Introduction to Systems of Linear Equations – 8.EE.8

Crystal McMachen

When introducing systems, many textbooks have you straight up teach how to graph to solve a system. Instead, I try to make it more student centered. I have used this approach with many types of problems, but this one seems to work the best. This story problem happens to come from the Connected Math Series. I start by giving my student with no guidance besides some norms, the story problem, and a very large sheet of grid paper.

1) The kids are in groups of 2-3.
2) My norms are simple – everyone gets a different color marker. Every color needs to be on the large grid paper. Use your prior knowledge before asking me questions. (I usually do this activity after graphing linear equations, so the students know how to graph and use tables.)
3) After every group has made their poster, I hang them up to analyze. We look for similarities and differences in the methods of solving the problem.
4) I keep the posters up to remind my student of how to solve these types of problems.

Sample type problem from Connected Math:

Henri challenges Emile to a walking race. Because Emile's walking rate is faster, Emile gives Henri a 45-meter head start. Emile knows his brother would enjoy winning the race, but he does not want to make the race so short that it is obvious his brother will win. How long should the track be so that Henri will win in a close race?

During the debrief, I use this time to concentrate on not only the correct answer, but on the errors that are common throughout the posters. This is a wonderful formative assessment and will let you know how to guide your talks on how to solve systems by graphing.

Showcase Your Teaching Practice and Win Money!

2020-2021 Presidential Award for Excellence in Mathematics and Science Teaching

DO YOU: ɛach mathematics in grades 7-12 (this cycle, next year will be k-6)?

Have a Bachelor's degree from an accredited institution?

Have at least 5 years of full-time employment prior to the 2020-2021 school year? Teach students full-time at least 50% of a school's allotted instructional time?

Have a passion for the subject you teach, approach your work with creativity and imagination, and work to improve your individual teaching practice daily?

If you have answered ***YES*** to the above questions, consider applying for the 2020-2021 PAEMST award ***TODAY***! The nomination window closes March 1, 2021 and the application window closes April 1, 2021.

For more information, visit www.PAEMST.org or click on the following link that would have been used in a session at the SD STEM Ed Conference to provide attendees more information about the PAEMST program.

PAEMST 2021 PowerPoint

PAEMST Overview:

The PAEMST program was established in 1983 by the White House and is sponsored by the National Science Foundation. The award is the nation's highest honor for math and science (including computer science) teachers. The program identifies outstanding math and science teachers in all 50 states and four US jurisdictions.

Awardees each receive a $10,000 award, a paid trip to Washington, DC to attend a week-long series of networking opportunities and recognition events, and a special citation signed by the President of the United States.

Other than the above, why would a nominee want to complete the application process?

Three CEU's from the South Dakota Department of Education can also be earned toward certificate renewal by completing the application process. To be eligible, a PAEMST candidate must complete all components of the application process and submit a scorable application that can be sent on to the state selection committee. All applicants submitting a scorable application will earn credit, not just the state finalists whose materials will be sent on to a national selection panel.

If you have any questions, please contact:

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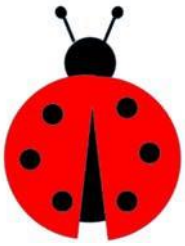


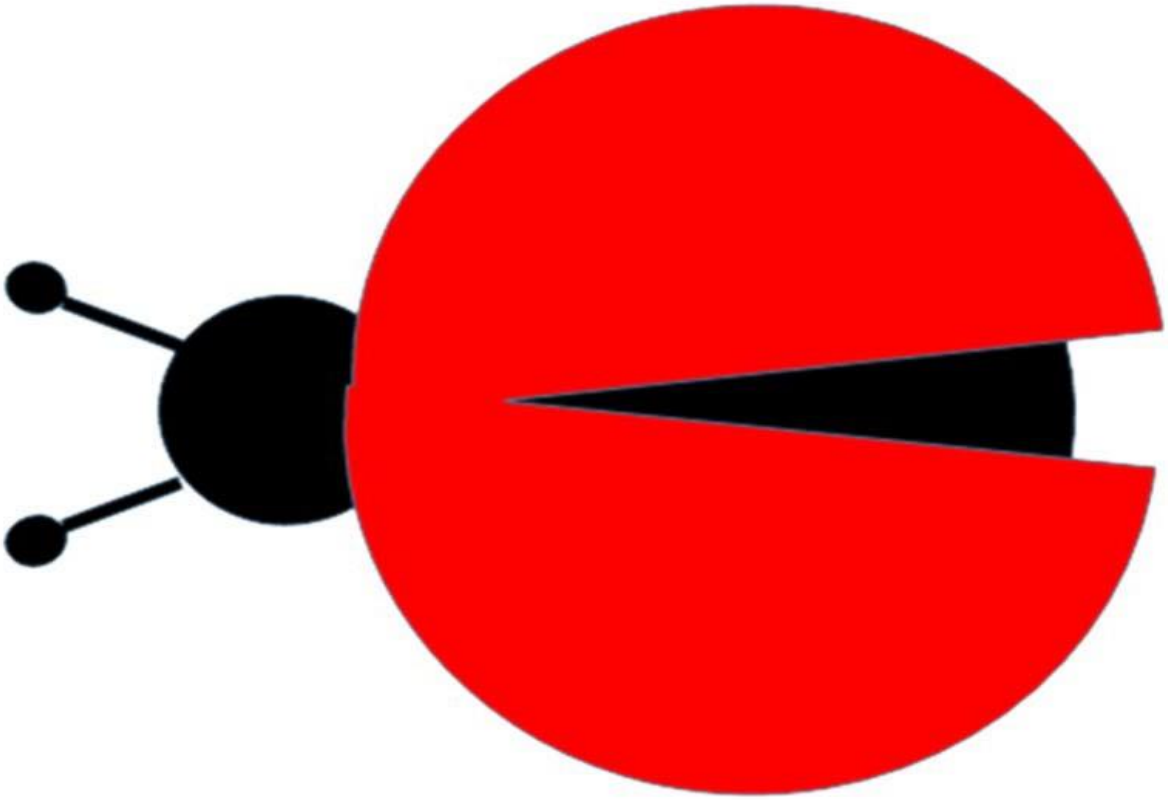
Family Math: Ladybug Spots

K.OA.5 Fluently add and subtract within five.

For 2 players

Materials: 5 (round) counters or other manipulative, 10 chips (other shape) for scoring Directions:

1. Place 5 counters on the Ladybug.
2. Player 1 closes their eyes and Player 2 takes some of the counters off of the ladybug.
3. Player 1 looks at the ladybug and determines how many counters Player 2 took off.
4. To check, players count the removed pieces together.
5. If correct, Player 1 takes one chip.
6. Players take turns removing counters and determining how many were removed.
7. The game is over when all chips have been won.



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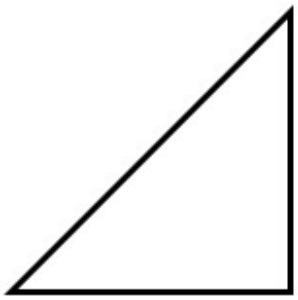
Unit Circle Self-Discovery Activity

In this activity, you will use your knowledge about triangles and trigonometry to discover the unit circle that we will be using a lot from this point forward.

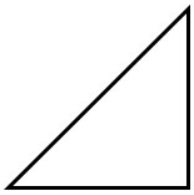


The triangle above is an isosceles triangle.

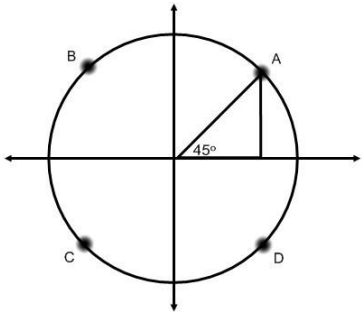
1) Label all of the angles of the triangle.

2) Assume one leg of the isosceles triangle is one unit long. Use this information to label all three side lengths of the triangle. Answers must be in radical form.

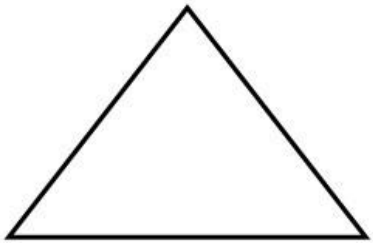
3) The triangle above and the triangle below are similar triangles. What would you have to do in order to find the new side lengths if you were given that the new triangle has a hypotenuse of 1 unit? Explain the process and then label the angles and side lengths of the triangle below. Rationalize the denominators, if applicable!



4) Assume that the radius of the circle below is one unit. Find the coordinates of point A when given the information below.



5) Use reflections to find points B, C & D.



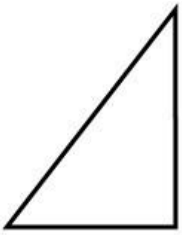
The triangle above is an equilateral triangle.

1) Label all of the angles of the triangle.

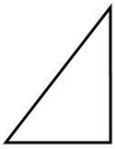
2) Assume one side length is 2 units long. Label all of the side lengths.

3) Draw in the altitude of the triangle and find its length. Leave your answer in radical form.

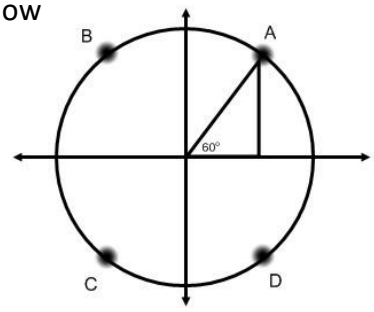
Fill in the angles and side lengths from the left half of your triangle on the triangle below.



4) The triangle above and the triangle below are similar triangles. What would you have to do in order to find the new side lengths if you were given that the new triangle has a hypotenuse of 1 unit? Explain the process and then label the angles and side lengths of the triangle below. Rationalize the denominators, if applicable!

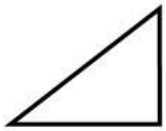


5) Assume that the radius of the circle below is one unit. Find the coordinates of point A when given the information below

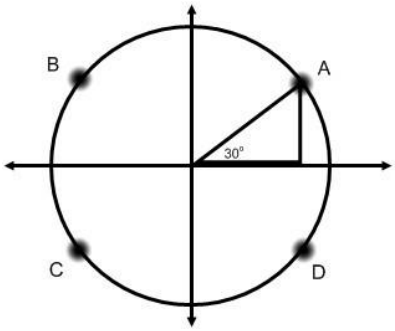


6) Use reflections to find points B, C, and D.

7) Rotate and reflect the triangle in #4 and use it to fill in the angles and side lengths of the triangle below.

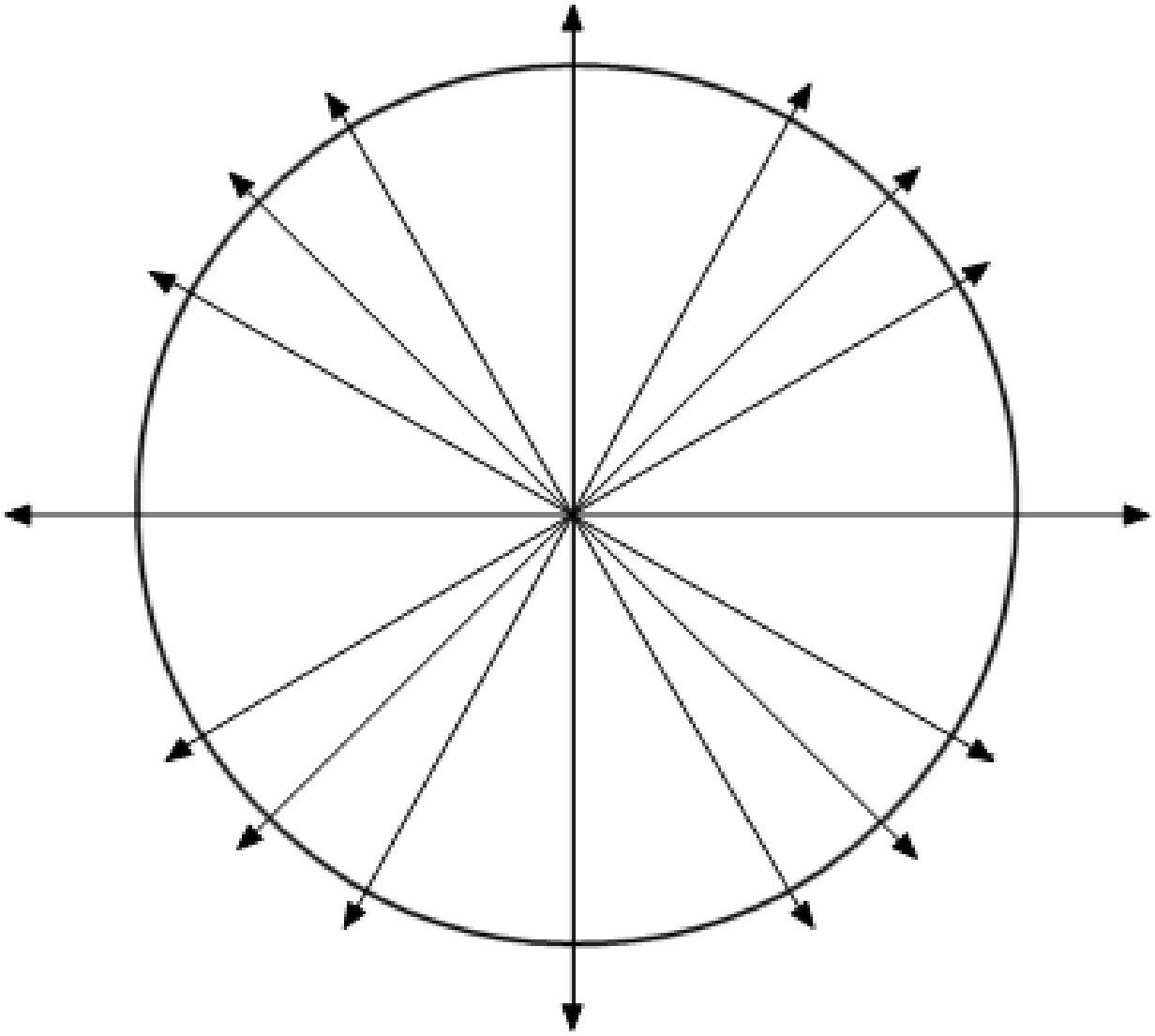


8) Assume that the radius of the circle below is one unit. Find the coordinates of point A when given the information below.



9) Use reflections to find points B, C, and D.

Below you will find a unit circle. Draw in all of the triangles and label the points. Use different colors for each reference triangle.



SD STEM-ED Conference, February 2021

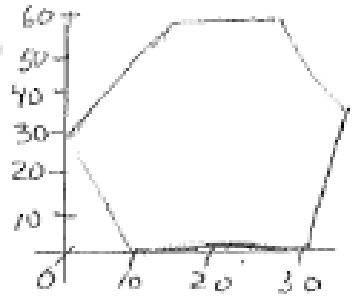
Presenter: Dr. Margaret Adams

Describing the Domain and Range of Geometrical Figures through Graphs

The presentation reveals how challenging it is for students (grades 9-12) to describe the domain of a function involving geometric figures, such as a hexagon. Their focus is on the particular figure, rather than on the interpretation of the figure. In the case of the hexagon, there are six sides and with a perimeter of 60 inches; hence, the sides are 10 inches in length. Each of the six sides constitute the domain, whereas the cumulative lengths constitute the range. Therefore the domain is [0,6] and range is [0,60]. In the process of focusing on the figure, students force the hexagon figure onto the graph rather than construct total length as a function of the number of sides. In the case of the LifeSavers, students often draw the roll of candy onto the graph rather than translate the information about the candy onto the graph. I hypothesize that students copy the figure's image to the graph, but do not cognitively abstract the figure's properties into the context of functions prior to graphing. The handouts of four domain and range finding tasks are for the audience to use in their classrooms as a critical thinking or enhancement exercise. Answers are on the last page.

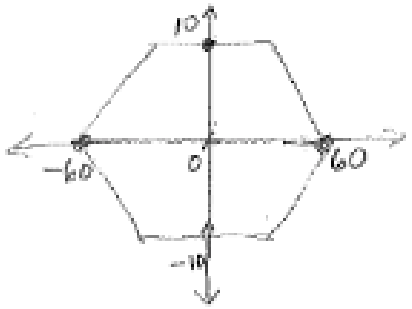
1. A hexagon-shaped playground has a perimeter of 60 inches. We want to find the domain and range of this hexagon. Select one of the graphs below that best represents this data.

(1)



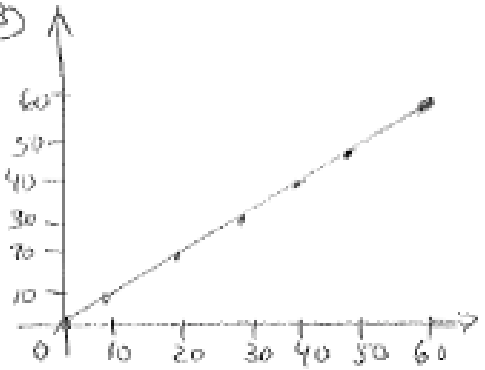
Dom: [10, 30]
Range [10, 60]

(2)



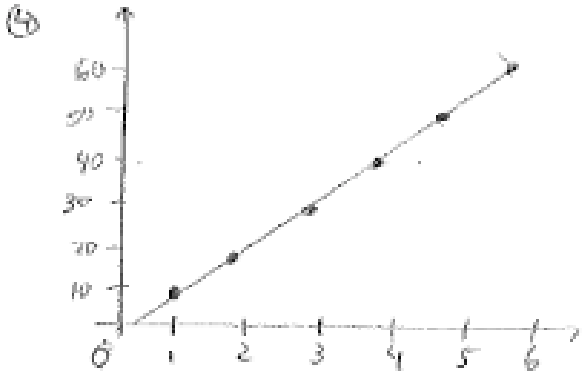
Dom [-60, 60]
Range [-10, 10]

(3)



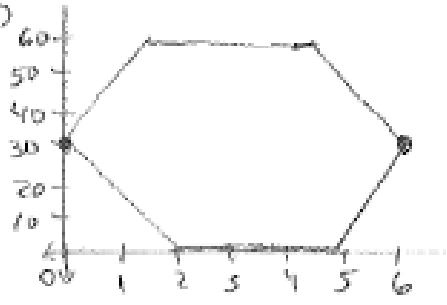
Dom: [0, 60]
Range: [0, 60]

(4)



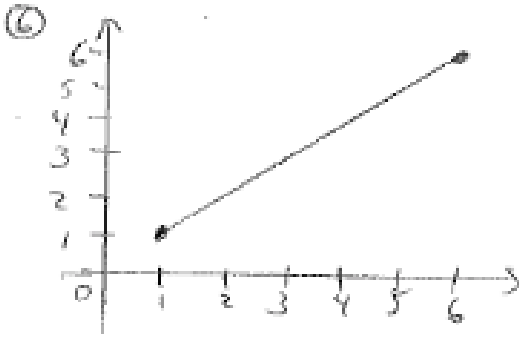
Dom: [0, 6]
Range: [0, 60]

(5)



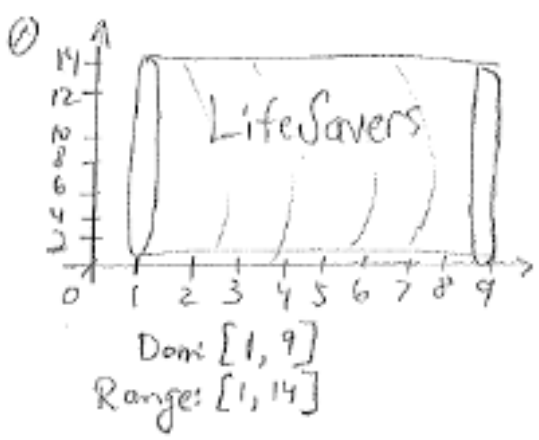
Dom: [0, 6]
Range: [0, 60]

(6)

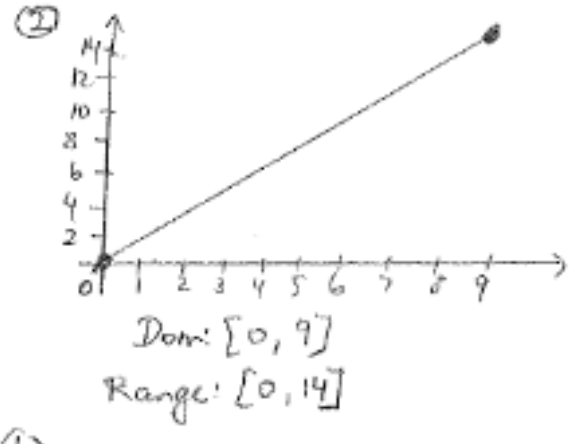


Dom: [1, 6]
Range: [1, 6]

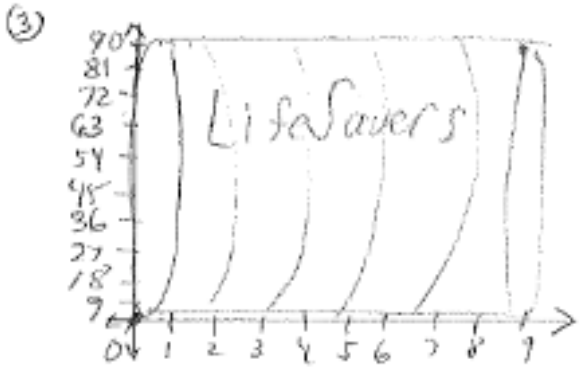
2. Dr. Oppenheimer likes LifeSavers. In every roll, there are 14 pieces of candy. Dr. Oppenheimer has 9 students in his physics class and gives everyone a roll of LifeSavers to encourage them to study more often. We want to find the domain and range of this function. Select one of the graphs below that best represents this data.



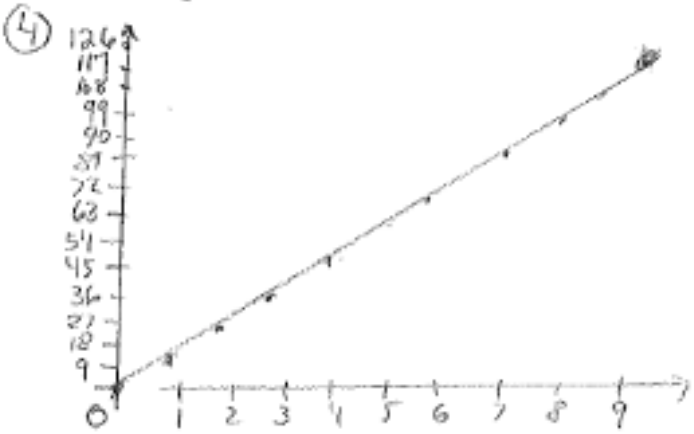
Dom: [1, 9]
Range: [1, 14]



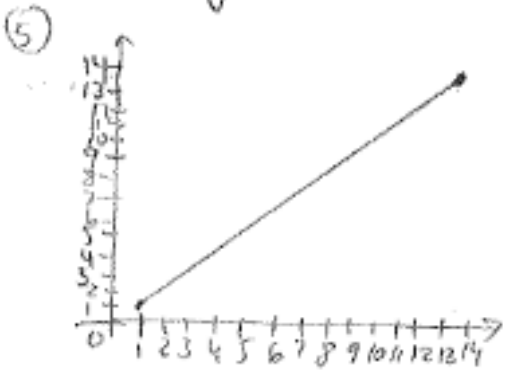
Dom: [0, 9]
Range: [0, 14]



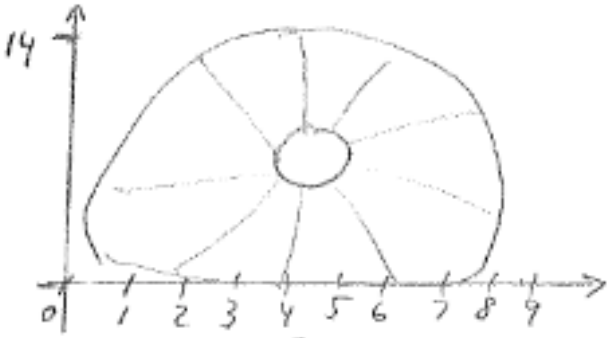
Dom: [0, 9]
Range [0, 90]



Dom [0, 9]
Range [0, 126]

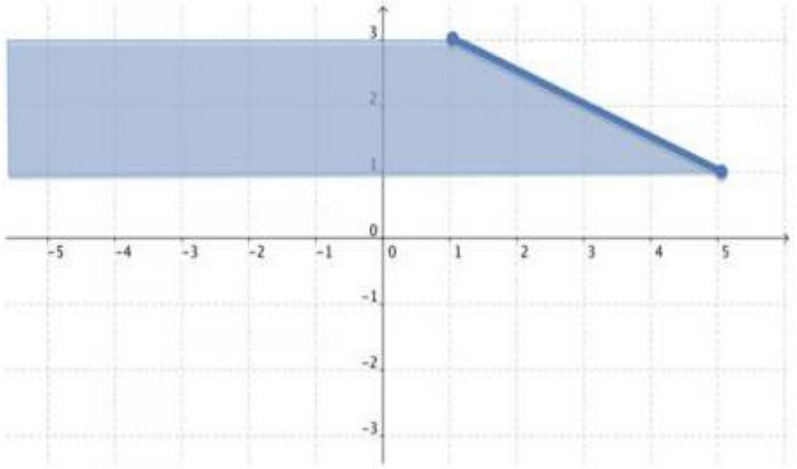


Dom: [1, 14]
Range [1, 14]



Dom [0, 9]
Range [0, 14]

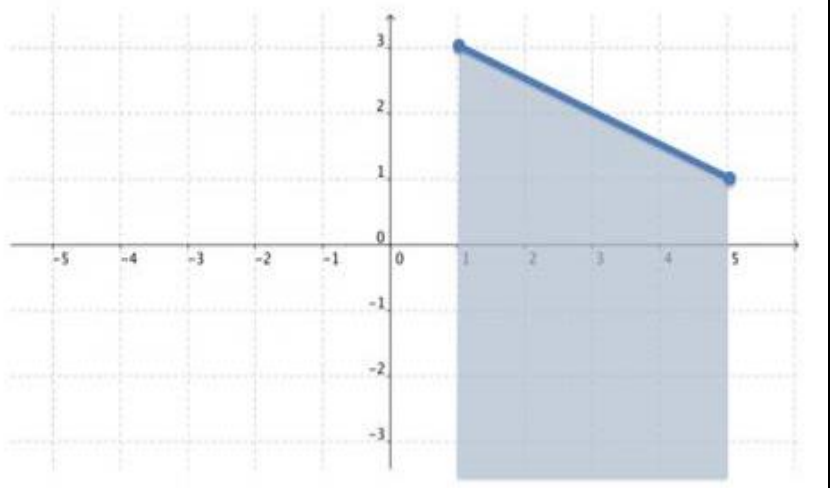
3. Look at the illustration below and write down the domain and the range.



Domain:

Range:

4. Look at the illustration below and write down the domain and the range.



Domain:

Range:

Answers:

Tasks 1 & 2: **Graph 4** both cases.

Note: in Task 1, the horizontal axis is number of sides, and vertical axis is total length. In Task 2, the horizontal axis is number of students, and vertical axis is total number of LifeSavers.

Tasks 3 & 4: Domain [1,5] and Range [1,3]

Geometry
McQuade

Bisectors, Medians & Altitudes
Extra Credit

Name _____

DO NOT staple the pages together. Write your name on both pages and hand them in together.

Plot the followings points and draw the triangle determined by the three points. $A(0,0); B(12,6); C(18,0)$

Select 4 colors:

Color #1:_____ Color #2: _____ Color #3: _____ Color #4: _____

1. Locate the midpoint of each side of the triangle (you can use a construction, the Midpoint formula or the graph itself). Use color #1 to *lightly* draw the medians of the triangle. What are the coordinates of the centroid? _____

2. Use color #2 to *lightly* draw the perpendicular bisectors of each side of the triangle. (Use the midpoints from #1 and your knowledge of the slopes of perpendicular lines.) What are the coordinates of the circumcenter? _____

3. Use color #3 to *lightly* draw the altitudes of each side of the triangle. (Once again, use your knowledge of slope…but remember that an altitude always passes through the vertex and not necessarily the midpoint of the side.) _____
What are the coordinates of the orthocenter?

Leonhard Euler's contributions to math are numerous. One contribution relates to the bisectors, medians, & altitudes of a triangle. He proved that the centroid, the orthocenter and the circumcenter are all collinear. The line containing these points is known as the *Euler Line.* He also proved that the centroid is one third the distance from the circumcenter to the orthocenter.

4. Use color #4 and **boldly** draw the Euler line.

5. Use two points from the line and the point-slope form of an equation of a line to find an equation of the *Euler Line* for ΔABC.

_____

6. Use the distance formula and the coordinates of the centroid, circumcenter and the orthocenter to verify the distance from the circumcenter to the centroid is one third the distance from the circumcenter to the orthocenter. *(Find the ratio of the distances…it should be* $\frac{1}{3}$*.)*

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