Precalc 13.6 Prob. $\frac{S}{T}$

Find the probability of an event by using the binomial theorem (Pascal's Δ)

2 options only

binomial experiment

$(2x+3y)^6$

$1(\ )^6 + 6(\ )^5(\ ) + 15(\ )^4(\ )^2 + 20(\ )^3(\ )^3$

$+15(\ )^2(\ )^4 + 6(\ )(\ )^5 + 1(\ )^6$

$\frac{1}{6}$ theoretical probability

experimental probability

simulation

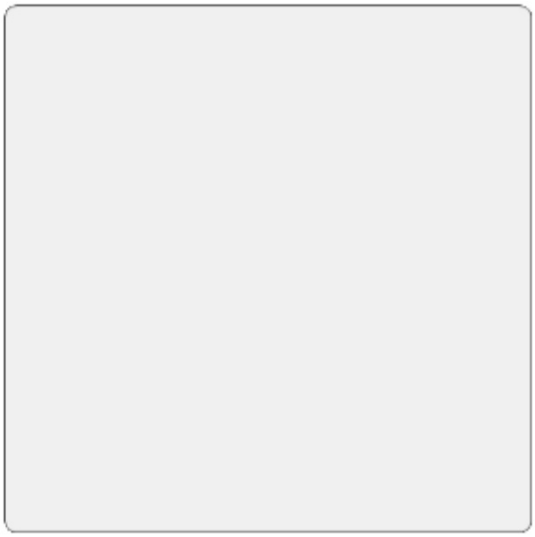
activity: coin flipping (for each separate trial...not 50-50...)

Conditions of a Binomial Experiment

A binomial experiment exists if and only if these conditions occur.

- Each trial has exactly two outcomes, or outcomes that can be reduced to two outcomes.
- There must be a fixed number of trials.
- The outcomes of each trial must be independent.

Experimental vs theoretical probability
How do you tell the difference?



Collect data
Flip coins x 50 and record heads vs tails

theoretical: 25 H 25 T
experimental:

8L 2D 7

Pascal's triangle

2 Eight out of every 10 persons who contract a certain viral infection can recover. If a group of 7 people become infected, what is the probability that exactly 3 people will recover from the infection?

3L 7D $(L+D)^7$

.8 .2

$$1(.8)^7 + 7(.8)^6(.2)^1 + 21(.8)^5(.2)^2 + 35(.8)^4(.2)^3 + 35(.8)^3(.2)^4$$

$$+ 21(.8)^2(.2)^5 + 7(.8)^1(.2)^6 + 1(.2)^7$$

$35(0.512)(0.0016) \approx 0.03$

3%

3 **LANDSCAPING** Refer to the application at the beginning of the lesson. What is the probability that 7 of the 10 trees planted will survive?

L 90% D 10% Plant 10

P_7 Live $(.9 + .1)^{10}$

$1(\ )\quad 10(\ )^{9}\quad 45(\ )^{8}\quad 120(.9)^{7}(.1)^{3}\ 210$

232 210 120 45 10 1

$0.057 \approx 5.7\%$

12. **Finance** A stock broker is researching 13 independent stocks. An investment in each will either make or lose money. The probability that each stock will make money is $\frac{5}{8}$. What is the probability that exactly 10 of the stocks will make money?

$\frac{5}{8}$ $\frac{3}{8}$

$\left(\frac{5}{8} + \frac{3}{8}\right)^{13}$

$1(\ )^{13} + 13(\ )^{12}(\ )^{1} + 78(\ )^{11}(\ )^{2} + 286(\ )^{10}(\ )^{3}$

10 make

$286\left(\frac{5}{8}\right)^{10}\left(\frac{3}{8}\right)^{3}$

$0.00909 \quad 0.05273$

$.137 \approx 14\%$

Jasmine Myers, a weather reporter for Channel 6, is forecasting a 30% chance of rain for today and the next four days. Find each probability.

8. *P*(not having rain on any day) 24%

9. *P*(having rain on exactly one day) 8%

10. *P*(having rain no more than three days) 99%

Rain 30%

Not rain 70%

$(.3 + .7)^4$

$1(\quad)^4 + 4(.3)^3(.7)^1 + 6(\quad)^2(\quad)^2 + 4(\quad)^1(\quad)^3 + 1(.7)^4$

$1 - (.3)^4$

0.0081

18%

24%

complement = 1-

p. 876

2 outcomes

ME

prob. known
+ constant

known no. of trials

13.6

13.410