Practice

1. Determine the probability of:

a) Tossing exactly two heads if a coin is tossed three times	$\frac{3}{8}$
b) Tossing at least two heads if a coin is tossed three times	$\frac{1}{2}$
c) Rolling a total of 9 with a standard pair of dice	$\frac{1}{9}$
d) Rolling a total that is less than 6 with a standard pair of dice	$\frac{5}{18}$

2. Calculate the odds in favour:

If the probability of A is $\frac{10}{17}$	$10:7$

3. The odds in favour of the Argos winning the Grey Cup are 10:7.

a) What would be the winnings if a \$2.00 bet is placed and the Argos win? $\frac{7}{10} = \frac{x}{2}$		\$ 1.40
b) How much money must one wager in order to win \$20.00 if the Argos wins? $\frac{7}{10} = \frac{20}{x}$		\$28.57

4. If a family is chosen at random from the set of all families with exactly two children, find the probability that

a) The family has two boys if it is known that one child is a boy $P(A \not\subset B) = P(A) \times P(B\|A)$ $\frac{1}{4} = \frac{3}{4} \times P(B\|A)$		$\frac{1}{3}$
b) The family has two boys if it is known that the first child is a boy $\frac{1}{4} = \frac{1}{2} \times P(B\|A)$		$\frac{1}{2}$

5. If a committee of five is to be chosen randomly from 6 males and 8 females, what is the probability that the committee is either all male or all female? $\frac{31}{1001}$

6. A card is drawn from a deck of cards, and then a second card is drawn without replacing the first card. $1^{st} \heartsuit = \frac{13}{52}$

a) What is the probability of the first card is a heart? (6b) $A = 1^{st}$ card $\heartsuit$ $P(A) = \frac{1}{4}$	$\frac{1}{4}$ $2^{nd} \heartsuit = \frac{12}{51}$
b) What is the probability of the second is also a heart? $B = 2^{nd}$ card $\heartsuit$ $A(A \cap B) = \frac{1}{17}$ $P(B\|A)$ $P(B\|A) = \frac{\frac{1}{17}}{\frac{1}{4}} = \frac{4}{17}$	$\frac{4}{17}$

7. The probability of its raining this morning is 0.1. if it rains, the probability that Gen will be late for school is $\frac{3}{5}$; otherwise, the probability is $\frac{1}{4}$. What is the probability that Gen will be late for school?
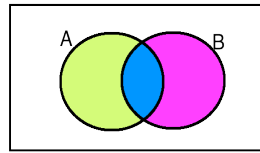
$\frac{57}{200}$

Learning Goal: Revisit Venn Diagrams

Mutually Exclusive and Non-mutually Exclusive Events:
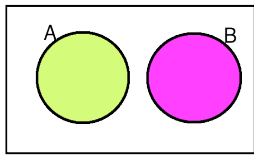
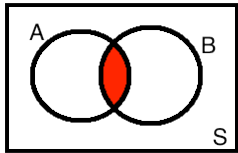Mutually Exclusive Events (Disjoint)
$$P(A \cup B) = P(A) + P(B)$$

Non-Mutually Exclusive Events
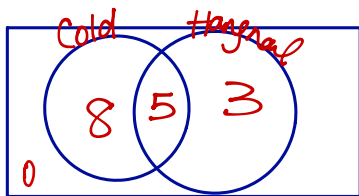$$P(A \cup B) = P(A) + P(B) - P(A \text{ and } B)$$

Events:

$$P(A \cap B) = P(A) \times P(B)$$

Practice:

1. Everyone in a doctor's office is suffering from a cold or a hangmail. 13 have a cold, 8 have a hangnail, and 5 have both. What is the probability that a patient in the doctor's office is having cold only?


$n(s) = 16$

$n(\text{Cold only}) = 8$

$n(\text{Cold} \cap \text{Hangmail}) = 5$

$n(\text{Hangmail only}) = 3$

$$P(\text{Cold only}) = \frac{n(\text{Cold only})}{n(S)}$$
$$= \frac{8}{16}$$
$$= \frac{1}{2}$$

2. A survey of a machine shop reveals the following information about its employees, if an employee is selected, what is the probability that the employee is a cleaner?

   44 employees can run a lathe
   49 employees can run the milling machines
   56 employees can operate a punch press
   27 employees can run a lathe and a milling machine
   19 employees can run a milling machine and operate a punch press
   24 employees can run a lathe and operate a punch press
   10 employees can operate all three machines
   9 employees cannot operate any of the three (the cleaners)

$n(s) = 98$ $P(\text{cleaner}) = \frac{9}{98}$
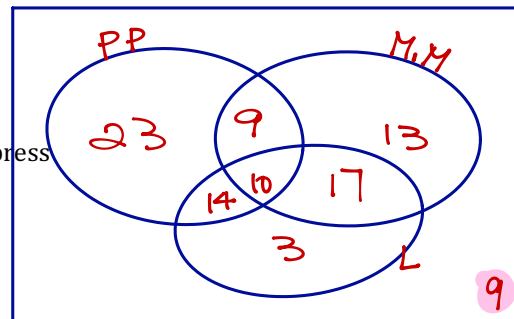
3. On the first day of school, a teacher surveyed the students in her class to find out who owned drawing instrucments. There are 35 students in the class and all have at least one instrument. If a teacher selects a student, what is the probability that the student has square only?

   20 had compasses
   12 had compasses and protractors
   17 had protractors
   7 had squares and protractors
   10 had compasses and squares
   5 had all three instruments

$x = 35 - 5 - 5 - 3 - 7 - 3 - 2$
$x = 35 - 25$
$x = 10$
$\therefore n(\text{square}) = 10$
$n(\text{Sample space}) = 35$

$$P(\text{square}) = \frac{10}{35} = \frac{2}{7}$$