

A simulation of n-sided dice rolls or random numbers generated to investigate the central limit theorem...

Linking the Table icon with the Statistics icon.

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Classroom Activity.

Simulations in rolling a dice, or two, or three etc and the production of an associated statistical graph, viz - histogram and comparing it to the 'bell shaped curve'.

1 die: 2 dice and adding the face totals: 3 dice and adding the face totals: 4 dice and adding the face totals: 5 dice and adding the face totals:

Enter into the **TABLE** icon

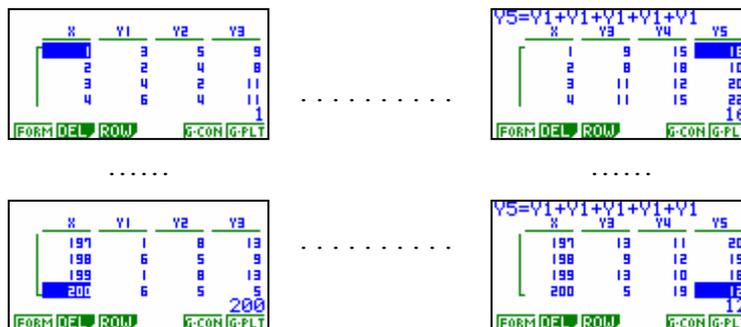


Type in $\text{Int}(\text{Ran}\# \times 6) + 1$ in the **Y1** space
And in **Y2** ... **Y5** as shown in this screen snap.

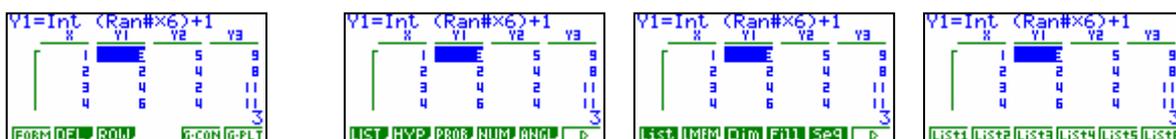
Use **[VAR]** **[GRAPH]** **[F1]** for 'Y' in each case NOT **[ALPHA]** **[Y]**



Generate 200 data points for each, i.e. 3000 simulations of a dice roll



and then transfer these across to the **STAT** icon. This is done by placing the cursor in the **Y1** etc column in **TABLE** and following the instructions below:



Move cursor to **Y1** column then **[OPTN]** **[F1]** for List **[F2]** for LMem **[F1]** for list 1
Repeat for each Y_n column, one at a time! Placing the subsequent $Y2$ lists etc into list 2 etc.

Once the transfers are completed, return to **[MENU]** and enter into the **[STAT]** icon.



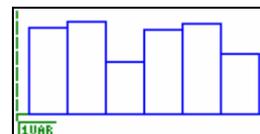
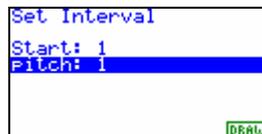
Set up the statistical graphs to be a **Histogram**



F1 for **GRPH**

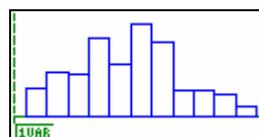
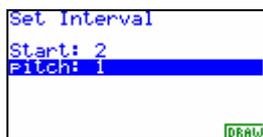
F6 for **SET** (change settings as required)

EXIT and **F1** for drawing the graph.
Set the Pitch to 1 (Width of the bars),
and **F6** to **DRAW**.

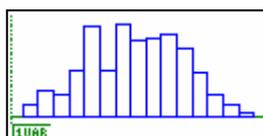


For each subsequent Histogram for 2, 3, 4 or 5 dice roll adjust the appropriate settings.

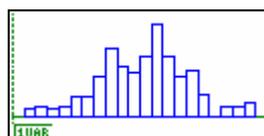
e.g.



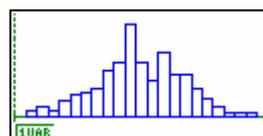
Examples of the histograms produced from the simulations are shown below.



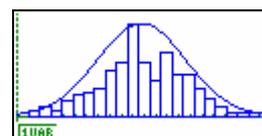
3 dice



4 dice



5 dice



5 dice (with the Normal distribution graph superimposed)

[N.B. These are results from simulations, so your results will vary with the statistical graphs shown here.]

The summary statistics can also be collected for each simulation, comparisons and links made to discuss the Central Limit Theorem if the size of the samples generated were varied.

Examples of rolling one 6-sided die:

Table Range X Start:1 End :10 Pitch:1	Table Range X Start:1 End :49 Pitch:1	Table Range X Start:1 End :81 Pitch:1
1-Variable Σx = 38 Σx² = 176 x̄n = 1.77763888 x̄n-1 = 1.87379591 n = 10	1-Variable Σx = 3.04081632 Σx² = 595 x̄n = 1.70184993 x̄n-1 = 1.71948616 n = 49	1-Variable Σx = 3.27160493 Σx² = 265 Σx² = 1121 x̄n = 1.77090578 x̄n-1 = 1.78193957 n = 81
n = 10	n = 49	n = 81
Table Range X Start:1 End :100 Pitch:1	Table Range X Start:1 End :144 Pitch:1	Table Range X Start:1 End :196 Pitch:1
1-Variable Σx = 3.44 Σx² = 344 Σx² = 1500 x̄n = 1.77943811 x̄n-1 = 1.78840259 n = 100	1-Variable Σx = 3.46527777 Σx² = 499 Σx² = 2137 x̄n = 1.68289265 x̄n-1 = 1.68876664 n = 144	1-Variable Σx = 3.15306122 Σx² = 618 Σx² = 2496 x̄n = 1.67119681 x̄n-1 = 1.67547645 n = 196
n = 100	n = 144	n = 196

Asking questions like will the average score be centred on 3.5, will the standard deviation of all the sample means be close to $\frac{\sigma}{\sqrt{n}}$ with the completion of many trials.