

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.

Press **2nd** **[VARS]** **([DISTR])** A:binompdf(

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

Navigate down to Paste and press **[ENTER]**.

```
binompdf
trials:3
p:0.5
x value:
Paste
```

The GDC displays a list of probabilities.

```
binompdf(3,0.5)
.....{.125 .375 .375 .125}
```

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Type $\times 200$ and press **ENTER** to find the expected values.

```
binompdf(3,0.5)
      { .125 .375 .375 .125 }
Ans*200
      { 25 75 75 25 }
```

Press **STO►** and press **2nd** **1** **[L1]** to store the expected values in a list.

```
binompdf(3,0.5)
      { .125 .375 .375 .125 }
Ans*200
      { 25 75 75 25 }
Ans→L1
      { 25 75 75 25 }
```

Press **[STAT]** 1:Edit and press **[ENTER]**

Type the observed frequencies in the first column.

Press **ENTER** or **▼** after each number to move to the next cell.

[illegible]



Press **STAT**. Press **▶ ▶** to access the TESTS menu.

Select D: χ^2 GOF-Test...

Observed : L_2

Expected: L_1

Enter df: 3

Use  to navigate down to Calculate. Press .

χ^2 GOF-Test
Observed: L2
Expected: L1
df: 3
Color: BLUE
Calculate Draw

$\chi^2 = 2.43$ 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.

χ^2 GOF-Test
 $\chi^2 = 2.426666667$
 $p = .4886899362$
 $df = 3$
 $CNTRB = \{.36 \ .8533333333 \ \dots$