Name: $\qquad$ Block: $\qquad$ Date: $\qquad$

## Odds

What is the probability that if you roll a 6 -sided number cube, you will roll 5 or less? $\qquad$
What is the probability that you will NOT roll 5 or less? $\qquad$
Since probability is between 0 and 1 , we can find the probability of something NOT occurring by subtracting: 1-P(event WILL occur).
In the above example: $P(5$ or less $)=\frac{5}{6} ; \quad P($ NOT 5 or less $)=1-\frac{5}{6}=\frac{1}{6}$
With odds, we create a ratio of the numbers ways an event can occur with the number of ways the event cannot occur. In the above example, the odds are $\underline{5: 1}$ (read $\underline{5}$ to 1 ) that you will roll a 5 or less.
When we want the Odds in Favor, we want the ratio of the event happening against the event NOT happening. In the above example, the odds in favor are 5:1.
When we want the Odds Against, we want the ratio of the event NOT happening compared to the event happening. In the above example, the odds against are 1:5.

| Odds | The odds in favor of an outcome is the ratio of the number of ways the outcome can occur <br> to the number of ways the outcome cannot occur. <br> Odds in favor = number of successes : number of failures |
| :---: | :--- |
| The odds against an outcome is the ratio of the number of ways the outcome cannot occur <br> to the number of ways the outcome can occur. <br> Odds against = number of failures : number of successes |  |

Example 1: Find the odds of a sum of 11 if a pair of number cubes are rolled.
Number of ways to get a sum of 11
Number of ways to NOT get a sum of 11 ODDS FOR: $\qquad$

Example 2: In a bag of marbles, 30 are blue, 15 are orange, 20 are yellow, and 10 are green. What are the odds against drawing a green marble from the bag?
Number of ways to draw a green
Number of ways NOT to draw a green $\qquad$ ODDS AGAINST: $\qquad$
You try:
Find the odds when rolling two number cubes of...
a) rolling doubles
b) not rolling doubles
c) getting double sixes d) not getting double sixes
e) A hockey team scores 3 goals for every 30 shots taken. What are the odds in favor of the next shot being a goal?

## Compound Events

A compound event consists of two or more events. To find the probability of a compound event, we must consider whether the events are independent, dependent, or mutually exclusive.
For independent and dependent events, the first event occurs AND the second event occurs. We multiply the probability of the individual events.
Independent events. The outcome of one event DOES NOT influence the outcome of another.
Example: You have a bag with two red marbles and two white marbles. What is the probability of drawing a red marble and then a white marble, if we replace the marbles after we draw?
$P($ red $)=$ $\qquad$ . If you replace the marble you drew back in the back, $P($ white) is also $\qquad$ .
In this case, we are asked to find $P$ (red and white, with replacement), so we multiply our individual probabilities to get $\frac{1}{2} \cdot \frac{1}{2}=\frac{1}{4}$.
Dependent events. The outcome of one event DOES influence the outcome of another. Suppose in the above example, we do NOT replace the marbles after each draw. The first probability, $\mathrm{P}\left(\right.$ red), will still be $\frac{1}{2}$. But if we do not replace the marble, we now have 1 red marble and 2 white marbles. What is the probability of now drawing a white marble? $\qquad$
So our probability is still the product of the individual probabilities, but we must be careful when calculating the second probability: $P($ red and white, without replacement $)=\frac{1}{2} \cdot \frac{2}{3}=\frac{1}{3}$ Mutually Exclusive events. Mutually exclusive events cannot happen at the same time - one $\underline{O R}$ the other occurs. If you roll two number cubes, you can't roll a sum that is both 5 and even. When asked to find the probability of mutually exclusive events, we add the probabilities. Example: What is the probability of rolling a number cube and landing on a 5 or an even number? We want $P(5$ or even $)=P(5)+P($ even $)=\frac{1}{6}+\frac{1}{2}=\frac{4}{6}=\frac{2}{3}$

## Summary:

| Independent | $P(A$ and $B$, with replacement $)=P(A) \cdot P(B)$ |
| :--- | :--- |
| Dependent | $P(A$ and $B$, without replacement $)=P(A) \cdot P(B$ following $A)$ |
| Mutually Exclusive | $P(A$ or $B)=P(A)+P(B)$ |

You try:
Two cards are drawn from a 52 -card deck WITHOUT replacement. Find
a) $P(4$ and 8$)$
b) $P$ (queen of hearts and 10)

If we draw one card from the deck, find
c) $P$ (queen of clubs or a red card)
d) $P$ (queen of hearts or 10)

