WAMC Lab Template

Math Concept(s): Ratios and Proportions
Source / Text: No text
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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: How Vitruvian are you?

Prerequisite skills:
Solving linear equations
Using measuring tools
Understanding unit conversions

Lab objective: Students in this lab will measure various parts of their body and compare them to the vitruvian man calculations. Students will then need to determine how much their various body parts would need to grow or shrink to be the same proportions as the Vitruvian Man

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

Mathematics K–12 Learning Standards:

- CCSS.MATH.CONTENT.HSA.REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
- CCSS.MATH.CONTENT.HSA.REI.B.4 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Standards for Mathematical Practice:

- Make sense of problems and persevere in solving them

- Reason abstractly and quantitatively
- Model with Mathematics
- Use appropriate tools strategically
- Attend to precision

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

- RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.4 Determine meaning of symbols, key terms, or other domain specific words and phrases as they are used in specific technical context

K-12 Science Standards

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Technology

- 1.2.1 Communicate and collaborate to learn with others
- 2.2.1 Develop skills to use technology effectively
- 2.4.1 Formulate and synthesize new knowledge

Engineering

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Leadership/21st Century Skills:

21st Century Skills		
Check those that students will demonstrate in this course:		
LEARNING & INNOVATION **Creativity and Innovation** ☐Think Creatively **x**Work Creatively with Others ☐ Implement Innovations **Critical Thinking and Problem Solving** **X** Reason Effectively ☐ Use Systems Thinking ☐ Make Judgments and Decisions **x** Solve Problems **Communication and Collaboration**	**INFORMATION, MEDIA & TECHNOLOGY SKILLS** **Information Literacy** **x** 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** **x** Adapt to Change **x** Be Flexible **Initiative and Self-Direction** **x** Manage Goals and Time **x** Work Independently ☐ Be Self-Directed Learners **Social and Cross-Cultural** **x** Interact Effectively with Others **x** Work Effectively in Diverse Teams **Productivity and Accountability**

x Communicate Clearly x Collaborate with Others		☐ Manage Projects ☐ Produce Results **Leadership and Responsibility** x Guide and Lead Others x Be Responsible to Others

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

Materials

- 1 tape measure per group
- Vitruvian man data sheet

Set-Up Required:

- Students will gather in groups of 2 or 3. Each student will take 6 measurements on their body (listed on the data sheet). Once students have measured themselves, they will create ratios of their measurements and compare them to the ideal measurements found on the Vitruvian man.
- Once those ratios are created, students will create proportions with their height and the vitruvian measurements to find the ideal "arm length" or "wingspan" given their height.

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- Students are accountable to each other to find accurate measurements for each of the body parts

Cooperative Learning:

- Students must communicate and collaborate to take the appropriate measurements and ratios

Expectations:

- For each of the measurements, students are expected to find a precise measurement, create appropriate ratios to compare with the vitruvian man ratios, and then solve proportions to find ideal measurements.

Timeline:

- This entire activity should be able to be completed in a 60 minute period. Measurements will take approximately 15 minutes. Creating ratios, comparing them with the vitruvian values, and a quick share out should take 10 minutes. A quick explanation of how to solve a proportion and then find ideal measurements will take the rest of the class period.

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- How can we use the ratios on a map or blueprint to find the real life measurements?
- If we know the ratio on a blueprint and one dimension for the real life building, how can we find the missing real life measurement?

Career Applications

- Architecture and Construction: All building plans are built with a scale that needs to be read and converted to real life measurements.
- Drones: Maps are created with a built in scale. When planning a flight or photography job, converting the map scale to the a real life scale will assist planning for the job.

Optional or Extension Activities

- Build a structure from a blueprint or, do the opposite and create a *to scale* blueprint of your classroom, house, or school.
- The above activity can also be done creatively in Minecraft

How Vitruvian are you?

The Vivtruvian man is a world-renowned drawing created by Leonardo da Vinci around the year 1487. The drawing depicts two superimposed images of a man with his arms and legs spread out inside a circle and a square. The drawing, according to the Roman architect "Vitruvius" is the perfect proportions of a man.

So, how Vitruvian are you? Today, we are going to take a few measurements of your body, determine how close you are to being of Vitruvian proportions, then solve a few proportion equations to find exactly how your body would need to change in order to be perfect.

First, we need the following measurements (DO ALL MEASUREMENTS IN CENTIMETERS)

1. Your height _____

2. Spread your arms to the left and right and measure fingertip to fingertip _____

3. The distance from the bottom of your chin to the bottom of your hairline _____

4. The distance from shoulder to shoulder _____

5. The distance from elbow to armpit _____

6. The length of your foot _____

Second, find the following proportions (give answers in fraction first, then convert to decimal)

1. $\frac{arm\ spread}{height} =$ Vitruvian = 1

2. $\frac{chin\ to\ hairline}{height} =$ Vitruvian = $\frac{1}{10} = .1$

3. $\frac{Shoulder\ distance}{height} =$ Vitruvian = $\frac{1}{4} = .25$

4. $\frac{elbow\ to\ armpit}{height} =$ Vitruvian = $\frac{1}{8} = .125$

5. $\frac{Foot\ length}{height} =$ Vitruvian = $\frac{1}{6} = .166$

6. Write a few sentences for how well you measure up to the Vitruvian Man (describe what measurements were close and which measurements were far away):

Finally, let's see if we can find the IDEAL measurements you should be, given the height that you have. Please setup and solve the following proportions (I'll setup the first three for you, but you need to do the last three yourself) The numbers in the parenthesis are what you use for your equation.

1. $\frac{x}{Your\ Height} = \frac{Vitruvian\ Armspread\ (1)}{Vitruvian\ Height\ (1)}$

2. $\frac{x}{Your\ Height} = \frac{Vitruvian\ Chin\ to\ Hairline\ (1)}{Vitruvian\ Heigh\ (10)}$

3. $\frac{x}{Your\ Height} = \frac{Vitruvian\ Shoulder\ Distance\ (1)}{Vitruvian\ Height\ (4)}$

4. Setup and solve the proportion where x = Your elbow to armpit length

5. Setup and solve the proportion where x = Your foot length

Vitruvian Man Assessment

1. The ratio of the vitruvian man's shoulder width to his height is 1:4. Setup and solve a proportion to determine if the vitruvian man were 5.5 feet tall, what would his shoulder width be?

2. The ratio of the vitruvian man's chin to hairline and his height is 1:10. Setup and solve a proportion to determine If his chin to hairline measurement was 6.8 inches, what would his height be?

3. The ratio of the vitruvian man's elbow to armpit to his height is 1:8. Setup and solve a proportion to determine if his height was 6.5 feet tall, what would his elbow to armpit measurement be?