Magical Rain

Materials:

- Four 5 oz paper cups
- Needle, pin, or safety pin
- 1 cup plastic measuring cup with ml, teaspoon, tablespoon, or quarter oz markings
- Pencil
- Large cup
- Timer or stop watch
- Paper towels, or a cloth towel for spills
- Waterproof surface on which to pour water (plastic under-bed storage box or cookie sheet)

Set up:

1. Using a pin or other sharp object with a similar diameter, poke holes in the bottom of three 5 oz paper cups as follows; poke 5 holes in cup 1, 10 holes in cup 2 and 15 holes in cup 3
2. Use a pencil to punch 1 pencil-sized hole in the bottom of cup 4
3. Place a plastic under-bed storage or cookie sheet on a table for drainage. The container will catch any spills and prevent damaging the table and floor. Recommended dimensions are approximately 22" x 17" x 5".

Activity:

1. Carefully measure 4 oz of water (1/2 cup) with the measuring cup. Record this on the worksheet.
2. Start with cup 2, the paper cup with 10 holes in it. In the directions below, 'paper cup' refers to a 5 oz cup.
3. Hold the paper cup over the large cup. Get a timer ready.
4. Predict what will happen when you pour the water into the paper cup. Will all of the water drain out? How long do you think it will take? Record your predictions on the worksheet.
5. Start the timer as you start to pour the water into the paper cup. The water draining out of the bottom of the cup should look like rain.
6. Press stop on the timer when the water stops draining. Recorded this time on the worksheet.
7. Pour the water remaining in the paper cup into the measuring cup. On the worksheet, recorded how much water remained in the paper cup.
8. How much water drained from the cup? You should be able to solve this word problem by subtracting two numbers. Recorded your answer on the worksheet.
9. Predict what will happen when you repeat steps 3 through 8 with the 5-hole cup and then with the 15-hole cup. Will there be water remaining in the cup? Will the number of holes change how long it takes for the water to drain? Record your answers on the worksheet under your predictions.
10. Repeat steps 3 through 8 using the 5-hole paper cup and then the 15-hole paper cup. Record all of your results on the worksheet.
11. What will happen if you use a larger hole instead of the pin holes you used earlier? Will a larger hole allow all the water to drain out? How quickly do you think it will take for the water to drain? Record your predictions on the worksheet.
12. Repeat steps 3 through 8 using the paper cup with the pencil hole in it. Record your findings on the worksheet.
13. Reflection: What did you find out? When you changed the number of holes, what effect did this have on the amount of water that drained from the cup? How about the amount of time it took to drain the water from the cup? How close were your predictions? What do you know now that you did not know when you started the experiment? What surprised you?

See adaptations for 4th & 5th Grade on reverse side

Adaptations:

For fourth grade:

- Ask learners to convert their measurements to another unit (i.e. from mL to L).
  - For example: if the amount of water was initially measured in mL, then convert the amount to L with the formula 1000 mL = 1 L.
  - If learners used cups, then they could convert to pints / quarts / gallons with the following conversions: 1 pint = 2 cups; 1 quart = 4 cups; 1 gallon = 4 quarts.
  - Both of these are done by multiplying the appropriate value by the conversion factor.
  - Also change time from seconds to minutes or hours using the appropriate conversion factors.
- Ask learners to record their data in different systems and compare their relative sizes.
  - To get a feel for the different units, use all of the units that are on the measuring cup. Split each water measurement into 3 parts and record in ounces, cups, and milliliters.
  - Compare the units to see which are easier to use and which are more familiar.
- Have the students graph their results to see patterns
  - On the back of the worksheet there are graphs. One graph is for plotting the number of holes against the amount of time it takes for the water to drain. The other graph is for plotting the number of holes against the amount of water remaining in the cup
  - To get better graphs, make sure the holes are all the same size. Include more data points by repeating the experiment with different amounts of holes in the bottom of the cup.

For fifth grade:

- Ask learners to convert their measurements to another scale.
  - There are three scales used on most measuring cups: ounces, cups, and milliliters. Ask learners to measure the water amounts in one scale and then use conversion factors to change between the scales. The students can check their math by looking at the water level in the measuring cup on the different scales.