Exercise 3-2

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Exercise 1 - 1

In [1]:
```
from os.path import basename, exists


def download(url):
    filename = basename(url)
    if not exists(filename):
        from urllib.request import urlretrieve

        local, _ = urlretrieve(url, filename)
        print("Downloaded " + local)


download("https://github.com/AllenDowney/ThinkStats2/raw/master/code/thinl
download("https://github.com/AllenDowney/ThinkStats2/raw/master/code/thinl
```

In [2]:
```
download("https://github.com/AllenDowney/ThinkStats2/raw/master/code/nsfg

download("https://github.com/AllenDowney/ThinkStats2/raw/master/code/2002l
download(
    "https://github.com/AllenDowney/ThinkStats2/raw/master/code/2002FemPr
)
```

In [3]:
```
import nsfg
```

In [4]:
```
preg = nsfg.ReadFemPreg()
preg.head()
```

Out[4]:

	caseid	pregordr	howpreg_n	howpreg_p	moscurrp	nowprgdk	pregend1	pregend2
0	1	1	NaN	NaN	NaN	NaN	6.0	NaN
1	1	2	NaN	NaN	NaN	NaN	6.0	NaN
2	2	1	NaN	NaN	NaN	NaN	5.0	NaN
3	2	2	NaN	NaN	NaN	NaN	6.0	NaN
4	2	3	NaN	NaN	NaN	NaN	6.0	NaN

5 rows × 244 columns

Select the `birthord` column, print the value counts, and compare to results published in the c

In [5]:
```
preg.birthord.value_counts().sort_index()
```

Out[5]:
```
1.0     4413
2.0     2874
3.0     1234
4.0      421
5.0      126
6.0       50
7.0       20
8.0        7
9.0        2
10.0       1
Name: birthord, dtype: int64
```

We can also use `isnull` to count the number of nans.

In [6]:
```
preg.birthord.isnull().sum()
```

Out[6]:
```
4445
```

Select the `prglngth` column, print the value counts, and compare to results published in the c

In [7]:
```
preg.prglngth.value_counts().sort_index()
```

Out[7]:
```
0        15
1         9
2        78
3       151
4       412
5       181
6       543
7       175
8       409
9       594
10      137
11      202
12      170
13      446
14       29
15       39
16       44
17      253
18       17
19       34
20       18
21       37
22      147
23       12
24       31
25       15
26      117
27        8
28       38
29       23
30      198
31       29
32      122
33       50
34       60
35      357
36      329
37      457
38      609
39     4744
40     1120
41      591
42      328
43      148
44       46
45       10
46        1
47        1
48        7
50        2
Name: prglngth, dtype: int64
```

To compute the mean of a column, you can invoke the `mean` method on a Series. For example, the mean birthweight in pounds:

In [8]:
```
preg.totalwgt_lb.mean()
```

Out[8]:
```
7.265628457623368
```

Create a new column named `totalwgt_kg` that contains birth weight in kilograms. Compute its
Remember that when you create a new column, you have to use dictionary syntax, not dot notati

In [9]:
```
preg['totalwgt_kg'] = preg.totalwgt_lb / 2.2
preg.totalwgt_kg.mean()
```

Out[9]:
```
3.302558389828807
```

`nsfg.py` also provides `ReadFemResp`, which reads the female respondents file and returns
`DataFrame`:

In [10]:
```
download("https://github.com/AllenDowney/ThinkStats2/raw/master/code/2002I
download("https://github.com/AllenDowney/ThinkStats2/raw/master/code/2002I
```

In [11]:
```
resp = nsfg.ReadFemResp()
```

`DataFrame` provides a method `head` that displays the first five rows:

In [12]:
```
resp.head()
```

Out[12]:

	caseid	rscrinf	rdormres	rostscrn	rscreenhisp	rscreenrace	age_a	age_r	cmbirth
0	2298	1	5	5	1	5.0	27	27	902
1	5012	1	5	1	5	5.0	42	42	718
2	11586	1	5	1	5	5.0	43	43	708
3	6794	5	5	4	1	5.0	15	15	1042
4	616	1	5	4	1	5.0	20	20	991

5 rows × 3087 columns

Select the `age_r` column from `resp` and print the value counts. How old are the youngest an
respondents?

In [13]:
```
resp.age_r.value_counts().sort_index()
```

Out[13]:
```
15    217
16    223
17    234
18    235
19    241
20    258
21    267
22    287
23    282
24    269
25    267
26    260
27    255
28    252
29    262
30    292
31    278
32    273
33    257
34    255
35    262
36    266
37    271
38    256
39    215
40    256
41    250
42    215
43    253
44    235
Name: age_r, dtype: int64
```

We can use the `caseid` to match up rows from `resp` and `preg`. For example, we can selec row from `resp` for `caseid` 2298 like this:

In [14]:
```
resp[resp.caseid == 2298]
```

Out[14]:

	caseid	rscrinf	rdormres	rostscrn	rscreenhisp	rscreenrace	age_a	age_r	cmbirth
0	2298	1	5	5	1	5.0	27	27	902

1 rows × 3087 columns

And we can get the corresponding rows from `preg` like this:

In [15]:
```
preg[preg.caseid == 2298]
```

Out[15]:

	caseid	pregordr	howpreg_n	howpreg_p	moscurrp	nowprgdk	pregend1	pregend
2610	2298	1	NaN	NaN	NaN	NaN	6.0	Na
2611	2298	2	NaN	NaN	NaN	NaN	6.0	Na
2612	2298	3	NaN	NaN	NaN	NaN	6.0	Na
2613	2298	4	NaN	NaN	NaN	NaN	6.0	Na

4 rows × 245 columns

How old is the respondent with `caseid` 1?

In [16]:
```
resp[resp.caseid == 1].age_r
```

Out[16]:
```
1069    44
Name: age_r, dtype: int64
```

What are the pregnancy lengths for the respondent with `caseid` 2298?

In [17]:
```
preg[preg.caseid == 2298].prglngth
```

Out[17]:
```
2610    40
2611    36
2612    30
2613    40
Name: prglngth, dtype: int64
```

What was the birthweight of the first baby born to the respondent with `caseid` 5012?

In [18]:
```
preg[preg.caseid == 5012].birthwgt_lb
```

Out[18]:
```
5515    6.0
Name: birthwgt_lb, dtype: float64
```

Exercise 1 - 2

Print the value counts for the variable pregum

In [19]:
```
resp_pregnum_counts = resp.pregnum.value_counts().sort_index()
resp_pregnum_counts
```

Out[19]:
```
0     2610
1     1267
2     1432
3     1110
4      611
5      305
6      150
7       80
8       40
9       21
10       9
11       3
12       2
14       2
19       1
Name: pregnum, dtype: int64
```

In [20]:
```
# Get the number of caseids using value count and convert it to a list
# Using the Collections package get the frequency of the number of births

import collections
preg_count = preg['caseid'].value_counts().tolist()

preg_pregnum = collections.Counter(preg_count)
preg_pregnum
```

Out[20]:
```
Counter({19: 1,
         14: 2,
         12: 2,
         11: 3,
         10: 9,
         9: 21,
         8: 40,
         7: 80,
         6: 150,
         5: 305,
         4: 611,
         3: 1110,
         2: 1432,
         1: 1267})
```

Exercise 2 - 1

For an evening news segment, I would focus on presenting the average and range of pregnancy The average is significant because most people associate pregnancy with the standard 40-week Highlighting the range is equally important, as it reveals that not all babies are born exactly at 40 This information addresses the curiosity of viewers who wonder about the earliest and latest wee babies can be born.

For an expectant parent feeling anxious, I would emphasize the average as a reassuring referen offering a sense of predictability during a time of uncertainty.

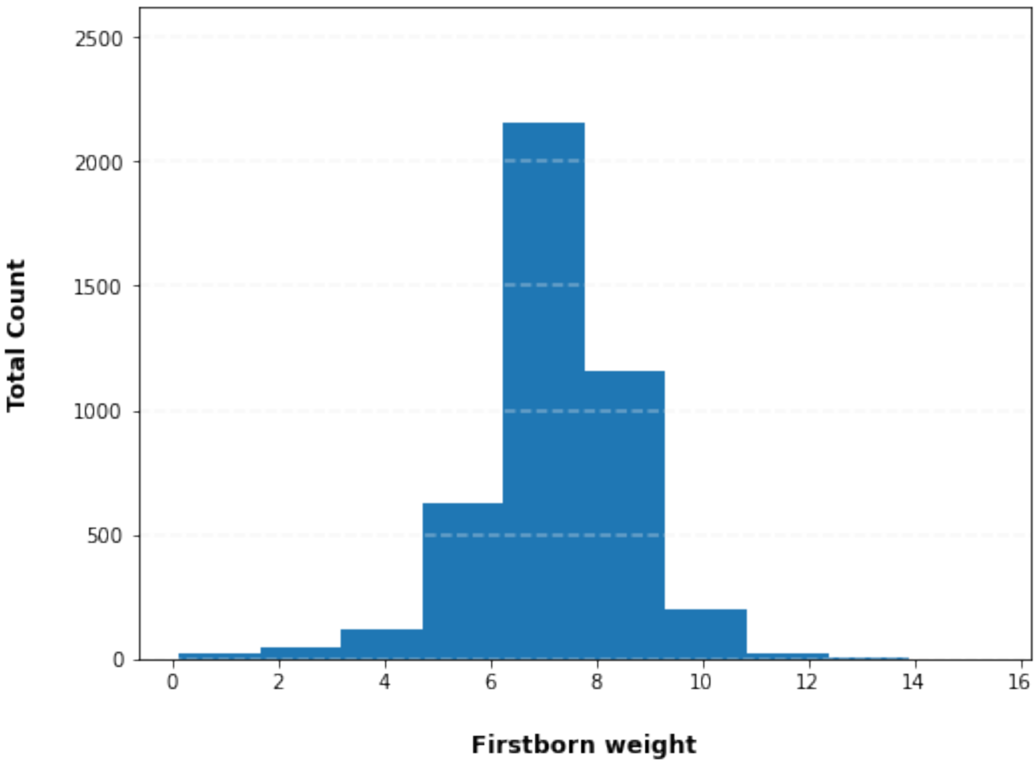
From a factual standpoint, there is a common belief that first babies are more likely to be "late," v subsequent babies tend to arrive earlier. However, data reveals that the average pregnancy leng first-time births is 38.601 weeks, compared to 38.523 weeks for subsequent births—a difference about 13 hours. This negligible variation indicates that the perception of first babies arriving signi later is largely a myth. In reality, their timelines are nearly identical to those of later pregnancies.

Exercise 2 - 4

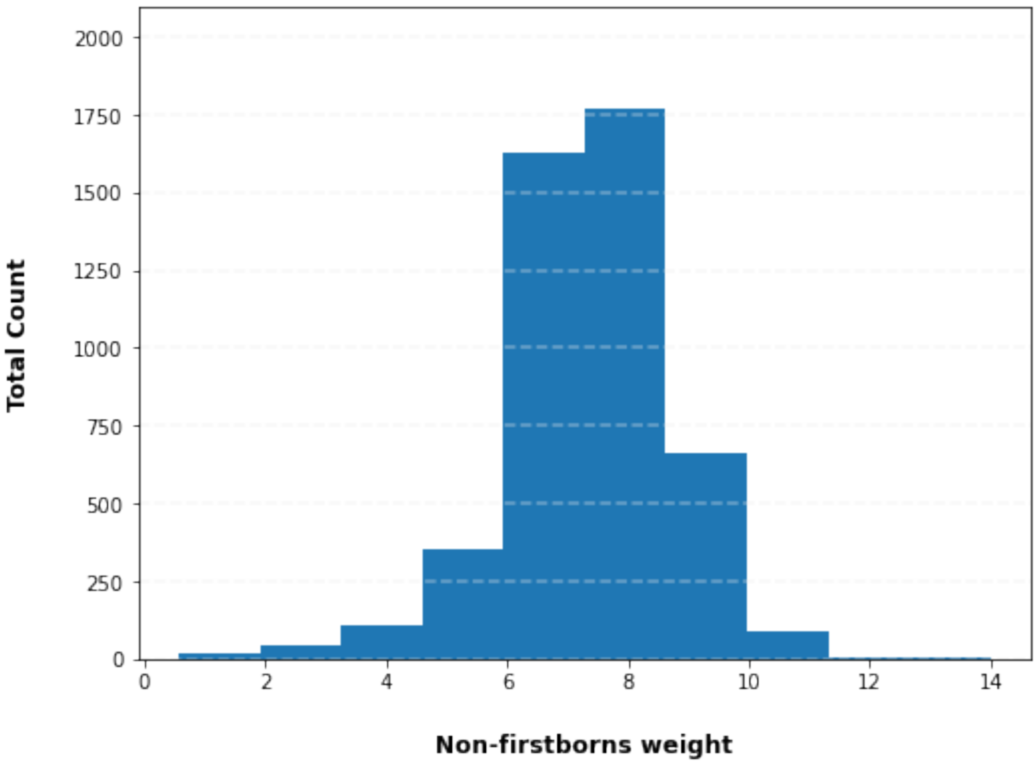
In [21]:
```
import matplotlib.pyplot as plt
from math import sqrt
```

In [22]:
```
# get first born data from pregnancy dataset
weight_firstborns = preg[preg.birthord == 1]

# get non first born data from pregnancy data
weight_others = preg[preg.birthord != 1]
```

In [23]:
```
# create histogram of first born total weight
firstborns_hist = weight_firstborns.hist(column = 'totalwgt_lb', bins = 1(

firstborns_hist = firstborns_hist[0]
for x in firstborns_hist:
    # Draw horizontal axis lines
    vals = x.get_yticks()
    for tick in vals:
        x.axhline(y=tick, linestyle='dashed', alpha=0.4, color='#eeeeee',

    # Remove title
    x.set_title("")

    # Set X-axis label
    x.set_xlabel("Firstborn weight", labelpad=20, weight='bold', size=12)

    # Set Y-axis label
    x.set_ylabel("Total Count", labelpad=20, weight='bold', size=12)

plt.show()
```



In [24]:
```
# create histogram of non-first born total weight
others_hist = weight_others.hist(column = 'totalwgt_lb', bins = 10, figsi:

others_hist = others_hist[0]
for x in others_hist:
    # Draw horizontal axis lines
    vals = x.get_yticks()
    for tick in vals:
        x.axhline(y=tick, linestyle='dashed', alpha=0.4, color='#eeeeee',

    # Remove title
    x.set_title("")

    # Set X-axis label
    x.set_xlabel("Non-firstborns weight", labelpad=20, weight='bold', size

    # Set Y-axis label
    x.set_ylabel("Total Count", labelpad=20, weight='bold', size=12)

plt.show()
```



In [25]:
```
# calculate mean of first born total weight
weight_firstborns_mean = weight_firstborns['totalwgt_lb'].mean()
weight_firstborns_mean
```

Out[25]: 7.201094430437772

In [26]:
```
# calculate mean of non-first born total weight
weight_others_mean = weight_others['totalwgt_lb'].mean()
weight_others_mean
```

Out[26]: 7.325855614973262

In [29]:
```
def CohensDEffectSize (group1, group2):
    '''
    Calculate Cohen's D effect size

    args
        group1 (df): first dataframe to compare
        group2 (df): second dataframe to compare

    returns:
        cohen_d (float): Cohen's D
    '''
    meanDiff = group1.mean() - group2.mean()

    var_1 = group1.var()
    var_2 = group2.var()
    len_1, len_2 = len(group1), len(group2)

    pooled_var = (len_1 * var_1 + len_2 * var_2) / (len_1 + len_2)
    cohen_d = meanDiff / sqrt(pooled_var)

    return cohen_d
```

In [30]:
```
CohensDEffectSize(weight_firstborns['totalwgt_lb'], weight_others['totalw
```

Out[30]:
```
-0.08893641177719079
```

Total weight for first borns is too small to say that there is a difference at all. With pregnancy leng 0.078 which is small also.