We have outlined a proof for a beautiful theorem concerning a triangle inscribed in a circle and the tangents at the vertices and have suggested that it is also a special case of the more general Pascal Theorem. Along the way were mentioned perhaps less well-known theorems about inscribed pentagons and quadrilaterals. We hope that we have been encouraged to look for a certain "genealogy" of theorems elsewhere.

A REFERENCE

Watson, Emery Ernest and Watson, Margaret Marie. Elements of Projective Geometry. Boston: D.C. Heath and Co., 1935.

HOW MANY BEANS IN THE JAR?
NON-COMPUTATIONAL ESTIMATION ACTIVITIES FOR ELEMENTARY TEACHERS

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Non-computational estimation can help children to solve problems at very early ages, especially because there are many problems in life which do not require computation or where computation is less efficient or inappropriate. It closely parallels the problem solving strategy of Guess and Check. Students estimate and then verify their guess by counting concrete objects or measuring with standard unit devices (rulers, scales, stopwatches, etc.).

Proficiency in non-computational estimation is related to a technique used in behavior modification. After all, learning can be defined as a change in student behavior. With each repetition, the student makes successively closer approximations of the desired behavior. For example, a child makes an educated guess. Then, upon checking the guess against a standard, the child is able to form a benchmark in her mind, so that she will be able to come closer to the actual measure on her next try at a similar task.

The more trials the child makes, the better she will become at the given estimation task.

Estimation can be learned only by doing! In more familiar terms, "Practice makes perfect" or "If at first you don't succeed, try, try again!" Some techniques can make the process easier for children. Estimation of the number of items in a set can be made simpler by placing the objects in some kind of order, such as an array. Also, sample units of measure (e.g., weights from a balance scale) and reference measures allow the child to start from a benchmark, rather than creating her own. Some examples of reference measures follow.

5 grams - nickel

1 gram - raisin, paper clip (depending on the size and thickness)

1 kilogram - the weight of half a 2-liter bottle of soda pop (1 liter bottles are sometimes available), the approximate weight of a quart of milk (carton and all).

1 liter - a half-full 2-liter bottle of soda pop, a quart carton of milk filled to the very top

1 centimeter - the width of a fingernail

1 decimeter - the distance across the palm of your hand

Most children enjoy the ability to handle concrete objects as they learn to estimate. This is natural if we remember that elementary school children are, by and large, at Piaget's concrete operational stage (Carin and Sund, 1980). Therefore, these types of learning activities are more enjoyable, not only because they are a break from the typical paper and pencil mathematics activities, but because they meet the children's learning styles. If you subscribe to the notions that children naturally like to learn and that they can learn about their environment on their own or from their peers, then estimation activities should fit your teaching style. Try some!

SUGGESTED ACTIVITIES:

1. Estimate the number of beans or other objects in a set. Vary the number, size, and position of the objects.
2. Pair students off. Have one student draw a line segment on a sheet of paper for the other to estimate its length. Verify. Then trade responsibilities and repeat several times.
3. Estimate the length or heights of objects around the interior and exterior of the school. Verify and repeat.
4. Estimate and verify the weight of objects found around the home or school.
5. Estimate different lengths of time (one second, ten seconds, thirty seconds, one minute).
6. Estimate the amount of time it takes for an event to occur.

REFERENCES

Carin, Arthur A. and Robert B. Sund. Teaching Science Through Discovery. Columbus: Merrill Publishing Co., 1980, p. 21.

ARE YOU USING YOUR MATHEMATICS TEACHING TIME EFFICIENTLY?

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The following discussion between two high school students was overheard in their school cafeteria.

Pam: Oh, I hate my mathematics class. It's so boring. All we ever do is the same old thing.