

## 5.3 Simulating experiments

### Simulation

- State* 1. Define response variable
- Plan* 2. Assign digits
3. Define one trial and what type of value will be recorded
- Do* 4. Run several trials and record data
5. Analyze data
- Conclude* 6. State your conclusion in the context of the problem. Be sure to answer any question asked.

1. Define response variable	<p>"I need to estimate the chances of..."</p> <p>or</p> <p>"I need to estimate the likelihood of..."</p>				
2. Assign digits	Identify the possible outcomes and link each to one or more random numbers.				
3. Define one trial and what type of value will be recorded	<p>Identify a source of <u>random numbers</u> (be sure you know how to use a table!), address how you will handle <u>duplicate numbers</u>, <u>define a stopping rule</u> that tells how you will know when a trial is finished, and identify what you will <u>count</u> as a "success".</p>				
4. Run several trials and record data	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Yes (success)</td> <td style="text-align: center;">No (failure)</td> </tr> <tr> <td style="height: 40px;"></td> <td style="height: 40px;"></td> </tr> </table>	Yes (success)	No (failure)		
Yes (success)	No (failure)				
5. Analyze data	<p>Summarize by finding the percent or proportion of successes:</p> $\hat{p} = \frac{\text{\# of "yes"}}{\text{\# of trials}}$				
6. State your conclusion in the context of the problem. Be sure to answer any question asked.	<p>"Based on a simulation of <u>   </u> <u>trials</u>, I estimate..."</p> <p>or</p> <p>"Based on a simulation of <u>   </u> <u>trials</u>, I could expect about..."</p> <p>Use context! Don't make definitive statements about what "will" happen! Write an estimate, not a prediction!</p>				

1. Define response variable	"I need to estimate how many..."																
2. Assign digits	Identify the possible outcomes and link each to one or more random numbers.																
3. Define one trial and what type of value will be recorded	Identify a source of <u>random numbers</u> (be sure you know how to use a table!), address how you will handle <u>duplicate numbers</u> , <u>define a stopping rule</u> that tells how you will know when a trial is finished, and identify what you will <u>count</u> .																
4. Run several trials and record data	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Trial</th> <th>How many</th> </tr> </thead> <tbody> <tr><td>1</td><td></td></tr> <tr><td>2</td><td></td></tr> <tr><td>3</td><td></td></tr> <tr><td>4</td><td></td></tr> <tr><td>.</td><td></td></tr> <tr><td>.</td><td></td></tr> <tr><td>.</td><td></td></tr> </tbody> </table>	Trial	How many	1		2		3		4		.		.		.	
Trial	How many																
1																	
2																	
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5. Analyze data	Summarize by finding the average: $\bar{x} =$																
6. State your conclusion in the context of the problem. Be sure to answer any question asked.	<p>"Based on a simulation of ___ <u>trials</u>, I estimate..."</p> <p>or</p> <p>"Based on a simulation of ___ <u>trials</u>, I could expect about..."</p> <p>Use context!</p> <p>Don't make definitive statements about what "will" happen!</p> <p>Write an estimate, not a prediction!</p>																

Ten brothers go to the shooting arcade. The arcade suddenly props up 10 duck decoys and each brother fires a rifle at a decoy. If each brother is a perfect shot, never missing, how many ducks would we expect to "survive"?

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101	19223	95034	05756	28713	96409	12531	42544	82853
102	73676	47150	99400	01927	27754	42648	82425	36290
103	45467	71709	77558	00095	32863	29485	82226	90056
104	52711	38889	93074	60227	40011	85848	48767	52573
105	95592	94007	69971	91481	60779	53791	17297	59335

A cereal company says that each box of Frooty Fruit Flakes has one of 6 toys inside. Timmy wants to collect all 6 toys. How many boxes of cereal would we expect Timmy's mom to have to buy in order to get all 6 toys?

107	82739	57890	20807	47511	81676	55300	94383	14893
108	60940	72024	17868	24943	61790	90656	87964	18883
109	36009	19365	15412	39638	85453	46816	83485	41979
110	38448	48789	18338	24697	39364	42006	76688	08708
111	81486	69487	60513	09297	00412	71238	27649	39950

Ex. Dumb Dora didn't study for her quiz and guesses on all 10 questions. Lucky for her, it's true/false. Use 5 trials to estimate her chances of passing.



117	38167	98532	62183	70632	23417	26185	41448	75532
118	73190	32533	04470	29669	84407	90785	65956	86382
119	95857	07118	87664	92099	58806	66979	98624	84826
120	35476	55972	39421	65850	04266	35435	43742	11937

Ex. Suppose a family decides to continue having kids until they have at least 2 of each gender. How many children might they expect to have?

124	71055	07001	12207	17127	17117	17117	17117	17117
125	96746	12149	37823	71868	18442	35119	62103	39244
126	96927	19931	36809	74192	77567	88741	48409	41903
127	43909	99477	25330	64359	40085	16925	85117	36071
128	15689	14227	06565	14374	13352	49367	81982	87209

Ex. Suppose that sports analysts consider one team in the World Series to be stronger, with a 55% chance to win any individual game. Estimate the likelihood that the underdog wins the series.

145	19687	12633	57857	95806	09931	02150	43163	58636
146	37609	59057	66967	83401	60705	02384	90597	93600
147	54973	86278	88737	74351	47500	84552	19909	67181
148	00694	05977	19664	65441	20903	62371	22725	53340

Now you're ready to work  
on exercises 59-67, starting  
on page 313.