S3 Practice Questions

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1. A set of scaffolding poles comes in two sizes, long and short. The length L of a long pole is distributed by $N\left(19.7, 0.5^2\right)$. The length S of a short pole is distributed by $N\left(4.9, 0.2^2\right)$. The random variables L and S are independent.

   (a) A long pole and a short pole are drawn at random. Find the probability that the length of the long pole is four times the length of the short pole.

   (b) Four short poles are selected at random and placed end to end to form a row of length T. Find the distribution of T and find $P\left(|L - T| < 0.1\right)$.

Solutions

1. (a)

$$\text{let } X = L - 4S$$

$$P(L > 4S) \Leftrightarrow P(X > 0)$$

$$X \sim N(0.1, 0.89)$$

$$P(X > 0) = P(Z > -0.11) = P(Z < 0.11) = 0.54380$$

(b)

$$T = S_0 + S_1 + S_2 + S_3$$

$$T \sim N(19.6, 0.16)$$

$$\text{let } Y = L - T$$

$$P(|L - T| < 0.1) = P(-0.1 < Y < 0.1) = P(Y < 0.1) - P(Y < -0.1)$$

$$P(Z < 0) - P(Z < -0.49) = 0.50000 - 0.31207 = 0.18793$$