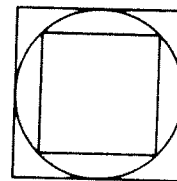


EMMY NOETHER MIDDLE SCHOOL MATHEMATICS DAY
Texas Tech University
May 12, 2010

Write your name, the name of your school and your current grade level on the front of the blue book. Show your reasoning and clearly indicate your answer to each problem. Each problem is worth 10 points. You should justify your answer in order to receive full credit. It is possible to receive partial credit. If you are not sure how to approach a problem, you are strongly encouraged to experiment and to try to discover. There are prizes for the best score from each school as well as for the best score at each grade level.

- 1.) The floor of a square room is covered by square tiles each one foot on a side. On the two diagonals of the room there are a total of 49 squares. What is the area of the floor of the room? (It may be helpful to draw a picture of the tiles on the floor and of the two diagonals.)
- 2.) The number 12 is exactly four times the sum of its digits. So is the number 24. Determine a positive integer (whole number) which is exactly twice the sum of its digits? Is your answer the only one? Either show that there are other such numbers or show that your answer is unique.
- 3.) A newspaper consists of nested double sheets of paper, folded such that there are four pages printed (including front and back) on each double sheet. Pages 6 and 19 are printed on the same double sheet. How many pages are in the newspaper?
- 4.) Several puppies are playing. All of the puppies have some white on their coats, either on their paws, on the tip of their tail or around their neck. Nineteen of the puppies have white paws (possibly with white elsewhere). Twenty of the puppies have white tips to their tails (possibly with white elsewhere). Eighteen of the puppies have white around their neck (possibly with white elsewhere). Twelve of the puppies have both white paws and white tips to their tails (possibly with white elsewhere). Eleven of the puppies have white paws and white around their necks (possibly with white elsewhere). Thirteen of the puppies have white tips to their tails and white around their necks (possibly with white elsewhere). Seven of the puppies have white paws, white tips to their tails and white around their necks. How many puppies are there in total?
- 5.) A square is inscribed in a circle and another square is circumscribed around the circle, as illustrated in the figure at right. The inner square has area 16. What is the area of the outer square? What is the radius of the circle?



- 6.) The Apollo 13 spacecraft had an explosion on April 13, 1970, while on the way to the Moon. Fortunately the crew was able to safely return to Earth. The 40th anniversary of this explosion occurred this year on Tuesday April 13, 2010. On what day of the week did the Apollo 13 spacecraft explosion occur? You must indicate reasoning (not just a guess or claimed answer) in order to receive full credit. Remember to account for leap years.