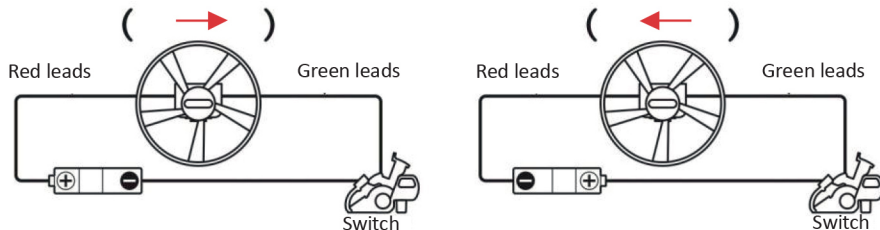


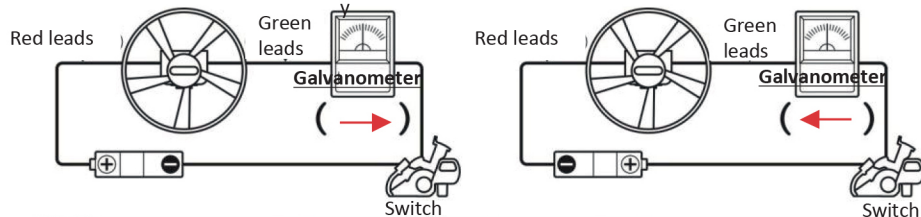
# Multi-Functional Electric Car - Model NR Worksheet

Experiment 1: Let's find out which way the batteries are connected and how the current flows!

☆ For each battery orientation, write the direction in which the motor is rotating with an arrow in ( ).

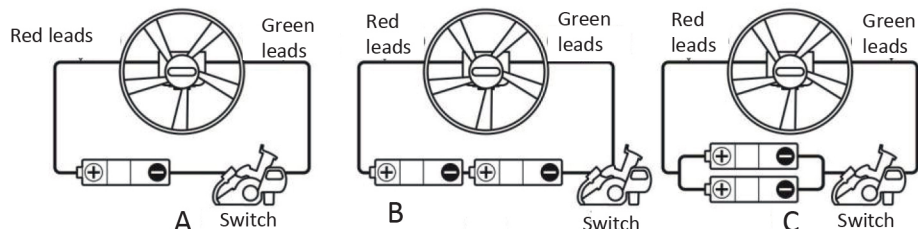


☆ For each battery orientation, write the galvanometer needle's direction with an arrow in ( ).



Experiment 2: Let's find out how strong the current is by changing how the batteries are connected!

☆ Which connection of A, B, and C turns the fastest? ( ) **B**

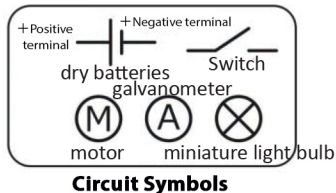
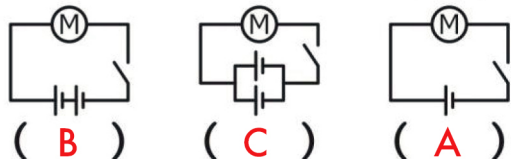


☆ What is the name of the method used to connect the batteries in B and C?

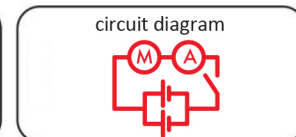
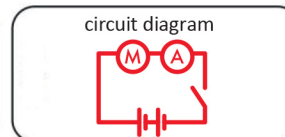
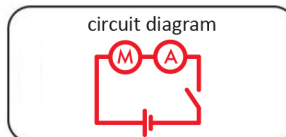
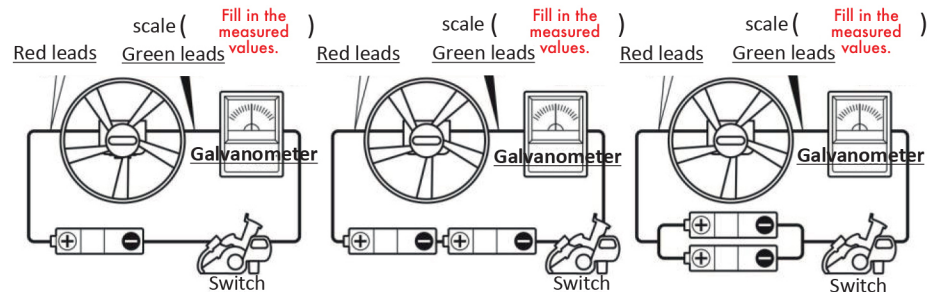
Let's write in the brackets ( ) below.

B ( **Series** ) connection C ( **Parallel** ) connection

☆ Choose the same connection method from A, B, and C as in the three schematics below, and write your answer in the blankets.



☆ Measure the current strength in each battery connection and write the number on the scale in the brackets. Draw a circuit diagram for each below.



☆ Write on the right the speed at which the motor turns when connected to two batteries compared to when connected to one battery.

speed at which motor turns  
<example>  
It is faster than connecting one battery.

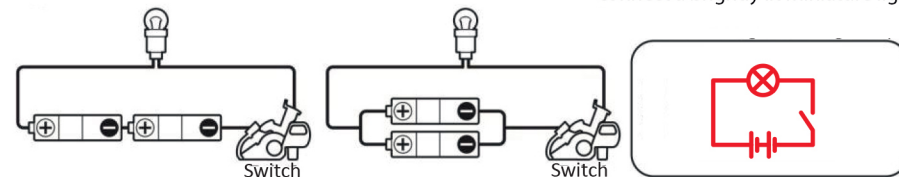
speed at which motor turns  
<example>  
About the same as connecting a single battery.

☆ Summarize the relationship between how to connect dry batteries and the strength of the current

<example>  
When the batteries are connected in series, a stronger current flows than when one is connected, and the motor rotates faster. When the batteries are connected in parallel, the same amount of current flows as when one is connected, and the rotation of the motor does not change.

**Let's try!** Let's find out how to connect a battery and the brightness of a miniature light bulb!

☆ Draw a schematic below showing how to connect a brightly lit miniature light bulb.



☆ What is the light bulb's brightness when connected to two batteries compared to one battery?

<example>  
The series connection of the batteries is brighter than the single battery connection, and when the batteries are connected in parallel, the brightness does not change

### Experiment 3: Let's check the strength of the current using motor car

**How to connect 1 dry battery**

Red leads

Green leads

position to connect to the galvanometer

Galvanometer

scale ( Fill in the measured values )

☆ Write down the speed at which the motor car moves when connected in series and parallel, compared to when connected to a single battery.

Running speed of the series connection  
<example> It runs faster than connecting one battery.

Running speed of the parallel connection  
<example> It runs as quickly as a single battery connection.

☆ Measure the current of each motor cars and write down the measurement in the bracket ( )

**Dry batteries connected in series**

Red leads

Green leads

position to connect to the galvanometer

Galvanometer

scale ( Fill in the measured values )

**Dry batteries connected in parallel**

Red leads

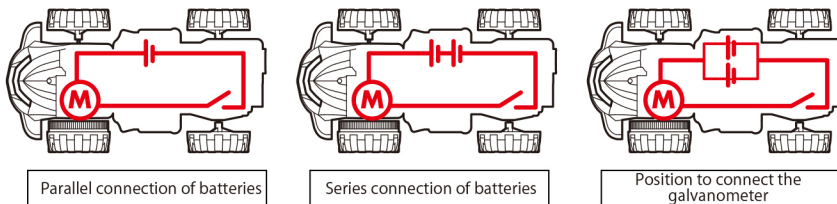
Green leads

position to connect to the galvanometer

Galvanometer

scale ( Fill in the measured values )

☆ Let's look at each motor car from above and add a circuit diagram to the diagram below.



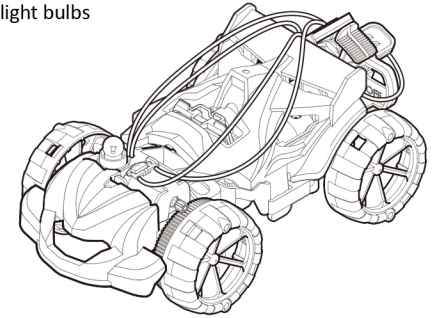
☆ Summarize the relationship between the speed at which a motor car runs and the strength of the electric current.

<example> A strong current flows in the series connection where the motor car runs fast.  
Also, if two batteries are connected in parallel, they will run at the same speed as when one battery is connected, and the same amount of current flows.

**Let's try!** Let's make a motor car run with miniature light bulbs

☆ Let's write your thoughts after running motor car with miniature light bulb

Each person fills in their own opinions.



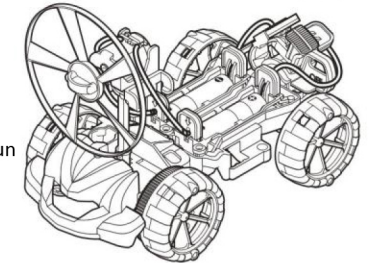
**Let's try!** Let's run a propeller car

How was the propeller car able to run?

<example>The propeller turned, and it started to run slowly.

Let's write your thoughts after making the propeller car run

Each person fills in their own opinions.



**Let's try!** Fly the propeller

☆ The propeller spins when I switch it on, but it doesn't fly up. What should I do?

☆ How does the propeller fly when connected to two batteries compared to one battery?

<example>Try changing the direction of the battery.

<example>When the batteries are connected in series, it flies higher than when there is only one battery. However, when the batteries are connected in parallel, the flying height remains the same.

