Addition Rule

Quiz: Monday

P(A or B) = probability that event A or event B occurs or they both occur

P(A or B) = P(A) + P(B) - P(A and B)

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Roll 2 dice. Record the sum.

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

P(sum is 3 or 7) $= \frac{2}{36} + \frac{6}{36} = \frac{8}{36} = \frac{2}{9}$

P(sum is even or mult. of 5)

P(even) + P(mult. of 5) − P(even and mult. 5)

$$\frac{18}{36} + \frac{7}{36} - \frac{3}{36} = \frac{22}{36} = \frac{11}{18}$$

Titanic Passengers

	Men	Women	Boys	Girls	Totals
Survived	332	318	29	27	706
Died	1360	104	35	18	1517
Total	1692	422	64	45	2223

Is there overlap?

No

Find the probability of selecting a man or a woman

$$P(M \cup W) = \frac{1692}{2223} + \frac{422}{2223} - 0$$

$$= \frac{2114}{2223} = .951$$

Titanic Passengers

	Men	Women	Boys	Girls	Totals
Survived	332	318	29	27	706
Died	1360	104	35	18	1517
Total	1692	422	64	45	2223

Is there overlap?

Yes

Find the probability of selecting a woman or someone who survived

$$P(W \cup Surv.) = \frac{422}{2223} + \frac{706}{2223} - \frac{318}{2223} = \frac{810}{2223} \approx .364$$

$$= \frac{332+318+29+27+104}{2223}$$

$$= \frac{810}{2223}$$

Titanic Passengers

	Men	Women	Boys	Girls	Totals
Survived	332	318	29	27	706
Died	1360	104	35	18	1517
Total	1692	422	64	45	2223

Is there overlap?

Yes

Find the probability of selecting a boy or someone who died

$$P(\text{Boy} \cup \text{died}) = \frac{1546}{2223} = .695$$

Titanic Passengers

	Men	Women	Boys	Girls	Totals
Survived	332	318	29	27	706
Died	1360	104	35	18	1517
Total	1692	422	64	45	2223

Is there overlap?

Find the probability of selecting a man or someone who died

$$\frac{1849}{2223} = .832$$

Titanic Passengers

	Men	Women	Boys	Girls	Totals
Survived	332	318	29	27	706
Died	1360	104	35	18	1517
Total	1692	422	64	45	2223

Is there overlap?

Find the probability of selecting a child or someone who did not survive.

$$\frac{1573}{2223}$$

$P(A) = .27$

$P(A \cup B) = .45$

$P(A \cap B) = .12$

$P(B) =$ ____

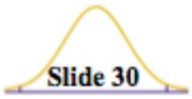
Use the addition rule formula to find P(B)

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

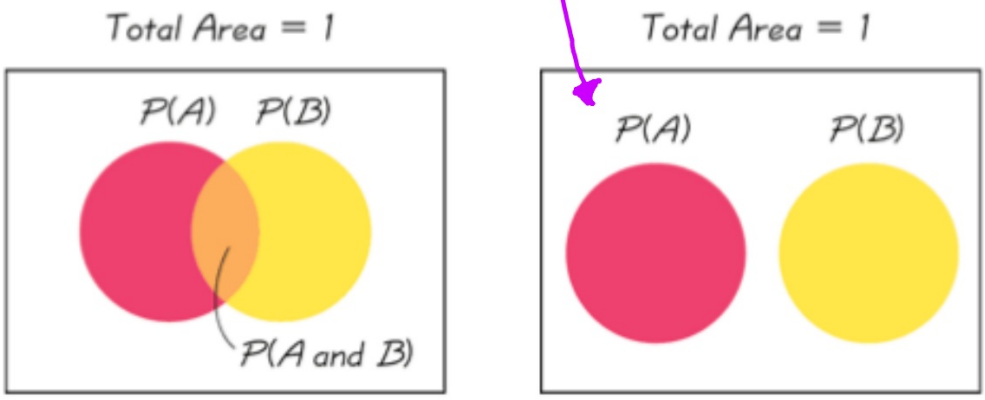
$.45 = .27 + P(B) - .12$

$.3 = P(B)$

Definition



Events *A* and *B* are disjoint (or mutually exclusive) if they cannot both occur together.



Are these events mutually exclusive?

Event A: randomly selecting a senior
Event B: randomly selecting a junior

Are these events mutually exclusive?

Event A: randomly selecting a senior
Event B: randomly selecting a junior

Yes, because there is no overlap.

Are these events mutually exclusive?

Event A: randomly selecting a doctor
Event B: randomly selecting a female

Are these events mutually exclusive?

Event A: randomly selecting a doctor
Event B: randomly selecting a female

No, there are female doctors.