SET THEORY

A SET

A.1 LISTING THE ELEMENTS

MCQ 1: List the elements of the set A, which includes all objects shown in this figure:

Choose one answer:

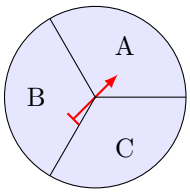
- ☐ $A =$ die, coin, duck
- ☐ $A = \{\text{duck, coin}\}$
- ☐ $A = \{\text{die, duck, coin}\}$

MCQ 2: List the elements of the set A, which includes all objects in this figure:

Choose one answer:

- ☐ $A =$ apple, cherry, lemon, orange
- ☐ $A = \{\text{apple, cherry}\}$
- ☐ $A = \{\text{apple, cherry, lemon, orange}\}$
- ☐ $A = \{\text{apple, cherry, lemon, orange, apple}\}$

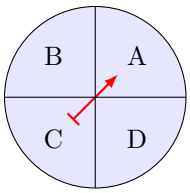
MCQ 3: List the elements of the set A, which includes all possible results the spinner can land on:



Choose one answer:

- ☐ $A = \{A, B, C\}$
- ☐ $A = \{A, B\}$
- ☐ $A = \{A, C\}$

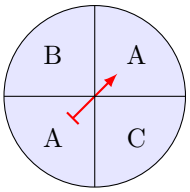
MCQ 4: List the elements of the set A, which includes all possible results the spinner can land on:



Choose two correct answers:

- ☐ $A = \{A, B, C, D\}$
- ☐ $A = \{A, B, C\}$
- ☐ $A = \{A, B\}$
- ☐ $A = \{D, B, C, A\}$

MCQ 5: List the elements of the set A, which includes all possible results the spinner can land on:



Choose one answer:

- ☐ $A = \{A, B, A, C\}$
- ☐ $A = \{A, B\}$
- ☐ $A = \{A, C\}$
- ☐ $A = \{A, B, C\}$

MCQ 6: Let A be the set of all possible combinations of two children in a family, where B means boy and G means girl (e.g., BG is a boy then a girl). List the elements of A.

Choose one answer:

- ☐ $A = \{BB, BG, GB, GG\}$
- ☐ $A = \{BB, GG\}$
- ☐ $A = \{B, G\}$

A.2 LISTING THE ELEMENTS IN ARITHMETIC

MCQ 7: What is the set A of all factors of 6?

Choose one answer:

- ☐ $A = \{1, 2, 3, 6\}$
- ☐ $A = \{0, 6, 12, 18, 24, \ldots\}$
- ☐ $A = \{0, 6, 12, 18, 24\}$
- ☐ $A = \{2, 3\}$

MCQ 8: What is the set A of all prime numbers between 1 and 10?

Choose one answer:

- ☐ $A = \{1, 2, 3, 5, 7\}$
- ☐ $A = \{2, 4, 6, 8, 10\}$
- ☐ $A = \{3, 5, 7, 9\}$
- ☐ $A = \{2, 3, 5, 7\}$

MCQ 9: What is the set A of all factors of 8?

Choose one answer:

- ☐ $A = \{1, 2, 4, 8\}$
- ☐ $A = \{0, 8, 16, 24, 32, \ldots\}$
- ☐ $A = \{2, 4, 6\}$

☐ $A = \{1, 3, 5, 7\}$

MCQ 10: What is the set A of all prime numbers between 10 and 20?

Choose one answer:

☐ $A = \{11, 13, 15, 17\}$

☐ $A = \{10, 12, 14, 16, 18\}$

☐ $A = \{13, 15, 17, 19\}$

☐ $A = \{11, 13, 17, 19\}$

A.3 CHECKING MEMBERSHIP

Ex 11: 2 ☐ $\in$ ☐ $\notin$ $\{1, 2, 3, 4, 5, 6\}$

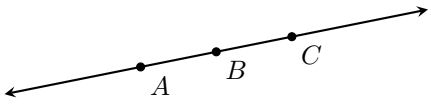
Ex 12: 7 ☐ $\in$ ☐ $\notin$ $\{1, 2, 3, 4, 5, 6\}$

Ex 13: d ☐ $\in$ ☐ $\notin$ $\{a, b, c, d\}$

Ex 14: z ☐ $\in$ ☐ $\notin$ $\{a, b, c, d\}$

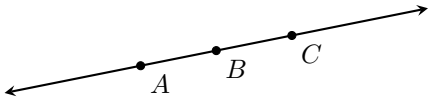
A.4 CHECKING MEMBERSHIP IN GEOMETRY

Ex 15:



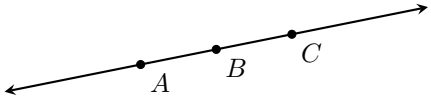
C ☐ $\in$ ☐ $\notin$ $\overleftrightarrow{AB}$

Ex 16:



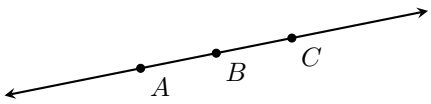
C ☐ $\in$ ☐ $\notin$ $\overline{BA}$

Ex 17:



B ☐ $\in$ ☐ $\notin$ $\overline{AC}$

Ex 18:



A ☐ $\in$ ☐ $\notin$ $\overleftrightarrow{BC}$

A.5 CHECKING SET EQUALITY

MCQ 19: Is this statement true or false?
$\{a, b, c\} = \{b, a, c\}$

Choose one answer:

☐ True

☐ False

MCQ 20: Is this statement true or false?
$\{a, b, c, d\} = \{a, b, c, d, e\}$

Choose one answer:

☐ True

☐ False

MCQ 21: Is this statement true or false?
$\{1, 2, 3\} = \{2, 1, 3\}$

Choose one answer:

☐ True

☐ False

MCQ 22: Is this statement true or false?
$\{1, 2, 3, 4\} = \{1, 2, 3, 4, 5\}$

Choose one answer:

☐ True

☐ False

B ORDERED PAIR

B.1 COMPARING PAIRS AND SETS

MCQ 23: A teacher picks one student to present on Monday and another for Tuesday from Louis and Hugo. The pair $(Louis, Hugo)$ means Louis presents on Monday and Hugo on Tuesday. Is this the same as $(Hugo, Louis)$?

Choose one answer:

☐ True

☐ False

MCQ 24: A teacher selects Louis and Hugo for a presentation. The set $\{Louis, Hugo\}$ shows both are chosen. Does $\{Louis, Hugo\}$ equal $\{Hugo, Louis\}$?

Choose one answer:

☐ True

☐ False

MCQ 25: A club picks two helpers, Zoe and Eli, for an event. The set $\{Zoe, Eli\}$ shows both are chosen. Does $\{Zoe, Eli\}$ equal $\{Eli, Zoe\}$?

Choose one answer:

☐ True

☐ False

MCQ 26: A coach assigns two players, Mia and Sam, to shoot baskets: one goes first, the other second. The pair (Mia, Sam) means Mia shoots first and Sam second. Is this the same as (Sam, Mia)?

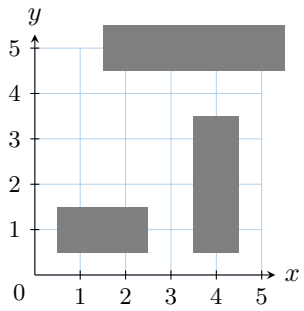
Choose one answer:

☐ True

☐ False

B.2 TARGETING SHIPS WITH COORDINATES

MCQ 27: In Battleship, players guess ship locations on a 5x5 grid using coordinates (x, y). Player 1 guesses $(2, 3)$. Check this grid:

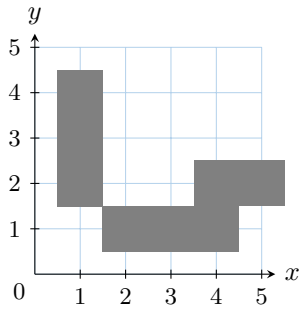


Does Player 2 say:

☐ Hit

☐ Miss

MCQ 28: In Battleship, players guess ship locations on a 5x5 grid using coordinates (x, y). Player 1 guesses $(4, 2)$. Check this grid:

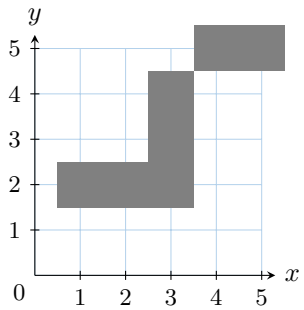


Does Player 2 say:

☐ Hit

☐ Miss

MCQ 29: In Battleship, players guess ship locations on a 5x5 grid using coordinates (x, y). Player 1 guesses $(3, 4)$. Check this grid:

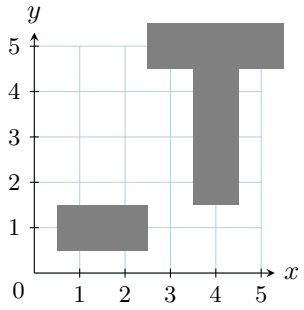


Does Player 2 say:

☐ Hit

☐ Miss

MCQ 30: In Battleship, players guess ship locations on a 5x5 grid using coordinates (x, y). Player 1 guesses $(2, 2)$. Check this grid:



Does Player 2 say:

☐ Hit

☐ Miss

C SUBSETS

C.1 CHECKING SUBSETS

MCQ 31: Given $A = \{1, 3, 5\}$ and $B = \{1, 2, 3, 4, 5\}$, is $A \subseteq B$?

☐ Yes

☐ No

MCQ 32: Given $A = \{4, 9\}$ and $B = \{1, 2, 3, 4, 5, 6, 7\}$, is $A \subseteq B$?

☐ Yes

☐ No

MCQ 33: Given $A = \{7, 8\}$ and $B = \{6, 7, 8, 9, 10\}$, is $A \subseteq B$?

☐ Yes

☐ No

MCQ 34: Given $A = \{2, 7, 10\}$ and $B = \{1, 2, 3, 4, 5, 6\}$, is $A \subseteq B$?

☐ Yes

☐ No

D INTERSECTION AND UNION

D.1 FINDING THE INTERSECTION/UNION

Ex 35:

$\{1, 2, 3\} \cap \{2, 3, 4\} =$

☐ $\{1, 2, 3, 4\}$
☐ $\{2, 3\}$
☐ $\{2\}$
☐ $\{1, 2, 3\}$

Ex 36:

$$\{1,2\} \cup \{2,3,4\} = \begin{array}{l} \square\ \{2,3,4\} \\ \square\ \{1,2,3,4\} \\ \square\ \{1,4\} \\ \square\ \{1,2\} \end{array}$$

Ex 37:

$$\{5,6,7\} \cap \{6,8,9\} = \begin{array}{l} \square\ \{5,6,7,8,9\} \\ \square\ \{5,6\} \\ \square\ \{7,8\} \\ \square\ \{6\} \end{array}$$

Ex 38:

$$\{a,b\} \cup \{b,c,d\} = \begin{array}{l} \square\ \{a,b\} \\ \square\ \{b,c\} \\ \square\ \{a,c,d\} \\ \square\ \{a,b,d\} \end{array}$$

Ex 39:

$$\{1,2,3\} \cap \{4,5,6\} = \begin{array}{l} \square\ \{1,2,3,4,5,6\} \\ \square\ \{\} \\ \square\ \{3,4\} \\ \square\ \{1,4\} \end{array}$$

Ex 40:

$$\{3,4,5\} \cap \{5,4,3\} = \begin{array}{l} \square\ \{3,4,5,6,7\} \\ \square\ \{5\} \\ \square\ \{4,5\} \\ \square\ \{3,4,5\} \end{array}$$

Ex 41:

$$\{5,6,7\} \cup \{\} = \begin{array}{l} \square\ \{5,6,7,\{\}\} \\ \square\ \{\} \\ \square\ \{5,7\} \\ \square\ \{5,6\} \end{array}$$

Ex 42:

$$\{a,b,c\} \cap \{\} = \begin{array}{l} \square\ \{a\} \\ \square\ \{b,c\} \\ \square\ \{a,c\} \\ \square\ \{\} \end{array}$$

E CARDINALITY

E.1 COUNTING

Ex 43: $n(\{1,2,3\}) =$ ☐

Ex 44: $n(\{a,b,c,d,e\}) =$ ☐

Ex 45: $n(\{\text{apple, cherry, lemon, orange}\}) =$ ☐

Ex 46: Let $A = \{\text{die, duck, coin}\}$. Find the number of elements in A.

$n(A) =$ ☐

Ex 47: Let $A = \{1,2,3,4,5\}$. Find the number of elements in A.

$n(A) =$ ☐

E.2 COUNTING WAYS

Ex 48: Three friends race in a sprint. How many different podiums are possible?

☐ podiums

Ex 49: You pick 2 flavors from 3 ice cream options (chocolate, vanilla, and strawberry). Order doesn't matter. How many different ice creams can you make?

☐ ice creams

Ex 50: Three students line up for a photo. How many different orders are possible?

☐ orders

Ex 51: You choose 2 toppings from 3 pizza options (pepperoni, cheese, olives). Order doesn't matter. How many different pizzas can you make?

☐ pizzas

F COMPLEMENT

F.1 FINDING THE COMPLEMENT

MCQ 52: You are given the universe $U = \{1,2,3,4,5,6\}$ and the set $A = \{1,3,5\}$. What is the complement A'?

Choose one answer:

- ☐ $A' = \{2,4,6\}$
- ☐ $A' = \{1,2,4,6\}$
- ☐ $A' = \{1,2,3,4,5,6\}$
- ☐ $A' = \{3,5\}$

MCQ 53: You are given the universe $U = \{a,b,c,d,e,f\}$ and the set $B = \{a,c,e\}$. What is the complement B'?.

Choose one answer:

- ☐ $B' = \{a,b,d,f\}$
- ☐ $B' = \{a,b,c,d,e,f\}$
- ☐ $B' = \{c,e\}$
- ☐ $B' = \{b,d,f\}$

MCQ 54: You are given the universe $U = \{1,2,3,4,5,6,7,8\}$ and the set $C = \{2,4,6,8\}$. What is the complement C'?. Find the complement of C.

Choose one answer:

- ☐ $C' = \{1,2,3,5,7\}$

☐ $C' = \{1, 3, 5, 7\}$

☐ $C' = \{2, 4, 6, 8\}$

☐ $C' = \{1, 2, 3, 4, 5, 6, 7, 8\}$

MCQ 55: The universe $U = \{BB, BG, GB, GG\}$ lists all two-child family combinations (B = boy, G = girl; e.g., BG = boy then girl). The set $A = \{BB\}$ includes only families with two boys. What is A'?

Choose one answer:

☐ $A' = \{BG, GB, GG\}$

☐ $A' = \{BB, BG\}$

☐ $A' = \{BG, GB\}$

☐ $A' = \{BB, GG\}$

MCQ 56: The universe $U = \{BB, BG, GB, GG\}$ lists all two-child family combinations (B = boy, G = girl; e.g., BG = boy then girl). The set $A = \{BG, GB\}$ includes families with one boy and one girl. What is A'?

Choose one answer:

☐ $A' = \{BG, GB, GG\}$

☐ $A' = \{BB, BG\}$

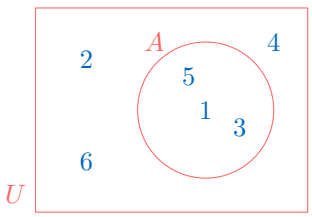
☐ $A' = \{BG, GB\}$

☐ $A' = \{BB, GG\}$

G VENN DIAGRAMS

G.1 IDENTIFYING ELEMENTS USING VENN DIAGRAMS

MCQ 57: For this Venn diagram:



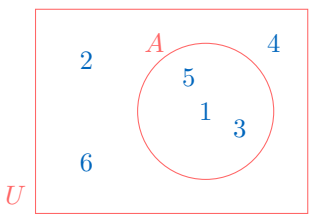
Find A.

☐ $A = \{2, 4, 6\}$

☐ $A = \{1, 3, 5\}$

☐ $A = \{1, 2, 3, 4, 5, 6\}$

MCQ 58: For this Venn diagram:



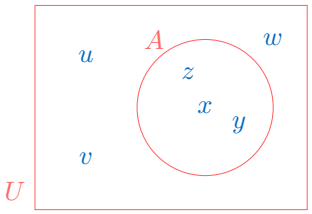
Find A'.

☐ $A' = \{2, 4, 6\}$

☐ $A' = \{1, 3, 5\}$

☐ $A' = \{2, 4, 6\}$

MCQ 59: For this Venn diagram:



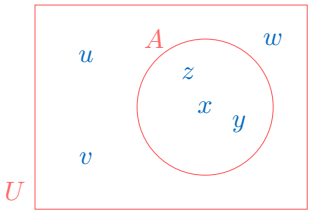
Find A'.

☐ $A' = \{u, v, w\}$

☐ $A' = \{x, y, z\}$

☐ $A' = \{u, v, w, x, y, z\}$

MCQ 60: For this Venn diagram:



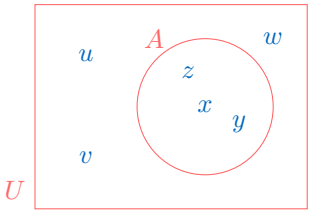
Find the universe U.

☐ $U = \{u, v, w\}$

☐ $U = \{x, y, z\}$

☐ $U = \{u, v, w, x, y, z\}$

MCQ 61: For this Venn diagram:



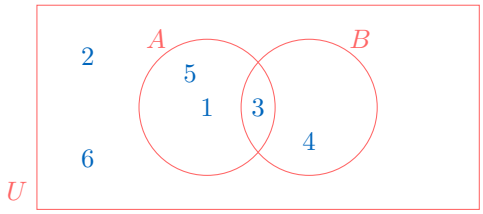
Find A.

☐ $A = \{u, v, w\}$

☐ $A = \{x, y, z\}$

☐ $A = \{u, v, w, x, y, z\}$

MCQ 62: For this Venn diagram:



Find B.

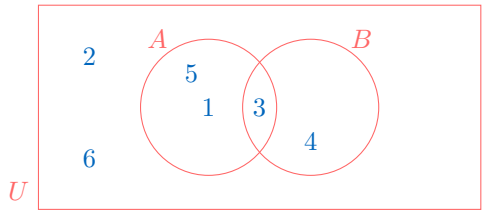
☐ $B = \{4\}$

☐ $B = \{4, 3\}$

☐ $B = \{1, 3, 4, 5\}$

☐ $B = \{2, 6\}$

MCQ 63: For this Venn diagram:



Find B'.

☐ $B' = \{4\}$

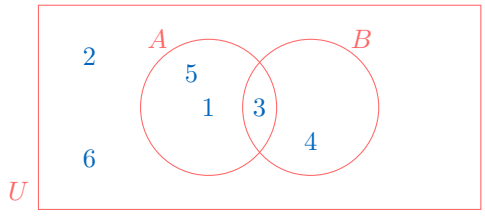
☐ $B' = \{4, 3\}$

☐ $B' = \{1, 2, 5, 6\}$

☐ $B' = \{2, 6\}$

G.2 IDENTIFYING ELEMENTS USING VENN DIAGRAMS

MCQ 64: For this Venn diagram:



Find $A \cup B$.

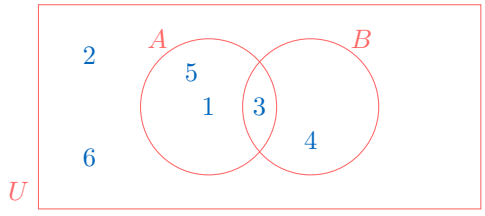
☐ $A \cup B = \{1, 3, 4, 5\}$

☐ $A \cup B = \{1, 2, 3, 4, 5, 6\}$

☐ $A \cup B = \{2, 4, 6\}$

☐ $A \cup B = \{1, 3, 4\}$

MCQ 65: For this Venn diagram:



Find $A \cap B$.

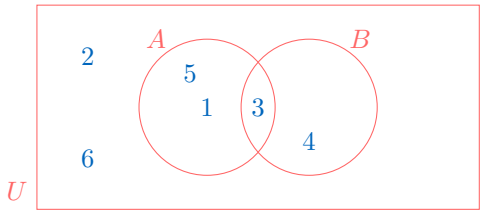
☐ $A \cap B = \{1, 3, 5\}$

☐ $A \cap B = \{3\}$

☐ $A \cap B = \{3, 4\}$

☐ $A \cap B = \{2, 6\}$

MCQ 66: For this Venn diagram:



Find $A' \cap B$.

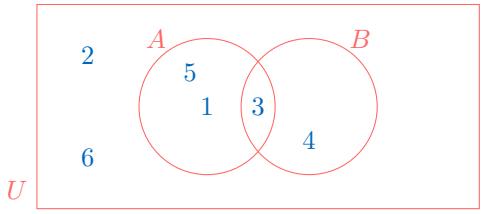
☐ $A' \cap B = \{2, 6\}$

☐ $A' \cap B = \{4\}$

☐ $A' \cap B = \{4, 3\}$

☐ $A' \cap B = \{1, 3, 4, 5\}$

MCQ 67: For this Venn diagram:



Find $A \cup B'$.

☐ $A \cup B' = \{1, 2, 5, 6\}$

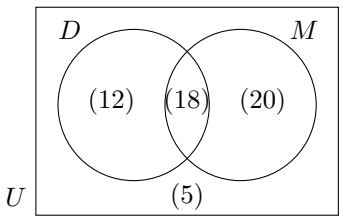
☐ $A \cup B' = \{2, 4, 6\}$

☐ $A \cup B' = \{1, 2, 3, 5, 6\}$

☐ $A \cup B' = \{1, 3, 4, 5\}$

G.3 SOLVING WORD PROBLEMS WITH VENN DIAGRAMS

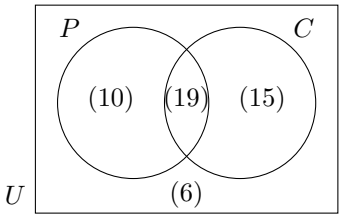
Ex 68: The Venn diagram shows the number of students in a school who participate in the drama club (D) and the music club (M).



How many students:

- are in the school? ☐ students
- participate in the music club? ☐ students
- participate in both clubs? ☐ students
- do not participate in either club? ☐ students
- participate in at least one club? ☐ students

Ex 69: The Venn diagram shows the number of participants in a community center attending painting (P) and cooking (C) classes.



How many participants:

- attend the community center? ☐ participants
- attend cooking classes? ☐ participants
- attend both classes? ☐ participants
- attend neither class? ☐ participants
- attend at least one class? ☐ participants

Ex 70: In a class of 40 students, 22 like mathematics (M), 18 like physics (P), and 10 like both. How many students:

- like at least one subject?
- like mathematics but not physics?
- like exactly one subject?
- like neither subject?

Ex 71: In a group of 40 employees, 25 work in sales (S), 20 in marketing (M), and 12 in both. How many employees:

- work in at least one department?
- work in sales but not marketing?
- work in exactly one department?
- work in neither department?