

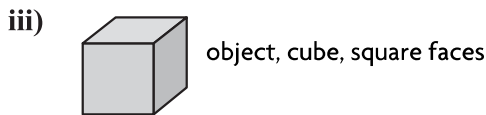
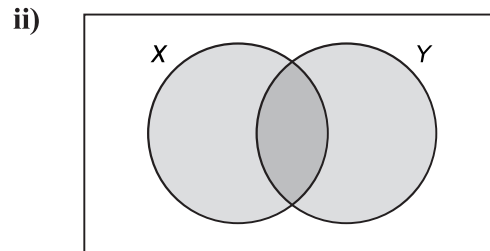
REVIEW OF TERMS AND CONNECTIONS

WORDS You Need To Communicate Effectively

1. Match each term with the picture or example that best illustrates its meaning.

- a) Venn diagram
- b) outcome table
- c) set-builder notation
- d) attributes
- e) set notation

i) $A = \{2, 4, 6, 8, 10\}$



iv) $Y = \{x \mid 3 < x < 10, x \in \mathbb{N}\}$

v)

Nickel		
	H	T
H	(H, H)	(H, T)
T	(T, H)	(T, T)

Dime

CONNECTIONS You Need for Success

Sorting and Classifying

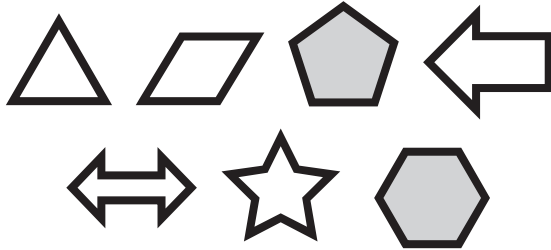
Strategies for classifying or sorting numbers, objects, shapes, and events into sets are studied in set theory. For example, the set of counting numbers from 1 to 10 can be sorted into even numbers (E) and odd numbers (O).

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

These numbers could also be sorted according to shape: curved (C), straight (S), or both curved and straight (B).

- $C = \{3, 6, 8, 9\}$
- $S = \{1, 4, 7\}$
- $B = \{2, 5, 10\}$

2. a) Sort the following shapes into two sets. State the attributes you used.
 b) Repeat part a) using different attributes.



Number Systems

The following number systems are part of the real number system, \mathbb{R} .

System and Symbol	Numbers in System
natural, \mathbb{N}	the “counting” numbers: 1, 2, 3, ...
whole, \mathbb{W}	the natural numbers, plus zero: 0, 1, 2, 3, ...
integer, \mathbb{I}	the natural numbers, their opposites, and zero: ..., -2, -1, 0, 1, 2, ...
rational, \mathbb{Q}	any number that can be represented in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$; for example, $-\frac{3}{7}$, $-\frac{1}{8}$, 0, 4, $\frac{17}{3}$
irrational, $\bar{\mathbb{Q}}$	all numbers that cannot be expressed in rational form; any number that can be expressed as a non-repeating decimal; for example, π , $\sqrt{7}$, $\sqrt[3]{24}$, $\sin 45^\circ$

3. List all the number systems that each number belongs to.
 a) 6.4 b) $\sqrt{36}$ c) -123 d) -8.5 e) $7^{\frac{1}{2}}$

Set-Builder Notation

Describing a set using set-builder notation is often more convenient than listing all the elements.

For example, consider the set of single-digit integers:

$$S = \{-9, -8, -7, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

This set can be written more concisely in set-builder notation:

$$S = \{x \mid -10 < x < 10, x \in \mathbb{I}\}$$

The set-builder notation is read as follows: The set S is all values of x , where x is greater than -10 and less than 10 , and x is an integer.

4. Given $T = \{5, 6, 7, \dots, 97, 98, 99\}$, write T in set-builder notation.

Counterexamples

A statement is false if a counterexample can be determined. For example, consider the following statement:

A quadrilateral with all four sides equal is a square.

A rhombus is a counterexample that proves this statement to be false.

5. If you know the length of two sides of a triangle, you can determine the length of the third side using the Pythagorean theorem:

$$a^2 + b^2 = c^2$$

Is this statement true? If not, provide a counterexample.

Deductive Reasoning

Deductive reasoning allows the formation and testing of conclusions based on statements that are accepted as true. For example, accept the following statements as true:

- All multiples of 4 are even numbers.
- 76 is a multiple of 4.

Conclusion: 76 is an even number.

6. Use deductive reasoning to draw a conclusion from the following statements:

- If the temperature is greater than 0°C , any snow on the ground will begin to melt.
- There is snow on the ground.
- Today, the temperature is going up to 6°C .

Conclusion: _____

PRACTISING

7. Create an outcome table for the sum of one six-sided die and one four-sided die.
8. a) Classify and sort the following numbers into two sets:
3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36
- b) Is there more than one solution? Explain.
9. List all the number systems that each number belongs to.
- a) -789
 - b) 62.3
 - c) $-98\frac{3}{4}$
 - d) 2.349 583 430 723 423 445 429 743 ...
 - e) $\sqrt{59}$
 - f) $\cos 116^\circ$
 - g) 19 387
 - h) $\tan 45^\circ$

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Date _____

10. List the elements in each set.

a) $K = \{a \mid -3 \leq a \leq 5, a \in \mathbb{I}\}$

b) $M = \{2p \mid 1 \leq p \leq 4, p \in \mathbb{N}\}$

11. Describe each set in words.

a) $Z = \{x \mid x \geq 100, x \in \mathbb{N}\}$

b) $L = \left\{x \mid x = \frac{y}{4}, 1 \leq x \leq 10, x \in \mathbb{N}\right\}$

12. Write each set in set-builder notation.

a) $W = \{\text{integers from } -25 \text{ to } 250\}$

b) $E = \{\text{even positive numbers greater than } 8\}$

13. Decide whether each statement is true or false. If it is false, provide a counterexample.

a) The square of a number is greater than or equal to the number itself.

b) If all three angles of a triangle are equal, then all three sides are equal.

14. Use deductive reasoning to write the logical conclusion for each situation.

a) The sum of the three angles in a triangle is 180° . In $\triangle XYZ$, $\angle X = 40^\circ$ and $\angle Y = 65^\circ$.

Conclusion: _____

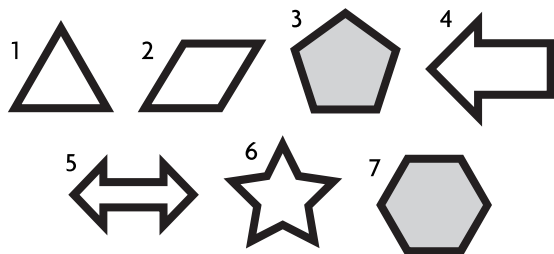
b) In the movie *Field of Dreams* (based on the novel *Shoeless Joe*), Ray hears a voice whispering, "If you build it, he will come." Ray builds it.

Conclusion: _____

REVIEW OF TERMS AND CONNECTIONS ANSWERS

1. a) ii) b) v) c) iv) d) iii) e) i)

2. Answers will vary, e.g.,



- a) Sort according to shading. Let H represent the set of hollow shapes, and let S represent the set of solid shapes: $H = \{1, 2, 4, 5, 6\}$, $S = \{3, 7\}$
 b) Sort according to number of sides. Let O represent the set of shapes with an odd number of sides, and let E represent the set of shapes with an even number of sides: $O = \{1, 3, 4\}$, $E = \{2, 5, 6, 7\}$

3. a) Q, R b) N, W, I, Q, R c) I, Q, R d) Q, R e) \bar{Q} , R

4. $T = \{a \mid 5 \leq a \leq 99, a \in \mathbb{I}\}$

5. This statement is false. Counterexample: A triangle can be drawn with side lengths 4 cm, 6 cm, and 8 cm, but $4^2 + 6^2$ is not equal to 8^2 ($16 + 36$ is equal to 52 , but 8^2 is equal to 64).

6. Conclusion: The snow on the ground will begin to melt.

7.

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10

8. Answers will vary, e.g.,

- a) odd = $\{3, 9, 15, 21, 27, 33\}$, even = $\{6, 12, 18, 24, 30, 36\}$
 b) Yes. Answers will vary, e.g., numbers whose digits add to 9 = $\{9, 18, 27, 36\}$, numbers whose digits do not add to 9 = $\{3, 6, 12, 15, 21, 24, 30, 33\}$

9. a) I, Q, R e) \overline{Q} , R
 b) Q, R f) \overline{Q} , R
 c) Q, R g) N, W, I, Q, R
 d) \overline{Q} , R h) N, W, I, Q, R
10. a) $K = \{-3, -2, -1, 0, 1, 2, 3, 4, 5\}$
 b) $M = \{2, 4, 6, 8\}$
11. a) $Z = \{\text{all natural numbers } 100 \text{ or greater}\}$
 b) $L = \{\text{multiples of } 4 \text{ from } 4 \text{ to } 40\}$
12. a) $W = \{x \mid -25 \leq x \leq 250, x \in \mathbb{I}\}$
 b) $E = \{y \mid y = 2x, x \geq 5, x \in \mathbb{N}\}$
13. a) False. Counterexample: The square of 0.5 is 0.25.
 b) True. (Equiangular triangles are equilateral.)
14. a) Conclusion: $\angle Z = 75^\circ$
 b) Answers will vary, e.g., Conclusion: He came.