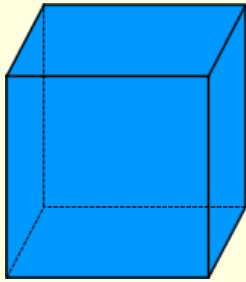## Starter

1) A small cube is enlarged by a length scale factor of 3.

The small cube has a surface area of 25cm^2 and a volume of 140cm^3.

What is the new surface area and volume of the enlarged shape?

$$25 \times 3^2 = 25 \times 9 = 225 \text{ cm}^2$$
$$25 \times 3^3 = 25 \times 27 = 675 \text{ cm}^3$$

Similarity

Today we are learning...

How to answer a range of exam style questions on similarity.

I will know if I have been successful if...

I can quickly calculate the scale factor.

I can find the volume once increased by a scale factor.

I can find the surface area once increased by a scale factor.

Similarity Question Relay

Answer one question at a time.

Once you have completed a question bring it to me to check your answer and collect the next question.

Write your answer on the question sheet.

Each team has a pass card - use it wisely!

Plenary

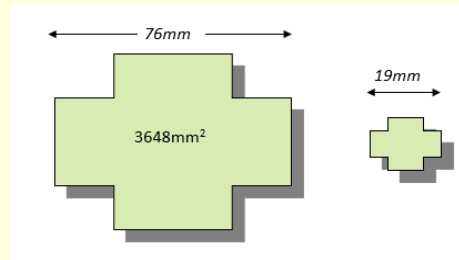A deflated beach ball has an initial surface area of 34cm^2 and a volume of 14cm^3.

It is inflated until it has increased in size by a scale factor of 4.
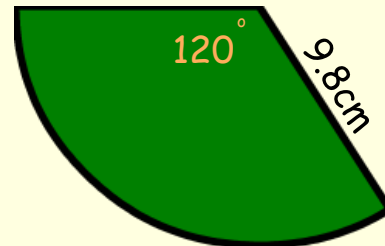
What is the new volume and surface area of the ball?

Starter

1) What is the area of the **smaller** shape?

76mm

19mm

3648mm²

2) What is the arc length and area of the sector shown?

120°

9.8cm

CAST Diagram

Today we are learning...

How to draw and use the CAST diagram to solve trig equations.

I will know if I have been successful if...

I know how to draw the CAST diagram.

I can identify which quadrants to use.
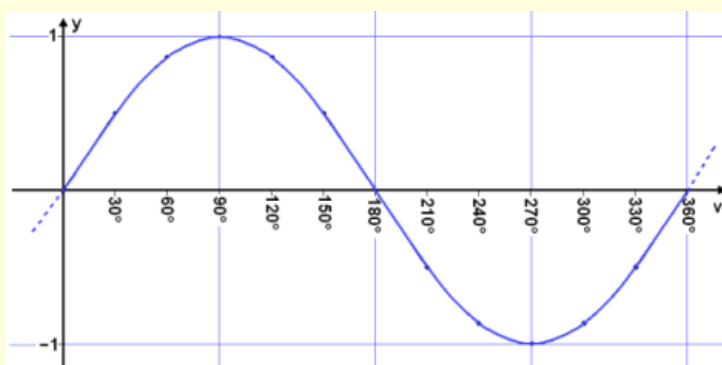
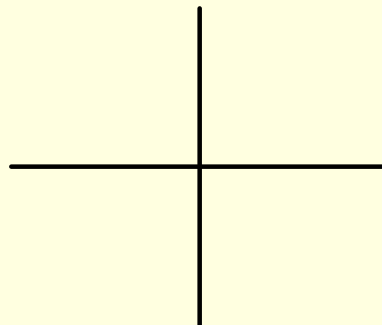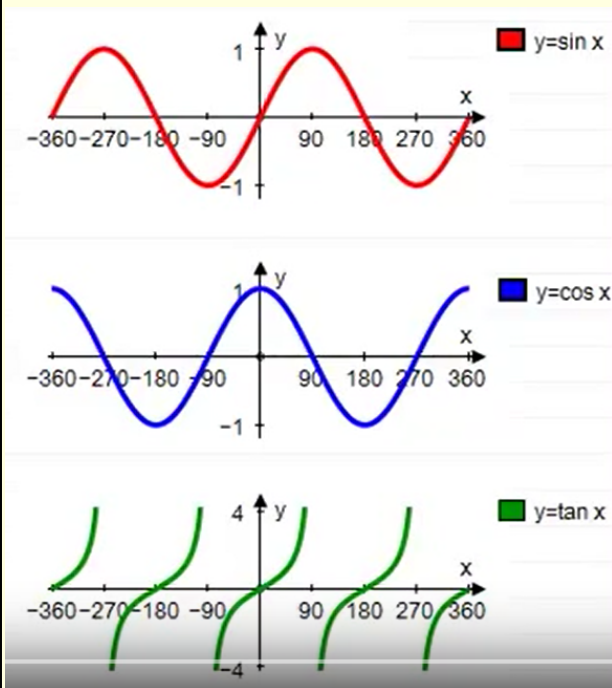I can solve to find the required values of theta.

Examples

1) sin(x) = 0.5   for 0 < x < 360

Examples

1) sin(x) = 0.5   for 0 < x < 360

Drawing the CAST Diagram

y=sin x

y=cos x

y=tan x

Examples
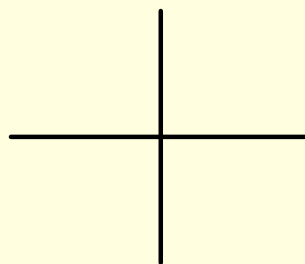
1) sin(x) = 0.5   for 0 < x < 360

Examples

2) $\cos(x) = 0.5$ for $0 < x < 360$

S	A
T	C
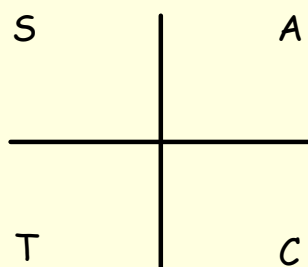
Examples

3) $\tan(\theta) = \sqrt{3}$ for $0 < x < 360$

S	A
T	C
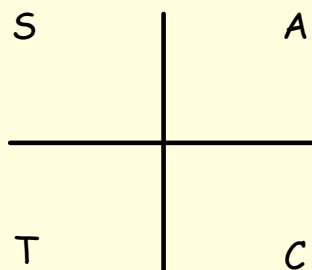
Examples

4) $\cos(\theta) = -0.5$ for $0 < x < 360$

S		A
T		C
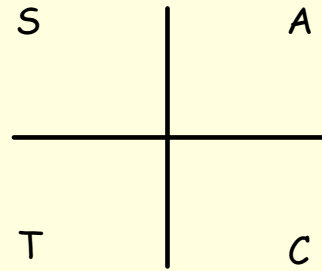
Practice

1. Solve the following equations where $0 \leq x \leq 360$

    (a) $\sin x° = 0·5$ **(b)** $\cos x° = 0·866$ **(c)** $\tan x° = 1$

    (d) $\cos x° = -0·5$ **(e)** $\tan x° = -0·577$ **(f)** $\sin x° = -0·866$

    (g) $\tan x° = 1·732$ **(h)** $\sin x° = 0·707$ **(i)** $\cos x° = 0·707$

    (j) $\sin x° = -0·707$ **(k)** $\cos x° = -0·866$ **(l)** $\tan x° = -1·732$

2. Solve the following equations where $0 \leq x \leq 360$

    (a) $\sin x° = 0·313$ **(b)** $\cos x° = 0·425$ **(c)** $\tan x° = 5·145$

    (d) $\cos x° = -0·087$ **(e)** $\tan x° = -0·869$ **(f)** $\sin x° = -0·191$

    (g) $\tan x° = 11·43$ **(h)** $\sin x° = 0·695$ **(i)** $\cos x° = 0·755$

    (j) $\sin x° = -0·358$ **(k)** $\cos x° = -0·682$ **(l)** $\tan x° = -0·268$

3. Solve the following equations where $0 \leq x \leq 360$

    (a) $2 \sin x° = 1$ **(b)** $3 \cos x° = 2$ **(c)** $3 \tan x° = 5$

    (d) $2 \cos x° = -1$ **(e)** $2 \tan x° = -8$ **(f)** $4 \sin x° = -3$

    (g) $5 \tan x° = 23·5$ **(h)** $5 \sin x° = 2$ **(i)** $6 \cos x° = 1$

    (j) $8 \sin x° = -3$ **(k)** $11 \cos x° = -9$ **(l)** $10 \tan x° = -9$

Answers

1. (a) 30°, 150°   (b) 30°, 330°   (c) 45°, 225°
   (d) 120°, 240°   (e) 150°, 330°   (f) 240°, 300°
   (g) 60°, 240°   (h) 45°, 135°   (i) 45°, 315°
   (j) 225°, 315°   (k) 150°, 210°   (l) 120°, 300°

2. (a) 18·2°, 161·8°   (b) 64·8°, 295·2°   (c) 79°, 259°
   (d) 95°, 265°   (e) 139°, 319°   (f) 191°, 349°
   (g) 85°, 265°   (h) 44°, 136°   (i) 41°, 319°
   (j) 201°, 339°   (k) 133°, 227°   (l) 165°, 345°

3. (a) 30°, 150°   (b) 48·2°, 311·8°   (c) 59°, 239°
   (d) 120°, 240°   (e) 104°, 284°   (f) 228·6°, 311·4°
   (g) 78°, 258°   (h) 23·6°, 156·4°   (i) 80·4°, 279·6°
   (j) 202°, 338°   (k) 144·9°, 215·1°   (l) 138°, 318°

Introduction to next lesson...

a) Solve $-2 + 3\sin(x) = 0$ for $0 < x < 360$
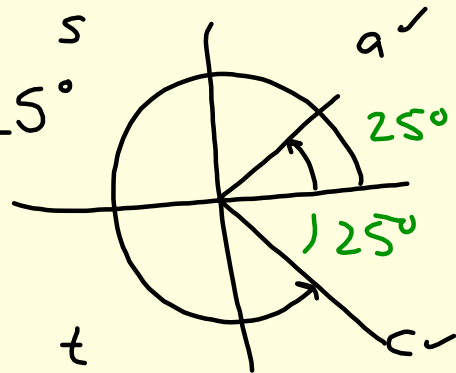
b) Solve $3 - 7\tan(x) = 2$ for $0 < x < 360$

Starter

1) Solve the following using the CAST diagram for 0 < x < 360.

a) tan(x) = 1.1917 $\tan^{-1}(1.1917) = 50°$

x = 50°, 230°

b) cos(x) = 0.9063

$\cos^{-1}(0.9063) = 25°$

x = 335°, 25°

s

a ✓

25°

) 25°

t

c ✓

Solving Trig Functions

Today we are learning...

How to solve trigonometric functions.

I will know if I have been successful if...

I can use the CAST diagram as a tool to help me.

I can rearrange equations where required.

I know that there may be more than one solution.

✔

Example

1) Solve the equation 5cos(x) = 1 for 0 < x < 360
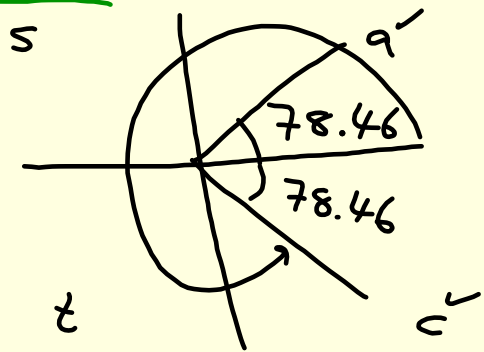
$$5\cos(x) = 1$$

$$\cos(x) = \frac{1}{5} = 0.2$$

$$\cos^{-1}(0.2) = 78.46°$$

$$x = 360 - 78.46$$

$$= 281.53°$$

Example

2) Solve the equation 5sin(x) + 4 = 0 for 0 < x < 360

$$5\sin(x) = -4$$

$$\sin(x) = \frac{-4}{5}$$

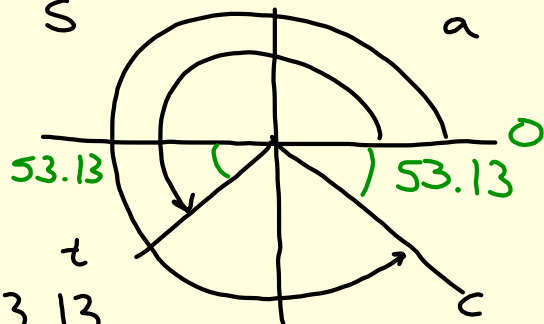$$\sin^{-1}\left(\frac{-4}{5}\right) = -53.13$$

$$x = 180 + 53.13$$

$$= 233.13°$$

$$x = 360 - 53.13$$

$$= 306.87°$$

Practice

1) Solve the following equations where $0 \le x \le 360$.

    (a) $2\sin x° = 1$ (b) $5\sin x° - 4 = 0$ (c) $5\sin x° = -3$

    (d) $6\sin x° + 1 = 0$ (e) $4\sin x° + 1 = 1.5$ (f) $12 + 9\sin x° = 8.$

2) Solve the following equations where $0 \le x \le 360$.

    (a) $6\cos x° = 3$ (b) $10\cos x° - 2 = 0$ (c) $3\cos x° = 2$

    (d) $7\cos x° + 4 = 0$ (e) $9\cos x° + 7 = 2$ (f) $18 + 4\cos x° = 15.$

Highlighted in red - negatives!

Answers

1)

	a		b	
a	30·0°	150°	b	53·1° 127°
c	217°	323°	d	190° 350°
e	7·18°	173°	f	206° 334°

2)

	a		b	
a	60·0°	300°	b	78·5° 282°
c	48.19	311.81	d	125° 235°
e	124°	236°	f	139° 221°

Plenary
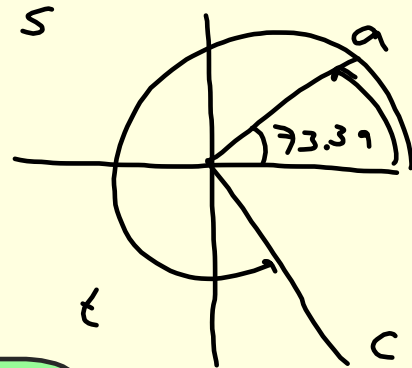
Solve **algebraically**, the equation $7\cos x° - 2 = 0$ for $0 \le x \le 360$ 3

$$7\cos(x) = 2$$
$$\cos(x) = \frac{2}{7} \checkmark$$
$$\cos^{-1}\left(\frac{2}{7}\right) = 73.39 \checkmark$$

S   a

73.39

t   c

> Answer

$$x = 360 - 73.39$$
$$= 286.61° \checkmark$$
$$x = 73.39°$$

$$\overline{3}$$

Starter

Solve by first rearranging and then using the CAST diagram.

1) cos(x) - 1 = -1   for 0 < x < 360

2) 3tan(x) + 1 = 4   for 0 < x < 360

Trigonometric Identities

Today we are learning...

The key trigonometric identities and how to use them.

I will know if I have been successful if...
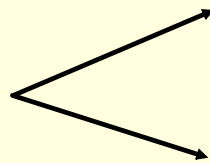
I can state some of the key identities.

I can substitute expressions involving the key identities.

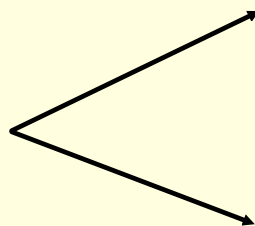I can simplify expressions using the key identities.

The Identities

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

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

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

Using the Identities

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

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

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

Using the Identities

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

2) Prove $\tan(x)\cos(x) = \sin(x)$

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

Using the Identities

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

3) Prove $8\cos^2(x) = 8 - 8\sin^2(x)$

Prove the following trigonometric **identities** :-

(a) $5\cos^2 A + 5\sin^2 A = 5$

(b) $4\cos^2 A = 4 - 4\sin^2 A$

(c) $2\cos^2 A - 1 = 1 - 2\sin^2 A$

(d) $6\cos^2 A - 5 = 1 - 6\sin^2 A$

(e) $(\cos X + \sin X)^2 = 1 + 2\sin X \cos X$

(f) $(\cos P - \sin P)^2 + 2\sin P \cos P = 1$

(g) $(\cos X + \sin X)(\cos X - \sin X) = 2\cos^2 X - 1$

(h) $(\cos X - \sin X)(\cos X + \sin X) = 1 - 2\sin^2 X$

(i) $\tan P \cos P = \sin P$

(j) $\dfrac{1 - \cos^2 \alpha}{\cos^2 \alpha} = \tan^2 \alpha$

(k) $\dfrac{1 - \sin^2 \alpha}{\sin^2 \alpha} = \dfrac{1}{\tan^2 \alpha}$

(l) $\dfrac{\sin \beta}{\cos \beta} + \dfrac{\cos \beta}{\sin \beta} = \dfrac{1}{\cos \beta \sin \beta}$.

Plenary

(b) Prove that

$$sin^3x + sinxcos^2x = sinx$$ (2 marks)

Hint: Factorise the expression first by taking out a common factor.

Starter

1) Solve the equation algebraically for 0 < x < 360

4tan(x) + 7 = 5

2) Simplify

tan(x)cos(x)

Trigonometric Identities

Today we are learning...

The key trigonometric identities and how to use them.

I will know if I have been successful if...

I can state some of the key identities.

I can substitute expressions involving the key identities.

I can simplify expressions using the key identities.