2.8

From a survey of the 840 top games, it was found that 196 were Shooters, 420 were multiplayer, and 138 were multiplayer and shooter. Find the number of these students who were:

a) shooters, multiplayer, or both:

$$A \cup B = A + B - A \cap B$$
$$196 + 420 - 138 = 478$$

$\cup$

b) Shooter but not multiplayer:

$$A - B = 420 - 138 = 58$$

c) Multiplayer but not shooter:

$$B - A \cap B = 420 - 138 = 282$$

```
System.out.println(vg.getGenreCount("Shooter", 20));
System.out.println(vg.getCountMultiplayers(20));
System.out.println(vg.getCountMultiAndGenre("Shooter", 20) + "\n");
System.out.println(vg.getMultiOrGenreCount("Shooter", 20));
System.out.println(vg.getGenreNotMultiCount("Shooter", 20));
System.out.println(vg.getMultiNotGenre("Shooter", 20));
```

```
Console ×
<terminated> TestVide
196
420
138

478
58
282
```

2.29

10 additional games are needed to complete a jury for a random test. They will be chosen from the 40 most popular games from 2024 to 2004.10 games are selected

a) Define the experiment and describe one sample point. Assume that you need to describe only the two jurors chosen and not the order in which they were selected.

The experiment is choosing 20 / 840 of the games and testing whether or not they are multiplayer

Example point: (*Game1*, *Game2*, *Game3*, *Game4, Game5*, *Game6, Game7, Game8, Game9, Game10*)

b) What is the probability that both games are the same genre?

We need to understand that 50% of the games are multiplayer.
P(both multiplayer) = $\frac{420C5}{420C5}$ **= .5 = 50%**

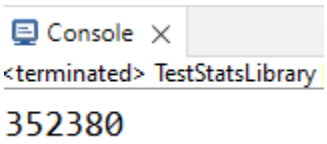
2.57

2 games are chosen from the top 40 from the years 2024 to 2004. What is the probability that the draw will yield an Indie and Racing?

Ways choose 2 from 840: totalCombos = $\binom{840}{2}$

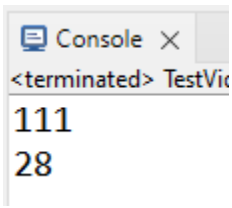
Ways choose 1 Indie: indieCombos = $\binom{111}{1}$

Ways choose 1 Racing: racingCombos = $\binom{28}{1}$



p(1 Indie and 1 Racing): $\frac{indieCombos * racingCombos}{totalCombos}$ **=** $\frac{3108}{352380}$ **= .0088 = .9%**

```
System.out.println(vg.getGenreCount("Indie", 22));
System.out.println(vg.getGenreCount("Racing", 22));
```



2.76

A survey of players in a particular community showed that 25% raged playing one game in the data set. Half the complaints dealt with multiplayer games. Find the probability that a player will

a) rage, given that they played a multiplayer game

P(raged) = .25

Understand that P(multiplayer) = .5

P(multiplayer | raged) = .5

Therefore,

P(raged | multiplayer) = $\frac{P(multiplayer \mid raged) * P(multiplayer)}{P(raged)}$ **= .25 = 25%**

b) Not rage, given that they played multiplayer.

P(Did not rage | multiplayer) = 1 - P(raged | multiplayer) = 75%

2.133

342/840 = 40% of the games are Action or Shooter and 60% are not. A game chosen at random from this population is multiplayer. Find the conditional probability that this game is not an action or shooter game.

Understand that there are 146 actions and 196 shooters

P(Action, Strategy, or Shooter) = .4

P(Not Action, Strategy, or Shooter) = .6

P(Multi | Action or Shooter) = 205/840 = .244

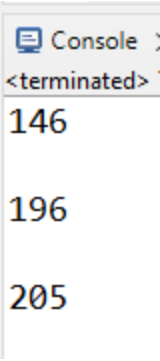
P(Multi | NOT Action or Shooter) = (420 - 205) / 840 = .255

P(NOT Action or Shooter | multi) =

$$\frac{P(Multi \mid NOT\ Action\ or\ Shooter) * P(NOT\ Action\ or\ Shooter)}{P(Multi \mid NOT\ Action\ or\ Shooter) * P(NOT\ Action\ or\ Shooter) + P(Multi \mid Action\ or\ Shooter) * P(\ Action\ or\ Shooter)}$$

$$= \frac{.255 * .6}{(.244 * .4 + .255 * .6)} = \frac{.153}{.2506} = \mathbf{.610 = 61\%.}$$

```
System.out.println(vg.getGenreCount("Action", 20) + "\n");
System.out.println(vg.getGenreCount("Shooter", 20) + "\n");
System.out.println(vg.getMultiGivenGenre("Action") + vg.getMultiGivenGenre("Shooter"));
```



3.23

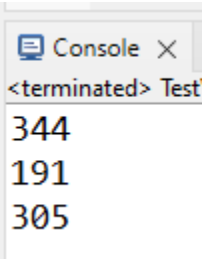
In a gambling game, a person draws a game from the 840 games. A person $15 for drawing a Mature or an Adults Only and $5 for drawing a Teen or an Everyone. A person who draws any other card pays $4. If a person plays this game, what is the expected gain?

Understand P(Mature or Adults Only) = 344/840 = .41 = 41%

Understand P(Teen or Everyone) = 191/840 = .23 = 23%

Understand P(Else) = 305/840 = .36 = 36%

```
int mAO = vg.getCountEsrb("Mature") + vg.getCountEsrb("Adults Only");
int TE = vg.getCountEsrb("Teen") + vg.getCountEsrb("Everyone");
int rest = 840 - mAO - TE;
System.out.println(mAO);
System.out.println(TE);
System.out.println(rest);
```



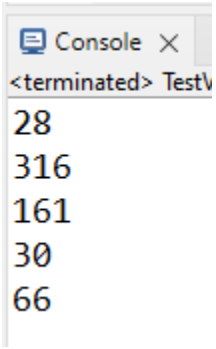
E(X) = (.41 * 15) + (.23 * 5) + (.36 * (-4)) = 5.86

3.41

The games will have 1 of 5 relevant ESRB ratings: Adults Only, Mature, Teen, Everyone, and Everyone 10+. Suppose that 20 random games's ESRB are tested. What is the probability that 5 are Mature?

P(Mature) = 316 / 840 = .376 = 37.6%

```
System.out.println(vg.getCountEsrb("Adults Only"));
System.out.println(vg.getCountEsrb("Mature"));
System.out.println(vg.getCountEsrb("Teen"));
System.out.println(vg.getCountEsrb("Everyone"));
System.out.println(vg.getCountEsrb("Everyone 10+"));
```



Use binomial distribution p = .376, n = 5

p(5) = $\binom{20}{5} * .376^{5} *.624^{20-5}$ **= .099 = 1%**

3.67

Games are tested sequentially and are selected at random from the pool. Find the probability that the first game rated E for Everyone game is found on the fifth test.

P(Everyone) = 30 / 840 = .036

Use Geometric distribution with p = .036

p(5) = $.964^{5-1} * .036$ **= .031 = 3.1%**

3.97

Random games are selected. They have a 50% chance of being multiplayer.

a) What is the probability that the third game is the first multiplayer?

Negative Binomial p =.5, k = 3, r = 1

p(3) = $\binom{2}{0}$ ***.** 5^2 ***.** 5 **= .125 = 12.5%**

b) What is the probability that the third multiplayer is the seventh test multiplayer?

Negative Binomial p =.5, k = 7, r = 3

p(7) = $\binom{6}{2}$ ***.** 5^3 ***.** 5^4 **= .117 = 11.7%**

d Find the mean and variance of the number of wells that must be drilled if the company wants to set up three producing wells.

Mean = $\frac{r}{p}$ **=** $\frac{3}{.5}$ **= 2**

Variance = $\frac{r(1-p)}{p^2}$ **= 6**

3.109

Video Game ESRB ratings indicate which audiences games are appropriate for. Mature and Adults Only games are controversial. 20 random games were picked from 2010. What are the odds that:

a) 2 are controversial?

Understand that 40 games, 18 controversial

```
System.out.println(vg.getControversialCount(vg.getYearlyGames(7)));
```

```
Console ×
<terminated> Test
18
```

Hypergeometric Distribution N = 40, n = 5, r = 5

p(2) = $\frac{\binom{18}{2}\binom{22}{3}}{\binom{40}{5}}$ **= .3581 = 35.81%**

b) Two or fewer emerged from treated seeds?

P(Y < 2) = .24

c) at least one emerged from untreated seeds?

P(Y > 1) = .759

3.127:

The number of games with metacritic errors is 150 with a Poisson distribution. What are the odds that there are 111?

Understand that there are 150 metacritic errors.

```
System.out.println(vg.getCountMetacriticErrors());
```

```
Console ×
<terminated> Test
150
```

Most of the errors are at the end. Account for that by subtracting some:

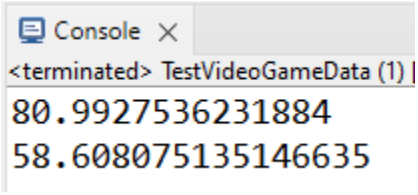
Poisson Distribution lambda = 120

p(110) = $\frac{120^{110}e^{-120}}{100!}$ **= .025 = 2.5%**

3.167

Let Y be the metacritic scores with mean 81 and variance 58. Using Tchebysheff's theorem, find

```
System.out.println(vg.getMetacriticMean());
System.out.println(vg.getMetacriticVariance());
```



a) a lower bound for P(71< Y < 91)

The "within num" is 10

Stdev is 7.62

k = 10 / 7.62 = 1.31

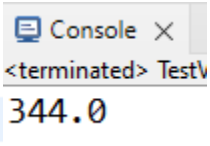
1 - $\frac{1}{1.31^2}$ = .418= 41.8%

4.2

Random games are tested to see if they are controversial (if their rating is Mature or Adults Only). Let Y be the trial number of the first controversial game:

Total controversial is 344

```
System.out.println(vg.getCountControversial());
```



a) Find the probability function for Y

p(y) = $\frac{1}{344}$

b) Give the corresponding distribution function.

F(Y) = 0, y < 1

$$\{ \frac{y}{344}, \mathbf{1} \leq \ y \ \leq \ 840$$

$$\mathbf{1, y > 840}$$

c) What is P(Y < 3)? P(Y ≤ 3)? P(Y = 3)?

P(Y = 3) = F(3)