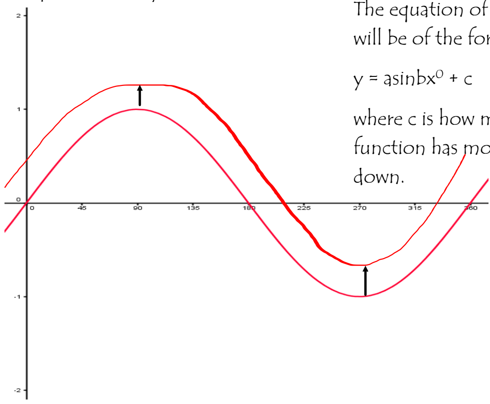


Calculate the volume of the 'Maxi' bottle. 3

Today we will be learning about vertical and horizontal transformations of graphs.

Vertical Movement - Graph Transformations

If a trig. graph is transformed vertically by shifting up or down, the amplitude will stay the same.



The equation of this function will be of the form

$y = a\sin bx^{0} + c$

where c is how much the function has moved up or down.

Vertical Movement - Graph Transformations

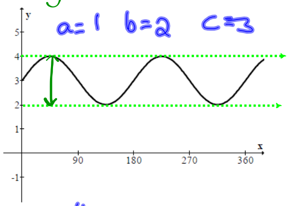
Examples: State the equations of the following

1.

(a)

$y = a\sin bx° + c$

$a = 1$ $b = 2$ $c = 3$



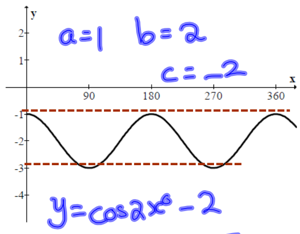
$y = \sin 2x + 3$

(b)

$y = a\cos bx^{0} + c$

$a = 1$ $b = 2$

$c = -2$



$y = \cos 2x° - 2$

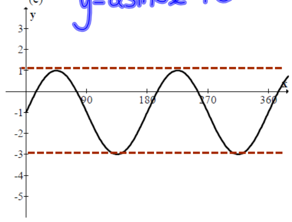
Vertical Movement - Graph Transformations

Examples: State the equations of the following

2.

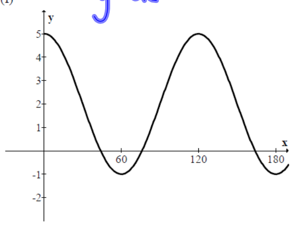
(e)

$y = a\sin bx° + c$



(f)

$y = a\cos bx° + c$



Daily Practice 21.6.2016

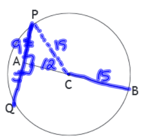
1. The diagram below shows a circle, centre C.

$x^2 = 15^2 - 12^2$

$x^2 = 81$

$x = 9cm$

Length $PQ = 9 \times 2 = 18cm$



The radius of the circle is 15 centimetres.

A is the mid-point of chord PQ.

The length of AB is 27 centimetres.

Calculate the length of PQ. 4

2. State the turning point of the function

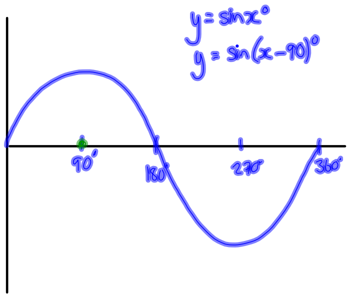
$y = 2(x - 3)^2 + 4$

T.P. = (3,4)

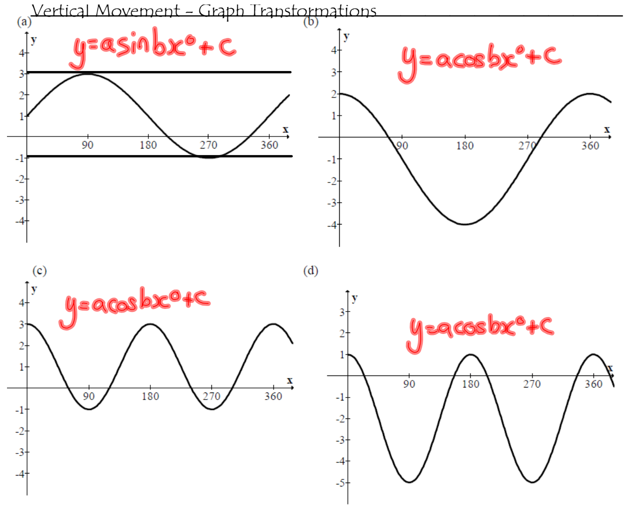
Today we will be continuing to learn about trig. graph transformations.

$y = \sin x^\circ$

$y = \sin(x-90)^\circ$



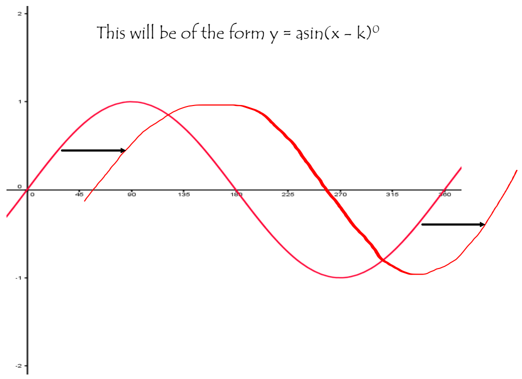
Vertical Movement – Graph Transformations



Horizontal Movement – Phase Angle

If a trig. graph is transformed horizontally left or right. The amplitude & period will stay the same but the roots will change.

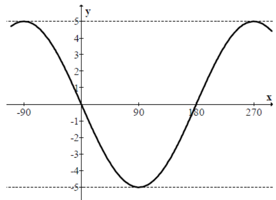
Similar to quadratic functions (+) means movement left and (–) means movement right.



Horizontal Movement – Phase Angle

Examples:

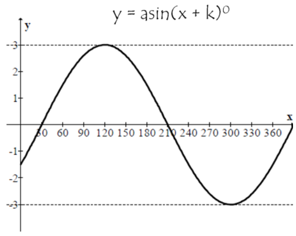
1. $y = a\cos(x + k)^\circ$



$a = 5$ $k = 90^\circ$

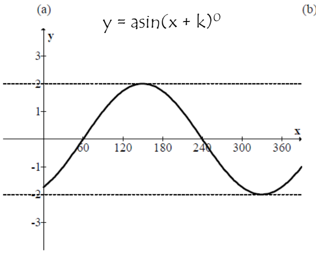
$y = 5\cos(x+90)^\circ$

2. $y = a\sin(x + k)^\circ$

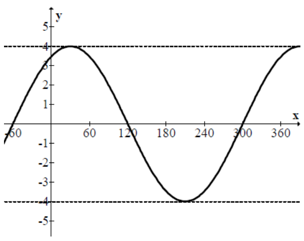


Horizontal Movement – Phase Angle

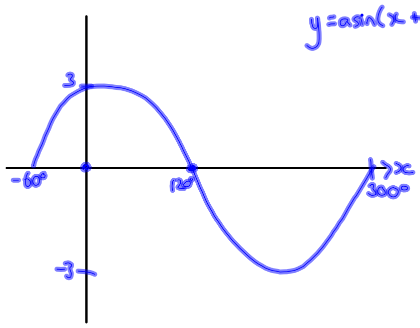
(a) $y = a\sin(x + k)^\circ$



(b) $y = a\cos(x + k)^\circ$



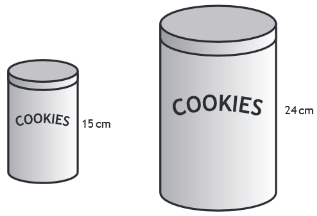
$y = a\sin(x+k)^\circ$



DAILY PRACTICE 24.6.2016

MARKS

A supermarket sells cylindrical cookie jars which are mathematically similar.



$S.f = \frac{24}{15} = 1{\cdot}6$ ✓

$V.s.f = (1{\cdot}6)^3$ ✓

$750 \times (1{\cdot}6)^3 =$

$\underline{3072\,cm^3}$ ✓

The smaller jar has a height of 15 centimetres and a volume of 750 cubic centimetres.

The larger jar has a height of 24 centimetres.

Calculate the volume of the larger jar. 3

Today we will be continuing to learn how to solve trig. equations.

Solving Trig. Equations

24.6.16

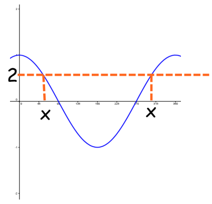
Solving trig. equations involves finding the corresponding x when you know the y.

Eg. $y = 3\cos x^o$ is a graph

When asked, solve

$3\cos x^o = 2$

This means, 'what are the values of x when y = 2?'



Solving Trig. Equations

Trig. equations can be solved in a similar way to regular equations.

For now, we are only going to look at getting "one solution" (the acute or reference angle).

Examples: Solve the following $0 \le x \le 90^o$

(a) $2\cos x^o = 1$

$\div 2 \quad \div 2$

$\cos x^o = 0{\cdot}5$

$x = \cos^{-1}(0{\cdot}5)$

$\underline{\underline{x = 60^o}}$

(b) $3\tan x^o = 4$

$\div 3 \quad \div 3$

$\tan x^o = \frac{4}{3}$

$x = \tan^{-1}(\frac{4}{3})$

$\underline{\underline{x = 53{\cdot}1^o}}$

(c) $5 + 4\sin x^o = 8$

$-5 \quad -5$

$4\sin x^o = 3$

$\div 4 \quad \div 4$

$\sin x^o = 0{\cdot}75$

$x = \sin^{-1}(0{\cdot}75)$

$\underline{\underline{x = 48{\cdot}6^o}}$

(d) $3 - 2\cos x^o = 4$

(e) $1 - 3\sin x^o = 2$

Solving Trig. Equations

Questions: Solve the following $0^o \le x \le 90^o$ (reference angle)

(i) $3\tan x^o = 5$

(ii) $\cos x^o - 0.6 = 0$

(iii) $2\cos x^o - 1 = 0$

(iv) $-2 + 2\tan x^o = 0$

(v) $5\cos x^o + 4 = 0$

$5\cos x^o + 4 = 0$

$5\cos x^o = -4$

$\cos x = -\frac{4}{5}$

Solve the following equations for $0^o \le x \le 90^o$ (reference angle)

(a) $2\sin x^0 - 1 = 0$

(b) $4\cos x^0 - 3 = 0$

(c) $5\tan x^0 - 12 = 0$

(d) $3\sin x^0 + 6 = 7$

(e) $4\tan x^0 - 3 = 10$

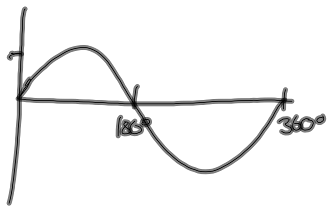
(f) $6\cos x^0 - 2 = 3$

(g) $3\cos x^0 + 4 = 2$

(h) $7\tan x^0 + 3 = 0$

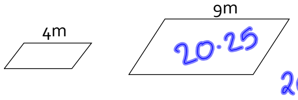
(i) $6\sin x^0 + 5 = 0$

(j) $10\cos x^0 + 12 = 6$



Daily Practice 18.8.2016

Q1. Two pieces of floor are similar in shape. The area of the larger piece is 20.25m², calculate the area of the smaller piece



$S.f = 9 \div 4 = 2.25$

$A.S.f = (2.25)^2$

$20.25 \div (2.25)^2 = \underline{4m^2}$

Q2. Calculate the internal angle of this pentagon

$360° \div 5 = 72°$

$(180° - 72°) \div 2 = 54°$

$54° \times 2 = \underline{108°}$

Today we will be continuing to learn how to solve Trigonometric Equations.

Solving Trig. Equations

Solve the equation $3\sin x^0 + 2 = 3$

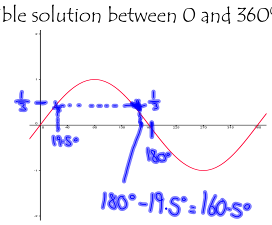
$-2 \quad -2$

$3\sin x° = 1$

$\sin x° = \frac{1}{3}$

$x° = \sin^{-1}(\frac{1}{3}) = \underline{19.5°}$

Is there another possible solution between 0 and 360°?



$180° - 19.5° = 160.5°$

Finding more than one solution

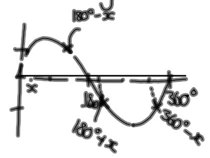
Due to symmetry in the sin, cos and tan graphs, there is often more than 1 solution to trig. equations.

These other angles can be found by using the acute or reference angle. Always keep this positive when using the inverse.

Eg. $\sin x° = (\frac{-3}{4})$

work out $\sin^{-1}(\frac{3}{4})$

Then sketch the graph of the function to see where it is positive or negative.



Solving Trig. Equations

$0° \leq x \leq 360°$

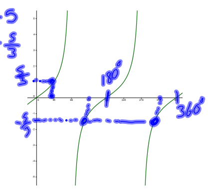
Solve the equation $3\tan x^0 + 2 = -3$

$-2 \quad -2$

$3\tan x° = -5$

$\tan x° = -\frac{5}{3}$

$x = \tan^{-1}(\frac{5}{3}) = 59°$ (ref.)

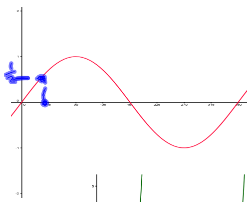


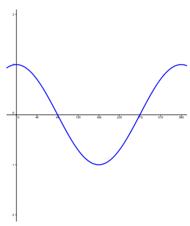
$180° - 59° = 121°$

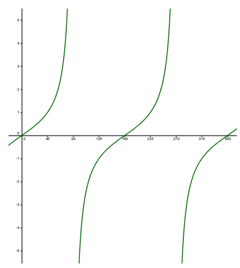
$360° - 59° = \underline{301°}$

Symmetry in Trig. Graphs

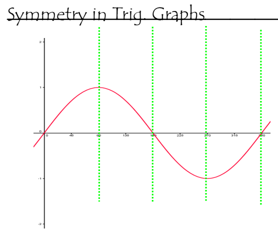
Due to symmetry, there are 4 places on the graphs of sin, cos and tan that give the same y – value (ignoring the sign.)

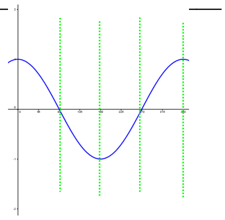


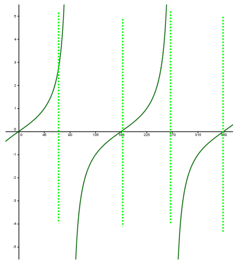




Symmetry in Trig. Graphs







Daily Practice 19.8.2016

Q1. Multiply out and simplify $(3x - 1)(2x^2 + 7x - 6)$

$6x^3 - 2x^2 + 21x^2 - 7x + 6 - 18x$

$6x^3 + 19x^2 - 25x + 6$

Q2. Factorise and then solve $x^2 - 6x - 16 = 0$

$(x+2)(x-8) = 0$

$x + 2 = 0$ $\quad$ $x - 8 = 0$

$x = -2$ $\quad$ $x = 8$

Q3. Write $x^2 + 6x - 1$ in the form $(x + p)^2 + q$

$(x+3)^2 - 10$

Q4. Write as a single fraction $\frac{3}{x+1} + \frac{2}{x}$ where $x \neq -1, 0$

$\frac{3x}{x(x+1)} + \frac{2(x+1)}{x(x+1)} = \frac{5x+2}{x(x+1)}$

Today we will be continuing to learn about trigonometric equations.

Symmetry in Trig. Graphs — Trig. Solving Equations

First find the acute or reference angle x^o. To get this, always find the sin/cos/tan inverse of the positive value.

Then use your graph to see where your angles are. They will be in 2 of the four sections of your graph. Your solutions will be 2 of the following:

- Between 0 and 90^o i.e. x^o
- $180^o - x^o$
- $180^o + x^o$
- $360^o - x^o$

Solving Trig. Equations (All Solutions)

Examples: Solve the following $\quad 0 \leq x \leq 360^o$

(a) $3 - 2\cos x^o = 4$

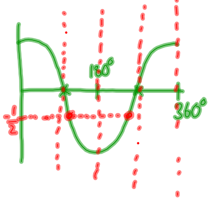
$-2\cos x^o = 1$

$\cos x^o = -\frac{1}{2}$

Ref. angle $= \cos^{-1}\left(\frac{1}{2}\right) = 60^\circ$

$x = 180^\circ - 60^\circ = 120^\circ$

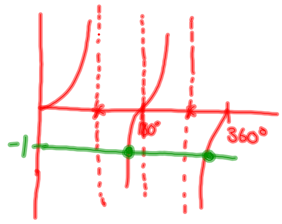
$x = 180^\circ + 60^\circ = 240^\circ$



(b) $5 + \tan x^o = 4$ $\quad 0 \leq x \leq 360^o$

$\tan x^\circ = -1$

ref. angle $= \tan^{-1}(1) = 45^\circ$



$x = 180^\circ - 45^\circ = 135^\circ$

$x = 360^\circ - 45^\circ = 315^\circ$

$0 \le x \le 360^0$

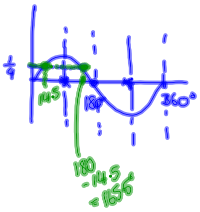
(c) $4\sin x^0 + 2 = 3$

$4\sin x^\circ = 1$

$\sin x^\circ = \frac{1}{4}$

$x = \sin^{-1}\left(\frac{1}{4}\right) = \underline{14.5^\circ}$

$x = 180^\circ - 14.5^\circ = \underline{\underline{165.5^\circ}}$



Q. Solve $2\cos x^\circ - 1 = 0$

Daily Practice 22.8.2016

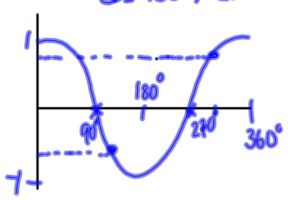
Write the following in order of size starting with the smallest.

cos 90° cos 100° cos 300°

0 - +

Justify your answer. 2

$\cos 100^\circ,\ \cos 90^\circ,\ \cos 300^\circ$



Today we will be continuing to learn how to solve trig. equations.

$0 \le x \le 360^0$

(d) $3 - 2\cos x^0 = 4$

Daily Practice 23.8.2016

Q1. Multiply out and simplify $(x + 3)(x + 2)^2$

$(x+2)(x+2)$

$(x+3)(x^2+4x+4)$

$x^3+4x^2+4x+3x^2+12x+12$

$x^3+7x^2+16x+12$

Q2. Calculate the value of a house worth £180 000 and appreciated by 2.4% per annum for 3 years

$102.4\% = 1.024$

$180000 \times 1.024^3 = \underline{\underline{£193\,273.53}}$

Q3. Factorise fully $36y^2 - 64$

$4(9y^2 - 16) = \underline{4(3y+4)(3y-4)}$

Q4. Solve $3\sin x^0 = 1$

$\sin x = \frac{1}{3}$

$\sin^{-1}\left(\frac{1}{3}\right) = \underline{\underline{19.5^\circ}}$

$180^\circ - 19.5^\circ = \underline{\underline{160.5^\circ}}$

Today we will be continuing to solve trig. equations and solve some in context too.

Solving Trig. Equations (All Solutions)

Solve the following equations where $0 \le x \le 360$

(a)	$2 \sin x^\circ = 1$	**(b)**	$3 \cos x^\circ = 2$	**(c)**	$3 \tan x^\circ = 5$
(d)	$2 \cos x^\circ = -1$	**(e)**	$2 \tan x^\circ = -8$	**(f)**	$4 \sin x^\circ = -3$
(g)	$5 \tan x^\circ = 23{\cdot}5$	**(h)**	$5 \sin x^\circ = 2$	**(i)**	$6 \cos x^\circ = 1$
(j)	$8 \sin x^\circ = -3$	**(k)**	$11 \cos x^\circ = -9$	**(l)**	$10 \tan x^\circ = -9$

Solve the following equations where $0 \le x \le 360$

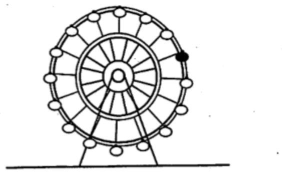
(a)	$\sin x^\circ - 1 = 0$	**(b)**	$\cos x^\circ + 1 = 0$	**(c)**	$\tan x^\circ - 1 = 0$
(d)	$2 \sin x^\circ + 1 = 0$	**(e)**	$2 \cos x^\circ - 1 = 0$	**(f)**	$2 \tan x^\circ - 1 = 0$
(g)	$4 \cos x^\circ - 3 = 0$	**(h)**	$3 \sin x^\circ - 2 = 0$	**(i)**	$5 \cos x^\circ + 2 = 0$
(j)	$3 \tan x^\circ - 2 = 0$	**(k)**	$3 \cos x^\circ + 1 = 0$	**(l)**	$7 \sin x^\circ + 3 = 0$

Solving Trig. Equations in Context

At the carnival, the height, H metres, of a carriage on the big wheel above the ground is given by the formula

$$H = 10 + 5 \sin t^\circ,$$

t seconds after starting to turn.



(a) Find the height of the carriage above the ground after 10 seconds. 2

(b) Find the two times during the first turn of the wheel when the carriage is 12·5 metres above the ground. 4

(a) $H = 10 + 5\sin 10^\circ = \underline{10{\cdot}87\text{ metres}}$

(b) $H = 12{\cdot}5$

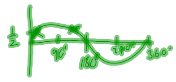
$12{\cdot}5 = 10 + 5\sin t^\circ$

$2{\cdot}5 = 5\sin t^\circ$

$0{\cdot}5 = \sin t^\circ$

$t = \sin^{-1}(0{\cdot}5) = 30^\circ$

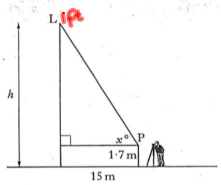
$180^\circ - 30^\circ = 150^\circ$



It is 12·5m above the ground after 30 seconds and after 150 seconds.

Solving Trig. Equations in Context

In the diagram below, the point L represents the lift.



The height, h metres, of the lift above the ground is given by the formula

$$h = 15 \tan x^\circ + 1{\cdot}7,$$

where x° is the angle of elevation of the lift from the surveyor at point P.

(a) What is the height of the lift above the ground when the angle of elevation from P is 25°? 2

$h = 15\tan 25^\circ + 1{\cdot}7 = \underline{8{\cdot}7\text{m}}$

(b) What is the angle of elevation at point P when the height of the lift above the ground is 18·4 metres? 3

$18{\cdot}4 = 15\tan x^\circ + 1{\cdot}7$
$-1{\cdot}7 \qquad -1{\cdot}7$

$16{\cdot}7 = 15\tan x^\circ$

$1{\cdot}113 = \tan x^\circ$

$x^\circ = \tan^{-1}(1{\cdot}113) = 48^\circ$

(Because it's an acute angle diagram.)

Today we will be practising mixed questions on trig. equations.

Daily Practice 25.8.2016

Q1. State the equation of the line joining (-2, 5) and (1, -4) and give your answer in the form Ax + By + C = 0

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{-4-5}{1-(-2)} = \dfrac{-9}{3} = -3$

$y - b = m(x - a)$

$y - 5 = -3(x + 2)$

$y - 5 = -3x - 6$

$\underline{3x + y + 1 = 0}$

Q2. State the turning point of the function $y = (x - 3)^2 + 2$

T.P. = (3, 2)

Q3. Write as a single fraction $\dfrac{3}{x} + \dfrac{2}{x+3}$ where $x \ne 0, -3$

$\dfrac{3(x+3) + 2x}{x(x+3)} = \underline{\dfrac{5x+9}{x(x+3)}}$

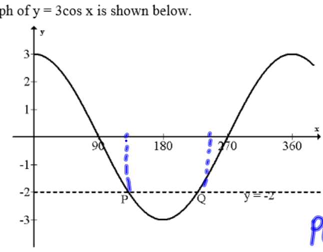
Q4. Factorise $x^2 - 9x + 18$

$\underline{(x-6)(x-3)}$

Trig. Graphs – Intersection of a line and a wave

Trig. Equations may come in disguised forms!

The graph of y = 3cos x is shown below.



$y = 3\cos x$

$-2 = 3\cos x$

$-\dfrac{2}{3} = \cos x$

$\cos^{-1}\left(\dfrac{2}{3}\right) = 48{\cdot}2^\circ$

$x = 180^\circ - 48{\cdot}2^\circ = \underline{131{\cdot}8^\circ}$

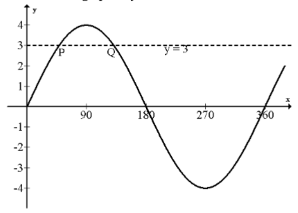
$x = 180^\circ + 48{\cdot}2^\circ = \underline{228{\cdot}2^\circ}$

$\underline{P(131{\cdot}8^\circ, -2)\ Q(228{\cdot}2^\circ, -2)}$

The line y= -2 has been drawn on the graph. Find the coordinates of P and Q.

Trig. Graphs - Intersection of a line and a wave

The diagram shows the graph of y = 4 sin x.



Find the coordinates of P and Q

$(\sin^2 x)$

$= (\sin x)^2 = 0{\cdot}49$

$\sin x = \sqrt{0{\cdot}49}$

Pg.122 Q3,4

Pg.83 Choose Q's if finished.

Like any other function, the roots of a trig. function can be found by equating y to zero and the y - intercept can be found by equating x to zero.

Daily Practice 26.8.2016

Q1. Factorise $2x^2 + 7x - 15$

$(2x-3)(x+5)$

Q2. Write as a single fraction $\frac{3x}{x+1} \div \frac{x}{2}$ where $x \neq -1$

$\frac{3x}{x+1} \times \frac{2}{x} = \frac{6x}{x(x+1)} \begin{matrix}\div x \\ \div x\end{matrix} = \frac{6}{x+1}$

Q3. Solve the equation $3 - 2\sin x^0 = 4$ where $0^0 \leq x \leq 360^0$

$-2\sin x^\circ = 1$

$\sin x^\circ = -\frac{1}{2}$

$\sin^{-1}(\frac{1}{2}) = 30^\circ$ ref.

$180^\circ + 30^\circ = 210^\circ$

$360^\circ - 30^\circ = 330^\circ$

Q4. Rearrange the formula such that q is the subject

$\frac{5b}{2q^2} = 1 - c$

$5b = 2q^2(1-c)$

$\div 2(1-c) \quad \div 2(1-c)$

$\frac{5b}{2(1-c)} = q^2$

$q = \sqrt{\frac{5b}{2(1-c)}}$

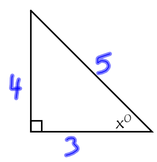
Today we will be learning about trigonometric identities.

Trig. Identities

Trig. Identities are relationships between sin, cos and tan. (Ways of getting one in terms of the other(s))

You can use them to show that statements are true.

You need to know these (but not their proofs) for your exam.



$\boxed{\sin^2 x + \cos^2 x = 1}$

$(\sin x)^2 + (\cos x)^2 = 1$

$\sin x^\circ = \frac{O}{H} = \frac{4}{5}$

$\cos x^\circ = \frac{A}{H} = \frac{3}{5}$

$(\frac{4}{5})^2 + (\frac{3}{5})^2 = \frac{16}{25} + \frac{9}{25} = \frac{25}{25} = 1$

Trig. Identities

$\boxed{\sin^2 x + \cos^2 x = 1}$

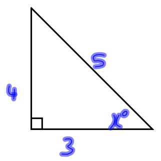
We can rearrange the above identity to get it in terms of cos or sin.

$\sin^2 x = 1 - \cos^2 x$

$\cos^2 x = 1 - \sin^2 x$

Trig. Identities

$$\frac{\sin x^0}{\cos x^0} = \tan x^0$$



$\sin x° = \frac{4}{5}$ $\cos x° = \frac{3}{5}$

$\frac{4}{5} \div \frac{3}{5} = \frac{4}{5} \times \frac{5}{3} = \frac{20}{15} = \frac{4}{3}$

$\tan x° = \frac{4}{3}$ too!!

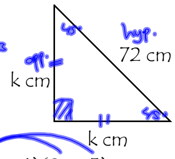
Daily Practice 29.8.16

Q1. Calculate the volume of a sphere with a diameter of 15cm. Give your answer to 2 s.f.

$V = \frac{4}{3}\pi \times 7.5^3 = 1767.14$

$\rightarrow 1800\,cm^3$

Q2. Calculate the length of k



$\sin 45° = \frac{k}{72}$

$72\sin 45° = k$

$50.9\,cm = k$

$k^2 + k^2 = 72^2$

$2k^2 = 72^2$

$k^2 = \frac{72^2}{2}$

$k = \sqrt{2592}$

$k = 50.9\,cm$

Q3. Multiply out and simplify $(3x - 4)(2x + 5)$

$6x^2 + 15x - 8x - 20$

$6x^2 + 7x - 20$

Q4. Solve the equation $x^2 + 8x - 20 = 0$

$(x + 10)(x - 2) = 0$

$x + 10 = 0$ or $x - 2 = 0$

$x = -10$ $x = 2$

Today we will be learning about trigonometric identities.

$4\cos^2 A$

$4(1 - \sin^2 A)$

$= 4 - 4\sin^2 A = R.H.S$

Trig. Identities 29.8.16

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

$\frac{\sin x}{\cos x} = \tan x$

Examples:

1. Show that $\cos x \tan x = \sin x$

L.H.S

$\cos x \tan x$

$\cos x \left(\frac{\sin x}{\cos x}\right)$

$= \frac{\cancel{\cos x}\sin x}{\cancel{\cos x}} = \sin x = R.H.S$

2. Show that $(\sin x - \cos x)^2 + 2\sin x\cos x = 1$

L.H.S $(\sin x - \cos x)^2 + 2\sin x\cos x$

$(\sin x - \cos x)(\sin x - \cos x) + 2\sin x\cos x$

$\sin^2 x - \sin x\cos x - \cos x\sin x + \cos^2 x + 2\sin x\cos x$

$\sin^2 x - \cancel{2\sin x\cos x} + \cos^2 x + \cancel{2\sin x\cos x}$

$= \sin^2 x + \cos^2 x = 1 = R.H.S$

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Daily Practice 30.8.2016

Q1. Factorise $3x^2 - 5x - 12$

$(3x + 4)(x - 3)$

$+4x$ $-9x$

Q2. Solve algebraically the set of equations

$x + 2y = 5$ and $-2y = 1 - x$

$+x$ $+x$

$x + 2y = 5$

$x - 2y = 1$ (+)

$2x = 6$

$x = 3$

$3 + 2y = 5$

$2y = 2$

$y = 1$

$(3, 1)$

Q3. Sketch the graph of $y = (x + 3)^2 - 2$ showing the turning point, y - intercept and axis of symmetry.

T.P. = $(-3, -2)$

$x = -3$ Axis of Symmetry

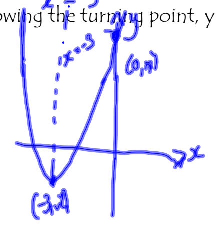
y-intercept $\Rightarrow x = 0$

$y = (0+3)^2 - 2$

$y = 9 - 2$

$y = 7$

$(0, 7)$



Today we will be continuing to practise trig. identities.

Prove $2\cos^2 A + 3\sin^2 A = 3 - \cos^2 A$

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

$\frac{\sin x}{\cos x} = \tan x$

$\sin^2 x = 1 - \cos^2 x$

LHS

$2\cos^2 A + 3\sin^2 A$

$2\cos^2 A + 3(1 - \cos^2 A)$

$2\cos^2 A + 3 - 3\cos^2 A$

$-\cos^2 A + 3$

$= 3 - \cos^2 A = R.H.S$

Daily Practice 1.9.2016

Q1. State the equation of the line joining (-3, 2) and (4, -1)

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1-2}{4-(-3)} = \frac{-3}{7}$

$y - b = m(x - a)$

$a = 3 \quad b = 5 \quad c = -7$

$y - 2 = \frac{-3}{7}(x + 3) \quad \times 7$

$7y - 14 = -3x - 9$

$7y = -3x + 5$

Q2. Solve the equation $3x^2 + 5x - 7 = 0$, give your answer to 2 d.p.

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-5 \pm \sqrt{5^2 - 4(3)(-7)}}{2(3)} = \frac{-5 + \sqrt{109}}{6}$ or $\frac{-5 - \sqrt{109}}{6}$

0.91 or -2.57 (2 d.p.)

Q3. Solve the equation $5\cos x° + 4 = 0 \qquad 0° \le x \le 360°$

$5\cos x° = -4$

$\cos x° = \frac{-4}{5}$

$\cos^{-1}\left(\frac{4}{5}\right) = 36.9°$ (ref.)

$x = 180° + 36.9° = 216.9°$

$180° - 36.9° = 143.1°$

180 360°

Q4. (a) Evaluate $(2^3)^2$.

$8^2 = 64$

(b) Hence find n, when $(2^3)^n = \frac{1}{64}$.

2^6

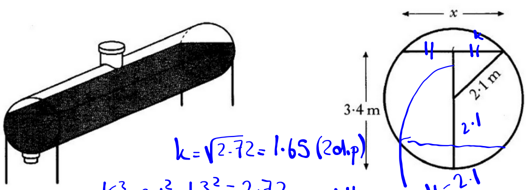
$\frac{1}{2^6} = \frac{1}{64}$

$n = -2$

Today we will be practising mixed questions on trigonometry.

An oil tank has a circular cross-section of radius 2·1 metres.

It is filled to a depth of 3·4 metres.



$k = \sqrt{2.72} = 1.65$ (2d.p)

$k^2 = 2.1^2 - 1.3^2 = 2.72$

$3.4 - 2.1 = 1.3$

(a) Calculate x, the width in metres of the oil surface.

Width $= 1.65 \times 2 = 3.3$m

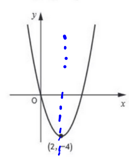
(b) What other depth of oil would give the same surface width?

diameter $= 4.2$

$4.2 - 3.4 = 0.8$m

The graph below shows part of the parabola with equation of the form

$y = (x + a)^2 + b.$



The minimum turning point (2, −4) is shown in the diagram.

(a) State the values of

(i) a

$a = -2$ ✓

(ii) b.

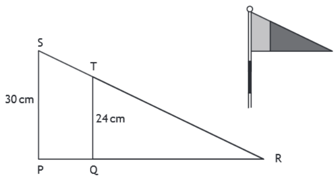
$b = -4$ ✓

$y = (x - 2)^2 - 4$

(b) Write down the equation of the axis of symmetry of the graph.

$x = 2$ ✓

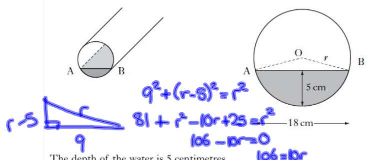
The flag at each hole on a golf course is coloured red and blue.
The diagram below represents a flag.
Triangle QRT represents the red section.
PQTS represents the blue section.



Triangles PRS and QRT are mathematically similar.
The area of triangle QRT is 400 square centimetres.
Calculate the area of PQTS, the blue section of the flag. 4

Daily Practice 2.9.2016

Q1. A pipe has water in it as shown.



$9^2+(r-5)^2=r^2$
$81+r^2-10r+25=r^2$
$106-10r=0$
$106=10r$
$r=10.6\text{cm}$

The depth of the water is 5 centimetres.
The width of the water surface, AB, is 18 centimetres.
Calculate r, the radius of the pipe.

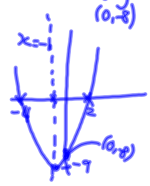
Q2. Draw a sketch of the graph $y = (x - 2)(x + 4)$ showing the turning point, axis of symmetry and roots.

Roots: $(x-2)(x+4)=0$
$x=2$ or $x=-4$

Axis of symmetry: $x=-1$

y-intercept: $(0-2)(0+4)=y$
$-8=y$
$(0,-8)$

T.P. $y=(-1-2)(-1+4)$
$(-3)(3)=-9$
$(-1,-9)$



Today we will be continuing to practise mixed questions on trigonometry.

Daily Practice 5.9.2016

Q1. Find the equation of the line joining (-3, 1) and (2, -5)

$m=\frac{-5-1}{2-(-3)}=\frac{-6}{5}$

$y-b=m(x-a)$
$y+5=\frac{-6}{5}(x-2)$

$y+5=-\frac{6}{5}x+\frac{12}{5}$
$5y+25=-6x+12$
$5y=-6x-13$

Q2. Multiply out and simplify $(3x - 4)(x + 7)$

$3x^2+21x-4x-28$
$3x^2+17x-28$

Q3. Rearrange $V = \pi r^2h$ such that r is the subject

$\div\pi h \quad \div\pi h$
$\frac{V}{\pi h}=r^2$
$r=\sqrt{\frac{V}{\pi h}}$

Q4. Solve the inequality $3x + 4 \leq x + 10$

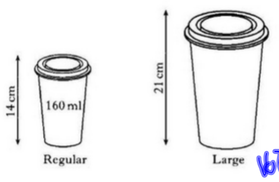
$-4 \quad -4$
$3x\leq x+6$
$-x \quad -x$
$2x\leq 6$
$x\leq 3$

Q5. State the turning point and y intercept of the function $y = (x + 4)^2$

T.P. $=(-4,0)$
y-intercept $\to$ $x=0$
$y=(0+4)^2=16$ $(0,16)$

Today we will be doing some revision for the Relationships Unit.

Coffee is sold in regular cups and large cups.
The two cups are mathematically similar in shape.



The regular cup is 14 centimetres high and holds 160 millilitres.
The large cup is 21 centimetres high.
Calculate how many millilitres the large cup holds.

$sf=\frac{21}{14}=1.5$
$V.s.f.=(1.5)^3$
$=(\frac{3}{2})^3$
Volume $=160\times(\frac{3}{2})^3$
$=160\times\frac{27}{8}$
$8\overline{)160}=20$
$27\times20=540\text{ml}$