

The members at BE FIT are 55% male, 60% play sports, 35% are males who play sports, 30% use free weights and 14% are women who use free weights. What is the probability that...

1) ... a member selected is male or plays sports?

$$55 + 60 - 35 = \boxed{80\%}$$

2) ... a female selected uses free weights?

Known

Both
Known

$$\frac{14}{45}$$

The members at BE FIT are 55% male, 60% play sports, 35% are males who play sports, 30% use free weights and 14% are women who use free weights. What is the probability that...

3) ... a sports player selected is male?

Known

$$\frac{7}{12}$$

$$\frac{35}{60}$$

Both
Known

4) ... a member selected is female or uses free weights?

$$45 + 30 - 14 = \boxed{61\%}$$

WB 204 Assignment: Conditional Probability

Use the following table for questions #1-5:

	Play Football	Don't Play Football	Total
Boys	42	33	75
Girls	12	23	35
Total	54	56	110

1. What is the probability of randomly selecting an individual who is a boy and who plays football?

$$\frac{42}{110} \quad \left(\frac{21}{55} \right)$$

2. What is the probability of a randomly selecting an individual that is a boy?

$$\frac{75}{110} \quad \left(\frac{15}{22} \right)$$

3. What is the probability of a randomly selecting an individual that plays football?

$$\frac{54}{110} \quad \left(\frac{27}{55} \right)$$

4. If you randomly select a boy, what is the probability they play football?

$$\frac{42}{75} \quad \left(\frac{14}{25} \right)$$

5. If you randomly select a football player, what is the probability that they are a boy?

$$\frac{42}{54} \quad \left(\frac{7}{9} \right)$$

6. In a school, the probability that a student takes environmental science and geography is 0.25. The probability that a student takes environmental science is 0.72 and the probability that a student takes geography is 0.55. What is probability that a student takes geography given that the student is taking environmental science?

$$\frac{0.25}{0.72}$$

$$\frac{25}{72}$$

7. In a tournament there is a $\frac{1}{12}$ chance of getting 1st place in your opening group. There is a $\frac{1}{18}$ chance of scoring a record number of points. And a $\frac{1}{24}$ chance of both. What is the probability of getting 1st place in your group or scoring a record number of points?

$$\frac{1}{12} + \frac{1}{18} - \frac{1}{24} =$$

8. The probability that Sue will go to Mexico in the winter and to France in the summer is $\frac{2}{5}$. The probability that she will go to Mexico in the winter is $\frac{3}{5}$ and the probability that she will go to France in the summer is $\frac{1}{2}$. Find the probability that she will go to France this summer, given that she just returned from her winter vacation in Mexico.

$$\frac{\frac{2}{5}}{\frac{3}{5}} = \frac{2}{3}$$

9. **A penny and a nickel are tossed.**

a. What is the probability that both coins show heads?

b. What is the probability that one or the other show heads?

c. What is the probability that the penny shows heads if you see that the nickel shows heads?

10.

	Senior	Junior
Male	35	10
Female	28	14

Using the table above find the probability of each:

a. $P(\text{senior} | \text{male})$

$$\frac{35}{45}$$

$$\frac{7}{9}$$

b. $P(\text{female} | \text{junior})$

$$\frac{14}{24}$$

$$\frac{7}{12}$$

11. A family that is known to have two children is selected at random from amongst all families with two children. Find the probability that both children are boys, given that there is a boy in this family.

U2: Probability

Expected Value

Unit 1 Topics

Consecutive Events

Compound Events

Basic Probability

Conditional

Expected Value

The sum of all potential gains multiplied by their individual probabilities

(outcomes)

- 1) Identify potential gains
- 2) Mult. by their probabilities
- 3) Find the sum

Expected Value

Expected value can be used to decide between possible business investments, find the average gain or loss of repeating an activity, or simply determine if a game is fair.

+ for you = Good choice / Game favors you

- for you = Bad choice / Game favors opponent

= for both = Options are equal / Game is fair

or 0

Just Watch this first example

At Pasta House you would be paid an hourly rate of \$4 per hour plus earn tips. According to your friend who works there, tips can range from \$2 to \$4 per hour. She estimates that she gets \$2 per hour 20% of the time, \$3 per hour 50% of the time and \$4 per hour the rest of the time.

$$\frac{6}{1.2} + \frac{7}{3.5} + \frac{8}{2.4} = \boxed{\$7.10}$$

The other possibility you are considering is taking a job at Noodle Hut. This job pays \$7 per hour but you are not allowed to accept tips. Which job should you apply for to make the most money?

Example:

The table below shows the likelihood of wins for the next 4 games for a baseball team:

Wins	0	1	2	3	4
Prob.	0.15	0.2	0.35	0.2	0.1

$$0 + 0.2 + 0.7 + 0.6 + 0.4 =$$

What is the expected number of wins for the team?

1.9 games

2) Which race would be best to run...

Race A costs \$10; you have the following winning chances, 1/20 to win \$750, 1/10 to win \$50, and 1/5 to win \$35 (the rest are \$0).

$$\begin{array}{r} 750 \\ \times 0.05 \\ \hline 37.5 \end{array} + \begin{array}{r} 50 \\ \times 0.1 \\ \hline 5 \end{array} + \begin{array}{r} 35 \\ \times 0.2 \\ \hline 7 \end{array} + \begin{array}{r} 0 \\ \times \square \\ \hline 0 \end{array} = 49.5 - 10 = \boxed{\$39.50}$$

Race B costs \$10; has the following winning chances, 1/50 to win \$1000, 1/5 to win \$40, and 1/4 to win \$20 (the rest are \$0).

$$\begin{array}{r} 1000 \\ \times 0.02 \\ \hline 20 \end{array} + \begin{array}{r} 40 \\ \times 0.2 \\ \hline 8 \end{array} + \begin{array}{r} 20 \\ \times 0.25 \\ \hline 5 \end{array} + \begin{array}{r} 0 \\ \times \square \\ \hline 0 \end{array} = 33 - 10 = \boxed{\$23}$$

You and your partner will roll your dice simultaneously and find the differences of the numbers that you roll.

Player A gets 1 point if the value is 0, 1, or 2.

Player B gets 1 point if the value is 3, 4, or 5.

1. Do you think this will be a fair game? Why or why not?

A	B
✓ 14	10
✓ 9	7
✓ 17	10
✓ 14	13
✓ 25	18
✓ 13	6
11	12 ✓
✓ 24	10
✓ 25	11

A	B
✓ 27	9
✓ 12	9
7	9 ✓
✓ 17	9
✓ 16	6
✓ 25	6
✓ 14	2
15	2

= 5
= 4
= 3
= 2
= 1
= 0

= 4
= 3
= 2
= 1
= 0
= 1

= 3
= 2
= 1
= 0
= 1
= 2

= 2
= 1
= 0
= 1
= 2
= 3

= 1
= 0
= 1
= 2
= 3
= 4

= 0
= 1
= 2
= 3
= 4
= 5

Expected Value

(A)

$$\frac{1 \times \frac{24}{36}}{\frac{2}{3}} - \frac{-1 \times \frac{12}{36}}{\frac{1}{3}} = \frac{1}{3}$$

Favors
A

You and your partner will roll your dice simultaneously and find the sum of the numbers that you roll.

Player A gets 1 point if the value is less than 7.

Player B gets 1 point if the value is greater than 7.

~~Player C~~ 0 point if the value is equal to 7.

1. Do you think this will be a fair game? Why or why not?

A	B
✓ 19	18
12	18 ✓
✓ 15	14
23	31 ✓
✓ 20	18
18	18
16	16
21	21
✓ 14	12
17	17

A	B
✓ 17	8
✓ 11	9
✓ 15	10
✓ 30	17
✓ 23	10
✓ 23	22
✓ 17	16
11	2
	✓

~~= 7~~
= 6
= 5
= 4
= 3
= 2

= 8
~~= 7~~
= 6
= 5
= 4
= 3

= 9
= 8
~~= 7~~
= 6
= 5
= 4

= 10
= 9
= 8
~~= 7~~
= 6
= 5

= 11
= 10
= 9
= 8
~~= 7~~
= 6

= 12
= 11
= 10
= 9
= 8
~~= 7~~

Expected Value

(A)

$$\begin{aligned} & 1 \quad 0 \quad -1 \\ & \times \frac{15}{36} \quad \times \frac{6}{36} \quad \times \frac{15}{36} \\ \hline & \frac{5}{12} + 0 \quad -\frac{5}{12} = 0 \end{aligned}$$

Fair

1) Bob works construction; 40% of his jobs earn \$200, 35% earn \$150 and 25% earn \$100.

a. What is the expected value for his work?

$$\frac{200 \times 0.4}{80} + \frac{150 \times 0.35}{52.5} + \frac{100 \times 0.25}{25} = \boxed{\$157.50} \times 50$$

b. What is the expected value for 50 jobs?

$$\boxed{\$7875}$$

c. How many jobs would he need to take to make \$1000 a week?

$$\frac{1000}{157.5} = 6.34...$$

$$\boxed{7 \text{ jobs}}$$