

The SSAT
Course Book
MIDDLE & UPPER LEVEL
QUANTITATIVE

Focusing on the Individual Student



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ANSWER KEY

Number Concepts & Operations
Number Concepts & Operations Practice
Algebra
Algebra Practice
Geometry
Geometry Practice
Data Analysis & Probability
Data Analysis & Probability Practice

Algebra

Absolute Value

The absolute value of a number is the distance between the number and zero on the number line. Think of the absolute value of a number as the “positive value” of that number. To simplify an expression within an absolute value sign, simplify just as you would simplify an expression in parentheses. Then take the absolute value of the result.

Scientific Notation

In “scientific notation,” a number is written so that the largest digit is in the units place, and it is multiplied by a power of 10.

Exponents

An exponent tells you how many times to multiply a number by itself. To multiply two numbers with the same base, add the exponents. To divide two numbers with the same base, subtract the exponents. To raise a power to a power, multiply the exponents.

Roots

A square root (also known as a radical) is an exponent of 2 in reverse. A number’s square root is the number which, when multiplied by itself, gives you the original number.

Algebraic Expressions

Simplifying an algebraic expression is often the first step in solving an algebraic equation. To simplify an algebraic expression, combine similar terms. Use the distributive property to multiply a single term by an expression inside parentheses. When multiplying two binomials, each term must be multiplied by each term in the other binomial. Use the FOIL method: multiply the first terms, outside terms, inside terms, and last terms.

Algebraic Equations

To solve an equation, get the variable by itself on one side of the equal sign. Keep the equation balanced. If you do something to one side, such as add a number or divide by a number, you must do the same to the other side. To solve an equation with a fraction, first get rid of the fraction by multiplying both sides of the equation by the denominator. To solve an equation with a radical sign, first get rid of the radical sign by isolating the radical on one side of the equation and then squaring both sides.

Plugging In

- ❑ Some SSAT math questions can be solved quickly by using the answer choices.

Questions involving algebraic equations can often be solved by plugging in the answer choices for a variable.

If $7x - 3 = 46$, then $x =$

- (A) 0
- (B) 1
- (C) 5
- (D) 7
- (E) 9

If you start with (C), you get $7(5) - 3 = 46$, or $32 = 46$ (not a true statement). So, x must be bigger than 5, because 32 is too small.

Eliminate (A) and (B), because these will make your quantity smaller.

Try (D) and (E).

The correct answer is (D) because $7(7) - 3 = 46$.

- ❑ When plugging in, start with answer choice (C).

Since numerical answer choices are presented in either ascending or descending order, choice (C) will be in the middle. If (C) isn't right, you might be able to tell if you need a larger or smaller number. By starting in the middle, you can reduce the number of answer choices you plug in, which will save you time.

Vocabulary

- ❑ An **integer** is any positive or negative whole number or zero.

$\{\dots-3, -2, -1, 0, 1, 2, 3, \dots\}$

- ❑ A **digit** is any whole number from 0 to 9.

$\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ is the set of all digits.

- ❑ A **prime number** is an integer greater than 1 that is divisible only by 1 and itself.

2 is the smallest prime number. It is also the only prime number that is even.

2, 3, 5, 7, 11, and 13 are examples of prime numbers.

- ❑ A **sum** is the result of an addition.

- ❑ A **difference** is the result of a subtraction.

- ❑ A **product** is the result of a multiplication.

- ❑ A **quotient** is the result of a division.

A **dividend** is the number being divided in a division.

A **divisor** is the number dividing in a division.

$$\begin{array}{r} \text{quotient} \\ \text{divisor} \overline{) \text{dividend}} \end{array}$$

- ❑ A **base** is a number being raised to an exponent.

An **exponent** is the number of times you multiply a base by itself.

- ❑ **Consecutive numbers** are whole numbers that increase or decrease incrementally by 1.

$\{31, 32, 33, 34\}$ and $\{-2, -1, 0, 1, 2, 3, 4, 5\}$ are sets of consecutive numbers.

Place Value

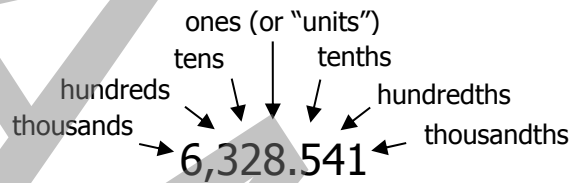
- Decimals are a way of writing fractions whose denominators are powers of 10.

$$\frac{4}{10} = .4$$

$$\frac{36}{1,000} = .036$$

$$\frac{1200}{10,000} = \underline{\hspace{2cm}}$$

- The position of each digit in a number determines the digit's **place value**.



- It might help to think of money when working with decimals and place value.

Diagram illustrating the relationship between place value and money:

- Hundreds:** One hundred dollar bill (100)
- Ones:** One ten dollar bill (10)
- Tens:** One one dollar bill (1)
- Tenths:** One dime (0.10)
- Hundredths:** One penny (0.01)

Ratios

- When two quantities are compared by dividing one quantity by the other, the comparison is called a **ratio**.

A ratio may be written as "X:Y" or "X/Y" or "X to Y."

- A ratio can be thought of as a comparison of parts.



In a fruit basket, there are 3 oranges to every 2 apples.

The ratio of apples to oranges is 2:3.

If there are only apples and oranges in the basket, the ratio of apples to the whole basket is 2:5 and the ratio of oranges to the whole basket is 3:5.

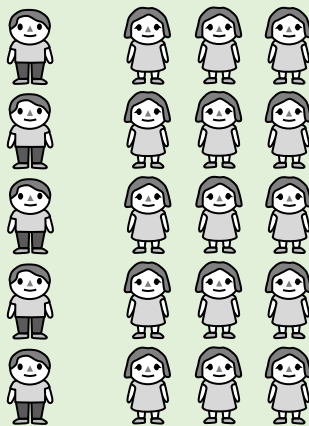
- A ratio doesn't necessarily represent the actual number of things.

If the ratio of boys to girls in a class is 1:3, it means that for every boy in the class, there are 3 girls.



The ratio of boys to total students is 1:4. The ratio of girls to total students is 3:4.

If there are 20 students in the class, 5 of the students are boys and 15 of the students are girls. You can figure this by multiplying both terms in the ratio by 5.



30. Lawrence bought a container with 64 ounces of milk. For different recipes, he used the following amounts, in ounces, of milk from his container: $2\frac{1}{2}$, $6\frac{2}{3}$, $10\frac{3}{4}$, and $4\frac{2}{3}$. How much milk, in ounces, does Lawrence have remaining in his container?

- (A) $38\frac{7}{12}$
(B) $39\frac{5}{12}$
(C) $39\frac{7}{12}$
(D) $41\frac{5}{12}$
(E) $41\frac{7}{12}$

31. Kristal is making cookies and muffins for a bake sale. She has a recipe for a dozen cookies and another recipe for a dozen muffins. The amount of white sugar and brown sugar needed for each recipe is shown in the table below.

Sugar Needed		
Type of Sugar	Brown	White
12 Cookies	$\frac{3}{4}$ cup	$\frac{1}{2}$ cup
12 Muffins	$\frac{2}{3}$ cup	$\frac{1}{2}$ cup

If Kristal wants to make 3 dozen muffins and 2 dozen cookies, what is the total amount of sugar, in cups, needed?

- (A) $2\frac{5}{12}$
(B) 6
(C) $6\frac{1}{12}$
(D) $7\frac{1}{4}$
(E) $14\frac{1}{6}$

Scientific Notation

- ❑ In "scientific notation," a number is written so that the largest digit is in the units place, and it is multiplied by a power of 10.

$$3,642,000,000,000 = 3.642 \times 10^{12}$$

$$0.00000000146 = 1.46 \times 10^{-9}$$

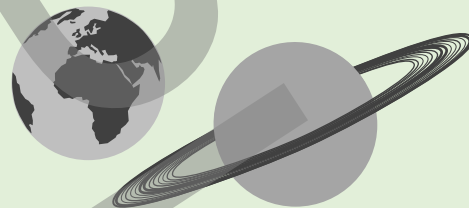
- ❑ To convert a number written in scientific notation to regular decimal format, simply move the decimal point according to the exponent on the 10.

If the exponent is positive, move the decimal to the right by that many places. If the exponent is negative, move the decimal to the left by that many places.

Write 0.000000000000678 in scientific notation:

Write 8.63×10^6 in decimal format:

The minimum distance from Earth to Saturn is about 8.0×10^8 miles. If light travels at a speed of about 2.0×10^5 miles per second, how long will it take light to travel from Earth to Saturn?



Use this formula: $\text{speed} \times \text{time} = \text{distance}$

Rewrite formula with given values: _____

Set equation equal to time: _____

Simplify: _____

How long will it take light to travel from Earth to Saturn? _____

TRY IT OUT

For each equation, find the value of the variable:

1. $R - 1 = 10$

2. $n + 5 = 10$

3. $(25,000) \times 0 = N$

4. $x + 1 = 1,001$

5. $\Delta + 100 = 150$

6. $100 \times N = 100$

7. $4 + x + 4 = 28$

8. $S - 20 = 105$

9. $36 - T = 26$

10. $2N + N = 60$

11. 50% of y equals 30.

12. $2x + 3 = 27$

13. $4x - 2 = 14$

14. $\frac{1}{2}n = 50$

15. $\frac{1}{3}n + 4 = 10$

16. $\frac{2x}{3} - 1 = \frac{13}{2}$

17. $\sqrt{x} = 4$

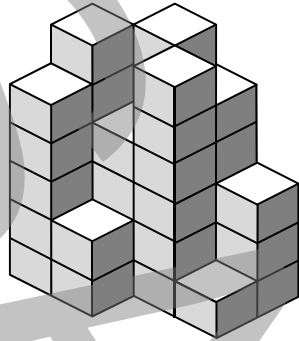
18. $\sqrt{x+2} = 10$

19. $2 - \sqrt{3x+4} = 2 - x$

20. $\sqrt[4]{2x} = 2$

PUT IT TOGETHER

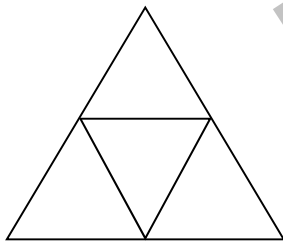
1.



The figure above shows 9 stacks of blocks. If the blocks are all the same size and shape and they are stacked on a level base, what is the total number of blocks in the 9 stacks?

- (A) 48
- (B) 46
- (C) 38
- (D) 35
- (E) 23

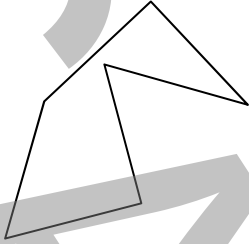
2. How many quadrilaterals are there in the figure shown?



- (A) 0
- (B) 3
- (C) 5
- (D) 6
- (E) 10

Geometry Practice – Upper Level

1.



All of the sides of the shape shown in the figure above have a length of 6. What is the perimeter?

- (A) 1
 - (B) 6
 - (C) 12
 - (D) 36
 - (E) It cannot be determined from the information given.
-

2. A square has a perimeter of $16x$. What is the length of a side of the square?

- (A) 2
 - (B) 4
 - (C) 8
 - (D) $2x$
 - (E) $4x$
-

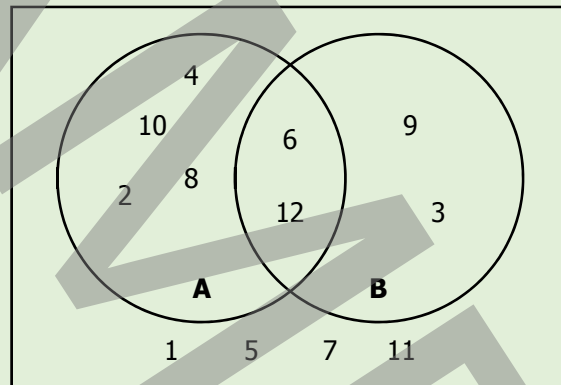
3. A prison is surrounded by 11 sides. If the perimeter of the prison is 220 yards, what is the average length in feet of one of the sides?

- (A) 20
- (B) 30
- (C) 60
- (D) 66
- (E) 204

Sets

- ❑ A set is a collection of distinct objects, such as a group of numbers or people.
- ❑ Sets overlap when they have elements in common. Venn diagrams can be used to represent which elements are included in both sets.

The Venn diagram below shows the numbers 1-12. Set A includes even numbers. Set B contains multiples of 3. The overlapping portion shows even numbers that are also multiples of 3 (6 and 12). Outside of the two sets are the numbers that are odd and are not multiples of 3 (1, 5, 7, and 11).



- ❑ To calculate the total number of elements in a set problem, use the following formula:

$$\text{Total} = \text{Set 1} + \text{Set 2} + \text{Neither} - \text{Overlap}$$

At Tater Industries, 100 employees own cars, 200 own trucks, 50 own both, and 20 own neither. How many employees work at Tater Industries?

TEST-TAKING FUNDAMENTALS**Pg. 8 – BEATING THE SSAT**

Try It Out

1. correct answer: D. attractor: B

Pg. 10 – MAKING YOUR BEST GUESS

D

Pg. 12 – USING THE ANSWER CHOICES

Try It Out

1. B

QUANTITATIVE**Pg. 20 – PLUGGING IN**

Put It Together

1. D
2. C
3. E
4. A

Pg. 22 – SOLVING BACKWARDS

Put It Together

1. E
2. B
3. A

Pg. 24 – CHOOSING NUMBERS

Put It Together

1. A
2. D
3. D

NUMBER CONCEPTS & OPERATIONS**Pg. 32 – ADDITION, SUBTRACTION, MULTIPLICATION, & DIVISION**

- 0
0
2,345
999
1
9,300
63,400
2.6
24.35

Try It Out

1. 100,700
2. 11,000
3. 1,150
4. 6,020
5. 11,110
6. 3,813
7. 0
8. 1,000
9. 13,000
10. 85
11. 21
12. 621
13. 28,900
14. 0
15. 999.9
16. 22
17. 412
18. 0
19. 347.76
20. 1

Put It Together

1. B
2. B
3. B
4. C
5. C
6. B
7. D

Pg. 36 – ODD & EVEN INTEGERS

Try It Out

1. 4, 6, 400
2. 0, 12, 18, 100
3. 1, 3, 11, 21

Put It Together

1. C
2. E
3. D