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| **TEAM Lesson Plan Template** |
| Teacher: Dr. Amanda Niedzialomski |
| Subject/Grade: Algebra I |
| Lesson Title: Domains |
| **STANDARDS** | **Identify what you intend to teach.** State, Common Core, ACT College Readiness Standards and/or State Competencies; Enduring Understandings and Essential Questions. |
| **A1.F.IF.B.4**: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.  |
| **OBJECTIVE(s)/Sub-Objectives** | **Connect prior learning to new learning.** Clear, Specific, Observable, Demanding, High Quality, Measurable, Aligned to Standard(s), and Integrated with other subjects, build on prior student knowledgeStudent-Friendly (I Can Statement) |
| I can represent discrete functions in four ways (using maps, tables, ordered pairs, and graphs). |
| **MATERIALS AND RESOURCES**  | **Content-related:** Clearly supports lesson objective(s); rigorous & relevant; Incorporates multimedia & resources beyond the textbook.  |
| **Activities & Materials** Materials: Graph paper post-it pad, index cards, highlighter, markerPreparation ahead of time: This activity will divide the class into six groups, and each group will be presented with three functions whose information is given on the post-it graph paper. Students will then work together to answer questions about the domains of these functions. In each group, one of the functions is discrete, and its information is given as either a map (see attached document Domain\_maps for Groups 1 and 2), or a table:Group 1$$-\frac{11}{2}$$$$-3$$$$0$$$$2$$$$5.25$$$$-2$$$$3$$$$7$$$$-5$$ $2$$$-5$$$$-1.5$$$$0$$$$\frac{13}{3}$$$$5$$ Group 2Group 3

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| $$x$$ | $$y$$ |
| $$-5.5$$ | $$3$$ |
| $$-\frac{7}{4}$$ | $$6$$ |
| $$0$$ | $$-3$$ |
| $$2.5$$ | $$3$$ |
| $$ 5$$ | $$3$$ |

Group 4

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| --- | --- |
| $$x$$ | $$y$$ |
| $$-5.75$$ | $$4$$ |
| $$-3$$ | $$-2$$ |
| $$0$$ | $$1$$ |
| $$\frac{5}{2}$$ | $$1$$ |
| $$ 6$$ | $$-3$$ |

Or as ordered pairs: Group 5 $\left\{\left(-5.5, 6\right), \left(-3,6 \right), \left(2,-2 \right), \left(4, 4\right), \left(\frac{16}{3}, -3\right)\right\}$Group 6 $\left\{\left(-5, 1\right), \left(-\frac{5}{4},-1 \right), \left(0.5,7\right), \left(2, -1\right), \left(4, 6\right)\right\}$Each group will also two other functions. Here are the links to the graphs in Desmos.Group 1: <https://www.desmos.com/calculator/6kuxddekzc><https://www.desmos.com/calculator/riyll39fdt>Group 2:<https://www.desmos.com/calculator/szybduzeuc><https://www.desmos.com/calculator/nqhdavzpwq>Group 3:<https://www.desmos.com/calculator/xxjv1yzdvu><https://www.desmos.com/calculator/jzewyazza7>Group 4:<https://www.desmos.com/calculator/kvzmmjb4dt><https://www.desmos.com/calculator/8vyclwngu2>Group 5:<https://www.desmos.com/calculator/fa4tv9o53i><https://www.desmos.com/calculator/wvrmxv4wwx>Group 6:<https://www.desmos.com/calculator/fokebetupm><https://www.desmos.com/calculator/c4l7bnjvmm>The information about these functions should be placed in six locations around the classroom. The teacher may decide to draw these graphs and the information about the discrete graph on the graph paper ahead of time, or print it and leave it to the students to draw it nicely on the graph paper.Also ahead of time, index cards should be prepared with three numbers written on them (from table below). Each student will get one, with cards duplicated as needed. The index cards should match one of the functions in one of the groups because those three numbers are all elements of the domain of that function. Create any duplicates needed so that the groups will be as evenly populated as possible. So that you can do this easily, the following table is given so that you know which index card will go with which group, but the group should not be written on the index card – the first job of each student is to determine which group they belong to.Index Cards

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| Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | Group 6 |
| -5, 0, 5 | -3, 0, 2 | -5.5, 0, 5 | -3, 0, 6 | -3, 2, 4 | -5, 2, 4 |
| -2, 6, 9 | 2, 3, 7 | -8, 6, 10 | -8, 2, 3 | -9, 3, 8 | -7, -2, 6 |
| -8, -3, 7 |  | -3, -1, 4.5 | -5, 2, 9.5 |  | -3, -2, 10.5 |

Each index card has the numbers from one of the cells of this table. For example, one index card will say -5, 0, 5. Duplicate cards are fine, just keep in mind that the card determines which group a student will be in. |
| **ACCOMMODATIONS/ADAPTATIONS** | **Learning styles and interests.** Anticipate learning difficulties, regularly incorporate student interests & cultural heritage; differentiate instructional methods. |
| **Modifications/Plans for Diverse Learners** (Adapt this to fit your specific classroom.) |

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| **MOTIVATING STUDENTS/ANTICIPATORY SET** | **“Hook”: Engage students’ attention and focus on learning.** Personally meaningful and relevant. |
| Prior Knowledge Needed: Before this activity, students should see definition of domain; examples with discrete functions with representations including maps, tables, and sets of ordered pairs; graphing the domain on the number line; writing the domain in set notation; writing the domain in interval notation. The graphs in this activity have asymptotes, holes, and other discontinuities; students do not need to understand how to graph functions that produce these outcomes (i.e., students do not need to know how to graph rational functions or piecewise defined functions). They do need to know how to read such graphs for the purpose of finding domain. |
| **INSTRUCTIONAL PROCEDURES** | **Step-by-Step Procedures-Lesson Sequence: Basic to Complex.** Lesson includes visuals, modeling, logical sequencing and segmenting (beginning, middle, ending); essential information; concise communication; grouping strategies; differentiated instructional strategies to provide intervention & extension; seamless routines; varied instructional strategies; key concepts & ideas highlighted regularly. |
| Students are each assigned an index card with three numbers written on it and nothing more. They are then tasked with walking around the room and finding a function that has all three of their numbers as elements in its domain. This will determine which students are working in which of the six groups. Once everyone has found their group, the students will be together creating three educational posters.1. First, the students will all work together within their groups on the discrete function. The group works together on scratch paper first. For this function, they will represent the function in four ways (one of which is already given). They will draw a map (as in document Domain\_maps), make a table, write the set of ordered pairs, and graph the points on the $xy$-plane. On the graph in the plane, the students should use the highlighter/marker to indicate the domain along the $x$-axis. Then they should graph the domain on a separate number line, and write the domain as a set. For the scratch work portion, these tasks can be divided among the group members, then compared. Once the math work is agreed on, the students should think about organization and scale and layout, with the end result to be a poster about the domain of discrete functions. They can use the marker/highlighter to separate sections or embellish appropriately. Once they have this mapped out on scratch paper they write it nicely on the graph paper.
2. After the first poster is finished, the students move to the other two functions. If the groups are of size 4 or more, the group can split at this point and half of the group create the second poster while the other half creates the third poster. For each of the other two posters, the graph of the function should be drawn (if the teacher has not already done this), the $x$-axis should be highlighted/marked to indicate domain, and the domain should be graphed on a separate number line and given in interval notation. In addition, the students should come up with a list of 10 numbers that are members of the domain. Like the first function, the students should organize this information in a poster.
3. Students should think about anything interesting about these chosen functions and their implications about domains. Was there some part of a function where they made a mistake or were unsure about what the domain would be? How did they resolve it? What are the keys for finding the domain of a discrete function? What are the keys for the other functions? Does a discontinuity of the graph mean a break in the domain? Always? When does it not? If you are given an $x$-value, how do you determine from the graph if it is an element of the domain? Their thoughts on these questions are good things to consider adding to their posters.

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| **QUESTIONING/THINKING/PROBLEM SOLVING (embedded throughout)** | **Balanced mix of question types.** Utilizes Blooms Taxonomy/Webb’s Depth of Knowledge; high frequency; purposeful & coherent; require active responses; balance based on volunteers/non-volunteers, ability, & gender; lead to further inquiry & self-directed learning.  **Implement four types of thinking (Analytical, Practical, Creative, & Research-based) & Teach/Reinforce problem-solving types**. Provide opportunities for students to generate ideas & alternatives; analyze, evaluate & explain information from multiple perspectives& viewpoints. |
| * Was there some part of a function where you made a mistake or were unsure about what the domain would be? How did you resolve it?
* What are the keys for finding the domain of a discrete function?
* What are the keys for the other functions?
* Does a discontinuity of the graph mean a break in the domain? Always? When does it not?
* If you are given an $x$-value, how do you determine from the graph if it is an element of the domain?

Ask additional questions as needed. |

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| **GROUPING** | **Maximize student understanding & learning** Varied group composition (race, gender, ability, & age); clearly understood roles, responsibilities & group work expectations; accountability for group & individual work; student opportunities for goal setting, reflection & evaluation of learning. |
| Students are each assigned an index card with three numbers written on it and nothing more. (See MATERIALS AND RESOURCES section above.) They are then tasked with walking around the room and finding a function that has all three of their numbers as elements in its domain. This will determine which students are working in which of the six groups. Once everyone has found their group, the students will be together creating three educational posters. |
| **ASSESSMENT** | **Formative and/or summative assessment.** A variety of assessments, including rubrics, measure achievement of objectives and informs instruction.  |
| The teacher will evaluate the work on each poster for accuracy. |
| **CLOSURE** | **Reflection/Wrap Up.** Summarizing, reminding, reflecting, restarting, connecting. |
| Each group presents information from one of their posters. The teacher probes deeper for students to explain their thought processes behind their work. |

**NOTES:**

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