Applied Statistics MATH 661 Assignment #4

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1 Question 1 IPC Excercise 4.2, 4.3, 4.4.

1.1 IPC 4.2 Are these phenomena random?

1.1.1 a) Temperature at noon on groundhog day.

Random

1.1.2 b) The first digit in student id number.

Deterministic

1.1.3 c) Drawing an ace from a well shuffled deck.

Random

1.2 IPC 4.3

1.2.1 a) Groundhog Day.

The temperature at noon on groundog day is considered random since the actual value of the temperature comes from a set of possible outcomes. The set of values in this case is the continuous numbers on a temperature scale. The likelyhood that the temperature will be a particular value on this scale is called the probability.

1.2.2 b) Student ID.

In this context, the probability is definied by the likelihood that the first digit of your student ID is a specific number. For example, my student ID number is 123456. How likely is it that the first digit of my student ID number is 1? Perfectly likely. More precisely, there is a probability of 1. In cases like this one, the term probability does not really apply since there are no other possible outcomes. There is no probbility that there will be any other outcome. This is a determinisitc value.

1.2.3 c) Drawong an ace.

In this context, the term probability refers to the likelyhood of drawing one specific card from a set of 52 cards.

1.3 IPC 4.4 Independent Trials?

1.3.1 a) Groundhog Temperature Readings.

Yes, the temperature reading one day does not depend on previous temperature readings.

1.3.2 b) Number of Tweets.

The number of tweets I get in the next ten mondays are not independent events. The number of tweets I get a week from today may depend on the number of tweets I get today as I may become a trending topic depending on my activity.

1.3.3 c) Grades form 5 Courses.

Grades from 5 subjects are not independent from each other. Performance on one subject is affected by the amount of work required on other subjects. *** # Question 2 IPC 4.18, 4.25, 4.26.

1.4 IPC 4.18 Probability Rules

1.4.1 a) P(A)=0.417, P(not A)?

P(notA)=(1-0.417)=0.583 by the Total Probability Rule

1.4.2 b) P(Four tosses, same outcome)?

Using Addition Rule P(Four tosses, Same Outcome)=P(no heads OR no tails) = 1/16+1/16 = 1/8 **Using Conditional Probability Rule** P(Four tosses, Same Outcome)= P(HEADS/HEADS/HEADS/HEADS)+P(TAILS/TAILS/TAILS/TAILS)=$(1/2)^{4+(1/2)}$4=1/8

1.4.3 c) P(head>=1 and tail>=1)

= P(1-(notA and not B))=1-(1/16+1/16)=7/8 ### **d)** Events A and B are disjoint. Probability cannot be >1 ### **e)** Negative probability? Probabilities cannot be negative.

1.5 IPC 4.25 Distribution of Blood Types

1.5.1 a) P(type=AB)?

P(type=AB)=1-(.42+.11+.44)=.03

1.5.2 b) P(O or B)?

P(O or B) = .11+.44=.55

1.6 IPC 4.26 Blood Types in Ireland

1.6.1 P(both type = O), P(both type=same)?

P(both type = O) = (.44.*52) = .2288 P(both type = same) = .42*.35+.11.*10+.03.*03+.52*.44

[1]:
```
P=.42*.35+.11*.10+.03*.03+.52*.44
print('P = %4.4f'%P)
```

```
P = 0.3877
```

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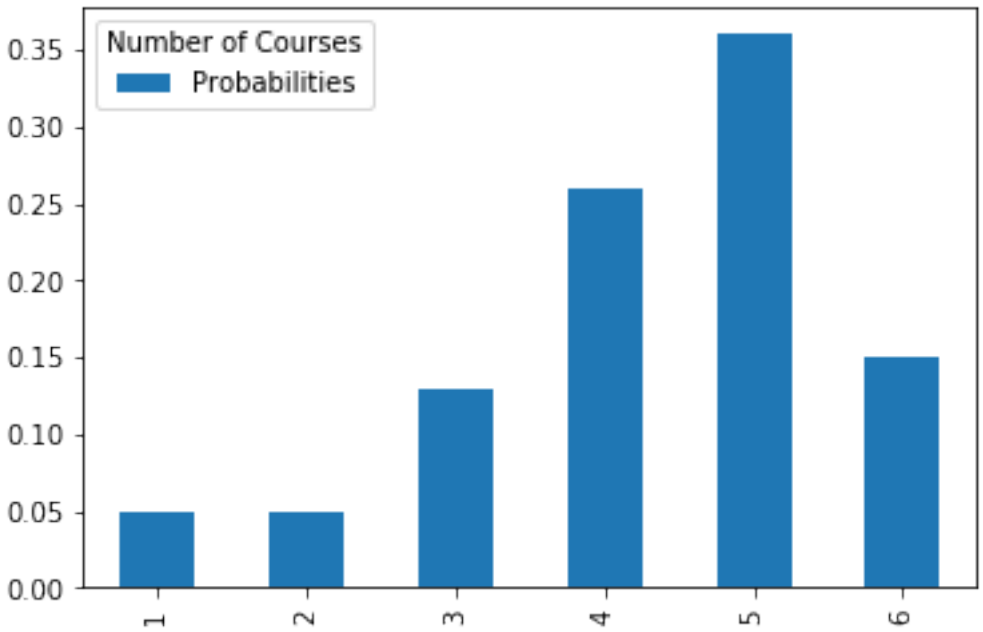
2 Question 3 IPC Excercise 4.46, 4.56

2.1 IPC 4.46 Make a graphical display of Probability Distribution.

[2]:
```
probs = {'Number of Courses':[1,2,3,4,5,6],
        'Probabilities':[.05,.05,.13,.26,.36,.15]}
import pandas as pd
df_probs = pd.DataFrame(probs,
                        index = [1,2,3,4,5,6],
                        columns = pd.Index(['Probabilities'],name='Number of␣
 ↪Courses'))
```

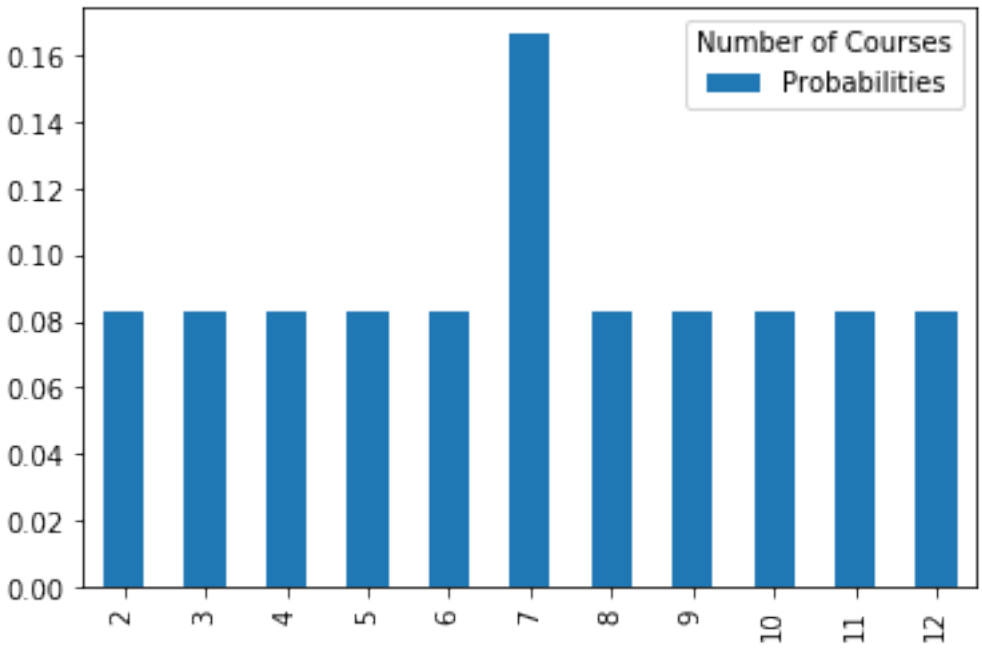
[3]:
```
%matplotlib inline
df_probs.plot(kind='bar')
```

[3]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x2b3b3bcb898>
```



[4]:
```
probs2 = {'Number of Spots':[2,3,4,5,6,7,8,9,10,11,12],
        'Probabilities':[3/36,3/36,3/36,3/36,3/36,6/36,3/36,3/36,3/36,3/36,3/
 ↪36]}
import pandas as pd
df_probs2 = pd.DataFrame(probs2,
                         index = [2,3,4,5,6,7,8,9,10,11,12],
                         columns = pd.Index(['Probabilities'],name='Number of␣
 ↪Courses'))
%matplotlib inline
df_probs2.plot(kind='bar')
```

[4]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x2b3b3cc0588>
```



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