Maths Points

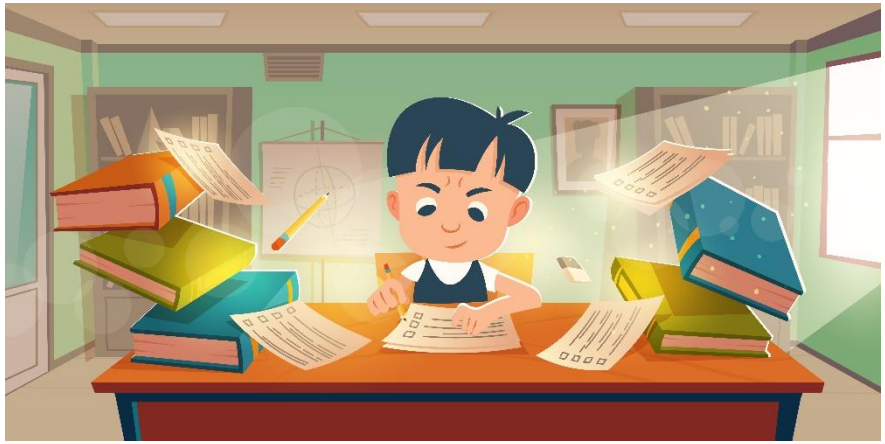
Junior and Leaving Cert

LCOL BASIC SKILLS

PACK 5

Leaving Cert Ordinary Level

LCOL Basic Skills: Pack 5 – Table of Contents



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Eleanor has a **gross** income of €38 500 for the year.
She has an annual tax credit of €3300.
The standard rate cut-off point is €33 800.
The standard rate of income tax is 20% and the higher rate is 40%.

Find Eleanor's **net** income for the year (i.e. after tax is paid).

Gross Income
€38,500

First calculate the balance of Eleanor's income that will be taxed at 40%.

$$38{,}500 - 33{,}800 = 4{,}700$$

Standard Rate Tax →
$33{,}800 \times 0.20$
$= €6{,}760$

Higher Rate Tax →
$4{,}700 \times 0.40$
$= €1{,}880$

Gross Tax →

$$\begin{array}{r} 6{,}760 \; + \\ 1{,}880 \\ \hline €8{,}640 \end{array}$$

Tax Payable = Gross Tax − Tax Credits

$$\begin{array}{r} 8{,}640 - \\ 3{,}300 \\ \hline €5{,}340 \end{array}$$

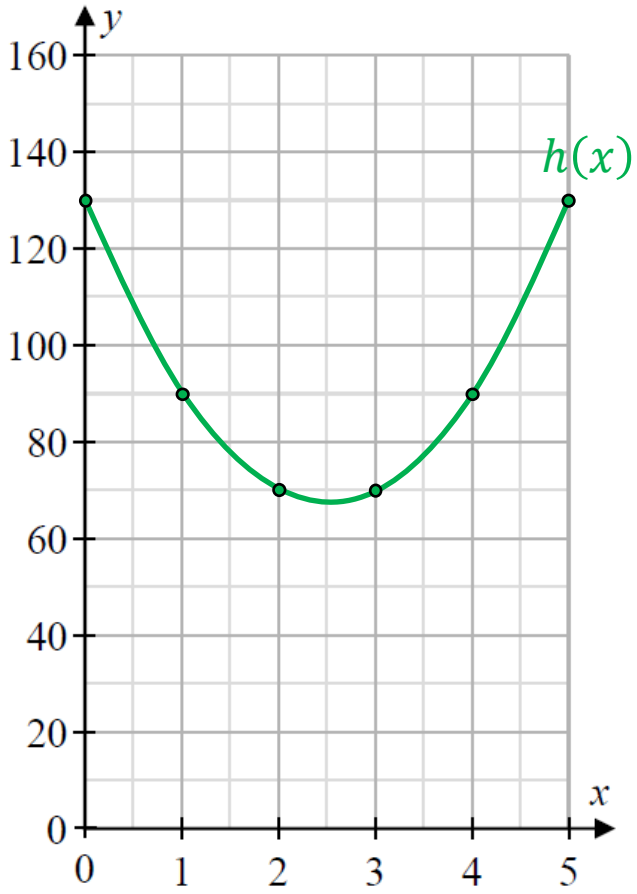
Net Income = Taxable Income − Deductions

$$\begin{array}{r} 38{,}500 - \\ 5{,}340 \\ \hline 33{,}160 \end{array}$$

Eleanor's net income is €33,160.

The function $h(x)$ below gives the approximate height of the water at Howth Harbour on a particular day, from 12 noon to 5 p.m.
$h(x) = 10x^2 - 50x + 130$,
where $h(x)$ is the height of the water in centimetres, and x is the time in hours after 12 noon.

Draw the graph of the function
$h(x) = 10x^2 - 50x + 130$
on the axes below, for $0 \leq x \leq 5,\ x \in \mathbb{R}$.



Always fill out a table.

x	$h(x) = 10x^2 - 50x + 130$	$h(x)$	Points
0	$10(0)^2 - 50(0) + 130$	130	$(0, 130)$
1	$10(1)^2 - 50(1) + 130$	90	$(1, 90)$
2	$10(2)^2 - 50(2) + 130$	70	$(2, 70)$
3	$10(3)^2 - 50(3) + 130$	70	$(3, 70)$
4	$10(4)^2 - 50(4) + 130$	90	$(4, 90)$
5	$10(5)^2 - 50(5) + 130$	130	$(5, 130)$

... always check solution by using table mode of the calculator!

Let $z = 1 + i$.

Find $|z|$.

$z = 1 + i$

Modulus of a Complex Number

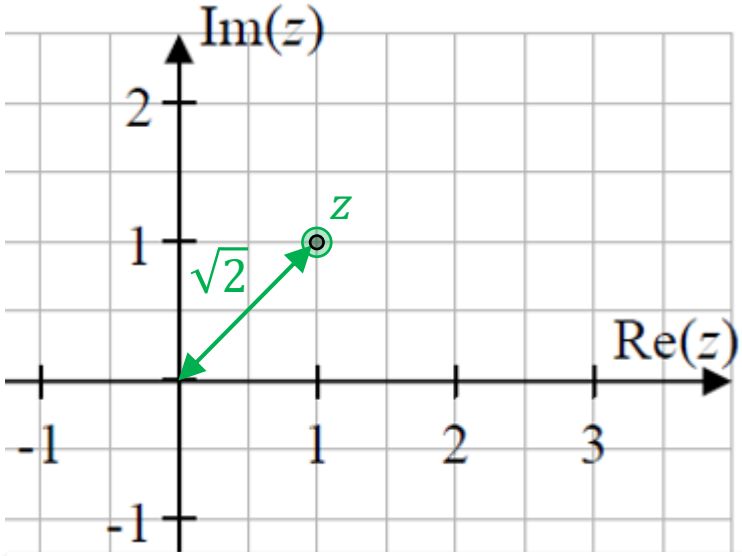
If $z = a + bi$
then the modulus $|z| = \sqrt{a^2 + b^2}$

$|z| = |1 + i|$

$|z| = \sqrt{(1)^2 + (1)^2}$

$|z| = \sqrt{1 + 1}$

$|z| = \sqrt{2}$



The modulus of a complex number measures the distance of the complex number to the origin, (0,0).

$A(2,-1)$ and $B(-4,7)$ are two points.

Find $|AB|$.

The formula for **Distance** is on **page 18** of the Maths Formulae Book.

Distance Formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$A(2,-1) \rightarrow (x_1, y_1)$

$B(-4,7) \rightarrow (x_2, y_2)$

The distance formula has been derived from Pythagoras Theorem!

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

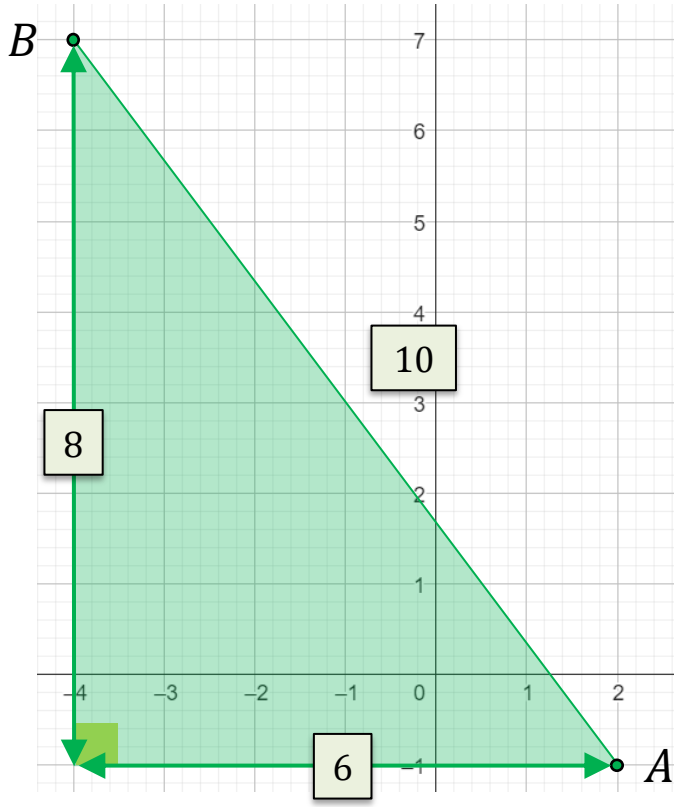
$$|AB| = \sqrt{(-4-2)^2 + \big(7-(-1)\big)^2}$$

$$|AB| = \sqrt{(-6)^2 + (8)^2}$$

$$|AB| = \sqrt{36 + 64}$$

$$|AB| = \sqrt{100}$$

$$|AB| = 10$$



The heights in 2011 of Irish males born in 1992 are normally distributed with mean 178.8 cm and standard deviation 7.9 cm.

Use the *empirical rule* to complete the following sentence:

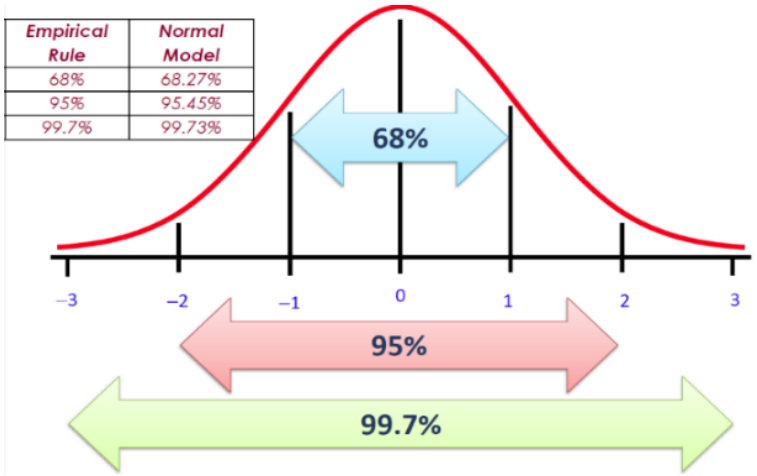
"95% of nineteen-year-old Irish men are between 163 and 194.6 in height."

Empirical Rule states that 95% of normal distribution is within 2 standard deviations of the mean.

$[178.8 - 2(7.9), 178 + 2(7.9)]$

$[163, 194.6]$

Empirical Rule	Normal Model
68%	68.27%
95%	95.45%
99.7%	99.73%



(ii)

Use the empirical rule to make one other statement about the heights of nineteen-year old Irish men.

Empirical Rule states that 68% of normal distribution are within 1 standard deviation of the mean.

$[178.8 - 7.9, 178 + 7.9]$

$[170.9, 186.7]$

"68% of nineteen-year-old Irish men are between 170.9 cm and 186.7 cm in height."

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