Information about Midterm Experience

This midterm has been designed to tie in the themes of the course focusing on creativity. The focus in on your understanding of the mathematical topics covered up to this point in class. Students are asked to think conceptually, not necessarily be caught up in the numerical answers. Students are expected to show that they can think mathematically and explain their reasoning. The test will be an opportunity for students to show their understanding of the mathematics and also the connections of mathematics to everyday life and their field of interest.

In order to study, students should:
- Have a good understanding of the mathematics covered.  See below for a list of topics
- Read through the PowerPoints and the worksheets
- Go to the interactive website under "Practice problems" in Canvas if they need a refresher
- Watch the videos on Canvas
- Make sure that they are proficient in the mathematics we've discussed.

**Test Topic Ideas**
Mathematics Covered
- Geometry
    - Triangles (similar triangles, right triangles, angles, area, Pythagorean Theorem)
    - Radians versus degrees and how to convert between the two
    - Euclidean (flat) versus non-Euclidean (what happens to triangle angle measures on a sphere and saddle, parallel lines)
    - Circles (radius, diameter, circumference)
- Graphs
    - Creative ways to represent data
    - Scale, axes, labels
    - Log scale versus standard scale (population data)
    - Linear versus nonlinear patterns
    - What truths can you infer?
    - What questions does this raise?
- Surfaces
    - Mobius strips
        - Challenged perceptions of the number of sides of paper
        - Explore different possibility and come to conclusions about patterns
- Estimation
    - What is an order of magnitude?
    - For what kinds of problems are estimates sufficient (over precise answers)
    - Precision versus estimation
    - Explain approach to conclusions
    - Measurement and units
- Axioms
    - Understand their role in mathematics
    - Recognize the importance of logic

**Part I**
Individual
No cellphones or other resources are permitted for this portion of the test.
1.) The total angle measure of a triangle drawn on a beach ball is _____ that of a triangle on a flat surface.
      a.  less than
      b.  more than
      c.  the same as

2.) Parallel lines on a flat surface will:
      a.  meet more than once
      b.  meet once
      c.  never meet

3.) Parallel lines on a sphere will:
      a.  meet
      b.  never meet

4.) The area of a triangle on a beach ball will be _____ the area of a triangle on a flat surface.
      a.  less than
      b.  more than
      c.  the same as

5.) What are the problems with representing the earth on paper (as in an Atlas)?

Each graph (A-D) has its' three own questions for this portion that pertain to that graph's particular data. See folder for specific questions.

**Part II**
Group

Students are asked to answer the following questions in groups. Each student's paper should be collected and graded.

   2.) Each of you analyzed a different graph. Share your graphs with each other, and taking all of them into account, name three possible correlations or relationships among the graphs. (How are they related?). Use complete sentences that clearly explain the connections.

     a.)
     b.)
     c.)

   3.) Share your individual estimates of the number of cars in the US with the group. Now that you have more information from the four graphs, revise your estimates and come up with

a better informed and perhaps more accurate group estimate for the number of cars in the US in 2017.

d.) Group estimate:

e.) Three key discussion points that helped us develop our group estimate and how we used them to formulate our group estimate.
   a.
   b.
   c.

4.) Take the globe beach ball.  At least two members of the group should put on latex gloves and dip your fingers in finger paint. Toss the ball among the group about ten times so that you have about 100 dots (fingerprints) on the ball.  Fill in the following table:

|  | Number | Percentage of total dots |
|---|---|---|
| Dots on landmass |  |  |
| Dots that landed on water |  |  |

   a.  What do the percentages provide an estimate of?
   b.  In class, we estimated that landmass is 35% of Earth and water is 65%

What is your estimate of water on Earth based on the finger paint experiment?
What are some possible reasons for the discrepancy between the results here and what you did in class on Tuesday?  Be sure to tie in to the questions that were asked on the individual portion of the test.