

1. Convert between a graph and table to display a probability distribution or density curve.

I roll 2 different 6-sided dice. Let  $X$  be the sum of the dice. Make a probability distribution for the discrete random variable  $X$ . Then make a probability histogram for  $X$ .

2. Calculate probabilities for values of a random variable when given the probability distribution for the random variable or when given a density curve.

For  $X$  as defined above, what is the probability of rolling a total less than 5?

For  $X$  as defined above, what is the probability of rolling a total of 8, 9, or 10?

The probability density curve of a random variable  $W$  is a rectangle with base 0 to 4 and height 0.25, what is the probability that  $W$  is between .5 and 1?

3. Calculate the mean or expected value for a random variable when given the probability distribution for the random variable.  
What is the mean for X as defined above?

What is the mean for Y, the outcome when a single 6-sided die is rolled?

What is the mean for Z, the outcome when a single 4-sided die is rolled?

4. Calculate the standard deviation for a random variable when given the probability distribution for the random variable.  
What is the standard deviation for X as defined above?

What is the standard deviation for Y, the outcome when a single 6-sided die is rolled?

What is the standard deviation for Z, the outcome when a single 4-sided die is rolled?

5. Calculate a probability for a range of values of a normally distributed random variable when given the mean and standard deviation.

Suppose ACT scores for a particular population are normally distributed with mean 21 and standard deviation 2. What proportion of the population has scores between 23 and 29?

Suppose a breed of chicken lays eggs with weights that are normally distributed with mean 3 ounces and standard deviation 0.5 ounces. What proportion of these eggs weigh less than 2 ounces?

6. Calculate a value of a normally distributed random variable when given the mean, standard deviation, and a probability.  
Suppose ACT scores for a particular population are normally distributed with mean 21 and standard deviation 2. How well does a student have to score to be in the top 20% of the population?

Suppose a breed of chicken lays eggs with weights that are normally distributed with mean 3 ounces and standard deviation 0.5 ounces. The lightest 15% of eggs weigh less than what number of ounces?

7. Calculate the mean for a combination of independent random variables. Suppose a breed of chicken lays eggs with weights that are normally distributed with mean 3 ounces and standard deviation 0.5 ounces. Using these eggs, what is the mean weight of a 3 egg omelet?

Suppose a game requires a 4-sided die and a 6-sided die to be rolled together. What is the mean of  $Y+Z$  as defined above?

Suppose a game requires three 4-sided dice and two 6-sided dice to be rolled together. What is the mean of  $Y_1 + Y_2 + Z_1 + Z_2 + Z_3$  as defined above?

Suppose a game requires that we take the outcome of rolling a 6-sided die and subtract the outcome of rolling a 4-sided die. What is the mean of  $Y-Z$  as defined above?

8. Calculate the variance and standard deviation for a combination of independent random variables.

Suppose a breed of chicken lays eggs with weights that are normally distributed with mean 3 ounces and standard deviation 0.5 ounces. Using these eggs, what is the standard deviation for weight of a 3 egg omelet?

Suppose a game requires a 4-sided die and a 6-sided die to be rolled together. What is the standard deviation of  $Y+Z$  as defined above?

Suppose a game requires three 4-sided dice and two 6-sided dice to be

rolled together. What is the standard deviation of  $Y_1 + Y_2 + Z_1 + Z_2 + Z_3$  as defined above?

Suppose a game requires that we take the outcome of rolling a 6-sided die and subtract the outcome of rolling a 4-sided die. What is the standard deviation of  $Y-Z$  as defined above?



9. Determine the effect of a linear transformation on the mean of a random variable.

Suppose the eggs described above are weighed in grams, rather than ounces. If 1 ounce = 28 grams, what is the mean weight of the eggs in grams?

If I roll a 4-sided die and then double the result ( $2Z$ ), what is the mean?

If I roll a 6-sided die and then triple the result ( $3Y$ ), what is the mean?

10. Determine the effect of a linear transformation on the variance and standard deviation of a random variable. Suppose the eggs described above are weighed in grams, rather than ounces. If 1 ounce = 28 grams, what are the variance and standard deviation of the weight of the eggs in grams?

If I roll a 4-sided die and then double the result ( $2Z$ ), what are the variance and standard deviation?

If I roll a 6-sided die and then triple the result ( $3Y$ ), what are the variance and standard deviation?

11. A combination of several parts of these previous problems.

Suppose some eggs have a mean weight of 3 ounces and standard deviation of 0.5 ounces, some sausage links have a mean weight of 2 ounces and a standard deviation of 0.3 ounces, and some bread weighs an average of 1 ounce per slice with the standard deviation of 0.2 ounces. Assuming all these are normally distributed, then if a restaurant offers a breakfast platter of 3 eggs, 2 sausage links, and 2 slices of toast, what is the probability that the platter weighs more than 16 ounces?