LAB for Topic 9 Block 5 AgileMind
Math Concept(s): Piecewise functions – Airplane Match
Source / Text: colleague
Developed by: Lorraine Berry E-Mail: : Lorraine.berry@vansd.org
Date: Summer Conference 2022

Attach the following documents:

- Lab Instructions
- Student Handout(s)
- Rubric and/or Assessment Tool

Short Description (Be sure to include where in your instruction this lab takes place):

Lab Plan

Lab Title: Airplane Match

Prerequisite skills:

- Finding absolute value of numbers (as opposed to variables)
- Solving linear equations using graphs, tables, or analytic techniques
- Graphing linear functions using graphs, tables, or analytic techniques
- Solving linear inequalities using graphs, tables, or analytic techniques

Lab objective:

- Correctly match a graph to a table, a set of piecewise functions and verbal description

Standards: *(Note SPECIFIC relationship to Science, Technology, and/or Engineering)*

Mathematics K–12 Learning Standards:

A-REI.D.11 (*Algebra*)
Explain why the *x*-coordinates of the points where the graphs of the equations ***y* = *f*(*x*)** and ***y* = *g*(*x*)** intersect are the solutions of the equation ***f*(*x*) = *g*(*x*)**; find the solutions approximately, e.g., using technology to ***graph the functions, make tables of values***, or find successive approximations. Include cases where ***f*(*x*)** and/or ***g*(*x*)** are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*

F-IF.C.07.b (*Functions*)
Graph square root, cube root, and **piecewise-defined functions**, including step functions and absolute value functions.

Standards for Mathematical Practice:

CCSS.MATH.PRACTICE.MP1 Make sense of problems and persevere in solving them.

- Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution.
- They monitor and evaluate their progress and change course if necessary.
- Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends.

CCSS.MATH.PRACTICE.MP3 Construct viable arguments and critique the reasoning of others.

- Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments.
- They justify their conclusions, communicate them to others, and respond to the arguments of others.
- Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is.
- Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

CCSS.MATH.PRACTICE.MP4 Model with mathematics.

- They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas.
- They can analyze those relationships mathematically to draw conclusions.

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- Reading Standards for Literacy in Science and Technical Subjects 6–12
  - 2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
  - 9.Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

K-12 Science Standards

-

Technology

-

Engineering

-
-

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)

☐ Global Awareness ☐ Financial/Economic/Business/Entrepreneurial Literacy ☐ Civic Literacy
☐ Health/Safety Literacy ☐ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION
Creativity and Innovation
☐ Think Creatively
☐ Work Creatively with Others
☐ Implement Innovations
Critical Thinking and Problem Solving
☒ Reason Effectively
☐ Use Systems Thinking
☐ Make Judgments and Decisions
☐ Solve Problems
Communication and Collaboration
☒ Communicate Clearly
☒ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
☐ Access and Evaluate Information
☐ Use and manage Information
Media Literacy
☐ Analyze Media
☐ Create Media Products
Information, Communications and Technology (ICT Literacy)
☐ Apply Technology Effectively

LIFE & CAREER SKILLS
Flexibility and Adaptability
☐ Adapt to Change
☒ Be Flexible
Initiative and Self-Direction
☒ Manage Goals and Time
☐ Work Independently
☐ Be Self-Directed Learners
Social and Cross-Cultural
☒ Interact Effectively with Others
☒ Work Effectively in Diverse Teams

Productivity and Accountability
☐ Manage Projects
☒ Produce Results
Leadership and Responsibility
☐ Guide and Lead Others
☒ Be Responsible to Others

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- The attached cards, printed for each group (not the answer key)
  - Recommend doing the sets on different colors for each group so they don't accidentally mix up their cards if they fall off the table or slide across the table
- Solution page – print 1 for you
- Scissors or paper cutter to cut out the cards
- Open tables for matching the cards

Set-Up Required:

- Organize supplies for students to pick up easily

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- Each team member should have a pair of scissors to start cutting out the cards
  - If you can keep them sorted and not written on this step could be done by your 1st class only
  - Ziploc baggies to store the cards in
  - Be responsible team members and make sure the garbage goes where it belongs.

Cooperative Learning:

- Communicate your ideas with your team members. Make sure they agree on sets you believe you have found.
- Collaborate when a teammate is struggling to determine if they have a match.

Expectations:

Be flexible, manage your time, pick up your trash, return scissors where they belong, store cards in Ziploc bag for next class

Timeline: 1-2 days for the lab

- Be flexible. Some groups will need to have their cards stored for the next class meeting.

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

-

Career Applications

- Working together as a team
- Communicating ideas
- Supporting beliefs with facts
- Time management for the activity (1 class period)
- Support team members when you see them struggling, ask for help if you are struggling

Optional or Extension Activities

- Desmos Activity – Intro to Piecewise Functions
  - https://teacher.desmos.com/activitybuilder/custom/5b0232029e40e60ac0c15806
- Desmos Activity – Piecewise Linear Functions
  - https://teacher.desmos.com/activitybuilder/custom/561582efbd554ea00760f944

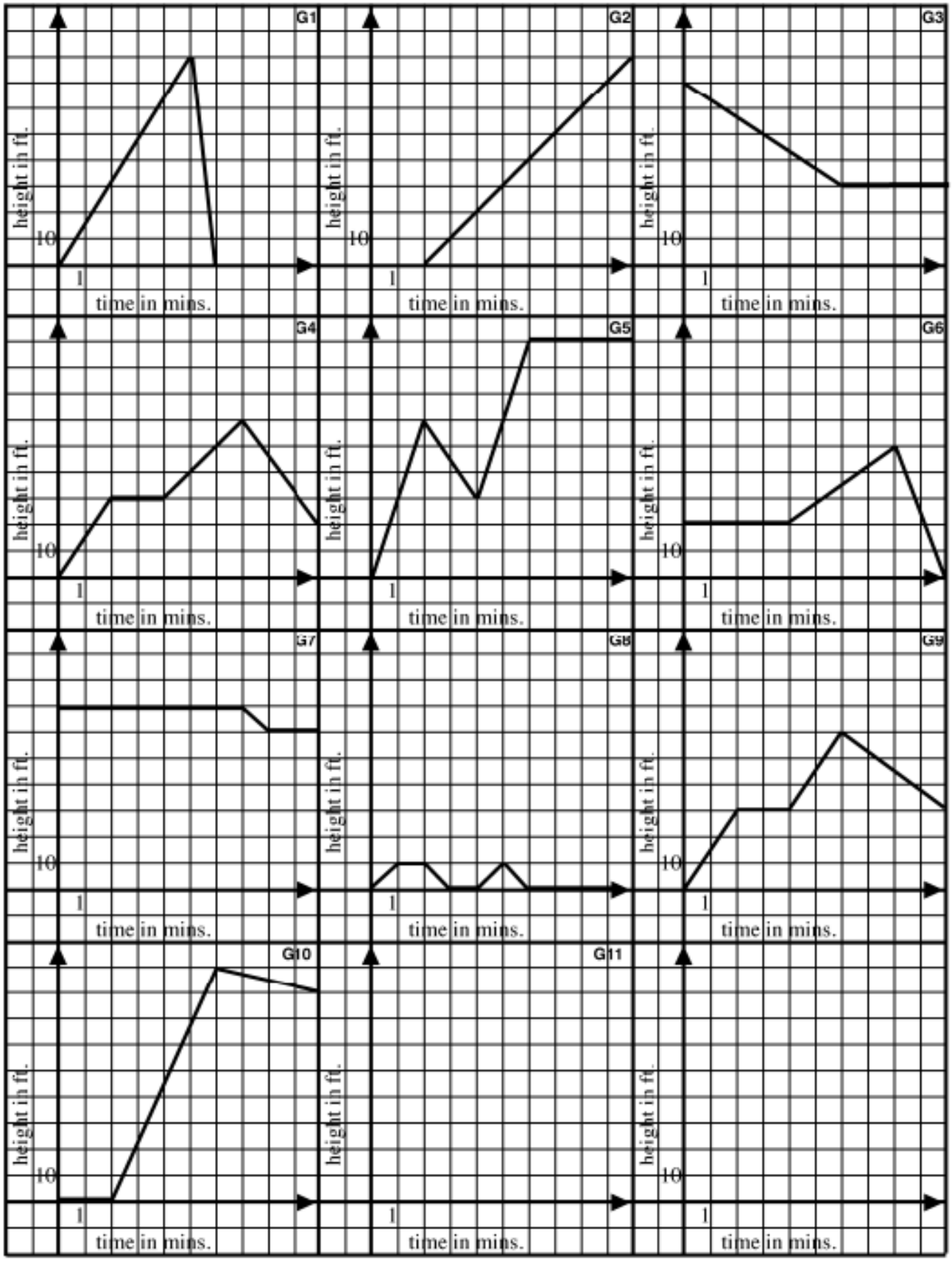
LAB CARDS TO PRINT

Single sided

Cardstock is best

1 set per group

D8	After 5 minutes of climbing at a constant rate, Bobby's plane malfunctioned and crashed to the ground.	D8	After 5 minutes of climbing at a constant rate, Bobby's plane malfunctioned and crashed to the ground.
D5	After two minutes, Susan's plane took off at a rate of 10 feet per minute.	D5	After two minutes, Susan's plane took off at a rate of 10 feet per minute.
D6	After letting his plane drop forty feet in six minutes, Mario kept his plane at a steady height for the rest of the of the flight.	D6	After letting his plane drop forty feet in six minutes, Mario kept his plane at a steady height for the rest of the of the flight.
D10	After elevating 30 feet in two minutes, Steve kept his plane at the same height for two more minutes before elevating it at a slower rate before he brought his plane in for a landing.	D10	After elevating 30 feet in two minutes, Steve kept his plane at the same height for two more minutes before elevating it at a slower rate before he brought his plane in for a landing.
D7	After rising and falling for six minutes, Lynn's plane reached the highest altitude and maintained it for the next few minutes.	D7	After rising and falling for six minutes, Lynn's plane reached the highest altitude and maintained it for the next few minutes.
D3	Lupe's plane maintained a constant altitude for four minutes, it then rose thirty more feet before stalling the engine, but she was able to glide it safely to the ground.	D3	Lupe's plane maintained a constant altitude for four minutes, it then rose thirty more feet before stalling the engine, but she was able to glide it safely to the ground.
D2	After Juan kept his plane at a steady altitude for 7 minutes, he decided to bring it down to 60 feet for the rest of the flight.	D2	After Juan kept his plane at a steady altitude for 7 minutes, he decided to bring it down to 60 feet for the rest of the flight.
D9	Albert's plane got airborne for three minutes before it came down. After he fixed the rudder, the plane could only stay in the air for a few more minutes before Albert decided to quit.	D9	Albert's plane got airborne for three minutes before it came down. After he fixed the rudder, the plane could only stay in the air for a few more minutes before Albert decided to quit.
D4	After elevating for 2 minutes, James maintained his plane at the same height for two more minutes before elevating it at the same rate as when he started before he brought his plane in for a landing.	D4	After elevating for 2 minutes, James maintained his plane at the same height for two more minutes before elevating it at the same rate as when he started before he brought his plane in for a landing.
D1	Roberta's plane taxied on the ground for 120 seconds before it finally rose to a height of 90 feet, but she couldn't maintain the altitude.	D1	Roberta's plane taxied on the ground for 120 seconds before it finally rose to a height of 90 feet, but she couldn't maintain the altitude.


G1
G2
G3
G4
G5
G6
G7
G8
G9
G10
G11
height in ft.
10
1
time in mins.

E1

$f(x) =$

$$\begin{cases} 0, & 0 \le x \le 2 \\ \frac{45x}{3} - 45, & 2 < x \le 6 \\ \frac{-5x}{2} + 105, & 6 < x \le 10 \end{cases}$$

E2

$f(x) =$

$$\begin{cases} 70, & 0 \le x \le 7 \\ -10x + 140 & 7 \le x \le 8 \\ 60, & 8 \le x \le 10 \end{cases}$$

E3

$f(x) =$

$$\begin{cases} 15x, & 0 \le x \le 2 \\ 30, & 2 \le x \le 4 \\ 10x - 10 & 4 \le x \le 7 \\ \frac{-40x}{3} + \frac{460}{3}, & 7 \le x \le 10 \end{cases}$$

E4

$f(x) =$

$$\begin{cases} 16x, & 0 \le x \le 5 \\ -80x + 480, & 5 \le x \le 6 \end{cases}$$

E5

$f(x) =$

$$\begin{cases} 0, & 0 \le x \le 2 \\ 10x - 20, & 2 \le x \le 10 \end{cases}$$

E6

$f(x) =$

$$\begin{cases} \frac{-20}{3}x + 70, & 0 \le x \le 6 \\ 30, & 6 \le x \le 10 \end{cases}$$

E7

$f(x) =$

$$\begin{cases} 20, & 0 \le x \le 4 \\ \frac{15x}{2} - 10, & 4 \le x \le 8 \\ -25x + 250, & 8 \le x \le 10 \end{cases}$$

E8

$f(x) =$

$$\begin{cases} 15x, & 0 \le x \le 2 \\ 30, & 2 \le x \le 4 \\ 15x - 30 & 4 \le x \le 6 \\ \frac{-15}{2}x + 105, & 6 \le x \le 10 \end{cases}$$

E9

$f(x) =$

$$\begin{cases} 10x & 0 \le x \le 1 \\ 10, & 1 \le x \le 2 \\ -10x + 30, & 2 < x \le 3 \\ 0, & 3 \le x \le 4 \\ 10x - 40, & 4 \le x \le 5 \\ -10x + 60, & 5 \le x \le 6 \\ 0, & 7 \le x \le 10 \end{cases}$$

E10

$f(x) =$

$$\begin{cases} 30x, & 0 \le x \le 2 \\ -15x + 90, & 2 \le x \le 4 \\ 30x - 90, & 4 \le x \le 6 \\ 90, & 6 \le x \le 10 \end{cases}$$

E11

$f(x) =$

E12

$f(x) =$

T1

x	1	2	3	4	5	6	10
$f(x)$	10	10	0	0	10	0	0

T1

x	1	2	3	4	5	6	10
$f(x)$	10	10	0	0	10	0	0

T2

x	$f(x)$
0	0
1	15
2	30
4	30
6	50
7	60
10	20

T2

x	$f(x)$
0	0
1	15
2	30
4	30
6	50
7	60
10	20

T3

x	$f(x)$
0	0
1	30
2	60
4	30
6	90
8	90
10	90

T3

x	$f(x)$
0	0
1	30
2	60
4	30
6	90
8	90
10	90

T4

x	0	1	2	3	4	5	6
$f(x)$	0	16	32	48	64	80	0

T4

x	0	1	2	3	4	5	6
$f(x)$	0	16	32	48	64	80	0

T5

x	$f(x)$
0	20
1	20
2	20
4	20
6	35
8	50
10	0

T5

x	$f(x)$
0	20
1	20
2	20
4	20
6	35
8	50
10	0

T6

x	0	1	2	4	6	8	10
$f(x)$	0	15	30	30	60	45	30

T6

x	0	1	2	4	6	8	10
$f(x)$	0	15	30	30	60	45	30

T7

x	$f(x)$
0	0
1	0
2	0
4	20
6	40
8	60
10	80

T7

x	$f(x)$
0	0
1	0
2	0
4	20
6	40
8	60
10	80

T8

x	$f(x)$
0	70
3	50
6	30
9	30
12	30
15	30
18	30

T8

x	$f(x)$
0	70
3	50
6	30
9	30
12	30
15	30
18	30

T9

x	0	1	2	4	6	8	10
$f(x)$	0	0	0	45	90	85	80

T9

x	0	1	2	4	6	8	10
$f(x)$	0	0	0	45	90	85	80

T10

x	0	4	5	7	8	9	10
$f(x)$	70	70	70	70	60	60	60

T10

x	0	4	5	7	8	9	10
$f(x)$	70	70	70	70	60	60	60

Name:

Period:

Date:

Description	Graph	Table	Equation
D1	_____	_____	_____
D2	_____	_____	_____
D3	_____	_____	_____
D4	_____	_____	_____
D5	_____	_____	_____
D6	_____	_____	_____
D7	_____	_____	_____
D8	_____	_____	_____
D9	_____	_____	_____
D10	_____	_____	_____

LAB ANSWERS TO PRINT

1 for teacher

ANSWER KEY

Description	Graph	Table	Equation
D1	G10	T9	E1
D2	G7	T10	E2
D3	G6	T5	E7
D4	G9	T6	E8
D5	G2	T7	E5
D6	G3	T8	E6
D7	G5	T3	E10
D8	G1	T4	E4
D9	G8	T1	E9
D10	G4	T2	E3

RUBRIC FOR LAB

5 per sheet

Rubric Airplane Matching Lab

4	3	2	1	0
2 or fewer errors on the answer sheet	4 or fewer errors on the answer sheet	6 or fewer errors on the answer sheet	7 or more errors on the answer sheet	Refused to participate

Rubric Airplane Matching Lab

4	3	2	1	0
2 or fewer errors on the answer sheet	4 or fewer errors on the answer sheet	6 or fewer errors on the answer sheet	7 or more errors on the answer sheet	Refused to participate

Rubric Airplane Matching Lab

4	3	2	1	0
2 or fewer errors on the answer sheet	4 or fewer errors on the answer sheet	6 or fewer errors on the answer sheet	7 or more errors on the answer sheet	Refused to participate

Rubric Airplane Matching Lab

4	3	2	1	0
2 or fewer errors on the answer sheet	4 or fewer errors on the answer sheet	6 or fewer errors on the answer sheet	7 or more errors on the answer sheet	Refused to participate

Rubric Airplane Matching Lab

4	3	2	1	0
2 or fewer errors on the answer sheet	4 or fewer errors on the answer sheet	6 or fewer errors on the answer sheet	7 or more errors on the answer sheet	Refused to participate

FOLLOW UP ASSESSMENT

Topic 9

LAB – Airplane Matching

You choose to use as a Formative or Summative

Assignment from Student Activity Sheet #5

NAME:

1. Terrence crosses the street holding his skateboard. Then he skates down the sidewalk, away from the street he crossed. He skates at 1 meter per second. After 2 seconds, he doubles his speed to 2 meters per second. Sketch a graph of Terrence's distance from his new starting point over time.

2. Label your graph with the equations that can be used to model each portion of the graph, along with the domain restrictions for each equation.

3. **REINFORCE**

Terrence is in his front yard, planning to skate to the park. He will follow a straight sidewalk beginning at his house and continuing toward the park. He sees a dog standing at the fence of a neighbor's yard 9 meters away. The neighbor's yard is between his house and the park, and the dog is right beside the sidewalk. Terrence starts skating on the sidewalk toward the dog at a rate of 3 meters per second. When he reaches the dog, he stops and pets the dog for 5 seconds. Then he continues toward the park at a rate of 2 meters per second.

a. Sketch a graph of Terrence's distance from the dog over time.

b. Label your graph with the equations that can be used to model each portion of the graph. Also label the domain restrictions for each equation.

4. **REINFORCE** Consider again the situation in question 9. Terrence leaves home, skates toward the dog, pets the dog, and then continues toward the park.

   a. Sketch a graph of Terrence's distance from his starting point over time.

   b. Label your graph with the equations that can be used to model each portion of the graph. Also label the domain restrictions for each equation.

5. **REINFORCE**
   Now create your own story. It does not have to be about Terrence. Be sure to include at least one change in direction and/or one change in rate. Sketch a graph that represents your story, and label your graph with the equations and domain restrictions that represent each part.

Berry Lesson Plan Topic 9 Blocks 1-5 AgileMind

Name(s): Lorraine Berry
Email Address: Lorraine.berry@vansd.org
Lesson Title: Piecewise functions – Airplane Match
Date: 6/21/2022
Text: AgileMind STEM Correlation: Topic Length: 10 days

Big Idea (Cluster): Piecewise Functions Topic 9 Block 5 AgileMind

Mathematics K–12 Learning Standards:

A-REI.D.11 (*Algebra*)
Explain why the *x*-coordinates of the points where the graphs of the equations ***y* = *f*(*x*)** and ***y* = *g*(*x*)** intersect are the solutions of the equation ***f*(*x*) = *g*(*x*)**; find the solutions approximately, e.g., using technology to ***graph the functions, make tables of values***, or find successive approximations. Include cases where ***f*(*x*)** and/or ***g*(*x*)** are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*

F-IF.C.07.b (*Functions*)
Graph square root, cube root, and **piecewise-defined functions**, including step functions and absolute value functions.

Mathematical Practice(s):

CCSS.MATH.PRACTICE.MP1 Make sense of problems and persevere in solving them.

- Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution.
- They monitor and evaluate their progress and change course if necessary.
- Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends.

CCSS.MATH.PRACTICE.MP3 Construct viable arguments and critique the reasoning of others.

- Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments.
- They justify their conclusions, communicate them to others, and respond to the arguments of others.
- Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is.
- Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

CCSS.MATH.PRACTICE.MP4 Model with mathematics.

- They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas.
- They can analyze those relationships mathematically to draw conclusions.

Content Objectives:

In this topic, students will:

- Construct graphs with and without technology, including determining maximum and minimum values and appropriate scales for graph axes
- Describe similarities and differences in graphical representations using appropriate mathematical vocabulary such as **scale**, **horizontal axis**, and **vertical axis**, and use these differences to justify a claim
- Verify that graphs accurately reflect data
- Determine independent and dependent variables in a relationship
- Use the language of justification, along with relevant mathematical

Language Objectives (ELL):

Incorporating a visual approach supports English language and struggling learners. Graphing the functions reinforces solving problems analytically. Graphing is another way to see if the solution makes sense in the context situation, and can help students think through the problem as they interpret the graph. Graphing is also a rich way to acquaint students with real-world applications of mathematics, including piecewise-defined functions.

The instructional activities support students' conversations in which they will use the academic language associated with absolute value functions.

Be sure that students understand the meaning of the word "within" in this context. Spend some time relating the word to the situation, using specific examples. As students work with inequalities, additional support may be needed to

<table>
<tr>
<td>vocabulary, to explain how to construct graphs to display data appropriately
• Identify the domain and range of a function and the situation it represents and be able to justify their choices
• Develop a conceptual understanding of the inverse of a function
• Recognize whether a discrete or a continuous graph is appropriate for a given set of data and explain why
• Describe a relationship between two variables or the graph of the relationship using appropriate vocabulary such as domain, range, continuous, and discrete</td>
<td>understand the meaning of each type of inequality symbol. A misconception may arise when the word "or" is introduced, as in, "less than or equal." Students may think that only one of the two conditions apply. A graphical approach may help students clarify their thinking.</td>
</tr>
<tr>
<td>Vocabulary:
domain,
inequality,
opposite,
piecewise-defined function,
solution set,
empty set,
interval,
set notation,
step function,
continuous,
discontinuous
Non-native speakers may also struggle with collateral vocabulary such as above, below, and on.</td>
<td>Connections to Prior Learning
• Plotting points and labeling axes
• Identifying independent and dependent variables
• Reading data from a table or from a graph
• Finding absolute value of numbers (as opposed to variables)
• Solving linear equations using graphs, tables, or analytic techniques
• Graphing linear functions using graphs, tables, or analytic techniques
• Solving linear inequalities using graphs, tables, or analytic techniques</td>
</tr>
<tr>
<td>Questions to Develop Mathematical Thinking:
• How is this graph like graphs you have seen before?
• How is it different?
• What do you notice about the shape of your graph?
• Why does the graph have this shape?
• How could you write an equation to represent the question "When was the plane holding a constant altitude?"
• What is the slope to your equation? How do you know?
• How do you solve linear equations and inequalities using a graph?
• How do you solve linear equations and inequalities using a table?
• What is the slope of each line segment?
• What would be the y-intercept of each line</td>
<td>Common Misconceptions:
• That “f(x)” is essentially “y”
• Not reading the piecewise functions as functions. Ie, the left side of the card in the giant bracket
• Not understanding there should be a section of graph for each function listed.
o *3 functions = 3 line segments in the graph
• Constant altitude, same height, and steady altitude are synonyms</td>
</tr>
</table>

segment? • With which segment should the boundary point be included? • What are the x-values that generate each segment?	

Assessment (Formative and Summative):

Formative assessment – SAS2, Q7a-c and 8a-b; and SAS3, Q10, 11, 12a-b,
Summative Assessment - LAB
Formative/Summative – SAS SAS3, Q13a-d, and 14a-b renumbered as #1 & 2 at end of this lesson plan

Materials:

- Online AgileMind access
- Hardcopies of
  - SAS2, Q7a-c and 8a-b
  - SAS3, Q10, 11, 12a-b,
  - LAB – Airplane Matching
  - SAS3, Q13a-d, and 14a-b
  - SAS4, Q10a-d *Guided practice*

Instruction Plan:

Block description	Agile Mind resources	Suggested assignment
Block 1 is designed to build students' proficiency in graphing sets of data and interpreting the representation as skewed or neutral.	*Overview* *Exploring* Representing data" SAS1 and SAS2	SAS2, Q7a-c and 8a-b
Block 2 asks students to consider different ways in which to display data. This block incorporates the use of a graphing calculator to help depict data in the best possible way by altering graphing window values. In addition, situations are analyzed to determine which variable is independent, or whether either one can be.	*Exploring* Focus on the action" SAS3	SAS3, Q10, 11, 12a-b, 13a-d, and 14a-b

Block 3 further develops students' understanding of the differences in the domain and range of a general problem situation and a function rule that models the situation, leading to a discussion of discrete versus continuous graphs.	*Exploring* Domain and range" SAS4	SAS4, Q10a-d *Guided practice*
LAB – Airplane Matching		
Block 4 provides students additional time to practice constructing and analyzing graphs.	*Constructed response* 1 and 2	*More practice* *Constructed response*, if not finished in class
Block 5 provides time for a topic-level assessment.	*Automatically scored*	None

Introduction:

Block 5 expands the concept of piecewise functions to include piecewise linear functions.

This topic (all of 9), **Absolute value equations and piecewise functions**, builds on students' understanding of the absolute value of a number and of the absolute value of a difference of two numbers as a distance on the number line to develop the absolute value function. Students model distance constraints using the absolute value function and **use multiple representations of the function to solve associated equations and inequalities.**

Block 4, which addresses analytic solution techniques for absolute value equations and inequalities, is an optional block. If your district does not require Algebra I students to master these techniques, **you may still choose to address some or all of this content to solidify students' understanding of the piecewise nature of the absolute value function.** The activities in this block also provide students with additional practice in solving linear equations and inequalities, as they arise from absolute value equations and inequalities.

Explore:

When I observe students:

- Recommend groups of 2 or 3 per set of matching cards
- Students can choose which cards to begin with (graphs, tables, functions, word descriptions)
- Look for errors so students can try again.
- Set correctly paired sets to one side of their work area. Stamp the sheet for a correct match when recorded.

Questions to Develop Mathematical Thinking as you observe:

- How is this graph like graphs you have seen before?
- How is it different?
- What do you notice about the shape of your graph?
- Why does the graph have this shape?

- How could you write an equation to represent the question "When was the plane holding a constant altitude?"
- What is the slope to your equation?, How do you know?
- How do you solve linear equations and inequalities using a graph?
- How do you solve linear equations and inequalities using a table?
- What is the slope of each line segment?
- What would be the y-intercept of each line segment?
- With which segment should the boundary point be included?
- What are the x-values that generate each segment?

Answers:

LESSON – online for each SAS (Student Activity Sheet)
LAB - Provided on the last page of the LAB plan

Summarize:

After this activity, you should be able to give the students 4 random pieces of information. 1 each of a table, graph, piecewise function and word description. The students should be able to create the other 3 pieces for each of the 4 you provide.

Career Application(s):

- Working together as a team
- Communicating ideas
- Supporting beliefs with facts
- Time management for the activity (1 class period)
- Support team members when you see them struggling, ask for help if you are struggling

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)

☐ Global Awareness ☐ Financial/Economic/Business/Entrepreneurial Literacy ☐ Civic Literacy
☐ Health/Safety Literacy ☐ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION
Creativity and Innovation
☐ Think Creatively
☐ Work Creatively with Others
☐ Implement Innovations
Critical Thinking and Problem Solving
☒ Reason Effectively
☐ Use Systems Thinking
☐ Make Judgments and Decisions
☐ Solve Problems
Communication and Collaboration
☒ Communicate Clearly
☒ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
☐ Access and Evaluate Information
☐ Use and manage Information
Media Literacy
☐ Analyze Media
☐ Create Media Products
Information, Communications and Technology (ICT Literacy)
☐ Apply Technology Effectively

LIFE & CAREER SKILLS
Flexibility and Adaptability
☐ Adapt to Change
☒ Be Flexible
Initiative and Self-Direction
☒ Manage Goals and Time
☐ Work Independently
☐ Be Self-Directed Learners
Social and Cross-Cultural
☒ Interact Effectively with Others
☒ Work Effectively in Diverse Teams

Productivity and Accountability
☐ Manage Projects
☒ Produce Results
Leadership and Responsibility
☐ Guide and Lead Others
☒ Be Responsible to Others