Georgia Milestones Assessment System

Algebra I Formula Sheet

Below are the formulas you may find useful as you take the test. However, you may find that you do not need to use all of the formulas. You may refer to this formula sheet as often as needed.

Linear Formulas

Slope Formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Linear Equations

Slope-intercept Form: $y = mx + b$
Point-slope Form: $y - y_1 = m(x - x_1)$
Standard Form: $Ax + By = C$

Arithmetic Sequence Formulas

Recursive: $a_n = a_{n-1} + d$
Explicit: $a_n = a_1 + d(n - 1)$

Exponential Formulas

Exponential Equation

$y = ab^x$

Geometric Sequence Formulas

Recursive: $a_n = r(a_{n-1})$
Explicit: $a_n = a_1 \cdot r^{n-1}$

Compound Interest Formula

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Quadratic Formulas

Quadratic Equations

Standard Form: $y = ax^2 + bx + c$
Vertex Form: $y = a(x - h)^2 + k$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Average Rate of Change

The change in the y-value divided by the change in the x-value for two distinct points on a graph.

Statistics Formulas

Mean

$$\bar{x} = \frac{x_1 + x_2 + x_3 + \ldots + x_n}{n}$$

Interquartile Range

$IQR = Q_3 - Q_1$

The difference between the first quartile and third quartile of a set of data.

Mean Absolute Deviation

$$\frac{\sum_{i=1}^{n} \left| x_i - \bar{x} \right|}{n}$$

The sum of the distances between each data value and the mean, divided by the number of data values.

You can find mathematics formula sheets on the Georgia Milestones webpage at http://www.gadoe.org/Curriculum-Instruction-and-Assessment/Assessment/Pages/Georgia-Milestones-EOC-Resources.aspx.

Item 1

Selected-Response

Sandra makes necklaces and sells them at a school craft fair. She uses the equation $P = 7.5n - (2.25n + 15)$ to determine her total profit at the fair when n necklaces are sold. Based on this equation, how much does she charge for each necklace?

A. $2.25
B. $7.50
C. $15.00
D. $17.25

Item 2

Selected-Response

The perimeter of a rectangle is $P = 2w + 2l$, where w is the width of the rectangle and l is the length of the rectangle. Rearrange this formula to find the width of the rectangle.

A. $w = P - 2l$

B. $w = \frac{P}{4 - l}$

C. $w = 2P - l$

D. $w = \frac{P}{2} - l$

Item 3

Constructed-Response

Read the following situation to determine whether the inequality correctly models the company's information.

The Mascot Company wants to spend no more than 1,250 dollars per month on the cost of school spirit items for sporting events. Production costs are 5 dollars per shirt and 8 dollars per banner. The company also wants monthly gross revenue from selling shirts and banners to be greater than 3,000 dollars. One shirt sells for 15 dollars, and one banner sells for 20 dollars.

An employee at the company wants to determine the number of shirts and banners that Mascot Company should produce for a month. He lets *s* represent the number of shirts and *b* represent the number of banners. He writes the following system of inequalities.

$$\begin{cases} 5s + 8b \geq 1{,}250 \\ 15s + 20b > 3{,}000 \end{cases}$$

Part A **Explain why the inequality $5s + 8b \geq 1{,}250$ incorrectly models the company's monthly production costs. Write your answer in the space provided.**

Part B **Explain why the inequality $15s + 20b > 3{,}000$ correctly models the company's monthly gross revenue. Write your answer in the space provided.**

Go on to the next page to finish item 3.

Item 3. *Continued*.

Part A

Part B

Item 4

Drag-and-Drop Technology-Enhanced

Move each expression into the correct column in the table.

?

Equivalent to $10\sqrt{5}$	Equivalent to $5\sqrt{10}$	Equivalent to $10\sqrt{10}$

$2\sqrt{250}$ $5\sqrt{2} \cdot \sqrt{5}$ $5\sqrt{5} + 5\sqrt{5}$ $\sqrt{50} \cdot \sqrt{5}$ $\sqrt{5} \cdot \sqrt{10} \cdot \sqrt{10}$

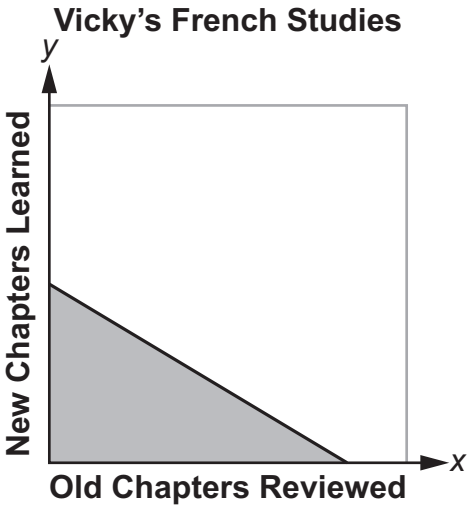
Use a mouse, touchpad, or touchscreen to move expressions into the columns. Each expression may be used once.

Item 5

Selected-Response

Vicky is studying French. She spends 1 hour reviewing each old chapter. She also spends 1.5 hours learning each new chapter. She spends at least 10 hours per week studying French. Which graph could represent the possible number of old chapters Vicky reviews, *x*, and new chapters Vicky learns, *y*, each week?

A.



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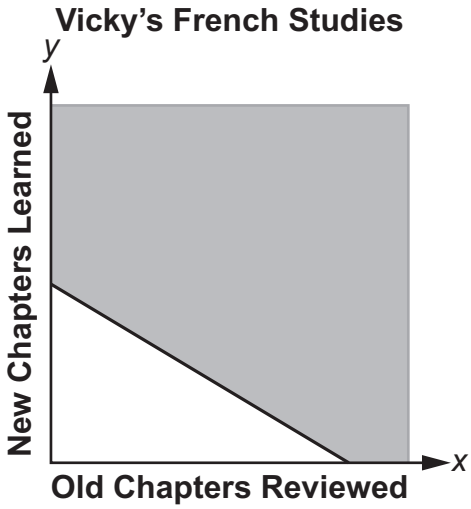
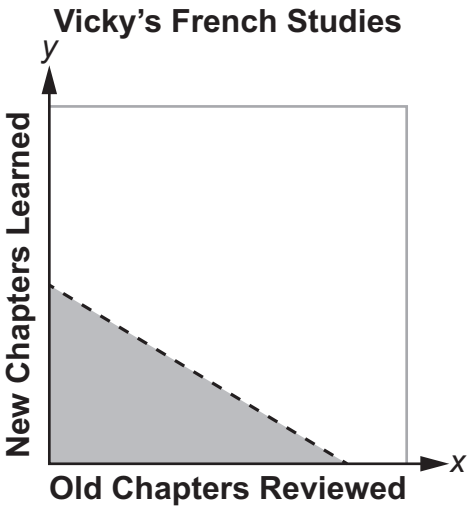
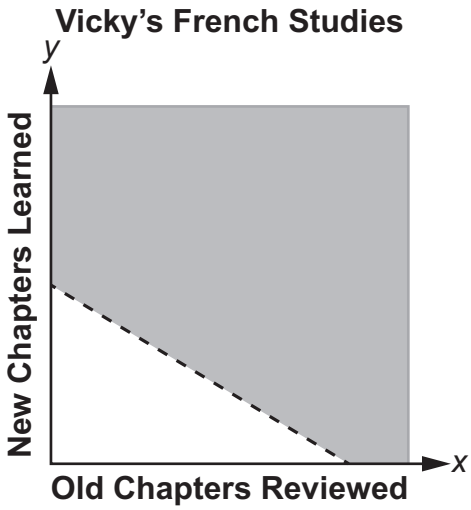


C.



D.



Item 6

Multi-Select Technology-Enhanced

The set of ordered pairs shown represents a function, *f*.

{(–5, 3), (4, 9), (3, –2), (0, 6)}

Select THREE ordered pairs that could be added to the set that would allow *f* to remain a function.

A. (–3, –2)
B. (4, 0)
C. (0, –1)
D. (1, 6)
E. (2, 3)
F. (–5, 9)

Item 7

Constructed-Response

The first four terms of a sequence are shown.

16, 48, 144, 432, . . .

What is the explicit function, *f*(*n*), that defines the sequence? Explain how you determined your answer. Write your answer in the space provided.

Item 8

Constructed-Response

It takes Matt *m* months to save $1,000.

Part A **Write an equation that models the average number of dollars, *x*, Matt saves each month. Write your answer in the space provided.**

Part B **Matt takes 20 months to save $1,000. Explain how you could use your equation from Part A to find the average number of dollars Matt saves each month. Write your answer in the space provided.**

Part A _____

Part B

_____

_____

_____

_____

_____

_____

_____

_____

Item 9

Selected-Response

Which function can be used to model the data in this table?

x	$f(x)$
0	–1
2	0
6	2

A. $f(x) = 3x$

B. $f(x) = \frac{x}{2} - 1$

C. $f(x) = x - 1$

D. $f(x) = 2x - 1$

Item 10

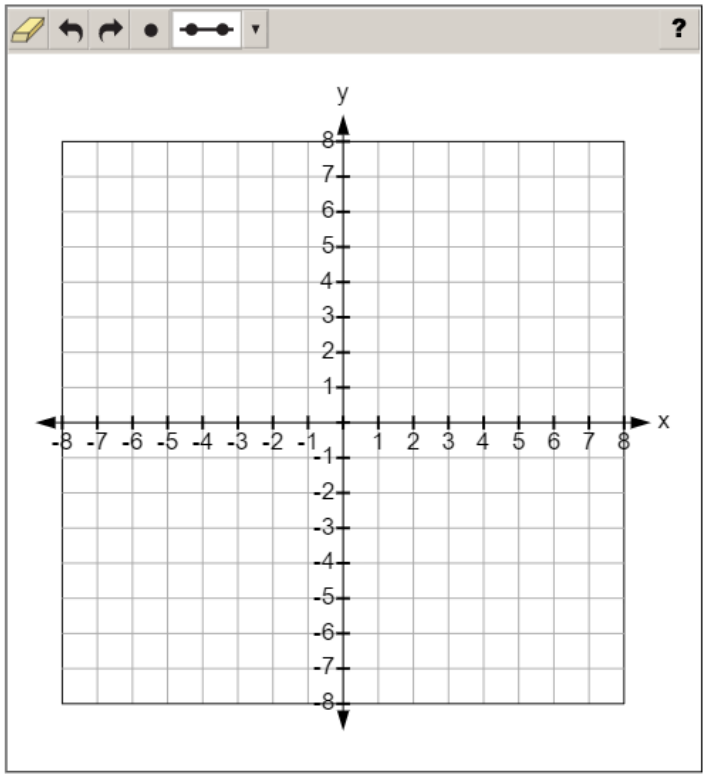
Coordinate-Graph Technology-Enhanced

A system of equations is shown.

$$y = \frac{1}{2}x - 4$$

$$x + 3y = 3$$

Graph the system of equations to show its solution.



Use a mouse, touchpad, or touchscreen to graph lines on the coordinate grid. At most 2 lines and 5 points can be graphed.

Item 11

Extended Constructed-Response

Amy owns a graphic design store. She purchases a new printer to use in her store. The printer depreciates by a fixed rate per year. The function $V = 2{,}400(0.86)^t$ can be used to model the value of the printer in dollars after t years.

Part A **Explain what the parameter 2,400 represents in the equation of the function. Write your answer in the space provided.**

Part B **At what rate does the value of the printer increase or decrease each year? Explain your answer. Write your answer in the space provided.**

Part C **What is the value of the printer after 5 years rounded to the nearest dollar? Write your answer in the space provided.**

Go on to the next page to finish item 11.

Item 11. *Continued*.

Part A

Part B

Part C _____

Item 12

Selected-Response

The function $f(x) = 3x - 9$ is shifted 2 units up. Which equation correctly describes the new function?

A. $g(x) = 6x - 9$
B. $g(x) = 3(x + 2) - 9$
C. $g(x) = 3x - 7$
D. $g(x) = 6x - 18$

Item 13

Selected-Response

A scientist studied the relationship between the number of trees, x, per acre and the number of birds, y, per acre in a neighborhood. She modeled the relationship with a scatter plot and used the equation $y = 4 + 6x$ for the regression line. What is the meaning of the slope and y-intercept of this regression line?

A. The slope is 6. This means that the average number of birds per acre in an area with no trees is 6. The y-intercept is 4. This means that for every 1 additional tree, she can expect an average of 4 additional birds per acre.
B. The slope is 4. This means that for every 1 additional tree, she can expect an average of 4 additional birds per acre. The y-intercept is 6. This means that the average number of birds per acre in an area with no trees is 6.
C. The slope is 6. This means that for every 1 additional tree, she can expect an average of 6 additional birds per acre. The y-intercept is 4. This means that the average number of birds per acre in an area with no trees is 4.
D. The slope is 4. This means that the average number of birds per acre in an area with no trees is 4. The y-intercept is 6. This means that for every 1 additional tree, she can expect an average of 6 additional birds per acre.

Item 14

Selected-Response

A random group of high school students was surveyed. Each student was asked whether it should be mandatory for all high school students to participate in a sport. The results are partially summarized in the two-way table.

	Agree	Disagree	No Opinion	Total
Freshman	53	12	7	
Sophomore	65	37	2	104
Junior	18	42	12	
Senior	56	67	4	
Total		158		375

What percentage is closest to the number of students in the freshman group who agree that it should be mandatory for all high school students to participate in a sport?

A. 14.1%
B. 22.6%
C. 53%
D. 73.6%

Item 15

Drag-and-Drop Multi-Part Technology-Enhanced

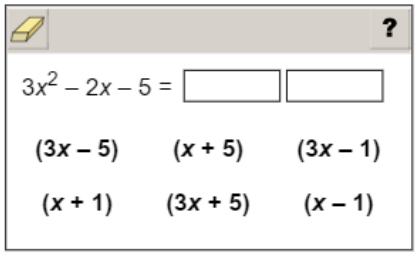
Part A

Part A

A quadratic expression is shown.

$$3x^2 - 2x - 5$$

Move an expression into each box to show the factored form of the given quadratic expression.



Use a mouse, touchpad, or touchscreen to move an expression into each box. Each expression may be used once.

Go on to the next page to finish item 15.

Item 15. *Continued*.

Part B

Part B

A function is shown.

$$f(x) = 3x^2 + 16x - 12$$

What are the zeros of function $f(x)$?

(a) $-\frac{2}{3}$ and -6

(b) $-\frac{2}{3}$ and 6

(c) $\frac{2}{3}$ and -6

(d) $\frac{2}{3}$ and 6

Use a mouse, touchpad, or touchscreen to select a response.

Item 16

Constructed-Response

Maria and Jeff collect data on the number of cars that pass through an intersection every Monday morning for 2 months. They record the findings as 78, 158, 63, 71, 56, 67, 75, and 64. They each use different methods to summarize the typical number of cars that pass through the intersection at the specified time and compare their findings. Jeff says that, on average, 79 cars pass through the intersection each Monday morning. Maria disagrees and says that the mean should not be used and uses the median instead to describe the typical number of cars that pass through the intersection on any given Monday morning.

Part A **What is the median value of the data? Write your answer in the space provided.**

Part B **Explain why the median should be used instead of the mean. Write your answer in the space provided.**

Part A _____

Part B

_____

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Item 17

Selected-Response

Which value is an irrational number?

A. $4 + \sqrt{7}$

B. $\sqrt{2}\ \sqrt{8}$

C. $\frac{\sqrt{3}\ \sqrt{12}}{5}$

D. $\sqrt{3} - \sqrt{3}$

Item 18

Selected-Response

The table defines a quadratic function.

x	*y*
–1	5
0	1
1	–1
3	1

What is the average rate of change between $x = -1$ and $x = 1$?

A. undefined

B. $-\frac{1}{3}$

C. –3

D. –4

Item 19

Multi-Part Technology-Enhanced

A quadratic function is shown.

$$f(x) = x^2 + 8x + 15$$

Part A

What is the factored form of $f(x)$ that reveals the zeros of the function?

A. $f(x) = (x + 4)(x + 2)$
B. $f(x) = (x + 3)(x + 5)$
C. $f(x) = (x + 2)(x + 6)$
D. $f(x) = (x + 1)(x + 15)$

Part B

What is the equivalent form of $f(x)$ that reveals the minimum value of the function?

A. $f(x) = (x + 4)^2 - 1$
B. $f(x) = (x + 3)^2$
C. $f(x) = (x + 2)^2 + 3$
D. $f(x) = (x + 1)^2 + 8$

Item 20

Drag-and-Drop Multi-Part Technology-Enhanced

Part A

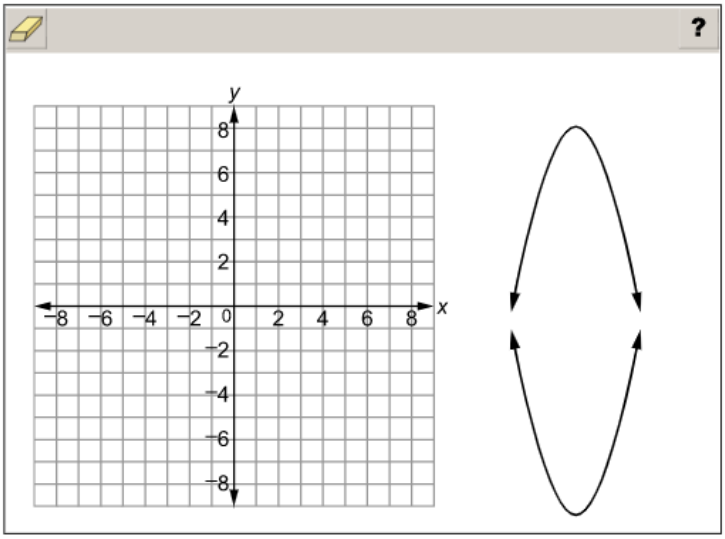
Use the coordinate grid to show key features of functions.

Part A

A quadratic equation is shown.

$$y = -x^2 + x + 6$$

Select the graph that represents the given quadratic equation and move it to the correct location on the coordinate grid.



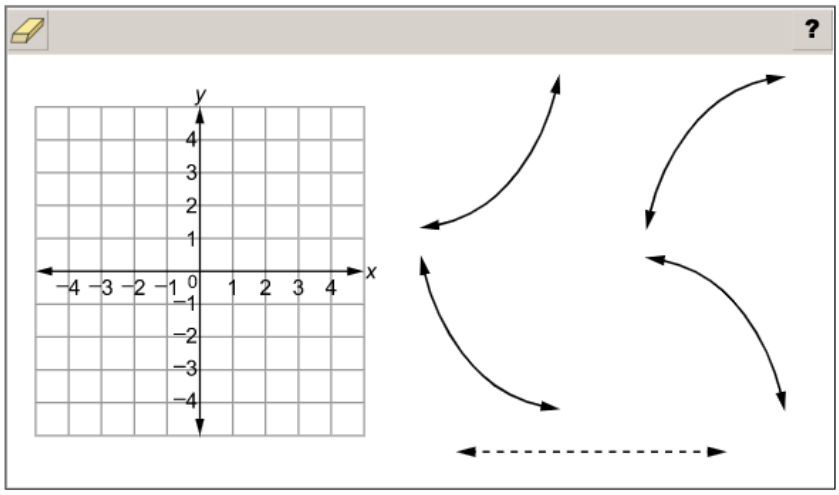
Use a mouse, touchpad, or touchscreen to move a graph into the coordinate grid. Only one graph may be used.

Go on to the next page to finish item 20.

Item 20. *Continued*.

Part B

Use the coordinate grid to show key features of functions.	**Part B** Exponential function $f(x)$ has a y-intercept of 3 and an x-intercept of –2. The function is always increasing as the value of x increases, but the function never reaches $y = 4$. Select the graph that represents $f(x)$ and move it to the correct location on the coordinate grid. The dotted line can be used to help you answer the question. You will not be given any points for moving the dotted line to the correct location.



Use a mouse, touchpad, or touchscreen to move a graph into the coordinate grid. Only one graph may be used.

Item 21

Extended Constructed-Response

Part A **What are the zeros of the function $f(x) = x^2 - 6x + 8$? Explain how you determined your answer. Write your answer in the space provided.**

Part B **Explain how you know that the function $g(x) = x^2 - 6x + 10$ has a minimum value and not a maximum value. Find the minimum value of the function. Write your answer in the space provided.**

Part A

Part B

Item 22

Constructed-Response

Shaun recycles bottles and cans. He earns 10 cents for each bottle he recycles and 5 cents for each can he recycles. After recycling a bag of bottles and cans, he gets a receipt that states he earned $12.75 and recycled a total of 210 bottles and cans. To determine the number of bottles and the number of cans he recycled, Shaun writes the system of equations below.

$$x + y = 210$$

$$10x + 5y = 1275$$

Part A **What does the *x* represent in terms of the situation? Write your answer in the space provided.**

Part B **Shaun graphs lines to represent the equations in his system. What are the coordinates of the point where the two lines intersect? Write your answer in the space provided.**

Part A _____
Part B _____

Item 23

Selected-Response

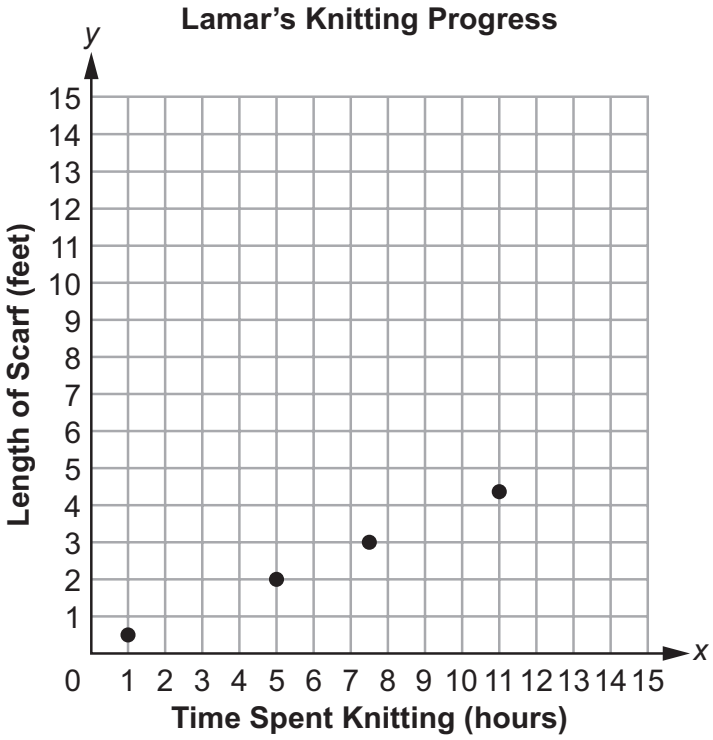
The total area of two rectangles can be represented by the expression $(x)(3x + 1) + (2x)(x + 3)$. Which expression represents the total area of the two rectangles?

A. $7x^2$
B. $6x^3 + 6x^2$
C. $6x^2 + 7x$
D. $5x^2 + 7x$

Item 24

Constructed-Response

Lamar is knitting a scarf at a constant rate. He makes each row of the scarf 1 foot wide and finishes an entire row before starting the next row. At various times, he records how long he's been knitting and the length of the scarf. After knitting for a total of 11 hours, he records the length of his scarf. Then, he stops and makes this graph.



The finished scarf will be about 6 feet long and 1 foot wide. He estimates he is about 75% finished.

Part A **Lamar determines the rate at which he is knitting by calculating the slope of the graph. The slope of the graph is about 0.4 foot per hour. Explain why the unit rate for the graph could also be 0.4 square foot per hour. Write your answer in the space provided.**

Part B **Lamar decides to represent his unit rate in 0.4 foot per hour. Explain how he could convert his rate to inches per hour. Write your answer in the space provided.**

Go on to the next page to finish item 24.

Item 24. *Continued*.

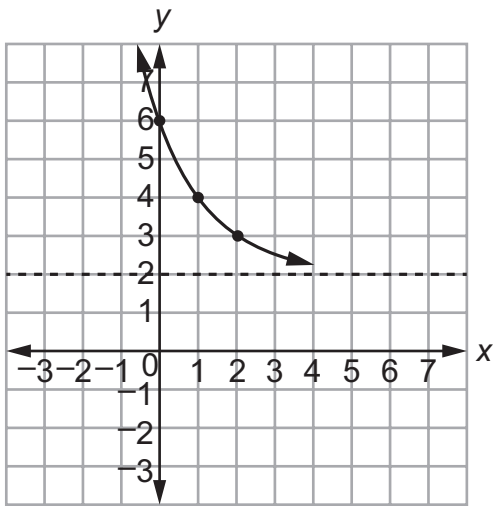
Part A

Part B

Item 25

Multi-Part Technology-Enhanced

The graph of the exponential function $f(x) = 4(0.5)^x + 2$ is shown.



Part A

Which function has the same end behavior as $f(x)$ for large, positive values of x?

A. $g(x) = 4(1.1)^x + 3$
B. $g(x) = 0.5(1.1)^x + 2$
C. $g(x) = 4(0.8)^x + 3$
D. $g(x) = 0.5(0.8)^x + 2$

Part B

Which function's graph has a y-intercept of 1?

A. $h(x) = 5(2)^x$
B. $h(x) = 5(0.5)^x + 0.5$
C. $h(x) = (0.5)^x + 1$
D. $h(x) = 0.5(2)^x + 0.5$

Item 26

Line-Plot and Drag-and-Drop Multi-Part Technology-Enhanced

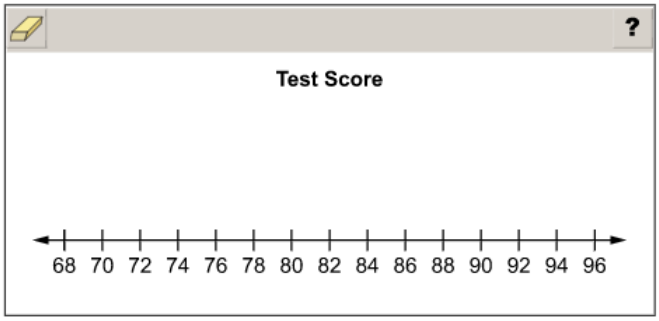
Part A

The frequencies of scores on a test are shown in the table.

Test Score	68	70	74	76	78	80	84	86	90	94	96
Frequency	1	1	1	1	2	1	2	3	1	1	1

Part A

Complete the line plot by adding the correct number of X's to represent the frequency of each test score.



Use a mouse, touchpad, or touchscreen to add X's to the line plot. At most 4 X's can be plotted for each score.

Go on to the next page to finish item 26.

Item 26. *Continued*.

Part B

The frequencies of scores on a test are shown in the table.

Test Score	68	70	74	76	78	80	84	86	90	94	96
Frequency	1	1	1	1	2	1	2	3	1	1	1

Part B

Move a value into the blank to complete the statement.

The median of the data set is ____.

68	69	70	71	72	73	74	75	76	77
78	79	80	81	82	83	84	85	86	87
	88	89	90	91	92	93	94	95	96

Use a mouse, touchpad, or touchscreen to move a numbers into the blank. Only one number many be used.