

**FRANKLIN MATH BOWL
PROBLEM SOLVING TEST
6TH GRADE
2002**

1. A square has 2 diagonals and a pentagon has 5 diagonals. Draw the next 4 polygons and count their diagonals. If your pattern holds, how many diagonals would a 10 sided polygon have? Show all of your reasoning.

2. If A, B, and C are natural numbers with $A > B > C$ and

$$\begin{array}{r} ABC \\ -CBA \\ \hline CAB \end{array}$$

Find the values of A, B, and C. Explain how you made your choices for A, B, and C.

3. A sheet of paper is 8 inches by 10 inches. It can be made into a cylinder by taping the 8 inch edges together or by taping the 10 inch edges together.

Which method makes the cylinder with larger volume? What is the ratio of the volumes of the two cylinders?

FRANKLIN MATH BOWL
PROBLEM SOLVING TEST
7TH GRADE
2002

1. Nancy wants to place buttons spaced evenly on the button band of the baby sweater she is knitting. The first button is placed $\frac{3}{4}$ inch from the bottom of the band and the 6th goes $\frac{1}{2}$ inch from the neck edge. The button band is $8\frac{1}{8}$ inches long. Where should she place the buttons? Explain your reasoning.

2. If 27 cubes are stacked on the floor to form one large cube, how many of the small cubes can be seen while walking around the large cube (without using x-ray vision)? Explain how you arrived at your answer.

3. Mary tiled her bathroom floor that is 5 feet by 7 feet with tiles that are 1 foot by 1 foot. Once the tiles were in place she decided to find the center of the bathroom floor. To do this she drew diagonals on the floor of the room. How many tiles did she have to clean in order to remove one of the diagonals after she had located the center?
If the bathroom had been 15 feet by 21 feet, how many tiles would have been marked on when the first diagonal was drawn?

**FRANKLIN MATH BOWL
PROBLEM SOLVING TEST
8TH GRADE
2002**

1. A square is constructed with sides of length 12 inches. A line segment is drawn perpendicular to one pair of opposite sides, with endpoints on the opposite sides, and so that it is twice as far from one side of the square as it is from the opposite side of the square. The midpoint of this segment is marked and labeled P. How far is it from point P to the nearest vertex of the square?

2. A cube 2 inches by 2 inches by 2 inches is painted red and then cut into 8 cubes all of the same size. What are the dimensions of each of the smaller cubes? What percent of the total surface area of the 8 smaller cubes is painted red?

3. A set of numbers consists of: $1, x, y$ and $x + y$. If $1 < x < y < x + y$, what is the difference between the mean and the median of the set of numbers? Which is larger, the mean or the median?

**FRANKLIN MATH BOWL
ANSWER KEY
PROBLEM SOLVING TESTS
2002**

6TH Grade:

1. If the following pattern continues the polygon with 10 sides would have 35 diagonals.

Number of sides	4	5	6	7
Number of diagonals	2	5	9	14

2. $A = 9$, $B = 5$, and $C = 4$

3. When the height is 10 inches, the volume is $\frac{160}{\pi}$. When the height is 8 inches, the volume of $\frac{200}{\pi}$. The cylinder with height of 8 inches has the larger volume and the ratio of the volumes is 200:160 or 5:4.

7th Grade:

1. Buttons should be $\frac{3}{4}$ in, $2 \frac{1}{8}$ in, $3 \frac{1}{2}$ in, $4 \frac{7}{8}$ in, $6 \frac{1}{4}$ in, and $7 \frac{5}{8}$ in from bottom of band.

2. 25 cubes

3. 11 tiles and 33 tiles

8th Grade

1. The distance is the square root of 52 or approximately 7.2 inches.

2. The smaller cubes are 1 inch by 1 inch by 1 inch. 50% of the total surface area of the 8 small cubes is red.

3. The median is $\frac{x+y}{2}$. The mean is $\frac{1+x+y+x+y}{4}$. The difference is $\frac{1}{4}$ and the mean is larger than the median.

Algebra:

1. (0-21)

2. 96 is the perimeter of the picture. The picture is 26 inches tall.

3. $n = 0, 2, 4, 10, 16, 18$