Sampling Procedures using a TI-Nspire OS4.2

Simple Random Sampling from a Single Set of Data
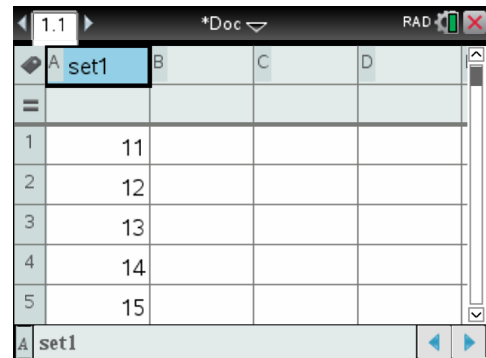
1. Have your data in a List & Spreadsheets page

Here we have data called 'set1' containing 5 numbers
{11,12,13,14,15}

2. Insert a Calculator Page and Seed the Random Number
Generator with a number of your choosing.

menu > Probability > Random > Seed
   OR
📖 > R > RandSeed
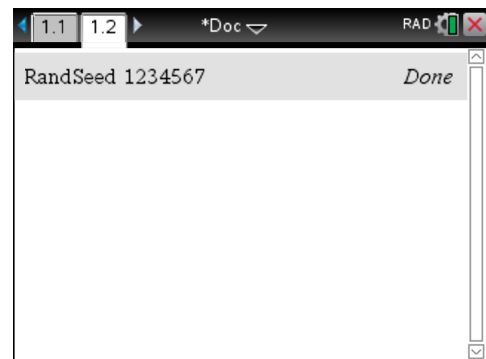
3. Use the randSamp(…) command to take a simple
random sample from your set, without replacement

menu > Probability > Random > Sample
   OR
📖 > R > randSamp(

The syntax is randSamp(List,#Trials[,noReplacement])
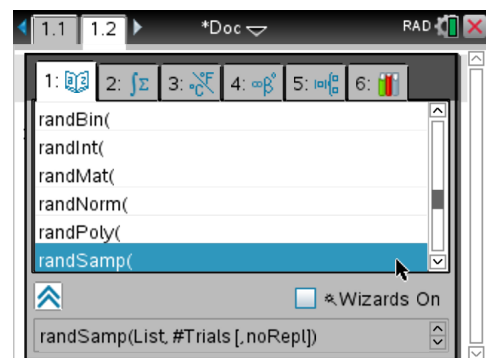
4. Create a sample list of 3 numbers from set1.

set1samp:=randSamp(set1,3,1)

Note that := can be obtained by pressing ctrl ⊡{₈. This
syntax means 'defined as equal to'

Putting the '1' as the final argument ensures that the
sample of size 3 is taken without repetition of any
element from set1.

Systematic Random Sampling from a Single Set of Data

1. Have your data in a List & Spreadsheets page

Here we have data called 'set1' containing 20 numbers: {11,12,13,14,15,….., 27,28,29,30}

2. Insert a Calculator Page and Seed the Random Number Generator with a number of your choosing.

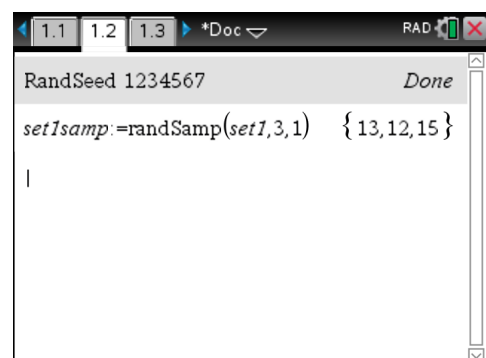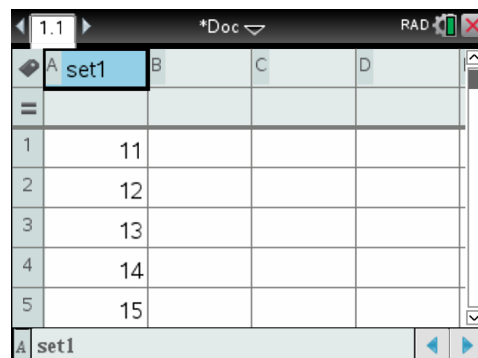menu > Probability > Random > Seed
   OR
📖 > R > RandSeed

You can now use the randInt(…) command to generate a random starting point, if required.

3. Use the seq(…) command to take a sequence of data points from your set

menu > Statistics > List Operations > Sequence
   OR
📖 > S > seq(

The syntax is:
      seq(Expression, Variable, Low, High[, Step])

4. Decide on your starting piece of data and how regularly you wish to sample.

In this example we shall start on the 3rd piece of data, and take every 4th piece of data and we don't want to exceed the 20th piece of data.

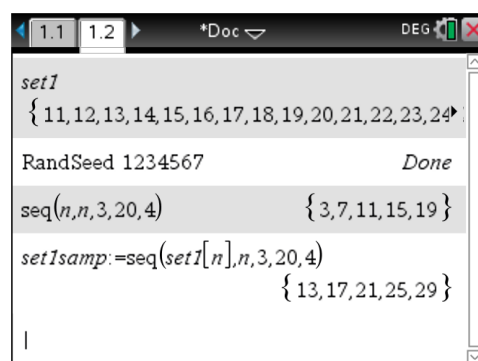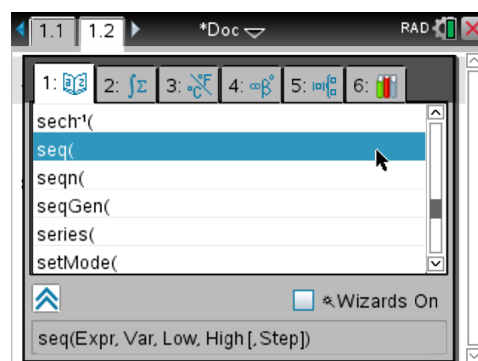So, to generate the sequence of values 3, 7, 11, 15, 19 we use the command seq(n,n,3,20,4)

To select these pieces of data, we use *set1*[…] in the command to pick the 3rd, 7th, 11th, 15th and 19th data points.

set1samp:= seq(set1[n],n,3,20,4)

Note that := can be obtained by pressing ctrl :=. This syntax means 'defined as equal to'

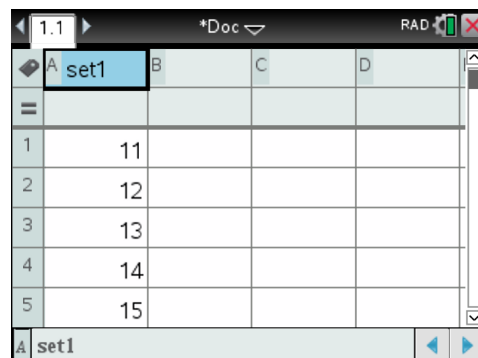Note where square brackets are used – they are obtained by pressing ctrl (

Stratified Random Sampling from a Single Set of Data

1. Have your data in a List & Spreadsheets page

Here we have data called 'set1' containing
{11,12,13,14,15, **20, 21, 22, 23**, 30, 31, 32, 33, 34, 35}

This has three strata in it – the first 5 numbers (11 to 15), the next 4 numbers (20 to 23) and the last 6 numbers (30 to 35)

2. Insert a Calculator Page and Seed the Random Number Generator with a number of your choosing.

[menu] > Probability > Random > Seed

If required, sort your list so that each strata are sequenced together.
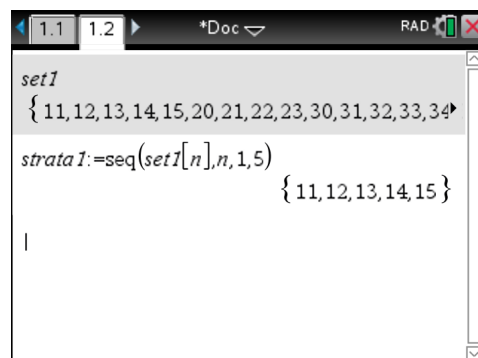[menu] > Statistics > List Operations > Sort Ascending

3. Extract from *set1* the first strata into a new list, called *strata1*

strata1:=seq(*set1*[*n*],*n*,1,5)

Note that := can be obtained by pressing [ctrl] [⌐|{ᵍ}]. This syntax means 'defined as equal to'

4. Repeat for the other strata, noting the start and end values of *n* in the sequence command that will depend upon the number of data points in each strata.

strata2:=seq(*set1*[*n*],*n*,6,9)

strata3:=seq(*set1*[*n*],*n*,10,15)

5. Perform simple random sampling on these new *strata* lists:

strata1samp:=randSamp(*strata1*,3,1)

Here we have taken a sample of size 3 from *strata1*.

Simple Random Sampling from Paired Sets of Data

1. Have your data in a List & Spreadsheets page

Here we have data called 'set1' containing {11,12,13,14,15}

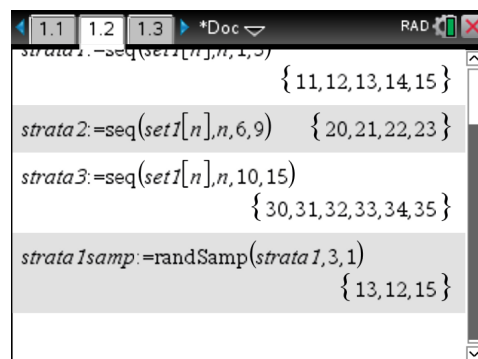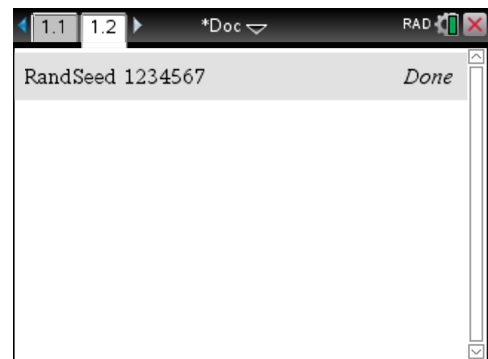And 'set2' containing {51, 52, 53, 54, 55}

2. Insert a Calculator Page and Seed the Random Number Generator with a number of your choosing.

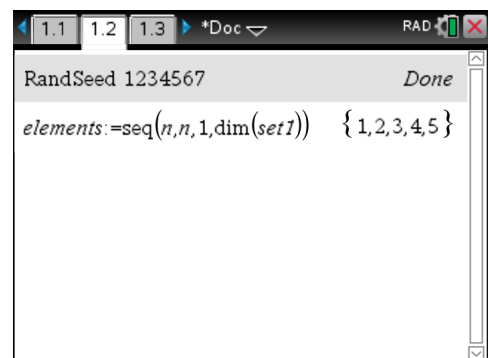[menu] > Probability > Random > Seed
   OR
[📖] > [R] > RandSeed

3. Create a list of the possible elements that we can select from.

$elements:=\text{seq}(n,n,1,\dim(set1))$

The dim(..) command returns the dimension of a list, which is the number of values in that list.
If we already knew that we had data sets of size 5, we could have replaced dim(set1) with the number 5.

4. Create a list containing a simple random sample from the *elements* – these are the positions of the pairs of data that we shall select from *set1* and *set2*

Here we are taking a sample of size 3.

$select:=\text{randSamp}(elements,3,1)$
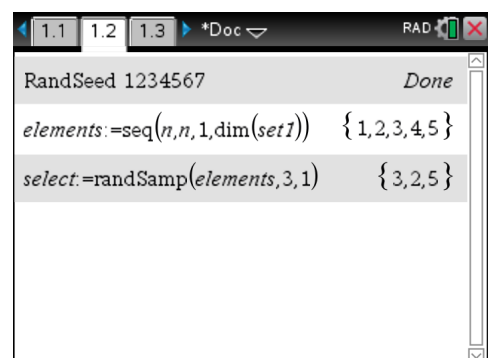
5. Extract the pairs of data from each of set1 and set2, using the select list to index them.

$set1samp:=\text{seq}(set1[select[n]],n,1,\dim(select))$

$set2samp:=\text{seq}(set2[select[n]],n,1,\dim(select))$

In each of these commands we knew we were dealing with samples of size 3, so we could replace dim(select) with the number 3, if we wished.

Systematic Random Sampling from Paired Sets of Data

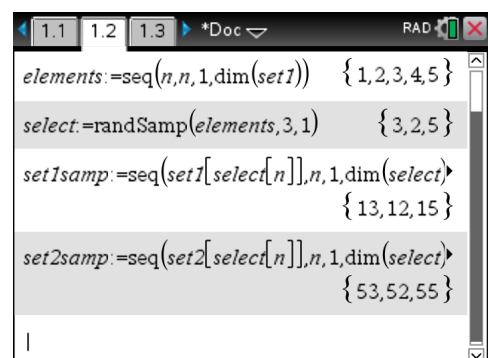1. Have your data in a List & Spreadsheets page

Here we have data called 'set1' containing 20 numbers {11,12,13,....., 27,28,29,30}

And 'set2' containing also containing 20 numbers {51, 52, 53, ..., 67, 68, 69, 70}

2. Insert a Calculator Page and Seed the Random Number Generator with a number of your choosing.

menu > Probability > Random > Seed
   OR
📖 > R > RandSeed

You can now use the randInt(...) command to generate a random starting point, if required.

3. Use the seq(...) command to take a sequence of data points from your set

menu > Statistics > List Operations > Sequence
   OR
📖 > S > seq(

The syntax is:
       seq(Expression, Variable, Low, High[, Step])

4. Decide on your starting piece of data and how regularly you wish to sample.

In this example we shall start on the 3rd piece of data, take every 4th piece of data and we don't want to exceed the 20th piece of data.

So, to generate the sequence of values 3, 7, 11, 15, 19 we use the command seq(n,n,3,20,4)
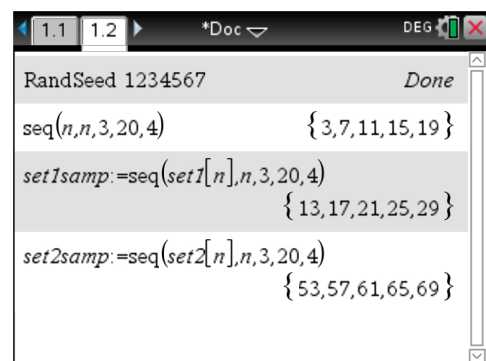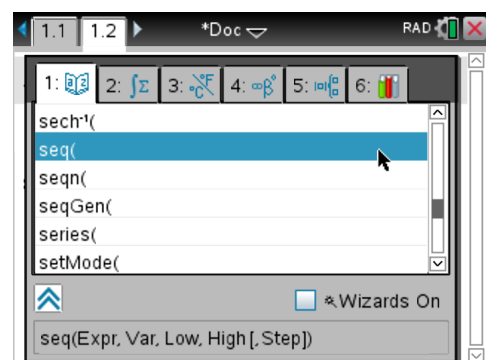
To select these pieces of data, we use *set1*[...] in the command to pick the 3rd, 7th, 11th, 15th and 19th data points.
set1samp:= seq(*set1*[n],n,3,20,4)

To select these pieces of data, we use *set1*[...] and *set2*[...] in the command to pick the 3rd, 7th, 11th, 15th and 19th data points.
set1samp:= seq(*set1*[n],n,3,20,4)
set2samp:= seq(*set2*[n],n,3,20,4)

Note where the <u>square</u> brackets are used – they are obtained by pressing ctrl (

Stratified Random Sampling from Paired Sets of Data

1. Have your data in a List & Spreadsheets page

Here we have data called 'set1' containing
{11,12,13,14,15, **20, 21, 22, 23**, 30, 31, 32, 33, 34, 35}
And 'set2' containing
{51,52,53,54,55, **60, 61, 62, 63**, 70, 71, 72, 73, 74, 75}

This has three strata in it – the first 5 pairs, the next 4 pairs and the last 6 pairs

2. Insert a Calculator Page and Seed the Random Number Generator with a number of your choosing.

[menu] > Probability > Random > Seed

Be cautious before sorting paired data, as you need to **select all columns** before sorting, to keep pairs together. This sorting can <u>only</u> be done on the Lists & Spreadsheets page.
    First select one column by…
    either [menu] > Actions > Select > Select Column
       or move over the column name and press ▲ once
    Next **hold down** [⇧shift] and use ◄ or ► to select all the other columns.
    Finally use either [menu] > Actions > Sort
          or [ctrl] [menu] > Data > Sort

3. Extract the first strata from each of *set1* and *set2* into new lists, called *strata1set1* and *strata1set2*

$strata1set1 := seq(set1[n], n, 1, 5)$

$strata1set2 := seq(set2[n], n, 1, 5)$

4. Repeat for the other strata, noting the start and end values of *n* in the sequence command that will depend upon the number of data points in each strata.
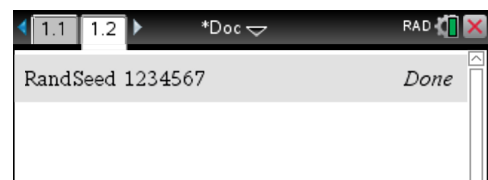
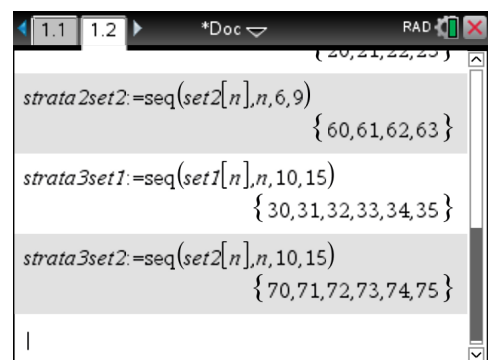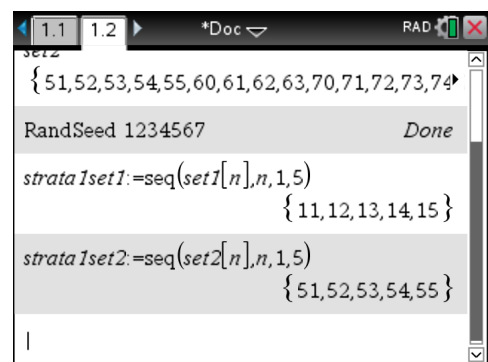$strata2set1 := seq(set1[n], n, 6, 9)$
$strata2set2 := seq(set2[n], n, 6, 9)$

$strata3set1 := seq(set1[n], n, 10, 15)$
$strata3set2 := seq(set2[n], n, 10, 15)$

5. Create a list of the possible elements that we can select from Strata 1

elements:=seq(*n*,*n*,1,dim(*strata1set1*))

Alternatively, we could have used dim(*strata1set2*), as both lists have the same number of elements in them.

6. Create a list containing a simple random sample from the *elements* – these are the positions of the pairs of data that we shall select from *strata1set1* and *strata1set2*

Here we are taking a sample of size 3.

select:=randSamp(*elements*,3,1)

7. Extract the pairs of data from each of *strata1set1* and *strata1set2*, using the *select* list to locate them.

strata1set1samp:=seq(*strata1set1*[*select*[*n*]],*n*,1,dim(*select*))

strata1set2samp:=seq(*strata1set2*[*select*[*n*]],*n*,1,dim(*select*))

In each of these commands we knew we were dealing with samples of size 3, so we could replace dim(select) with the number 3, if we wished.