

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

$$n! = n(n-1)(n-2)\dots 3 \cdot 2 \cdot 1,$$

where $n \in N$ 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 C. 646 D. 720
- _____ 2. The simplification of $\frac{(n+2)!}{(n+4)!}$ without factorial notation is:
- A. $(n+4)(n+3)$ C. $(n+2)(n+3)$
B. $\frac{1}{(n+4)(n+3)}$ D. $\frac{1}{(n+2)(n+3)}$
- _____ 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.

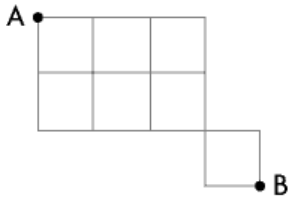
$$\binom{4}{1}$$

- 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 you 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 _____

Context B would be solved using a _____

Context C would be solved using a _____

Context D would be solved using a _____

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?

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

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

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

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

16. Solve for n .

$${}_nP_2 = 12$$

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

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?

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

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?

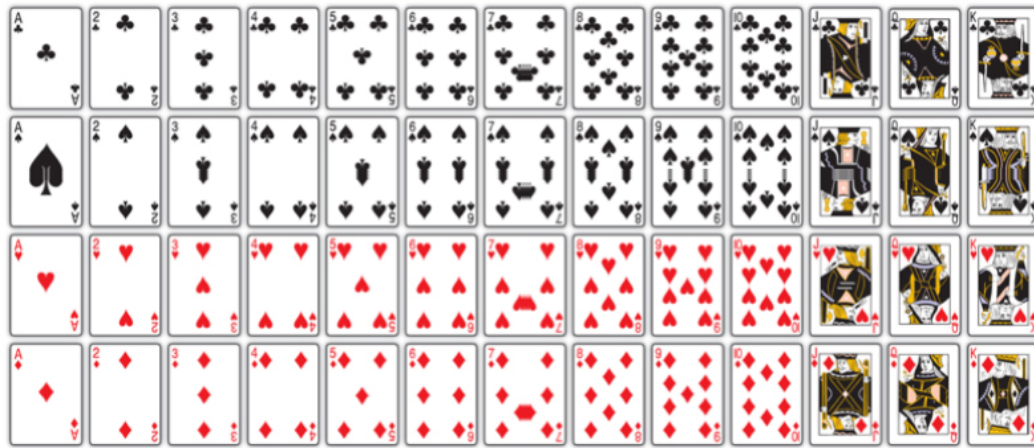
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

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?

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

20.

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



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

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?