FREE CLASSROOM ACTIVITY

Understanding *Size & Scale*

Ages 10-16 | 20-30 minutes | Pairs or small groups

Open web activity

Estimate first. Check second. The six tasks below mirror the live Understanding Size & Scale activity. Write down your estimate before following the comparison links.

Name / pair: _____ Class: _____ Date: _____

SIX STEPS ACROSS THE SCALE

1 Start in your hand

Without checking, decide whether A4 paper or a smartphone has the greater selected length. Estimate the ratio, then check the real comparison.

Check on Just How Big?: A4 vs smartphone

My prediction:

My estimated ratio:

What the comparison showed:

Use the same selected length/property for both things.

2 Build a human-scale ladder

Order Family car, Double-decker bus and Blue whale by selected length. Which adjacent pair is closest?

Check on Just How Big?: car vs bus | bus vs blue whale

Smallest -> largest:

Closest adjacent pair:

Why?

Do not rely on the pictures alone - check the selected values.

3 Estimate a landmark ratio

How many Eiffel Tower heights fit into the selected architectural height of Burj Khalifa? Give an estimate first, then compare them visually.

Check on Just How Big?: Burj Khalifa vs Eiffel Tower

My estimate:

Values shown on the site:

Calculated ratio:

A useful answer states the ratio, not just which landmark is taller.

4 Cross the microscopic world

Put DNA double helix, Virus, 2 um bacterium and Red blood cell in ascending order by their selected linear measurement. Express at least two values in scientific notation.

Check on Just How Big?: DNA vs virus | virus vs bacterium | bacterium vs cell

Ascending order:

Two values in scientific notation:

Largest-to-smallest ratio from your set:

Keep your units consistent before comparing values.

5 Compare worlds

Order Moon, Earth and Jupiter by mean diameter. Estimate how many Moon diameters fit across Earth and how many Earth diameters fit across Jupiter.

Check on Just How Big?: Earth vs Moon | Earth vs Jupiter

Smallest -> largest:

Moon diameters across Earth - estimate / actual:

Earth diameters across Jupiter - estimate / actual:

Use diameter throughout; radius and circumference would answer different questions.

6 Think in powers of ten

The selected body length of Honeybee is 1.5 cm; Earth's mean diameter is 12,740 km. Estimate the ratio and its nearest power of ten. Then travel through the scale of everything.

Check on Just How Big?: Scale of everything

Convert both values to metres:

My estimated ratio:

Calculated ratio:

Nearest power of ten:

Hint: 1.5 cm = 0.015 m and 12,740 km = 12,740,000 m.

REFLECT

Which result was furthest from your original estimate?

Where did a ratio communicate scale better than a simple difference?

What changes when you move from everyday units to scientific notation?

Live activity and comparison links: justhowbig.com/education/understanding-scale/

TEACHER GUIDE

Teaching Understanding Size & Scale

This guide matches the six live web tasks one-for-one.

Age / level	Approximately 10-16; adaptable across upper primary and secondary.
Time	20-30 minutes.
Set-up	One connected device per pair. Ask students to write estimates before opening the comparison links.
Core ideas	Measurement; ratio and proportion; estimation; unit conversion; powers of ten; scientific notation; orders of magnitude.

Suggested flow

- 2-3 min: model one estimate without opening the answer.
- 12-15 min: pairs work through all six tasks.
- 5 min: compare the most surprising ratios.
- 3-5 min: reflection or student-written challenge question.

What to mark

- A stated prediction before checking.
- Consistent units and the correct measurement property.
- A ratio or order-of-magnitude statement, not only a ranking.
- Working shown where conversions or scientific notation are used.

TASK-BY-TASK NOTES

1. A4 vs smartphone	Expected relationship: the selected A4 paper length should exceed the selected smartphone length. The point is to insist on a shared measurement basis before calculating a ratio.
2. Car - bus - blue whale	Expected order: family car < double-decker bus < blue whale by selected length. Students should use the two linked comparisons to decide which adjacent pair is closer.
3. Eiffel - Burj	Students estimate how many Eiffel Tower heights fit into Burj Khalifa's selected architectural height, then calculate the live ratio from the values shown on the site.
4. Microscopic ladder	Expected order: DNA double helix < virus < 2 um bacterium < red blood cell. Mark scientific notation and unit conversion as part of the reasoning, not as decoration.
5. Moon - Earth - Jupiter	Expected order by mean diameter: Moon < Earth < Jupiter. Use the current live values for the two diameter ratios; the key idea is multiplicative comparison.
6. Honeybee - Earth	Using the worksheet values: 0.015 m vs 12,740,000 m. Earth / bee is about 8.49 x 10^8, so the nearest power of ten is 10^9.

Differentiate

Younger learners: focus on ordering, choosing sensible units and simple ratios. **Older learners:** require SI conversion, scientific notation, order-of-magnitude reasoning and a short critique of measurement choices.

Extension

Ask each pair to design one new comparison using two real things from Just How Big?. They must record the answer privately, challenge another pair, then explain the result with a ratio or power-of-ten statement.

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