

Elab 2.10

[A/AS102]

The two main types of variables are *categorical* and *quantitative*. It's essential that you keep this basic distinction in mind.

For some purposes, it's helpful to make even more distinctions among different kinds of variables: categorical, ordinal, interval, and ratio.

A *categorical* variable is one that has discrete named categories, for example, country names, languages, yes-or-no. When there is a natural ordering to the categories, we call it an *ordinal* variable: "ORDinal" as in "ORDer." For example, the categories *infant, toddler, child, adolescent, adult* have a natural order: a toddler is between an infant and a child. Sometimes, ordinal variables are encoded as numbers just to show the order.

An interval variable is an ordinal variable with an additional qualification: numerical differences between values have meaning. The age categories written as words can't be subtracted one from another, but if we coded them as numbers we would be able to do so. But the age categories are not an interval variable: it isn't meaningful to say that the difference between a child and an adolescent is the same as the difference between a toddler and a child. However, if we measured age in years rather than as categories, it would have the interval property since the difference in age between a 5-year old and a 10-year old is the same as the difference between a 15- and 20-year old.

Age in years has some additional properties: it's meaningful to talk about ratios. A 20-year old is twice as old as a 10-year old. This isn't true for all quantitative variables. For example, it doesn't mean much to say that a temperature of 60 degrees F is not twice 30 degrees. Variables where comparisons like "twice" or "one-half" make sense are called ratio variables. Note that for a ratio variable, the value zero has a special physical meaning. This is true, for instance, for age-in-years but not true for temperature on the Fahrenheit or Celsius scales. (When temperature is measured in degrees Kelvin, zero does have an absolute meaning.)

The types of variables are generally considered to fall on a kind of scale, from weakest to strongest: categorical, ordinal, interval, ratio.

For example, all ratio variables also have the interval property, all interval variables have the ordinal property.

Classify each of the following variables with the strongest type that applies.

1. hair color: categorical ordinal interval ratio Elab 2.10-1
2. salary: categorical ordinal interval ratio Elab 2.10-2
3. weight of cars: categorical ordinal interval ratio Elab 2.10-3
4. religious affiliation: categorical ordinal interval ratio Elab 2.10-4
5. grams of fat in a cheeseburger:
categorical ordinal interval ratio Elab 2.10-5

6. number of customers served at lunch in the dining hall: categorical ordinal interval ratio
7. number of times “3” is observed after rolling a die 10 times:
categorical ordinal interval ratio Elab 2.10-7
8. types of surgical procedures offered at a hospital, e.g., appendectomy, tonsillectomy, gall bladder removal, hysterectomy, coronary by-pass:
categorical ordinal interval ratio Elab 2.10-8
9. outside temperature in degrees Fahrenheit:
categorical ordinal interval ratio Elab 2.10-9
10. body temperature in degrees Celsius:
categorical ordinal interval ratio Elab 2.10-10
11. The answer to a survey item like this: Indicate your level of agreement with the following statement by circling the appropriate entry: “Milk is good for you.”

Disagree Stongly	Disagree	Neutral	Agree	Agree Strongly
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The variable type is:

categorical ordinal interval ratio Elab 2.10-11