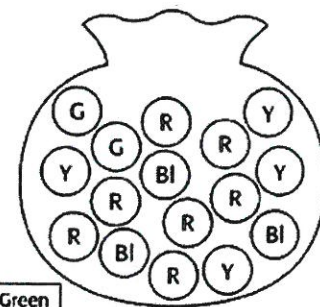


* Corrected as of 4/11/15

Name: Answer Key Per: _____ Date: _____
Serafino • Precalculus S2

9A Simple Probability & Odds

Notes & Classwork / Homework



G = Green
BI = Black
Y = Yellow
R = Red

$$P(A) = \frac{n(A)}{n(S)}$$

Simple Probability:

A ratio or percent of an event occurring vs. all possibilities

S = The Sample Space (acts as the Universal Set) of one Experiment

A bag has 16 marbles: 2 Green, 3 Black, 4 Yellow, 7 Red

$$S = \{g, g, b, b, b, y, y, y, y, r, r, r, r, r, r\} \quad n(S) = 16$$

An Experiment is any event. Picking a marble out of a bag, rolling a die, etc.

$$P(\text{Yellow}) = \text{the probability of selecting a Yellow marble} = \frac{4}{16} \rightarrow P(Y) = \frac{1}{4} \text{ (Reduced Fraction)} \\ = 0.25 \text{ (Decimal)} \\ = 25\% \text{ (Percent)}$$

Note that Probability will always be a number between 0 and 1. Percent will be between 0% and 100%.

1. A marble is drawn at random from the bag

$$P(\text{Green}) = \frac{2}{16} = \frac{1}{8}$$

$$P(\text{Red}) = \frac{7}{16}$$

$$P(\text{Not Yellow}) = \frac{12}{16} = \frac{3}{4}$$

$$P(\text{Black}) = \frac{3}{16}$$

$$P(\text{Blue}) = 0$$

$$P(\text{Not Blue}) = 1$$

Odds:

The ratio of an event occurring vs. NOT occurring.

$$\text{Odds (A)} = n(A) : n(A')$$

$$\text{Odds (Green)} = \text{Green} : \text{Non-Green} = 2 : 14 = 1 : 7 \\ \text{(expressed as a ratio with a colon between the values)}$$

2. A marble is drawn at random

$$\text{Odds (Green)} = 1 : 7$$

$$\text{Odds (Not White)} = 1$$

$$\text{Odds (Black)} = 3 : 13$$

P(A or B) – Mutually Exclusive Outcomes

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

NOTE: *This ONLY works because these colors are MUTUALLY EXCLUSIVE *

$$P(\text{Yellow OR Green}) = P(\text{Yellow}) + P(\text{Green}) \\ = \frac{4}{16} + \frac{2}{16} = \frac{6}{16} = \frac{3}{8}$$

No marble is BOTH Yellow AND Green, so you don't have to worry about counting anyone twice.

3. A marble is drawn a random. Find the Probability. (Star the one of these that is NOT mutually exclusive)

$$P(\text{Red or Black}) = \frac{10}{16} = \frac{5}{8}$$

$$P(\text{Red or Not Yellow}) = \frac{12}{16} = \frac{3}{4}$$

$$P(\text{Green or Black}) = \frac{5}{16}$$

$$P(\text{Red, Green or Yellow}) = \frac{13}{16}$$

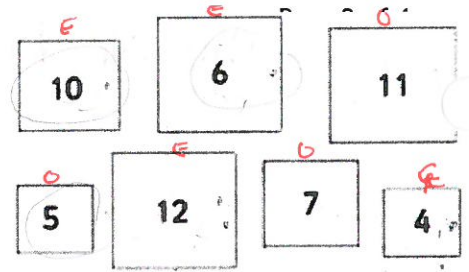
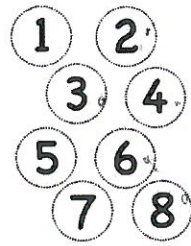
$$P(\text{Yellow or Blue}) = \frac{4}{16} = \frac{1}{4}$$

$$P(\text{Red or Not Red}) = 1$$

Probability: Overlapping Outcomes

The following 15 numbered shapes are thrown in a bag
One is selected at random.

Sample Space = {C1, C2, C3, C4, C5, C6, C7, C8, S4, S5, S6, S7, S10, S11, S12}



4. A numbered shape is drawn at random

$P(\text{Circle}) = \frac{8}{15}$

$P(\text{Square}) = \frac{7}{15}$

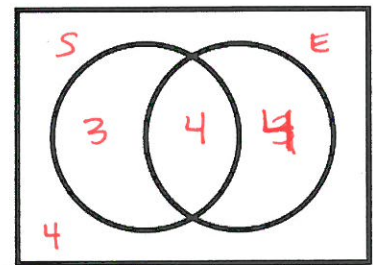
$P(\text{Number less than 10}) = \frac{12}{15} = \frac{4}{5}$

Odds (Even Number) = $\frac{8}{15}$ $8:7$ Odds (Two-Digit Number) = $\frac{3}{15} = \frac{1}{5}$ $1:4$

Odds (Multiple of 4) = $\frac{4}{15}$ $4:11$

P(A and B) = Probability the Outcome is both A and B

Let Squares = S and the Even Numbers = E
Make a Venn Diagram with the number of elements in subsets S and E



5. A numbered shape is drawn at random.
"What's the probability of selecting something a Square AND Even?"

$P(S \cap E) = \frac{4}{15}$

$P(\text{Single Digit and Square}) = \frac{4}{15}$

$P(\text{Circle and Prime}) = \frac{4}{15}$

$P(\text{Multiple of 2 and Multiple of 3}) = \frac{3}{15} = \frac{1}{5}$

P(A or B) – Overlapping Events

"What's the probability of selecting a Square OR an Even Number?"

We know that if we want $S \cup E$, we shade both.
If we shade them one at a time, we have shaded one region TWICE!

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
We MUST subtract the overlap when items can have both properties

$P(\text{Square or Even}) = P(\text{Square}) + P(\text{Even}) - P(\text{Even Squares})$
 $P(S \cup E) = P(S) + P(E) - P(S \cap E)$
 $= \frac{7}{15} + \frac{8}{15} - \frac{4}{15} = \frac{11}{15}$

When an item can be BOTH, when you do "or", you have to add the probabilities but subtract the overlap.

6. A numbered shape is drawn at random

$P(\text{Even or Circle}) = \frac{12}{15} = \frac{4}{5}$

$P(\text{Odd or two Digit}) = \frac{9}{15} = \frac{3}{5}$

$P(\text{Square or Prime}) = \frac{11}{15}$

$P(\text{Multiple of 2 or Multiple of 3}) = \frac{9}{15} = \frac{3}{5}$

~~$P(\text{Multiple of 2 and multiple of 3})$~~

Odds (Composite or Circle) $\frac{12}{15} = \frac{4}{5} = 4:1$ Odds

Odds (Multiple of 3 or Multiple of 4) $7:8$ $P(\text{Multiple of 2 and multiple of 3 and a square}) = \frac{2}{15}$

Sample Space for Choosing a Card from a Deck

7. A card is drawn randomly.

	Ace	2	3	4	5	6	7	8	9	10	Jack	Queen	King
P	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥
P	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
P	♠	♠	♠	♠	♠	♠	♠	♠	♠	♠	♠	♠	♠
P	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣

$$P(\text{Ace}) = \frac{4}{52} = \frac{1}{13}$$

$$P(\text{Ace or Club}) = \frac{4}{13}$$

$$P(\text{Ace or Red}) = \frac{7}{13}$$

$$P(\text{Ace or Black}) = \frac{7}{13}$$

$$P(\text{Face or 5}) = \frac{16}{52} = \frac{4}{13}$$

$$P(\text{Red Face}) = \frac{6}{52} = \frac{3}{26}$$

$$P(\text{Club or Even}) = \frac{7}{13}$$

$$P(\text{Black and Prime}) = \frac{2}{13}$$

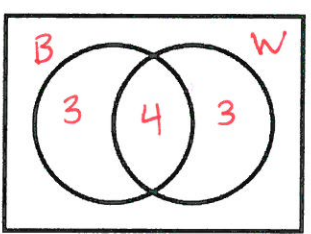
$$P(\text{Red and Club}) = 0$$

Odds (Even or Face) = ~~8:5~~ 8:5 Odds (4, 5 or 6) = 3:10

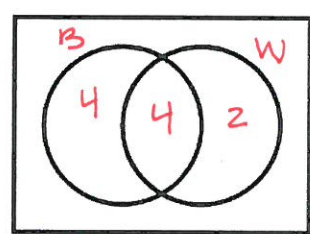
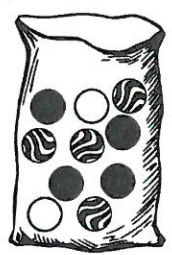
Odds (Male or Ace) = $\frac{12}{52}$ P = $\frac{3}{13}$
O = $\frac{3}{10}$

8. The marbles in the bags below are either Black, White or Black & White Striped. Complete Venn Diagrams & find the probability that a marble drawn at random will contain the indicated color in some way.

Bag 1



Bag 2



From Bag 1:

$$P(B \cap W') = \frac{3}{10} \quad P(W \cap B') = \frac{3}{10}$$

$$P(B) = \frac{7}{10} \quad P(W) = \frac{7}{10}$$

$$P(B') = \frac{3}{10} \quad P(W') = \frac{3}{10}$$

$$P(B \cap W) = \frac{2}{5} \quad P(B \cup W) = 1$$

From Bag 2:

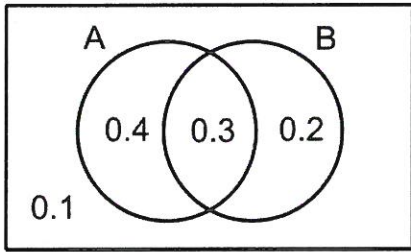
$$P(B \cap W') = \frac{2}{5} \quad P(W \cap B') = \frac{1}{5}$$

$$P(B) = \frac{4}{5} \quad P(W) = \frac{3}{5}$$

$$P(B') = \frac{1}{5} \quad P(W') = \frac{2}{5}$$

$$P(B \cap W) = \frac{2}{5} \quad P(B \cup W) = 1$$

9. A survey was given to students about their report card grades. Below is the breakdown for the percentage of students who had As and/or B's somewhere on their report card.

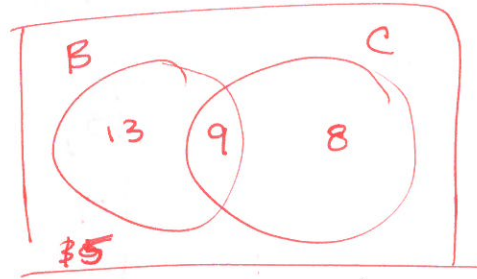


$P(B's) = 50\%$ $P(\text{No As}) = 30\%$ $P(\text{Only Cs or below}) = 10\%$
 $P(\text{Only As}) = 40\%$ $P(\text{As or Bs}) = 90\%$ $P(\text{Only B's or Below}) = 60\%$

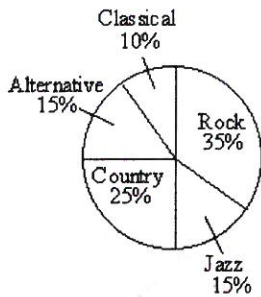
10. 45 Students are surveyed. 17 take Chemistry, 22 take biology, and 9 take both. Make a Venn Diagram if it helps you find the probability of selecting a student who

Takes Chemistry $17/45$
 Only takes Biology $13/45$

Takes Neither $1/3$
 Takes Chemistry or Biology $2/3$



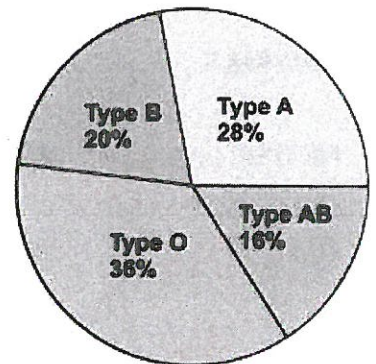
11. A survey was given to students to see the one type of music they can't stand. If you pick one student at random, what is the probability that student's least favorite music is...



Country 25% Rock or Alternative 50%
 Not Classical 90% Jazz or Alternative 30%

12. The Blood Drive collected blood from 25 donors at lunch. Clumsy Clarissa spilled water on all the labels and they got ruined. The pie chart shows the breakdown of the percentages of who gave blood that day. If she picks up one vial of blood, what is the probability the type will...

Blood Types of 25 Donors



Have an A in it? 44% Have one letter? 84%
 Have an A or a B in it? 64% Not have an A in it? 56%

What are the odds it will be Type O? Odds it will not have a B in it?

$9:16$ ~~9:16~~ $116:9$

What is the probability it will be a match for YOUR blood type? (Find out if you don't know your blood type)

Mrs S is type A- , so 28% (for me)