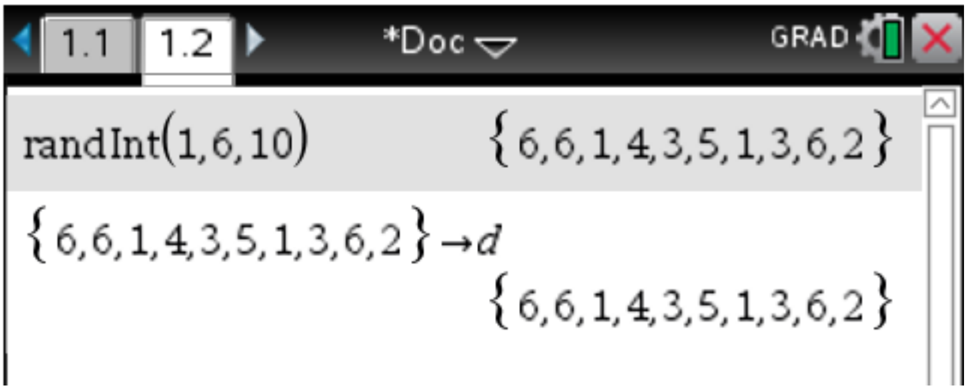
Probability & simulations

Simulation : randint(a,b,n)

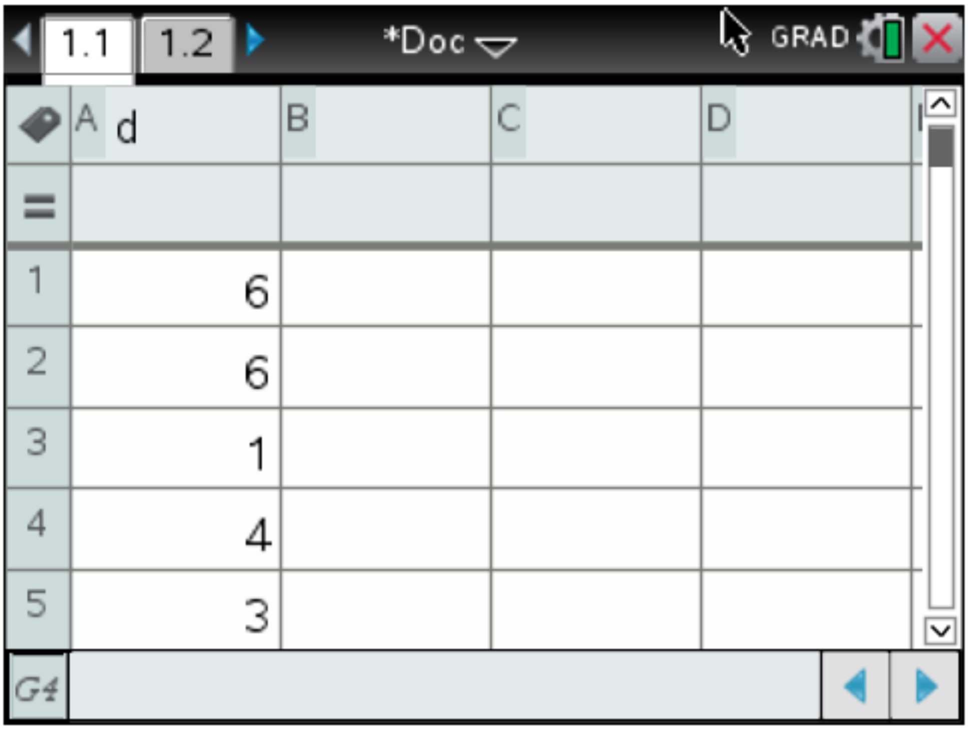
a dice	randint(1,6,n)
a coin	randint(0,1,n) *sum(randint(0,1,n))*
a family	randint(0,1,n) *sum(randint(0,1,n))*

Transport your result to a spreadsheet :

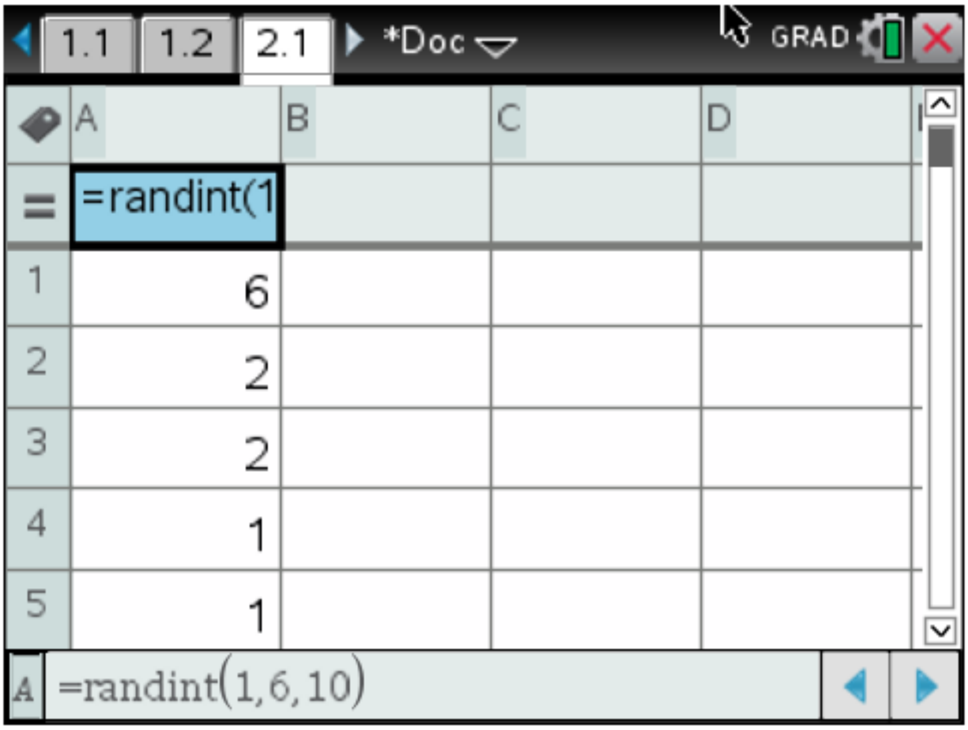
randint(1,6,10) ; enter
CTRL *var* and type *d* ; enter



Open a spreadsheet and name your column *d* ; enter.

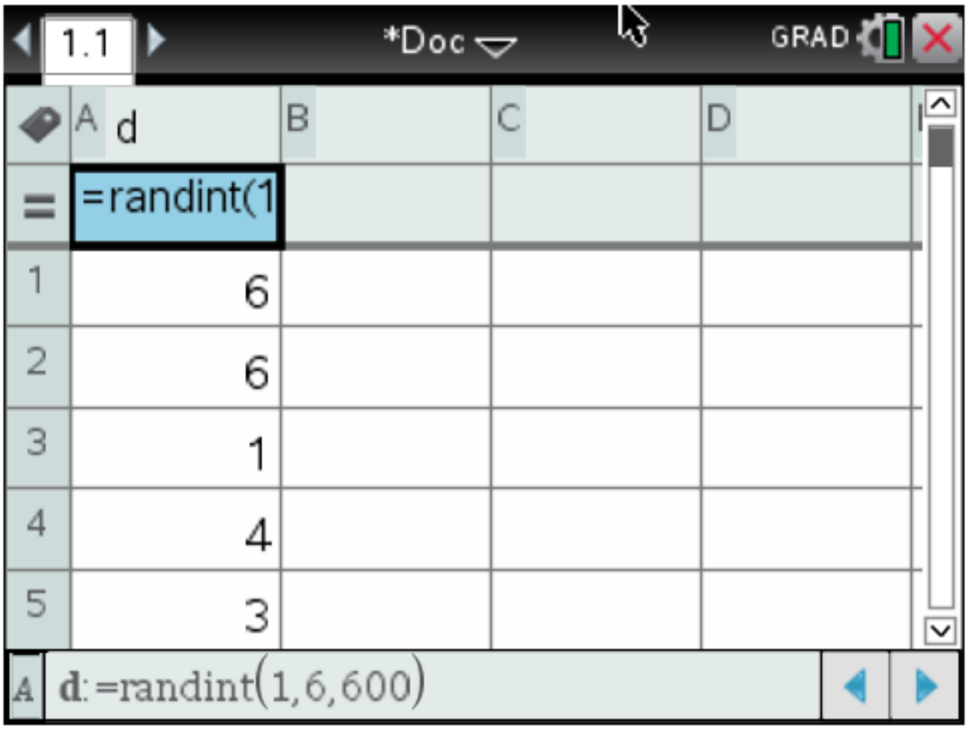


Or use the formula bar in your spreadsheet :

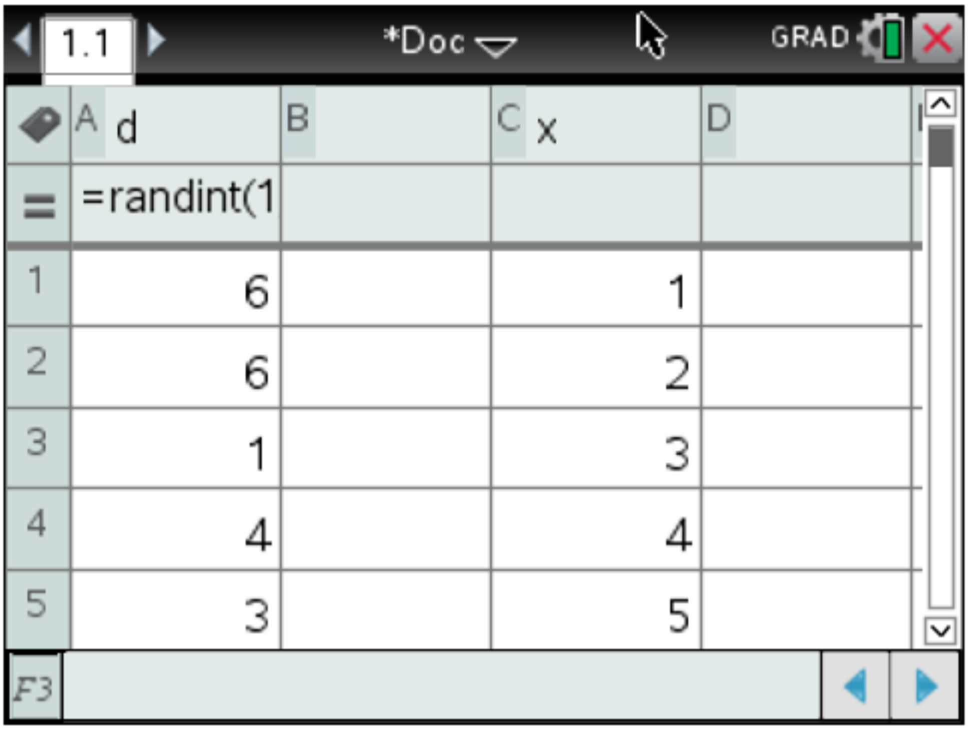


EXAMPLE 1 Throw 600 times with a dice and calculate the probability of each outcome.

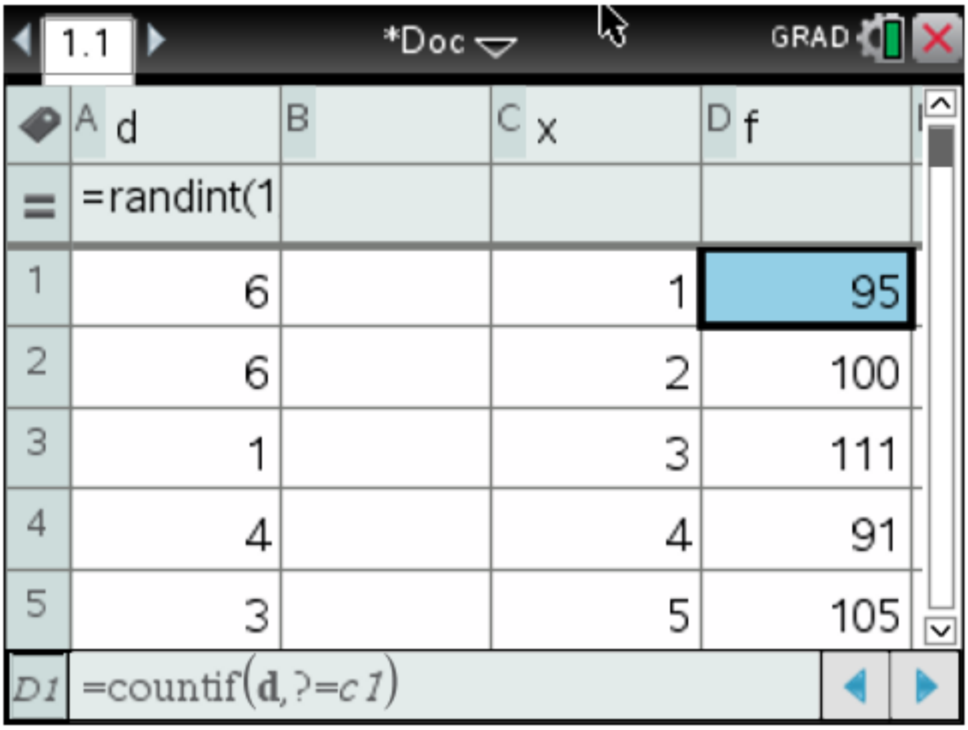
Simulate 600 times throwing a dice.
Name your column **d**.



Make a column **x** with the outcomes 1, 2, 3, 4, 5 and 6.



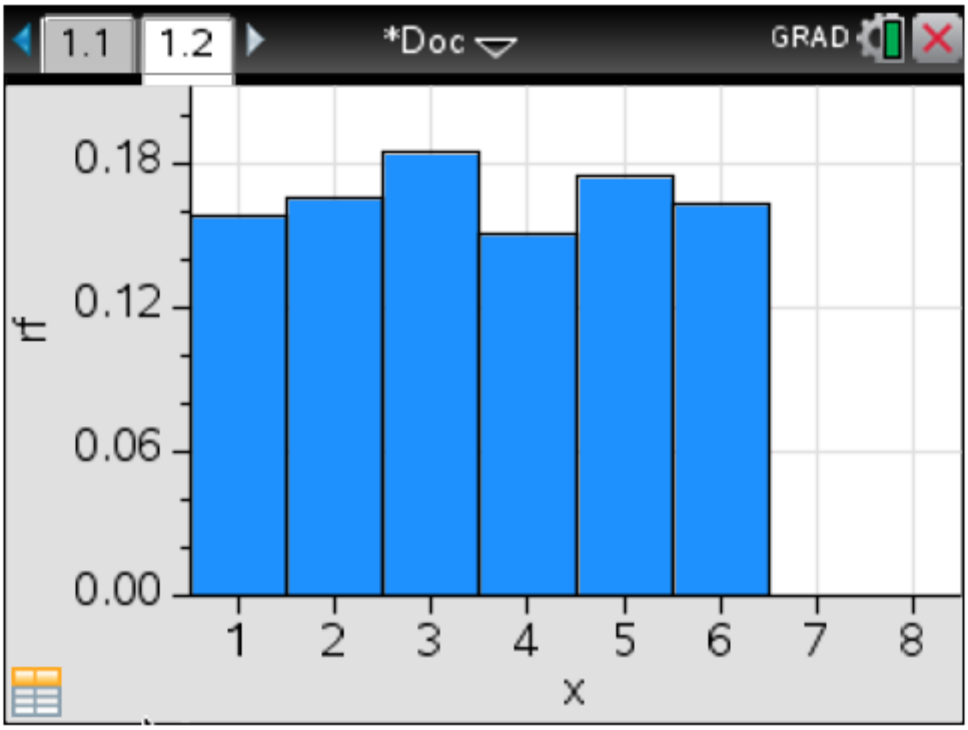
Make a frequency list **f** and go to the first free cell (here D1).
To give the frequencies we use : =countif(**d**,?=*c1*) ; enter.
Than select this cell and go to MENU : 3 data : 3 fill to copy this formula to *c2* till *c6*.



Now we can calculate the relative frequencies (**rf**) and for example make it visible in a graph.

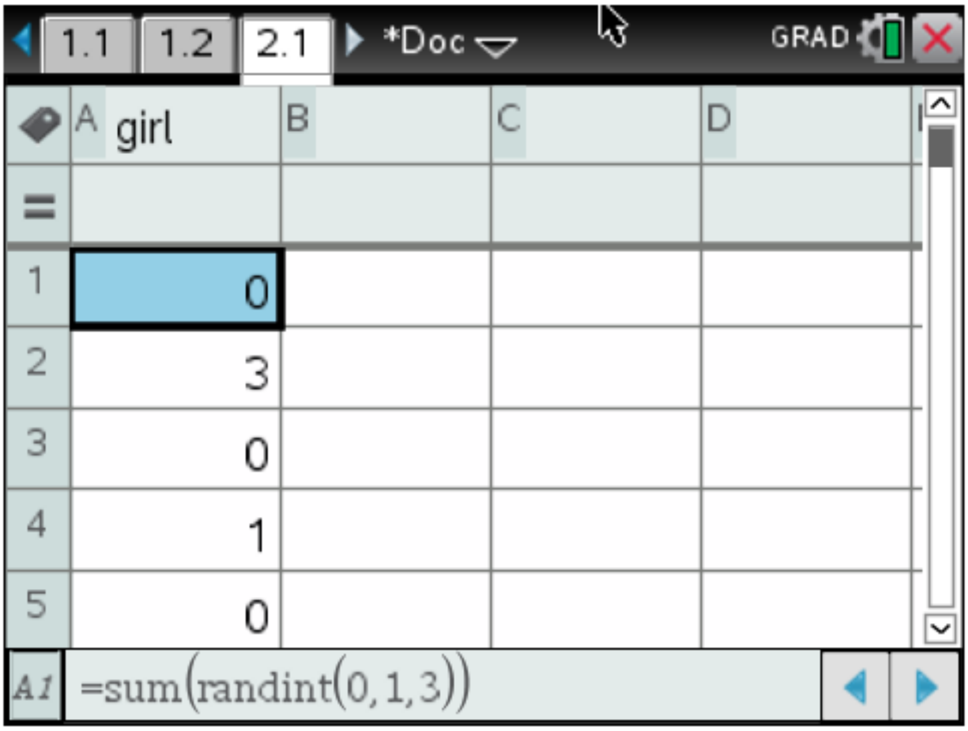
	A d	B	C x	D f	E rf	F	G	H
=	=randint(1				='f/600*1.			
1	6		1	95	0.158333			
2	6		2	100	0.166667			
3	1		3	111	0.185			
4	4		4	91	0.151667			
5	3		5	105	0.175			
6	5		6	98	0.163333			
7	1							
8	3							
9	6							
10	2							
11	5							

J9



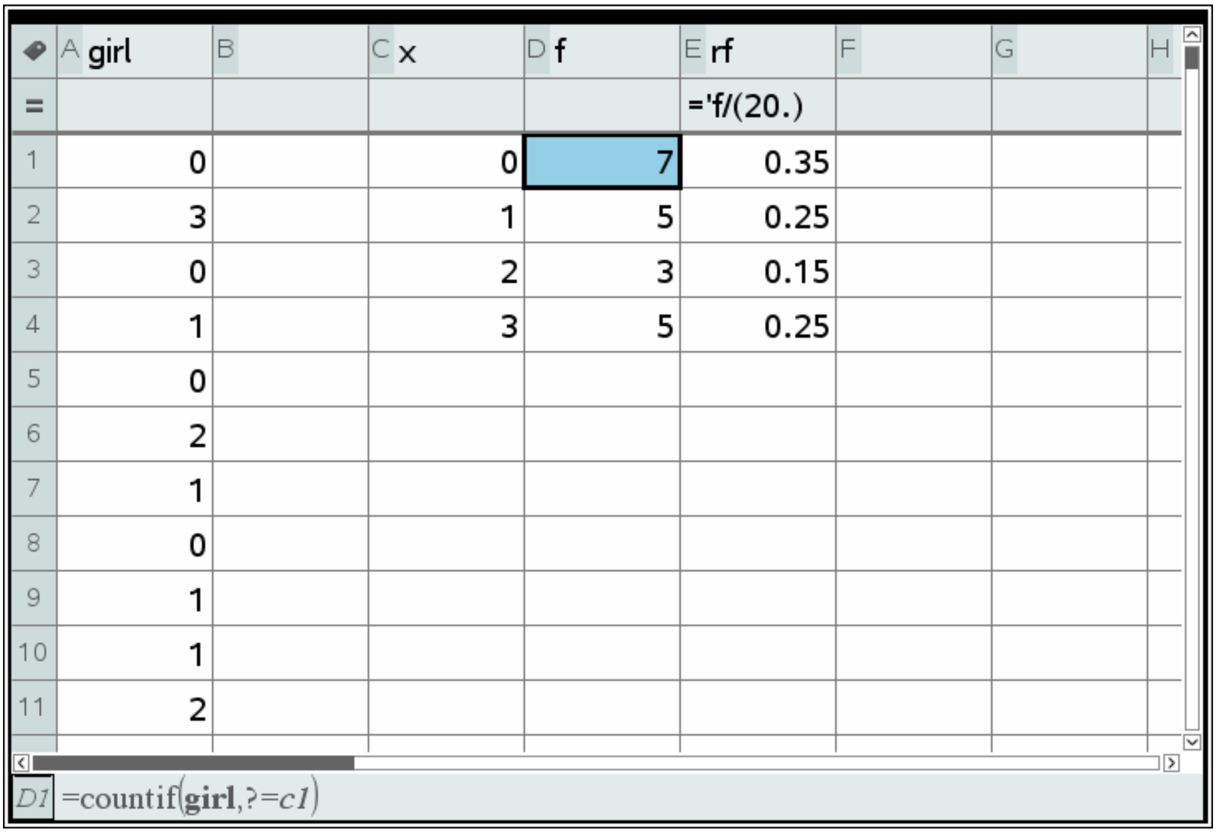
Example 2 Simulate 20 families with 3 children and calculate the probability of having 2 girls.

<u>Method 1</u> sum(randint(0,1,3))



	A girl	B	C	D
=				
1	0			
2	3			
3	0			
4	1			
5	0			

A1 =sum(randint(0,1,3))

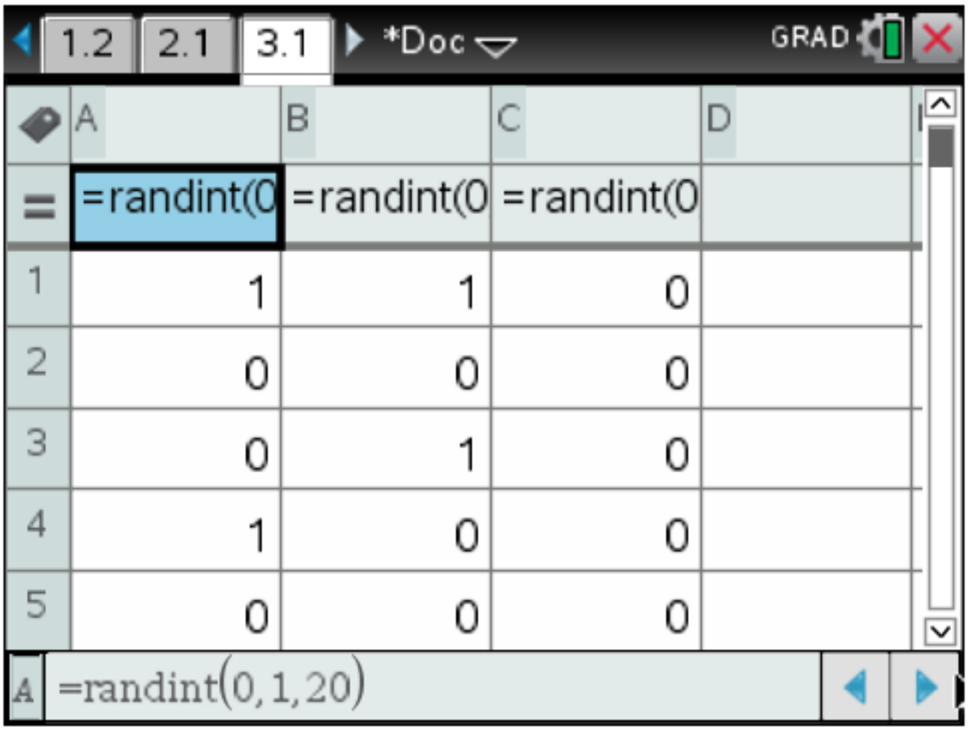


	A girl	B	C x	D f	E rf	F	G	H
=					='f/(20.)			
1	0		0	7	0.35			
2	3		1	5	0.25			
3	0		2	3	0.15			
4	1		3	5	0.25			
5	0							
6	2							
7	1							
8	0							
9	1							
10	1							
11	2							

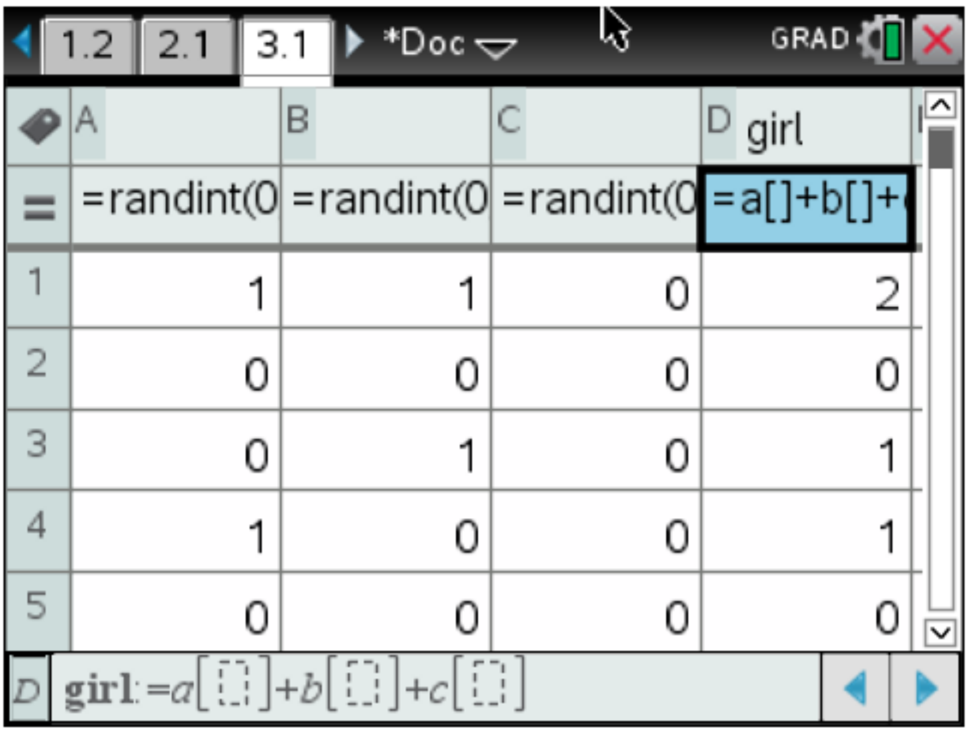
D1 =countif(girl,?=c1)

<u>Method 2</u>   randint(0,1,20)

Use 3 lists ; one for the first child, one for the second child and one for the last child.



Make a column **'girl'** and calculate A+B+C.



Complete your spreadsheet.

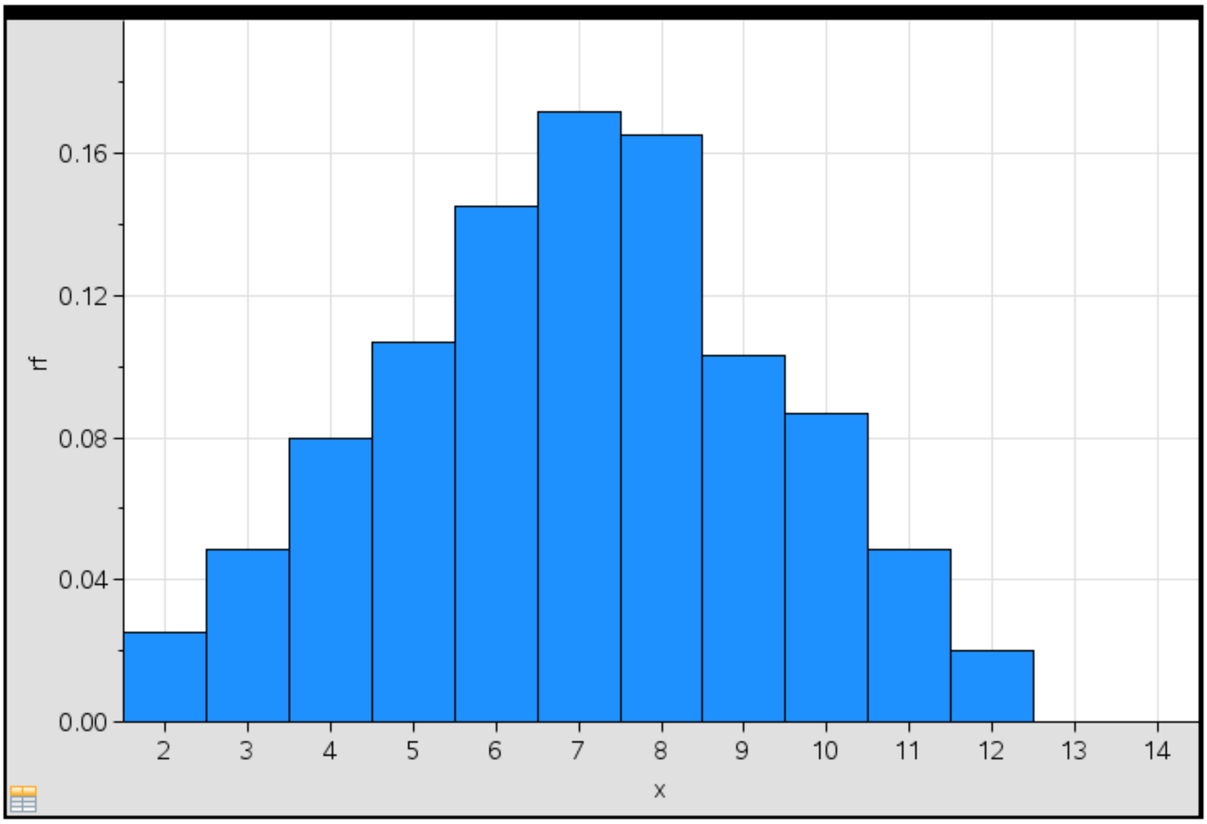
	A	B	C	D girl	E x	F f	G rf	H
=	=randint(0	=randint(0	=randint(0	=a[]+b[]+			='f/(20.)	
1	1	1	0	2	0	3	0.15	
2	0	0	0	0	1	7	0.35	
3	0	1	0	1	2	10	0.5	
4	1	0	0	1	3	0	0.	
5	0	0	0	0				
6	1	1	0	2				
7	1	1	0	2				
8	1	0	1	2				
9	1	0	0	1				
10	1	1	0	2				
11	0	0	1	1				

F1 =countif(**girl**,?=*e1*)

EXAMPLE 3 Simulate throwing 600 times with two die and calculate the probability that the sum of the two die is 10 or more. Use the method of lists.

	A	B	C d	D x	E f	F rf	G	H
=	=randint(1	=randint(1	=a[]+b[]			='f/(600.)		
1	1	2	3	2	15	0.025		
2	6	4	10	3	29	0.048333		
3	1	6	7	4	48	0.08		
4	2	5	7	5	64	0.106667		
5	3	1	4	6	87	0.145		
6	2	6	8	7	103	0.171667		
7	4	4	8	8	99	0.165		
8	1	4	5	9	62	0.103333		
9	4	3	7	10	52	0.086667		
10	5	4	9	11	29	0.048333		
11	5	1	6	12	12	0.02		

F9:F11



EXAMPLE 4 From a survey in 2008 is given that 59% of the Flemish people older than 18 do sports.

Simulate 300 times a group of 3 Flemish people and calculate the experimental probability that 0, 1, 2 or 3 persons of that group do sports. Generate 3 rows with zeros and ones where the one stands for ‘do sport’. Keep in mind that 59% of the Flemish people do sport.

Example 5 From a survey in the secondary school is given that 20% of the students often chat during class and don’t pay attention to the explanation of the teacher.

Simulate 300 times a group of 5 students.

a) Calculate how many groups have no students that chat during the explanation of the teacher.
b) Calculate how many groups only have one student that chat during the explanation of the teacher.