# Defining and Measuring Behavior

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As discussed earlier:

- This is a course on the **experimental methods** used in Applied Behavior Analysis
- Our purpose in this course is to teach you how to solve problems that applied behavior analysts address through experimentation.

# So We Start with Behavioral Definitions

- Scientists start with defining the kinds of phenomena they study. Applied behavior analysts study behavior.
- You have learned in your first course that we defined behavior as:
  - Observable actions of an individual
  - Two people should agree on occurrence
  - Action passes **the deadman´s test**.

# When we say Observable, we really mean Measurable…

- It is not sufficient to observe behavior once, we have to observe it repeatedly.
- It is not sufficient for most behavioral treatments that only one person observe, we have to obtain agreement.
- So to track an observation more than once and to check if there is agreement, we need to talk about measurement.

Behavior, sometimes called on-going behavior, is measured directly by measuring one or more of its dimensions:

**repeatable-it occurs more than once**

**locus-it occurs in a place, and**

**time-it takes time to occur**

**Example**:

Molly answers questions when asked by her teacher.

Count the number of answers:
**repeatable**

**Example**:

Molly answers questions when asked by her teacher.

When asked by her teacher: **locus**

**Example**:

Molly answers 10 questions per minute within 1.5 seconds when asked by her teacher.

Per minute and within 1.5 seconds: examples of **time**

# Responses and Response Classes

- To understand behavior with the methods of experimental science, behavior analysts describe response classes
- There are two kinds of response classes: topographical and functional

# Topography and Function

- Topography-the structure of the behavior-its form, frequency, duration, latency in the presence of stimuli, magnitude etc.
- Function-the consequences it produces

# Response Classes and Topography Examples

- Think: what does it look like, how often, how long, how quickly, how intensely
- Examples
  - How often she hit her brother with her fist
  - How long his screaming last
  - How quickly she matched the picture to the word
  - How many decibels his screams produced

# Response Class and Functional Examples

- Think:
  - Behaviors that produce the same consequence
- Examples:
  - All actions that produce attention from peers
  - All actions that allow escape from demands
  - All actions that produce littering

# Is this littering?

www.vbs.vt.edu

# Synonyms and Similarities

- Behaviors, responses, topographies
- Operants, functional response classes

# Why do we focus on observable, measurable behaviors?

- Helps verify effectiveness of treatments
- Helps identify examples of pseudoscience
- Makes us accountable to our clients
- Helps us meet ethical standards

# Measurement helps Practitioners determine…

- Determine current level of behavior
- Determine if an intervention is warranted
- Determine whether change has occurred
- Determine the variability of behavior before, during, and after treatment
- Determine whether changes have occurred in other settings, with other people, or with other behaviors

- Typically applied behavior analysts are interested in either behavior **deficits** or **excesses.**
- Deficits are behaviors that you are trying to increase
  - The student does not state his math facts and I am measuring whether there is improvement
  - The child does not identify common kitchen objects and her parents wish to increase tacting.

- Excesses are behaviors that you are trying to decrease
  - Biting is a behavioral excess: we want to Amelia to stop biting her brother.
  - Smoking marijuana may be a behavioral excess: we want Mary to decrease the amount of marijuana she smokes.

# Teams

- Give an example of a behavioral deficit and an example of a behavioral excess from a client, student, friend, or family member.
- Be sure that your examples meet the definition of an observable behavior.
- Examine your behavioral excesses and behavioral deficits and say whether they are described topographically or functionally.

# Criteria for Behavior

- What is the observable action?
- Can it be measured?
- Can two people agree on its occurrence?
- Does it pass the deadman's test?
- Is a specific topography described?
- Is a consequence described?

# Common measures

- Frequency (Rate)
- Counting events
- Celeration
- Magnitude
- Duration
- Latency
- Interresponse time

# Measuring Repeatability

- Repeatability is often measured in behavior analysis with frequency or rate


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- Sometimes frequency is called event recording or count
  - Frequency includes all methods for **counting occurence**,
  - Frequency does not necessarily have a time measure,
  - Sometimes the time is implied.

# Examples of Frequencies

- The number of members of a band,
- The number of eggs in a box,
- The number of students who rated the course as excellent
- The number of times Siena fought with her mates (time period implied)

# Behavior Analysts Mostly Measure Rate

– The number of times a behavior occurs per unit of time.

# Examples of Rates

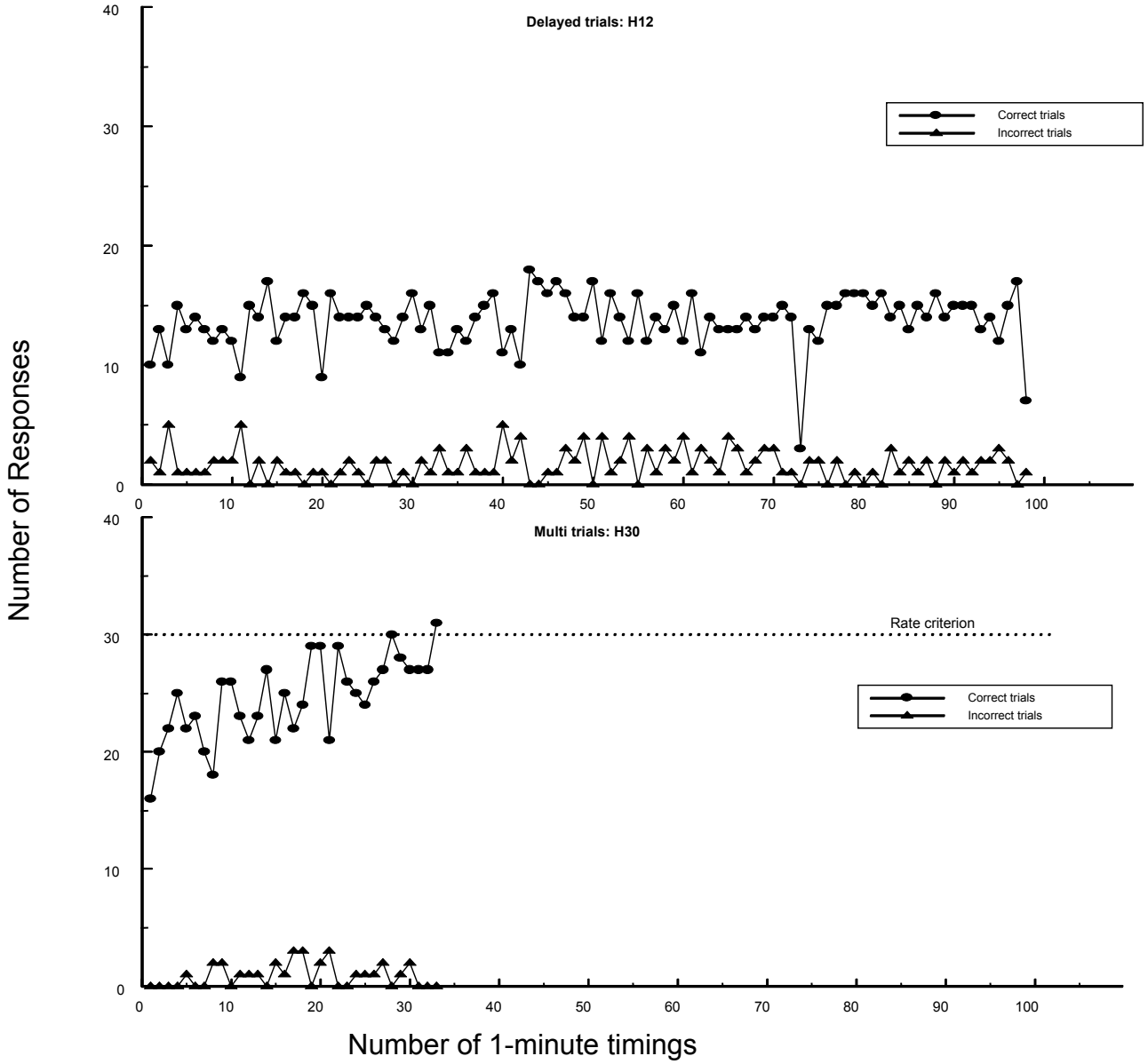
- **Number of times** *per day* a staff person interacts with client A.
- **Number of head hits** against wall *per ten second interval.*
- **Number of key strokes** *per minute*.
- **Number of time and motion word problems** the student completes correctly *per minute*.

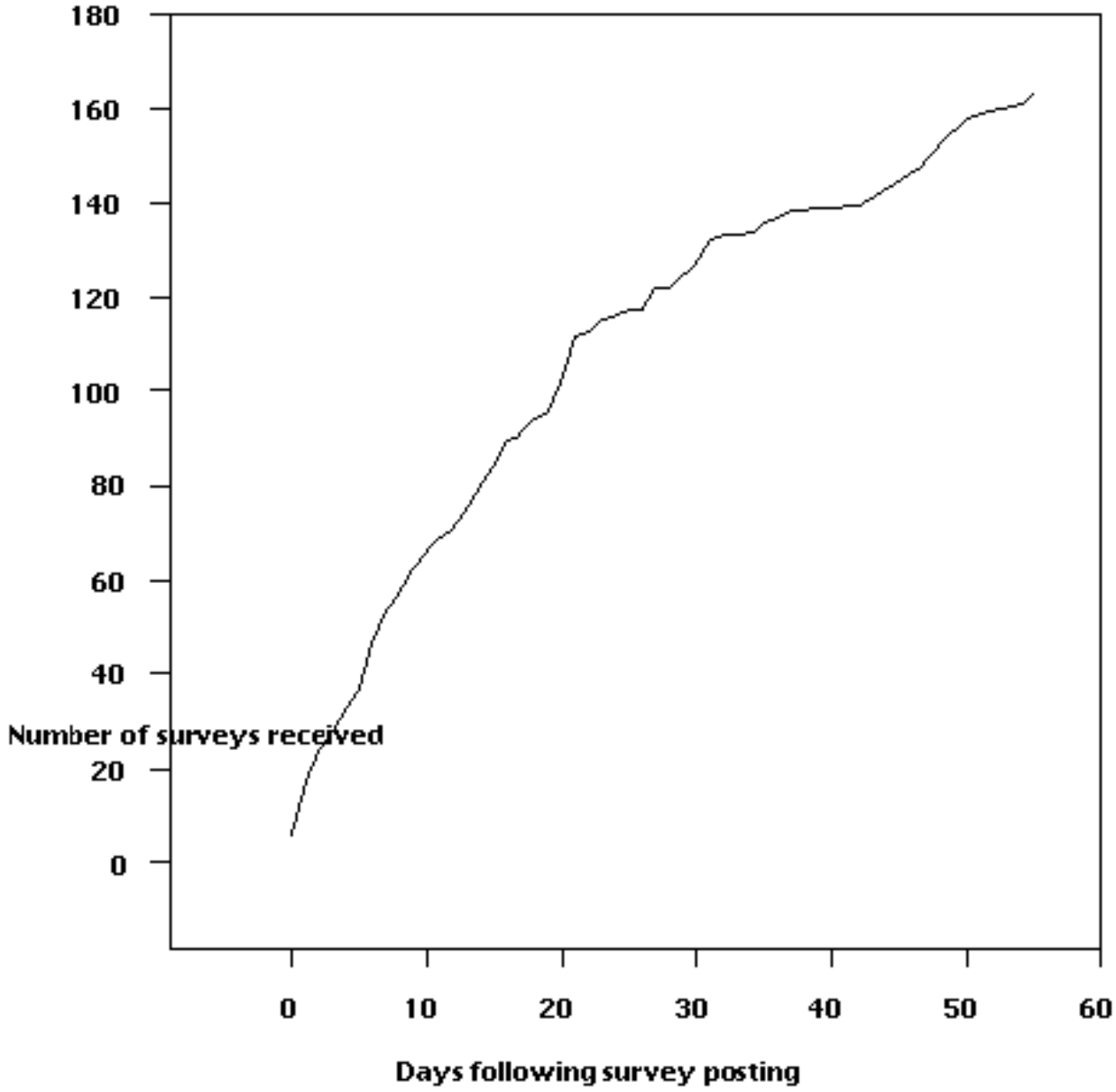
# Frequencies and Rates Used When

- Target behavior has definite beginning and end
- Behavior not occurring at too high a rate
- Behavior does not occur for extended time periods
- Best used when time period is constant
- Best to turn simple frequencies into rates whenever possible

# Graphing Frequencies and Rates

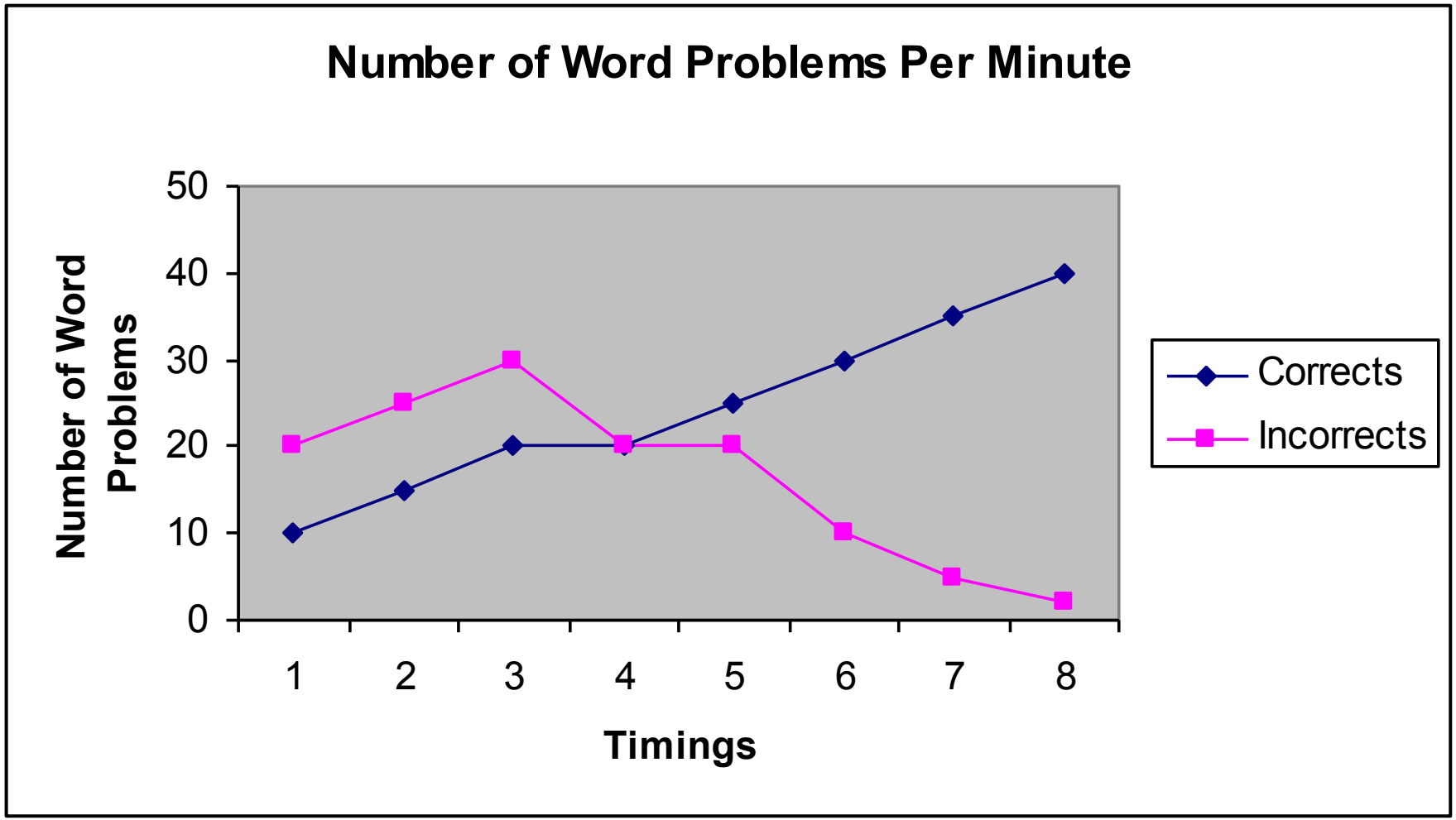
- Behavioral frequencies and rates are often graphed in line graphs or cumulative graphs.

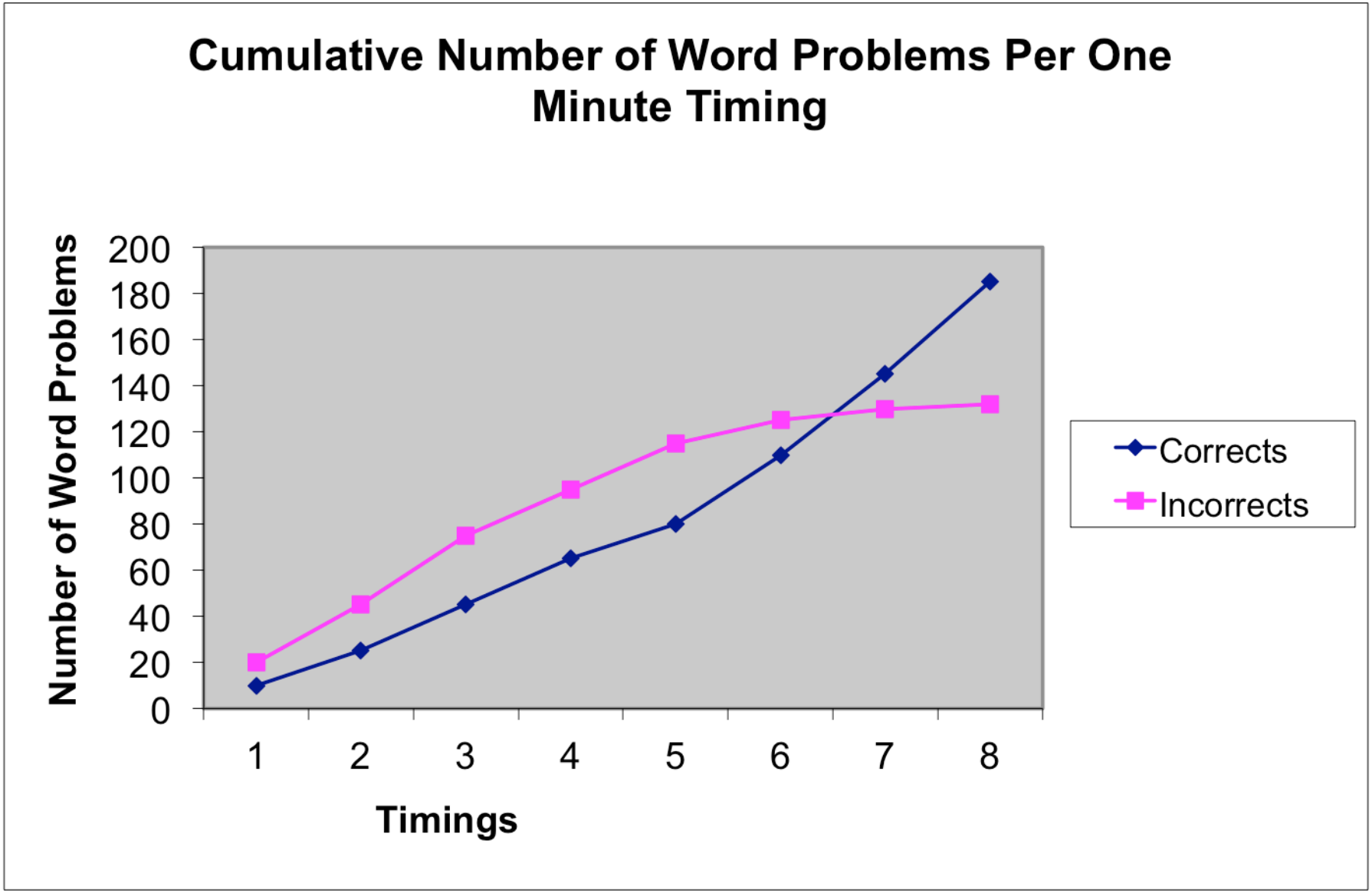

Delayed trials: H12
Correct trials
Incorrect trials
Multi trials: H30
Rate criterion
Correct trials
Incorrect trials
Number of Responses
Number of 1-minute timings
0
10
20
30
40
50
60
70
80
90
100


180
160
140
120
100
80
60
40
20
0
Number of surveys received
0
10
20
30
40
50
60
Days following survey posting

# Simple Table for Rate Analysis

| ***One Minute*** *Timings* | *Corrects* | *Incorrects* |
|---|---|---|
| 1 | 10 | 20 |
| 2 | 15 | 25 |
| 3 | 20 | 30 |
| 4 | 20 | 20 |
| 5 | 25 | 20 |
| 6 | 30 | 10 |
| 7 | 35 | 5 |
| 8 | 40 | 2 |
| | | |


Number of Word Problems Per Minute
Number of Word Problems
50
40
30
20
10
0
1
2
3
4
5
6
7
8
Timings
Corrects
Incorrects


Cumulative Number of Word Problems Per One Minute Timing
Number of Word Problems
200
180
160
140
120
100
80
60
40
20
0
1
2
3
4
5
6
7
8
Timings
Corrects
Incorrects

# Teams

- Design a data sheet for tracking **either** a behavioral deficit or excess that can be measured as a frequency or rate (your examples from previous questions might work).
- The data sheet should have a column for sessions and a column for the instances of the behavior. Fill-in the data sheet with pretend data for a period of at least ten sessions.
- Graph the data in a frequency graph.
- Graph the data in a cumulative graph.

# Measuring Durations

- Time is commonly measured with duration:
  - The number of hours, minutes, and/or seconds a behavior occurs

# Examples of Duration

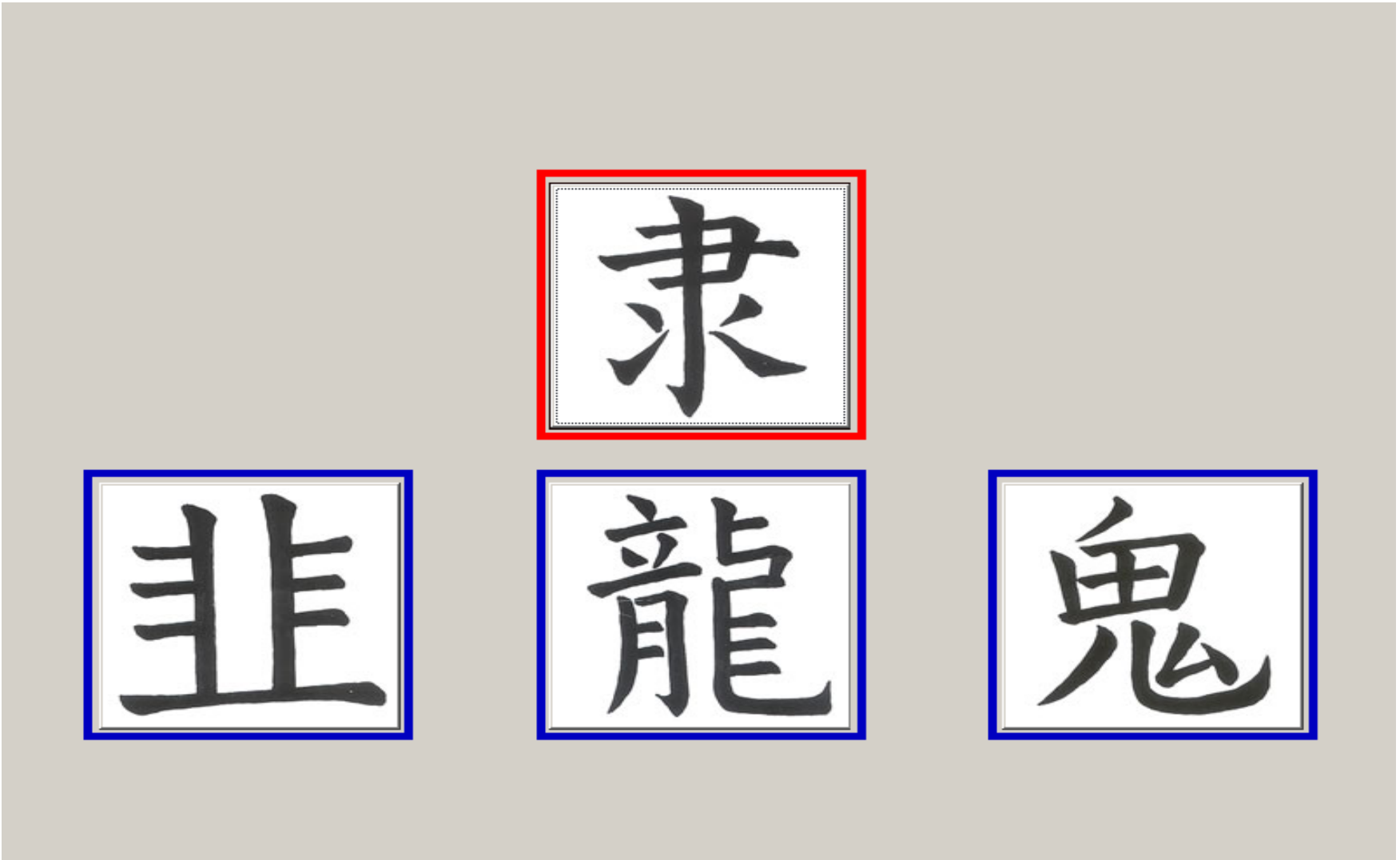
- It took the student 40 minutes to finish the pretest and only 20 minutes to complete the post test.
- The duration of a football (soccer) game is set (except when the ref adds minutes ☺). The duration of a baseball/cricket game is not.
- The client spent 15 minutes each day arguing with staff.

- Durations are usually calculated when:
  - behavior occurs infrequently
  - behavior varies in duration from occurence to occurence
  - behavior has a distinct beginning and end
  - Length of time is the most important dimension of behavior

# Measuring Time: Latency or Reaction Time

- Latency recording: Time elapsed between the onset of a stimulus and the initiation of the behavior
- Examples:
  - Time to reply to a staff members question.
  - Time to put on clothes once they are laid out in front of individual.
  - Time to respond to the comparison in a matching-to-sample task.
  - Do you know matching-to-sample?

# Matching to Sample



# Derivative Measures-Percentage

- Definition
  - A ratio that expresses a proportion in terms of 100 (per 100)
  - Formed by dividing a part by a whole
- Examples
  - Number of times a behavior is observed per 100 opportunities
  - Proportion of corrects to the sum of corrects plus incorrects
  - Proportion of total intervals observed when behavior occurred

# Considerations for Using Percentage

- Often misunderstood, used incorrectly
  - Hard to compare ratios with different totals or wholes
  - **If I said one treatment led to a score on a test of 25% correct and another led to a score of 10% correct, which treatment would you say was better?**

# Answer:

- You cannot tell.
- If the 25% score was derived from a test with 4 questions and the 10% change was derived from a test with 10 questions both would involve answering one question correctly:
  - 1/4 X 100= 25%; 1/10 X 100=10%;
  - But both involve a change of only one behavior.
- This leads to some other considerations for using percentages

# Percentages Best used as Totals Increase

- The bigger the divisor the more fine grained the differences between ratios with the same divisor
  - Egs: the difference between 1/4 and 2/4 is 25% whereas the difference between 1/10 and 2/10 is 10%; 10% is more fine grained than 25%
- Pure number-limits use in understanding behavior change unless we know more about the behaviors in the ratio
- Sets artificial limits on behavior change-ceilings. **What is the ceiling for percent correct?**

# Characteristics of a Good Definition

- Objective
  - Refer only to observable/measurable events
- Clear
  - Readable and unambiguous
- Complete
  - Delineate boundaries of definition through descriptions of topographies, functions, and conditions:
    - Inclusions-does it include the range of examples you want to measure?
    - Exclusions-does it exclude examples outside of what you want to measure?
  - Write as sentence: Include the measure, the behavior, the individual's name, and the conditions.

# Examples of Operational Definitions

- The percentage of academic tasks assigned by her teachers that Laura completes per week.
- The rate per minute that Luca puts his fingers in his mouth or puts his hand in his pants in public settings in front of other people for longer than 5 consecutive seconds.
- The number of minutes that Monica is walking around the school without permission.

# Teams: Operational Definitions

- View the Youtube video in the next slide.
- You will define a behavior with three different kinds of measurement.
- You will use a rate measure to calculate the rate from the video.

# Video

- Baby laughing?
  - https://www.youtube.com/watch?v=RP4abiHdQpc

- Provide three definitions with different measures. Each definition should describe who does what, as measured by what, under what conditions. It should be objective, clear, and complete (includes all instances of what you intend to measure and excludes what you do not intend to measure).
- One of your measures should be rate
- Using the rate measure for one of the behaviors, calculate the rate for the total time of the video. Report as rate per minute.