# Math Awareness Week Competition
# 1998 Examination for 5th-6th Grades

1. How many different ways can a half dollar be made into change using any combination of pennies, nickels, dimes, and quarters?

2. The diagram showns a figure in which all the long sides are the same length and each is twice as long as each of the short sides. The angles are all right angles and the area of the figure is 200 in^2. What is the perimeter of the figure?
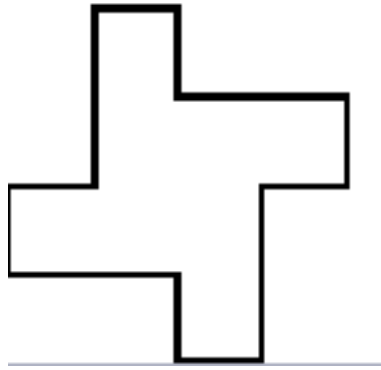
3. What day of the week is January 1, 2000?

4. A bag contains only blue balls and green balls. There are exactly 6 blue balls in the bag. The chances of drawing a blue ball at random is 1:4 (another way of saying this is that the probability of drawing a blue ball at random is $\frac{1}{4}$). What is the number of green balls in the bag?

5. I walk at 4 miles per hour and run at 6 miles per hour. I find I can save 3 minutes and 45 seconds by running instead of walking to school in the mornings. How far do I live from school?

1998 Examination for 7th-9th Grades

1. A 25 foot ladder is placed against a vertical wall of a building. The foot of the ladder is 7 feet from the base of the building. If the top of the ladder slips 4 feet, the foot of the ladder will slide how many feet?

2. The rails on a railroad are 30 feet long. As the train passes over the point where the rails are joined, there is an audible click. The speed of the train in miles per hour is an integer. How long (in terms of seconds) must we count the number of clicks so that the number of clicks is the same as the speed of the train?

3. The figure shown maybe folded along the lines to form a cube. What is the largest sum of three numbers whose faces come together at a corner?
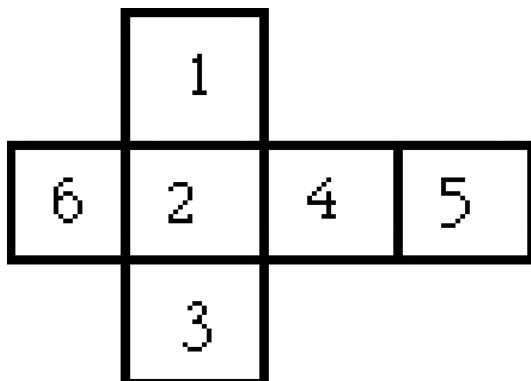

4. Ten balls numbered 1 to 10 are in a jar. Jack reaches into the jar and randomly removes one of the balls. Then Jill reaches into the jar and randomly removes a different ball. Find the probability that the sum of the two numbers on the balls removed is even.

5. Find the sum of the digits in the answer to

where a string of 98 nines is multiplied by a string of 98 eights.

1998 Examination for 10th-12th Grades

1. If $\tan x + \tan y = 25$ and $\cot x + \cot y = 30$, what is $\tan(x + y)$?

2. Start with a square. Connect the midpoints and vertex as shown in the figure. Compute $\sin\theta$.
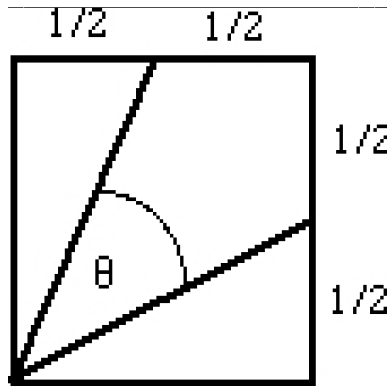
3. Instead of walking along two adjacent sides of a rectangle field, a boy took a short-cut along the diagonal of the field and saved a distance equal to $\frac{1}{2}$ the longer side. Find the ratio of the shorter side of the rectangle to the longer side.

4. The complex number z satisfies $z + |z| = 2 + 8i$. What is $|z|^2$? Note that if $z = a + bi$, then $|z| = \sqrt{a^2 + b^2}$.

5. If r and s are roots of the equation $ax^2 + bx + c = 0$, find the value of $\frac{1}{r^2} + \frac{1}{s^2}$ in terms of a, b, and c.