

Worksheet: Basics of Sets

This worksheet will help you understand the basic concepts of set theory, such as notation, elements of sets, subsets, cardinality and power sets.

Model answers to
this sheet



Basics of Sets
study guide



- Write the following sets using the proper mathematical symbols and syntax.
 - The set A consisting of the elements *iron, shield, hammer, green, bow, spider*.
 - The set B consisting of the prime numbers less than 30 (see Factsheet: [Prime Numbers Under 1000](#))
 - The set C consisting of all positive, even, whole numbers.
 - The set D consisting of all whole numbers greater than or equal to -2 and strictly less than 5.

- The study guide: [Different Kinds of Numbers](#) introduced the following sets of numbers:

\mathbb{N} is the set of **natural** or **counting numbers** $\{1, 2, 3, \dots\}$

\mathbb{Z} is the set of **integers** or **whole numbers** $\{\dots, -2, -1, 0, 1, 2, \dots\}$

\mathbb{Q} is the set of **rational numbers** $\{a/b : a, b \in \mathbb{Z}, b \neq 0\}$

- Which of these sets is the number 2 an element of? Now write your answers using the proper mathematical notation and syntax. Now repeat this for the numbers:

i) -8

ii) $\frac{2}{3}$

iii) 0

iv) π

b) Which of the following sets are subsets of \mathbb{N} , \mathbb{Z} or \mathbb{Q} ? Write your answers in a proper mathematical way, explaining your thinking clearly.

i) The set $E = \{1, 2, 3, 4, 5, 6, 7\}$

ii) The set $F = \{2, -8, \frac{2}{3}, 0\}$

iii) The set $G = \{b : b \text{ is a multiple of 4 and a whole number}\}$

iv) The set $H = \emptyset$

3. So far in the worksheet, you have seen 8 sets: A , B , C , D , E , F , G and H . Write down the cardinality of each of these sets, using proper mathematical notation to express your answer. Do you think the infinite sets (if there are any) satisfy Cantor's definition of countably infinite? Write down any reasons you can think of to support your claim? Can you write down an example of an infinite set that is of a larger cardinality than any in the worksheet so far?

4. This question is about the set $S = \{1, 2, 3, 4\}$.

a) Write down the elements of the power set of S , which is written $P(S)$.

What is the cardinality of $P(S)$?

b) Decide which (if any) of the following are elements of $P(S)$. If not, explain why not.

i) 2 ii) S iii) $\{5\}$ iv) \emptyset

c) Decide which (if any) of the following are subsets of $P(S)$. If not, explain why not.

i) $\{2, 3\}$ ii) $\{\{1\}, \{2\}, \{3\}, \}$ iii) $\{\{4\}\}$ iv) $\{1, \{2\}\}$



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