

1. In a given semester, a small college offers 3 different Mathematics courses, 5 different Science courses, and 4 different History courses. If a student must take one of each, how many different ways can this be done?
 - A. 12
 - B. 16
 - C. 60
 - D. 120
2. Evaluate $14P_2$
 - A. 7
 - B. 182
 - C. 91
 - D. 43,589,145,600
3. Evaluate $8C_4$
 - A. 8
 - B. 1680
 - C. 336
 - D. none of these
4. The library is to be given 5 books as a gift. The books will be selected from a list of 21 titles. If each book selected must have a different title, how many possible selections are there?
 - A. 20,349
 - B. $4.257578514 \times 10^{17}$
 - C. $5.109094217 \times 10^{19}$
 - D. 2,441,880
5. Of the 2,598,960 different five-card poker hands possible from a deck of 52 playing cards, how many would contain all black cards?
 - A. 32,890 hands
 - B. 263,120 hands
 - C. 131,560 hands
 - D. 65,780 hands

6. The table shows the distribution of family size in a certain U.S. city:

Family Size	Probability
2	0.432
3	0.223
4	0.199
5	0.090
6	0.036
7	0.020

- (a) Does the table represent a probability distribution?
- (b) A family is selected at random from the city. Find the probability that the size of the family is between 2 and 5 inclusive.
- A. 0.522
 - B. 0.944
 - C. 0.422
 - D. 0.854
- (c) What is the expected value of the family size?
7. A student takes a 5 question multiple choice quiz with 4 choices for each question. If the student guesses at random on each question, what is the probability that the student gets
- (a) exactly 3 questions correct?
- A. 0.022
 - B. 0.066
 - C. 0.088
 - D. 0.176
- (b) gets no questions correctly?

8. In a certain college, 33% of the physics majors belong to ethnic minorities. 10 students are selected at random from the physics majors.
 1. Is this a binomial experiment?
 2. Find the probability that **exactly** 3 of them belong to an ethnic minority?
 3. Find the probability that **at most** 7 of them belong to an ethnic minority?
 4. Find the probability that **at least** 6 of them belong to an ethnic minority?
 5. Find the probability that **more than** 2 of them belong to an ethnic minority?
 6. Find the probability that **less** 5 of them belong to an ethnic minority?
 7. How many adult physics majors do you **expect** to belong to an ethnic minority?
9. Let $U = \{1, 2, 4, 5, a, b, c, d, e\}$. Find the complement of the set $Q = \{2, 4, b, d\}$.
 - A. $\{1, 3, 5, a, c, e\}$
 - B. $\{1, 5, a, c, e\}$
 - C. $\{1, 5, a, e\}$
 - D. $\{1, 2, 4, 5, a, b, c, d, e\}$
10. Let $U = \{q, r, s, t, u, v, w, x, y, z\}$
 $A = \{q, s, u, w, y\}$
 $B = \{q, s, y, z\}$
 $C = \{v, w, x, y, z\}$
 List the elements in the set $A \cup B$
 - A. $\{q, s, u, w, y, z\}$
 - B. $\{q, s, y\}$
 - C. $\{q, s, t, u, v, w, x, y, z\}$
 - D. $\{s, u, w\}$

11. Using the same sets as above, list the elements in the set $(A \cup B)^c \cap C^c$

- A. $\{v, w, x, y\}$
- B. $\{q, r, s, t, u, z\}$
- C. $\{c\}$
- D. $\{q, r, s, t, u\}$
- E. $\{r, t\}$

12. List the elements in the set $\{x \mid x \text{ is a whole number between 1 and 5}\}$

- A. $\{1, 2, 3, 4, 5\}$
- B. $\{2, 3, 4\}$
- C. $\{2, 3, 4, 5\}$
- D. $\{1, 2, 3, 4\}$

13. Complete the blank with either $\in$, $\notin$ or $\subseteq$, $\not\subseteq$ to make the statement true.

(a)

$$8 \text{ _____ } \{5, 6, 7, 8, 9\}$$

(b)

$$10 \text{ _____ } \{5, 6, 7, 8, 9\}$$

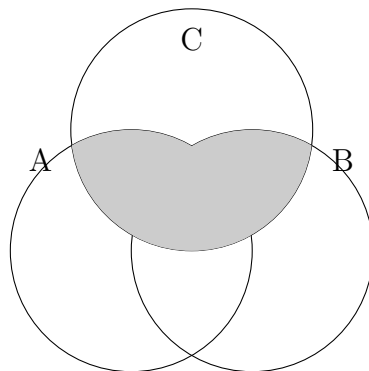
(c)

$$\{4, 5, 8\} \text{ _____ } \{5, 6, 7, 8, 9\}$$

(d)

$$\{5, 8\} \text{ _____ } \{5, 6, 7, 8, 9\}$$

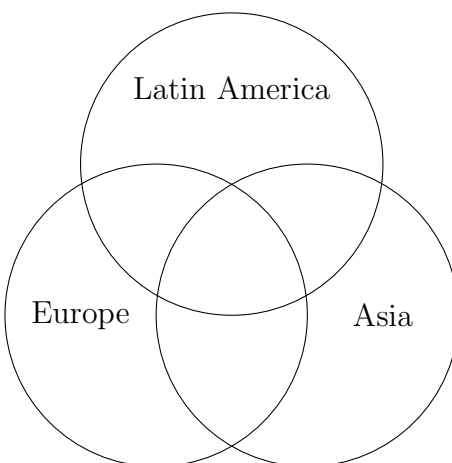
14. The shaded region in the Venn diagram represents which of the following?



- A. $(A \cup B) \cap C$
- B. $A \cap B \cap C$
- C. $(A \cap B) - C$
- D. $(A \cap C) \cup (B - C)$

15. How many rows must be in the truth table for a statement with 4 variables?
16. In a survey of 280 people, a travel company asked people about places they plan to visit in the next 5 years. The results were as follows:
- 48 plan to visit Europe
 - 58 plan to visit Latin America
 - 34 plan to visit Asia
 - 14 plan to visit Europe and Latin America
 - 12 plan to visit Latin America and Asia
 - 11 plan to visit Europe and Asia
 - 4 plan to visit all three

How many people plan to visit exactly two of these places?



17. Let A and B be finite sets. Determine whether the following statement is true or false. Here $n(A)$ means cardinality.

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

- A. True
 - B. False
18. Use De Morgan's laws to write a statement that is equivalent to: "It is not true that Napoleon Bonaparte was a rock star or a nurse."
- A. Napoleon Bonaparte was neither a rock star or a nurse.
 - B. Napoleon Bonaparte was not a rock star or was not a nurse.
 - C. It is not true that Napoleon Bonaparte was not a rock star or not a nurse.
 - D. Napoleon Bonaparte was either a rock star or a nurse.

19. Write the negation of the statement: "Some reptiles are snakes."
- Not all reptiles are snakes.
 - No reptiles are snakes.
 - All snakes are reptiles.
 - All reptiles are snakes.
20. Write the negation of the statement: "Some flowers are not roses."
- All flowers are not roses.
 - All flowers are roses.
 - No roses are flowers.
 - Some flowers are roses.
21. Determine whether the statement is true or false:
"9 + 2 = 19 and Canada is in North America"
- True
 - False
22. Construct a truth table for the statement: $\sim p \vee \sim q$

p	q	$\sim p$	$\sim p \vee \sim q$
T	T		
T	F		
F	T		
F	F		

Given an example of an equivalent statement to $\sim p \vee \sim q$.

23. Construct a truth table for the statement: $\sim (p \wedge q) \wedge \sim p$

p	q	$p \wedge q$	$\sim (p \wedge q)$	$\sim (p \wedge q) \wedge \sim p$
T	T			
T	F			
F	T			
F	F			

24. Construct a truth table for the statement: $((\sim p \wedge q) \wedge (r \vee \sim q))$. Identify any tautologies or contradictions in the table.

p	q	r	$\sim p \wedge q$	$r \vee \sim q$	$((\sim p \wedge q) \wedge (r \vee \sim q))$
T	T	T			
T	T	F			
T	F	T			
T	F	F			
F	T	T			
F	T	F			
F	F	T			
F	F	F			