

Accu✓Tutor

**SHSAT**

Curriculum Sample

# SHSAT Logic

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## Logical Reasoning Section

- ✓ 10 Questions
- ✓ Be careful with timing, these questions may have many details so timing is essential.

## Logical Reasoning Directions

- ✓ Remember to familiarize yourself with the test directions. This will save you time on test day.

**DIRECTIONS:** Read the information given and choose the **best** answer to each question. Base your answer **only on the information given**.

In a logical reasoning test, certain words must be read with caution. For example, “The red house is **between** the yellow and blue houses,” does not necessarily mean, “The red house is **between and next to** the yellow and blue houses”; one or more other houses may separate the red house from the yellow house or from the blue house. This precaution also applies to words such as **above, below, before, after, ahead of and behind**.

## Logical Reasoning Question Types

- ✓ Order Problems
- ✓ Math-Related
- ✓ Deduction
- ✓ Codes

\*We will go over each type problem presented on the test and work through examples together.

## Logical Reasoning: How to Approach the Question

- ✓ Read the problem carefully.
- ✓ Identify what the question is asking.
- ✓ Re-read the problem and make accurate logical conclusions, if necessary.
- ✓ Draw pictures, charts or diagrams when possible.
  - Often visuals will help you organize your thoughts and make it easier to select an answer.
- ✓ Eliminate all incorrect answers.
  - Be careful when choosing your answer not to assume anything. All answers should be logical and valid.
  - Some answers may seem logical, but often you are looking for the answer that **MUST** be true.

# SHSAT Logic: Order Problems

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## Logical Reasoning: Order Problems

- ✓ These questions will ask you to order a group of objects.
- ✓ Examples: You may be asked to order a group of people by height or age. Or you may be asked to position or arrange a objects in order, such as a group of people sitting at a table.
- ✓ We will cover two types of Order Problems
  - Order based on Conditions
  - Sequence

## Order Based on Conditions

- ✓ Some problems will give you certain conditions and it will be your job to put these conditions together and draw logical conclusions.
- ✓ Many times these problems are easy to diagram, so draw a picture when necessary and fill in the relevant information.

## Example

There are six people sitting at a circular table. Each person is partnered with one other person. Each set of partners sit directly across from each other at the table. The people are positioned as follows:

1. Andy and Jen are partners
2. Michael and Sue are partners
3. Willie and Izzi are partners
4. Michael does not sit next to Willie, but does sit next to Andy's left

Which two people sit next to Sue?

- A. Andy and Michael
- B. Willie and Jen
- C. Izzi and Andy
- D. Izzi and Jen
- E. Not enough information

**Step 1:** Read the problem carefully.

There are six people sitting at a circular table. Each person is partnered with one other person. Each set of partners sit directly across from each other at the table. The people are positioned as follows:

1. Andy and Jen are partners
2. Michael and Sue are partners
3. Willie and Izzi are partners
4. Michael does not sit next to Willie, but does sit next to Andy's left

**Step 2:** Identify what the question is asking.

Place the six people in order at the circular table using the given conditions.

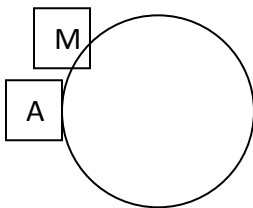
**Step 3:** Re-read the problem and make accurate logical conclusions, if necessary.

- ✓ Identify the important the important clues.
  - Partners **MUST** sit across from each other
  - Michael sits to Andy's left and does not sit next to Willie

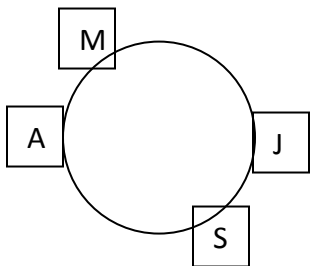
**Step 4:** Draw pictures, charts or diagrams when possible.

- ✓ Often visuals will help you organize your thoughts and make it easier to select an answer.
- ✓ **Hint:** Most order problems should be diagrammed.
- ✓ When diagramming, use letters to represent each person: A=Andy; J=Jen; M=Michael; S=Sue; W=Willie, I=Izzi

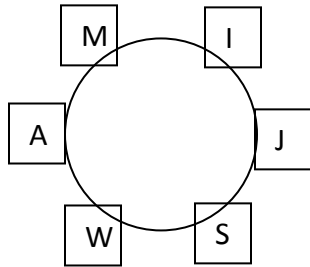
1. Position Michael and Andy at the table since we know they sit next to each other.



2. We know that Sue sits across from Michael since they are partners, and Andy sits across from Jen since they are partners so place them at the table.



3. We know that Willie does not sit next to Michael, so Izzi must sit next to Michael. Since Izzi and Willie are partners, we also know they sit across from each other.



**Step 5:** Eliminate all incorrect answers.

- Be careful when choosing your answer not to assume anything. All answers should be logical and valid.
- Some answers may seem logical, but often you are looking for the answer that **MUST** be true.

Which two people sit next to Sue?

- A. Andy and Michael- NO
- B. Willie and Jen- YES
- C. Izzi and Andy- NO
- D. Izzi and Jen- NO
- E. Not enough information- NO

Using our diagram we find that answer **B** is correct.

# SHSAT Logic: Sequence

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- ✓ Many problems on the test will ask you to put information into a logical order using clues. For example, a problem may ask you to order a group of people by age you height.
- ✓ When completing these problems, use the clues to draw a diagram of the information in logical order.

## Example

Seven students stand in a line from shortest to tallest. There are three seventh graders named Jack, Paul and Samantha and there four eighth graders named Rowena, Megan, Wyatt, and Tom.

1. All of the seventh graders are shorter than all the eighth graders.
2. Samantha is the shortest seventh grader and Paul is the tallest seventh grader.
3. Wyatt is the tallest eighth grader and Rowena is the shortest eighth grader.

Who is second in the line of students?

- A. Jack
- B. Paul
- C. Sam
- D. Megan
- E. Not enough information

Who is fifth in the line of students?

- A. Rowena
- B. Megan
- C. Wyatt
- D. Tom
- E. Not enough information

**Step 1:** Read the problem carefully.

Seven students stand in a line from shortest to tallest. There are three seventh graders named Jack, Paul and Samantha and there are four eighth graders named Rowena, Megan, Wyatt, and Tom.

1. All of the seventh graders are shorter than all the eighth graders.
2. Samantha is the shortest seventh grader and Paul is the tallest seventh grader.
3. Wyatt is the tallest eighth grader and Rowena is the shortest eighth grader.

**Step 2:** Identify what the question is asking.

Order the seven students from shortest to tallest.

**Step 3:** Re-read the problem and make accurate logical conclusions, if necessary.

- ✓ All the seventh graders are shorter than the eighth graders, so the three smallest students are Jack (J), Paul (P) and Samantha (S)
- ✓ Samantha is the shortest 7<sup>th</sup> grader and Paul is the tallest.
- ✓ Wyatt is the tallest 8<sup>th</sup> grader and Rowena is the shortest.

**Step 4:** Draw pictures, charts or diagrams when possible.

- Often visuals will help you organize your thoughts and make it easier to select an answer.
  - Sequence Problems often need visuals
  - Make sure to also label each name with a letter: Jack (J), Paul (P), Samantha (S), Rowena (R), Megan (M), Wyatt (W), Tom (T)
1. Knowing that the 7<sup>th</sup> graders are shorter than the 8<sup>th</sup> graders J, P, and S are positioned 1-3 and we know S is the shortest

1. S	2.	3.	4.	5.	6.	7.
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2. We know that P is the tallest 7<sup>th</sup> grader so he must be in position 3, leaving J in position 2.

1. S	2. J	3. P	4.	5.	6.	7.
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3. There are four 8<sup>th</sup> graders in positions 4-7, W is the tallest and R is the shortest.

1. S	2. J	3. P	4. R	5.	6.	7. W
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4. We have no additional information so position 5 or 6 can be occupied by M or T.

1. S	2. J	3. P	4. R	5. M/T	6. M/T	7. W
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**Step 5:** Eliminate all incorrect answers.

- ✓ Be careful when choosing your answer not to assume anything. All answers should be logical and valid.

Who is second in the line of students?

- A. Jack- YES
- B. Paul- NO
- C. Sam- NO
- D. Megan- NO
- E. Not enough information- NO

Who is fifth in the line of students?

- A. Rowena- NO
- B. Megan- Maybe
- C. Wyatt- NO
- D. Tom- Maybe
- E. Not enough information- YES because it could be Megan or Tom.

The correct answers are **A** and **E**.

### **Practice Problems**

There are six people playing cards at a circular table. At the table there are 3 males named Joe, Matt, and Fred. There are 3 three females named Amy, Stephanie and Emily. They are arranged as follows:

- A. None of the male players sit next to each other.
- B. Stephanie sits to the right of Fred and across from Joe

Which two female players sit next to Matt?

- A. Amy and Emily
- B. Stephanie and Emily
- C. Stephanie and Amy
- D. Not enough information

**Answer: D. We know that Stephanie sits next to Matt but we do not know who sits on the other side of Matt.**

# SHSAT Math: Strategies

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- ✓ Sometimes you will get a problem on the exam that you may not know the answer to. There are several strategies to help you answer these questions. As we discussed earlier, you should select an answer for every problem on the test, as there is no penalty for wrong answers.

## Picking Numbers

- ✓ This strategy works best for problems with variables. When you pick numbers, you simply substitute numbers for variables.
- ✓ Be sure to pick numbers that are easy to work with such as  $-2$ ,  $2$ , or  $3$ .
- ✓ Avoid numbers like  $-1$ ,  $0$ , and  $1$  because they have special properties.

### Example:

$$3x(2y + 1) =$$

- A.  $6xy + 4x$
- B.  $3xy + 3x$
- C.  $6xy + 3x$
- D.  $5xy + 3x$
- E.  $5xy + 4x$

**Step 1:** In order to solve this number using the Picking Numbers Strategy, you must simply pick numbers to substitute in for  $x$  and  $y$ .

$$x = 2, y = 3$$

**Step 2:** Substitute the numbers into the original equation.

$$3x(2y + 1) = 3 \times 2(2 \times 3 + 1) = 3 \times 2(6 + 1) = 6 \times 7 = 42$$

**Step 3:** Substitute the numbers into the answer choices.

- A.  $6xy + 4x = 6(2)(3) + (4)(2) = 44$
- B.  $3xy + 3x = 3(2)(3) + 3(2) = 24$
- C.  $6xy + 3x = 6(2)(3) + 3(2) = 42$
- D.  $5xy + 3x = 5(2)(3) + 3(2) = 36$
- E.  $5xy + 4x = 5(2)(3) + 4(2) = 38$

**Step 4:** Select the answer choice that is the same as the answer in Step 2.

Answer: **C**

## Practice Problems: Picking Numbers

$$2x + 4 =$$

- A.  $2(x + 4)$
- B.  $2(2x + 2)$
- C.  $2(x + 1)$
- D.  $2(x + 2)$
- E.  $4(x + 1)$

**Answer: D**

## Working Backwards

- ✓ Simply work backwards from the answer choices. Since all the questions are multiple choice you can use this to your advantage.
- ✓ Hint: When working backwards start with answer C. If answer C is not correct determine whether you need a smaller number or a larger number. The answer choices are always arranged from smallest to largest or largest to smallest.

## Example:

What is the greatest common factor of 180 and 72?

- A. 2
- B. 3
- C. 6
- D. 36
- E. 72

**Step 1:** Determine which answer choices are factors of 180 and 72.

- A. 2- Is a factor of both numbers
- B. 3- Is a factor of both numbers
- C. 6- Is a factor of both numbers
- D. 36- Is a factor of both numbers
- E. 72- Is a factor of 72, but not a factor of 180

**Step 2:** Determine which factor is the largest, since we are looking for the GCF.

**Answer: D**

Note that if you started with answer C you would see that 6 is a factor of both numbers. Since we are looking for the GCF you can eliminate A and B. Now, move to answer D which is a factor of

both and then to answer E which is not a factor of both. Therefore the GCF is 36 and we have saved valuable time by starting with answer C.

**Practice: Working Backwards**

5% of a number is 1. What is the number?

- A. 5
- B. 10
- C. 15
- D. 20
- E. 25

**Answer: D**

# Mean, Median, Mode and Range

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- ✓ **Mean:** The mean is the mathematical average of a set of numbers. The average is calculated by adding up two or more numbers and dividing the total by the number of numbers in the set.
- ✓ **Median:** In a set of numbers; it is the middle number when the numbers are arranged from smallest to largest. If there are two numbers in the middle, simply average the middle two numbers to find the median.
- ✓ **Mode:** The number that occurs most often in a set of numbers.
- ✓ **Range:** The range of a set of numbers is the highest number minus the lowest number.

## Example:

Students with the following GPAs applied for a job: 2.5, 2.6, 2.5, 2.5, 3.9, 3.3, 2.4, 2.4, 2.4, and 2.7. Find the mean, median and mode of the students GPAs.

## Mean

- ✓ The mean is the mathematical average of a set of numbers. The average is calculated by adding up two or more numbers and dividing the total by the number of numbers in the set.
- ✓ Mean = Sum of the numbers in the set ÷ the number of numbers in the set.

**Step 1:** Add up all the numbers in the above set.

$$2.5 + 2.6 + 2.5 + 2.5 + 3.9 + 3.3 + 2.4 + 2.4 + 2.4 + 2.7 = 27.1$$

**Step 2:** Determine the number of number in the above set.

There are 10 numbers in the above set.

**Step 3:** Divide the sum by the number of numbers.

$$\frac{27.1}{10} = 2.71$$

## Median

- ✓ The median in a set of numbers is the middle number when the numbers are arranged from smallest to largest. If there are two numbers in the middle, simply average the middle two numbers to find the median.

**Step 1:** Arrange the numbers from smallest to largest.

2.4, 2.4, 2.4, 2.5, 2.5, 2.5, 2.6, 2.7, 3.3, 3.9

**Step 2:** Determine which number is in the middle of the set.

- ✓ Hint: For sets with an even number of numbers there will be numbers that must be averaged.
- ✓ Hint: For sets with an odd number of numbers there will be one number that is your solution.

The two numbers in the above set that are in the middle are 2.5 and 2.5. Average these 2 numbers.

$$\frac{2.5 + 2.5}{2} = \frac{5}{2} \text{ or } 2.5$$

### Mode

- ✓ The mode is number that occurs most often in a set of numbers.

**Step 1:** Arrange the numbers from smallest to largest, as you did for the Median.

2.4, 2.4, 2.4, 2.5, 2.5, 2.5, 2.6, 2.7, 3.3, 3.9

**Step 2:** Determine the number that is repeated most frequently.

Both 2.4 and 2.5 are repeated 3 times. Our modes are 2.4 and 2.5.

### Range

- ✓ The range of a set of numbers is largest number minus the smallest number.

**Step 1:** Arrange the numbers from smallest to largest, as you did for the Median and Mode.

2.4, 2.4, 2.4, 2.5, 2.5, 2.5, 2.6, 2.7, 3.3, 3.9

**Step 2:** Subtract the smallest number from the largest number.

$$3.9 - 2.4 = 1.5$$

### Practice Problem

The following grades were posted on the latest exam: 68, 74, 70, 52, 50, 50, 52, 50, 82, and 97. Find the mean, median, mode and range for the grades on the latest exam.

Answer: Mean = 64.5, Median=60, Mode=50, Range=47