Acc Pre-Calculus
Unit 8 Review - Probability

Name: Answer key

Combinations and Permutations

1. $_{12}P_4$ $\quad \frac{12!}{8!} = \boxed{11,880}$

2. $_8P_5$ $\quad \frac{8!}{3!} = \boxed{6720}$

3. $_{14}C_{11}$ $\quad \frac{14!}{3!\,11!} = \boxed{364}$

4. $\binom{n+4}{n+2}$ $\quad \frac{(n+4)!}{((n+4)-(n+2))!\,(n+2)!} = \frac{(n+4)(n+3)\cancel{(n+2)!}}{2!\,\cancel{(n+2)!}} = \boxed{\frac{n^2+7n+12}{2}}$

5. You are ordering a pizza. The three-topping pizza costs \$8. If there are 18 toppings to choose from, 4 different crusts, and 2 different sauces, how many different 3-topping pizzas can you order?

$_4C_1 \cdot {_2C_1} \cdot {_{18}C_3}$

$4 \cdot 2 \cdot 816 = \boxed{6528}$

6. A radio station is playing 10 different songs. If 2 of the songs are going to be played twice, and one of the songs is going to be played 4 times, how many ways can the station fill 15 song slots?

repetition $\frac{_{15}P_{15}}{2!\,2!\,4!} = \boxed{1,3621,608,000}$

*If we also need to decide 2 songs to repeat twice and 1 song to repeat 4 times: $_{10}C_2 \cdot {_8C_1}$ or $_{10}C_1 \cdot {_9C_2}$ $= 360$
The massive answer would be multiplied by 360. Crazy, no?!?

7. Triangles are often labeled by placing a different letter at each vertex. In how many different ways could a given scalene triangle be labeled using any of the 26 letters of the alphabet?

$_{26}P_3 = \boxed{15,600}$

8. You are picking a hand of 5 cards from a standard deck of playing cards. What is the probability that your hand has 2 10s and 3 Jacks?

2598960-5card hands

$_4C_2 \cdot {_4C_3}$

$6 \cdot 4$ $\quad \boxed{\frac{24}{2598960}}$

9. At South High School, 55 students entered an essay contest. From these students, 10 are selected as finalists. How many different ten-student rankings could be made from the 55 entrants?

$_{55}P_{10} = \boxed{1.061374991 \times 10^{17}}$

Binomial Distribution

1. Find P(5) if n = 12 and p = .40 (show setup) $\quad \binom{12}{5}(.40)^5(.60)^7 = \boxed{.227}$

2. Find P(X < 7) if n = 20 and p = .85 $\quad$ binomcdf(20, .85, 6) = $\boxed{.0000000459}$

3. Find P(X ≥ 9) if n = 25 and p = .35 $\quad$ 1 − binomcdf(25, .35, 8) = $\boxed{.5332}$

4. Find P(3 < X < 6) if n = 10 and p = .42 $\quad$ binomcdf(10, .42, 5) − binomcdf(10, .42, 3) = $\boxed{.4649}$

5. Find P(3 ≤ X ≤ 6) if n = 10 and p = .42 $\quad$ binomcdf(10, .42, 6) − binomcdf(10, .42, 2) = $\boxed{.7917}$

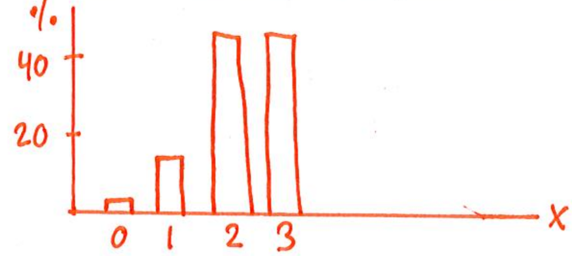
6. If a dark-haired mother and father have a particular combination of genes, each of their babies have a ¼ probability of having light hair.
    a. What is the probability of any one baby having dark hair? 3/4
    b. If they have 3 babies, calculate P(0), P(1), P(2), and P(3), the probabilities of having 0, 1, 2, and 3 dark-haired babies.
    c. Plot the graph of this probability distribution. Does this distribution have a special name?

b) $P(0) = \text{binompdf}(3, \frac{3}{4}, 0) = .0156$

$P(1) = .1406$

$P(2) = .4219$

$P(3) = .4219$



7. Statistics show that about 8% of all males are color-blind. Supposed 20 males are selected at random.
    a. Find the probability that 2 of the males are color-blind. binompdf(20, .08, 2) = .2711
    b. Find the probability that more than 5 of the males are color-blind. .0038
    c. Find the probability that less than 3 of the males are color-blind. .7879
    d. Find the probability that between 4 and 7 (inclusive) of the males are color-blind. .0706

8. Large tractor-trailer trucks usually have 18 tires. Suppose the probability that any one tire will blow out on a given cross-country trip is 0.03.
    a. Find the probability that none of the 18 tires blow out. P(0) = .5780
    b. Find the probability that 1 of the tires blows out. .3217
    c. Find that probability that more than 2 of the tires blow out. .0846
    d. If a trucker wants to have a 95% probability of making the trip without a blowout, what must be the reliability of each tire?

$P(0) = .95$

$P(0) = \binom{18}{0}(p)^0(1-p)^{18}$

$.95 = 1 \cdot 1 \cdot (1-p)^{18}$

$\sqrt[18]{.95} = 1-p$

$.99715 = 1-p$

$\boxed{p = .0028}$