Import Data

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

In [ ]:
```
df = pd.read_csv('/content/Udemy Courses.csv')
df.head()
```

Out[ ]:

	course_id	course_title	is_paid	price	num_subscribers	num_reviews	num_lectures	
0	288942	#1 Piano Hand Coordination: Play 10th Ballad i...	True	35	3137	18	68	
1	1170074	#10 Hand Coordination - Transfer Chord Ballad ...	True	75	1593	1	41	In
2	1193886	#12 Hand Coordination: Let your Hands dance wi...	True	75	482	1	47	In
3	1116700	#4 Piano Hand Coordination: Fun Piano Runs in ...	True	75	850	3	43	In
4	1120410	#5 Piano Hand Coordination: Piano Runs in 2 ...	True	75	940	3	32	In

Prepare Data

In [ ]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3682 entries, 0 to 3681
Data columns (total 11 columns):
 #   Column               Non-Null Count  Dtype 
---  ------               --------------  ----- 
 0   course_id            3682 non-null   int64 
 1   course_title         3682 non-null   object
 2   is_paid              3682 non-null   bool  
 3   price                3682 non-null   object
 4   num_subscribers      3682 non-null   int64 
 5   num_reviews          3682 non-null   int64 
 6   num_lectures         3682 non-null   int64 
 7   level                3682 non-null   object
 8   content_duration     3682 non-null   object
 9   published_timestamp  3682 non-null   object
 10  subject              3682 non-null   object
dtypes: bool(1), int64(4), object(6)
memory usage: 291.4+ KB
```

In [ ]:
```
df.describe()
```

Out[ ]:

	course_id	num_subscribers	num_reviews	num_lectures
count	3.682000e+03	3682.000000	3682.000000	3682.000000
mean	6.766121e+05	3194.230310	156.093156	40.065182
std	3.436355e+05	9499.378361	934.957204	50.373299
min	8.324000e+03	0.000000	0.000000	0.000000
25%	4.078430e+05	110.250000	4.000000	15.000000
50%	6.885580e+05	911.500000	18.000000	25.000000
75%	9.617515e+05	2540.250000	67.000000	45.000000
max	1.282064e+06	268923.000000	27445.000000	779.000000

Data Cleaning

Check Missing Values

IF there is null values:

1. df.dropna(inplace=True) to Remove All Rows with Null values (inplace to ensure it remove from original data).
2. df.fillna(df.mean(),inplace=True) to Replace Null values with Mean.
3. df.fillna(df.median(),inplace=True) to Replace Null values with median.

In [ ]:
```
df.isnull().sum()
```

Out[ ]:

	0
course_id	0
course_title	0
is_paid	0
price	0
num_subscribers	0
num_reviews	0
num_lectures	0
level	0
content_duration	0
published_timestamp	0
subject	0

dtype: int64

Check duplicates

IF there is duplicated rows:

- df.drop_duplicates(inplace=True) **to Remove All duplicated rows** (inplace to ensure it remove from original data).

In [ ]:
```
df.duplicated().sum()
```

Out[ ]:
```
np.int64(6)
```

In [ ]:
```
df.drop_duplicates(inplace=True)
df.duplicated().sum()
```

Out[ ]:
```
np.int64(0)
```

Drop the Courses that has no lectures as it doesn't make sense for the courses to not contain any lecture.

In [ ]:
```
for x in df.index:
  if df.loc[x,"num_lectures"] == 0:
    df.drop(x,inplace=True)
```

We have two unique and unneeded columns('course_id'&'url') so we will drop them.

In [ ]:
```
df['course_id'].nunique()
```

```
Out[ ]: 3671
```

```
In [ ]: df.drop(columns=['course_id'],inplace=True)
```

```
In [ ]: df.shape
```

```
Out[ ]: (3671, 10)
```

Data Transformation

- df['published_timestamp'] = pd.to_datetime(df['published_timestamp']) **to Change datatype published_timestamp From String to datetime.**
- df ['year'] = df['published_timestamp'].dt.year **to Create New Column to year only.**
- df ['month'] = df['published_timestamp'].dt.month **to Create New Column to month only.**
- df ['day'] = df['published_timestamp'].dt.day **to Create New Column to day only.**

```
In [ ]: df['published_timestamp'] = pd.to_datetime(df['published_timestamp'])
        df ['year'] = df['published_timestamp'].dt.year
        df ['month'] = df['published_timestamp'].dt.month
        df ['day'] = df['published_timestamp'].dt.day
        df.head()
```

Out[ ]:

	course_title	is_paid	price	num_subscribers	num_reviews	num_lectures	level
0	#1 Piano Hand Coordination: Play 10th Ballad i...	True	35	3137	18	68	All Levels
1	#10 Hand Coordination - Transfer Chord Ballad ...	True	75	1593	1	41	Intermediate Level
2	#12 Hand Coordination: Let your Hands dance wi...	True	75	482	1	47	Intermediate Level
3	#4 Piano Hand Coordination: Fun Piano Runs in ...	True	75	850	3	43	Intermediate Level
4	#5 Piano Hand Coordination: Piano Runs in 2 ...	True	75	940	3	32	Intermediate Level

- df['content_duration'] = df['content_duration'].str.replace(' hours', '', regex=False) **to Remove hours from content_duration.**
- df['content_duration'] = df['content_duration'].str.replace(' hour', '', regex=False) **to Remove hour from content_duration.**
- df['content_duration'] = df['content_duration'].str.replace(' mins', '', regex=False) **to Remove mins from content_duration.**
- df['content_duration'] = df['content_duration'].astype(float) **to Change datatype content_duration From String to float.**

In [ ]:

```
df['content_duration'] = df['content_duration'].str.replace(' hours', '', regex=Fal
df['content_duration'] = df['content_duration'].str.replace(' hour', '', regex=Fals
df['content_duration'] = df['content_duration'].str.replace(' mins', '', regex=Fals
df['content_duration'] = df['content_duration'].astype(float)
df.head()
```

Out[ ]:

	course_title	is_paid	price	num_subscribers	num_reviews	num_lectures	level
0	#1 Piano Hand Coordination: Play 10th Ballad i...	True	35	3137	18	68	All Levels
1	#10 Hand Coordination - Transfer Chord Ballad ...	True	75	1593	1	41	Intermediate Level
2	#12 Hand Coordination: Let your Hands dance wi...	True	75	482	1	47	Intermediate Level
3	#4 Piano Hand Coordination: Fun Piano Runs in ...	True	75	850	3	43	Intermediate Level
4	#5 Piano Hand Coordination: Piano Runs in 2 ...	True	75	940	3	32	Intermediate Level

In [ ]:

```
df['course_title'] = (df['course_title']
    .str.strip()  # Remove leading/trailing whitespace
    .str.lower()  # Convert to lowercase
    .str.replace(r'#\d+', '', regex=True)  # Remove hashtags and numbers like #1, #
    .str.replace(r'[^\w\s]', '', regex=True)  # Remove punctuation
    .str.replace(r'\s+', ' ', regex=True)  # Replace multiple spaces with single sp
)

# Optional: Capitalize first letter of each word
df['course_title'] = df['course_title'].str.title()
df.head()
```

Out[ ]:

	course_title	is_paid	price	num_subscribers	num_reviews	num_lectures	level
0	Piano Hand Coordination Play 10Th Ballad In E...	True	35	3137	18	68	All Levels
1	Hand Coordination Transfer Chord Ballad 9 C B...	True	75	1593	1	41	Intermediate Level
2	Hand Coordination Let Your Hands Dance With B...	True	75	482	1	47	Intermediate Level
3	Piano Hand Coordination Fun Piano Runs In 2 B...	True	75	850	3	43	Intermediate Level
4	Piano Hand Coordination Piano Runs In 2 Beats...	True	75	940	3	32	Intermediate Level

- df['price'] = pd.to_numeric(df['price'], errors='coerce') **to Convert to Float and Set 'Free' to NaN**

In [ ]:
```
df['price'] = pd.to_numeric(df['price'], errors='coerce')
df.head()
```

Out[ ]:

	course_title	is_paid	price	num_subscribers	num_reviews	num_lectures	level
0	Piano Hand Coordination Play 10Th Ballad In E...	True	35.0	3137	18	68	All Levels
1	Hand Coordination Transfer Chord Ballad 9 C B...	True	75.0	1593	1	41	Intermediate Level
2	Hand Coordination Let Your Hands Dance With B...	True	75.0	482	1	47	Intermediate Level
3	Piano Hand Coordination Fun Piano Runs In 2 B...	True	75.0	850	3	43	Intermediate Level
4	Piano Hand Coordination Piano Runs In 2 Beats...	True	75.0	940	3	32	Intermediate Level

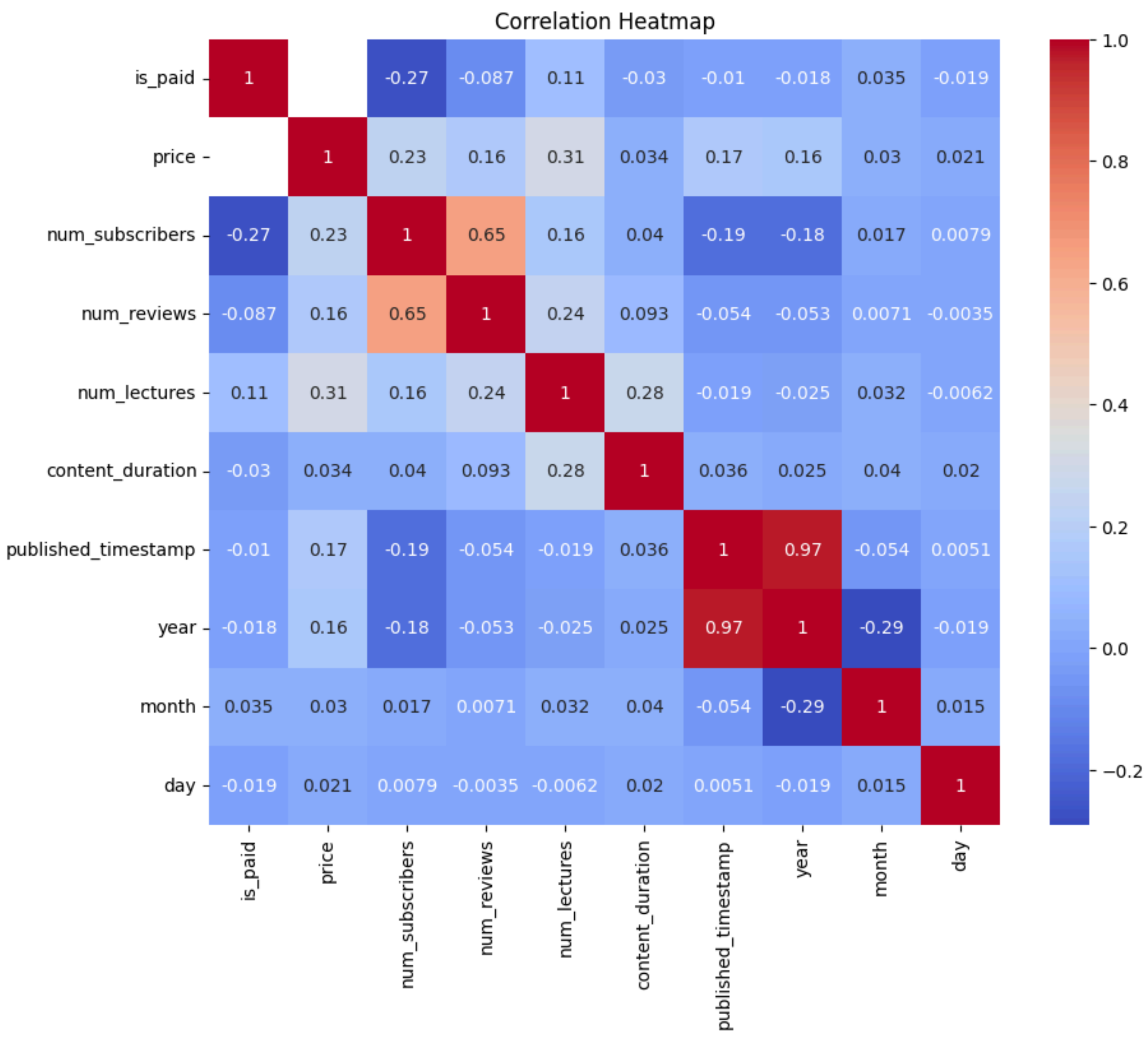
EDA and Visualization

1- HeatMap: to illustrate the colleration between the features (numerical data).

- numerical_df = df.select_dtypes(include=[np.number] **OR** numerical_df = df.select_dtypes(exclude= np.object_) **to Get only numerical data Columns.**
- List item

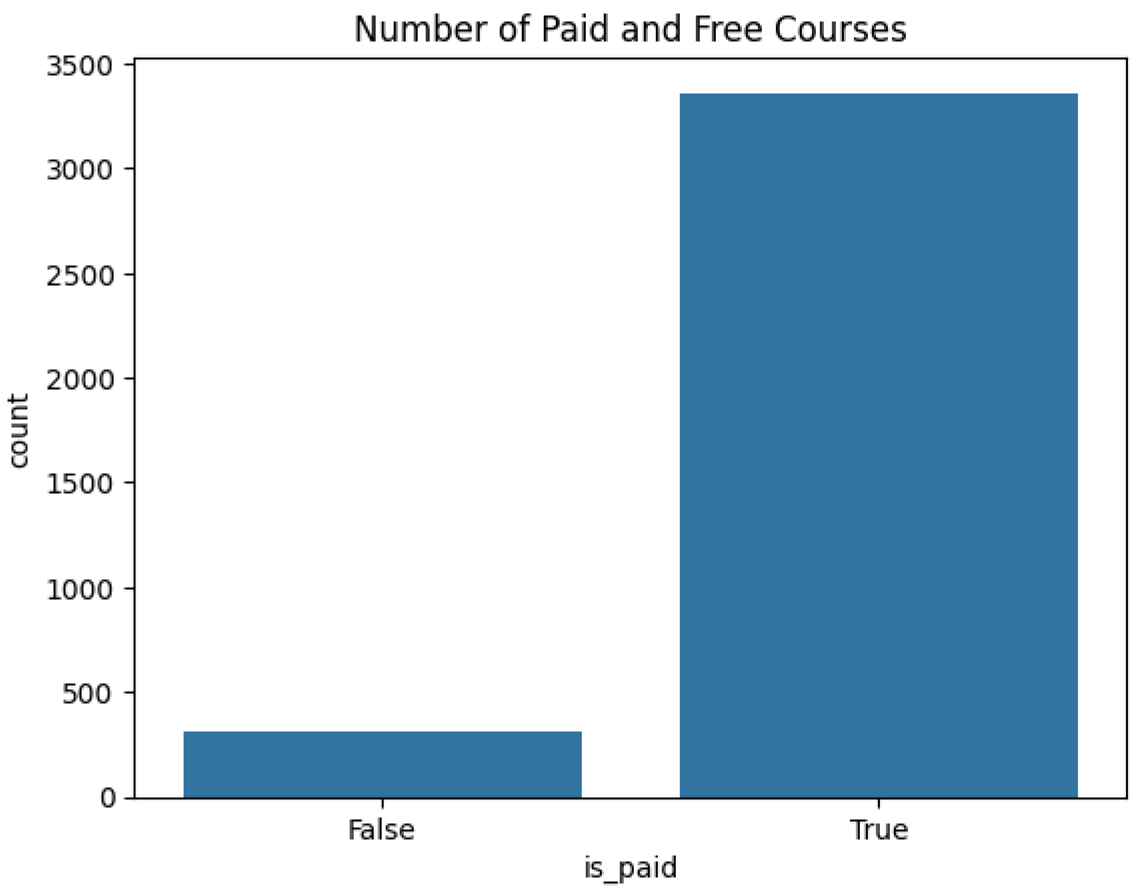
In [ ]:
```
# numerical_df = df.select_dtypes(include=[np.number])
numerical_df = df.select_dtypes(exclude= np.object_)

plt.figure(figsize=(10, 8))
sns.heatmap(numerical_df.corr(), annot=True, cmap='coolwarm')
plt.title('Correlation Heatmap')
plt.show()
```

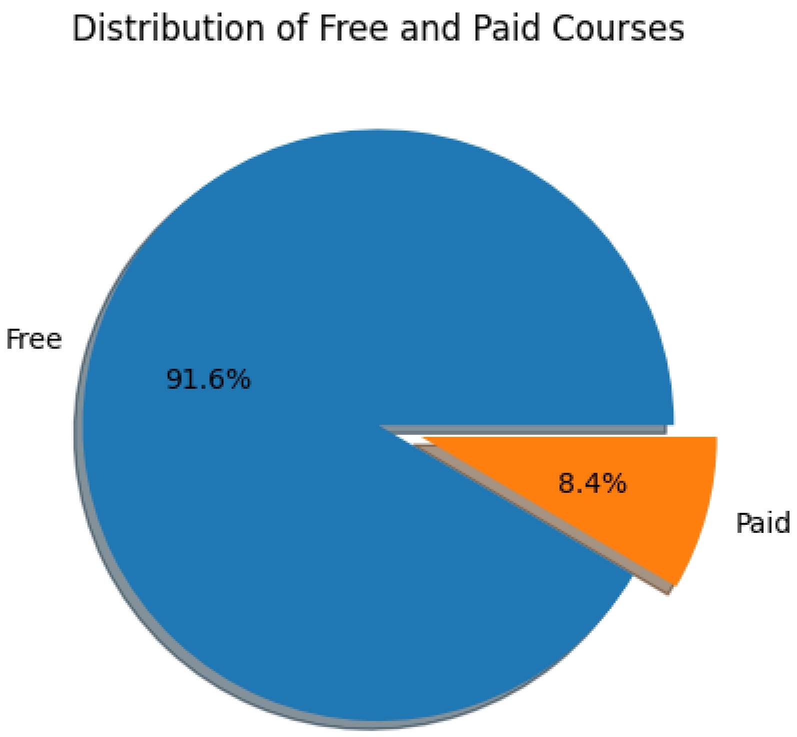


2- Number of paid and free Courses

```
In [ ]: sns.countplot(x='is_paid', data=df)
        plt.title('Number of Paid and Free Courses')
        plt.show()
```



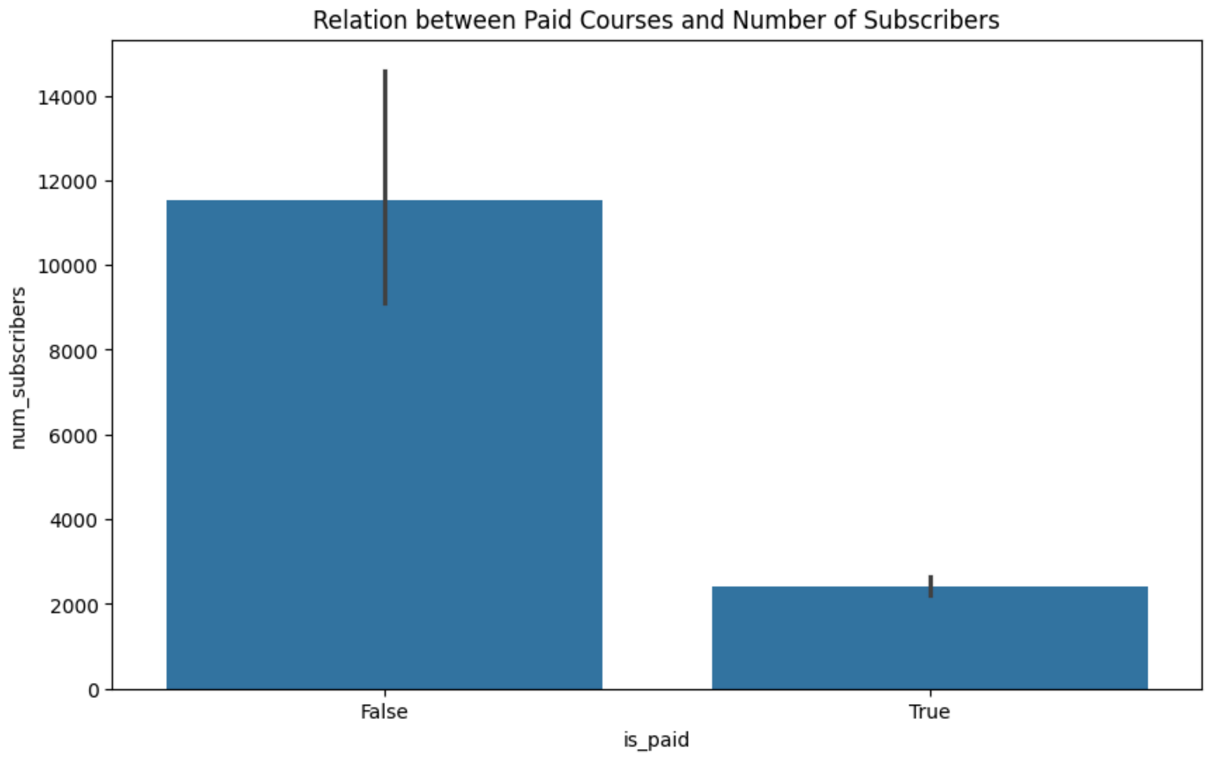
```
In [ ]: plt.pie(df['is_paid'].value_counts(), labels=['Free', 'Paid'], autopct='%1.1f%%', s
        plt.title('Distribution of Free and Paid Courses')
        plt.show()
```



We can see that most of the courses are paid. But which one are on demand ?

3- Relation between paid courses and number of subscribers.

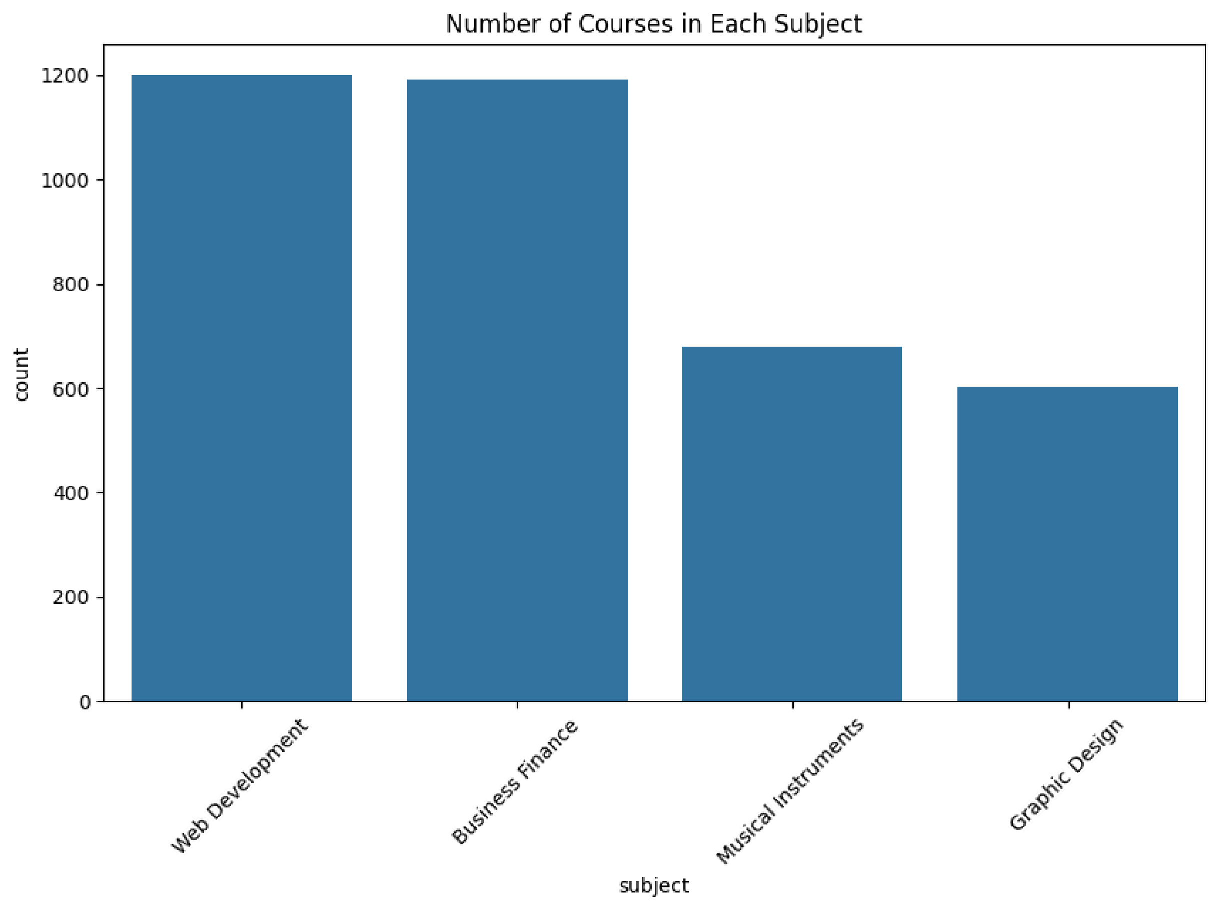
```
In [ ]: plt.figure(figsize=(10, 6))
        sns.barplot(x='is_paid', y='num_subscribers', data=df)
        plt.title('Relation between Paid Courses and Number of Subscribers')
        plt.show()
```



Free courses are in demand more than paid courses.

4- Number of Courses in each subject.

```
In [ ]: plt.figure(figsize=(10, 6))
        sns.countplot(x='subject', data=df , order=df['subject'].value_counts().index)
        plt.title('Number of Courses in Each Subject')
        plt.xticks(rotation=45)
        plt.show()
```



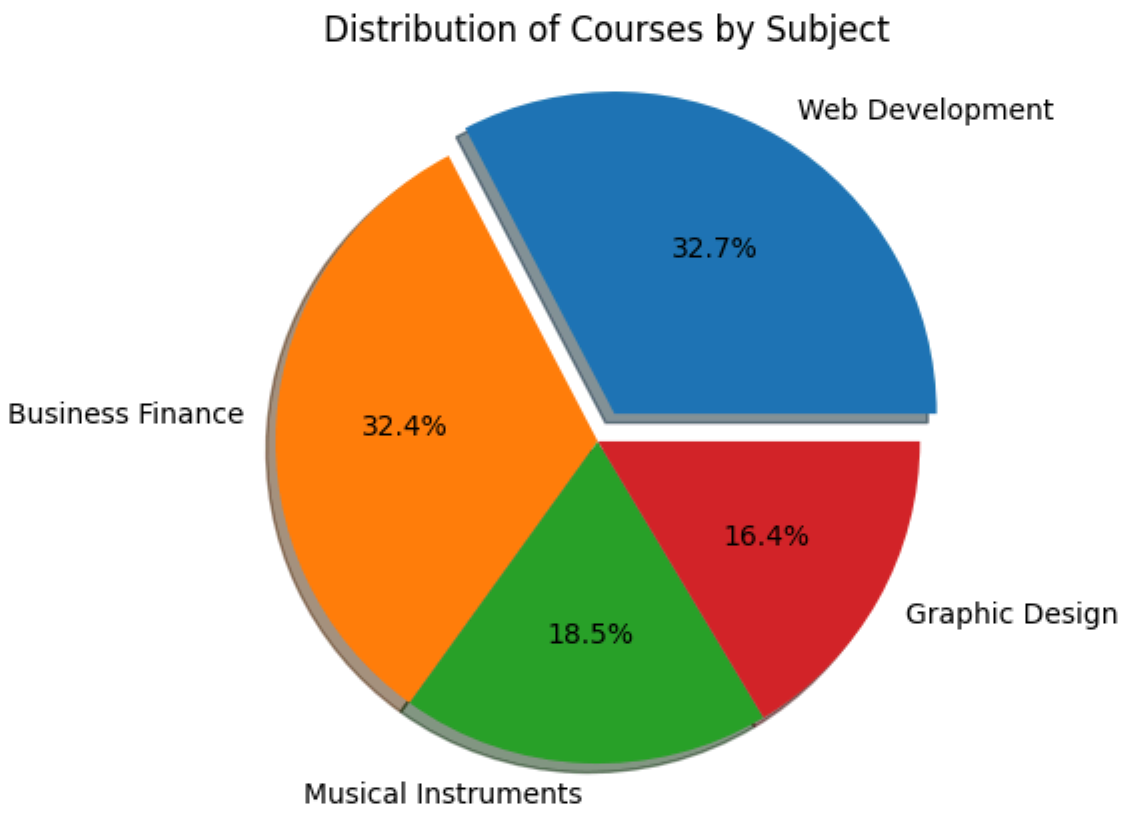
In [ ]:
```
df['subject'].value_counts()
```

Out[ ]:

subject	count
Web Development	1199
Business Finance	1190
Musical Instruments	680
Graphic Design	602

dtype: int64

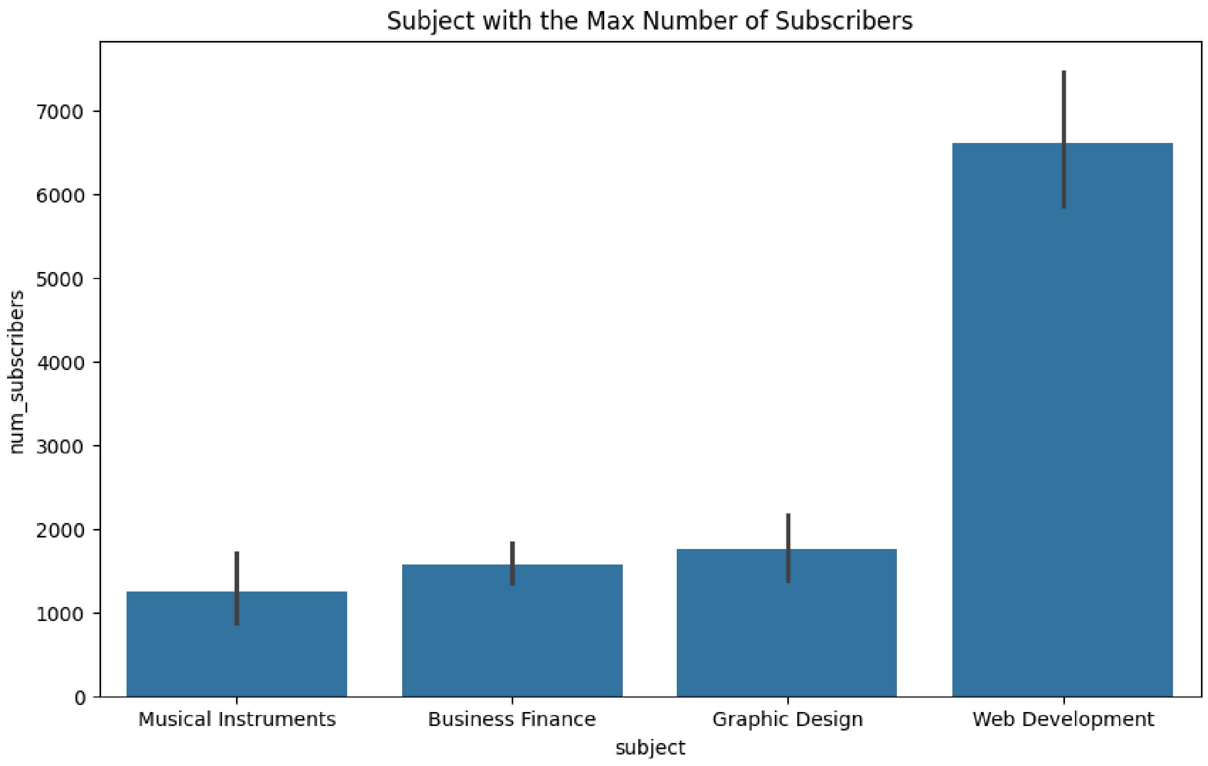
In [ ]:
```
plt.pie(df['subject'].value_counts(), labels=df['subject'].value_counts().index, au
plt.title('Distribution of Courses by Subject')
plt.axis('equal')  # Equal aspect ratio ensures that pie is drawn as a circle.
plt.show()
```



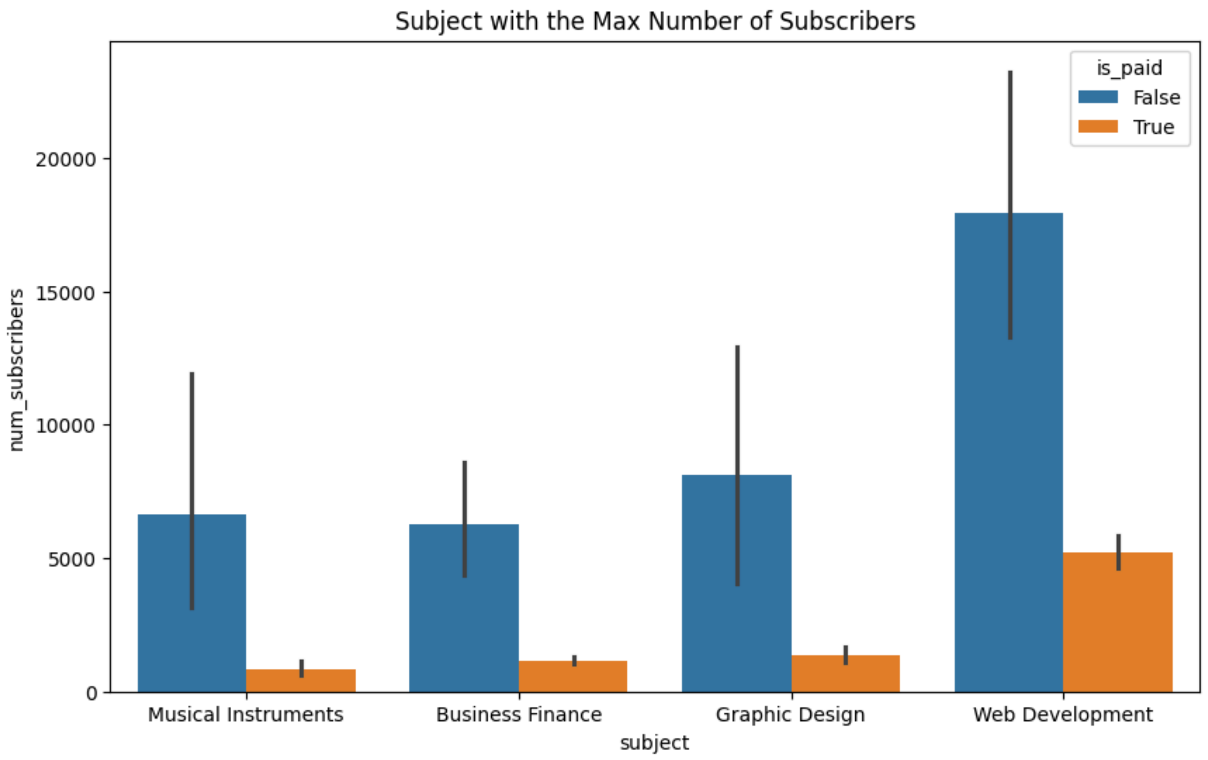
Web Development and Business Finance have the bigger numder of courses and they are almost equal. butwhich subject is most popular to the subscribers?

5- Which subject has the Max Number of Subscribers?

In [ ]:
```
plt.figure(figsize=(10, 6))
sns.barplot(x='subject', y='num_subscribers', data=df)
plt.title('Subject with the Max Number of Subscribers')
plt.show()
```



```
In [ ]: plt.figure(figsize=(10, 6))
        sns.barplot(x='subject', y='num_subscribers', hue= 'is_paid', data=df)
        plt.title('Subject with the Max Number of Subscribers')
        plt.show()
```

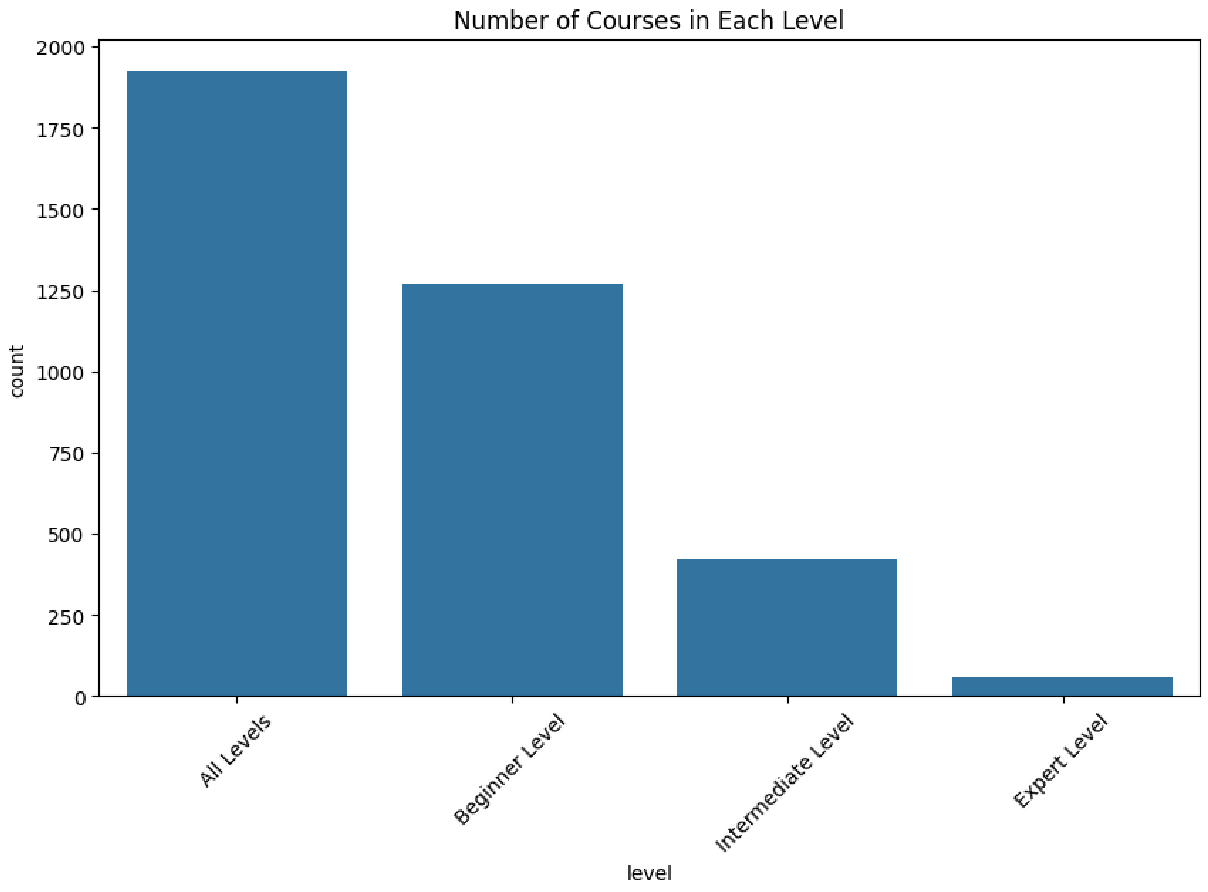


It is obvious that web development and free courses are the most popular to the subscribers.

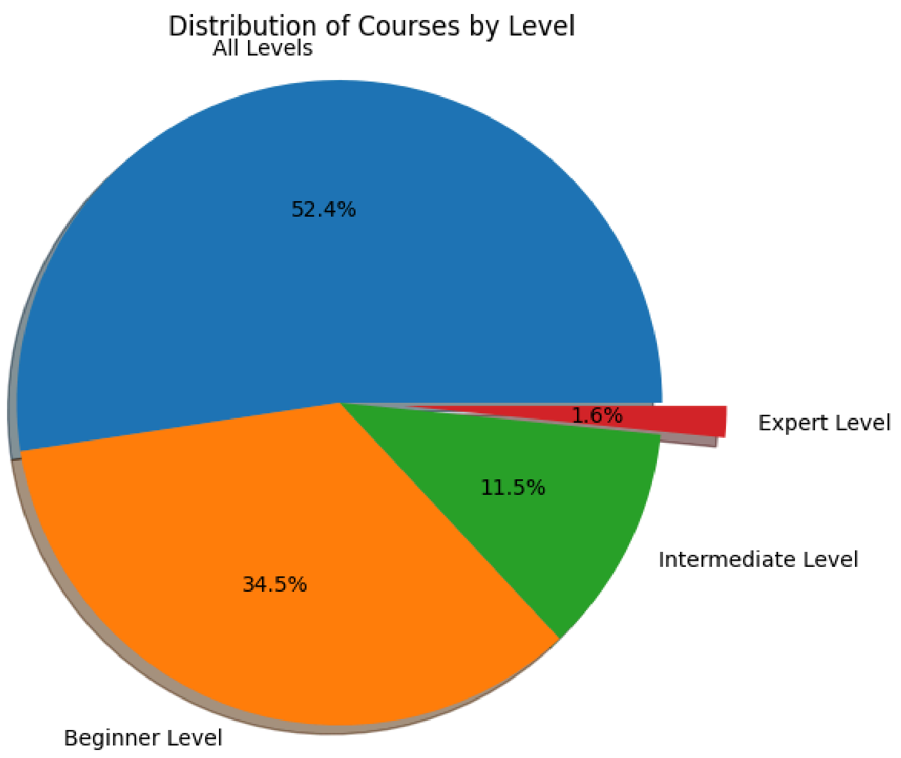
6- Number of Courses in each level

```
In [ ]: plt.figure(figsize=(10, 6))
        sns.countplot(x='level', data=df , order=df['level'].value_counts().index)
        plt.title('Number of Courses in Each Level')
        plt.xticks(rotation=45)
        plt
```

```
Out[ ]: <module 'matplotlib.pyplot' from '/usr/local/lib/python3.11/dist-packages/matplotl
        ib/pyplot.py'>
```



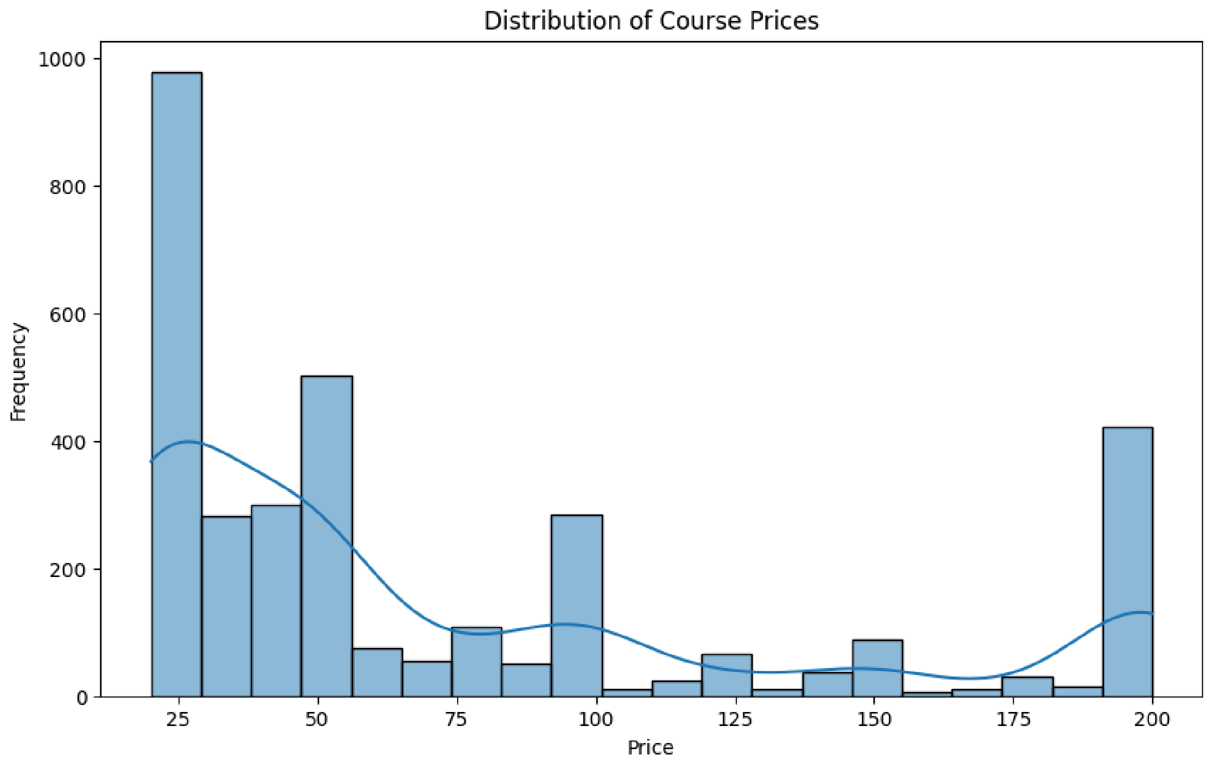
```
In [ ]: plt.figure(figsize=(10, 6))
        plt.pie(df['level'].value_counts(), labels=df['level'].value_counts().index, autopc
        plt.title('Distribution of Courses by Level')
        plt.axis('equal')
        plt.show()
```



We can conclude that bigger number of courses are in all levels and only few courses are in expert level.

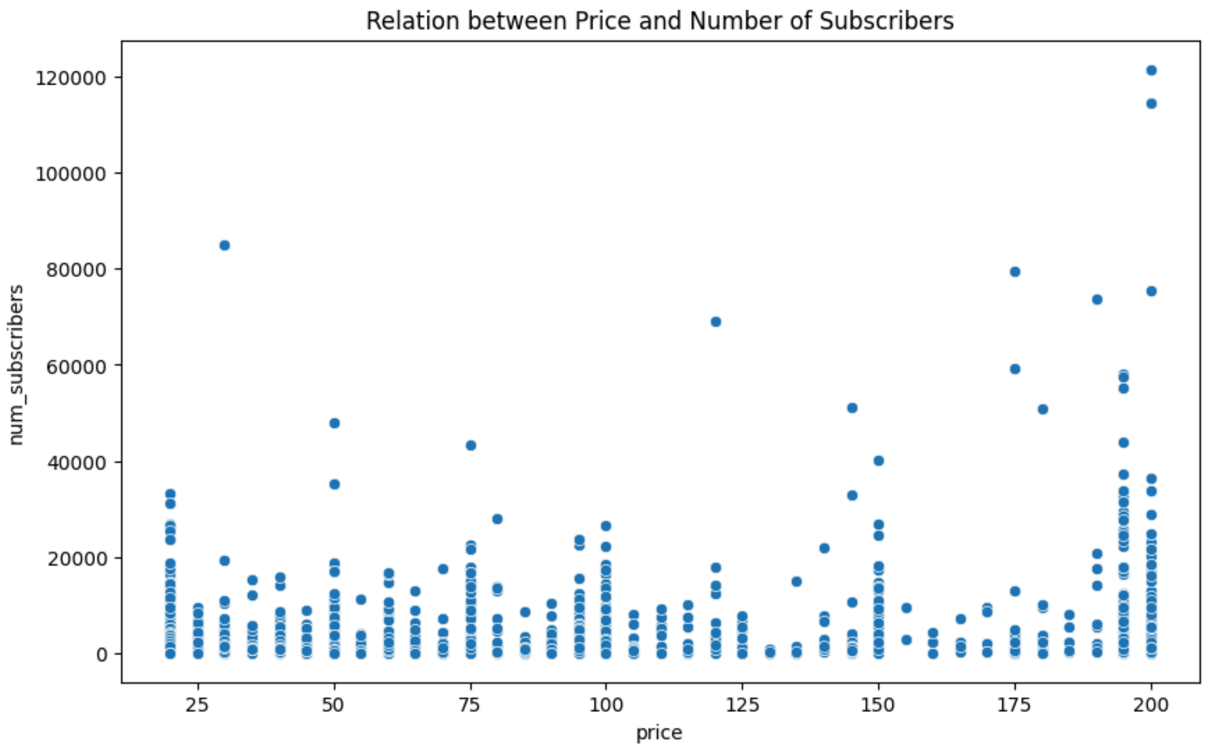
7- Distribution of Course prices

In [ ]:
```
plt.figure(figsize=(10, 6))
sns.histplot(df['price'], bins=20, kde=True)
plt.title('Distribution of Course Prices')
plt.xlabel('Price')
plt.ylabel('Frequency')
plt.show()
```



8- Relation between price and number of subscribers.

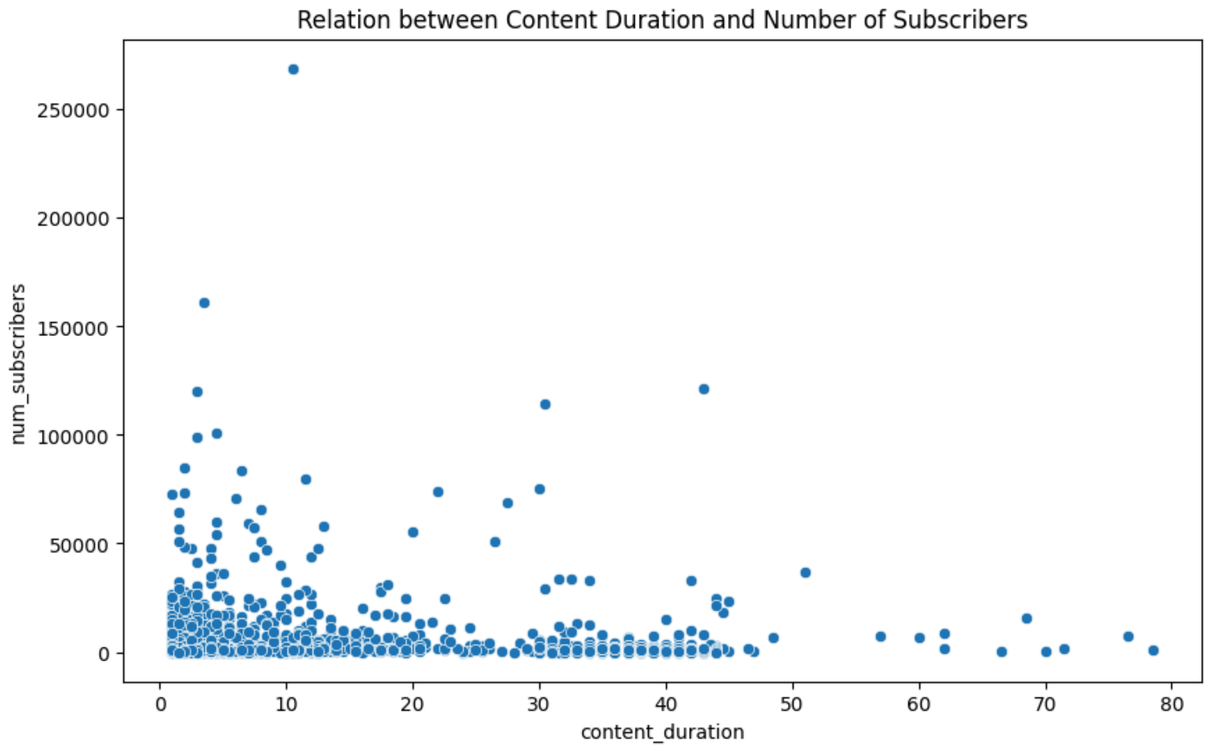
```
In [ ]: plt.figure(figsize=(10, 6))
        sns.scatterplot(x='price', y='num_subscribers', data=df)
        plt.title('Relation between Price and Number of Subscribers')
        # plt.xlabel('Price')
        # plt.ylabel('Number of Subscribers')
        plt.show()
```



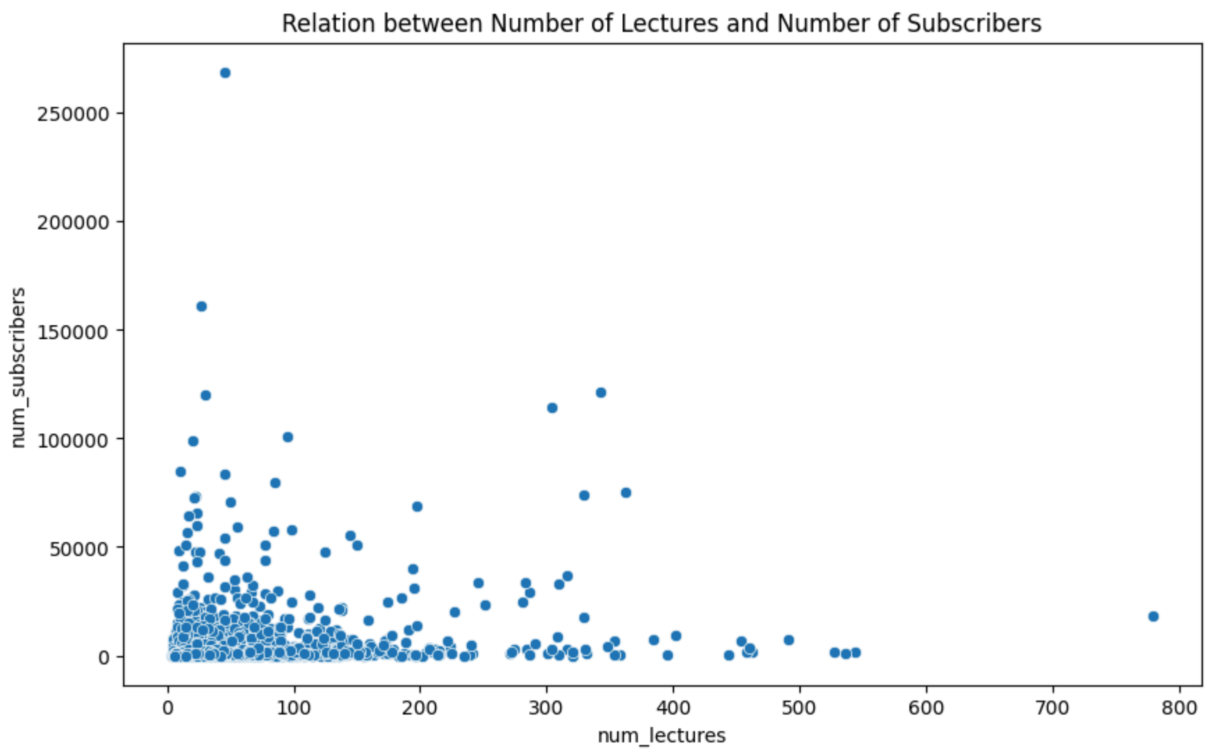
The most popular courses tend to be either free or very expensive.

9- Which Course duration and number of lectures does subscribers prefer?

In [ ]:
```
plt.figure(figsize=(10, 6))
sns.scatterplot(x='content_duration', y='num_subscribers', data=df)
plt.title('Relation between Content Duration and Number of Subscribers')
plt.show()
```

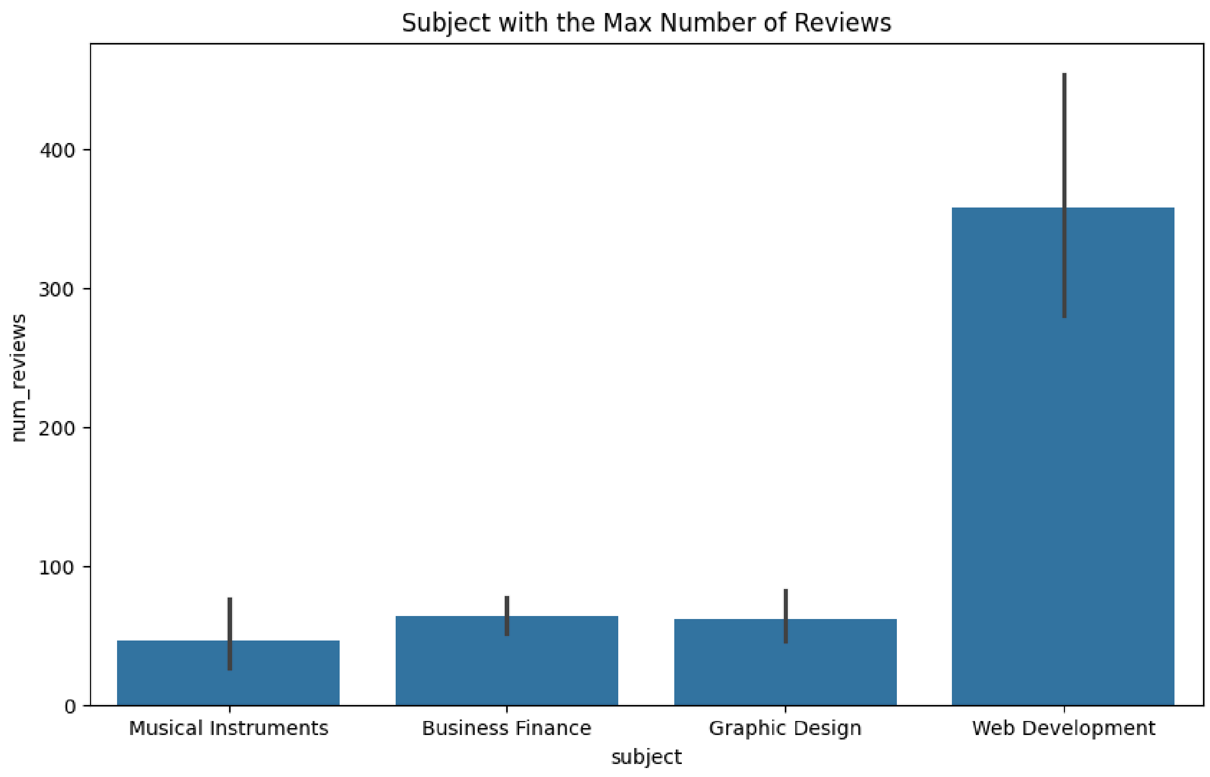


In [ ]:
```
plt.figure(figsize=(10, 6))
sns.scatterplot(x='num_lectures', y='num_subscribers', data=df)
plt.title('Relation between Number of Lectures and Number of Subscribers')
plt.show()
```



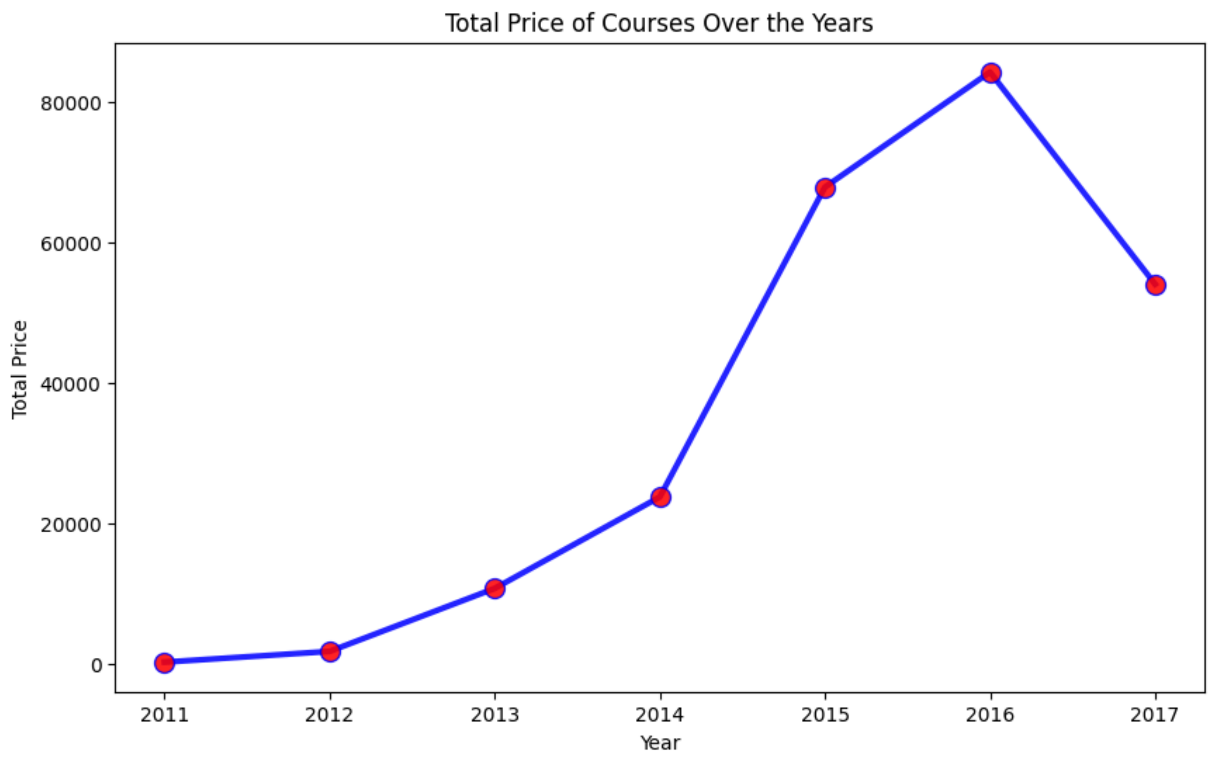
9- Which subject has the Max Number of Reviews?

In [ ]:
```python
plt.figure(figsize=(10, 6))
sns.barplot(x='subject', y='num_reviews', data=df)
plt.title('Subject with the Max Number of Reviews')
plt.show()
```



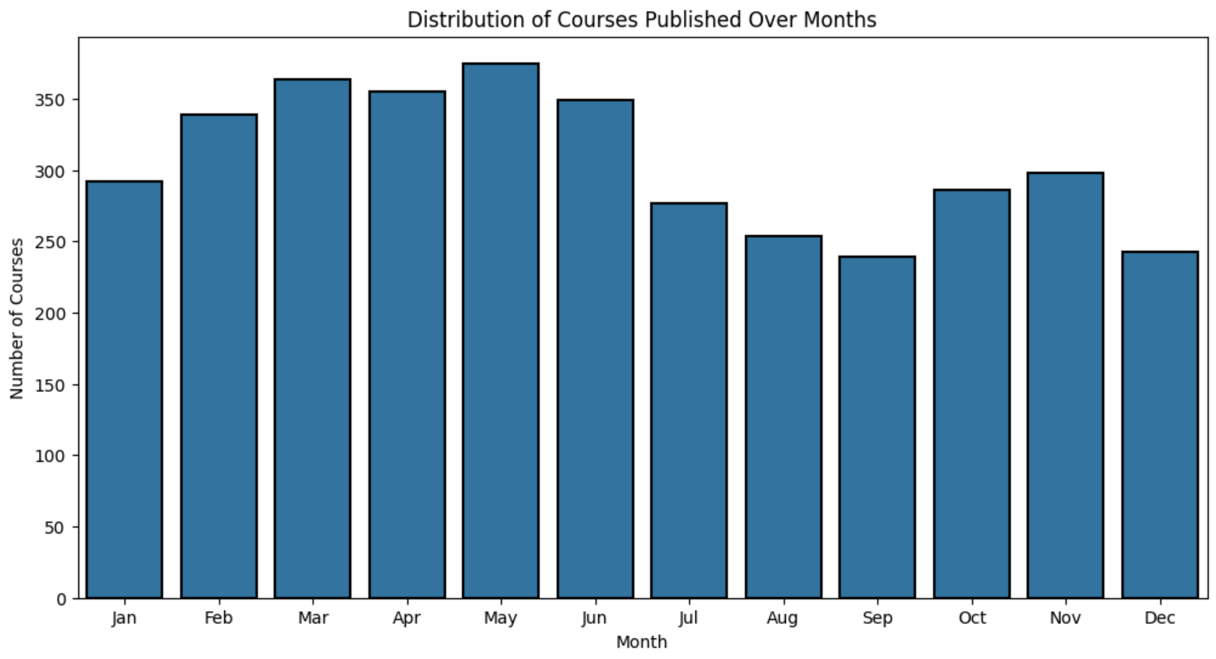
10- Total price of courses over the years

In [ ]:
```
plt.figure(figsize=(10, 6))
plt.plot(df.groupby('year')['price'].sum() , marker='o' , linestyle='-' , color='b'
plt.title('Total Price of Courses Over the Years')
plt.xlabel('Year')
plt.ylabel('Total Price')
plt.show()
```



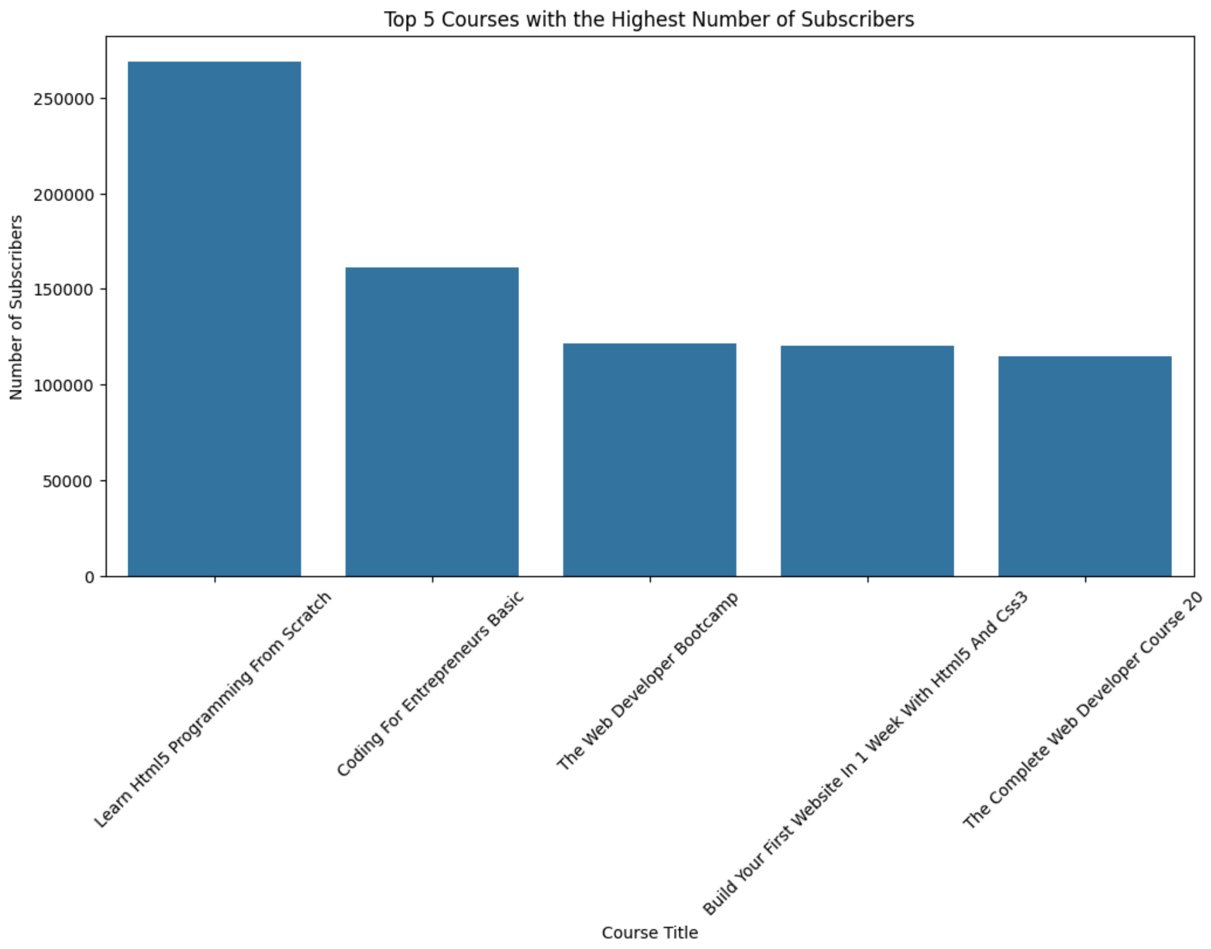
11- Distribution of Courses Published Over Months

In [ ]:
```
plt.figure(figsize=(12, 6))
sns.countplot(x='month', data=df , edgecolor='black', linewidth=1.5)
plt.title('Distribution of Courses Published Over Months')
plt.xlabel('Month')
plt.ylabel('Number of Courses')
plt.xticks(range(0, 12),['Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun', 'Jul', 'Aug', 'S
plt.show()
```



12- What is the most 5 courses that have high subscribes?

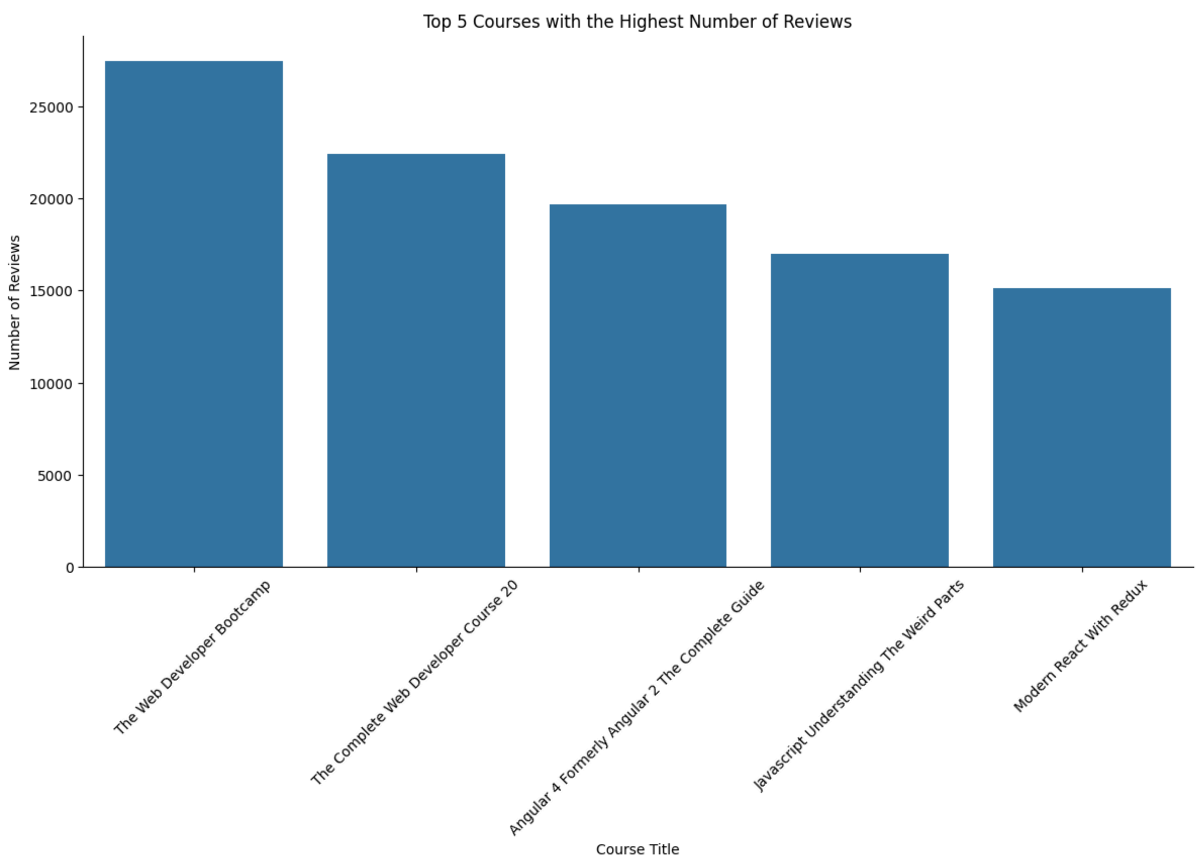
```
In [ ]: plt.figure(figsize=(12, 6))
        sns.barplot(y='num_subscribers', x='course_title', data=df.sort_values(by='num_subs
        plt.title('Top 5 Courses with the Highest Number of Subscribers')
        plt.ylabel('Number of Subscribers')
        plt.xlabel('Course Title')
        plt.xticks(rotation=45)
        plt.show()
```



13- Most 5 courses that have high reviews

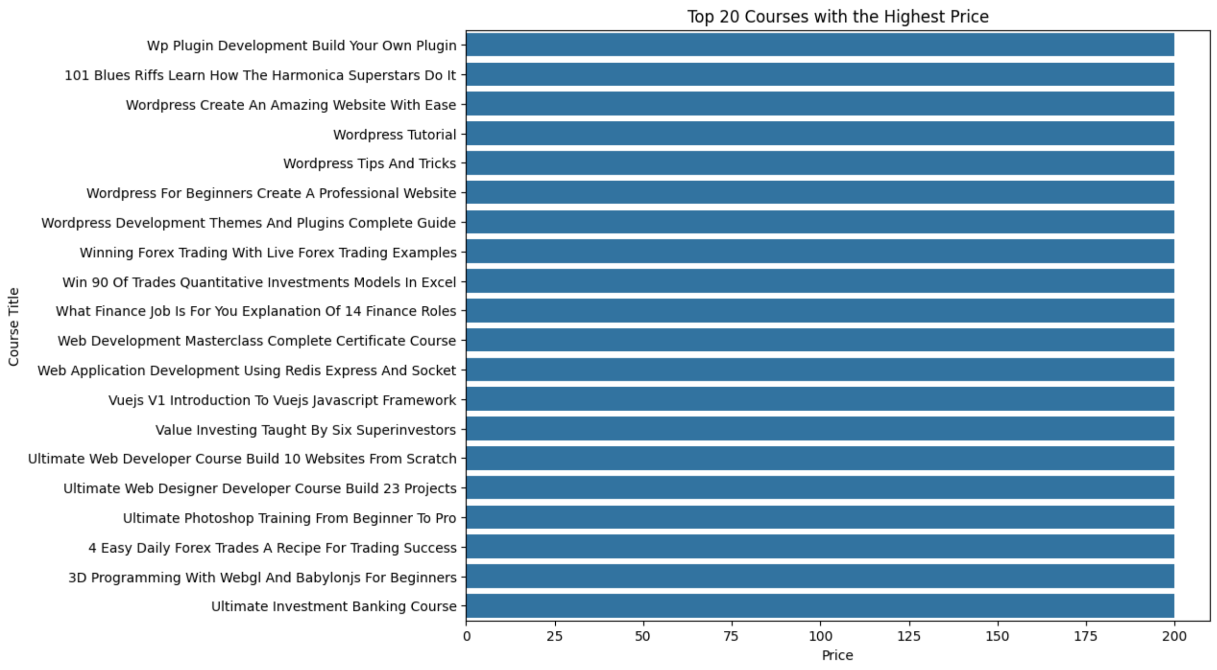
In [ ]:

```
sns.catplot(y='num_reviews', x='course_title', data=df.sort_values(by='num_reviews'
plt.title('Top 5 Courses with the Highest Number of Reviews')
plt.ylabel('Number of Reviews')
plt.xlabel('Course Title')
x_ticks = plt.xticks(rotation=45)
plt.show()
```



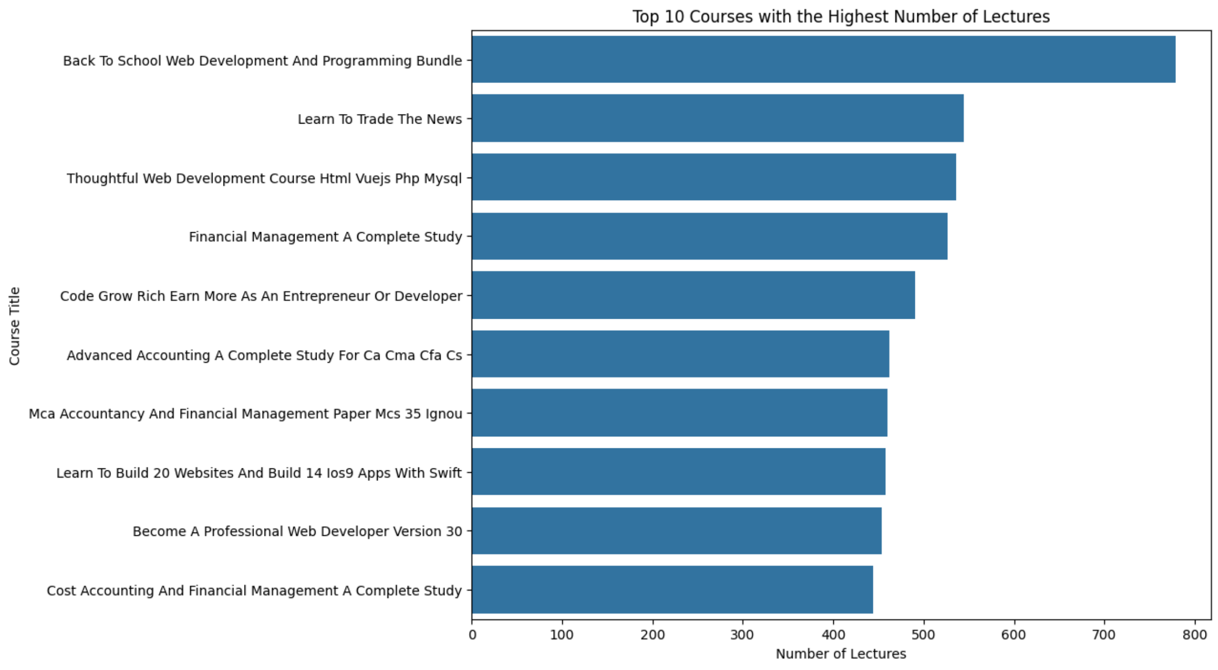
14- Top 20 courses that have price

```
In [ ]: plt.figure(figsize=(10, 8))
        sns.barplot(x='price', y='course_title', data=df.sort_values(by='price', ascending=
        plt.title('Top 20 Courses with the Highest Price')
        plt.xlabel('Price')
        plt.ylabel('Course Title')
        plt.show()
```



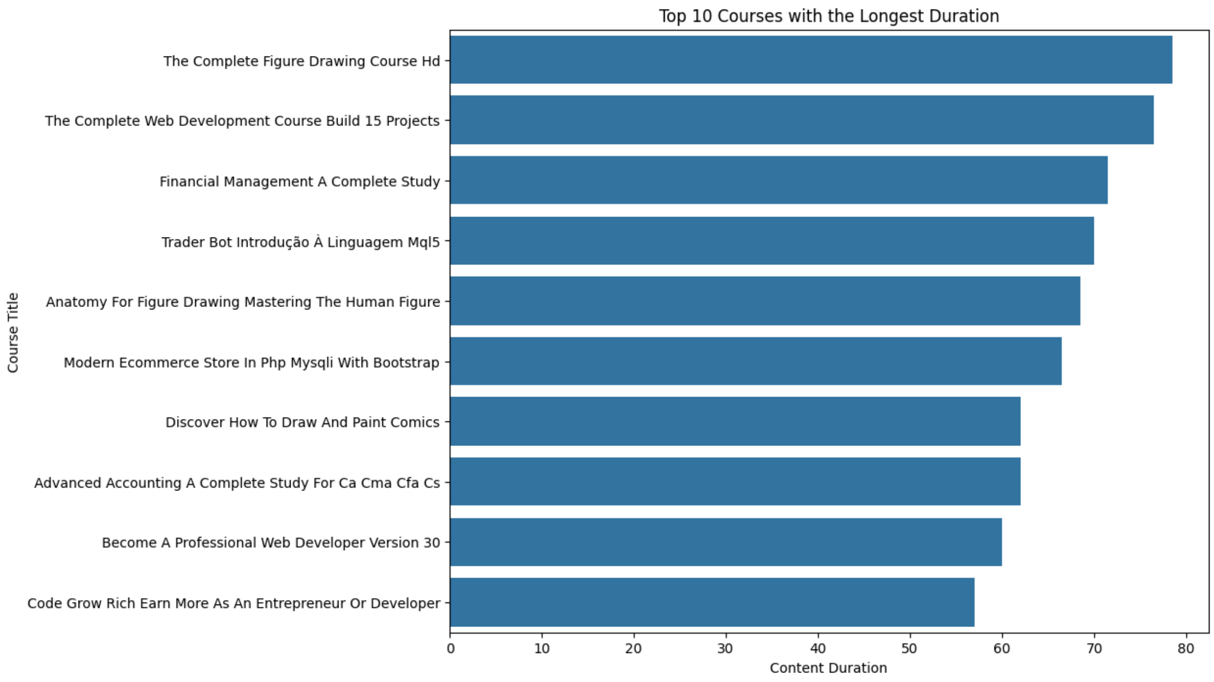
15- Top 10 Courses that have high num_lectures

```
In [ ]: plt.figure(figsize=(10, 8))
        sns.barplot(x='num_lectures', y='course_title', data=df.sort_values(by='num_lecture
        plt.title('Top 10 Courses with the Highest Number of Lectures')
        plt.xlabel('Number of Lectures')
        plt.ylabel('Course Title')
        plt.show()
        #
```



16- Top 10 Courses that have longest duration

```
In [ ]: plt.figure(figsize=(10, 8))
        sns.barplot(x='content_duration', y='course_title', data=df.sort_values(by='content
        plt.title('Top 10 Courses with the Longest Duration')
        plt.xlabel('Content Duration')
        plt.ylabel('Course Title')
        plt.show()
```


Top 10 Courses with the Longest Duration
Course Title
The Complete Figure Drawing Course Hd
The Complete Web Development Course Build 15 Projects
Financial Management A Complete Study
Trader Bot Introdução À Linguagem Mql5
Anatomy For Figure Drawing Mastering The Human Figure
Modern Ecommerce Store In Php Mysqli With Bootstrap
Discover How To Draw And Paint Comics
Advanced Accounting A Complete Study For Ca Cma Cfa Cs
Become A Professional Web Developer Version 30
Code Grow Rich Earn More As An Entrepreneur Or Developer
0
10
20
30
40
50
60
70
80
Content Duration