centre de développement pédagogique
pour la formation générale en science et technologie

Lemonade



TEACHER'S GUIDE

August 2009

PREPARATION

Activity 1

Objective: Have the students realise that the shape of the container (its volume) has an influence on the height of the level of water.

Material – see Annex 1 - Preparation guide, p. 1

Duration: 20 minutes

Before beginning the activity, the teacher fills the one litre bottle of water and adds the food colouring. (S)he animates a discussion around the various containers.

- Will the water in the 1 litre bottle fit into the other containers?
- Will the water overflow?

Then the teacher demonstrates. (S)he transfers the litre of water into each of the containers.

N.B. The bottle may be replaced by a 1 litre measuring cup.

The 1L containers we used.



PREPARATION

Activity 2

Objectives: ***- Have the students realise that the shape of the container influences the quantity of liquid contained.***

- Give the students efficient work methods (water manipulation and note taking).

Material:

- **See Annex 1 - Preparation guide, pages 2 and 3**
- **Student booklet, pages 1 and 2**
- **Annex 2 : Steps to follow**

Duration: 60 minutes

The teacher animates a discussion in a large group. (S)he places the various glasses in a visible spot and asks several questions:

- What are the characteristics of these glasses?
  - There are small ones and big ones;
  - This one is high;
  - There's one that's really small;
  - They are made out of plastic;
  - That one is for fancy occasions;
  - Etc.

Note the key-words on the board so as to help the students to write their hypothesis (higher, bigger, smaller, wider, and thinner). Place the correct vocabulary: height, width, capacity, depth, etc.

The teacher asks the students to estimate which glass contains the most water. They formulate their hypothesis

The types of glasses we used.



Bottle and graduated cylinder with masking tape to mark the level of water in each glass.



individually or in a group. *(They use a coloured pencil or a marker so that they can not erase after the experiment).*

In teams of two, the capacity of the glasses is verified. To make this verification, the smallest glass (the shot glass) becomes the standard measure for quantity.

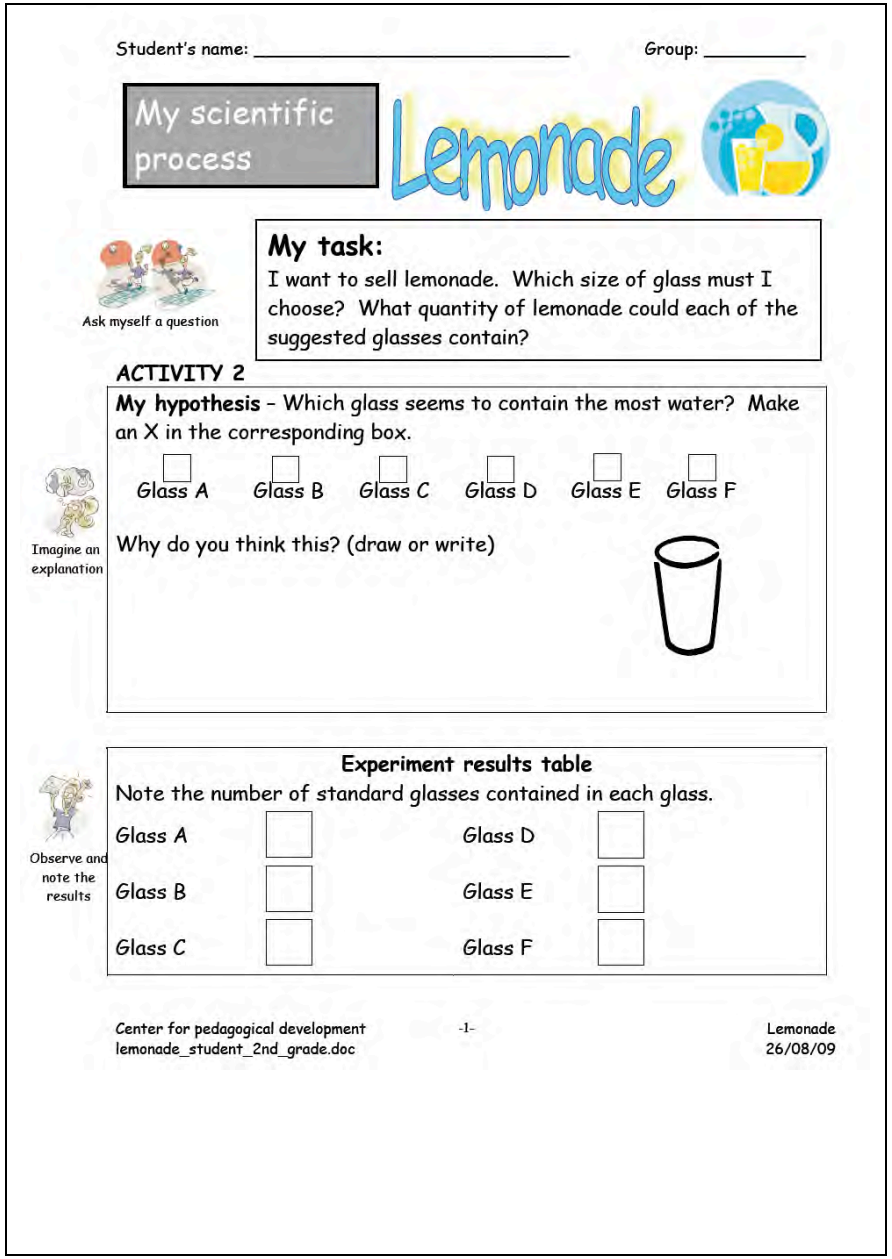
Before the experiment, animate a discussion using the following questions and note the precautions to be taken on the board.

- You will have to take notes while manipulating water. To what will you need to pay attention?
  - *Not to get my papers wet;*
  - *Not to get my pencil and eraser wet.*
- Where could you put your papers?
  - *On another desk;*
  - *On the chair if I am not sitting down.*

Have the students work standing up to avoid messes. The students will have an easier time pouring.

A group discussion can take place to see how the students will go about counting the number of standard glasses.

- You must count the number of small glasses you will pour into the larger ones. How will you go about this?
  - *I will fill all the glasses I can and count those.*
- How will you avoid spilling your glasses?
  - *I will pour and my partner will hold the other glass.*
- How can you be sure you won't make a mistake counting?
  - *I can write down how many I have poured;*
  - *I can count on my fingers;*
  - *My partner can count for me.*



Student's name: _____ Group: _____

My scientific process

Lemonade

Ask myself a question

My task:
I want to sell lemonade. Which size of glass must I choose? What quantity of lemonade could each of the suggested glasses contain?

ACTIVITY 2

My hypothesis – Which glass seems to contain the most water? Make an X in the corresponding box.

☐ Glass A ☐ Glass B ☐ Glass C ☐ Glass D ☐ Glass E ☐ Glass F

Imagine an explanation

Why do you think this? (draw or write)

Observe and note the results

Experiment results table

Note the number of standard glasses contained in each glass.

Glass A	☐	Glass D	☐
Glass B	☐	Glass E	☐
Glass C	☐	Glass F	☐

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A protocol is supplied with the task so that the students can carry out the experiment, see ANNEX 2.

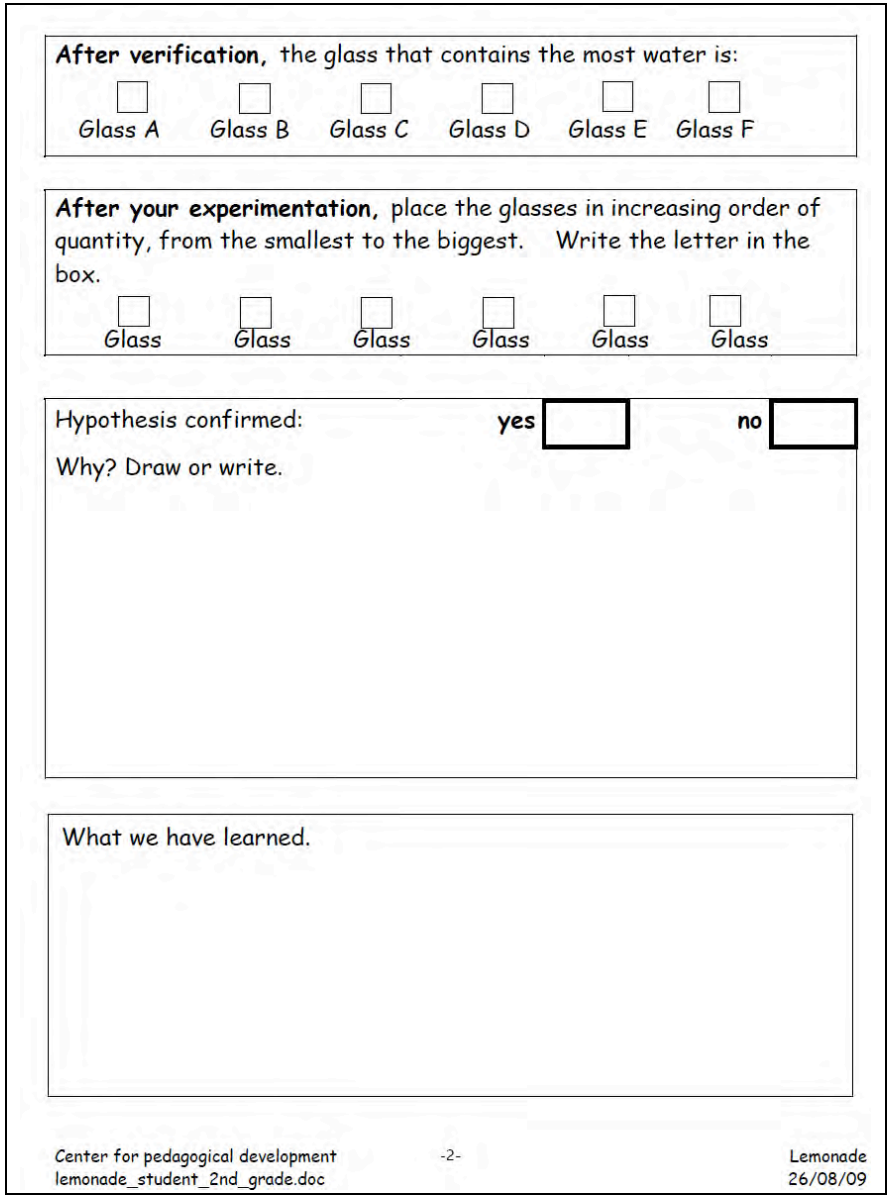
Once the experiment carried out, the students note their results.

The students are then invited to complete the booklet by placing the glasses in increasing order of quantity, from the smallest to the biggest.

Before moving on to the next step, the teacher invites the students to complete page 2 of the booklet. The students must confirm their hypothesis and write (or draw) what they have learned.

The teacher draws a conclusion, using the new vocabulary that the students write in their booklet. (Volume, capacity, dimension).

Signal to the students that we want to sell the lemonade. Later, they will have to choose a glass size for the situational problem in math.



After verification, the glass that contains the most water is:

☐ Glass A ☐ Glass B ☐ Glass C ☐ Glass D ☐ Glass E ☐ Glass F

After your experimentation, place the glasses in increasing order of quantity, from the smallest to the biggest. Write the letter in the box.

☐ Glass ☐ Glass ☐ Glass ☐ Glass ☐ Glass ☐ Glass

Hypothesis confirmed: **yes** ☐ **no** ☐

Why? Draw or write.

What we have learned.

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REALISATION

Activity 3

Objectives: ***- Initiate the students to the concepts of mixtures, solubility and observation via the senses.***

- Initiate the students to the use of science and technology tools.

MATERIAL:

- **See Annex 1 – Preparation guide, pages 4 to 6**
- **Student booklet, page 3**

Duration: 45 minutes

CONTEXT: We want to make lemonade. Lemonade is a mixture of water with another substance (pure lemon juice and sugar or commercial powder). We will carry out and observe the different water based mixtures.

BEFOREHAND

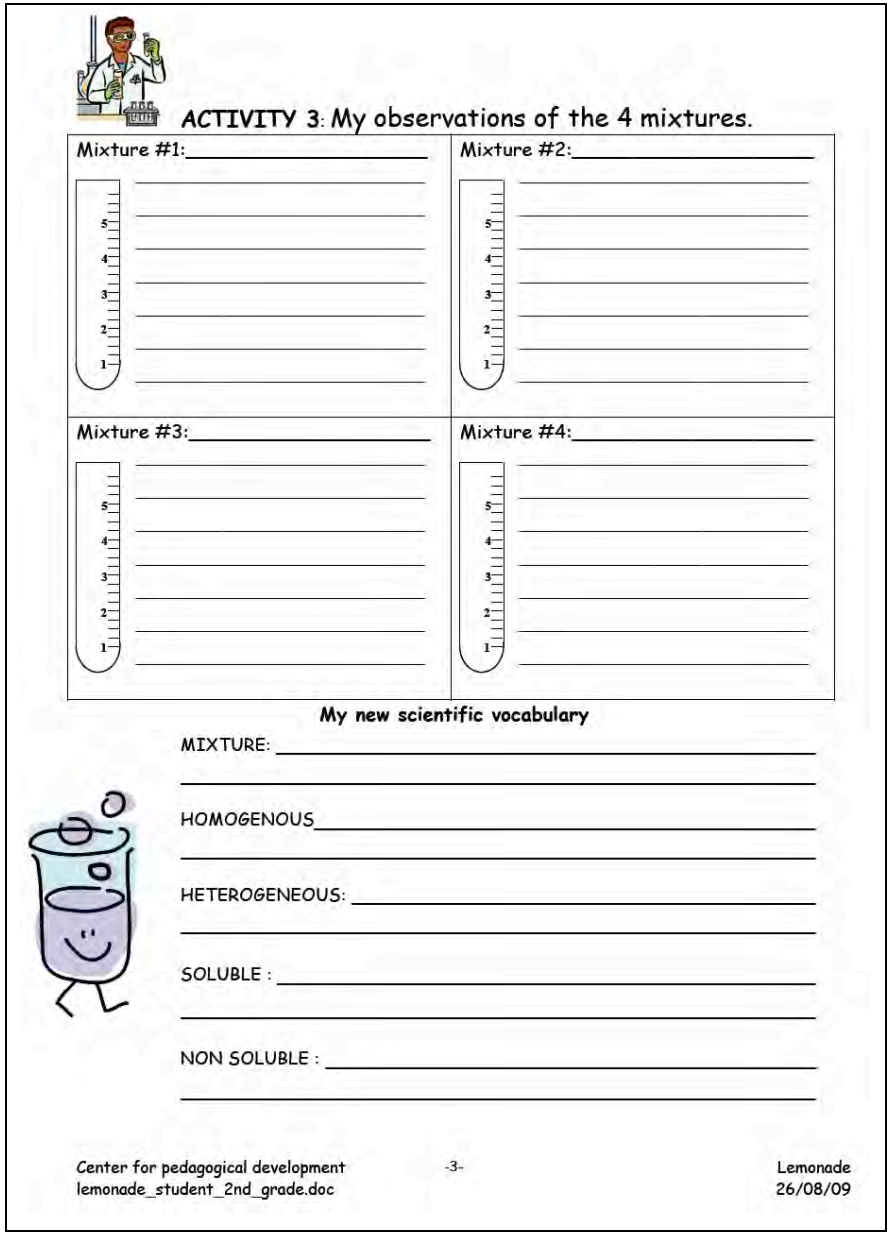
Discuss with the students of different states of matter (solids, liquids and gases) and bring out examples.

Question: What can we mix?

MIXTURE: *Mix of two or several substances.*

solid substance + solid substance;
(brass, two-coloured detergent; granite; reinforced concrete; alloys.)

solid substance + liquid substance;
(orange juice with pulp, milk with chocolate



ACTIVITY 3: My observations of the 4 mixtures.

Mixture #1:

Mixture #2:

Mixture #3:

Mixture #4:

My new scientific vocabulary

MIXTURE:

HOMOGENOUS

HETEROGENEOUS:

SOLUBLE :

NON SOLUBLE :

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powder).

liquid substance + liquid substance;
(salad dressing, milk with chocolate syrup; pop with grenadine).

liquid substance + gaseous substance;
(sparkling water, pop)

gaseous substance + gaseous substance;
(air = CO2, nitrogen, oxygen, argon).

The teacher prepares the test tubes, one at a time, as indicated in the preparation guide. (S)he places a different substance in each test tube. By inversion (tip the test tube downwards, then back up), (s)he mixes the substance with the water. (S)he asks the students to observe the 6 mixes and to describe what they see:

- The solid substance has disappeared and the water has remained transparent;
- The substance has disappeared and the water has changed colours;
- The mixture is opaque;
- Small particles are suspended in the liquid;
- The substance floats on the top of the water;
- The substance is depositing on the bottom;
- The substance's volume is diminished;
- The level of the water has risen or fallen.

The use of Video Flex or Proscope could allow the whole class to observe more easily at the same time.

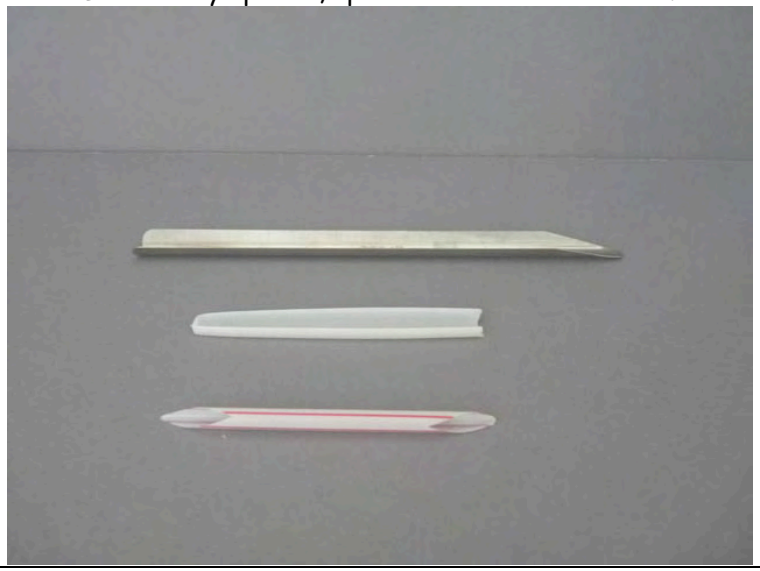
(S)he notes certain vocabulary words on the board to guide the students' observations.

After this discussion, the students are led to a similar

Test tubes or pill jar with 5 mL mark.



Laboratory spatula, spoon handle and cut straw.



experiment of their own with other substances.

Objectives:

- Measure a liquid (5ml);
- Use measurement instruments : graduated cylinder and eye-dropper;
- Note observations on the phenomena that occur;
- Become familiar with a new vocabulary.

Have the students come to the realisation that certain elements are soluble in water while others are not. With Grade 2 students, define the terms MIXTURES, HOMOGENOUS and HETEROGENEOUS, SOLUBLE and NONSOLUBLE.

See the theoretical capsule concerning these notions.

Here are some observations coming form children:

- The water is transparent (water + salt)
- The water is see through and the sand fell to the bottom
- The sugar disappeared (water + sugar)
- It's floating inside and we still see the pepper
- The water has gone into the couscous
- It's stuck to the sides (water + paprika)
- There are bubbles (water + detergent)

INTEGRATION

Activity 4

Objective: Observe that a soluble solid in too great a quantity will not disappear into water. The properties of the mixture are altered (colour, volume, smell, precipitate formation, viscosity, taste).

Material:

- **See Annex 1 – Preparation guide, page 7**
- **Student booklet, page 4**

Duration: 30 minutes

The teacher pours the same quantity of water into three glasses. (S)he pours three different quantities of powder into the glasses (see the guide for an idea of the quantities). Have the students observe the three mixtures with the following questions being used to guide the observation. The teacher can note the results of this discussion on the board.

- What do you notice?
- What differences are there between the glasses (colour, volume of the liquid)
- Which juice would you prefer to drink and why?

To make these observations, the students may smell, observe the colour, the presence of deposit, the increase in volume, the texture. It would be interesting to taste the mixture. This practice, however, is never undertaken in science for safety reasons. It is important to emphasize this to the children.

The students complete the student booklet using the notes taken during the discussion.

ACTIVITY 4

We have poured different quantities of flavour crystals into three transparent containers that contained the same amount of water.

Use a coloured pencil to represent the differences between each of the mixtures. Also note your observations.

With a little powder	With enough powder	With a lot of powder
		
_____ _____ _____	_____ _____ _____	_____ _____ _____

Which glass of juice would you want to drink? Why?_____

_____

_____

Place the following words in the correct spaces:
saturated, heterogeneous, soluble, homogenous, insoluble.

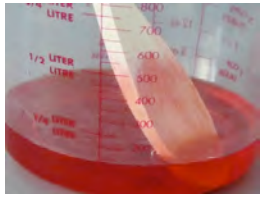
WHAT WE HAVE LEARNED

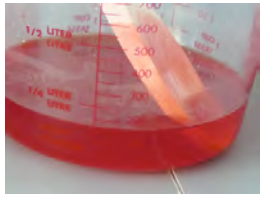
If a product disappears into a liquid, it is said to _____. If it does not disappear, it is said to be _____. If we had seen the product in the liquid the mixture is called _____. If we had not seen the product it is called _____. When there is too much product for a given quantity of liquid, we say the mixture is _____.

It could be interesting to transpose this demonstration into everyday life. Have the students bring up examples:

- When you put sugar in your cereal and there is a deposit in the bottom of the bowl;
- When your chocolate milk is too chocolaty or not chocolaty enough;
- When the soup has too much or not enough pepper.

Once the demonstration is finished, we can recuperate our saturated mixtures to make real lemonade or fruit punch, and drink it as a group.







We notice that the colour changes from one mixture to the next.

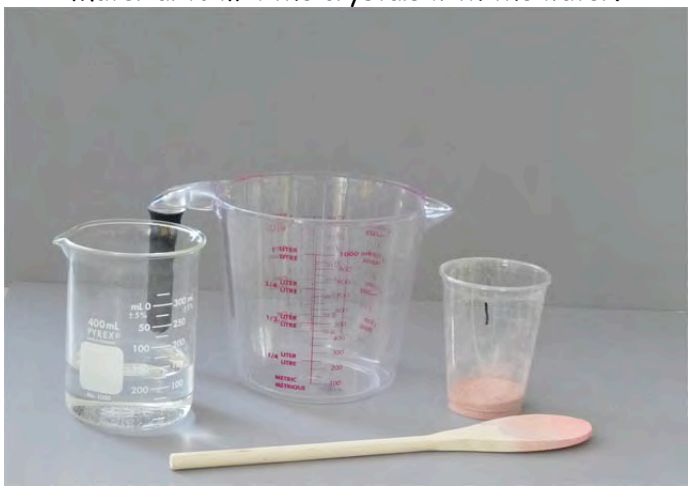
We notice that the volume increases from one mixture to the next.

We notice the deposit in the third mixture.

The three quantities of crystals to be added to 125 mL of water.



Material to mix the crystals with the water.



SITUATIONAL PROBLEM RELATED TO MATHEMATICS

Situation 1

Material:

- **Water pitcher**
- **The six glasses from activity 2**
- **Lemonade powder**

Duration: 30 minutes

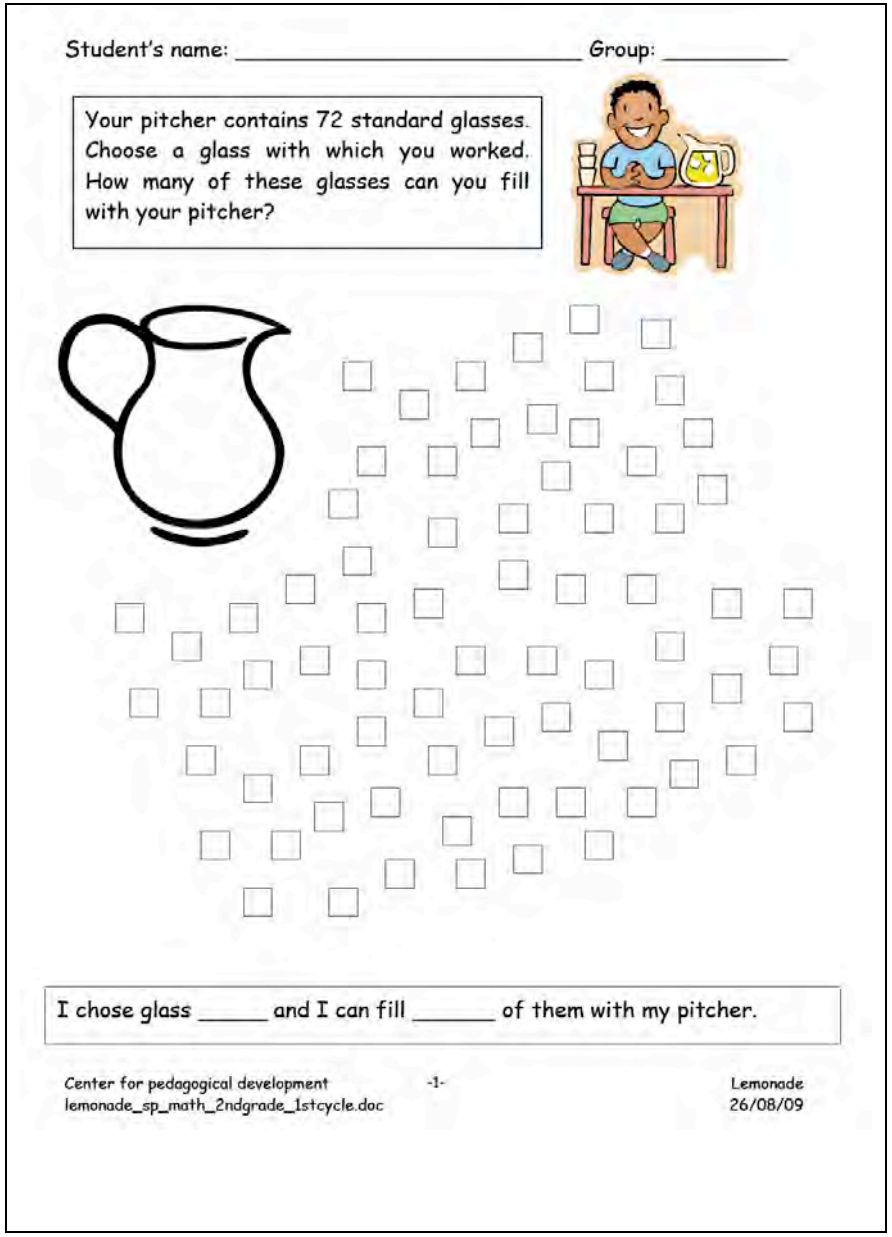
Following these manipulations, the student is ready to resolve the situational problems.

This mathematical situational problem can be adapted to the capacity of your pitcher. A 72 ounce pitcher offers interesting solutions to obtain whole numbers. (3, 4, 6 and 8 ounce glasses)

The teacher presents his pitcher. (S)he indicates to the students that the pitcher contains 72 standard glasses (standard glass). You make use this occasion to explain this scientific vocabulary word. (standard glass)

The students must resolve the mathematical problem. To resolve it, they may use all the manipulation material at their disposal.

Two possibilities are open to you. You may choose one or two glasses used in activity 1 (glasses that will allow division without a remainder) or allow the students to choose their own glasses.


Student's name: _____ Group: _____

Your pitcher contains 72 standard glasses. Choose a glass with which you worked. How many of these glasses can you fill with your pitcher?

I chose glass _____ and I can fill _____ of them with my pitcher.

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SITUATIONAL PROBLEM RELATED TO MATHEMATICS

Situation 2

Material:

- **Centicubes**
- **Tokens**
- **Money**
- **Drawing pencils**
- **etc.**

Duration: 30 minutes

This situational problem may be adapted to the time of year the activities take place. The numbers written on the file were tried in a regular group in September.

To resolve this problem, the students may use all the material manipulation material put at their disposal.

To go further in math following these activities:

- Estimate the dimensions of the glasses
- Compare non conventional units of measure
- Fractions in relation to the everyday life of the students

