Introduction to Probability, Statistics and Data Handling	Gaussian and Binomial distributions
Tutorial 5b	

1. A multiple-choice test has 15 questions, each of which has five choices. An unprepared student taking the test answers each of the questions completely randomly by choosing an arbitrary answer from the five provided. Suppose X denotes the number of answers that the student gets right. The student passes the exam if the number of correct answers is at least 8. Calculate the probability of his/her success.

2. A random sample of 125 students is selected from a large college in which the proportion of students who are females is 57%. Suppose X denotes the number of female students in the sample. Calculate the probability that we find 65 female students in our sample.

3. The probability of a serious failure in nuclear power plant is 0.1%. What is the probability that in a country that has 20 power plants one would occur?

4. Let X be a standard normal random variable. Calculate: $P(-1 < X < 1)$, $P(-2 < X < 2)$, $P(-3 < X < 3)$, $P(2 < X < 3)$, $P(-2 < X < -1)$. Show that: $\Phi(-a) = 1 - \Phi(a)$.

5. Let X be a normal random variable with mean $\mu = 10$ and standard deviation $\sigma = 2.5$. Compute the following probabilities: $P(X < 14)$, $P(8 < X < 14)$, $P(-8 < X < 0)$, $P(0 < X < 8)$.

6. Heights of 25-year-old men in a certain region have mean 69.75 inches and standard deviation 2.55 inches. These heights are approximately normally distributed. Sketch a qualitatively accurate graph of the density function for X. Find the probability that a randomly selected 25-year-old man is more than 70.15 inches tall.

7. The RV Z has a standard normal distribution.

a) Find the value z^* of Z so that $P(Z < z^*) = 0.0125$. The value z^* is a cuts off a **left** tail of area 0.0125 in the standard normal distribution,

b) Find the value z^* of Z so that $P(Z > z^*) = 0.0250$. The value z^* is a cuts off a **right** tail of area 0.0250 in the standard normal distribution,

c) Find the values z_a such that: $P(-z_a < Z < z_a) = 0.68$ and $P(-z_a < Z < z_a) = 0.95$

You need the statistical tables, see, for example, here.