Quiz 1

1. **(25 points)** A shipment consists of 160 items: 40 items are oversized, 20 are undersized, and 100 meet the specifications. Suppose that two items are drawn at random without replacement. Calculate the probability that both items are undersized or both are oversized.

2. **(25 points)** Twenty five athletes hope to win a medal (either gold, silver or bronze) in a competition at the Winter Olympics. All of the 25 athletes have approximately the same ability.
   a. **(10 points)** How many different arrangements of medal winners can occur?
   b. **(15 points)** If three of the athletes are good friends, what is the probability that they will win at least one medal?

3. **(25 points)** The mass fraction of an impurity in a polymer, $X$, has the following probability density function:
   
   $$ f(X) = C (2X - 0.1) \quad \text{for} \quad 0.1 < X < 0.3 $$

   a. **(10 points)** What is the value of $C$?
   b. **(15 points)** Determine the value of $X$ for which there is a probability of 0.1 that the impurity is greater than this value.

4. **(25 points)** The weight of a bag of solid pellets filled by a machine is normally distributed with a standard deviation of 0.07 kg and a mean value which can be set by the machine operator. At what value should the mean be set if it is desired that only 2% of the bags weigh less than 12 kg?

THE END