

```
data = np.array([1.0, 2.0, 3.0, 4.0])
math.sqrt(np.sum(np.power(data - np.mean(data), 2))/(len(data) - 1))
```

$$\begin{array}{c}
 \downarrow \quad \quad \quad \uparrow \\
 \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} - \begin{bmatrix} 2.5 \\ 2.5 \\ 2.5 \\ 2.5 \end{bmatrix} \\
 \underbrace{\hspace{10em}} \\
 \begin{bmatrix} -1.5 \\ -0.5 \\ +0.5 \\ +1.5 \end{bmatrix} \quad \begin{matrix} -1.5^2 \\ -0.5^2 \\ +0.5^2 \\ 1.5^2 \end{matrix} \quad \begin{bmatrix} 2.25 \\ 0.25 \\ 0.25 \\ 2.25 \end{bmatrix} \rightarrow \sqrt{\frac{5}{4-1}}
 \end{array}$$

```
import numpy as np
a = np.array([1, 2, 3])
b = np.array([4, 5, 6])
x = (3 * b) + a
```

$$\begin{bmatrix} 3 \\ 3 \\ 3 \end{bmatrix} \times \begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix} \rightarrow \begin{bmatrix} 12 \\ 15 \\ 18 \end{bmatrix} + \begin{bmatrix} 4 \\ 2 \\ 3 \end{bmatrix} \rightarrow \begin{bmatrix} 13 \\ 17 \\ 21 \end{bmatrix}$$

After above the code executes what is the value of x?

- A. 13
- B. np.array([13, 17, 21])
- C. np.array([15, 21, 27])
- D. np.array([7, 7, 9])

Answer: B

3\*b is np.array([12, 15, 18]) and the addition is element-wise so the result is np.array([13, 17, 21])

```
import numpy as np
a = np.array([1, 2, 3])
b = np.array([4, 5, 6])
x = np.sum(np.power(b-a, 2))
```

$$\begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix} - \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \rightarrow \begin{bmatrix} 3 \\ 3 \\ 3 \end{bmatrix} \rightarrow \begin{bmatrix} 9 \\ 9 \\ 9 \end{bmatrix} \rightarrow 27$$

After above the code executes what is the value of x?

- A. 13
- B. 21
- C. 27
- D. np.array([27, 27, 27])

Answer: C

b-a is np.array([3, 3, 3]) thus the element-wise power operation produces np.array([9, 9, 9]). The resulting sum of that vector is the scalar 27.