

Please write **Your name:** _____

Show all work: either write at least a sentence explaining your reasoning, or annotate your math work with brief explanations. Correct answer with no solution will give only a partial credit. There is NO need to simplify, and NO calculators are allowed. You may leave your answer in terms of sums, products, factorials or binomial coefficients, and fractions.

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In this quiz use the notation $\Phi(x)$ for the distribution function for $\mathcal{N}(0, 1)$, that is

$$\Phi(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^x e^{-y^2/2} dy = \mathbb{P}(Z < x)$$

where Z is the standard normal random variable. You do not need a table of values of Φ .

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- (1) We toss a pair of coins and say that we have a success if both are heads, and failure otherwise. Let S_n be the number of successes if we toss n pairs of coins. What is the mean and the standard deviation of S_n if $n = 48$?

Please write your answer here:

$\mathbb{E}S_{48} =$	$SD(S_{48}) =$
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- (2) Estimate the probability that $S_{48} \geq 15$ using the normal approximation. Do not use the continuity correction. Your answer should include Φ .

Please write your answer here:

$\mathbb{P}(S_{48} \geq 15) \approx$

Please go to the next page ...

- (3) In the same situation, estimate the probability that $S_{48} = 12$ using the normal approximation with the continuity correction. Your answer should include Φ .

Please write your answer here:

$$\mathbb{P}(S_{48} = 12) \approx$$

- (4) Find a formula for $\mathbb{P}(-5 \leq X \leq 4)$ if X is $\mathcal{N}(-2, 9)$. Your answer should include Φ twice.

Please write your answer here:

$$\mathbb{P}(-5 \leq X \leq 4) =$$

end of the quiz