

Wk 3 Project 2 - Project-based Assessment

Description Handout for the Students

Project Title: Designing a Rainwater Harvesting System

Overview

As climate change leads to more frequent and intense storms, communities face challenges in managing the increased volume of rainwater. In this project, you will design a rainwater harvesting system that effectively captures and stores rainwater from storm events. Your goal is to ensure that valuable water resources are not lost and can be utilized for personal or agricultural needs.

Objectives

- Research rainfall data from a selected storm.
- Calculate the volume of water that can be harvested based on your chosen catchment area and surface material.
- Design a non-scaled model of a rainwater harvesting system.

Steps to Complete the Project

1. Select a Storm:

- You will be given a list of recent storms. Choose one storm to research its rainfall data. Record the total rainfall amount.

2. Choose a Catchment Area:

- Decide on the type of catchment area you will use for your design. You can choose from:
 - Triangular
 - Rectangular
 - Circular
- Use the provided worksheet to find the appropriate formula for calculating the area based on your choice.

3. Determine the Surface Material:

- Select a surface material for your catchment area. Refer to the runoff coefficient table on the worksheet to understand how different materials affect water

collection.

4. Calculate Potential Water Harvested:

- Use the formula:

$$V = A \times R \times C$$

Where:

- = volume of water harvested (in gallons)
- = catchment area (in square feet)
- = total rainfall from the storm (in feet)
- = runoff coefficient (based on your selected surface material)

5. Water Storage Capacity:

- Refer to the "Water Storage Capacity Needed for a Household Committing to Use Harvested Rainwater as the Primary Water Source" section on the worksheet to determine how much storage capacity you will need for your system.

6. Design a Non-Scaled Model:

- Create a non-scaled model of your rainwater harvesting system. This can be done using materials like cardboard, paper, or any other craft supplies. Your model should include:
 - The catchment area
 - The storage tank
 - Any additional components (e.g., filtration system, overflow system)

7. Documentation:

- Prepare a brief report that includes:
 - The storm you researched and its rainfall data.
 - Your calculations for the volume of water collected.
 - A description of your design choices and the components of your model.

Materials Needed

- Access to research tools (internet, library)
- Worksheet with formulas and runoff coefficients
- Rainwater Harvest Calculations.pdf - <https://www.harvestingrainwater.com/wp-content/uploads/Appendix3Calculations.pdf>
- Craft materials for the model (cardboard, paper, scissors, glue, etc.)

Rubric for Assessment (Mathematics Focus)

Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
Accuracy of Calculations	All calculations are accurate and clearly shown; demonstrates a strong understanding of volume and area.	Most calculations are accurate; minor errors present but do not significantly affect the overall results.	Some calculations are correct; several errors noted that affect the results.	Many calculations are incorrect or missing; demonstrates a lack of understanding of the concepts.
Application of Formulas	Correctly selects and applies appropriate formulas for catchment area and volume calculations; shows clear reasoning.	Correctly applies most formulas; minor errors in selection or application.	Limited application of formulas; some incorrect selections or applications noted.	Fails to apply relevant formulas; significant misunderstandings evident.
Understanding of Concepts	Demonstrates a thorough understanding of the relationship between catchment area, rainfall, and water volume; can explain reasoning clearly.	Shows a good understanding of the concepts; can explain most reasoning but lacks depth in some areas.	Basic understanding of concepts; explanations are unclear or incomplete.	Lacks understanding of key concepts; unable to explain reasoning.
Use of Runoff Coefficient	Correctly selects and applies the appropriate runoff coefficient based on surface	Selects a mostly appropriate runoff coefficient; minor errors in explanation.	Limited understanding of runoff coefficients; some incorrect selections noted.	Fails to use or incorrectly applies runoff coefficients; lacks explanation.

Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
	material; explains the choice effectively.			