

Unit 1: Skill Builder 2 - Turning
Goals:

You will write a program on the calculator to turn the Rover left and right at various angles. You are challenged to make their Rover slowly turn like the hands of clock and to report the time of day on the calculator.

1. Explore how the Rover turns using the RV commands.
2. Use variables to calculate and display data.
3. Experiment with speed settings
4. Use For Loops to carry out repetitive tasks.

Background:

The Rover turns by rotating its wheels in opposite directions at the same speed at the same time. This type of turn is called a spin because it spins in a circle that has a center at the midpoint of the two wheels. This midpoint is also the location of the marker tip when a dry-erase marker is inserted into the pen holder. When the Rover performs a turn, the program needs to inform the motors the direction and size of the spin. The direction is determined by LEFT or RIGHT, this direction is from the view of as if Rover had a driver's seat. The size is determined by the angle, this is a value in degrees, radians, or gradians. A full spin is 360 degrees. This number is from the base 60 sexagesimal system used by the Sumerians in ancient Babylon. Similarly, a full spin is 2π radians. This number comes from the fact that the angular width of an arc of one radius in length along the circumference of any circle is defined as one radian. Also, a full spin is 400 gradians. The grad is defined in the metric system as 1/100 of a circle quadrant. The Rover can accept all three units when an angle is given using the key words of DEGREES, RADIANS and GRADS.

Rover Command	Example	Behavior
RV LEFT <i>angle</i> SPEED <i>speed</i> UNIT	RV LEFT	?? You will discover this in your exploration...
RV RIGHT <i>angle</i> SPEED <i>speed</i> UNIT	RV RIGHT	?? You will discover this in your exploration...
	RV LEFT 45	Rover makes a 45° left hand spin
	RV RIGHT 3.14 RADIANS **	Rover makes a π radians (180°) right hand spin
	RV RIGHT 200 GRAD ***	Rover makes a 200 gradians (180°) right hand spin
	RV LEFT 180 SPEED 0.14 M/S ****	Rover makes a slow 180° left hand turn
	RV RIGHT 180 SPEED 0.23 M/S ****	Rover makes a fast 180° right hand turn

* The LEFT and RIGHT turns are made with a frame of reference from Rover's driver's seat.

** Radians is an angular unit of measure used in mathematics. There are 2π RADIANS in 360° DEGREES.

*** Gradians is an angular unit of measure also used in mathematics. There are 100 GRADIANS in a quarter circle; hence 400 grads in a full circle.

**** The maximum speed is 0.23 M/S and the minimum is 0.14 M/S.

Challenges:

Challenge 1: You will use the RV Right command to rotate the Rover in a complete circle.

- ☐ Task 1: Write a program named **c1** that uses the RV RIGHT command. How many degrees does the Rover turn if an angle isn't given in this command?
- ☐ Task 2: Now modify your program to rotate the Rover in a complete circle.
- ☐ Task 3: Modify your program to complete the circle rotation faster than in Task 2.

Challenge 2: Write a program named **c2** to make the Rover turn four times to create a circle and display the total angle turned at the end of each turn step.

Challenge 3: Write a program named **c3** and use a For...End loop to turn three circles to the right and then three circles to the left and display the total angle turned by the Rover on the calculator screen.

Challenge 4: Write a program named **c4** that has Rover model the hour hand on a clock. Include the time that Rover is pointing to on the display of the calculator.

- ☐ Extension: Can you make it do one complete rotation in approximately 12 seconds? Can you make it take 24 seconds?