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Problem 1

Let
U = Universal Set= { All college students }
M = { All male students }
S = { All students who smoke }
F = { All Freshmen }

Give a description of "all students who are female or who are not freshmen" in terms of a set

- A. $M \cap S$
- B. $\overline{M} \cup \overline{F}$
- C. $F \cup S \cup M$
- D. $M \cup S$

Correct Answers:
- B

+6pc-1pc
Problem 2

Let $S = \{a, b, c\}$, $T = \{a, c, d, e\}$

Determine $S \cup T$

- A. $\{a, b, c, d, e\}$
- B. $\{a, c\}$
- C. $\{\}$
- D. $\{a, a, b, c, c, d, e\}$
- E. $\{b, e\}$

Solution:

Solution:

$S = \{a, b, c\}$
$T = \{a, c, d, e\}$

$S \cup T$, or S "union" T, is defined as the set of elements that are contained in either S or T.
In this case, the answer is
$\{a, b, c, d, e\}$
Remember that even if an element is in both sets, it is only counted once.

Correct Answers:

- A

+6pc-1pc
Problem 3

Let $A = \{1, 2, 3\}$, $B = \{4, 5, 6\}$

Determine $A \cap B$

- A. $\{1, 2, 3, 4, 5, 6\}$
- B. $\{3, 4\}$
- C. $\{1, 2, 3\}$
- D. $\{\}$
- E. $\{4, 5, 6\}$

Solution:

Solution:

$A = \{1, 2, 3\}$
$B = \{4, 5, 6\}$

$A \cap B$, or A "intersect" B, is defined as the set of elements that are contained in both A and B.
In this case, the answer is
$\{\}$

Correct Answers:
- D

+6pc-1pc
Problem 4

Identify the correct property for the following expression.

$(A \cap B) \cap C = A \cap (B \cap C)$

- A. Commutativity
- B. De Morgan's Law
- C. Associativity
- D. Distributivity

Solution:

Solution:

$(A \cap B) \cap C = A \cap (B \cap C)$

Rearranging parentheses is possible due to the law of **Associativity** .

Correct Answers:

- C

+6pc-1pc
Problem 5

Let $A = \{0, 4, 8, 10, 11\}$, $B = \{0, 9, 10, 11\}$.
Find the following sets in list form. Separate elements with commas. If there are no elements in the set, enter "NONE".

a) $A \cap B =$ _____

b) $A \cup B =$ _____
Correct Answers:

- $\{0, 10, 11\}$
- $\{0, 4, 8, 9, 10, 11\}$

+6pc-1pc
Problem 6

Let $A = \{1, 4, 5, 6, 7\}$, $B = \{1, 2, 6, 7\}$, $C = \{0, 1, 2, 3, 5, 8\}$.
List the elements of the following sets. If there is more than one element write them separated by commas.

$A \cap B = \{$ _____ $\}$

$A \cup B = \{$ _____ $\}$

$(B \cup C) \cap A = \{$ _____ $\}$

$B \cup (C \cap A) = \{$ _____ $\}$

Correct Answers:

- $1, 6, 7$
- $1, 2, 4, 5, 6, 7$
- $1, 5, 6, 7$
- $1, 2, 5, 6, 7$

+6pc-1pc

Problem 7

$A = \{1, 3, 5\}, B = \{2, 3\}$

Check ALL elements of the following sets:
(a) $A \cap B$

- A. 3
- B. 4
- C. 1
- D. 5
- E. 2

(b) $A \cup B$

- A. 4
- B. 3
- C. 2
- D. 1
- E. 5

(c) $A \setminus B$

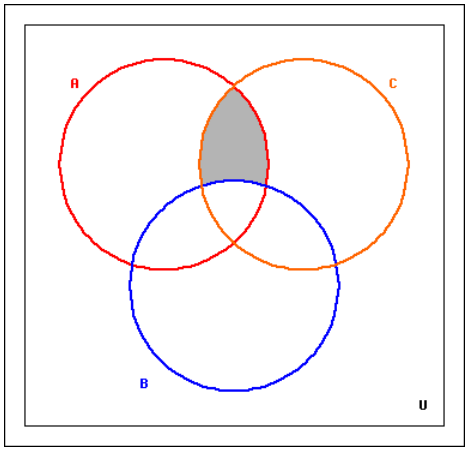
- A. 2
- B. 3
- C. 5
- D. 4
- E. 1

Correct Answers:

- A
- BCDE
- CE

+6pc-1pc

Problem 8



Which expression corresponds to the shaded region?

- A. $\overline{\overline{A} \cup C \cup B}$
- B. $\overline{A \cup B \cup C}$
- C. $\overline{\overline{A} \cup \overline{C}} \cap \overline{B}$
- D. $B \cap C \cap \overline{A}$

Correct Answers:

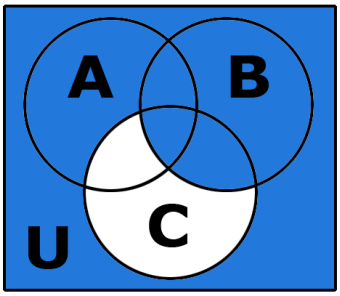
- C

+6pc-1pc

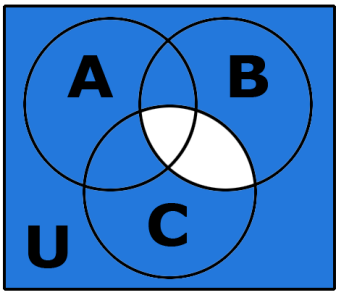
Problem 9

Which of the following Venn diagrams corresponds to $B \cup C^c$?

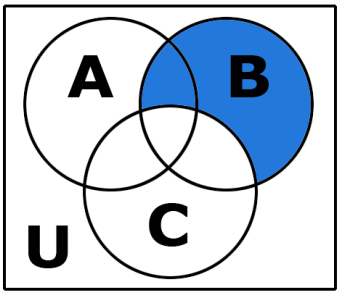
- A.



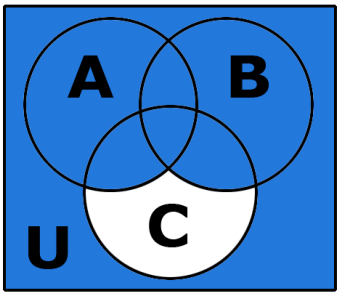
- B.



- C.



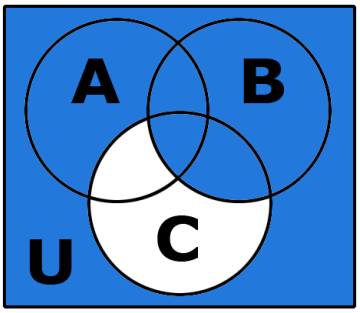
- D.



Solution:

Solution:

The Venn diagram for $B \cup C^c$ is



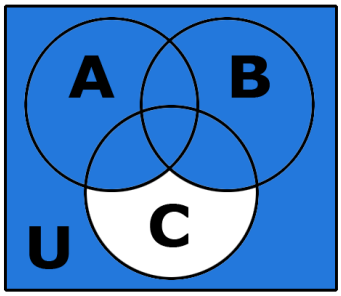
Correct Answers:

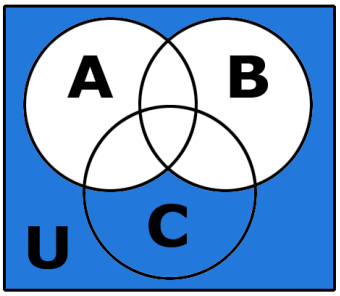
- A

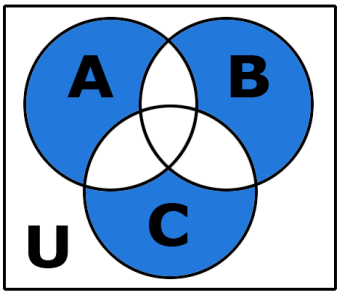
+6pc-1pc

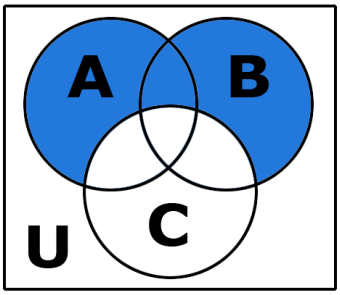
Problem 10

Which of the following Venn diagrams corresponds to $A \cup B \cup C^c$?

- A. 

- B. 

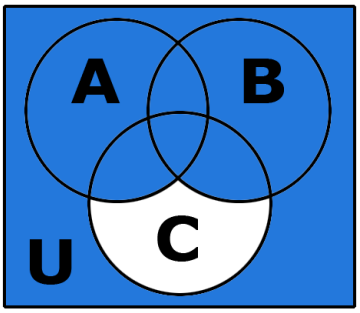
- C. 

- D. 

Solution:

Solution:

The Venn diagram for $A \cup B \cup C^c$ is

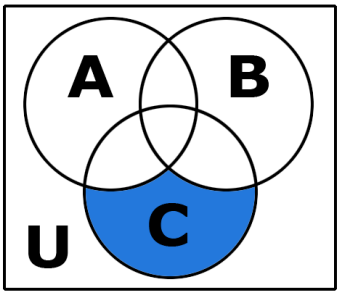


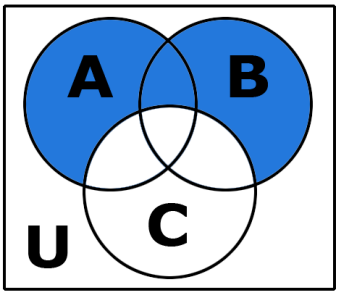
Correct Answers:

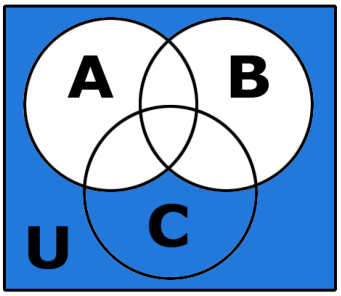
- A

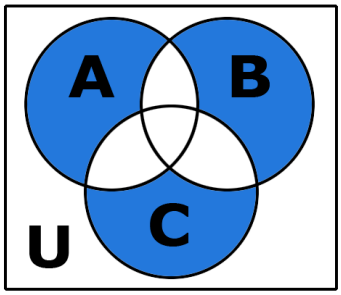
+6pc-1pc
Problem 11

Which of the following Venn diagrams corresponds to $A^c \cap B^c$?

- A.


- B.


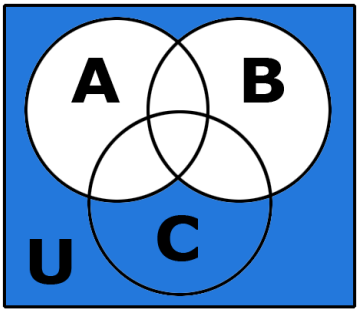
- C.


- D. 

Solution:

Solution:

The Venn diagram for $A^c \cap B^c$ is

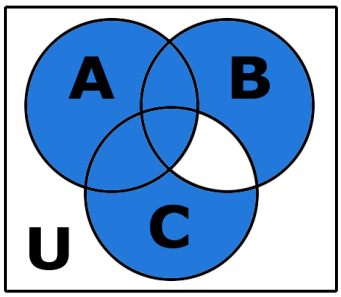


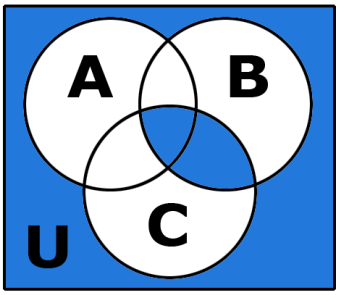
Correct Answers:

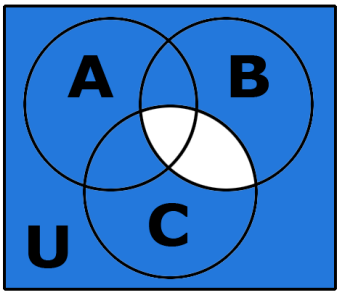
- C

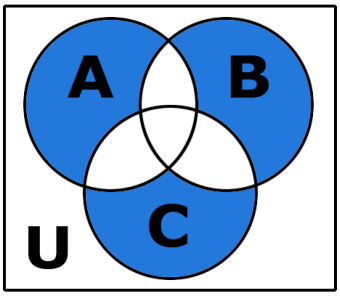
+6pc-1pc
Problem 12

Which of the following Venn diagrams corresponds to $U - (B \cap C)$?

- A. 

- B. 

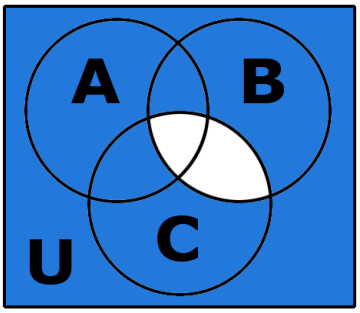
- C. 

- D. 

Solution:

Solution:

The Venn diagram for $U - (B \cap C)$ is



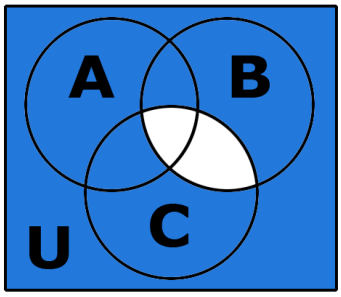
Correct Answers:

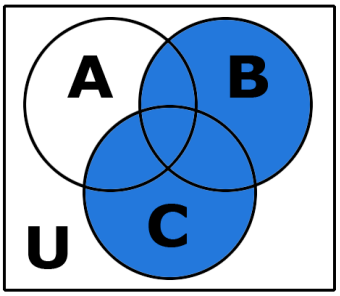
- C

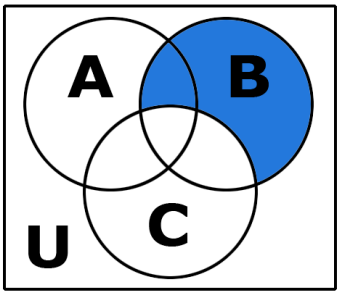
+6pc-1pc

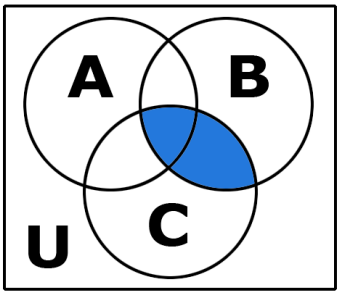
Problem 13

Which of the following Venn diagrams corresponds to $B \cup C$?

- A. 

- B. 

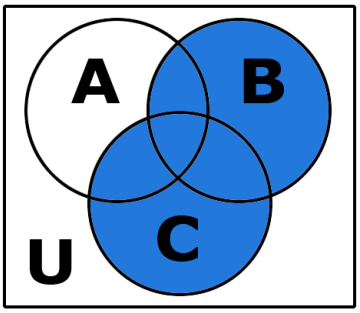
- C. 

- D. 

Solution:

Solution:

The Venn diagram for $B \cup C$ is

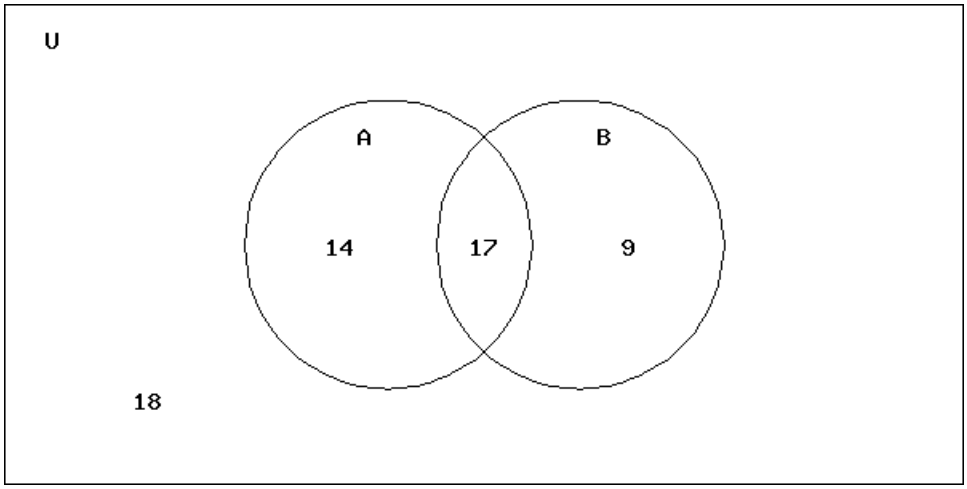


Correct Answers:

- B

+6pc-1pc
Problem 14

The number of elements in each region are shown in the Venn diagram below. Find $n(A \cap B)$.



$n(A \cap B) =$ _____
Correct Answers:

- 17

+6pc-1pc
Problem 15

Suppose the set $A = U$.

How many elements are in A^c? _____
Solution:

Solution:

A^c is defined as the set of elements that are not in A. This set must be restricted by the elements avaiable to the "universe," U. An easy way to think of the complement is to think of the difference between the universe and the set, or $U - A$.

Since $A = U$, $A - U$ yields the empty set, $\{\}$, which contains zero elements.

Correct Answers:

- 0

+6pc-1pc

Problem 16

A certain discrete mathematics class consists of 34 students. Of these, 15 plan to major in mathematics and 18 plan to major in computer science. Five students are not planning to major in either subject. How many students are planning to major in both subjects? (Be prepared to explain your reasoning with some sort of diagram.)
Number of students majoring in both = ____

Solution:

SOLUTION

There are $34 - 5$ students majoring in either math only, CS only, or both math and CS. Since there are 15 math majors and 18 CS majors, and since $15 + 18$ is 4 more than $34 - 5$, there must be 4 majoring in both.

Correct Answers:

- 4

+6pc-1pc

Problem 17

Determine the size of the sample space that corresponds to the experiment of tossing a coin the following number of times:

(a) 3 times

Answer: ____

(b) 7 times

Answer: ____

(c) n times

Answer: ____

Correct Answers:

- 8
- 128
- 2^n

+6pc-1pc

Problem 18

The players on a soccer team wear shirts, with each player having one of the numbers 1, 2, ..., 11 on their backs. The set A contains players with even numbers on their shirts. The set B comprises players wearing an odd number less than 7. The set C contains the defenders, which are those wearing numbers less than 6. Select the correct set that corresponds to each of the following.

Part a)

$(A^c \cup B^c) \cap C^c$

- A. $\{6, 7, 8, 9, 10, 11\}$
- B. $\{5, 7, 9, 11\}$
- C. $\{6, 7, 8, 9, 11\}$
- D. $\{1, 3, 5\}$
- E. $\{1, 2, 3, 4, 5\}$

Part b)

$(A \cap B) \cup (A \cap C)$

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

Solution:

We have $A = \{2, 4, 6, 8, 10\}$, $B = \{1, 3, 5\}$, and $C = \{1, 2, 3, 4, 5\}$.

Part a:

$(A^c \cup B^c) \cap C^c = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\} \cap \{6, 7, 8, 9, 10, 11\}$
$= \{6, 7, 8, 9, 10, 11\}$

Part b:

$(A \cap B) \cup (A \cap C) = \emptyset \cup \{2, 4\}$
$= \{2, 4\}$

Correct Answers:

- A
- A

+6pc-1pc
Problem 19

A bag contains only red marbles and blue marbles.

There are 6 marbles in the bag.

The bag contains twice as many blue marbles as red marbles.

Nadia takes one marble from the bag without looking.

The probability that the marble is blue is __.
Solution:

Solution

Since there are twice as many blue marbles as red marbles, the probability that the probability that Nadia picked a blue marble is $\frac{2}{3}$.

IN THIS PROBLEM ON THE NEAP EXAM YOU WERE EXPECTED TO SHOW YOUR WORK. SOMETHING SIMILAR TO THE SOLUTION ABOVE WOULD BE APPROPRIATE.

Notice that you did not even need the information that there were 6 marbles in the bag.

Correct Answers:

- 0.666667

+6pc-1pc
Problem 20

One die is rolled. List the outcomes comprising the following events: (make sure you use the correct notation with the set braces , put comma between the outcomes and do not put space between them)

(a) event the die comes up even
answer: _____

(b) event the die comes up odd
answer: _____

(c) event the die comes up 4 or more
answer: _____

Correct Answers:

- 2,4,6
- 1,3,5
- 4,5,6

+6pc-1pc
Problem 21

One die is rolled. Let

A = event the die comes up even
B = event the die comes up odd
C = event the die comes up 4 or more
D = event the die comes up at most 2
E = event the die comes up 3

give your answer as "yes" or "no" (without the quotation)

(a) Are events C and D mutually exclusive?
answer: _____

(b) Are events A and D mutually exclusive?
answer: _____

(c) Are events C and E mutually exclusive?
answer: _____

(d) Are events C, D and E mutually exclusive?
answer: _____

(e) Are events A and C mutually exclusive?
answer: _____

Correct Answers:

- yes
- no
- yes
- yes
- no

+6pc-1pc

Problem 22

Determine the size of the sample space that corresponds to the experiment of tossing a coin the following number of times:

(a) 3 times

answer: ____

(b) 4 times

answer: ____

(c) n times

answer: ____
Correct Answers:

- 8
- 16
- 2^n

+6pc-1pc
Problem 23

An experiment consists of choosing a subset from a fixed number of objects where the arrangement/order of the chosen objects is not important. Determine the size of the sample space when you choose the following:

(a) 4 objects from 9

Answer : ____

(b) 6 objects from 29

Answer : ____

(c) 7 objects from 12

Answer : ____
Correct Answers:

- 126
- 475020
- 792

+6pc-1pc
Problem 24

In an experiment, a ball is drawn from an urn containing 9 orange balls and 14 green balls. If the ball is orange, three coins are tossed. Otherwise two coins are tossed.

How many elements of the sample space will have a orange ball? _____

How many elements of the sample space are there altogether? _____

Solution: There are 9 orange balls, so we have 9 ways to pick that color ball. Then, having picked that ball, we flip 3 coins; each of those may land heads or tails, so there are two outcomes per flip, or 2^3 total outcomes. Then, by the basic principle of counting, the total number of outcomes in this event is $9 \cdot 2^3 = 72$ outcomes.

Reasoning as before, there are 72 events associated with drawing a orange ball first, and $14 \cdot 2^2 = 56$ events associated with drawing a green ball. Thus there are $72 + 56 = 128$ total elements in the sample space.

Correct Answers:

- $9 \cdot 2^3$
- $14 \cdot 2^2 + 9 \cdot 2^3$