

Math-2a

Lesson 11-6

Probability

And

Venn Diagrams

2-Way Table

Column quantity of measure: make of car

Row quantity of measure: color

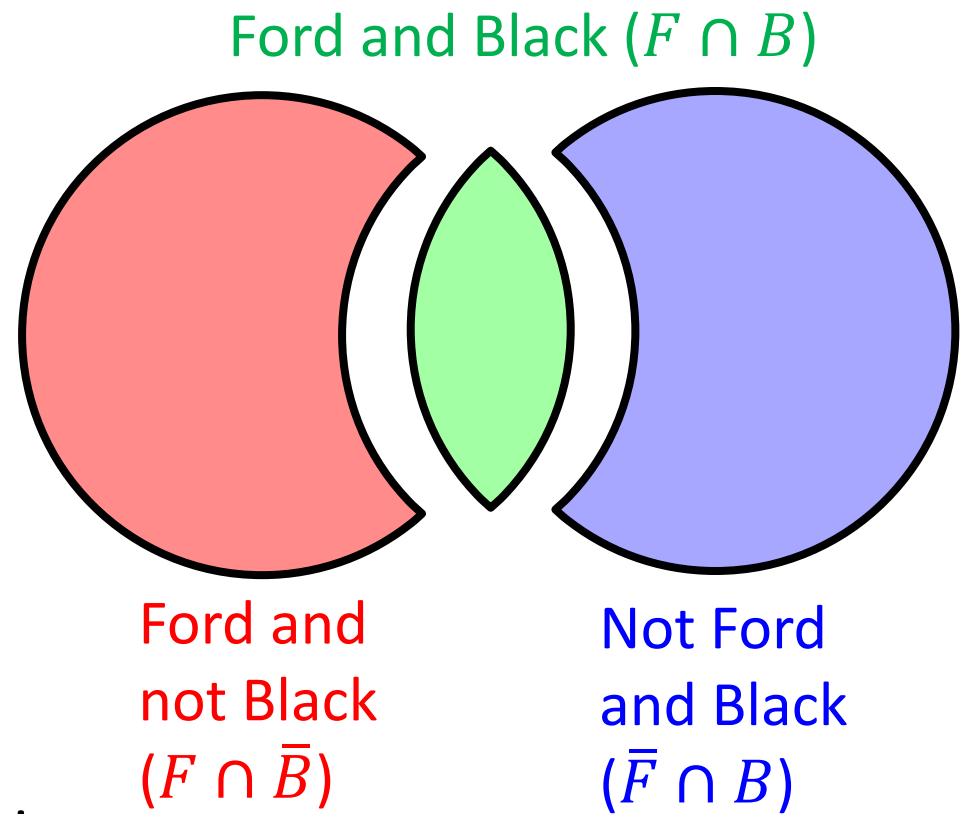
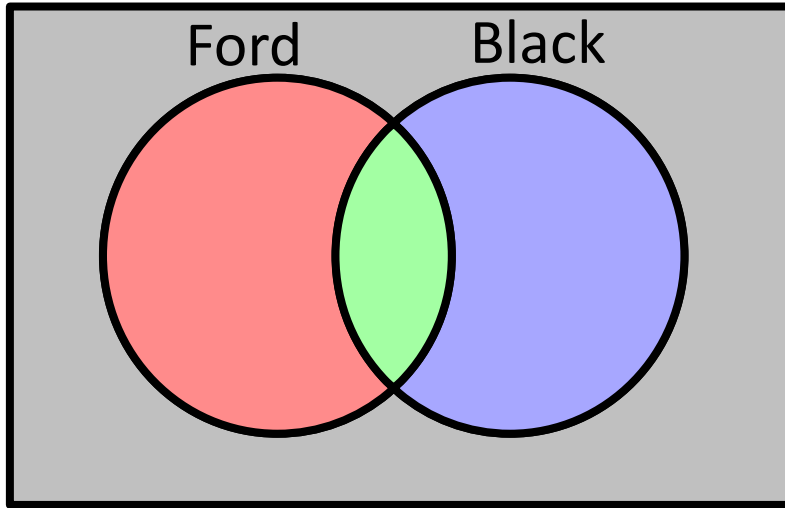
Columns contain mutually exclusive ways to measure one quantity. Ford and Not Ford cannot refer to the same make of car!

	Ford	Not a Ford	Totals
Black	$F \cap B$	$\bar{F} \cap B$	B
Not Black	$F \cap \bar{B}$	$\bar{B} \cap \bar{F}$	\bar{B}
Totals	F	\bar{F}	

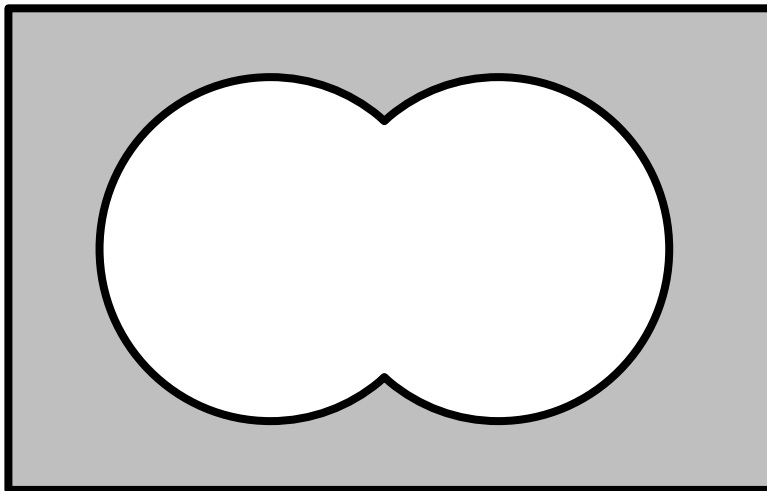
Rows contain mutually exclusive ways to measure one quantity. Black and Not Black cannot refer to the same color!

Fill in the symbol that describes each space in the table.

Venn Diagram: a picture that (in this case) shows two different classification categories.

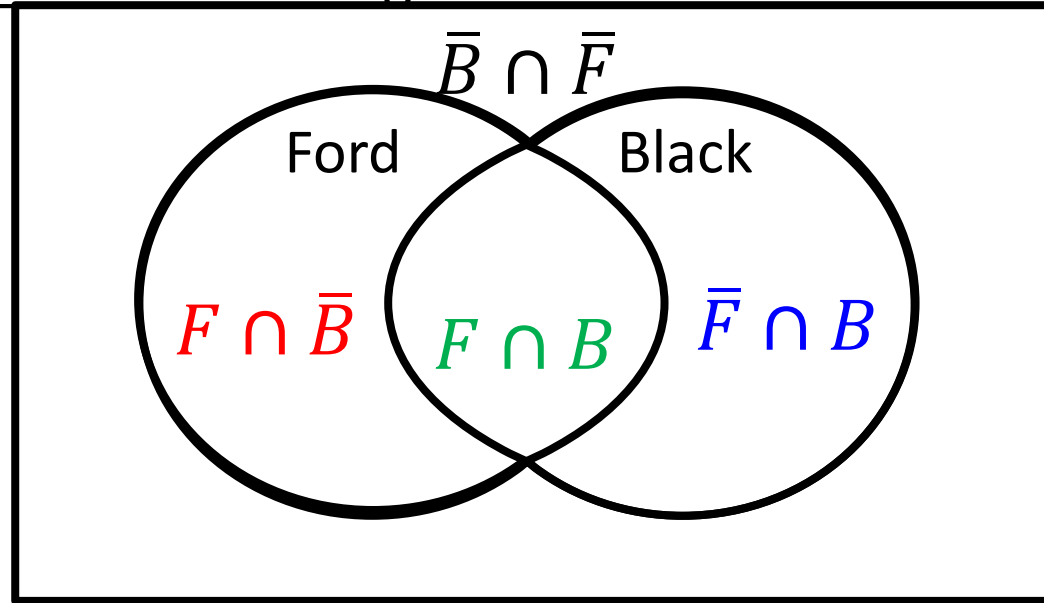


This Venn Diagram has 4 distinct regions



Not Ford and not Black ($\bar{F} \cap \bar{B}$)

Label the regions of the Venn Diagram



What categories are in the table but are NOT in the Venn Diagram?

	Ford	Not a Ford	Totals
Black	$F \cap B$	$\bar{F} \cap B$	B
Not Black	$F \cap \bar{B}$	$\bar{B} \cap \bar{F}$	\bar{B}
Totals	F	\bar{F}	

Only numbers from the “field” of the table are shown in the Venn diagram.

	Ford	Not Ford	Totals
Black	3	4	7
Not Black	8	2	10
Totals	11	6	17

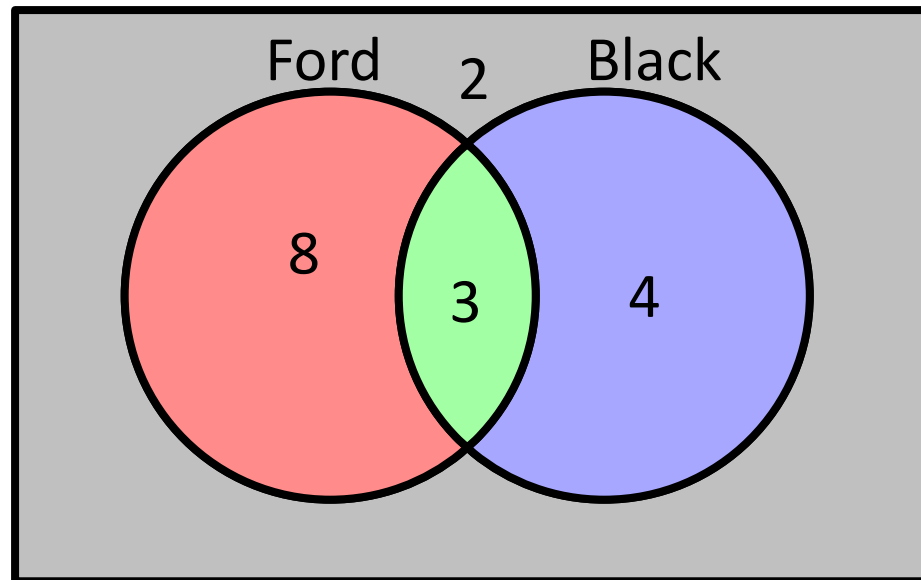
Transfer the numbers from the table into the corresponding region of the Venn Diagram.

How many Fords are in the Venn Diagram?

$$8 + 3 = 11$$

How many Black cars are in the Venn Diagram?

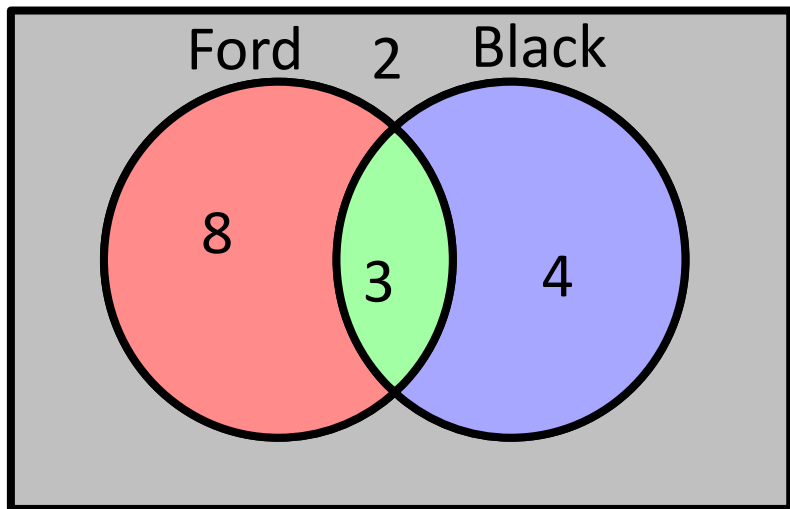
$$3 + 4 = 7$$



How many cars are in the Venn Diagram?

$$8 + 3 + 4 + 2 = 17$$

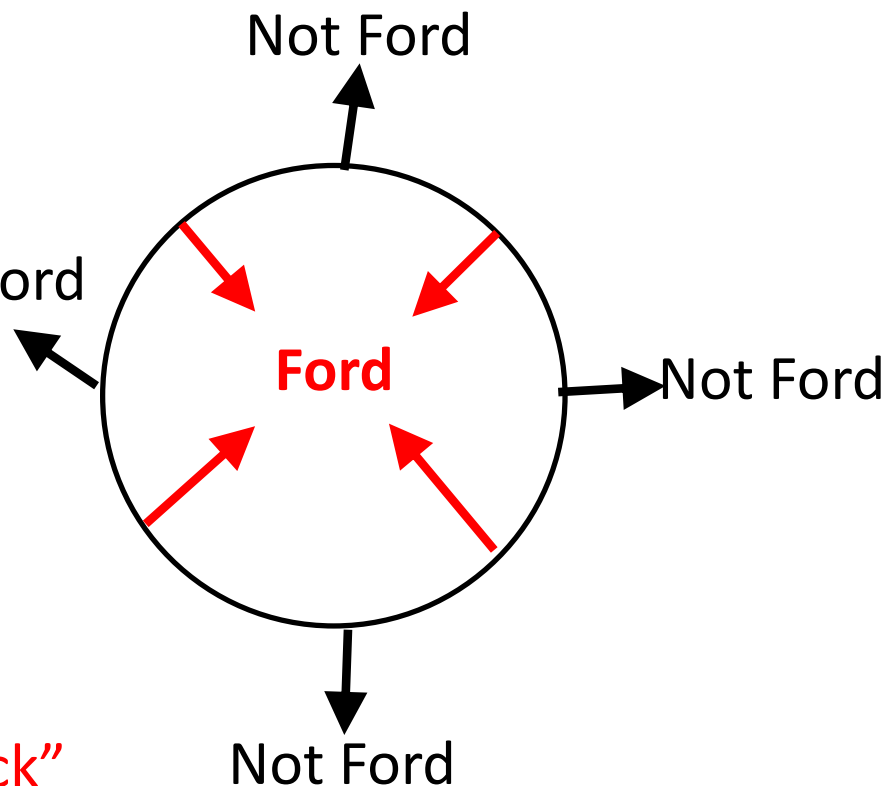
There are two mutually exclusive categories for cars: (1) Ford and (2) Not Ford. Why isn't there a circle/region for the "not Ford" case?



Inside "Ford" circle → "Ford"
Outside of "Ford" circle → "Not Ford".

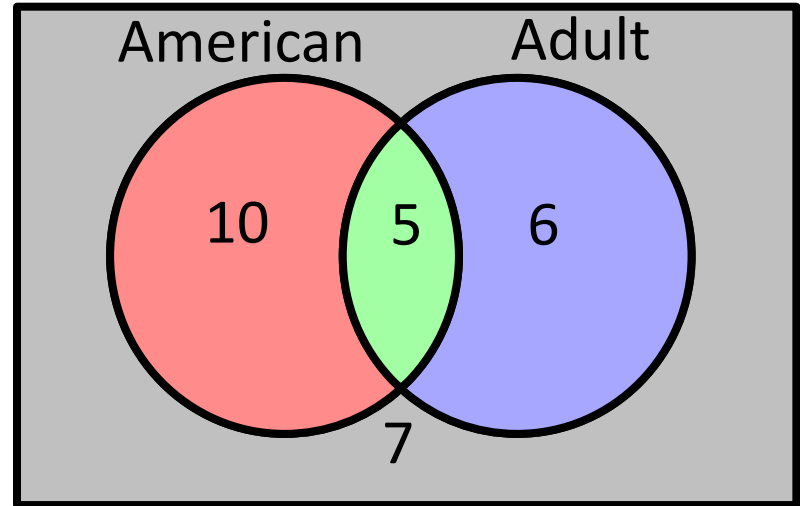
There are two mutually exclusive categories for colors: (1) Black and (2) Not Black. Why isn't there a circle/region for the "not Black" case?

Inside "Black" circle → "Black"
Outside "Black" circle → "Not Black"



Find:

1. $P(\text{American})$
2. $P(\text{Adult})$
3. $P(\text{American and Adult})$
4. $P(\text{American and not Adult})$
5. $P(\text{not American and not Adult})$
6. $P(\text{not American and Adult})$



7. $P(\text{Adult given American})$
8. $P(\text{American given Adult})$

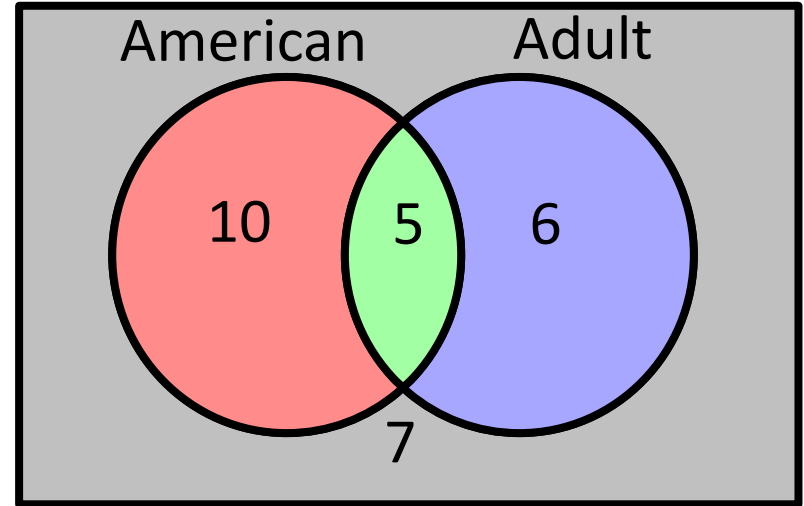
Do you prefer to calculate probabilities from a 2-way table or a Venn diagram?

Build a 2-way table to replace the Venn diagram.

What are the row categories?

What are the column categories?

Transfer numbers to the table.



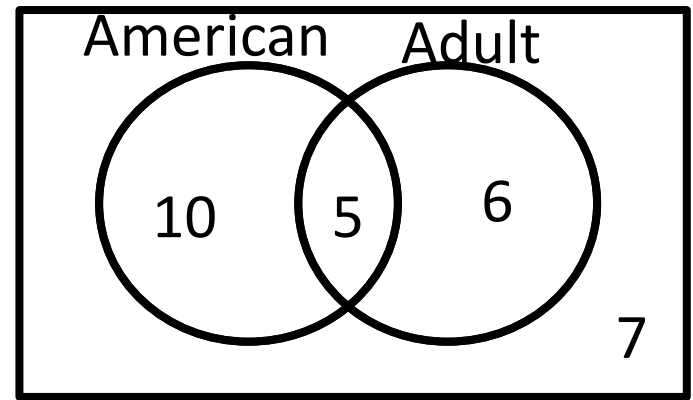
What numbers are NOT shown in the Venn diagram?

	Adult	Not Adult	Total
American	5	10	15
Not American	6	7	13
Total	11	17	28

$$1. P(\text{American}) = \frac{15}{28}$$

$$2. P(\text{Adult}) = \frac{11}{28}$$

$$3. P(\text{American and Adult}) = \frac{5}{28}$$



	Adult	Not Adult	Total
American	5	10	15
Not American	6	7	13
Total	11	17	28

$$4. P(\text{American and not Adult}) = \frac{10}{28}$$

$$5. P(\text{not Adult given not American}) = \frac{7}{13}$$

$$6. P(\text{American given not Adult}) = \frac{10}{17}$$

$$7. P(\text{Adult given American})$$

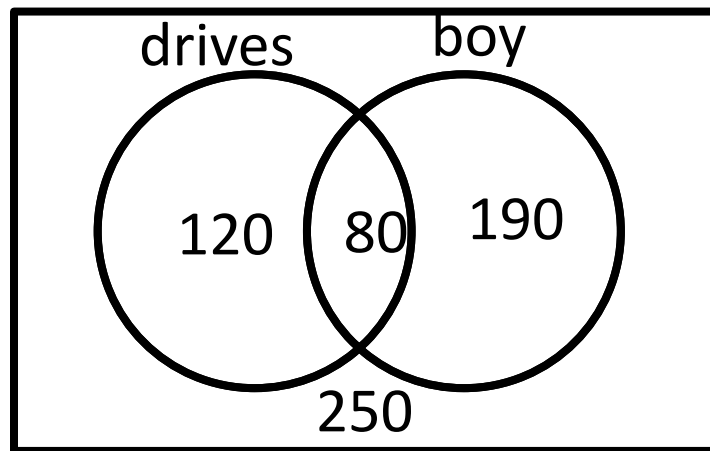
$$= \frac{5}{15}$$

$$8. P(\text{American given Adult})$$

$$= \frac{5}{11}$$

Build a 2-Way Table in order to calculate the following probabilities (drives to school) and (boy):

Find:



$$1. P(D \cap B) = \frac{80}{640}$$

$$2. P(B) = \frac{270}{640}$$

$$3. P(\bar{D}) = \frac{440}{640}$$

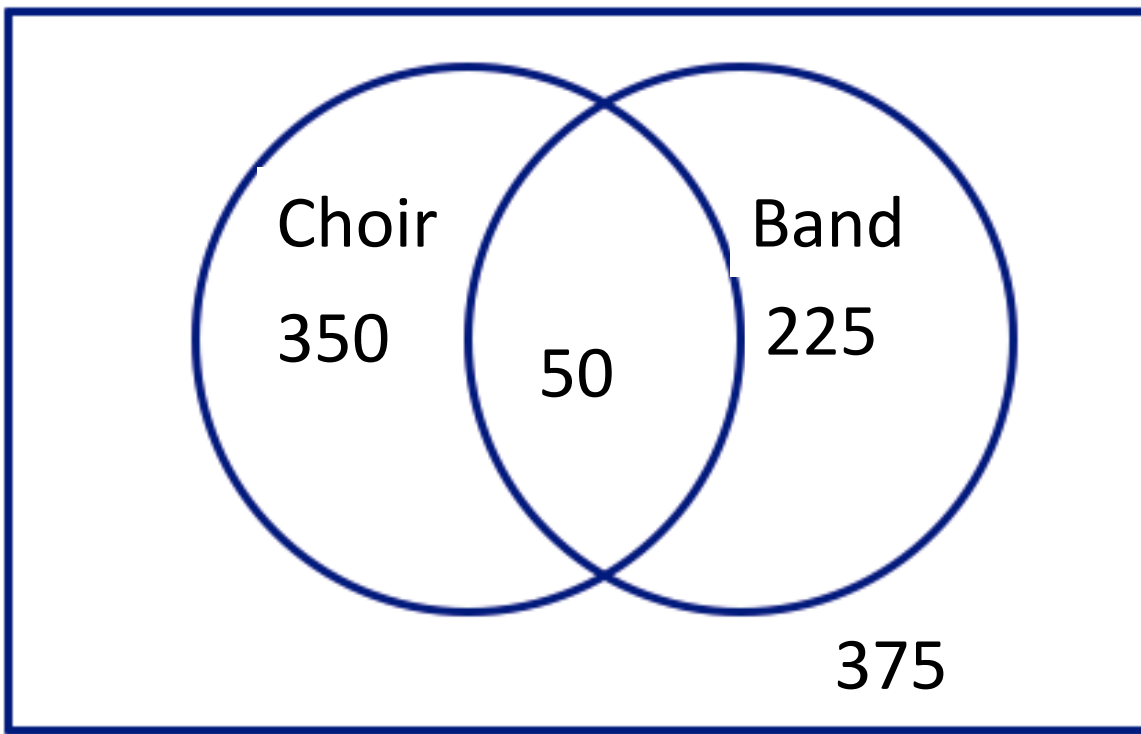
$$4. P(\bar{D} \cap B) = \frac{190}{640}$$

$$5. P(D / B) = \frac{80}{270}$$

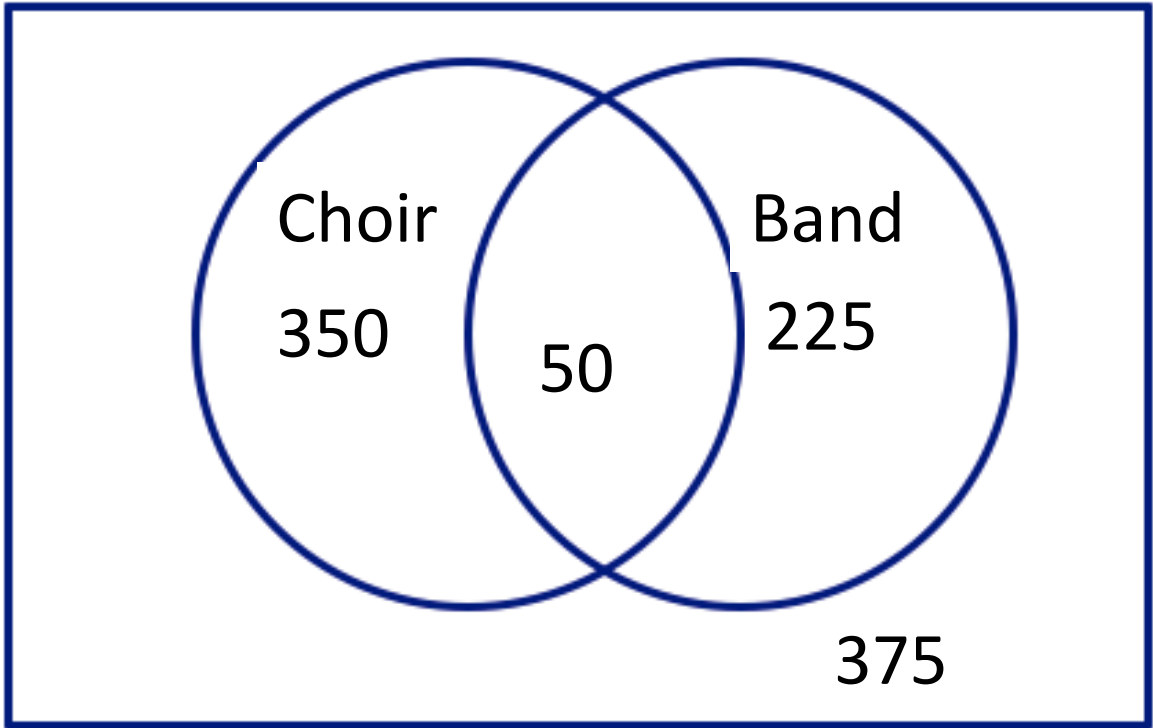
$$6. P(B / D) = \frac{80}{200}$$

$$7. P(\bar{D} / B) = \frac{190}{270}$$

	B	\bar{B}	Total
D	80	120	200
\bar{D}	190	250	440
Total	270	370	640



1. How many students were surveyed?
2. What were the students asked?
3. What does the number 375 represent?
4. How many students are in both choir and band?
5. How many students are not in either choir or band?
6. What is the probability that a randomly selected student would be in band?



Build a 2-way table.

1. Build a Venn Diagram for the following table.

2. Find:

$$1. P(B \cap S) = \frac{5}{26}$$

$$2. P(B) = \frac{12}{26}$$

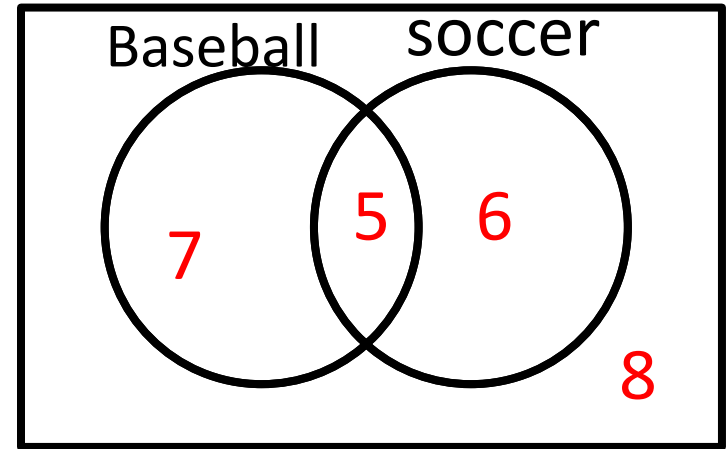
$$3. P(\bar{B}) = \frac{14}{26}$$

$$4. P(\bar{B} \cap S) = \frac{6}{26}$$

$$5. P(B / S) = \frac{5}{11}$$

$$6. P(S / B) = \frac{5}{12}$$

$$7. P(\bar{B} / S) = \frac{6}{11}$$



	soccer	\overline{soccer}	Total
Baseball	5	7	12
$\overline{baseball}$	6	8	14
Total	11	15	26