

Set Match Lab

Compare sets, test subsets, and build power sets.

HIGH SCHOOL • MA.912.LT.5.1

MA.912.LT.5.1 "Given two sets, determine whether the two sets are equivalent and whether one set is a subset of another. Given one set, determine its power set."

NAME _____

DATE _____

THE BIG IDEA

Two sets are equivalent when they have the same number of elements, even if the elements are different. X is a subset of Y when every element of X is also in Y . For a set with n elements, its power set contains 2^n subsets, including the empty set and the set itself.

WORKED EXAMPLE

Let $A = \{11, 12\}$ and $B = \{12, 11\}$. Determine whether A and B are equivalent, whether $A \subseteq B$, and find $P(A)$.

1. A and B have the same elements, so they are equivalent.
2. Every element of A is in B , so $A \subseteq B$.
3. List the empty set, each one-element subset, and the full set.

Answer: A and B are equivalent. $A \subseteq B$. $P(A) = \{\emptyset, \{11\}, \{12\}, \{11, 12\}\}$.

PRACTICE 6 problems

- 1** Let $A = \{1, 4, 7\}$ and $B = \{7, 1, 4\}$. Are A and B equivalent? Is $A \subseteq B$?

ANSWER _____

- 2** Let $C = \{2, 5\}$ and $D = \{2, 5, 8\}$. Are C and D equivalent? Is $C \subseteq D$?

ANSWER _____

- 3** Let $E = \{3, 6, 9\}$ and $F = \{0, 3, 6\}$. Are E and F equivalent? Is $E \subseteq F$?

ANSWER _____

- 4** Let $G = \{a, b, c, d\}$ and $H = \{b, c\}$. Are G and H equivalent? Is $H \subseteq G$?

ANSWER _____

- 5** Let $R = \{10, 14\}$. Write $P(R)$.

ANSWER _____

- 6** Let $Q = \{x, y, z\}$. Write $P(Q)$.

ANSWER _____

APPLY IT Show your work

1

At a school concert, the volunteer list for the sound crew is $S = \{\text{Jada, Luis, Mei, Omar}\}$. The list of volunteers trained to run the mixing board is $T = \{\text{Mei, Omar}\}$. Are S and T equivalent? Is T a subset of S ?

WORK SPACE

ANSWER _____

2

For a game-design club project, a student can pick any combination of three optional features: soundtrack (S), leaderboard (L), and tutorial (T). Let $F = \{S, L, T\}$. Write $P(F)$.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Let $A = \{1, 2, 3, 4\}$ and $B = \{2, 4\}$. Are $P(B)$ and $P(A)$ equivalent? Is $P(B) \subseteq P(A)$? Explain your reasoning.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Let $A = \{1, 4, 7\}$ and $B = \{7, 1, 4\}$. Are A and B equivalent? Is $A \subseteq B$?	Equivalent: yes. $A \subseteq B$: yes.
2	Let $C = \{2, 5\}$ and $D = \{2, 5, 8\}$. Are C and D equivalent? Is $C \subseteq D$?	Equivalent: no. $C \subseteq D$: yes.
3	Let $E = \{3, 6, 9\}$ and $F = \{0, 3, 6\}$. Are E and F equivalent? Is $E \subseteq F$?	Equivalent: yes. $E \subseteq F$: no.
4	Let $G = \{a, b, c, d\}$ and $H = \{b, c\}$. Are G and H equivalent? Is $H \subseteq G$?	Equivalent: no. $H \subseteq G$: yes.
5	Let $R = \{10, 14\}$. Write $P(R)$.	$P(R) = \{\emptyset, \{10\}, \{14\}, \{10, 14\}\}$.
6	Let $Q = \{x, y, z\}$. Write $P(Q)$.	$P(Q) = \{\emptyset, \{x\}, \{y\}, \{z\}, \{x, y\}, \{x, z\}, \{y, z\}, \{x, y, z\}\}$.

PART 2 • APPLY IT

- S and T are not equivalent. $T \subseteq S$.** T has fewer elements than S, so the sets are not equivalent. Both members of T are also in S, so T is a subset of S.
- $P(F) = \{\emptyset, \{S\}, \{L\}, \{T\}, \{S, L\}, \{S, T\}, \{L, T\}, \{S, L, T\}\}$.** List the empty choice, each single feature, each pair of features, and all three features.

CHALLENGE

$P(B)$ and $P(A)$ are not equivalent. $P(B) \subseteq P(A)$ because every subset of B is also a subset of A. $P(B)$ has 4 subsets, while $P(A)$ has 16 subsets.

Accept subsets and power-set elements in any order. Accept $\{\}$ as another notation for the empty set, and accept c when students use it to mean subset.