

MATH 30 - 2

1.2 EXPLORING RELATIONSHIPS BETWEEN SETS

“VENN DIAGRAMS”

In simple terms, a Venn diagram is simply a visual representation of how sets (and their elements) intersect with each other. A Venn diagram always has a rectangle representing all the elements. Inside the rectangle are two or three circles (usually) that may or may not intersect each other.

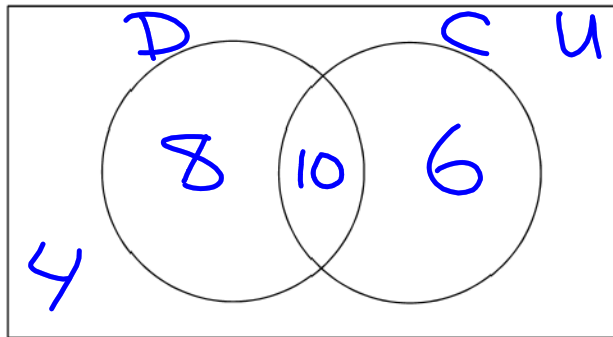
Example: Fill in the following Venn diagram with the below information:

A class of 28 students was surveyed and asked if they ever had dogs or cats for pets at home.

This is what they said:

- 8 students said they only ever had a dog.
- 6 students said they only ever had a cat.
- 10 students said they had a dog and a cat.

all #'s add up to 28



1. How many students have had at least a dog in their house?

18

2. How many students have had at least a cat in their house?

16

3. How many students have never had a dog or cat?

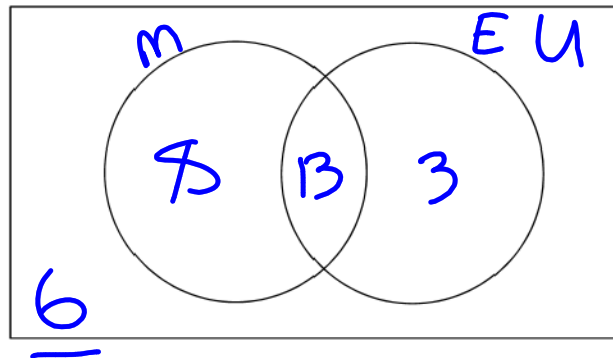
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Rarely are you given as much information as in the previous question. By asking and answering the proper questions, we can fill in a Venn diagram to help show a situation.

Example: In a group of 30 students, 21 students are taking Math this semester, 16 are taking English and 6 aren't enrolled in either. How many students are enrolled in both Math and English this semester? Use a Venn diagram to show your solution.

- How many students are enrolled in Math and/or English?
- If 24 students are enrolled in Math and/or English and 21 are taking Math, how many of the 24 are *JUST* in English? Write that number in the English 'moon' in the Venn diagram.
- If 16 students are taking English and only 3 are taking *JUST* English, how many students are taking both Math and English? Write that number in the intersection of the two circles.
- 21 students are taking Math and 13 are taking both Math and English. How many are taking *JUST* Math? Write that number in the Math 'moon'.
- Verify your solution by making sure each *COMPLETE* circle adds up to the numbers in the problem.



- We can *algebraically* find the intersection. Complete the following:
 $M (\# \text{ of Math students}) + E (\# \text{ of English students}) - B (\text{Intersection}) = 24$
 $21 + 16 - B = 24$

$$\begin{array}{r}
 37 + x = 24 \\
 + x \quad + x \\
 \hline
 37 = 24 + x \\
 - 24 \quad - 24 \\
 \hline
 13 = x
 \end{array}$$

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Using the logic/steps from the previous page, complete the Venn diagrams for the following questions.

1. A marketing company surveyed 100 students. They found 75 students owned a cell phone and 45 students owned their own car. Fifteen students didn't have either. How many students owned both a car and a cell phone?

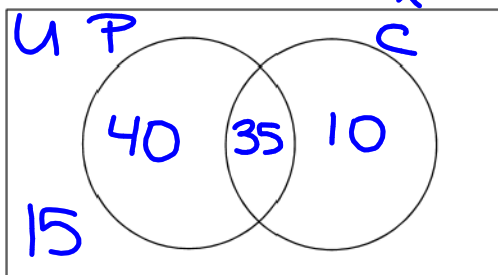
$n(U) = 100$

$$n(P) + n(C) - x = 85 \quad \text{Intersection} \quad (100 - 15)$$

$$75 + 45 - x = 85$$

$$120 - x = 85$$

$$+ x = +35$$



2. 150 coffee drinkers were surveyed. 37 put cream in their coffee, 84 put sugar and 50 drink their coffee black. How many drinkers put BOTH cream and sugar in their coffee?

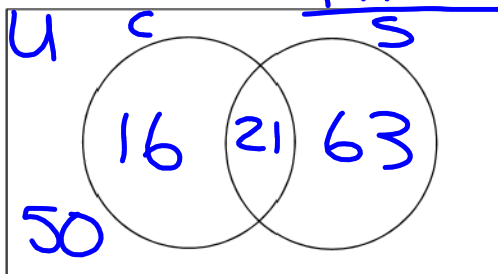
$n(U) = 150$

$$n(C) + n(S) - x = 100$$

$$37 + 84 - x = 100$$

$$121 - x = 100$$

$x = 21$



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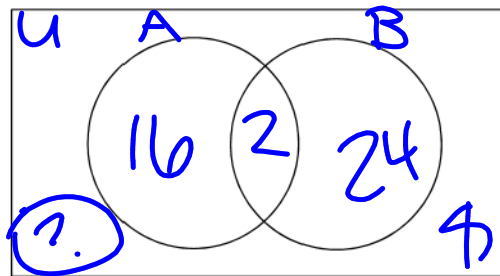
3. Solve the EXPLORE the Math from page 19 on the below Venn diagram.

$V = \{\text{volleyball players}\}$
 $B = \{\text{basketball players}\}$
 $n(U) = 65$
 $n(V) = 23$
 $n(B) = 26$
 $n(V \& B) = 31$

$$\begin{aligned}
 n(V) + n(B) - x &= 34 \\
 23 + 26 - x &= 34 \\
 49 - x &= 34 \\
 x &= 15
 \end{aligned}$$

4. The below problem is written in set notation. You may find it useful to use your definition page to translate this symbolic notation into words.

$n(U) = 50$
 $n(A) = 18$
 $n(B) = 26$
 $n(A \cap B) = 2$
 $n(A \cup B) = ?$



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