Stats: Actual Significance Levels For Binomial Hypothesis Tests NEW

A true critical region for a hypothesis test can give us an actual significance level.

E1: Ase buys sweets with her lunch with probability 0.27. The next 20 days, she buys sweets with her lunch once. The test is set at the 5% significance level. Find the actual significance level for this test.

Method	**Working**
1) Give the distribution:	X~B (20, 0.27)
2) Use a calculator to find cumulative probabilities:	See below

Casio fx-991CW Classwiz	**Casio fx-CG 50**
1) Press MENU and select Distribution	1) Press MENU and select 2 Statistics
2) Select Binomial CD and then List	2) Input the required values into List 2*
3) Input the required values into the x column*	3) Input 0's in List 1 to match the values in List 2
4) Press EXE with any x value highlighted	4) Press F5 for DIST and F5 again for Binomial
5) Input the appropriate N and p values	5) Press F2 for Bcd and F1 for List
6) Select ▶ Execute and press EXE	6) Select L.List, press F1, type 1, press EXE
7) The probabilities we need are in the p column	7) Select U.List, press F1, type 2, press EXE
	8) Input the appropriate Numtrial and p values
	9) Select Save Res, press F2, type 3, press EXE
	10) Press EXE again and then press EXIT twice
	11) The probabilities we need are in List 3

*To find the required values, multiply n and p to find the mean result. Then:

- If H_1 is $p < k$, input all the integers from 0 up to the mean
- If H_1 is $p > k$, input all the integers from the mean up to n
- If H_1 is $p \neq k$, we **may** want all the integers from 0 to n

Use the table above to find all the required probabilities.

3) Find the highest probability **below** the significance level:	$P(X \leq 1) = 0.0155$
4) This is the **actual** significance level:	Actual significance level is 0.0155

E2: Mike gets Maths questions right with probability 0.81. He revises thoroughly before the next Maths test and gets 15 of the 16 questions right. Mike claims he has increased his probability of answering Maths questions correctly. The test is set at the 10% significance level. Find the actual significance level.

Method	**Working**
1) Give the distribution:	X~B (16, 0.81)
2) Use a calculator to find cumulative probabilities:	$16 \times 0.81 = 12.96$; need 13 up to 16
3) Find the highest probability below the significance level:	$1 - P(X \leq 15) = 0.0344$

Note

- For two-tailed hypothesis tests, find the required probabilities in **both** tails and add them