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Blood Alcohol Content

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Final Project – Write-up
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I. Making Use of the Model

The way we can make use of this model in a classroom setting is by using it to explain to the students what Blood Alcohol Concentration (BAC) means, and how it affects the human body. The way this model works is the student will select a user to begin the simulation. Once they do that, the user character will appear in a party with a variety of drinks, both alcoholic and nonalcoholic. In this simulation the BAC of the user will increase by .05 (male) and .07 (female). If the BAC rate gets to .30 or higher, the user will die from alcohol poisoning. One of the ways they can manage the users drinking (to keep him/her alive) is by pacing themselves since BAC rates decrease over time.

In addition to this simulation, students will create graphs using a given formula on Microsoft Excel to look at the relationship between the different variables that affect a person's BAC. The nature of this activity allows for a variety of involvement from both the students and the teacher. If the students are fairly independent and quick learners, then the teacher can have the students look at more variables. If the students require more assistance from the teacher, than the teacher can make some of the variable constant so the students have less unknowns to worry about.

Overall, these activities both help students to understand the relationship between drinking, BAC, and time, as well as practice with communication skills by discussing these relationships with their peers by looking at all of the graphs that were made in the classroom. These resources can be expanded or condensed based of the needs and desires of the teacher and students.

II. Guiding Questions for Students

1. What are ways to prevent your BAC from reaching .30?
2. What drink raises your BAC the most in the least amount of time?
3. In the simulation, whose BAC raises more per drink, the male user or the female user? Why is this the case in real life?
4. What drinks can help your user decrease his/her BAC? Why is this the case in real life?
5. In this Model, if the user is standing still, how many seconds does it take for the user's BAC to go down by .01?
6. How does time affect this simulation (as well as drinking in general)?

III. Common Core Learning Standards for Mathematical Practice:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
4. Model with mathematics.
5. Use appropriate tools strategically.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

IV. Common Core Learning Standards for Mathematical Content:

- N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.
- N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
- A-REI.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
- F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★
- F-IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.★
- F-IF.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★
- F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context.
- S-ID.1. Represent data with plots on the real number line (dot plots, histograms, and box plots).
- S-ID.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
    - a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.
    - b. Informally assess the fit of a function by plotting and analyzing residuals.
    - c. Fit a linear function for a scatter plot that suggests a linear association.
- Although specific modeling standards have not been created, based on the introduction given for this section, the activities planned for students clearly incorporate the modeling standard.