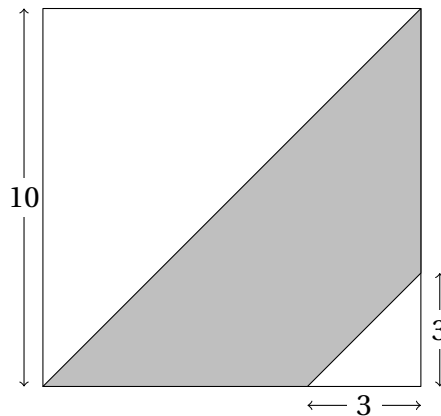


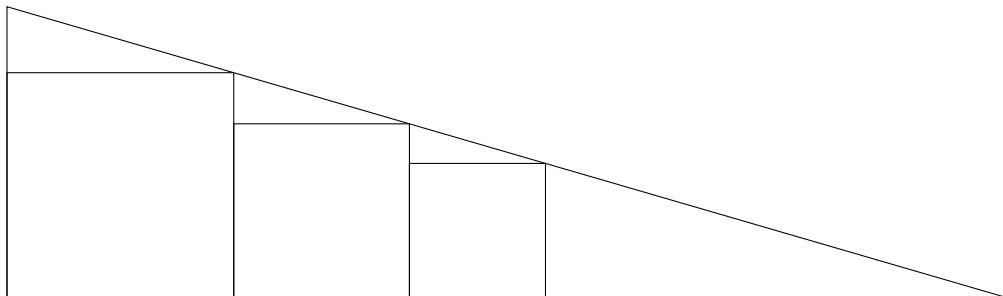
**EASY: 2 points each**

- 1 A palindrome is a number which reads the same left to right as it does right to left. How many distinct three-digit palindromes are there that do not contain the digit 7?
- 2 Your goal is to form a 24-letter word using the letters of the word *EXTRAVAGANZA*. How many such words, whether existent or non-existent, can be formed if you are allowed to repeat all the letters as many times as you want?
- 3 Zane plays against Amy in a game with twelve rounds. In each round, the winner scores 5 points and the loser scores 3 points. At the end of the game, Zane's total score is 44 points. How many rounds did Amy win?
- 4 Gisel and her hamster walk home from school. It takes Gisel 36 minutes at a constant rate, and her hamster walks twice as fast as her. They start together, but the hamster returns to meet Gisel after it reaches home. After meeting Gisel, the hamster walks home again and turns back to meet Gisel again. Gisel starts at noon to walk home. After how many minutes does she meet the hamster for the second time?
- 5 All the sides of a pentagon are increased by 50%. What is the percent increase in area?
- 6 Evaluate  $1 + 2(1 + 2(1 + 2(1 + 2(1 + 2(1 + 2(1 + 2(1 + 2))))))$ .
- 7 What is the 2012th term of the sequence 2, 1, 3, 2, 4, 3, 5, 3, 6, ...?
- 8 Find the area of the shaded region in the square in the figure.



**AVERAGE: 3 points each**

- 1 Three squares are placed side by side inside a right triangle as shown. The side of the largest square is 20 and the side of the smallest is 12. What is the area of the middle square?



- 2 There are 100 pebbles in a fishbowl. Half of the pebbles were thrown outside. Half of the remaining pebbles were placed on a shelf. A fifth of the pebbles on the shelf were placed back in the fishbowl. All of the pebbles in the fishbowl were thrown outside. What is the difference between the number of pebbles thrown outside and the number of pebbles on the shelf?
- 3 Four years ago, my age was one-third the age of my brother Michael. Two years from now, his age will be twice my age. How old will I be 6 years from now?
- 4 A goat is tethered outside a fence in the shape of a regular hexagon, with side length 12 m. The cord is 12 m long and connected to one corner of the fence. What is the greatest area in which the goat can move around?
- 5 When 8 is added to both numerator and denominator of a fraction, the resulting fraction is  $\frac{5}{7}$ . When 4 is subtracted from both numerator and denominator of the same fraction, the result is  $\frac{1}{2}$ . What is the fraction?

**DIFFICULT: 5 points each**

- 1 Six standard dice are placed adjacent to each other in a straight line such that each one of the faces 1, 2, 3, 4, 5, 6 appears on top exactly once. Find the smallest possible sum of the twenty visible faces (i.e. excluding the bottom faces). Note that in a standard die, the sum of opposite faces is always 7.
- 2 September 22, 2012 is a Saturday. On what day will September 22, 2080 fall?
- 3 Mr. Burttt drove from home to the office at an average speed of 75 kph. But before he left the car, he remembered that he needed to buy something at a department store. He drove from the office to the department store at an average speed of 50 kph. If the distance he drove from the office to the department store is twice that of the distance of home to the office, what was his average speed for the whole journey?
- 4 A stack of blocks has six levels. Each of the first five levels has exactly half as many blocks as all the other levels below it. What is the smallest number of blocks the pyramid could possibly have?
- 5 In Zoolandia, there is a square cage that has 9 male lions. They are tied up in a certain spot in the figure\* so that the fighting between the lions will be avoided. Using two additional square cages (not necessarily of the same area), how can the owner of Zoolandia give each lion a personal cage?

**VERY DIFFICULT: 8 points each**

- 1 Simplify  $\frac{2012^{n-2} + 2012^n}{2012^{n-1}}$ .
- 2 The vertices of an equilateral triangle coincide with the vertices of a cube. If the perimeter of the equilateral triangle is  $9\sqrt{2}$  units, find the volume of the cube.
- 3 Right triangle  $ABC$  has vertex at  $B$  and has  $\angle BAC = 20^\circ$ . Let  $D$  be the point on  $AC$  such that  $AD = 2BC$ . Let  $M$  be a point on segment  $AB$  such that  $\angle DMA = \angle CMB$ . Find  $\angle DMC$ .

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\* Sadly, the figure was not part of the document that I have.