Edexcel
New GCE A Level Maths workbook
Trigonometry 02

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Trigonometry

Sine, cosine and tangent functions. Their graphs, symmetries and periodicity.

Knowledge of graphs of curves with equations such as

$y = 3 \sin x$, $y = \sin\left(x + 30^0\right)$, $y = \sin 2x$ is expected.

Knowledge and use of $\tan\theta = \frac{\sin\theta}{\cos\theta}$, and

$\sin^2\theta + \cos^2\theta = 1$.

Solution of simple trigonometric equations in a given interval.

Candidates should be able to solve equations such as

$\sin\left(x + 45^0\right) = \frac{3}{4}$ for $0 < x < 360$,

$\cos(x + 30°) = \frac{1}{2}$ for $-180° < x < 180°$,

$\tan 2x = 1$ for $90° < x < 270°$,

$6\cos^2 x° + \sin x° - 5 = 0, \quad 0 \le x < 360$,

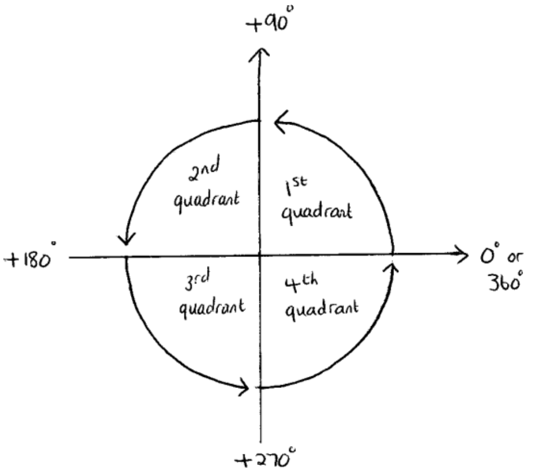
$\sin^2\left(x + 30^0\right) = \frac{1}{2}$ for $-180 \le x < 180$.

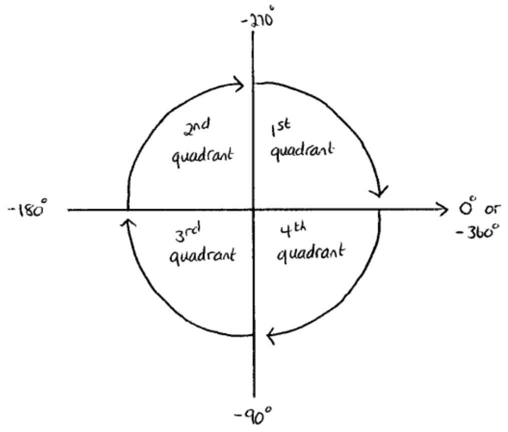
Using and Understanding Trig Functions for Positive and Negative Angles

The Three Trigonometric ratios are

$$\sin\theta = \frac{opp}{hyp} \qquad \cos\theta = \frac{adj}{hyp} \qquad \tan\theta = \frac{opp}{adj}$$

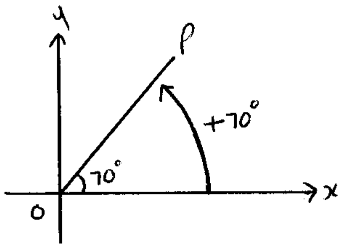
The x-y plane is divided into 4 quadrants



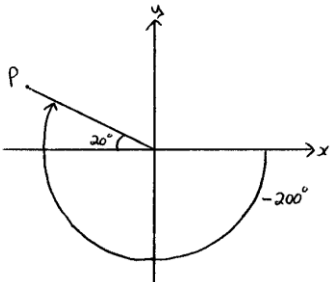


Example 1. Draw the line OP, where O is the origin, and the angle θ makes an angle with the positive x-axis.

a) +70°



b) -200°



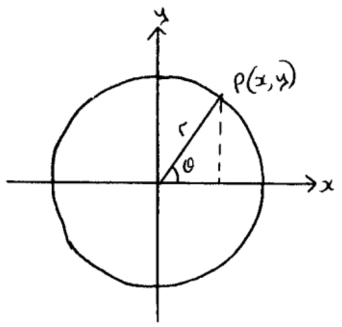
Equivalent Trigonometric Ratios

For all values of θ, the definition of sin θ, cos θ and tan θ are taken to be…

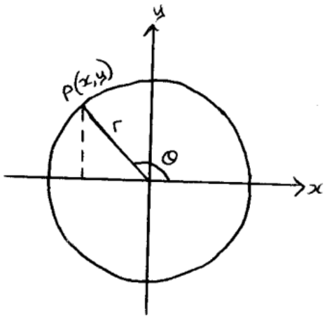
$\sin\theta = \dfrac{y}{r}$ where x and y are the coordinates of P and r is the length OP

$\cos\theta = \dfrac{x}{r}$

$\tan\theta = \dfrac{y}{x}$



If θ is acute



If θ is obtuse

Some definitions are:-

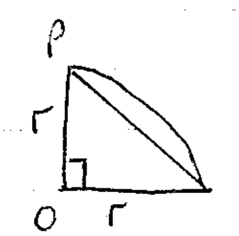
$\sin 90° = 1$	$\sin(-90°) = -1$
$\sin 180° = 0$	$\sin(-180°) = 0$
$\sin 270° = -1$	$\sin(-270°) = 1$
$\cos 180° = -1$	$\cos(-180°) = -1$
$\cos(-90°) = 0$	$\cos 90° = 0$
$\cos 450° = 0$	$\cos(-450°) = 0$

Why?

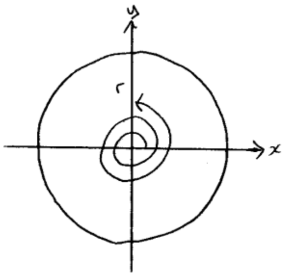
$\sin\theta = \dfrac{y}{r}$ for sin 90°

$\sin 90° = \dfrac{r}{r}$

$\sin 90° = 1$



Example 1. Find the value of cos 810°



$810° = 360 + 360 + 90$

$\cos\theta = \dfrac{x}{r}$

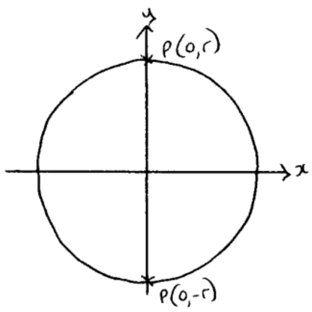
$\cos 810° = \dfrac{0}{r}$

$\cos 810° = 0$

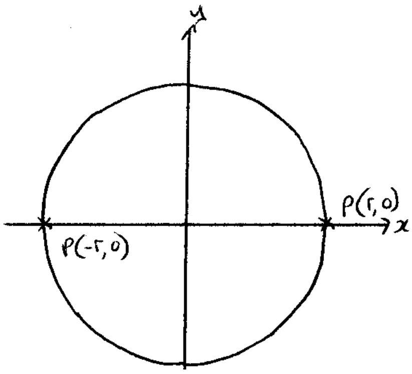
For Tan

a) Tan is indeterminate when θ is an odd multiple of 90°.

When y = 0 tan θ = 0. This is because when P is at (r ,0) or (– r, 0)

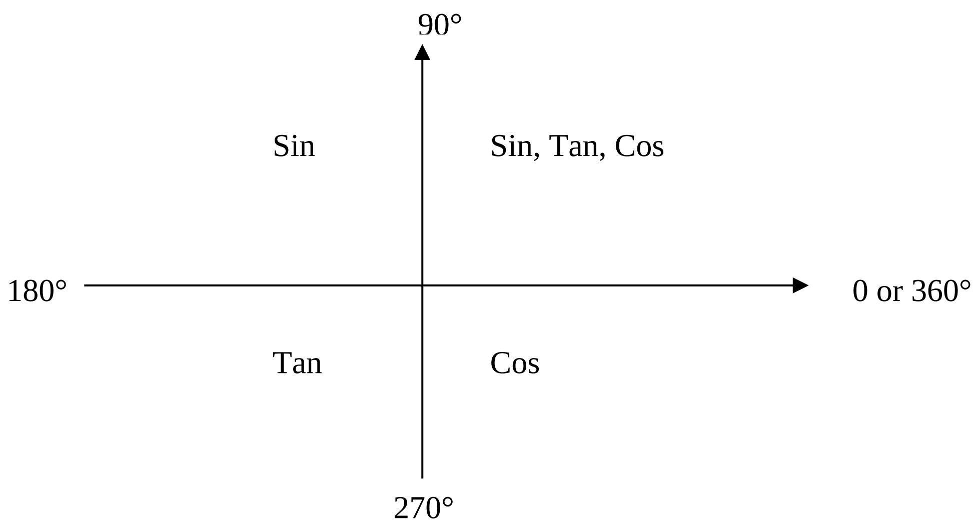


b) Tan θ = 0 When θ is 0° or an even multiple of 90°



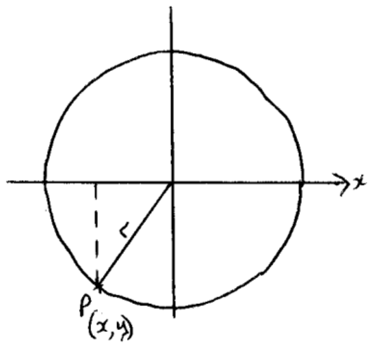
Expressing Angles in Term of Equivalent Acute Trigonometric Ratios

Angle	Positive	Negative
0-90	All	None
90-180	Sin	Cos,Tan
180-270	Tan	Sin,Cos
270-360	Cos	Sin, Tan



Learn the saying "All Sinners Tan Cos they can!!

Why?



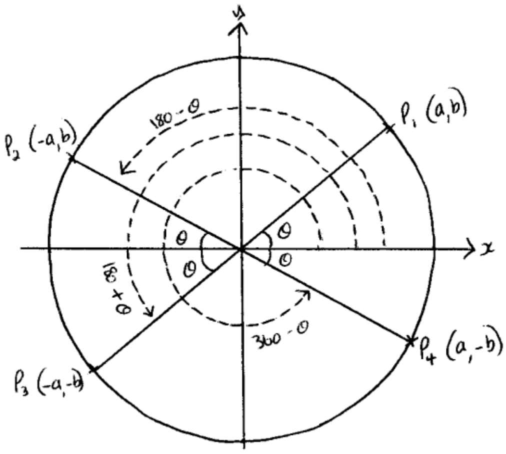
In 3rd Quadrant: –

$$\sin\theta = \frac{y}{r} = \frac{-ve}{+ve} = -ve$$

$$\cos\theta = \frac{x}{r} = \frac{-ve}{+ve} = -ve$$

$$\tan\theta = \frac{y}{x} = \frac{-ve}{-ve} = +ve$$

Similar Angles



for $\sin\theta = \dfrac{y}{r}$ so: –

$\sin\theta = \dfrac{b}{r}$ $\qquad$ $\sin\theta = \sin 180 - \theta$

$\sin(180 - \theta) = \dfrac{b}{r}$ $\qquad$ $\sin 180 + \theta = \sin 360 - \theta$

$\sin(180 + \theta) = -\dfrac{b}{r}$ $\qquad$ $\sin 180 + \theta = -\sin\theta$

$\sin(360 - \theta) = -\dfrac{b}{r}$ $\qquad$ $\sin 360 - \theta = -\sin\theta$ etc

The results for sine, cosine and tangent are:-

Quadrant 2

$\sin(180 - \theta) = \sin\theta$

$\cos(180 - \theta) = -\cos\theta$

$\tan(180 - \theta) = -\tan\theta$

Quadrant 3

$\sin(180 + \theta) = -\sin\theta$

$\cos(180 + \theta) = -\cos\theta$

$\tan(180 + \theta) = \tan\theta$

Quadrant 4

$\sin((360 - \theta) = -\sin\theta$

$\cos(360 - \theta) = \cos\theta$

$\tan(360 - \theta) = -\tan\theta$

Notice the connection with the quadrants.

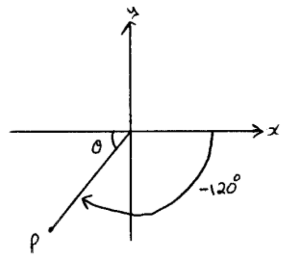
It is telling us where the answers will be positive or negative.

Example 1. Express in terms of trigonometric ratios of acute angles, the angle sin (-120°).

In the 3rd quadrant sin is negative

$= -\sin\theta$

$= -\sin 60°$

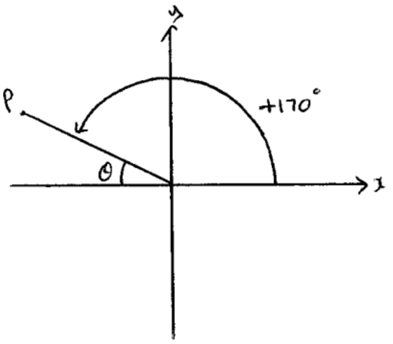


Example 2. Express in terms of trigonometric ratios of acute angles, the angle tan (530°)

In the 2nd quadrant tan is negative

$= -\tan\theta$

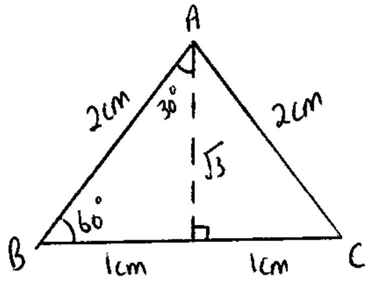
$= -\tan 10°$



Finding Exact Values of Trigonometric Ratios

How to find 30° and 60° angles

Take an equilateral triangle with sides 2cm
(you could do this with any equilateral triangle)



$AD = \sqrt{2^2 - 1^2}$

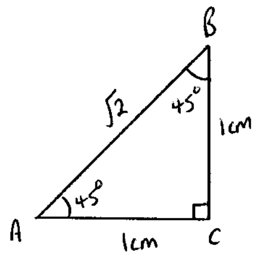
$AD = \sqrt{3}\ cm$

$\therefore \quad \sin 30° = \dfrac{1}{2} \qquad \cos 30° = \dfrac{\sqrt{3}}{2} \qquad \tan 30° = \dfrac{1}{\sqrt{3}} = \dfrac{\sqrt{3}}{3}$

$\sin 60° = \dfrac{\sqrt{3}}{2} \qquad \cos 60° = \dfrac{1}{2} \qquad \tan 60° = \sqrt{3}$

How to find a 45° angle

Take an isosceles right angled triangle with sides 1cm
(again you can use any isosceles triangle)

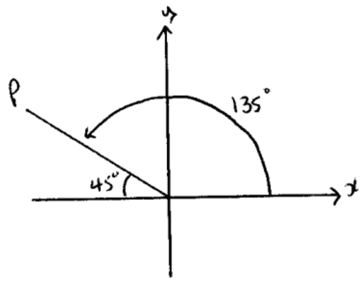


$AB = \sqrt{1^2 - 1^2}$

$AB = \sqrt{2}\ cm$

$\therefore \quad \sin 45° = \dfrac{1}{\sqrt{2}} = \dfrac{\sqrt{2}}{2} \qquad \cos 45° = \dfrac{1}{\sqrt{2}} = \dfrac{\sqrt{2}}{2} \qquad \tan 45° = \dfrac{1}{1} = 1$

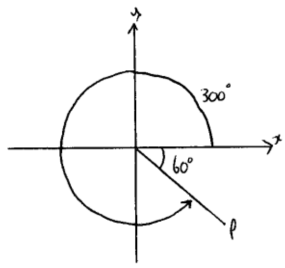
Example 1. Find the exact value of sin 135°



$\sin 135° = \sin 45°$ sin is positive in 2nd quadrant

$= \dfrac{\sqrt{2}}{2}$

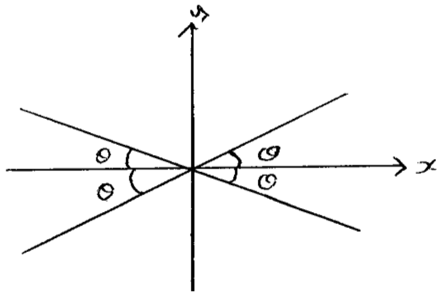
Example 2. Find the exact value of tan 300°



$\tan 300° = -\tan \theta$ tan is negative in 4th quadrant

$= -\tan 60°$

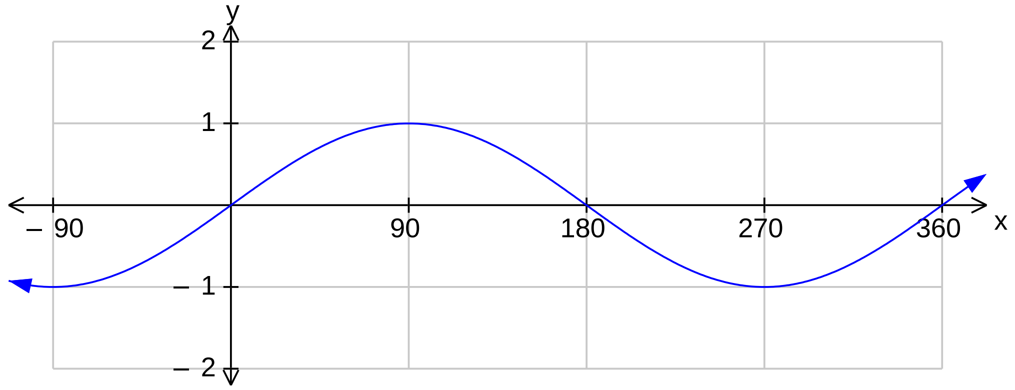
Remember to first work out the value of θ, then work out whether the quadrant is positive or negative.



Recognising Trigonometric Graphs

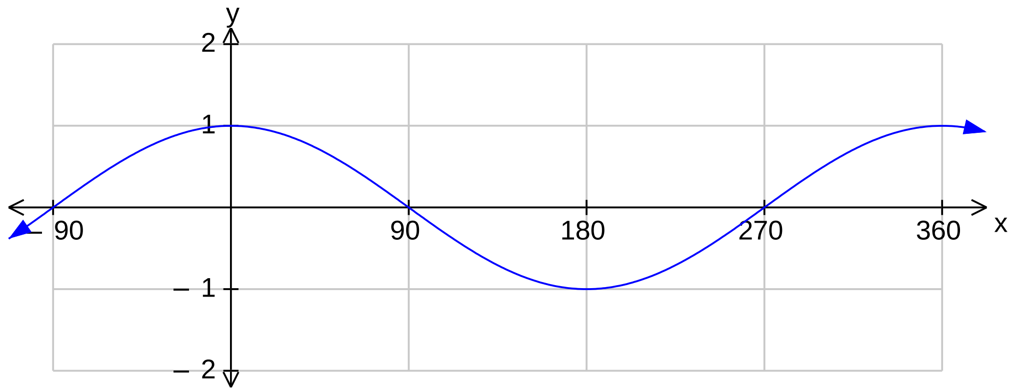
y = sin *x*

The graph is periodic, the period is 360° or 2π radians, the graph is symmetrical about $\theta = 90^\circ$



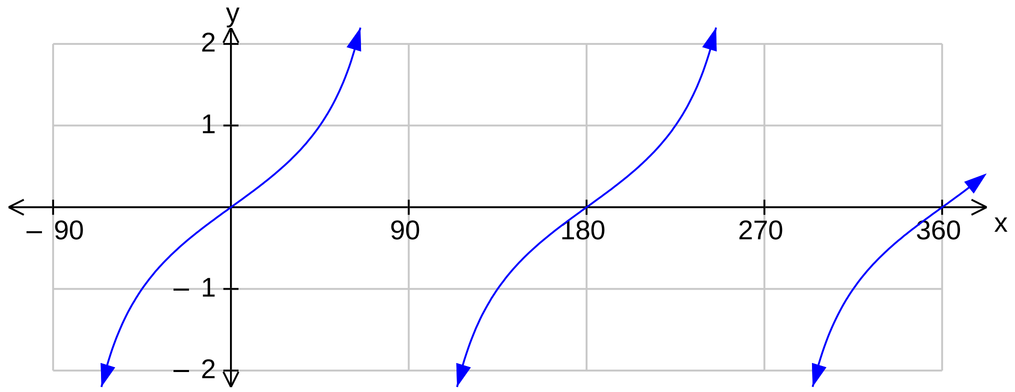
y= cos *x*

The graph is periodic, the period is 360° or 2π radians, the graph is the same as the cos graph which has been translated 90° to the left, the graph is symmetrical about $\theta = 0^\circ$



y = tan *x*

The graph is periodic, the period is 180° or 2π radians, asymptotes occur at 90° and at odd multiples of 90° there after.



Transformation of Trigonometric Graphs

These follow the same rules as we had for normal graphs.

a) $y = \sin x + 1$

Move the graph up 1 = add 1 to the y coordinate

b) $y = \cos(x + 90°)$

Move the graph left 90° = subtract 90° to the x coordinate

c) $y = 3\cos x$

Stretch the graph vertically by 3 = multiply the y coordinate by 3

d) $y = \sin 2x$

Stretch the graph horizontally by ½ = multiply the x coordinate by 2

e) $y = -\tan x$

Reflect the graph in the x-axis = change the sign of the y coordinate

f) $y = \cos(-x)$

Reflect the graph in the y-axis = change the sign of the x coordinate

Solving Trigonometric Equations in Degrees

Using the relationship between Sin, Cos and Tan

1. For all values of θ (except for when tan θ is not defined and where cos θ = 0)

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

Why?

$$\tan\theta = \frac{y}{x}$$

$$\frac{y}{x} = \frac{y}{r} \times \frac{r}{x} \qquad \text{as } \frac{x}{r} = \cos\theta \quad \text{and } \frac{y}{x} = \sin\theta$$

$$\therefore \frac{y}{x} = \sin\theta \times \frac{1}{\cos\theta}$$

$$\therefore \frac{y}{x} = \frac{\sin\theta}{\cos\theta}$$

$$\text{hence } \tan\theta = \frac{\sin\theta}{\cos\theta}$$

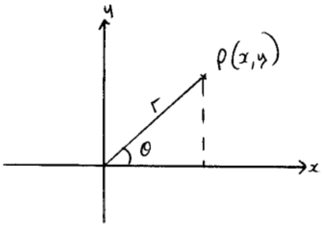
2. For all values of θ, $\cos^2\theta + \sin^2\theta = 1$

Why?

$$\sin\theta = \frac{y}{r} \qquad \text{so} \quad y = r\sin\theta$$

$$\cos\theta = \frac{x}{r} \qquad \text{so} \quad y = r\cos\theta$$

Using Pythagoras



$$x^2 + y^2 = r^2$$

$$(r\cos\theta)^2 + (r\sin\theta)^2 = r^2$$

$$r^2\cos^2\theta + r^2\sin^2\theta = r^2$$

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

Example 1: Simplify $\sin^2 2\theta + \cos^2 2\theta$

as $\sin^2\theta + \cos^2\theta = 1$

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

Example 2: Show that $\frac{\cos^4\theta - \sin^4\theta}{\cos^2\theta} = 1 - \tan^2\theta$

$$\frac{\cos^4\theta - \sin^4\theta}{\cos^2\theta} = \frac{(\cos^2\theta - \sin^2\theta)(\cos^2\theta + \sin^2\theta)}{\cos^2\theta}$$ ← Use difference of 2 squares

as $\sin^2\theta + \cos^2\theta = 1$ $\quad = \frac{\cos^2\theta - \sin^2\theta}{\cos^2\theta}$

$$= 1 - \frac{\sin^2\theta}{\cos^2\theta}$$

as $\frac{\sin\theta}{\cos\theta} = \tan\theta$ $\quad = 1 - \tan^2\theta$

Example 3: Given $\cos\theta = -\frac{3}{5}$ and that θ is reflex, find the value of $\sin\theta$ and $\tan\theta$

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

as $\cos\theta = -\frac{3}{5}$ $\quad$ so $\cos^2\theta = \left(-\frac{3}{5}\right)^2$

$$\therefore \sin^2\theta + \left(-\frac{3}{5}\right)^2 = 1$$

$$\sin^2\theta = \frac{16}{25}$$

$$\sin\theta = \frac{4}{5}$$

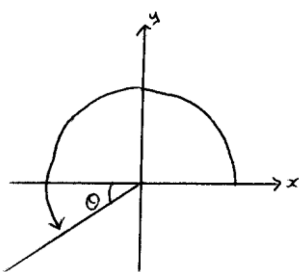
As cos was negative in the question and reflex, it must be in quadrant 3

$$\sin\theta = -\frac{4}{5}$$

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

$$= \frac{-0{\cdot}8}{-0{\cdot}6}$$

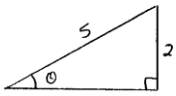
$$= \frac{4}{3}$$



Example 4: Given that $\sin\theta = \frac{2}{5}$ and it is obtuse. Find the exact value of $\cos\theta$

$$x = \sqrt{5^2 - 2^2}$$

$$x = \sqrt{21}$$



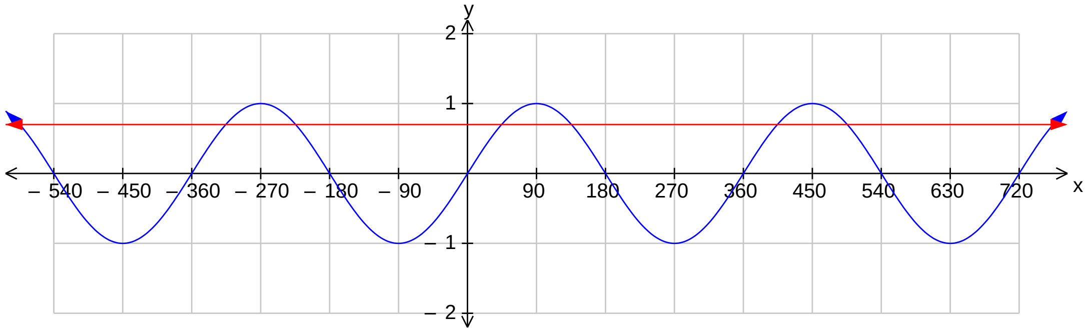
$$\therefore \cos\theta = \frac{\sqrt{21}}{5}$$

As $\sin\theta$ is positive and obtuse it must be in the 2nd quadrant.

$$\therefore \cos\theta = -\frac{\sqrt{21}}{5}$$ because cos is negative in the 2nd quadrant

Solving Simple Trigonometric Equations

If you have an equation like $\sin x = 0{\cdot}7$ we can show this on a graph



Where the 2 lines intersect are the answers.

Or we can use algebra and our knowledge of trigonometric functions and quadrants.

Angle	positive	negative	How to calculate answer
0 - 90°	All	None	Keep angle
90° - 180°	Sin	Tan, cos	180° - angle
180° - 270°	Tan	Sin, cos	180° + angle
270° - 360°	Cos	Sin, tan	360° - °angle

Example 1: Find the solution to $\sin\theta = 0{\cdot}6$ for $0 \leq \theta \leq 360°$

$\sin\theta = 0{\cdot}6$

$\theta = 36{\cdot}9°$ (1dp)

$\sin\theta$ is positive in quadrants 1 and 2

$Q1 = 36{\cdot}9°$

$Q2 = 180 - 36{\cdot}9$

$= 143{\cdot}1°$

$\therefore$ The solutions are $36{\cdot}9°$ & $143{\cdot}1°$

Example 2: Find the solution to $\tan\theta = -\sqrt{3}$ for $0 \le \theta \le 360°$

$\tan\theta = \sqrt{3}$ ignore the signs to find the initial angle θ

$\theta = 60°$

tan is negative in quadrants 2 and 4

$Q2 = 180 - 60$

$= 120°$

$Q4 = 360 - 60$

$= 300°$

The solutions are 120° & 300°

If you need to find more solutions because one of your initial answers lie outside your region, then you can plus or minus the period of the graph.

What's that? $\cos\theta$ $\theta = 1\theta$ so $\frac{360}{1} = 360°$

The period is 360° so you can either add or subtract 360° to find the other solutions

$\sin 3\theta$ so $\frac{360}{3} = 120°$

The 3 means it has been squashed horizontally

The period here is 120° so you can either add or subtract 120° to find other solutions

Solving Harder Trigonometric Equations in Degrees

The key to solving these equations is to try and rearrange the original equation into the form Sin θ = C , this will then give you the value of θ. If you have sin (θ + C) = k then you leave the brackets till the end

Example 1: Find the solution to $3\cos(x - 30°) = 1$ for $0 \leq \theta \leq 360°$

$$3\cos(x - 30) = 1$$

$$\cos(x - 30) = \frac{1}{3}$$

$$(x - 30) = 70{\cdot}53°$$

$$\therefore \quad \theta = 70{\cdot}53$$

cos is positive in quadrants 1 and 4

Q1 $\quad x - 30 = 70{\cdot}53$

$\quad\quad x = 100{\cdot}53°$

Q2 $\quad x - 30 = 360 - 70{\cdot}53$

$\quad\quad x - 30 = 289{\cdot}47$

$\quad\quad x = 319{\cdot}47°$

$\therefore$ The solutions are $100{\cdot}53°$ & $319{\cdot}47°$

Remember 'inside the bracket leave till the end'

Solving Harder Trigonometric Equations

You need to solve them the same as any other quadratic equation

Example 1: $2\cos^2\theta - \cos\theta = 1$ solve for $0 \le x \le 360°$

$2\cos^2\theta - \cos\theta = 1$

$(2\cos\theta + 1)(\cos\theta - 1) = 0$

$\cos\theta = -\frac{1}{2}$ or $\cos\theta = 1$

using $\cos\theta = \frac{1}{2}$

$\theta = 60°$

cos θ is negative in quadrants 2 & 3

Q2 $\theta = 180 - 60$

$\theta = 120°$

Q3 $\theta = 180 + 60$

$\theta = 240°$

using $\cos\theta = 1$

$\theta = 0$

cos θ is positive in quadrants 1 & 4

Q1 $\theta = 0°$

Q4 $\theta = 360 - 0$

$\theta = 360°$

The solutions are 0°, 120° , 240° , 360°

Be aware you may need to use $\sin^2 x + \cos^2 x = 1$ to simplify before you can factorise.

Homework Questions 1 – Solving Trig Equations in Degrees

Solve the following equations for $0 \leq x \leq 360°$

a) $\sin x = 0{\cdot}3$

b) $\cos x = 0{\cdot}7$

c) $\sin x = 0{\cdot}54$

d) $\tan x = -0{\cdot}6$

e) $\sin x = -0{\cdot}92$

f) $\cos x = 0{\cdot}87$

g) $\cos x = -0{\cdot}37$

h) $\tan x = 0{\cdot}56$

i) $\sin x = 0{\cdot}87$

j) $\tan x = -0{\cdot}03$

Homework Questions 2 – Solving Trig Equations in Degrees

Solve the following equations for $-180 < x < 180$

a) $\sin x = 0{\cdot}54$

b) $\cos x = 0{\cdot}93$

c) $\tan x = -0{\cdot}11$

d) $\cos x = 0{\cdot}69$

e) $\sin x = 0{\cdot}41$

f) $\tan x = -0{\cdot}43$

g) $\cos x = 0{\cdot}86$

h) $\tan x = 0{\cdot}47$

i) $\sin x = -0{\cdot}3$

j) $\cos x = -0{\cdot}66$

Homework Questions 3 – Solving Harder Trig Equations in Degrees

Solve the following equations for $0 \leq x \leq 360°$

a) $\sin(x + 20°) = 0{\cdot}43$

b) $\cos(x - 50°) = 0{\cdot}76$

c) $3\sin x = 2{\cdot}6$

d) $5\sin x = 4{\cdot}42$

e) $2\tan(x + 10°) = -1{\cdot}3$

f) $3\cos(x - 30°) = 2{\cdot}6$

g) $4\cos(x - 18°) + 2 = 5$

h) $2\tan(x + 60°) - 3 = -1{\cdot}2$

i) $2\cos(x + 55°) - 0{\cdot}5 = -0{\cdot}5$

j) $5\sin(x + 17°) + 3 = 4{\cdot}6$

Homework Questions 5 – Solving Trig Equations with more than 2 Solutions

Solve the following equations for $0 \leq x \leq 180°$

a) $\sin 3x = 0{\cdot}96$

b) $\cos 2x = 0{\cdot}48$

c) $\tan 2x = -0{\cdot}55$

d) $\sin 4x = 0{\cdot}8$

Solve the following equations for $0 \leq x \leq \pi$

e) $\sin 2x = 0{\cdot}77$

f) $\cos 3x = -0{\cdot}84$

g) $\tan 3x = 0{\cdot}94$

h) $\cos 2x = -0{\cdot}86$

Solve the following equations for $-180° \le x \le 180°$

i) $3 \sin 2x = 1{\cdot}6$

j) $2 \cos 2x = 1{\cdot}6$

k) $4 \sin 3x = -3{\cdot}66$

l) $2 \tan 2x = 1{\cdot}18$

Solve the following equations for $-180° \le x \le 180°$

m) $3 \sin 2x - 1 = -2$

n) $4 \cos 3x + 2 = 3$

Homework Questions 6– Solving Trig Equations after Simplifying First

Solve the following equations for $0 \leq x \leq 360°$

a) $\sin\theta = 6\cos\theta$

b) $6 + \cos\theta = 1 + 6\sin^2\theta$

c) $2 - \sin\theta = 1 + 2\cos^2\theta$

d) $13 - 15\cos^2\theta + 7\sin\theta = 0$

1. Solve, for $0 \leq x \leq 180°$, the equation

(*a*) $\sin(x + 10°) = \frac{\sqrt{3}}{2}$,

(*b*) $\cos 2x = –0.9$, giving your answers to 1 decimal place.

2. (*a*) Find all the values of θ, to 1 decimal place, in the interval $0° \leq \theta < 360°$ for which

$$5 \sin(\theta + 30°) = 3.$$

(*b*) Find all the values of θ, to 1 decimal place, in the interval $0° \leq \theta < 360°$ for which

$$\tan^2 \theta = 4.$$

3. Solve, for $0 \leq x < 360°$,

(*a*) $\sin(x - 20°) = \frac{1}{\sqrt{2}}$,

(*b*) $\cos 3x = -\frac{1}{2}$.

4. (*a*) Given that $\sin \theta = 5 \cos \theta$, find the value of $\tan \theta$.

(*b*) Hence, or otherwise, find the values of θ in the interval $0 \leq \theta < 360°$ for which

$$\sin \theta = 5 \cos \theta,$$

giving your answers to 1 decimal place.

5. (*a*) Show that the equation

$$5 \cos^2 x = 3(1 + \sin x)$$

can be written as

$$5 \sin^2 x + 3 \sin x - 2 = 0.$$

(*b*) Hence solve, for $0 \leq x < 360°$, the equation

$$5 \cos^2 x = 3(1 + \sin x),$$

giving your answers to 1 decimal place where appropriate.

6. (*a*) Show that the equation

$$3 \sin^2 \theta - 2 \cos^2 \theta = 1$$

can be written as

$$5 \sin^2 \theta = 3.$$

(*b*) Hence solve, for $0° \leq \theta < 360°$, the equation

$$3 \sin^2 \theta - 2 \cos^2 \theta = 1,$$

giving your answer to 1 decimal place.

7. (*a*) Show that the equation

$$4 \sin^2 x + 9 \cos x - 6 = 0$$

can be written as

$$4 \cos^2 x - 9 \cos x + 2 = 0.$$

(*b*) Hence solve, for $0 \leq x < 720°$,

$$4 \sin^2 x + 9 \cos x - 6 = 0,$$

giving your answers to 1 decimal place.

8. (i) Solve, for $-180° \leq \theta < 180°$,

$$(1 + \tan \theta)(5 \sin \theta - 2) = 0.$$

(ii) Solve, for $0 \leq x < 360°$,

$$4 \sin x = 3 \tan x.$$

9. (*a*) Show that the equation

$$5 \sin x = 1 + 2 \cos^2 x$$

can be written in the form

$$2 \sin^2 x + 5 \sin x - 3 = 0.$$

(*b*) Solve, for $0 \leq x < 360°$,

$$2 \sin^2 x + 5 \sin x - 3 = 0.$$

10. (*a*) Given that $5 \sin \theta = 2 \cos \theta$, find the value of $\tan \theta$.

(*b*) Solve, for $0 \leq x < 360°$,

$$5 \sin 2x = 2 \cos 2x ,$$

giving your answers to 1 decimal place.

11. (*a*) Show that the equation

$$3 \sin^2 x + 7 \sin x = \cos^2 x - 4$$

can be written in the form

$$4 \sin^2 x + 7 \sin x + 3 = 0.$$

(*b*) Hence solve, for $0 \leq x < 360°$,

$$3 \sin^2 x + 7 \sin x = \cos^2 x - 4$$

giving your answers to 1 decimal place where appropriate.

12. (*a*) Solve for $0 \leq x < 360°$, giving your answers in degrees to 1 decimal place,

$$3 \sin (x + 45°) = 2.$$

(*b*) Find, for $0 \leq x < 2\pi$, all the solutions of

$$2 \sin^2 x + 2 = 7\cos x,$$

giving your answers in radians.

You must show clearly how you obtained your answers.

13. (i) Find the solutions of the equation $\sin(3x - 15°) = \frac{1}{2}$, for which $0 \leq x \leq 180°$.

(6)

(ii)

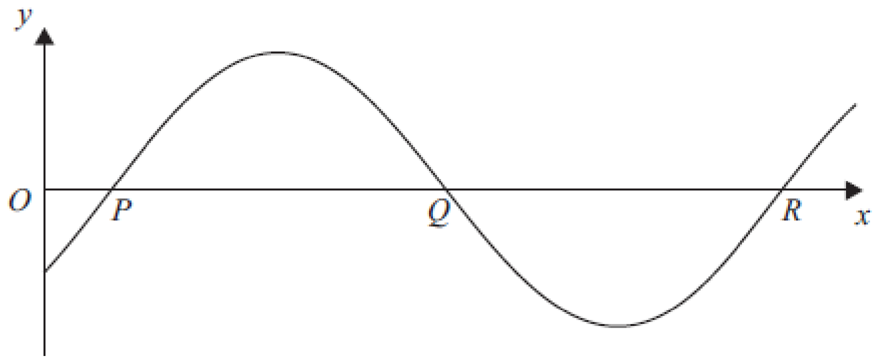


Figure 4

Figure 4 shows part of the curve with equation

$$y = \sin(ax - b), \text{ where } a > 0, \quad 0 < b < 180.$$

The curve cuts the x-axis at the points P, Q and R as shown.

Given that the coordinates of P, Q and R are $(18, 0)$, $(108, 0)$ and $(198, 0)$ respectively, find the values of a and b.

14. (*a*) Show that the equation

$$\tan 2x = 5 \sin 2x$$

can be written in the form

$$(1 - 5 \cos 2x) \sin 2x = 0.$$

(*b*) Hence solve, for $0 \leq x \leq 180°$,

$$\tan 2x = 5 \sin 2x,$$

giving your answers to 1 decimal place where appropriate.

You must show clearly how you obtained your answers.

15.

(*a*) Show that the equation

$$\frac{5 + \sin\theta}{3\cos\theta} = 2\cos\theta, \qquad \theta \neq (2n+1)90°, \quad n \in ¢$$

may be rewritten as

$$6\sin^2\theta + \sin\theta - 1 = 0$$

(*b*) Hence solve, for $-90° < \theta < 90°$, the equation

$$\frac{5 + \sin\theta}{3\cos\theta} = 2\cos\theta$$

Give your answers to one decimal place, where appropriate.

16. (*a*) Given that $7\sin x = 3\cos x$, find the exact value of $\tan x$.

(*b*) Hence solve for $0 \leq \theta < 360°$

$$7\sin(2\theta + 30°) = 3\cos(2\theta + 30°)$$

giving your answers to one decimal place.

17. (i) Showing each step in your reasoning, prove that

$$(\sin x + \cos x)(1 - \sin x\cos x) \equiv \sin^3 x + \cos^3 x$$

(ii) Solve, for $0 \leq \theta < 360°$,

$$3\sin\theta = \tan\theta$$

giving your answers in degrees to 1 decimal place, as appropriate.