

Math 30-2

Counting Methods

Name:

Mathematics 30–2 Formula Sheet

Relations and Functions

Graphing Calculator Window Format

$$x: [x_{\min}, x_{\max}, x_{\text{scl}}]$$

$$y: [y_{\min}, y_{\max}, y_{\text{scl}}]$$

Exponents and Logarithms

$$y = a^x \leftrightarrow x = \log_a y$$

$$\log_b c = \frac{\log_a c}{\log_a b}$$

Laws of Logarithms

$$\log_a (M \cdot N) = \log_a M + \log_a N$$

$$\log_a \left(\frac{M}{N} \right) = \log_a M - \log_a N$$

$$\log_a (M^n) = n \log_a M$$

Exponential functions

$$y = a \cdot b^x$$

Sinusoidal functions

$$y = a \cdot \sin(bx + c) + d$$

$$\text{Period} = \frac{2\pi}{b}$$

Quadratic equations

$$\text{For } ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Probability

$$n! = n(n-1)(n-2)\dots 3 \cdot 2 \cdot 1, \\ \text{where } n \in N \text{ and } 0! = 1$$

$${}_nP_r = \frac{n!}{(n-r)!}$$

$${}_nC_r = \frac{n!}{(n-r)!r!}$$

$${}_nC_r = \binom{n}{r}$$

$$P(A \cup B) = P(A) + P(B)$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A \cap B) = P(A) \cdot P(B)$$

$$P(A \cap B) = P(A) \cdot P(B | A)$$

Logical Reasoning

A' Complement

$\emptyset$ Empty set

$\cap$ Intersection

$\subset$ Subset

$\cup$ Union

Mathematics 30-2 Chapter 2: Counting Methods Unit Exam**Multiple Choice**

*Identify the choice that best completes the statement or answers the question.
(1 mark each)*

- _____ 1. The lunch special at a sandwich bar offers you a choice of 6 sandwiches, 4 salads, 6 drinks, and 3 desserts. How many different meals are possible if you choose one item from each category?
- A. 432** B. $576(n+2)!$ C. 646 D. 720
- _____ 2. The simplification of _____ without factorial notation is:
- A.** $(n+4)(n+3)$ C. $(n+2)(n+3)$
B. $\frac{(n+4)(n+3)}{(n+4)(n+3)}$ D. $\frac{(n+2)(n+3)}{(n+2)(n+3)}$
- _____ 3. Suppose a word is any string of letters. How many three-letter words can you make from the letters in REGINA if you do not repeat any letters in the word?
- A. 20 B. 16 C. 216 **D. 120**
- _____ 4. How many different arrangements can be made using all the letters in CANADA?
- A. 120** B. 180 C. 360 D. 720
- _____ 5. How many different arrangements can be made using all the letters in CALGARY, if the first letter must be G?
- A. 120 **B. 360** C. 480 D. 720
- _____ 6. Evaluate 6C_2
- A. 15** B. 18 C. 30 D. 36

_____ 7. Evaluate.

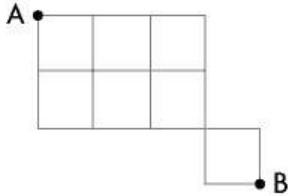
$$\binom{4}{1}$$

- A. 0 **B. 4** C. 16 D. 24

_____ 8. Which of the following is equivalent to ${}_{18}C_{15}$?

- A. $\frac{18!}{3!}$ B. $\frac{18!}{3 \cdot 15!}$ **C. $\frac{18!}{3! \cdot 15!}$** D. $\frac{18!}{15!}$

_____ 9. How many different routes are there from A to B, if you only travel south or east?



- A. 10 **B. 20** C. 40 D. 8

_____ 10. How many ways can 8 friends stand in a row for a photograph if Molly, Krysta, and Simone always stand together?

- A. 1440 B. 2160 **C. 4320** D. 5040

_____ 11. A student council consists of 5 girls and 3 boys. How many committees of 4 can be formed if there must be one boy?

A. ${}^3P_1 \cdot {}^5P_3$

B. ${}^3C_1 \cdot {}^5C_3$

C. ${}^3C_3 \cdot {}^5C_1$

D. ${}^3C_1 \cdot {}^5C_3 \cdot 4!$

- _____ 12. A fun fair requires 4 employees to work at the snack bar. There are 13 people available. How many ways can a group of 4 be chosen?
- A. 1000 **B. 715** C. 635 D. 808

Numeric Response

Clearly indicate your answer in the response grid provided. (1 mark each)

13. A student is classifying the following contexts that require the use of either permutations or combinations.

Context A: Opening a 4-digit bike lock

Context B: Choosing 6 players for a dodgeball team

Context C: Selecting a new phone number

Context D: Picking a new 5-digit P.I.N. number

0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

For each context, use a 1 to indicate if it should be solved using a **permutation** and use a 2 to indicate if it should be solved using a **combination**.

Context A would be solved using a **permutation**_____

Context B would be solved using a ____ **combination** _____

Context C would be solved using a ____ **permutation** _____

Context D would be solved using a ____ **permutation** _____

14. The “Pita Patrol” offers these choices for each sandwich:

- white or whole wheat pitas
- 3 types of cheese
- 5 types of filling
- 12 different toppings
- 4 types of sauce

How many different pitas can be made with 1 cheese, 1 filling, 1 topping, and 1 sauce?

$$2 \times 3 \times 5 \times 12 \times 4 = 1440$$

15. Solve for n , where $n \in \mathbb{I}$.

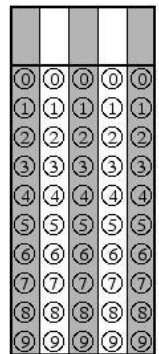
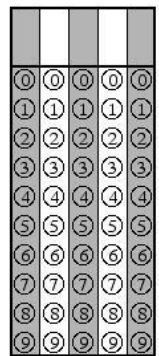
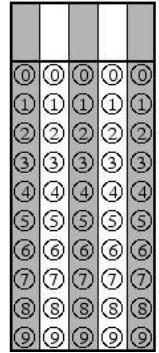
$$\frac{n!}{2(n-2)!} = 45$$

$$n = 10, n = -9$$

16. Solve for

$$n \cdot {}_nP_2 = 12$$

$$n = 2.6759$$



17. Mo has 8 new songs on his mp3 player. How many different 5-song playlists can be created from his new songs, if no songs are repeated?

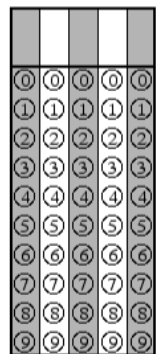
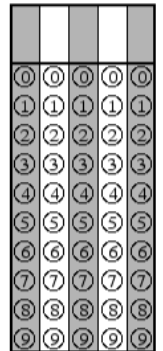
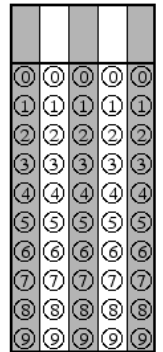
6720

18. There are nine different marbles in a bag. Suppose you reach in and draw one at a time, and do this three times. How many ways can you draw the three marbles if you do not replace the marble each time?

504

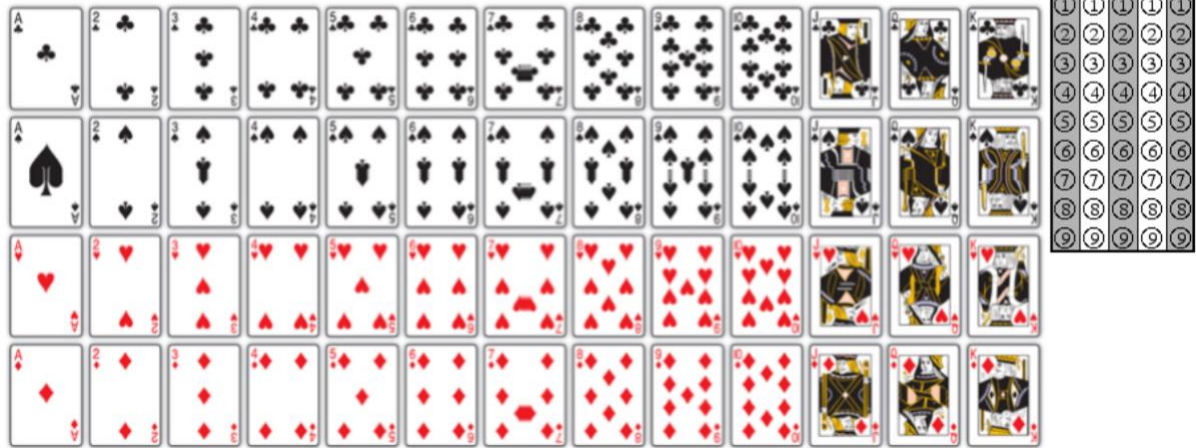
19. The numbers 10 to 18 are written on identical slips of paper and put in a hat. How many ways can 7 numbers be drawn at the same time?

36



20.

A standard deck of cards contains 52 cards as shown..



There are four suits, two red and two black, with 13 cards in each suit.

Euchre is played with a deck of 24 cards that is similar to a standard deck of 52 playing cards, but with only the ace, 9, 10, jack, queen, and king for all four suits.

How many different five-card hands are there with at least four red cards?

480

