Note: All answers should be expressed as exact values where possible. Examples: sqrt(2) (not 1.414), 1/3 (not .3333). Scientific, non-programmable, calculators are permitted.

1. How many squares are there in the figure below?

Answer: 31

2. For all positive integers n, the symbol n! denotes the product of the first n positive integers.
   Example: 4! = 4x3x2x1=24

   Find the value of n for which (3!)(5!)(7!) = n!

   Answer: 10

3. Given January 1st, 2007 fell on a Monday, which day of the week will occur most frequently in 2009?

   Answer: Thursday

4. How many regions is a sphere divided into by four great circles, where no more than two great circles intersect at any single point?

   Answer: 14
5. A man has three children. He tells a census-taker, who has come to his door, that the product of their ages is 72 and the sum is the same as his house number. The census-taker looks at the number on his house and says, “I still need more information.” The man replies, “Of course. I forgot to tell you that my oldest child loves cherry pie.” The census-taker immediately writes down the ages of the three children. What is the man’s house number?

Answer: 14

6. It takes 852 digits to number the pages of a book consecutively. How many pages are there?

Answer: 320

7. A traveler at Pearson Airport has time on her hands between flights, so she decides to conduct an experiment on one of the moving walkways. She finds she can walk the length of the walkway, moving in its forward direction, in 1 minute. Walking at the same rate against the forward direction of the walkway, it takes her 3 minutes to cover the same distance. How long would it take her to cover one length of the walkway if the walkway were to stop?

Answer: 1.5 minutes

8. You are given a square, each of whose sides measure x meters. If the corners of the square are cut off so that a regular octagon remains, how long is each side of the resulting octagon in terms of x?

Answer: (sqrt2-1)x meters

9. An ant of negligible dimensions starts at the origin (0,0) of the standard two-dimensional rectangular coordinate system. The ant walks one unit right, then one-half unit up, then 1/4 unit left, then 1/8 unit down, etc. In each move, it always turns counter-clockwise at a 90 degree angle and goes half the distance it went on the previous move. Which point (x,y) in the xy-plane is the ant approaching in its spiraling journey?

Answer: (4/5, 2/5)

10. If you multiply two whole numbers together, the last digit of the answer will be a number between 0 and 9. What is the probability of the most likely number? Express your answer as a percentage, where 100% probability means that a certain number will always appear as the last digit and 0% probability means that a certain number will never appear as the last digit.

Answer: 27%