**Homework 03.**

In this assignment you will have a chance to see how probability is used in the real-world.

**Assigned: 5 September 2017**

**Due: 5:00PM PST, 12 September 2017**

**Instructions: There are ten multiple choice questions. To receive credit, EMAIL your solution by the deadline to** [**tony\_statman@yahoo.com**](mailto:tony_statman@yahoo.com) **according to the following instructions:**

* The SUBJECT LINE must be “**GSBA545 HW03 for [Last name, First name] –** “ and then the ten letters corresponding to your answers; so, for example, if your name were John Doe, and you believed the answers were ABCCDCABED, then the subject line of the email must be “**GSBA545 HW03** for **Doe, John - CABEDABCCD**”
  + The first six characters (**GSBA545**) do not have a space between “GSBA” and “545”
  + The ten characters of your answer should have no spaces in between
  + If you submit less than 10 letters, it is assumed that the first letter corresponds to your answer to the first question, etc.
* The FIRST LINE of the body of the email should be your last name, your first name, and your student ID
* The SECOND LINE of the body of the email should be five letters, corresponding to the answers to the five questions (make sure your answer consists of five characters)

**For example, a typical email might be**

From: John Doe <john.doe@usc.edu>

To: tony\_statman <tony\_statman@yahoo.com>

Subject: GSBA545 HW03 for Doe, John - CABEDABCCD

DOE, JOHN 123456789  
CABEDABCCD

Making movies is a risky but potentially profitable enterprise. Data from 61 films from 2016 were used to derive the following assumptions (see <http://www.boxofficemojo.com/yearly/chart/?view=releasedate&view2=domestic&yr=2016> ):

* Assume a film costs $76M to produce and to market
* Assume that there is a 22% chance that a film will be a “hit” and generate $222M in sales, and a 78% chance that film will be “average” and generate $30M in sales
* For any film, a sequel can be produced, either at the same time as the first film or after the sales from the first film are known
  + If the sequel is filmed at the same time as the original film, the cost is $95M
  + If the sequel is filmed after the original film, the cost will be $122M
* If a sequel is produced, it has a 90% chance of generating the same sales as the original film, and a 10% chance to have the opposite result (i.e., a 10% chance for the sequel of a “hit” to be only “average”, and a 10% chance for the sequel for an “average” film to become a surprise “hit”).

1. If it is decided in advance that no sequel will be produced (e.g., a one-time film), what is the expected net value of producing a single film? Choose the answer that is closest to correct.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. $50M | 1. $72M | 1. $104M | 1. –$4M | 1. –$16M |

1. If it is decided in advance that both a film and its sequel will be produced at the same time, what is the expected net value after for the two films? Choose the answer that is closest to correct.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. –$39M | 1. –$16M | 1. –$12M | 1. $14M | 1. $20M |

1. If it is decided in advance that both a film and its sequel will be produced at the same time, what is the standard error for the net value after the two films? Choose the answer that is closest to correct.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. $86M | 1. $116M | 1. $127M | 1. $154M | 1. $202M |

1. If you were a movie executive, what strategy would you recommend to maximize profit, given the above assumptions?
2. Do not produce a film in the first place: the expected value for a film is negative.
3. Produce both a film and its sequel, to save $27M in the cost of filming the sequel.
4. Produce the first film, and produce a sequel if and only if the first film is a “hit”
5. Produce the first film, and produce a sequel if and only if it is known that the sequel will be a “hit”
6. Produce the first film, and produce a sequel if and only if the first film is “average”, to allow an “average” film a second chance to generate a “hit”
7. What is the expected net value of the profit-maximizing strategy? Choose the answer that is closest to correct.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. –$16M | 1. $14M | 1. $20M | 1. $24M | 1. $50M |

**Table 3.1. Total gross revenue for films from four major studios (BV, Uni., Fox, Uni.), 2016**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| rank | Movie Title | Total ($M) |  | rank | Movie Title | Total ($M) |
| 1 | Rogue One: A Star Wars Story | $532.2 |  | 54 | Why Him? | $60.3 |
| 2 | Finding Dory | $486.3 |  | 55 | My Big Fat Greek Wedding 2 | $59.7 |
| 3 | Captain America: Civil War | $408.1 |  | 59 | The BFG | $55.5 |
| 4 | The Secret Life of Pets | $368.4 |  | 60 | Neighbors 2: Sorority Rising | $55.5 |
| 5 | The Jungle Book (2016) | $364.0 |  | 63 | Assassin's Creed | $54.6 |
| 6 | Deadpool | $363.1 |  | 67 | The Huntsman: Winter's War | $48.4 |
| 7 | Zootopia | $341.3 |  | 70 | Warcraft | $47.4 |
| 8 | Batman v Superman: Dawn of Justice | $330.4 |  | 72 | Mike and Dave Need Wedding Dates | $46.0 |
| 9 | Suicide Squad | $325.1 |  | 73 | War Dogs | $43.0 |
| 10 | Sing | $270.3 |  | 74 | Almost Christmas | $42.1 |
| 11 | Moana | $248.8 |  | 79 | The Nice Guys | $36.3 |
| 12 | Fantastic Beasts and Where … | $234.0 |  | 82 | Ouija: Origin of Evil | $35.1 |
| 13 | Doctor Strange | $232.6 |  | 89 | Hail, Caesar! | $30.5 |
| 14 | Hidden Figures | $169.4 |  | 93 | The Finest Hours | $27.6 |
| 15 | Jason Bourne | $162.4 |  | 99 | Bridget Jones's Baby | $24.3 |
| 17 | X-Men: Apocalypse | $155.4 |  | 100 | Kevin Hart: What Now? | $23.6 |
| 18 | Trolls | $153.7 |  | 117 | Eddie the Eagle | $15.8 |
| 20 | Kung Fu Panda 3 | $143.5 |  | 119 | Keeping Up with the Joneses | $14.9 |
| 23 | The Legend of Tarzan | $126.6 |  | 127 | The Light Between Oceans | $12.5 |
| 24 | Sully | $125.1 |  | 136 | Live By Night | $10.4 |
| 27 | Independence Day: Resurgence | $103.1 |  | 138 | Popstar: Never Stop Never Stopping | $9.6 |
| 33 | Ride Along 2 | $91.2 |  | 141 | Queen of Katwe | $8.9 |
| 35 | Miss Peregrine's Home … | $87.2 |  | 165 | Morgan | $3.9 |
| 36 | The Accountant | $86.3 |  | 172 | Midnight Special | $3.7 |
| 38 | The Purge: Election Year | $79.2 |  | 173 | Rules Don't Apply | $3.7 |
| 39 | Alice Through the Looking Glass | $77.0 |  | 185 | The Other Side of the Door | $3.0 |
| 40 | Pete's Dragon (2016) | $76.2 |  | 208 | Purple Rain (2016 re-release) | $1.9 |
| 41 | The Girl on the Train (2016) | $75.4 |  | 254 | The Polar Express (2016) | $0.8 |
| 43 | Storks | $72.7 |  | |  | | --- | | 282 | | Willy Wonka and the Chocolate… | $0.5 |
| 49 | Ice Age: Collision Course | $64.1 |  | 296 | Mad Max: Fury Road (Academy) | $0.4 |
| 50 | The Boss | $63.3 |  |  |  |  |

The following article [with numerical edits for clarity] appeared in the 9/14/2012 edition of USA Today:

**Pre-marriage doubts signal unhappy unions, divorce**

**by Sharon Jayson, USA TODAY**

Those wedding cold feet are a real signal of trouble ahead, according to a study that shows premarital jitters can predict splitsville later.

Researchers at the University of California, Los Angeles, say their four-year study of 464 newlyweds finds those with uncertainty were less satisfied with their marriages, and women with doubts who took the plunge anyway were [more than three] times more likely to divorce.

"The question was 'Were you ever uncertain or hesitant about getting married?' Just a yes or no. The simplicity is great because it's such a basic question," says lead author Justin Lavner, a UCLA researcher. "But unfortunately, it doesn't allow us to say if it's doubts about the partner or doubts about marriage in general. Doubts specific to the relationship or partner are generally worse than doubts about marriage in general."

Among the newlyweds, [46.98%] of husbands and [37.93%] of wives said they had doubts. The study, published online in the *Journal of Family Psychology*, found that about 10% more husbands than wives had doubts, but the women's inklings of trouble better predicted divorce.

Among women, [19.32%] who reported pre-wedding doubts were divorced four years later, compared with [6.25%] who didn't report having doubts. For husbands, [13.76%] who reported doubts were divorced four years later, compared with [8.94%] who didn't report doubts.

[…]

New York attorney Lubov Stark, who has practiced family law for 17 years, says not everyone has conscious doubts.

"A lot of people have jitters -- a subconscious feeling that something may be off here," she says. "But they are swept away with the whole experience of getting engaged and getting married. Everybody wants to believe it will work out."

The study also found that in [36.21%] of couples, neither partner had doubts.

And Lavner warns, not having doubts doesn't mean the marriages survived. Among those in which neither expressed doubts, [6.03%] still got divorced.

(<https://www.usatoday.com/story/news/nation/2012/09/14/marriage-doubts-divorce/1571411/> )

Use the article to answer the following questions:

1. Suppose a couple is picked at random. What is the probability that BOTH the husband and the wife had doubts? Choose the answer that is closest to correct.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. 17% | 1. 26% | 1. 18% | 1. 21% | 1. 36% |

1. Suppose it is known that the wife has doubts. What is the probability that the husband has doubts, too? Choose the answer that is closest to correct.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. 21% | 1. 33% | 1. 45% | 1. 56% | 1. 64% |

1. What was the overall four-year divorce rate among all couples in this study? Choose the answer that is closest to correct.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. 6% | 1. 7% | 1. 11% | 1. 15% | 1. 23% |

1. What was the four-year divorce rate among couples where both the husband and wife had doubts? Choose the answer that is closest to correct.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. 15% | 1. 17% | 1. 21% | 1. 23% | 1. 26% |

1. Let H be the event "Husband was uncertain / hesitant about getting married", and let W be the event "Wife was uncertain / hesitant about getting married." Are the events H and W independent, mutually exclusive, both independent and mutually exclusive, or neither independent nor mutually exclusive?

A. Independent but not mutually exclusive

B. Mutually exclusive but not independent

C. Both independent and mutually exclusive

D. Neither independent nor mutually exclusive

E. Dependent and mutually exclusive