GENERAL MATHEMATICS 11

Name of Learner:_____ Grade Level:_____

Section:_____ Date:_____

LEARNING ACTIVITY SHEET

DOMAIN AND RANGE OF AN EXPONENTIAL FUNCTION

Background Information for Learners

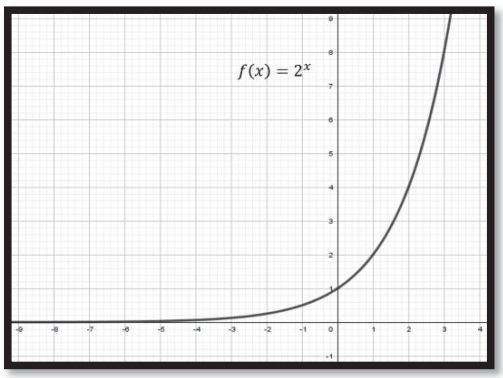
What is domain and range of a function? The ***domain*** of a function is the set of all possible values that the variable x can take, and ***range*** is the set of all the values that $f(x)$ or y will take.

The domain of an exponential function with base b of the form $f(x) = b^x$ or $y = b^x$ where $b > 0, b \neq 1$ is always the set of all real numbers, while its range is always the set of all positive real numbers.

Constructing a table of values and sketching a graph of an exponential function can help in easily determining the domain and range especially for the transformation of an exponential function which is in the form $F(x) = a \cdot b^{x+c} + d$ where a, c and d are real numbers.

Example: Find the domain and range of $f(x) = 2^x$.

Graph the function on a Cartesian plane.



Based on the graph, the function is defined for all real numbers. Thus, the domain of the function $f(x) = 2^x$ is set of real numbers.

As the value of x tends to $+\infty$, the value of the function also tends to $+\infty$, and as the value of x tends to $-\infty$, the function approaches the x-axis but never touches it. Therefore, the range of the function is set of positive real numbers or $\{x \in \mathbb{R} | x > 0\}$.

Learning Competency

Finds the domain and range of an exponential function (**M11GM-If-3**).

Directions/Instructions:

Activity 1. "Take it easy!"
Direction: Determine the domain and range of the following exponential functions. **[1 point each]**

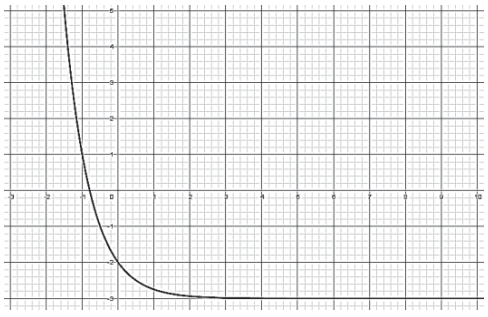
1. $f(x) = 3^x$
2. $g(x) = 10^x$
3. $h(x) = 15^x$
4. $i(x) = 0.50^x$
5. $y = 5^{-x}$
6. $y = \left(\frac{1}{10}\right)^x$
7. $y = -4^x$
8. $y = 6^{x-1}$

Activity 2. "Find Me! Find Me!"
Direction: Answer the following problems. Show complete solution in a separate sheet of paper. **[1 points each]**

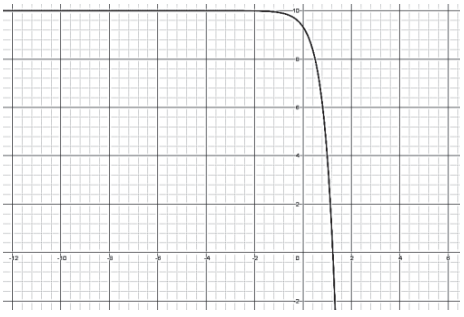
1. Give the domain and range of the function $y = 7^x$
   a. for all values of x
   b. for $0 \leq x \leq 5$
2. Give the domain and range of the function $y = \left(\frac{1}{2}\right)^x$
   a. for all values of x
   b. for $5 \leq x < +\infty$
   .
3. Give the domain and range of the function $y = -5^x + 2$
   a. for all value of x
   b. for $x > 0$

Activity 3. "Stop, Look and Answer!"
Direction: Determine the domain and range of the following graphs of exponential functions. **[2 points each]**

1.



2.



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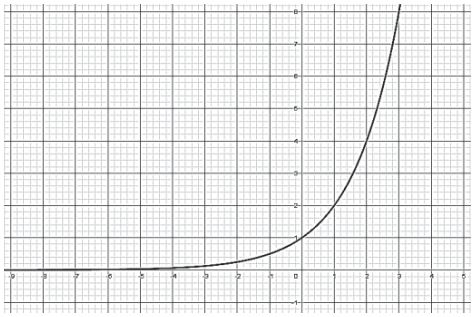

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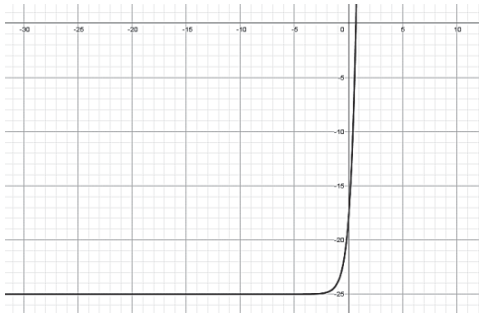

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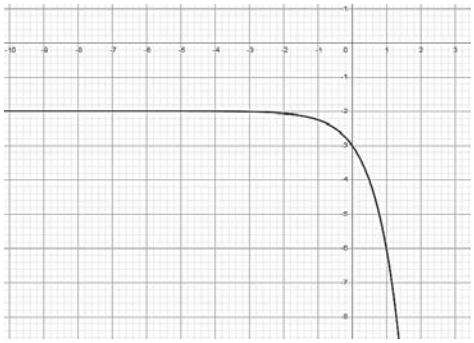


Activity 4. "Construct, Sketch and State!"

Direction: For each of the following functions, construct a table of values, sketch the graph and state the domain and range.

1. $f(x) = 5^x$

x							
$f(x)$							

Domain:_____
Range:_____

2. $g(x) = \left(\frac{1}{5}\right)^{-x}$

x							
$g(x)$							

Domain:_____
Range:_____

3. $y = 0.25^{3-x}$

x							
y							

Domain:_____
Range:_____

4. $h(x) = 6^x - 5$

x							
$h(x)$							

Domain:_____
Range:_____

5. $d(x) = 4^{x-2} + 2$

x							
$d(x)$							

Domain:_____
Range:_____

6. $y = \frac{1}{2}(2)^{2-x}$

x							
y							

Domain:_____
Range:_____

Rubrics for Scoring the Table of Values and Graph

	0 Point	1 Point	2 Points	3 Points
Table of Values	Learner gives no correct answers.	Learner gives 1 to 3 correct answers.	Learner gives 4 to 6 correct answers.	Learner gives all correct answers.
Graph	Learner gives no graph/graph is not accurate.	Learner graphs the function less neatly and organize, and a little accurate.	Learner graphs the function neatly and organized, and accurate.	Learner graphs the function very neatly and organized and very accurate.

Rubrics in Scoring

	0 Point	1 Point	2 Points	3 Points
Amount of Work	Learner gives no answer.	Learner gives answer but no solution/proof of answer.	Learner gives answer with partial solution/proof of answer.	Learner gives answer with complete solution/proof of answer.
Understanding	The learner shows no understanding in solving the problem.	The learner shows limited understanding in solving the problem.	The learner shows partial understanding in solving the problem.	The learner shows thorough understanding in solving the problem.

Reflection

What did you learn about domain and range of exponential functions?

_____
_____
_____
_____
_____
_____

References

General Mathematics Textbook, Chapter 4: Exponential Functions (Teachers Guide), General Mathematics Textbook, Chapter IV: Exponential Functions (Learner's Materials), eSolutions Manual

Answer Key

Activity 1.

1. Domain: Set of all real numbers
   Range: Set of all positive real numbers
2. Domain: Set of all real numbers
   Range: Set of all positive real numbers
3. Domain: Set of all real numbers
   Range: Set of all positive real numbers
4. Domain: Set of all real numbers
   Range: Set of all positive real numbers
5. Domain: Set of all real numbers
   Range: Set of all positive real numbers
6. Domain: Set of all real numbers
   Range: Set of all positive real numbers
7. Domain: Set of all real numbers
   Range: Set of all negative real numbers
8. Domain: Set of all real numbers
   Range: $\{y|y > 2\}$ or $(2, +\infty)$

Activity 2.

1.
   a. Domain: Set of all real numbers
      Range: Set of all positive real numbers
   b. Domain: $\{x|0 \leq x \leq 10\}$ or $[0,10]$
      Range: $\{y|1 \leq y \leq 16807\}$ or $[1,16807]$

2.
   a. Domain: Set of all real numbers
      Range: Set of all positive real numbers
   b. Domain: $\{x|5 \leq x < +\infty\}$ or $[5, +\infty]$
      Range: $\{y|0 < x \leq \frac{1}{32}\}$ or $(0, \frac{1}{32}]$

3.
   a. Domain: Set of all real numbers
      Range: $\{x| -\infty < x \leq 2\}$ or $(-\infty, 2]$
   b. Domain: $\{x|x > 0\}$ or $(0, +\infty)$
      Range: $\{y|y < 0\}$ or $(-\infty, 0)$

Activity 3.

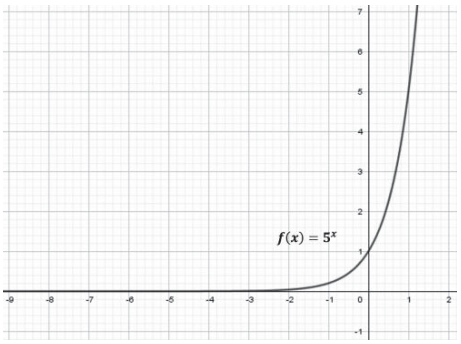
1. Domain: Set of all real numbers
   Range: $\{y|y > -3\}$ or $(-3, +\infty)$
2. Domain: Set of all real numbers
   Range: $\{y|y < 10\}$ or $(-\infty, 10)$
3. Domain: Set of all real numbers
   Range: Set of all positive real numbers
4. Domain: Set of all real numbers
   Range: $\{y|y > -25\}$ or $(-25, +\infty)$
5. Domain: Set of all real numbers
   Range: $\{y|y < -2\}$ or $(-\infty, -2)$Activity 4.

1. $f(x) = 5^x$

a. Table of Values

$\boldsymbol{x}$	-3	-2	-1	0	1	2	3
$f(x) = 5^x$	$\frac{1}{125}$	$\frac{1}{25}$	$\frac{1}{5}$	1	5	25	125

b. Graph



c. Domain and Range

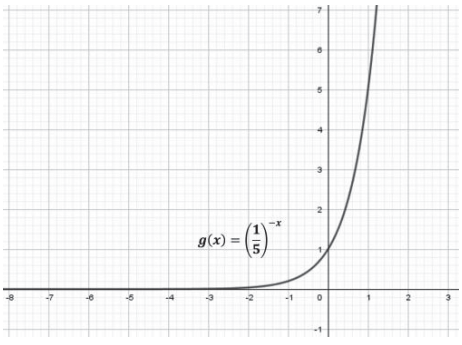
Domain: Set of all real numbers ($\mathbb{R}$)
Range: Set of all positive real numbers

2. $g(x) = \left(\frac{1}{5}\right)^{-x}$

a. Table of Values

$\boldsymbol{x}$	-3	-2	-1	0	1	2	3
$g(x) = \left(\frac{1}{5}\right)^{-x}$	$\frac{1}{125}$	$\frac{1}{25}$	$\frac{1}{5}$	1	5	25	125

b. Graph



c. Domain and Range

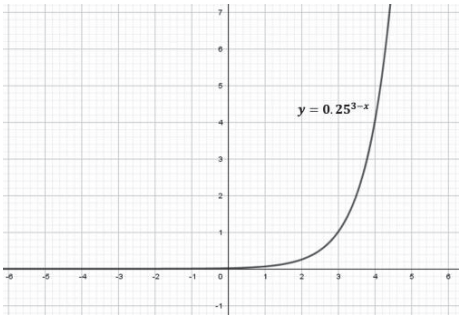
Domain: Set of all real numbers ($\mathbb{R}$)
Range: Set of all positive real numbers

3. $y = 0.25^{3-x}$

a. Table of Values

x	-3	-2	-1	0	1	2	3
$y = 0.25^{3-x}$	$\frac{1}{4096}$	$\frac{1}{1024}$	$\frac{1}{256}$	$\frac{1}{64}$	$\frac{1}{16}$	$\frac{1}{4}$	1

b. Graph



c. Domain and Range

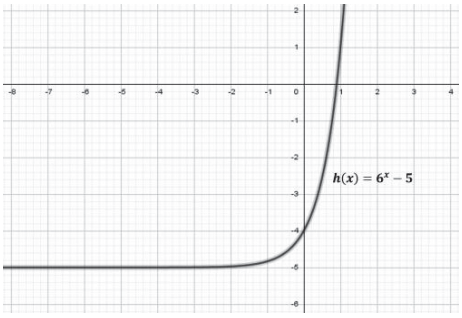
Domain: Set of all real numbers ($\mathbb{R}$)
Range: Set of all positive real numbers

4. $h(x) = 6^x - 5$

a. Table of Values

x	-3	-2	-1	0	1	2	3
$h(x) = 6^x - 5$	$-\frac{1079}{216}$	$-\frac{179}{36}$	$-\frac{29}{6}$	-4	1	31	211

b. Graph



c. Domain and Range

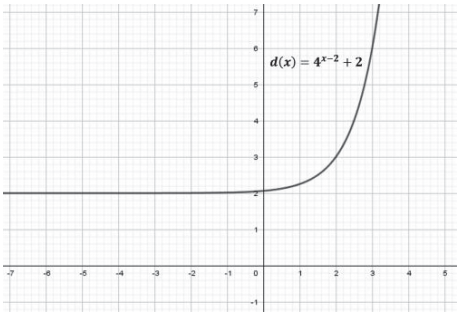
Domain: Set of all real numbers ($\mathbb{R}$)
Range: $y > -5$ or $(-5, +\infty)$

5. $d(x) = 4^{x-2} + 2$

a. Table of Values

x	-3	-2	-1	0	1	2	3
$d(x) = 4^{x-2} + 2$	$\frac{2049}{1024}$	$\frac{513}{256}$	$\frac{129}{64}$	$\frac{33}{16}$	$\frac{9}{4}$	3	6

b. Graph



c. Domain and Range

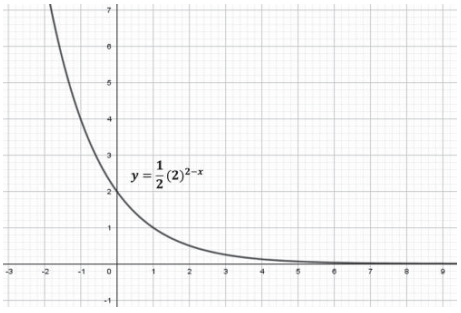
Domain: Set of all real numbers ($\mathbb{R}$)
Range: $y > 2$ or $(2, +\infty)$

6. $y = \frac{1}{2}(2)^{2-x}$

a. Table of Values

x	-3	-2	-1	0	1	2	3
$y = \frac{1}{2}(2)^{2-x}$	16	8	4	2	1	$\frac{1}{2}$	$\frac{1}{4}$

b. Graph



c. Domain and Range

Domain: Set of all real numbers ($\mathbb{R}$)
Range: Set of all positive real numbers