

Kitchen and Bathroom Scales Exploration #4

Content Goals

- to explore how everyday electro-mechanical devices work
- to see how pin joints and rigid joints are used
- to see how loads and moments are in transmitted in structures
- to practice drawing free body diagrams of hardware

Process Goals

- to explore how you look at a piece of hardware
- to explore whether thumbnail analysis helps develop your understanding of hardware

Pre-requisites

- Vectors, Couples, Free Body Diagrams



Kitchen Scales

Prediction (15 minutes)

For discussion and in your logbooks (to hand in) ...

Have you taken apart a kitchen scale before?
What kind of things have you taken apart?

Sketch ideas for the interior of the scale, annotating your sketches where necessary?
Do not take apart the scale until you have exhausted suggestions and tests to explore how it might work inside.

Dissection and Analysis

Take apart the kitchen scale and figure out how it works.

In your logbook...

Draw a labeled quick sketch and write an explanation of how the scale works. Be prepared to explain it to the class.

What are the different components for? What are the different calibration methods?

Write down any questions that you ask during your exploration. Save a couple that you could or couldn't answer to ask the class.

Questions: (in your log book)

1. Identify pinned and rigid joints in the scale mechanism
2. When a 2 LB load is placed on the scale estimate the load on the small tension spring at the rear. Explain your rationale.
3. Does the position of the load on the scale pan affect the scale reading? Why or why not?

Hint: Look at how the main spring deforms and how it is loaded. Bend a metal strip under different loading conditions to get an idea of the loading conditions in the scale spring. Draw a free body diagram of the main spring.

What do you think of this scale? It sells for \$8 at Payless.

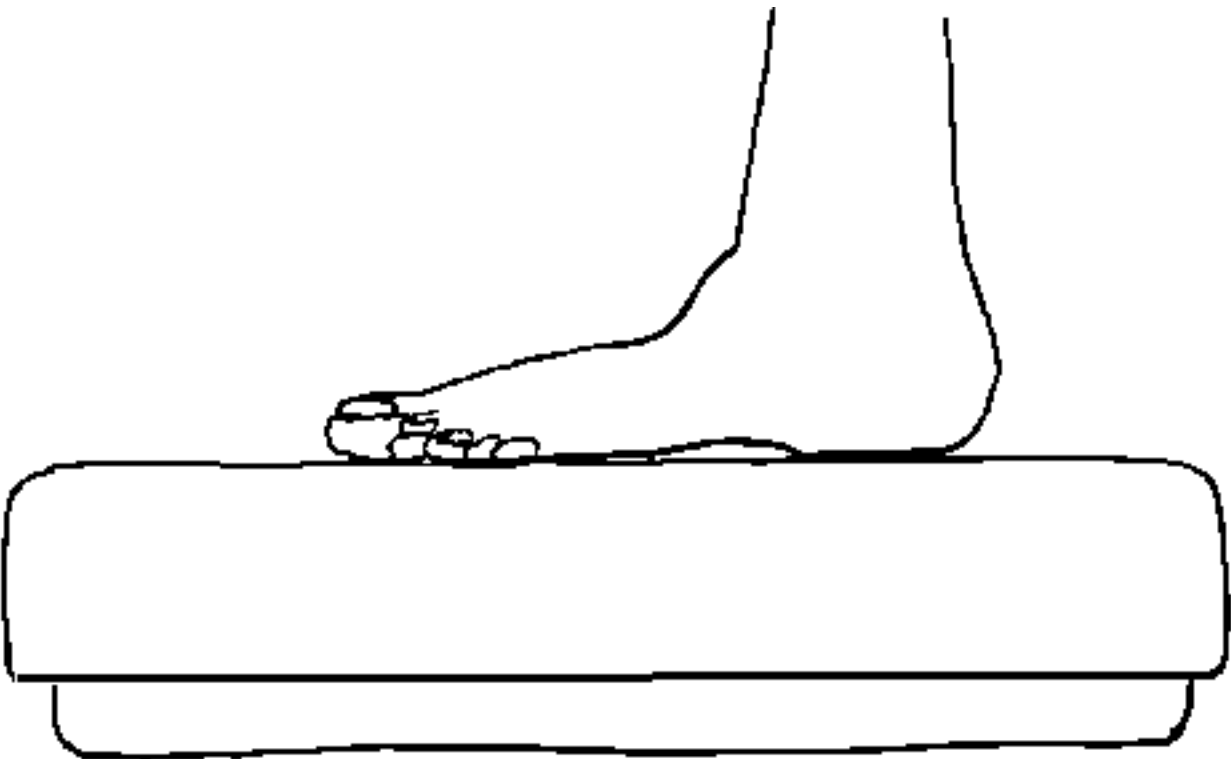
Digital and Analog Bathroom Scales

Prediction (15 minutes)

In your logbook...

Have you taken apart bathroom scales before?

How do you think the bathroom scales might work inside? List or sketch ideas.



Using the bathroom scale:

Bathroom scales manufacturers often warn that the scale will read incorrectly if placed on a rug instead of a hard surface. Why do you think this is?

Dissection and Analysis

Take apart the bathroom scale and figure out how it works.

Draw a labeled quick sketch, and write an explanation of how the scale works in your logbook. Be prepared to explain it to the class.

What are the different components for?

Write down any questions that you ask during your exploration. Save a couple that you could or couldn't answer to ask the class.

Questions: (in your logbook)

1. How do the four contact points produce a single reading?

2.(a) In scales with levers...

what is the load on the main spring when a 200 LB person stands on the scale?

2.(b) In the strain gage scale...

(only those who have/ are taking E14, E11), try drawing a shear moment diagram of the beam.

3. In both types of scale...

Does it matter where you stand on the scale? Can you alter the reading?