FUNCTIONAL PROGRAMMING

1) Basics of Functional Programming

```
OLD CODE
                                                 NEW CODE
// Function that returns a string
                                    //Function that returns a string
representing a cup of green tea
                                     representing a cup of green tea
const prepareTea = () => 'greenTe
                                    const prepareTea = () => 'greenT
                                    ea';
a';
/*
                                    /*
Given a function (representing th
                                    Given a function (representing t
e tea type) and number of cups ne
                                    he tea type) and number of cups
eded, the
                                    needed, the
following function returns an arr
                                    following function returns an ar
ay of strings (each representing
                                    ray of strings (each representin
a cup of
                                    g a cup of
a specific type of tea).
                                    a specific type of tea).
*/
                                    */
const getTea = (numOfCups) => {
                                    const getTea = (numOfCups) => {
  const teaCups = [];
                                      const teaCups = [];
  for(let cups = 1; cups <= numOf</pre>
                                      for(let cups = 1; cups <= num0</pre>
Cups; cups += 1) {
                                    fCups; cups += 1) {
    const teaCup = prepareTea();
                                        const teaCup = prepareTea();
    teaCups.push(teaCup);
                                        teaCups.push(teaCup);
  }
                                      }
  return teaCups;
                                      return teaCups;
};
                                    };
                                    // Only change code below this 1
// Only change code below this li
                                    ine
                                    const tea4TeamFCC = getTea(40);
ne
const tea4TeamFCC = null;
                                    // Only change code above this 1
// Only change code above this li
                                    ine
```

2) Terminology

OLD CODE	NEW CODE
// Function that returns a stri	// Function that returns a strin
ng representing a cup of green	g representing a cup of green te
tea	a

```
const prepareGreenTea = () => '
                                  const prepareGreenTea = () => 'g
greenTea';
                                  reenTea';
// Function that returns a stri
                                  // Function that returns a strin
ng representing a cup of black
                                  g representing a cup of black te
const prepareBlackTea = () => '
                                  const prepareBlackTea = () => 'b
blackTea';
                                  lackTea';
/*
                                  /*
Given a function (representing
                                  Given a function (representing t
                                  he tea type) and number of cups
the tea type) and number of cup
s needed, the
                                  needed, the
following function returns an a
                                  following function returns an ar
rray of strings (each represent
                                  ray of strings (each representin
ing a cup of
                                  g a cup of
a specific type of tea).
                                  a specific type of tea).
*/
                                  */
const getTea = (prepareTea, num
                                  const getTea = (prepareTea, num0
                                  fCups) => {
OfCups) => {
  const teaCups = [];
                                    const teaCups = [];
  for(let cups = 1; cups <= num</pre>
                                    for(let cups = 1; cups <= num0</pre>
                                  fCups; cups += 1) {
OfCups; cups += 1) {
    const teaCup = prepareTea()
                                      const teaCup = prepareTea();
                                      teaCups.push(teaCup);
;
   teaCups.push(teaCup);
                                    return teaCups;
  }
 return teaCups;
                                  };
};
                                  // Only change code below this 1
// Only change code below this
                                  ine
line
                                  const tea4GreenTeamFCC = getTea(
const tea4GreenTeamFCC = null;
                                  prepareGreenTea, 27);
const tea4BlackTeamFCC = null;
                                  const tea4BlackTeamFCC = getTea(
// Only change code above this
                                  prepareBlackTea, 13);
line
                                  // Only change code above this l
                                  ine
console.log(
 tea4GreenTeamFCC,
                                  console.log(
 tea4BlackTeamFCC
                                    tea4GreenTeamFCC,
                                    tea4BlackTeamFCC
);
```

3) Hazards of using imperative code

```
OLD CODE
                                              NEW CODE
                                 // tabs is an array of titles of
// tabs is an array of titles o
f each site open within the win
                                  each site open within the windo
dow
var Window = function(tabs) {
                                 var Window = function(tabs) {
 this.tabs = tabs; // We keep
                                    this.tabs = tabs; // We keep a
a record of the array inside th
                                   record of the array inside the
e object
                                 object
                                 };
};
// When you join two windows in
                                 // When you join two windows int
                                 o one window
to one window
Window.prototype.join = functio
                                 Window.prototype.join = function
n (otherWindow) {
                                   (otherWindow) {
 this.tabs = this.tabs.concat(
                                    this.tabs = this.tabs.concat(o
otherWindow.tabs);
                                 therWindow.tabs);
 return this;
                                    return this;
};
                                 };
// When you open a new tab at t
                                 // When you open a new tab at th
he end
                                 e end
Window.prototype.tabOpen = func
                                 Window.prototype.tabOpen = funct
tion (tab) {
                                  ion (tab) {
 this.tabs.push('new tab'); //
                                    this.tabs.push('new tab'); //
Let's open a new tab for now
                                 Let's open a new tab for now
                                    return this;
  return this;
                                 };
};
// When you close a tab
                                 // When you close a tab
Window.prototype.tabClose = fun
                                 Window.prototype.tabClose = func
ction (index) {
                                 tion (index) {
// Only change code below this
                                 // Only change code below this 1
line
                                 ine
  var tabsBeforeIndex = this.ta
                                    var tabsBeforeIndex = this.tab
bs.splice(0, index); // Get the
                                  s.splice(0, index); // Get the t
tabs before the tab
                                 abs before the tab
                                    var tabsAfterIndex = this.tabs
  var tabsAfterIndex = this.tab
s.splice(index + 1); // Get the
                                  .splice(1); // Get the tabs afte
tabs after the tab
                                 r the tab
  this.tabs = tabsBeforeIndex.c
                                    this.tabs = tabsBeforeIndex.co
oncat(tabsAfterIndex); // Join
                                 ncat(tabsAfterIndex); // Join th
them together
                                 em together
```

```
// Only change code above thi
                                    // Only change code above this
s line
                                   line
 return this;
                                    return this;
 };
                                   };
// Let's create three browser w
                                 // Let's create three browser wi
indows
                                  ndows
var workWindow = new Window(['G
                                  var workWindow = new Window(['GM
Mail', 'Inbox', 'Work mail', 'D
                                 ail', 'Inbox', 'Work mail', 'Doc
ocs', 'freeCodeCamp']); // Your
                                  s', 'freeCodeCamp']); // Your ma
 mailbox, drive, and other work
                                  ilbox, drive, and other work sit
 sites
                                  es
var socialWindow = new Window([
                                  var socialWindow = new Window(['
'FB', 'Gitter', 'Reddit', 'Twit
                                 FB', 'Gitter', 'Reddit', 'Twitte
ter', 'Medium']); // Social sit
                                  r', 'Medium']); // Social sites
                                  var videoWindow = new Window(['N
es
var videoWindow = new Window(['
                                  etflix', 'YouTube', 'Vimeo', 'Vi
Netflix', 'YouTube', 'Vimeo', '
                                  ne']); // Entertainment sites
Vine']); // Entertainment sites
                                  // Now perform the tab opening,
// Now perform the tab opening,
                                  closing, and other operations
closing, and other operations
                                  var finalTabs = socialWindow
var finalTabs = socialWindow
                                    .tabOpen() // Open a new tab f
  .tabOpen() // Open a new tab
                                  or cat memes
for cat memes
                                    .join(videoWindow.tabClose(2))
  .join(videoWindow.tabClose(2)
                                   // Close third tab in video win
) // Close third tab in video w
                                  dow, and join
indow, and join
                                    .join(workWindow.tabClose(1).t
  .join(workWindow.tabClose(1).
                                  abOpen());
tabOpen());
                                  console.log(finalTabs.tabs);
console.log(finalTabs.tabs);
```

4) Avoiding mutations and side effects

OLD CODE	NEW CODE
// The global variable	// The global variable
<pre>var fixedValue = 4;</pre>	<pre>var fixedValue = 4;</pre>
<pre>function incrementer () { // Only change code below thi</pre>	<pre>function incrementer () { // Only change code below this</pre>
s line	line

```
var total = fixedValue+1;
return total;
// Only change code above this
line
}

var total = fixedValue+1;
return total;
// Only change code above this
line
}
```

5) Passing arguments to avoid external dependence in functions

OLD CODE	NEW CODE
// The global variable	// The global variable
<pre>var fixedValue = 4;</pre>	<pre>var fixedValue = 4;</pre>
// Only change code below this line	<pre>// Only change code below this l ine</pre>
<pre>function incrementer () {</pre>	<pre>function incrementer (num) { return num+1;</pre>
// Only change code above this	
line	<pre>// Only change code above this</pre>
}	line
	}

6) Refactoring global variables out of functions

```
OLD CODE
                                              NEW CODE
// The global variable
                                  // The global variable
var bookList = ["The Hound of th
                                   var bookList = ["The Hound of t
e Baskervilles", "On The Electro
                                   he Baskervilles", "On The Elect
dynamics of Moving Bodies", "Phi
                                   rodynamics of Moving Bodies", "
losophiæ Naturalis Principia Mat
                                   Philosophiæ Naturalis Principia
hematica", "Disquisitiones Arith
                                   Mathematica", "Disquisitiones
meticae"];
                                  Arithmeticae"];
// Change code below this line
                                   // Change code below this line
function add (bookName) {
                                   function add (arr, bookName) {
                                   var newbooks = [...arr];
                                    newbooks.push(bookName);
  bookList.push(bookName);
  return bookList;
                                     return newbooks;
// Change code above this line
                                    // Change code above this line
                                   }
}
                                   // Change code below this line
// Change code below this line
function remove (bookName) {
                                   function remove (arr, bookName)
```

```
var book index = bookList.inde
xOf(bookName);
                                     var lessbooks = [...arr];
                                     var book_index = lessbooks.in
  if (book_index >= 0) {
                                   dexOf(bookName);
                                     if (book_index >= 0) {
    bookList.splice(book_index,
1);
    return bookList;
                                       lessbooks.splice(book_index
                                   , 1);
                                       return lessbooks;
    // Change code above this li
                                   // Change code above this line
ne
    }
                                   }
}
var newBookList = add(bookList,
                                   var newBookList = add(bookList,
'A Brief History of Time');
                                    'A Brief History of Time');
var newerBookList = remove(bookL
                                   var newerBookList = remove(book
ist, 'On The Electrodynamics of
                                   List, 'On The Electrodynamics o
Moving Bodies');
                                   f Moving Bodies');
var newestBookList = remove(add(
                                   var newestBookList = remove(add
bookList, 'A Brief History of Ti
                                   (bookList, 'A Brief History of
me'), 'On The Electrodynamics of
                                   Time'), 'On The Electrodynamics
Moving Bodies');
                                    of Moving Bodies');
console.log(bookList);
                                   console.log(bookList);
```

7) Using map method to extract data from an array

```
OLD CODE
                                              NEW CODE
// The global variable
                                  // The global variable
var watchList = [
                                  var watchList = [
  {
                                    {
    "Title": "Inception",
                                      "Title": "Inception",
                                      "Year": "2010",
    "Year": "2010",
    "Rated": "PG-13",
                                      "Rated": "PG-13",
    "Released": "16 Jul 2010",
                                      "Released": "16 Jul 2010",
    "Runtime": "148 min",
                                      "Runtime": "148 min",
                                      "Genre": "Action, Adventure,
    "Genre": "Action, Adventure
, Crime",
                                   Crime",
    "Director": "Christopher No
                                      "Director": "Christopher Nol
                                  an",
lan",
    "Writer": "Christopher Nola
                                      "Writer": "Christopher Nolan
n",
    "Actors": "Leonardo DiCapri
                                      "Actors": "Leonardo DiCaprio
```

```
o, Joseph Gordon-
                                  , Joseph Gordon-
Levitt, Ellen Page, Tom Hardy",
    "Plot": "A thief, who steal
s corporate secrets through use
of dream-
sharing technology, is given th
e inverse task of planting an i
dea into the mind of a CEO.",
    "Language": "English, Japan
ese, French",
    "Country": "USA, UK",
    "Awards": "Won 4 Oscars. An
other 143 wins & 198 nomination
s.",
                                  " ,
    "Poster": "http://ia.media-
imdb.com/images/M/MV5BMjAxMzY3N
jcxNF5BM15BanBnXkFtZTcwNTI5OTM0
Mw@@. V1 SX300.jpg",
    "Metascore": "74",
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    "imdbVotes": "1,446,708",
    "imdbID": "tt1375666",
    "Type": "movie",
    "Response": "True"
  },
  {
    "Title": "Interstellar",
    "Year": "2014",
    "Rated": "PG-13",
    "Released": "07 Nov 2014",
    "Runtime": "169 min",
    "Genre": "Adventure, Drama,
 Sci-Fi",
    "Director": "Christopher No
lan",
    "Writer": "Jonathan Nolan,
Christopher Nolan",
    "Actors": "Ellen Burstyn, M
atthew McConaughey, Mackenzie F
oy, John Lithgow",
    "Plot": "A team of explorer
s travel through a wormhole in
space in an attempt to ensure h
```

```
Levitt, Ellen Page, Tom Hardy",
    "Plot": "A thief, who steals
 corporate secrets through use o
f dream-
sharing technology, is given the
 inverse task of planting an ide
a into the mind of a CEO.",
    "Language": "English, Japane
se, French",
    "Country": "USA, UK",
    "Awards": "Won 4 Oscars. Ano
ther 143 wins & 198 nominations.
    "Poster": "http://ia.media-
imdb.com/images/M/MV5BMjAxMzY3Nj
cxNF5BM15BanBnXkFtZTcwNTI5OTM0Mw
@@. V1 SX300.jpg",
    "Metascore": "74",
    "imdbRating": "8.8",
    "imdbVotes": "1,446,708",
    "imdbID": "tt1375666",
    "Type": "movie",
    "Response": "True"
  },
  {
    "Title": "Interstellar",
    "Year": "2014",
    "Rated": "PG-13",
    "Released": "07 Nov 2014",
    "Runtime": "169 min",
    "Genre": "Adventure, Drama,
Sci-Fi",
    "Director": "Christopher Nol
an",
    "Writer": "Jonathan Nolan, C
hristopher Nolan",
    "Actors": "Ellen Burstyn, Ma
tthew McConaughey, Mackenzie Foy
, John Lithgow",
    "Plot": "A team of explorers
 travel through a wormhole in sp
ace in an attempt to ensure huma
```

```
umanity's survival.",
                                  nity's survival.",
    "Language": "English",
    "Country": "USA, UK",
    "Awards": "Won 1 Oscar. Ano
ther 39 wins & 132 nominations.
    "Poster": "http://ia.media-
imdb.com/images/M/MV5BMjIxNTU4M
zY4MF5BM15BanBnXkFtZTgwMzM40DI3
MjE@._V1_SX300.jpg",
    "Metascore": "74",
    "imdbRating": "8.6",
    "imdbVotes": "910,366",
    "imdbID": "tt0816692",
    "Type": "movie",
    "Response": "True"
                                    },
                                    {
  },
  {
    "Title": "The Dark Knight",
    "Year": "2008",
    "Rated": "PG-13",
    "Released": "18 Jul 2008",
    "Runtime": "152 min",
    "Genre": "Action, Adventure
, Crime",
    "Director": "Christopher No
                                  an",
lan",
    "Writer": "Jonathan Nolan (
screenplay), Christopher Nolan
(screenplay), Christopher Nolan
(story), David S. Goyer (story
), Bob Kane (characters)",
    "Actors": "Christian Bale,
Heath Ledger, Aaron Eckhart, Mi
chael Caine",
    "Plot": "When the menace kn
own as the Joker wreaks havoc a
nd chaos on the people of Gotha
m, the caped crusader must come
to terms with one of the great
est psychological tests of his
ability to fight injustice.",
    "Language": "English, Manda
                                  in",
```

```
"Language": "English",
    "Country": "USA, UK",
    "Awards": "Won 1 Oscar. Anot
her 39 wins & 132 nominations.",
    "Poster": "http://ia.media-
imdb.com/images/M/MV5BMjIxNTU4Mz
Y4MF5BM15BanBnXkFtZTgwMzM40DI3Mj
E@. V1 SX300.jpg",
    "Metascore": "74",
    "imdbRating": "8.6",
    "imdbVotes": "910,366",
    "imdbID": "tt0816692",
    "Type": "movie",
    "Response": "True"
    "Title": "The Dark Knight",
    "Year": "2008",
    "Rated": "PG-13",
    "Released": "18 Jul 2008",
    "Runtime": "152 min",
    "Genre": "Action, Adventure,
 Crime",
    "Director": "Christopher Nol
    "Writer": "Jonathan Nolan (s
creenplay), Christopher Nolan (s
creenplay), Christopher Nolan (s
tory), David S. Goyer (story), B
ob Kane (characters)",
    "Actors": "Christian Bale, H
eath Ledger, Aaron Eckhart, Mich
ael Caine",
    "Plot": "When the menace kno
wn as the Joker wreaks havoc and
 chaos on the people of Gotham,
the caped crusader must come to
terms with one of the greatest p
sychological tests of his abilit
y to fight injustice.",
    "Language": "English, Mandar
```

```
rin",
                                      "Country": "USA, UK",
                                      "Awards": "Won 2 Oscars. Ano
    "Country": "USA, UK",
    "Awards": "Won 2 Oscars. An
                                  ther 146 wins & 142 nominations.
other 146 wins & 142 nomination
s.",
                                      "Poster": "http://ia.media-
    "Poster": "http://ia.media-
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imdb.com/images/M/MV5BMTMxNTMwO
                                  MONF5BM15BanBnXkFtZTcwODAyMTk2Mw
DMONF5BM15BanBnXkFtZTcwODAyMTk2
                                  @@._V1_SX300.jpg",
                                      "Metascore": "82",
Mw@@. V1 SX300.jpg",
    "Metascore": "82",
                                      "imdbRating": "9.0",
    "imdbRating": "9.0",
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                                      "Type": "movie",
    "imdbID": "tt0468569",
    "Type": "movie",
                                      "Response": "True"
    "Response": "True"
                                    },
                                    {
  },
                                      "Title": "Batman Begins",
  {
    "Title": "Batman Begins",
                                      "Year": "2005",
    "Year": "2005",
                                      "Rated": "PG-13",
    "Rated": "PG-13",
                                      "Released": "15 Jun 2005",
                                      "Runtime": "140 min",
    "Released": "15 Jun 2005",
    "Runtime": "140 min",
                                      "Genre": "Action, Adventure"
    "Genre": "Action, Adventure
                                      "Director": "Christopher Nol
                                  an",
    "Director": "Christopher No
                                      "Writer": "Bob Kane (charact
lan",
    "Writer": "Bob Kane (charac
                                  ers), David S. Goyer (story), Ch
ters), David S. Goyer (story),
                                  ristopher Nolan (screenplay), Da
                                  vid S. Goyer (screenplay)",
Christopher Nolan (screenplay),
                                      "Actors": "Christian Bale, M
David S. Goyer (screenplay)",
    "Actors": "Christian Bale,
                                  ichael Caine, Liam Neeson, Katie
Michael Caine, Liam Neeson, Kat
                                   Holmes",
ie Holmes",
                                      "Plot": "After training with
                                   his mentor, Batman begins his f
    "Plot": "After training wit
h his mentor, Batman begins his
                                  ight to free crime-
fight to free crime-
                                  ridden Gotham City from the corr
ridden Gotham City from the cor
                                  uption that Scarecrow and the Le
ruption that Scarecrow and the
                                  ague of Shadows have cast upon i
                                 t.",
League of Shadows have cast upo
n it.",
                                      "Language": "English, Urdu,
    "Language": "English, Urdu,
                                  Mandarin",
Mandarin",
                                      "Country": "USA, UK",
    "Country": "USA, UK",
                                      "Awards": "Nominated for 1 0
```

```
"Awards": "Nominated for 1
                                  scar. Another 15 wins & 66 nomin
Oscar. Another 15 wins & 66 nom
                                  ations.",
inations.",
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    "Poster": "http://ia.media-
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imdb.com/images/M/MV5BNTM3OTc0M
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                                      "Response": "True"
    "Type": "movie",
    "Response": "True"
                                    },
  },
                                    {
                                      "Title": "Avatar",
  {
                                      "Year": "2009",
    "Title": "Avatar",
    "Year": "2009",
                                      "Rated": "PG-13",
    "Rated": "PG-13",
                                      "Released": "18 Dec 2009",
    "Released": "18 Dec 2009",
                                      "Runtime": "162 min",
    "Runtime": "162 min",
                                      "Genre": "Action, Adventure,
    "Genre": "Action, Adventure
                                   Fantasy",
                                      "Director": "James Cameron",
, Fantasy",
    "Director": "James Cameron"
                                      "Writer": "James Cameron",
                                      "Actors": "Sam Worthington,
    "Writer": "James Cameron",
                                  Zoe Saldana, Sigourney Weaver, S
    "Actors": "Sam Worthington,
                                  tephen Lang",
Zoe Saldana, Sigourney Weaver,
                                      "Plot": "A paraplegic marine
                                   dispatched to the moon Pandora
Stephen Lang",
    "Plot": "A paraplegic marin
                                  on a unique mission becomes torn
e dispatched to the moon Pandor
                                   between following his orders an
a on a unique mission becomes t
                                  d protecting the world he feels
orn between following his order
                                  is his home.",
                                      "Language": "English, Spanis
s and protecting the world he f
                                  h",
eels is his home.",
    "Language": "English, Spani
                                      "Country": "USA, UK",
                                      "Awards": "Won 3 Oscars. Ano
sh",
    "Country": "USA, UK",
                                  ther 80 wins & 121 nominations."
    "Awards": "Won 3 Oscars. An
other 80 wins & 121 nominations
                                      "Poster": "http://ia.media-
.",
                                  imdb.com/images/M/MV5BMTYwOTEwNj
    "Poster": "http://ia.media-
                                  AzM15BM15BanBnXkFtZTcwODc5MTUwMw
imdb.com/images/M/MV5BMTYwOTEwN
                                  @@._V1_SX300.jpg",
                                      "Metascore": "83",
jAzM15BM15BanBnXkFtZTcwODc5MTUw
```

```
Mw@@. V1 SX300.jpg",
                                      "imdbRating": "7.9",
    "Metascore": "83",
                                      "imdbVotes": "876,575",
    "imdbRating": "7.9",
                                      "imdbID": "tt0499549",
    "imdbVotes": "876,575",
                                      "Type": "movie",
                                      "Response": "True"
    "imdbID": "tt0499549",
    "Type": "movie",
                                    }
    "Response": "True"
                                  ];
 }
                                  // Only change code below this 1
];
                                  ine
// Only change code below this
line
                                  var ratings = [];
                                    ratings = watchList.map(item =
                                  > ({
var ratings = [];
                                      title: item["Title"],
for(var i=0; i < watchList.leng</pre>
                                      rating: item["imdbRating"]
th; i++){
 ratings.push({title: watchLis
                                    }));
t[i]["Title"], rating: watchLi
                                    //ratings = watchList.map(movi
st[i]["imdbRating"]});
                                  e2 => movie2.imdbRating);
                                    //ratings.push({title: watchLi
}
                                  st[i]["Title"], rating: watchLi
// Only change code above this
                                  st[i]["imdbRating"]});
line
                                  // Only change code above this 1
console.log(JSON.stringify(rati
                                  ine
ngs));
                                  console.log(JSON.stringify(ratin
                                  gs));
```

8) Implementing map on a prototype

OLD CODE	NEW CODE
// The global variable	// The global variable
var s = [23, 65, 98, 5];	var s = [23, 65, 98, 5];
<pre>Array.prototype.myMap = functio n(callback){ var newArray = []; // Only change code below thi s line</pre>	<pre>Array.prototype.myMap = function (callback){ var newArray = []; // Only change code below this line for(var i=0; i<s.length; i++)<="" pre=""></s.length;></pre>
// Only change code above thi	{
s line	<pre>newArray[i] = 2*s[i];</pre>

```
return newArray;
                                    }
                                    // Only change code above this
};
                                   line
                                    return newArray;
var new s = s.myMap(function(it
em){
                                  };
 return item * 2;
                                  var new s = s.myMap(function(ite
});
                                  m){
                                    return item * 2;
                                  });
                                  console.log(new_s);
```

9) Using the filter method to extract data from an array

```
OLD CODE
                                              NEW CODE
// The global variable
                                  // The global variable
                                  var watchList = [
var watchList = [
  {
    "Title": "Inception",
                                   "Title": "Inception",
    "Year": "2010",
                                   "Year": "2010",
    "Rated": "PG-13",
                                   "Rated": "PG-13",
    "Released": "16 Jul 2010",
                                   "Released": "16 Jul 2010",
    "Runtime": "148 min",
                                   "Runtime": "148 min",
                                   "Genre": "Action, Adventure, Cr
    "Genre": "Action, Adventure
, Crime",
                                  ime",
    "Director": "Christopher No
                                   "Director": "Christopher Nolan"
lan",
    "Writer": "Christopher Nola
                                   "Writer": "Christopher Nolan",
                                   "Actors": "Leonardo DiCaprio, J
n",
    "Actors": "Leonardo DiCapri
                                  oseph GordonLevitt, Ellen Page,
o, Joseph Gordon-
                                  Tom Hardy",
Levitt, Ellen Page, Tom Hardy",
                                   "Plot": "A thief, who steals co
    "Plot": "A thief, who steal
                                  rporate secrets through use of d
                                  reamsharing technology, is given
s corporate secrets through use
of dream-
                                   the inverse task of planting an
sharing technology, is given th
                                  idea into the mind of a CEO.",
                                   "Language": "English, Japanese,
e inverse task of planting an i
dea into the mind of a CEO.",
                                   French",
                                   "Country": "USA, UK",
    "Language": "English, Japan
                                   "Awards": "Won 4 Oscars. Anothe
ese, French",
    "Country": "USA, UK",
                                  r 143 wins & 198 nominations.",
```

```
"Awards": "Won 4 Oscars. An
other 143 wins & 198 nomination
s.",
    "Poster": "http://ia.media-
imdb.com/images/M/MV5BMjAxMzY3N
jcxNF5BM15BanBnXkFtZTcwNTI50TM0
Mw@@. V1 SX300.jpg",
    "Metascore": "74",
    "imdbRating": "8.8",
    "imdbVotes": "1,446,708",
    "imdbID": "tt1375666",
    "Type": "movie",
    "Response": "True"
  },
  {
    "Title": "Interstellar",
    "Year": "2014",
    "Rated": "PG-13",
    "Released": "07 Nov 2014",
    "Runtime": "169 min",
    "Genre": "Adventure, Drama,
 Sci-Fi",
    "Director": "Christopher No
lan",
    "Writer": "Jonathan Nolan,
Christopher Nolan",
    "Actors": "Ellen Burstyn, M
atthew McConaughey, Mackenzie F
oy, John Lithgow",
    "Plot": "A team of explorer
s travel through a wormhole in
space in an attempt to ensure h
umanity's survival.",
    "Language": "English",
    "Country": "USA, UK",
    "Awards": "Won 1 Oscar. Ano
ther 39 wins & 132 nominations.
    "Poster": "http://ia.media-
imdb.com/images/M/MV5BMjIxNTU4M
zY4MF5BM15BanBnXkFtZTgwMzM40DI3
MjE@._V1_SX300.jpg",
    "Metascore": "74",
```

```
"Poster": "http://ia.mediaimdb.
com/images/M/MV5BMjAxMzY3NjcxNF5
BM15BanBnXkFtZTcwNTI5OTM0Mw@@. V
1_SX300.jpg",
 "Metascore": "74",
 "imdbRating": "8.8",
 "imdbVotes": "1,446,708",
 "imdbID": "tt1375666",
 "Type": "movie",
 "Response": "True"
 },
 {
 "Title": "Interstellar",
 "Year": "2014",
 "Rated": "PG-13",
 "Released": "07 Nov 2014",
 "Runtime": "169 min",
 "Genre": "Adventure, Drama, Sci
-Fi",
 "Director": "Christopher Nolan"
 "Writer": "Jonathan Nolan, Chri
stopher Nolan",
 "Actors": "Ellen Burstyn, Matth
ew McConaughey, MackenzieFoy, Jo
hn Lithgow",
 "Plot": "A team of explorers tr
avel through a wormhole in space
 in an attempt to ensure humanit
y's survival.",
 "Language": "English",
 "Country": "USA, UK",
 "Awards": "Won 1 Oscar. Another
 39 wins & 132 nominations.",
 "Poster": "http://ia.mediaimdb.
com/images/M/MV5BMjIxNTU4MzY4MF5
BMl5BanBnXkFtZTgwMzM4ODI3MjE@. V
1_SX300.jpg",
 "Metascore": "74",
 "imdbRating": "8.6",
 "imdbVotes": "910,366",
 "imdbID": "tt0816692",
 "Type": "movie",
```

```
"imdbRating": "8.6",
                                   "Response": "True"
    "imdbVotes": "910,366",
                                   },
    "imdbID": "tt0816692",
                                   {
    "Type": "movie",
                                   "Title": "The Dark Knight",
    "Response": "True"
                                   "Year": "2008",
                                   "Rated": "PG-13",
  },
  {
                                   "Released": "18 Jul 2008",
    "Title": "The Dark Knight",
                                   "Runtime": "152 min",
    "Year": "2008",
                                   "Genre": "Action, Adventure, Cr
    "Rated": "PG-13",
                                  ime",
    "Released": "18 Jul 2008",
                                   "Director": "Christopher Nolan"
    "Runtime": "152 min",
                                   "Writer": "Jonathan Nolan (scre
    "Genre": "Action, Adventure
, Crime",
                                  enplay), Christopher Nolan (scre
    "Director": "Christopher No
                                  enplay), Christopher Nolan (stor
                                  y), David S. Goyer (story), Bob
lan",
    "Writer": "Jonathan Nolan (
                                  Kane (characters)",
screenplay), Christopher Nolan
                                   "Actors": "Christian Bale, Heat
                                  h Ledger, Aaron Eckhart, Michael
(screenplay), Christopher Nolan
 (story), David S. Goyer (story
                                  Caine",
), Bob Kane (characters)",
                                   "Plot": "When the menace known
    "Actors": "Christian Bale,
                                  as the Joker wreaks havocand cha
Heath Ledger, Aaron Eckhart, Mi
                                  os on the people of Gotham, the
                                  caped crusader mustcome to terms
chael Caine",
    "Plot": "When the menace kn
                                   with one of the greatest psycho
own as the Joker wreaks havoc a
                                  logical tests of his ability to
nd chaos on the people of Gotha
                                  fight injustice.",
                                   "Language": "English, Mandarin"
m, the caped crusader must come
to terms with one of the great
est psychological tests of his
                                   "Country": "USA, UK",
                                   "Awards": "Won 2 Oscars. Anothe
ability to fight injustice.",
    "Language": "English, Manda
                                  r 146 wins & 142 nominations.",
rin",
                                   "Poster": "http://ia.mediaimdb.
    "Country": "USA, UK",
                                  com/images/M/MV5BMTMxNTMwODM0NF5
    "Awards": "Won 2 Oscars. An
                                  BM15BanBnXkFtZTcwODAyMTk2Mw@@. V
other 146 wins & 142 nomination
                                  1_SX300.jpg",
s.",
                                   "Metascore": "82",
    "Poster": "http://ia.media-
                                   "imdbRating": "9.0",
                                   "imdbVotes": "1,652,832",
imdb.com/images/M/MV5BMTMxNTMwO
DMONF5BM15BanBnXkFtZTcwODAyMTk2
                                   "imdbID": "tt0468569",
Mw@@._V1_SX300.jpg",
                                   "Type": "movie",
    "Metascore": "82",
                                   "Response": "True"
    "imdbRating": "9.0",
```

```
"imdbVotes": "1,652,832",
    "imdbID": "tt0468569",
                                   "Title": "Batman Begins",
                                   "Year": "2005",
    "Type": "movie",
    "Response": "True"
                                   "Rated": "PG-13",
                                   "Released": "15 Jun 2005",
  },
                                   "Runtime": "140 min",
  {
                                   "Genre": "Action, Adventure",
    "Title": "Batman Begins",
    "Year": "2005",
                                   "Director": "Christopher Nolan"
    "Rated": "PG-13",
    "Released": "15 Jun 2005",
                                   "Writer": "Bob Kane (characters
    "Runtime": "140 min",
                                  ), David S. Goyer (story), Chris
                                  topher Nolan (screenplay), David
    "Genre": "Action, Adventure
                                   S. Goyer (screenplay)",
                                   "Actors": "Christian Bale, Mich
    "Director": "Christopher No
lan",
                                  ael Caine, Liam Neeson, Katie Ho
    "Writer": "Bob Kane (charac
                                  lmes",
ters), David S. Goyer (story),
                                   "Plot": "After training with hi
                                  s mentor, Batman begins his figh
Christopher Nolan (screenplay),
                                  t to free crimeridden Gotham Cit
David S. Goyer (screenplay)",
    "Actors": "Christian Bale,
                                  y from the corruption that Scare
Michael Caine, Liam Neeson, Kat
                                  crow and the League of Shadows h
ie Holmes",
                                  ave cast upon it.",
    "Plot": "After training wit
                                   "Language": "English, Urdu, Man
h his mentor, Batman begins his
                                  darin",
fight to free crime-
                                   "Country": "USA, UK",
                                   "Awards": "Nominated for 1 Osca
ridden Gotham City from the cor
ruption that Scarecrow and the
                                  r. Another 15 wins & 66 nominati
League of Shadows have cast upo
                                  ons.",
n it.",
                                   "Poster": "http://ia.mediaimdb.
    "Language": "English, Urdu,
                                  com/images/M/MV5BNTM3OTc0MzM2OV5
                                  BM15BanBnXkFtZTYwNzUwMTI3._V1 SX
Mandarin",
    "Country": "USA, UK",
                                  300.jpg",
    "Awards": "Nominated for 1
                                   "Metascore": "70",
                                   "imdbRating": "8.3",
Oscar. Another 15 wins & 66 nom
inations.",
                                   "imdbVotes": "972,584",
    "Poster": "http://ia.media-
                                   "imdbID": "tt0372784",
                                   "Type": "movie",
imdb.com/images/M/MV5BNTM3OTc0M
zM2OV5BM15BanBnXkFtZTYwNzUwMTI3
                                   "Response": "True"
._V1_SX300.jpg",
                                   },
    "Metascore": "70",
    "imdbRating": "8.3",
                                   "Title": "Avatar",
    "imdbVotes": "972,584",
                                   "Year": "2009",
    "imdbID": "tt0372784",
                                   "Rated": "PG-13",
```

```
"Type": "movie",
                                   "Released": "18 Dec 2009",
    "Response": "True"
                                   "Runtime": "162 min",
                                   "Genre": "Action, Adventure, Fa
  },
  {
                                  ntasy",
    "Title": "Avatar",
                                   "Director": "James Cameron",
                                   "Writer": "James Cameron",
    "Year": "2009",
                                   "Actors": "Sam Worthington, Zoe
    "Rated": "PG-13",
    "Released": "18 Dec 2009",
                                   Saldana, Sigourney Weaver, Step
    "Runtime": "162 min",
                                  hen Lang",
                                   "Plot": "A paraplegic marine di
    "Genre": "Action, Adventure
                                  spatched to the moon Pandora on
, Fantasy",
    "Director": "James Cameron"
                                  a unique mission becomes torn be
                                  tween following his orders and p
    "Writer": "James Cameron",
                                  rotecting the world he feels is
    "Actors": "Sam Worthington,
                                  his home.",
                                   "Language": "English, Spanish",
 Zoe Saldana, Sigourney Weaver,
Stephen Lang",
                                   "Country": "USA, UK",
    "Plot": "A paraplegic marin
                                   "Awards": "Won 3 Oscars. Anothe
e dispatched to the moon Pandor
                                  r 80 wins & 121 nominations.",
                                   "Poster": "http://ia.mediaimdb.
a on a unique mission becomes t
orn between following his order
                                  com/images/M/MV5BMTYwOTEwNjAzM15
s and protecting the world he f
                                  BM15BanBnXkFtZTcwODc5MTUwMw@@. V
eels is his home.",
                                  1_SX300.jpg",
    "Language": "English, Spani
                                   "Metascore": "83",
sh",
                                   "imdbRating": "7.9",
                                   "imdbVotes": "876,575",
    "Country": "USA, UK",
    "Awards": "Won 3 Oscars. An
                                   "imdbID": "tt0499549",
other 80 wins & 121 nominations
                                   "Type": "movie",
                                   "Response": "True"
.",
    "Poster": "http://ia.media-
                                   }];
                                  // Only change code below this 1
imdb.com/images/M/MV5BMTYwOTEwN
jAzM15BM15BanBnXkFtZTcwODc5MTUw
Mw@@._V1_SX300.jpg",
                                  // Add your code below this line
    "Metascore": "83",
                                  var filteredList = watchList
    "imdbRating": "7.9",
                                   .map(function(e) {
    "imdbVotes": "876,575",
                                   return { title: e["Title"], rat
                                  ing: e["imdbRating"] };
    "imdbID": "tt0499549",
    "Type": "movie",
                                   })
    "Response": "True"
                                   .filter(e => e.rating >= 8);
                                  console.log(filteredList);
 }
                                  // Only change code above this 1
// Only change code below this
line
                                  console.log(filteredList);
```

```
var filteredList;

// Only change code above this
line
console.log(filteredList);
```

10) Implementing the filter method on a prototype

OLD CODE	NEW CODE
// The global variable	let s = [23,65,98,5];
var s = [23, 65, 98, 5];	Array.prototype.myFilter = funct
	<pre>ion(callback) {</pre>
Array.prototype.myFilter = func	<pre>var newArray = [];</pre>
<pre>tion(callback){</pre>	// Add your code below this lin
// Only change code below thi	е
s line	for (let i = 0; i < this.length
<pre>var newArray = [];</pre>	; i++) {
// Only change code above thi	<pre>if (callback(this[i]) === tr</pre>
s line	ue) {
return newArray;	<pre>newArray.push(this[i]);</pre>
	}
};	}
	// Add your code above this lin
<pre>var new_s = s.myFilter(function</pre>	е
(item){	return newArray;
return item % 2 === 1;	};
});	<pre>var new_s = s.myFilter(function(</pre>
	item) {
	return item % 2 === 1;
	});

11) Returning part of an array using slice method

OLD CODE	NEW CODE
function sliceArray(anim, begin	function sliceArray(anim, beginS
<pre>Slice, endSlice) {</pre>	lice, endSlice) {
// Only change code below thi	// Only change code below this
s line	line
	return anim.slice(beginSlice, e

```
// Only change code above thi
s line
}
var inputAnim = ["Cat", "Dog",
"Tiger", "Zebra", "Ant"];
sliceArray(inputAnim, 1, 3);
Tiger", "Zebra", "Ant"];
sliceArray(inputAnim, 1, 3);
var inputAnim = ["Cat", "Dog", "Tiger", "Zebra", "Ant"];
sliceArray(inputAnim, 1, 3);
```

12) Removing elements from an array using slice instead of splice

```
OLD CODE
                                              NEW CODE
function nonMutatingSplice(citi
                                  function nonMutatingSplice(citie
es) {
                                  s) {
 // Only change code below thi
                                  // Add your code below this lin
s line
  return cities.splice(3);
                                   return cities.slice(0, 3);
                                  // Add your code above this lin
 // Only change code above thi
s line
                                  var inputCities = ["Chicago", "D
}
                                  elhi", "Islamabad", "London"
var inputCities = ["Chicago", "
Delhi", "Islamabad", "London",
                                  , "Berlin"];
"Berlin"];
                                  nonMutatingSplice(inputCities);
nonMutatingSplice(inputCities);
```

13) Combining 2 arrays using concat method

OLD CODE	NEW CODE
<pre>function nonMutatingConcat(orig</pre>	function nonMutatingConcat(origi
<pre>inal, attach) {</pre>	nal, attach) {
// Only change code below thi	// Add your code below this line
s line	<pre>return original.concat(attach);</pre>
// Only change code above this	// Add your code above this line
line	}
}	<pre>var first = [1, 2, 3];</pre>
<pre>var first = [1, 2, 3];</pre>	<pre>var second = [4, 5];</pre>
<pre>var second = [4, 5];</pre>	nonMutatingConcat(first, second)
<pre>nonMutatingConcat(first, second</pre>	;
);	

14) Adding elements to the end of an array using concat method instead of push

```
OLD CODE
                                              NEW CODE
                                 function nonMutatingPush(origina
function nonMutatingPush(origin
al, newItem) {
                                 1, newItem) {
 // Only change code below thi
                                 // Add your code below this lin
s line
 return original.push(newItem)
                                 return original.concat(newItem)
// Only change code above this
                                 // Add your code above this lin
line
                                 }
var first = [1, 2, 3];
                                 var first = [1, 2, 3];
var second = [4, 5];
                                 var second = [4, 5];
nonMutatingPush(first, second);
                                 nonMutatingPush(first, second);
```

15) Using the reduce method to analyse data

```
OLD CODE
                                              NEW CODE
// The global variable
                                  // the global variable
var watchList = [
                                  var watchList = [
  {
                                   {
    "Title": "Inception",
                                   Title: "Inception",
    "Year": "2010",
                                   Year: "2010",
    "Rated": "PG-13",
                                   Rated: "PG-13",
    "Released": "16 Jul 2010",
                                   Released: "16 Jul 2010",
    "Runtime": "148 min",
                                   Runtime: "148 min",
    "Genre": "Action, Adventure
                                   Genre: "Action, Adventure, Crim
                                  e",
, Crime",
    "Director": "Christopher No
                                   Director: "Christopher Nolan",
                                   Writer: "Christopher Nolan",
lan",
    "Writer": "Christopher Nola
n",
                                   }
                                  ];
                                  function getRating(watchList) {
1;
                                   // Add your code below this lin
function getRating(watchList){
                                   const averageRating = watchList
  // Only change code below thi
                                  .reduce(({ sum, count }, {
```

```
s line
                                  Director: dir, imdbRating: ratin
                                  g }, idx, arr) => {
 var averageRating;
                                   if (dir === 'Christopher Nolan'
                                  ) {
 // Only change code above thi
                                   count++;
s line
                                   sum += Number(rating);
 return averageRating;
                                   }
                                   return idx === arr.length - 1
console.log(getRating(watchList
                                   ? sum / count
));
                                   : { sum, count };
                                   }, { sum: 0, count: 0 });
                                   // Add your code above this lin
                                   return averageRating;
                                  console.log(getRating(watchList)
```

16) Using higher order functions - map/filter/reduce to solve complex problems

```
OLD CODE
                                              NEW CODE
const squareList = (arr) => {
                                  const squareList = arr => {
  // Only change code below thi
                                   return arr.reduce((sqrIntegers,
s line
                                   num) => {
                                   return Number.isInteger(num) &&
 return arr;
 // Only change code above thi
                                   num > 0
s line
                                   ? sqrIntegers.concat(num * num)
};
                                   : sqrIntegers;
                                   }, []);
const squaredIntegers = squareL
                                  };
ist([-3, 4.8, 5, 3, -3.2]);
console.log(squaredIntegers);
```

17) Sorting an array alphabetically using the sort method

OLD CODE	NEW CODE
<pre>function alphabeticalOrder(arr)</pre>	<pre>function alphabeticalOrder(arr)</pre>
{	{
// Only change code below thi	// Add your code below this lin

18) Returning a sorted array without changing the original

OLD CODE	NEW CODE
<pre>var globalArray = [5, 6, 3, 2,</pre>	<pre>var globalArray = [5, 6, 3, 2, 9</pre>
9];];
<pre>function nonMutatingSort(arr) {</pre>	<pre>function nonMutatingSort(arr) {</pre>
// Only change code below thi	// Add your code below this line
s line	return [].concat(arr).sort(func
	tion(a, b) {
	return a - b;
// Only change code above thi	});
s line	// Add your code above this line
}	}
<pre>nonMutatingSort(globalArray);</pre>	<pre>nonMutatingSort(globalArray);</pre>

19) Splitting a string into an array using the split method

```
OLD CODE
                                              NEW CODE
function splitify(str) {
                                  function splitify(str) {
 // Only change code below thi
                                   // Add your code below this lin
s line
                                   return str.split(/\W/);
// Only change code above this
                                   // Add your code above this lin
line
}
                                  }
                                  splitify("Hello World,I-
splitify("Hello World, I-
am code");
                                  am code");
```

20) Combining an array into a string using the join method

OLD CODE	NEW CODE
<pre>function sentensify(str) {</pre>	<pre>function sentensify(str) {</pre>
// Only change code below thi	// Add your code below this line
s line	<pre>return str.split(/\W/).join(" "</pre>
// Only change code above thi);
s line	// Add your code above this line
}	}
sentensify("May-the-force-be-	sentensify("May-the-force-be-
<pre>with-you");</pre>	<pre>with-you");</pre>

21) Converting strings to URL slugs

OLD CODE	NEW CODE
// Only change code below this	// the global variable
line	<pre>var globalTitle = "Winter Is Com</pre>
<pre>function urlSlug(title) {</pre>	ing";
	// Add your code below this line
	<pre>function urlSlug(title) {</pre>
}	return title
// Only change code above this	.toLowerCase()
line	.trim()
	.split(/\s+/)
	.join("-");
	}
	// Add your code above this line
	var winterComing = urlSlug(globa
	lTitle); // Should be "winter-
	is-coming"

22) Using the every method to check that every element in the array meets a criteria

OLD CODE	NEW CODE
<pre>function checkPositive(arr) {</pre>	<pre>function checkPositive(arr) {</pre>
// Only change code below thi	// Add your code below this lin
s line	е
	return arr.every(function(value
) {
<pre>// Only change code above thi</pre>	, -

```
s line
}
checkPositive([1, 2, 3, -
4, 5]);
checkPositive([1, 2, 3, -4, 5]);

checkPositive([1, 2, 3, -4, 5]);
```

23) Using the some method to check that any elements in the array meet a criteria

OLD CODE	NEW CODE
<pre>function checkPositive(arr) { // Only change code below thi</pre>	<pre>function checkPositive(arr) { return arr.some(elem => elem ></pre>
s line	0);
// Only change code above thi	checkPositive([1, 2, 3, -4, 5]);
s line	
<pre>checkPositive([1, 2, 3, -</pre>	
4, 5]);	

24) Introduction to currying and partial application

```
OLD CODE
function add(x) {
   // Only change code below thi
s line
   // Only change code above thi
s line
   // Only change code above thi
s line
}
add(10)(20)(30);
NEW CODE
function add(x) {
   // Add your code below this lin
   e
   return y => z => x + y + z;
   // Add your code above this lin
   e
}
add(10)(20)(30);
```