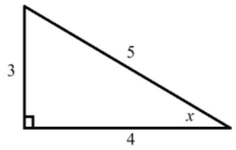
www.m4ths.com – Year 1 AS Trigonometry (1)

(1) Using the triangle below, show that:

(a) $\dfrac{\sin x}{\cos x} = \tan x$

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



(2) Simplify the following expressions:

(a) $\dfrac{\sin 3\theta}{\cos 3\theta}$

(b) $4\sin^2 2x + 4\cos^2 2x$

(c) $3 - 3\cos^2 5x$

(d) $\dfrac{3\sin^2 4p}{\sin 4p\sqrt{1-\sin^2 4p}}$

(3) Show the expression $(\sin x + \cos x)^2 - (\sin x - \cos x)^2$ can be written as $k\sin x\cos x$ stating the value of k.

(4) Prove the following identities:

(a) $\dfrac{\sin^2 x - \cos^2 x}{\sin x + \cos x} \equiv \sin x - \cos x$

(b) $\dfrac{\sqrt{1-\cos^2 3x}}{\sqrt{1-\sin^2 3x}} \equiv \tan 3x$

(c) $\sin^4 x - \cos^4 x \equiv 1 - 2\cos^2 x$

(d) $\dfrac{\cos x}{\sin x} + \dfrac{\sin x}{\cos x} \equiv \dfrac{1}{\sin x\cos x}$

(5) Given $\sin A = \dfrac{3}{5}$ and that A is obtuse, find the values of:

(a) $\cos A$

(b) $\tan A$

(6) Given $x = 3\cos A$ and $y = 2\sin A$, write an equation connecting y and x.

Give all answers to 1 decimal place where appropriate.

(7) Solve the following equations in the interval $0 \le x \le 360^o$:

(a) $\sin x = 0.5$

(b) $\cos x = \dfrac{1}{\sqrt{2}}$

(c) $\tan x = 1$

(d) $\cos x = \dfrac{\sqrt{3}}{2}$

(e) $\sin x = -\dfrac{\sqrt{3}}{2}$

(8) Solve the following equations in the interval $0 \le x \le 360^o$:

(a) $\sin x = \dfrac{\sqrt{3}}{2}$

(b) $\tan x = \dfrac{1}{\sqrt{3}}$

(c) $\cos x = -\dfrac{1}{2}$

(d) $\tan x = -1$

(9) Solve the following equations for $0 \le x \le 360^o$:

(a) $\sin x = 0.24$

(b) $\cos x = 0.83$

(c) $3\tan x - 1 = 2.12$

(d) $4\sin x = -1.08$

(10) Solve the following equations for $0 \le x \le 360^o$:

(a) $\cos x = -0.54$

(b) $\tan x = 3.7$

(c) $1 - \sin x = 0.43$

(d) $2\cos x = \sin x$

(11) Solve the following equations in the interval $-180^o \le x \le 180^o$:

(a) $\sin\left(x - 30^o\right) = \dfrac{\sqrt{3}}{2}$

(b) $\cos\left(x + 45^o\right) = \dfrac{1}{2}$

(c) $3\tan\left(x - 15^o\right) = \sqrt{3}$

(d) $2\sin(x + 60^o) = \sqrt{2}$

(12) Solve the following equations in the interval $0 \le x \le 360^o$:

(a) $2\cos(x + 60) = \sqrt{3}$

(b) $\tan(x - 45) = \frac{1}{\sqrt{3}}$

(13) Solve the following equations for $0 \le x \le 180^o$.

(a) $\sin(3x) = \dfrac{\sqrt{3}}{2}$

(b) $\cos\left(2x\right) = 0.45$

(c) $\sin\left(3x - 20^o\right) = 0.3$

(d) $\tan\left(2x + 12^o\right) = 1.3$

(14) Solve the following equations the interval $0 \le x \le 180^o$

(a) $\tan\left(3x - 1.2^c\right) = 0.4$

(b) $\sin\left(2x - 0.2^c\right) = -0.12$

(c) $2\cos\left(3x + 0.65^c\right) = 1.87$

(15) Solve the following equations in the interval $0 \le x \le 360^o$:

(a) $2\sin x = \sin x\cos x$

(b) $\sin\left(2x - 10^o\right) = \sin\left(50^o\right)$

(c) $\tan\left(3\theta - 20^o\right) = \tan\left(30^o\right)$

(16) Solve the following equations for $0 \le x \le 360^o$:

(a) $\sin^2 x = \dfrac{1}{2}$

(b) $\tan^2 2x = 1$

(c) $2\sin^2 x - \sin x = 1$

(d) $\left(\cos x - 1\right)\left(2\sin x - 1\right) = 0$

(e) $4\sin^2 x - 4\cos x - 1 = 0$

(f) $2\cos\dfrac{1}{2}x = \tan\dfrac{1}{2}x$

(17) Solve the following equations for $0 \le x \le 360^o$:

(a) $\cos^2 x - \sin(90 - x) = 2$

(b) $3\tan^2 x + 5\tan x - 2 = 0$

(c) $\sin x\left(2\sin x + 1\right) = 0$

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Some questions are in radians!

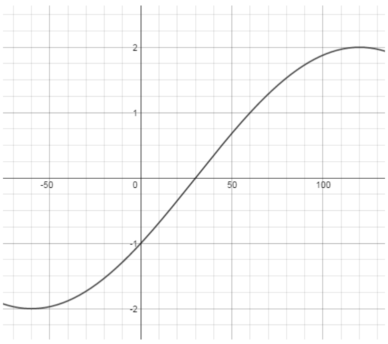
(1) Solve the equation
$2\cos^2 x - 9\sin x + 3 = 0$
in the interval $0 < x \le 2\pi$ giving your answers as multiples of π.

(2) (a) Show the equation $2\cos x + 3\sin x = 0$ can be written as $\tan x = -\frac{2}{3}$.
(b) Hence or otherwise solve the equation
$2\cos\frac{\theta}{2} + 3\sin\frac{\theta}{2} = 0$
in the interval $0 \le \theta \le 360^o$ giving your answer to 3 significant figures.

(3) (a) If $x = 3\cos\theta - 1$ and $y = 3\sin\theta + 2$ show that
$(x+1)^2 + (y-2)^2 = r^2$
stating the value of r.
(b) Sketch the graph of $(x+1)^2 + (y-2)^2 = r^2$ showing any points of intersection with the coordinate axis in exact from.

(4) Show that the equation $2\sin x = 3\tan x$ has 2 solutions in the interval $0 < x \le 2\pi$ giving the solutions as multiples of π.

(5) The graph below shows part of the curve $y = p\sin(x - q^o)$.
(a) Write down the values of p and q.
(b) Solve the equation
$p\sin(x - q^o) = \sqrt{3}$
in the interval $0 \le x \le 360^o$.



(6) (a) Show the expression $\sin^4 x - \cos^4 x$ can be written in the form $a\sin^2 x - 1$ stating the value of a.
(b) Hence or otherwise solve the equation
$\sin^4 2x - \cos^4 2x = -\frac{1}{2}$
in the interval $0 \le x \le 180^o$

(7) (a) Show the equation $1 + \tan x = 2\left(\frac{\cos x}{\sin x}\right)$ can be written as $\tan^2 x + \tan x - 2 = 0$.
(b) Solve the equation
$\tan^2 x + \tan x - 2 = 0$
for $-180^o < x \le 180^o$ giving your answers to 3 significant figures where appropriate.

(8) Given $\sin\alpha = 0.8$ and $90^o < \alpha < 180^o$ find the value of:
(a) $\cos\alpha$
(b) $\tan^3\alpha$
(c) $\sin\alpha\cos^2\alpha$

(9) (a) Sketch the graphs of $y = \sin 2x$ and $y = \cos 2x$ for $0 \le x \le 2\pi$ on the same set of axis.
(b) Using your graph show there are 4 solutions to the equation $\sin 2x = \cos 2x$ in the interval $0 \le x \le 2\pi$.
(c) Solve the equation $\sin 2x = \cos 2x$ for $0 \le x \le 2\pi$ giving your answers as multiples of π.