**Measuring AR from Scratch**

**Objective:** Students will use an augmented reality (AR) program in Scratch to measure real-life objects in non-standard units (apples, speakers, balls, and blocks). They will discuss the number of items needed for each measurement, record their findings in a table, and calculate conversions between the non-standard units.

**Grade Level:** Middle School (Grades 6-8)

**Materials:**

* Tablets or computers with internet access and camera capabilities
* Scratch AR program preloaded with objects (apple, speaker, ball, block)
* Real-life objects to measure (desk, book, shoebox, etc.)
* Measuring tape or ruler (for verification)
* Worksheet for practice conversions

**Pre-lesson Activities:**

* Brief introduction to AR technology.
* Review how to use Scratch and the specific AR program.
* Discuss non-standard units of measurement and their usefulness.

**Lesson Activities:**

1. **AR Measurement Introduction (10 minutes):**
   * Explain the concept of using AR for measurement.
   * Demonstrate how to use the AR program in Scratch to measure objects.
2. **Measurements Using AR (20 minutes):**
   * In pairs, students will measure different classroom objects using the AR program.
   * They will use the non-standard units provided in the program: apples, speakers, balls, and blocks.
3. **Recording Measurements (20 minutes):**
   * Students will record the number of each non-standard unit needed to measure each real-life object in a table.
4. **Discussion (15 minutes):**
   * Discuss as a class how many of each object was needed to measure each real-life object.
   * Talk about why different objects might be more or less useful for measuring.
5. **Conversion Calculations (15 minutes):**
   * Students will calculate the conversion between each non-standard unit based on their measurements.
6. **Reflection (10 minutes):**
   * Reflect on the use of non-standard units.
   * Discuss the importance of having a standard unit of measure.

**Closure (10 minutes):**

* Summarize the lesson's main points.
* Answer any remaining questions.
* Explain the homework assignment using the worksheet.

**Assessment:**

* Participation in discussions.
* Accuracy of recorded measurements and conversions in the table.

**Homework:**

* Complete the provided worksheet for practice with one-step conversions using the non-standard units.

**-Scratch project - https://scratch.mit.edu/projects/949635648/**

**Student Instruction Sheet: Comparative Measurement Using AR in Scratch**

**Objective:** Apply the provided conversion factors to practice one-step conversions between different non-standard units of measurement.

**Materials:**

* A pencil or pen
* Calculator (optional)

**Instructions:**

Use the conversion factors listed below to solve each conversion problem. Write your answers in the space provided.

**Conversion Factors:**

* 1 pencil = 3 erasers
* 1 notebook = 2 pencils
* 1 water bottle = 4 notebooks
* 1 stuffed animal = 6 water bottles

**Problems:**

1. If you have 5 pencils, how many erasers do you have?
2. How many notebooks are equivalent to 3 water bottles?
3. If you have 2 stuffed animals, how many water bottles is that?
4. Convert 12 erasers into pencils.
5. How many stuffed animals are equivalent to 24 notebooks?
6. If you have 18 pencils, how many notebooks can you get?
7. Convert 10 water bottles into erasers.

**Reflection:** After completing the worksheet, think about the following questions:

* How did using the conversion factors help you solve the problems?
* Why is it important to understand the concept of unit conversion?
* Can you think of any real-life scenarios where you might need to convert between different units of measurement?

**Note:** Make sure to show your work for each problem. This will help you track your calculations and also make it easier for your teacher to understand how you arrived at your answers. Good luck!