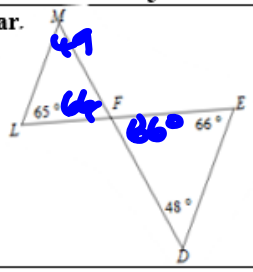
Bell Ringer

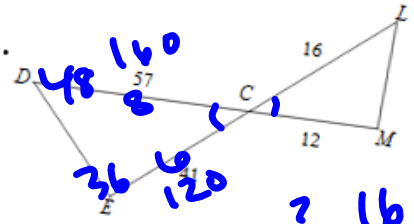
Tuesday 4/30

State if the triangles in each pair are similar. If so, state how you know they are similar.

1.



2.



AA
SAS
SSS

$\frac{57}{41} \stackrel{?}{=} \frac{16}{12}$

1.3902 $1.\overline{3}$

Turn in Sage #1 and #2 Reviews

Do #10 from 14.1 yesterday

10. What is the probability that x^2+7x+k is factorable if $0 \le k \le 20$ and k is an integer?

How many different numbers could k be? 21 options

12, 6, 10, 0

How many of those numbers are actual solutions?

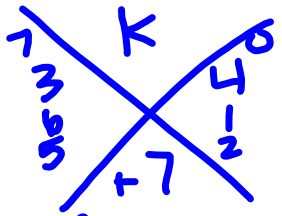
desired / total outcomes

x^2+7x+6 $(x+1)(x+6)$

$x^2+7x+10$ $(x+5)(x+2)$

$x^2+7x+12$ $(x+3)(x+4)$

x^2+7x+0 $x(x+7)$



$\frac{4}{21} = 19\%$

due tomorrow - questions?

Name: _____ Hour: _____

14.1 Sample Space and Simple Probability

State the sample space for each of the following events. Remember the sample space is a list of all possible outcomes for the event. Please try and use either an area model or a tree diagram to help construct the sample space. Please explain why you chose the method used.

1. Event: Flip three coins a penny, a nickel, and a dime

2. Event: Roll two dice and record their sum.

3. Event: Shooting One – and – One Free Throws

4. Use question #1 to answer the following, find the probability of each of the following events occurring. Be sure to show your thinking clearly:
   a) Three heads
   b) At least two heads
   c) One head and two tails
   d) At least one tail
   e) Exactly two tails
   f) At least one head and one tail
   g) Which is more likely, flipping at least 2 heads or a least 2 tails? Explain
   f) Did you choose the best method to represent this sample space? Explain

5. Use question #2 to answer the following.
   a) In a standard casino dice game the roller wins on the first roll if he rolls a sum of 7 or 11. What is the probability of winning on the first roll?

   b) The player loses on the first roll if he rolls a sum of 2, 3, or 12. What is the probability of losing on the first roll?

   c) If the player rolls any other sum, he continues to roll the dice until the first sum he rolled comes up again or until he rolls a 7, whichever happens first. What is the probability that the game continues after the first roll?

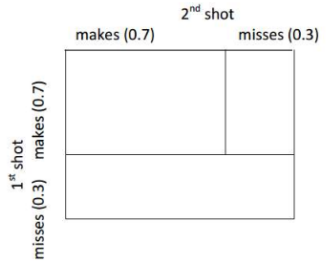
6. Still using question #2, in a different game of dice, you win if you roll a sum of six, lose if you roll a sum of seven. If anything else happens you ignore the results and roll again.
   a) How many ways are there to get a sum of six?

   b) How many ways are there to get a sum of seven?

   c) How many possible outcomes are important in this problem?

7. Rimshot McGee has a 70% free throw average. The opposing team is ahead by one point. Rimshot is at the foul line in a one-and-one situation with just seconds left in the game. (A one-and-one situation means that the player shoots a free throw. (If he makes the shot, he is allowed to shoot another. If he misses the shot, he gets no second shot. Each shot made is worth one point.)
   a) Take a guess. What do you think is the most likely outcome for Rimshot (use the sample space from question #3 to help if necessary)?

   b) Jeremy is working on the problem with Jenna and he remembers that area models are sometimes useful for solving problems related to probability. They set up the following area modes. Which part of the model represents Rimshot getting one point? How can you use the model to help you calculate the probability that Rimshot will get exactly one point?



   c) Use a model to find the probability of each outcome (0 points, 1 point, 2 points). What is the most likely of the three outcomes?

8. Eddie told Alfred, "*I'll bet if I flip three coins I can get exactly two heads.*" Alfred replied, "*I'll bet I can get exactly two heads if I flip four coins!*" Eddie scoffed. "*Well, so what? That's easier.*" Alfred argues, "*No, it's not. It's harder.*" Who is correct? Show all of your work and be prepared to defend your conclusion.

9. Harold sorted his jellybeans into two jars. He likes purple ones best and the black ones next best, so these are both in one jar. His next favorites are yellow, orange, and white, and these are in another jar. He throws all the rest in the garbage. Harold allows himself to eat only one jellybean from each jar per day. He wears a blindfold when he selects his jellybeans so he cannot choose his favorite first. What is the probability that Harold gets one black jellybean and one orange jellybean, if the first jar has 60% black and 40% purple jellybeans and the second jar has 30% yellow, 50% orange, and 20% white jellybeans?

10. What is the probability that x^2+7x+k is factorable if $0 \le k \le 20$ and k is an integer?

11. A coin is flipped. Find the probability of heads (P(H) *means the probability of a Head is*)?

12. A die is rolled. What is P(2)? What is the probability of an odd number? P(Prime)?

13. A card is drawn from a standard deck of playing cards. (4 suits – black clubs, black spades, red diamonds, red hearts; 13 of each suit, Ace (A), numbers 2 thru 10, Face Cards – Jack (J), Queen (Q), King (K); 52 cards in all). Find the following probabilities.
    a) P(2)
    b) P(red)
    c) P(K)
    d) P(club)
    d) P(face card)
    e) P(black face card)

Pass out Task Sheets

Unit 14 – Probabilities: TASK 14.2

Describing Subsets Name: _____

Roulette - A Develop Understanding Task

In the mid 1600's, a French nobleman, the Chevalier de Mere, was wondering why he was losing money on a bet where he thought was a sure winner. He asked the mathematician Blaise Pascal, who consulted with another mathematician, Pierre de Fermat. Together they solved the problem, and this work provided a beginning for the development of the probability theory. Since argument over the analysis of a dice game provided a basis for the study of this important area of mathematics, casino games are reasonable place to continue to investigate and clarify the ideas and language of probability.

As one of the simplest casino games to analyze, roulette is a good place to start. In American roulette the a person places a bet, the croupier spins the wheel and drops the ball and then all wait for the ball to land in one of 38 slots. The 38 slots on the wheel are numbered 00, 0, 1, 2, 3 … 36. Eighteen of the numbers are red and eighteen are black; 00 and 0 are green.

Before the ball is dropped, players place their chips on the roulette layout, shown at the right. Bets can be placed on:

- A single number.
- Two numbers by placing the chip on the line between them,
- Three numbers by placing a chip on the line at the edge of a row of three,
- Four numbers by placing the chip where the four corners meet,
- Five numbers (00, 0, 1, 2, 3)
- Six numbers by placing the bet at the an intersection at the edge,
- A column, the 1st twelve, 2nd twelve, or 3rd twelve,
- Evens,
- Odds,
- 1- 18,
- 19- 36,
- Reds, or
- Blacks

Note (1, 3, 5, 7, 9, 12, 14, 16, 18, 19, 21, 23, 25, 27, 30, 32, 34, and 36 are red)

Obtain a copy of the Roulette - Resource Page to help answer the following.

1. What is the sample space for spinning the roulette wheel once?

S = {00, 0, 1-36} 38 outcomes

2. A subset (smaller set) of outcomes from the sample space is called an event. For example, chip A represents the event {34}, and chip B represents the event {20, 21}. What is the event for each of the other bets?

A = {34} C = {25,26,27} F = {13 -24}

B = {20, 21} D = {4,5,7,8} H = {reds}

3. Since each of the outcomes is equally likely (the ball has equal probability of landing on any number) the probability of an event can be expressed as the counting rule:

$$P(event) = \frac{\text{\# desired outcomes (success)}}{\text{total \# outcomes}}$$

What is the probability of each event in problem #2?

Express answers as a fraction.

A = $\frac{1}{38}$ C = $\frac{3}{38}$ F = $\frac{12}{38}$

B = $\frac{2}{38}$ D = $\frac{4}{38}$ H = $\frac{18}{38}$

4. A player places a chip on the event **F**:{13 – 24} and another event **H**:{Reds}. Find the probabilities listed below. **Express answers as a fraction.**

   a. What is the P(F)? $\frac{12}{38}$

   b. What is P(H)? $\frac{18}{38}$

   c. What is the P(F and H)? $\frac{6}{18}$ 14, 16, 18, 19, 21, 23

P(A and B) P(A ∩ B) ∩ Intersection

***To find the Probability of an event A and even B use the counting method when there are multiple conditions for a singular event, it is called the Intersection of conditions to create one event.*

and = intersection; the symbol for an intersection = ∩

5. Calculate the probability of each using the roulette resource page. ***Express answers as a percent rounded to the nearest tenth.*** P(a number less than 5 and black)

Some roulette players like to place two (or more) bets at the same time. When making two bets, the player is hoping that one ***or*** the other of the two events occurs. When mathematician talk about one ***or*** another occurring, they call it the **union** of two events. ***or = union. Symbol for union*** = ∪.

A ∪

6. Calculate the probability of winning either when a player puts one chip on the event {7 8 10 11} and another on the event {10 11 12 13 14 15}. **Express answers as a fraction.** $\frac{4}{38}$ $\frac{6}{38}$ B

P(A or B) $= \frac{4}{38} + \frac{6}{38} - \frac{2}{38} = \frac{8}{38}$

7. Viola described the method for finding the probability for part (5a) above:
   "Instead of counting the outcomes I just added the two probabilities and then subtracted the probability of the overlapping events. So it's just $\frac{4}{38}+\frac{6}{38}-\frac{2}{38}=\frac{8}{38}$*."*

Viola's method of "adding the two probabilities and subtracting the probability of the overlapping event" is called the **addition rule** and can be written mathematically as:

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

You have already seen that event A *or* event B can be called a union and that event A *and* event B is called an **intersection**. So the addition rule can also be written:

$$P(A \text{ union } B) = P(A) + P(B) - P(A \text{ intersection } B)$$
$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Again refer to the resource roulette page, consider a player who puts a chip on both events "D" and "E". ***Express answers as a fraction.***

7. How does event D *or* J (union) differ from event D *and* J (intersection)?

8. Calculate the probability of each using the roulette resource page.
   a) P(chip F or chip H) b) P(chip C and chip H) c) P(chip C or chip G)

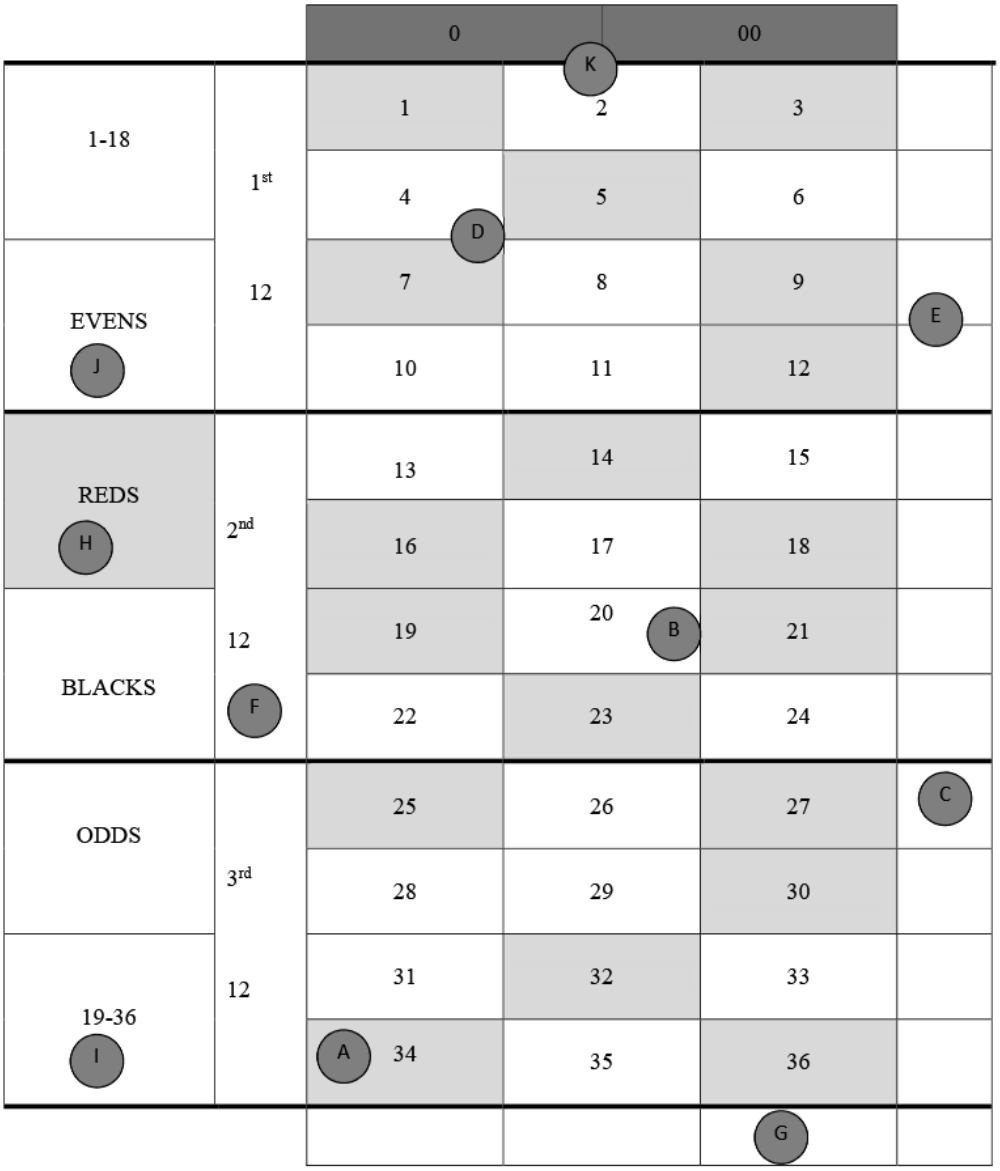
9. Use the formula for a union to answer the question below. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
   In a random sample of 25,000 college students, a research comply found that 47.4% had a membership in an athletic club and 32.3% exercised 4 or more hours per week. When they reported their findings, the research company indicated that 61.4% of college students had an athletic club membership or they exercised 4 or more hours per week. Given this information, what is the probability that a college student has a membership at an athletic club and exercises 4 or more hours per week?

Describing Subsets

Roulette – Resource Page

The shaded numbers are red

The white numbers are black



P(A or B) = P(A) + P(B) - P(A and B)

P(A and B) ---- counting method

P

Draw 1 card...

P(Ace or Red) = $\frac{4}{52} + \frac{26}{52} - \frac{2}{52}$

$\frac{28}{52}$

P(Ace and Red) = $\frac{2}{52}$

AR, AB

P(face card or spade) = $\frac{12}{52} + \frac{13}{52} - \frac{3}{52} = \frac{22}{52}$

P(face card and spade) = $\frac{3}{52}$

P(F ∩ S)

P(A or B) = P(A) + P(B) - P(A and B)

P(A and B) ---- counting method

Draw 1 card...

P(jack or red) = $\frac{4}{52} + \frac{26}{52} - \frac{2}{52} = \frac{28}{52}$

JJJJ

P(jack and red) = $\frac{2}{52}$

P(face card or 2) = $\frac{12}{52} + \frac{4}{52} - 0 = \frac{16}{52}$

P(face card and 2) = 0

Use the tree diagram to answer 8-11 OR → add!

8. What is the probability that you order a taco that has a hard shell with chicken?

(.45)(.2) = .09 9%

9. What is the probability of ordering a taco with pork as the meat?

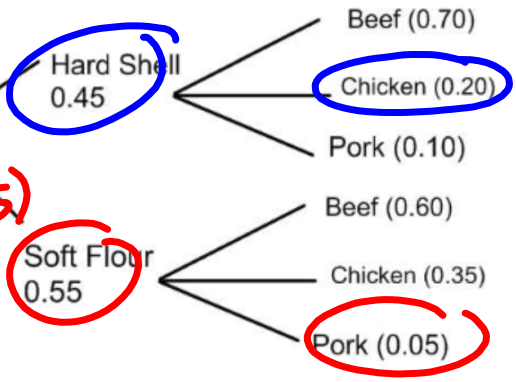
(.45)(.1) + (.55)(.05)

HP or SP = .0725

10. What is the probability of ordering a soft flour taco with beef?

(.55)(.6) = .33

11. What is the probability of ordering a hard shell taco?



14.2– Probabilities of Unions and Intersections

Describing Subsets Name: _____

Ready Hour: _____

Find the probability of the following events.

1. Avery has been learning to play some new card games and is curious about the probabilities of being dealt different cars from a standard 52 – card deck. Help him figure out the probabilities listed below:
   a. P(king) b. P(queen)

   c. P(diamond) d. P(black)

   e. P(face card) f. P(three or four)

2. Assume that two standard dice are being rolled and the sum is being calculated.
   a. P(sum 2) b. P(sum of 9)

   c. Event A = {the sum is a multiple of 3}, find P(A)

   d. Event B = {the sum is a multiple of 4}, find P(B)

Set

3. Using the situation described in problem #1 answer the following:
   a. What is P(king or diamond)? How does your answer relate to the probabilities you calculated in problem #1?

   b. What is the P(king or queen)? Again, how does your answer relate to the probabilities you calculated in problem #1?

   c. P(diamond or face card) d. P(10 or black)

   e. P(8 and red) f. P(less than 5)

   g. P(less than 3 or face card) h. P(greater than 5 but less than 10)

4. Using the situation described in problem #2 find the following.
   a. What is P(A and B)? b. What is P(A or B)?

5. In a random sample of 10,000 college students, a research comply found that 35.7% were involved in a club and 27.8% studied 4 or more hours per day. When they reported their findings, the research company indicated that 53.4% of college students were either involved in a club or they studied 4 or more hours per day. Given this information, what is the probability that a college student is involved in a club and studies 4 or more hours per day?

Go!

6. Eddie is arguing with Tana about the probability of flipping three coins. They decide to flip a penny, nickel and a dime. If they flip three coins, would a tree diagram or an area model be better for determining the sample space? Justify your answer.

7. Zelda, the fortune teller at the fair, foresees you meeting a tall dark stranger in the next 140 days. What is the portability that you will meet the stranger on Monday? What is the probability that you will meet the stranger on the weekend? What is the probability you will meet the stranger on a weekday?

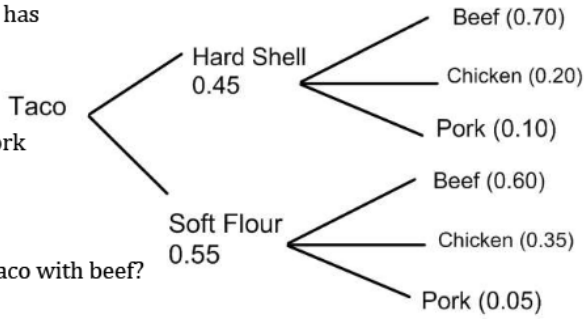
Use the tree diagram to answer 8-11

8. What is the probability that you order a taco that has a hard shell with chicken?

9. What is the probability of ordering a taco with pork as the meat?

10. What is the probability of ordering a soft flour taco with beef?

11. What is the probability of ordering a hard shell taco?



Use the tree diagram to answer 12-15

12. What is the probability that you order a sandwich on white bread?

13. What is the probability of ordering a sandwich with turkey on wheat?

14. What is the probability of ordering a sandwich with ham?

15. What is the probability of ordering a sandwich with ham on white?