1. **Computing individual binomial probabilities.** For $n = 5$, 10, or 20, and $p = 0.1$, 0.5, and 0.7, find the probability of exactly three successes. There are nine different problems here. Just do enough to be confident that you could do any single similar problem.

   Here is a detailed solution to the first. For $n = 5$ and $p = 0.1$,

   $$\Pr\{Y = 3\} = {}_5C_3(0.1)^3(0.9)^2 = \frac{5!}{2!3!}(0.1)^3(0.9)^2 = \frac{5 \cdot 4 \cdot 3!}{2 \cdot 1 \cdot 3!}(0.1)^3(0.9)^2 = 20(0.1)^3(0.9)^2 \doteq 0.0081.$$

   Here are all of the answers.

   Binomial Probabilities

	p		
n	0.1	0.5	0.7
5	0.0081	0.3125	0.3087
10	0.0574	0.1172	0.009
20	0.1901	0.0011	0

2. **Computing sums of binomial probabilities.** For $n = 5$, 10 and 15, and $p = 0.25$, find the probability of: (a) two or more successes; and (b) two or fewer successes.

   Here is a solution to (a) when $n = 5$.

   $$\Pr\{Y \geq 2\} = 1 - \Pr\{Y < 2\} = 1 - \Pr\{Y \leq 1\} = 1 - \Pr\{Y = 0\} - \Pr\{Y = 1\}$$

   $$= 1 - (0.75)^5 - 5(0.25)(0.75)^4 \doteq 1 - 0.2373 - 0.3955 = 0.3672$$

   If you round off individual probabilities to four digits, you should find these answers: $n = 5$, (a) 0.3672, and (b) 0.8965; $n = 10$, (a) 0.756, and (b) 0.5256; $n = 15$, (a) 0.9198, and (b) 0.2361;

3. **Finding areas under normal curves.** Consider a normal distribution with mean $\mu = 125$ and standard deviation $\sigma = 14$.

   (a) Find the area to the left of 100. [0.0367]
   (b) Find the area to the right of 140. [0.1423]
   (c) Find the area between 110 and 150. [0.9633 - 0.1423 = 0.821]
   (d) Find the probability of being more than 20 from the mean. [$2 \times 0.0764 = 0.1528$]

4. **Finding quantiles from normal curves.** Consider a normal distribution with mean $\mu = 125$ and standard deviation $\sigma = 14$.

   (a) Find the 20th and 70th percentiles. [$z = -0.84$, $z = 0.52$, 113.2, 132.3]
   (b) Find the values that cut off the middle 99 percent. [$z = \pm 2.575$, 88.9, 161.1]

5. **Sampling distribution of $\bar{Y}$.** Consider a random sample of size $n = 15, 20, 25, 30$ from a normal population with $\mu = 125$ and standard deviation $\sigma = 14$.

   (a) For each n, find the probability that the sample mean is within one of the population mean. [0.2206, 0.251, 0.2812, 0.3034.]
   (b) For each n, find the 0.975 quantile. [132.1, 131.1, 130.5, 130.]