AVERAGES WITH DICE
Student Notes

This activity will help you to:
- understand and use estimates of probability;
- use the TI-Nspire to perform experiments with dice;
- use the range, mean, median and mode.

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1. Roll some dice

a) Your TI-Nspire can produce numbers like a dice. This is called *simulating* a dice

You must tell it to choose a random number between 1 and 6.

Open a new document with a calculator page.

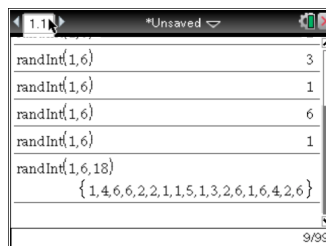Now type **randint(1,6)** using the alpha keys for letters and the comma.

Press enter to roll the dice.

Press it again and again to repeat the command and choose more numbers at random.

b) Now change the randint command to produce 18 throws of the dice all at once.

How many sixes would you expect? This is the *expected frequency*.

Type **randint(1,6,18)**.

How many sixes did you throw?

On the left there was only one six. Is there something wrong?

Press enter several more times. Count how many sixes you get and compare with the expected frequency

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c) In this activity you will often need to use the randint command. You can save time by defining a short cut.
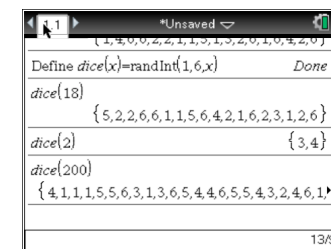
For example, you can teach the TI-Nspire that if you type dice(18) you mean randint(1,6,18).

Also   dice(200) will mean randint(1,6,200)
        dice(2)   will mean randint(1,6,2)
and in general
        dice(x)   will mean randint(1,6,x).

Carefully type:

define dice(x)=randint(1,6,x)

Test the new command as shown here.

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2. How long to throw a six?

a) In some board games you have to throw a six before you can start. How many times would you expect to have to throw the dice in order to get a six? Make a guess and write it down. Now carry out an experiment with your TI-Nspire to see how good your guess was.

Enter dice(50) and count how many throws it takes to produce the first six.

Press enter to repeat this and make a list of the number of throws each time.

b) Now record the numbers of throws to produce a six in a spreadsheet.

Press ctrl doc▾ 4 to add a Lists & Spreadsheet page.

Enter your data in the first column.

Go to the top of the column and label it **throws**.

Continue rolling the dice, counting the throws needed to get a six and entering the data in the spreadsheet.

How many times do you think you need to do this?

c) Now you can use your TI-Nspire in different ways to analyse the data you have collected.

Start with a dot plot to show the distribution: press ctrl doc▾ 5 to add a Data & Statistics page.

Move to the horizontal axis and choose the variable **throws**.

Yours will be different from this. But is this the sort of distribution you expected?

What is the *range* of your data?

What average would be good to use for these data?

What is the *mode*? You should be able to find it easily from the dot plot.

d) You can find the median by drawing a box plot: press

menu 1 2

Move the cursor to show the median.

To calculate the mean go back to page 1.1, type **mean(throws)** and press ctrl enter.

Write down the mean, median and mode for your set of data. How do they compare with your first guess of the number of times you would expect to have to throw the dice to get a six?

3. Throwing two dice

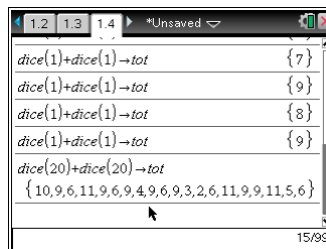a) Start a new calculator page on your TI-Nspire by going to page 1.3 and pressing [ctrl] [doc▾] [1].

The **total** of two dice can be calculated and stored by pressing:
dice(1)+dice(1)[ctrl][var]tot

Pressing [enter] repeatedly gives lots of totals but an easier way is to enter, for example,
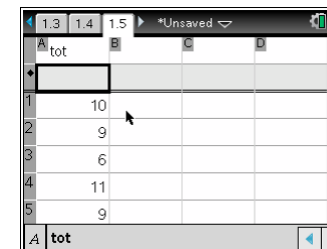
dice(20)+dice(20)→tot

Try it.

The list of 20 totals can easily be stored in a spreadsheet.

Create a new Lists & Spreadsheets page. Then press ▲▲, type **tot** and press [enter]. Check that your list of 20 totals is in column A.

b) What is the range of your data? What are the largest and smallest possible totals? Perhaps you have not had a double 6 or double 1 yet?

Go back to the calculator page (1.4) and get a bigger data set by changing the 20s to 100s.

Create a Data & Statistics page and draw a dot plot to show how the 100 totals are distributed.

Find suitable averages for this data set.
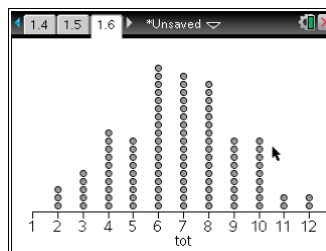
Now create a set of 1000 totals on page 1.4.

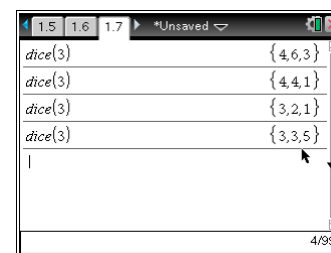You are now simulating 1000 throws of the two dice, so it may take a few seconds.

How do the averages of this set of 1000 totals compare with those for the set of 100?

4. Triple odds

a) In another dice game players take it in turns to roll 3 dice. The winner is the first one to roll 3 odd numbers. Think about it: how many rolls on average will it take before a player rolls triple odds?

b) This time you can use dice(3) to simulate the three dice. Use it repeatedly and count how many throws it takes to get triple odds. Enter that number in a spreadsheet.

Collect enough data for you to check your answer to the question in part a).

Triple odds on the 4th throw!