Maths Points

Junior and Leaving Cert

LCOL BASIC SKILLS
PACK 6

Leaving Cert Ordinary Level

Topic, Year and Level

Maths Points

Junior and Leaving Cert

Last year Elena had a gross income of €36,960.
She had to pay Universal Social Charge (USC) and income tax on her gross income.
The rates and bands of USC are as follows.

Find the amount of USC that was deducted from Elena's gross income last year.

Income band	Rate of USC
Up to €10 036	2%
Between €10 036 and €16 016	4%
Above €16 016	7%

First calculate the amounts to be taxed at 4% $(16016 - 10036)$ and 7% $(36960 - 16016)$.

$16016 - 10036 = 5980$ at 4%
$36960 - 16016 = 20944$ at 7%

Find 2% of €10036

$10036 \times 0.02 = 200.72$

Find 4% of €5980

$5980 \times 0.04 = 239.20$

Find 7% of €20944

$20944 \times 0.07 = 1466.08$

The total USC is the sum of each of these amounts.

$200.72 + 239.20 + 1466.08 = €1906$

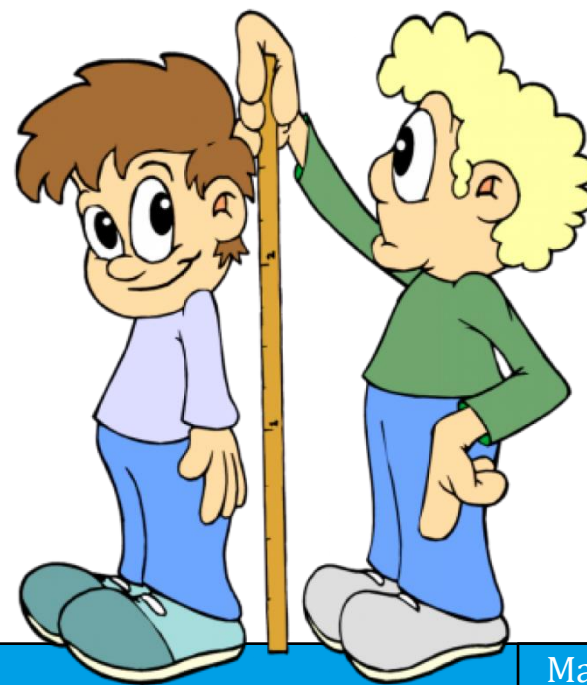Filip measures the height of seven of the students in his class. Their heights, in cm, are:

| 166 | 168 | 168 | 169 | 172 | 173 | 177 |

Write down the **mode** of the data, in cm.

| 166 | 168 | 168 | 169 | 172 | 173 | 177 |

The **mode** is the **most common** value.

Mode = 168 cm

Main Menu

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Filip measures the height of seven of the students in his class. Their heights, in cm, are:

| 166 | 168 | 168 | 169 | 172 | 173 | 177 |

Write down the **median** of the data, in cm.

| 166 | 168 | 168 | 169 | 172 | 173 | 177 |

The **median** is the **middle value** when ordered from lowest to highest.

There are 7 values.

$$\frac{7}{2} = 3.5$$

If we get a decimal we always round up.

→ 4ᵗʰ value

Median = 169 cm

Main Menu

Filip measures the height of seven of the students in his class. Their heights, in cm, are:

| 166 | 168 | 168 | 169 | 172 | 173 | 177 |

Work out the **mean** of the data. Give your answer in cm, correct to one decimal place.

| 166 | 168 | 168 | 169 | 172 | 173 | 177 |

$$\textbf{Mean } = \frac{\text{sum of all the values}}{\text{number of values}}$$

$$\text{Mean} = \frac{\text{Sum of Heights}}{\text{Number of Students}}$$

$$= \frac{166 + 168 + 168 + 169 + 172 + 173 + 177}{7}$$

$$= \frac{1193}{7}$$

$$= 170.43$$

$$\approx 170.4 \text{ cm}$$

$a(-4, 3), b(6, -1)$ and $c(2, 7)$ are three points.

Find the area of the triangle abc.

$(-4, 3) \quad \rightarrow \quad (0, 0)$

$(6, -1) \quad \rightarrow \quad (10, -4)$

$(2, 7) \quad \rightarrow \quad (6, 4)$

Translate
x value ↑ 4
y value ↓ 3

Area of a Triangle
$$A = \frac{1}{2}|x_1 y_2 - x_2 y_1|$$

$a(-4, 3)$
$b(6, -1)$
$c(2, 7)$

Before we can use this formula, we need to move one of the points to (0,0) and find the image of the other 2 points under the same translation.

$$A = \frac{1}{2}|x_1 y_2 - x_2 y_1|$$

$$A = \frac{1}{2}|(10)(4) - (-4)(6)|$$
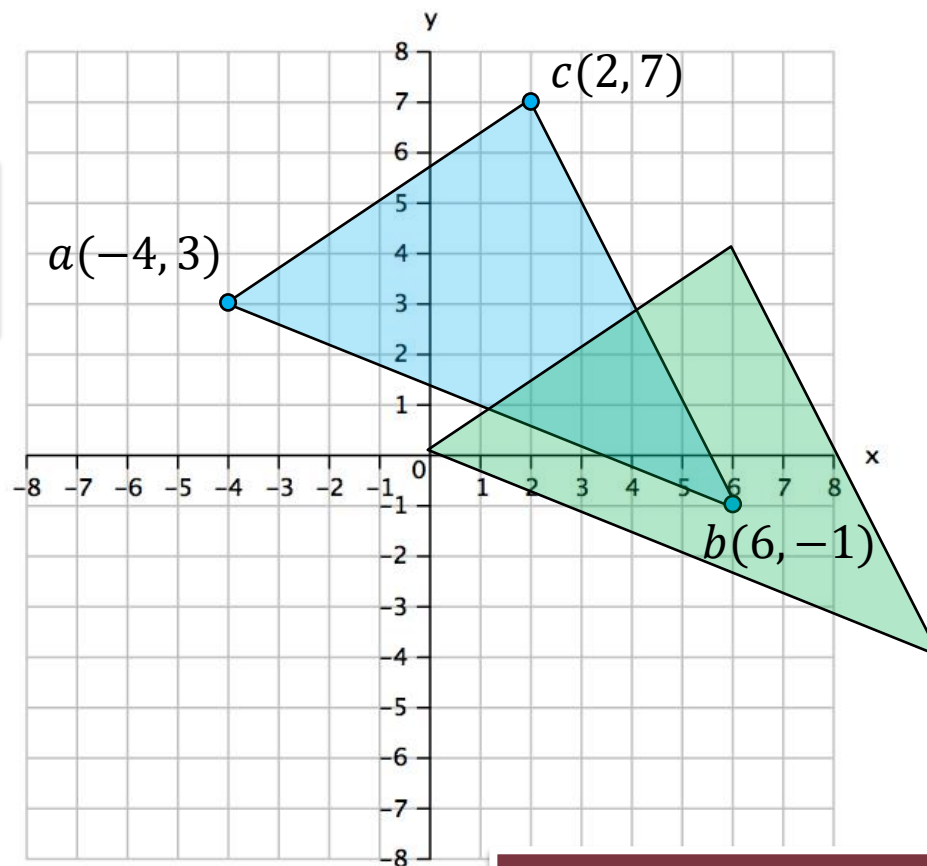
$$A = \frac{1}{2}|40 + 24|$$

$$A = \frac{1}{2}|64|$$

$$A = 32 \text{ units}^2$$

The formula for the **Area of a Triangle** can be found on **page 18** of the Maths Formulae Book.

A circle has centre o and radius 4 cm.
a and b are two points on the circle and $|\angle aob| = 150°$.

(i)   Find the area of the circle, correct to the nearest cm².
(ii)   Find the area of the sector aob, correct to the nearest cm².
(iii)   Find the length of the shorter arc ab, correct to the nearest cm.
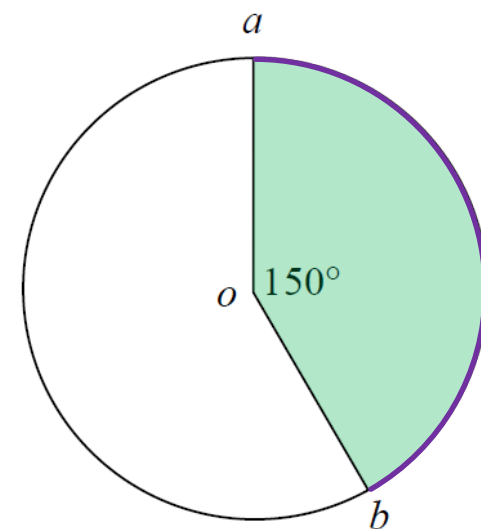
(i)

Area of a Circle
$A = \pi r^2$

$A = \pi r^2$

$A = \pi(4)^2$

$A = 16\pi$

$A = 50.265$

$A \approx 50 \text{ cm}^2$

The formulae for the **Area of a Circle**, **Area of a Sector** and **Length of an Arc** are on **pages 8/9** of the Maths Formulae Book.

(ii)

Area of a Sector
$A = \pi r^2 \times \left(\dfrac{\theta}{360}\right)$

$A = \pi r^2 \times \left(\dfrac{\theta}{360}\right)$

$A = \pi(4)^2 \times \left(\dfrac{150}{360}\right)$

$A = 20.94$

$A \approx 21 \text{ cm}^2$

(iii)

Length of Arc
$l = 2\pi r \times \left(\dfrac{\theta}{360}\right)$

$l = 2\pi r \times \left(\dfrac{\theta}{360}\right)$

$l = 2\pi(4) \times \left(\dfrac{150}{360}\right)$

$l = 10.47 \text{ cm}$

$l \approx 10 \text{ cm}$

The columns in the table below represent the following sets of numbers:

Natural numbers ($\mathbb{N}$), Integers ($\mathbb{Z}$), Rational numbers ($\mathbb{Q}$), Irrational numbers ($\mathbb{R}\backslash\mathbb{Q}$) and Real numbers ($\mathbb{R}$).

Complete the table by writing either '**Yes**' or '**No**' into each box indicating whether each of the numbers $\sqrt{5}$, $8, -4, 3\frac{1}{2}, \frac{3\pi}{4}$ is or is not an element of each.

(One box has already been filled in. The '**Yes**' indicates that the number 8 is an element of the set of Real numbers, $\mathbb{R}$).

Number/Set	$\mathbb{N}$	$\mathbb{Z}$	$\mathbb{Q}$	$\mathbb{R}\backslash\mathbb{Q}$	$\mathbb{R}$
$\sqrt{5}$	No	No	No	Yes	Yes
8	Yes	Yes	Yes	No	**Yes**
-4	No	Yes	Yes	No	Yes
$3\frac{1}{2}$	No	No	Yes	No	Yes
$\frac{3\pi}{4}$	No	No	No	Yes	Yes

Natural numbers are the ordinary counting numbers
$\mathbb{N} = \{1,2,3,4 \dots\}$

Integers are all positive and negative whole numbers.
$\mathbb{Z} = \{\dots -4, -3, -2, -1, 0, 1, 2, 3, 4 \dots\}$

Rational numbers are also called fractions
$\mathbb{Q} = \left\{\text{any number that can be written } \frac{a}{b}, \text{where } a, b \text{ are integers and } b \neq 0.\right\}$

Irrational numbers $\mathbb{R}/\mathbb{Q}$ cannot be written as fractions $\frac{a}{b}$ where a, b are integers and $b \neq 0$.
Examples $- \sqrt{2}, \pi, e$

In the case of $\sqrt{5}$ explain your choice in relation to the set of Irrational numbers ($\mathbb{R}\backslash\mathbb{Q}$) (i.e. give a reason for writing either 'Yes' or 'No').

Number/Set	$\mathbb{N}$	$\mathbb{Z}$	$\mathbb{Q}$	$\mathbb{R}\backslash\mathbb{Q}$	$\mathbb{R}$
$\sqrt{5}$	No	No	No	Yes	Yes
8	Yes	Yes	Yes	No	**Yes**
-4	No	Yes	Yes	No	Yes
$3\frac{1}{2}$	No	No	Yes	No	Yes
$\frac{3\pi}{4}$	No	No	No	Yes	Yes

Yes $\sqrt{5}$ is an irrational number, $\mathbb{R}\backslash\mathbb{Q}$.

$\sqrt{5}$ cannot be written as a fraction $\frac{a}{b}$, where $a, b \in \mathbb{Z}$.

Famous irrational numbers include π and **e**.

e is approximately equal to 2.71828

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