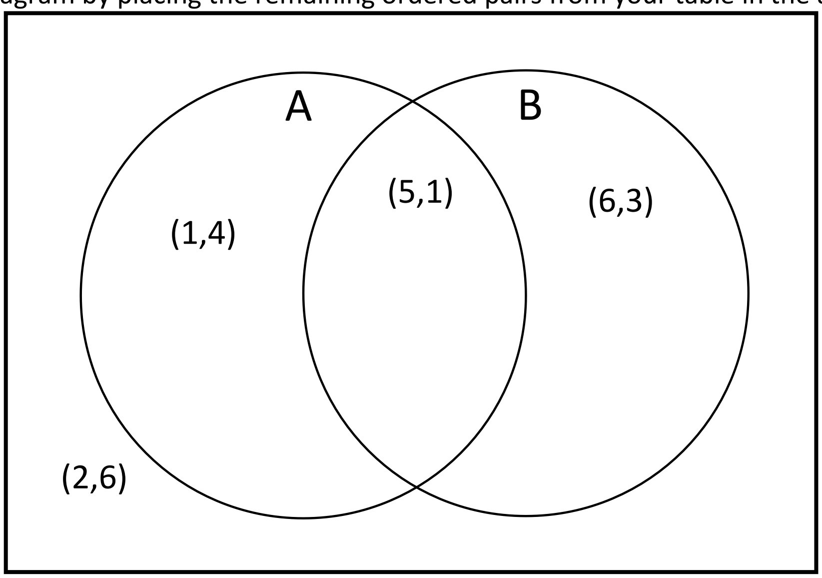
How Odd

Name_________________________
Date____________Period________

1. Using your table, determine the probability of having a least one of the two dice show an odd number.

2. The different outcomes that determine the probability of rolling odd can be visualized using a Venn Diagram, the beginning of which is seen below. Each circle represents the possible ways that each die can land on an odd number. Circle A is for the first die landing on an odd number and circle B for the second die landing on odd. The circles overlap because some rolls of the two dice are successes for both dice. In each circle, the overlap, and the area outside the circles, one of the ordered pairs from the table has been placed. $(1,4)$ appears in circle A because the first die is odd, $(6,3)$ appears in circle B because the second die is odd, $(5,1)$ appears in both circles at the same time (the overlap) because each die is odd, and $(2,6)$ appears outside of the circles because neither dice is odd.

   a. Finish the Venn Diagram by placing the remaining ordered pairs from your table in the appropriate place.



   b. How many outcomes appear in circle A? (Remember, if ordered pairs appear in the overlap, they are still within circle A).

   c. How many outcomes appear in circle B?

   d. The portion of the circles that overlap is called the **intersection**. The notation used for intersections is $\cap$. For this Venn Diagram the intersection of A and B is written $A \cap B$ and is read as "A intersect B" or "A and B." How many outcomes are in $A \cap B$?

e. When you look at different parts of a Venn Diagram together, you are considering the **union** of the two outcomes. The notation for unions is $\cup$, and for this diagram the union of A and B is written $A \cup B$ and is read "A union B" or "A or B." In the Venn Diagram you created, $A \cup B$ represents all the possible outcomes where an odd number shows. How many outcomes are in the union?

f. Record your answers to b, c, d, and e in the table below.

b. Circle A	c. Circle B	d. $A \cap B$	e. $A \cup B$

g. How is your answer to e related to your answers to b, c, and d?

h. Based on what you have seen, make a conjecture about the relationship of A, B, $A \cup B$ and $A \cap B$ using notation you just learned.

i. What outcomes fall outside of $A \cup B$ (outcomes we have not yet used)? Why haven't we used these outcomes yet?

In a Venn Diagram the set of outcomes that are *not* included in some set is called the complement of that set. The notation used for the complement of set A is $\overline{\text{A}}$, read "A bar", or ~A, read "not A". For example, in the Venn Diagram you completed above, the outcomes that are outside of $A \cup B$ are denoted $\overline{A \cup B}$.

j. Which outcomes appear in $\overline{\text{A}}$ - B?

k. Which outcomes appear in $\overline{B} - \overline{A \cup B}$?

3. The investigation of the Venn Diagram in question 2 should reveal a new way to see that the probability of rolling at least one odd number on two dice is $\frac{27}{36} = \frac{3}{4}$. How does the Venn diagram show this probability?