

Lecture Notes

MODULE 0: BASIC MATH

M0.1 Counting and Comparing Numbers

M0.1 Practice 1 - Counting Numbers

Definitions

- Understanding meanings of “math words” is essential for comprehending mathematical concepts.
- Write down the definitions into your notebook and get to know them.
- A **whole number** is any number that is not a fraction or a decimal.
 - Ex: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10...

Count the number of triangles.



There are 2 triangles. (Type a whole number.)

- Use **finger counting** at first, if necessary.
- Here we are counting triangles. Many years ago, farmers were counting sheep or horses, etc.
- The numbers we use to count objects are called **counting numbers**.
 - They do not include zero, fractions, decimals, or negative numbers.

Use a number line to determine what number comes after 10.



Find the number that comes after 10.

10, 11

- Going **left** on the **number line** means that numbers are getting **smaller**.
- Going **right** on the number line means that numbers are getting **bigger**.

What number comes before 6 and after 4?

Find the number that comes before 6 and after 4.

4, 5, 6

What number comes before 28 and after 26?

Find the number that comes before 28 and after 26.

26, 27, 28

- The numbers are in the **twenties**: 26, 27, 28.
- What number then is between 6 and 8?

What number comes before 148 and after 146?

Find the number that comes before 148 and after 146.

146, 147, 148

- The numbers are in the **one hundred forties**: 146, 147, 148.
- What number then is between 6 and 8?

Count forward from 5.

5, 6, 7, 8

- Going to the **right** on the number line means that the number is getting **bigger**, which is what is meant by “count forward”.

Count forward from 34.

34, 35, 36, 37

- The starting number is in the **thirties**: 34.
- Then we start “counting forward” from the number 4.

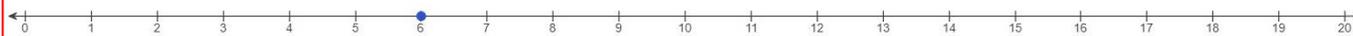
Count forward from 112.

112, 113, 114, 115

- The starting number is **112**.
- Then we start “counting forward” from the number 2.

M0.1 Practice 2 - Skip Counting Numbers

Use a number line to count by 2's starting at 6.



Count by 2's starting at 6.

6, 8, 10, 12

- We will **skip count** by 2's.
- Starting at **6**, we skip count: **6**, 7, **8**, 9, **10**, 11, **12**.

Use a number line to count by 5's starting at 2.



Count by 5's starting at 2.

2, 7, 12, 17

- We will skip count by 5's.
- Starting at **2**, we skip count: **2**, 3, 4, 5, 6, **7**, 8, 9, 10, 11, **12**, 13, 14, 15, 16, **17**.
- A better and faster way to do this is to start at **2** and then keep adding by **5**.
 - $2 + 5 = 7$; then $7 + 5 = 12$; then $12 + 5 = 17$.

Use a number line to count by 10's starting at 36.



Count by 10's starting at 36.

36, 46, 56, 66

- We will skip count by 10's.
- Starting at **36**, we keep adding by **10**.
 - $36 + 10 = 46$; then $46 + 10 = 56$; then $56 + 10 = 66$.

Use a number line to count by 100's starting at 160.



Count by 100's starting at 160.

160, 260, 360, 460

- We will skip count by 100's.
- Starting at **160**, we keep adding by **100**.
 - $160 + 100 = 260$; then $260 + 100 = 360$; then $360 + 100 = 460$.

Write the number that completes the pattern. Then determine the pattern rule.

24, 26, 28, 30, ____, 34

Complete the pattern.

24, 26, 28, 30, **32**, 34

The pattern skips numbers by **2**.

- To discern a pattern, we must look at the side of the “blank spot” that has the *most numbers*.
- The left side of the “blank spot” has the most numbers: 24, 26, 28, 30.
- How much are those numbers skip counting by? They are skip counting by **2**, right?
- Therefore, if we add **2** to the 30, we will complete the pattern. The answer is **32**.
- As a check, we see that the number on the right side of **32** is 34. This verifies we are correct because **32** + **2** = 34.

Write the number that completes the pattern. Then determine the pattern rule.

18, ____, 28, 33, 38, 43

Complete the pattern.

18, **23**, 28, 33, 38, 43

The pattern skips numbers by **5**.

- Another way to discern a pattern is to calculate the **difference** between each number.
 - The word **difference** in math means to **subtract**.
- We start with the highest number, which is 43.
- Then we **subtract** 43 by the next lowest number, which is 38. So, $43 - 38 = 5$.
 - The difference between 43 and 38 is **5**.
- Then we **subtract** 38 by the next lowest number, which is 33. So, $38 - 33 = 5$.
 - The difference between 38 and 33 is **5**.
- We can see that the difference between all the numbers is **5**, which is another way of saying that the skip count is **5**.
- Finally, we can add **5** to the 18 and get **23**, the answer.

Write the number that completes the pattern. Then determine the pattern rule.

144, 154, ____, 174, 184, 194

Complete the pattern.

144, 154, **164**, 174, 184, 194

The pattern skips numbers by **10**.

Write the number that completes the pattern. Then determine the pattern rule.

200, 300, 400, 500, 600, ____

Complete the pattern.

200, 300, 400, 500, 600, 700

The pattern skips numbers by 100.

Which of the following numbers are divisible by 2?

22, 3, 16, 5, 26, 8, 9, 20, 4, 15, 14

The numbers divisible by 2 are 22, 16, 26, 8, 20, 4, 14.
(Use commas to separate answers.)

- A number is **divisible** by another number if it divides evenly into it with no remainder.
- Quick discussion of **place value**.
- A number *is* divisible by **2** (called **even**) if it has **0, 2, 4, 6, or 8** at the “ones” digit place.
 - Example: 18 is divisible by 2 because 18 has an **8** in its “ones” digit place.
 - If you were to divide 18 by 2, the answer would be exactly 9, with no remainder.
- A number *is not* divisible by **2** (called **odd**) if it has **1, 3, 5, 7, or 9** at the “ones” digit place.
 - Example: 17 is not divisible by 2 because 17 has a **7** in its “ones” digit place.
 - If you were to divide 17 by 2, the answer would be 8, with a remainder of 1.

Example: Determine whether 14 is even or odd.

Example: Determine whether 47 is even or odd.

M0.1 Practice 3 - Comparing Numbers

In the given pair of numbers, determine the smaller number. Then use < or > to write a true statement.

7, 4

Which number is smaller?

4

7

Write a true statement.

4 < 7

- One way to visualize which of two numbers (4 and 7 for example) is bigger is to write the **digits**, including any number between 4 and 7, like this: **4 5 6 7**.
 - Then recall that for any number (4 for example) listed on the number line, if it is to the left of another number (7 for example), then the number to the left (the number 4) is the smaller number.
 - Similarly, for any number (7 for example) listed on the number line, if it is to the right of another number (4 for example), then the number to the right (the number 7) is the bigger number.
- A simpler way to notate which of two numbers is smaller or bigger than the other is to use a **strict inequality** symbol: < or >.
 - The **pointer** of the **arrowhead** should be situated so that it points to the **smaller** number.
 - Conversely, the **wide part** of the **arrowhead** should be situated so that it faces the **bigger** number.
- The answer is pronounced like this, “four is **less than** 7.”
- It would also be mathematically correct to say, “seven is **greater than** 4.”
- However, since we typically read from left to right, saying “four is less than seven” is the preferred and more formal way to define the answer.

Use < or > for to write a true statement.

4 1

4 1

Use < or > for to write a true statement.

1 0

1 0