LESSON MAKER PRO

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 ⊆ 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 ⊆ B.
3. List the empty set, each one-element subset, and the full set.

Answer: A and B are equivalent. A ⊆ B. P(A) = {∅, {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 ⊆ B?

ANSWER _____

2 Let C = {2, 5} and D = {2, 5, 8}. Are C and D equivalent? Is C ⊆ D?

ANSWER _____

3 Let E = {3, 6, 9} and F = {0, 3, 6}. Are E and F equivalent? Is E ⊆ F?

ANSWER _____

4 Let G = {a, b, c, d} and H = {b, c}. Are G and H equivalent? Is H ⊆ 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 = {Jada, Luis, Mei, Omar}. The list of volunteers trained to run the mixing board is T = {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

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

WORK SPACE AND ANSWER

ANSWER KEY # Set Match Lab

PART 1 · PRACTICE

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

PART 2 · APPLY IT

1. **S and T are not equivalent. T ⊆ 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.
2. **P(F) = {∅, {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) ⊆ 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 ⊂ when students use it to mean subset.