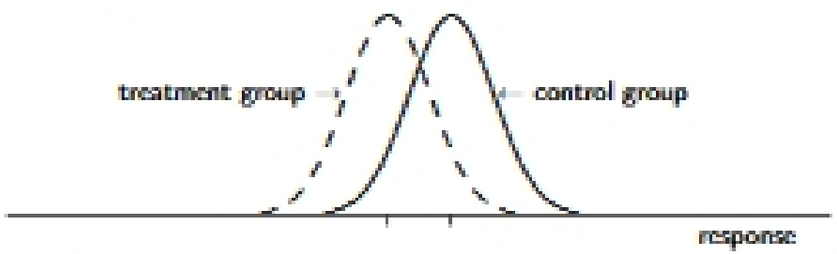
MAKING COMPARISONS

- Suppose some study turns out this way:

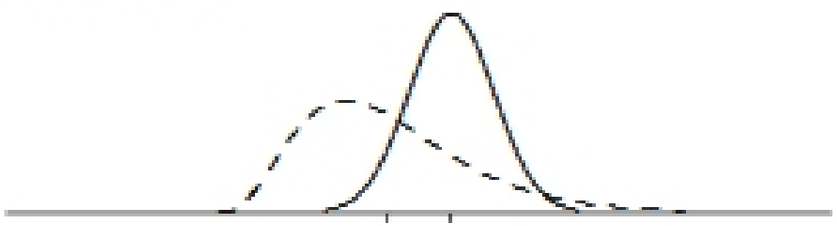


It would natural to measure the effect of the treatment by the change in _____.

- How are the results of this next study similar to those of the previous one? How are they different?

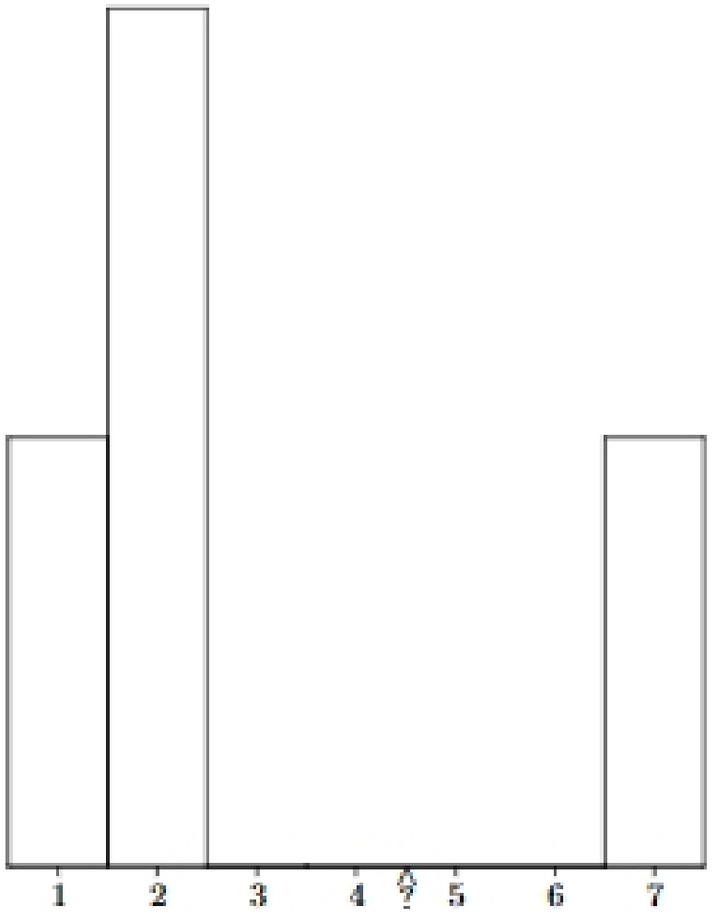
The greater the _____ of the distributions, the less important is a given change in location.

- Measures of location and spread are important summaries of a distribution. But watch out for situations where they don't tell the whole story:



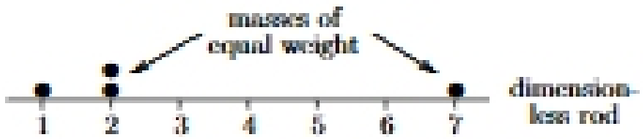
A BALANCING ACT

- At what value on the horizontal axis would you pivot this histogram in order to get it to balance?



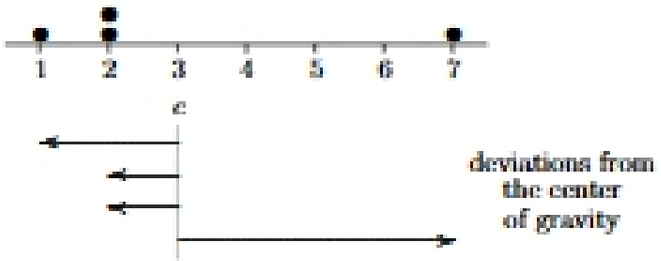
A PROBLEM FROM PHYSICS

- Consider the following physical system:



What is the center of gravity of this system, i.e., the point c at which the rod would balance?

- By experiment: _____
- By theory: _____



$$\begin{aligned} 0 &= \text{sum of deviations} \\ &= (1-c)+(2-c)+(2-c)+(7-c) \\ &= (1+2+2+7)-4c \end{aligned}$$

so $c = \text{—} =$_____.

MEASURING LOCATION: THE AVERAGE

- In general, if a list of numbers is marked off on a dimensionless line:

then the center of gravity c of the $\times$'s is

$$c = \frac{\text{Sum of the values}}{\text{How many there are}} = \begin{matrix}\text{Average of} \\ \text{the list}\end{matrix} = \text{The Mean.}$$

- What is the average of the list -2, -1, 0, 0, 2, 4?

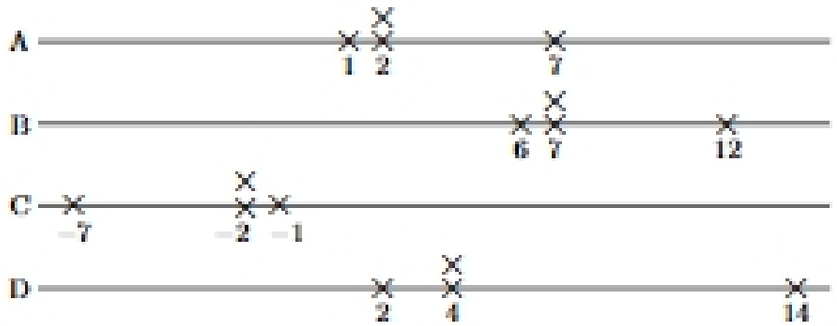
- By eye: _____
- By calculator: $\dfrac{-2-1+0+0+2+4}{6} = \dfrac{3}{6} = \dfrac{1}{2}$

- What is the average of the list -2, -1, 0, 0, 2, 7?

- If you need the exact value of an average, use a calculator. If a rough approximation will suffice, guess the center of gravity by eye.

HOW IS THE AVERAGE EFFECTED BY CHANGES OF LOCATION AND SCALE?

- Consider these four lists:



  - How is list B related to list A? How is the average of list B related to the average of list A?

    The numbers shifted by 5, and so did their average.

  - Ditto, for C?

    The numbers changed sign, and so did their average.

  - Ditto, for D?

    The numbers doubled, and so did their average.

- What is the general rule?

  - If each element of a list is shifted by some constant, the average will be _____ by that constant.

  - If each element of a list is multiplied by some constant, the average will be _____ by that constant.

FROM LISTS TO HISTOGRAMS

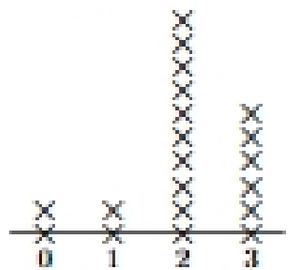
- An instructor gives a quiz with 3 questions, each worth 1 point.

30%	of the class scores	3
50%	"	2
10%	"	1
10%	"	0

  - If there are 10 people in the class, what is the average score?

Average: —

  - Ditto, for 20 people?



Average: —

  - Can you figure the average score without being told the number of people in the class?

    Yes. All you need are the percentages.

- Can you figure the average of a list if the only information available is a histogram of the numbers in that list?

  Yes. The histogram gives you the percentages.