Chapter 14 / **Example 14**

Goodness of fit to binomial distribution

In a trial three coins are tossed.

a Find the probability of obtaining: 0 heads, exactly 1 head, exactly 2 heads, exactly 3 heads.

Hagar tosses three coins 200 times and makes a note of the number of heads each time. Her results are as follows.

Number of heads	Probability
0	28
1	67
2	83
3	22

She is interested to find out if her coins are fair and so performs a χ^2 goodness-of-fit test at the 5% significance level on her data.

b Use the probabilities for B(3, 0.5) and the fact that Hagar tossed the coins 200 times, to find the expected values for the number of heads.

c Write down the null and alternative hypotheses and the degrees of freedom for the test.

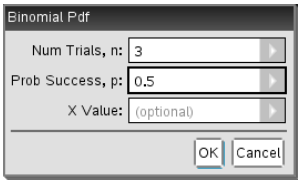
The critical value is 7.815.

Open a new document and add a Calculator page.

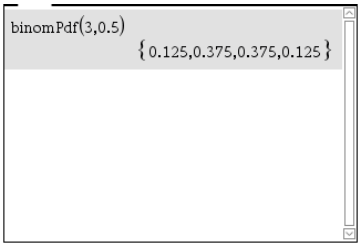
Press menu 5:Probability | 5:Distributions | A:Binomial Pdf…

Enter 3 as the number of trials, 0.5 as the probability of success and leave the X value empty.

Press enter or click OK with the touchpad.



The GDC displays a list of probabilities.



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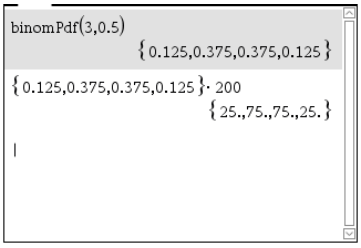
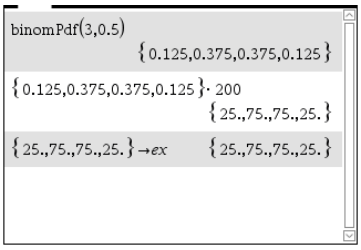
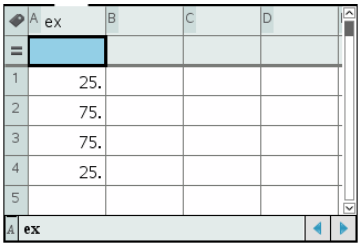
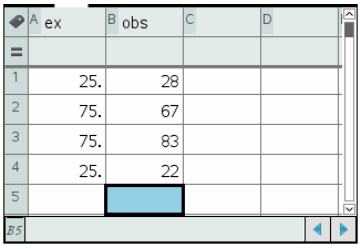
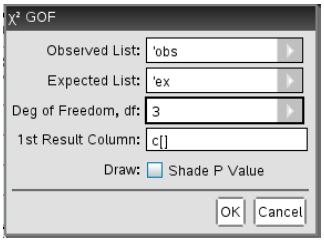
Type × 200 and press enter to find the expected values.	
Press ctrl var (sto→) and type ex. Press enter when you have finished. The list you created is stored as a variable ex.	
Add a new Lists & Spreadsheet page to your document by pressing ctrl doc (+page) 4:Add Lists & Spreadsheet Type 'ex' in the first cell and press enter. The list of expected values are displayed in the first column.	
Type 'obs' in the cell to the right of 'ex' Enter the observed values in the second column.	
To calculate the *p*-value Press menu 4:Statistics | 4:Stat Tests | 7: χ^2 GOF… Open the drop down lists with ▶ and select using ▼ and enter Observed List: obs Expected List: ex For this test you must enter the degrees of freedom yourself. Enter df: 3 Click the touchpad on OK or press enter	

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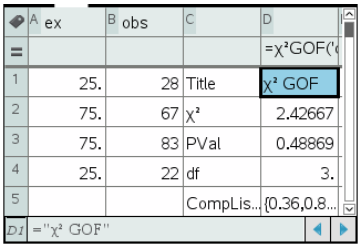
$\chi^2 = 2.43$ and the p-value = 0.489

Either: $2.43 < 7.815$,

or $0.489 > 0.05$

Hence not significant so no reason to reject the null hypothesis.



	A ex	B obs	C	D
				=χ²GOF('(
1	25.	28	Title	χ² GOF
2	75.	67	χ²	2.42667
3	75.	83	PVal	0.48869
4	25.	22	df	3.
5			CompLis...	{0.36,0.8...
D1	="χ² GOF"			