



A photograph showing a vast, icy landscape under a clear blue sky. The sun is positioned in the upper right quadrant, its rays creating a bright, radial pattern against the blue sky. In the foreground and middle ground, numerous small, white icebergs of various shapes are scattered across the dark blue water. A few larger, more prominent icebergs are visible on the left and right sides. The horizon line is relatively flat, meeting the sky at a distant point.

Global Warming

Lecture 1.3

Units

Measurements are useless without units!



Unit analysis

Start from the
units that you
have

Be sure of the
units that you
want!

Use conversion factors
to cancel out units you
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Gronk weighs 265 pounds. How much is this in kilograms?

What's the conversion factor between
pounds and kilograms?

265 lbs

= ? kg

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Gronk weighs 265 pounds. How much is this in kilograms?

What's the conversion factor between pounds and kilograms?

$$265 \text{ lbs} \times \frac{X \text{ kg}}{Y \text{ lbs}} = ? \text{ kg}$$

equal to 1

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Gronk weighs 265 pounds. How much is this in kilograms?

What's the conversion factor between
pounds and kilograms?

$$265 \text{ lbs} \times \frac{1 \text{ kg}}{2.2 \text{ lbs}} = ? \text{ kg}$$

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Gronk weighs 265 pounds. How much is this in kilograms?

What's the conversion factor between pounds and kilograms?

$$265 \cancel{\text{ lbs}} \times \frac{1 \text{ kg}}{2.2 \cancel{\text{ lbs}}} = 120.5 \text{ kg}$$

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Julian Edelman is 5 feet 10 inches tall. How
tall is he in cm?

5 feet = 60 inches

$$70 \text{ in} \times \frac{X \text{ cm}}{Y \text{ in}} = ? \text{ cm}$$

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$$70 \text{ in} \times \frac{2.54 \text{ cm}}{1 \text{ in}} = ? \text{ cm}$$

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Julian Edelman is 5 feet 10 inches tall. How tall is he in cm?

5 feet = 60 inches

$$70 \text{ in} \times \frac{2.54 \text{ cm}}{1 \text{ in}} = 177.8 \text{ cm}$$

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Tom Brady can throw a football about 60 miles per hour.
How fast is this in m/s?

$$60 \frac{\text{mi}}{\text{hour}} \times$$

?

$$= ? \frac{\text{m}}{\text{s}}$$

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Tom Brady can throw a football about 60 miles per hour.
How fast is this in m/s?

$$60 \frac{\text{mi}}{\text{hour}} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \quad = ? \quad \frac{\text{m}}{\text{s}}$$

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Tom Brady can throw a football about 60 miles per hour.
How fast is this in m/s?

$$60 \frac{\text{mi}}{\text{hour}} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{1 \text{ m}}{3.28 \text{ ft}} = ? \frac{\text{m}}{\text{s}}$$

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How fast is this in m/s?

$$60 \frac{\cancel{\text{mi}}}{\text{hour}} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{1 \text{ m}}{3.28 \cancel{\text{ft}}} \times \frac{1 \text{ hour}}{60 \cancel{\text{min}}} \times \frac{1 \text{ min}}{60 \cancel{\text{s}}} = 26.8 \frac{\text{m}}{\text{s}}$$

Scientific notation & Order of magnitude

a convenient way to express numbers that are too big or too small

$$m \times 10^n$$

Scientific notation & Order of magnitude

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$$m \times 10^n$$

$$1 \leq |m| < 10$$

the exponent n is an integer, n --- order of magnitude

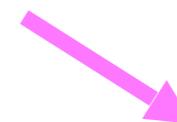
Scientific notation & Order of magnitude

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Allows easy comparison of numbers

Scientific notation & Order of magnitude

a convenient way to express numbers that are too big or too small

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$$1 \leq |m| < 10$$



the exponent n is an integer, n --- order of magnitude

Tom Brady throws an interception on 1.8% of his passes (a fraction of 0.018). Write this in scientific notation.

Scientific notation & Order of magnitude

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$$1 \leq |m| < 10$$



the exponent n is an integer, n --- order of magnitude

Tom Brady throws an interception on 1.8% of his passes (a fraction of 0.018). Write this in scientific notation.

0.018 -> 1.8×10^{-2}

Scientific notation & Order of magnitude

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the exponent n is an integer, n --- order of magnitude

Write 3,000,201,339 in scientific notation.

Scientific notation & Order of magnitude

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the exponent n is an integer, n --- order of magnitude

Write 3,000,201,339 in scientific notation.

3,000,201,339 -> 3.000201339×10^9 ~ 3.0×10^9

Scientific notation & Order of magnitude

$$m \times 10^n$$

Scientific notation & Order of magnitude

$$m \times 10^n$$

Order of magnitude is n if $m < 3.16$ ($3.16 = 10^{0.5}$)

Order of magnitude is n+1 if $m \geq 3.16$

Scientific notation & Order of magnitude

$$m \times 10^n$$

Order of magnitude is n if $m < 3.16$

Order of magnitude is $n+1$ if $m \geq 3.16$

What's the order of magnitude of:

23.5?

2.1?

7.91?

31.6?

Scientific notation & Order of magnitude

$$m \times 10^n$$

Order of magnitude is n if $m < 3.16$

Order of magnitude is $n+1$ if $m \geq 3.16$

What's the order of magnitude of:

23.5? 2.35×10^1

2.1? 2.1×10^0

7.91? 7.91×10^0

31.6? 3.16×10^1

Scientific notation & Order of magnitude

$$m \times 10^n$$

Order of magnitude is n if $m < 3.16$

Order of magnitude is $n+1$ if $m \geq 3.16$

What's the order of magnitude of:

23.5?	2.35×10^1	10
2.1?	2.1×10^0	1
7.91?	7.91×10^0	10
31.6?	3.16×10^1	100