Question #8154 Precision park a co Ltd by shares is a job shop that specialises in electric motor shafts. the average shaft for the E300 elctric motor is 0.55cm with the standard deviation of 0.10cm. it is normally distributed.

1. What is the probability that a shaft selected at random would be between 0.55cm and 0.65cm.

2. What is the probability that the shaft size will be greater than 0.65cm

3. What is the probability that the shaft size would be between 0.53cm and 0.59cm.

4. What is the probability that the shaft size would be under 0.45cm

Solution. The condition implies that shaft $\xi \simeq \mathcal{N}(0.55, 0.01)$. We are to find

1) $\mathsf{P}(0.55 < \xi < 0.65) = \mathsf{P}(0/0.1 < (\xi - 0.55)/0.1 < 0.1/0.1) = \Phi(1) - \Phi(0) \approx 0.84 - 0.5 = 0.34$.

2) $\mathsf{P}(\xi > 0.65) = \mathsf{P}((\xi - 0.55)/0.1 > 0.1/0.1) = 1 - \Phi(1) \approx 1 - 0.84 = 0.16$.

3) $\mathsf{P}(0.53 < \xi < 0.59) = \mathsf{P}(-0.2 < (\xi - 0.55)/0.1 < 0.4) = \Phi(0.4) - \Phi(-0.2) \approx 0.66 - 0.42 = 0.24$.

4) $\mathsf{P}(\xi < 0.45) = \mathsf{P}((\xi - 0.55)/0.1 < -0.1) = \Phi(-0.1) \approx 0.46$.

Here $\Phi(\cdot)$ denotes cumulative distribution function of standrad normal distribution.