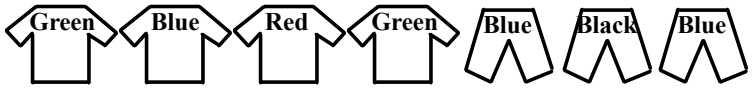
Name: _____

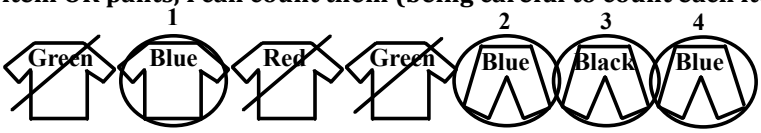
Basics of Probability with "Or"

When you want the probability of an event OR another event happening, you are still only looking for ONE probability, because you only want one of the two options to happen. This basically means that you have to count up all of the possibilities that fit into either category, without double-counting options that fall into both categories.

For example, if I have the following options:



and I want either a blue item OR pants, I can count them (being careful to count each item only once):



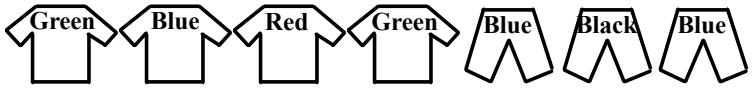
So, the probability would be:

$$\text{P(blue or pants)} = \boxed{\frac{4}{7}}$$

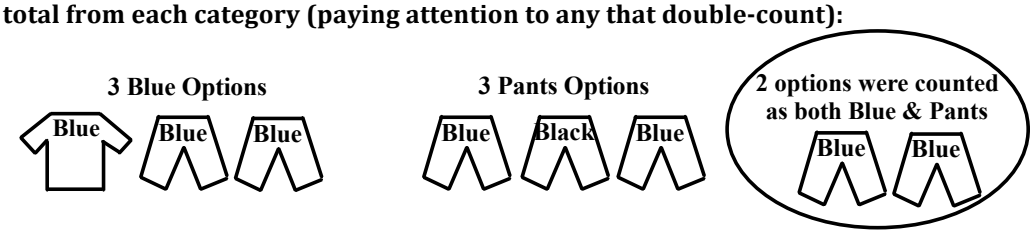
You can also do this process using addition, but you must be careful not to double-count items that fall into both categories. To avoid this, you add the total from each category then subtract all of the overlapping items that got counted in both categories.

$$\text{Probability with "Or"} = \frac{\text{1st want} + \text{2nd want} - \text{overlap}}{total}$$

For example, if I have the same options, and want the same thing – either a blue item OR pants:



I can get the total from each category (paying attention to any that double-count):



then, I add the categories, and subtract the double-counted options:

$$\text{blue} + \text{pants} - \text{bluepants} = 3 + 3 - 2 = 4$$

So, the probability would be:

$$\text{P(blue or pants)} = \frac{\text{blue} + \text{pants} - \text{bluepants}}{\text{total}} = \boxed{\frac{4}{7}}$$

Determine the probability of each.

EXAMPLE There are 6 red pens, 7 blue pens, 3 red pencils, 4 black pencils, and 5 black pens. Determine the probability of randomly selecting a red item or a pencil. Then determine the complement of that event.

Sample Space:	Red Pen	Blue Pen	Red pencil	Black pencil	Black pen
Amount of that item:	6	7	3	4	5
Sample Size:	25	25	25	25	25

I want a RED ITEM or a PENCIL. I can either identify what I have that meets my criteria (highlighted above) and combine them 6 RED Pens, 3 RED PENCILS, and 4 Black PENCILS to make **13 items that I want**

Or, I can use the formula 1st want + 2nd want – overlap

9 total red + 7 total pencils – 3 red pencils = 16 – 3 = **13 items that I want**

Either way, my probability will be: $P(red\ or\ pencil) = \frac{red\ or\ pencil}{total} = \boxed{\frac{13}{25}}$

The probability of the complement (NOT red or a pencil), would be the remaining options so, if 13 of the 25 are what I want, then the other 12 are what I don't want. Therefore, $P(NOT\ red\ or\ pencil) = \boxed{\frac{12}{25}}$

1. There are 6 red pens, 7 blue pens, 3 red pencils, 4 black pencils, and 5 black pens. Determine the probability of randomly selecting a black item or a pen. Then determine the complement of that event.

Sample Space:	Red Pen	Blue Pen	Red pencil	Black pencil	Black pen
Amount of that item:	6	7	3	4	5
Sample Size:	25	25	25	25	25

2. There are 6 red pens, 7 blue pens, 3 red pencils, 4 black pencils, and 5 black pens. Determine the probability of randomly selecting a blue item or a pencil. Then determine the complement of that event.

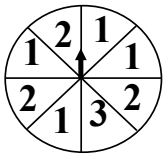
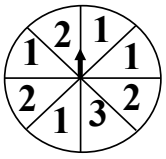
Sample Space:					
Amount of that item:					
Sample Size:					

3. There are 2 gray cats, 1 white cat, 4 white dogs, 3 white rabbits, and 2 gray rabbits. Determine the probability of randomly choosing a white animal or a cat. Then determine the complement of that event.

4. There are 2 gray cats, 1 white cat, 4 white dogs, 3 white rabbits, and 2 gray rabbits. Determine the probability of randomly choosing a gray animal or a rabbit. Then determine the complement of that event.

5. There are 2 gray cats, 1 white cat, 4 white dogs, 3 white rabbits, and 2 gray rabbits. Determine the probability of randomly choosing a gray animal or a dog. Then determine the complement of that event.

6. In a deck of cards there are 13 cards with black spades, 13 cards with black clubs, 13 cards with red diamonds, and 13 cards with red hearts. Determine the probability of randomly selecting a black card or a heart. Then determine the complement of that event.

7. In a deck of cards there are 13 cards with black spades, 13 cards with black clubs, 13 cards with red diamonds, and 13 cards with red hearts. Determine the probability of randomly selecting a club or a diamond. Then determine the complement of that event.	8. In a deck of cards there are 13 cards with black spades, 13 cards with black clubs, 13 cards with red diamonds, and 13 cards with red hearts. Determine the probability of randomly selecting a black card or a club. Then determine the complement of that event.
9. There are 7 cats, 10 butterflies, 3 birds, 5 dogs, 9 fish, 3 rabbits, and 6 hamsters. Determine the probability of randomly selecting a cat or a rabbit. Then determine the complement of that event.	10. There are 7 cats, 10 butterflies, 3 birds, 5 dogs, 9 fish, 3 rabbits, and 6 hamsters. Determine the probability of randomly selecting an animal that flies or an animal that has legs. Then determine the complement of that event.
11. Determine the probability of randomly spinning a 1 or a number greater than 2. Then determine the complement of that event. 	12. Determine the probability of randomly spinning an odd number or a 2. Then determine the complement of that event. 

Basics of Probability with "Or"
Answers

1. $P(black\ or\ pen) = \frac{22}{25}$ $P(NOT\ black\ or\ pen) = \frac{3}{25}$	2. $P(blue\ or\ pencil) = \frac{14}{25}$ $P(NOT\ blue\ or\ pencil) = \frac{11}{25}$
3. $P(white\ or\ cat) = \frac{5}{6}$ $P(NOT\ white\ or\ cat) = \frac{1}{6}$	4. $P(gray\ or\ rabbit) = \frac{7}{12}$ $P(NOT\ gray\ or\ rabbit) = \frac{5}{12}$
5. $P(gray\ or\ dog) = \frac{2}{3}$ $P(NOT\ gray\ or\ dog) = \frac{1}{3}$	6. $P(black\ or\ heart) = \frac{3}{4}$ $P(NOT\ black\ or\ heart) = \frac{1}{4}$
7. $P(club\ or\ diamond) = \frac{1}{2}$ $P(NOT\ club\ or\ diamond) = \frac{1}{2}$	8. $P(black\ or\ club) = \frac{1}{2}$ $P(NOT\ black\ or\ club) = \frac{1}{2}$
9. $P(cat\ or\ rabbit) = \frac{10}{43}$ $P(NOT\ cat\ or\ rabbit) = \frac{33}{43}$	10. $P(flies\ or\ has\ legs) = \frac{34}{43}$ $P(DOES\ NOT\ fly\ or\ have\ legs) = \frac{9}{43}$
11. $P(1\ or\ greater\ than\ 2) = \frac{5}{8}$ $P(NOT\ 1\ or\ greater\ than\ 2) = \frac{3}{8}$	12. $P(odd\ or\ 2) = 1$ $P(NOT\ odd\ or\ 2) = 0$