Rigorous and Reliable Formative Assessments

Presented by: Alex Fischer and Frank Wapole

This presentation is published here: WiFi: NCTM2019
https://goo.gl/PQqmgB

- Please open this padlet, and answer the corresponding question

Goals

- Understand how rigor, validity, and reliability contribute to effective formative assessment practices

- Use research based frameworks to improve your formative assessment practices.

Introduction

What's your name?

What's your favorite movie?

What class(es) do you currently teach?

Given the choice to teach AP Calculus or Algebra 1, which would you teach and why?

Experience Before Label

In your groups, or with the people around you:

- Review the formative assessment below
- What do you like and what do you dislike?
- Be prepared to share at least one idea

1) Formative 1

Mathematics Class Name:_____

Formative 1

Find the explicit rule for the nth term of the sequence shown, then find the 59th term of the sequence.

1. 6, 10, 14, 18, …

Explicit Rule: _____

59th Term: _____

2. 101, 74, 47, 20, …

Explicit Rule: _____

59th Term: _____

YES or NO: I can write the explicit formula of an arithmetic sequence in order to find a given term of the sequence.

If you answered NO to the above statement, then what aspects of the learning target are you struggling with?

_____

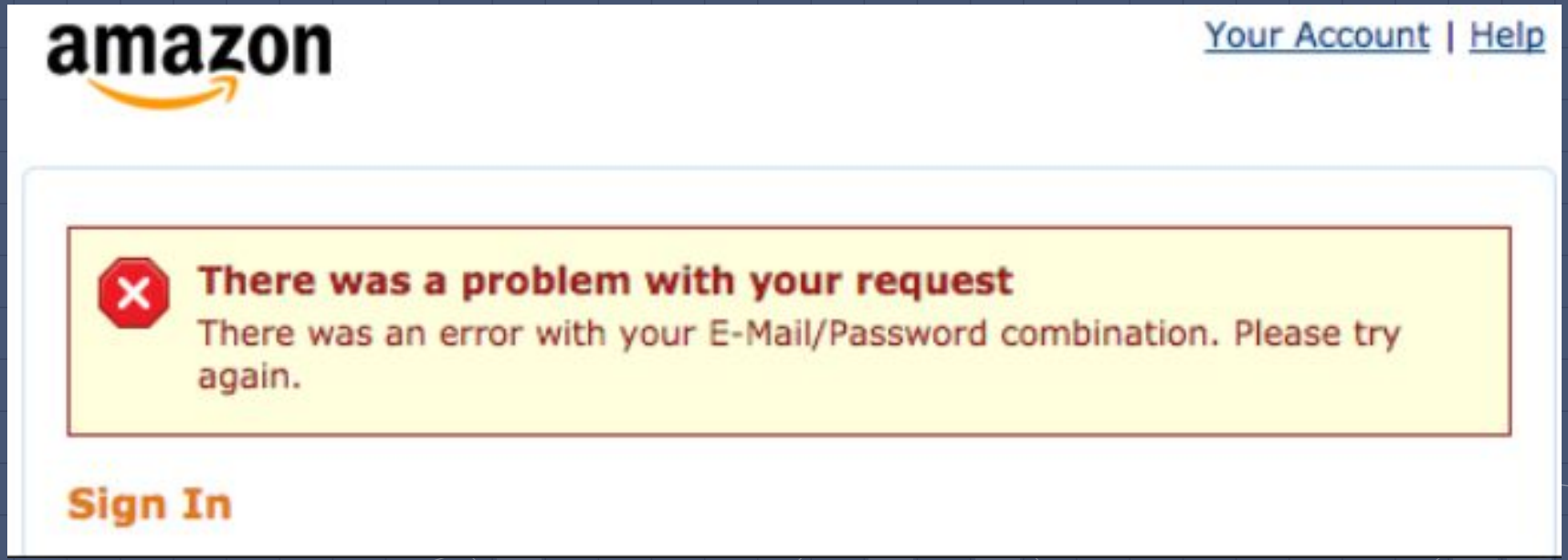
_____

_____

Validity and Reliability

Something to think about...

Give us your opinions here


amazon
Your Account | Help
There was a problem with your request
There was an error with your E-Mail/Password combination. Please try again.
Sign In


OLD FAITHFUL
CEYSER

A Second Look

In your groups, or with the people around you:

- Review the formative assessment below
- What do you like and what do you dislike?
- Be prepared to share at least one idea

Formative 2

Mathematics Class Name:_____

Formative 2

3 Things I learned today	- - -
2 Things I found interesting	- -
1 Question I still have	-

Organization for Economic Cooperation and Development

1) Establish a classroom culture that encourages interaction and use of assessment tools.

2) Establish learning goals, and track individual student progress toward those goals.

3) Use of varied instruction methods.

4) Use of varied approaches to assessment.

5) Feedback on student performance and adaptation of instruction to meet identified needs.

6) Active involvement of students in the learning process.

In your groups, or with the people around you:

- Review the formative assessment below
- What do you like and what do you dislike?
- Be prepared to share at least one idea

Formative 3

Mathematics Class Name:_____

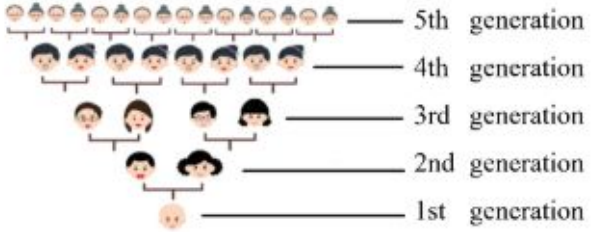
Formative 3

Use your homework from last night to complete the following problems.

6) Answer each of the following questions about the number of relatives in each generation of your family.

a) Determine what type of pattern the number of relatives in each generation follows.

A) Arithmetic B) Geometric C) Other D) None



b) Determine how many relatives would be in the 10^{th} generation.

A) 32 B) 256 C) 512 D) 1024

c) Write the explicit formula to find the nth term of the sequence.

$a_n =$ _____

7) Write an example of a geometric sequence that converges as n approaches infinity.

$a_n =$ _____

Formative Assessment General Principles

1) Specify what is to be assessed

2) Procedures are selected due to relevance to characteristics or performance to be measured

3) Comprehensive assessments use a variety of procedures

4) Awareness in limitations

5) Assessment as a means to an end, not an end itself

In your groups, or with the people around you:

- Review the formative assessments below
- What do you like and what do you dislike?
- Be prepared to share at least one idea

Formative 4 (electronic)
Formative 5
Formative 6

https://docs.google.com/forms/d/e/1FAIpQLSc-CQfcV_m6rYmW4pl4UqFah2RCUQTkr3XvmmpRv5f0JGIcLQ/viewform

I can derive the formula for the sum of a finite series, and use the formula to solve problems.

Evaluate the series:

$$\sum_{n=1}^{59} 7+3(n-1)$$

Your answer

Evaluate the series:

$$\sum_{n=1}^{27} 4(1.2)^{n-1}$$

Your answer

A recovering heart attack patient is told to get on a regular walking program. The patient is told to walk a distance of 5 km the first week, 8 km the second week, 11 km the third week and so on for a period of 20 weeks. At that point the patient is to maintain the distance walked during the 20th week. How far will the patient walk for the first twenty weeks?

Your answer

What aspect of this learning target do you understand very well?

Your answer

What aspect of this learning target do you struggle with?

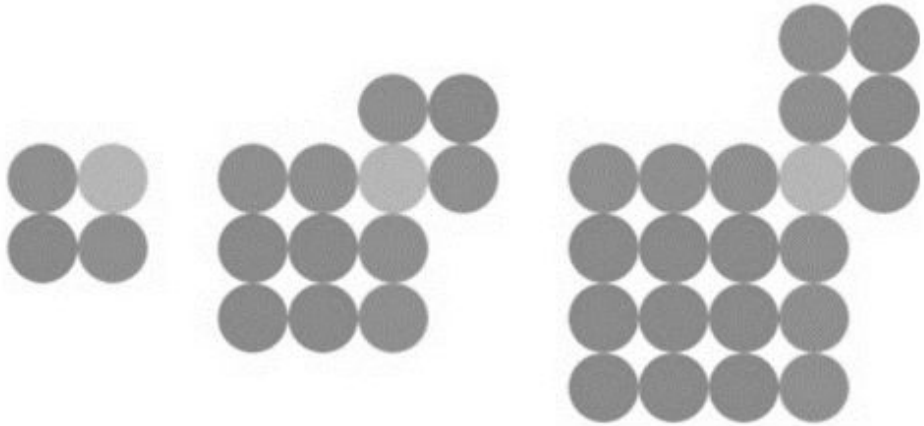
Your answer

SUBMIT

Mathematics Class Name:_____

Formative 5

Using numbers, words, and/or symbols. Describe the pattern shown below.



_____

_____

_____

Mathematics Class Name:_____

Formative 6

Find the common ratio, the term named in the problem, and the explicit formula.

1) 4, −12, 36, −108, ...
Find a_{12}

2) −1, −2, −4, −8, ...
Find a_{12}

Circle what number best describes your current level of understanding when you are done.

Level 1	Level 2	Level 3	Level 4	Level 5
I can completely unclear about what to do. I cannot figure out what I am doing wrong.	I understand some parts but I am still confused about others. I am beginning to learn this concept but I still need help.	I can use models and examples from the teacher to help me. I still make mistakes sometimes.	I am clear about what to do without help. I can show my work with models and/or symbols.	I can solve three similar problems alone. I can explain my thinking and work. I can help others understand.

Link to Google Form Answers

Summarize

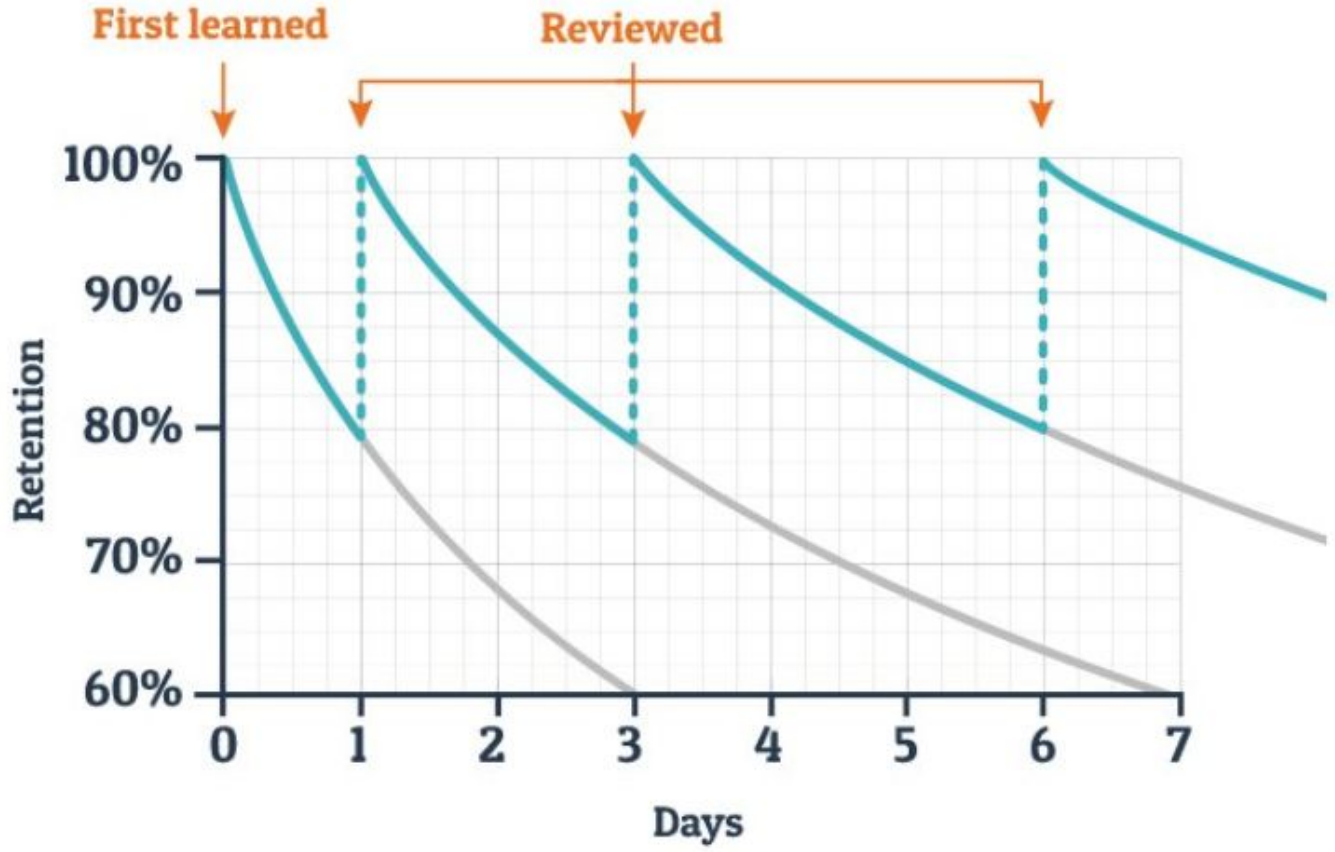
- Your group has exactly two minutes
- What are the characteristics of effective formative assessment?

Formative 4 (electronic)
Formative 5
Formative 6

BRAIN BREAK!!!!!!!!

Putting it All Together at Jacobs High School

Typical Forgetting Curve for Newly Learned Information



HDJ Algebra II Mathlete: _____

Track My MATH Understanding
Chapter 1 – Interpreting Functions

Levels of MATH Mastery:

Master – I have mastered the skills and understanding of the target at hand. I can complete my own work, and could even teach others.

Almost There - I am approaching a full understanding of this material. I am able to comprehend the problem and am able to work on it by myself. I may have some doubts about my abilities or some mistakes in my work.

Trying – I am developing a working understanding. I can complete some portions on my own but may need help in certain areas.

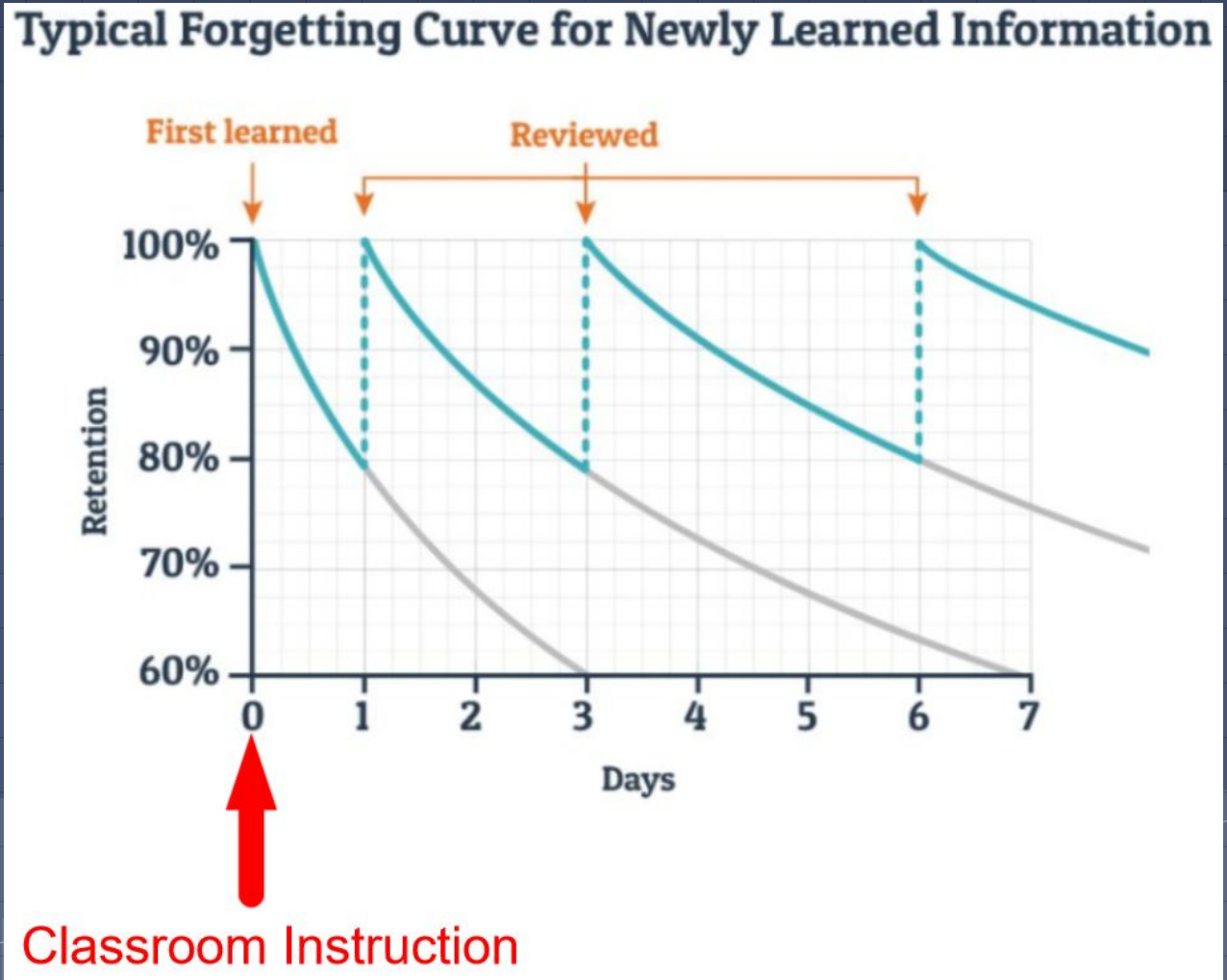
Help – I am just beginning to learn and understand. I need help and assistance in order to complete my work.

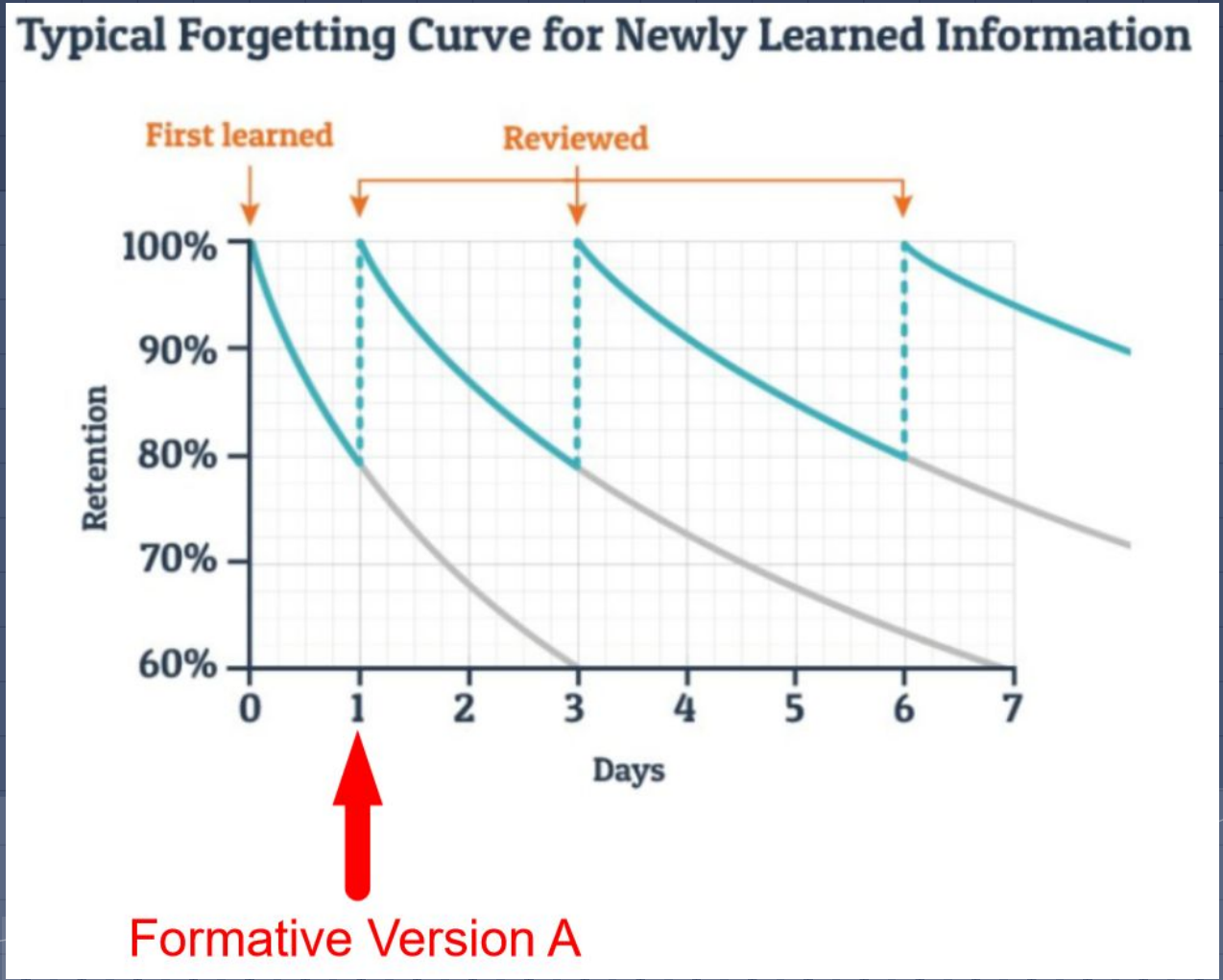
Learning Target 1: I can find the output of a function when given an input.				
Attempt	Help	Trying	Almost there	Master
1st Formative				
2nd Formative				
Summative Exam				

From this learning target I struggle with: _____

_____

From this learning target I excel at: _____


Typical Forgetting Curve for Newly Learned Information
First learned
Reviewed
100%
90%
80%
70%
60%
Retention
0
1
2
3
4
5
6
7
Days
Classroom Instruction


Typical Forgetting Curve for Newly Learned Information
First learned
Reviewed
100%
90%
80%
70%
60%
Retention
0
1
2
3
4
5
6
7
Days
Formative Version A

HDJ Algebra II

Mathlete: _____

Version A

Learning Target 1: I can find the output of a function when given an input.				
Self Evaluation (circle one)	Help	Trying	Almost there	Master
Teacher Evaluation (leave blank)	Help	Trying	Almost there	Master

$g(3) = 7(3) - 6$

$21 - 6$

$g(3) = 15$

For Problem 1 circle True or False:

1. If $g(t) = 7t - 6$, then $g(3) = 4$. TRUE FALSE

Use the following functions to answer problems 2 and 3.

$r(s) = 15 - 2s$ $q(s) = \frac{1}{4}(s)^2$

$r(2) = 15 - 2(2)$

$15 - 4$

9

$q(4) = \frac{1}{4}(4)^2$

$\frac{1}{4}(16)$

24

2. $r(2) =$ 9

3. $q(4) =$ 24

If $f(5) = 12$, then write a potential function for $f(x)$.

4. $f(x) =$ $4n - 10$

Learning Target 1: Input Values				
Attempt	Help	Trying	Almost there	Master
1st Formative				
2nd Formative				
Summative Exam				

From this learning target I struggle with: I struggles with coming up with an equation.

From this learning target I excel at: I did good with solving the problems.

Typical Forgetting Curve for Newly Learned Information

Formative Version A Corrections

HDJ Algebra II

Mathlete: _____

Version A Corrections

Learning Target 1: I can find the output of a function when given an input.				
Self Evaluation (circle one)	Help	Trying	Almost there	Master
Teacher Evaluation (leave blank)	Help	Trying	Almost there	Master

For Problem 1 circle True or False:

1. If $g(t) = 7t - 6$, then $g(3) = 4$. TRUE FALSE

Use the following functions to answer problems 2 and 3.

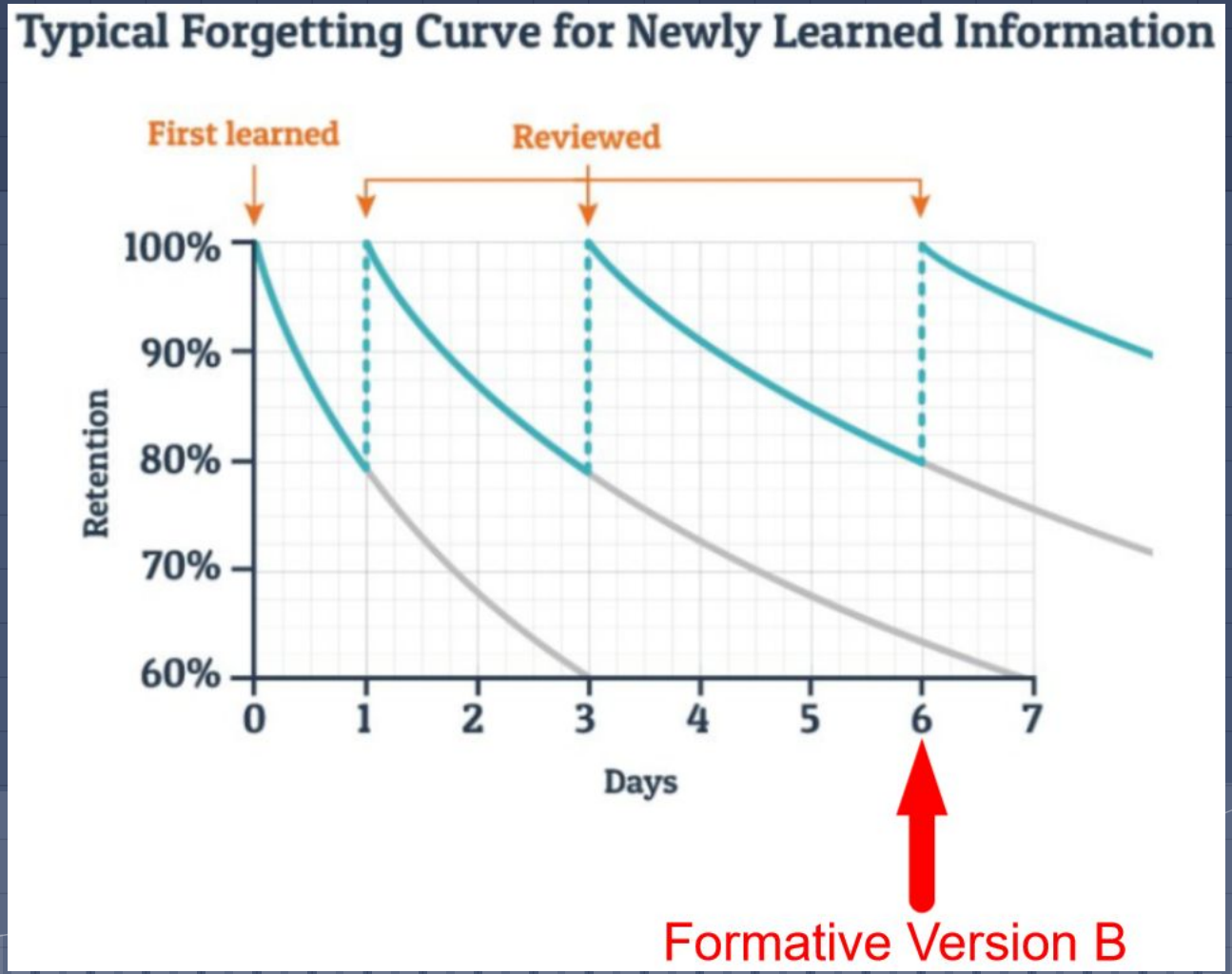
$r(s) = 15 - 2s$ $q(s) = \frac{1}{4}(s)^2$

2. $r(2) =$ 11 $15 - 2(2)$ $15 - 4$ 11

3. $q(4) =$ 4 $\frac{1}{4}(16)$ 4

If $f(5) = 12$, then write a potential function for $f(x)$.

4. $f(x) =$ $3x - 3$


Typical Forgetting Curve for Newly Learned Information
First learned
Reviewed
100%
90%
80%
70%
60%
Retention
0
1
2
3
4
5
6
7
Days
Formative Version B

HDJ Algebra II Mathlete: _____

Version B

Learning Target 1: I can find the output of a function when given an input.				
Self Evaluation (circle one)	Help	Trying	Almost there	Master
Teacher Evaluation (leave blank)	Help	Trying	Almost there	Master

$g(20)=\frac{1}{2}(20)-$

$10-8$

2

For Problem 1 circle True or False:

1. If $g(t)=\frac{1}{2}t-8$, then $g(20)=12$. TRUE (FALSE)

Use the following functions to answer problems 2 and 3.

$r(s)=15-2s$ $q(s)=\frac{1}{4}(s)^2$

$r(4)=15-2(4)$

$15-8$

7

$q(2)=\frac{1}{4}(2)^2$

$\frac{1}{4}(4)$

1

2. $r(4)=$ 7

3. $q(2)=$ 1

$1+2x$

If $f(5)=11$, then write a potential function for $f(x)$.

4. $f(x)=$ $2x+1$

Learning Target 1: Input Values				
Attempt	Help	Trying	Almost there	Master
1st Formative				
2nd Formative				
Summative Exam				

From this learning target I struggle with: I struggles with coming up with an equation.

From this learning target I excel at: I did good with solving the problems.

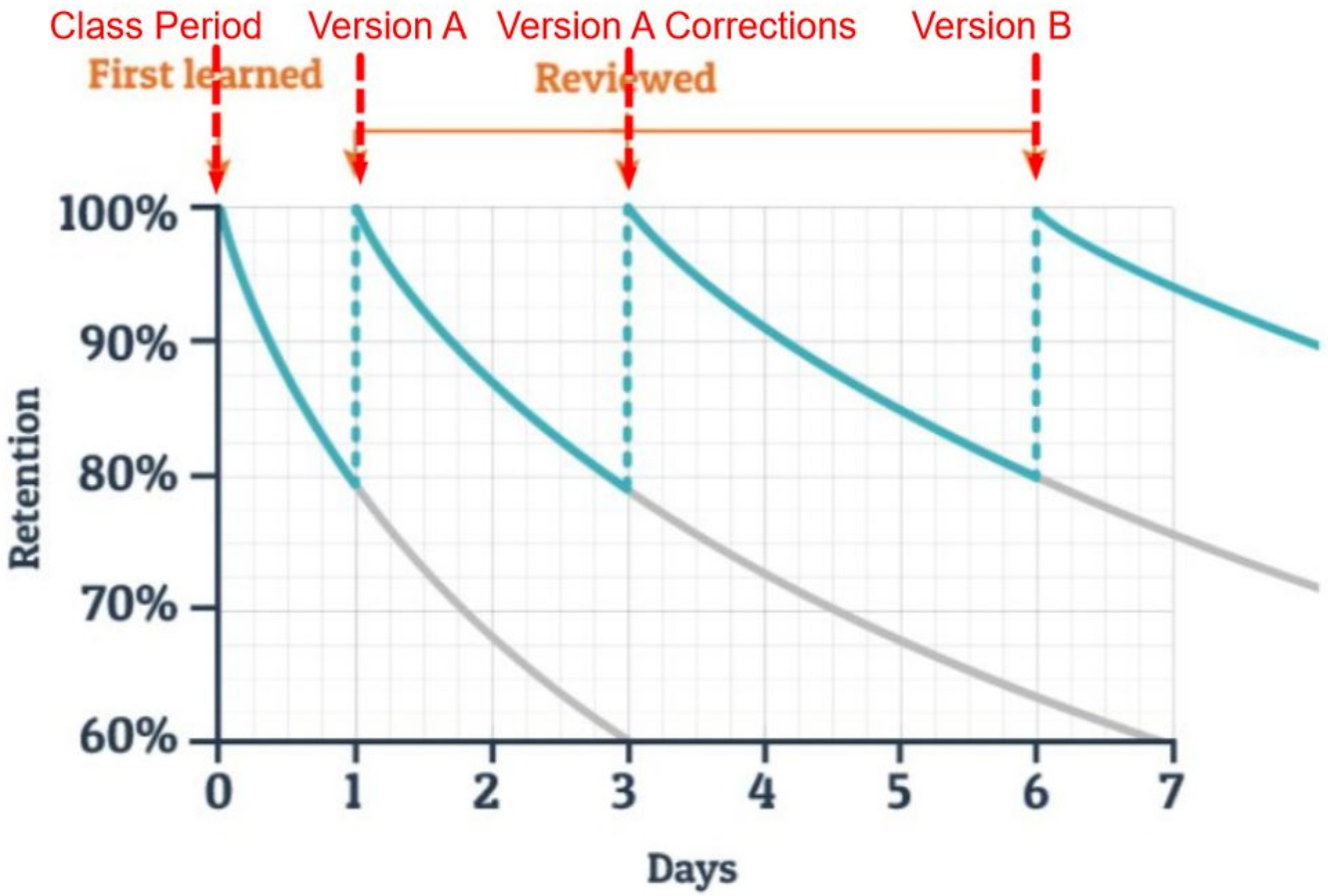
Learning Target	Non Calculator Questions	Calculator Questions	Points Earned	Points Possible
LT 1: I can evaluate a function.	#1-2	#6	5.5	**6**
LT 2: I can solve an equation.	#3-5	#7	7.5	**8**
LT 3: I can solve an inequality.	N/A	#8, 9	5	**5**
LT 4: I can solve an absolute value equation.	N/A	#10, 11	6.5	**7**
TOTAL POINTS EARNED:			24.5	**26**

Learning Target 1: Input Values				
Attempt	Help	Trying	Almost there	Master
1st Formative				
2nd Formative				
Summative Exam				

From this learning target I struggle with: I struggles with coming up with an equation.

From this learning target I excel at: I did good with solving the problems.

Typical Forgetting Curve for Newly Learned Information



2014-2015 Advanced Geometry Gradebook

	Categories			
Grade	Final	Homework	Tests	
C	62.77 %	65.28 %	73.54 %	-8.26
A	91.11 %	88.42 %	93.53 %	-5.11
B	71.66 %	92.14 %	81.72 %	10.42
C	66.66 %	79.33 %	80.07 %	-.74
B	76.66 %	97.52 %	89.97 %	7.55
C	62.22 %	97.52 %	77.50 %	20.02
C	54.44 %	89.66 %	71.89 %	17.77
A	88.88 %	92.56 %	90.50 %	2.06
C	56.66 %	88.01 %	70.71 %	17.3
C	50.00 %	90.08 %	71.63 %	18.45
B	66.66 %	95.45 %	87.86 %	7.59
B	72.22 %	90.90 %	81.33 %	9.57
C	51.66 %	96.69 %	70.31 %	26.38
C	62.77 %	82.64 %	75.59 %	7.25
B	83.33 %	85.12 %	89.57 %	-4.45
B	68.88 %	86.77 %	83.31 %	3.46
C	63.88 %	88.42 %	77.11 %	11.31
D	47.22 %	92.14 %	67.74 %	24.4
B	73.33 %	93.38 %	87.07 %	6.31
B	76.11 %	96.69 %	86.41 %	10.28

Average Difference = +10.728

	Categories		
Grade	Classwork	Assessments	Final Exam
F	60.00 %	40.00 %	23.00 %
A	90.43 %	93.52 %	81.00 %
B	83.47 %	88.82 %	68.00 %
D	70.43 %	68.23 %	47.00 %
C	74.68 %	78.52 %	72.00 %
B	89.00 %	88.52 %	72.00 %
B	88.68 %	85.29 %	66.00 %
B	86.66 %	83.23 %	74.00 %
A	90.43 %	90.58 %	88.00 %
A	91.30 %	92.94 %	94.00 %
B	89.56 %	91.76 %	85.00 %
B	89.47 %	91.17 %	81.00 %
C	86.08 %	75.29 %	55.00 %
B	79.13 %	85.58 %	68.00 %
C	80.00 %	71.47 %	68.00 %
C	83.47 %	77.94 %	62.00 %

20
-3.09
-5.35
2.2
-3.86
.48
3.59
2.85
-.15
-1.64
-2.2
-1.7
10.79
-6.45
8.53
5.53

2017-2018 Advanced Geometry Gradebook

Average Difference = +1.85

HDJ Algebra II Mathlete: _____

Track My MATH Understanding
Chapter 1 – Interpreting Functions

Levels of MATH Mastery:

Master – I have mastered the skills and understanding of the target at hand. I can complete my own work, and could even teach others.

Almost There - I am approaching a full understanding of this material. I am able to comprehend the problem and am able to work on it by myself. I may have some doubts about my abilities or some mistakes in my work.

Trying – I am developing a working understanding. I can complete some portions on my own but may need help in certain areas.

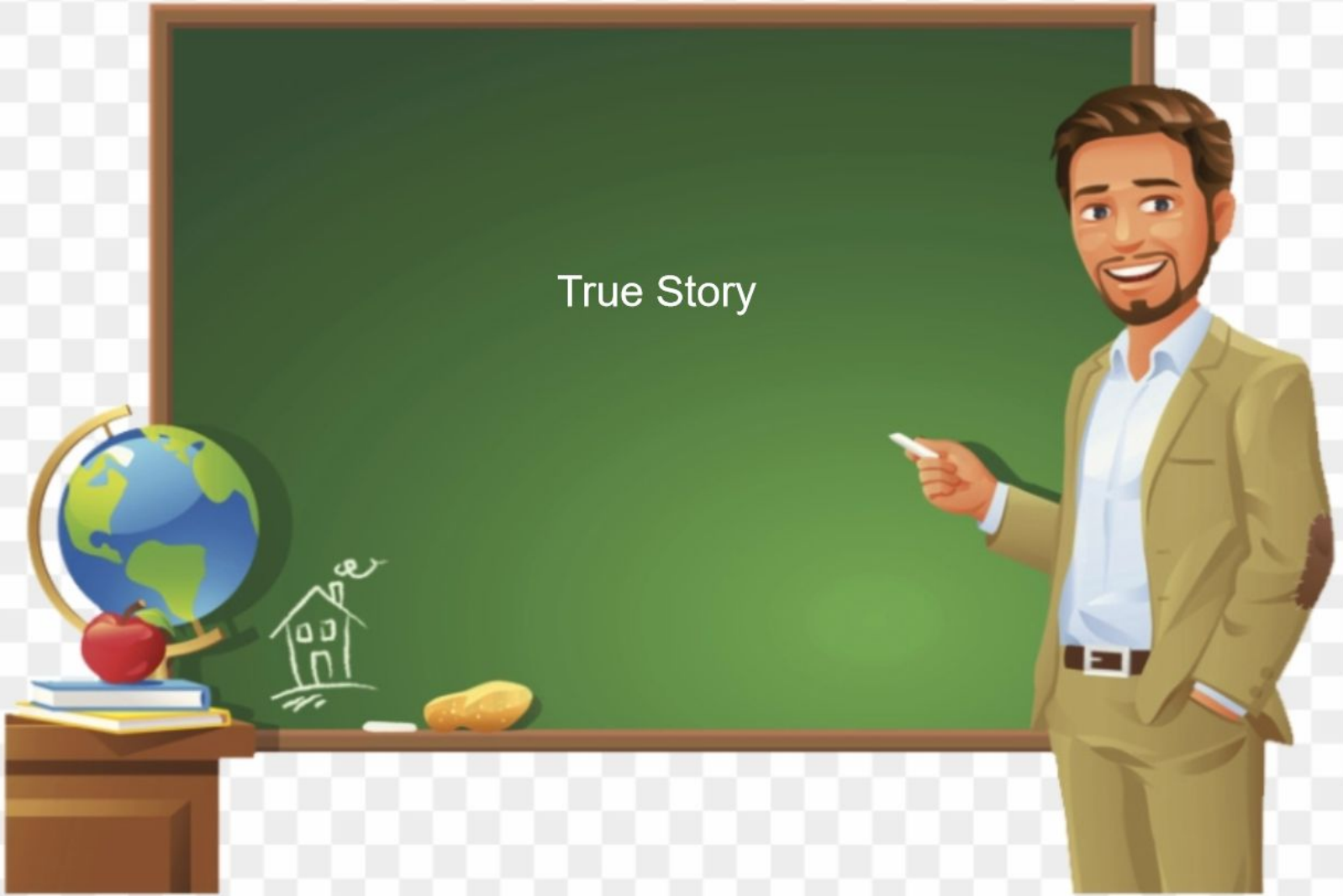
Help – I am just beginning to learn and understand. I need help and assistance in order to complete my work.

Learning Target 1: I can find the output of a function when given an input.				
Attempt	Help	Trying	Almost there	Master
1st Formative				
2nd Formative				
Summative Exam				

From this learning target I struggle with: _____

_____

From this learning target I excel at: _____


True Story

Primary Sources

- *Assessment and Classroom Learning* by Black and Wiliam
- *Understanding Reliability* by Traub and Rowley
- *Measurement and Assessment in Teaching* by Miller, Linn and Gronlund
- *Assessment for Learning: Formative Assessment* by the Centre for Educational Research and Innovation
- *Standards for Educational and Psychological Testing* by the American Educational Research Association, American Psychological Association, and National Council on Measurement in Education