

AQR Review Packet

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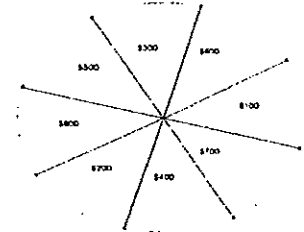
Name _____ Date _____ Period _____

Math Support: Expected Value Practice Worksheet

1. Find the Expected Value from the table:

Outcome Value	400	-800
Probability	$\frac{4}{7}$	$\frac{3}{7}$

2. What is the expected value of spinning the wheel to the right once?



3. In a board game, players take turns spinning a wheel with 4 spaces and values of \$100, \$300, \$400, \$800. The probability of landing on \$100 is $\frac{4}{9}$. The probability of landing on \$300 is $\frac{2}{9}$. The probability of landing on \$400 is $\frac{2}{9}$. The probability of landing on \$800 is $\frac{1}{9}$. What is the expected value of spinning the wheel once?
4. In question 3, what is the expected value of spinning the wheel 5 times?
5. In a game, 2 players each flip a coin. If both land on heads, player A gets 2 points and player B loses 1 points. If both land on tails, player B gets 2 points and player A loses 1 point. Find the expected value of the game for each player.

6. In basketball, you can earn 3 points for a shot and 1 point for a free throw. If Sam's probability of getting a 3-point shot is $\frac{4}{10}$ and $\frac{8}{10}$ for a free throw, what is his expected value for the game?

7. At a raffle, 25 tickets are sold at \$1 each for 3 prizes of \$100, \$50, and \$10. You buy 1 ticket. What is the expected value of your gain?

8. What is the expected value of rolling a die that has 6 sides?

9. On Jeopardy there are 5 monetary categories- \$100, \$200, \$300, \$400, and \$500. Each of them has an equally likely chance of popping up. What is their expected value?

10. At a fundraiser, 8000 tickets are sold at \$10 each for four prizes: a new car worth \$30,000, a European vacation worth \$9000, a home theater system worth \$4000, and a cash prize of \$1000. You buy 1 ticket. What is the expected value of your gain?

NAME: _____

UNIT 4 •

Lesson 4: Creating a Spinner from Data

Prerequisite Practice 4.4.1: Calculating Expected Value

Find the expected value of winnings for each game.

1. Jennifer is playing a game at an amusement park. There is a 0.1 probability that she will score 10 points, a 0.2 probability that she will score 20 points, and a 0.7 probability that she will score 30 points. How many points can Jennifer expect to receive by playing the game?
2. Luanda played a game in which she could win 10 points with a probability of 0.2. There is a 0.8 probability that she will not win any points. How many points can Luanda expect to win?
3. Rudy is purchasing a toaster. Of the toasters in the store, 70% cost \$10, 20% cost \$20, and 10% cost \$50. How much can Rudy expect to pay for a toaster?
4. Half of the players of a game win 100 points, and the other half win 200 points. How many points can Edie expect to win if she plays the game?
5. Matt wants to purchase a book at Jo's Bookshop. Of the books in the shop, 60% cost \$10 and 40% cost \$12. How much can Matt expect to pay for a book at Jo's Bookshop?

NAME: _____

UNIT 4 •

Lesson 5: Applying Expected Value

Prerequisite Practice 4.5.1: Calculating Expected Value

Find the expected value of winnings for each game.

1. Juan is playing a game in which he can win \$100 with probability 0.1, \$200 with probability 0.2, or \$300 with probability 0.7. What is the expected value of Juan's winnings?

2. Marina is playing a game in which she needs to throw a ball into a bucket. If she throws the ball into the bucket, she will win \$100; if not, she will win \$0. The probability that Marina will throw the ball into the bucket is 0.2. What is the expected value of Marina's winnings?

3. Linda estimates the number of questions she answered correctly on a test. She answered 10 correctly with probability 0.6, 20 correctly with probability 0.3, and 50 correctly with probability 0.1. What is the expected value of the number of questions Linda answered correctly?

4. Mara is playing a game. There are two marbles in a bag. If she chooses the purple marble, she will win \$10. If she chooses the orange marble, she will win \$200. What is the expected value of Mara's winnings from the game?

5. Benjamin plays a game in which he will win 110 points with probability 0.6 and 120 points with probability 0.4. What is the expected number of points that he will win by playing the game?

Practice with Expected Value

1. You draw one card from a standard deck of playing cards. If you pick a heart, you will win \$10. If you pick a face card, which is not a heart, you win \$8. If you pick any other card, you lose \$6. Do you want to play? Explain.
2. The world famous gambler from Philadelphia, Señor Rick, proposes the following game of chance. You roll a fair die. If you roll a 1, then Señor Rick pays you \$25. If you roll a 2, Señor Rick pays you \$5. If you roll a 3, you win nothing. If you roll a 4 or a 5, you must pay Señor Rick \$10, and if you roll a 6, you must pay Señor Rick \$15. Is Señor Rick loco for proposing such a game? Explain.
3. You pay \$10 to play the following game of chance. There is a bag containing 12 balls, five are red, three are green and the rest are yellow. You are to draw one ball from the bag. You will win \$14 if you draw a red ball and you will win \$12 if you draw a yellow ball. How much do you expect to win or lose if you play this game 100 times?
4. A detective figures that he has a one in nine chance of recovering stolen property. His out-of-pocket expenses for the investigation are \$9,000. If he is paid his fee only if he recovers the stolen property, what should he charge clients in order to breakeven?
5. At Tucson Raceway Park, your horse, Soon-to-be-Glue, has a probability of $\frac{1}{20}$ of coming in first place, a probability of $\frac{1}{10}$ of coming in second place, and a probability of $\frac{1}{4}$ of coming in third place. First place pays \$4,500 to the winner, second place \$3,500 and third place \$1,500. Is it worthwhile to enter the race if it costs \$1,000?
6. Your company plans to invest in a particular project. There is a 35% chance that you will lose \$30,000, a 40% chance that you will break even, and a 25% chance that you will make \$55,000. Based solely on this information, what should you do?
7. A manufacturer is considering the manufacture of a new and better mousetrap. She estimates the probability that the new mousetrap is successful is $\frac{3}{4}$. If it is successful it would generate profits of \$120,000. The development costs for the mousetrap are \$98,000. Should the manufacturer proceed with plans for the new mousetrap? Why or why not?
8. A grab bag contains 12 packages worth 80 cents apiece, 15 packages worth 40 cents apiece and 25 packages worth 30 cents apiece. Is it worthwhile to pay 50 cents for the privilege of picking one of the packages at random?



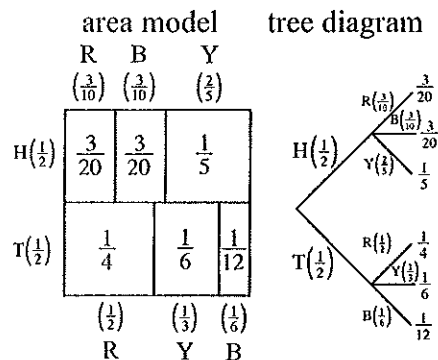
GEOMETRIC PROBABILITY

#8

The **PROBABILITY** of an event involving outcomes with different probabilities is represented using an area model and a tree diagram. For one example and a complete explanation of the two methods see the Math Notes box on page 212 of the textbook. Two additional examples are shown below.

Example 1

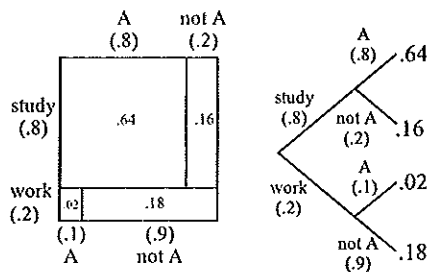
A popular game at a county fair is Flip-to-Spin-or-Roll. You start by flipping a coin. If heads comes up, you get to spin the big wheel, which has ten equal sectors: three red, three blue, and four yellow. If the coin shows tails, you roll a cube with three sides red, two yellow sides, and one blue side. If your spin lands on blue or the blue side of the cube comes up you win a prize. What is the probability of winning a prize?



Using the two blue boxes from the area model or the two blue branches from the tree diagram, the probability of winning a prize is $\frac{3}{20} + \frac{1}{12} = \frac{14}{60} = \frac{7}{30}$.

Example 2

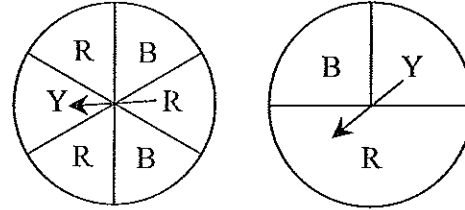
There are five children in Sarah's family. Each night one child has to help at the family business. A spinner is used to determine who has to work each night. Sarah has a big math test tomorrow and knows there is an 80% chance of getting an "A" if she can study but only a 10% chance of getting an "A" if she can not study. What is the probability of Sarah getting an "A"?



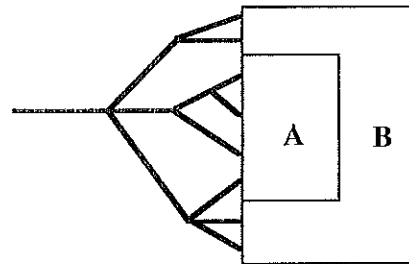
Using the two "A" boxes from the area model or the two "A" branches from the tree diagram, the probability of getting an A is $0.64 + 0.02 = 0.66$.

For each question use an area model or a tree diagram to compute the desired probability.

For problems 1-3 use the spinners at right

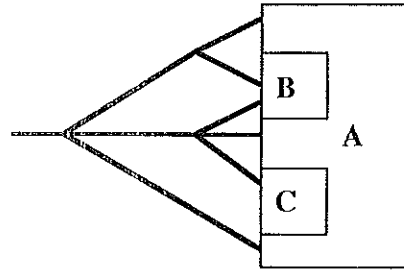


1. If each spinner is spun once, what is the probability that both spinners show blue?
2. If each spinner is spun once, what is the probability that both spinners show the same color?
3. If each spinner is spun once, what is the probability of getting a red-blue combination?
4. A pencil box has three yellow pencils, one blue, and two red pencils. There are also two red erasers and one blue. If you randomly choose one pencil and one eraser, what is the probability of getting the red-red combination?
5. Sally's mother has two bags of candy but she says that Sally can only have one piece. Bag #1 has 70% orange candies and 30% red ones. Bag #2 has 10% orange, 50% white, and 40% green. Sally's eyes are covered and she chooses one bag and pulls out one candy. What is the probability that she choose her favorite color-orange?
6. You throw a die and flip a coin. What is the probability of getting tails on the coin and a number less than five on the die?
7. A spinner is evenly divided into eight sections—three are red, three are white and two are blue. If the spinner is spun twice, what is the probability of getting the same color twice?
8. Your friend and you have just won a chance to collect a million dollars. You place the money in one room at right and you friend has to walk through the maze. In which room should you place the money so that your friend will have the best chance of finding the million dollars?



9. Find the probability of randomly entering each room.

- a) $P(A)$
b) $P(B)$
c) $P(C)$



10. The weather forecast is a 60% chance of rain. If there is no rain then there is an 80% chance of going to the beach. What is the probability of going to the beach?
11. A baseball player gets a hit 40% of the time if the weather is good but only 20% of the time if it is cold or windy. The weather forecast is a 70% chance of nice, 20% chance of cold, and 10% chance of windy. What is the probability of getting a hit?
12. If you have your assignment completed before the next day there is an 80% chance of a good grade. If the assignment is finished during class or late then there is only a 30% chance of a good grade. If assignments are not done at all then there is only a 5% chance of a good grade. In a certain class, 50% of the students have the assignment completed before class, 40% finish during class, and 10% do not do their assignments. If a student is selected at random, what is the probability that student has a good grade?

Name _____

Date _____

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Worksheet A2 : Fundamental Counting Principle, Factorials, Permutations Intro

1. A restaurant offers four sizes of pizza, two types of crust, and eight toppings. How many possible combinations of pizza with one topping are there?
2. How many ways can 5 paintings be line up on a wall?
3. Rob has 4 shirts, 3 pairs of pants, and 2 pairs of shoes that all coordinate. How many outfits can you put together?
4. Grace loves to eat salad! How many salads can she put together if she can pick out one type of lettuce from 2 choices, one vegetable from 4 choices and one dressing from 7 choices?
5. PA license plates have 3 letters followed by 4 numbers.
 - a. If the same letter or number can be repeated, how many can be made?
 - b. If the same letter CANNOT be repeated, how many can be made?
6. How many 5-digit numbers can be formed (using 0 - 9)?
7. How many 5-digit numbers can be formed if each one uses all the digits 0, 1, 2, 3, 4 without repetition?
8. In how many ways can 6 bicycles be parked in a row?

9. Evaluate (show all your work):

a. $6!$

b. $9!$

c. $10!$

10. Rewrite $10!$ with a factor of $8!$ (Hint: $\underline{\hspace{1cm}} \cdot \underline{\hspace{1cm}} \cdot 8!$)

11. $\frac{5!}{2!}$

12. $\frac{10!}{8!}$

13. $\frac{25!}{20!}$

14. $\frac{12!}{(12-7)!}$

15. $\frac{12!}{9!3!}$

16. In how many ways can 7 different cards be laid out on a table in a row?

Name _____

Date _____

Worksheet B2 : Permutations

1. A lock contains 3 dials, each with ten digits. How many possible sequences of numbers exist?
2. Four students are to be chosen from a group of 10 to fill the positions of president, vice-president, treasurer and secretary. In how many ways can this be accomplished?
3. How many ways can the letters MATH be arranged?
4. A shelf can hold 7 trophies. How many ways can the trophies be arranged if there are 10 trophies available?
5. Bill has three pairs of pants, 5 shirts and 2 pairs of shoes. How many outfits can he make?

Name _____

Date _____

Worksheet C2 : All Types of Permutations

- How many 5-number license plates can be made using the digits 0, 1, 2, 3, 4, 5, if
 - repetitions ARE allowed
 - repetitions are NOT allowed
- A teacher wants to write an ordered 4-question test from a pool of 12 questions. How many different forms of the test can the teacher write?
- How many 5-number license plates can be made using the digits 1, 2, 3, 4, 5, 6, 7, if an odd digit must come first and
 - repetitions ARE allowed
 - repetitions are NOT allowed
- Assume the same situation as #3, but tell me how many EVEN license plates can be made if repetitions ARE allowed.
- In how many ways can 4 blue, 3 red, and 2 green flags be arranged on a pole?

6. Find the number of permutations of the letters of these words:

a. DEED

b. COMMITTEE

c. CINCINNATI

7. A player in a word game has the letters E, E, B, D, G, G, G. In how many ways can these letters be arranged?

8. Find the number of permutations of six colors on a spinner.

9. Find the number of ways 10 cheerleaders can make a circular formation.

Name _____

Date _____

Worksheet D2: Graphing Calculator Practice

Meet Your TI-84 or TI-83+ Graphing Calculator

Some basic functions:

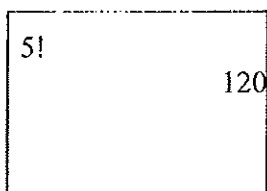
- To turn you calculator on: Press on
- To turn your calculator off: Press the yellow 2nd button and press on
- To square a number:
 - Example: 8^2 : Press 8; press x^2 ; press ENTER
- To raise a number to a power greater than 2:
 - Example: 5^4 : Press 5; press \wedge ; press 4
- To find the square root of a number:
 - Example: $\sqrt{63}$: Press the yellow 2nd button; press x^2 ; press 63; press ENTER
- To find the nth root of a number:
 - Example: $\sqrt[6]{995}$: Press 6; press MATH; press 5; press 995; press ENTER
- To add fractions:
 - Example: $3\frac{1}{3} + \frac{1}{15} + 1\frac{2}{3}$: Press (; press 3; press +; press 1; press +; press 3; press); press +; press (; press 1; press +; press 15; press); press +; press (; press 1; press +; press 2; press +; press 3; press); press ENTER
 - To convert from decimal to fraction: press MATH, press ENTER; press ENTER
 - For the example above, the answer is 253/75.

Worksheet D2 - continued

Factorials and Permutations on your Graphing Calculator

HOW TO USE YOUR CALCULATOR FOR FACTORIALS (!)

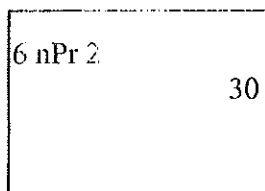
- Example: $5!$:
 - Press **5**;
 - press **MATH**;
 - scroll with \leftarrow or \rightarrow to reach the **PRB** column;
 - scroll with \wedge or \vee to reach the **!**;
 - press **ENTER**;
 - press **ENTER**;
 - Screen:



A rectangular box representing a calculator screen. On the left side, the text "5!" is displayed. On the right side, the text "120" is displayed.

HOW TO USE YOUR CALCULATOR FOR PERMUTATIONS (${}_n P_r$)

- Example: ${}_6 P_2 =$
 - Press **6**;
 - press **MATH**;
 - scroll with \leftarrow or \rightarrow to reach the **PRB** column;
 - scroll with \wedge or \vee to reach the **nPr**;
 - press **ENTER**;
 - Press **2**;
 - press **ENTER**;
 - Screen:



A rectangular box representing a calculator screen. On the left side, the text "6 nPr 2" is displayed. On the right side, the text "30" is displayed.

Worksheet D2 – continued

Graphing Calculator

Name _____

- Round final answers as indicated. Do NOT round until final answer is reached.
- Place answers on space provided

1 pt each

Give final answers as indicated.

Example: $12\frac{7}{8} - 5\frac{3}{20} =$ (simplest fraction)

Answer: $12\frac{7}{8} - 5\frac{3}{20} = 7.725 = 7\frac{29}{40}$

1. $1\frac{3}{5} \times 2\frac{5}{6} \div \frac{3}{7} =$ (simplest fraction) _____

2. $16\frac{5}{8} + 14\frac{3}{16} - 4\frac{7}{15} =$ (simplest fraction) _____

3. $23\frac{5}{9} \div 10\frac{13}{16} =$ (simplest fraction) _____

4. $\sqrt{316} =$ (nearest hundredth) _____

5. $\sqrt[3]{425} =$ (nearest hundredth) _____

6. $32^2 =$ _____

7. $12^4 =$ _____

Worksheet D2 – continued

Graphing Calculator

Name _____

- Place answers on space provided
- Complete all problems using your graphing calculator

1 pt each

1. $10!$ _____

2. What is the highest $n!$ such that your calculator will display all of the digits? _____

Hint: $3! = 6$

$25! = 1.551121004 \text{ E}25$ on calculator

The correct answer is between these two.

3. ${}_{10}P_6 =$ _____

4. ${}_{60}P_4 =$ _____

5. ${}_{6}P_9 =$ (according to your calculator) _____

6. Why does your answer for problem #5 make sense? (i.e. Why does your calculator display this answer for problem #5?)

!!!!!! Reminder: These graphing calculator functions are tools to help you check your work. You will be required to show all work by hand on assessments!!!!!!

Name _____

Date _____

Worksheet E2 : Combinations

Use the combinations formula to simplify each problem.

1. ${}^9C_4 =$

2. ${}^4C_4 =$

3. ${}^9C_0 =$

4. ${}^{40}C_3 =$

5. ${}^{12}C_4 =$

6. ${}^{12}C_8 =$

7. How many different 12-member juries be chosen from a pool of 32 people?
8. A test consists of 20 questions, but you are told to answer only 15. In how many different ways can you choose the 15 questions?
9. How many ways can nine starting players be chosen from a softball team of 15?
10. Four seniors will speak at graduation. If 30 students audition to speak, how many different groups of 4 speakers can be selected?

Name _____

Date _____

Worksheet F2 : More Combinations

Use the combinations formula to simplify each problem.

1. $\binom{9}{5} =$

2. $\binom{50}{2} =$

3. $\binom{12}{8} =$

4. $\binom{n}{n} =$

5. $\binom{n}{n-1} =$

6. $\binom{n+1}{n-1} =$

7. How many basketball games are played in a 10-team league if each team plays all other teams TWICE?
8. Of the first 8 questions on a test, a student must answer 6. Of the next 7 questions, 4 must be answered. In how many ways can this be done?
9. Irene's Ice Cream serves 10 flavors of ice cream, 4 kinds of syrup, and 6 varieties of toppings. How many different Sundaes can you make if each has 2 flavors of ice cream, 2 kinds of syrup, and 3 toppings?

Name _____

Date _____

Worksheet G2: Mixed Combinatorics

Decide if the problem is an example of a permutation or combination. Then evaluate each one. Show proper notation, and your work.

1. How many teams of 4 horses would be made if there were 9 horses in the stable?
2. A lock manufacturer uses the numbers 1 - 30 in its combinations. How many different combinations for the lock are there if it uses 3-number combinations?
3. Mike has nine baseball trophies to arrange on the shelf. How many different ways can they be arranged?
4. In math class, there are 24 students. The teacher picks 4 students to help do a demonstration. How many different groups of 4 could she have chosen?
5. In how many ways can 10 people wait in line for concert tickets?
6. The teacher has listed 30 books as book report options. You must read 5. How many different sets of 5 books could you have chosen to read?
7. How many different ways are there to purchase 2 CD's, 3 DVD's and 1 set of headphones if there are 7 CD titles, 5 DVD titles, and 3 types of headphones available?

Name _____

Date _____

Worksheet H2 : Intro to Binomial Theorem

Use Pascal's triangle and the pattern from our notes sheet to expand each binomial according to the power.

1. $(x + y)^3$

2. $(a + b)^6$

3. $(x + y)^7$

4. $(a + b)^8$

Name _____

Date _____

Worksheet 12 : Binomial Theorem

Use Combinations and the pattern from our notes sheet to expand each binomial according to the power.

1. $(2x + 5y)^3$

2. $(a - b)^6$

3. $(3x + y)^7$

4. $(a - 2b)^8$

Name _____

Date _____

Worksheet J2 : Binomial Theorem- Find 1 Term

Use Combinations and the pattern from our notes sheet to find each SINGLE TERM from the binomial expansion.

1. Find the 2nd term of $(2x + 3y)^3$

2. Find the 4th term of $(a - b)^7$

3. Find the 5th term of $(3x + 4y)^7$

4. Write the term of $(a - 5b)^8$ that contains a^3b^5 .

Name _____

Date _____

Worksheet K2 : REVIEW problems

- Find the number of permutations of the digits 0 - 9 for each situation.
 - 4-digit numbers
 - 6-digit numbers

- A display case has room for 10 statues. Find the number of ways 10 statues can be displayed if each number of statues is available.
 - 10 statues
 - 20 statues

- Find the number of permutations of the letters in each word.
 - factorial
 - permutation
 - applications

- In a class of 30 students, find the number of permutations for each situation.
 - 7 students for the debate team

 - 25 students for the baseball team

 - first, second, and third place in the art show

- Find the value of each expression.
 - ${}_8C_3 \times {}_{10}C_2$
 - $\frac{{}_{12}C_3}{{}_3C_2}$
 - ${}_{10}P_4$

6. Find the number of ways a French test can be made.
- a. 20 questions from a test bank of 100 questions

 - b. 4 questions from a test bank of 12 questions
7. Pizzas can be topped with 4 different sauces, 5 different meats and 4 different cheeses. In how many ways can a pizza be made with the following ingredients?
- a. 2 meats and 2 cheeses
 - b. 3 sauces, 4 meats, and 2 cheeses
8. Determine if the situation involves a permutation or a combination, then find the answer.
- a. In how many ways can 12 members of a jury be selected from a jury pool of 150?

 - b. In how many ways can a foreman, assistant foreman, and secretary be selected from a 12-member group?
9. Expand each binomial raised to a power - don't just use the distributive property!
- a. $(x - y)^5$
 - b. $(2x + 3y)^4$
10. For the expression of $(x + 4y)^8$, find the indicated terms.
- a. 3rd term
 - b. 7th term