chilla with Baba Aammar

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Bachelor's in Computer Science

Table of Content

DataScience with Python | Crash Course

(1). PYTHON Basics

1st Program with PY !

In [1]:
```
print("Fahad")
print("COMSATS University Islamabad (Sahiwal Campus)")
print(2+3)
```

```
Fahad
COMSATS University Islamabad (Sahiwal Campus)
5
```

operators.py

In [2]:
```
print("Add:", 42+55)
print("Mul:", 2*2)
print("Mod:", 9%2)
print("Div with Float:", 10/5)
print("Div without Float:", 10//5)
print("Sub:", 4-2)
print("Power:", 2**3)

print("PEMDAS Rule: ", 8+5-2*6-8/8+6/2*4)
```

```
Add: 97
Mul: 4
Mod: 1
Div with Float: 2.0
Div without Float: 2
Sub: 2
Power: 8
PEMDAS Rule:  12.0
```

strings.py

In [3]:
```
print("Muhammad Fahad")

print('PAKISTAN !')

print('''SP19-BCS-042''')
```

```
Muhammad Fahad
PAKISTAN !
SP19-BCS-042
```

variables.py

In [4]:
```
# (1)
f=42
print(f)
print(type(f))

# (2)
x="Myself Fahad"
print(x)
print(type(x))

# (3)
y=5.5
print(y)
print(type(y))

# (4)
fruit = "Apples, Bananas"
print(fruit)

# (5)
# vegetables = "Carrot, Potato"
# del vegetables
# print(vegetables)
```

```
42
<class 'int'>
Myself Fahad
<class 'str'>
5.5
<class 'float'>
Apples, Bananas
```

input_variables.py

In [5]:
```
# (1)
# age=input("What's your Age: ")
# print(age)

# (2)
# fruit_basket=input("Which fruit is your favorite: ")
# print("I like", fruit_basket)


# (3)
name="Faadie!"
welcome="Hy"

print(welcome, name)
print("ALi")


# (4)
# name=input("What's your Good Name:")
# age=input("What's your Age:")
# greetings= "Welcome! "

# print(greetings, name, ", Younger Boy", age)
```

```
Hy Faadie!
ALi
```

conditional_logics_operators.py

In [6]:
```
school_age=5

# (1)
# child_age=4
# print(child_age == school_age)

# (2)
child_age=input("What's your Child Age:")
print(type(child_age))
child_age=int(child_age)
print(type(child_age))
print(child_age >= school_age)
```

```
What's your Child Age:23
<class 'str'>
<class 'int'>
True
```

type_conversion.py

In [7]:
```
# (1)
age=22
print("Age: ", age, type(str(age)))

# (2)
reg="42"
print(reg, type(reg))

# (3)
reg=float(reg)
print("reg", reg, type(reg))
```

```
Age:  22 <class 'str'>
42 <class 'str'>
reg 42.0 <class 'float'>
```

(if_else_elif)_condition_statements.py

In [8]:
```
school_age=5
college_age=16
uni_age=18

child_age=input("What's your Child Age:")
child_age=int(child_age)

# (1)
if child_age >= school_age and child_age < college_age:
    print("You Join School !")
# (2)
elif child_age >= college_age and child_age < uni_age:
    print("You Join College !")
elif child_age >= uni_age:
    print("You Join University OR Doing Work well in Market!")
# (3)
else:
    print("Please care of your Baby !!!")
```

```
What's your Child Age:23
You Join University OR Doing Work well in Market!
```

functions.py

In [9]:

```
# # (1)
# def home():
#     print("House: 1419")
# home()

# # (2)
# def shop():
#     text="Okanwala Road CCW"
#     print(text)
#     print(text)
#     print(text)
# shop()

# # (3)
# def uni(place):
#     print("COMSATS University!", place)
# uni("Sahiwal")

# print()
# print()
# print()

# (4)
# print("MADE SCHOOL CALCULATOR FOR KIDS !")
# school_age=5
# college_age=16
# uni_age=18

# def school_age_calculator(child_age):
#     if child_age >= school_age and child_age < college_age:
#         print("You Join School !")
#     elif child_age >= college_age and child_age < uni_age:
#         print("You Join College !")
#     elif child_age >= uni_age:
#         print("You Join University OR Doing Work well in Market!")
#     else:
#         print("Please care of your Baby !!!")

# school_age_calculator(16)
```

```
# # (5)
# print("MADE SCHOOL CALCULATOR FOR KIDS !")
# school_age=5
# college_age=16
# uni_age=18

# child_age = input("What's your Age: ")
# child_age = int(child_age)
# def school_age_calculator(text, child_age):
#     if child_age >= school_age and child_age < college_age:
#         print("You Join School !")
#     elif child_age >= college_age and child_age < uni_age:
#         print("You Join College !")
#     elif child_age >= uni_age:
#         print("You Join University OR Doing Work well in Market!")
#     else:
#         print("Please care of your Baby !!!")

# school_age_calculator("Your age is: ", child_age)


# # (6)
# print("Age-Prediction in Future !")

# def future_Age(age):
#     new_age = age+10
#     print("Future Prediction: ", new_age)
# future_Age(22)


# (7)
print("Age-Prediction in Future !")

def future_Age(age):
    new_age = age+3
    return new_age

future_Age(22)
```

```
Age-Prediction in Future !
```

Out[9]: 25

loops.py

While-Loop

In [10]:
```
# (1)
x=1
while(x<=5):
    print("No:", x)
    x=x+1

# (2)
# y=10
# while(y>0):
#     print("No:", y)
#     y=y-1
```

```
No: 1
No: 2
No: 3
No: 4
No: 5
```

For-Loop

In [11]:
```
# # (1)
# for x in range(1, 5):
#     print(x)

# (2)
for y in range(10, 16):
    print(y)
```

```
10
11
12
13
14
15
```

arrays.py

In [12]:
```
# (1)
# array !
brothers = ["Tayyab","Adil","Tahar","Fahad"]
for bros in brothers:
    print("Brothers are:", bros)


# (2)
# array !
# days = ["Mon", "Tue", "Wed", "Thu", "Fri", "Sat", "Sun"]
# for d in days:
#     print("Days are:", d)


# # (3)
# # array !
# days = ["Mon", "Tue", "Wed", "Thu", "Fri", "Sat", "Sun"]
# for d in days:
#     if(d=="Fri"): continue # Skip !
#     if(d=="Wed"): break # Loop Stops !
#     print("Days are:", d)
```

```
Brothers are: Tayyab
Brothers are: Adil
Brothers are: Tahar
Brothers are: Fahad
```

libraries.py

In [13]:
```
# Important Libraries.(numpy, pandas)

# (1)
# import math
# print("The Value of 'pi' is:", math.pi)
# print("The Value of 'celsius' is:", math.ceil)


# (2)
import statistics
x=[150, 200, 250, 100]
print("Mean:", statistics.mean(x))
print("Median:", statistics.median(x))
```

```
Mean: 175
Median: 175.0
```

trouble_shoot_errors.py

In [14]:
```
# Syntax Error !
# Run-time Error !
# Logical Error !
```

(2). Data Structures

- Indexing

In [15]:
```
green = "Pakistan Zindabad"
green
```

Out[15]: 'Pakistan Zindabad'

In [16]:
```
green[0]
```

Out[16]: 'P'

In [17]:
```
green[9:17]
```

Out[17]: 'Zindabad'

In [18]:
```
green[5]
```

Out[18]: 't'

In [19]:
```
green[-1]
```

Out[19]: 'd'

In [20]:
```
len(green)
```

Out[20]: 17

- Strings

In [21]:
```
food = "Biryani"
print("Food: "+food)
```

```
Food: Biryani
```

In [22]:
```
food.find("i")
```

Out[22]: 1

In [23]:
```
len(food)
```
Out[23]: 7

In [24]:
```
food.upper()
```
Out[24]: 'BIRYANI'

In [25]:
```
food.lower()
```
Out[25]: 'biryani'

In [26]:
```
food.replace("B","Sh")
```
Out[26]: 'Shiryani'

In [27]:
```
food.casefold()
```
Out[27]: 'biryani'

In [28]:
```
name = "muhammad Fahad"
name
```
Out[28]: 'muhammad Fahad'

In [29]:
```
name.count("a")
```
Out[29]: 4

In [30]:
```
name.count("m")
```
Out[30]: 3

In [31]:
```
name.find("m")
```
Out[31]: 0

In [32]:
```
name.find("d")
```

Out[32]: 7

- Finding an index number in string

In [33]:
```
name.find("f")
```

Out[33]: -1

In [34]:
```
taste = "I love Chicken Burger, Sandwitch, Pizza, Fries and Rice !"
taste
```

Out[34]: 'I love Chicken Burger, Sandwitch, Pizza, Fries and Rice !'

In [35]:
```
taste.split(",")
```

Out[35]: ['I love Chicken Burger', ' Sandwitch', ' Pizza', ' Fries and Rice !']

In [36]:
```
taste.split("a")
```

Out[36]: ['I love Chicken Burger, S', 'ndwitch, Pizz', ', Fries ', 'nd Rice !']

---

(3). Basic Data structures in Python

=> Tuple .(Un-Muteable, Not changeable/modifiable)

=> List .[Muteable, changeable/modifiable]

=> Dictionary .{ Muteable, changeable/modifiable }

=> Set .{No-Duplication, Unordered Indexed, Boolean-type not Allowed}

=> 1.Tuple... ( )

In [37]:
```
set_tuple = (42, "COMSATS", 42.5, 1)
print("Tuple():", set_tuple)
type(set_tuple)
```

```
Tuple(): (42, 'COMSATS', 42.5, 1)
```

Out[37]: tuple

In [38]:
```
set_tuple[1]
set_tuple[0:2]
```

Out[38]: (42, 'COMSATS')

In [39]:
```
len(set_tuple)
```

Out[39]: 4

In [40]:
```
set_tuple1 = (55, "LUMS", 45.5, False)
print("Tuple():", set_tuple)
type(set_tuple)
```

```
Tuple(): (42, 'COMSATS', 42.5, 1)
```

Out[40]: tuple

In [41]:
```
set_tuple + set_tuple1
```

Out[41]: (42, 'COMSATS', 42.5, 1, 55, 'LUMS', 45.5, False)

In [42]:
```
set_tuple*2 + set_tuple1
```

Out[42]: (42, 'COMSATS', 42.5, 1, 42, 'COMSATS', 42.5, 1, 55, 'LUMS', 45.5, False)

In [43]:
```
tp = (42, 55, 47, 50, 12, 10 ,18)
```

In [44]:
```
min(tp)
```

Out[44]:
```
10
```

In [45]:
```
max(tp)
```

Out[45]:
```
55
```

In [46]:
```
tp*2
```

Out[46]:
```
(42, 55, 47, 50, 12, 10, 18, 42, 55, 47, 50, 12, 10, 18)
```

In [47]:
```
tp*3
```

Out[47]:
```
(42,
 55,
 47,
 50,
 12,
 10,
 18,
 42,
 55,
 47,
 50,
 12,
 10,
 18,
 42,
 55,
 47,
 50,
 12,
 10,
 18)
```

=> 2.List... [ ]

In [48]:
```
list1 = [1, "Fahad", 42, True]
list1
```

Out[48]:
```
[1, 'Fahad', 42, True]
```

In [49]:
```
type(list1)
```

Out[49]:
```
list
```

In [50]:
```
list1[1:3]
```

Out[50]:
```
['Fahad', 42]
```

In [51]:
```
list2 = [55, 42, 12, 18, 47, 48, 26, 31, 35, 42, 33]
list2
```

Out[51]:
```
[55, 42, 12, 18, 47, 48, 26, 31, 35, 42, 33]
```

In [52]:
```
list1 + list2
```

Out[52]:
```
[1, 'Fahad', 42, True, 55, 42, 12, 18, 47, 48, 26, 31, 35, 42, 33]
```

In [53]:
```
list1.reverse()
```

In [54]:
```
list1
```

Out[54]:
```
[True, 42, 'Fahad', 1]
```

In [55]:
```
list2.sort()
```

In [56]:
```
list2
```

Out[56]:
```
[12, 18, 26, 31, 33, 35, 42, 42, 47, 48, 55]
```

In [57]:
```
list2.count(42)
```

Out[57]:
```
2
```

In [58]:
```
list1.append("reg")
```

In [59]:
```
list1
```

Out[59]:
```
[True, 42, 'Fahad', 1, 'reg']
```

In [60]:
```
len(list2)
```

Out[60]:
```
11
```

=> 3.Dictionary... { }

In [61]:
```
dict = {"pizza": 400, "burger": 200, "Fries": 100, "Shawarma": 130, "Paratha Roll": 180}
dict1 = {"eng": 100, "urdu": 70, "chem": 150, "phy": 170, "mth": 200}
```

In [62]:
```
print("Food:", dict)
print("Books:", dict1)
```

```
Food: {'pizza': 400, 'burger': 200, 'Fries': 100, 'Shawarma': 130, 'Paratha Roll': 180}
Books: {'eng': 100, 'urdu': 70, 'chem': 150, 'phy': 170, 'mth': 200}
```

In [63]:
```
type(dict1)
```

Out[63]:
```
dict
```

In [64]:
```
keys_dict = dict.keys()
values_dict = dict.values()

print("Keys of Food:", keys_dict)
print("Values of Food:", values_dict)
```

```
Keys of Food: dict_keys(['pizza', 'burger', 'Fries', 'Shawarma', 'Paratha Roll'])
Values of Food: dict_values([400, 200, 100, 130, 180])
```

In [65]:
```
dict1["bio"] = 250
dict1
```

Out[65]:
```
{'eng': 100, 'urdu': 70, 'chem': 150, 'phy': 170, 'mth': 200, 'bio': 250}
```

In [66]:
```
dict1["bio"] = 300
dict1
```

Out[66]:
```
{'eng': 100, 'urdu': 70, 'chem': 150, 'phy': 170, 'mth': 200, 'bio': 300}
```

In [67]:
```
# merge the 2 Dictionaries !
dict.update(dict1)
dict
```

Out[67]:
```
{'pizza': 400,
 'burger': 200,
 'Fries': 100,
 'Shawarma': 130,
 'Paratha Roll': 180,
 'eng': 100,
 'urdu': 70,
 'chem': 150,
 'phy': 170,
 'mth': 200,
 'bio': 300}
```

=> 4.Sets... ()

In [68]:
```
data = {1, 1419, "Fahad", "COMSATS", True, "CCW"}
data
```

Out[68]:
```
{1, 1419, 'CCW', 'COMSATS', 'Fahad'}
```

In [69]:
```
data.add(55)
data
```

Out[69]:
```
{1, 1419, 55, 'CCW', 'COMSATS', 'Fahad'}
```

In [70]:
```
data.remove(1419)
data
```

Out[70]:
```
{1, 55, 'CCW', 'COMSATS', 'Fahad'}
```

In [71]:
```
data
```

Out[71]:
```
{1, 55, 'CCW', 'COMSATS', 'Fahad'}
```

(4). Numpy Practice

In [72]:
```
import numpy as np
```

1D-array. (Vector Array)

Creating an array using numpy

In [73]:
```
food = np.array(["pizza", "burger", "roll"])
food
```

Out[73]:
```
array(['pizza', 'burger', 'roll'], dtype='<U6')
```

In [74]:
```
food.ndim
```

Out[74]:
```
1
```

In [75]:
```
type(food)
```

Out[75]:
```
numpy.ndarray
```

In [76]:
```
len(food)
```

Out[76]:
```
3
```

In [77]:
```
food[1]
```

Out[77]:
```
'burger'
```

In [78]:
```
food[1:]
```

Out[78]:
```
array(['burger', 'roll'], dtype='<U6')
```

In [79]:
```
number = np.array([42, 55, 47, 50, 26])
number
```

Out[79]:
```
array([42, 55, 47, 50, 26])
```

In [80]:
```
type(number)
```

Out[80]:
```
numpy.ndarray
```

In [81]:
```
len(number)
```

Out[81]: 5

In [82]:
```
number[3]
```

Out[82]: 50

In [83]:
```
number[2:]
```

Out[83]: array([47, 50, 26])

In [84]:
```
number.mean() # mean method !
```

Out[84]: 44.0

In [85]:
```
np.zeros(4)  # zeroes method !
```

Out[85]: array([0., 0., 0., 0.])

In [86]:
```
np.ones(6) # ones method !
```

Out[86]: array([1., 1., 1., 1., 1., 1.])

In [87]:
```
np.empty(3)
```

Out[87]: array([0., 0., 0.])

arange method **!**

In [88]:
```
np.arange(8)
```

Out[88]: array([0, 1, 2, 3, 4, 5, 6, 7])

In [89]:
```
np.arange(1,10)
```

Out[89]: array([1, 2, 3, 4, 5, 6, 7, 8, 9])

In [90]:
```
np.arange(5,55,5) # table of (5)
```

Out[90]:
```
array([ 5, 10, 15, 20, 25, 30, 35, 40, 45, 50])
```

In [91]:
```
np.linspace(1,20,10)
```

Out[91]:
```
array([ 1.        ,  3.11111111,  5.22222222,  7.33333333,  9.44444444,
       11.55555556, 13.66666667, 15.77777778, 17.88888889, 20.        ])
```

In [92]:
```
np.sort(number)
```

Out[92]:
```
array([26, 42, 47, 50, 55])
```

Array-Functions

In [93]:
```
a = np.array([5, 6, 9, 50, 1, 30, 24, 14, 2, 42, 26]) # integer array
a
```

Out[93]:
```
array([ 5,  6,  9, 50,  1, 30, 24, 14,  2, 42, 26])
```

In [94]:
```
a.ndim
```

Out[94]:
```
1
```

In [95]:
```
b = np.array([14.1, 13.5, 35.1, 2.71, 3.05, 26.4, 42.7, 18.3, 40.4, 10.2]) # floating-point array
b
```

Out[95]:
```
array([14.1 , 13.5 , 35.1 ,  2.71,  3.05, 26.4 , 42.7 , 18.3 , 40.4 ,
       10.2 ])
```

In [96]:
```
a.sort()
a
```

Out[96]:
```
array([ 1,  2,  5,  6,  9, 14, 24, 26, 30, 42, 50])
```

In [97]:
```
b.sort()
b
```

Out[97]:
```
array([ 2.71,  3.05, 10.2 , 13.5 , 14.1 , 18.3 , 26.4 , 35.1 , 40.4 ,
       42.7 ])
```

In [98]:
```
c = np.concatenate([a,b])
c
```

Out[98]:
```
array([ 1.  ,  2.  ,  5.  ,  6.  ,  9.  , 14.  , 24.  , 26.  , 30.  ,
       42.  , 50.  ,  2.71,  3.05, 10.2 , 13.5 , 14.1 , 18.3 , 26.4 ,
       35.1 , 40.4 , 42.7 ])
```

In [99]:
```
np.sort(c)
```

Out[99]:
```
array([ 1.  ,  2.  ,  2.71,  3.05,  5.  ,  6.  ,  9.  , 10.2 , 13.5 ,
       14.  , 14.1 , 18.3 , 24.  , 26.  , 26.4 , 30.  , 35.1 , 40.4 ,
       42.  , 42.7 , 50.  ])
```

In [100]:
```
c.ndim
```

Out[100]:
```
1
```

2D-array. (Matrix Array)

In [101]:
```
a = np.array([[1,2,2],[3,5,3],[11,22,33]])
a
```

Out[101]:
```
array([[ 1,  2,  2],
       [ 3,  5,  3],
       [11, 22, 33]])
```

In [102]:
```
b = np.array([[4,6,4],[5,2,3],[2,3,5]])
b
```

Out[102]:
```
array([[4, 6, 4],
       [5, 2, 3],
       [2, 3, 5]])
```

In [103]:
```
c = np.concatenate([a,b], axis=0) # Length would be same !
c
```

Out[103]:
```
array([[ 1,  2,  2],
       [ 3,  5,  3],
       [11, 22, 33],
       [ 4,  6,  4],
       [ 5,  2,  3],
       [ 2,  3,  5]])
```

In [104]:
```
d = np.concatenate([a,b], axis=1) # Length would be same !
d
```

Out[104]:
```
array([[ 1,  2,  2,  4,  6,  4],
       [ 3,  5,  3,  5,  2,  3],
       [11, 22, 33,  2,  3,  5]])
```

In [105]:
```
d.ndim
```

Out[105]:
```
2
```

In [106]:
```
np.reshape(d, newshape=(1,18), order='C')
```

Out[106]:
```
array([[ 1,  2,  2,  4,  6,  4,  3,  5,  3,  5,  2,  3, 11, 22, 33,  2,
         3,  5]])
```

3D-array. (Tensor Array)

In [107]:
```
x = np.array([[[1,2],[3,4]],
              [[5,6],[7,8]],
              [[9,1],[4,8]]])
x
```

Out[107]:
```
array([[[1, 2],
        [3, 4]],

       [[5, 6],
        [7, 8]],

       [[9, 1],
        [4, 8]]])
```

In [108]:
```
x.ndim
```

Out[108]:
```
3
```

In [109]:
```
type(x)
```

Out[109]:
```
numpy.ndarray
```

In [110]:
```
np.size(x)
```

Out[110]:
```
12
```

In [111]:
```
x
```

Out[111]:
```
array([[[1, 2],
        [3, 4]],

       [[5, 6],
        [7, 8]],

       [[9, 1],
        [4, 8]]])
```

In [112]:
```
x.shape
```

Out[112]:
```
(3, 2, 2)
```

In [113]:
```
y = np.array([[[9,8],[7,6]],
              [[5,4],[3,2]],
              [[1,2],[4,3]]])
y
```

Out[113]:
```
array([[[9, 8],
        [7, 6]],

       [[5, 4],
        [3, 2]],

       [[1, 2],
        [4, 3]]])
```

In [114]:
```
y.ndim
```

Out[114]:
```
3
```

In [115]:
```
type(y)
```

Out[115]:
```
numpy.ndarray
```

In [116]:
```
np.size(y)
```

Out[116]:
```
12
```

In [117]:
```
y
```

Out[117]:
```
array([[[9, 8],
        [7, 6]],

       [[5, 4],
        [3, 2]],

       [[1, 2],
        [4, 3]]])
```

In [118]:
```
y.shape
```

Out[118]:
```
(3, 2, 2)
```

arange method **!**

In [119]:
```
a = np.arange(27) # arange [27]
a
```

Out[119]:
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
       17, 18, 19, 20, 21, 22, 23, 24, 25, 26])
```

In [120]:
```
t = a.reshape(3,3,3) # reshape = [3*3*3 = 27]
t
```

Out[120]:
```
array([[[ 0,  1,  2],
        [ 3,  4,  5],
        [ 6,  7,  8]],

       [[ 9, 10, 11],
        [12, 13, 14],
        [15, 16, 17]],

       [[18, 19, 20],
        [21, 22, 23],
        [24, 25, 26]]])
```

In [121]:
```
t = np.arange(27).reshape(3,3,3)
t
```

Out[121]:
```
array([[[ 0,  1,  2],
        [ 3,  4,  5],
        [ 6,  7,  8]],

       [[ 9, 10, 11],
        [12, 13, 14],
        [15, 16, 17]],

       [[18, 19, 20],
        [21, 22, 23],
        [24, 25, 26]]])
```

---

convert 1D-array to 2D-array

In [122]:
```
u = np.array([5,6,8,9,4,3,2])
u
```

Out[122]:
```
array([5, 6, 8, 9, 4, 3, 2])
```

In [123]:
```
u[2:5]
```

Out[123]:
```
array([8, 9, 4])
```

In [124]:
```
u[:6]
```

Out[124]:
```
array([5, 6, 8, 9, 4, 3])
```

In [125]:
```
u[1:]
```

Out[125]:
```
array([6, 8, 9, 4, 3, 2])
```

In [126]:
```
u.sum()
```

Out[126]:
```
37
```

In [127]:
```
u.mean()
```

Out[127]:
```
5.285714285714286
```

In [128]:
```
u*2
```

Out[128]:
```
array([10, 12, 16, 18,  8,  6,  4])
```

In [129]:
```
u+1
```

Out[129]:
```
array([ 6,  7,  9, 10,  5,  4,  3])
```

In [130]:
```
u.shape
```

Out[130]:
```
(7,)
```

In [131]:
```
u.ndim
```

Out[131]:
```
1
```

In [132]:
```
# row-wise (2D)
o = u[np.newaxis, :]
o
```

Out[132]:
```
array([[5, 6, 8, 9, 4, 3, 2]])
```

In [133]:
```
# columns-wise (2D)
o = u[:, np.newaxis]
o
```

Out[133]:
```
array([[5],
       [6],
       [8],
       [9],
       [4],
       [3],
       [2]])
```

In [134]:
```
o.shape
```

Out[134]:
```
(7, 1)
```

In [135]:
```
o.ndim
```

Out[135]:
```
2
```

More Practice

In [136]:
```
import numpy as np
```

1D-array

In [137]:
```
p = np.array([42, 55, 50]) # 1D-array / Vector
p
```

Out[137]:
```
array([42, 55, 50])
```

In [138]:
```
aa = np.array([5, 6 ,1 ,8])
bb = np.array([16, 19, 50, 100, 11, 3])
cc = np.concatenate((aa, bb))
cc
```

Out[138]:
```
array([  5,   6,   1,   8,  16,  19,  50, 100,  11,   3])
```

In [139]:
```
np.sort(cc)
```

Out[139]:
```
array([  1,   3,   5,   6,   8,  11,  16,  19,  50, 100])
```

In [140]:
```
np.sort(p)
```

Out[140]:
```
array([42, 50, 55])
```

In [141]:
```
type(p)
```

Out[141]:
```
numpy.ndarray
```

In [142]:
```
len(p)
```

Out[142]:
```
3
```

In [143]:
```
p[0]
```

Out[143]:
```
42
```

In [144]:
```
res = np.array([1, 2, 3, 4, 5, 6]) # array
res
```

Out[144]:
```
array([1, 2, 3, 4, 5, 6])
```

In [145]:
```
a = np.zeros(2) # for zeroes 0's
a
```

Out[145]:
```
array([0., 0.])
```

In [146]:
```
b = np.ones(3) # for ones 1's
b
```

Out[146]:
```
array([1., 1., 1.])
```

In [147]:
```
c = np.empty(5) # empty
c
```

Out[147]:
```
array([3.98210433e+209, 4.95270038e+223, 2.11329293e+214, 1.33856863e-152,
       1.96086552e+243])
```

In [148]:
```
d = np.arange(9) # range to (9)
d
```

Out[148]:
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8])
```

In [149]:
```
e = np.arange(1, 56) # range b/w (1 to 56)
e
```

Out[149]:
```
array([ 1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16, 17,
       18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34,
       35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51,
       52, 53, 54, 55])
```

In [150]:
```
f = np.arange(0, 30, 3) # range with difference 3's b/w (0 to 30)
f
```

Out[150]:
```
array([ 0,  3,  6,  9, 12, 15, 18, 21, 24, 27])
```

In [151]:
```
g = np.linspace(2, 20, num=10) # lineraly spaced array
g
```

Out[151]:
```
array([ 2.,  4.,  6.,  8., 10., 12., 14., 16., 18., 20.])
```

In [152]:
```
h = np.ones(5, dtype=np.int8) # choose specific- dataType
h
```

Out[152]:
```
array([1, 1, 1, 1, 1], dtype=int8)
```

In [153]:
```
i = np.ones(4, dtype=np.float16) # choose specific- dataType
i
```

Out[153]:
```
array([1., 1., 1., 1.], dtype=float16)
```

2D-array

In [154]:
```
r = np.array([[1, 2, 3], [4, 5, 6], [7, 8, 9]]) # 2d-array
r
```

Out[154]:
```
array([[1, 2, 3],
       [4, 5, 6],
       [7, 8, 9]])
```

In [155]:
```
type(r)
```

Out[155]:
```
numpy.ndarray
```

In [156]:
```
len(r)
```

Out[156]:
```
3
```

In [157]:
```
r[2]
```

Out[157]:
```
array([7, 8, 9])
```

In [158]:
```
x = np.zeros([2,3])
x
```

Out[158]:
```
array([[0., 0., 0.],
       [0., 0., 0.]])
```

In [159]:
```
xx = np.ones([3,2])
xx
```

Out[159]:
```
array([[1., 1.],
       [1., 1.],
       [1., 1.]])
```

In [160]:
```
y = np.empty([3,3])
y
```

Out[160]:
```
array([[1.06136230e-312, 0.00000000e+000, 1.06395697e+224],
       [7.79508003e-043, 3.93069376e-061, 1.39223140e+165],
       [8.38113347e+169, 4.46875511e-086, 6.27207943e-310]])
```

In [161]:
```
k = np.array([5, 6 ,1 ,8])
j = np.array([16, 19, 50, 100, 11, 3])
pp = np.concatenate([k, j])
pp
```

Out[161]:
```
array([  5,   6,   1,   8,  16,  19,  50, 100,  11,   3])
```

3D-array

In [162]:
```
dd = np.arange(45).reshape(3,5,3)
dd
```

Out[162]:
```
array([[[ 0,  1,  2],
        [ 3,  4,  5],
        [ 6,  7,  8],
        [ 9, 10, 11],
        [12, 13, 14]],

       [[15, 16, 17],
        [18, 19, 20],
        [21, 22, 23],
        [24, 25, 26],
        [27, 28, 29]],

       [[30, 31, 32],
        [33, 34, 35],
        [36, 37, 38],
        [39, 40, 41],
        [42, 43, 44]]])
```

In [163]:
```
ddd = np.arange(24).reshape(4,2,3)
ddd
```

Out[163]:
```
array([[[ 0,  1,  2],
        [ 3,  4,  5]],

       [[ 6,  7,  8],
        [ 9, 10, 11]],

       [[12, 13, 14],
        [15, 16, 17]],

       [[18, 19, 20],
        [21, 22, 23]]])
```

In [164]:
```
t = np.arange(30).reshape(5,2,3)
t
```

Out[164]:
```
array([[[ 0,  1,  2],
        [ 3,  4,  5]],

       [[ 6,  7,  8],
        [ 9, 10, 11]],

       [[12, 13, 14],
        [15, 16, 17]],

       [[18, 19, 20],
        [21, 22, 23]],

       [[24, 25, 26],
        [27, 28, 29]]])
```

(5). Pandas Practice

In [165]:
```
# Libraries !
import pandas as pd
import numpy as np
import stats
import matplotlib.pyplot as plt
import seaborn as sns
```

In [166]:
```
a = np.array([1,5,10,10,15,20])
a
```

Out[166]:
```
array([ 1,  5, 10, 10, 15, 20])
```

In [167]:
```
np.mean(a)
```

Out[167]:
```
10.166666666666666
```

In [168]:
```
np.median(a)
```

Out[168]:
```
10.0
```

In [169]:
```
stats.mode(a)
```

Out[169]:
```
10
```

In [170]:
```
flowers = sns.load_dataset("iris")
flowers.head()
```

Out[170]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

In [171]:
```
flowers.to_csv("iris.csv")
```

In [172]:
```
flowers = pd.read_csv("iris.csv")
flowers.head()
```

Out[172]:

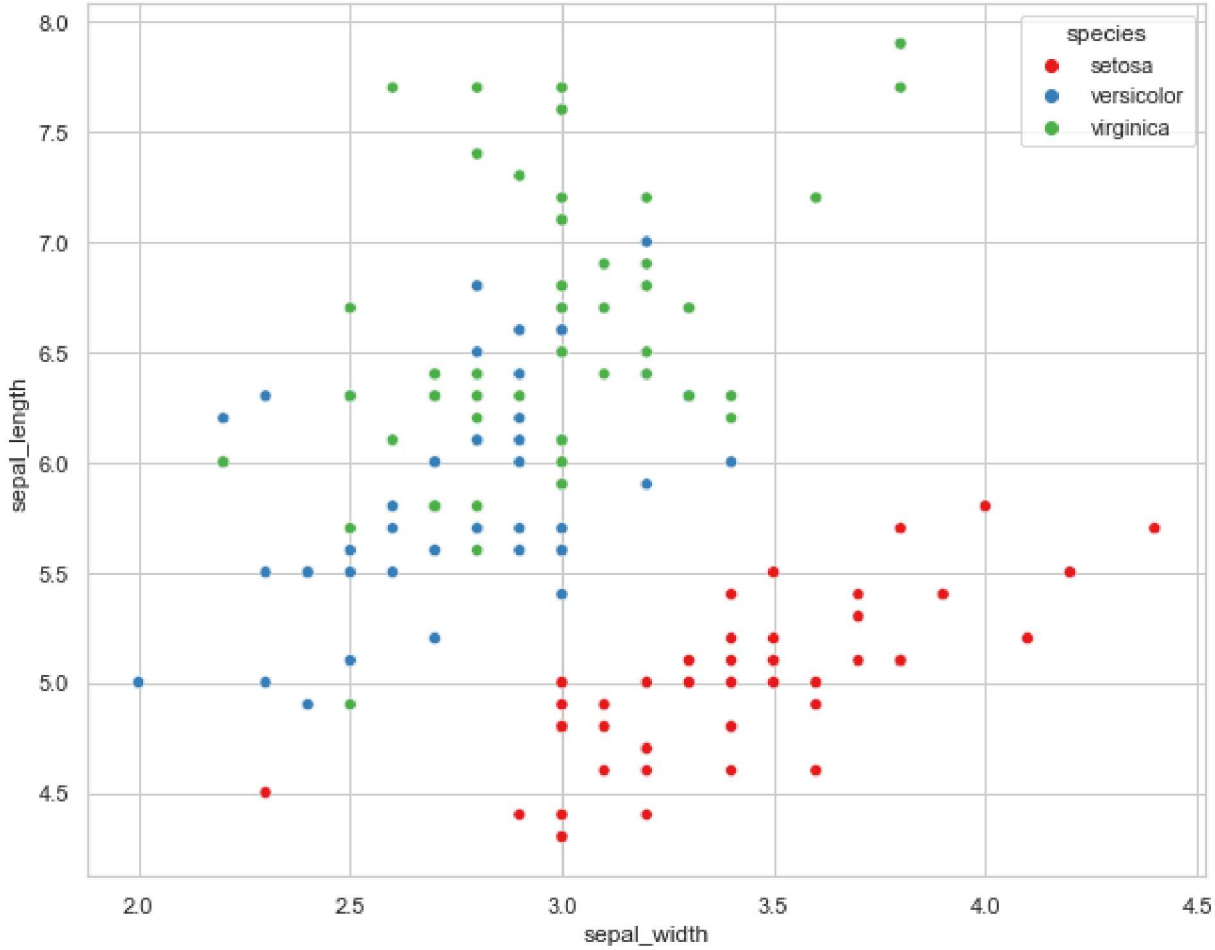
	Unnamed: 0	sepal_length	sepal_width	petal_length	petal_width	species
0	0	5.1	3.5	1.4	0.2	setosa
1	1	4.9	3.0	1.4	0.2	setosa
2	2	4.7	3.2	1.3	0.2	setosa
3	3	4.6	3.1	1.5	0.2	setosa
4	4	5.0	3.6	1.4	0.2	setosa

In [173]:
```
flowers.describe()
```

Out[173]:

	Unnamed: 0	sepal_length	sepal_width	petal_length	petal_width
count	150.000000	150.000000	150.000000	150.000000	150.000000
mean	74.500000	5.843333	3.057333	3.758000	1.199333
std	43.445368	0.828066	0.435866	1.765298	0.762238
min	0.000000	4.300000	2.000000	1.000000	0.100000
25%	37.250000	5.100000	2.800000	1.600000	0.300000
50%	74.500000	5.800000	3.000000	4.350000	1.300000
75%	111.750000	6.400000	3.300000	5.100000	1.800000
max	149.000000	7.900000	4.400000	6.900000	2.500000

In [174]:
```
plt.figure(figsize=(10,8))

sns.set_theme(style="whitegrid", color_codes=True)
sns.scatterplot(x="sepal_width",
                y="sepal_length",
                hue="species",
                data=flowers,
                palette="Set1")
plt.show()
```



PANDAS Hand's ON

In [175]:
```
# import Libraries !
import pandas as pd
import numpy as np
```

In [176]:
```
a = pd.array([1, 2, np.nan, 5, 6, 7, 2, 4, 9])
a
```

Out[176]:
```
<IntegerArray>
[1, 2, <NA>, 5, 6, 7, 2, 4, 9]
Length: 9, dtype: Int64
```

In [177]:
```
a = pd.Series(a) # Columns
a
```

Out[177]:
```
0       1
1       2
2    <NA>
3       5
4       6
5       7
6       2
7       4
8       9
dtype: Int64
```

In [178]:
```
b = pd.Series([1, 2, np.nan, 5, 6, 7, 2, 4, 9]) # Columns
b
```

Out[178]:
```
0    1.0
1    2.0
2    NaN
3    5.0
4    6.0
5    7.0
6    2.0
7    4.0
8    9.0
dtype: float64
```

In [179]:
```
b = pd.array(b)
b
```

Out[179]:
```
<PandasArray>
[1.0, 2.0, nan, 5.0, 6.0, 7.0, 2.0, 4.0, 9.0]
Length: 9, dtype: float64
```

In [180]:
```
dates = pd.date_range("20220101", periods=10) # dates
dates
```

Out[180]:
```
DatetimeIndex(['2022-01-01', '2022-01-02', '2022-01-03', '2022-01-04',
               '2022-01-05', '2022-01-06', '2022-01-07', '2022-01-08',
               '2022-01-09', '2022-01-10'],
              dtype='datetime64[ns]', freq='D')
```

In [181]:
```
# df stands data-frame contains both (Rows & Columns) !
df = pd.DataFrame(np.random.randn(10,5),
                  index=dates,
                  columns=list("FAHAD"),
                  dtype="float64")

df
```

Out[181]:

	F	A	H	A	D
2022-01-01	0.270539	0.211822	-0.228018	-0.078165	-0.354149
2022-01-02	1.910453	-0.009998	1.018073	-0.340792	-0.878497
2022-01-03	-0.457669	2.350047	0.485818	-1.252309	0.177939
2022-01-04	-1.058304	-0.711036	-0.636656	3.561210	-0.778522
2022-01-05	1.795361	0.477407	-1.902090	0.000053	0.585707
2022-01-06	-0.673901	0.268804	-0.990408	-0.780895	-1.381989
2022-01-07	0.110143	-1.386319	-2.533721	-0.912674	-0.577733
2022-01-08	-0.007949	-1.535179	-0.963049	0.688605	0.902782
2022-01-09	-1.121337	-0.428408	-2.505800	-0.013866	-0.273100
2022-01-10	-0.159756	0.084009	-0.064466	2.036232	0.580233

In [182]:
```
df.dtypes
```

Out[182]:
```
F    float64
A    float64
H    float64
A    float64
D    float64
dtype: object
```

In [183]:
```
df1 = pd.DataFrame(
    {
        "A": 42.0,
        "B": pd.date_range("20220101", periods=5),
        "C": pd.Series(1, index=list(range(5)), dtype="float32"),
        "D": np.array([2] * 5, dtype="int32"),
        "E": pd.Categorical(["Male", "Female", "Male", "Female","Male"]),
        "F": "Human",
        "G": np.array([1,2,3,5,6]),
        "H": pd.Timestamp("20220131")
    }
)
df1
```

Out[183]:

	A	B	C	D	E	F	G	H
0	42.0	2022-01-01	1.0	2	Male	Human	1	2022-01-31
1	42.0	2022-01-02	1.0	2	Female	Human	2	2022-01-31
2	42.0	2022-01-03	1.0	2	Male	Human	3	2022-01-31
3	42.0	2022-01-04	1.0	2	Female	Human	5	2022-01-31
4	42.0	2022-01-05	1.0	2	Male	Human	6	2022-01-31

In [184]:
```
df1.dtypes
```

Out[184]:
```
A           float64
B    datetime64[ns]
C           float32
D             int32
E          category
F            object
G             int32
H    datetime64[ns]
dtype: object
```

In [185]:
```
df1.head(2)
```

Out[185]:

	A	B	C	D	E	F	G	H
0	42.0	2022-01-01	1.0	2	Male	Human	1	2022-01-31
1	42.0	2022-01-02	1.0	2	Female	Human	2	2022-01-31

In [186]:
```
df1.tail(2)
```

Out[186]:

	A	B	C	D	E	F	G	H
3	42.0	2022-01-04	1.0	2	Female	Human	5	2022-01-31
4	42.0	2022-01-05	1.0	2	Male	Human	6	2022-01-31

In [187]:
```
df1.index
```

Out[187]:
```
Int64Index([0, 1, 2, 3, 4], dtype='int64')
```

In [188]:
```
df.index
```

Out[188]:
```
DatetimeIndex(['2022-01-01', '2022-01-02', '2022-01-03', '2022-01-04',
               '2022-01-05', '2022-01-06', '2022-01-07', '2022-01-08',
               '2022-01-09', '2022-01-10'],
              dtype='datetime64[ns]', freq='D')
```

In [189]:
```
df.to_numpy
```

Out[189]:
```
<bound method DataFrame.to_numpy of                   F         A         H         A         D
2022-01-01  0.270539  0.211822 -0.228018 -0.078165 -0.354149
2022-01-02  1.910453 -0.009998  1.018073 -0.340792 -0.878497
2022-01-03 -0.457669  2.350047  0.485818 -1.252309  0.177939
2022-01-04 -1.058304 -0.711036 -0.636656  3.561210 -0.778522
2022-01-05  1.795361  0.477407 -1.902090  0.000053  0.585707
2022-01-06 -0.673901  0.268804 -0.990408 -0.780895 -1.381989
2022-01-07  0.110143 -1.386319 -2.533721 -0.912674 -0.577733
2022-01-08 -0.007949 -1.535179 -0.963049  0.688605  0.902782
2022-01-09 -1.121337 -0.428408 -2.505800 -0.013866 -0.273100
2022-01-10 -0.159756  0.084009 -0.064466  2.036232  0.580233>
```

In [190]:
```
df1.to_numpy
```

Out[190]:
```
<bound method DataFrame.to_numpy of       A          B    C  D       E      F  G          H
0  42.0 2022-01-01  1.0  2    Male  Human  1 2022-01-31
1  42.0 2022-01-02  1.0  2  Female  Human  2 2022-01-31
2  42.0 2022-01-03  1.0  2    Male  Human  3 2022-01-31
3  42.0 2022-01-04  1.0  2  Female  Human  5 2022-01-31
4  42.0 2022-01-05  1.0  2    Male  Human  6 2022-01-31>
```

In [191]:
```
df.describe()
```

Out[191]:

	F	A	H	A	D
count	10.000000	10.000000	10.000000	10.000000	10.000000
mean	0.060758	-0.067885	-0.832032	0.290740	-0.199733
std	1.053468	1.095273	1.203527	1.475384	0.741545
min	-1.121337	-1.535179	-2.533721	-1.252309	-1.381989
25%	-0.619843	-0.640379	-1.674170	-0.670870	-0.728325
50%	-0.083853	0.037006	-0.799852	-0.046015	-0.313624
75%	0.230440	0.254559	-0.105354	0.516467	0.479659
max	1.910453	2.350047	1.018073	3.561210	0.902782

In [192]:
```
df1.describe()
```

Out[192]:

	A	C	D	G
count	5.0	5.0	5.0	5.000000
mean	42.0	1.0	2.0	3.400000
std	0.0	0.0	0.0	2.073644
min	42.0	1.0	2.0	1.000000
25%	42.0	1.0	2.0	2.000000
50%	42.0	1.0	2.0	3.000000
75%	42.0	1.0	2.0	5.000000
max	42.0	1.0	2.0	6.000000

In [193]:
```
# Transpose of Dataset !
df1.T
```

Out[193]:

	0	1	2	3	4
A	42.0	42.0	42.0	42.0	42.0
B	2022-01-01 00:00:00	2022-01-02 00:00:00	2022-01-03 00:00:00	2022-01-04 00:00:00	2022-01-05 00:00:00
C	1.0	1.0	1.0	1.0	1.0
D	2	2	2	2	2
E	Male	Female	Male	Female	Male
F	Human	Human	Human	Human	Human
G	1	2	3	5	6
H	2022-01-31 00:00:00	2022-01-31 00:00:00	2022-01-31 00:00:00	2022-01-31 00:00:00	2022-01-31 00:00:00

In [194]:
```
df1
```

Out[194]:

	A	B	C	D	E	F	G	H
0	42.0	2022-01-01	1.0	2	Male	Human	1	2022-01-31
1	42.0	2022-01-02	1.0	2	Female	Human	2	2022-01-31
2	42.0	2022-01-03	1.0	2	Male	Human	3	2022-01-31
3	42.0	2022-01-04	1.0	2	Female	Human	5	2022-01-31
4	42.0	2022-01-05	1.0	2	Male	Human	6	2022-01-31

Sorting

In [195]:
```
# FALSE contains Descending output !
df1.sort_index(axis=0, ascending=False)
```

Out[195]:

	A	B	C	D	E	F	G	H
4	42.0	2022-01-05	1.0	2	Male	Human	6	2022-01-31
3	42.0	2022-01-04	1.0	2	Female	Human	5	2022-01-31
2	42.0	2022-01-03	1.0	2	Male	Human	3	2022-01-31
1	42.0	2022-01-02	1.0	2	Female	Human	2	2022-01-31
0	42.0	2022-01-01	1.0	2	Male	Human	1	2022-01-31

In [196]:
```
# TRUE contains Ascending output !
df1.sort_index(axis=0, ascending=True)
```

Out[196]:

	A	B	C	D	E	F	G	H
0	42.0	2022-01-01	1.0	2	Male	Human	1	2022-01-31
1	42.0	2022-01-02	1.0	2	Female	Human	2	2022-01-31
2	42.0	2022-01-03	1.0	2	Male	Human	3	2022-01-31
3	42.0	2022-01-04	1.0	2	Female	Human	5	2022-01-31
4	42.0	2022-01-05	1.0	2	Male	Human	6	2022-01-31

In [197]:
```
df1["E"] # Specific Columns
```

Out[197]:
```
0      Male
1    Female
2      Male
3    Female
4      Male
Name: E, dtype: category
Categories (2, object): ['Female', 'Male']
```

In [198]:
```
df
```

Out[198]:

	F	A	H	A	D
2022-01-01	0.270539	0.211822	-0.228018	-0.078165	-0.354149
2022-01-02	1.910453	-0.009998	1.018073	-0.340792	-0.878497
2022-01-03	-0.457669	2.350047	0.485818	-1.252309	0.177939
2022-01-04	-1.058304	-0.711036	-0.636656	3.561210	-0.778522
2022-01-05	1.795361	0.477407	-1.902090	0.000053	0.585707
2022-01-06	-0.673901	0.268804	-0.990408	-0.780895	-1.381989
2022-01-07	0.110143	-1.386319	-2.533721	-0.912674	-0.577733
2022-01-08	-0.007949	-1.535179	-0.963049	0.688605	0.902782
2022-01-09	-1.121337	-0.428408	-2.505800	-0.013866	-0.273100
2022-01-10	-0.159756	0.084009	-0.064466	2.036232	0.580233

In [199]:
```
# sort by specific value !
df.sort_values(by="F")
```

Out[199]:

	F	A	H	A	D
2022-01-09	-1.121337	-0.428408	-2.505800	-0.013866	-0.273100
2022-01-04	-1.058304	-0.711036	-0.636656	3.561210	-0.778522
2022-01-06	-0.673901	0.268804	-0.990408	-0.780895	-1.381989
2022-01-03	-0.457669	2.350047	0.485818	-1.252309	0.177939
2022-01-10	-0.159756	0.084009	-0.064466	2.036232	0.580233
2022-01-08	-0.007949	-1.535179	-0.963049	0.688605	0.902782
2022-01-07	0.110143	-1.386319	-2.533721	-0.912674	-0.577733
2022-01-01	0.270539	0.211822	-0.228018	-0.078165	-0.354149
2022-01-05	1.795361	0.477407	-1.902090	0.000053	0.585707
2022-01-02	1.910453	-0.009998	1.018073	-0.340792	-0.878497

In [200]:
```
df["D"].head()
```

Out[200]:
```
2022-01-01   -0.354149
2022-01-02   -0.878497
2022-01-03    0.177939
2022-01-04   -0.778522
2022-01-05    0.585707
Freq: D, Name: D, dtype: float64
```

In [201]:
```
df[0:]
```

Out[201]:

	F	A	H	A	D
2022-01-01	0.270539	0.211822	-0.228018	-0.078165	-0.354149
2022-01-02	1.910453	-0.009998	1.018073	-0.340792	-0.878497
2022-01-03	-0.457669	2.350047	0.485818	-1.252309	0.177939
2022-01-04	-1.058304	-0.711036	-0.636656	3.561210	-0.778522
2022-01-05	1.795361	0.477407	-1.902090	0.000053	0.585707
2022-01-06	-0.673901	0.268804	-0.990408	-0.780895	-1.381989
2022-01-07	0.110143	-1.386319	-2.533721	-0.912674	-0.577733
2022-01-08	-0.007949	-1.535179	-0.963049	0.688605	0.902782
2022-01-09	-1.121337	-0.428408	-2.505800	-0.013866	-0.273100
2022-01-10	-0.159756	0.084009	-0.064466	2.036232	0.580233

In [202]:
```
df[:3]
```

Out[202]:

	F	A	H	A	D
2022-01-01	0.270539	0.211822	-0.228018	-0.078165	-0.354149
2022-01-02	1.910453	-0.009998	1.018073	-0.340792	-0.878497
2022-01-03	-0.457669	2.350047	0.485818	-1.252309	0.177939

In [203]:
```
df[0:5]
```

Out[203]:

	F	A	H	A	D
2022-01-01	0.270539	0.211822	-0.228018	-0.078165	-0.354149
2022-01-02	1.910453	-0.009998	1.018073	-0.340792	-0.878497
2022-01-03	-0.457669	2.350047	0.485818	-1.252309	0.177939
2022-01-04	-1.058304	-0.711036	-0.636656	3.561210	-0.778522
2022-01-05	1.795361	0.477407	-1.902090	0.000053	0.585707

In [204]:
```
df1[:3]
```

Out[204]:

	A	B	C	D	E	F	G	H
0	42.0	2022-01-01	1.0	2	Male	Human	1	2022-01-31
1	42.0	2022-01-02	1.0	2	Female	Human	2	2022-01-31
2	42.0	2022-01-03	1.0	2	Male	Human	3	2022-01-31

In [205]:
```
# row-wise selection !
df.loc[dates[0]]
```

Out[205]:
```
F    0.270539
A    0.211822
H   -0.228018
A   -0.078165
D   -0.354149
Name: 2022-01-01 00:00:00, dtype: float64
```

In [206]:
```
df.loc[dates[6]]
```

Out[206]:
```
F    0.110143
A   -1.386319
H   -2.533721
A   -0.912674
D   -0.577733
Name: 2022-01-07 00:00:00, dtype: float64
```

In [207]:
```
df.loc[dates[2:3]]
```

Out[207]:

	F	A	H	A	D
2022-01-03	-0.457669	2.350047	0.485818	-1.252309	0.177939

In [208]:
```
df.loc[["20220106", "20220108"],["H","D"]]
```

Out[208]:

	H	D
2022-01-06	-0.990408	-1.381989
2022-01-08	-0.963049	0.902782

In [209]:
```
df.loc["20220106":"20220108",["H","D","F"]]
```

Out[209]:

	H	D	F
2022-01-06	-0.990408	-1.381989	-0.673901
2022-01-07	-2.533721	-0.577733	0.110143
2022-01-08	-0.963049	0.902782	-0.007949

In [210]:
```
df.loc["20220103",["H","D","F"]]
```

Out[210]:
```
H    0.485818
D    0.177939
F   -0.457669
Name: 2022-01-03 00:00:00, dtype: float64
```

In [211]:
```
df.loc["20220103"]
```

Out[211]:
```
F   -0.457669
A    2.350047
H    0.485818
A   -1.252309
D    0.177939
Name: 2022-01-03 00:00:00, dtype: float64
```

In [212]:
```
# at this specific date !
df.at[dates[5], "H"]
```

Out[212]:
```
-0.9904080734838805
```

In [213]:
```
df.iloc[0:2, [2,3]]
```

Out[213]:

	H	A
2022-01-01	-0.228018	-0.078165
2022-01-02	1.018073	-0.340792

In [214]:
```
df.iloc[2:6, 3:5]
```

Out[214]:

	A	D
2022-01-03	-1.252309	0.177939
2022-01-04	3.561210	-0.778522
2022-01-05	0.000053	0.585707
2022-01-06	-0.780895	-1.381989

In [215]:
```
df.iloc[:2, 1:3]
```

Out[215]:

	A	H
2022-01-01	0.211822	-0.228018
2022-01-02	-0.009998	1.018073

In [216]:
```
df.iloc[2:4, :4]
```

Out[216]:

	F	A	H	A
2022-01-03	-0.457669	2.350047	0.485818	-1.252309
2022-01-04	-1.058304	-0.711036	-0.636656	3.561210

In [217]:
```
df.head(2)
```

Out[217]:

	F	A	H	A	D
2022-01-01	0.270539	0.211822	-0.228018	-0.078165	-0.354149
2022-01-02	1.910453	-0.009998	1.018073	-0.340792	-0.878497

In [218]:
```
df[df["H"] > 1]
```

Out[218]:

	F	A	H	A	D
2022-01-02	1.910453	-0.009998	1.018073	-0.340792	-0.878497

In [219]:
```
df[df < 0]
```

Out[219]:

	F	A	H	A	D
2022-01-01	NaN	NaN	-0.228018	-0.078165	-0.354149
2022-01-02	NaN	-0.009998	NaN	-0.340792	-0.878497
2022-01-03	-0.457669	NaN	NaN	-1.252309	NaN
2022-01-04	-1.058304	-0.711036	-0.636656	NaN	-0.778522
2022-01-05	NaN	NaN	-1.902090	NaN	NaN
2022-01-06	-0.673901	NaN	-0.990408	-0.780895	-1.381989
2022-01-07	NaN	-1.386319	-2.533721	-0.912674	-0.577733
2022-01-08	-0.007949	-1.535179	-0.963049	NaN	NaN
2022-01-09	-1.121337	-0.428408	-2.505800	-0.013866	-0.273100
2022-01-10	-0.159756	NaN	-0.064466	NaN	NaN

In [220]:
```
df1 = df.copy()
df1
```

Out[220]:

	F	A	H	A	D
2022-01-01	0.270539	0.211822	-0.228018	-0.078165	-0.354149
2022-01-02	1.910453	-0.009998	1.018073	-0.340792	-0.878497
2022-01-03	-0.457669	2.350047	0.485818	-1.252309	0.177939
2022-01-04	-1.058304	-0.711036	-0.636656	3.561210	-0.778522
2022-01-05	1.795361	0.477407	-1.902090	0.000053	0.585707
2022-01-06	-0.673901	0.268804	-0.990408	-0.780895	-1.381989
2022-01-07	0.110143	-1.386319	-2.533721	-0.912674	-0.577733
2022-01-08	-0.007949	-1.535179	-0.963049	0.688605	0.902782
2022-01-09	-1.121337	-0.428408	-2.505800	-0.013866	-0.273100
2022-01-10	-0.159756	0.084009	-0.064466	2.036232	0.580233

In [221]:
```
df1["new"] = ["a", "b", "c", "d","a", "b", "c", "d","e","f"]
df1
```

Out[221]:

	F	A	H	A	D	new
2022-01-01	0.270539	0.211822	-0.228018	-0.078165	-0.354149	a
2022-01-02	1.910453	-0.009998	1.018073	-0.340792	-0.878497	b
2022-01-03	-0.457669	2.350047	0.485818	-1.252309	0.177939	c
2022-01-04	-1.058304	-0.711036	-0.636656	3.561210	-0.778522	d
2022-01-05	1.795361	0.477407	-1.902090	0.000053	0.585707	a
2022-01-06	-0.673901	0.268804	-0.990408	-0.780895	-1.381989	b
2022-01-07	0.110143	-1.386319	-2.533721	-0.912674	-0.577733	c
2022-01-08	-0.007949	-1.535179	-0.963049	0.688605	0.902782	d
2022-01-09	-1.121337	-0.428408	-2.505800	-0.013866	-0.273100	e
2022-01-10	-0.159756	0.084009	-0.064466	2.036232	0.580233	f

In [222]:
```
df1["mean"] = [1,2,3,4,5,2,3,4,5,1]
df1
```

Out[222]:

	F	A	H	A	D	new	mean
2022-01-01	0.270539	0.211822	-0.228018	-0.078165	-0.354149	a	1
2022-01-02	1.910453	-0.009998	1.018073	-0.340792	-0.878497	b	2
2022-01-03	-0.457669	2.350047	0.485818	-1.252309	0.177939	c	3
2022-01-04	-1.058304	-0.711036	-0.636656	3.561210	-0.778522	d	4
2022-01-05	1.795361	0.477407	-1.902090	0.000053	0.585707	a	5
2022-01-06	-0.673901	0.268804	-0.990408	-0.780895	-1.381989	b	2
2022-01-07	0.110143	-1.386319	-2.533721	-0.912674	-0.577733	c	3
2022-01-08	-0.007949	-1.535179	-0.963049	0.688605	0.902782	d	4
2022-01-09	-1.121337	-0.428408	-2.505800	-0.013866	-0.273100	e	5
2022-01-10	-0.159756	0.084009	-0.064466	2.036232	0.580233	f	1

In [223]:
```
df1 = df1.iloc[2:5, 5:7] # Near Specific Locate !
```

In [224]:
```
df1
```

Out[224]:

	new	mean
2022-01-03	c	3
2022-01-04	d	4
2022-01-05	a	5

Case Study with PANDAS

In [225]:
```
# import Libraires !

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [226]:
```
boat = sns.load_dataset("titanic")
boat.head(5)
```

Out[226]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alone
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	NaN	Southampton	no	False
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	C	Cherbourg	yes	False
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	False	NaN	Southampton	yes	True
3	1	1	female	35.0	1	0	53.1000	S	First	woman	False	C	Southampton	yes	False
4	0	3	male	35.0	0	0	8.0500	S	Third	man	True	NaN	Southampton	no	True

In [227]:
```
# Saving csv file !
boat.to_csv("boat.csv")
```

In [228]:
```
boat.describe()
```

Out[228]:

	survived	pclass	age	sibsp	parch	fare
count	891.000000	891.000000	714.000000	891.000000	891.000000	891.000000
mean	0.383838	2.308642	29.699118	0.523008	0.381594	32.204208
std	0.486592	0.836071	14.526497	1.102743	0.806057	49.693429
min	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	0.000000	2.000000	20.125000	0.000000	0.000000	7.910400
50%	0.000000	3.000000	28.000000	0.000000	0.000000	14.454200
75%	1.000000	3.000000	38.000000	1.000000	0.000000	31.000000
max	1.000000	3.000000	80.000000	8.000000	6.000000	512.329200

In [229]:
```
boat.mean()
```

```
C:\Users\fahad\AppData\Local\Temp/ipykernel_10660/416833424.py:1: FutureWarning: Dropping of nuisance columns
in DataFrame reductions (with 'numeric_only=None') is deprecated; in a future version this will raise TypeErro
r.  Select only valid columns before calling the reduction.
  boat.mean()
```

Out[229]:
```
survived       0.383838
pclass         2.308642
age           29.699118
sibsp          0.523008
parch          0.381594
fare          32.204208
adult_male     0.602694
alone          0.602694
dtype: float64
```

In [230]:
```
boat.head(2)
```

Out[230]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alone
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	NaN	Southampton	no	False
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	C	Cherbourg	yes	False

In [231]:
```
# Drop Few Columns from Dataset !
new_boat = boat.drop(["deck", "embark_town", "adult_male"], axis=1)
new_boat
```

Out[231]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	alive	alone
0	0	3	male	22.0	1	0	7.2500	S	Third	man	no	False
1	1	1	female	38.0	1	0	71.2833	C	First	woman	yes	False
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	yes	True
3	1	1	female	35.0	1	0	53.1000	S	First	woman	yes	False
4	0	3	male	35.0	0	0	8.0500	S	Third	man	no	True
...	...	...	...	...	...	...	...	...	...	...	...	...
886	0	2	male	27.0	0	0	13.0000	S	Second	man	no	True
887	1	1	female	19.0	0	0	30.0000	S	First	woman	yes	True
888	0	3	female	NaN	1	2	23.4500	S	Third	woman	no	False
889	1	1	male	26.0	0	0	30.0000	C	First	man	yes	True
890	0	3	male	32.0	0	0	7.7500	Q	Third	man	no	True

891 rows × 12 columns

In [232]:
```
new_boat.head(3)
```

Out[232]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	alive	alone
0	0	3	male	22.0	1	0	7.2500	S	Third	man	no	False
1	1	1	female	38.0	1	0	71.2833	C	First	woman	yes	False
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	yes	True

In [233]:
```
boat.value_counts(['survived'])
```

Out[233]:
```
survived
0           549
1           342
dtype: int64
```

In [234]:
```
boat.groupby(['sex']).mean()
```

Out[234]:

sex	survived	pclass	age	sibsp	parch	fare	adult_male	alone
female	0.742038	2.159236	27.915709	0.694268	0.649682	44.479818	0.000000	0.401274
male	0.188908	2.389948	30.726645	0.429809	0.235702	25.523893	0.930676	0.712305

In [235]:
```
boat.groupby(['sex', 'class']).mean()
```

Out[235]:

sex	class	survived	pclass	age	sibsp	parch	fare	adult_male	alone
female	First	0.968085	1.0	34.611765	0.553191	0.457447	106.125798	0.000000	0.361702
	Second	0.921053	2.0	28.722973	0.486842	0.605263	21.970121	0.000000	0.421053
	Third	0.500000	3.0	21.750000	0.895833	0.798611	16.118810	0.000000	0.416667
male	First	0.368852	1.0	41.281386	0.311475	0.278689	67.226127	0.975410	0.614754
	Second	0.157407	2.0	30.740707	0.342593	0.222222	19.741782	0.916667	0.666667
	Third	0.135447	3.0	26.507589	0.498559	0.224784	12.661633	0.919308	0.760807

In [236]:
```
boat[boat["age"] < 15].groupby(["sex"]).mean()
```

Out[236]:

sex	survived	pclass	age	sibsp	parch	fare	adult_male	alone
female	0.615385	2.641026	6.410256	1.384615	1.282051	28.332159	0.0	0.076923
male	0.538462	2.615385	5.222308	2.256410	1.358974	35.076710	0.0	0.025641

In [237]:
```
boat[boat["age"] < 18].groupby(["sex","class"]).mean()
```

Out[237]:

sex	class	survived	pclass	age	sibsp	parch	fare	adult_male	alone
female	First	0.875000	1.0	14.125000	0.500000	0.875000	104.083337	0.000000	0.125000
	Second	1.000000	2.0	8.333333	0.583333	1.083333	26.241667	0.000000	0.166667
	Third	0.542857	3.0	8.428571	1.571429	1.057143	18.727977	0.000000	0.228571
male	First	1.000000	1.0	8.230000	0.500000	2.000000	116.072900	0.250000	0.000000
	Second	0.818182	2.0	4.757273	0.727273	1.000000	25.659473	0.181818	0.181818
	Third	0.232558	3.0	9.963256	2.069767	1.000000	22.752523	0.348837	0.232558

(Land) FAO Dataset

In [238]:
```
# import Libraries !
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [239]:
```
land = pd.read_csv("pakisatan_Land.csv")
land.head(3)
```

Out[239]:

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	Unit	Value	Flag	Flag Description
0	RL	Land Use	165	Pakistan	5110	Area	6610	Agricultural land	1961	1961	1000 ha	35730.0	Fm	Manual Estimation
1	RL	Land Use	165	Pakistan	5110	Area	6610	Agricultural land	1962	1962	1000 ha	35840.0	Fm	Manual Estimation
2	RL	Land Use	165	Pakistan	5110	Area	6610	Agricultural land	1963	1963	1000 ha	35880.0	Fm	Manual Estimation

In [240]:
```
land.describe()
```

Out[240]:

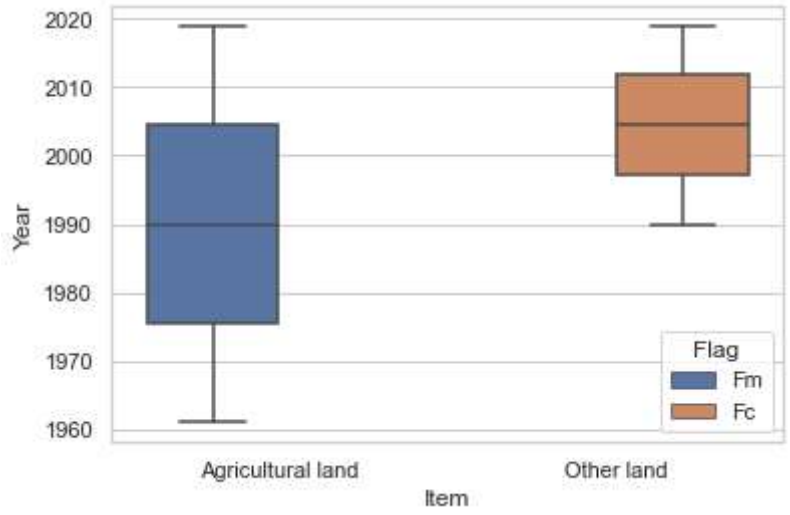
	Area Code	Element Code	Item Code	Year Code	Year	Value
count	89.0	89.0	89.000000	89.000000	89.000000	89.000000
mean	165.0	5110.0	6630.224719	1994.887640	1994.887640	36375.441573
std	0.0	0.0	28.523417	16.355037	16.355037	673.361841
min	165.0	5110.0	6610.000000	1961.000000	1961.000000	35206.000000
25%	165.0	5110.0	6610.000000	1983.000000	1983.000000	35859.999000
50%	165.0	5110.0	6610.000000	1997.000000	1997.000000	36312.975000
75%	165.0	5110.0	6670.000000	2008.000000	2008.000000	36856.011000
max	165.0	5110.0	6670.000000	2019.000000	2019.000000	38509.000000

In [241]:
```
land.drop(["Area Code", "Element Code", "Element", "Domain", ], axis=1).head(3)
```

Out[241]:

	Domain Code	Area	Item Code	Item	Year Code	Year	Unit	Value	Flag	Flag Description
0	RL	Pakistan	6610	Agricultural land	1961	1961	1000 ha	35730.0	Fm	Manual Estimation
1	RL	Pakistan	6610	Agricultural land	1962	1962	1000 ha	35840.0	Fm	Manual Estimation
2	RL	Pakistan	6610	Agricultural land	1963	1963	1000 ha	35880.0	Fm	Manual Estimation

In [242]:
```
sns.set_theme(style="whitegrid", color_codes=True)
sns.boxplot(x="Item",
            y="Year",
            hue="Flag",
            data=land)
plt.show()
```

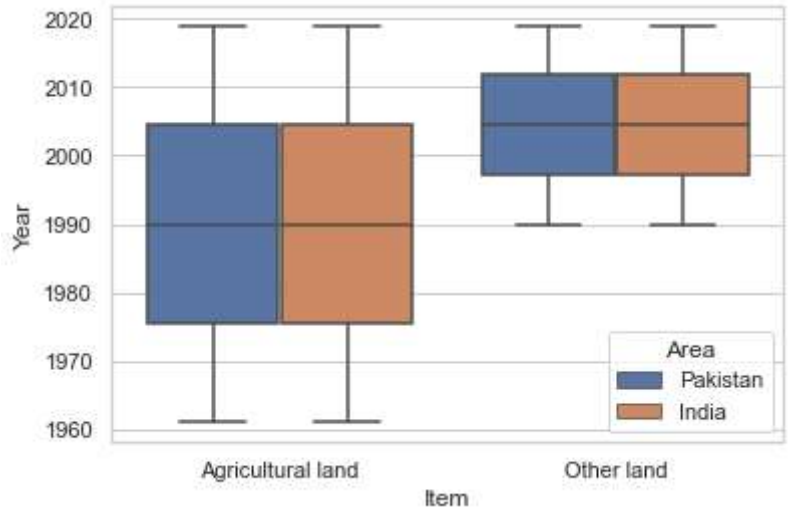


In [243]:
```
land = pd.read_csv("indo-Pak_Land.csv")
land.head(3)
```

Out[243]:

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	Unit	Value	Flag	Flag Description
0	RL	Land Use	165	Pakistan	5110	Area	6610	Agricultural land	1961	1961	1000 ha	35730.0	Fm	Manual Estimation
1	RL	Land Use	165	Pakistan	5110	Area	6610	Agricultural land	1962	1962	1000 ha	35840.0	Fm	Manual Estimation
2	RL	Land Use	165	Pakistan	5110	Area	6610	Agricultural land	1963	1963	1000 ha	35880.0	Fm	Manual Estimation

In [244]:
```
sns.set_theme(style="whitegrid", color_codes=True)
sns.boxplot(x="Item",
            y="Year",
            hue="Area",
            data=land)
plt.show()
```



(6). Statistics

EDA. (Exploratory Data Analysis)

In [245]:
```
# import Libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [246]:
```
boat = sns.load_dataset("titanic")
```

In [247]:
```
boat.to_csv("titanic.csv")
```

01_Undestand the Data !

In [248]:
```
boat.head()
```

Out[248]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alone
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	NaN	Southampton	no	False
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	C	Cherbourg	yes	False
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	False	NaN	Southampton	yes	True
3	1	1	female	35.0	1	0	53.1000	S	First	woman	False	C	Southampton	yes	False
4	0	3	male	35.0	0	0	8.0500	S	Third	man	True	NaN	Southampton	no	True

In [249]:
```
boat.tail()
```

Out[249]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alone
886	0	2	male	27.0	0	0	13.00	S	Second	man	True	NaN	Southampton	no	True
887	1	1	female	19.0	0	0	30.00	S	First	woman	False	B	Southampton	yes	True
888	0	3	female	NaN	1	2	23.45	S	Third	woman	False	NaN	Southampton	no	False
889	1	1	male	26.0	0	0	30.00	C	First	man	True	C	Cherbourg	yes	True
890	0	3	male	32.0	0	0	7.75	Q	Third	man	True	NaN	Queenstown	no	True

In [250]:
```
boat.shape
```

Out[250]:
```
(891, 15)
```

In [251]:
```
boat.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 15 columns):
 #   Column       Non-Null Count  Dtype   
---  ------       --------------  -----   
 0   survived     891 non-null    int64   
 1   pclass       891 non-null    int64   
 2   sex          891 non-null    object  
 3   age          714 non-null    float64 
 4   sibsp        891 non-null    int64   
 5   parch        891 non-null    int64   
 6   fare         891 non-null    float64 
 7   embarked     889 non-null    object  
 8   class        891 non-null    category
 9   who          891 non-null    object  
 10  adult_male   891 non-null    bool    
 11  deck         203 non-null    category
 12  embark_town  889 non-null    object  
 13  alive        891 non-null    object  
 14  alone        891 non-null    bool    
dtypes: bool(2), category(2), float64(2), int64(4), object(5)
memory usage: 63.0+ KB
```

In [252]:
```
boat.describe()
```

Out[252]:

	survived	pclass	age	sibsp	parch	fare
count	891.000000	891.000000	714.000000	891.000000	891.000000	891.000000
mean	0.383838	2.308642	29.699118	0.523008	0.381594	32.204208
std	0.486592	0.836071	14.526497	1.102743	0.806057	49.693429
min	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	0.000000	2.000000	20.125000	0.000000	0.000000	7.910400
50%	0.000000	3.000000	28.000000	0.000000	0.000000	14.454200
75%	1.000000	3.000000	38.000000	1.000000	0.000000	31.000000
max	1.000000	3.000000	80.000000	8.000000	6.000000	512.329200

In [253]:
```
boat.columns
```

Out[253]:
```
Index(['survived', 'pclass', 'sex', 'age', 'sibsp', 'parch', 'fare',
       'embarked', 'class', 'who', 'adult_male', 'deck', 'embark_town',
       'alive', 'alone'],
      dtype='object')
```

In [254]:
```
boat.nunique()
```

Out[254]:
```
survived         2
pclass           3
sex              2
age             88
sibsp            7
parch            7
fare           248
embarked         3
class            3
who              3
adult_male       2
deck             7
embark_town      3
alive            2
alone            2
dtype: int64
```

In [255]:
```
boat['who'].unique()
```

Out[255]:
```
array(['man', 'woman', 'child'], dtype=object)
```

In [256]:
```
boat['class'].unique()
```

Out[256]:
```
['Third', 'First', 'Second']
Categories (3, object): ['First', 'Second', 'Third']
```

In [257]:
```
boat['alone'].append(boat['alive']).unique()
```

Out[257]:
```
array([False, True, 'no', 'yes'], dtype=object)
```

02_Cleaning & Filtering the Data !

- Find missing values

In [258]:
```
boat.isnull().sum()
```

Out[258]:
```
survived         0
pclass           0
sex              0
age            177
sibsp            0
parch            0
fare             0
embarked         2
class            0
who              0
adult_male       0
deck           688
embark_town      2
alive            0
alone            0
dtype: int64
```

-- Remove missing values

In [259]:
```
# Remove duck columns !
boat_new = boat.drop(['deck'], axis=1)
boat_new.head(2)
```

Out[259]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	embark_town	alive	alone
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	Southampton	no	False
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	Cherbourg	yes	False

In [260]:
```
boat_new.columns
```

Out[260]:
```
Index(['survived', 'pclass', 'sex', 'age', 'sibsp', 'parch', 'fare',
       'embarked', 'class', 'who', 'adult_male', 'embark_town', 'alive',
       'alone'],
      dtype='object')
```

In [261]:
```
boat_new.isnull().sum()
```

Out[261]:
```
survived         0
pclass           0
sex              0
age            177
sibsp            0
parch            0
fare             0
embarked         2
class            0
who              0
adult_male       0
embark_town      2
alive            0
alone            0
dtype: int64
```

-- Remove missing values

In [262]:
```
boat_new.shape
```

Out[262]:
```
(891, 14)
```

In [263]:
```
891-177-2-2
```

Out[263]:
```
710
```

In [264]:
```
boat_new1 = boat_new.dropna()
boat_new1.head()
```

Out[264]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	embark_town	alive	alone
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	Southampton	no	False
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	Cherbourg	yes	False
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	False	Southampton	yes	True
3	1	1	female	35.0	1	0	53.1000	S	First	woman	False	Southampton	yes	False
4	0	3	male	35.0	0	0	8.0500	S	Third	man	True	Southampton	no	True

In [265]:
```
boat_new1.isnull().sum()
```

Out[265]:
```
survived       0
pclass         0
sex            0
age            0
sibsp          0
parch          0
fare           0
embarked       0
class          0
who            0
adult_male     0
embark_town    0
alive          0
alone          0
dtype: int64
```

In [266]:
```
boat_new1.shape
```

Out[266]:
```
(712, 14)
```

In [267]:
```
boat_new1['who'].value_counts()
```

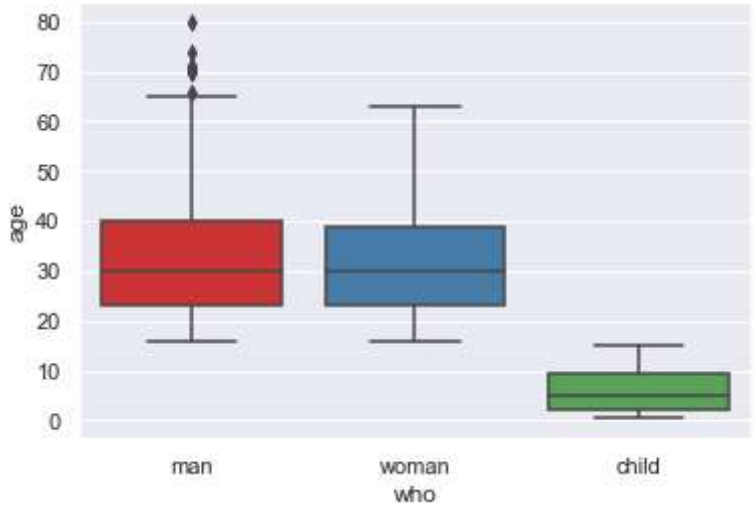
Out[267]:
```
man      413
woman    216
child     83
Name: who, dtype: int64
```

In [268]:
```
boat_new1['alive'].value_counts()
```

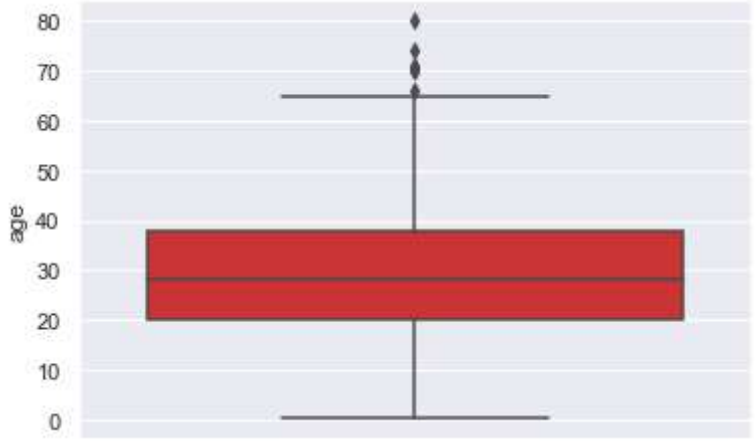
Out[268]:
```
no     424
yes    288
Name: alive, dtype: int64
```

-- Remove Outliers

In [269]:
```
# box-plot !

sns.set_theme(style="darkgrid", color_codes=True)
sns.boxplot(data=boat_new1,
            x="who",
            y="age",
            palette="Set1")
plt.show()
```

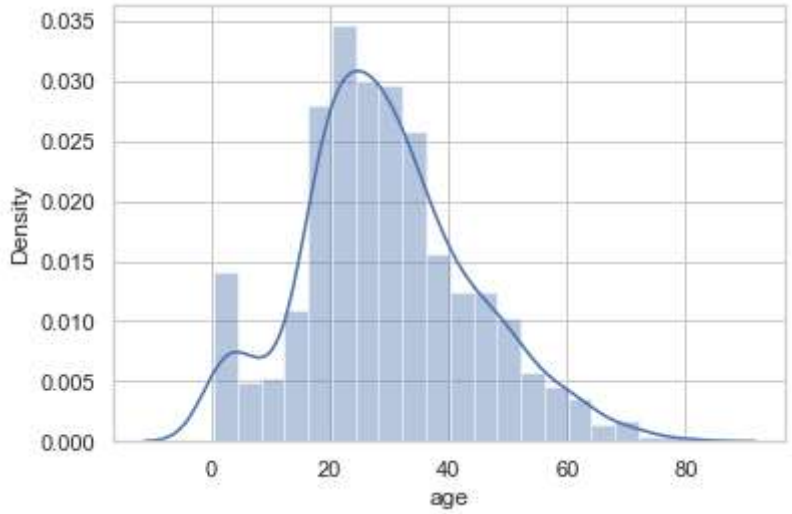


In [270]:
```
# box-plot !

sns.set_theme(style="darkgrid", color_codes=True)
sns.boxplot(data=boat_new1,
            y="age",
            palette="Set1")
plt.show()
```



In [271]:
```
# dist-plot !

sns.set_theme(style="whitegrid", color_codes=True)
sns.distplot(boat_new1['age'])
plt.show()
```

```
c:\python38\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated functio
n and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level func
tion with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```



In [272]:
```
boat_new1.age
```

Out[272]:
```
0      22.0
1      38.0
2      26.0
3      35.0
4      35.0
       ...
885    39.0
886    27.0
887    19.0
889    26.0
890    32.0
Name: age, Length: 712, dtype: float64
```

In [273]:
```
boat_new1['age'].mean()
```

Out[273]:
```
29.64209269662921
```

In [274]:
```
boat_new1.columns
```

Out[274]:
```
Index(['survived', 'pclass', 'sex', 'age', 'sibsp', 'parch', 'fare',
       'embarked', 'class', 'who', 'adult_male', 'embark_town', 'alive',
       'alone'],
      dtype='object')
```

In [275]:
```
boat_new1 = boat_new1[boat_new1['age']<=60]
boat_new1.head(3)
```

Out[275]:

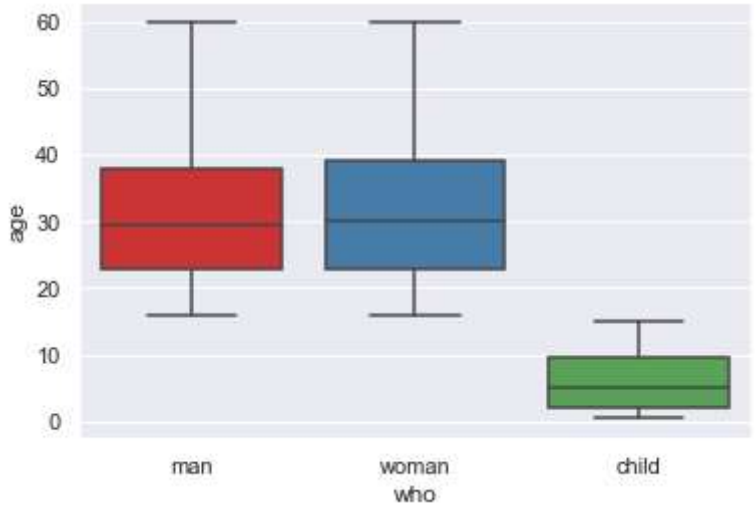
	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	embark_town	alive	alone
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	Southampton	no	False
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	Cherbourg	yes	False
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	False	Southampton	yes	True

In [276]:
```
boat_new1.age
```

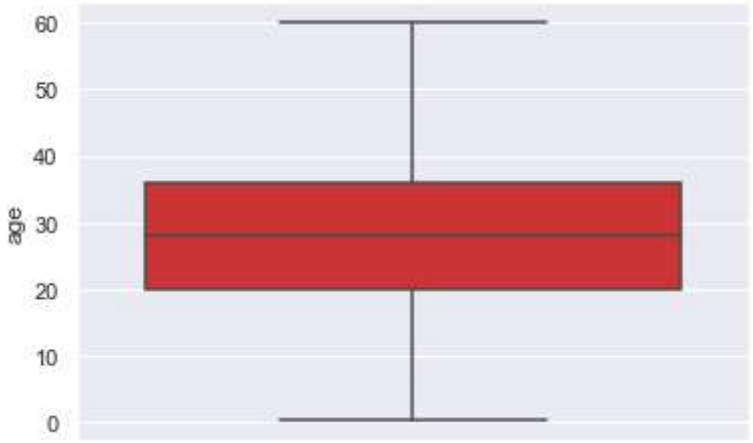
Out[276]:
```
0      22.0
1      38.0
2      26.0
3      35.0
4      35.0
       ...
885    39.0
886    27.0
887    19.0
889    26.0
890    32.0
Name: age, Length: 691, dtype: float64
```

Plots

In [277]:
```
# box-plot !

sns.set_theme(style="darkgrid", color_codes=True)
sns.boxplot(data=boat_new1,
            x="who",
            y="age",
            palette="Set1")
plt.show()
```

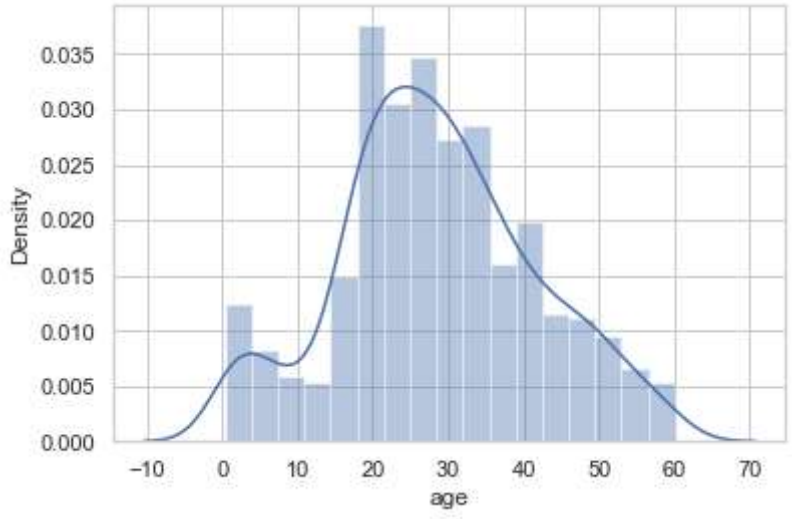


In [278]:
```
# box-plot ! of men

sns.set_theme(style="darkgrid", color_codes=True)
sns.boxplot(data=boat_new1,
            y="age",
            palette="Set1")
plt.show()
```



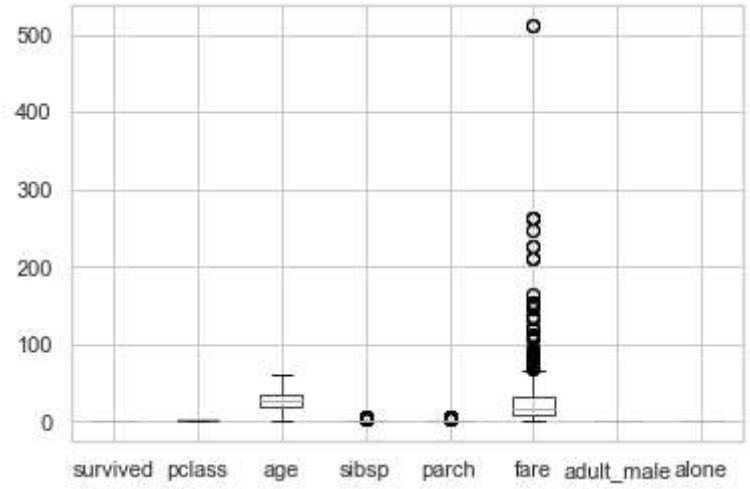
In [279]:
```
# dist-plot !

sns.set_theme(style="whitegrid", color_codes=True)
sns.distplot(boat_new1['age'])
plt.show()
```

```
c:\python38\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated functio
n and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level func
tion with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

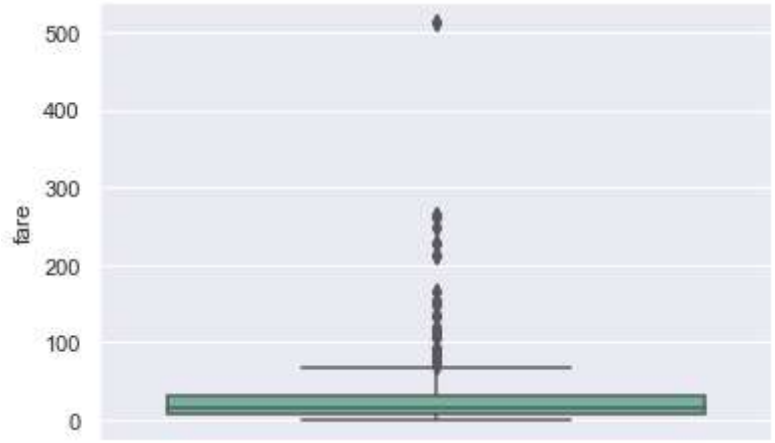


In [280]:
```
# box-plot !

boat_new1.boxplot()
```

Out[280]: <AxesSubplot:>

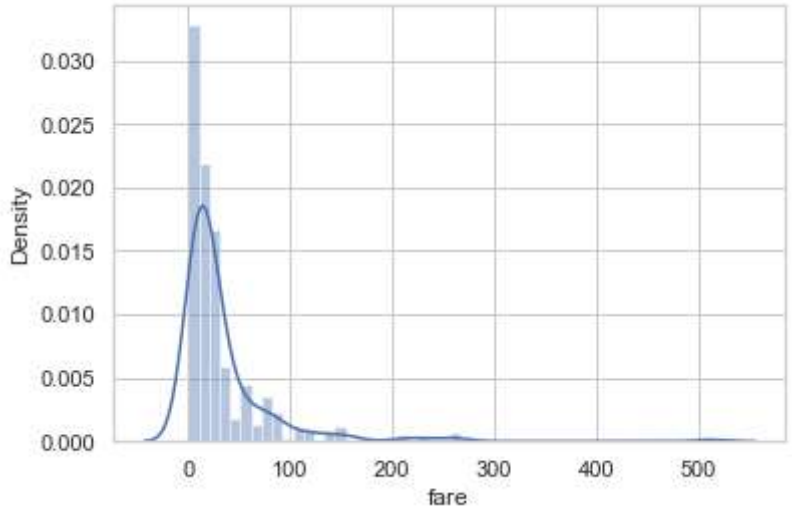


In [281]:
```
# box-plot ! of men

sns.set_theme(style="darkgrid", color_codes=True)
sns.boxplot(data=boat_new1,
            y="fare",
            palette="Set2")
plt.show()
```



In [282]:
```
# dist-plot !

sns.set_theme(style="whitegrid", color_codes=True)
sns.distplot(boat_new1['fare'])
plt.show()
```

```
c:\python38\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated functio
n and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level func
tion with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```



In [283]:
```
boat_new1['fare'].max()
```

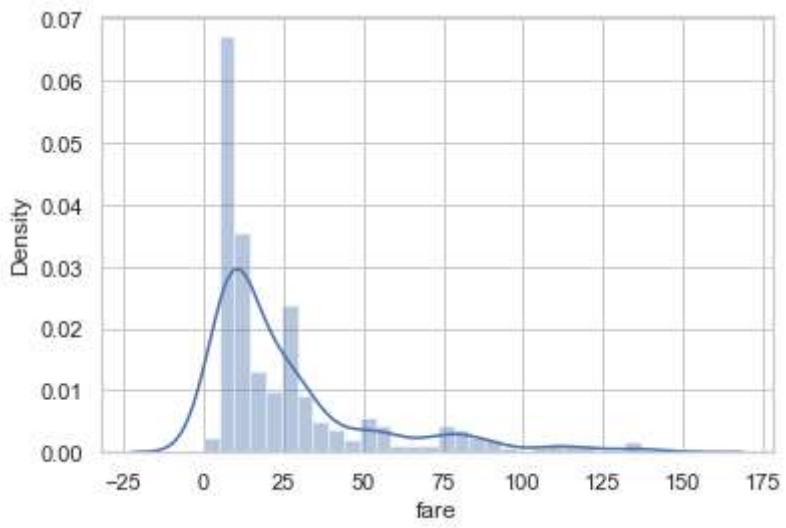
Out[283]:
```
512.3292
```

In [284]:
```
boat_new1 = boat_new1[boat_new1['fare']<=150]
boat_new1.fare.max()
```

Out[284]:
```
146.5208
```

In [285]:
```
# dist-plot !

sns.set_theme(style="whitegrid", color_codes=True)
sns.distplot(boat_new1['fare'])
plt.show()
```

```
c:\python38\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated functio
n and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level func
tion with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

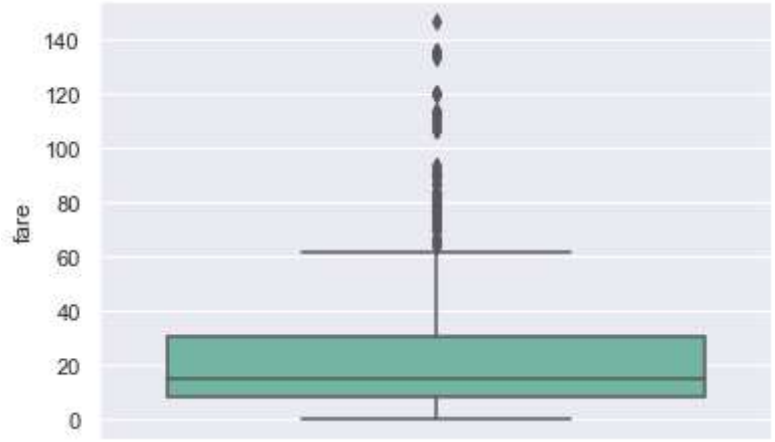


In [286]:
```
# log transformation !

boat_new1['log_fare'] = np.log(boat_new1[['fare']])
boat_new1.head(2)
```

Out[286]:

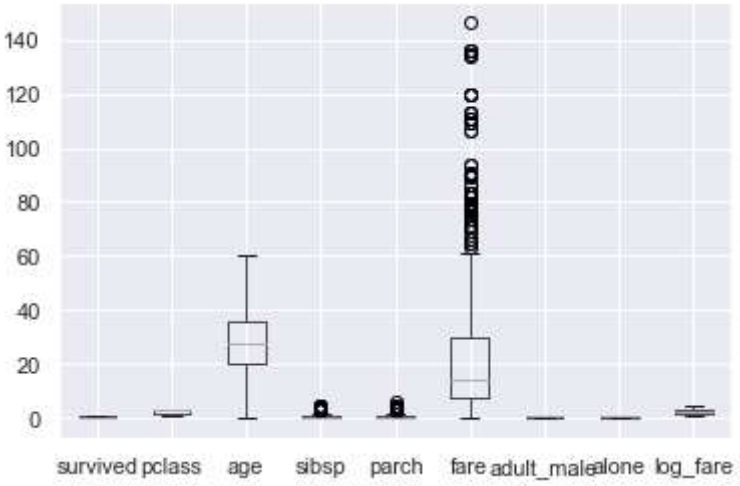
	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	embark_town	alive	alone	log_fare
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	Southampton	no	False	1.981001
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	Cherbourg	yes	False	4.266662

In [287]:
```
# box-plot ! of men

sns.set_theme(style="darkgrid", color_codes=True)
sns.boxplot(data=boat_new1,
            y="fare",
            palette="Set2")
plt.show()
```



In [288]:
```
# box-plot !

boat_new1.boxplot()
```

Out[288]: <AxesSubplot:>



In [289]:
```
boat.shape
```

Out[289]: (891, 15)

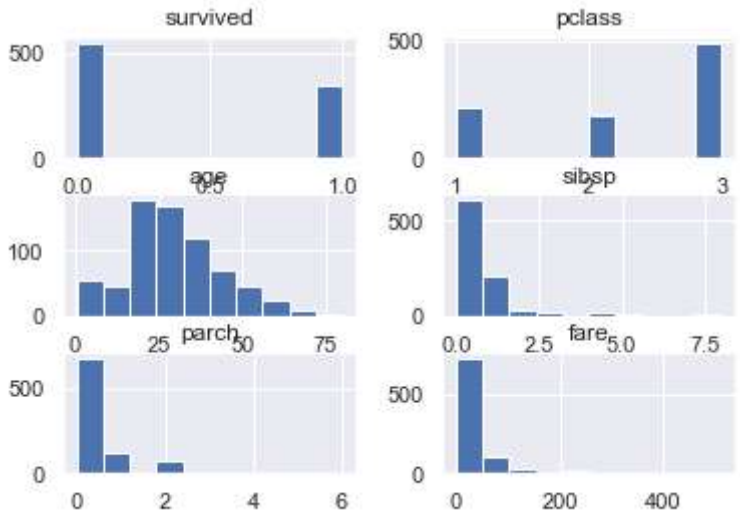
In [290]:
```
boat_new1.shape
```

Out[290]: (665, 15)

In [291]:
```
# (Log transformation) for Normalize our data !
```

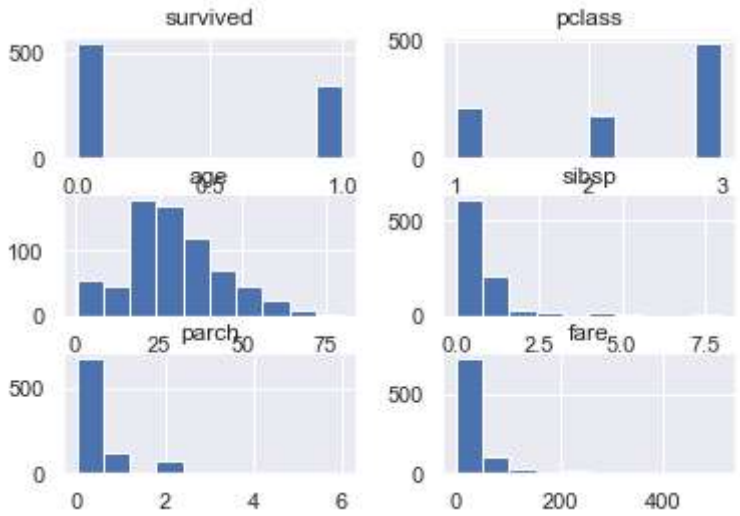
In [292]:
```
boat.hist()
```

Out[292]:
```
array([[<AxesSubplot:title={'center':'survived'}>,
        <AxesSubplot:title={'center':'pclass'}>],
       [<AxesSubplot:title={'center':'age'}>,
        <AxesSubplot:title={'center':'sibsp'}>],
       [<AxesSubplot:title={'center':'parch'}>,
        <AxesSubplot:title={'center':'fare'}>]], dtype=object)
```



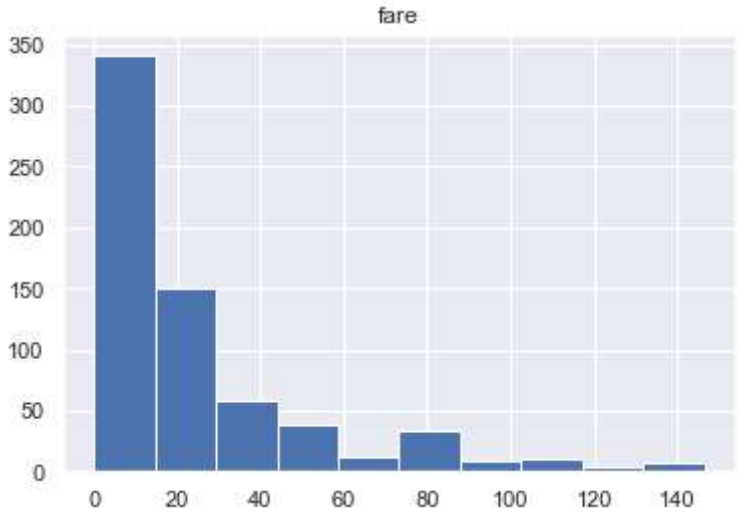
In [293]:
```
boat_new.hist()
```

Out[293]:
```
array([[<AxesSubplot:title={'center':'survived'}>,
        <AxesSubplot:title={'center':'pclass'}>],
       [<AxesSubplot:title={'center':'age'}>,
        <AxesSubplot:title={'center':'sibsp'}>],
       [<AxesSubplot:title={'center':'parch'}>,
        <AxesSubplot:title={'center':'fare'}>]], dtype=object)
```



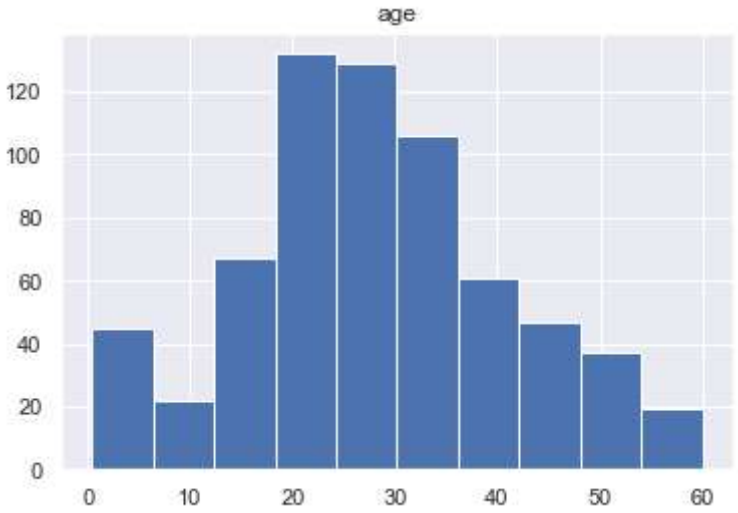
In [294]:
```
boat_new1.hist(['fare'])
```

Out[294]:
```
array([[<AxesSubplot:title={'center':'fare'}>]], dtype=object)
```



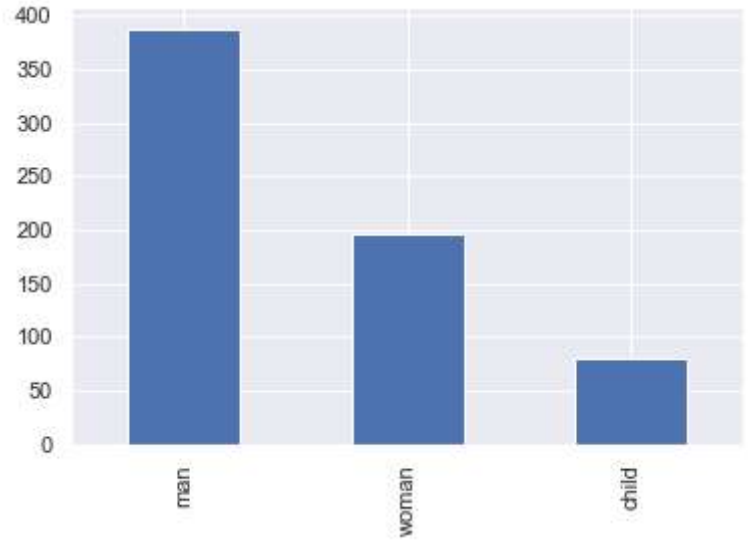
In [295]:
```
boat_new1.hist(['age'])
```

Out[295]:
```
array([[<AxesSubplot:title={'center':'age'}>]], dtype=object)
```



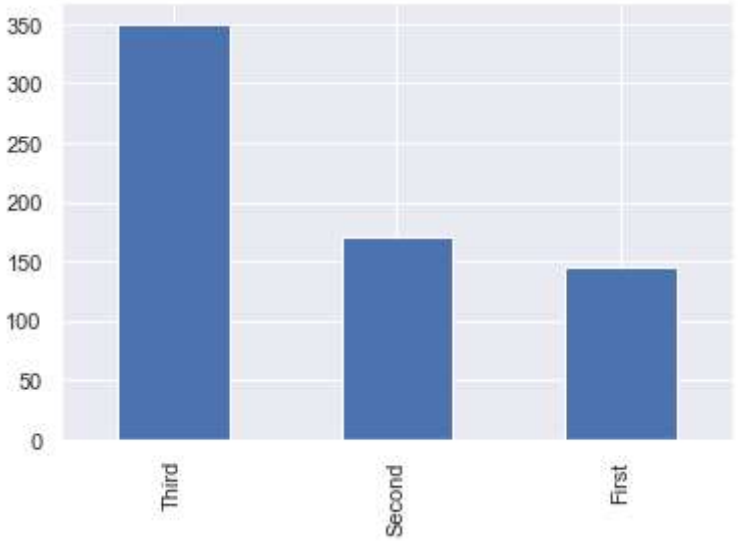
In [296]:
```
pd.value_counts(boat_new1['who']).plot.bar()
```

Out[296]: <AxesSubplot:>



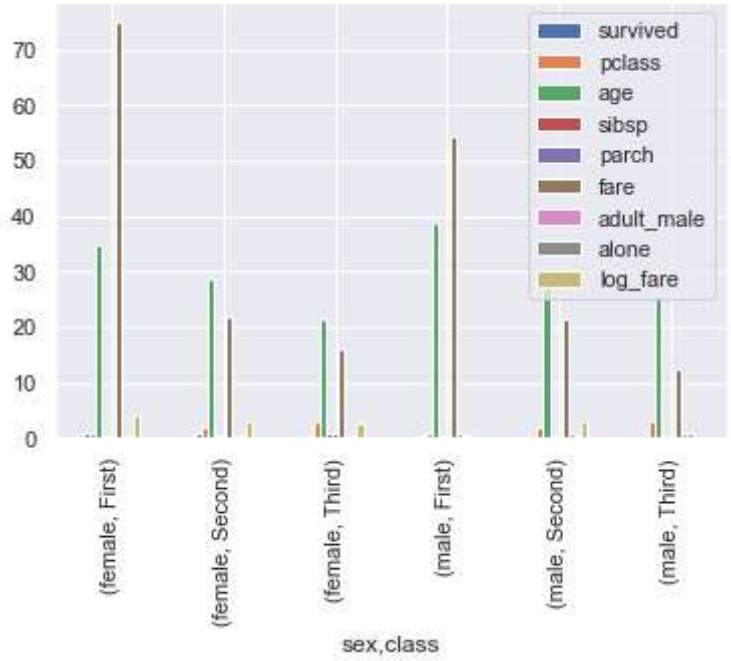
In [297]:
```
pd.value_counts(boat_new1['class']).plot.bar()
```

Out[297]: <AxesSubplot:>



In [298]:
```
boat_new1.groupby(['sex', 'class']).mean().plot.bar()
```

Out[298]: <AxesSubplot:xlabel='sex,class'>



In [299]:
```
boat.groupby(['sex', 'class']).mean()
```

Out[299]:

sex	class	survived	pclass	age	sibsp	parch	fare	adult_male	alone
female	First	0.968085	1.0	34.611765	0.553191	0.457447	106.125798	0.000000	0.361702
	Second	0.921053	2.0	28.722973	0.486842	0.605263	21.970121	0.000000	0.421053
	Third	0.500000	3.0	21.750000	0.895833	0.798611	16.118810	0.000000	0.416667
male	First	0.368852	1.0	41.281386	0.311475	0.278689	67.226127	0.975410	0.614754
	Second	0.157407	2.0	30.740707	0.342593	0.222222	19.741782	0.916667	0.666667
	Third	0.135447	3.0	26.507589	0.498559	0.224784	12.661633	0.919308	0.760807

In [300]:
```
boat_new1.groupby(['sex', 'class']).mean()
```

Out[300]:

sex	class	survived	pclass	age	sibsp	parch	fare	adult_male	alone	log_fare
female	First	0.984127	1.0	34.920635	0.492063	0.365079	74.904432	0.00000	0.380952	4.221755
	Second	0.918919	2.0	28.722973	0.500000	0.621622	21.951070	0.00000	0.405405	2.985791
	Third	0.455446	3.0	21.341584	0.831683	0.960396	15.937625	0.00000	0.366337	2.621204
male	First	0.439024	1.0	38.945122	0.390244	0.231707	54.294156	0.97561	0.536585	NaN
	Second	0.145833	2.0	29.638854	0.385417	0.250000	21.444792	0.90625	0.625000	2.906213
	Third	0.152610	3.0	25.847068	0.497992	0.261044	12.239556	0.88755	0.734940	NaN

In [301]:
```
boat_new1.isnull().sum()
```

Out[301]:
```
survived       0
pclass         0
sex            0
age            0
sibsp          0
parch          0
fare           0
embarked       0
class          0
who            0
adult_male     0
embark_town    0
alive          0
alone          0
log_fare       0
dtype: int64
```

03_Relationship between Data !

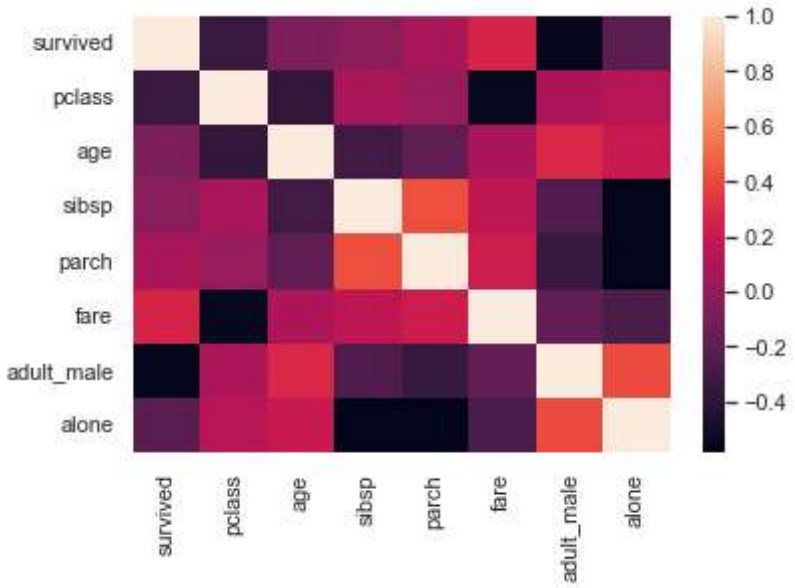
In [302]:
```
boat_corr = boat.corr()
boat_corr
```

Out[302]:

	survived	pclass	age	sibsp	parch	fare	adult_male	alone
survived	1.000000	-0.338481	-0.077221	-0.035322	0.081629	0.257307	-0.557080	-0.203367
pclass	-0.338481	1.000000	-0.369226	0.083081	0.018443	-0.549500	0.094035	0.135207
age	-0.077221	-0.369226	1.000000	-0.308247	-0.189119	0.096067	0.280328	0.198270
sibsp	-0.035322	0.083081	-0.308247	1.000000	0.414838	0.159651	-0.253586	-0.584471
parch	0.081629	0.018443	-0.189119	0.414838	1.000000	0.216225	-0.349943	-0.583398
fare	0.257307	-0.549500	0.096067	0.159651	0.216225	1.000000	-0.182024	-0.271832
adult_male	-0.557080	0.094035	0.280328	-0.253586	-0.349943	-0.182024	1.000000	0.404744
alone	-0.203367	0.135207	0.198270	-0.584471	-0.583398	-0.271832	0.404744	1.000000

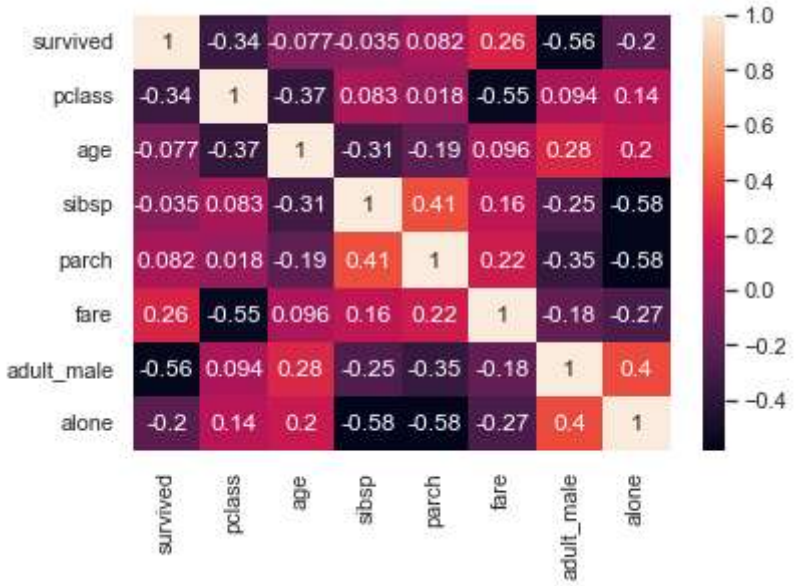
In [303]:
```
sns.heatmap(boat_corr)
```

Out[303]: <AxesSubplot:>



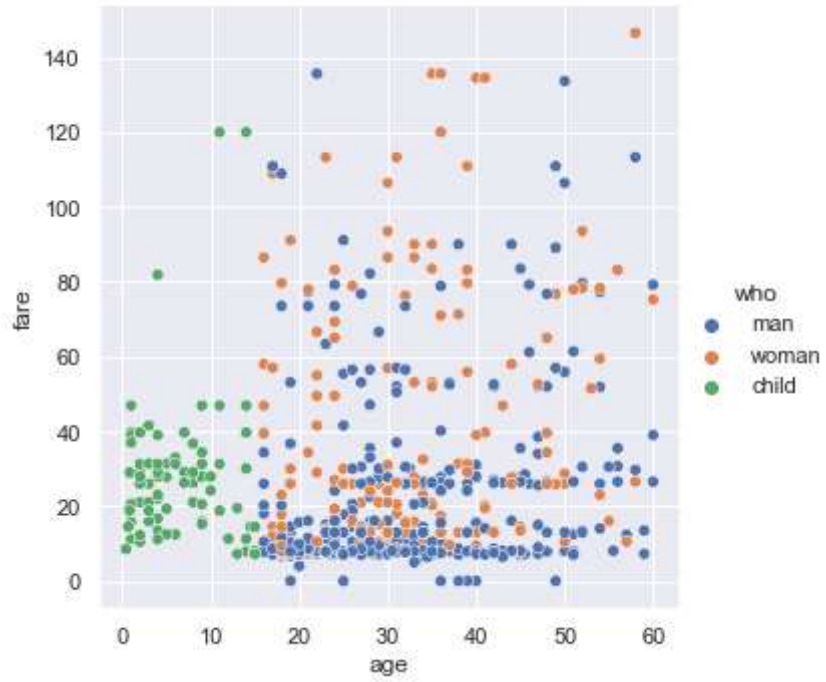
In [304]:
```
sns.heatmap(boat_corr, annot=True)
```

Out[304]: <AxesSubplot:>



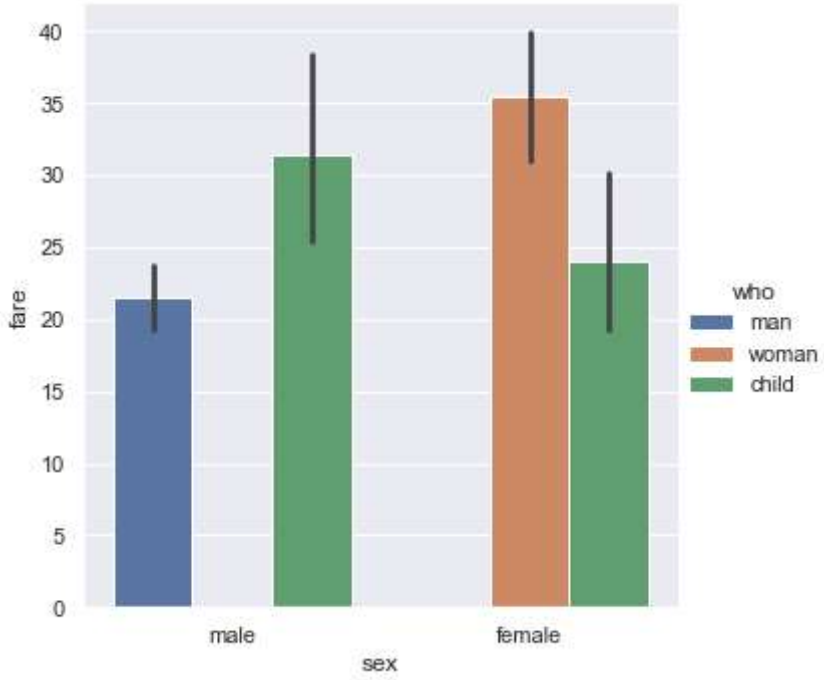
In [305]:
```
sns.relplot(x='age',
            y='fare',
            hue='who',
            data=boat_new1)
```

Out[305]: <seaborn.axisgrid.FacetGrid at 0x17232dd8>



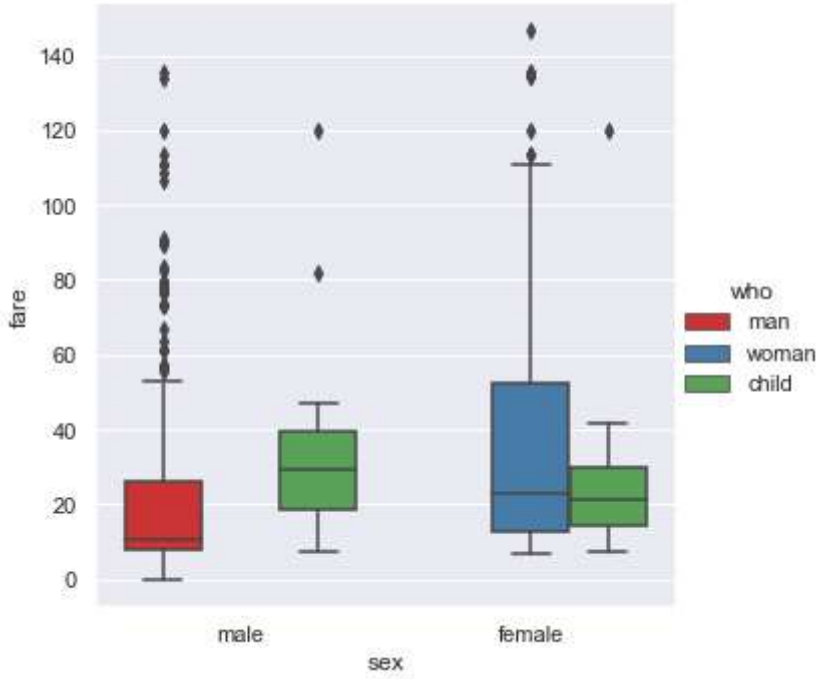
In [306]:
```
sns.catplot(x='sex',
            y='fare',
            hue='who',
            data=boat_new1,
            kind='bar')
```

Out[306]: <seaborn.axisgrid.FacetGrid at 0x172ac4d8>



In [307]:
```
sns.catplot(x='sex',
            y='fare',
            hue='who',
            data=boat_new1,
            kind='box',
            palette="Set1")
```

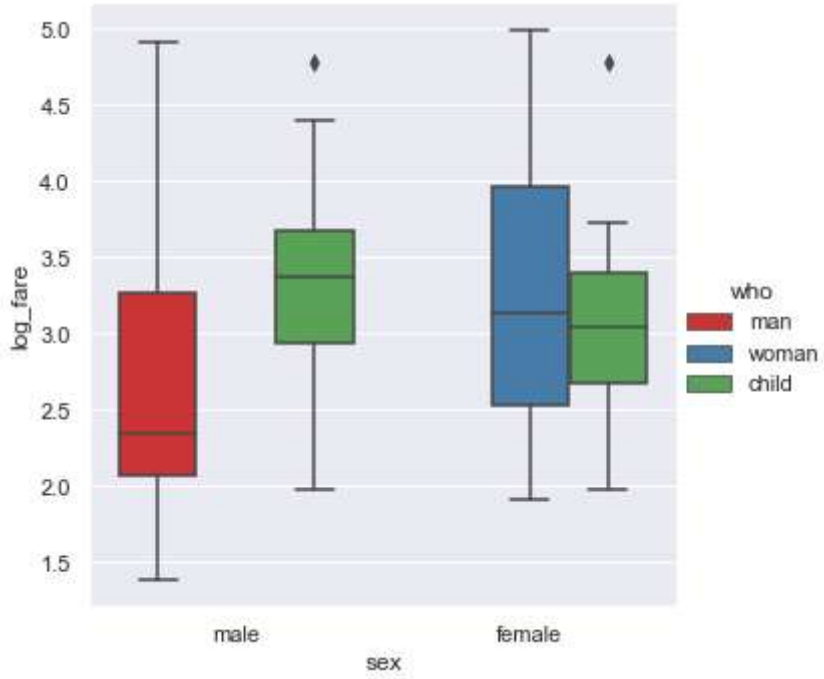
Out[307]: <seaborn.axisgrid.FacetGrid at 0x17a69310>



After taking log(fare)

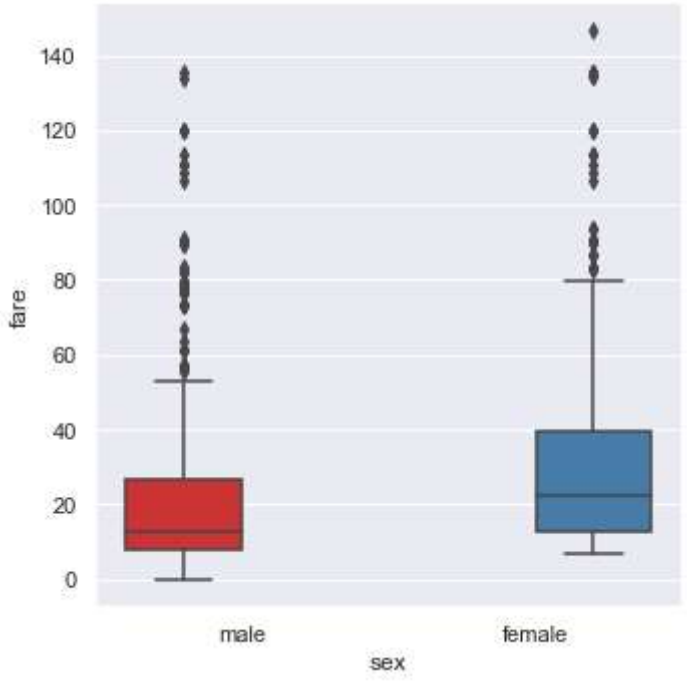
In [308]:
```
sns.catplot(x='sex',
            y='log_fare',
            hue='who',
            data=boat_new1,
            kind='box',
            palette="Set1")
```

Out[308]: <seaborn.axisgrid.FacetGrid at 0x17a8a310>



In [309]:
```
sns.catplot(x='sex',
            y='fare',
            hue='sex',
            data=boat_new1,
            kind='box',
            palette="Set1")
```

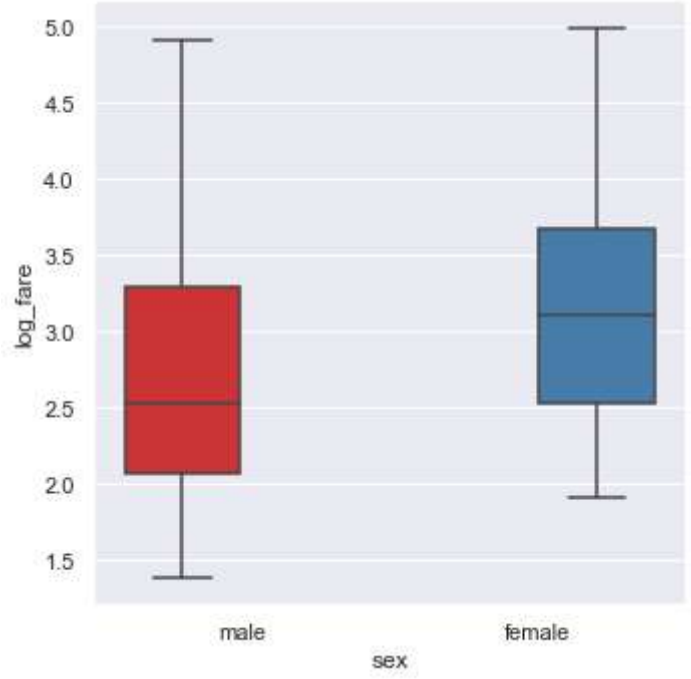
Out[309]: <seaborn.axisgrid.FacetGrid at 0x17b280d0>



After taking log(fare)

In [310]:
```
sns.catplot(x='sex',
            y='log_fare',
            hue='sex',
            data=boat_new1,
            kind='box',
            palette="Set1")
```

Out[310]: <seaborn.axisgrid.FacetGrid at 0x17b07400>



Data Wrangling ! (Data Pre-processing)

In [311]:
```
# import Libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [312]:
```
boat = sns.load_dataset('titanic')
boat1 = sns.load_dataset('titanic')
boat2 = sns.load_dataset('titanic')
```

In [313]:
```
boat.head()
```

Out[313]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alone
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	NaN	Southampton	no	False
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	C	Cherbourg	yes	False
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	False	NaN	Southampton	yes	True
3	1	1	female	35.0	1	0	53.1000	S	First	woman	False	C	Southampton	yes	False
4	0	3	male	35.0	0	0	8.0500	S	Third	man	True	NaN	Southampton	no	True

Simple Operation. (Math operator)

In [314]:
```
(boat['age']+1).head(3)
```

Out[314]:
```
0    23.0
1    39.0
2    27.0
Name: age, dtype: float64
```

Find missing values

In [315]:
```
boat.isnull().sum()
```

Out[315]:
```
survived         0
pclass           0
sex              0
age            177
sibsp            0
parch            0
fare             0
embarked         2
class            0
who              0
adult_male       0
deck           688
embark_town      2
alive            0
alone            0
dtype: int64
```

Find shape of Dataset

In [316]:
```
boat.shape
```

Out[316]:
```
(891, 15)
```

In [317]:
```
boat.deck.isnull().sum()
```

Out[317]: 688

Remove the missing values of specific column.(deck) in x-axis

In [318]:
```
boat.deck.isnull().sum()
```

Out[318]: 688

In [319]:
```
boat.dropna(subset=['deck'], axis=0, inplace=True)
```

In [320]:
```
boat.deck.isnull().sum()
```

Out[320]: 0

In [321]:
```
boat.shape
```

Out[321]: (203, 15)

In [322]:
```
boat.isnull().sum()
```

Out[322]:
```
survived        0
pclass          0
sex             0
age            19
sibsp           0
parch           0
fare            0
embarked        2
class           0
who             0
adult_male      0
deck            0
embark_town     2
alive           0
alone           0
dtype: int64
```

Remove the missing values from whole Dataset

In [323]:
```
boat = boat.dropna()
boat.isnull().sum()
```

Out[323]:
```
survived       0
pclass         0
sex            0
age            0
sibsp          0
parch          0
fare           0
embarked       0
class          0
who            0
adult_male     0
deck           0
embark_town    0
alive          0
alone          0
dtype: int64
```

In [324]:
```
boat.shape
```

Out[324]:
```
(182, 15)
```

In [325]:
```
boat1.head(2)
```

Out[325]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alone
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	NaN	Southampton	no	False
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	C	Cherbourg	yes	False

In [326]:
```
boat1.shape
```

Out[326]:
```
(891, 15)
```

In [327]:
```
boat1.isnull().sum()
```

Out[327]:
```
survived         0
pclass           0
sex              0
age            177
sibsp            0
parch            0
fare             0
embarked         2
class            0
who              0
adult_male       0
deck           688
embark_town      2
alive            0
alone            0
dtype: int64
```

Find mean of age

In [328]:
```
age_mean = boat1.age.mean()
age_mean
```

Out[328]:
```
29.69911764705882
```

Replace the missing values with the average(mean) of that column.(age)

In [329]:
```
boat1.age.isnull().sum()
```

Out[329]:
```
177
```

In [330]:
```
boat1['age'] = boat1['age'].replace(np.nan, age_mean)
```

In [331]:
```
boat1.age.isnull().sum()
```

Out[331]:
```
0
```

Remove the missing values of specific column.(deck) in x-axis

In [332]:
```
boat1.deck.isnull().sum()
```

Out[332]:
```
688
```

In [333]:
```
boat1.dropna(subset=['deck'], axis=0, inplace=True)
```

In [334]:
```
boat1.deck.isnull().sum()
```

Out[334]:
```
0
```

In [335]:
```
boat1.shape
```

Out[335]:
```
(203, 15)
```

Remove the missing values from whole Dataset

In [336]:
```
boat1 = boat1.dropna()
boat1.isnull().sum()
```

Out[336]:
```
survived       0
pclass         0
sex            0
age            0
sibsp          0
parch          0
fare           0
embarked       0
class          0
who            0
adult_male     0
deck           0
embark_town    0
alive          0
alone          0
dtype: int64
```

In [337]:
```
boat1.shape
```

Out[337]:
```
(201, 15)
```

Data Cleaning !

> ***Data Formatting/ Duplicate Removal/ Data Standardization***

In [338]:
```
boat2.head(2)
```

Out[338]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alone
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	NaN	Southampton	no	False
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	C	Cherbourg	yes	False

In [339]:
```
boat2.dtypes
```

Out[339]:
```
survived          int64
pclass            int64
sex              object
age             float64
sibsp             int64
parch             int64
fare            float64
embarked         object
class          category
who              object
adult_male         bool
deck           category
embark_town      object
alive            object
alone              bool
dtype: object
```

Convert data-types of indexes

In [340]:
```
boat2['survived'].dtypes
```

Out[340]:
```
dtype('int64')
```

In [341]:
```
boat2['survived'] = boat2['survived'].astype('float32')
```

In [342]:
```
boat2['survived'].dtypes
```

Out[342]:
```
dtype('float32')
```

Convert age in days

In [343]:
```
boat2.age.head()
```

Out[343]:
```
0    22.0
1    38.0
2    26.0
3    35.0
4    35.0
Name: age, dtype: float64
```

In [344]:
```
boat2['age'] = boat2['age']*365
```

In [345]:
```
boat2.age.head()
```

Out[345]:
```
0     8030.0
1    13870.0
2     9490.0
3    12775.0
4    12775.0
Name: age, dtype: float64
```

Rename column (age to age_days)

In [346]:
```
boat2.head(1)
```

Out[346]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alone
0	0.0	3	male	8030.0	1	0	7.25	S	Third	man	True	NaN	Southampton	no	False

In [347]:
```
boat2['age'] = boat2.rename(columns={'age': 'age_days'}, inplace=True)
```

In [348]:
```
boat2.head(1)
```

Out[348]:

	survived	pclass	sex	age_days	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alone	age
0	0.0	3	male	8030.0	1	0	7.25	S	Third	man	True	NaN	Southampton	no	False	None

Data Normalization / Human-Readable size /Machine-Readable size ! (Bell curve)

Parametric Analysis tests

Non-Parametric Analysis tests

Method of Normalize Data. (Scaling Method)

- Simple Feature
- Min-Max Method
- Z-score. (Standard Score)
- log transformation

Formula's

- *Simple Feature*. { set['value'] = set['value'] / set['value'].max() }
- *Min-Max Method*. { set['value'] = (set['value']-set['value'].min()) / (set['value'].max()-set['value'].min())}
- *Z-score. (Standard Score)*. { set['value'] = (set['value']-set['value'].mean()) / set['value'].std() }
- *log transformation*. { set['value'] = np.log(set['value']) }

Simple Feature Scaling

- Range.(0 to 1)

In [349]:
```
m1 = boat2[['age_days', 'fare']]
m1.head()
```

Out[349]:

	age_days	fare
0	8030.0	7.2500
1	13870.0	71.2833
2	9490.0	7.9250
3	12775.0	53.1000
4	12775.0	8.0500

In [350]:
```
m1['age_days'] = m1['age_days']/m1['age_days'].max()
m1['fare'] = m1['fare']/m1['fare'].max()

m1.head()
```

```
C:\Users\fahad\AppData\Local\Temp/ipykernel_10660/1515070788.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

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)
  m1['age_days'] = m1['age_days']/m1['age_days'].max()
C:\Users\fahad\AppData\Local\Temp/ipykernel_10660/1515070788.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

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)
  m1['fare'] = m1['fare']/m1['fare'].max()
```

Out[350]:

	age_days	fare
0	0.2750	0.014151
1	0.4750	0.139136
2	0.3250	0.015469
3	0.4375	0.103644
4	0.4375	0.015713

In [351]:
```
m1.min()
```

Out[351]:
```
age_days    0.00525
fare        0.00000
dtype: float64
```

In [352]:
```
m1.max()
```

Out[352]:
```
age_days    1.0
fare        1.0
dtype: float64
```

Min-Max Scaling Method

- Range.(0 to 1)

In [353]:
```
m2 = boat2[['age_days', 'fare']]
m2.head()
```

Out[353]:

	age_days	fare
0	8030.0	7.2500
1	13870.0	71.2833
2	9490.0	7.9250
3	12775.0	53.1000
4	12775.0	8.0500

In [354]:
```
m2['age_days'] = (m2['age_days']-m2['age_days'].min()) / (m2['age_days'].max()-m2['age_days'].min())
m2['fare'] = (m2['fare']-m2['fare'].min()) / (m2['fare'].max()-m2['fare'].min())
m2.head()
```

```
C:\Users\fahad\AppData\Local\Temp/ipykernel_10660/2700239246.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

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)
  m2['age_days'] = (m2['age_days']-m2['age_days'].min()) / (m2['age_days'].max()-m2['age_days'].min())
C:\Users\fahad\AppData\Local\Temp/ipykernel_10660/2700239246.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

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)
  m2['fare'] = (m2['fare']-m2['fare'].min()) / (m2['fare'].max()-m2['fare'].min())
```

Out[354]:

	age_days	fare
0	0.271174	0.014151
1	0.472229	0.139136
2	0.321438	0.015469
3	0.434531	0.103644
4	0.434531	0.015713

In [355]:
```
m2.min()
```

Out[355]:
```
age_days    0.0
fare        0.0
dtype: float64
```

In [356]:
```
m2.max()
```

Out[356]:
```
age_days    1.0
fare        1.0
dtype: float64
```

Z-score Scaling Method ! (Standard Score)

- Range.(-3 to +3)

In [357]:
```
m3 = boat2[['age_days', 'fare']]
m3.head()
```

Out[357]:

	age_days	fare
0	8030.0	7.2500
1	13870.0	71.2833
2	9490.0	7.9250
3	12775.0	53.1000
4	12775.0	8.0500

In [358]:
```
m3['age_days'] = (m3['age_days']-m3['age_days'].mean()) / (m3['age_days'].std())
m3['fare'] = (m3['fare']-m3['fare'].mean()) / (m3['fare'].std())
m3.head()
```

```
C:\Users\fahad\AppData\Local\Temp/ipykernel_10660/3802698713.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

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)
  m3['age_days'] = (m3['age_days']-m3['age_days'].mean()) / (m3['age_days'].std())
C:\Users\fahad\AppData\Local\Temp/ipykernel_10660/3802698713.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

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)
  m3['fare'] = (m3['fare']-m3['fare'].mean()) / (m3['fare'].std())
```

Out[358]:

	age_days	fare
0	-0.530005	-0.502163
1	0.571430	0.786404
2	-0.254646	-0.488580
3	0.364911	0.420494
4	0.364911	-0.486064

In [359]:
```
m3.min()
```

Out[359]:
```
age_days   -2.015566
fare       -0.648058
dtype: float64
```

In [360]:
```
m3.max()
```

Out[360]:
```
age_days    3.462699
fare        9.661740
dtype: float64
```

log transformation

- Range.(1 to 1000)

In [361]:
```
m4 = boat2[['age_days', 'fare']]
m4.head()
```

Out[361]:

	age_days	fare
0	8030.0	7.2500
1	13870.0	71.2833
2	9490.0	7.9250
3	12775.0	53.1000
4	12775.0	8.0500

In [362]:
```
m4['age_days'] = np.log(m4['age_days'])
m4['fare'] = np.log(m4['fare'])

m4.head()
```

```
C:\Users\fahad\AppData\Local\Temp/ipykernel_10660/1973992703.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

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)
  m4['age_days'] = np.log(m4['age_days'])
c:\python38\lib\site-packages\pandas\core\arraylike.py:364: RuntimeWarning: divide by zero encountered in log
  result = getattr(ufunc, method)(*inputs, **kwargs)
C:\Users\fahad\AppData\Local\Temp/ipykernel_10660/1973992703.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

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)
  m4['fare'] = np.log(m4['fare'])
```

Out[362]:

	age_days	fare
0	8.990940	1.981001
1	9.537484	4.266662
2	9.157994	2.070022
3	9.455245	3.972177
4	9.455245	2.085672

In [363]:
```
m4.min()
```

Out[363]:
```
age_days    5.032397
fare            -inf
dtype: float64
```

In [364]:
```
m4.max()
```

Out[364]:
```
age_days    10.281924
fare         6.238967
dtype: float64
```

Binning

> *Parametric Analysis tests*
>
> *Non-Parametric Analysis tests*

In [365]:
```
boat4 = boat[['age', 'sex', 'who']]
```

In [366]:
```
boat4.age.head()
```

Out[366]:
```
1     38.0
3     35.0
6     54.0
10     4.0
11    58.0
Name: age, dtype: float64
```

In [367]:
```
boat4.age.max()
```

Out[367]:
```
80.0
```

In [368]:
```
# bins = np.linespace(min(boat4['age']), max(boat4['age']), num=80)
# age_groups = ['child', 'young', 'older']

# boat4['age'] = pd.cut(boat4['age'], bins, labels=age_groups, include_lowest=True)
# boat4['age']
```

Converting Catagorical variables into dummies !

In [369]:
```
boat4.sex.head()
```

Out[369]:
```
1     female
3     female
6       male
10    female
11    female
Name: sex, dtype: object
```

In [370]:
```
boat4 = pd.get_dummies(boat4, columns=['sex'])
```

In [371]:
```
boat4.head()
```

Out[371]:

	age	who	sex_female	sex_male
1	38.0	woman	1	0
3	35.0	woman	1	0
6	54.0	man	0	1
10	4.0	child	1	0
11	58.0	woman	1	0

In [372]:
```
boat4.who.head()
```

Out[372]:
```
1     woman
3     woman
6       man
10    child
11    woman
Name: who, dtype: object
```

In [373]:
```
boat4 = pd.get_dummies(boat4, columns=['who'])
```

In [374]:
```
boat4.head()
```

Out[374]:

	age	sex_female	sex_male	who_child	who_man	who_woman
1	38.0	1	0	0	0	1
3	35.0	1	0	0	0	1
6	54.0	0	1	0	1	0
10	4.0	1	0	1	0	0
11	58.0	1	0	0	0	1

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(7). Machine Learning

Simple_Linear_Regression

Dataset: Salary_Prediction

Step: 01: (Import Dataset)

In [375]:
```
# import Dataset !
import pandas as pd

df = pd.read_csv("salary_data.csv")
df.head()
```

Out[375]:

	YearsExperience	Salary
0	1.1	39343
1	1.3	46205
2	1.5	37731
3	2.0	43525
4	2.2	39891

Step: 02: Data Already Cleaned or Organize

Step: 03: Splitting Dataset into (Training and Testing) Data

In [376]:
```
X = df[['YearsExperience']]
y = df[['Salary']]
```

In [377]:
```
X.head()
```

Out[377]:

	YearsExperience
0	1.1
1	1.3
2	1.5
3	2.0
4	2.2

In [378]:
```
y.head()
```

Out[378]:

	Salary
0	39343
1	46205
2	37731
3	43525
4	39891

In [379]:
```
# import library for splitting !
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0)
```

Step: 04: Fit Linear-Regression Model

In [380]:
```
# import model !
from sklearn.linear_model import LinearRegression

model = LinearRegression().fit(X_train, y_train)
model
```

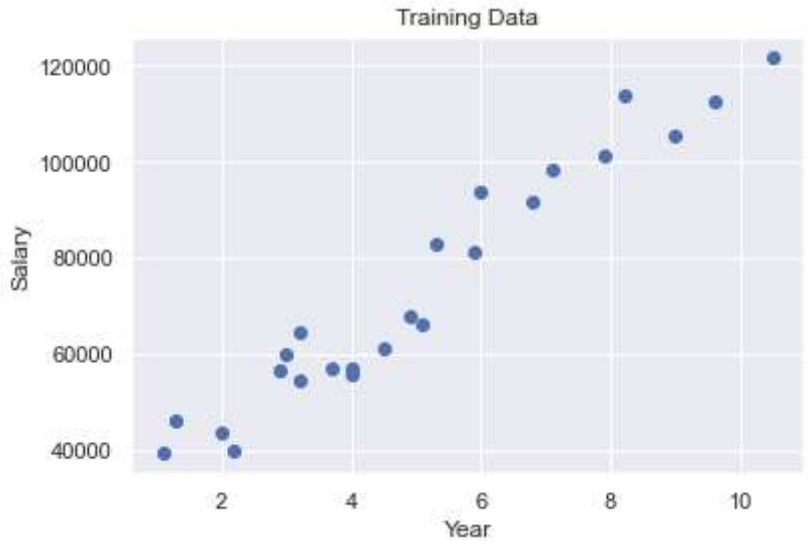
Out[380]:
```
LinearRegression()
```

Step: 05: Plotting

In [381]:
```
# import libraries !
import matplotlib.pyplot as plt
import seaborn as sns
```

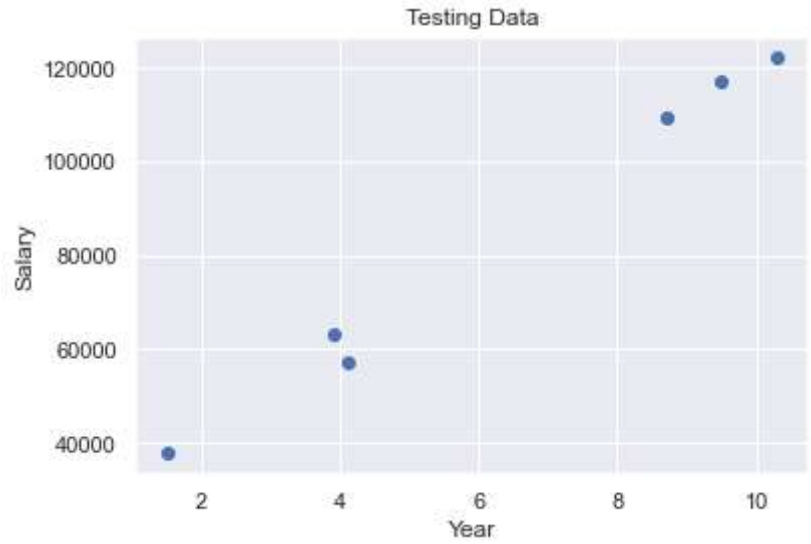
In [382]:
```
sns.set_theme(style="darkgrid", color_codes=True)
plt.scatter(X_train, y_train)
# plt.plot(X_train, model.predict(X_train), color="red")
plt.title('Training Data')
plt.xlabel('Year')
plt.ylabel('Salary')
```

Out[382]:
```
Text(0, 0.5, 'Salary')
```



In [383]:
```
sns.set_theme(style="darkgrid", color_codes=True)
plt.scatter(X_test, y_test)
# plt.plot(X_test, model.predict(X_test), color="blue")
plt.title('Testing Data')
plt.xlabel('Year')
plt.ylabel('Salary')
```

Out[383]:
```
Text(0, 0.5, 'Salary')
```



Step: 06: Evaluate or Test Model Accuracy

In [384]:
```
# Model fitness test !
print("Score of Training: ", model.score(X_train, y_train)*100)

print("Score of Testing: ", model.score(X_test, y_test)*100)
```

```
Score of Training:  94.11949620562126
Score of Testing:  98.8169515729126
```

Step: 07: Prediction of Un-known values

In [385]:
```
model.predict([[1]])
```

```
c:\python38\lib\site-packages\sklearn\base.py:445: UserWarning: X does not have valid feature names, but Linea
rRegression was fitted with feature names
  warnings.warn(
```

Out[385]:
```
array([[36092.67427736]])
```

In [386]:
```
model.predict(X_test)
```

Out[386]:
```
array([[ 40748.96184072],
       [122699.62295594],
       [ 64961.65717022],
       [ 63099.14214487],
       [115249.56285456],
       [107799.50275317]])
```

In [387]:
```
model.predict([[2], [4], [6], [8]])
```

```
c:\python38\lib\site-packages\sklearn\base.py:445: UserWarning: X does not have valid feature names, but Linea
rRegression was fitted with feature names
  warnings.warn(
```

Out[387]:
```
array([[ 45405.24940409],
       [ 64030.39965754],
       [ 82655.549911  ],
       [101280.70016446]])
```

In [388]:
```
f = [[10], [20], [30]]

model.predict(f)
```

```
c:\python38\lib\site-packages\sklearn\base.py:445: UserWarning: X does not have valid feature names, but Linea
rRegression was fitted with feature names
  warnings.warn(
```

Out[388]:
```
array([[119905.85041792],
       [213031.60168521],
       [306157.3529525 ]])
```

Multiple_Linear_Regression

Dataset: Salary_Prediction

Step: 01: (Import Dataset)

In [389]:
```
# import Dataset !
import pandas as pd

df = pd.read_csv("ml_data_salary.csv")
df.head()
```

Out[389]:

	age	distance	YearsExperience	Salary
0	31.1	77.75	1.1	39343
1	31.3	78.25	1.3	46205
2	31.5	78.75	1.5	37731
3	32.0	80.00	2.0	43525
4	32.2	80.50	2.2	39891

Step: 02: Data Normalization

In [390]:
```
features = df[['age', 'distance', 'YearsExperience']]
features.head()
```

Out[390]:

	age	distance	YearsExperience
0	31.1	77.75	1.1
1	31.3	78.25	1.3
2	31.5	78.75	1.5
3	32.0	80.00	2.0
4	32.2	80.50	2.2

In [391]:
```
# features['age'] = features['age']/features['age'].max()
# features['distance'] = features['distance']/features['distance'].max()
# features['YearsExperience'] = features['YearsExperience']/features['YearsExperience'].max()

# features.head()
```

In [392]:
```
# # Data transformation
# from sklearn.preprocessing import MinMaxScaler

# scaler = MinMaxScaler()
# features = scaler.fit_transform(features)
# features
```

Step: 03: Splitting Dataset into (Training and Testing) Data

In [393]:
```
X = features
y = df[['Salary']]
```

In [394]:
```
X.head()
```

Out[394]:

	age	distance	YearsExperience
0	31.1	77.75	1.1
1	31.3	78.25	1.3
2	31.5	78.75	1.5
3	32.0	80.00	2.0
4	32.2	80.50	2.2

In [395]:
```
y.head()
```

Out[395]:

	Salary
0	39343
1	46205
2	37731
3	43525
4	39891

In [396]:
```
# import library for splitting !
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0)
```

Step: 04: Fit Linear-Regression Model

In [397]:
```
# import model !
from sklearn.linear_model import LinearRegression

model = LinearRegression().fit(X_train, y_train)
model
```

Out[397]:
```
LinearRegression()
```

In [398]:
```
model.coef_
```

Out[398]:
```
array([[ 1.53152206e+16,  1.89735921e+14, -1.57895604e+16]])
```

In [399]:
```
model.intercept_
```

Out[399]:
```
array([-4.73686812e+17])
```

Step: 05: Plotting

In [400]:
```
# import libraries !
import matplotlib.pyplot as plt
import seaborn as sns
```

In [401]:
```
# sns.set_theme(style="whitegrid", color_codes=True)
# plt.scatter(X_train, y_train)
# # plt.plot(X_train, model.predict(X_train), color="red")
# plt.title('Training Data')
# plt.xlabel('Year')
# plt.ylabel('Salary')
```

Step: 06: Evaluate or Test Model Accuracy

In [402]:
```
# model.score(X_train, y_train)
model.score(X_train, y_train)*100
```

Out[402]:
```
94.10812914659125
```

Step: 07: Prediction of Un-known values

In [403]:
```
model.predict([[31.1, 77.75, 1.1]])
```

```
c:\python38\lib\site-packages\sklearn\base.py:445: UserWarning: X does not have valid feature names, but Linea
rRegression was fitted with feature names
  warnings.warn(
```

Out[403]:
```
array([[36992.]])
```

Decision_Tree_Classifier

Dataset: Food_Prediction

Step: 01: (Import Dataset)

In [404]:
```
# import Dataset !
import pandas as pd

df = pd.read_csv("chillamldata.csv")
df.head()
```

Out[404]:

	age	height	weight	gender	likeness
0	27	170.688	76.0	Male	Biryani
1	41	165.000	70.0	Male	Biryani
2	29	171.000	80.0	Male	Biryani
3	27	173.000	102.0	Male	Biryani
4	29	164.000	67.0	Male	Biryani

Step: 02: Data be Normalized !

In [405]:
```
df['gender'] = df['gender'].replace('Male', 1)
df['gender'] = df['gender'].replace('Female', 0)
```

In [406]:
```
# selection of input & output variables !

X = df.drop(['likeness'], axis=1)
y = df[['likeness']]
```

In [407]:
```
X.head()
```

Out[407]:

	age	height	weight	gender
0	27	170.688	76.0	1
1	41	165.000	70.0	1
2	29	171.000	80.0	1
3	27	173.000	102.0	1
4	29	164.000	67.0	1

In [408]:
```
y.head()
```

Out[408]:

	likeness
0	Biryani
1	Biryani
2	Biryani
3	Biryani
4	Biryani

Step: 03: Splitting Dataset into (Training and Testing) Data

In [409]:
```
# import library for splitting !
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0)
```

Step: 04: Fit Decision Tree Model

In [410]:
```
# import model !
from sklearn.tree import DecisionTreeClassifier

# Create & Fit Model
model = DecisionTreeClassifier().fit(X_train, y_train)
model
```

Out[410]:
```
DecisionTreeClassifier()
```

Step: 05: Evaluate or Test Model Accuracy

In [411]:
```
predicted_values = model.predict(X_test)
predicted_values

# import library for score !
from sklearn.metrics import accuracy_score

score = accuracy_score(y_test, predicted_values)*100
score
```

Out[411]:
```
38.775510204081634
```

Step: 06: Prediction of Un-known values

In [412]:
```
model.predict([['27', '170.688', '76.0', '1']])
```

```
c:\python38\lib\site-packages\sklearn\base.py:445: UserWarning: X does not have valid feature names, but Decis
ionTreeClassifier was fitted with feature names
  warnings.warn(
```

Out[412]:
```
array(['Biryani'], dtype=object)
```

In [413]:
```
model.predict([['22', '163.688', '63.0', '1']])
```

```
c:\python38\lib\site-packages\sklearn\base.py:445: UserWarning: X does not have valid feature names, but Decis
ionTreeClassifier was fitted with feature names
  warnings.warn(
```

Out[413]:
```
array(['Samosa'], dtype=object)
```

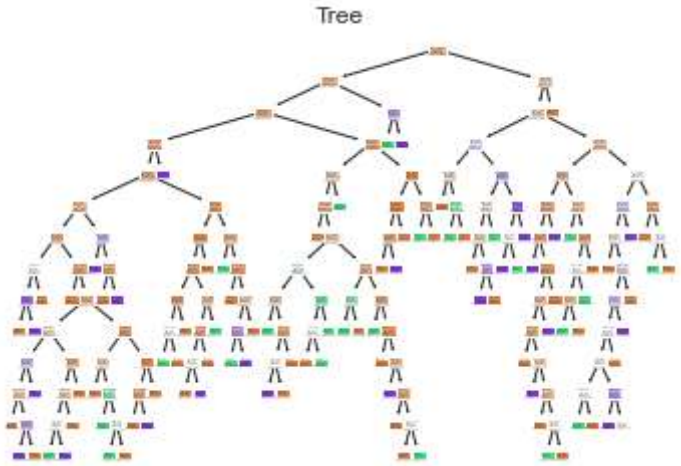
How to save model !

In [414]:
```
# import libraries !
import pandas as pd
from sklearn.tree import DecisionTreeClassifier
import joblib as jb

model = DecisionTreeClassifier()
jb.dump(model, 'foodie.joblib')
```

Out[414]:
```
['foodie.joblib']
```

Graph

In [415]:
```
# graph
from sklearn.tree import plot_tree
from sklearn.tree import DecisionTreeClassifier
import matplotlib.pyplot as plt

model1 = DecisionTreeClassifier().fit(X,y)
plot_tree(model1, filled=True)
plt.title("Tree")
plt.show()
```



Decision_Tree_Classifier

Dataset: iris

Task

In [416]:
```
import pandas as pd
import seaborn as sns
```

In [417]:
```
df = sns.load_dataset('iris')
df.head()
```

Out[417]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

In [418]:
```
df.isnull().sum()
```

Out[418]:
```
sepal_length    0
sepal_width     0
petal_length    0
petal_width     0
species         0
dtype: int64
```

In [419]:
```
# splitting data !
X = df.drop(['species'], axis=1)
y = df[['species']]
```

In [420]:
```
X.head(2)
```

Out[420]:

	sepal_length	sepal_width	petal_length	petal_width
0	5.1	3.5	1.4	0.2
1	4.9	3.0	1.4	0.2

In [421]:
```
y.head(2)
```

Out[421]:

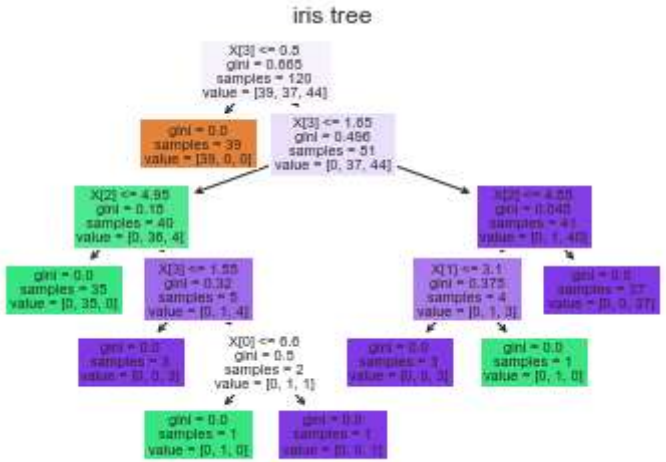
	species
0	setosa
1	setosa

In [422]:
```
# train / test data !
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size= 0.2, random_state= 1)
```

In [423]:
```
# create & fit model !
from sklearn.tree import DecisionTreeClassifier

model = DecisionTreeClassifier()
model.fit(X_train, y_train)
model
```

Out[423]:
```
DecisionTreeClassifier()
```

In [424]:
```
# Draw graph !
from sklearn.tree import plot_tree
import matplotlib.pyplot as plt
import seaborn as sns

sns.set_theme(style="white", color_codes=True)
plot_tree(model, filled=True)
plt.title('iris tree')
plt.show()
```



In [425]:
```
pred_val = model.predict(X_test)
pred_val

# r^2 method !
from sklearn.metrics import accuracy_score
r2_score = accuracy_score(y_test, pred_val)*100
r2_score
```

Out[425]: 96.66666666666667

In [426]:
```
# check Accuracy !
model.score(X_train, y_train)*100
```

Out[426]: 100.0

In [427]:
```
# check Accuracy !
model.score(X, y)*100
```

Out[427]: 99.33333333333333

Random-Forest_Classifier

Dataset: iris

Task

In [428]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

In [429]:
```
flowers = sns.load_dataset('iris')
flowers.head()
```

Out[429]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

In [430]:
```
X = flowers.drop(['species'], axis=1)
y = flowers[['species']]
```

In [431]:
```
X.head(1)
```

Out[431]:

	sepal_length	sepal_width	petal_length	petal_width
0	5.1	3.5	1.4	0.2

In [432]:
```
y.head(1)
```

Out[432]:

	species
0	setosa

In [433]:
```
# splitting !
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=1)
```

standard (no's of trees)n_estimators is (10 to 100) ... (like, RandomForestClassifier(n_estimators=(10 to 100)))

In [434]:
```
from sklearn.ensemble import RandomForestClassifier
```

In [435]:
```
model1 = RandomForestClassifier(n_estimators=10).fit(X, y)
model1.predict([[10, 20, 30, 40]])
```

```
C:\Users\fahad\AppData\Local\Temp/ipykernel_10660/2813647156.py:1: DataConversionWarning: A column-vector y wa
s passed when a 1d array was expected. Please change the shape of y to (n_samples,), for example using ravel
().
  model1 = RandomForestClassifier(n_estimators=10).fit(X, y)
c:\python38\lib\site-packages\sklearn\base.py:445: UserWarning: X does not have valid feature names, but Rando
mForestClassifier was fitted with feature names
  warnings.warn(
```

Out[435]:
```
array(['virginica'], dtype=object)
```

In [436]:
```
model = RandomForestClassifier().fit(X_train, y_train)
model
```

```
C:\Users\fahad\AppData\Local\Temp/ipykernel_10660/2183830046.py:1: DataConversionWarning: A column-vector y wa
s passed when a 1d array was expected. Please change the shape of y to (n_samples,), for example using ravel
().
  model = RandomForestClassifier().fit(X_train, y_train)
```

Out[436]:
```
RandomForestClassifier()
```

In [437]:
```
pred_value = model.predict(X_test)
pred_value
```

Out[437]:
```
array(['setosa', 'versicolor', 'versicolor', 'setosa', 'virginica',
       'versicolor', 'virginica', 'setosa', 'setosa', 'virginica',
       'versicolor', 'setosa', 'virginica', 'versicolor', 'versicolor',
       'setosa', 'versicolor', 'versicolor', 'setosa', 'setosa',
       'versicolor', 'versicolor', 'virginica', 'setosa', 'virginica',
       'versicolor', 'setosa', 'setosa', 'versicolor', 'virginica'],
      dtype=object)
```

In [438]:
```
from sklearn.metrics import accuracy_score

r2_score = accuracy_score(y_test, pred_value)*100
r2_score
```

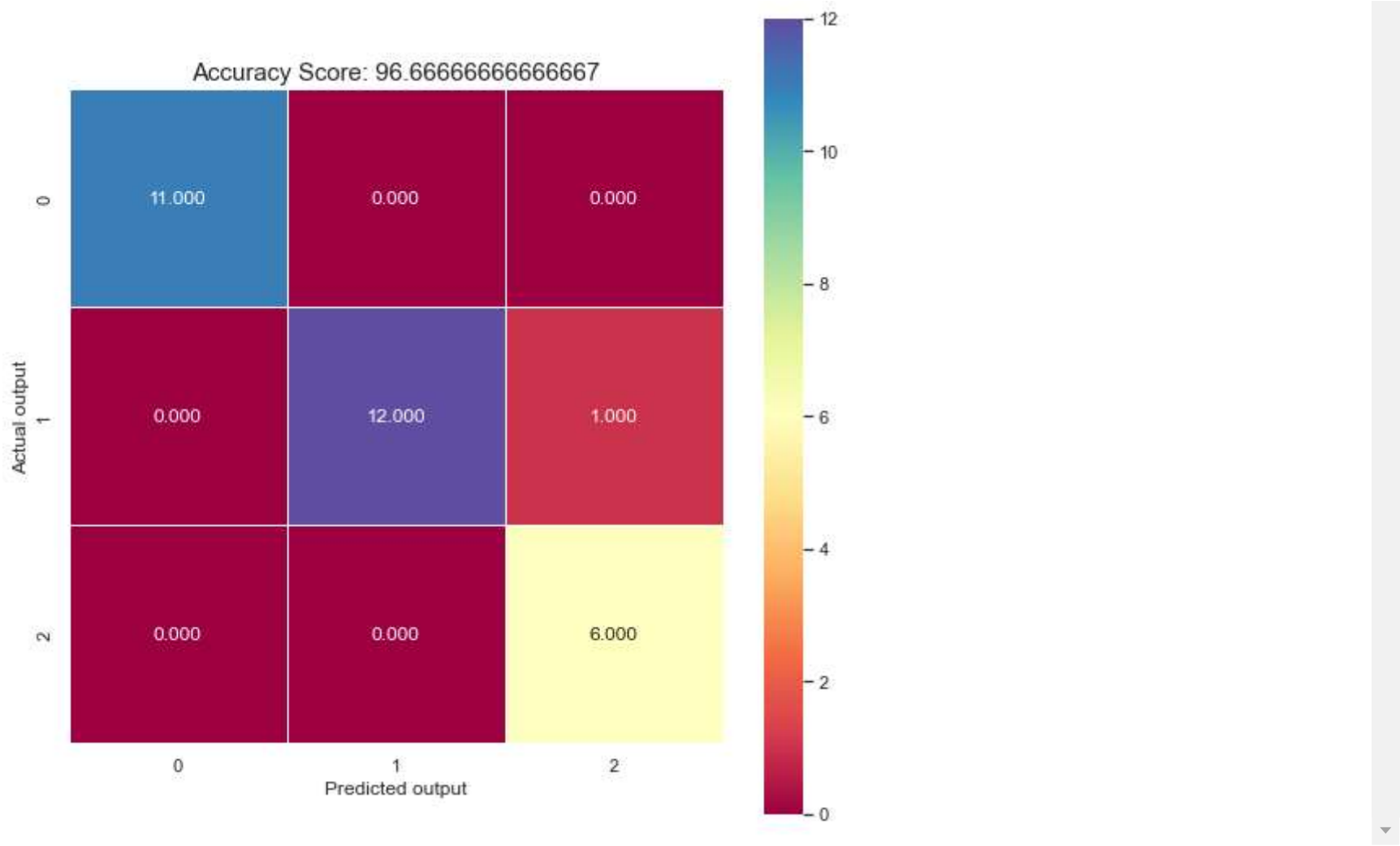
Out[438]:
```
96.66666666666667
```

In [439]:
```
# make confution metrics !
from sklearn.metrics import confusion_matrix

cm = confusion_matrix(y_test, pred_value)
cm
```

Out[439]:
```
array([[11,  0,  0],
       [ 0, 12,  1],
       [ 0,  0,  6]], dtype=int64)
```

In [440]:
```
sns.set_theme(style="white", color_codes=True)
plt.figure(figsize=(9,9))

sns.heatmap(cm, annot= True, fmt= '.3f', linewidths= .5, square= True, cmap= 'Spectral')

plt.xlabel("Predicted output")
plt.ylabel("Actual output")

all_sample_title= "Accuracy Score: {0}".format(r2_score)

plt.title(all_sample_title, size= '15')
```

Out[440]:
```
Text(0.5, 1.0, 'Accuracy Score: 96.66666666666667')
```



K-Nearest_Neighbors

Dataset: Chilla Dataset !

Step: 01: (Import Dataset)

In [441]:
```
# import Dataset !
import pandas as pd

df = pd.read_csv('chillamldata.csv')
df.head()
```

Out[441]:

	age	height	weight	gender	likeness
0	27	170.688	76.0	Male	Biryani
1	41	165.000	70.0	Male	Biryani
2	29	171.000	80.0	Male	Biryani
3	27	173.000	102.0	Male	Biryani
4	29	164.000	67.0	Male	Biryani

In [442]:
```
df['gender'] = df['gender'].replace('Male', 1)
df['gender'] = df['gender'].replace('Female', 0)
```

In [443]:
```
X = df.drop('likeness', axis=1)
y = df.likeness
```

In [444]:
```
X.head(2)
```

Out[444]:

	age	height	weight	gender
0	27	170.688	76.0	1
1	41	165.000	70.0	1

In [445]:
```
y.head(2)
```

Out[445]:
```
0    Biryani
1    Biryani
Name: likeness, dtype: object
```

Step: 02: Data Cleaned or Organize

In [446]:
```
df.isnull().sum()
```

Out[446]:
```
age         0
height      0
weight      0
gender      0
likeness    0
dtype: int64
```

Step: 03: Splitting Dataset into (Training and Testing) Data

In [447]:
```
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0)
```

Step: 04: Fit K-Nearest_Neighbor Model

In [448]:
```
from sklearn.neighbors import KNeighborsClassifier

model = KNeighborsClassifier(n_neighbors=5).fit(X_train, y_train)
model
```

Out[448]:
```
KNeighborsClassifier()
```

Step: 05: Evaluate or Test Model Accuracy

In [449]:
```
predicted_values = model.predict(X_test)
predicted_values

from sklearn.metrics import accuracy_score

score = accuracy_score(y_test, predicted_values)*100
print("K-NN. (r2.score):", score)
```

```
K-NN. (r2.score): 57.14285714285714
```

Step: 06: Prediction of Un-known values

In [450]:
```
model.predict(X_test)
```

Out[450]:
```
array(['Biryani', 'Samosa', 'Biryani', 'Biryani', 'Biryani', 'Biryani',
       'Biryani', 'Biryani', 'Biryani', 'Biryani', 'Samosa', 'Biryani',
       'Samosa', 'Biryani', 'Biryani', 'Biryani', 'Biryani', 'Biryani',
       'Biryani', 'Biryani', 'Biryani', 'Biryani', 'Biryani', 'Biryani',
       'Biryani', 'Biryani', 'Biryani', 'Samosa', 'Biryani', 'Samosa',
       'Biryani', 'Biryani', 'Biryani', 'Biryani', 'Biryani', 'Samosa',
       'Samosa', 'Biryani', 'Biryani', 'Biryani', 'Biryani', 'Samosa',
       'Pakora', 'Biryani', 'Biryani', 'Biryani', 'Biryani', 'Biryani',
       'Biryani'], dtype=object)
```

Polynomial Regression

Dataset: Salaries !

In [451]:
```
# import Libraries !

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [452]:
```
dataset = pd.read_csv('Position_Salaries.csv')
dataset.head(3)
```

Out[452]:

	Position	Level	Salary
0	Business Analyst	1	45000
1	Junior Consultant	2	50000
2	Senior Consultant	3	60000

In [453]:
```
X = dataset[['Level']]
y = dataset[['Salary']]
```

In [454]:
```
X.head(2)
```

Out[454]:

	Level
0	1
1	2

In [455]:
```
X.head()
```

Out[455]:

	Level
0	1
1	2
2	3
3	4
4	5

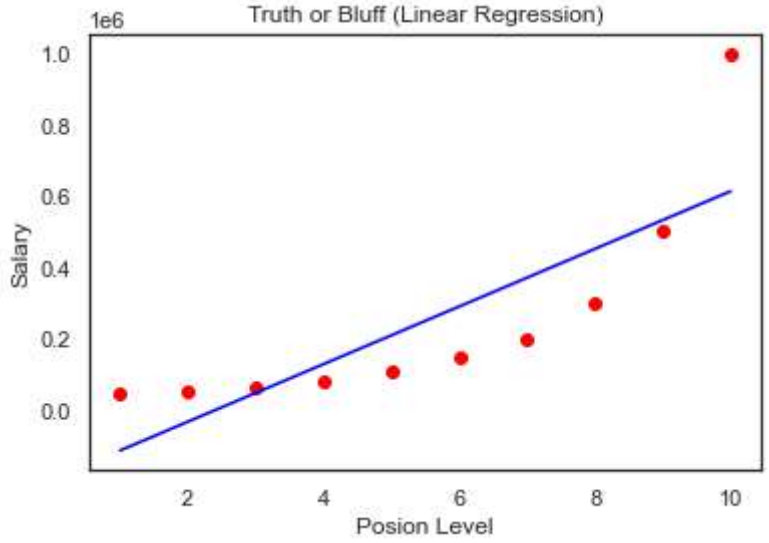
In [456]:
```
y.head(2)
```

Out[456]:

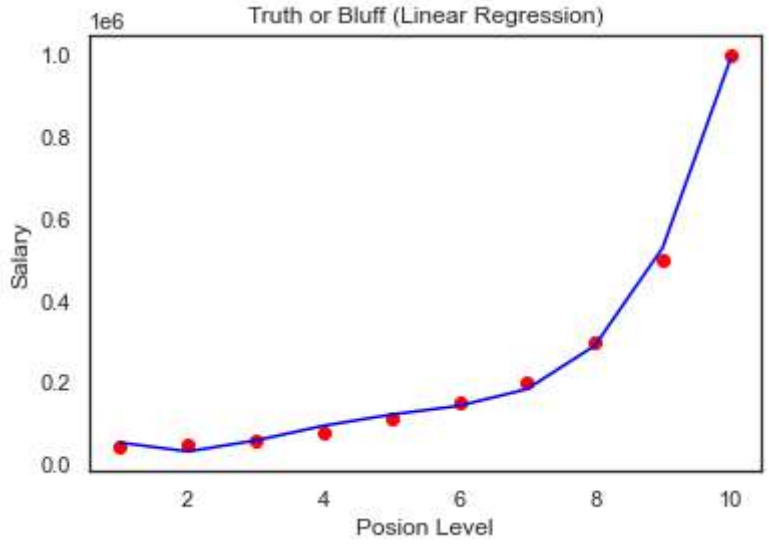
	Salary
0	45000
1	50000

In [457]:
```
# Splitting
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0)
```

In [458]:
```
from sklearn.linear_model import LinearRegression

model = LinearRegression()
model.fit(X, y)

sns.set_theme(style="white", color_codes=True)
plt.scatter(X, y, color='red')
plt.plot(X, model.predict(X), color='blue')
plt.title('Truth or Bluff (Linear Regression)')
plt.xlabel('Posion Level')
plt.ylabel('Salary')
plt.show()
```



In [459]:
```
# fit polynomial regression to dataset
from sklearn.preprocessing import PolynomialFeatures

poly_reg = PolynomialFeatures(degree=4)
X_poly = poly_reg.fit_transform(X)
poly_reg = LinearRegression()
poly_reg.fit(X_poly, y)

sns.set_theme(style="white", color_codes=True)
plt.scatter(X, y, color='red')
plt.plot(X, poly_reg.predict(X_poly), color='blue')
plt.title('Truth or Bluff (Linear Regression)')
plt.xlabel('Posion Level')
plt.ylabel('Salary')
plt.show()
```



In [460]:
```
pred_linear = model.predict([[11]])
pred_linear
```

```
c:\python38\lib\site-packages\sklearn\base.py:445: UserWarning: X does not have valid feature names, but Linea
rRegression was fitted with feature names
  warnings.warn(
```

Out[460]:
```
array([[694333.33333333]])
```

Naive Bayes

Dataset: iris !

In [461]:
```
# import Libraries !

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

Step: 01: (Import Dataset)

In [462]:
```
df = sns.load_dataset('iris')
df.head()
```

Out[462]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

In [463]:
```
X = df.drop('species', axis=1)
y = df[['species']]
```

In [464]:
```
X.head(2)
```

Out[464]:

	sepal_length	sepal_width	petal_length	petal_width
0	5.1	3.5	1.4	0.2
1	4.9	3.0	1.4	0.2

In [465]:
```
y.head(2)
```

Out[465]:

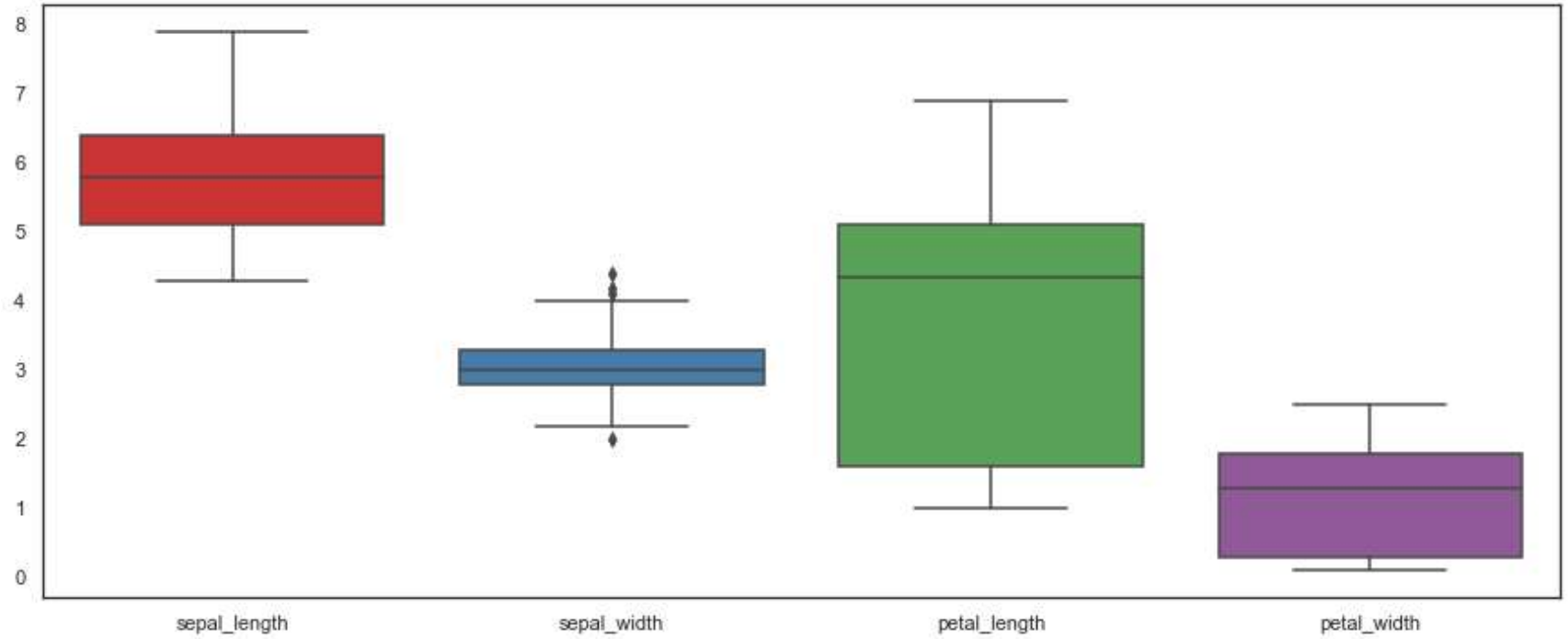
	species
0	setosa
1	setosa

Step: 02: Data Cleaned or Organize

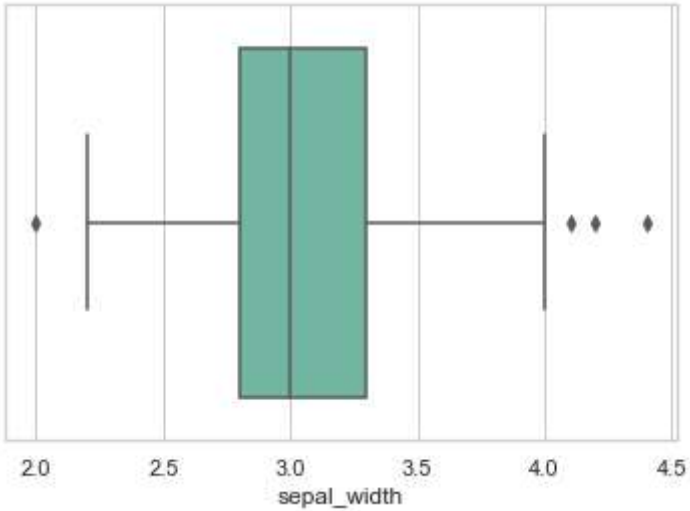
In [466]:
```
df.isnull().sum()
```

Out[466]:
```
sepal_length    0
sepal_width     0
petal_length    0
petal_width     0
species         0
dtype: int64
```

In [467]:
```
plt.figure(figsize=(15,6))
sns.set_theme(style="white", color_codes=True)
sns.boxplot(data=df,
            palette="Set1")
plt.show()
```

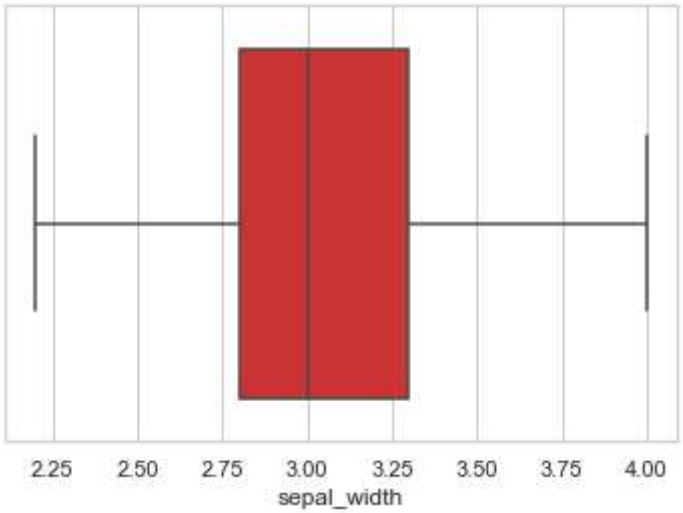


In [468]:
```
sns.set_theme(style="whitegrid", color_codes=True)
sns.boxplot(data=df,
            x="sepal_width",
            palette="Set2")
plt.show()
```



In [469]:
```
df = df[df['sepal_width']<4.1]
df = df[df['sepal_width']>2.1]
```

In [470]:
```
sns.set_theme(style="whitegrid", color_codes=True)
sns.boxplot(data=df,
            x="sepal_width",
            palette="Set1")
plt.show()
```



Step: 03: Splitting Dataset into (Training and Testing) Data

In [471]:
```
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.25, random_state=1)
```

Step: 04: Fit Naive Bayes Model

In [472]:
```
from sklearn.naive_bayes import GaussianNB

model = GaussianNB().fit(X_train, y_train)
model
```

```
c:\python38\lib\site-packages\sklearn\utils\validation.py:985: DataConversionWarning: A column-vector y was pa
ssed when a 1d array was expected. Please change the shape of y to (n_samples, ), for example using ravel().
  y = column_or_1d(y, warn=True)
```

Out[472]:
```
GaussianNB()
```

Step: 05: Evaluate or Test Model Accuracy

In [473]:
```
predicted_values = model.predict(X_test)
predicted_values

from sklearn.metrics import accuracy_score

score = round(accuracy_score(y_test, predicted_values)*100, 4)
print("GaussianNB. (r2.score):", score)
```

```
GaussianNB. (r2.score): 97.3684
```

Step: 06: Prediction of Un-known values

In [474]:
```
model.predict(X_test)
```

Out[474]:
```
array(['setosa', 'versicolor', 'versicolor', 'setosa', 'virginica',
       'versicolor', 'virginica', 'setosa', 'setosa', 'virginica',
       'versicolor', 'setosa', 'virginica', 'versicolor', 'versicolor',
       'setosa', 'versicolor', 'versicolor', 'setosa', 'setosa',
       'versicolor', 'versicolor', 'virginica', 'setosa', 'virginica',
       'versicolor', 'setosa', 'setosa', 'versicolor', 'virginica',
       'versicolor', 'virginica', 'versicolor', 'virginica', 'virginica',
       'setosa', 'versicolor', 'setosa'], dtype='<U10')
```

Support_Vector_Machine

Dataset: Breast Cancer !

In [475]:
```
# import dataset !
from sklearn import datasets
```

In [476]:
```
# dataset
cancer = datasets.load_breast_cancer()
```

In [477]:
```
cancer.data.shape
```

Out[477]:
```
(569, 30)
```

In [478]:
```
# print the names of features !. (Independent)
print("Features: ", cancer.feature_names)

# print the label type of cancer ! (Dependent)
print("Targets: ", cancer.target_names)
```

```
Features:  ['mean radius' 'mean texture' 'mean perimeter' 'mean area'
 'mean smoothness' 'mean compactness' 'mean concavity'
 'mean concave points' 'mean symmetry' 'mean fractal dimension'
 'radius error' 'texture error' 'perimeter error' 'area error'
 'smoothness error' 'compactness error' 'concavity error'
 'concave points error' 'symmetry error' 'fractal dimension error'
 'worst radius' 'worst texture' 'worst perimeter' 'worst area'
 'worst smoothness' 'worst compactness' 'worst concavity'
 'worst concave points' 'worst symmetry' 'worst fractal dimension']
Targets:  ['malignant' 'benign']
```

In [479]:
```
features = cancer.data
features
```

Out[479]:
```
array([[1.799e+01, 1.038e+01, 1.228e+02, ..., 2.654e-01, 4.601e-01,
        1.189e-01],
       [2.057e+01, 1.777e+01, 1.329e+02, ..., 1.860e-01, 2.750e-01,
        8.902e-02],
       [1.969e+01, 2.125e+01, 1.300e+02, ..., 2.430e-01, 3.613e-01,
        8.758e-02],
       ...,
       [1.660e+01, 2.808e+01, 1.083e+02, ..., 1.418e-01, 2.218e-01,
        7.820e-02],
       [2.060e+01, 2.933e+01, 1.401e+02, ..., 2.650e-01, 4.087e-01,
        1.240e-01],
       [7.760e+00, 2.454e+01, 4.792e+01, ..., 0.000e+00, 2.871e-01,
        7.039e-02]])
```

In [480]:
```
target = cancer.target
target
```

Out[480]:
```
array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0,
       0, 0, 1, 0, 1, 1, 1, 1, 1, 0, 0, 1, 0, 0, 1, 1, 1, 1, 0, 1, 0, 0,
       1, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1, 0, 0, 1, 1, 1, 0, 0, 1, 0, 0, 0,
       1, 1, 1, 0, 1, 1, 0, 0, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0, 1, 1, 0, 1,
       1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 0, 1, 1, 1, 0, 0, 1, 0, 1, 0,
       0, 1, 0, 0, 1, 1, 0, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 0, 1, 1, 1, 1, 0, 0, 1, 0, 1, 1, 0, 0, 1, 1, 0, 0, 1, 1, 1,
       1, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 1, 1, 1, 0, 1, 1, 0, 0, 1, 0, 0,
       0, 0, 1, 0, 0, 0, 1, 0, 1, 0, 1, 1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0,
       1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 0, 0, 1, 0, 1, 1,
       1, 1, 0, 1, 1, 1, 1, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 1, 1, 1, 1, 1, 1, 0, 1, 0, 1, 1, 0, 1, 1, 0, 1, 0, 0, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 1, 0, 1, 0, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 0, 1, 0, 1, 1, 1, 1, 0, 0,
       0, 1, 1, 1, 1, 0, 1, 0, 1, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 0,
       0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0,
       1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 0, 0, 1, 1,
       1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 1, 1, 0,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1, 1, 1, 1,
       1, 0, 1, 1, 0, 1, 0, 1, 1, 0, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0,
       1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1,
       1, 1, 1, 0, 1, 0, 1, 1, 0, 1, 1, 1, 1, 1, 0, 0, 1, 0, 1, 0, 1, 1,
       1, 1, 1, 0, 1, 1, 0, 1, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 0, 1, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 1])
```

In [481]:
```
# data splitting !
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(features, target, test_size=0.2, random_state=0)
```

In [482]:
```
# model !
from sklearn import svm

clf_svm = svm.SVC(kernel='linear').fit(X_train, y_train) # linear kernal
clf_svm
```

Out[482]:
```
SVC(kernel='linear')
```

In [483]:
```
y_pred = clf_svm.predict(X_test)
y_pred
```

Out[483]:
```
array([0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 0, 1, 0, 0, 0, 0, 0,
       1, 1, 0, 1, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1,
       0, 0, 1, 1, 1, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 1, 0, 1,
       0, 0, 0, 1, 0, 0, 1, 1, 0, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 1, 1, 1,
       0, 0, 1, 0, 0, 0, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 0, 1, 0, 1, 0, 0,
       1, 0, 0, 1])
```

In [484]:
```
# accuracy !
from sklearn import metrics

r2_score = round(metrics.accuracy_score(y_test, y_pred)*100, 4)
print("accuracy:", r2_score)
```

```
accuracy: 95.614
```

In [485]:
```
# precision !
from sklearn import metrics

precision = round(metrics.precision_score(y_test, y_pred)*100, 4)
print("r2_score:", precision)
```

```
r2_score: 98.4375
```

In [486]:
```
# precision !
from sklearn import metrics

recall = round(metrics.recall_score(y_test, y_pred)*100, 4)
print("r2_score:", recall)
```

```
r2_score: 94.0299
```

In [487]:
```
# confusion matrics !
from sklearn import metrics

cm = metrics.confusion_matrix(y_test, y_pred)
cm
```

Out[487]:
```
array([[46,  1],
       [ 4, 63]], dtype=int64)
```

Clustering

> K-Mean CLustering

In [488]:
```
# import libraries !

import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

In [489]:
```
# import dataset !

df = pd.read_csv('dataset_FreshCo.csv')
df.head()
```

Out[489]:

	homeshop	storeshop	employ	income	location	size	age
0	20	310	9	NaN	2	1	72
1	92	230	9	30550.0	2	2	60
2	69	240	10	64971.0	2	4	19
3	88	192	9	37298.0	4	2	63
4	49	42	1	41135.0	4	6	47

In [490]:
```
df.shape
```

Out[490]:
```
(2093, 7)
```

In [491]:
```
df.isnull().sum()
```

Out[491]:
```
homeshop       0
storeshop      0
employ         0
income       681
location       0
size           0
age            0
dtype: int64
```

In [492]:
```
# check empty (column %) !

for feature in df:
    if df[feature].isnull().sum()>1:
        print(feature,":", np.round(df[feature].isnull().mean(),4)*100,'%')
```

```
income : 32.54 %
```

In [493]:
```
df['income'] = df['income'].replace(np.nan, df.income.mean())
```

In [494]:
```
df.income.isnull().sum()
```

Out[494]:
```
0
```

In [495]:
```
df.head()
```

Out[495]:

	homeshop	storeshop	employ	income	location	size	age
0	20	310	9	28871.518414	2	1	72
1	92	230	9	30550.000000	2	2	60
2	69	240	10	64971.000000	2	4	19
3	88	192	9	37298.000000	4	2	63
4	49	42	1	41135.000000	4	6	47

In [496]:
```
# scaling !

from sklearn.preprocessing import MinMaxScaler
scale = MinMaxScaler()

# feature = [i for i in df]
feature = df.columns
df[feature] = scale.fit_transform(df[feature])
df.head()
```

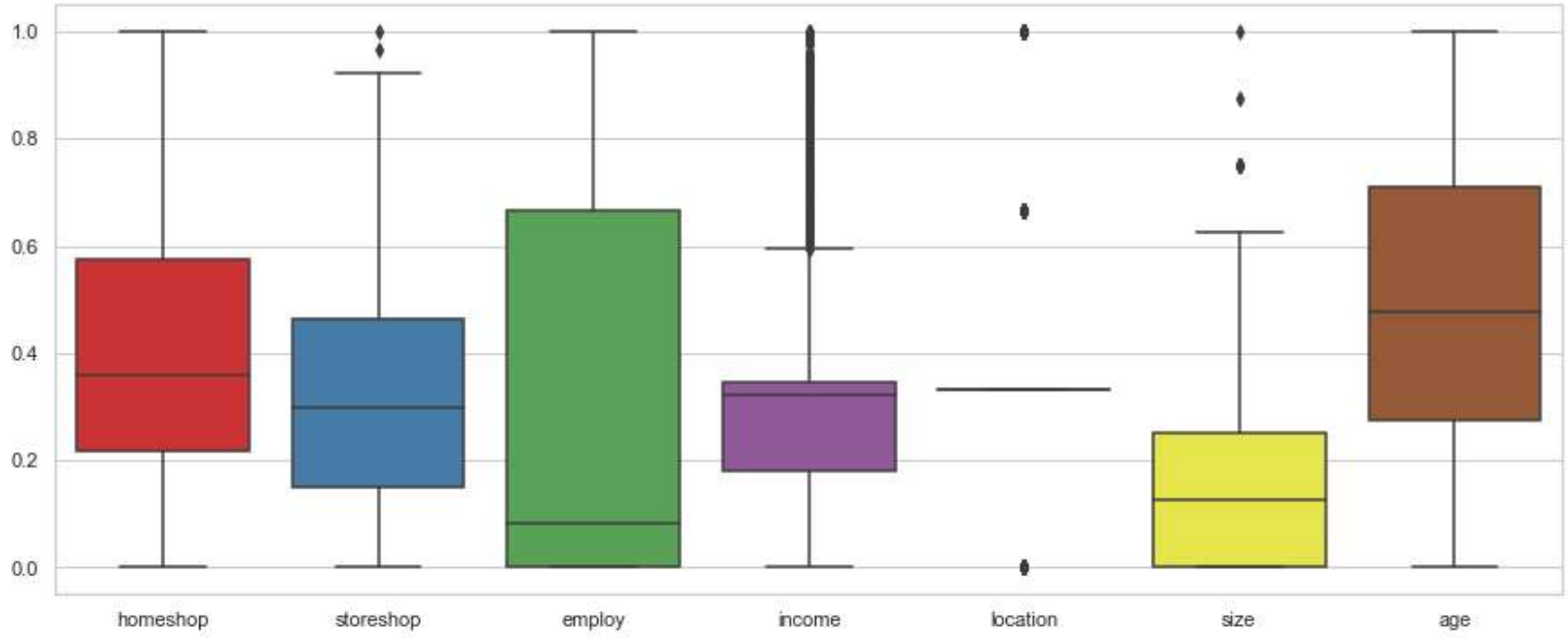
Out[496]:

	homeshop	storeshop	employ	income	location	size	age
0	0.075000	0.498361	0.666667	0.321213	0.333333	0.000	0.811594
1	0.375000	0.367213	0.666667	0.339892	0.333333	0.125	0.637681
2	0.279167	0.383607	0.750000	0.722952	0.333333	0.375	0.043478
3	0.358333	0.304918	0.666667	0.414988	1.000000	0.125	0.681159
4	0.195833	0.059016	0.000000	0.457689	1.000000	0.625	0.449275

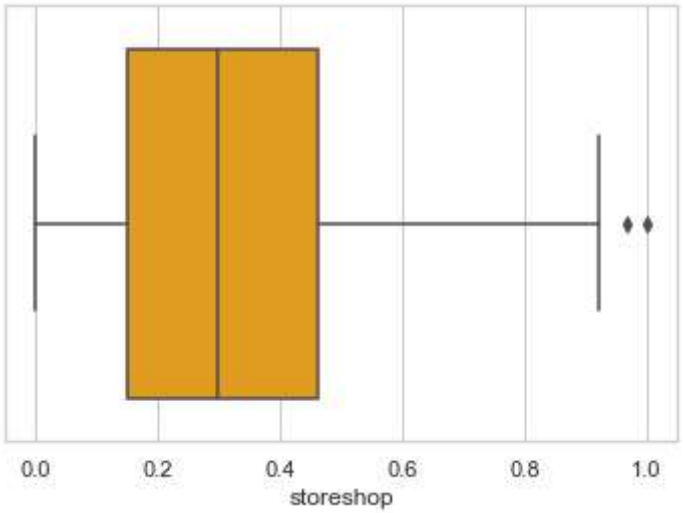
In [497]:
```
df.shape
```

Out[497]:
```
(2093, 7)
```

In [498]:
```
plt.figure(figsize=(15,6))
sns.set_theme(style="whitegrid", color_codes=True)
sns.boxplot(data=df,
            palette="Set1")
plt.show()
```

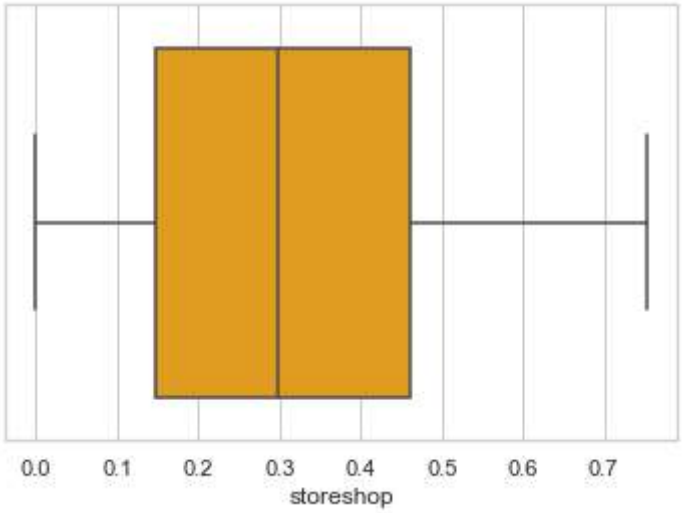


In [499]:
```
# storeshop

sns.set_theme(style="whitegrid", color_codes=True)
sns.boxplot(data=df,
            x="storeshop",
            color="orange")
plt.show()
```



In [500]:
```
df = df[df['storeshop']<0.92]
```

In [501]:
```
# storeshop

sns.set_theme(style="whitegrid", color_codes=True)
sns.boxplot(data=df,
            x="storeshop",
            color="orange")
plt.show()
```

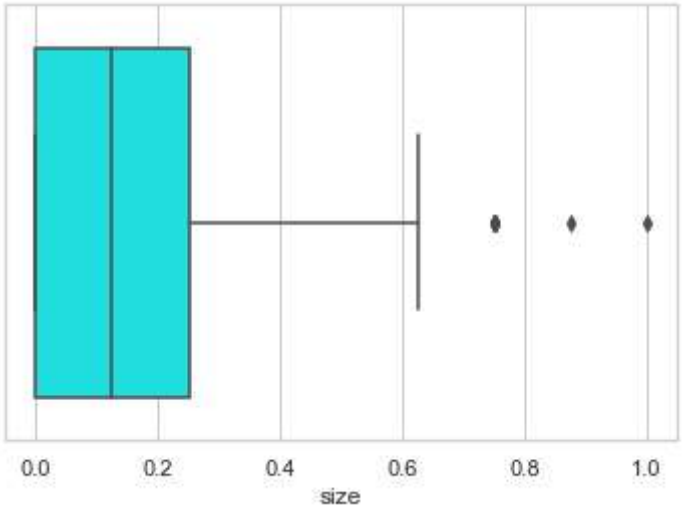


In [502]:
```
# income

sns.set_theme(style="whitegrid", color_codes=True)
sns.boxplot(data=df,
            y="income",
            color="purple")
plt.show()
```

In [503]:
```
df = df[df['income']<0.55]
```

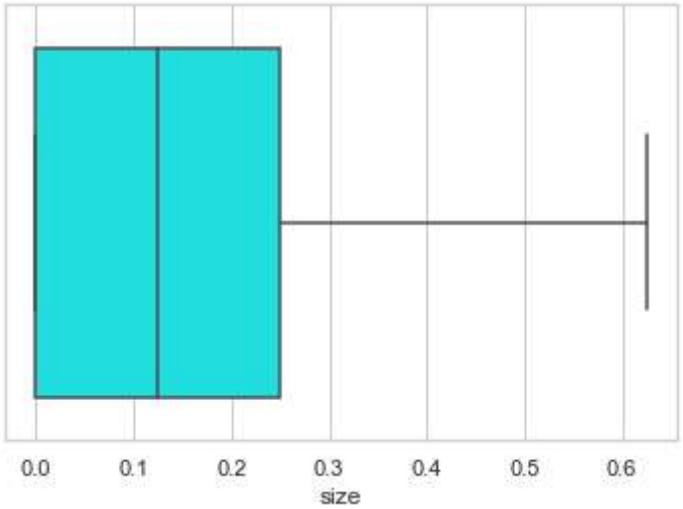
In [504]:
```
# income

sns.set_theme(style="whitegrid", color_codes=True)
sns.boxplot(data=df,
            y="income",
            color="purple")
plt.show()
```

In [505]:
```
# size

sns.set_theme(style="whitegrid", color_codes=True)
sns.boxplot(data=df,
            x="size",
            color="cyan")
plt.show()
```

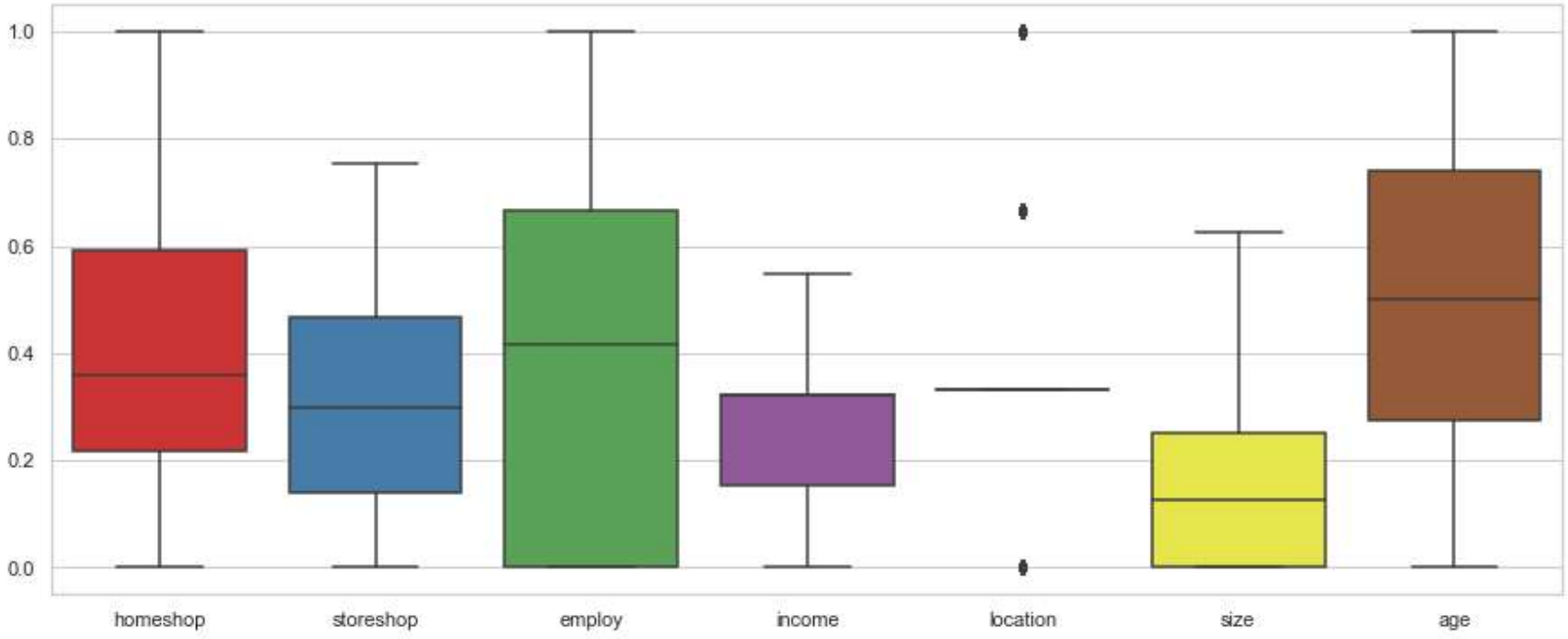


In [506]:
```
df = df[df['size']<0.7]
```

In [507]:
```
# size

sns.set_theme(style="whitegrid", color_codes=True)
sns.boxplot(data=df,
            x="size",
            color="cyan")
plt.show()
```



In [508]:
```
plt.figure(figsize=(15,6))
sns.set_theme(style="whitegrid", color_codes=True)
sns.boxplot(data=df,
            palette="Set1")
plt.show()
```



In [509]:
```
df.shape
```

Out[509]: (1802, 7)

In [510]:
```
df.corr()
```

Out[510]:

	homeshop	storeshop	employ	income	location	size	age
homeshop	1.000000	0.035334	0.024863	-0.028314	-0.031369	-0.085414	0.024872
storeshop	0.035334	1.000000	0.066341	-0.029724	-0.000752	-0.028723	0.089951
employ	0.024863	0.066341	1.000000	-0.235544	0.040185	-0.241091	0.522935
income	-0.028314	-0.029724	-0.235544	1.000000	0.028272	0.206271	-0.111635
location	-0.031369	-0.000752	0.040185	0.028272	1.000000	-0.063996	0.186306
size	-0.085414	-0.028723	-0.241091	0.206271	-0.063996	1.000000	-0.427604
age	0.024872	0.089951	0.522935	-0.111635	0.186306	-0.427604	1.000000

In [511]:
```
df.corr('spearman')
```

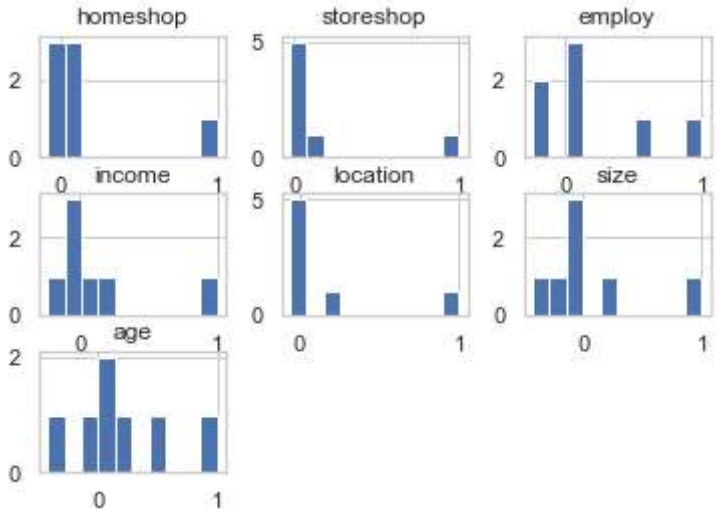
Out[511]:

	homeshop	storeshop	employ	income	location	size	age
homeshop	1.000000	0.042739	0.020479	-0.029298	-0.026507	-0.101423	0.029608
storeshop	0.042739	1.000000	0.060644	-0.029751	-0.009795	-0.026722	0.088454
employ	0.020479	0.060644	1.000000	-0.202976	0.051019	-0.231175	0.529576
income	-0.029298	-0.029751	-0.202976	1.000000	0.007903	0.224505	-0.109254
location	-0.026507	-0.009795	0.051019	0.007903	1.000000	-0.067336	0.188844
size	-0.101423	-0.026722	-0.231175	0.224505	-0.067336	1.000000	-0.421772
age	0.029608	0.088454	0.529576	-0.109254	0.188844	-0.421772	1.000000

In [512]:
```
pearson = df.corr('pearson')
```

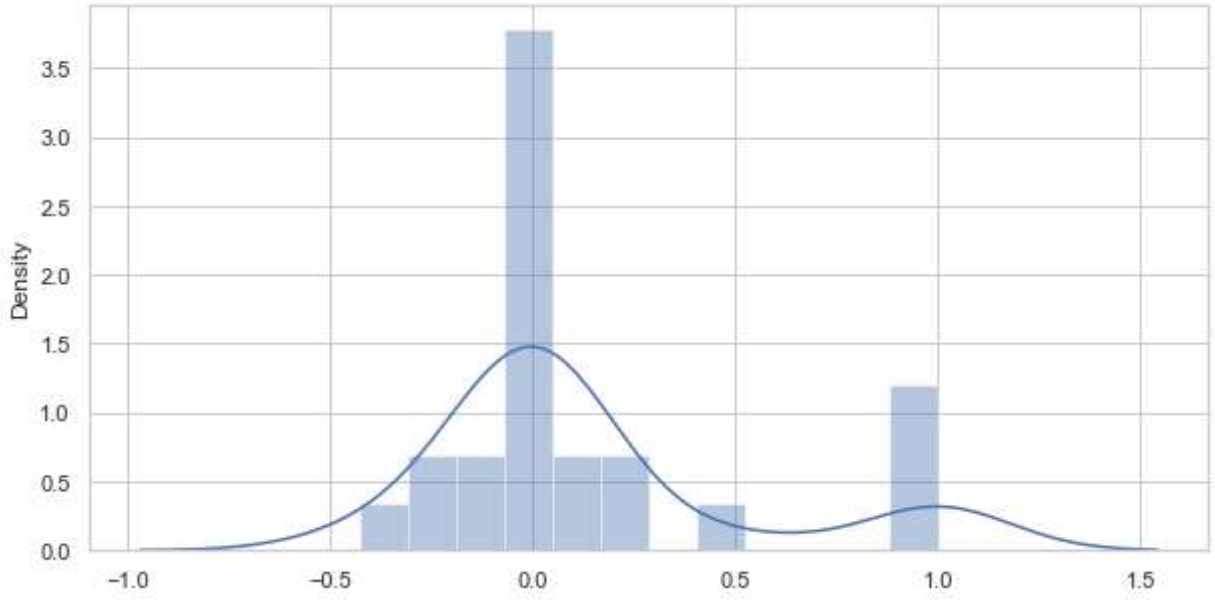
In [513]:
```
# Correlation !

df = pd.DataFrame(pearson)

plt.figure(figsize=(12,6))
corrMatrix = df.corr()
sns.heatmap(corrMatrix, annot=True)
plt.show()
```

In [514]:
```
# histogram

df.hist()
plt.show()
```



In [515]:
```
# displot (check: bell curve)


plt.figure(figsize=(10,5))
sns.set_theme(style="whitegrid", color_codes=True)
sns.distplot(df)
plt.show()
```

```
c:\python38\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated functio
n and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level func
tion with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```



In [516]:
```
from sklearn.cluster import KMeans

k_mean = KMeans(n_clusters=3)
k_mean
```

Out[516]:
```
KMeans(n_clusters=3)
```

In [517]:
```
y_predicted = k_mean.fit_predict(df)
y_predicted
```

Out[517]:
```
array([2, 2, 0, 1, 0, 1, 0])
```

In [518]:
```
df["Cluster"] = y_predicted
```

In [519]:
```
df.head()
```

Out[519]:

	homeshop	storeshop	employ	income	location	size	age	Cluster
homeshop	1.000000	0.035334	0.024863	-0.028314	-0.031369	-0.085414	0.024872	2
storeshop	0.035334	1.000000	0.066341	-0.029724	-0.000752	-0.028723	0.089951	2
employ	0.024863	0.066341	1.000000	-0.235544	0.040185	-0.241091	0.522935	0
income	-0.028314	-0.029724	-0.235544	1.000000	0.028272	0.206271	-0.111635	1
location	-0.031369	-0.000752	0.040185	0.028272	1.000000	-0.063996	0.186306	0

In [520]:
```
df.tail()
```

Out[520]:

	homeshop	storeshop	employ	income	location	size	age	Cluster
employ	0.024863	0.066341	1.000000	-0.235544	0.040185	-0.241091	0.522935	0
income	-0.028314	-0.029724	-0.235544	1.000000	0.028272	0.206271	-0.111635	1
location	-0.031369	-0.000752	0.040185	0.028272	1.000000	-0.063996	0.186306	0
size	-0.085414	-0.028723	-0.241091	0.206271	-0.063996	1.000000	-0.427604	1
age	0.024872	0.089951	0.522935	-0.111635	0.186306	-0.427604	1.000000	0

THE END