

Probability & simulations

Simulation : randint(a,b,n)

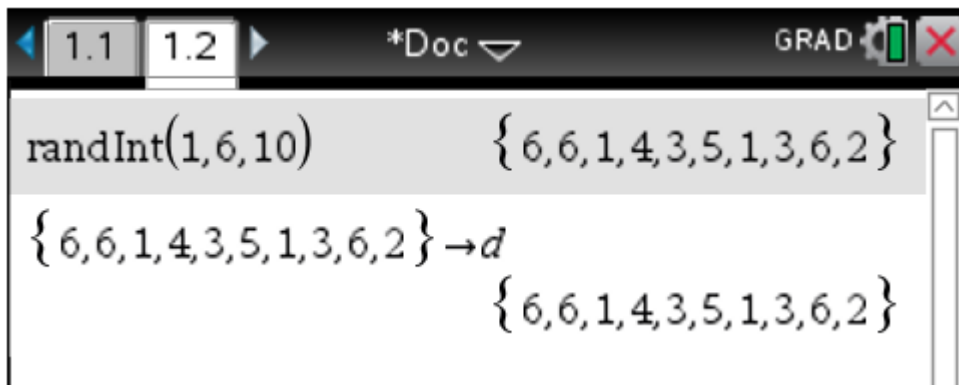
a dice randint(1,6,n)

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.

	A d	B	C	D
=				
1	6			
2	6			
3	1			
4	4			
5	3			

Or use the formula bar in your spreadsheet :

The screenshot shows a spreadsheet window with tabs 1.1, 1.2, and 2.1. The active tab is 2.1. The formula bar at the top shows the formula `=randint(1` being entered into cell A1. The spreadsheet grid shows columns A, B, C, and D, and rows 1 through 5. The values in column B are 6, 2, 2, 1, and 1 respectively. The formula bar at the bottom shows the full formula `A =randint(1,6,10)`.

	A	B	C	D
=	=randint(1			
1		6		
2		2		
3		2		
4		1		
5		1		

A =randint(1,6,10)

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**.

The screenshot shows a spreadsheet window with tab 1.1. The active tab is 1.1. The formula bar at the top shows the formula `=randint(1` being entered into cell A1. The spreadsheet grid shows columns A, B, C, and D, and rows 1 through 5. The values in column B are 6, 6, 1, 4, and 3 respectively. The formula bar at the bottom shows the full formula `A d:=randint(1,6,600)`.

	A d	B	C	D
=	=randint(1			
1		6		
2		6		
3		1		
4		4		
5		3		

A d:=randint(1,6,600)

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

	A d	B	C x	D
=	=randint(1			
1	6		1	
2	6		2	
3	1		3	
4	4		4	
5	3		5	

Make a frequency list **f** and go to the first free cell (here D1).

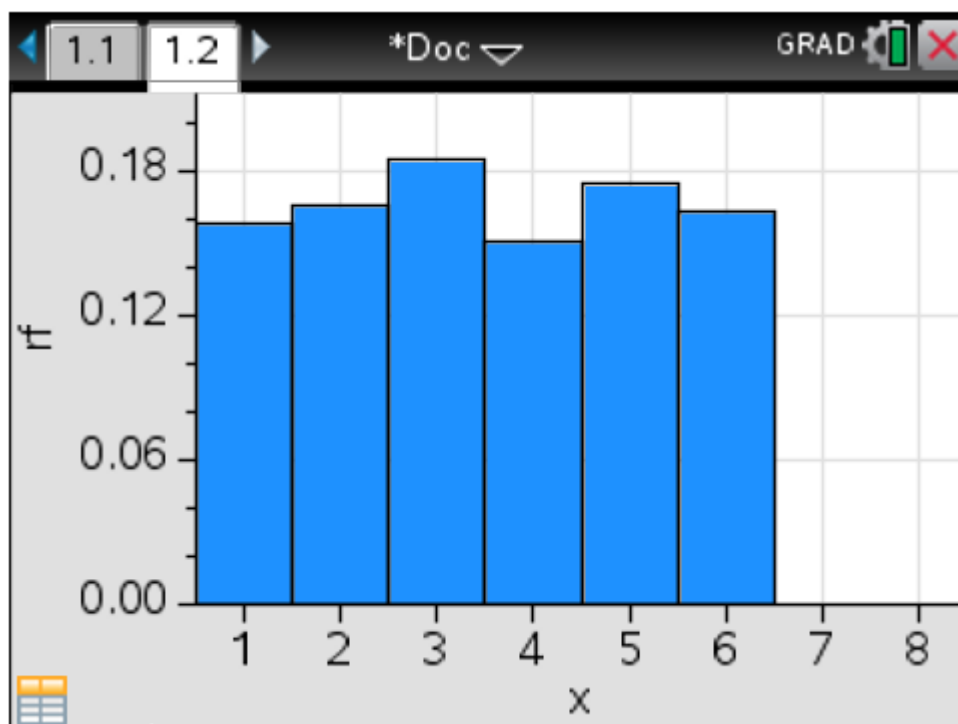
To give the frequencies we use : `=countif(d,?=c1)` ; enter.

Then select this cell and go to MENU : 3 data : 3 fill to copy this formula to c2 till c6.

	A d	B	C x	D f
=	=randint(1			
1	6		1	95
2	6		2	100
3	1		3	111
4	4		4	91
5	3		5	105

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							



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

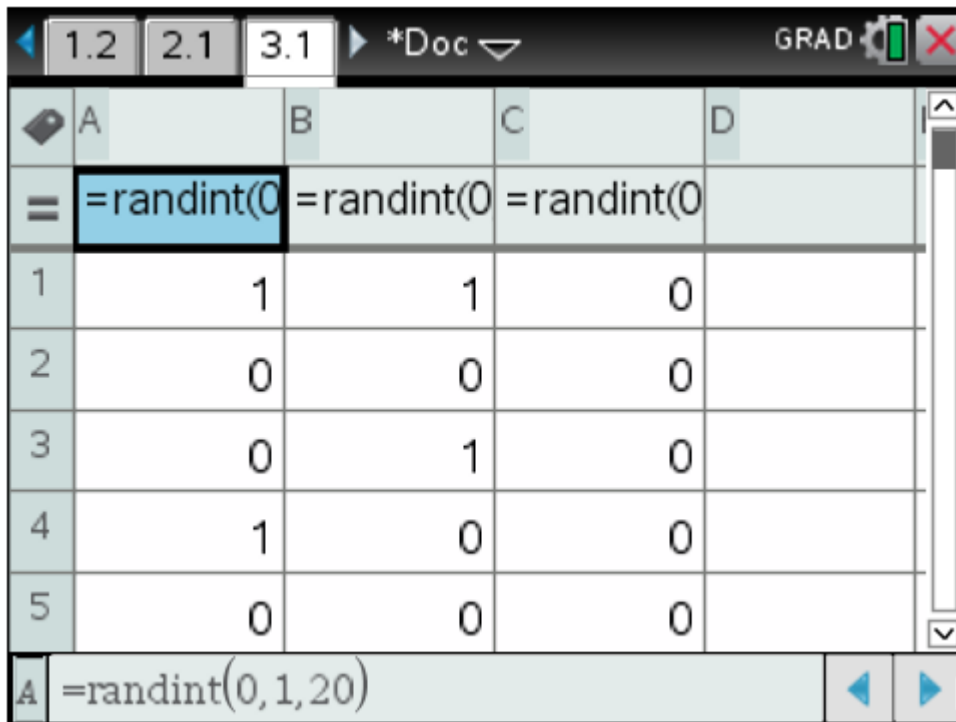
Method 1 `sum(randint(0,1,3))`

	A girl	B	C	D
=				
1	0			
2	3			
3	0			
4	1			
5	0			
A1	<code>=sum(randint(0,1,3))</code>			

	A girl	B	C x	D f	E rf	F	G	H
=					<code>=f/(20.)</code>			
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	<code>=countif(girl,?=c1)</code>							

Method 2 randint(0,1,20)

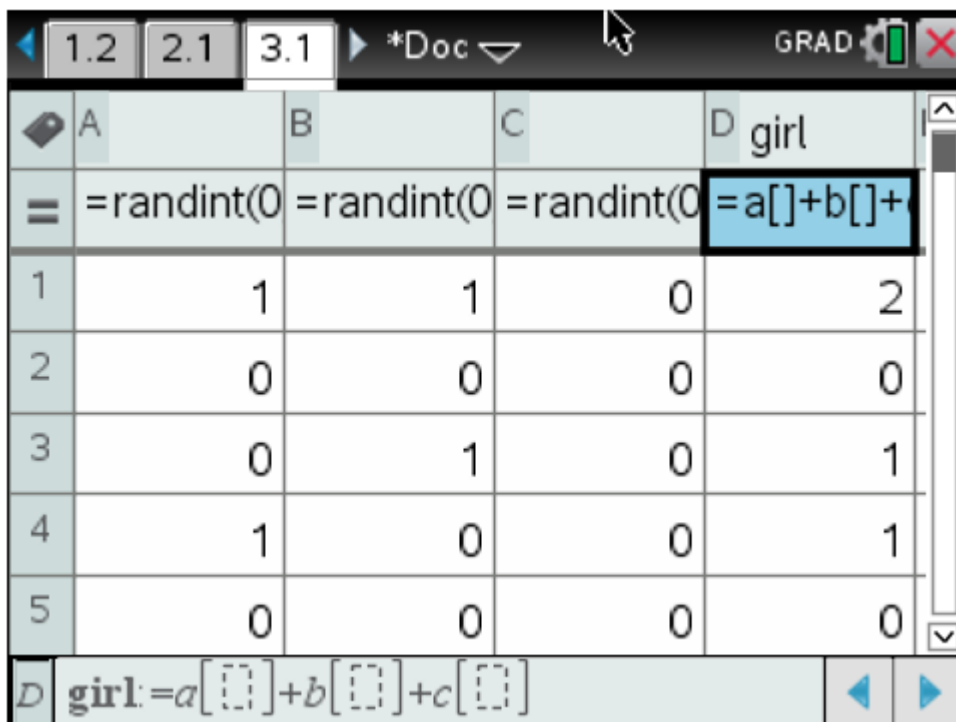
Use 3 lists ; one for the first child, one for the second child and one for the last child.



The screenshot shows a spreadsheet application with a dark theme. The top bar includes tabs for 1.2, 2.1, and 3.1, a document icon, and a 'GRAD' label. The spreadsheet has four columns labeled A, B, C, and D. The formula bar at the bottom shows '=randint(0,1,20)'. The data rows are as follows:

	A	B	C	D
	=randint(0,1,20)	=randint(0,1,20)	=randint(0,1,20)	
1	1	1	0	
2	0	0	0	
3	0	1	0	
4	1	0	0	
5	0	0	0	

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



The screenshot shows the same spreadsheet application with an additional column 'girl' added to the right of column D. The formula bar at the bottom shows '=a[]+b[]+'. The data rows are as follows:

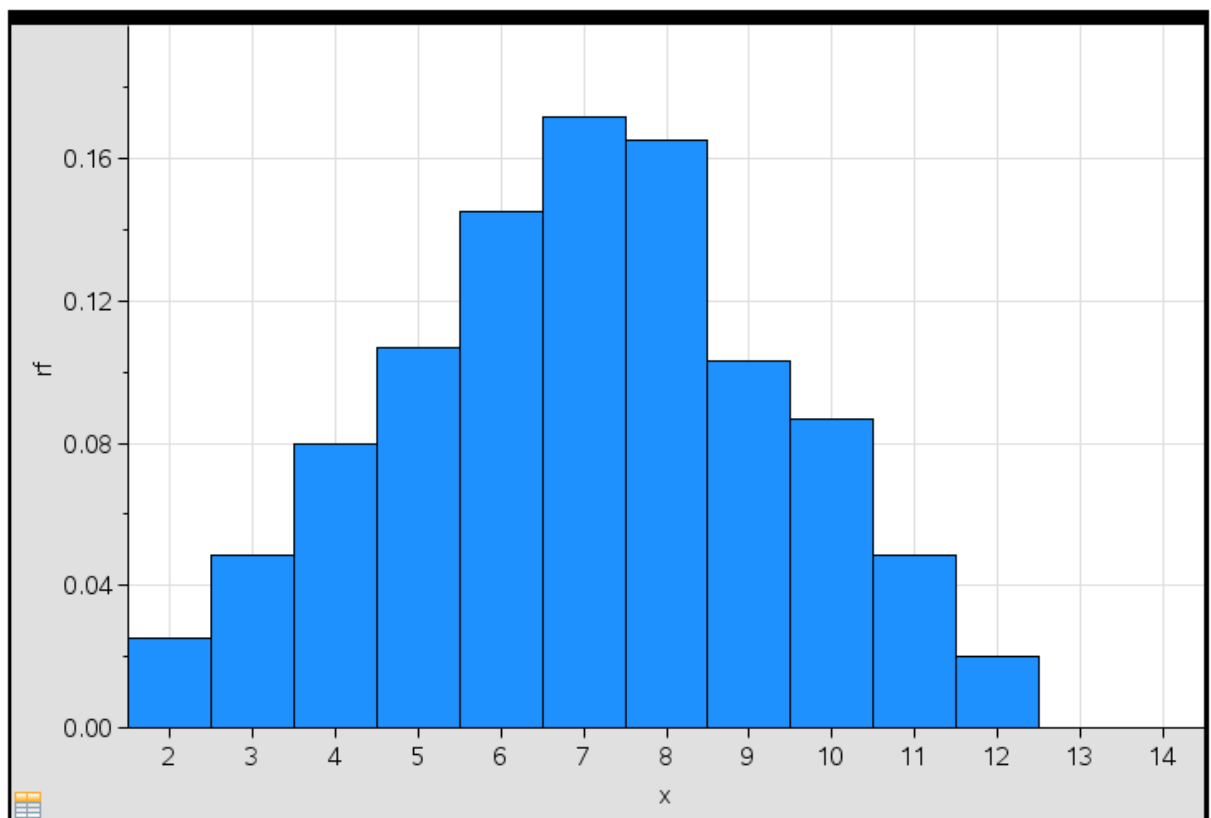
	A	B	C	D	girl
	=randint(0,1,20)	=randint(0,1,20)	=randint(0,1,20)		=a[]+b[]+
1	1	1	0	2	
2	0	0	0	0	
3	0	1	0	1	
4	1	0	0	1	
5	0	0	0	0	

Complete your spreadsheet.

	A	B	C	D girl	E x	F f	G rf	H
=	=randint(0	=randint(0	=randint(0	=a[]+b[]+c			=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	



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.