TASK: We worked with the data below in our last few lessons when finding the probability of an event in a two way frequency table. We often want to calculate probabilities of more than one event, such as the **union** (combination) or **intersection** (overlap) of events.

Two Way Frequency Table

	Sport Utility Vehicle (SUV)	Sports Car	Totals
male	21	39	60
female	135	45	180
Totals	156	84	240

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NOTES: Before we continue working with this data, we need to introduce the concepts of **union** and **intersection**, along with how to calculate them from a two way frequency table. Copy the following table in your notes and then **_watch the video linked to the right on our website_** explaining how to calculate each type of probability.

Type of Probability	Intersection (and)	Union (or)
What does it mean?	The chances that both events occur, the overlap of the two.	The chances that at least one event occurs, the combination of the two.
Notation	$P(A \cap B)$	$P(A \cup B)$
Formula (from table)	$\dfrac{overlap\ of\ A\ \&\ B}{total}$	$\dfrac{A + B - overlap\ of\ A\&B}{total}$

Revisiting the data from above, let's try these questions:

- $n(M$ and $V)$ = the number of males who prefer SUV's (an *intersection* of these sets) =

- $n(F$ and $C)$ = the number of females who prefer Sports Cars (an *intersection* of these sets) =

- $n(F$ or $C)$ = the number of females or preferences of Sports Cars (a *union* of these sets) =

[BEFORE MOVING ON TO THE APPLICATION, CHECK YOUR ANSWERS ON OUR WEBSITE]

APPLICATION: A small high school surveyed 52 of its seniors about their plans after they graduate. They found the following data and wanted to analyze it based on gender. In this case, if we pick a student at random we can place them into one of four events:

M = Male   F = Female

C = Going to College   N = Not going to college

	Gender		
	Male	Female	Total
Going to College	16	13	29
Not Going to College	14	9	23
Total	30	22	52

1. Give the values for the probability of a random student for each of the following:

   (a) $P(M) = \frac{30}{52}$ (already completed for you)

   (b) $P(F) =$

   (c) $P(C) =$

   (d) $P(N) =$

2. What is the probability that a person picked at random would be a female who is going to college?

3. What is the probability that a person picked at random would be a female or someone going to college?

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4. Consider the sample space for the rolling of a single fair die: S = {1, 2, 3, 4, 5, 6}.

   (a) What is the probability of rolling an odd number **and** a prime number?

   (b) What is the probability of rolling an even number **and** a number greater than 3?

5. Red Hook High School has 480 freshmen. Of those freshmen, 333 take Algebra, 306 take Biology, and 188 take both Algebra and Biology. Create a two-way frequency table and determine which of the following represents the number of freshmen who take at least one of these two classes?

   (1) 639   (2) 384   (3) 451   (4) 425