Assignment: "Haberman Survival Data Set"

OBJECTIVE: Classify the range of person's who lived more than 5 years after the diagnose or not.

In [34]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

haber = pd.read_csv('haberman.csv')
```

In [35]:
```
haber.shape
```

Out[35]:
```
(306, 4)
```

In [36]:
```
#Q) How our dataset looks like?

haber
```

Out[36]:

	age	year	nodes	status
0	30	64	1	1
1	30	62	3	1
2	30	65	0	1
3	31	59	2	1
4	31	65	4	1
5	33	58	10	1
6	33	60	0	1
7	34	59	0	2
8	34	66	9	2
9	34	58	30	1
10	34	60	1	1
11	34	61	10	1
12	34	67	7	1
13	34	60	0	1
14	35	64	13	1
15	35	63	0	1
16	36	60	1	1
17	36	69	0	1
18	37	60	0	1
19	37	63	0	1
20	37	58	0	1
21	37	59	6	1
22	37	60	15	1
23	37	63	0	1
24	38	69	21	2
25	38	59	2	1
26	38	60	0	1
27	38	60	0	1
28	38	62	3	1
29	38	64	1	1
...	...	...	...	...
276	67	66	0	1
277	67	61	0	1
278	67	65	0	1
279	68	67	0	1
280	68	68	0	1
281	69	67	8	2
282	69	60	0	1
283	69	65	0	1
284	69	66	0	1
285	70	58	0	2
286	70	58	4	2
287	70	66	14	1
288	70	67	0	1
289	70	68	0	1
290	70	59	8	1
291	70	63	0	1
292	71	68	2	1
293	72	63	0	2
294	72	58	0	1
295	72	64	0	1
296	72	67	3	1
297	73	62	0	1
298	73	68	0	1
299	74	65	3	2
300	74	63	0	1
301	75	62	1	1
302	76	67	0	1
303	77	65	3	1
304	78	65	1	2
305	83	58	2	2

306 rows × 4 columns

Observation:

From the above Haberman dataset we can easily identify the column names.

In [37]:
```
haber['status'] = haber['status'].apply(lambda x:'Positive' if x == 1 else 'Negative')

#Uses above syntax from applied ai comment section.
```

Indication of Haberman Dataset: (In Column "Status")

1 = the patient survived 5 years or longer.

2 = the patient died within 5 year.

Observation:

1) We used this function to make one of our column as identifier of person.

2) Since in the Data set all the columns are of integer type so here we convert 'Status' column as our diciding column of our dataset.

In [38]:
```
#haber['year'] += 1900

#We can use this function if we want to show the year in a correct way.
```

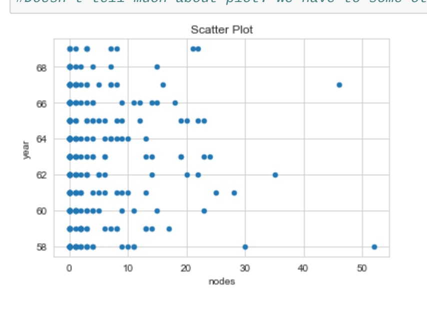
In [39]:
```
#(Q) Calculate the number of Positive and Negative cases?

haber['status'].value_counts()
```

Out[39]:
```
Positive    225
Negative     81
Name: status, dtype: int64
```

Observation:

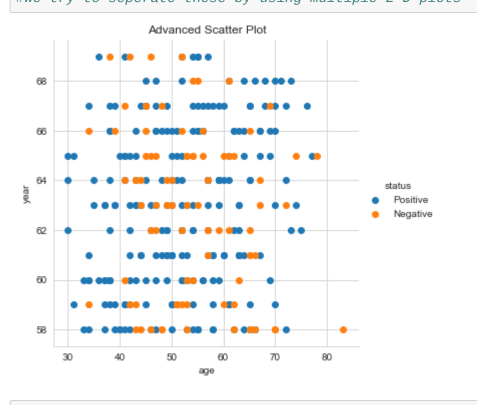
1) As our deciding column doesn't have symmetry (i.e., Positive and Negative outputs), So we have to predict our result on many assumptions.

In [42]:
```
# 2-D Scatter Plot

haber.plot(x='nodes', y='year', kind='scatter')
plt.title('Scatter Plot')
plt.show()

#Doesn't tell much about plot. We have to some other methods to give a proper view on it.
```



In [43]:
```
#haber.describe()
```

In [44]:
```
# 2-D Scatter plot with color-coding for Status of a Person

sns.set_style('whitegrid')
sns.FacetGrid(haber, hue='status', height=5)\
   .map(plt.scatter,'age','year')\
   .add_legend()
plt.title('Advanced Scatter Plot')
plt.show()

#Here we can't seperate Blue and Yellow dots.
#We try to seperate these by using multiple 2-D plots
```

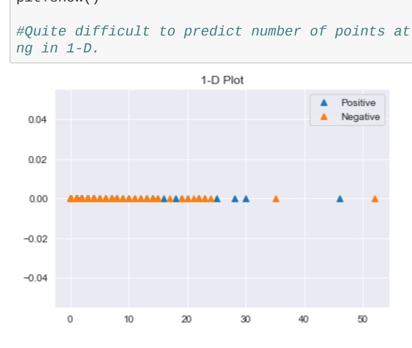


In [45]:
```
# Pair-Plot: pairwise scatter plot.

plt.close();
sns.set_style('darkgrid');
sns.pairplot(haber,hue='status',height=4,diag_kind = 'hist',palette = 'husl', markers = ['o'
,'s']);
plt.show();
```

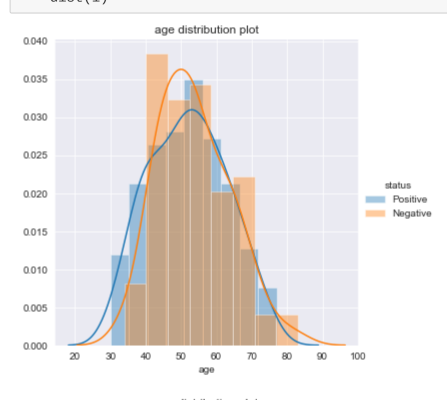
Observation:

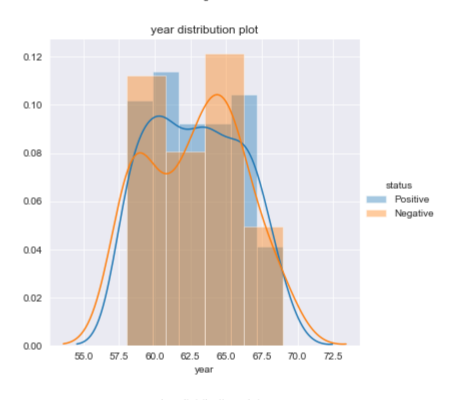
1) By doing Pair-Plot, we can somehow tell this, that in nodes vs year graph, we can see quite good difference between points of 2 status (Positive and Negative) in comparison to other plots.

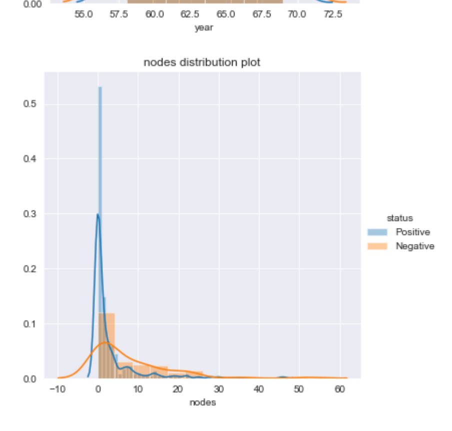
In [46]:
```
#1-D plot:

haber_positive = haber.loc[haber['status'] == 'Positive']
haber_negative = haber.loc[haber['status'] == 'Negative']

plt.plot(haber_positive["nodes"], np.zeros_like(haber_positive['nodes']), '^',label = 'Posit
ive')
plt.plot(haber_negative["nodes"], np.zeros_like(haber_negative['nodes']), '^',label = 'Negat
ive')

plt.title('1-D Plot')
plt.legend()
plt.show()

#Quite difficult to predict number of points at a position because many points are overlappi
ng in 1-D.
```



In [47]:
```
#distplot : distribution plot
def dist(feature):
    sns.FacetGrid(haber, hue = 'status', height = 5).map(sns.distplot, feature).add_legend()
    plt.title(feature + ' distribution plot')
    plt.show()

lst = ['age','year','nodes']
for i in lst:
    dist(i)
```



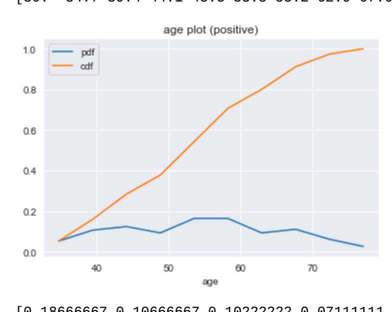




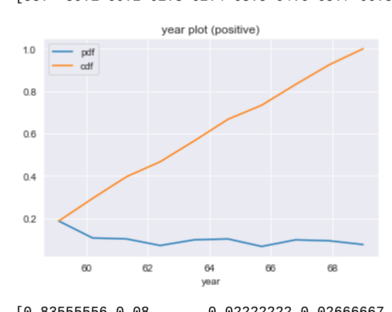
PDF and CDF:

In [48]:
```
#PDF and CDF of Haberman Dataset by using 'age', 'year', 'nodes'.
def p_d_pos(feature):
    counts, bin_edges = np.histogram(haber_positive[feature], bins = 10)

    pdf = counts/sum(counts)
    print(pdf)
    print(bin_edges)

    cdf = np.cumsum(pdf)
    plt.plot(bin_edges[1:],pdf, label='pdf')
    plt.plot(bin_edges[1:],cdf, label='cdf')
    plt.title(feature + ' plot (positive)')
    plt.xlabel(feature)
    plt.legend()

    plt.show()

lst = ['age','year','nodes']
for i in lst:
    p_d_pos(i)
```

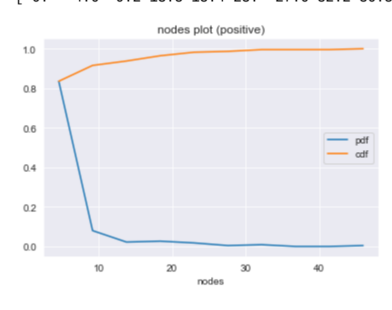
```
[0.05333333 0.10666667 0.12444444 0.09333333 0.16444444 0.16444444
 0.09333333 0.11111111 0.06222222 0.02666667]
[30.  34.7 39.4 44.1 48.8 53.5 58.2 62.9 67.6 72.3 77. ]
```




```
[0.18666667 0.10666667 0.10222222 0.07111111 0.09777778 0.10222222
 0.06666667 0.09777778 0.09333333 0.07555556]
[58.  59.1 60.2 61.3 62.4 63.5 64.6 65.7 66.8 67.9 69. ]
```

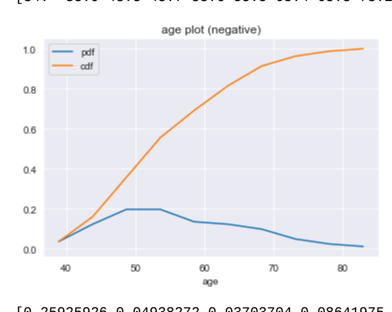



```
[0.83555556 0.08       0.02222222 0.02666667 0.01777778 0.00444444
 0.00888889 0.         0.         0.00444444]
[ 0.   4.6  9.2 13.8 18.4 23.  27.6 32.2 36.8 41.4 46. ]
```

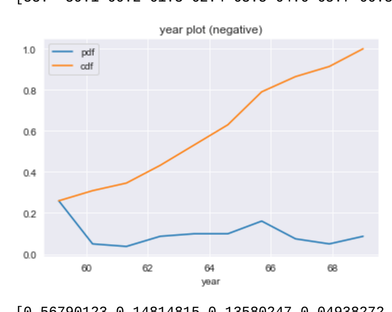


In [49]:
```
#counts, bin_edges = np.histogram(haber_positive['age'], bins = 20)
def p_c_neg(feature):
    counts, bin_edges = np.histogram(haber_negative[feature], bins = 10)

    pdf = counts/sum(counts)
    print(pdf)
    print(bin_edges)

    cdf = np.cumsum(pdf)
    plt.plot(bin_edges[1:],pdf, label='pdf')
    plt.plot(bin_edges[1:],cdf, label='cdf')
    plt.xlabel(feature)
    plt.title(feature + ' plot (negative)')
    plt.legend()
    plt.show()

lst = ['age','year','nodes']
for i in lst:
    p_c_neg(i)
```

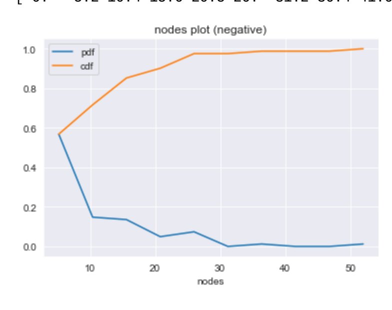
```
[0.03703704 0.12345679 0.19753086 0.19753086 0.13580247 0.12345679
 0.09876543 0.04938272 0.02469136 0.01234568]
[34.  38.9 43.8 48.7 53.6 58.5 63.4 68.3 73.2 78.1 83. ]
```




```
[0.25925926 0.04938272 0.03703704 0.08641975 0.09876543 0.09876543
 0.16049383 0.07407407 0.04938272 0.08641975]
[58.  59.1 60.2 61.3 62.4 63.5 64.6 65.7 66.8 67.9 69. ]
```




```
[0.56790123 0.14814815 0.13580247 0.04938272 0.07407407 0.
 0.01234568 0.         0.         0.01234568]
[ 0.   5.2 10.4 15.6 20.8 26.  31.2 36.4 41.6 46.8 52. ]
```



Mean, Variance and Standard Deviation

In [50]:
```
#Mean and Std. Deviation of age on the basis of Positive and Negative Cases.

print("Means:")
print(np.mean(haber_positive["age"]))
print(np.mean(haber_negative["age"]))


print("\nStd-dev:");
print(np.std(haber_positive["age"]))
print(np.std(haber_negative["age"]))
```

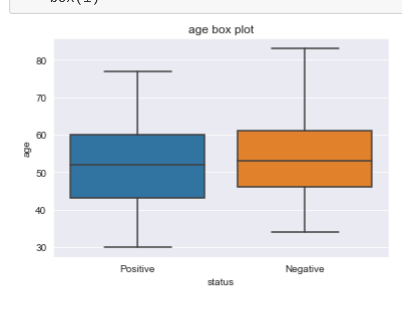
```
Means:
52.01777777777778
53.67901234567901

Std-dev:
10.98765547510051
10.10418219303131
```

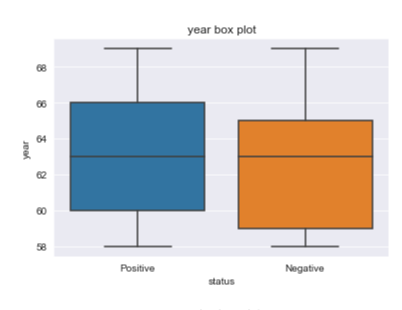
In [51]:
```
print("\nMedians:")
print(np.median(haber_positive["age"]))
print(np.median(haber_negative["age"]))


print("\nQuantiles:")
print(np.percentile(haber_positive["age"],np.arange(0, 101, 25)))
print(np.percentile(haber_negative["age"],np.arange(0, 101, 25)))
```

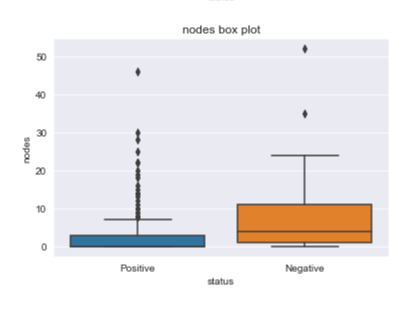
```
Medians:
52.0
53.0

Quantiles:
[30. 43. 52. 60. 77.]
[34. 46. 53. 61. 83.]
```

Box-Plot with Whiskers

In [52]:
```
def box(feature):
    sns.boxplot(x='status',y=feature, data=haber)
    plt.title(feature + ' box plot')
    plt.show()

lst = ['age','year','nodes']
for i in lst:
    box(i)
```

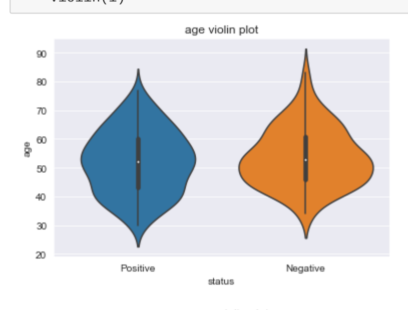


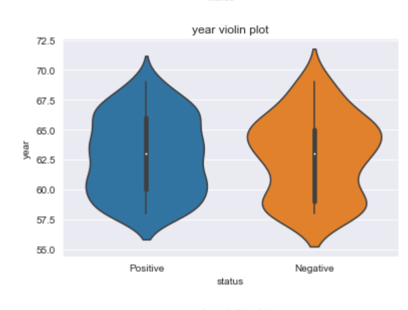


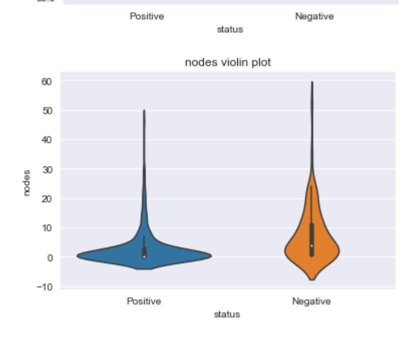


Violin Plot:

In [53]:
```
def violin(feature):
    sns.violinplot(x="status", y=feature, data=haber, size=8)
    plt.title(feature + ' violin plot')
    plt.show()


lst = ['age','year','nodes']
for i in lst:
    violin(i)
```







Observations:

1) Around 85% of the people who diagnosed have less than or equal to 4 positive nodes.

2) The patients who diagnosed before 1960 have less chance to servive more than 5 years.[from Box and Violin Plot]

3) The patients who diagnosed after 1969 have higher chance to servive more than 5 years compare to others.[from Box and Violin Plot]

In [ ]:
```

```