Problem 1 (6 pts). Assume that you are provided with a feature array named X and a label array named y. Consider the code below. Provide the output for the last 6 print statements on the lines provided. Provide your answers exactly as they would be displayed in Python.

Code	Output
`print(X.shape)`	**(460, 12)**
`print(y.shape)`	**(460,)**

```
from sklearn.model_selection import train_test_split

X_train, X_tv, y_train, y_tv = train_test_split(
        X, y, test_size=0.40, random_state=1)

X_val, X_test, y_val, y_test = train_test_split(
        X_tv, y_tv, test_size=0.5, random_state=1)
```

`print(X_train.shape)` $(276, 12)$

`print(X_val.shape)` $(92, 12)$

`print(X_test.shape)` $(92, 12)$

`print(y_train.shape)` $(276,)$

`print(y_val.shape)` $(92,)$

`print(y_test.shape)` $(92,)$

Problem 2 (6 pts). Describe the purpose of each of the following datasets in a supervised learning task:

- **Training Set**

    Used to train the model. The learning algorithm will select the model that minimizes the training loss.

- **Validation Set**

    Used for model selection and hyper parameter tuning.

- **Testing Set**

    This is used to evaluate the final model.

Problem 3 (12 pts). Four blocks of code are provided below. For each block, do the following:
- If the block will run without errors, write "Runs without errors." in the space to the right.
- If the code in the block results in an error, then explain circle or highlight the line on which the error occurs, and explain what causes the error.

For each block, assume that the following import statements have been ran previously:

```python
import numpy as np
from sklearn.linear_model import LinearRegression
```

```python
X = np.array([[4, 5], [1, 3], [6, 2], [3, 7], [4, 4]])
y = np.array([24, 12, 16, 20, 14])

mod = LinearRegression()
mod.fit(X, y)

Xnew = np.array([5, 3])
pred = mod.predict(Xnew)
```

Predict expects a 2D array, but Xnew has shape (2,).

```python
X = np.array([[4, 5], [1, 3], [6, 2], [3, 7], [4, 4]])
y = np.array([24, 12, 16, 20, 14])

mod = LinearRegression(X, y)

Xnew = np.array([[5, 3]])
pred = mod.predict(Xnew)
```

You cannot use the predict method of a model that has not been fit.

```python
X = np.array([[4, 5], [1, 3], [6, 2], [3, 7], [4, 4]])
y = np.array([24, 12, 16, 20, 14])

mod = LinearRegression()
mod.fit(X, y)

Xnew = np.array([[5, 3]])
pred = mod.predict(Xnew)
```

Runs without errors.

```python
X = np.array([[4], [5], [1], [3], [6], [2], [3], [7], [4], 4]])
y = np.array([24, 12, 16, 20, 14])

mod = LinearRegression()
mod.fit(X, y)

Xnew = np.array([[5], [3]])
pred = mod.predict(Xnew)
```

X has shape (10,1) and y has shape (5,).

The fit method cannot be used on arrays with different numbers of samples.