Day 2 Unit 1

- Applications of Venn Diagrams

Arrival…

Remember to get out

- Unit Outline
- Last night's HW (including form(s))
- paper and a pencil for notes!
- Name tent (extra cards are by window if you lost yours)

Has everyone accessed the class website?

Warm Up Day 2 ~ Unit 1

Know your notation!!

You'll want your calculator tomorrow… so please bring it!

1. Given sets **A** = {m, a, t, h} **B** = {a, h, u, e}

A^c = _____ **A U B** = _____ $A \cap B$ = _____

n(A) = _____ $n(A \cap B)$ = _____ **$n(B^c)$** = _____

2 a. If **A** = {a, c, d} & **B** = {b, e, f, g}, find $n(A \cap B)$.

b. Draw a Venn Diagram to represent $A \cap B$

3. As I was going to St. Ives, I met a man leaving with seven wives, Each wife had seven sacks, Each sack had seven cats, Each cat had seven kits: Kits, cats, sacks, wives,
How many were going from St. Ives?

Warm Up Day 2 ~ Unit 1

- Know your notation!!

- 1. Given sets **A** = {m, a, t, h} **B** = {a, h, u, e}

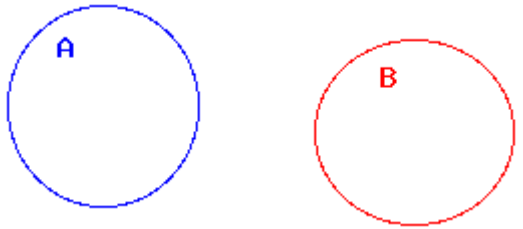
A^c = {u,e} **A U B** = {m,a,t,h,u,e} $A \cap B$= {a,h}

n(A) = 4 $n(A \cap B)$ = 2 **n(B^c)** = 2

- 2 a. If **A** = {a, c, d} & **B** = {b, e, f, g}, find $n(A \cap B)$. 0

- b. Draw a venn diagram to represent $A \cap B$

mutually exclusive or disjoint sets



Answer the question posed in the last line of the poem.

As I was going to St. Ives,
I met a man leaving with seven wives,
Each wife had seven sacks,
Each sack had seven cats,
Each cat had seven kits:
Kits, cats, sacks, wives,
How many were going from St. Ives?

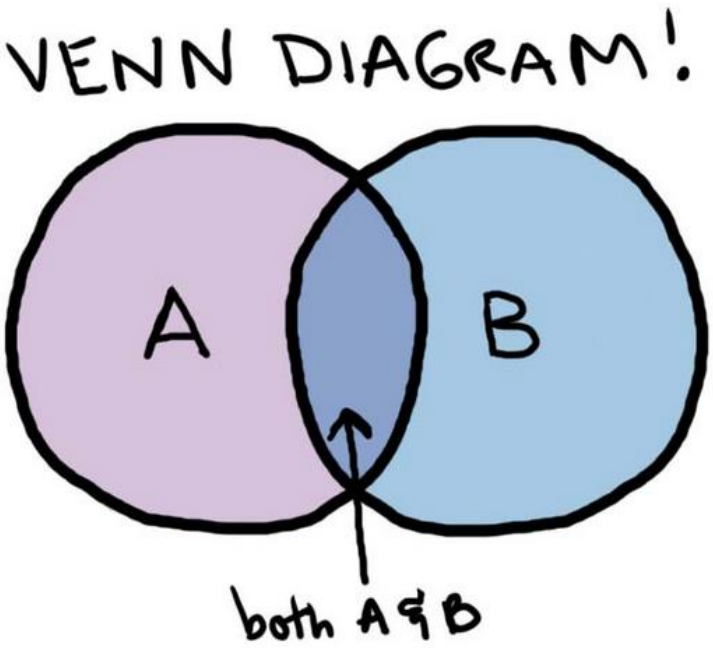
$$7 \cdot 7 \cdot 7 \cdot 7 = 2401 + 1 = 2402$$

Homework Questions?

Tonight's Homework
Packet p. 3-4

Reminder:

VENN DIAGRAMS: Diagrams that show all possible logical relations between a finite collection of sets

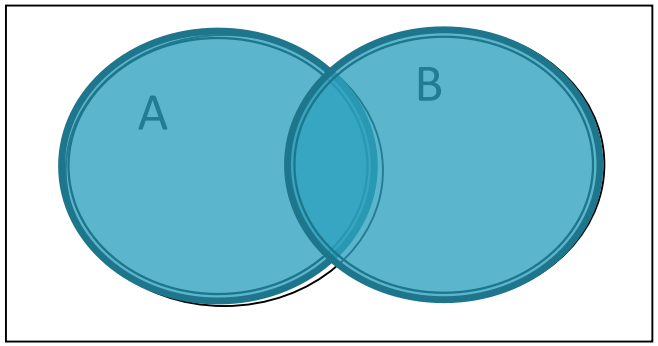


Grab a Whiteboard, marker and eraser!

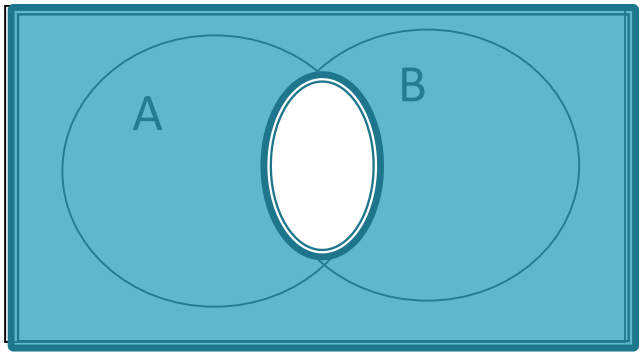
One person from each group of 3 or 4 can get the items for everyone!

Venn Diagram Examples: Given sets A and B, shade the following:

- $A \cup B$



- $(A \cap B)^c$



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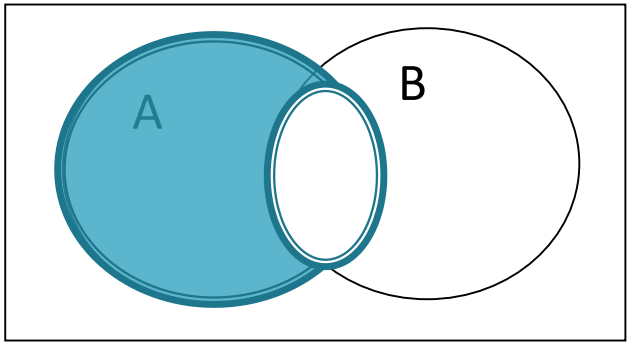
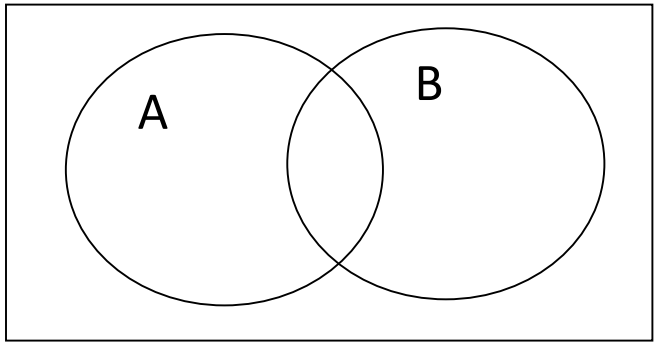


DeMorgan's Law

- Let A & B be sets, then

Write this in your NOTES too!

$$\left(A \cup B\right)^C = A^C \cap B^C$$



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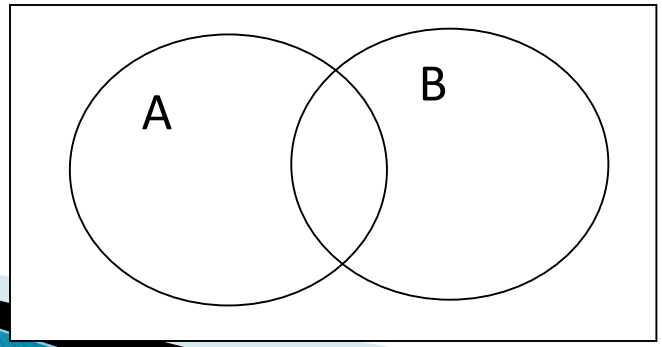

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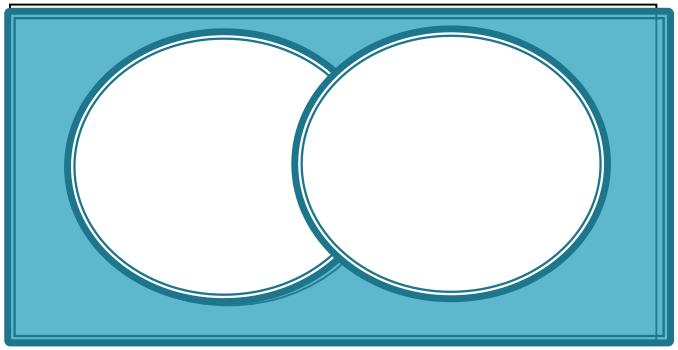

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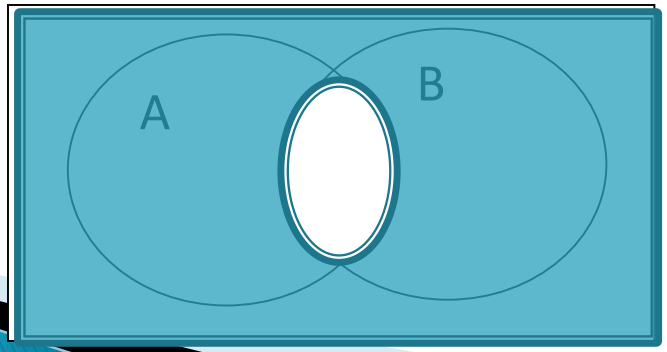
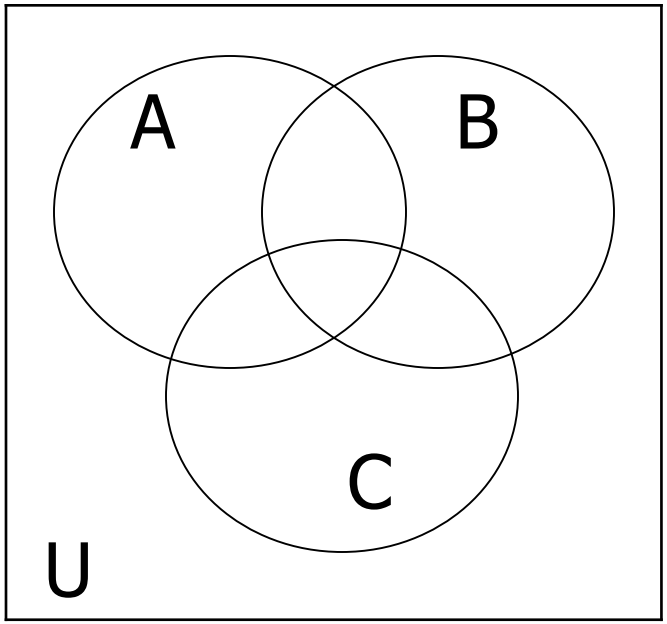
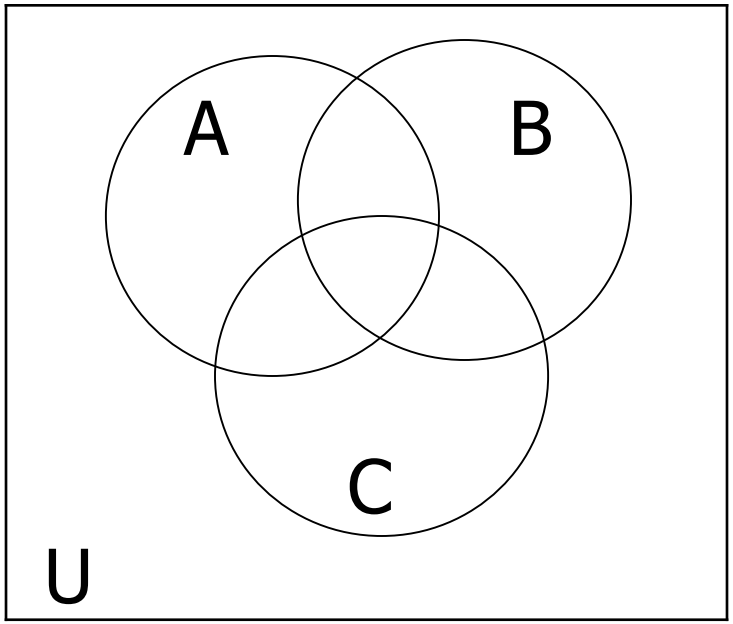


What would these look like??

$A \cap B \cap C$



$A \cup B \cup C$



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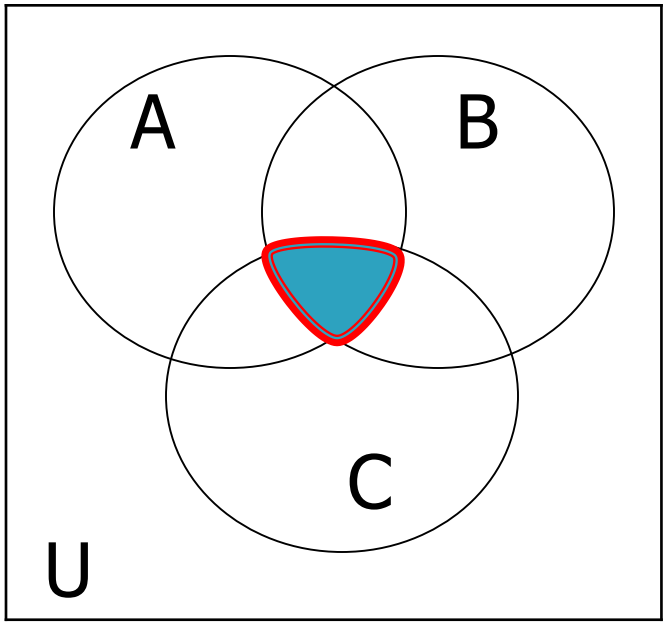
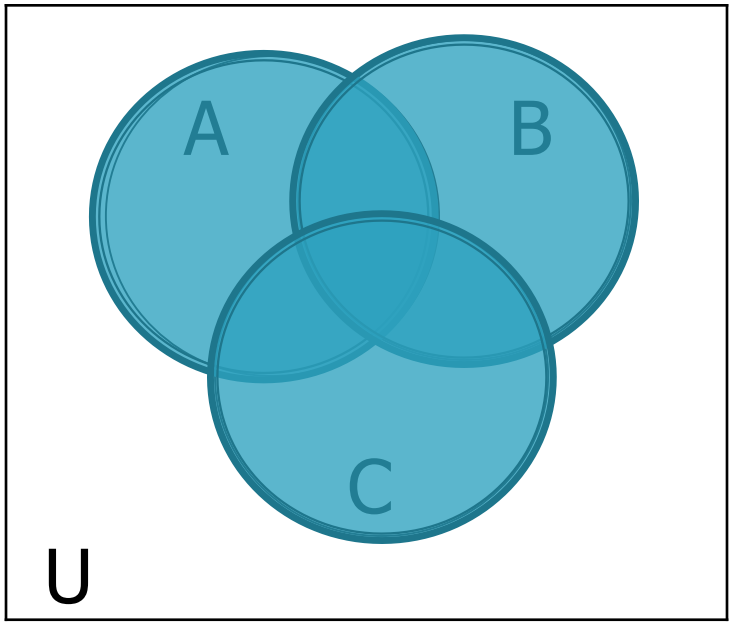


$A \cup B \cup C$



Consider the Universal Set consisting of the integers between 1 and 8. Given A={2,3,5,7}, B={2,4,6,8}, C={6} and D={3,4,5,6}, **use Venn diagrams** to help find the following.

$A \cap D$

$B \cup D$

A^C

$C^C \cup B$

$B^C \cap D$

Be prepared to write your answers on the board ☺

Consider the Universal Set consisting of the integers between 1 and 8. Given A={2,3,5,7}, B={2,4,6,8}, C={6} and D={3,4,5,6}, **use Venn diagrams** to help find the following.

$A \cap D = \{3, 5\}$

$B \cup D = \{2, 3, 4, 5, 6, 8\}$

$A^C = \{1, 4, 6, 8\}$

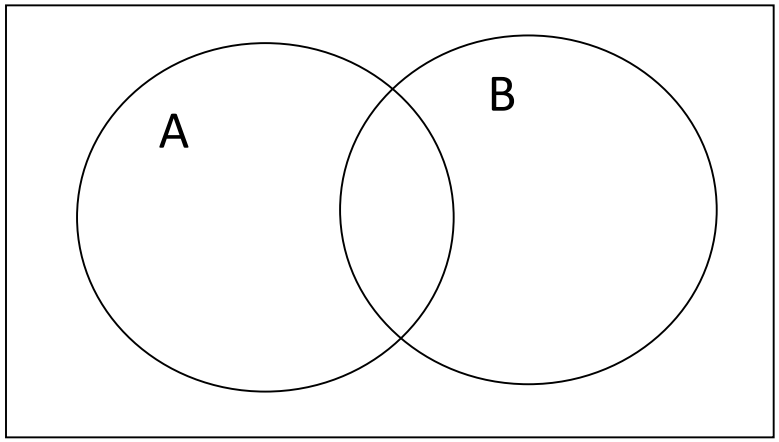
$C^C \cup B = \{1, 2, 3, 4, 5, 6, 7, 8\}$

$B^C \cap D = \{3, 5\}$

Be prepared to write your answers on the board ☺

Notes: Use Venn diagrams to solve the following.

Suppose there are a total of 54 people in which 35 of them are type A, 32 of them are type B, while 7 are B, but not A.



How many are in A, but not B?

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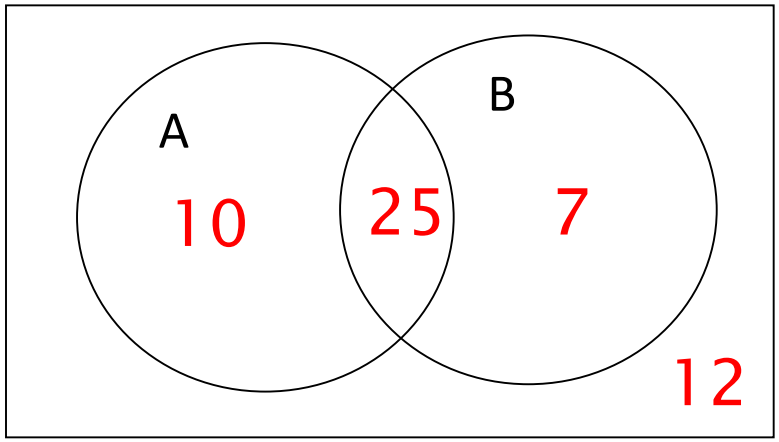


How many are in A, but not B?

A=10

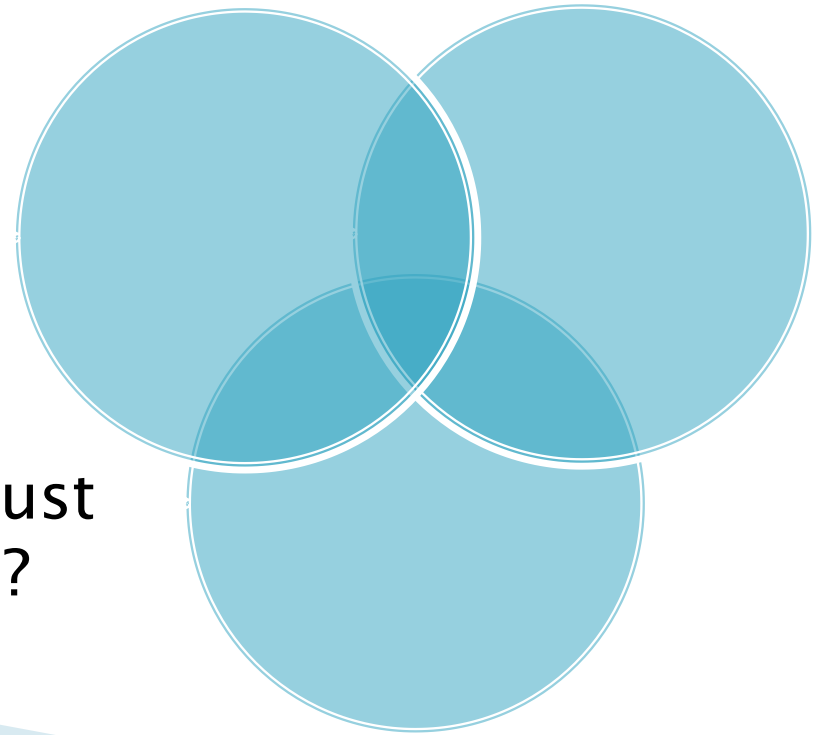
How many are in A and B?

A and B=25

Notes Example: In a club of varsity athletes, 25 athletes played soccer, 14 athletes played basketball, 19 athletes played football, 7 athletes played soccer and basketball 6 athletes played soccer and football, 4 athletes played basketball and football, and 2 athletes played all three sports.

Draw a Venn Diagram and answer the questions.

1. How many athletes played soccer, but not basketball or football?
2. How many athletes played soccer and basketball, but not football?
3. How many athletes played just one of the three sports?



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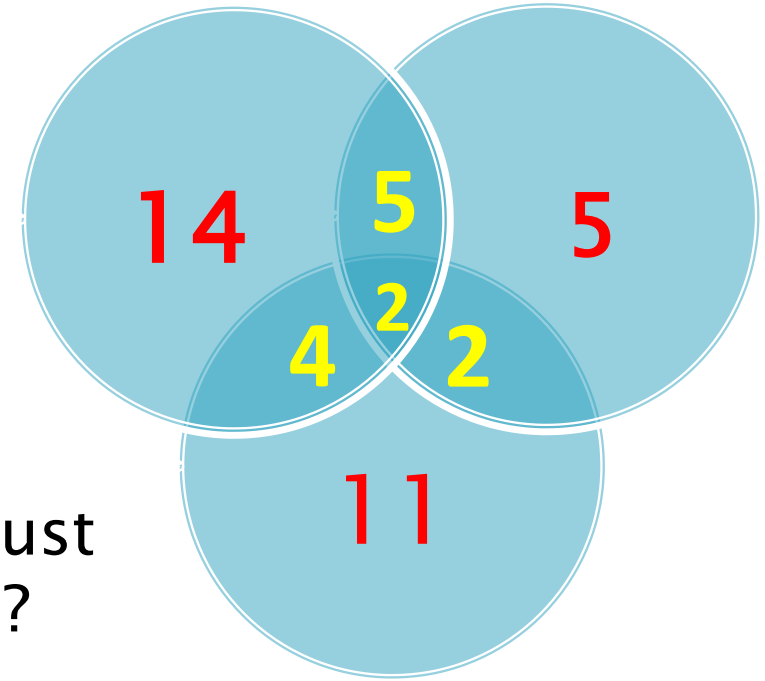
Draw a Venn Diagram and answer the questions.

1. How many athletes played soccer, but not basketball or football? 14

2. How many athletes played soccer and basketball, but not football? 5

3. How many athletes played just one of the three sports? 30



Example: YOU TRY!

A survey of 300 workers yielded the following information: 231 belonged to the Teamsters Union, and 195 were Democrats. If 172 of the Teamsters were Democrats, how many workers were in the following situations?

A. Belonged to the Teamsters or were Democrats

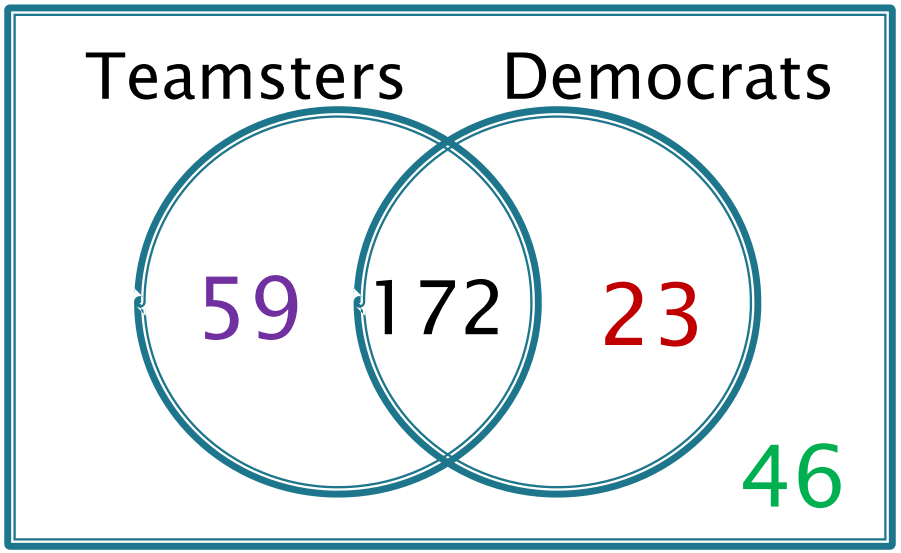
B. Belonged to the Teamsters but were not Democrats

C. Were Democrats but did not belong to the Teamsters

D. Neither belonged to the Teamsters nor were Democrats.

Example: You Try! A survey of 300 workers yielded the following information: 231 belonged to the Teamsters Union, and 195 were Democrats. If 172 of the Teamsters were Democrats, how many workers were in the following situations?

Let us define T = The event that a worker belongs to the Teamsters, and D = the event that a worker is a Democrat. Note that $n(U) = 300$.



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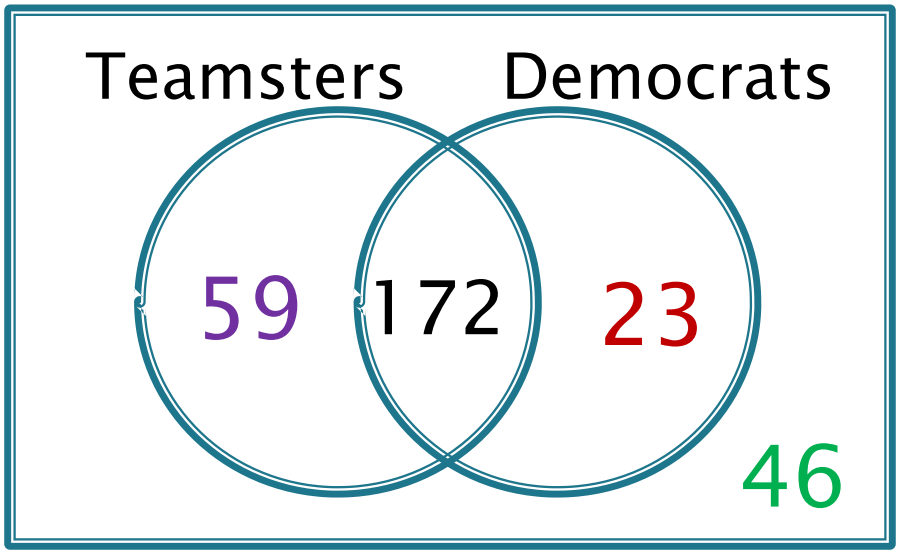


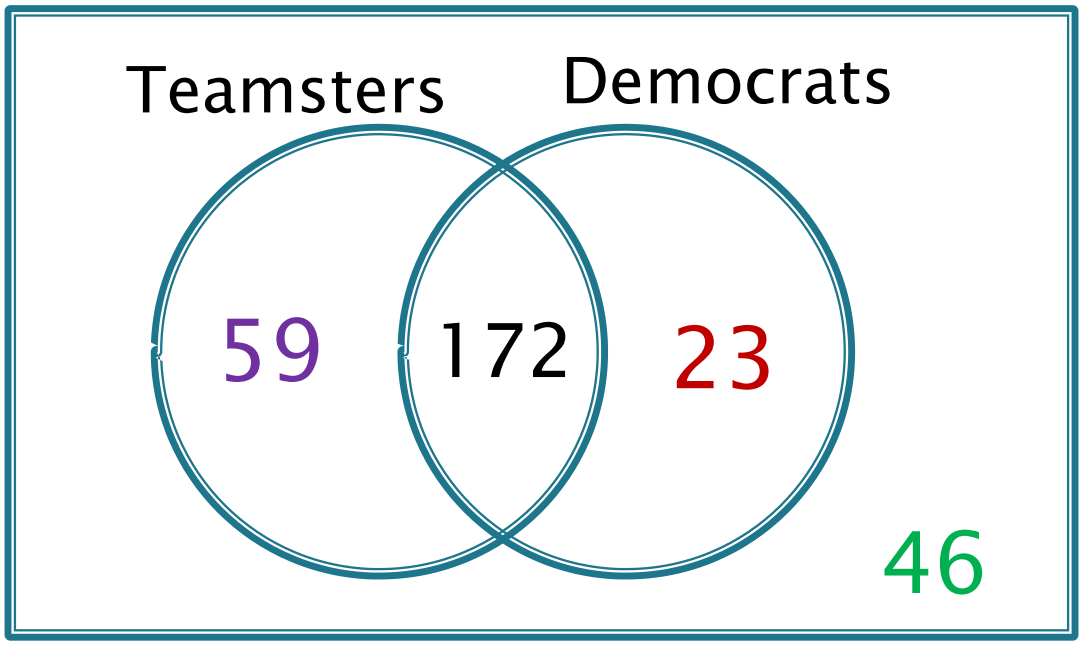
We were given the fact that 172 workers were both a Teamster and a Democrat, that is $n(T \cap D) = 172$

Those who are only Teamsters but not Democrats are $n(T) - n(T \cap D)$
$= 231 - 172 = 59$.

Those who are only Democrats and do not belong to the Teamsters are $n(D) - n(T \cap D) = 195 - 172 = 23$.

Those who where neither Teamsters, nor Democrats, are $n(T \cup D)^c = 59 - 172 - 23 = 46$

Example: YOU TRY!



A. Belonged to the Teamsters or were Democrats
254

B. Belonged to the Teamsters but were not Democrats
59

C. Were Democrats but did not belong to the Teamsters
23

D. Neither belonged to the Teamsters nor were Democrats.
46

Example: You try!

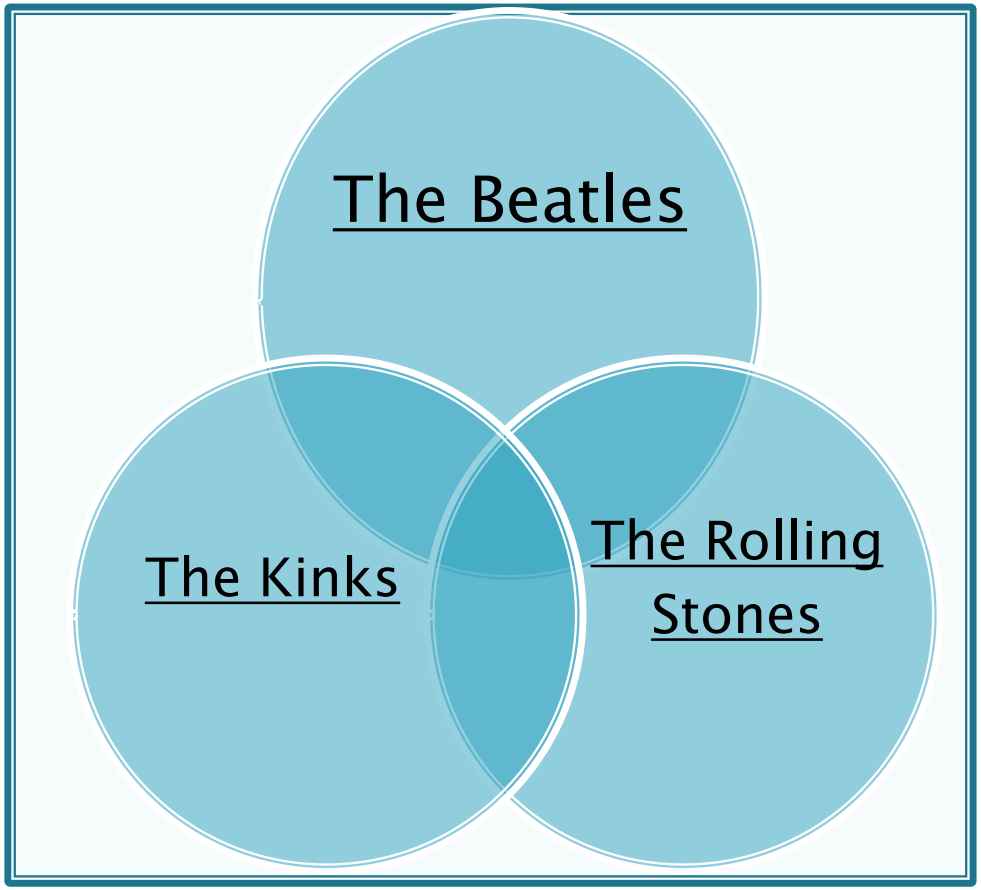
- Way back in 1965, The Beatles, The Kinks, and The Rolling Stones toured the USA. A large group of teenagers were surveyed and the following information was obtained:

- 825 saw The Kinks,
- 1033 saw The Beatles,
- 1247 saw The Rolling Stones,
- 211 saw all three, 514 saw none,
- 240 saw only The Rolling Stones,
- 677 saw The Rolling Stones and The Beatles,
- 201 saw The Beatles and The Kinks but not The Rolling Stones.

A. What percent of the teenagers saw at least one band?

B. What percent of the teenagers saw exactly one band?

Example: You try!



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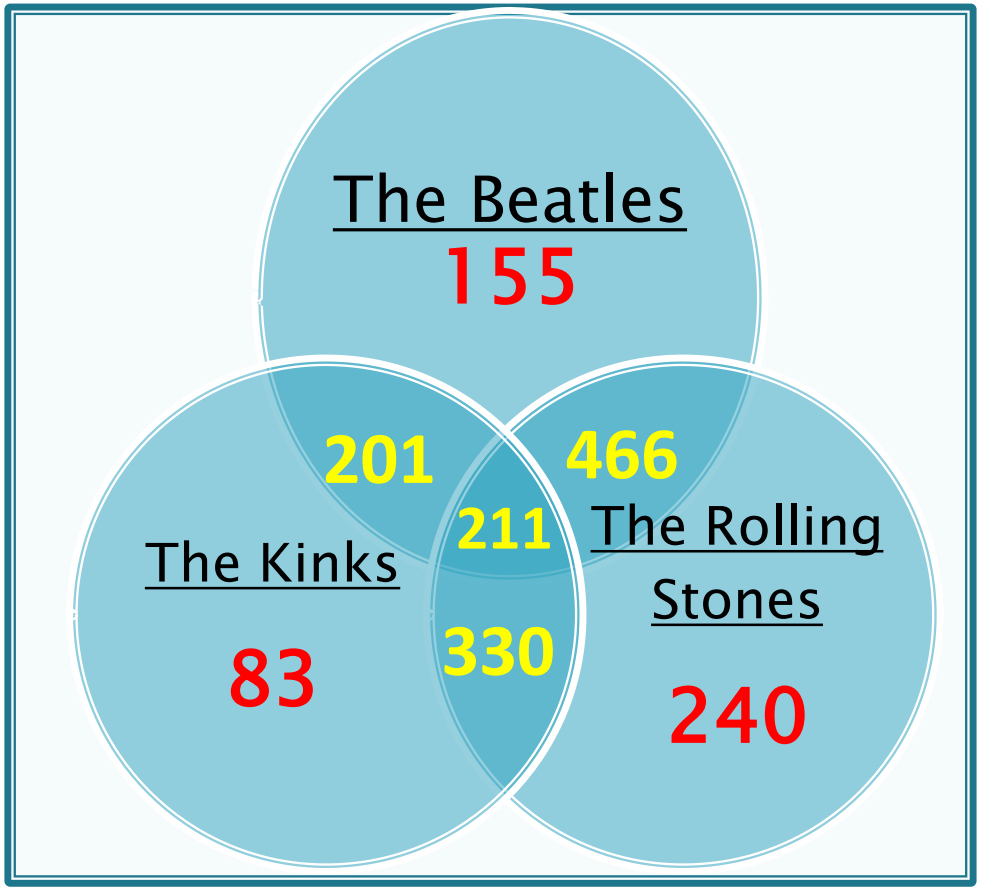

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- 201 saw The Beatles and Kinks but not The Rolling Stones.

A. What percent of the teenagers saw at least one band?

$1686/2200 = 76.6\,\%$

B. What percent of the teenagers saw exactly one band?

$478/2200 = 21.7\,\%$

Explanation

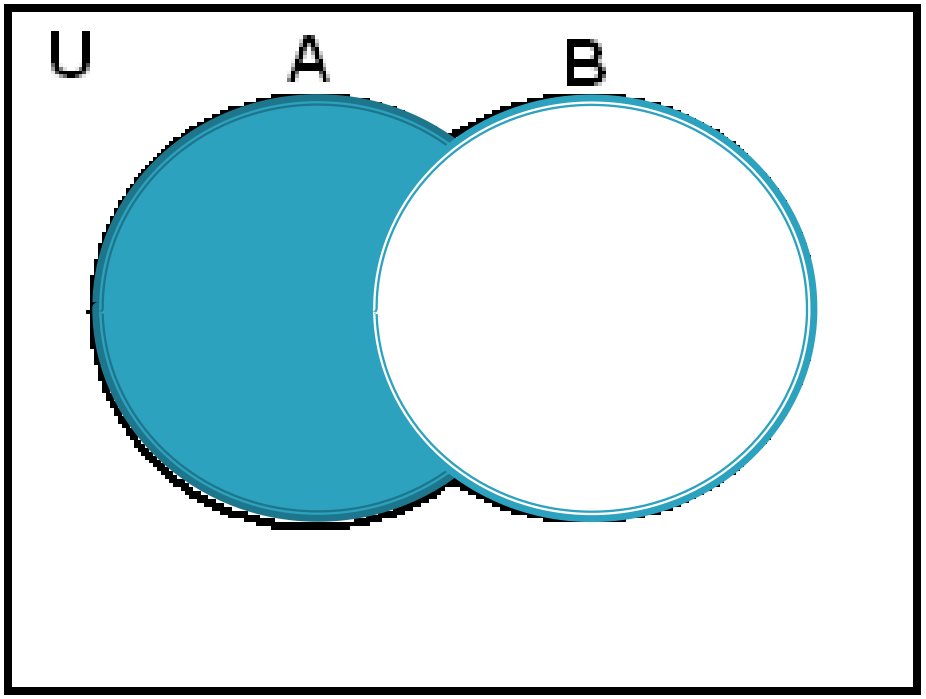
- Begin labeling the diagram with the innermost overlap. 211 saw all three.
- Note also that the region outside of the circle contains 514. These are teens who saw no band.
- Continue using the given info: 240 saw only the Rolling Stones.
- 201 saw The Beatles and The Kinks but not The Rolling Stones.
- 677 saw The Beatles and The Rolling Stones. Now that region already has 211 people in there. Take 677-211 and that will give 466 people who saw The Beatles and the Rolling Stones but not The Kinks.
- Now we can find the people who only saw The Beatles.
- Take 1033 and subtract (201+211+466). This gives 155 people who only saw The Beatles.
- To find the number of people who saw The Rolling Stones and The Kinks but not the Beatles, take 1247 – (211+466+240)=330.
- To find the number of people who only saw The Kinks 825 – (211+ 201+33) = 83.
- The total number of people surveyed is 83+201+211+330+240+446+155+514=2200.
- Now answer question A: The people who saw at least one band is (2200-514)/2200=76.6%
- Question B: The people who saw only one band is (83+155+240)/2200=21.7%.

Whiteboard Practice

- Get a whiteboard, marker and eraser!

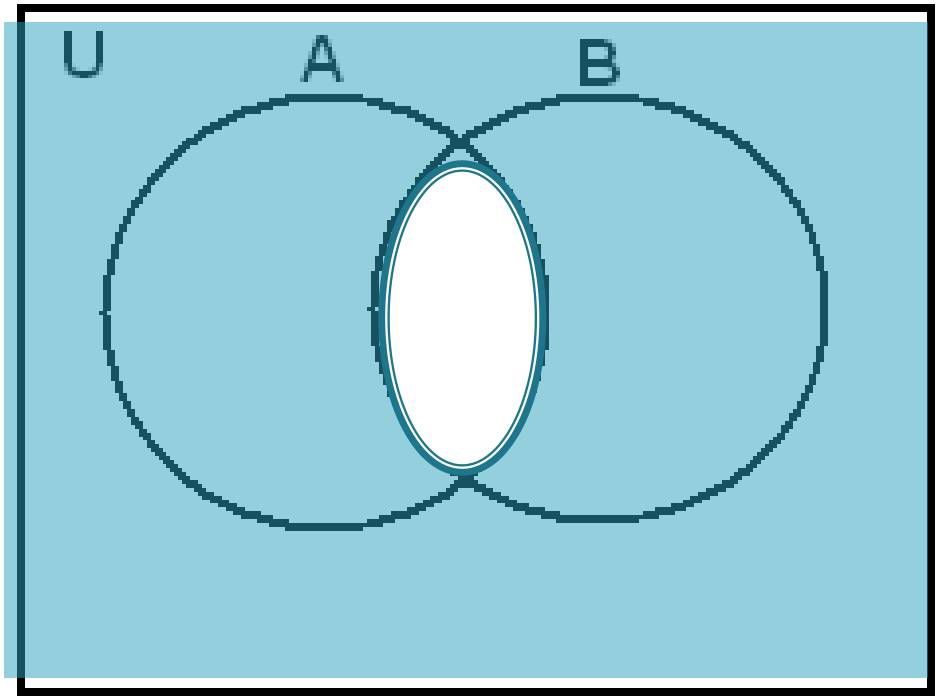
Example 1: Shade the Venn Diagram

$$A \cap B^c$$



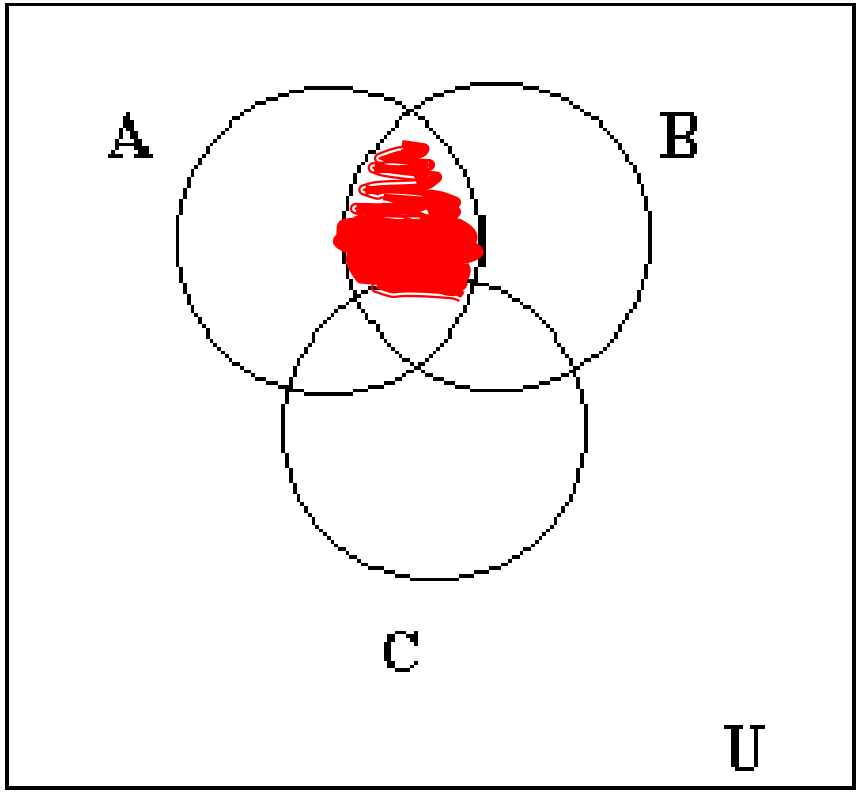
Example 2: Shade the Venn Diagram

$$A^c \cup B^c$$



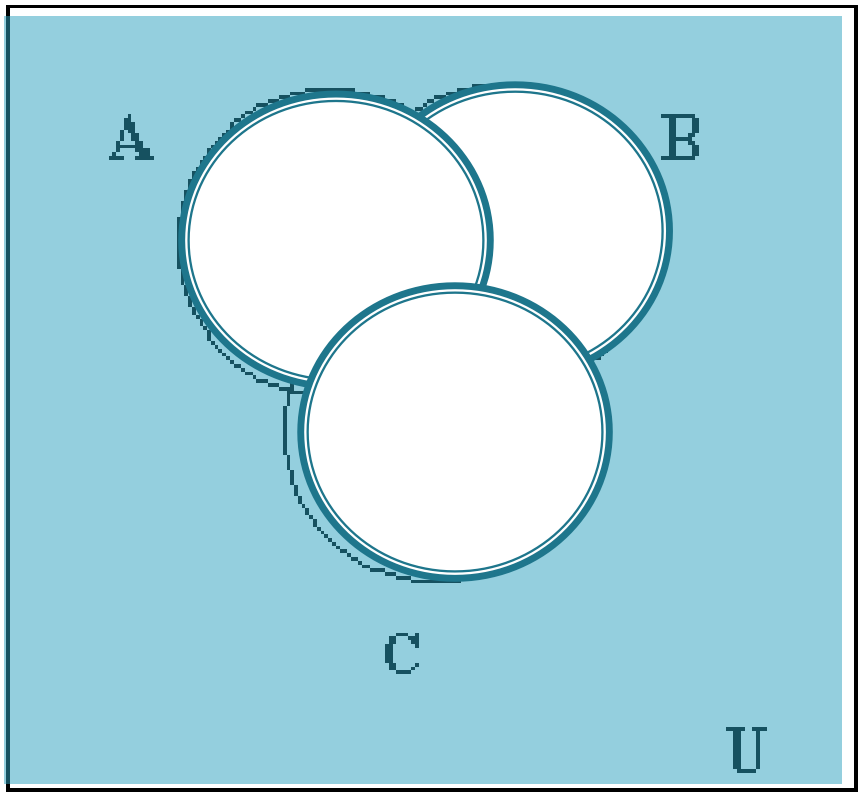
Example 3:

$$A \cap B \cap C^c$$



Example 4:

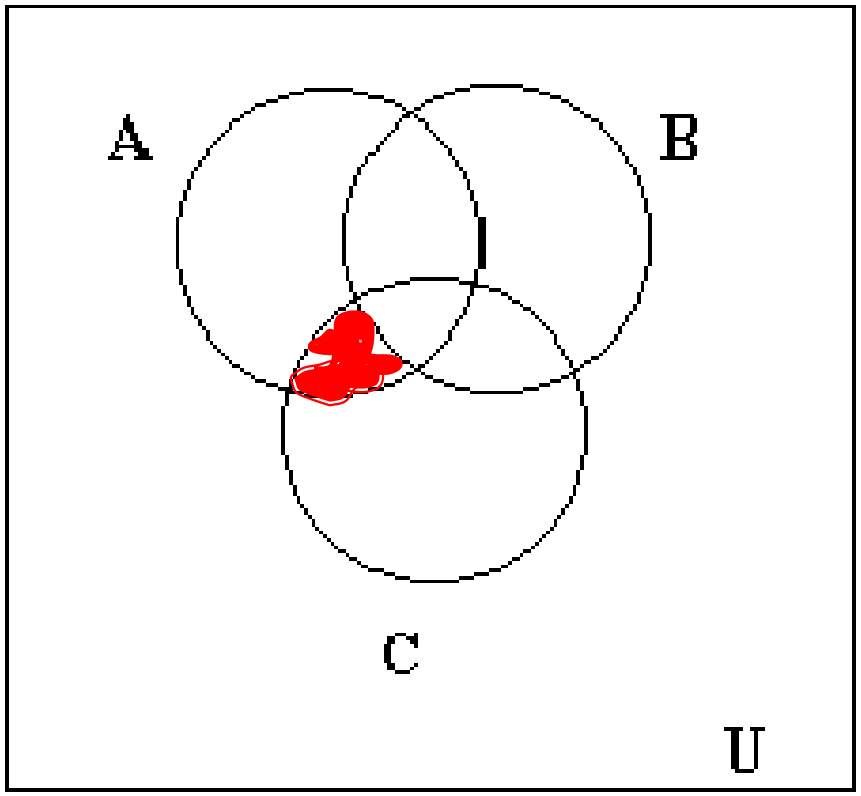
$$A^c \cap B^c \cap C^c$$



Example 5:

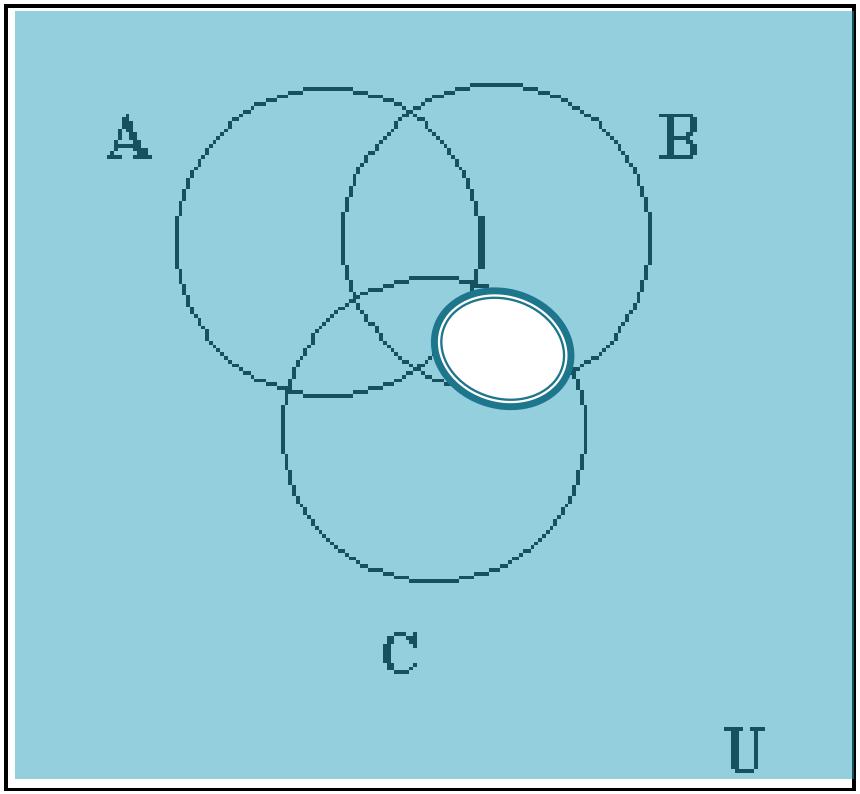
Draw and shade the Venn Diagram.

$$A \cap C \cap B^c$$



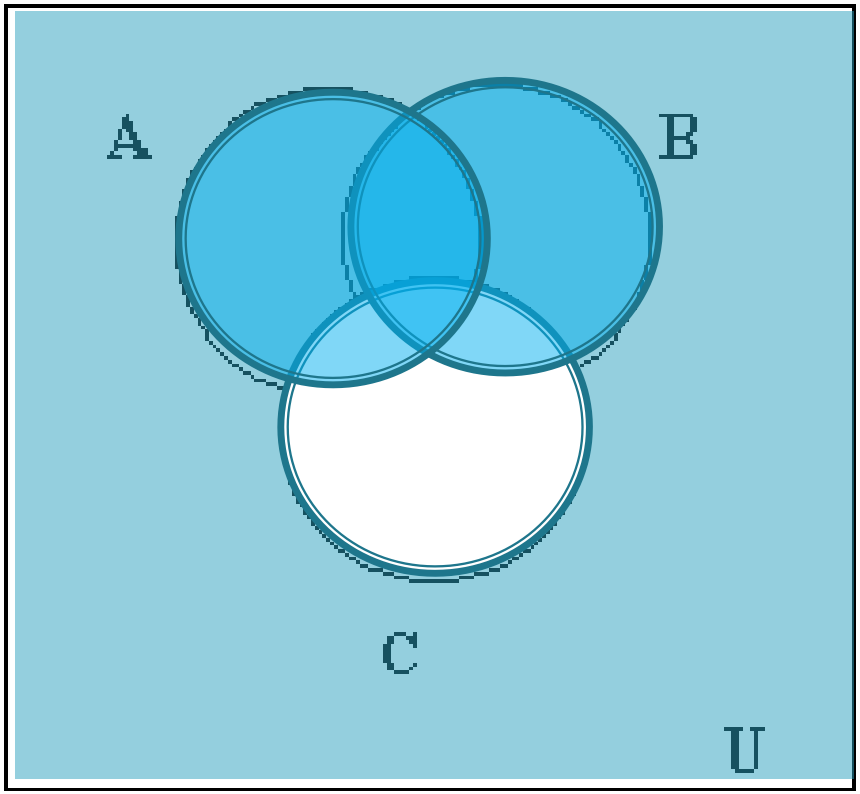
Example 6:

$$A \cup (B \cap C)^c$$



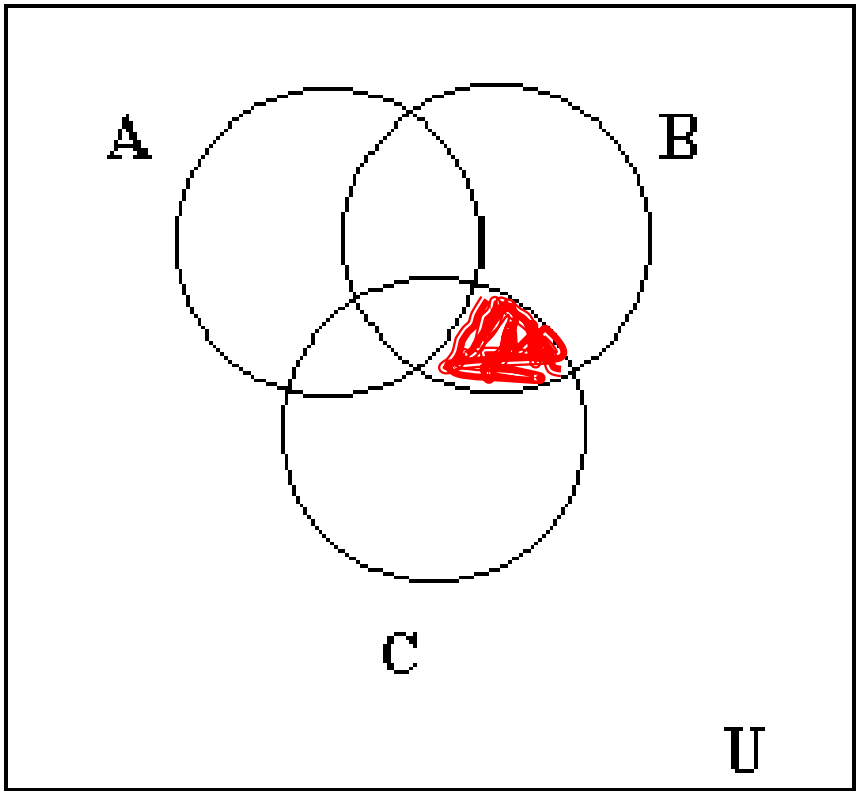
Example 7:

$$A \cup B \cup C^c$$



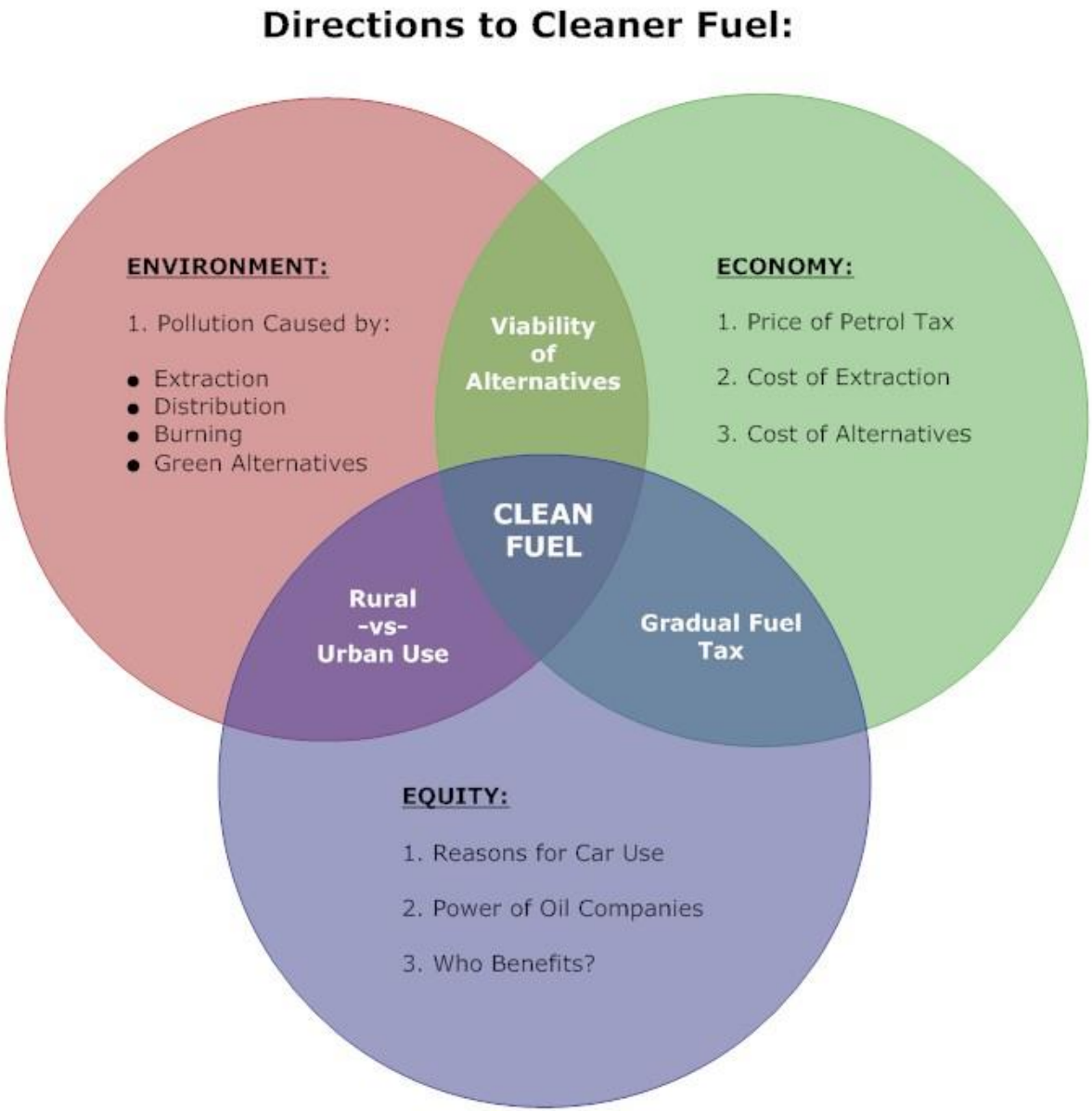
Example 8:

$$A^c \cap B \cap C$$

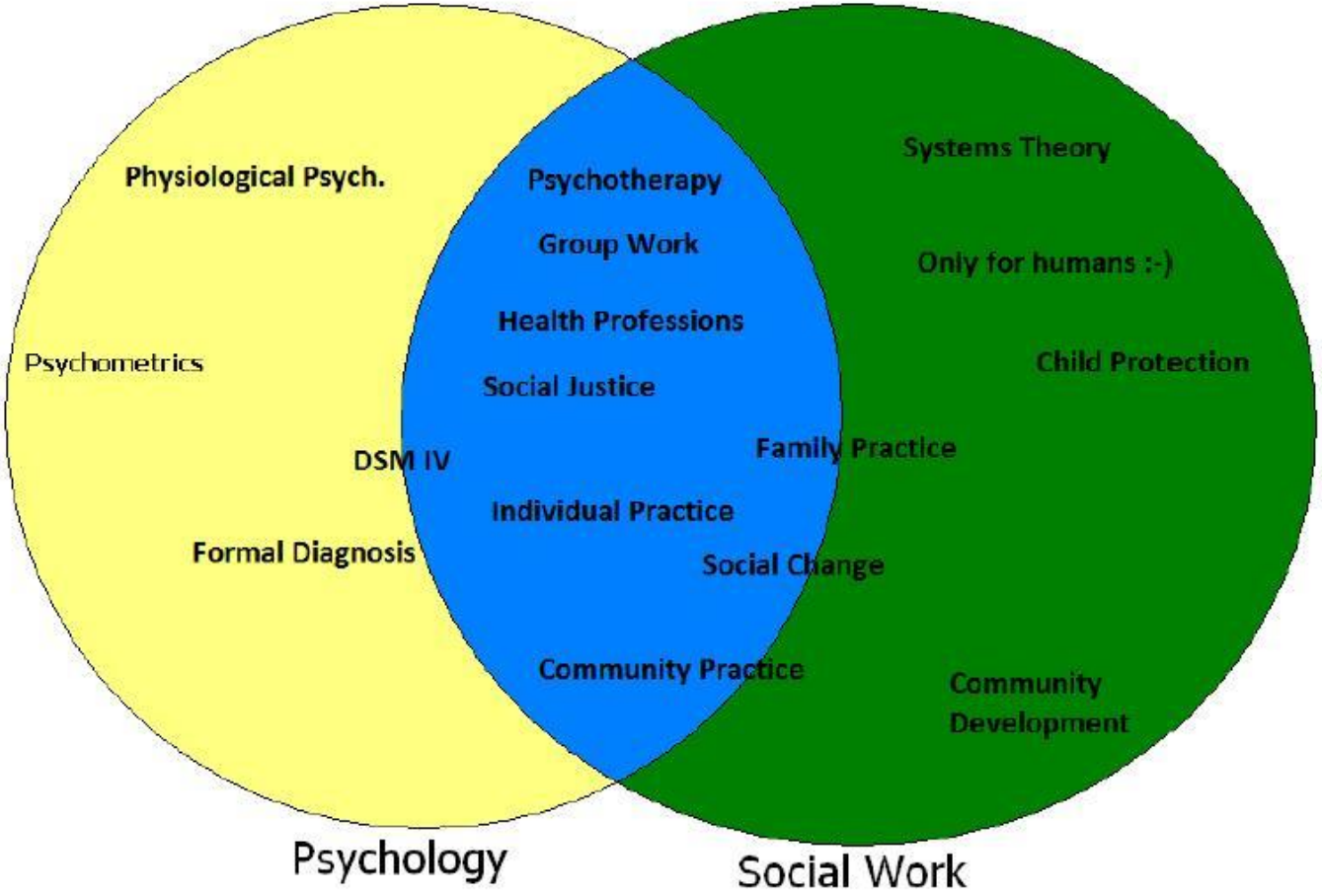


Applications of Venn Diagrams

More applications for Venn diagrams

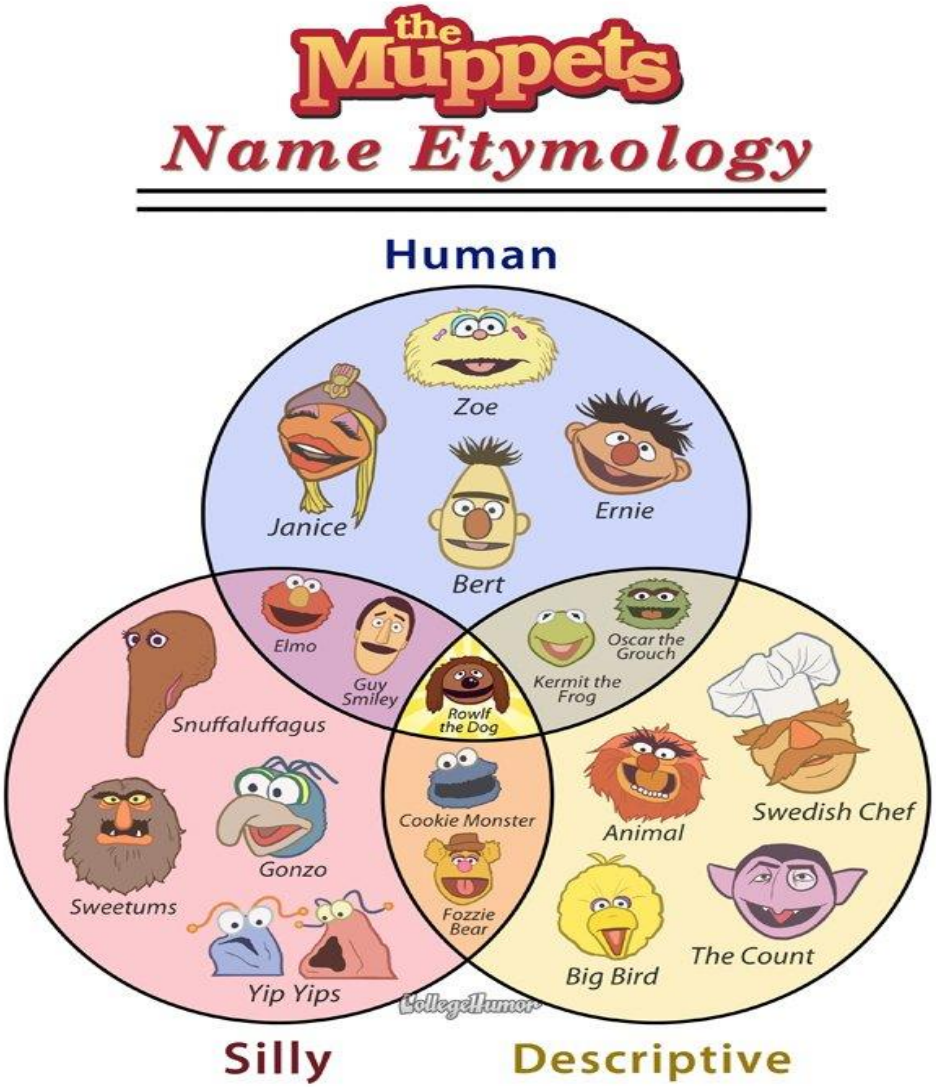


Diagrams can also be used by Human Resource Managers and Careers Advisors to show the characteristics of different jobs.

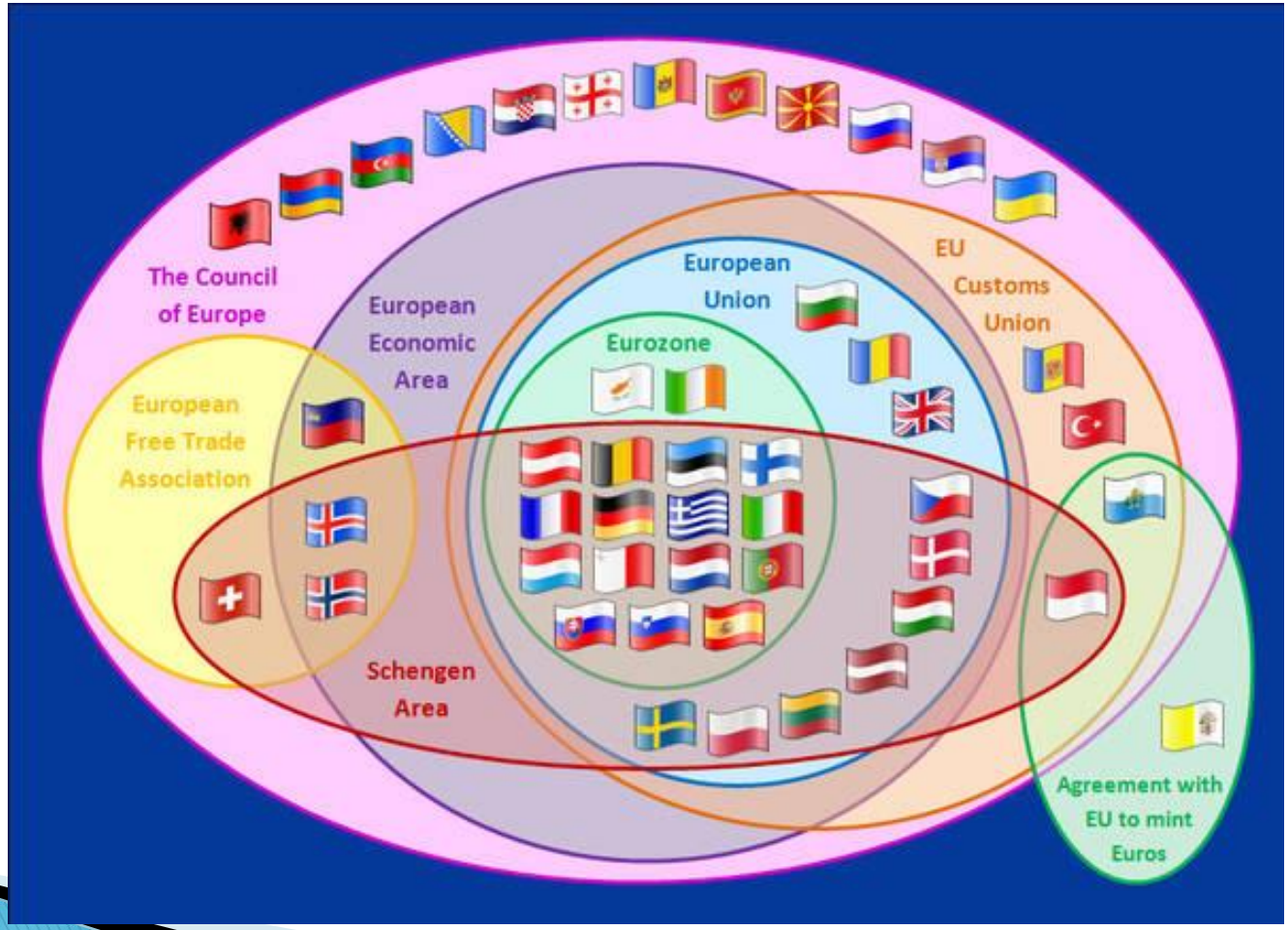


Modern Marketing Analysis.

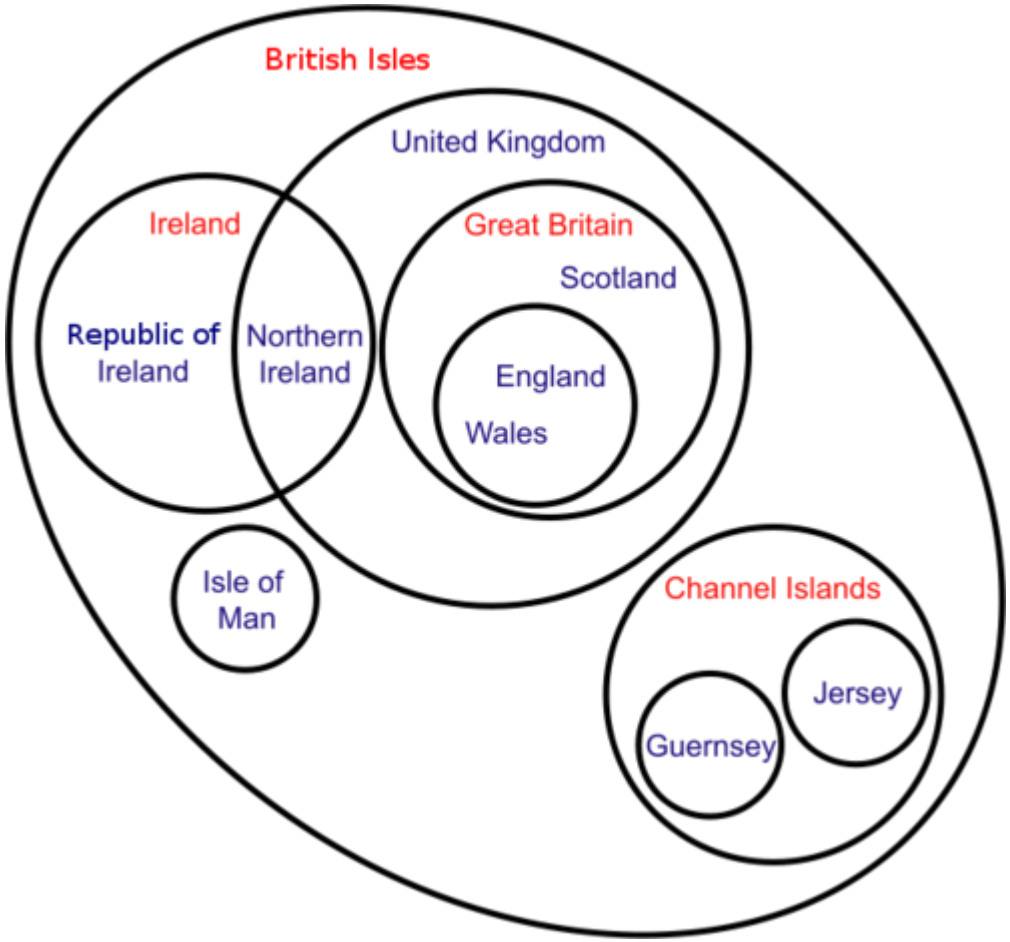
We can analyze the characters in TV shows like “The Muppets” with a Venn Diagram.



Venn Diagrams can be used to show the relationships in complex organizations such as the European Economic Union.



Diagrams can also be used in Geography to explain how nation groups and states belong to each other.



Classification

- If we want to go beyond two or three fairly similar things and talk about all the animals that live in water, what we're really doing is *classifying* things. Instead of identifying similarities and differences between two things, we need to establish *categories* of things, and once we've done that, we can place lots of things in them.

CHARTS

Suppose we establish some categories for our water-dwelling animals. Let's take all of the characteristics of these animals out of the diagram and turn them into a chart.

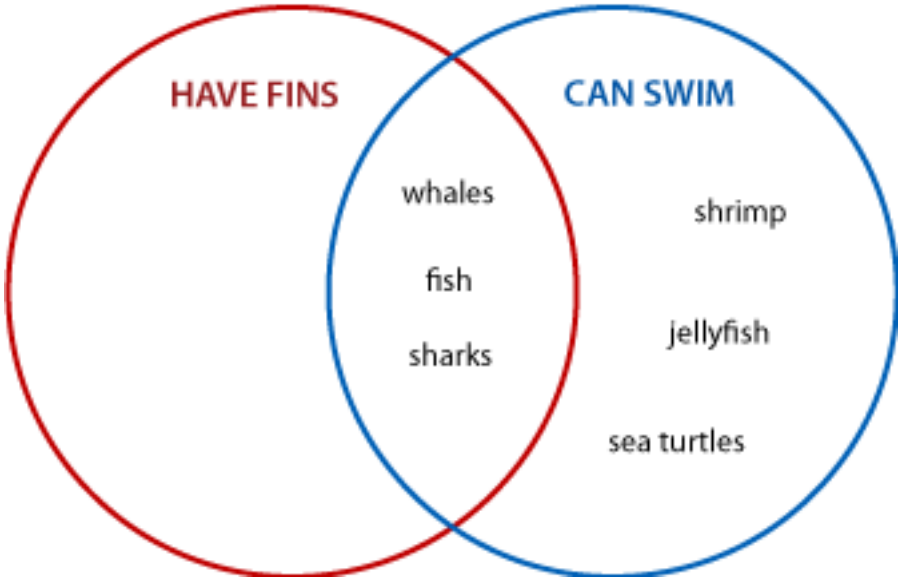
Table 1. Classifying animals that live in water.

have fins	have legs	have internal skeletons	breathe air	can swim	lay eggs
whales fish	shrimp sea turtles	whales fish sea turtles	whales sea turtles	whales fish shrimp sea turtles	fish shrimp sea turtles

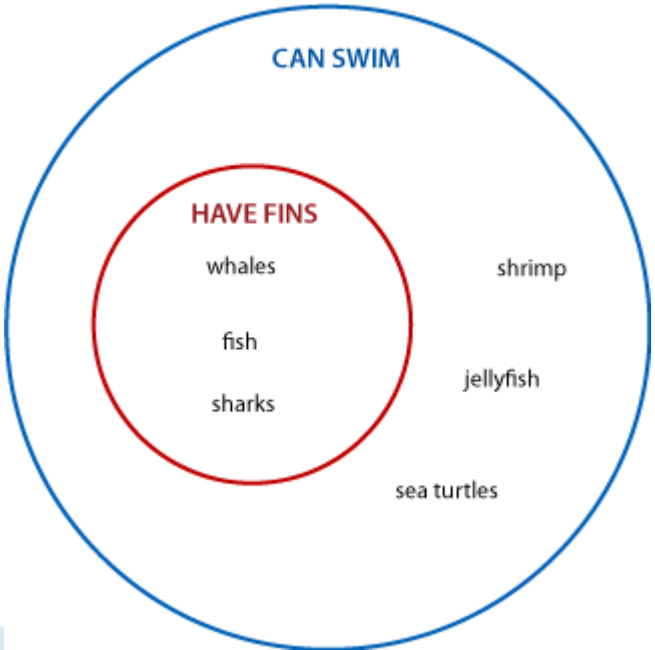
But this chart has a couple of problems. Each animal multiple is listed times, first of all — that's inconvenient, and hard to read. I can see very quickly which animals share a particular characteristic, such as breathing air, but I'd like to be able to see at a glance all of the characteristics of a particular animal, as well.

	have fins	have legs	have internal skeletons	breathe air	can swim	lay eggs
whales	X		X	X	X	
fish	X		X		X	X
shrimp		X			X	X
sea turtles		X	X	X	X	X
oysters						X
sea anemones						
sharks	X		X		X	X
jellyfish					X	X

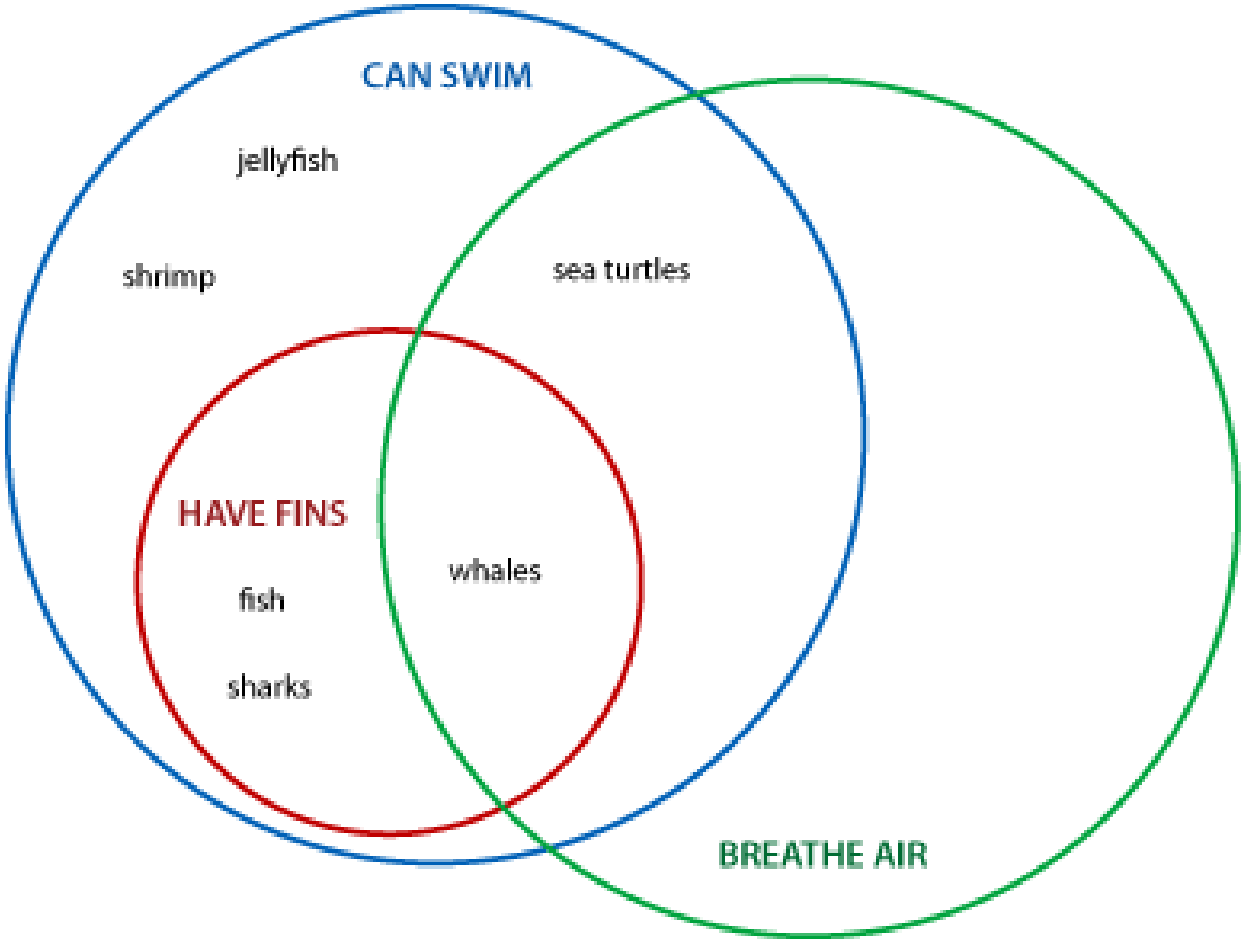
A two category Venn diagram



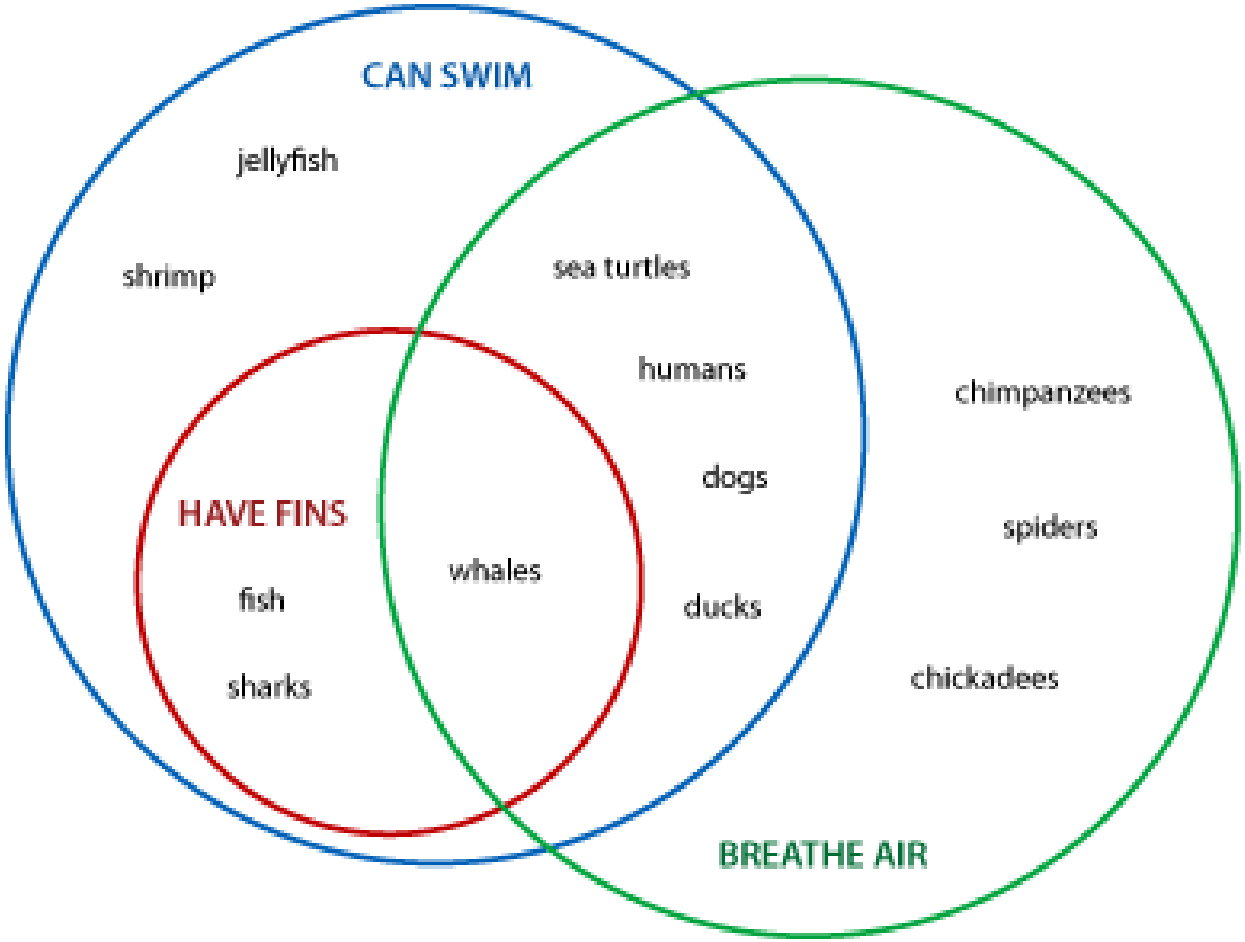
Or can be written as subsets



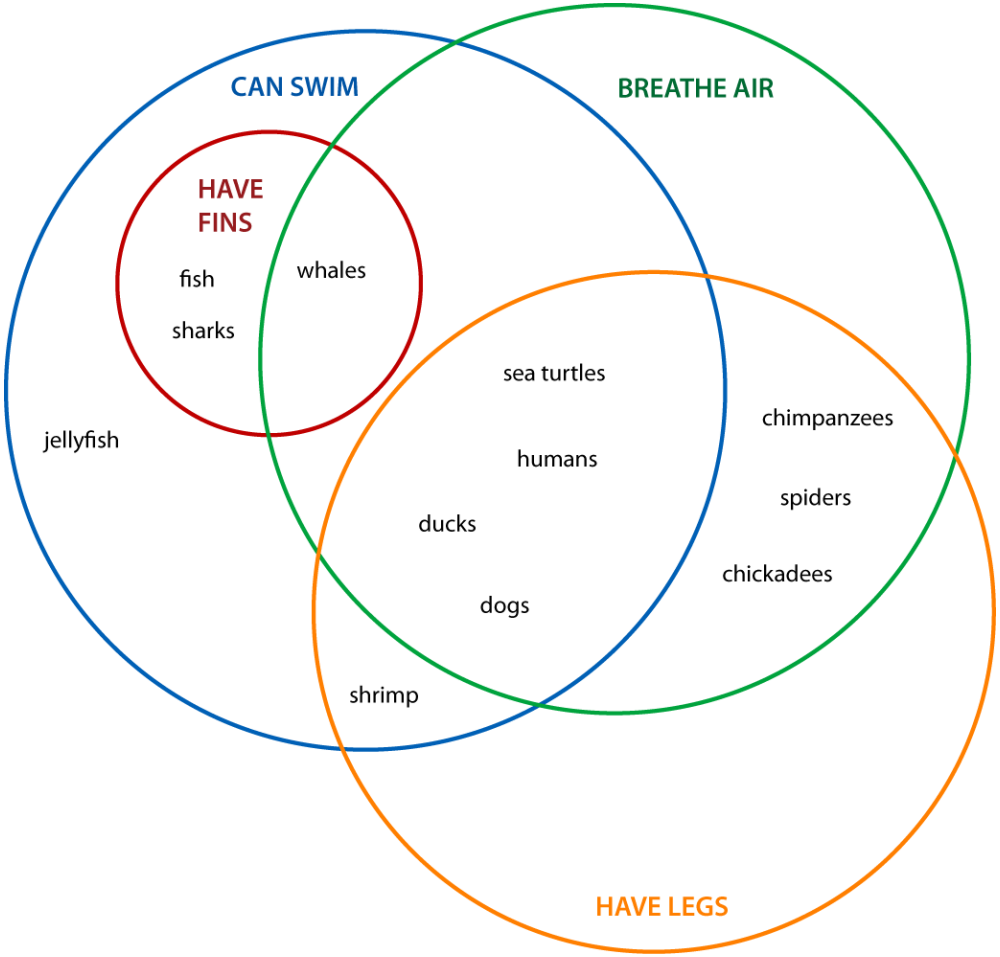
Adding a category



We can add in additional living creatures to help give more of a comparison.

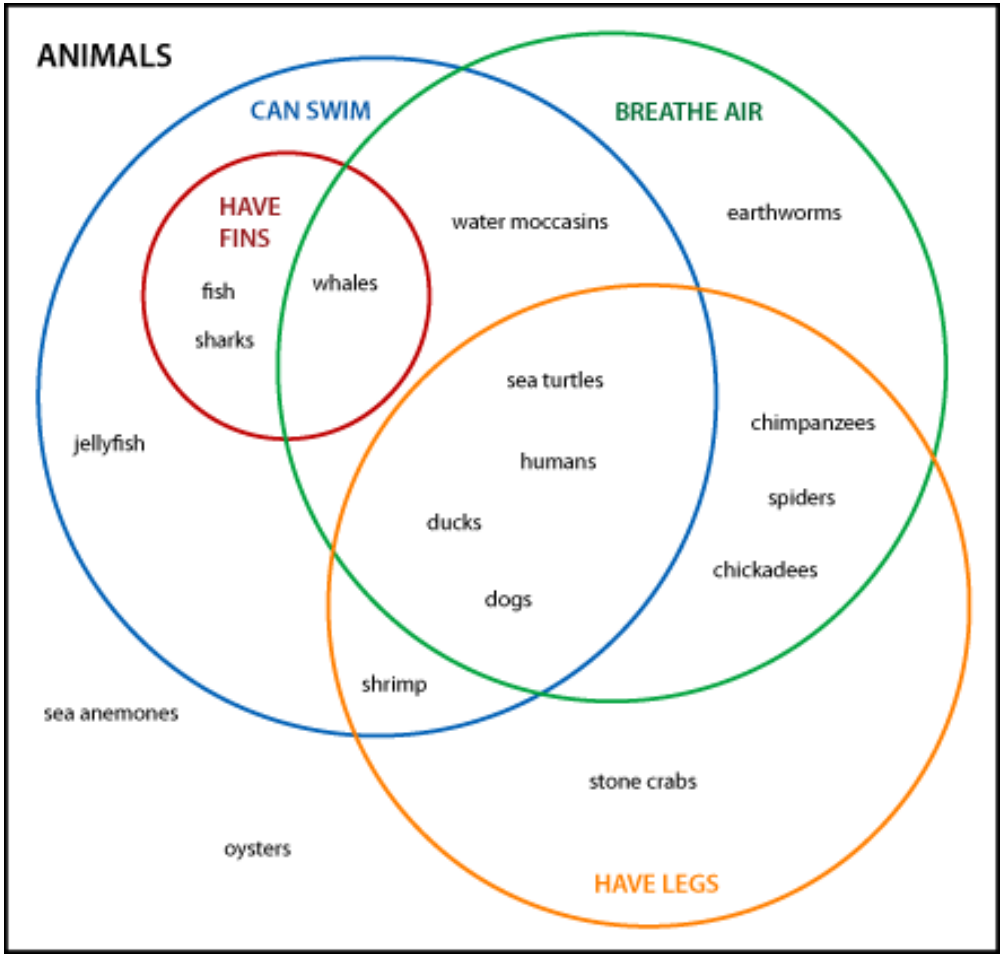


Adding a 4th category



Again, adding animals for comparison

Listing the universal set as well as including the remaining animals from the original table.



- In class assignment:

With a partner, pick a general topic that has several different categories (at least three). Make a table listing the categories and at least 7 individual pieces.

After creating the table, create a Venn diagram which includes all of the material from the table.

Possible general topics:

Superheroes, sports, marching band instruments, music, businesses, etc.

When done, create 3 questions (easy, medium and difficult) for your Venn diagram

Homework
Packet p. 3-4