

EMMY NOETHER MIDDLE SCHOOL MATHEMATICS DAY
Texas Tech University
May 6, 2009

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. 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.

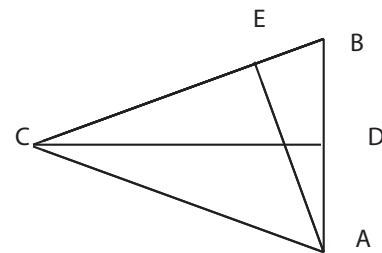
- 1.) A store has shoes marked to sell at 20% more than the shoes cost the store. Joan uses a 15% off marked price coupon and buys the shoes for \$1.00 more than they cost the store. How much did Joan pay for the shoes?

- 2.) Susan has 13 coins, each of which is either a penny (1 cent piece), dime (10 cent piece) or quarter (25 cent piece). The total value of the coins is \$0.97. How many of each type coin (penny, dime and quarter) does Susan have?

- 3.) How many three letter words can be formed from the letters T E X A S T E C H? A word is any ordered sequence of three letters from the above collection, e.g. HST. A "word" does not necessarily have "meaning" in any particular "language."

- 4.) Determine the exact number of degrees in the smaller angle between the hour and minute hands of an analog clock at 1:24. Remember that there are 360° in a complete circle. Assume that each hand moves at a uniform constant angular rate. Thus the hour hand moves uniformly between 1 and 2 on the clock face between 1:00 and 2:00, being a proportionate angle between them at 1:24.

5.) Triangle ABC is illustrated at right. Line segment AE is perpendicular to side CB and line segment CD is perpendicular to side AB . Prove that angle EAB equals angle BCD ($\angle EAB = \angle BCD$). Remember that the sum of the angles for every triangle is 180° .



6.) The crew of Apollo 11 made the first human landing on the Moon on July 20, 1969. The 40th anniversary of this event will occur this year on Monday July 20, 2009. On what day of the week did the Apollo 11 spacecraft land on the Moon? You must indicate reasoning (not just a guess or claimed answer) in order to receive full credit. Remember to account for leap years.