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2007 MathEdge+ Advanced Level Contest

Please box the answer. No partial credit will be given. Only correct answer counts. No Calculator. 50 mins.

1) What is the remainder when 100000000001 is divided by 3?

2) Find the unit digit of 7 x 9 x 11 x … x 2003 x 2005 x 2007.

3) A book requires **4221** digits to number the pages starting with page 1. How many pages does this book contain?

4) How many digits are there when the product of $3^3 \times 4^5 \times 5^{13}$ is written in decimal notation?

5) Two prime numbers P and Q have the property that both their sum and their difference are again prime numbers. What are P and Q?

6) How many 5-digit positive integers have the property that all their digits are odd and the product of the digits is not a multiple of 5?

7) Let x be a positive integer. If the least common multiple (LCM) of 2002 and x is 30030, how many different possible values of x are there?

8) Alisa's phone number is a 7-digit number where each digit is greater than each of the digits to its left. Her phone number doesn't start with 0 or 1. How many different phone numbers can be her phone number?

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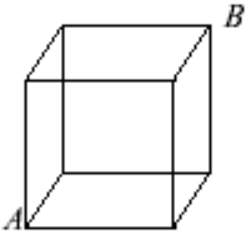
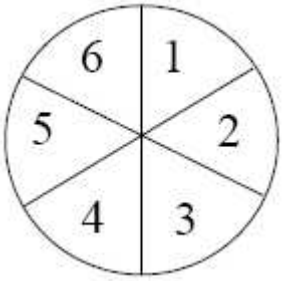
9) Elsa takes 1.5 times as long as her brother to eat a pizza. If they share a pizza (each eating at their own rate) they would take 10 minutes. How long (in minutes) would it take Elsa to eat the pizza all by herself?

10) A and B are riding bicycles around a circular track starting at the opposite side of the circle (i.e., at the two endpoints of a diameter) and at the same time. If both of them ride in the same direction, they will meet after 80 minutes. If both of them ride facing each other, they will meet after 10 minutes. A is riding faster than B at a constant speed of 36km/hr. Assume also that B is riding at a constant speed. What would be B's speed?

11) How many shortest distances along the edges of the cube are there that connect vertex *A* with the opposite vertex *B?*



12) A pizza is cut into six pie-shaped pieces. John can choose any piece to eat first, but after that, each piece he chooses must have been next to a piece that has already been eaten (to make it easy to get the piece out of the pan). In how many different orders could he eat the six pieces?



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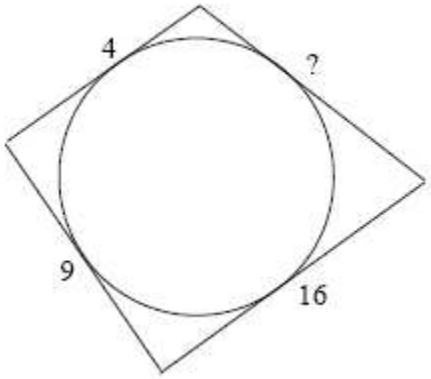
13) Amy, Bart and Carol are eating carrot sticks. Amy ate half the number that Bart ate, plus one-third the number that Carol ate, plus one. Bart ate half the number that Carol ate, plus one-third the number that Amy ate, plus two. Carol ate half the number that Amy ate, plus one-third the number that Bart ate, plus three. How many carrot sticks did they eat altogether ?

14) A quadrilateral circumscribes a circle. Three of its sides have length 4, 9 and 16 cm, as shown. What is the length in cm of the fourth side?



15) Len eats a meal at a restaurant and then gets his bill. He also has a gift certificate that he could use to reduce his bill. He notices that if he uses the gift certificate and then adds on a tip of 20% of the reduced bill, the new total is exactly $1 less than the original bill; however if he adds on 25% of the reduced bill instead, the new total is exactly $1 more than the original bill. How much is the gift certificate worth?

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16) Garg and Singh played 10 games of badminton together. In each game, whoever scores 15 points is the winner (i.e. the winner need not win by at least two points). It turned out that Garg won more games than Singh did, but Garg got fewer total points than Singh did. What is the largest possible total number of points Garg could have?

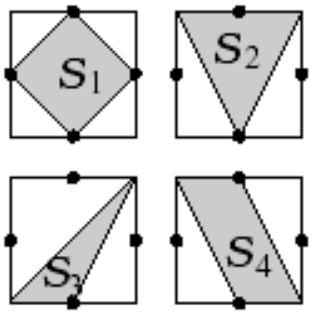
17) Notice that $\frac{1}{2}-\frac{2}{6}=\frac{1}{6}$. What number A makes the equation $\frac{2}{3}-\frac{3}{A}=\frac{2}{A}$ true?

18) How many different three-digit numbers divisible by 25 can be made with the digits 0, 3, 5, 7 if the digits can be repeated?

19) Who is right?
Andy: "The largest number possible has 0 as the last digit."
Bill: "The largest number is googolplex."
Clark: "The largest number possible has 1000 digits."
Danny: "The largest number possible has all 9's."
Elvis: "The largest number possible cannot be written."

20) There are four congruent squares. In each of them the midpoints of the sides are indicated and some regions with areas S_1, S_2, S_3 and S_4 are shaded. Which expression below is true?

A) $S_3 < S_4 < S_1 = S_2$ B) $S_3 < S_1 = S_2 = S_4$
C) $S_3 < S_1 = S_4 < S_2$ D) $S_3 < S_4 < S_1 < S_2$
E) $S_4 < S_3 < S_1 < S_2$



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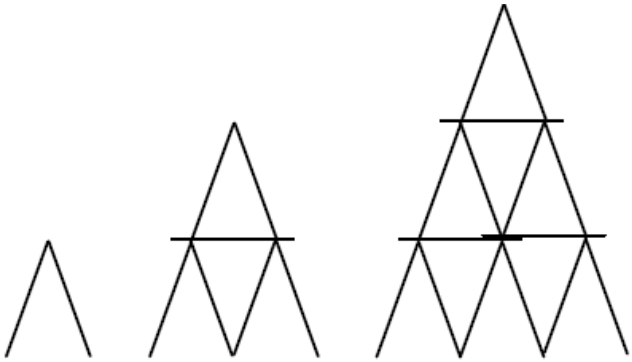
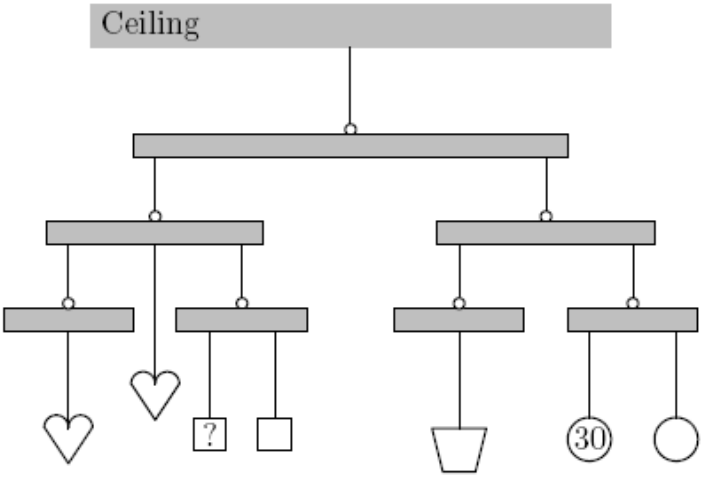
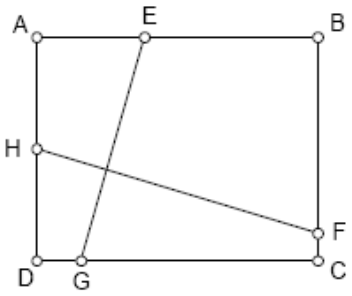
21) Johnny builds a house made out of cards. In the picture, one-floor, two-floor, and three-floor such houses are shown. How many cards does Johnny need to build 4-floor house?



22) The weights in the figure are in balance. The same shapes have the same weight. The weight of each circular shape is 30 ounces. What is the weight of the square shape indicated with the question mark?



23) In the figure, ABCD is a rectangle. E, F, G, H are points on AB, BC, CD, DA respectively with EG = 3, FH = 4 . Find the largest possible perimeter of the rectangle.



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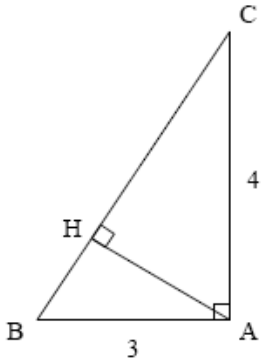
24) Let ABC be the right triangle with AB =3, AC =4. Find the length of the altitude AH from A to BC.



25) Two of the numbers located on the two circles (see the picture) are represented by letters A and B. The sum of the numbers on each circle is equal to 55. What number is represented by letter A?