

Student Worksheet 1

TI-30XB MultiView™: That's So Random!

W1

Name: _____

Randomness is a big idea which influences many areas of our life.

In this task we explore random number generators, and some different ways that they can be used to simulate situations affected by chance.

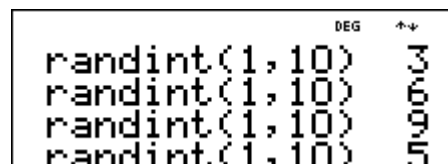
Most software that generates random numbers uses a method which produces a decimal number between 0 and 1. On the TI-30XB MultiView™ there is also a random integer command **randint(a,b)**, which will generate a random integer between two given numbers a and b (inclusive). For example the command **randint(1,10)** will generate a random integer between 1 and 10.

On your TI-30XB MultiView™, do the following:

- Press **prb** and then **▶** to access the RAND menu
- Press 2 to select the **randint(** command
- Type **randint(1,10)** to generate a random integer between 1 and 10 inclusive
- Press **enter** a few times to generate some extra random numbers



```
PRB [2ND] [10]
1:rand
2:randint(
DEG
```



```
randint(1,10) 3
randint(1,10) 6
randint(1,10) 9
randint(1,10) 5
DEG
```

You should see some random numbers generated.

(Note: The comma symbol is found via 2nd **,**)

1. What command, using the **randint(** function will generate a random integer between the following numbers? (Note: "exclusive" means *not* including the end numbers)
 - a) 1 and 20 inclusive _____
 - b) 1 and 20 exclusive _____
 - c) 21 and 30 inclusive _____

Now use your calculator to check your answers.

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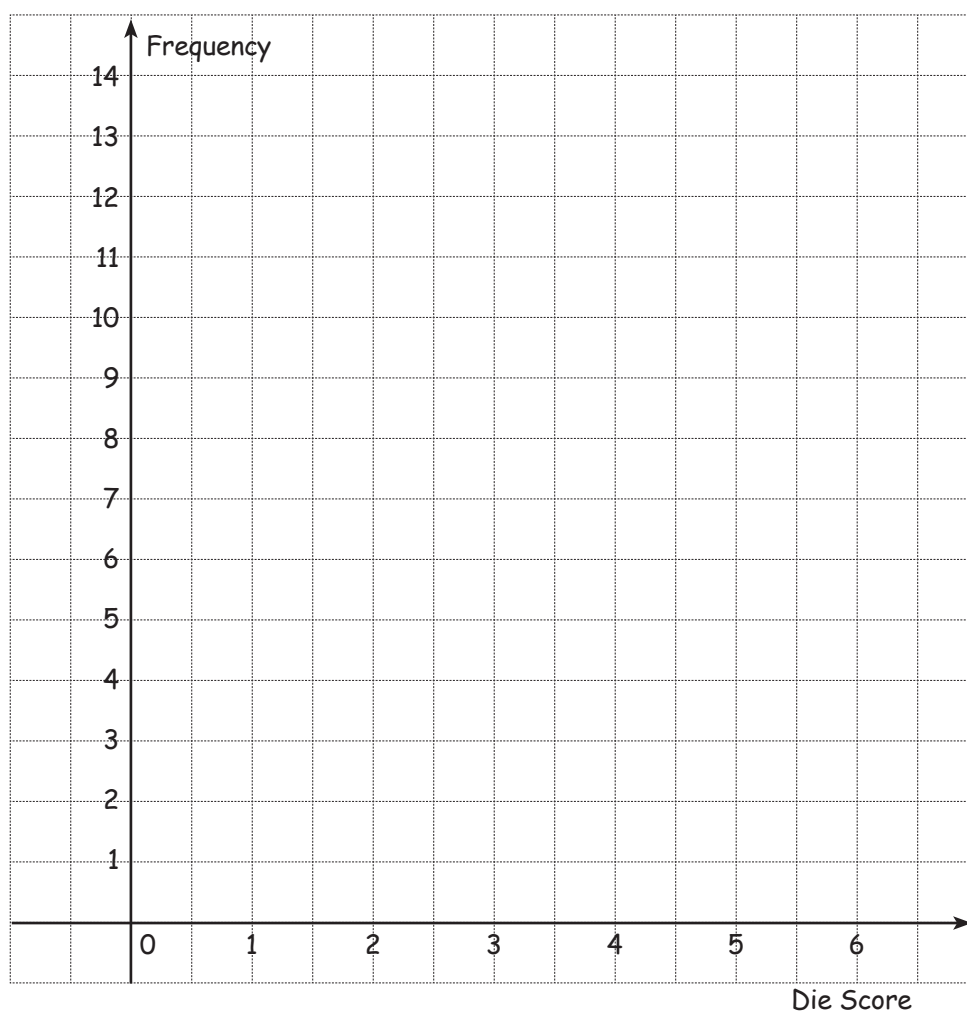
2. This random integer function can be used to simulate experiments that are affected by chance. Consider the experiment of rolling a single six-sided die.

a) What command would simulate this experiment? _____

b) Trial this command 60 times, and record the results in the frequency table below.

Die score	1	2	3	4	5	6
Tally						
Frequency						

3. Construct a bar chart on the axes below to display the results of your experiment.



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Observe your table and bar charts results.

a) Which score occurred most frequently? _____

b) Which score occurred least frequently? _____

4. Compare your results with some other students near you. What do you notice?

5. Are all the outcomes equally likely (explain your reasoning)?

6. We can obtain a relative frequency of each score by dividing the frequency of each outcome (eg. getting a die score of 1) by the total number of trials.

Use this method to calculate the relative frequency of obtaining a die score of 1.

Complete this frequency table for your previous results.

Die score	1	2	3	4	5	6
Frequency						
Relative frequency (fraction)						
Relative frequency (decimal)						

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7. What would you expect the relative frequency of a die score of 1 to get close to if you conducted this trial a very large number of times?

(Express your answer as a fraction and a decimal approximation)

8. If we were to conduct this experiment 6,000 times, how many times would you expect the number 1 to appear (give reasons)?

Student Worksheet 2

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W2

Name: _____

To simulate the process of rolling two six-sided dice, and adding the resulting numbers, we can add two random integers.

1. What command would simulate this?

2. Try this command a number of times on your calculator.

a) What is the smallest value you can obtain as a sum of the two random integers?

b) What is the largest value you can obtain as a sum of the two random integers?

3. Now try the command 100 times, and record the results in a frequency table.
Also calculate the relative frequency of each dice sum (as a decimal approximation):

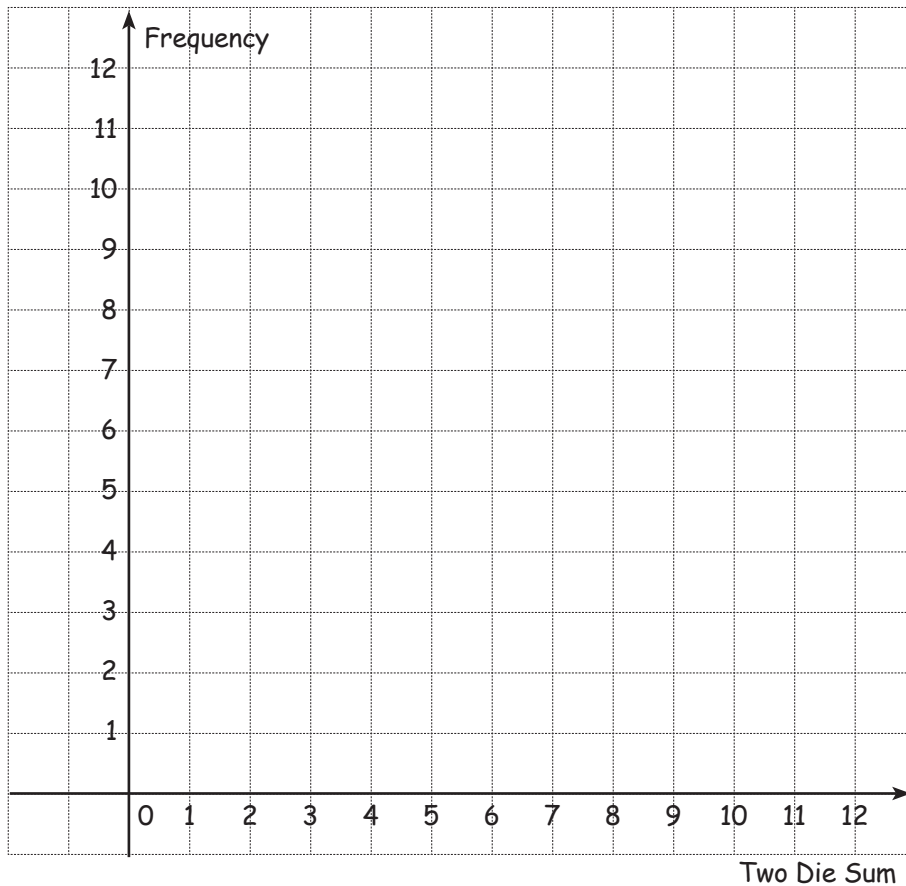
Two Die Sum											
Tally											
Frequency											
Relative Frequency (decimal)											

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W2

4. Construct a bar chart on the axes below to display the results of your experiment:



5. Comment on the distribution of results you obtained. Do you think that each outcome in this experiment is equally likely (explain your reasoning)?

To work out what we expect to happen in the two-dice sum experiment in the long run, let's look at all the possible outcomes when two dice are rolled.

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W2

6. Complete the following table to display all the possible outcomes when rolling two dice:

	Die 1 score					
Die 2 score	1	2	3	4	5	6
1	1 + 1 = 2	1 + 2 = 3				
2	2 + 1 = 3					
3						
4						
5						
6						

7. For this experiment, how many possible outcomes are there in total? _____

The **theoretical probability** (what we expect to happen in the long run) of a particular **event** (eg. a sum of 3) can be calculated as follows:

$$\begin{aligned}
 \text{Probability of a sum of 3} &= \frac{\text{No. of outcomes with a sum of 3}}{\text{Total possible outcomes}} \\
 &= \frac{2}{36} \\
 &\approx 0.056
 \end{aligned}$$

8. Use the method on the bottom of the previous page to calculate the probability of obtaining a sum of 2, 3, 4, ... 12, and then complete the table below:

Sum	2	3	4	5	6	7	8	9	10	11	12
No. of ways to obtain this outcome											
Probability (fraction)											
Probability (decimal)											

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9. Compare these theoretical probabilities with the relative frequencies obtained in your answer to question 3, and comment:

10. If we were to conduct this experiment 1,000 times, how many times would you expect the die sum of:

a) 4 to appear _____

b) 7 to appear _____

11. Summarise what you have learnt about the difference between relative frequency and theoretical probability:

Assessment Task

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AT

Name: _____

1. A student wishes to simulate the experiment of rolling a 20 sided die. What calculator command (using randint) will simulate this?

2. A student wishes to simulate the experiment of rolling two 4-sided dice, and record the sum of the numbers on the two dice.

- a) What calculator command (using randint) will simulate this?

- b) List the possible outcomes for this experiment.

- c) Are all the outcomes equally likely (explain your reasoning)?

- d) Which result is most likely (explain your reasoning)?

3. An experiment that simulates the rolling of a six sided die is performed 60,000 times. How many times would you expect to get:

- a) a three

- b) an even number

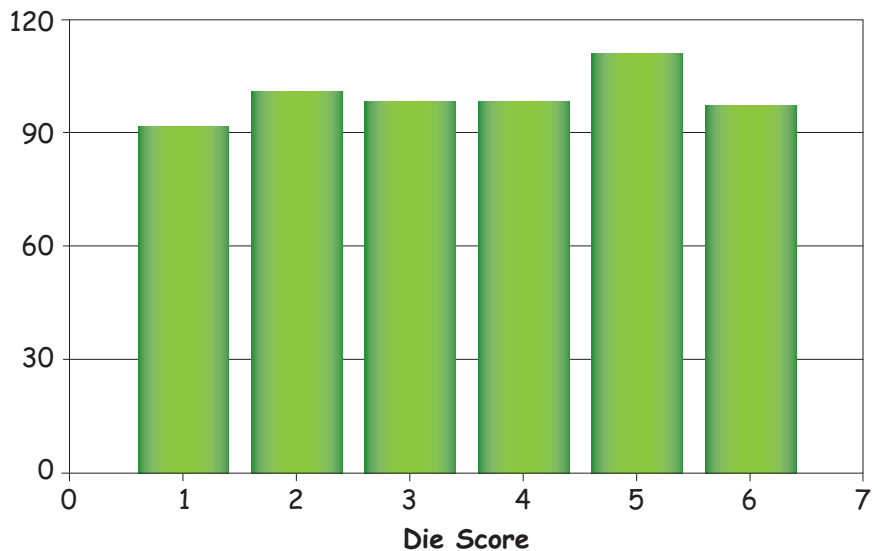
- c) an even number or a three?

Assessment Task

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AT

4. A calculator has been used to generate 600 random integers between 1 and 6 inclusive, and the results are shown in the graph below.



- a) If the same experiment was conducted 6,000 times, how would you expect the shape of the graph to change?

- b) If the same experiment was conducted 60 times, how would you expect the shape of the graph to change?

5. If a six-sided die is rolled, what is the theoretical probability (expressed as a fraction) of obtaining:

- a) an odd number

- b) a five

- c) an odd or an even number
