Maths Points

Junior and Leaving Cert

# LCOL BASIC SKILLS

## PACK 9

Leaving Cert Ordinary Level

# LCOL Basic Skills: Pack 3 – Table of Contents

Topic, Year and Level



Maths Points

Junior and Leaving Cert

Solve the equation

$$\frac{1}{2}(7x - 2) + 5 = 2x + 7.$$

**Method 1**

**Multiplying Signs**

$(+)(+) = +$

$(-)(-) = +$

$(+)(-) = -$

$(-)(+) = -$

$$\frac{1}{2}(7x - 2) + 5 = 2x + 7$$

$$7x - 2 + 10 = 4x + 14$$

Multiply both sides of the equation by 2 to remove the fraction.

$$7x - 4x = 14 - 10 + 2$$

Collect the $x$ terms on one side of the equals and the numbers (constants) on the other.

$$3x = 6$$

$$x = \frac{6}{3}$$

Divide by the coefficient of $x$ (the number beside it!)

$$x = 2$$

Continued

Method 2

Solve the equation

$$\frac{1}{2}(7x-2)+5=2x+7.$$

**Multiplying Signs**

$(+)(+)=+$

$(-)(-)=+$

$(+)(-)=-$

$(-)(+)=-$

$$\frac{1}{2}(7x-2)+5=2x+7$$

$$3.5x-1+5=2x+7$$

Remove brackets first by multiplying the term outside the bracket by the terms inside.

$$3.5x-2x=7+1-5$$

Collect the $x$ terms on one side of the equals and the numbers (constants) on the other.

$$1.5x=3$$

$$x=\frac{3}{1.5}$$

Divide by the coefficient of $x$ (the number beside it!)

$$x=2$$

An importer buys an item for £221 sterling when the rate of exchange is €1 = £0·85 sterling.

He sells it at a profit of 14% of the cost price.

Calculate, in euro, the price for which he sells the item.

For **currency** questions we either multiply or divide by the exchange rate. Cross multiplying is a good way to figure out which one if you are not sure!

$$€1 = £0.85$$
$$€x = £221$$

$$0.85x = 1(221)$$
$$x = \frac{221}{0.85}$$
$$x = 260$$

OR

Divide the amount of sterling you get for each euro (0.85) by the number of sterling (221).

The cost price in euro is €260.

The selling price is equal to the cost price + 14%, or 114% of the cost price.

$$260 \times 1.14 = €296.40$$

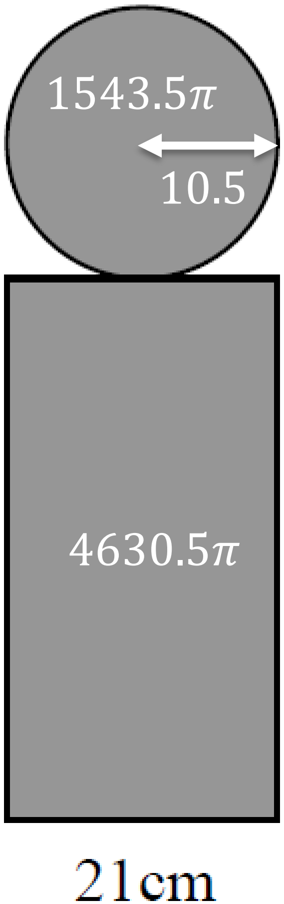
He sells the item for €296.40.

A team trophy for the winners of a football match is in the shape of a sphere supported on a cylindrical base, as shown. The diameter of the sphere and of the cylinder is 21 cm.

Find the volume of the sphere, in terms of $\pi$ .

**Volume of a Sphere**

$$V = \frac{4}{3}\pi r^3$$




$$V = \frac{4}{3}\pi r^3$$

$$V = \frac{4}{3}\pi (10.5)^3$$

$$V = 1543.5\pi \text{ cm}^3$$

The formulae for the **Volumes of Spheres and Cylinders** can be found on **page 10** of the Maths Formulae Book.

(ii)

The volume of the trophy is $6174\pi$ cm$^3$.

Find the height of the cylinder.

We know that the volume of the sphere is $1543.5\pi$ so subtract this from the total volume, $6174\pi$ to get the volume of the cylindrical section.

$$6174\pi -$$
$$\underline{1543.5\pi}$$
$$4630.5\pi$$

Let the volume of the cylinder $(4630.5\pi)$ equal the formula and solve for the height, $h$.

**Volume of a Cylinder**

$$V = \pi r^2 h$$

$$r = 10.5$$

$$\cancel{\pi} r^2 h = 4630.5\cancel{\pi}$$

$$r^2 h = 4630.5$$

$$(10.5)^2 h = 4630.5$$

$$110.25h = 4630.5$$

$$h = \frac{4630.5}{110.25}$$

$$h = 42 \text{ cm}$$

In the triangle $ABC$, $|BC| = 6$ cm, $|\angle ABC| = 90°$, $|\angle CAB| = \theta$ and $\sin\theta = \frac{3}{5}$.

Find $|AC|$.

**Pythagoras Theorem** and the **Trigonometric Ratios** can be found on **page 9** of the Maths Formulae Book.

**Trigonometry Ratio**

$$\tan = \frac{\text{opposite}}{\text{adjacent}}$$

$$\boxed{\sin = \frac{\text{opposite}}{\text{hypotenuse}}}$$

$$\cos = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\sin\theta = \frac{3}{5}$$

**Steps:**

1. Label the sides.
2. Pick a ratio.
3. Write an equation.
4. Solve for $|AC|$.

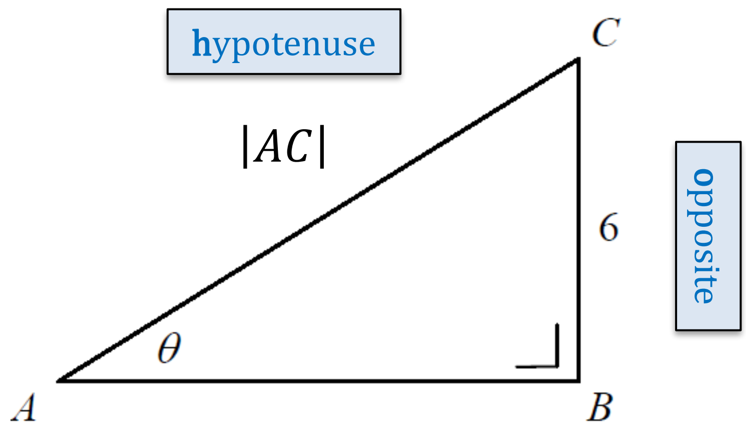
$$\sin\theta = \frac{6}{|AC|}$$

$$\frac{6}{|AC|} = \frac{3}{5}$$

$$3|AC| = (5)(6)$$

$$3|AC| = 30$$

$$|AC| = 10 \text{ cm}$$




(ii)

Find $|AB|$.

**Pythagoras**

$c^2 = a^2 + b^2$

$$c^2 = a^2 + b^2$$

$$|10|^2 = |AB|^2 + 6^2$$

$$100 = |AB|^2 + 36$$

$$100 - 36 = |AB|^2$$

$$64 = |AB|^2$$

$$|AB| = 8 \text{ cm}$$

Continued

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

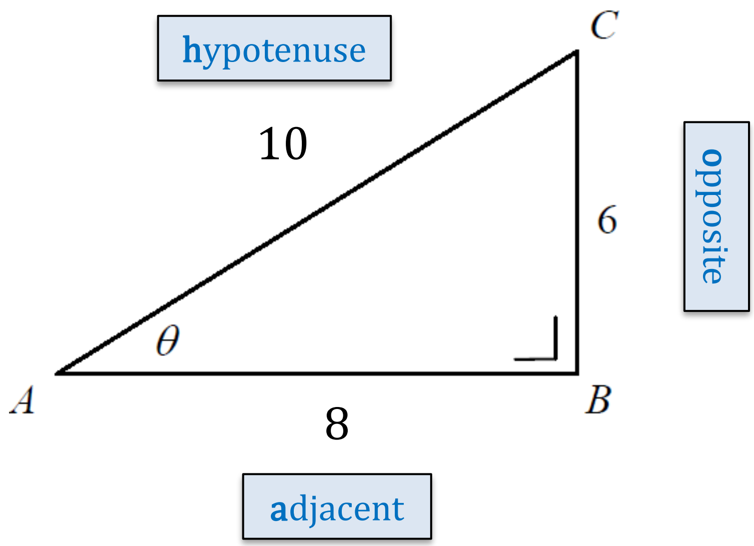
Write expressions for $\cos\theta$ and $\sin\theta$.

**Trigonometry Ratio**

$$\tan = \frac{\text{opposite}}{\text{adjacent}}$$

$$\sin = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos = \frac{\text{adjacent}}{\text{hypotenuse}}$$




$$\cos = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\cos\theta = \frac{8}{10}$$

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

$$\sin = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\sin\theta = \frac{6}{10}$$

$$\sin\theta = \frac{3}{5}$$

$$\cos^2\theta + \sin^2\theta = \left(\frac{4}{5}\right)^2 + \left(\frac{3}{5}\right)^2$$

$$\cos^2\theta + \sin^2\theta = \frac{16}{25} + \frac{9}{25}$$

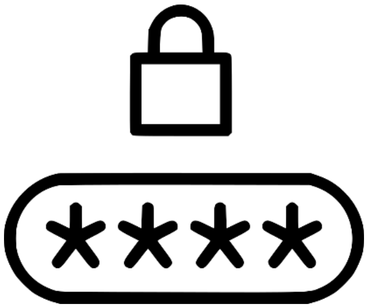
$$\cos^2\theta + \sin^2\theta = 1$$

As required.

A code consists of a four-digit number which is formed from the digits 3 to 9 inclusive.
No digit can occur more than once in the code.

(i) Write down the smallest possible four-digit code.
(ii) How many different codes are possible?
(iii) How many of the four-digit codes are greater than 6000?
(iv) How many of the four-digit codes are divisible by 2?

**Digits 3 to 9 inclusive:**
3, 4, 5, 6, 7, 8, 9



(i) 3456

(ii) $[7] \times [6] \times [5] \times [4]$
$= 840$

There are 7 possibilities for the first digit then 6 for the second digit, then 6 for the third etc.

(iii) $[4] \times [6] \times [5] \times [4]$
$= 480$

Greater than 6000, so there are only 4 options for the first digit., then 6, then 5 etc

(iv) $[6] \times [5] \times [4] \times [3]$
$= 360$

Divisible by 2 means it must end in an even number so there are 3 options for the final digit, then 6 options for the first, 5 for the second etc

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