MOOC Analysis-Writeup

February 7, 2018

1 Assessment and User Analysis

As online learning is getting more and more popular, MOOCs (Massive Online Open Courses) are growing and they're generating alot of data as a result. The produced data may be about their users, their learning checks, or both.

When organizations analyze their assessment data, they may identify trends and patterns such as most missed questions and identifying key modes of central tendencies for a given assessment. They may then use that information to tweak their assessments to help their users succeed in the future.

When organizations analyzee their user data, they may make use of certain characteristics such where they are from to them with an adequate learning environment to help them assist with their learning.

1.1 Summary of Results

Upon completion of this analysis, we are able to determine the following results:

11,988 users took assesments

4870 users took the High Availability, Fault Tolerance and Scalability assessment. Of the 4870, 113 users completed the assessment.

1160 users took the Implementing Backup Strategies assessment. Of the 1160, 35 users completed the assessment.

1022 took the VPC and VPC Networking assessment. Of the 1022, 75 users completed the assessment.

1565 users took the Design and Implement S3 Solutions assessment. Of the 1565, 68 users completed the assessment.

1862 users took the Implement Elastic Beanstalk Solution assessment, of the 1862 users, 52 users completed the assessment.

1509 Troubleshoot Multi-Tier Application assessment. Of the 1509, 40 completed the assessment.

245 people have made a zero across all assessments

Roughly 81% of people would recommend this to friends

Nearly half of the users are from the United States

Roughly 84% are satisfied with the assessment they took

On average, the longest time a user took on an 24.5 minutes and that was the Troubleshoot Multi-tier Applications assessment

On average, the shortest time a user took on an 17 minutes and that was the Implementing Backup Strategies assessment

The following details the steps we took to determine the above. Please read through this following document and it provides the methods we used to determine the above key results.

In [1]:
```
# import data analysis libraries

import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from datetime import datetime
%matplotlib inline


# display all column headers
pd.set_option("display.max_columns", None)
pd.set_option("display.max_rows", None)

# Set Pandas Dataframes via relative path
events = pd.read_csv("AssessmentRealTimeEvents.csv")
score = pd.read_csv("AssessmentScore.csv")
dump = pd.read_csv("UsersDump.csv")
survey = pd.read_csv("UserSurveyResults.csv")
```

In [2]:
```
# peak at events
events.head()
```

Out[2]:

	TestID	assessmentname	eventcode	timestamp
0	3602	High Availability, Fault Tolerance, and Scalab...	STRASMNT	2017-07-20 12:30:31.000
1	3602	High Availability, Fault Tolerance, and Scalab...	VIEWASMTDIAG	2017-07-20 12:30:32.000
2	3652	High Availability, Fault Tolerance, and Scalab...	STRASMNT	2017-07-20 19:01:25.000
3	3652	High Availability, Fault Tolerance, and Scalab...	VIEWASMTDIAG	2017-07-20 19:01:25.000
4	3707	Implement Elastic Beanstalk Solutions	STRASMNT	2017-07-21 00:02:41.000

In [3]:
```
# peak at score
score.head()
```

Out[3]:

	TestId	UserId	assessment_name
0	3451	1824	High Availability, Fault Tolerance, and Scalab...
1	3453	1825	High Availability, Fault Tolerance, and Scalab...
2	3450	1823	High Availability, Fault Tolerance, and Scalab...
3	3454	1826	High Availability, Fault Tolerance, and Scalab...
4	3457	1826	VPC and VPC Networking

```
        score
0    6.580000
1    0.000000
2   73.699997
3   95.209999
4  100.000000
```

In [4]:
```
# peak at survey
survey.head()
```

Out[4]:
```
   TestID                                           question  \
0    3527  Please rate this assessment from one to five, ...
1    3527  What did you love about Cloud Assessments and ...
2    3527               Why did you rate it the way you did?
3    3527  Did you understand what was expected of you (w...
4    3527  Was the skill level appropriate for what we de...

                          answer
0                              5
1  i would love to see my skills
2                              8
3                            yes
4                              9
```

In [5]:
```
# peak at dump
dump.head()
```

Out[5]:
```
   UserId            country                              certifications
0       1  No Value Provided                                          []
1    1011     Texas Republic  ["aws_developer", "aws_devops_engineer"]
2    1009      United States                          ["aws_developer"]
3    1016      United States                          ["aws_developer"]
4    1024  No Value Provided                                          []
```

In [6]:
```
score = score.dropna() # drops null values in the score df and reassigns it to score
```

1.2 To start off, we'll perform the following:

Filter the existing 'score' df to see how many users scored within a certain range across all assessments.

Calculate the percentage of people of made a score within a given range out of all the scores.

In [7]:
```
score_0 = score[score["score"] == 0]

score_0.shape[0]
```

Out[7]:
```
245
```

In [8]:
```
score_0.shape[0] / score.shape[0]
```

```
Out[8]: 0.4246100519930676

In [9]: score_l50 = score[(score["score"] < 50) & (score["score"] > 0)]

        score_l50.shape[0]

Out[9]: 90

In [10]: score_l50.shape[0] / score.shape[0]

Out[10]: 0.1559792027729636

In [11]: score_fs = score[(score["score"] < 70) & (score["score"] >= 50)]

         score_fs.shape[0]

Out[11]: 52

In [12]: score_fs.shape[0] / score.shape[0]

Out[12]: 0.09012131715771231

In [13]: score_c = score[(score["score"] < 80) & (score["score"] >= 70)]

         score_c.shape[0]

Out[13]: 32

In [14]: score_c.shape[0] / score.shape[0]

Out[14]: 0.05545927209705372

In [15]: score_b = score[(score["score"] < 90) & (score["score"] >= 80)]

         score_b.shape[0]

Out[15]: 32

In [16]: score_b.shape[0] / score.shape[0]

Out[16]: 0.05545927209705372

In [17]: score_a = score[(score["score"] < 100) & (score["score"] >= 90)]

         score_a.shape[0]

Out[17]: 50

In [18]: score_a.shape[0] / score.shape[0]

Out[18]: 0.08665511265164645
```

```
In [19]: score_100 = score[score["score"] == 100]

         score_100.shape[0]

Out[19]: 76

In [20]: score_100.shape[0] / score.shape[0]

Out[20]: 0.1317157712305026
```

From the above, we see the following:
245 (~42.5%) people made a score of zero
90 (~15.6%) people made a score between 0 and 50
52 (~9%) people made a score between 50 and 70
32 (~5.5%) people made a score between 70 and 80
32 (~5.5%) people made a score between 80 and 90
50 (~8.7%) people made a score between 90 and 100
76 (~13.2%) people made a score of 100

It's certainly alarming that almost half of the people made a score of zero across all assessments.

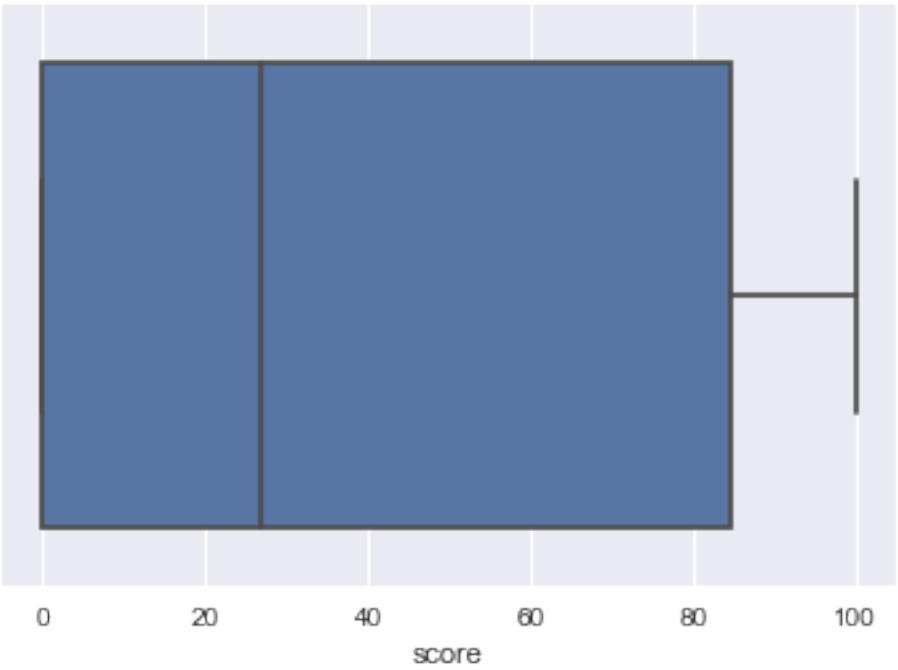
Assuming the pass/no pass cutoff point is 80%, it is also alarming that the number of people who made a zero is greater than the number who pass the assessment.

2 We'll perform the following steps for some explatory statistics

Create a Box and Whisker Plot that describes the assessment scores located in the `score` dataframe

Calculate some additional explatory statistics beyond what the Box and Whisker Plot shows

```
In [21]: sns.boxplot(score["score"]);
```



```
In [22]: var = score["score"].var()
         std = score["score"].std()
         mean = score["score"].mean()
         med = score["score"].median()
         max = score["score"].max()
         min = score["score"].min()
         Q3 = np.percentile(score["score"], 75)
         Q1 = np.percentile(score["score"], 25)
         IQR = Q3 - Q1
         Q1O = Q1 - 1.5 * IQR
         Q1EO = Q1 - 3 * IQR
         Q3O = Q3 + 1.5 * IQR
         Q3EO = Q3 + 3 * IQR

         print("The mean score is {}".format(mean))
         print("The median score is {}".format(med))
         print("The maximum score is {}".format(max))
         print("The minimum score is {}".format(min))
         print("The variance between the scores is {}".format(var))
         print("The standard deviation of the squres is {}".format(std))
         print("The Third Quartile is {}".format(Q3))
         print("The First Quartile is {}".format(Q1))
         print("The Interquartile Range is {}".format(IQR))
         print("The outliers are below {}".format(Q1O))
         print("The extreme outliers are below {}".format(Q1EO))
         print("The outliers are above {}".format(Q3O))
         print("The extreme outliers are above {}".format(Q3EO))

The mean score is 40.00133433686482
The median score is 26.67000008
The maximum score is 100.0
The minimum score is 0.0
The variance between the scores is 1688.141559245361
The standard deviation of the squres is 41.086999881292876
The Third Quartile is 84.63999939
The First Quartile is 0.0
The Interquartile Range is 84.63999939
The outliers are below -126.95999908499999
The extreme outliers are below -253.91999816999999
The outliers are above 211.599998475
The extreme outliers are above 338.55999756
```

Considering we are observing assessment scores, negative values and values above 100 doesn't make any sense. That said, for all intents and purposes, there are no outliers of any kind.

Remembering the fact that almost half of observations have a score of 0, it is not surprising the first quartile is 0.

2.1 Next we'll work on the `survey` dataframe by:

Inspect the `question` column to return an array with all of the unique questions in the column.

Filter the dataframe to return rows that contain the string regarding the likelihood the user will recommend the assessment to friends.

```
In [23]: pd.unique(survey["question"])
```

```
Out[23]: array(['Please rate this assessment from one to five, five being the highest',
                'What did you love about Cloud Assessments and this assessment in particular?',
                'Why did you rate it the way you did?',
                'Did you understand what was expected of you (was the scenario clear)?',
                'Was the skill level appropriate for what we described?',
                'On a scale of one to ten, how likely are you to recommend this to your friends?
                'Do you have any specific suggestions for improvements?',
                'What additional features would you like to see?',
                'What other types of assessments would you like to see?',
                'Would you be interested in a verified micro certification?'], dtype=object)
```

```
In [24]: recommend = survey[survey.question.str.contains('On a scale of one to ten, how likely a
```

```
In [25]: recommend.head()
```

```
Out[25]:     TestID                                           question answer
         5     3527  On a scale of one to ten, how likely are you t...     10
         15    3527  On a scale of one to ten, how likely are you t...     10
         25    3527  On a scale of one to ten, how likely are you t...     10
         35    3522  On a scale of one to ten, how likely are you t...     10
         45    3521  On a scale of one to ten, how likely are you t...     10
```

```
In [26]: recommend.dtypes # Returns the dtypes of a Dataframee
```

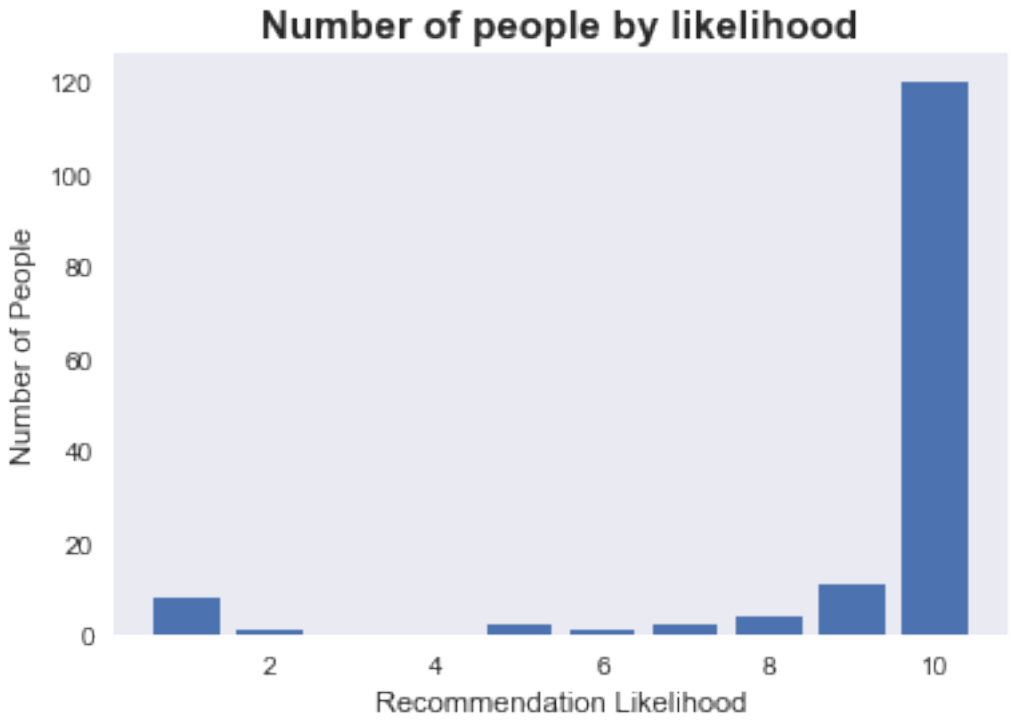
```
Out[26]: TestID       int64
         question    object
         answer      object
         dtype: object
```

```
In [27]: recommend["answer"] = pd.to_numeric(recommend["answer"]) # Converts the Series to `as_n
```

```
In [28]: recommend.dtypes # Making sure I'm not crazy
```

```
Out[28]: TestID       int64
         question    object
         answer       int64
         dtype: object
```

```
In [29]: perec = recommend[recommend["answer"] == 10].shape[0]
         perecp = round(perec / recommend.shape[0] * 100, 2)

         rec9 = recommend[recommend["answer"] == 9].shape[0]
         rec9p = round(rec9 / recommend.shape[0] * 100, 2)

         rec8 = recommend[recommend["answer"] == 8].shape[0]
         rec8p = round(rec8 / recommend.shape[0] * 100, 2)

         rec7 = recommend[recommend["answer"] == 7].shape[0]
         rec7p = round(rec7 / recommend.shape[0] * 100, 2)

         rec6 = recommend[recommend["answer"] == 6].shape[0]
         rec6p = round(rec6 / recommend.shape[0] * 100, 2)

         rec5 = recommend[recommend["answer"] == 5].shape[0]
         rec5p = round(rec5 / recommend.shape[0] * 100, 2)

         rec4 = recommend[recommend["answer"] == 4].shape[0]
         rec4p = round(rec4 / recommend.shape[0] * 100, 2)

         rec3 = recommend[recommend["answer"] == 3].shape[0]
         rec3p = round(rec3 / recommend.shape[0] * 100, 2)

         rec2 = recommend[recommend["answer"] == 2].shape[0]
         rec2p = round(rec2 / recommend.shape[0] * 100, 2)

         rec1 = recommend[recommend["answer"] == 1].shape[0]
         rec1p = round(rec1 / recommend.shape[0] * 100, 2)

In [30]: scale = [x for x in range(1,11)]
         recscale = [rec1, rec2, rec3, rec4, rec5, rec6, rec7, rec8, rec9, perec]

In [31]: plt.bar(scale, recscale)
         plt.title("Number of people by likelihood", weight = 'bold', fontsize = 15)
         plt.xlabel("Recommendation Likelihood")
         plt.ylabel("Number of People")
         plt.grid(False)
```




```
In [32]: print("The number people who are extremely likely to recommend this to a friend is {} (
         print("The number people who are most likely to recommend this to a friend is {} ({}%)"
         print("The number people who are really likely to recommend this to a friend is {} ({}%
         print("The number people who are kind of likely to recommend this to a friend is {} ({}
         print("The number people who maybe recommend this to a friend is {} ({}%)".format(rec6,
         print("The number people who are indifferent to recommend this to a friend is {} ({}%)"
         print("The number people who are hesitant to recommend this to a friend is {} ({}%)".fo
         print("The number people who are most likely not to recommend this to a friend is {} ({
         print("The number people who are extremely not likely recommend this to a friend is {}
         print("The number people who are would not recommend this to a friend is {} ({}%)".form
```

```
The number people who are extremely likely to recommend this to a friend is 120 (80.54%)
The number people who are most likely to recommend this to a friend is 11 (7.38%)
The number people who are really likely to recommend this to a friend is 4 (2.68%)
The number people who are kind of likely to recommend this to a friend is 2 (1.34%)
```

```
The number people who maybe recommend this to a friend is 1 (0.67%)
The number people who are indifferent to recommend this to a friend is 2 (1.34%)
The number people who are hesitant to recommend this to a friend is 0 (0.0%)
The number people who are most likely not to recommend this to a friend is 0 (0.0%)
The number people who are extremely not likely recommend this to a friend is 1 (0.67%)
The number people who are would not recommend this to a friend is 8 (5.37%)
```

2.1.1 Next, we'll inspect the `dump` dataframe and the unique values in the country column

```
In [34]: pd.unique(dump["country"])
```

```
Out[34]: array(['No Value Provided', 'Texas Republic', 'United States', 'USA', 'US',
                'united states', 'Ireland', 'Ukraine', 'United Kingdom', 'Canada',
                'India', 'Estados Unidos', 'Venezuela', 'venezuela', 'Mexico',
                'France', 'England', 'Spain', 'United States of America', 'Brazil',
                'Colombia', 'Romania', 'Argentina', 'Australia', 'UK',
                'Philippines', 'New Zealand', 'Vietnam', 'australia', 'Italia',
                'NIGERIA', 'Russia', 'Poland', 'Israel', 'Netherlands', 'Paraguay',
                'Croatia', 'Indonesia', 'Taiwan', 'usa', 'uk', 'Scotland',
                'South Africa', 'Kenya', 'Germany', 'Japan', 'USA ', 'Usa', 'japan',
                'UAE', 'INDIA', 'the Netherlands', 'Netherlands ', 'Switzerland',
                'Austria ', 'Russian Federation', 'Bulgaria', 'Nederland',
                ' Ireland', 'Denmark', 'Saudi Arabia', 'Cyprus', 'Ind', 'Sweden',
                'Canda', 'Arlington', 'Harris', 'Unisted States', 'Sri Lanka',
                'London', 'Belgium', 'Singapore', 'Bahrain', 'Bosnia', 'Austrsalia',
                'Malaysia', 'Slovakia', 'Suomi', 'China', 'Unkted Kingdom',
                'Guatemala', 'Deutschland', 'italy', 'united kingdom', 'k', 'india',
                'Peru', 'Uk', 'Ecuador', 'Lithuania', 'Saudi Arabi', 'Morocco',
                'Cambodia', 'Serbia', 'Moldova', 'United Arab Emirates', 'Nepal',
                'Chile', 'Hong Kong SAR, China', 'Lebanon', 'united state',
                'MYANMAR', 'Italy', 'U.S.A.', 'Pakistan', 'Bangladesh', 'asdfasdf',
                'Jordan', 'Nigeria', 'Belarus', 'Brasil', 'Egypt', 'Kiev',
                'Albania', 'france', 'Bosnia and Herzegovina', 'Austria', 'Norway',
                'Espaa', 'asdf', 'Turkey', 'Greece', 'PK', 'PAKISTAN', 'germany',
                'Costa Rica', 'Finland', 'sambalpur', 'Timor Leste', 'Pune',
                'mexico', 'Ie', 'aaa', 'Senegal', 'United Kindom', 'us', 'Viet Nam',
                'Belgique', 'Solomon Islands', 'Midlothian', 'CANADA', 'IND',
                'india ', 'Macao', 'United states', 'Oman', 'egypt', 'MEXICO ', 'u',
                'Portugal', 'Trinidad and Tobago'], dtype=object)
```

2.1.2 Using the unique values, we'll create a mapping dictionary to clean the `country` column

```
In [35]: coumap = {
             "Texas Republic" : "Texas",
             "USA" : "United States",
             "US" : "United States",
             "united states" : "United States",
```

```
"No Value Provided" : np.nan,
"Texas Republic" : "United States",
"United States" : "United States",
"Ireland" : "Ireland",
"Ukraine" : "Ukraine",
"United Kingdom" : "United Kingdom",
"Canada" : "Canada",
"India" : "India",
"Estados Unidos" : "United States",
"Venezuela" : "Venezuela",
"venezuela": "Venezuela",
"Mexico" : "Mexico",
"France" : "France",
"England" : "England",
'Spain' : "Spain",
'United States of America' : "United States",
'Brazil' : "Brzail",
'Colombia' : "Columbia",
'Romania' : "Romania",
'Argentina' : "Argentina",
'Australia' : "Austrailia",
'UK' : "United Kingdom",
'Philippines' : "Philippines",
'New Zealand' : "New Zealand",
'Vietnam' : "Vietnam",
'australia' : "Austrailia",
'Italia' : "Italy",
'NIGERIA' : "Nigeria",
'Russia' : "Russia",
'Poland' : "Poland",
'Israel' : "Israel",
'Netherlands' : "Netherlands",
'Paraguay' : "Paraguay",
'Croatia' : "Croatia",
'Indonesia' : "Indonesia",
'Taiwan' : "Taiwan",
'usa' : "United States",
'uk' : "United Kingdom",
'Scotland' : "Scotland",
'South Africa' : "South Africa",
'Kenya' : "Kenya",
'Germany' : "Germany",
'Japan' : "Japan",
'USA ': "United States",
'Usa' : "United States",
'japan' : "Japan",
'UAE' : "United Arab Emirates",
'INDIA' : "India",
```

```
'the Netherlands' : "Netherlands",
'Netherlands ' : "Netherlands",
'Switzerland' : "Switzerland",
'Austria ' : "Austria",
'Russian Federation' : "Russia",
'Bulgaria' : "Bulgaria",
'Nederland' : "Netherlands",
' Ireland' : "Ireland",
'Denmark' : "Denmark",
'Saudi Arabia' : "Saudi Arabia",
'Cyprus' : "Cyprus",
'Ind' : "India",
'Sweden' : "Sweeden",
'Canda' : "Canada",
'Arlington' : "United States",
'Harris' : "United States",
'Unisted States' : "United States",
'Sri Lanka' : "Sri Lanka",
'London' : "London",
'Belgium' : "Belgium",
'Singapore' : "Singapore",
'Bahrain' : "Bahrain",
'Bosnia': "Bosnia and Herzegovina",
'Austrsalia' : "Austrailia",
'Malaysia' : "Malaysis",
'Slovakia' : "Slovakia",
'Suomi' : "Finland",
'China' : "China",
'Unkted Kingdom' : "United Kingdom",
'Guatemala' : "Guatemala",
'Deutschland' : "Germany",
'italy' : "Italy",
'united kingdom' : "United Kingdom",
'k' : np.nan,
'india' : "India",
'Peru' : "Peru",
'Uk' : "United Kingdom",
'Ecuador' : "Ecuador",
'Lithuania' : "Lithuania",
'Saudi Arabi' : "Saudi Arabia",
'Morocco' : "Morocco",
'Cambodia' : "Cambodia",
'Serbia' : "Serbia",
'Moldova' : "Moldova",
'United Arab Emirates' : "United Arab Emirates",
'Nepal' : "Nepal",
'Chile' : "Chile",
'Hong Kong SAR, China' : "China",
```

```
'Lebanon' : "Lebanon",
'united state' : "United States",
'MYANMAR' : "Myanmar",
'Italy' : "Italy",
'U.S.A.' : "United States",
'Pakistan' : "Pakistan",
'Bangladesh' : "Bangladesh",
'asdfasdf' : np.nan,
'Jordan' : "Jordan",
'Nigeria' :  "Nigeria",
'Belarus' : "Belarus",
'Brasil' : "Brazil",
'Egypt' : "Egypt",
'Kiev' : "Ukraine",
'Albania' : "Albania",
'france' : "France",
'Bosnia and Herzegovina' : "Bosnia and Herzegovina",
'Austria' : "Austria",
'Norway' : "Norway",
'Espaa' : "Spain",
'asdf' : np.nan,
'Turkey' : "Turkey",
'Greece' : "Greece",
'PK' : "Pakistan",
'PAKISTAN' : "Pakistan",
'germany' : "Germany",
'Costa Rica' : "Costa Rica",
'Finland' : "Finland",
'sambalpur' : "India",
'Timor Leste' : "Timor Leste",
'Pune' : "India",
'mexico' : "Mexico",
'Ie' : "Ireland",
'aaa' : np.nan,
'Senegal' : "Senegal",
'United Kindom' : "United Kingdom",
'us' : "United States",
'Viet Nam' : "Vietnam",
'Belgique' : "Belgium",
'Solomon Islands' : "Solomon Islands",
'Midlothian' : "United States",
'CANADA' : "Canada",
'IND' : "India",
'india ' : "India",
'Macao' : "Morocco",
'United states' : "United States",
'Oman' : "Oman",
'egypt' : "Egypt",
```

```
            'MEXICO ' : "Mexico",
            'u' : np.nan,
            'Portugal' : "Portugal",
            'Trinidad and Tobago' : "Trinidad and Tobogo"
        }
```

```
In [36]: dump["country"] = dump["country"].map(coumap) # Applying thee mapping dictionary to the
```

```
In [37]: pd.unique(dump["country"]) #Again, making sure I'm not crazy
```

```
Out[37]: array([nan, 'United States', 'Ireland', 'Ukraine', 'United Kingdom',
                'Canada', 'India', 'Venezuela', 'Mexico', 'France', 'England',
                'Spain', 'Brzail', 'Columbia', 'Romania', 'Argentina', 'Austrailia',
                'Philippines', 'New Zealand', 'Vietnam', 'Italy', 'Nigeria',
                'Russia', 'Poland', 'Israel', 'Netherlands', 'Paraguay', 'Croatia',
                'Indonesia', 'Taiwan', 'Scotland', 'South Africa', 'Kenya',
                'Germany', 'Japan', 'United Arab Emirates', 'Switzerland',
                'Austria', 'Bulgaria', 'Denmark', 'Saudi Arabia', 'Cyprus',
                'Sweeden', 'Sri Lanka', 'London', 'Belgium', 'Singapore', 'Bahrain',
                'Bosnia and Herzegovina', 'Malaysis', 'Slovakia', 'Finland',
                'China', 'Guatemala', 'Peru', 'Ecuador', 'Lithuania', 'Morocco',
                'Cambodia', 'Serbia', 'Moldova', 'Nepal', 'Chile', 'Lebanon',
                'Myanmar', 'Pakistan', 'Bangladesh', 'Jordan', 'Belarus', 'Brazil',
                'Egypt', 'Albania', 'Norway', 'Turkey', 'Greece', 'Costa Rica',
                'Timor Leste', 'Senegal', 'Solomon Islands', 'Oman', 'Portugal',
                'Trinidad and Tobogo'], dtype=object)
```

```
In [38]: dump = dump.dropna() # Drop all null values
```

```
In [39]: dump["country"].value_counts() # Returns the number of times a single country appears i
```

```
Out[39]: United States            435
         India                    233
         United Kingdom            73
         Austrailia                32
         Canada                    23
         Germany                   19
         Spain                     17
         Ireland                   12
         Mexico                    12
         Ukraine                   11
         Netherlands               11
         Brzail                    10
         Poland                     8
         Russia                     7
         France                     7
         Philippines                6
         United Arab Emirates       6
         Brazil                     6
```

Romania	6
Israel	5
Venezuela	5
China	5
Pakistan	5
Malaysis	5
Vietnam	5
Indonesia	4
Turkey	4
South Africa	4
Singapore	4
Italy	4
Bangladesh	4
Japan	4
Croatia	4
New Zealand	4
Saudi Arabia	3
Austria	3
Serbia	3
Denmark	3
Belgium	3
England	3
Argentina	3
Switzerland	3
Nigeria	2
Bahrain	2
Slovakia	2
Greece	2
Morocco	2
Scotland	2
Moldova	2
Lebanon	2
Cyprus	2
Finland	2
Bosnia and Herzegovina	2
Columbia	2
Kenya	2
Sweeden	2
Peru	2
Egypt	2
Timor Leste	1
Oman	1
Guatemala	1
Nepal	1
Cambodia	1
Portugal	1
Ecuador	1
Paraguay	1

```
London                      1
Chile                       1
Senegal                     1
Sri Lanka                   1
Costa Rica                  1
Trinidad and Tobogo         1
Norway                      1
Taiwan                      1
Bulgaria                    1
Myanmar                     1
Albania                     1
Solomon Islands             1
Lithuania                   1
Belarus                     1
Jordan                      1
Name: country, dtype: int64
```

```
In [40]: dump["country"].value_counts().sum() # Calculates sum of users in every country listed
```

```
Out[40]: 1079
```

```
In [41]: dump["country"].value_counts() / dump["country"].value_counts().sum()
         # Returns the percentage of users in a single country
```

```
Out[41]: United States             0.403151
         India                     0.215941
         United Kingdom            0.067655
         Austrailia                0.029657
         Canada                    0.021316
         Germany                   0.017609
         Spain                     0.015755
         Ireland                   0.011121
         Mexico                    0.011121
         Ukraine                   0.010195
         Netherlands               0.010195
         Brzail                    0.009268
         Poland                    0.007414
         Russia                    0.006487
         France                    0.006487
         Philippines               0.005561
         United Arab Emirates      0.005561
         Brazil                    0.005561
         Romania                   0.005561
         Israel                    0.004634
         Venezuela                 0.004634
         China                     0.004634
         Pakistan                  0.004634
         Malaysis                  0.004634
         Vietnam                   0.004634
```

Indonesia	0.003707
Turkey	0.003707
South Africa	0.003707
Singapore	0.003707
Italy	0.003707
Bangladesh	0.003707
Japan	0.003707
Croatia	0.003707
New Zealand	0.003707
Saudi Arabia	0.002780
Austria	0.002780
Serbia	0.002780
Denmark	0.002780
Belgium	0.002780
England	0.002780
Argentina	0.002780
Switzerland	0.002780
Nigeria	0.001854
Bahrain	0.001854
Slovakia	0.001854
Greece	0.001854
Morocco	0.001854
Scotland	0.001854
Moldova	0.001854
Lebanon	0.001854
Cyprus	0.001854
Finland	0.001854
Bosnia and Herzegovina	0.001854
Columbia	0.001854
Kenya	0.001854
Sweeden	0.001854
Peru	0.001854
Egypt	0.001854
Timor Leste	0.000927
Oman	0.000927
Guatemala	0.000927
Nepal	0.000927
Cambodia	0.000927
Portugal	0.000927
Ecuador	0.000927
Paraguay	0.000927
London	0.000927
Chile	0.000927
Senegal	0.000927
Sri Lanka	0.000927
Costa Rica	0.000927
Trinidad and Tobogo	0.000927
Norway	0.000927

```
Taiwan                   0.000927
Bulgaria                 0.000927
Myanmar                  0.000927
Albania                  0.000927
Solomon Islands          0.000927
Lithuania                0.000927
Belarus                  0.000927
Jordan                   0.000927
Name: country, dtype: float64
```

2.2 We'll return to working on the `survey` dataframe by:

Inspect the `question` column to return an array with all of the unique questions in the column.

Filter the dataframe to return rows that contain the string asking the user to rate the assessment.

```
In [42]: rate = survey[survey.question.str.contains('Please rate this assessment from one to fiv

In [43]: rate.head()

Out[43]:     TestID                                           question answer
         0     3527  Please rate this assessment from one to five, ...      5
         10    3527  Please rate this assessment from one to five, ...      5
         20    3527  Please rate this assessment from one to five, ...      5
         30    3522  Please rate this assessment from one to five, ...      5
         40    3521  Please rate this assessment from one to five, ...      5

In [44]: rate.dtypes # Check the dtypes of the rate dataframe

Out[44]: TestID       int64
         question    object
         answer      object
         dtype: object

In [45]: rate["answer"] = pd.to_numeric(rate["answer"]) # Converting the answer Series to numeri

In [46]: rate.dtypes # Making sure I'm not crazy

Out[46]: TestID       int64
         question    object
         answer       int64
         dtype: object

In [47]: rate["answer"].mean()

Out[47]: 4.624161073825503

In [48]: rate1p = round(rate[rate["answer"] == 1].shape[0] / rate.shape[0] * 100, 2)
         rate1 = rate[rate["answer"] == 1].shape[0]
```

```
        rate2p = round(rate[rate["answer"] == 2].shape[0] / rate.shape[0] * 100, 2)
        rate2 = rate[rate["answer"] == 2].shape[0]

        rate3p = round(rate[rate["answer"] == 3].shape[0] / rate.shape[0] * 100, 2)
        rate3 = rate[rate["answer"] == 3].shape[0]

        rate4p = round(rate[rate["answer"] == 4].shape[0] / rate.shape[0] * 100, 2)
        rate4 = rate[rate["answer"] == 4].shape[0]

        rate5p = round(rate[rate["answer"] == 5].shape[0] / rate.shape[0] * 100, 2)
        rate5 = rate[rate["answer"] == 5].shape[0]
```

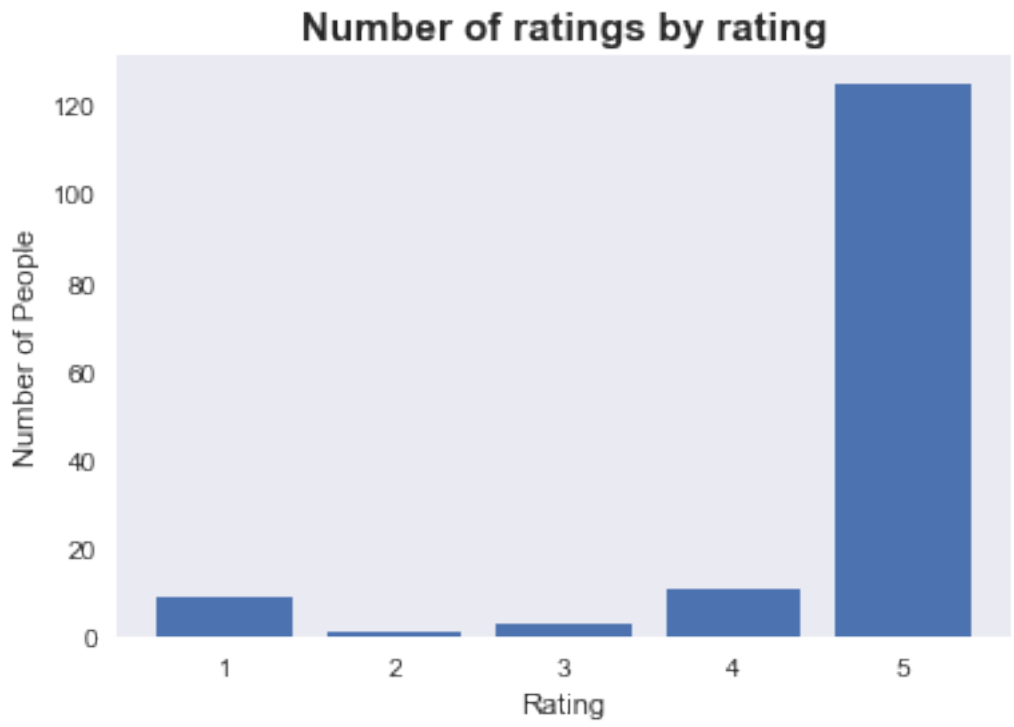
```
In [49]: print("The number of people who rated this assigmnet a 5 is {} ({}%)".format(rate5, rat

         print("The number of people who rated this assigmnet a 4 is {} ({}%)".format(rate4, rat

         print("The number of people who rated this assigmnet a 3 is {} ({}%)".format(rate3, rat

         print("The number of people who rated this assigmnet a 2 is {} ({}%)".format(rate2, rat

         print("The number of people who rated this assigmnet a 1 is {} ({}%)".format(rate1, rat
```

```
The number of people who rated this assigmnet a 5 is 125 (83.89%)
The number of people who rated this assigmnet a 4 is 11 (7.38%)
The number of people who rated this assigmnet a 3 is 3 (2.01%)
The number of people who rated this assigmnet a 2 is 1 (0.67%)
The number of people who rated this assigmnet a 1 is 9 (6.04%)
```

```
In [50]: rscale = [x for x in range(1,6)]
         numpeo = [rate1, rate2, rate3, rate4, rate5]

In [51]: print(rscale, numpeo) # Making sure the list compresion and the list declaration worked
```

```
[1, 2, 3, 4, 5] [9, 1, 3, 11, 125]
```

```
In [52]: plt.bar(rscale, numpeo)
         plt.xlabel("Rating")
         plt.ylabel("Number of People")
         plt.title("Number of ratings by rating", weight = 'bold', fontsize = 15)
         plt.grid(False)
```



2.2.1 We're returning to the `score` dataframe and doing the following:

Filter down the `assessment_name` column to return the rows of the `score` dataframe containing the name of each assessment and assigning that to its own dataframe

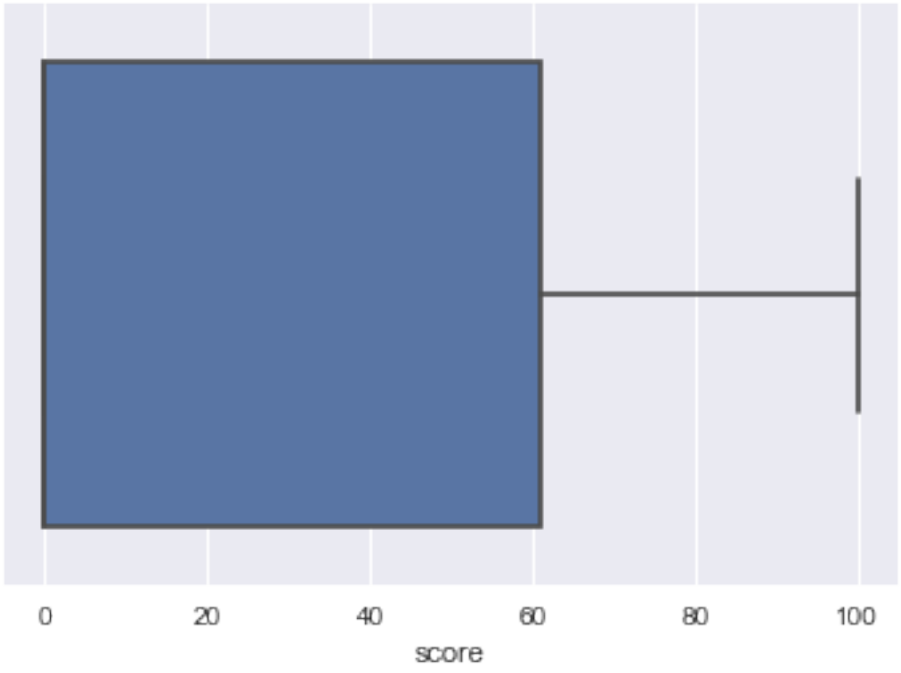
Create a Box and Whisker Plot that describes the each assessment scores located in the newly created dataframes

Use the `.describe()` method to display some basic statistics for the `score` column of each newly created dataframes

```
In [53]: pd.unique(score["assessment_name"])

Out[53]: array(['High Availability, Fault Tolerance, and Scalability',
                'VPC and VPC Networking', 'Design and Implement S3 Solutions',
                'Troubleshoot Multi-Tier Applications',
                'Implement Elastic Beanstalk Solutions',
                'Implementing Backup Strategies'], dtype=object)

In [54]: HAFTS = score[score.assessment_name.str.contains('High Availability, Fault Tolerance, a

         VPC = score[score.assessment_name.str.contains('VPC and VPC Networking', 'Design and Im

         TMMA = score[score.assessment_name.str.contains('Troubleshoot Multi-Tier Applications')

         IEBS = score[score.assessment_name.str.contains('Implement Elastic Beanstalk Solutions'
```

```
IBS = score[score.assessment_name.str.contains('Implementing Backup Strategies')].copy(

DIS = score[score.assessment_name.str.contains('Design and Implement S3 Solutions')].co
```

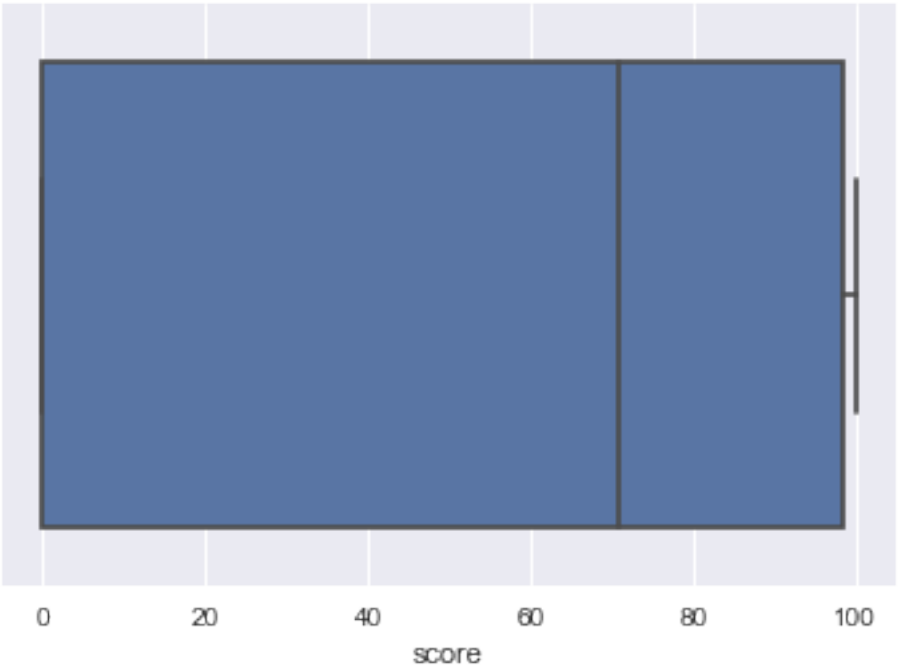
In [55]:
```
sns.boxplot(HAFTS["score"]);
```



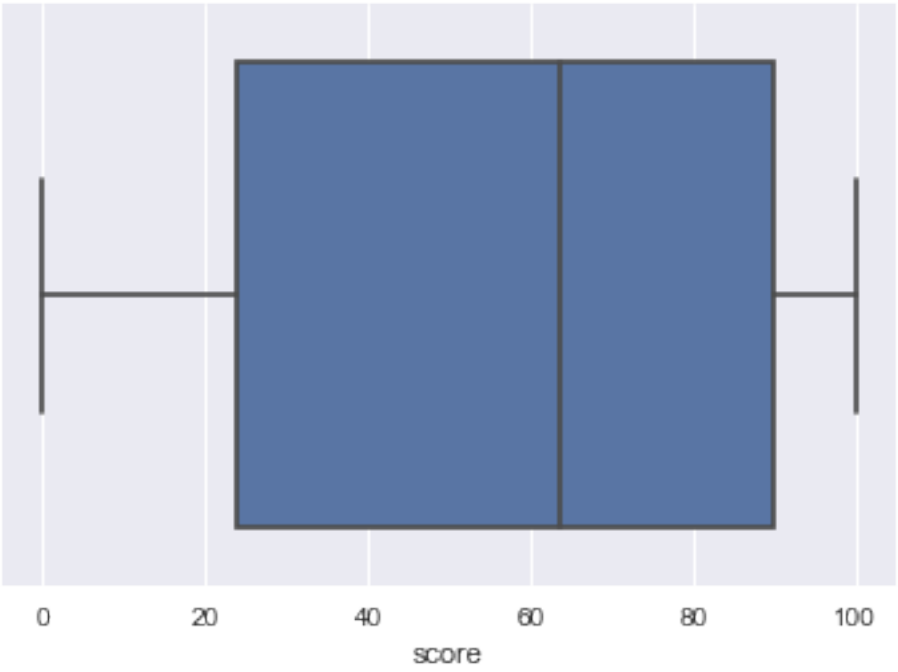
In [56]:
```
HAFTS["score"].describe()
```

Out[56]:
```
count    227.000000
mean      23.962995
std       38.595826
min        0.000000
25%        0.000000
50%        0.000000
75%       61.050001
max      100.000000
Name: score, dtype: float64
```

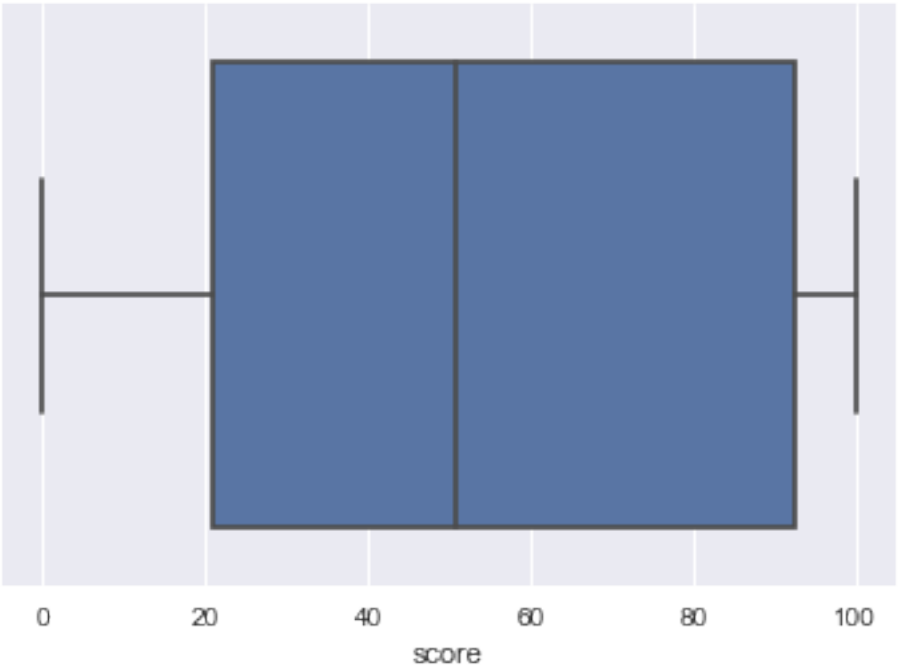
In [57]:
```
sns.boxplot(VPC["score"]);
```



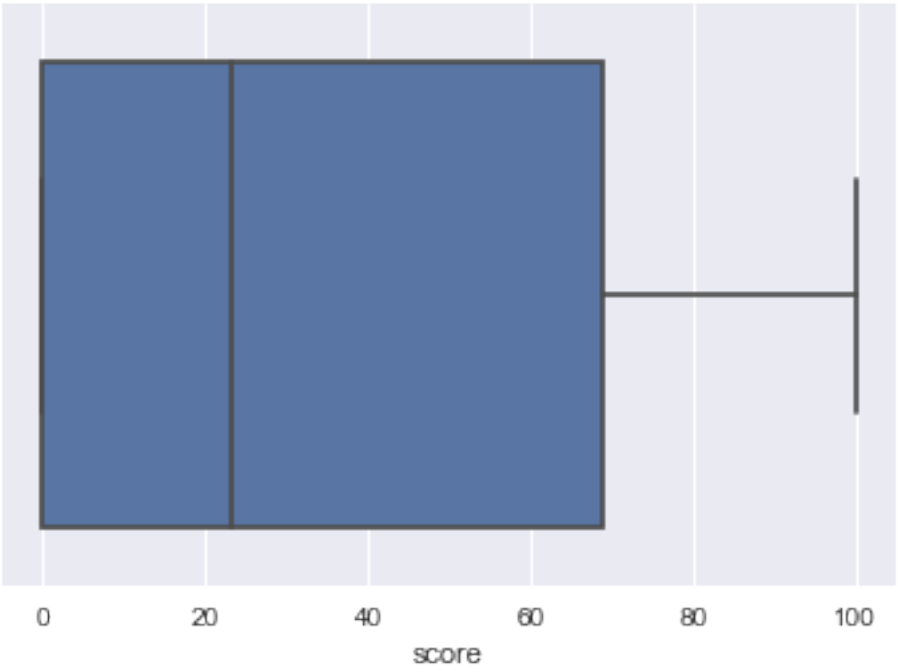

```
In [58]: VPC["score"].describe()

Out[58]: count     86.000000
         mean      56.860000
         std       42.348337
         min        0.000000
         25%        0.000000
         50%       70.830002
         75%       98.542500
         max      100.000000
         Name: score, dtype: float64

In [59]: sns.boxplot(TMMA["score"]);
```



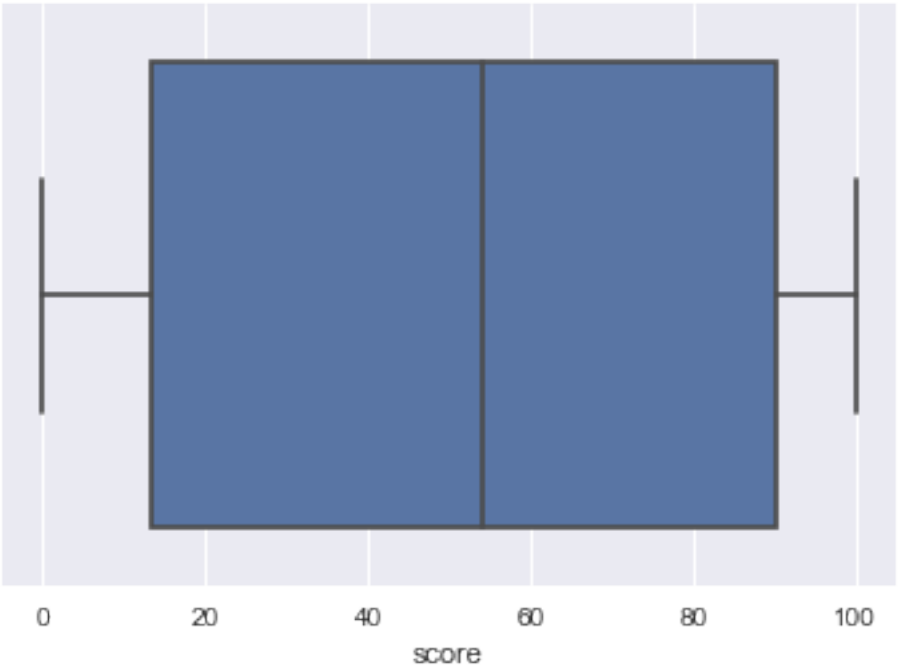

```
In [60]: TMMA["score"].describe()

Out[60]: count    45.000000
         mean     55.586222
         std      36.211001
         min       0.000000
         25%      24.000000
         50%      63.540001
         75%      89.989998
         max      99.989998
         Name: score, dtype: float64

In [61]: sns.boxplot(IEBS["score"]);
```




```
In [62]: IEBS["score"].describe()

Out[62]: count     93.000000
         mean      51.884624
         std       37.575058
         min        0.000000
         25%       20.840000
         50%       50.840000
         75%       92.500000
         max      100.000000
         Name: score, dtype: float64

In [63]: sns.boxplot(IBS["score"]);
```




```
In [64]: IBS["score"].describe()

Out[64]: count     57.000000
         mean      32.961929
         std       35.945481
         min        0.000000
         25%        0.000000
         50%       23.340000
         75%       68.889999
         max      100.000000
         Name: score, dtype: float64

In [65]: sns.boxplot(DIS["score"]);
```




```
In [66]: DIS["score"].describe()

Out[66]: count     69.000000
         mean      51.387391
         std       39.232317
         min        0.000000
         25%       13.340000
         50%       54.139999
         75%       90.349998
         max      100.000000
         Name: score, dtype: float64
```

```
SELECT z.assessmentname as "Assessment",
       AVG(z.elapsedtime)/60 as "Average Minutes"
FROM
(
SELECT e1."TestID",
       e1.assessmentname,
       e1.eventcode,
       e1.timestamp,
       e2."TestID",
       e2.eventcode,
       e2.timestamp,
       EXTRACT('second' FROM e2.timestamp::TIMESTAMP - e1.timestamp::TIMESTAMP) + 60 * EXTRACT('
    FROM public."Events" AS e1
```

```
    LEFT JOIN public."Events" AS e2 on e1."TestID" = e2."TestID"
    WHERE e1.eventcode = 'STRASMNT' and e2.eventcode = 'CMPLASMNT'
    ORDER BY e1."TestID"
) z
GROUP BY assessmentname
```

```
In [67]: pd.read_csv("average_time.csv")
```

```
Out[67]:                                            Assessment  \
         0                      Implementing Backup Strategies
         1  High Availability, Fault Tolerance, and Scalab...
         2                              VPC and VPC Networking
         3                  Design and Implement S3 Solutions
         4               Troubleshoot Multi-Tier Applications
         5              Implement Elastic Beanstalk Solutions

            Average Time Taken (in minutes)
         0                         17.077143
         1                         19.807670
         2                         20.150000
         3                         19.602206
         4                         26.361250
         5                         18.618590
```

```
SELECT s."TestId",
       s."UserId",
       s."assessment_name",
       s."score",
       u."question",
       u."answer",
       d."country",
       d."certifications"
FROM public."Score" s
INNER JOIN public."Survey" u ON s."TestId" = u."TestID"
INNER JOIN public."Dump" d ON s."UserId" = d."UserId"
WHERE s.score >= 80
AND u.question ILIKE '%scale of one to ten%'
AND u.answer ILIKE '10'
AND d.country ILIKE 'U%S%A'
AND d.certifications ILIKE '%aws%'
```

```
In [68]: pd.read_csv("score_and_perf_US_aws.csv")
```

```
Out[68]:    TestId  UserId         assessment_name  score  \
         0    3894    1809  VPC and VPC Networking    100

                                                 question  answer country  \
         0  On a scale of one to ten, how likely are you t...      10     USA
```

```
                    certifications
        0  [aws_solutions_architect]
```

```
SELECT e1.assessmentname,
       COUNT(e1.assessmentname)
FROM public."Events" as e1
LEFT JOIN public."Events" AS e2 on e1."TestID" = e2."TestID"
WHERE e1.eventcode = 'STRASMNT' and e2.eventcode = 'CMPLASMNT'
GROUP BY e1.assessmentname
```

```
In [70]: pd.read_csv('complete_assessments.csv')
```

```
Out[70]:                                      assessmentname  count
        0                     Implementing Backup Strategies     35
        1  High Availability, Fault Tolerance, and Scalab...    113
        2                              VPC and VPC Networking     75
        3                 Design and Implement S3 Solutions     68
        4               Troubleshoot Multi-Tier Applications     40
        5              Implement Elastic Beanstalk Solutions     52
```