Chapter Audio Summary for McDougal Littell
Algebra 2

Chapter 12 Probability and Statistics

You began Chapter 12 by calculating probabilities. Then you used what you learned about combinations and the binomial theorem to expand a binomial that is raised to a power. You found probabilities of independent and dependent events. You constructed and interpreted binomial distributions and used them to test a hypothesis. Then you used normal distributions to calculate probabilities and approximate binomial distributions.

Turn to the lesson-by-lesson Chapter Review that starts on p. 756 of the textbook.

Lesson 12.1 The Fundamental Counting Principal and Permutations

An important word to know is: *permutation.*

The first goal of Lesson 12.1 is to use the fundamental counting principle to count the number of ways an event can happen.
With 2 pairs of jeans and 5 shirts, you can make 2 • 5, or 10, outfits.

The second goal of Lesson 12.1 is to use permutations to count the number of ways an event can happen. The number of ways 4 members from a family of 5 can line up for a photo is ${}_5P_4 = \frac{5!}{(5-4)!} = \frac{5!}{1!} = \frac{120}{1} = 120$.

Recall from Lesson 11.5 that 0! = 1 and 1! = 1.

Now try Exercises 1 through 8. If you need help, go to the worked-out Examples on pages 702 through 704.

Lesson 12.2 Combinations and the Binomial Theorem

Important words to know are: *combination, Pascal's triangle*, and *binomial theorem.*

The first goal of Lesson 12.2 is to use combinations to count the number of ways an event can happen when order is not important. Suppose you must write reports on 3 of the 12 most recent Presidents of the United States. The number of possible combinations is: ${}_{12}C_3 = \frac{12!}{9! \bullet 3!}$. To simplify this fraction, expand the numerator until it has a factor similar to the most of the denominator, 9! in this case. Factor out 9! and simplify to get 220.

The second goal of Lesson 12.2 is to use the binomial theorem to expand a binomial that is raised to a power. The procedure is shown in the second Example.

Now try Exercises 9 through 18. If you need help, go to the worked-out Examples on pages 708 through 711.

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Lesson 12.3 An Introduction to Probability

Important words to know are: *probability, theoretical probability, experimental probability,* and *geometric probability.*

The first goal of Lesson 12.3 is to find theoretical and experimental probabilities. Theoretical probability is the number of ways a specific event can happen divided by the number of possible outcomes. Here, there are 3 ways the sum can be 4, and 36 possible outcomes. So the theoretical probability is 3/36, or 1/12. Experimental probability is the number of ways a specific event actually happens divided by the number of trials.

Remember that you need data about events that actually occurred in order to calculate experimental probability.

The second goal of Lesson 12.3 is to find geometric probabilities, such as the probability that an archer hits the center of a target. In the Examples, geometric probability is calculated by finding the ratio of the area of the shaded square, 4, to the area of the entire target, 16. This simplifies to 1/4.

Now try Exercises 19 through 22. If you need help, go to the worked-out Examples on pages 716 through 718.

Lesson 12.4 Probability of Compound Events

Important words to know are: *compound event, mutually exclusive events,* and *complement.*

The first goal of Lesson 12.4 is to find probabilities of unions and intersections of two events. The union or intersection of two events is called a compound event. In the Example, A and B are two events. $P(A) = 3/4$, $P(B) = 2/5$ and $P(A \text{ and } B) = 1/4$. Use the formula $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ to find the probability that compound events will occur. Substituting values, you get $P(A \text{ or } B) = \frac{3}{4} + \frac{2}{5} - \frac{1}{4}$. Simplify to get $P(A \text{ or } B) = 9/10$.

The probability of the complement of A is $1 - P(A) = 1 - 3/4 = 1/4$. Remember that the complement of A is all events that are not in A.

The second goal of Lesson 12.4 is to use complements to find the probability of an event.

Now try Exercises 23 through 25. If you need help, go to the worked-out Examples on pages 724 through 726.

Lesson 12.5 Probability of Independent and Dependent Events

Important words to know are: *independent events, dependent events,* and *conditional probability.*

The first goal of Lesson 12.5 is to find the probability of independent events. In the Examples, slips of paper are placed in a hat and drawn randomly. If the first slip of paper is replaced before selecting the second, *A* and *B* are *independent* events. *P*(*A* and *B*) = *P*(*A*) • *P*(*B*), or 5/9 • 4/9. This is about 0.247. If the first slip of paper is NOT replaced before selecting the second, *A* and *B* are *dependent* events and your second drawing involves the probability of choosing an even number from only 8 choices. So *P*(*A* and *B*) = *P*(*A*) • *P*(*B* | *A*), or 5/9 • 4/8. This is about 0.278.

The second goal of Lesson 12.5 is to find the probability of dependent events, such as finding the probability that the Florida Marlins win three games in a row.

Now try Exercises 26 through 28. If you need help, go to the worked-out Examples on pages 730 through 733.

Lesson 12.6 Binomial Distributions

Important words to know are: *binomial experiment, binomial distribution, symmetric distribution, skewed distribution,* and *hypothesis testing.*

The first goal of Lesson 12.6 is to find binomial probabilities and analyze binomial distributions. A binomial experiment is one in which each trial is independent and has only two outcomes, success or failure, with the probability of success constant. The Example shows how to find the binomial probability of tossing a coin 10 times and getting exactly 7 heads. Substitute values for *k* and *n* into the formula for binomial probability. You get $\frac{10!}{3! \bullet 7!}(0.5)^7 \bullet (0.5)^3 \approx 0.117$. Notice the probability, 0.117, is given as an approximation.

The second goal of Lesson 12.6 is to test a hypothesis.

Now try Exercises 29 through 34. If you need help, go to the worked-out Examples on pages 739 through 741.

Lesson 12.7 Normal Distributions

Important words to know are: *normal curve* and *normal distributions.*

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The first goal of Lesson 12.7 is to calculate probabilities using normal distributions. Refer to the diagram and the property box on page 746.

The second goal of Lesson 12.7 is to use normal distributions to approximate binomial distributions. Many real-life distributions are normal or approximately normal. You can approximate the answer to the question posed in the Example with a normal distribution having a mean of $\bar{x} = np$ and a standard deviation of $\sigma = \sqrt{np(1-p)}$. Substitute values for n and p to find the mean and the standard deviation. So, the probability that between 29 and 50 births were twins is $P(\bar{x} - 3\sigma \le x \le \bar{x})$. Using the diagram on page 746 to evaluate, the probability is 0.4985.

Remember that your final answer will be an approximation.

Now try Exercises 35 through 38. If you need help, go to the worked-out Examples on pages 747 and 748.