

Measurement At Home Temperature Bounce



How does temperature affect bounciness?

- ❖ After a night in the freezer, will balls bounce more or less?
- ❖ How will the difference vary with ball type?
- ❖ This test uses the metre, which NPL measures very accurately

Estimated time: 2 x 20 minutes with 5+ hours between
No experience needed

Instructions

Watch the video ([YouTube: 4syol5KkTlq](https://www.youtube.com/watch?v=4syol5KkTlq))

1. Mark a point 1 metre from the ground on a wall.
2. Hold a ball so its lowest point is at the 1 metre point.
3. Drop ball and mark where the lowest part of the ball is after the first bounce. **When looking at bounce ball height, keep your head in the same place to avoid problems with parallax.** Repeat 6 times to obtain 6 marks.
4. Measure (and write down) the average of the 6 tests, and also the range. If the range is 3 cm, write it as +/- 1.5 cm.
5. Repeat using as many balls as you wish (and have space to store in your freezer).
6. Put tested balls into a plastic bag and store them in the freezer overnight.
7. After a night in the freezer, repeat the bounce tests with the balls. Make sure you test each one immediately after removing from the freezer, so it doesn't have time to warm up. Again, record the average and the range.
8. Enter your results in our webpage, one ball at a time.

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Results table

| Ball type | Before overnight in freezer | | After overnight in freezer | |
|-----------|-----------------------------|---------------------------------------|----------------------------|---|
| | Average bounce height (cm) | Range of first bounce height (+/- cm) | Average bounce height (cm) | Range of first bounce height (+ / - cm) |
| | | | | |
| | | | | |

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Equipment required

Flat hard floor next to wall
Tape measure or ruler to measure height
Blu-tack to mark positions on wall
One or more balls (tennis, ping pong etc.)
Enough space in freezer to contain ball/s
Pencil and paper to record results
Plastic bag to store balls in freezer

Risks

- ❖ Keep balls tidy to avoid tripping on them
- ❖ Keep balls in freezer in clean bag for hygiene reasons
- ❖ Make sure the measurement area is clean and tidy before and afterwards

SI measurement units

- ❖ metre (m) for length
- ❖ newton (N) for force (= kg m / s²)

Challenge Topics

Measurement Science, Maths, Physics, Materials Testing

Thoughts, tips and information

- ❖ What material in balls makes them bouncy and what causes changes in bounciness with temperature?
- ❖ How important is the amount of bounce in sport? There are rules about the amount of bounce balls have, and ways to test it!
- ❖ Averages of repeated measurements, can be closer to the 'true' value than single ones, and the spread of results can indicate measurement uncertainty.

Adult direction or supervision is required. All experiments are carried out at your own risk.
For more experiments, visit [NPL Measurement at Home](https://npl.co.uk/measurement-at-home).