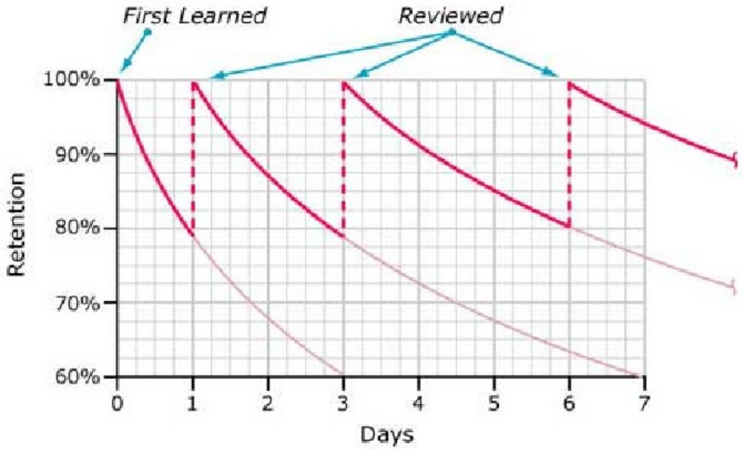
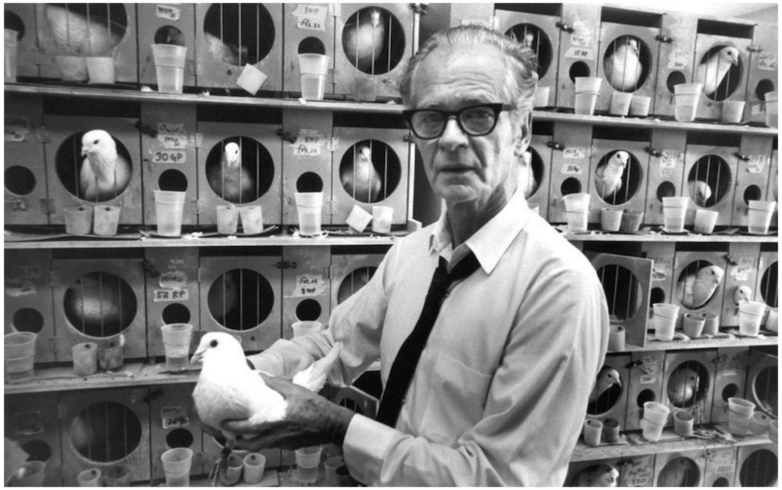
Important People

- Hermann Ebbinghaus
- Studied memory
- Discovered the forgetting curve



Important People

- B. F. Skinner
- Pioneered radical behaviorism
- Invented “GLIDER”



GLIDER

- Implemented:
- Automatic, immediate and regular reinforcement without the use of aversive control
- Adjustable spacing of repetitions to suite the individuals learning speed.

GLIDER

- GLIDER could not automatically adjust the spacing of repetitions, this was done manually, and based on “intuition,” not a mathematical model.
- It was mechanical.
- It was very expensive.

My Program

My Program

- Uses same operant conditioning principles as “GLIDER.”
- Automatically calculates spacing of repetitions. This makes it more precise than GLIDER, and allows learning to occur at the maximum rate that an individual is capable of.
- Calculates the forgetting curve of each set of information. This is so that users can look at pictures of a graph of the forgetting curves, (in a future update).

Spacing

- Spacing of repetitions is implemented by this formula:

$$I_i = I_{i-1} * C_2$$

- It just means:
- The length of time for the new interval to the next repetition, is equal to that of the previous interval, multiplied by difficulty.
- Or;
- newInterval = previousInterval * difficulty;

Difficulty

- Difficulty, as seen in the previous slide, determines the length of the interval between repetitions.
- Difficulty is implemented by this formula:

$$y = mx + b$$

- This is known as the “slope-intercept” formula.

$y = mx + b$

- What is $y = mx + b$ doing here?
- Difficulty is calculated as the point of a line that intercepts the y-axis of a cartesian co-ordinate graph.
- The line must not intersect the y-axis outside of the values 1.3, and 2.5.
- Otherwise, the study sessions can occur too often, and slow progress down, or not often enough, and cause the ability to retrieve information to decay to much.

$y = mx + b$

- m is the slope. This provides the constraints

$$m = \frac{rise}{run}$$

$rise = y_2 - y_1$

$y_2 = 2.5$ Very Easy

$y_1 = 1.3$ Very Difficult

$run = x_2 - x_1$

$x_2 =$ the number of problems, or questions, for the topic. This is the highest number of possible correct answers that can intersect with 2.5, the value that is correlated with being very easy.

$x_1 =$ Zero. This is the lowest possible number of corect answers. It is the intersection point where y_1 exists, the value at the extreme end of difficulty, 1.3.

y = mx + b

$y = mx + b$

m = defined on the previous slide

x = actual number of correct responses.

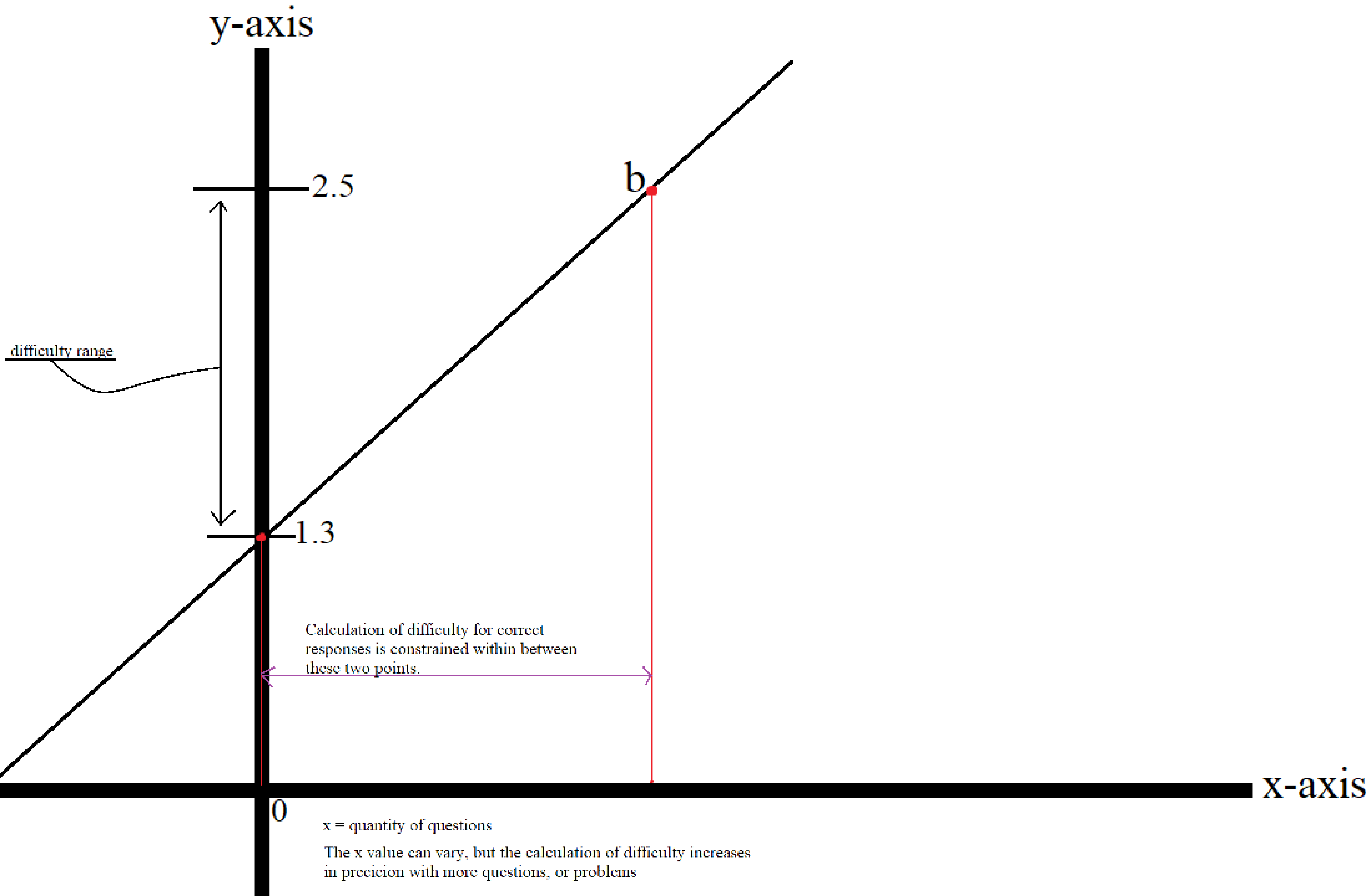
$b = 2.5$. This is where mx would intersect, if the divisor for m, run, is equal to the number of correct responses.

y = difficulty

y = mx + b, or:

$$\text{difficulty} = \overset{m}{\left(\text{[illegible]} \right)} \overset{x}{\text{correctResponses}} + \overset{b}{\text{totalQuantityOfQuestions}}$$

y = mx + b


y-axis
2.5
b
difficulty range
1.3
Calculation of difficulty for correct responses is constrained within between these two points.
x-axis
0
x = quantity of questions
The x value can vary, but the calculation of difficulty increases in precicion with more questions, or problems

Prepare the course.

It’s easy to use!

- The program is easy to use.
- Step 1: Note the number of chapters.

Brief Contents

It’s easy to use!

- The program is easy to use.
- Step 2: Note the number of topics, for each chapter.

Contents

= 6

= 7

= 7

It’s easy to use!

- Step 3: Note the number of sub-topics, for each topic. Also, label each one, (or write it down in a notebook)

SECTION 1.2 **EXPONENTS AND SCIENTIFIC NOTATION** 17

LEARNING OBJECTIVES

In this section students will:

- Use the product rule of exponents.
- Use the quotient rule of exponents.
- Use the power rule of exponents.
- Use the zero exponent rule of exponents.
- Use the negative rule of exponents.
- Find the power of a product and a quotient.
- Simplify exponential expressions.
- Use scientific notation.

Number of sub-topics for this topic

1.2 EXPONENTS AND SCIENTIFIC NOTATION = 9

Mathematicians, scientists, and economists commonly encounter very large and very small numbers. But it may not be obvious how common such figures are in everyday life. For instance, a pixel is the smallest unit of light that can be perceived and recorded by a digital camera. A particular camera might record an image that is 2,048 pixels by 1,536 pixels, which is a very high resolution picture. It can also perceive a color depth (gradations in colors) of up to 48 bits per frame, and can shoot the equivalent of 24 frames per second. The maximum possible number of bits of information used to film a one-hour (3,600-second) digital film is then an extremely large number.

Using a calc… 600 and press **ENTER**. The calculator displays **1.304596316E13**. What does… represents the exponent 13 of ten, so there are a maximum of approximat… ilm. In this section, we review rules of exponents first and then apply them to calculations involving very large or small numbers.

Label each sub-topic

1.2.1 Using the Product Rule of Exponents

Consider the product $x^3 \cdot x^4$. Both terms have the same base, x, but they are raised to different exponents. Expand each expression, and then rewrite the resulting expression.

3 factors 4 factors

$$x^3 \cdot x^4 = x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$$

It’s easy to use!

- Step 4: Not the number of questions, or problems (only ones with answers provided!), for each sub-topic.

SECTION 1.2 **EXPONENTS AND SCIENTIFIC NOTATION** 17

LEARNING OBJECTIVES

In this section students will:

- Use the product rule of exponents.
- Use the quotient rule of exponents.
- Use the power rule of exponents.
- Use the zero exponent rule of exponents.
- Use the negative rule of exponents.
- Find the power of a product and a quotient.
- Simplify exponential expressions.
- Use scientific notation.

Number of sub-topics for this topic

1.2 EXPONENTS AND SCIENTIFIC NOTATION = 9

Mathematicians, scientists, and economists commonly encounter very large and very small numbers. But it may not be obvious how common such figures are in everyday life. For instance, a pixel is the smallest unit of light that can be perceived and recorded by a digital camera. A particular camera might record an image that is 2,048 pixels by 1,536 pixels, which is a very high resolution picture. It can also perceive a color depth (gradations in colors) of up to 48 bits per frame, and can shoot the equivalent of 24 frames per second. The maxi... used to film a one-hour (3,600-second) digital film is then an extremely l... Using a calc... 600 and press ENT... What does ... represents the exp... approximat... film. In this section ... apply them to calculations involving very large or small numbers.

Label each sub-topic

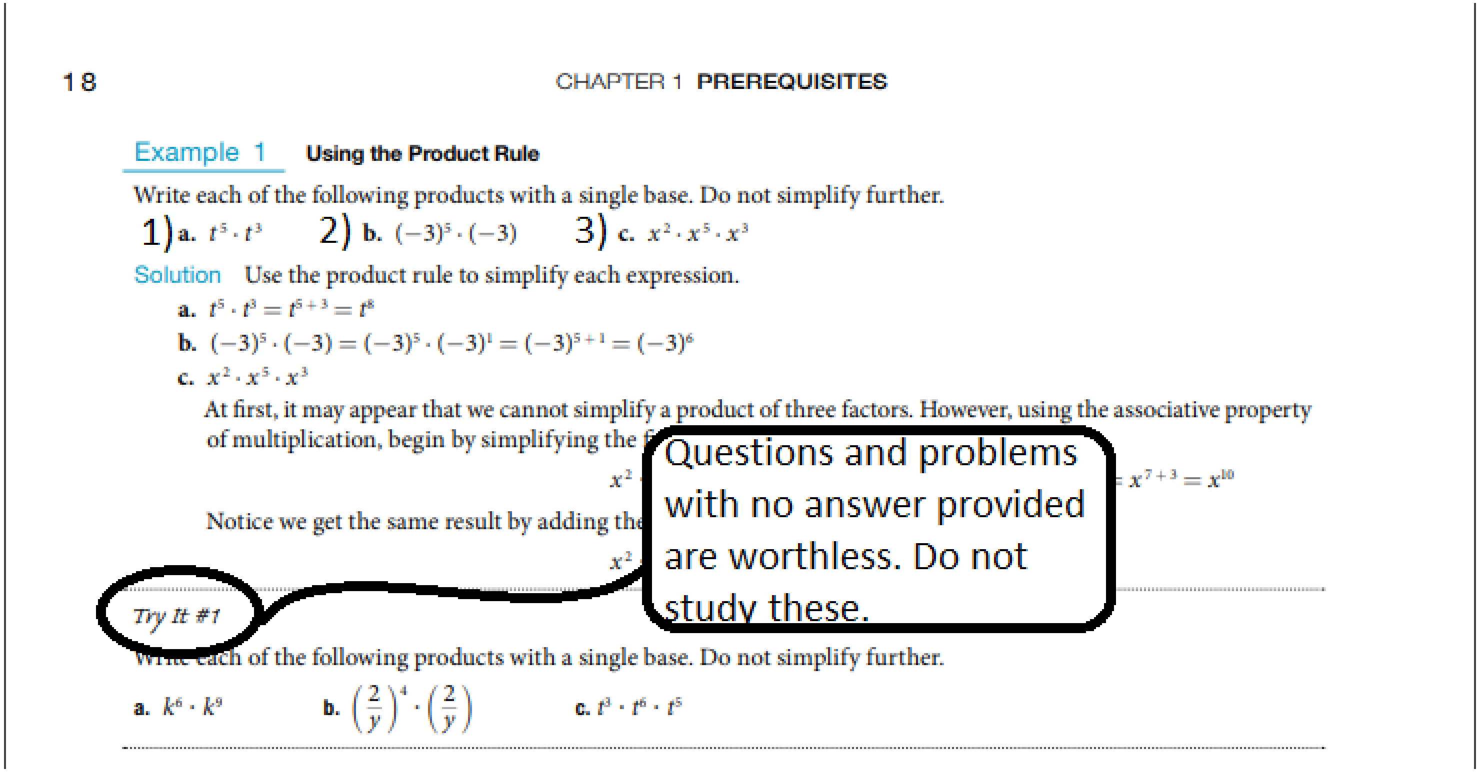
Note the number of questions, (that have answers), for every sub-topic

1.2.1 Using the Product Rule of Exponents = 6

Consider the product $x^3 \cdot x^4$. Both terms have the same base, x, but they are raised to different exponents. Expand each expression, and then rewrite the resulting expression.

It's easy to use!

- Note about Step 4:



18 CHAPTER 1 **PREREQUISITES**

Example 1 **Using the Product Rule**

Write each of the following products with a single base. Do not simplify further.

1) a. $t^5 \cdot t^3$ 2) b. $(-3)^5 \cdot (-3)$ 3) c. $x^2 \cdot x^5 \cdot x^3$

Solution Use the product rule to simplify each expression.

a. $t^5 \cdot t^3 = t^{5+3} = t^8$

b. $(-3)^5 \cdot (-3) = (-3)^5 \cdot (-3)^1 = (-3)^{5+1} = (-3)^6$

c. $x^2 \cdot x^5 \cdot x^3$

At first, it may appear that we cannot simplify a product of three factors. However, using the associative property of multiplication, begin by simplifying the f

x^2 $= x^{7+3} = x^{10}$

Notice we get the same result by adding the

x^2

Try It #1

Write each of the following products with a single base. Do not simplify further.

a. $k^6 \cdot k^9$ b. $\left(\frac{2}{y}\right)^4 \cdot \left(\frac{2}{y}\right)$ c. $t^3 \cdot t^6 \cdot t^5$

- This is true for mathematical subjects, not for programming languages.

Upload the course

Uploading

- Step 1: Write down the questions and answers.

1.1.1 6 questions

1) Who was the first president of the United States of America?

   a) George Washington

2) through 6) are math problems that are in the book

1.1.2

1) through 5) are in book.

6) A question?

   a) An answer.

- Using pen & paper is quicker than making images for a digital flashcard system.

Uploading

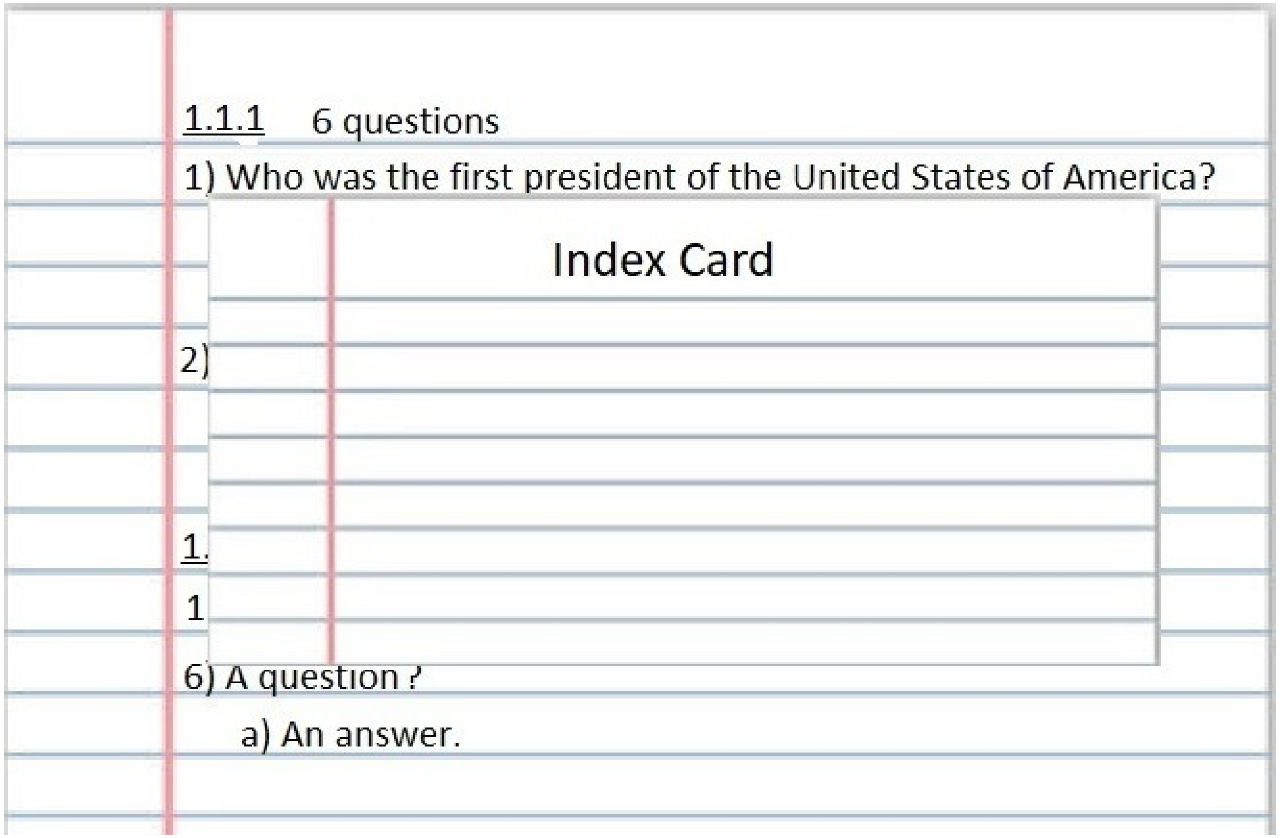
- Step 2: Upload all of the information.

- A future update will allow one chapter at a time.

Use the program!

Use it!

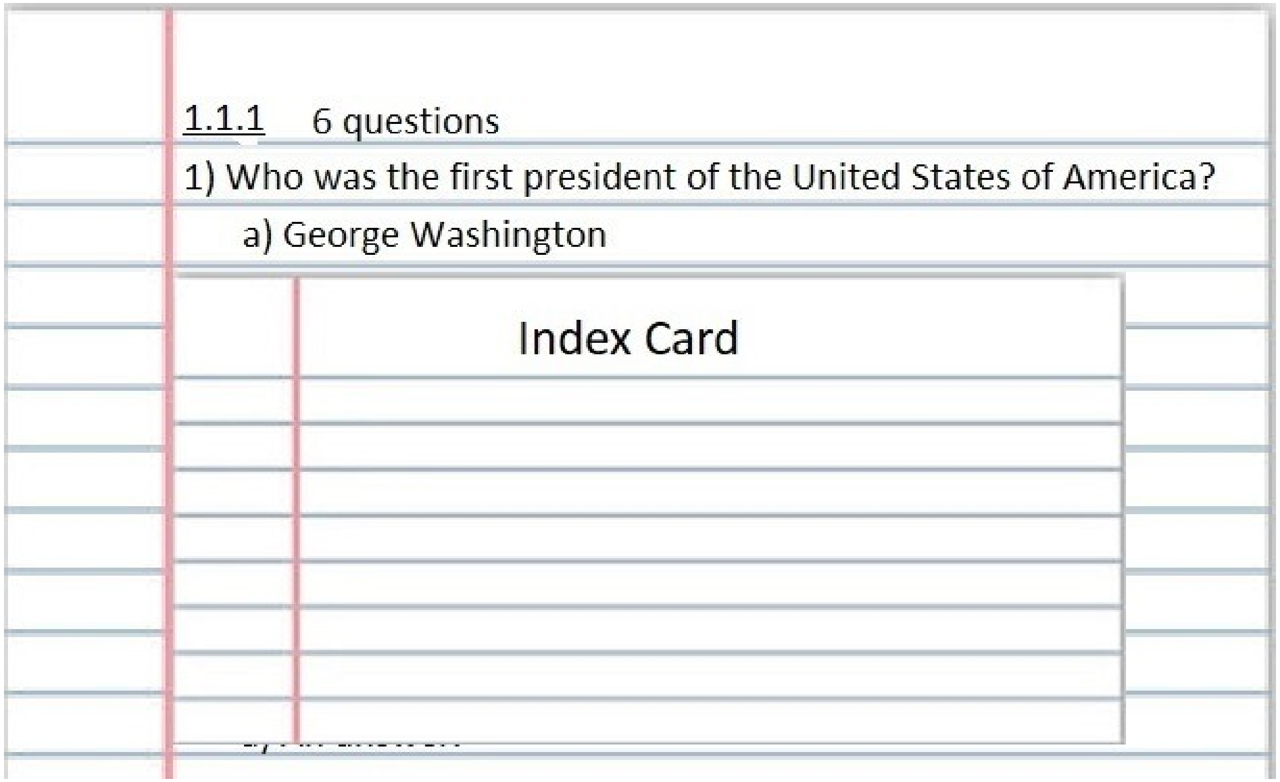
- Use an index card.



- Hide the answer while you respond to the question, or problem.

Use it!

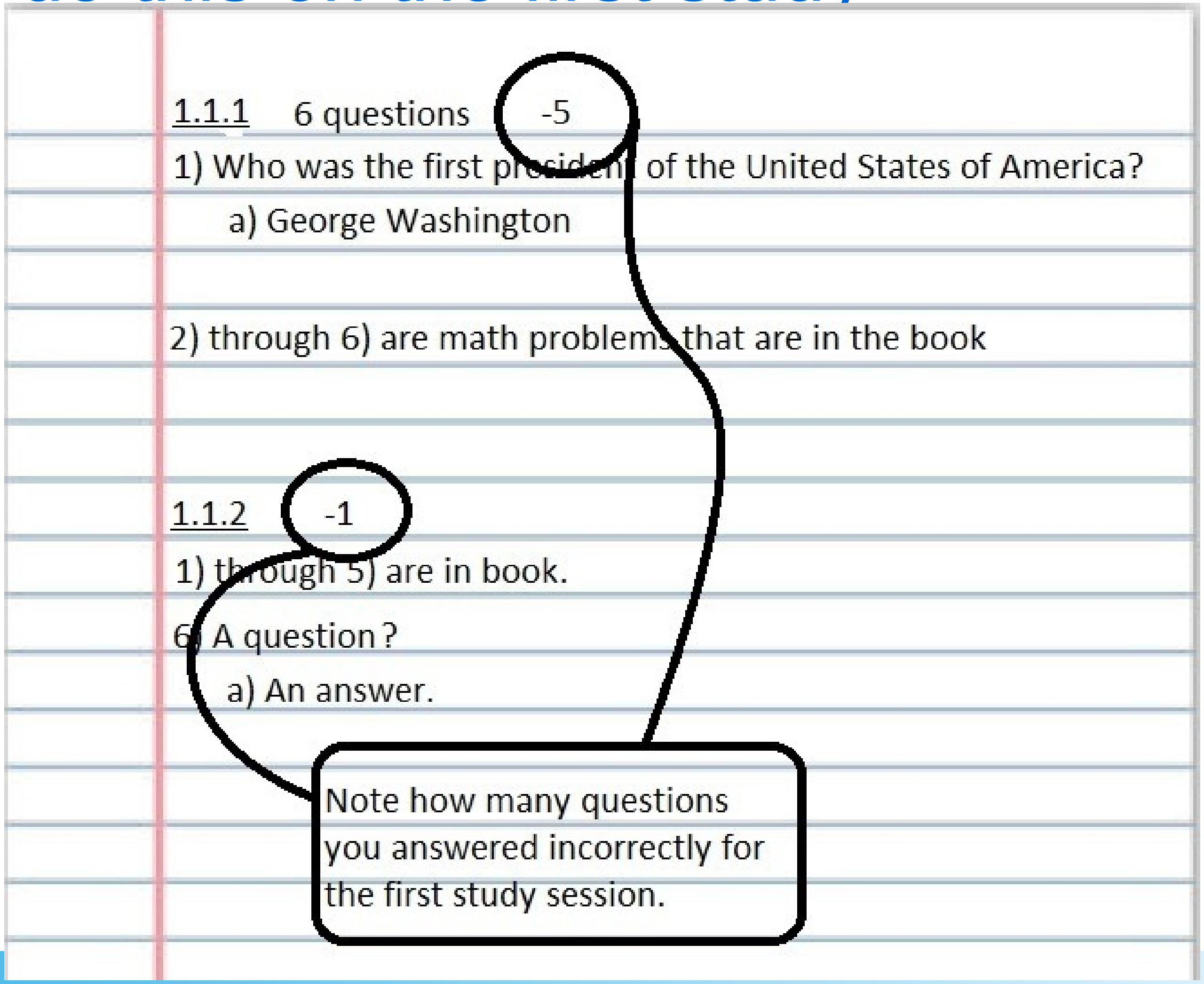
- Reinforce desired responses.



- If you get the right answer, then you just reinforced, and strengthened, the engram's stability.

Use it!

- Note the quantity of incorrect responses in your notebook. Only do this on the first study session.



This is needed to calculate the difficulty

Use it!

- After the first study session of a topic:
- Check the program every day. Some days will have no practiced material to rehearse.
- (A future update will pop a notification up in your taskbar, and schedule the rehearsals in your calendar. There will also be a GUI)
- Do not let too much time pass from a scheduled repetition! The memory of that information will decay, and you will have to relearn the information.

Use it!

- The rehearsals are scheduled on days that retrieval decays to 95%
- Example of 1st repetition forgetting curve: