angles 90, 60 and 30 degrees. The sum of the angles is 180 degrees in each case. Mark the midpoint of the base of the triangle D. In a triangle with angles measuring 90, 60 and 30 degrees, the longer side is always twice as long as the shortest side. Show this by folding. See Fig. 2.

Area of a Parallelogram

A parallelogram is a quadrilateral whose opposite sides are parallel. Cut out a parallelogram as shown in Fig. 3a. To show that the area of this figure is the base times the altitude, fold the end of the parallelogram to form a right triangle as shown in Fig. 3b. Cut along the fold and fit onto the other end to form a rectangle.

Any triangle is always of equal area to a parallelogram having a base equal to that of the triangle. Cut out a triangle and then a parallelogram with a base equal to that of the triangle and an altitude half that of the triangle. Fold the triangle as you did before to find the area and fold and cut the parallelogram to find its area. Do the areas seem to be the same?

Make a Six-Pointed Star

Can you make a six-pointed star from a circle? See Fig. 4.

Cut out a circle and fold at a diameter and crease. Open it up again and fold another diameter. Where the two folds intersect is the center of the circle. Now fold a chord AB so that its arc touches the center of the circle. Crease. Fold another chord BC to the center as before, and a third CA. Fold the vertex of each of the angles thus formed to the center of the circle and you will have three new angles. The vertices of these six angles form the points of the star.

From the star, fold a hexagon or a six-sided figure.

Knots Form Geometric Shapes

Take a fairly long half-inch strip of paper and tie a simple knot pressing the folds down carefully and you have formed a pentagon as shown in Fig. 5.

Take two one-half inch strips of paper of different colors and intertwine them as in Figs. 6a and 6b. Secure the knot carefully and flatten, forming a hexagon. More complex polygons can be formed by more complicated knots. How many persons think of knots in terms of geometric shapes? This subject should be a challenge to many.

Parallel Sides of a Triangle

If two triangles have two sides of one parallel to the corresponding two sides of the other triangle and straight lines can be drawn from an external point through their vertices, then the third sides of the triangles are parallel to each other.

Take a sheet of paper and fold along the heavy lines as indicated in Fig. 7, being sure that lines FE and IH are parallel and EG and HJ are parallel. Now fold along the dotted lines FG and IJ. These lines should also be parallel.

Measure the angles of the two triangles with your protractor. What significant relationship do you find in the angles of triangles whose corresponding sides are parallel?

Construct an Octahedron

Three-dimensional forms of solid geometry also can be constructed by paper folding. A simple structure is shown in Fig. 8. By cutting out and folding along the lines as shown in the diagram, an eight-sided structure or octahedron is formed.

Paper folding is not the only method of constructing three-dimensional geometric shapes. Making geometric models with cardboard, glue and other equipment is an elaborate art that has been highly developed. Beautiful intricate shapes in different colors have been created.

Other means of constructing three-dimensional shapes have been devised, such as toothpicks or similar sticks and preformed joints or modeling clay. Basic geometric solids including cones and cylinders are on the market to help the student. Models built by the students themselves, however, seem to be the most helpful.

Fold an Algebraic Equation

Even algebraic expressions can be demonstrated by paper folding.

Take the equation (a + b) squared = a squared + 2ab + b squared. Cut a square piece of paper. Fold down one side parallel to the edge. Fold down an equal distance in the other direction as shown in Fig. 9.

Mark the sections as shown in the diagram. Cut out each section and arrange the pieces according to the equation and the relationship becomes immediately evident.

Much learning by children is through doing and feeling. A creative teacher can devise paper folding problems of his own to explain geometric principles where concrete illustrations will help.

For those interested the necessary materials for mathematical paper folding and a series of experiments that can be worked out at home or in the classroom, unit No. 267 of THINGS of science is available at 75¢ each, from Science Service, 1719 N St., N.W., Washington 6, D. C.

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PUBLIC SAFETY

Food Stockpiling Urged

Following an atomic attack, farm production will drop to about one-fourth of normal and it is imperative to stockpile a sufficient food reserve, says a California scientist.

➤ MASSIVE stockpiling of fuel and food for use after an atomic war is advocated by Dr. Albert Bellamy, professor of biophysics, emeritus, at the University of California, Los Angeles.

Dr. Bellamy is a former chief of the radiological section, California Office of Civil Defense, and is a consultant to the civil defense liaison branch of the Atomic Energy Commission's division of biology and medicine.

He points out that non-military defense systems against nuclear attack should be considered in two broad phases:

1. Casualty prevention during the acute phase of nuclear attack.
2. Acceleration of national recovery during a much longer post-attack period.

The first phase, perhaps a two-week period concerned with blast-resistant fallout shelters and emergency supplies, has been widely discussed. But the second phase, which may extend over a period of several years, has received little attention.

"Surviving populations in and near our great cities and industrial centers are likely to be greeted with scenes of destruction not unlike those of Hiroshima and Nagasaki," Dr. Bellamy says.

"On the other hand, people in rural areas and smaller communities are likely to emerge from fallout shelters into familiar and undamaged surroundings.

"But because today's agriculture depends to a large extent on machines—such as tractors and trucks—agriculture will be at a virtual standstill because of lack of gasoline and diesel supplies. Petroleum fuels, therefore, should be stored where they will be available to run agricultural and transport equipment."

Quoting figures developed by Dr. Perry R. Stout, professor of soil science and chairman of the department of soils and plant nutrition of the University of California, Davis, Dr. Bellamy says that following an atomic attack, farm production will fall to about 29% of normal.

It is imperative, he points out, to stockpile a food reserve that will last two years or more—within walking distance of population centers and near drinking water. It is estimated that 750 pounds of supplementary dried food, which could be stored in a cube two feet, eight inches on a side, would be sufficient to keep an individual alive for the two-year period.

"We should not rely on reserves alone in stockpiling either fuel or food to sustain the population in the post-attack phase, but should strive for a balanced development of both categories," the UCLA biophysicist says. "There are far too many unforeseeable variables for us to risk being too little with too late."

He points out that stockpiling can be accomplished without undue economic strain. For many years we have been underwriting the costs of producing and storing many kinds of foods.

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