# QUESTION 1

In [2]:
```
import pandas as pd
import numpy as np
```

In [12]:
```
df = pd.read_csv('popularity.csv')
```

1.1

In [13]:
```
df.drop('Unnamed: 0', axis=1, inplace=True)
df
```

Out[13]:

| | avg_shares | avg_comments | avg_expert | popularity_score |
|---|---|---|---|---|
| **0** | 147.3 | 23.9 | 19.1 | 14.6 |
| **1** | 28.6 | 1.5 | 33.0 | 7.3 |
| **2** | 17.9 | 37.6 | 21.6 | 8.0 |
| **3** | 94.2 | 4.9 | 8.1 | 9.7 |
| **4** | 293.6 | 27.7 | 1.8 | 20.7 |
| **...** | ... | ... | ... | ... |
| **195** | 4.1 | 11.6 | 5.7 | 3.2 |
| **196** | 76.4 | 26.7 | 22.3 | 11.8 |
| **197** | 218.5 | 5.4 | 27.4 | 12.2 |
| **198** | 140.3 | 1.9 | 9.0 | 10.3 |
| **199** | 266.9 | 43.8 | 5.0 | 25.4 |

200 rows × 4 columns

1.2

In [14]:
```
null_filter = df['avg_shares'].isnull()
df[null_filter]
```

Out[14]:

| | avg_shares | avg_comments | avg_expert | popularity_score |
|---|---|---|---|---|
| **19** | NaN | 7.6 | 7.2 | 9.7 |

In [15]:
```
mean = df['avg_shares'].mean()
df['avg_shares'].fillna(mean, inplace=True)
df[19:20]
```

Out[15]:

| | avg_shares | avg_comments | avg_expert | popularity_score |
|---|---|---|---|---|
| **19** | 147.291457 | 7.6 | 7.2 | 9.7 |

In [16]:
```
null_filter = df['avg_comments'].isnull()
df[null_filter]
```

Out[16]:

| | avg_shares | avg_comments | avg_expert | popularity_score |
|---|---|---|---|---|
| **7** | 168.4 | NaN | 12.8 | 11.7 |
| **26** | 202.5 | NaN | 31.6 | 16.6 |
| **37** | 163.5 | NaN | 7.4 | 18.0 |
| **45** | 70.6 | NaN | 40.8 | 10.5 |

In [17]:
```
mean = df['avg_comments'].mean()
df['avg_comments'].fillna(mean, inplace=True)
df[7:46]
```

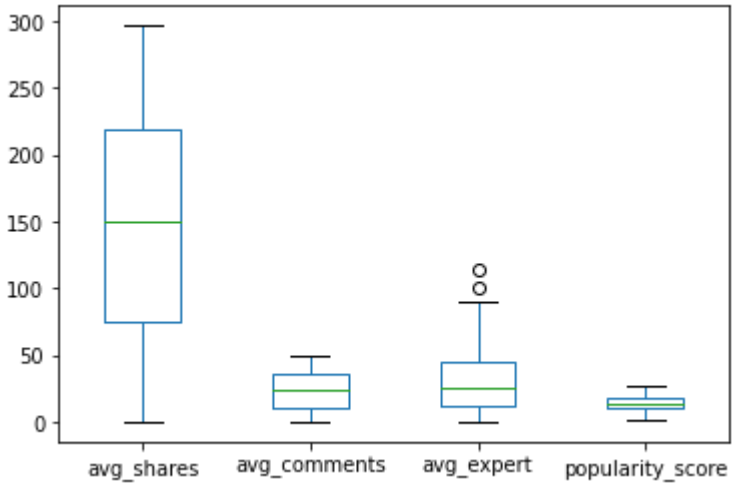
Out[17]:

| | avg_shares | avg_comments | avg_expert | popularity_score |
|---|---|---|---|---|
| **7** | 168.400000 | 23.319388 | 12.8 | 11.7 |
| **8** | 280.200000 | 10.100000 | 21.4 | 14.8 |
| **9** | 19.400000 | 16.000000 | 22.3 | 6.6 |
| **10** | 107.400000 | 14.000000 | 10.9 | 11.5 |
| **11** | 177.000000 | 9.300000 | 6.4 | 12.8 |
| **12** | 296.400000 | 36.300000 | 100.9 | 23.8 |
| **13** | 237.400000 | 27.500000 | 11.0 | 18.9 |
| **14** | 232.100000 | 8.600000 | 8.7 | 13.4 |
| **15** | 206.900000 | 8.400000 | 26.4 | 12.9 |
| **16** | 131.100000 | 42.800000 | 28.9 | 18.0 |
| **17** | 191.100000 | 28.700000 | 18.2 | 17.3 |
| **18** | 151.500000 | 41.300000 | 58.5 | 18.5 |
| **19** | 147.291457 | 7.600000 | 7.2 | 9.7 |
| **20** | 120.200000 | 19.600000 | 11.6 | 13.2 |
| **21** | 43.100000 | 26.700000 | 35.1 | 10.1 |
| **22** | 197.600000 | 3.500000 | 5.9 | 11.7 |
| **23** | 239.300000 | 15.500000 | 27.3 | 15.7 |
| **24** | 74.700000 | 49.400000 | 45.7 | 14.7 |
| **25** | 109.800000 | 14.300000 | 31.7 | 12.4 |
| **26** | 202.500000 | 23.319388 | 31.6 | 16.6 |
| **27** | 141.300000 | 26.800000 | 46.2 | 15.5 |
| **28** | 27.500000 | 1.600000 | 20.7 | 6.9 |
| **29** | 38.200000 | 3.700000 | 13.8 | 7.6 |
| **30** | 95.700000 | 1.400000 | 7.4 | 9.5 |
| **31** | 248.400000 | 30.200000 | 20.3 | 20.2 |
| **32** | 205.000000 | 45.100000 | 19.6 | 22.6 |
| **33** | 67.800000 | 36.600000 | 114.0 | 12.5 |
| **34** | 261.300000 | 42.700000 | 54.7 | 24.2 |
| **35** | 117.200000 | 14.700000 | 5.4 | 11.9 |
| **36** | 171.300000 | 39.700000 | 37.7 | 19.0 |
| **37** | 163.500000 | 23.319388 | 7.4 | 18.0 |
| **38** | 240.100000 | 7.300000 | 8.7 | 13.2 |
| **39** | 240.100000 | 16.700000 | 22.9 | 15.9 |
| **40** | 239.900000 | 41.500000 | 18.5 | 23.2 |
| **41** | 292.900000 | 28.300000 | 43.2 | 21.4 |
| **42** | 104.600000 | 5.700000 | 34.4 | 10.4 |
| **43** | 109.800000 | 47.800000 | 51.4 | 16.7 |
| **44** | 289.700000 | 42.300000 | 51.2 | 25.4 |
| **45** | 70.600000 | 23.319388 | 40.8 | 10.5 |

1.3

In [18]:
```
df.boxplot(column =['avg_shares','avg_comments','avg_expert','popularity_score'], grid =
```

Out[18]: <AxesSubplot:>




1.4

In [19]:
```
from sklearn import preprocessing
d = preprocessing.normalize(df)
scaled_df = pd.DataFrame(d)
scaled_df.head(200)
```

Out[19]:

| | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| **0** | 0.974525 | 0.158121 | 0.126364 | 0.096592 |
| **1** | 0.645597 | 0.033860 | 0.744919 | 0.164785 |
| **2** | 0.376136 | 0.790096 | 0.453885 | 0.168105 |
| **3** | 0.989807 | 0.051487 | 0.085111 | 0.101923 |
| **4** | 0.993117 | 0.093697 | 0.006089 | 0.070019 |
| **...** | ... | ... | ... | ... |
| **195** | 0.294287 | 0.832617 | 0.409131 | 0.229687 |
| **196** | 0.901235 | 0.314961 | 0.263057 | 0.139196 |
| **197** | 0.990413 | 0.024477 | 0.124198 | 0.055300 |
| **198** | 0.995191 | 0.013477 | 0.063840 | 0.073061 |
| **199** | 0.982311 | 0.161204 | 0.018402 | 0.093483 |

200 rows × 4 columns

# QUESTION 2

2.1

In [20]:
```
df = pd.read_csv('test.csv')
```

In [21]:
```
null_filter = df['Age'].isnull()
df[null_filter]
```

Out[21]:

| | PassengerId | Pclass | Name | Sex | Age | SibSp | Parch | Ticket | Fare | Cabin | Embarked |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **10** | 902 | 3 | Ilieff, Mr. Ylio | male | NaN | 0 | 0 | 349220 | 7.8958 | NaN | S |
| **22** | 914 | 1 | Flegenheim, Mrs. Alfred (Antoinette) | female | NaN | 0 | 0 | PC 17598 | 31.6833 | NaN | S |
| **29** | 921 | 3 | Samaan, Mr. Elias | male | NaN | 2 | 0 | 2662 | 21.6792 | NaN | C |
| **33** | 925 | 3 | Johnston, Mrs. Andrew G (Elizabeth Lily" Watson)" | female | NaN | 1 | 2 | W./C. 6607 | 23.4500 | NaN | S |
| **36** | 928 | 3 | Roth, Miss. Sarah A | female | NaN | 0 | 0 | 342712 | 8.0500 | NaN | S |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **408** | 1300 | 3 | Riordan, Miss. Johanna Hannah"" | female | NaN | 0 | 0 | 334915 | 7.7208 | NaN | Q |
| **410** | 1302 | 3 | Naughton, Miss. Hannah | female | NaN | 0 | 0 | 365237 | 7.7500 | NaN | Q |
| **413** | 1305 | 3 | Spector, Mr. Woolf | male | NaN | 0 | 0 | A.5. 3236 | 8.0500 | NaN | S |
| **416** | 1308 | 3 | Ware, Mr. Frederick | male | NaN | 0 | 0 | 359309 | 8.0500 | NaN | S |
| **417** | 1309 | 3 | Peter, Master. Michael J | male | NaN | 1 | 1 | 2668 | 22.3583 | NaN | C |

86 rows × 11 columns

In [22]:
```
mean = df['Age'].mean()
df['Age'].fillna(mean, inplace=True)
df
```

Out[22]:

| | PassengerId | Pclass | Name | Sex | Age | SibSp | Parch | Ticket | Fare | Cabin | Emba |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 892 | 3 | Kelly, Mr. James | male | 34.50000 | 0 | 0 | 330911 | 7.8292 | NaN | |
| **1** | 893 | 3 | Wilkes, Mrs. James (Ellen Needs) | female | 47.00000 | 1 | 0 | 363272 | 7.0000 | NaN | |
| **2** | 894 | 2 | Myles, Mr. Thomas Francis | male | 62.00000 | 0 | 0 | 240276 | 9.6875 | NaN | |
| **3** | 895 | 3 | Wirz, Mr. Albert | male | 27.00000 | 0 | 0 | 315154 | 8.6625 | NaN | |
| **4** | 896 | 3 | Hirvonen, Mrs. Alexander (Helga E Lindqvist) | female | 22.00000 | 1 | 1 | 3101298 | 12.2875 | NaN | |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **413** | 1305 | 3 | Spector, Mr. Woolf | male | 30.27259 | 0 | 0 | A.5. 3236 | 8.0500 | NaN | |
| **414** | 1306 | 1 | Oliva y Ocana, Dona. Fermina | female | 39.00000 | 0 | 0 | PC 17758 | 108.9000 | C105 | |
| **415** | 1307 | 3 | Saether, Mr. Simon Sivertsen | male | 38.50000 | 0 | 0 | SOTON/O.Q. 3101262 | 7.2500 | NaN | |
| **416** | 1308 | 3 | Ware, Mr. Frederick | male | 30.27259 | 0 | 0 | 359309 | 8.0500 | NaN | |
| **417** | 1309 | 3 | Peter, Master. Michael J | male | 30.27259 | 1 | 1 | 2668 | 22.3583 | NaN | |

418 rows × 11 columns

2.2

In [23]:
```
from sklearn import preprocessing
le = preprocessing.LabelEncoder()
df['Sex'] = le.fit_transform(df["Sex"])
df['Embarked'] = le.fit_transform(df["Embarked"])
df
```

Out[23]:

| | PassengerId | Pclass | Name | Sex | Age | SibSp | Parch | Ticket | Fare | Cabin | Embarke |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 892 | 3 | Kelly, Mr. James | 1 | 34.50000 | 0 | 0 | 330911 | 7.8292 | NaN | |
| **1** | 893 | 3 | Wilkes, Mrs. James (Ellen Needs) | 0 | 47.00000 | 1 | 0 | 363272 | 7.0000 | NaN | |
| **2** | 894 | 2 | Myles, Mr. Thomas Francis | 1 | 62.00000 | 0 | 0 | 240276 | 9.6875 | NaN | |
| **3** | 895 | 3 | Wirz, Mr. Albert | 1 | 27.00000 | 0 | 0 | 315154 | 8.6625 | NaN | |
| **4** | 896 | 3 | Hirvonen, Mrs. Alexander (Helga E Lindqvist) | 0 | 22.00000 | 1 | 1 | 3101298 | 12.2875 | NaN | |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **413** | 1305 | 3 | Spector, Mr. Woolf | 1 | 30.27259 | 0 | 0 | A.5. 3236 | 8.0500 | NaN | |
| **414** | 1306 | 1 | Oliva y Ocana, Dona. Fermina | 0 | 39.00000 | 0 | 0 | PC 17758 | 108.9000 | C105 | |
| **415** | 1307 | 3 | Saether, Mr. Simon Sivertsen | 1 | 38.50000 | 0 | 0 | SOTON/O.Q. 3101262 | 7.2500 | NaN | |
| **416** | 1308 | 3 | Ware, Mr. Frederick | 1 | 30.27259 | 0 | 0 | 359309 | 8.0500 | NaN | |
| **417** | 1309 | 3 | Peter, Master. Michael J | 1 | 30.27259 | 1 | 1 | 2668 | 22.3583 | NaN | |

418 rows × 11 columns

In [28]:
```
drop_data = df.drop(['Pclass','SibSp','Parch','Cabin'], axis = 1)
drop_data.head()
```

Out[28]:

| | PassengerId | Name | Sex | Age | Ticket | Fare | Embarked |
|---|---|---|---|---|---|---|---|
| **0** | 892 | Kelly, Mr. James | 1 | 34.5 | 330911 | 7.8292 | 1 |
| **1** | 893 | Wilkes, Mrs. James (Ellen Needs) | 0 | 47.0 | 363272 | 7.0000 | 2 |
| **2** | 894 | Myles, Mr. Thomas Francis | 1 | 62.0 | 240276 | 9.6875 | 1 |
| **3** | 895 | Wirz, Mr. Albert | 1 | 27.0 | 315154 | 8.6625 | 2 |
| **4** | 896 | Hirvonen, Mrs. Alexander (Helga E Lindqvist) | 0 | 22.0 | 3101298 | 12.2875 | 2 |

# QUESTION 3

In [15]:
```
import PIL
from PIL import Image
from matplotlib import image
from matplotlib import pyplot
```

In [110]:
```
data = image.imread('SampleImage.jpg')
pyplot.imshow(data)
pyplot.show()
```

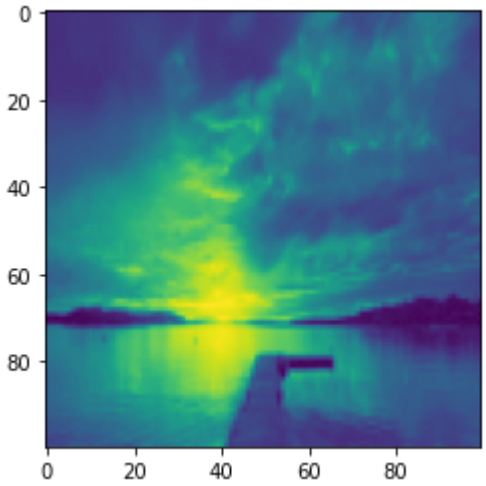

3.1

In [16]:
```
img = Image.open('SampleImage.jpg')
imgGray = img.convert('L')
imgGray.save('SampleImage_gray.jpg')
image2 = Image.open('SampleImage_gray.jpg')
```

3.2

In [17]:
```
image = PIL.Image.open("sampleImage.jpg")
resized_img = image.resize((100, 100))
```

In [18]:
```
pyplot.imshow(resized_img)
pyplot.show()
```




3.3

In [19]:
```
from numpy import asarray
data = asarray(image)
print(data)
```

```
[[  0   0   6 ...   0   5   0]
 [  7   0   0 ...  21   0 255]
 [  0  12 255 ...   0   8   0]
 ...
 [  0   9   0 ...   2 236  16]
 [  0 255   4 ...   2  23   0]
 [ 11   0   4 ...   0 255   3]]
```

# QUESTION 4

```
4.1
```

In [3]:
```
import nltk
nltk.download('punkt')
from nltk.tokenize import word_tokenize
df = pd.read_csv('a3-Q4.csv')
def func(text):
    tokens = word_tokenize(text)
    return tokens
for i in df['content'].index:
    df['content'][i] = func(df['content'][i])
df
```

```
[nltk_data] Downloading package punkt to C:\Users\Nupur
[nltk_data]     goel\AppData\Roaming\nltk_data...
[nltk_data]   Package punkt is already up-to-date!
<ipython-input-3-4c1b679125a4>:9: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  df['content'][i] = func(df['content'][i])
```

Out[3]:

| | tweet_id | sentiment | author | content |
|---|---|---|---|---|
| **0** | 1956967341 | empty | xoshayzers | [@, tiffanylue, i, know, i, was, listenin, to,... |
| **1** | 1956967666 | sadness | wannamama | [Layin, n, bed, with, a, headache, ughhhh, ..... |
| **2** | 1956967696 | sadness | coolfunky | [Funeral, ceremony, ..., gloomy, friday, ...] |
| **3** | 1956967789 | enthusiasm | czareaquino | [wants, to, hang, out, with, friends, SOON, !] |
| **4** | 1956968416 | neutral | xkilljoyx | [@, dannycastillo, We, want, to, trade, with, ... |
| **...** | ... | ... | ... | ... |
| **39995** | 1753918954 | neutral | showMe_Heaven | [@, JohnLloydTaylor] |
| **39996** | 1753919001 | love | drapeaux | [Happy, Mothers, Day, All, my, love] |
| **39997** | 1753919005 | love | JenniRox | [Happy, Mother, 's, Day, to, all, the, mommies... |
| **39998** | 1753919043 | happiness | ipdaman1 | [@, niariley, WASSUP, BEAUTIFUL, !, !, !, FOLL... |
| **39999** | 1753919049 | love | Alpharalpha | [@, mopedronin, bullet, train, from, tokyo, th... |

40000 rows × 4 columns

4.2

In [24]:
```
import string
string.punctuation
def remove_punctuation(x):
    x_nopunct = [word for word in x if word not in string.punctuation]
    return x_nopunct
df['content_clean'] = df['content'].apply(lambda x: remove_punctuation(x))
df
```

Out[24]:

| | tweet_id | sentiment | author | content | content_clean |
|---|---|---|---|---|---|
| **0** | 1956967341 | empty | xoshayzers | @tiffanylue i know i was listenin to bad habi... | [t, i, f, f, a, n, y, l, u, e, , i, , k, n, ... |
| **1** | 1956967666 | sadness | wannamama | Layin n bed with a headache ughhhh...waitin o... | [L, a, y, i, n, , n, , b, e, d, , w, i, t, ... |
| **2** | 1956967696 | sadness | coolfunky | Funeral ceremony...gloomy friday... | [F, u, n, e, r, a, l, , c, e, r, e, m, o, n, ... |
| **3** | 1956967789 | enthusiasm | czareaquino | wants to hang out with friends SOON! | [w, a, n, t, s, , t, o, , h, a, n, g, , o, ... |
| **4** | 1956968416 | neutral | xkilljoyx | @dannycastillo We want to trade with someone w... | [d, a, n, n, y, c, a, s, t, i, l, l, o, , W, ... |
| **...** | ... | ... | ... | ... | ... |
| **39995** | 1753918954 | neutral | showMe_Heaven | @JohnLloydTaylor | [J, o, h, n, L, l, o, y, d, T, a, y, l, o, r] |
| **39996** | 1753919001 | love | drapeaux | Happy Mothers Day All my love | [H, a, p, p, y, , M, o, t, h, e, r, s, , D, ... |
| **39997** | 1753919005 | love | JenniRox | Happy Mother's Day to all the mommies out ther... | [H, a, p, p, y, , M, o, t, h, e, r, s, , D, ... |
| **39998** | 1753919043 | happiness | ipdaman1 | @niariley WASSUP BEAUTIFUL!!! FOLLOW ME!! PEE... | [n, i, a, r, i, l, e, y, , W, A, S, S, U, P, ... |
| **39999** | 1753919049 | love | Alpharalpha | @mopedronin bullet train from tokyo the gf ... | [m, o, p, e, d, r, o, n, i, n, , b, u, l, l, ... |

40000 rows × 5 columns

4.3

In [31]:
```
from nltk.corpus import stopwords
df = pd.read_csv('a3-Q4.csv')
d = df[['content']]
for i in d:
    data = d[i]
    text = data.to_string()
    tokens = word_tokenize(text)
    tokens = [w.lower() for w in tokens]
    words = [word for word in tokens if word.isalpha()]
    stop_words = stopwords.words('english')
    print(stop_words)
```

```
['i', 'me', 'my', 'myself', 'we', 'our', 'ours', 'ourselves', 'you', "you're", "you've", "you'll", "you'd", 'your', 'yours', 'yourself', 'yourselves', 'he', 'him', 'his', 'himself', 'she', "she's", 'her', 'hers', 'herself', 'it', "it's", 'its', 'itself', 'they', 'them', 'their', 'theirs', 'themselves', 'what', 'which', 'who', 'whom', 'this', 'that', "that'll", 'these', 'those', 'am', 'is', 'are', 'was', 'were', 'be', 'been', 'being', 'have', 'has', 'had', 'having', 'do', 'does', 'did', 'doing', 'a', 'an', 'the', 'and', 'but', 'if', 'or', 'because', 'as', 'until', 'while', 'of', 'at', 'by', 'for', 'with', 'about', 'against', 'between', 'into', 'through', 'during', 'before', 'after', 'above', 'below', 'to', 'from', 'up', 'down', 'in', 'out', 'on', 'off', 'over', 'under', 'again', 'further', 'then', 'once', 'here', 'there', 'when', 'where', 'why', 'how', 'all', 'any', 'both', 'each', 'few', 'more', 'most', 'other', 'some', 'such', 'no', 'nor', 'not', 'only', 'own', 'same', 'so', 'than', 'too', 'very', 's', 't', 'can', 'will', 'just', 'don', "don't", 'should', "should've", 'now', 'd', 'll', 'm', 'o', 're', 've', 'y', 'ain', 'aren', "aren't", 'couldn', "couldn't", 'didn', "didn't", 'doesn', "doesn't", 'hadn', "hadn't", 'hasn', "hasn't", 'haven', "haven't", 'isn', "isn't", 'ma', 'mightn', "mightn't", 'mustn', "mustn't", 'needn', "needn't", 'shan', "shan't", 'shouldn', "shouldn't", 'wasn', "wasn't", 'weren', "weren't", 'won', "won't", 'wouldn', "wouldn't"]
```

4.4

In [29]:
```
from nltk.stem.porter import PorterStemmer
df = pd.read_csv('a3-Q4.csv')
d = df[['content']]
for i in d:
    data = d[i]
    text = data.to_string()
    tokens = word_tokenize(text)
    print(tokens[:100])
    porter = PorterStemmer()
    stemmed = [porter.stem(word) for word in tokens]
    print(stemmed[:100])
```

```
['0', '@', 'tiffanylue', 'i', 'know', 'i', 'was', 'listenin', 'to', 'bad', 'habi', '...', '1', 'Layin', 'n', 'bed', 'with', 'a', 'headache', 'ughhhh', '...', 'waitin', 'o', '...', '2', 'Funeral', 'ceremony', '...', 'gloomy', 'friday', '...', '3', 'wants', 'to', 'hang', 'out', 'with', 'friends', 'SOON', '!', '4', '@', 'dannycastillo', 'We', 'want', 'to', 'trade', 'with', 'someone', 'w', '...', '5', 'Re-pinging', '@', 'ghostridah14', ':', 'why', 'did', "n't", 'you', 'go', 'to', '...', '6', 'I', 'should', 'be', 'sleep', ',', 'but', 'im', 'not', '!', 'thinking', 'about', '...', '7', 'Hmmm', '.', 'http', ':', '//www.djhero.com/', 'is', 'down', '8', '@', 'charviray', 'Charlene', 'my', 'love', '.', 'I', 'miss', 'you', '9', '@', 'kelcouch', 'I', "'m", 'sorry']
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