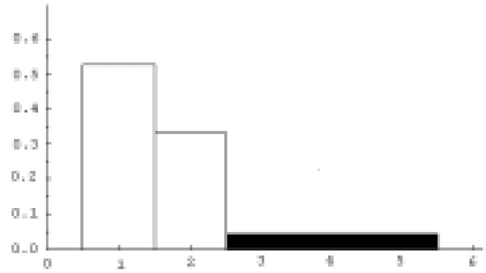
Statistics 515 - Fall 2001 - Answers for Exam 1 ***(slightly modified for Fall 2002 Practice)***

Part I:

1)



Since the area is 0.15 and the width is 3, the height must be 0.05.

2) A town consists of several less expensive subdivisions of houses, and one very expensive subdivision. To make the cost of living sound as inexpensive as possible the town should report the **median** housing price. The distribution of housing prices is **skewed to the right**.

3) A data set is highly skewed. It has a mean of 50 and a standard deviation of 5. What can we say about the percentage of the data that is between 40 and 60? **It is at least $1-1/k^2 = 1-1/2^2 = 1-1/4 = 75\%$**

4) P(A)=0.5, P(B)=0.2. If A and B are mutually exclusive, what is P(AUB)? **Since $P(A\cap B)=0$, it is just $P(A)+P(B)=0.5+0.2=0.7$**

5) P(A)=0.5, P(B)=0.2. If A and B are independent, what is P(AUB)? **$P(AUB)=P(A)+P(B)-P(A\cap B)$ = $=0.5+0.2-(0.5*0.2)=0.7-0.1=0.6$**

6)

x	1	2	4
p(x)	0.2	0.2	0.6

$\mu = 1(0.2)+2(0.2)+4(0.6)=0.2+0.4+2.4=3$

$\sigma^2=(1-3)^2(0.2) + (2-3)^2(0.2) + (4-3)^2(0.6) = 0.8 + 0.2 + 0.6 = 1.6$

7) X is a normal random variable with $\mu=100$, $\sigma^2=225$, and $\sigma=15$. Find $P(X \geq 145)$ = **$P((X-\mu)/\sigma \geq (145-100)/15))$**
$= P(Z \geq 3) = 1-0.4987 = 0.0013.$

8) Z is a standard normal random variable. Find z_0 such that $P(Z \leq z_0) = 0.0179$.
Look up 0.5-0.0179=0.4821 on the table to find 2.1. We are on the negative side, so -2.1 is the correct answer. (Draw the picture, and notice that a probability of 0.0179 has to be on the negative side!)

Part II:

1a) Find the mean. **(1 oz. + 6oz. + 3oz. + 2oz. + 3oz.)/5 = 15oz./5 = 3 ounces**

b) Find the median. 1 oz, 2oz, **3oz**, 3oz, 6oz

c) Find the variance. **$(1oz.-3oz.)^2+(6oz.-3oz.)^2+(3oz.-3oz.)^2+(2oz.-3oz.)^2+(3oz.-3oz.)^2 / (5-1)$**
$= (4\ oz^2+9\ oz^2+0\ oz^2+1\ oz^2+0\ oz^2)/4=14\ z^2/4=3.5oz^2$

d) Find the range. **Largest - Smallest = 6-1**

e) Find the relative frequency of 6 ounces. **# 6 oz obs/ tot # obs = 1/5 = 0.2**

2a) What is the expected number of sixes rolled out of 120 times? **np = 120(1/6) = 20**

b) What is the standard deviation of the number of sixes rolled out of 120 times? **$\sqrt{np(1-p)} = \sqrt{120(1/6)(5/6)} = \sqrt{100/6}$**
≈ 4.08

c) What is the exact probability that exactly 20 sixes would be rolled out of 120 times? (You do not need to simplify your answer). **(120 choose 20) $(1/6)^{20}$ $(1-1/6)^{120-20}$ = (120 choose 20) $(1/6)^{20}(5/6)^{100}$**

d) What is the exact probability that exactly 20 or fewer sixes would be rolled out of 120 times? (You do not need to simplify your answer). **We need to take P(X=0)+P(X=1)+P(X=2)+... + P(X=20), so**
=(120 choose 0) $(1/6)^0(5/6)^{120}$+ (120 choose 1) $(1/6)^1(5/6)^{119}$+... + (120 choose 20 $(1/6)^0(5/6)^{100}$

e) Assume the number of sixes rolled is approximately normal with the mean and standard deviation you found above. Use the normal table to find $P(X \leq 20.5)$.
$P(X\leq 20.5) = P((X-\mu)/\sigma \leq (20.5-20)/4.08) \approx P(Z\leq 0.12) \approx 0.5000 + .0478 = 0.5478$