

# Meet TI-Rover

# Geometry Challenges Day

TI-84 Plus CE

TI-Basic

Texas Instruments

@ticalculators



[www.TIstemProjects.com](http://www.TIstemProjects.com)

---

Contact [stem-team@ti.com](mailto:stem-team@ti.com) with questions

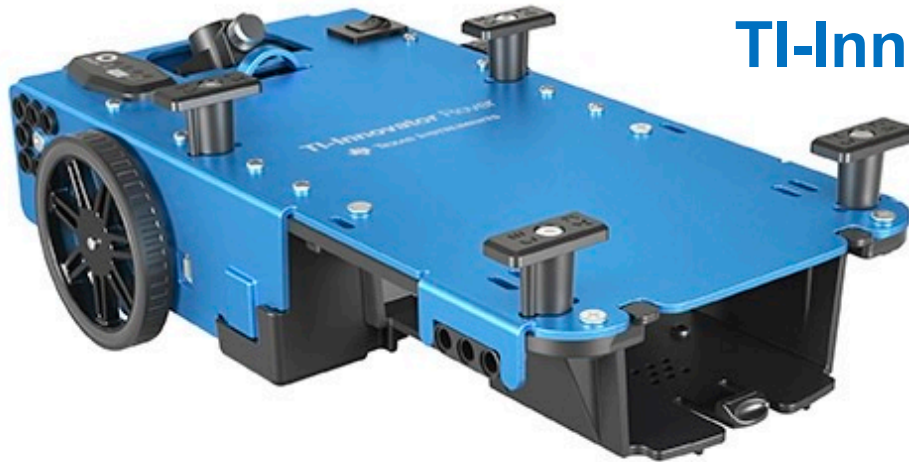
# Meet the TI-Innovator™ Rover



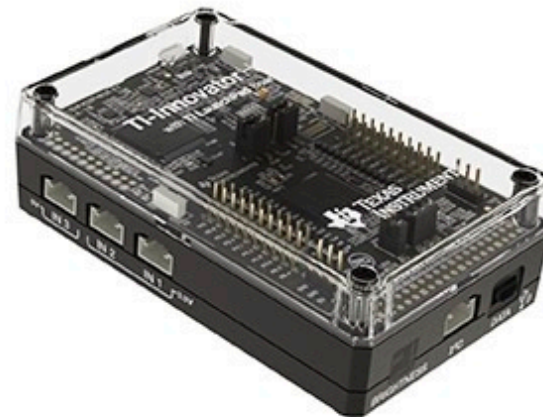
## TI Graphing Calculator



## TI-Innovator™ Rover



## TI-Innovator™ Hub



# Rover from the top

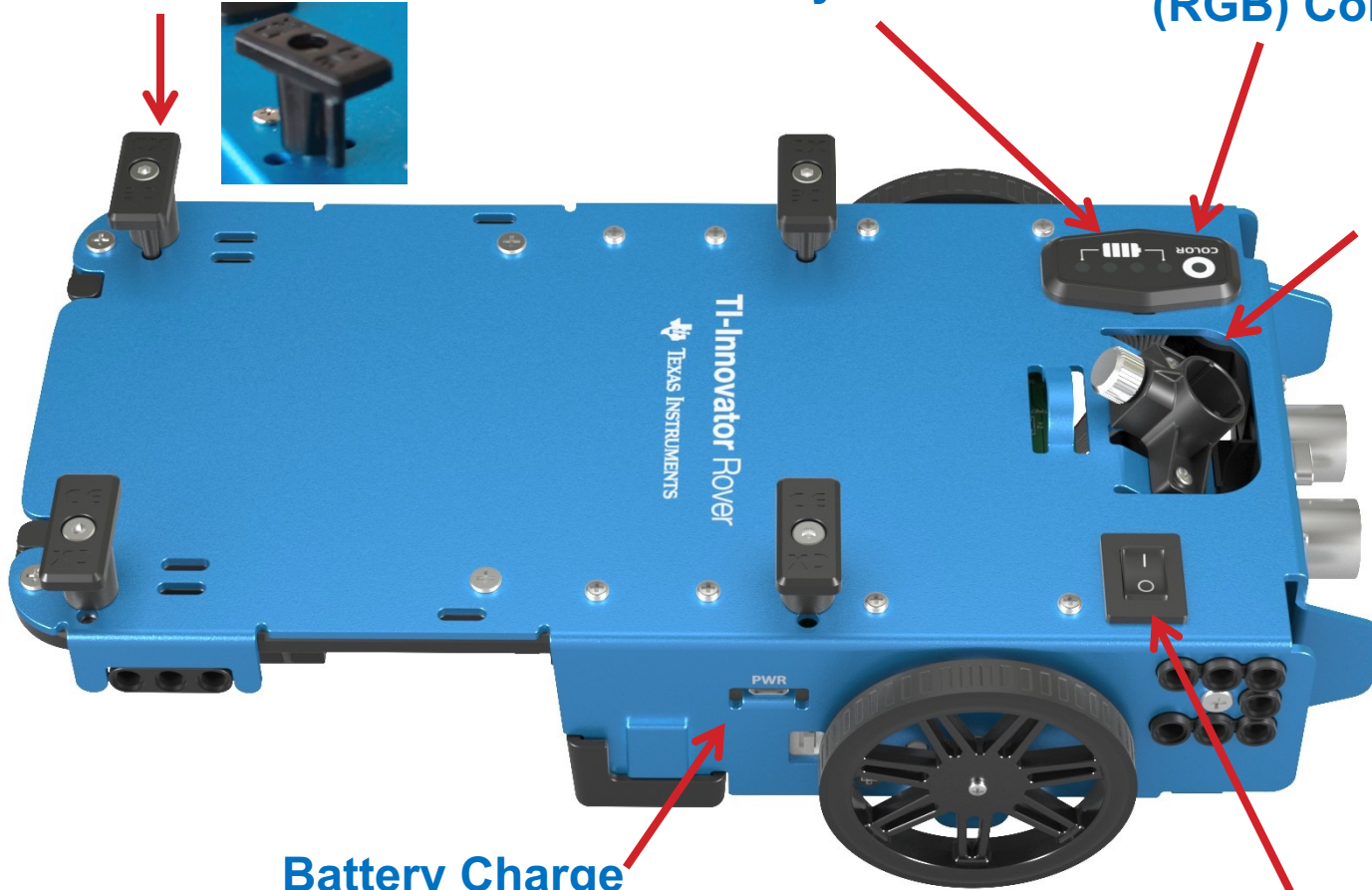
Calculator holder posts.  
Lift and twist to CE or CX side.



Battery indicator

Red-Green-Blue  
(RGB) Color LED

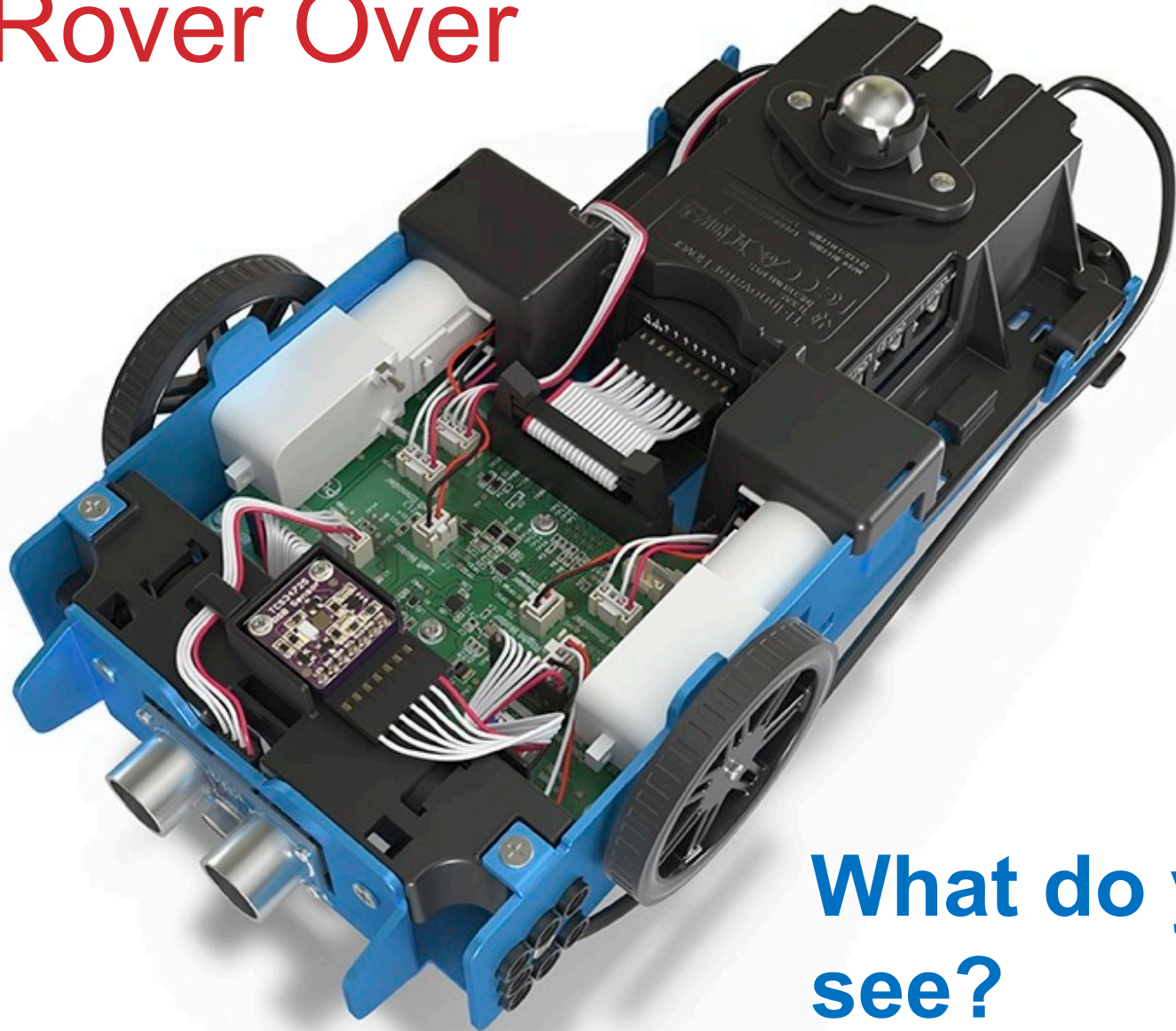
Marker holder  
(Expo Fine and  
Ultra Fine sizes)



Battery Charge  
with USB micro  
to wall adapter.

On/Off Switch

# Turn Rover Over



What do you see?

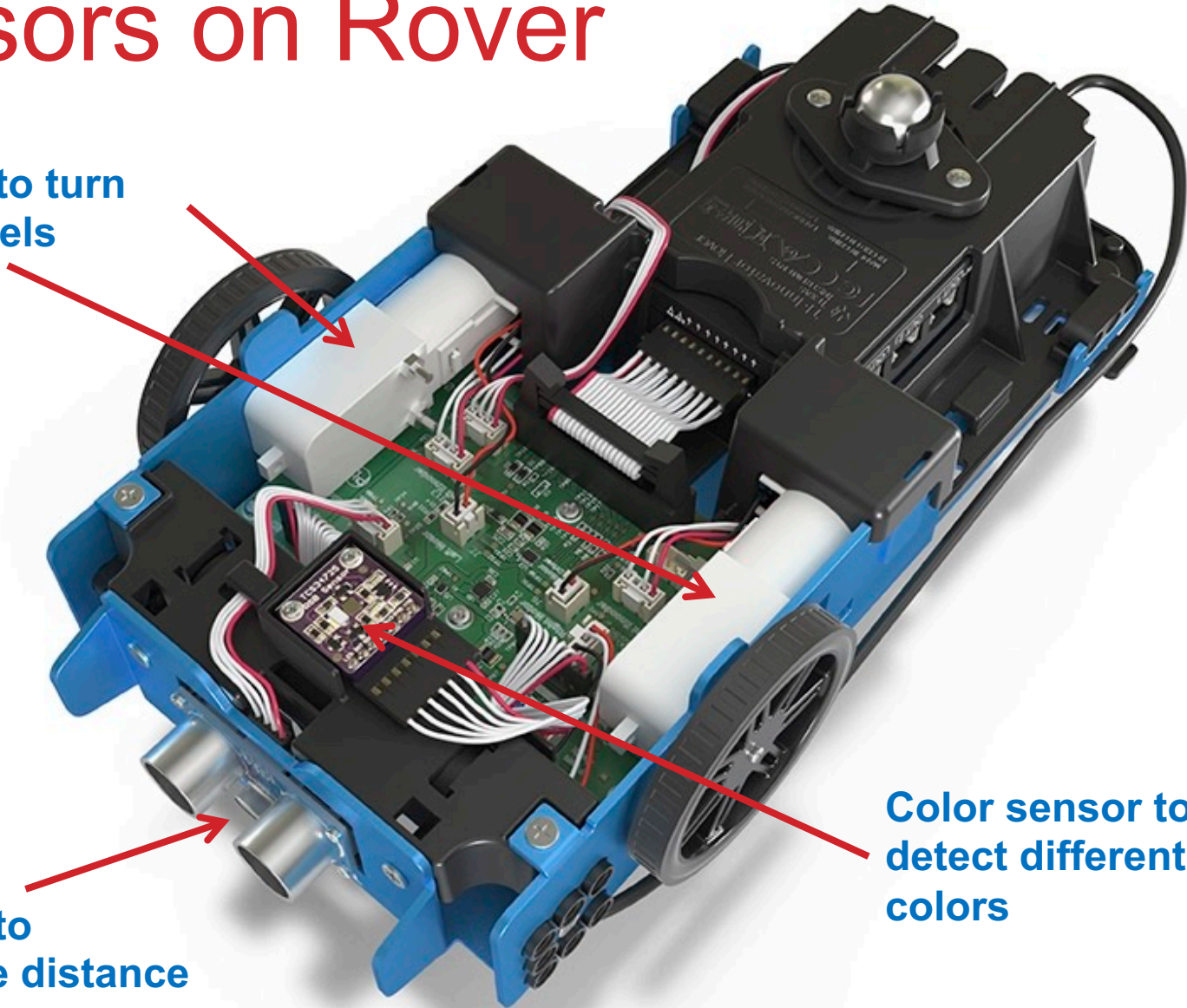


# Sensors on Rover

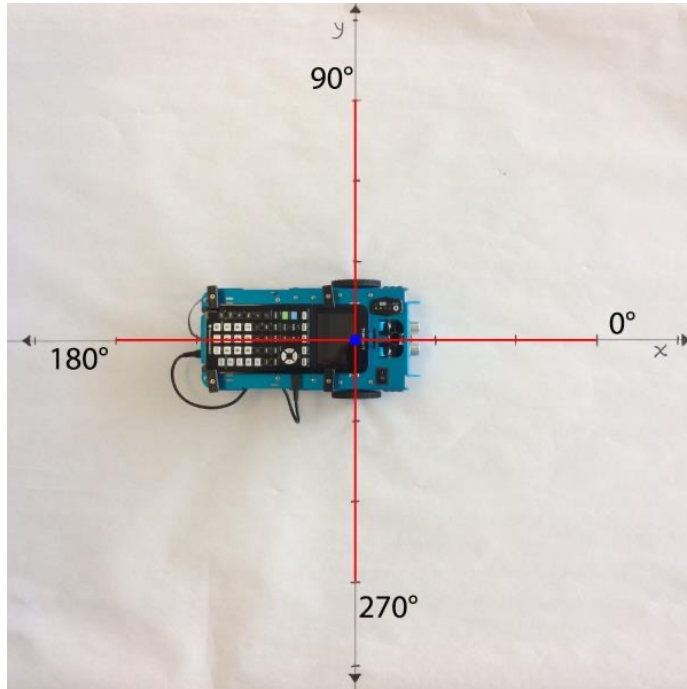
Motors to turn the wheels

Ranger to measure distance

Color sensor to detect different colors



# TI-Rover orientation and virtual grid



Rover programs set the initial position as the origin and the heading as 0 degrees measured from the x-axis.

**Note:** The Rover tracks its position on a virtual coordinate grid with a unit value of 10 cm. The coordinate grid position applies to the RV TO XY, RV TO POLAR, and RV TO ANGLE on the Drive RV Drive menu. The virtual grid also applies to the RV Path menu functions.

# Connecting Rover to your calculator



1 Make sure that your Rover is switched on.

3 Plug A side into port on calculator the Rover Hub.

2 Plug B side into USB B port of the Rover Hub.



Unit-to-unit cable





# Connecting your calculator to the Rover

## Initial Connection

- » Step 1: Make sure that Rover is switched ON
- » Step 2: plug unit-to-unit cable into Hub
  - » (Use end of cable labeled B)
- » Step 3: plug unit-to-unit cable into the calculator
  - » (Use end of cable labeled A)

## Troubleshooting

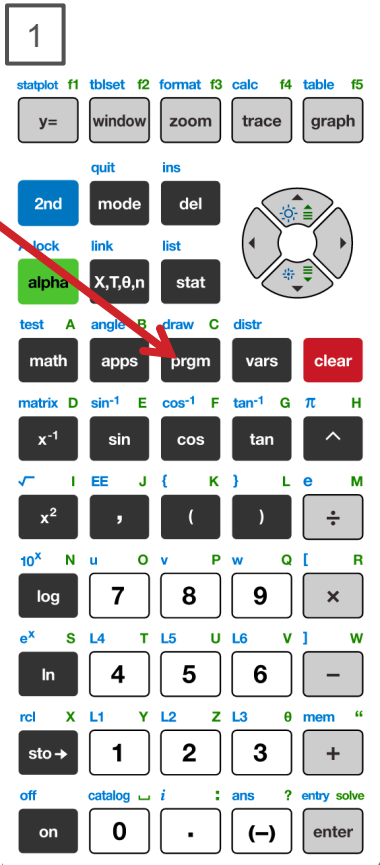
### Try the following as a fast fix:

- » Step 1: unplug the unit-to-unit cable from the hub and the calculator.
- » Step 2: re-connect in the order of first Hub then calculator second.

### If the fast fix does not work, try these steps:

- » Step 1: unplug unit-to-unit cable from both the hub and the calculator
- » Step 2: Switch Rover OFF
- » Wait a second
- » Step 3: Switch Rover ON
- » Step 4: plug unit-to-unit cable into Hub
- » Step 5: plug unit-to-unit cable into the calculator

# Creating a new Rover Program



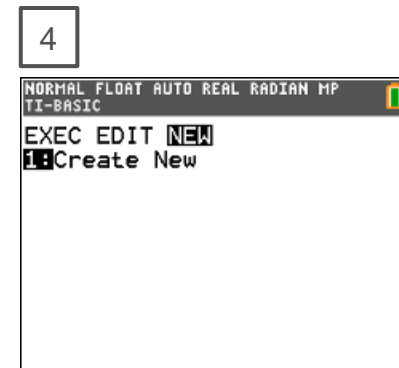
Press the **[prgm]** key to create, edit and execute TI-Basic programs.



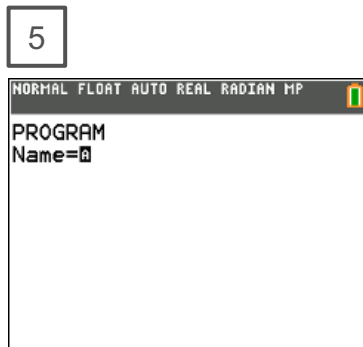
Press **[enter]** or Press **[1]** to select 1: TI-Basic



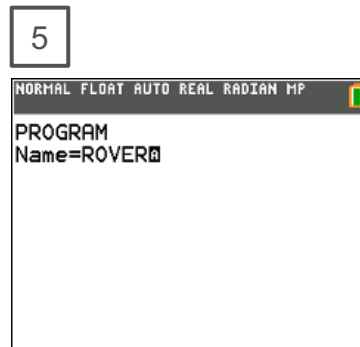
You have the option to execute (run), edit or create programs.



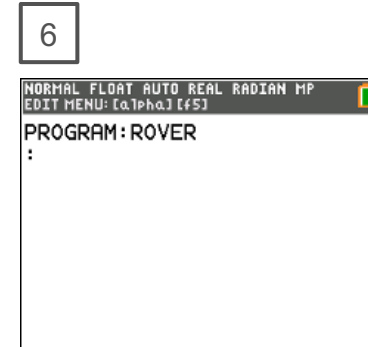
Use **right arrow** key to move to NEW 1:Create New Press **[1]** or **[enter]** to select.



You are prompted to enter a program name. The blinking A cursor shows that you are in alpha entry mode. The green alpha labels on the keys are active.



Type your program name and press **[enter]**.



You are now in position to begin entering commands to your program.

# Entering a Rover Program

1

```
NORMAL FLOAT AUTO REAL RADIAN MP
CTL I/O COLOR EXEC HUB
1: If
2: Then
3: Else
4: For(
5: While
6: Repeat
7: End
8: Pause
9: Lbl
```

Press the **[prgm]** key again to bring up the program edit menu. You will see this menu when you are editing a program.

5

```
NORMAL FLOAT AUTO REAL RADIAN MP
EDIT MENU: [aTpha] [f5]
PROGRAM: ROVER
:Send("CONNECT RV")
```

The command is pasted to your program. Send("Connect RV") is required at the beginning of every Rover program.

2

```
NORMAL FLOAT AUTO REAL RADIAN MP
CTL I/O COLOR EXEC HUB
1: Send("SET...
2: Send("READ...
3: Settings...
4: Wait
5: Get(
6: eval(
7: Rover (RV)...
8: Send("CONNECT-Output...
9: Send("CONNECT-Input...
```

Press **right arrow** repeatedly or **left arrow** to move to the HUB menu.

6

```
NORMAL FLOAT AUTO REAL RADIAN MP
EDIT MENU: [aTpha] [f5]
PROGRAM: ROVER
:Send("CONNECT RV")
:
```

Press **[enter]** to move to a new line in the program. Every command must be on its own line.

3

```
NORMAL FLOAT AUTO REAL RADIAN MP
CTL I/O COLOR EXEC HUB
1: Send("SET...
2: Send("READ...
3: Settings...
4: Wait
5: Get(
6: eval(
7: Rover (RV)...
8: Send("CONNECT-Output...
9: Send("CONNECT-Input...
```

Use down arrow to move to 7: Rover and press **[enter]** or press **[7]**

7

```
NORMAL FLOAT AUTO REAL RADIAN MP
CTL I/O COLOR EXEC HUB
1: If
2: Then
3: Else
4: For(
5: While
6: Repeat
7: End
8: Pause
9: Lbl
1: Send("SET...
2: Send("READ...
3: Settings...
4: Wait
5: Get(
6: eval(
7: Rover (RV)...
8: Send("CONNECT-Output...
9: Send("CONNECT-Input...
Rover (RV)
1: Drive RV...
2: Read RV Sensors...
3: RV Settings...
4: Read RV Path...
5: RV Color...
6: RV Setup...
7: RV Control...
8: Send("CONNECT RV")
9: Send("DISCONNECT RV")
Send("RV FORWARD 3")
1: FORWARD
2: BACKWARD
3: LEFT
4: RIGHT
5: STOP
6: RESUME
7: STAY
8: TO XY
9: TO POLAR
```

Press **[prgm]**, **left arrow** to HUB menu, **[7]** Rover, **[1]** Drive then **[enter]** to select FORWARD

4

```
NORMAL FLOAT AUTO REAL RADIAN MP
Rover (RV)
1: Drive RV...
2: Read RV Sensors...
3: RV Settings...
4: Read RV Path...
5: RV Color...
6: RV Setup...
7: RV Control...
8: Send("CONNECT RV")
9: Send("DISCONNECT RV")
```

Use down arrow to move to 8: Send("Connect RV") and press **[enter]** or press **[8]**

8

```
NORMAL FLOAT AUTO REAL RADIAN MP
EDIT MENU: [aTpha] [f5]
PROGRAM: ROVER
:Send("CONNECT RV")
:Send("RV FORWARD 3")
PROGRAM: ROVER
:Send("CONNECT RV")
:Send("RV FORWARD 3")
:
```

The command is pasted to your program. Finish the command by entering the number of units to drive, then close the command with **Alpha “** (plus key) and **close paren )** followed by **[enter]** to move to the next line.

# Running (Executing) a Rover Program

1

```
NORMAL FLOAT AUTO REAL RADIAN MP
EDIT MENU: {a,1pha} [f5]
PROGRAM: ROVER
:Send("CONNECT RV")
:Send("RV FORWARD 3")
:█
```

Press **[2<sup>nd</sup>] [quit]** (mode key) to exit the program editor and return to home screen.

2

```
NORMAL FLOAT AUTO REAL RADIAN MP
█
```

You run programs on the home screen. Press **[prgm]** again to see the menu of programs to run.

3

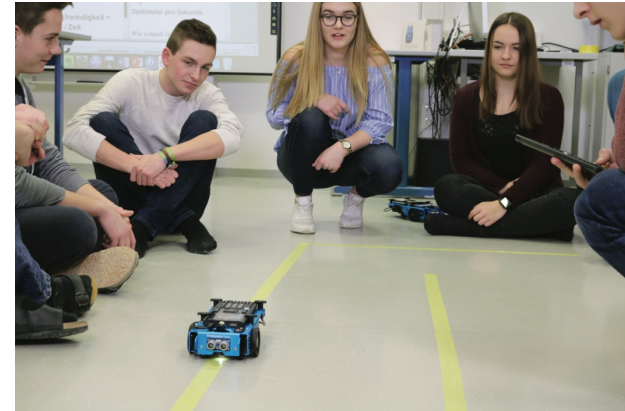
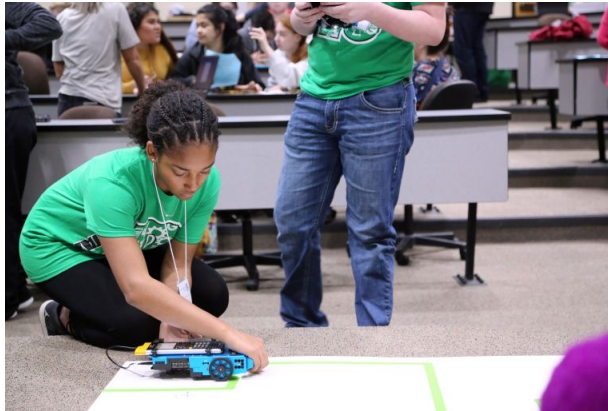
```
NORMAL FLOAT AUTO REAL RADIAN MP
TI-BASIC
EXEC EDIT NEW
1:ROVER
```

Select the program to run from the EXEC (execute) menu. In this case press **[enter]** or **[1]**.

4

```
NORMAL FLOAT AUTO REAL RADIAN MP
prgmROVER
```

Your selection is pasted to the home screen. Make sure that your Rover is connected and switched on. Press **[enter]** to run the program. Your Rover will drive forward 3 units.





# Editing a Rover Program

1

```
NORMAL FLOAT AUTO REAL RADIANT MP
prgmROVER
..... Done
█
```

Press the **[prgm]** key again to bring up the program menu.

2

```
NORMAL FLOAT AUTO REAL RADIANT MP
TI-BASIC
EXEC EDIT NEW
1:ROVER
```

Press **right arrow** to see a menu of programs to edit. Select a program from the menu.

3

```
NORMAL FLOAT AUTO REAL RADIANT MP
EDIT MENU: [a,Tpha] [f5]
PROGRAM:ROVER
:Send("CONNECT RV")
:Send("RV FORWARD 3")
:
```

Use arrow keys to move the cursor to a value to change.

4

```
NORMAL FLOAT AUTO REAL RADIANT MP
EDIT MENU: [a,Tpha] [f5]
PROGRAM:ROVER
:Send("CONNECT RV")
:Send("RV FORWARD █")
:
```

Type over the original value with a new value, then use the cursor to move to the next line.

5

```
NORMAL FLOAT AUTO REAL RADIANT MP
EDIT MENU: [a,Tpha] [f5]
PROGRAM:ROVER
:Send("CONNECT RV")
:Send("RV FORWARD 5")
:█
```

Add a turn command and another FORWARD command from the Rover Drive RV... menu.

6

```
NORMAL FLOAT AUTO REAL RADIANT MP
EDIT MENU: [a,Tpha] [f5]
PROGRAM:ROVER
:Send("CONNECT RV")
:Send("RV FORWARD 5")
:Send("RV LEFT 180")
:Send("RV FORWARD 5")
:█
```

You have the option to run the program from a menu within the program editor. Press **[alpha] f5** (graph key).

7

```
NORMAL FLOAT AUTO REAL RADIANT MP
PROGRAM:ROVER
:Sel█Execute Program
:Sel2:Undo Clear
:Sel3:Insert Line Above
:Sel4:Cut Line
:
5:Copy Line
6:Paste Line Below
7:Insert Comment Above
8:Quit Editor [2nd][quit]
FRAC | FUNC | YVAR | MENU
```

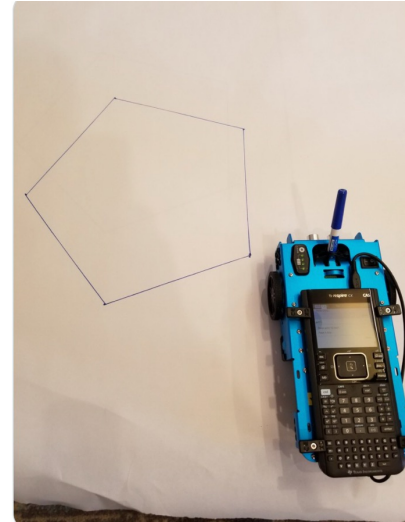
Make sure that your Rover is connected and on a surface ready to roll. tPress **[1]** or **[enter]** to run (execute) the program.

8

```
NORMAL FLOAT AUTO REAL RADIANT MP
prgmROVER
..... Done
prgmROVER
..... Done
█
```

The calculator program is done. You are ready for your next task.

# Drawing with the TI-Rover



Use Expo Fine or Extra Fine dry erase markers.

The markers drop into a slot on the front of the Rover.

Note: The Texas Instruments Workshop Loan Rover cases include markers.

Drawing surface: We recommend butcher paper held in place with painters tape on a hard surface.

# MAKE IT MOVE!

## New Program:

```
NORMAL FLOAT AUTO REAL RADIAM MP
EDIT MENU: [alpha] [f5]
PROGRAM:RV
:Send("CONNECT RV")
:Send("RV FORWARD █
```

**Task: Discover how far Rover drives per unit.**

Use differing values (1-20) to determine what 1 Rover unit is.

Enter a value for the number of grid units to drive forward.

Finish the command by entering the number of units to drive, then close the command with **alpha quotes (plus key)** and **close paren )** followed by **[enter]** to move to the next line.

# Change the Color

## New Program:

```
NORMAL FLOAT AUTO REAL RADIAN MP
EDIT MENU: [alpha] [f5]

PROGRAM: COLOR
:Send("CONNECT RV")
:Send("SET RV.COLOR █
```

**Task: Set the color output of the RGB LED.**

Each color takes a value (0-255).

**Challenge Task: Try to make Yellow**

Find the RV.COLOR command on the Rover menu.

```
NORMAL FLOAT AUTO REAL RADIAN MP
CTL I/O COLOR EXEC HUB
1:Send("SET...
2:Send("READ...
3:Settings...
4:Wait
5:Get(
6:eval(
7:Rover (RV)...
8:Send("CONNECT-Output...
9:Send("CONNECT-Input...
```

```
NORMAL FLOAT AUTO REAL RADIAN MP
Rover (RV)
1:Drive RV...
2:Read RV Sensors...
3:RV Settings...
4:Read RV Path...
5:RV Color...
6:RV Setup...
7:RV Control...
8:Send("CONNECT RV")
9:Send("DISCONNECT RV")
```

```
NORMAL FLOAT AUTO REAL RADIAN MP
Send("SET
1:RV.COLOR
2:RV.COLOR.RED
3:RV.COLOR.GREEN
4:RV.COLOR.BLUE
```

Enter values for RED, GREEN and BLUE separated by spaces, **[alpha]** space (0 key).

Then close the command with **alpha** quotes (**plus key**) and **close paren** followed by **[enter]** to move to the next line.



# Explore angles

## New Program:

```
NORMAL FLOAT AUTO REAL RADIAM MP
EDIT MENU: [a]pho] [f5]
PROGRAM: SQUARE
:Send("CONNECT RV")
:Send("RV FORWARD
:Send("RV LEFT
:Send("RV FORWARD
:Send("RV LEFT
:Send("RV FORWARD
:Send("RV LEFT
:Send("RV FORWARD
:Send("RV LEFT
```

The program above is a framework for driving a square.  
Enter values for distance and turn angle.

## Task: Drive a square.

## Challenge Task: Try to drive an equilateral triangle.

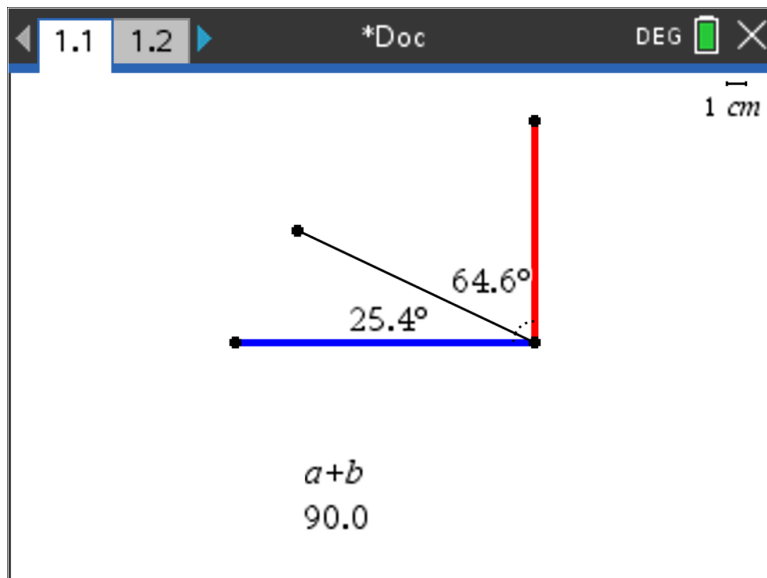
Enter values for forward drive distance and turn angle.

Close the commands with **alpha** quote (**plus key**) and **close paren** ) followed by **[enter]** to move to the next line.

# Quick Math Reminders

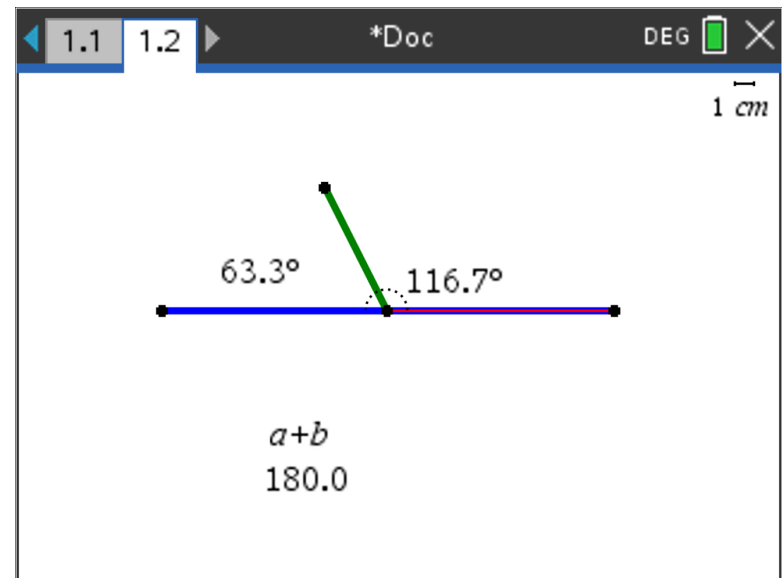
» Complementary Angles:

» Sum to 90 degrees



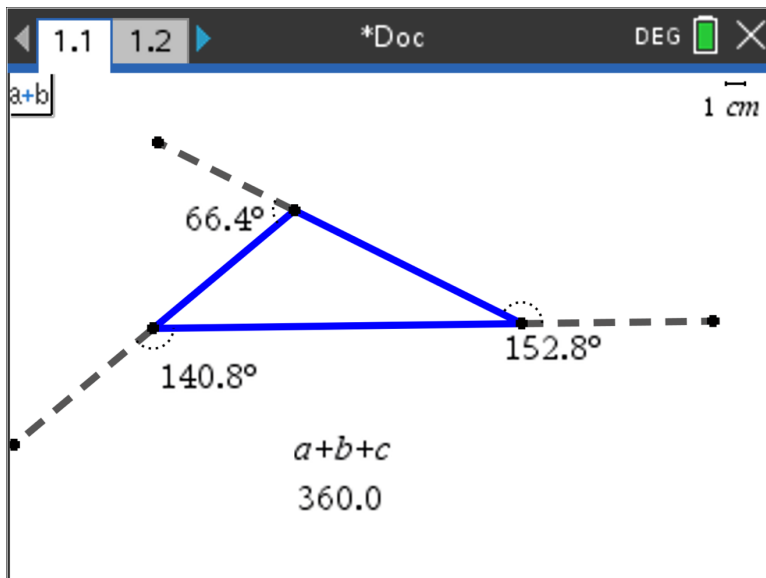
» Supplementary Angles:

» Sum to 180 degrees

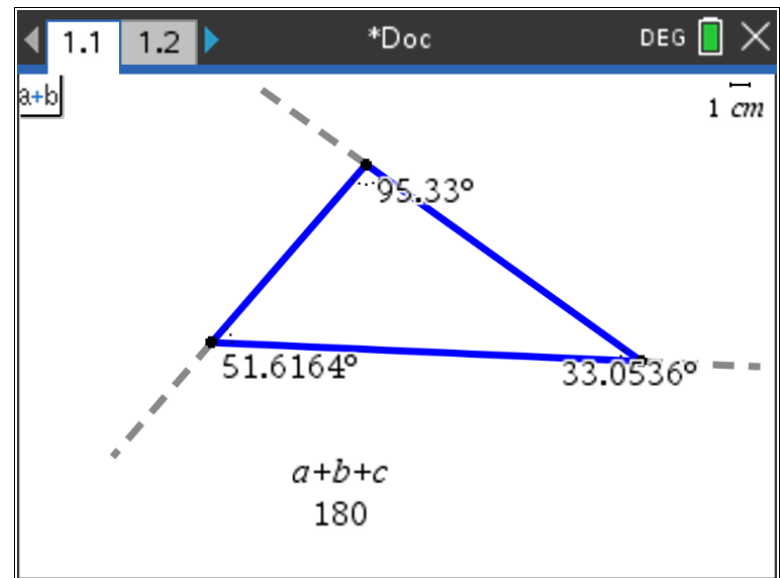


# Quick Math Reminders

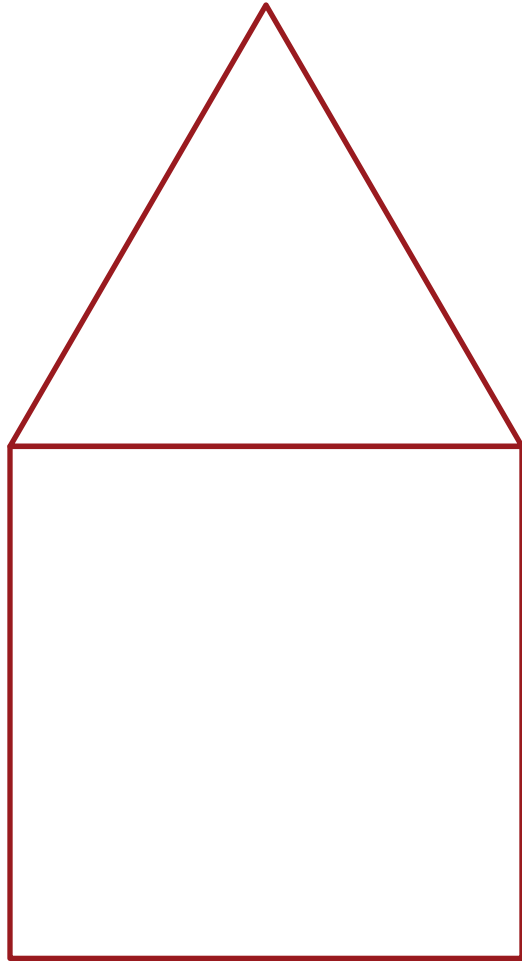
» Exterior angles:



» Interior Angles:



# Logic Challenge



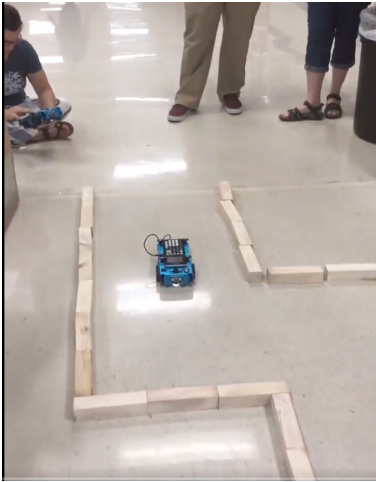
**Task: Drive the figure shown without crossing any lines or going back over a line and without picking up the pen.**

When you are ready put the pen in and trace your path

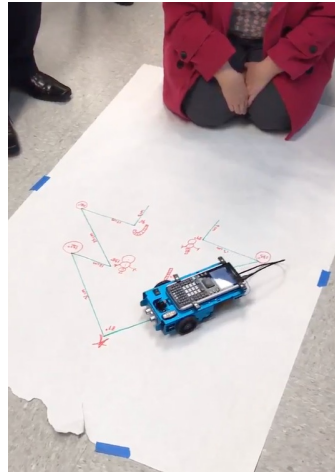




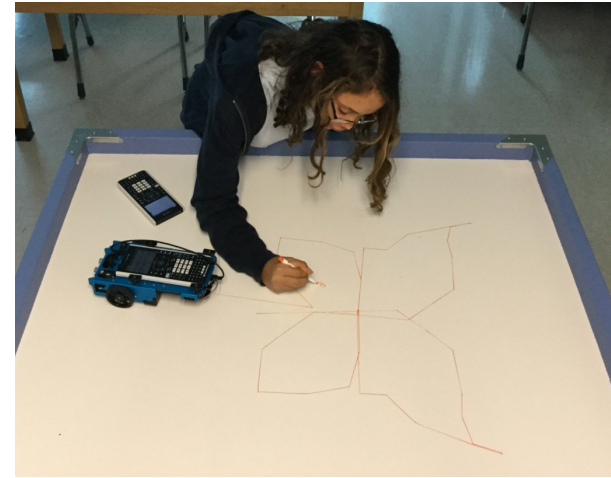
# Where can you go next with TI-Rover?



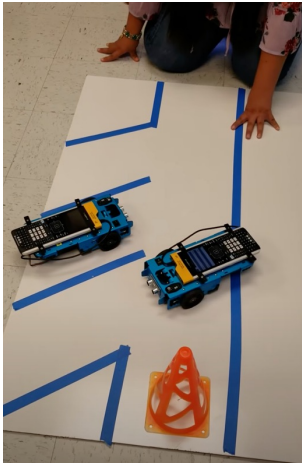
Drive an obstacle course



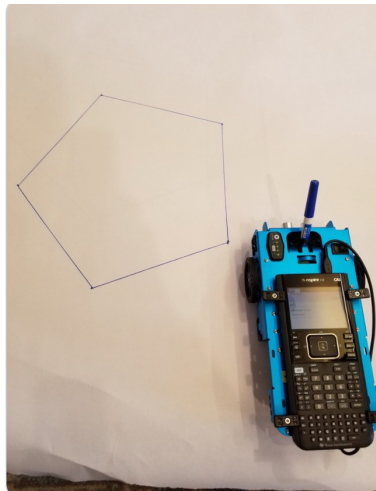
Drive a design



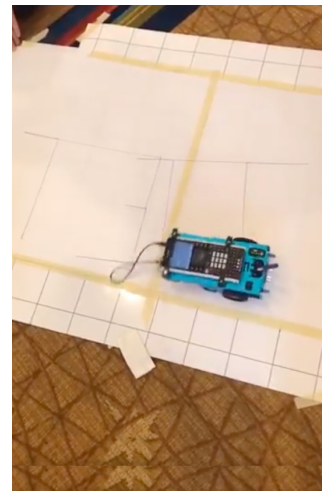
Draw artwork



Park your Rover



Use a For loop to draw polygons



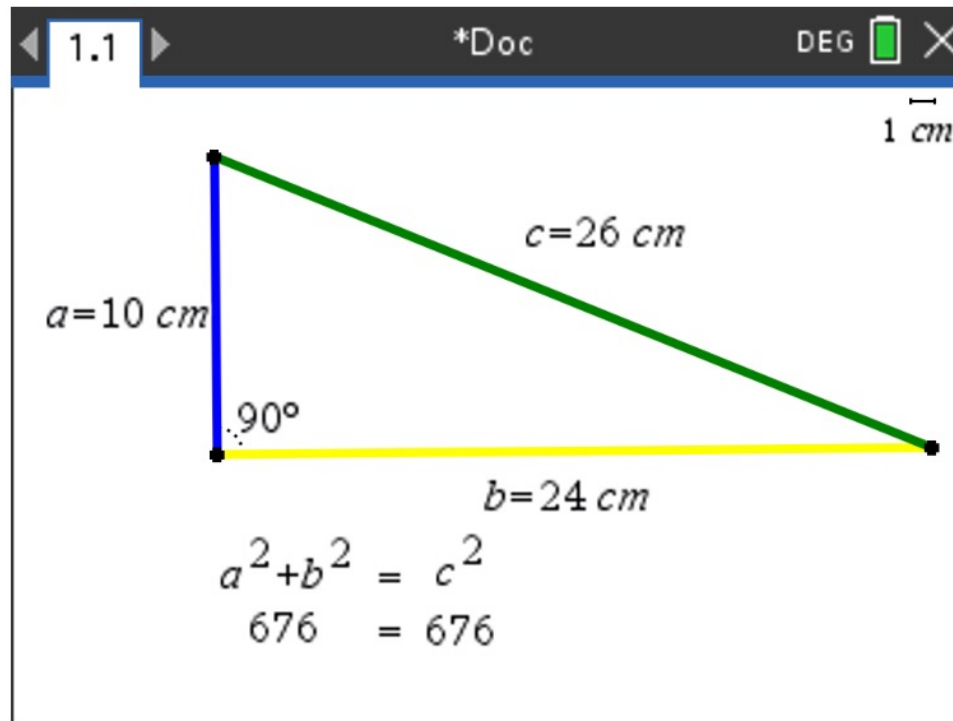
Write your name



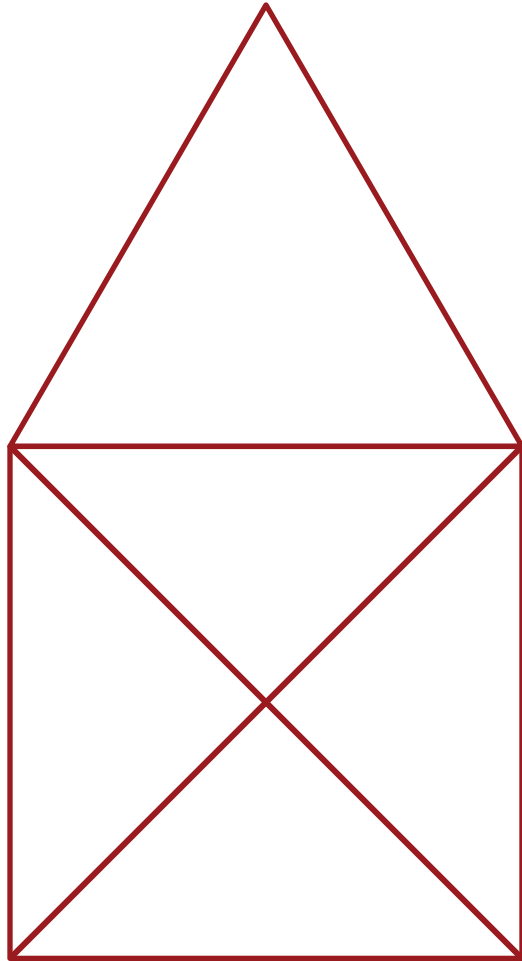
Navigate a map

# Quick Math Reminders

## » Pythagorean Theorem



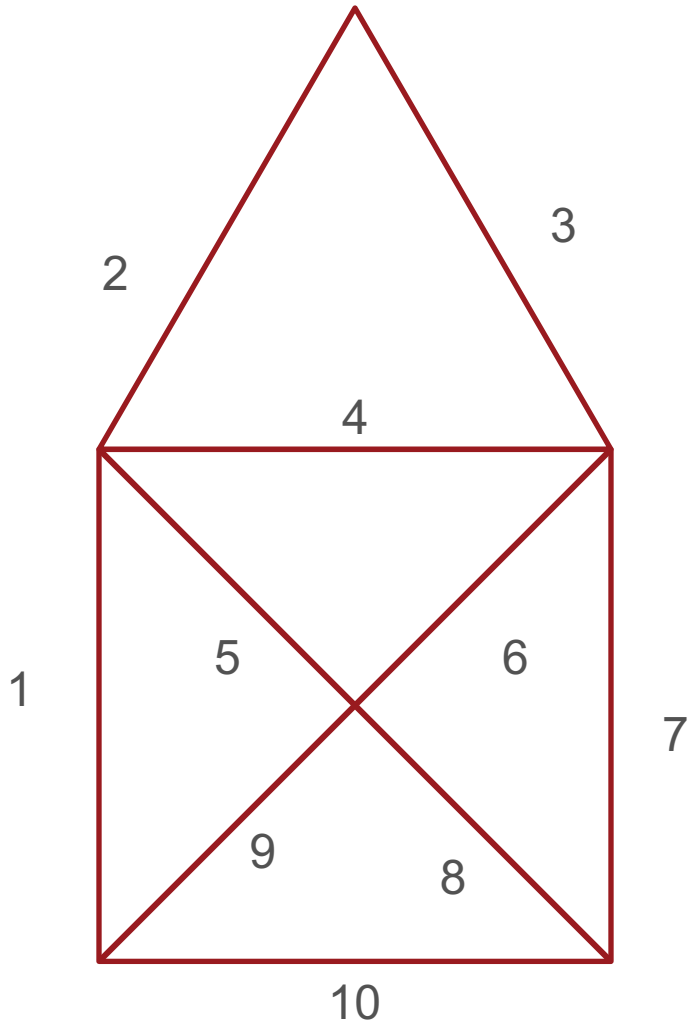
# Logic Challenge 2



**Task: Drive the figure shown without crossing any lines or going back over a line and without picking up the pen.**

When you are ready put the pen in and trace your path

# Logic Challenge 2





# Thank you!

See [www.TIstemProjects.com](http://www.TIstemProjects.com) for more TI STEM and coding activities and projects.