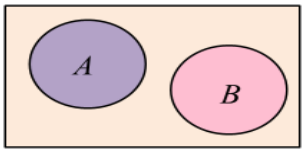
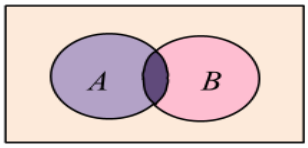
Addition Rule (Keywords: or, either, at least, at most)

Mutually Exclusive Events

Two events A and B cannot occur at the same time



A and B are mutually exclusive



A and B are not mutually exclusive

$P(A \text{ or } B) = P(A) + P(B)$ $P(A \text{ or } B) = P(A) + P(B) - p(A \text{ and } B)$

If there is no **overlapping** between event A and B, then they are called mutually exclusive $P(A \text{ and } B) = 0$

E.1, If we draw a card from a deck of card what is the probability that it will be **red *or* King**?

$$P(\text{R or } K) = P(R) + P(K) - P(R \text{ and } K) = \frac{26}{52} + \frac{4}{52} - \frac{2}{52} = \frac{28}{52} = \frac{7}{13} = 53.85\%$$

E.2, If we draw a card from a deck of card what is the probability that it will be **Queen *or* King**?

$$P(Q \text{ or } K) = P(Q) + P(K) - P(Q \text{ and } K) = \frac{4}{52} + \frac{4}{52} - \frac{0}{52} = \frac{8}{52} = \frac{2}{13} = 15.38\%$$

E.3 In a group of 101 students 40 are juniors, 50 are female, and 22 are female juniors. Find the probability that a student picked from this group at random is a junior **or** female.

P(junior or female) = 40/101 + 50/101 – 22/101 = 68/101

E. 4 Of the 60 people who answered "yes" to a question, 35 were male. Of the 40 people who answered "no" to the question, 10 were male.

	Yes	**No**	
Male	35	10	**?**
Female	?	?	**?**
	60	40	

Use the given information to complete the table.

	Yes	**No**	
Male	35	10	**45**
Female	25	30	**55**
	60	**40**	**100**

If **one** person is selected at random from the group, answers the following questions

Find the probability that the person answered "yes" **or** is male? $P(yes \text{ or } male) = \frac{60}{100} + \frac{45}{100} - \frac{35}{100} = \frac{70}{100} = 70\%$

Find the probability that the person answered "no" **or** is female? $P(no \text{ or } female) = \frac{40}{100} + \frac{55}{100} - \frac{30}{100} = \frac{65}{100} = 65\%$

B. The distribution of master degree in a college is listed as such

Major	Frequency
Math	**110**
Engineering	**250**
Business	**300**
Education	**100**
English	**240**
Total	**1000**

If one student is selected at random then what ids the probability that he/she is majoring in Math or English?

$$P(M)+P(E)=\frac{110}{1000}+\frac{240}{1000}=\frac{340}{1000}=34\%$$

If one student is selected at random then what ids the probability that he/she is majoring in Math or English or Business?

$$P(M)+P(E)+P(B)=\frac{110}{1000}+\frac{240}{1000}+\frac{300}{1000}=\frac{640}{1000}=64\%$$

C. The table below shows a random sample of 500 students getting traffic tickets in terms of their **gender** and **living arrangements.**

	Home	**A**partment	**D**orm	
Male	102	72	39	**213**
Female	209	33	45	**287**
	311	**105**	**84**	**500**

If **one** student who got traffic ticket is randomly selected then find the following probability that

1. The student is **M**ale **or** lives at **H**ome $P(M)+P(H)-P(M\ and\ H)=\frac{213}{500}+\frac{311}{500}-\frac{102}{500}=\frac{422}{500}=84.4\%$

2. The student is **F**emale **or** lives at **D**orm $P(F)+P(D)-P(F\ and\ D)=\frac{287}{500}+\frac{84}{500}-\frac{45}{500}=\frac{326}{500}=65.2\%$

3. The student is Female or lives at Home $P(F)+P(H)-P(F\ and\ H)=\frac{287}{500}+\frac{311}{500}-\frac{209}{500}=\frac{389}{500}=77.8\%$

4. The student lives at Dorm or at Apt $P(D)+P(A)-P(D\ and\ A)=\frac{84}{500}+\frac{105}{500}-\frac{0}{500}=\frac{189}{500}=37.8\%$