Bull's-eye, Page 1: Combinatorics and Numbers

1. What is the smallest positive integer which is *not* a factor of 25! ?

   1. _____

2. Richie has one penny, two nickels, and three dimes. How many different amounts of money can he make using one or more of these six coins?

   2. _____ amounts

3. The picture below shows 7 stools arranged in a row. Initially they were all unoccupied. Alfie chose a stool at random and sat down. Then Beti chose an empty stool at random and sat down. What is the probability that Alfie and Beti chose stools that are next to each other? Express your answer as a common fraction.
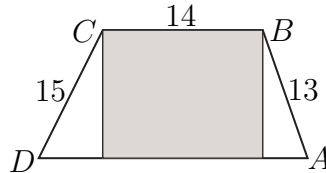
   3. _____

   ⬤ ⬤ ⬤ ⬤ ⬤ ⬤ ⬤

4. Suppose that we write $(2 \times 2007)^2$ as $a_1 \times a_2 \times \cdots \times a_n$, where a_1, a_2, ..., a_n are prime numbers, not necessarily distinct. What is the value of $a_1 + a_2 + \cdots + a_n$? Note that 1 is not a prime.

   4. _____

Bull's-eye, Page 2: Problem Solving

5. Alicia's heart beats 50 times per minute when she is asleep, and 70 times per minute when she is awake, except that it beats 90 times per minute when she is doing mathematics—which she never does while she sleeps. In the last 24 hours, Alicia slept for 8 hours, and did mathematics for 8 hours. What was Alicia's average number of heart beats per minute over the last 24 hours?

5. _____ beats/min

6. Every week, Alfie works 20 hours at Burper Queen for $6.50 per hour, and 20 hours at Florida Fried Fat for $6.00 per hour. How many weeks of work will Alfie need in order to pay his $4500 university fees?

6. _____ weeks

7. Alphonse and Beth drove on the freeway, in separate cars, from Miniburg to Microville. They left Miniburg at the same time. Alphonse drove at a steady 90 km per hour, and Beth drove at a steady 80 km per hour. Alphonse arrived in Microville 10 minutes before Beth did. What is the freeway distance from Miniburg to Microville?

7. _____ km

8. Alicia is driving at 60 miles per hour. How many feet does she drive per second? (There are 5280 feet in 1 mile.)

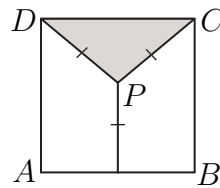8. _____ feet/sec

Bull's-eye, Page 3: Geometry

9. In the diagram below, which is not drawn to scale, the shaded rectangle has width 14 cm and height 12 cm, and is contained in trapezoid $ABCD$. Given that $AB = 13$ cm, $BC = 14$ cm, and $CD = 15$ cm, what is the perimeter of trapezoid $ABCD$?

9. _____ cm

10. A spruce plank which is $18\,$cm wide, $100\,$cm long, and $2\,$cm thick weighs $1.62\,$kg. What is the weight, in kg, of a spruce plank which is $12\,$cm wide, $200\,$cm long, and $2\,$cm thick? Give your answer as a decimal, to the nearest hundredth of a kg.

10. _____ kg

11. In the figure below, $ABCD$ is a square, and P is a point inside the square such that the distances from P to C, to D, and to AB are all equal. What fraction of the area of the square is shaded?

11. _____

12. The figure below is a quarter-circle with center O and radius 12. Point M bisects the line segment OP. Point N is on the quarter-circle, with $\angle NOP = 30°$. What is the area of the shaded region? Express your answer in terms of π

12. _____ units^2