

Topic 20: Probability
~*Super Challenge*~
Enrichment Packet

Due Monday

NAME: _____

Name _____

Date _____

Statistics & Probability

Directions: In the space to the right, determine the probability of each question.

- 1) Drawing a 6 from a deck of cards? _____
- 2) Drawing 3 cards that are all queen from a deck of cards? _____
- 3) Drawing a black card from a deck of cards? _____
- 4) Rolling an odd number on a die? _____
- 5) Drawing a 3 from a deck of cards? _____
- 6) Drawing a club from a deck of cards? _____
- 7) Drawing 2 cards that are all 8 from a deck of cards? _____
- 8) Drawing a heart from a deck of cards? _____
- 9) Drawing a 7 from a deck of cards? _____
- 10) Drawing 2 cards that are all 2 from a deck of cards? _____
- 11) Rolling an even number on a die? _____
- 12) Drawing 3 cards that are all 9 from a deck of cards? _____
- 13) Drawing a red card from a deck of cards? _____
- 14) Rolling a 6 on a die? _____
- 15) Drawing a 5 from a deck of cards? _____

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1. In the table write down some events that could happen to you. Then say whether they are *likely* or *not likely* to happen. The first two have been done for you.

Event	Likely or Not likely
I will sleep at home tonight.	Likely
I will still be awake at midnight tonight.	Unlikely

2. Put one of the following words in the table with the events:

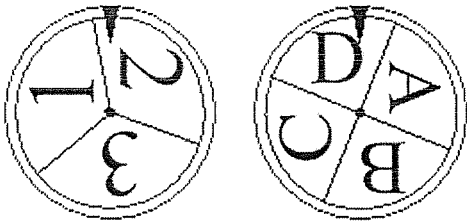
Impossible
Unlikely
Likely
Certain

Event	Probability
I will see King Henry VIII tonight.	Impossible
The sun will shine at some time tomorrow.	Likely
It will snow tomorrow.	
If I choose a card from a pack, it will be a heart.	
I will see a rainbow tomorrow.	
The sun will rise tomorrow.	
If I put a tennis ball on water, it will float.	

Work out the following.

When necessary, give your answer in fractions eg. $\frac{2}{5}$

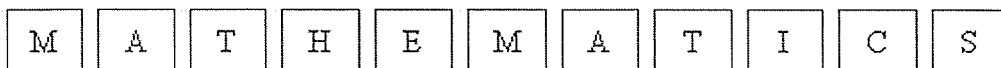
1. When a fair die is thrown, what is the probability of getting a number greater than 4?
2. If a number is chosen at random from the numbers 1 to 20 inclusive, what is the probability that:
 - a) a prime number will be picked?
 - b) an even number will be picked?
 - c) a single digit number will be picked?
3. Each of the letters of the word "SUCCESS" is written on a card and all the cards are placed into a bag. A card is randomly selected from the bag. Find the probability that the card bears:
 - a) the letter 'S'
 - b) a vowel
 - c) the letter 'A'
4. A bag contains 7 white balls, 3 red balls and 2 black balls. A ball is picked from the bag at random. Find the probability of:
 - a) picking a red ball
 - b) picking a black ball.
 - c) picking either a white or black ball.
5. Jonathan spins 2 spinners; one of which is labelled 1, 2 and 3, and the other is labelled A, B, C and D.



Given that all the outcomes are equally likely, find the probability that:

- a) the spinners stop at "2" and "C".
- b) the spinners stop at "3" and either "B" or "D"
- c) the spinners stop at "A" and any number.

6. Albert chooses a card at random from those as shown below:



What is the probability that the card is:

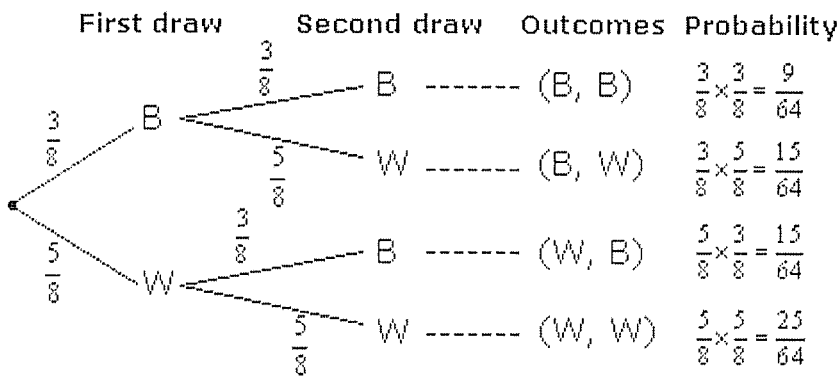
- a) an M?
- b) an A or an E?
- c) a U?

TREE DIAGRAM EXAMPLES

A bag contains 3 black balls and 5 white balls. Paul picks a ball at random from the bag and replaces it back in the bag. He mixes the balls in the bag and then picks another ball at random from the bag.

- a) Construct a probability tree of the problem.
- b) Calculate the probability that Paul picks:
 - i) two black balls
 - ii) a black ball in his second draw

Solution:

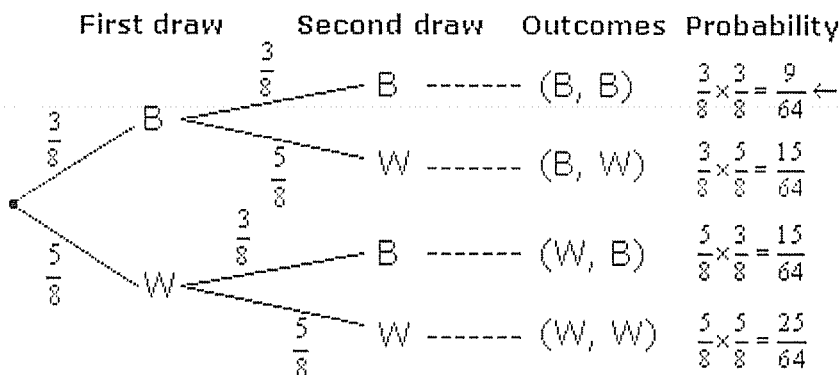


a)

Check that the probabilities in the last column add up to 1.

$$\frac{9}{64} + \frac{15}{64} + \frac{15}{64} + \frac{25}{64} = \frac{64}{64} = 1$$

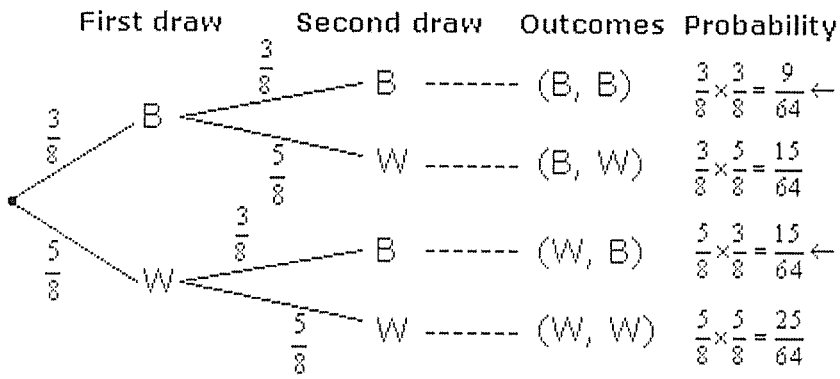
b) i) To find the probability of getting two black balls, first locate the B branch and then follow the second B branch. Since these are independent events we can multiply the probability of each branch.



$$P(\text{two black balls}) = \frac{3}{8} \times \frac{3}{8} = \frac{9}{64}$$

ii) There are two outcomes where the second ball can be black.

Either (B, B) or (W, B)



From the probability tree diagram, we get:

$$P(B, B) = \frac{9}{64} \text{ and } P(W, B) = \frac{15}{64}$$

P(second ball black)

$$= P(B, B) \text{ or } P(W, B)$$

$$= P(B, B) + P(W, B)$$

$$= \frac{9}{64} + \frac{15}{64}$$

$$= \frac{24}{64}$$

$$= \frac{3}{8}$$

BONUS PROBLEMS: 1) How many different handshakes are possible in a room with the Tuesday Math group people today?

2) A pitcher in baseball can throw 5 different kinds of pitches: 2 types of curve balls, 2 types of fast balls, and 1 knuckleball. If the pitcher strikes out a hitter in three pitches, how many different combinations could he throw?

Quiz: Tree Diagrams

1. A dice numbered 1 to 6 is rolled and a dime tossed. Draw a tree diagram to represent the possible outcomes.
2. There are 3 different roads from city A to city B and 3 different roads from city B to city C. Draw a tree diagram to represent total path from city A to city C via city B?
3. 2 coins green and blue are tossed simultaneously. Draw a tree diagram to represent the possible outcomes.
4. A jar contains blue balls numbered 1 to 3, violet balls numbered 1 to 2, and red balls numbered 1 to 2. Draw a tree diagram to represent total outcomes for selecting two marbles.
5. Draw a tree diagram to represent total outcomes for flipping a dime twice.
6. 2 six-sided numbered cubes are rolled. Draw a tree diagram to represent total outcomes?
7. 2 dimes and one six-sided dice numbered from 1 to 6 are tossed. Draw a tree diagram to illustrate total outcomes.
8. If a shopkeeper has 2 kinds of pens in 2 different ink colors and a notepad of two different sizes. Draw a tree diagram to select a pen and a notepad.
9. A nurse has 4 patients to visit. Draw a tree diagram to represent the possible outcomes.
10. A jar contains green marbles numbered 1 to 3 and violet marbles numbered 1 to 2. Draw a tree diagram to represent total outcomes for selecting two balls.

Circle # correct	0	1	2	3	4	5	6	7	8	9	10
Percentage Score	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

1. Dayton is deciding what to wear to school. He has a red shirt and a green shirt, and he has blue and black pants. He also has sandals, high tops, and boots. If he can wear any color shirt with any pair of pants and any pair of shoes, how many different combinations can Dayton pick?
2. Renee is picking her activities for this year. She wants to play one sport, join one club, and participate in one music activity. The sports she can play are soccer, golf, and basketball. The clubs she is considering are the science club, the journalism club, and the art club. For music, she can pick marching band, piano lessons, or orchestra. How many different combinations of activities can Renee pick?
3. Rudy is deciding what to order at the ice cream shop. He can choose a plain cone or waffle cone, and he can have mint or strawberry ice cream. He can have butterscotch or raspberry sauce. How many different combinations can Rudy order?
4. Shandrice is planning her workout. She can walk, skate, or bike. For each activity, she can go up the mountain or around the lake. When she gets back, Shandrice will do push-ups, pull-ups, or sit-ups. How many different combinations does Shandrice have to choose from?
5. A girls' choir is choosing a uniform for their concert. They can pick blue, pink, or purple sweaters, and they can pick brown, tan, or black skirts. The shoes they need come in white, navy blue, and black. Assuming all the colors go together, how many different combinations can the choir pick?
6. Steve is filling his backpack for school. He can bring a blue binder or a green one. He has blue, red, green, and yellow water bottles. His pencils come in blue or black. How many ways can he fill his backpack?
7. Colman is planning his workout. He can hike or bike. For each activity, he can go around the lake, along the river, or through the woods. When he gets back, Colman will do jumping jacks or sit-ups. How many different combinations does Colman have to choose from?
8. Jaclyn is filling up her pencil case before school. She wants to bring one pen, one pencil, one highlighter, and one extra item. She has green or black pens, and she has pencils decorated with stars, stripes, dogs, or dots. The highlighters come in yellow, green, light blue, and orange. She has room left for an eraser, a glue stick, or a small ruler. Given these choices, how many different combinations of items could Jaclyn put in her pencil case?

Solve the problems below using your knowledge of probability. Write fractions in lowest terms.

1. What is the probability of choosing a king from a standard deck of playing cards?
2. What is the probability of choosing a green marble from a jar containing 5 red, 6 green and 4 blue marbles?
3. What is the probability of choosing a marble that is not blue in problem 2?
4. What is the probability of getting an odd number when rolling a single 6-sided die?
5. What is the probability of choosing a jack or a queen from a standard deck of 52 playing cards?
6. What is the probability of landing on an odd number after spinning a spinner with 7 equal sectors numbered 1 through 7?
7. What is the probability of getting a 7 after rolling a single die numbered 1 to 6?
8. What is the probability of choosing a queen, a king or an ace from a standard deck of playing cards?
9. What is the probability of choosing the letter i from the word probability?
10. What is the sample space for choosing a letter from the word probability?

1. Steve is ordering a car. He has the choice of red, green, brown, silver, and white exteriors. He can choose a convertible or a standard top. He must also choose between stick shift and automatic. His last choice is of the interior color, which can be taupe, burgundy, or sky blue. How many different cars can he choose?
2. Xaphod is planning a vacation. He can go to the planets Earth, Mars, or Venus. He can choose a rocket, a shuttle, or a space pod. He must choose a departure of any day of the week, and a return day of any weekday (Mon – Fri). How many different vacation combinations does he have?
3. Mary is at the stable and is planning her ride. She can choose any of these horses: Bunny, Cinnamon, Brandy, or Chocolate. She can choose a brown, gray-black, or black saddle. She may choose to ride the south trail, east trail, or west trail, in either the morning or afternoon. How many choices does she have?
4. Jerry is making a cake for Mother's Day. He can make chocolate, vanilla, spice or carrot cakes, in one, two, or three layers. He can choose chocolate, vanilla, or double chocolate frostings. He has 6 colors of sprinkles. How many different cakes can he make for his mother?
5. Angela is trying to decorate her family room, and is modeling it on her computer. She has narrowed her choices to 4 paint colors, 3 trim colors, 5 carpet colors, and three chandeliers. How many different rooms does she have modeled on her computer?
6. Benjamin is trying to design his property. For the orchard he must choose between apples, cherries, pears, and apricots. In his small vegetable garden, he needs to choose between tomatoes, cucumbers, carrots, celery, or peas. In his flower bed, he'd like one of roses, peonies, hydrangeas, or butterfly bushes. How many different looks can he have for his property?
7. George is starting a farm, and he must choose his first animals. He can get cows, pigs, horses, or donkeys for his barn. He can put chickens, ducks, geese, pheasants, or turkeys in his bird yard. He can plant corn, wheat, or soy in his fields. How many ways can George start out his farm?
8. William is ordering lunch at the local sandwich shop. He can choose white, wheat, or sourdough bread. He can choose turkey, ham, or roast beef. His cheese choices are swiss, provolone, or cheddar. He may decide to put any of these toppings on (there are either on the sandwich or not): pickles, olives, hot peppers, tomatoes, lettuce, olive oil, mayonnaise, mustard, or sandwich sauce. How many combinations of sandwich can he make?

PROBABILITY

A) * Work out the probabilities for these pairs of events and give your answer as a fraction in its simplest form.

* Then plot them on the probability scale.

* Use this to decide which is most likely and circle the most likely event from each pair.

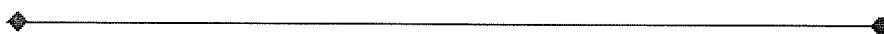
EXAMPLE

X: rolling a 6 with one die

Y: rolling an even number with one die

0

1

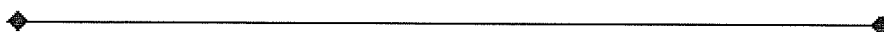


1) A: a head from tossing a coin

B: number greater than 3 with one die

0

1

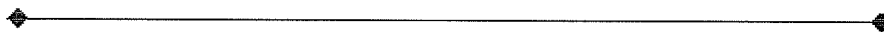


2) C: pick a red ball from a bag of 4 red, 3 green, 5 blue.

D: pick a green ball from the same bag

0

1

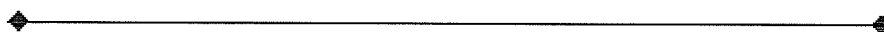


3) E: pick a heart from a pack of cards

F: pick a face card

0

1



B) Match the event to the probability:

A head when you toss a coin

Picking a king from a pack of cards

Choosing a ball less than 11 from 50 different bingo balls

Rolling a number greater than 6 with a die

$\frac{1}{50}$

$\frac{1}{13}$

Rolling a 5 with a die

$\frac{1}{6}$

0

Choosing the 5 ball from 50 different

$\frac{1}{5}$