

## Beginning Activities for Section 2.3

*Mathematical Reasoning: Writing and Proof, Version 3*

### Beginning Activity 1 (Sets and Set Notation)

Mathematicians use notation to convey their ideas. So it is very important to learn and understand correct mathematical notation. In particular, the concept of sets pervades much of mathematics and so understanding set notation is extremely important as is the ability to write set notation correctly. We should make sure that we completely understand the notation used in the answers to these beginning activities.

1. (a) The set of real numbers that are solutions of the equation  $x^2 - 5x = 0$  is  $\{0, 5\}$ .  
(b) The set of natural numbers that are less than or equal to 10 is  $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ .  
(c) The set of integers that are greater than  $-2$  is  $\{-1, 0, 1, 2, \dots\}$ .

2.

Set	Some other elements of the set
$A = \{1, 4, 7, 10, \dots\}$	13, 16, 19, 22, 25, 28, 31
$B = \{2, 4, 8, 16, \dots\}$	32, 64, 128, 256, 512, 1024
$C = \{\dots - 8, -6, -4, -2, 0\}$	$-20, -18, -16, -14, -12, -10$
$D = \{\dots - 9, -6, -3, 0, 3, 6, 9, \dots\}$	$-21, -18, -15, -12, 12, 15, 18, 21$

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### Beginning Activity 2 (Variables)

1. (a) The equation  $x^2 - 25 = 0$  becomes a true statement if  $-5$  is substituted for  $x$ .  
(b) The equation  $x^2 - 25 = 0$  becomes a false statement if  $\sqrt{5}$  is substituted for  $x$ .
2. The only real numbers that will make the sentence " $y^2 - 2y - 15 = 0$  a true statement when substituted for  $y$  are  $-3$  and  $5$ ."
3. The only natural number that will make the sentence " $y^2 - 2y - 15 = 0$  a true statement when substituted for  $y$  is  $5$ ."
4. Any non-negative real number will make the sentence " $\sqrt{x}$  is a real number" a true statement when substituted for  $x$ ."
5. Any real number will make the sentence " $\sin^2 x + \cos^2 x = 1$ " a true statement when substituted for  $x$ ."
6. The natural numbers that are perfect squares will make the sentence " $\sqrt{n}$  is a natural number" a true statement when substituted for  $n$ . Perfect squares are natural numbers such as  $1, 4, 9, 16, \dots$
7. Any real number greater than  $3$  will make the sentence

$$\int_0^y t^2 dt > 9$$

a true statement when substituted for  $y$ ?

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