Counting Methods and Probability HW **Name** Answers

Count the number of possibilities for each scenario below.

1. the winner and first, second, and third runners-up in a contest with 10 finalists

$_{10}P_4$ or $10 \cdot 9 \cdot 8 \cdot 7 = 5{,}040$ ways

2. selecting two of eight employees to attend a business seminar

$_8C_2 = 28$ ways

3. an arrangement of letters in the word *flummox*

2 m's → $\frac{_7P_7}{_2P_2}$ or 2 m's → $\frac{7!}{2!} = 2520$

4. placing an algebra book, a geometry book, a chemistry book, an English book, and a health book on a shelf in any order

if you don't care about order $_5C_5 = 1$ or if you care about order $_5P_5 = 120$ or $5!$

5. selecting 9 books to check out of the library from a reading list of twelve

$_{12}C_9 = 220$ ways

6. selecting and ranking your top 3 favorite subjects from the 6 you are currently taking

order matters → $_6P_3$ or $6 \cdot 5 \cdot 4 = 120$ ways

7. an arrangement of the word *poppy*

$\frac{_5P_5}{_3P_3}$ or $\frac{5!}{3!} = 20$ ways

9. Among the seven nominees for two vacancies on the city council are three men and four women. In how many ways may these vacancies be filled? 3 m 4 w

a) with any two of the nominees? $_7C_2 = 21$

b) with any two of the women? $_4C_2 = 6$

c) with one of the men and one of the women?

$_3C_1 \cdot {}_4C_1 = 12$

10. Stewy has 4 pairs of pants, 7 shirts, and 3 sweaters. In how many ways may she choose 2 of the pairs of pants, 3 of the shirts, and 1 of the sweaters to pack for a trip?

#10. $_4C_2 \cdot {}_7C_3 \cdot {}_3C_1 = 630$

11. A bag is filled with marbles: 6 blue, 3 orange, and 4 puce. A damsel selects one marble and then puts it back and selects another. Find the probability of each situation below:

6 b, 3 o, 4 p = 13 total

a) P(pick orange, then puce) $\frac{3}{13} \cdot \frac{4}{13} = \frac{12}{169}$

b) P(pick orange and puce in any order) $\frac{3}{13} \cdot \frac{4}{13} + \frac{4}{13} \cdot \frac{3}{13} = \frac{24}{169}$

c) P(pick two of the same color)

$\frac{6}{13} \cdot \frac{6}{13} + \frac{3}{13} \cdot \frac{3}{13} + \frac{4}{13} \cdot \frac{4}{13} = \frac{61}{169}$

bb or oo or pp

12. The situation is the same as in question #11 except now the damsel holds onto her first marble and then selects the second. Find the probability of each situation below:

a) P(pick orange, then puce) $\frac{3}{13} \cdot \frac{4}{12} = \frac{12}{156}$

b) P(pick orange and puce in any order) $\frac{3}{13} \cdot \frac{4}{12} + \frac{4}{13} \cdot \frac{3}{12} = \frac{24}{156}$

c) P(pick two of the same color)

$\frac{6}{13} \cdot \frac{5}{12} + \frac{3}{13} \cdot \frac{2}{12} + \frac{4}{13} \cdot \frac{3}{12} = \frac{48}{156}$

13. The probability that it will rain in the next three days is 40% or 0.4. Find the probability that it will not rain on any of the next three days.

or $\frac{27}{125}$

P(not rain) = .6 · .6 · .6 → .216 or 21.6%

14. a) $(2x+3)^5 = (2x)^5 + 5(2x)^4(3) + 10(2x)^3(3)^2 + 10(2x)^2(3)^3 + 5(2x)(3)^4 + 3^5$

$= 32x^5 + 240x^4 + 720x^3 + 1080x^2 + 810x + 243$

b) $(x^2 - 2y)^4 = (x^2)^4 + 4(x^2)^3(-2y) + 6(x^2)^2(-2y)^2 + 4(x^2)(-2y)^3 + (-2y)^4$

$= x^8 - 8x^6y + 24x^4y^2 - 32x^2y^3 + 16y^4$

c) 7th term of $(3x-5)^9$ $\quad {}_9C_6 (3x)^3(-5)^6 = 84 \cdot 27x^3 \cdot 15625 \rightarrow 35437500x^3$