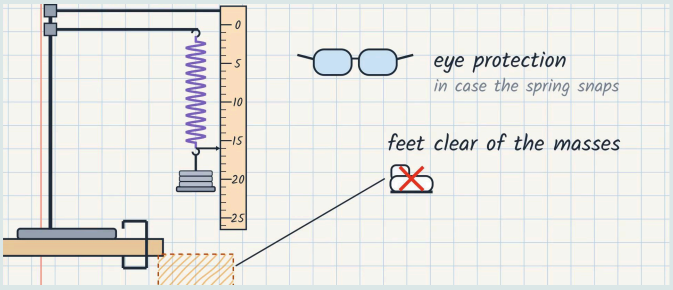
Springs practical

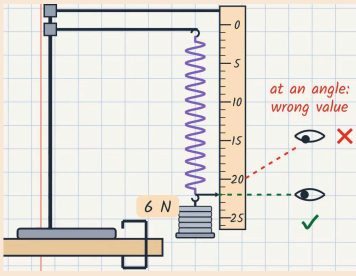
Required practical: force and extension

1 Set-up



- Clamp the stand to the bench. Hang the spring from the clamp, with a **vertical metre rule** beside it and a **pointer** on the spring's end.
- Wear **eye protection** and keep your feet clear of the masses.

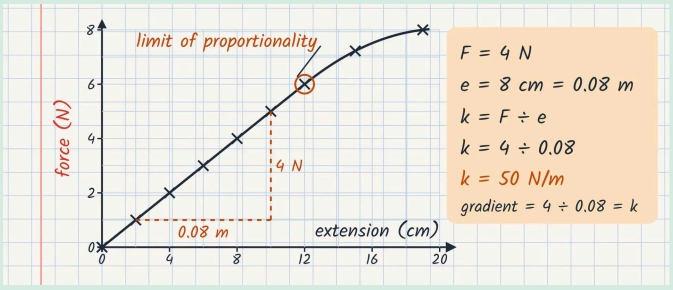
2 Readings



force (N)	reading (cm)	extension (cm)
0	10.0	0.0
1	12.0	2.0
2	14.0	4.0
3	16.0	6.0
4	18.0	8.0
5	20.0	10.0
6	22.0	12.0

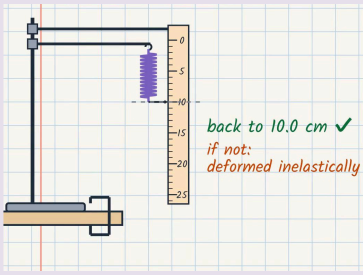
- Read the pointer with no masses on: the **original reading** (here 10.0 cm). Add 1 N at a time and read it again each time.
- **Extension = new reading − original reading** (12.0 − 10.0 = 2.0 cm). Read the ruler with your eye level with the pointer.

3 Graph



- Force (y) against extension (x): a **straight line through the origin** means extension is directly proportional to force, up to the **limit of proportionality**.
- Spring constant from the straight part: 4 N at 8 cm = 0.08 m, k = 4 ÷ 0.08 = **50 N/m**. It is also the **gradient**.

4 Accuracy



- Specific improvements: use a pointer and read at eye level; wait until the spring stops bouncing; **repeat and calculate a mean**.
- Check the spring returns to its original length. If not, it has been deformed inelastically.

$$F = k\,e$$

force = spring constant × extension (e in metres)

Exam tip

"Repeat the experiment" alone isn't enough. Say "repeat, and calculate a mean".

Check yourself

- 1 No load: 15 cm. With a load: 21 cm. What is the extension?
- 2 Why should you read the ruler at eye level?

Answers: 1. 21 − 15 = 6 cm 2. So you don't read it at an angle, which gives the wrong value