Infinity - Basic Middle School Math

Unit 1, Lesson 1: Place Value, Number Forms, and Comparing Whole Numbers

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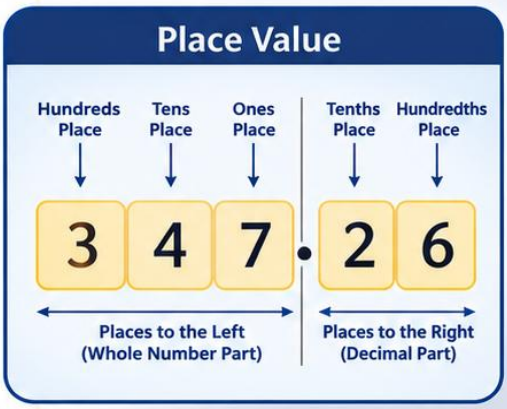
You already know how to count, read numbers, and use whole numbers in everyday life. In this lesson, you will begin looking more closely at how our number system is organized.

A number is not just a row of digits. Each digit has a specific value based on where it is located. The decimal point acts as the main reference point:

- One place to the left is the **ones place**.
- Two places to the left is the **tens place**.
- Three places to the left is the **hundreds place**.
- One place to the right is the **tenths place**.
- Two places to the right is the **hundredths place**.

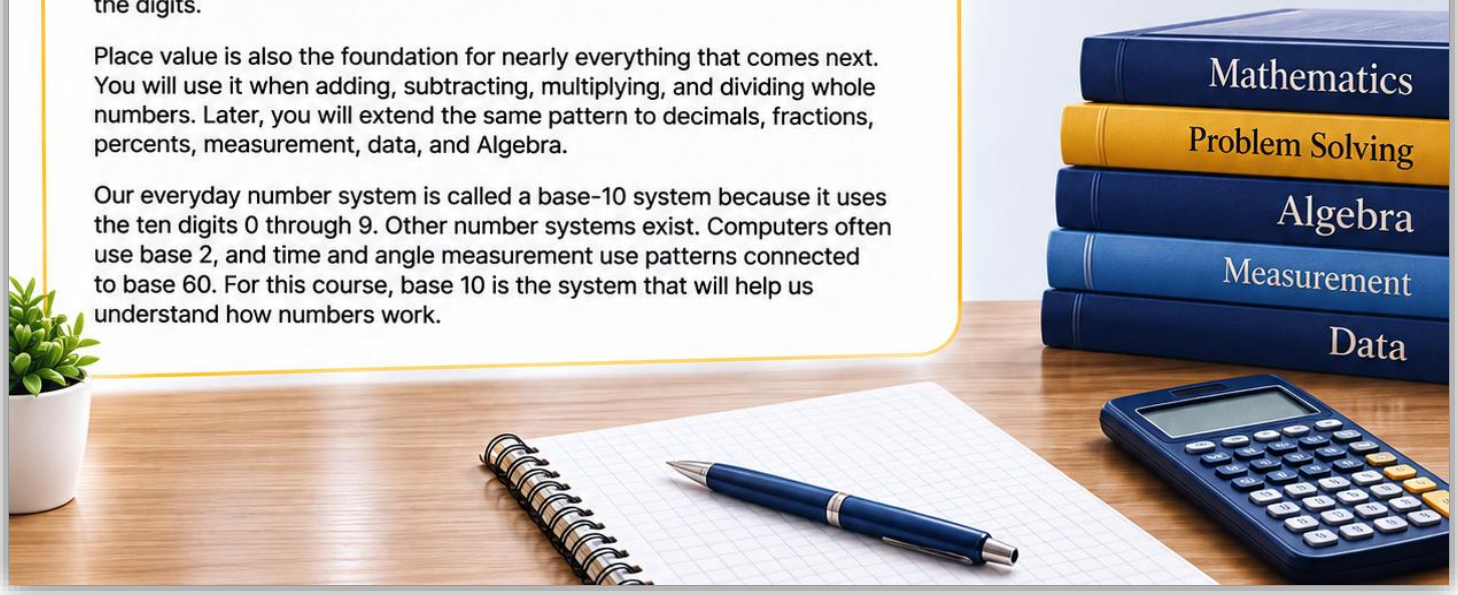


Even when a whole number is written without a decimal point, you can imagine the decimal point immediately to the right of the ones place.

You will learn how to identify the value of a digit, write numbers in different forms, compare and order numbers, and round numbers to nearby values. These skills help you understand the size of numbers instead of only reading the digits.

Place value is also the foundation for nearly everything that comes next. You will use it when adding, subtracting, multiplying, and dividing whole numbers. Later, you will extend the same pattern to decimals, fractions, percents, measurement, data, and Algebra.

Our everyday number system is called a base-10 system because it uses the ten digits 0 through 9. Other number systems exist. Computers often use base 2, and time and angle measurement use patterns connected to base 60. For this course, base 10 is the system that will help us understand how numbers work.



What You Should Already Know

Before beginning this lesson, you should already be comfortable with basic counting and elementary whole-number skills.

You should know how to:

- Count forward and backward using whole numbers.
- Recognize the digits 0 through 9.
- Read and write smaller whole numbers.
- Understand that 10 ones make 1 ten and 10 tens make 1 hundred.
- Compare smaller numbers.

Quick Review

- 6 tens = 60
- 4 hundreds = 400
- 73 > 68 because 7 tens is greater than 6 tens.
- 12 inches = 1 foot

Key Vocabulary

Whole Number: A number with no fraction or decimal part. Whole numbers begin with 0 and continue as 1, 2, 3, 4, and so on.

Digit: One of the ten symbols used to write numbers: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

Decimal Point: The point that separates whole-number places from decimal places. It is the main reference point for determining place value.

Place Value: The position of a digit in a number. Examples include the ones place, tens place, hundreds place, tenths place, and hundredths place.

Value of a Digit: The amount a digit represents because of its place value. Example: In 48,263, the digit 8 is in the thousands place, so its value is 8,000.

Base-10 Number System: A number system that uses the ten digits 0 through 9. Each place is worth 10 times as much as the place directly to its right.

Standard Form: A number written using digits. Example: 42,619.

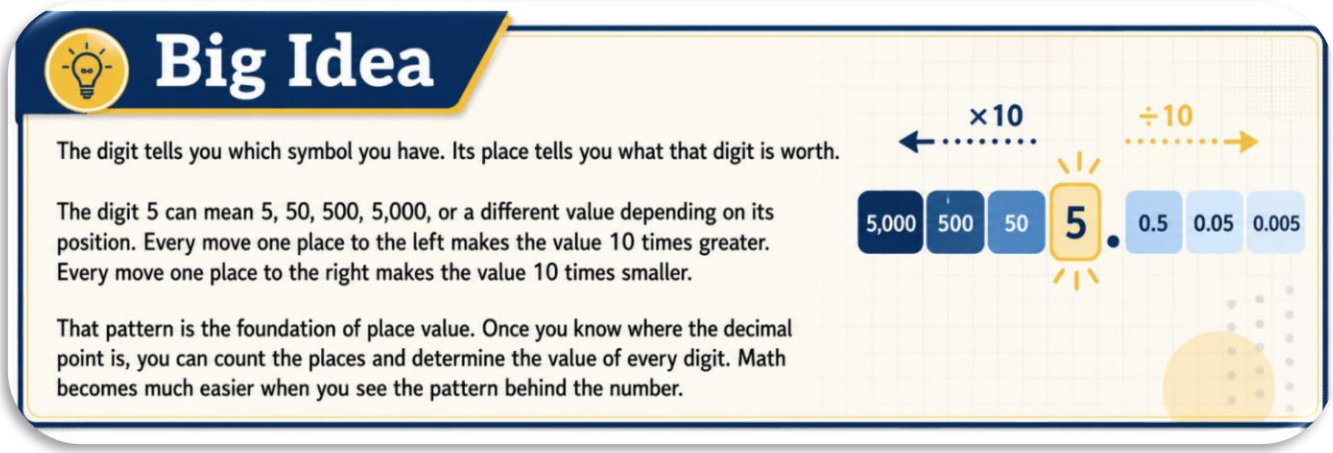
Word Form: A number written using words. Example: forty-two thousand, six hundred nineteen.

Expanded Form: A number written as the sum of the value of each nonzero digit. Example: 42,619 = 40,000 + 2,000 + 600 + 10 + 9.

Compare: To decide whether one number is greater than, less than, or equal to another number. The symbols >, <, and = are used to show comparisons.

Order: To arrange numbers from least to greatest or from greatest to least.

Rounding: Replacing a number with a nearby value that is easier to use. Example: 4,682 rounds to 4,700 to the nearest hundred.



Infinity Method

Start at the Decimal Point

The decimal point is the reference point for place value. In a whole number, the decimal point is usually not written, but you can imagine it immediately after the ones place.

For example:

48,263 = 48,263.

Count places from the decimal point:

- 1 place left: ones
- 2 places left: tens
- 3 places left: hundreds
- 4 places left: thousands
- 5 places left: ten-thousands
- 6 places left: hundred-thousands

Every time you move one place to the left, the value becomes 10 times greater.

In 55,555:

- The first 5 is worth 50,000.
- The second 5 is worth 5,000.
- The third 5 is worth 500.
- The fourth 5 is worth 50.
- The last 5 is worth 5.

The digit stays the same, but its position changes its value.

Find the Value of a Digit

Use this pattern:

Digit · place value = value of the digit

In 472,316, the digit 7 is in the ten-thousands place.

7 · 10,000 = 70,000

The value of the digit 7 is 70,000.

Read Large Numbers by Periods

Commas divide large numbers into groups called periods. Each period contains up to three digits.

4,582,719

Read one period at a time:

- 4 million
- 582 thousand
- 719

Word form:

four million, five hundred eighty-two thousand, seven hundred nineteen

When writing whole numbers in word form, do not use the word “and.” The word “and” will later help show the location of a decimal point.

Compare from Left to Right

When comparing whole numbers:

Compare the number of digits.

If the numbers have the same number of digits, begin on the left.

Move right until you find the first place where the digits are different.

Compare those digits.

The first different place decides which number is greater.

Example:

805,216 and 850,126

The hundred-thousands digits are both 8.

The ten-thousands digits are 0 and 5.

Since 0 < 5:

805,216 < 850,126

Do not compare the last few digits first. A digit farther to the left has a greater place value and matters more.

Round: Target, Neighbor, Zeros

To round a whole number:

Find the target place.

Look at the neighboring digit immediately to its right.

If the neighbor is 0, 1, 2, 3, or 4,
keep the target digit the same.

If the neighbor is 5, 6, 7, 8, or 9, increase the target digit by 1.

Change every digit to the right of the target place to 0.

A simple reminder:

0–4: Keep it where it is.

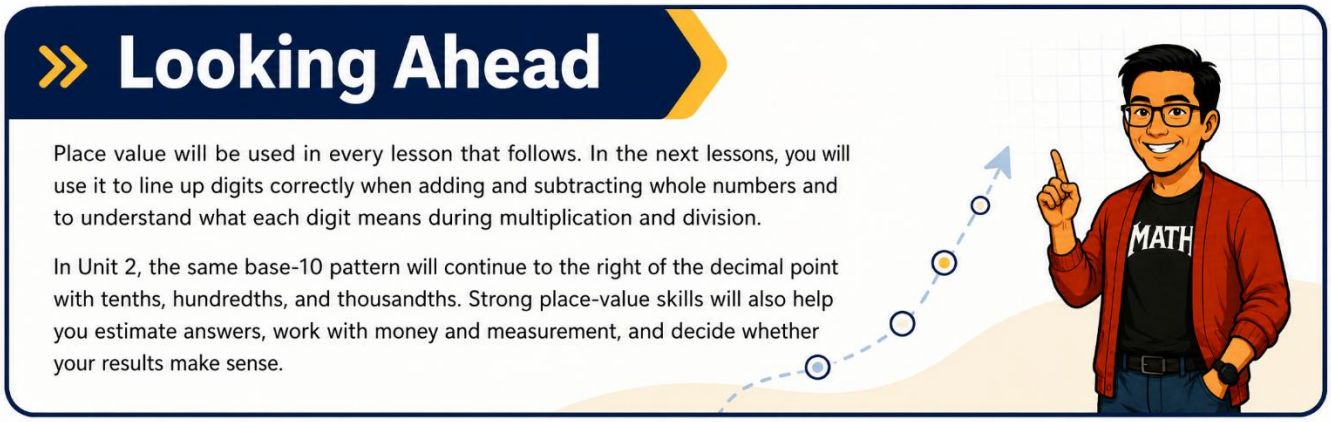
5–9: Raise it one more time.

Rounding gives you a nearby number that is easier to use. It is useful for estimating and checking whether an answer is reasonable, but it does not give an exact value.

Build Greatest and Least Numbers

To make the greatest possible number, place the digits from greatest to least.

To make the least possible number, place the digits from least to greatest, but a whole number cannot begin with 0. Put the smallest nonzero digit first, then place 0, followed by the remaining digits from least to greatest.



Worked Examples

Example 1: Finding the Value of a Digit

Problem:

What is the value of the digit 3 in 6,430,018?

Solution:

Imagine the decimal point after the ones place:
6,430,018.

Count from the decimal point toward the left:

- 8 is in the ones place.
- 1 is in the tens place.
- 0 is in the hundreds place.
- 0 is in the thousands place.
- 3 is in the ten-thousands place.

The digit 3 represents 3 ten-thousands.

$3 \cdot 10{,}000 = 30{,}000$

Answer:

The value of the digit 3 is 30,000.

Example 2: Writing a Number in Different Forms

Problem:

Write 305,714 in word form and expanded form.

Solution:

Separate the number into periods: 305 | 714

Read each period:

- 305 thousand
- 714

Word form:

three hundred five thousand, seven hundred fourteen

Now give each nonzero digit its own value:

- 3 hundred-thousands = 300,000
- 5 thousands = 5,000
- 7 hundreds = 700
- 1 ten = 10
- 4 ones = 4

The 0 in the ten-thousands place has a value of 0, so it does not need to appear in expanded form.

Expanded form:

305,714 = 300,000 + 5,000 + 700 + 10 + 4

Answer:

Word form: three hundred five thousand, seven hundred fourteen

Expanded form: 300,000 + 5,000 + 700 + 10 + 4

Example 3: Comparing Whole Numbers

Problem:

Compare using <, >, or =.

4,508,219 ___ 4,580,219

Solution:

Both numbers have seven digits, so begin comparing from left.

- Millions: 4 = 4
- Hundred-thousands: 5 = 5
- Ten-thousands: 0 < 8

The first different digits are 0 and 8 in the ten-thousands place. Since 0 is less than 8, the first number is smaller.

Answer:

4,508,219 < 4,580,219

Common Mistake:

Do not begin by comparing 219. The digits farther to the left have greater values and must be compared first.

Example 4: Ordering Whole Numbers

Problem:

Order the numbers from least to greatest.

52,984; 52,489; 52,849

Solution:

All three numbers begin with 52 thousand, so compare the hundreds digits.

- 52,984 has 9 hundreds.
- 52,489 has 4 hundreds.
- 52,849 has 8 hundreds.

Order the hundreds digits from least to greatest: 4, 8, 9

Answer:

52,489; 52,849; 52,984

Example 5: Rounding Whole Numbers

Problem:

Round 426,781 to the nearest thousand.

Solution:

The target place is the thousands place.

426,781

The digit in the thousands place is 6.

Look one place to the right. The hundreds digit is 7.

Since 7 is in the 5–9 group, increase the thousands digit from 6 to 7.

Change every digit to the right of the thousands place to 0.

Answer:

426,781 rounds to 427,000.

Reasonableness Check:

426,781 is between 426,000 and 427,000. It is closer to 427,000, so the rounded answer makes sense.

Example 6: Creating the Greatest and Least Numbers

Problem:

Use the digits 8, 4, 0, 6, 2, and 9 exactly once.

a) Create the greatest possible six-digit number.

b) Create the least possible six-digit number.

Solution:

Part a: Greatest Number

Arrange the digits from greatest to least:

9, 8, 6, 4, 2, 0

Greatest number:

986,420

Part b: Least Number

The digits in order from least to greatest are:

0, 2, 4, 6, 8, 9

The number cannot begin with 0 because 024,689 would be read as 24,689, which is only a five-digit number.

Place the smallest nonzero digit first. Then place 0 and the remaining digits from least to greatest:

2, 0, 4, 6, 8, 9

Least number:

204,689

Answer:

a) 986,420

b) 204,689

Guided Practice

Try It 1: Find a Digit's Value

What is the value of the digit 8 in 48,263?

Hint: Imagine the decimal point after the ones place and count to the left.

8 is in the _____ place.

8 · _____ = _____

Check Your Work:

8 is in the thousands place.

8 · 1,000 = 8,000

The value of the digit 8 is 8,000.

Try It 2: Write in Standard Form

Write the number in standard form:

six million, one hundred twenty thousand, three hundred

Break it into periods:

6 million = _____

120 thousand = _____

3 hundred = _____

Combine the values:

Check Your Work:

6,000,000 + 120,000 + 300 = 6,120,300

Try It 3: Write in Expanded Form

Write 72,946 in expanded form.

72,946 = 70,000 +

_____ + _____ +

_____ + _____

Check Your Work:

72,946 = 70,000 + 2,000 + 900 + 40 + 6

Try It 4: Compare from Left to Right

Compare using <, >, or =.

5,020,060 ___ 5,020,006

Hint: Move from left to right until you find the first place where the digits are different.

Check Your Work:

The first different digits are in the tens place.

6 tens > 0 tens

5,020,060 > 5,020,006

Try It 5: Order the Numbers

Order from least to greatest.

63,481; 63,418; 63,841

Hint: All three numbers begin with 63 thousand. Compare the hundreds digits next.

Check Your Work:

63,418; 63,481; 63,841

Try It 6: Round a Whole Number

Round 83,649 to the nearest hundred.

Target digit: _____

Neighboring digit: _____

Should the target stay the same or increase?

_____

Rounded number: _____

Check Your Work:

The target digit is 6 in the hundreds place.

The neighboring digit is 4.

Since 4 is in the 0–4 group, the 6 stays the same.

83,649 rounds to 83,600.

Try It 7: Check the Error

A student says:

72,430 > 724,030 because 72,430 has fewer zeros.

Is the student correct? Explain briefly.

Check Your Work:

The student is not correct. The number 724,030 has six digits, while 72,430 has five digits. A six-digit whole number is greater than a five-digit whole number.

72,430 < 724,030

Try It 8: Build a Number

Use the digits 5, 0, 8, 3, 1, and 6 exactly once.

a) Create the greatest possible six-digit number.

b) Create the least possible six-digit number.

Hint: For the least number, do not place 0 first.

Check Your Work:

a) Greatest: 865,310

b) Least: 103,568

Class Worksheet

Name: _____ **Date: _____**

Unit 1: Whole Numbers, Place Value, and Operations
Lesson 1: Place Value, Number Forms, and Comparing Whole Numbers

Instructions:
Complete each problem. Show your work when needed. Use the examples from the lesson to help you.

Part 1: Place Value and Number Forms

1. What is the value of the digit 6 in 364,821?

2. What is the value of the digit 9 in 2,917,450?

3. What is the value of the digit 4 in 8,036,412?

4. Write the number in standard form: seventy-three thousand, five hundred eight.

5. Write the number in standard form: four million, sixty-two thousand, nineteen.

6. Write 508,214 in word form.

7. Write 64,932 in expanded form.

8. Write 3,207,406 in expanded form.

Part 2: Compare, Order, and Round

9. Compare using <, >, or =.

58,219 _____ 58,291

10. Compare using <, >, or =.

4,060,008 _____ 4,006,080

11. Compare using <, >, or =.

725,400 _____ 725,400

12. Order the numbers from least to greatest.

46,728; 46,287; 46,782

13. Order the numbers from greatest to least.

803,219; 830,129; 803,291

14. Round 52,784 to the nearest hundred.

15. Round 438,615 to the nearest thousand.

16. Round 6,472,891 to the nearest ten-thousand.

Part 3: Apply It

17. Use the digits 7, 3, 0, 9, 2, and 5 exactly once.

a) Create the greatest possible six-digit number.

b) Create the least possible six-digit number.

18. A student says, “84,920 > 849,200 because 84,920 has fewer zeros.” Is the student correct? Explain the mistake and write the correct comparison.

19. A library recorded 126,748 visitors last year and 126,784 visitors this year.

a) Which year had more visitors?

b) Write a comparison using <, >, or =.

c) Round each number to the nearest hundred.

Last year:

This year:

20. Complete the missing forms for 705,309.

Word Form:

Expanded Form:

Class Worksheet Answer Key

1. 60,000: The digit 6 is in the ten-thousands place.
2. 900,000: The digit 9 is in the hundred-thousands place.
3. 400: The digit 4 is in the hundreds place.
4. 73,508
5. 4,062,019
6. five hundred eight thousand, two hundred fourteen
7. 64,932 = 60,000 + 4,000 + 900 + 30 + 2
8. 3,207,406 = 3,000,000 + 200,000 + 7,000 + 400 + 6
9. 58,219 < 58,291
10. 4,060,008 > 4,006,080
11. 725,400 = 725,400
12. 46,287; 46,728; 46,782
13. 830,129; 803,291; 803,219
14. 52,800: The tens digit is 8, so hundreds digit rounds up.
15. 439,000: The hundreds digit is 6, so the thousands digit rounds up.
16. 6,470,000: The thousands digit is 2, so the ten-thousands digit stays the same.
17. a) 975,320

    b) 203,579: The least number cannot begin with 0, so the smallest nonzero digit goes first.
18. The student is not correct. The number 849,200 has six digits, while 84,920 has five digits. A six-digit whole number is greater than a five-digit whole number.

    84,920 < 849,200
19. a) This year had more visitors.

    b) 126,748 < 126,784

    c) Last year: 126,700

    This year: 126,800
20. Word Form:

    seven hundred five thousand, three hundred nine

    Expanded Form: 705,309 = 700,000 + 5,000 + 300 + 9

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Infinity - Basic Middle School Mathematics
Unit 1, Lesson 1: Place Value, Number Forms, and Comparing Whole Numbers
Homework - Version A

1. Write the value of the indicated digit.

a) What is the value of the 8 in 48,263?

b) What is the value of the 7 in 715,904?

c) What is the value of the 2 in 3,209,451?

d) What is the value of the 3 in 6,430,018?

2. Write each number in standard form.

a) forty-two thousand, six hundred nineteen

b) three hundred eight thousand, four hundred five

c) two million, seventy-five thousand, nine

d) six million, one hundred twenty thousand, three hundred

3. Write each number in expanded form.

a) 54,782

b) 306,419

c) 2,018,605

d) 7,400,092

4. Compare using <, >, or =.

a) 48,219 ___ 48,291

b) 305,700 ___ 350,700

c) 2,040,008 ___ 2,040,080

d) 6,500,000 ___ 6,050,000

5. Multiple Choice: Which number is written in expanded form as 400,000 + 70,000 + 6,000 + 300 + 20 + 9?

A. 476,329
B. 470,629
C. 467,329
D. 476,239

6. Multiple Choice: Which statement correctly compares 805,216 and 850,126?

A. 805,216 > 850,126 because 216 is greater than 126.
B. 805,216 < 850,126 because 805 thousands is less than 850 thousands.
C. 805,216 = 850,126 because both numbers have six digits.
D. 805,216 > 850,126 because 805 is greater than 850.

7. Explain why the digit 5 has a different value in 5,000, 500, 50, and 5.

8. A student says 72,430 is greater than 724,030 because 72,430 has fewer zeros, so it is easier to read. Explain the mistake and write the correct comparison.

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Infinity - Basic Middle School Mathematics
Unit 1, Lesson 1: Place Value, Number Forms, and Comparing Whole Numbers
Homework - Version A

9. Real-World: A school district has 48,736 students. A nearby district has 48,763 students.

a) Which district has more students?

b) How many more students does that district have?

c) Round each number to the nearest hundred.

10. Multi-Step Application: A stadium had 52,489 people at a football game on Friday and 52,984 people at a football game on Saturday.

a) Compare the two attendance numbers using <, >, or =.

b) Find the difference in attendance.

c) Round each attendance number to the nearest thousand.

d) Based on the rounded numbers, explain why rounding is useful but not exact.

11. Algebra-Prep Bridge: Let n = 638,472.

a) What is the value of the digit 6 in n?

b) What is the value of the digit 3 in n?

c) What is the value of the digit 8 in n?

d) Write n in expanded form.

12. Challenge: Use the digits 8, 4, 0, 6, 2, and 9 exactly once to create each number.

a) Create the greatest possible six-digit number.

b) Create the least possible six-digit number.

c) Explain why your least number cannot begin with 0.

d) Find the difference between the greatest and least numbers.