What can you do with thumbtacks?

W. GEORGE CATHCART
Assistant Professor
University of Alberta
Edmonton, Alberta

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Many common objects which teachers usually have in abundance in their desk drawers can become very useful manipulative aids. What can you do with thumbtacks in a mathematics class? Here are some ideas.

WEIGHT

In the early grades, initial experiences with any kind of measurement should be in terms of nonstandard units. Thumbtacks can serve as a unit of weight. The following type of activity card might be used in Grades II to IV. Children should work in groups of 2 or 3 children each. A balance is required for this activity. If your school does not have a pan balance you can easily construct one with string, foil cupcake cups, masking tape, and a piece of wood 15" to 18" long. The following diagram illustrates the assembly of the balance.
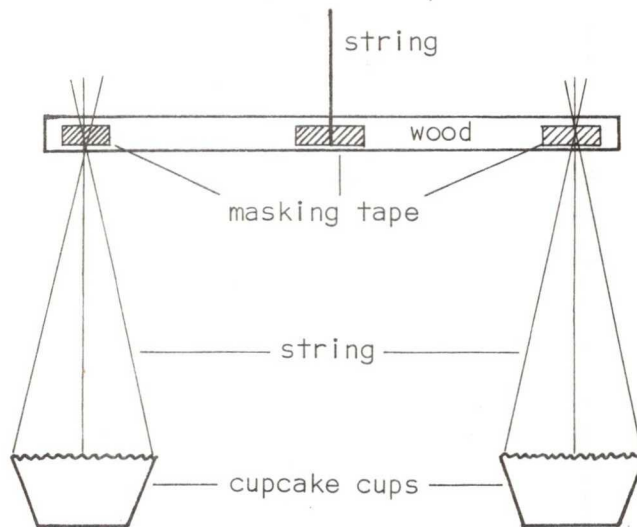
TACK WEIGHT

Objective: To provide initial experiences with measurement of weight.

Materials: Box of thumbtacks, balance, penny, chalk, pencil, other light objects.

Directions:

1. How many thumbtacks does it take to balance the penny?
2. One penny weighs about _____ thumbtacks.
3. Guess how many thumbtacks each of the following weigh:
   (a) a piece of chalk.
   (b) your pencil.
4. Weigh the chalk and your pencil and compare the weight with your guess.
5. Find some other small objects and weigh them with thumbtacks.

You may want your students to record their findings in a table. Pupils should discuss the weight of their pencils. Why were there differences here?

If you want to develop the use of standard units, you could ask the students to find the weight of one thumbtack. Metric weights (grams) work best. Unless you have milligram weights, this becomes a problem-solving activity because children will have to find out how many tacks are required to balance the one gram weight and then divide to find the weight of one tack.

PROBABILITY

Thumbtacks can also serve as a useful aid in working with probability at the upper elementary or early junior high school level. A laboratory activity like the following could be used.

THUMBTACK PROBABILITY

Objective: To determine the probability of the different ways a thumbtack may land.

Materials: 10 identical thumbtacks, paper or styrofoam cup.

Directions:
1. Toss one thumbtack several times. What are the possible ways the tack can land?
2. Estimate how many times a thumbtack will land in each position if tossed 100 times. Record your estimate in the table below.
3. Put the 10 tacks into the cup. Shake and dump the tacks onto the table. Count how many landed in each position. Record your results. Repeat 9 more times.

Outcome (How landed)	Estimate	1	2	3	4	Experiment number 5	6	7	8	9	10	Total

4. How close was your estimate to your experimental result?
5. Find a thumbtack with a smaller head. Will this make a difference? Experiment to find out.
6. Obtain a thumbtack with a longer stem. Experiment to see if this makes a difference.
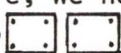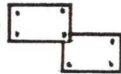7. What other things might change the probabiltiy?

PROBLEM SOLVING

We are constantly looking for ways to place children into meaningful problem-solving situations. The following problem[1] could arise from an art lesson when the children want to hang their product. The problem is based on the assumption that all the art is done on identical rectangular paper. This problem could be attempted by students from Grade I through Grades VI or VII.

PICTURE HANGING

Objective: To provide an interesting problem-solving opportunity.

Materials: Thumbtacks, rectangular paper, equilateral triangular paper.

Directions:
1. To hang one picture, we need 4 tacks, [▭] to hang 2 pictures, we could use 8 tacks, [▫][▫] although 7, [▫▭] , would do and even 6, [▭▭]

2. Every picture must be fastened by 4 tacks, one through each corner; no drawing may be covered by another except along the edge.

3. Complete the following table:

Number of pictures	Number of ways to hang	Smallest number of tacks needed	Largest number of tacks needed
1			
2			
3			
4			
5			
6			

4. Suppose your pictures were shapped like an equilateral triangle, △ . Make a table like the one in number 3 for triangular pictures.

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[1]This problem is adapted from Ernest R. Ranucci, "Thumb-Tacktics", *The arithmetic teacher*, 1969, 16, pp.605+.

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FIGURATE NUMBERS

When your class is studying some topics from number theory, you could have one group of 2 or 3 children outline with tacks the triangular number on the bulletin board. (See Figure 1) Another group could illustrate the square numbers (Figure 2). If you have students who show a keen interest in figurate numbers, you could challenge them to find the series of pentagonal and hexagonal numbers and represent these on the bulletin board with thumbtacks.
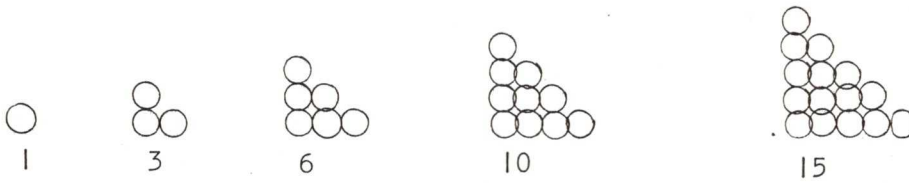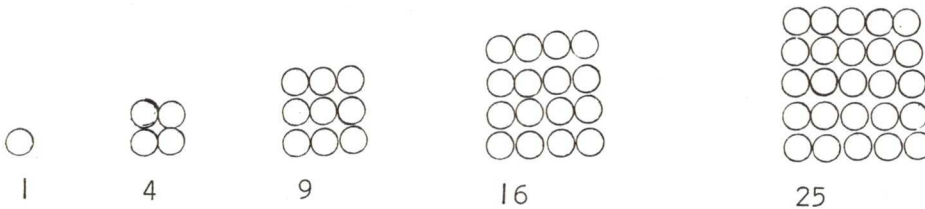

Figure 1   TRIANGULAR NUMBERS

Figure 2   SQUARE NUMBERS