

Prerequisites

```
import numpy as np
```

Question 1 - Dot and Cross

```
u = np.array([2, 4, -1])  
v = np.array([1, -3, 5])  
np.dot(u, v)  
  
-15
```

Question 2 - Matrix Multiplications

```
A = np.array([[3, -1],  
              [2, 4]])  
B = np.array([[5, 2],  
              [-1, 0]])  
print(np.matmul(A, B))  
print(f'{np.linalg.det(A):.0f}')  
  
[[16  6]  
 [ 6  4]]  
14
```

Question 3 - Probability

```
print("3 / 6")  
  
3 / 6
```

Question 4 - Probability

```
print("26 / 26")  
  
26 / 26
```

Question 5 - Prime Numbers

```
first_five_primes = [2, 3, 5, 7, 11]  
first_five_primes  
  
[2, 3, 5, 7, 11]
```

Question 6 - Even / Odd

```
def is_even(num: int) -> str:
    return "Odd" if num % 2 else "Even"
```

Question 7 - NumPy Matrices

```
randarray = np.random.rand(3, 3)
print(randarray)
transposed = randarray.T
print(transposed)

[[0.70393914 0.22099322 0.14898089]
 [0.07371348 0.7440815  0.90432532]
 [0.4300282  0.84015148 0.85990781]]
[[0.70393914 0.07371348 0.4300282 ]
 [0.22099322 0.7440815  0.84015148]
 [0.14898089 0.90432532 0.85990781]]
```

Question 8 - Simulation

```
theoretical = 1 / 6
monte = [0 for _ in range(6)]
for inx in range(100):
    carlo = np.random.randint(1, 6)
    monte[carlo] += 1

print(f"The simulated value is {monte[3] / 100:.4f}")
print(f"The theoretical value is {theoretical:.4f}")

The simulated value is 0.1800
The theoretical value is 0.1667
```
