

## Question 3

In the NBA 3-point contest the player shoots 20 shots: 16 normal balls (1 pt each), and 4 money balls (2 pts each). Assume shot success probability is 0.43.

**Part 1:** What is the expected value of points scored?

### Solution

Let  $X_1 \sim \text{Binomial}(16, 0.43)$  be hits on normal balls and  $X_2 \sim \text{Binomial}(4, 0.43)$  hits on money balls. Total points  $T = X_1 + 2X_2$ , so

$$\mathbb{E}[T] = 16(0.43) + 2 \cdot 4(0.43) = 6.88 + 3.44 = 10.32$$

### Answer

$\mathbb{E}[T] = 10.32$

**Part 2:** What is the standard deviation of the total points scored?

### Solution

We have

$$\text{Var}(X_1) = 16 \cdot 0.43 \cdot 0.57$$

$$\text{Var}(X_2) = 4 \cdot 0.43 \cdot 0.57$$

and since  $\text{Var}(2X_2) = 4 \text{Var}(X_2)$  and  $X_1, X_2$  independent,

$$\begin{aligned} \text{Var}(T) &= 16 \cdot 0.43 \cdot 0.57 + 4 \times (4 \cdot 0.43 \cdot 0.57) \\ &= 2 \times 16 \cdot 0.43 \cdot 0.57 \\ &= 32 \cdot 0.43 \cdot 0.57 \\ &\approx 7.843 \end{aligned}$$

so

$$\sigma_T = \sqrt{32 \cdot 0.43 \cdot 0.57} \approx 2.80$$

### Answer

$\sigma_T = \sqrt{32 \cdot 0.43 \cdot 0.57} \approx 2.80$