

Show all steps. You do not have to simplify

(1) Suppose a coin is tossed 16 times. Find the formula for the normal approximation for the probability to have at least 6 heads. Your answer should include Φ :

$\mu = 8, \sigma = 2$, therefore

$$\mathbb{P}(X \geq 6) = \mathbb{P}(X > 5.5) \approx \mathbb{P}(8 + 2Z > 5.5) = \mathbb{P}(Z > -1.25) = \Phi(1.25) \approx 0.89435$$

From the binomial applet we can find this probability as 0.89494

(2) Suppose a coin is tossed 16 times. Find the formula for the normal approximation for the probability to have exactly 6 heads. Your answer should include Φ twice:

$$\mathbb{P}(X = 6) = \mathbb{P}(6.5 > X > 5.5) \approx \mathbb{P}(6.5 > 8 + 2Z > 5.5) = \mathbb{P}(-0.75 > Z > -1.25) = \Phi(1.25) - \Phi(0.75) \approx 0.89435 - 0.77337 = 0.12098$$

From the binomial applet we can find this probability as 0.12219

(3) If X is a $\mathcal{N}(-3, 4)$ normal variable, find $\mathbb{P}(|X| > 5)$. Your answer should include Φ twice:

$$\begin{aligned} \mathbb{P}(|X| > 5) &= \mathbb{P}(-3 + 2Z > 5) + \mathbb{P}(-3 + 2Z < -5) \\ &= \mathbb{P}(Z > 4) + \mathbb{P}(Z < -1) = 1 - \Phi(4) + \Phi(-1) = 2 - \Phi(4) - \Phi(1) \end{aligned}$$

End of the quiz