Name: Key Date:

Algebra II Period:

Review 12.1 – 12.3

Complete the entire review on a separate sheet of paper.

Useful Formulas: $\frac{n!}{q_1!\cdot q_2!\cdot\ldots\cdot q_k!}$ $\frac{n!}{(n-r)!}$ $\frac{n!}{(n-r)!\,r!}$

1) Eight members of a school marching band are auditioning for 3 drum major positions. In how many ways can students be chosen to be drum majors?

$_8C_3 =$ 56 ways

2) Your school yearbook has an editor in chief and an assistant editor in chief. The staff of the yearbook has 15 students. In how many ways can a student be chosen for these 2 positions?

$_{15}P_2$ or $15\cdot 14 =$ 210 ways

3) A relay race has 4 runners who run different legs of the race. There are 16 students on your track team. In how many ways can your coach select students to compete in the race? Assume that the order in which the students run matters.

$_{16}P_4$ or $16\cdot 15\cdot 14\cdot 13 =$ 43680 ways

4) Your must take 6 elective classes to meet your graduation requirements for college. There are 12 classes you are interested in. In how many ways can you select your elective classes?

$_{12}C_6 =$ 924 ways

5) A basketball team has five starting players. There are 13 girls on the team. In how many ways can the coach select players to start the game? (Assume each player can play every position.)

$_{13}C_5 =$ 1287 ways

6) In a dog show there are 17 dogs. In how many different ways can the dogs win first, second, and third place?

$_{17}P_3 =$ 4080 ways

7) A committee of five people is to be chosen from a group of 20 people. If no person is assigned any specific role in the committee, how many different 5 people committees are possible?

$_{20}C_5 =$ 15,504 possible committees

8) A committee of five people is to be chosen from a group of 20 people. How many different ways can a chairperson, assistant chairperson, treasurer, community advisor, and record keeper be chosen?

$_{20}P_5 =$ 1,860,480 possible committees

9) An ice cream shop has a choice of 12 toppings. In how many ways can you have 5 different toppings on your ice cream?

$_{12}C_5 =$ 792 ways

10) An amusement park has 27 different rides. If you have enough time to go on 4 rides, how many different combinations of rides can you take?

$_{27}C_4 =$ 17,550 combinations

11) Nine people in our class want to be on a 5-person basketball team to represent the class. How many different teams can be chosen?

$_9C_5 =$ 126 teams

12) 75 people run the Basking Ridge 5k and medals are only awarded to the 1st, 2nd, 3rd, 4th, and 5th place positions. How many different ways can the runners be awarded?

$_{75}P_5 =$ 2,071,126,800 ways

13) A deli offers 5 different types of meat, 3 types of breads, 4 types of cheeses and 6 condiments. How many different types of sandwiches can be made of 1 meat, 1 bread, 1 cheese, and 1 condiment?

$5 \cdot 3 \cdot 4 \cdot 6 =$ 360 sandwiches

(5: # of meats; 3: # of breads; 4: # of cheeses; 6: # of condiments)

14) Police use photographs of various facial features to help eyewitnesses identify suspects. One basic identification kit contains 15 hairlines, 48 eyes and eyebrows, 24 noses, 34 mouths, and 28 chins and 28 cheeks. Find the total number of different faces.

$15 \cdot 48 \cdot 24 \cdot 34 \cdot 28 \cdot 28 =$ 460,615,680 faces

Determine how many different 5 digit postal zip codes are possible for the given configuration.

Problem	Digits are repeated	Digits are not repeated
15) Begins with a 4	$1 \cdot 10 \cdot 10 \cdot 10 \cdot 10$ = 10,000 zip codes (1: one choice (#4))	$1 \cdot 9 \cdot 8 \cdot 7 \cdot 6$ = 3024 zip codes
16) Begins with a 3 or a 1 = (# that begin w/ a 3) + (# that begin w/ 1)	$1 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 10{,}000$ + $1 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 10{,}000$ 20,000	$1 \cdot 9 \cdot 8 \cdot 7 \cdot 6 = 3024$ + $1 \cdot 9 \cdot 8 \cdot 7 \cdot 6 = 3024$ 6048
OR →	$2 \cdot 10 \cdot 10 \cdot 10 \cdot 10$ = 20,000	$2 \cdot 9 \cdot 8 \cdot 7 \cdot 6 =$ 6048

Choose the statement below that is true about the given quantities.

A. The number in column A is greater.
B. The number in column B is greater.
C. The two numbers are equal.
D. The relationship cannot be determined from the given information.

	Column A	Column B	(A,B,C, or D)
17)	${}_8P_4 = 1680$	${}_8P_2 = 56$	A
18)	6!	${}_6P_5$	C
19)	${}_{12}P_6$	${}_{12}C_6$	A

20) Find the number of distinguishable permutations of the letters in the word.

a. CALIFORNIA → 2 × A, 2 × I

$$\frac{10!}{2!\,2!} = \frac{10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot \cancel{4}^{2}\cdot 3\cdot \cancel{2}\cdot 1}{\cancel{2}\cdot\cancel{2}}$$

$= 907200$ permutations

b. CINCINNATTI → 2 × C, 3 × I, 2 × N, 2 × T

$$\frac{10!}{2!\,3!\,2!\,2!} = \frac{10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot \cancel{3!}}{2\cdot \cancel{3!}\cdot 2\cdot 2}$$

$$= \frac{10\cdot 9\cdot \cancel{8}\cdot 7\cdot 6\cdot 5\cdot 4}{\cancel{8}} = 75600$$

21) Write the first six rows of Pascal's Triangle.

```
                1                    ← row 0
              1   1
            1   2   1
          1   3   3   1
        1   4   6   4   1            ← row 4
      1   5  10  10   5   1          ← row 5
    1   6  15  20  15   6   1        ← row 6
```

Expand the binomial.

22) $(x-y)^5$ use row 5:

$$= 1(x)^5(-y)^0 + 5(x)^4(-y)^1 + 10(x)^3(-y)^2 + 10(x)^2(-y)^3 + 5(x)^1(-y)^4 + 1(x)^0(-y)^5$$

$$= x^5 - 5x^4y + 10x^3y^2 - 10x^2y^3 + 5xy^4 - y^5$$

$(a+b)^n$

1. Write the row # of Pascal's △ that corresponds to "n"
2. Write (a) (b) next to each entry
3. Write the exponents. Start at "n" for (a) and "0" for (b) → they will always add to "n"
4. Simplify

23) $(3x-2)^4$

$= 1(3x)^4(-2)^0 + 4(3x)^3(-2)^1 + 6(3x)^2(-2)^2 + 4(3x)^1(-2)^3 + 1(3x)^0(-2)^4$

$= 3^4x^4 + 4\cdot3^3\cdot(-2)x^3 + 6\cdot3^2\cdot4x^2 + 4\cdot3\cdot(-8)\cdot x + 16$

$= 81x^4 - 216x^3 + 216x^2 - 96x + 16$

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1

$(x+3)^4 = 1(x^4)(3)^0 + 4x^3(3)^1 + 6x^2(3)^2 + 4x^1(3)^3 + 1x^0(3)^4$

1,4,6,4,1

$x^4 + 12x^3 + 54x^2 + 108x + 64$

A jar contains 5 red marbles, 3 green marbles, 2 yellow marbles, and 1 blue marble. Find the probability of randomly drawing the given types of marbles

11 total

24) a yellow marble $\frac{2}{11} \approx .1818 = 18.18\%$

25) a red marble $\frac{5}{11} \approx .4545 = 45.45\%$

26) a blue or green marble $\frac{4}{11} \approx .3636 = 36.36\%$

27) Thirty five students are in an Algebra 2 class that took a test. There were 9 A's, 18 B's, and 8 C's. What is the probability that a randomly chosen student did not receive a C?

$\frac{\text{Not C's}}{\text{total}} \Rightarrow \frac{27}{35} \approx .7714 = 77.14\%$

Extra Practice (optional)

For the given configurations, determine how many different computer passwords are possible if (a) repetition is allowed and (b) if repetition is not allowed.

1. 2 letters followed by 4 digits

a. $26 \cdot 26 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 6{,}760{,}000$

b. $26 \cdot 25 \cdot 10 \cdot 9 \cdot 8 \cdot 7 = 3{,}276{,}000$

2. 3 odd digits followed by 2 vowels(no y)

a. $5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 = 3125$

b. $5 \cdot 4 \cdot 3 \cdot 5 \cdot 4 = 1200$

Find the number of distinguishable permutations of the letters in the following words.

* *

****

3. MATH

$\frac{4!}{0!} = 24$

4. PERMUTATION

$\frac{11!}{2!} = 19958400$

5. MISSISSIPPI

$\frac{11!}{4!\,4!\,2!} = 34,650$

6. You are choosing curtains, paint, and carpet for your room. You have 12 choices of curtains, 8 choices of paint, and 20 choices of carpeting. How many different ways can you choose curtains, paint, and carpeting for your room?

$12_{C} \cdot 8_{C} \cdot 20_{P} = 1920$

7. A baseball coach is determining a batting order for the nine players on the field. If the pitcher does not bat in one of the first four spots, how many different batting orders can the coach make?

${}_8P_4$ No pitcher ${}_5P_5$ 1st 4 Last 5 pitcher is back

${}_8P_4 \cdot {}_5P_5$

$1680 \cdot 120 = 201,600$

8. Next year you are taking math, English, history, TV, chemistry, physics, gym, and a study hall. Each class is offered during each of the eight periods in the day. In how many different orders can you schedule your classes?

8 classes ${}_8P_8 = 40,320$

9. A pizza shop offers twelve different toppings. How many different pizzas can you order with no more than three toppings?

${}_{12}C_3 + {}_{12}C_2 + {}_{12}C_1 + {}_{12}C_0 = 299$

${}_{12}C_3$ ↑ #w/3 ; ${}_{12}C_2$ ↑ #w/2 ; ${}_{12}C_1$ ↑ #w/1 ; ${}_{12}C_0$ ↑ #w/0

10. A basketball team has five starting players with individual positions. There are 13 girls on the team. In how many ways can the coach select the players for each individual position?

${}_{12}P_5 = 95,040$

Find the number of 5-card hands that contain the specified cards.

11. 5 black cards

${}_{26}C_5$

65,780

12. only face cards

${}_{12}C_5$

792

13. 3 hearts and 2 diamonds

${}_{13}C_5 \cdot {}_{13}C_2$

$1287 \cdot 78$

100,386

Expand the binomial using Pascal's Triangle.

$a=x \quad b=2$

$a=x \quad b=-3$

14. $(x+2)^5$

$1a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + 1b^5$

$1(x)^5 + 5(x)^4(2) + 10(x)^3(2)^2 + 10(x)^2(2)^3 + 5(x)(2)^4 + 1(2)^5$

$x^5 + 5(x^4)(2) + 10(x^3)(4) + 10(x^2)(8) + 5(x)(16) + 1(32)$

$x^5 + 10x^4 + 40x^3 + 80x^2 + 80x + 32$

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1

15. $(x-3)^4$

$1a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + 1b^4$

$1(x)^4 + 4(x)^3(-3) + 6(x)^2(-3)^2 + 4(x)(-3)^3 + 1(-3)^4$

$1(x^4) + 4(x^3)(-3) + 6(x^2)(9) + 4(x)(-27) + 1(81)$

$x^4 - 12x^3 + 54x^2 - 108x + 81$

**For extra 12.3 Practice, refer to the book. You should know how to do the majority of the problems in that section.