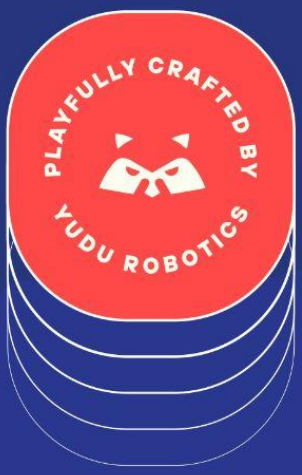


Grade 6

play tronix

SR NO	PROJECT NAME	PROJECT DESCRIPTION	LEARNING OUTCOMES	PG NO
1	Electricity & Evaluation	In this lesson, students will learn about electrical circuits and how to use LEDs in them.	• Comprehend the fundamental principles of electrical circuits and LED. • Apply knowledge of LED functionality by constructing a basic circuit, reinforcing understanding of circuit design and component integration.	5
2	Sound Tech	In this lesson, students will learn about the working of a beeper and how to create a simple circuit using a beeper.	• Comprehend how a beeper works and how it produces sound. • Construct basic circuits integrating a Beeper to reinforce comprehension of circuitry. • Measure current in a circuit using a multimeter.	9
3	World of Switches	In this lesson, students will learn about switches and building circuits using a tact switch and slide switch to control an LED module.	• Identify the basic principles of open and closed circuits and the components used in electronic circuits. • Demonstrate practical understanding of open and closed circuits by constructing circuits with a tact switch.	13
4	Dim Story	In this lesson, students will learn to build a series LED array using basic electronic components like LEDs.	• Identify the basic principles of building a series LED array using electronic components such as LEDs. • Demonstrate the ability to create a series LED array.	17
5	Bright Story	In this lesson, students will learn how to build a parallel LED array using basic electronic components such as LEDs.	• Identify the basic principles of building a parallel LED array using electronic components such as LEDs. • Demonstrate the ability to create a parallel LED array.	21

play dynamex

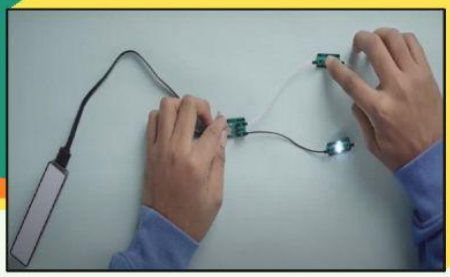
SR NO	PROJECT NAME	PROJECT DESCRIPTION	LEARNING OUTCOMES	PG NO
1	Inclinometer	In this lesson, students will build an inclinometer to measure the inclination of different surfaces.	• Apply knowledge of various parts such as beams, axle and bushes to build the inclinometer. • Understand the concept of inclination and the measurement of angles using the inclinometer. • Measure surface inclination using the constructed inclinometer.	26
2	Bowling Cube	In this lesson, students will build a bowling cube game to show the concept of momentum.	• Comprehend concept of force and its effect on motion of objects. • Comprehend linear & oscillatory motions.	30
3	Rocket Launcher	In this lesson, students will build a rocket launcher and shoot beams using it.	• Comprehend the concept of elasticity and its applications. • Demonstrate an understanding of Class 1 Levers to construct the launcher mechanism. • Exhibit practical knowledge of rocket launcher systems, by constructing it.	30
4	Bascule bridge	In this lesson, students will build a bascule bridge using pulleys.	• Comprehend about simple and compound pulley system. • Analyze the structural integrity and load-bearing capacity of the bascule bridge.	30
5	Rubber Band Gun	In this lesson, student will build a rubber band powered gun to shoot beams at targets.	• Learn and apply knowledge of energy conservation to construct a rubber band-powered toy gun. • Analyze and calculate the factors such as launch angle, trajectory, range, and maximum height of the projectile. • Demonstrate proficiency in assembling and operating a rubber band-powered gun.	30

SR NO	PROJECT NAME	PROJECT DESCRIPTION	LEARNING OUTCOMES	PG NO
1	Illuminate	In this lesson, students will explore the different type of PeeCee's inbuilt LEDs to create patterns using single and multi argument command.	• Identify hardware components involved in physical computing. • Apply sequential programming algorithms to create patterns.	46
2	Weather Animator	In this lesson, students will use PeeCee's multiple inbuilt RGB LEDs to create a smooth transition of colors from RED to BLUE.	• Reinforce the concept of output devices by using PeeCee's inbuilt buzzer to create different sound patterns with block coding. • Apply knowledge of wait and action blocks and create more complex sound patterns with PeeCee's buzzer. • Comprehend the concept of circuits and explore how to connect external modules to PeeCee.	51
3	Left or Right	In this lesson, students will use a Tact switch as an input device to control the buzzer and RGB LEDs and create an Indicator system showing the Left or Right directions.	• Comprehend the basic principles of circuit design and understand how a Tact switch can be used as an input device. • Apply the knowledge of circuit design to create a functional system that utilizes a Tact switch to create a left/right indicator system.	55
4	Street Lamp	In this lesson, students will use an Dual Switch to control an External Dual Channel LED. And also use LDR to make the system automatic.	• Identify the function of an input device in controlling an output device. • Apply the concepts of input sensors, conditional programming, and output devices to real-life situations.	59
5	Smart Room	In this lesson, students will create a system to indicate the temperature level in the room using Temperature sensor. The system will also measure the light intensity and Control the lights in the room automatically	• Create a system that measures temperature and light intensity, and use the data to control output devices. • Use algorithms and programming concepts such as single argument commands, sequential programming, conditional programming, and loops to automate tasks.	63

play tronix

Grade 4 & 5
Time: 60 min

Electricity & Evaluation



Have you ever looked at those cool LED light bulbs in your house and wondered, "How do they work?" Well, today we are going to find out! We shall learn about electricity and how it makes those LED lights shine so bright. But wait, there is more! We are also going to build our own circuit using an LED.

And that is not all, we shall be using a device called a multimeter to measure something called "voltage".

1 Challenge of the day

- ☐ Design and build a circuit to produce light using LEDs.
- ☐ Use a multimeter to measure Voltage across a glowing LED.

2 Gear Up

Hardware

- LED Module - 1
- Power Module - 1
- Power Bank - 1
- Multimeter - 1
- USB Type C cable - 1
- Jumper Wires - 2

Software

- Playtronix Simulation Tool - 1

Design Sheets

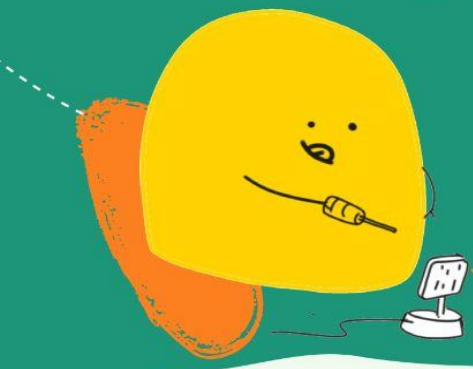
- Playtronix Circuit Design Sheet - 1

#

#electricity #LED #circuit #voltage #multimeter
#ISTE_1.1.d_Empowered_Learner #NGSS_4-PS3-2_Energy

3 Get Crafty

Let us get ready to explore and learn together!
Scan the QR code to watch the instructional video and get started, or wait for your mentor to play the instructional video for the whole class



4 Test & Tweak

Uh-oh, roadblocks ahead? No worries, we have got you covered!
Take a look at the following tips for troubleshooting:

1. LED is not glowing!

- ☐ Check the connections of the circuit by comparing it to the circuit diagram provided in the instructional video. Ensure that positive & negative terminals of the power module are connected to positive and negative terminals of the LED respectively.
- ☐ Check if the USB Type C cable is connected properly to the Power module.
- ☐ Check if the powerbank is completely charged, if not, charge the power bank. (A fully charged power bank lights up in static blue color)

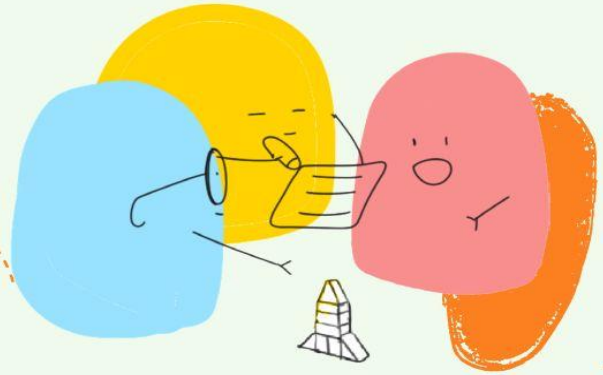
2. Multimeter not showing anything on its display!

- ☐ Check if the Selector Switch (Knob) is not at “OFF” and is pointing towards “20” on the voltage side.
- ☐ Check if the measurement terminals (black and red colored ones) are inserted properly into the multimeter input terminals.
- ☐ Try replacing the battery inside the multimeter (can be replaced by opening the back panel of the multimeter).

3. Multimeter shows unidentifiable digit/alphabet on screen!

- ☐ This may be due to the reason that the voltage being measured is greater than the highest voltage value selected using the selector switch. On the center dial of the multimeter set the selection switch (knob) to “20” on the voltage side to see the proper readings.

5 Think & Reflect



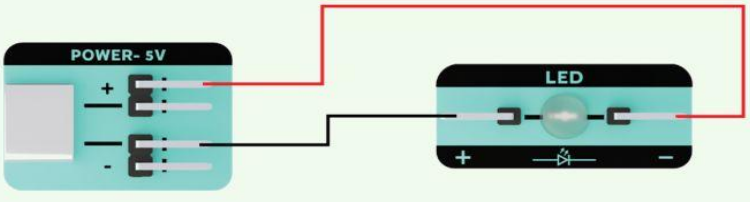
1. Correct way of measuring voltage in an electrical circuit using a multimeter is by..

a. Connecting the multimeter in series with the circuit.
b. Connecting the multimeter in parallel with the circuit.
c. Touching the multimeter to the circuit without connecting it.
d. Shaking the multimeter near the circuit.

2. What is the importance of voltage in electrical circuits?

a. To create an electric field that drives the flow of current.
b. To prevent short circuits and electrical hazards to the devices.
c. To ensure that the circuit is safe to use for anyone nearby.
d. To prevent electrical surges and fluctuations in the circuit.

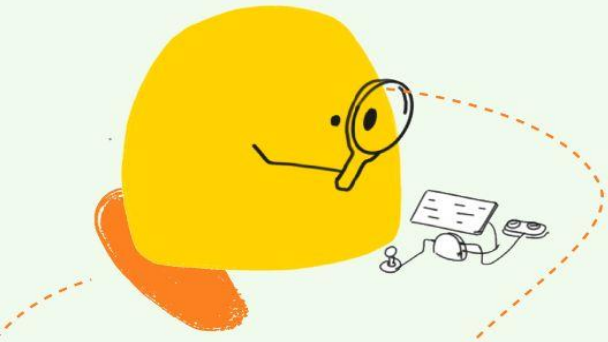
3. Is the circuit image provided below correct? Justify your reasoning.



4. Which of the following statements is true?

a. Only for an LED the positive end should be connected to the negative terminal of the battery and the negative end to the positive terminal of the battery.
b. Only for a regular bulb the positive end should be connected to the positive terminal of the battery and the negative end to the negative terminal of the battery.
c. Only for an LED the positive end should be connected to the positive terminal of the battery and the negative end to the negative terminal of the battery.
d. All the statements are true.

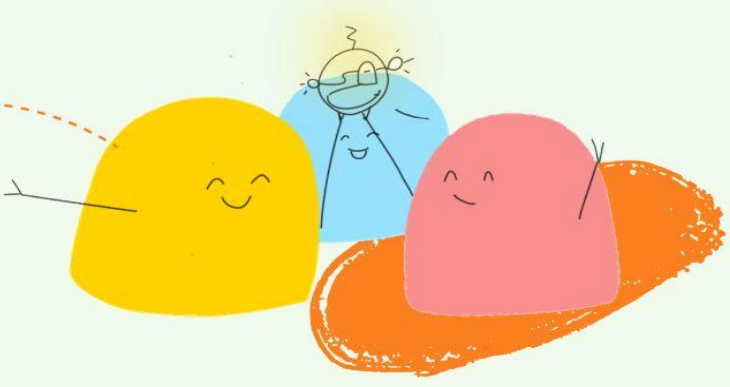
6 Collab & Explore



Now that you know how an LED module works and learnt how to measure voltage, try to take up the following challenge.

- Use some transparent coloured gelatin paper to cover the LED and see how different colors affect the brightness of the LED in the circuit?
- Let us find out the power capacity of a power bank! Take a fully charged power bank and measure the voltage across the positive and negative terminals of the power module to determine its voltage. Utilize the power bank to illuminate an LEDcircuit for some time, and then remeasure the voltage to find out if it has more or less energy than before.

7 Research & Innovate

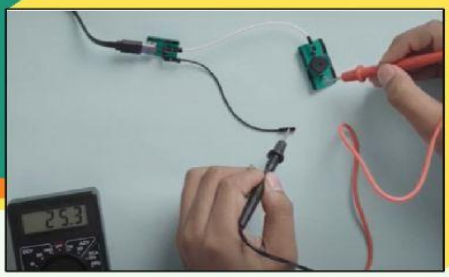


- Research & list three benefits of using LEDs instead of regular light bulbs.
- Measuring the Voltage across the LED was something new!
  Multimeter has many other features. Research and find out what other electrical parameters can be measured using a Multimeter?

play tronix

Grade 6 & 7
Time: 40 min

Sound Tech



Say Hello to a new device in our journey of learning electrical components, “Beepers”. From the sound of a washing machine which has finished washing the clothes to the alarm that alerts us about obstacles while reversing the car, all of it created by beepers.

In this fun & sonic lesson we shall learn about the working of beepers and shall also learn to create an electrical circuit to produce sound from the beeper. We will also be learning to use multimeters to measure a new electrical parameter, “electrical current” across the beeper.

1 Challenge of the day

Design and build a circuit to produce sound from a beeper module and also measure the electrical current across the beeper module.

2 Gear Up

Hardware

- Beeper Module - 1
- Power Module - 1
- Power Bank - 1
- Multimeter - 1
- USB Type C cable - 1
- Jumper Wires - 2

Software

- Playtronix Simulation Tool - 1

Design Sheets

- Playtronix Circuit Design Sheet - 1

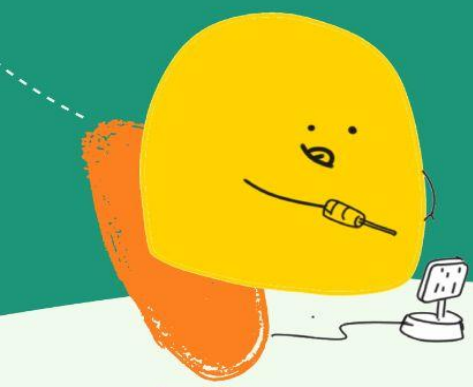
#

#beeper #multimeter #current
#ISTE_1.1.d_Empowered_Learner #NGSS_Standard_4-PS3-4_Energy

3 Get Crafty

Let's get ready to explore and learn together!

Scan the QR code to watch our instructional video and get started, or wait for your mentor to play the instructional video.



4 Test & Tweak

Uh-oh, roadblocks ahead? No worries, we have got you covered! Take a look at the following tips for troubleshooting:

- Beeper

1. Beeper not producing any sound

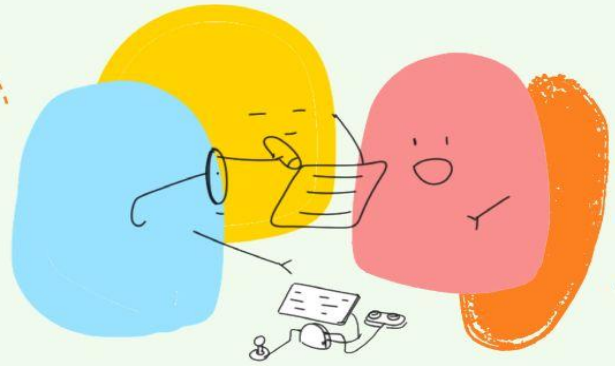
- Check the connections of the circuit by comparing it to the circuit diagram provided in the instructional video.
- Check if the USB Type C cable is connected properly to the Power module.
- Check if the powerbank is completely charged, if not, charge the power bank.

- Multimeter

2. Multimeter shows zero on display

- This may be due to the reason that the current being measured is too less than the current value selected using the selector switch. On the center dial of the multimeter set the selection switch (knob) to different values such as 2000µ, 20m, 200m and 10. At one of the values, the display will show correct reading depending on the current flowing through the circuit.

5 Collab & Reflect



1. Which of the following is a common use of beepers in daily life?

A. Providing light in dark areas.
B. Serving as a backup power source.
C. Helping to cook food in a microwave.
D. Alerting about a guest on the door.

2. Can a beeper produce different types of sounds? If yes, state the process to create 3 different types of sound from a beeper module.

---

3. What tool is needed to measure electrical current across a beeper module?

A. 

B. 

C. 

D. 

4. What is the unit of measurement for electrical current?

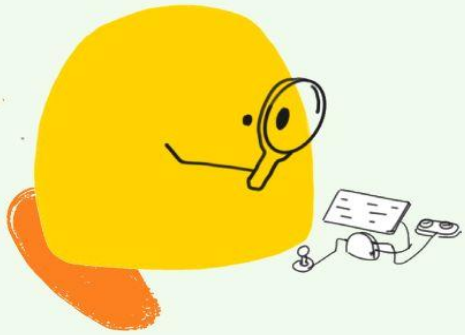
A. Volt (V)

B. Ohm (Ω)

C. Ampere (A)

D. Watt (W)

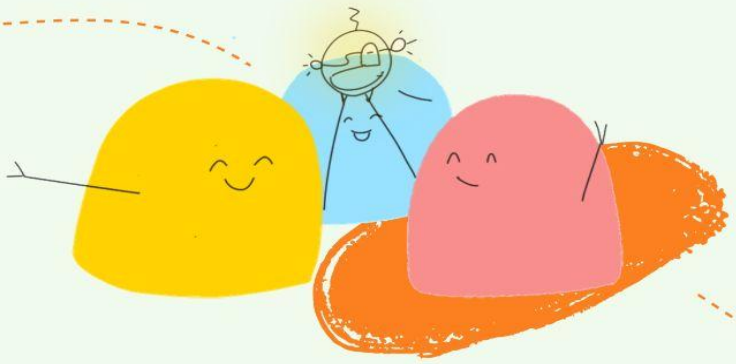
6 Let Us Explore



Now that you know how a beeper module works, try to take up the following challenge:

- Swap the positive and negative terminal of the beeper module in the circuit. Check if the beeper module is still capable of producing sound? If yes, compare the outcome with the swapped LED module's positive and negative terminal.
- Design a circuit with both beeper and LED in it then measure & record the voltage & current across both of them. Based on the recorded data, state the amount of current and voltage consumed by each one of them in a circuit.

7 Research & Innovate

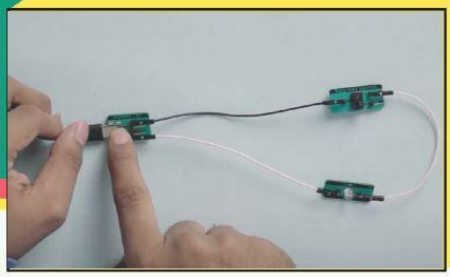


- Explore & create a plan in which beepers can be used to create spatial awareness for individuals with visual impairments.
- Do you know that humans can hear sounds of a specific range of frequencies only? Find more about this and create a table with a list of range of sound frequencies that are heard by different animals.
- You have learnt to build circuits using LEDs and Beepers, Now how can we control our circuits without actually breaking the circuit?
- What do you do at home when you want to turn off the lights or turn on the fan? Research how we can involve a switch in our circuit to turn the circuit ON and OFF whenever needed.

play tronix

Grade 8 & 9
Time : 60 min

World of Switches

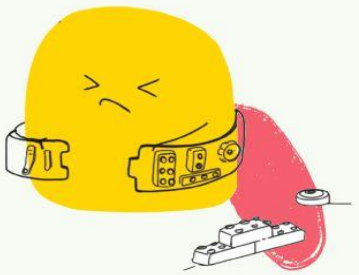


Would it be appropriate for an electrical device like a light bulb or a fan to not have a switch? What if they were always “ON” irrespective of whether you need light or fresh breeze of air in your room or not! It obviously would not be appropriate. To make it appropriate we need a “Switch” with every such electrical device. The switch acts as a control point, through which you can choose a device to stay ON or OFF.

In this lesson we will learn about two such control devices, or also called an input device, TACt switch and Two-way switch. We will use a tact switch and a two-way switch in a circuit to control the LED Module to turn it ON or OFF.

1 Challenge of the day

Design and build a circuit using a tact switch and slide switch to control an LED module.



2 Gear Up

Hardware

LED Module	-	1
TACT switch	-	1
Two way switch	-	1
Power Module	-	1
Power Bank	-	1
USB Type C cable	-	1
Jumper Wires	-	3

Design Sheet

- Playtronix Circuit Design Sheet - 1

Software

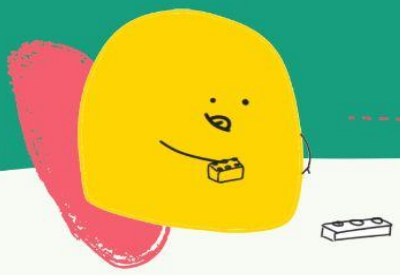
- Playtronix Simulation Tool - 1

#switch #tact_switch
#ISTE_1.5.c_Computational Thinker #NGSS_4-PS3-2_Energy

3

Lets get started !

Let us get ready to explore and learn together!
Scan the QR code to watch the instructional video and get started, or wait for your mentor to play the instructional video for the whole class.



4

Test & Tweak

Uh-oh, roadblocks ahead? No worries, we have got you covered!
Take a look at the following tips for troubleshooting:

LED

1. The LED is not glowing!

- ☐ Check the connections of the circuit by comparing it to the circuit diagram provided in the instructional video. Ensure that positive & negative terminals of the power module are connected to positive and negative terminals of the LED respectively.
- ☐ Check if the USB Type C cable is connected properly to the Power module.
- ☐ Check if the powerbank is completely charged, if not, charge the power bank. (A fully charged power bank lights up in static blue color)

TACT switch

2. TACT Switch is not turning the LED ON or OFF!

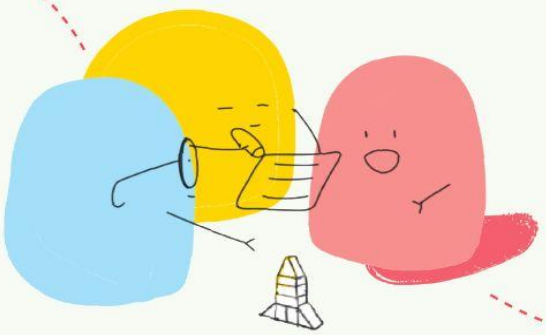
- ☐ Check the connections of the circuit by comparing it to the circuit diagram.
- ☐ Try pressing the tact switch a little more firmly.
- ☐ Check if all jumper wires in the circuit are tightly connected with the modules.
- ☐ Check if the power bank is fully charged, if not, charge it.

Two way switch

2. Two-Switch is not turning the LED ON or OFF!

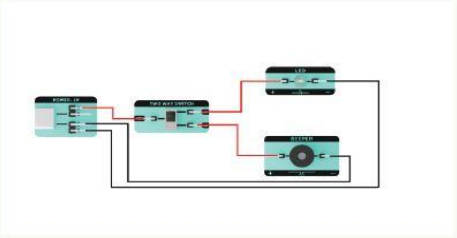
- ☐ Check the connections of the circuit by comparing it to the circuit diagram.
- ☐ Check if the Two-Way Switch is not shorting the positive and negative terminals in the circuit.
- ☐ Check if all jumper wires in the circuit are tightly connected with the modules.

5 Think & Reflect



1. **What is the difference between a tact switch and a conventional switch?**
   A. Tact switch is used in digital circuits while conventional switch is used in analog circuits.
   B. Tact switch turns ON only when it is pressed while conventional switch stays ON until it is turned OFF.
   C. Tact switch stays ON until it's turned OFF while conventional switch turns ON only when it is pressed.
   D. Tact switch and conventional switch are the same and can be used interchangeably in circuits.

2. **In this circuit, which device will turn ON if the power source is connected to the circuit.**
   A. LED
   B. Beeper
   C. Both LED and Beeper.
   D. None of them.



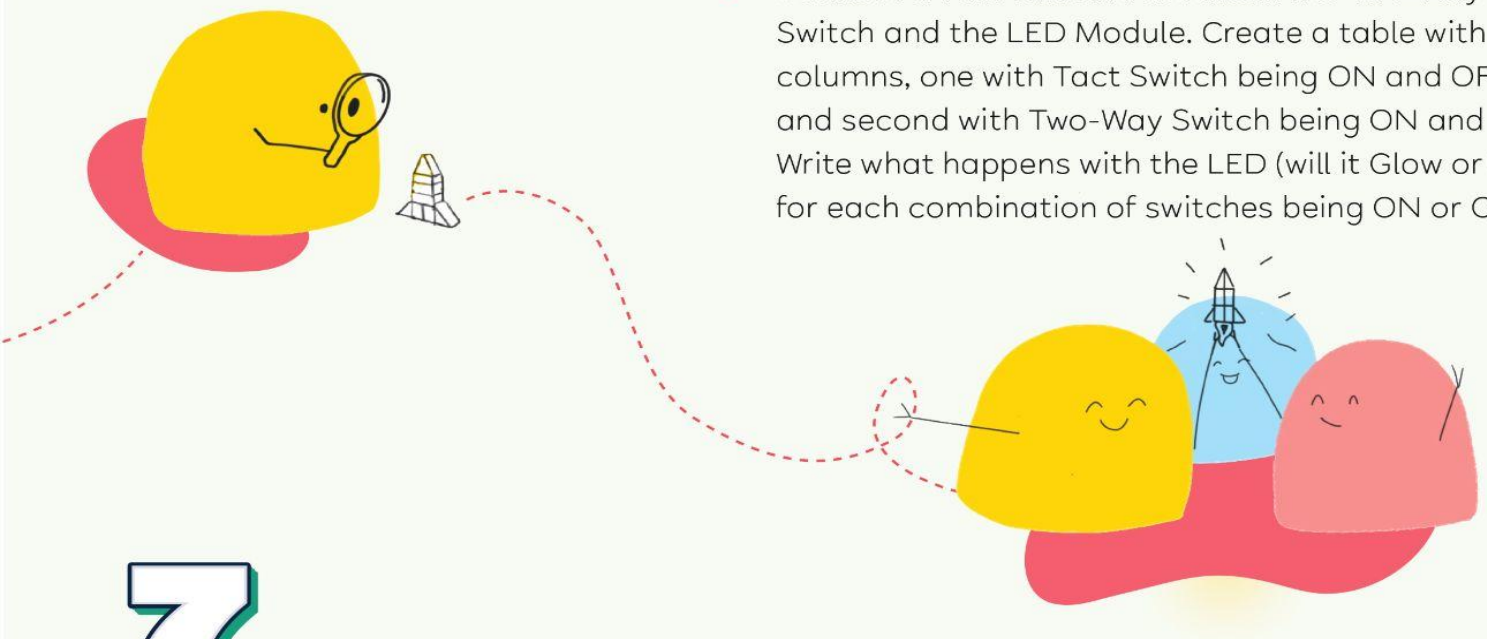
3. **What is the advantage of using a tact switch?**
   A. It requires less force to operate compared to other switches.
   B. It is a more durable switch than other types of switches.
   C. It turns OFF on its own when the switch is not pressed.
   D. It can be used to control multiple circuits simultaneously.

4. **In which of the following, is the tact switch NOT used?**
   A. Volume key of mobile phone.
   B. Laptop keyboard
   C. PC mouse button
   D. Table fan switch

6 Collab & Explore

Now that you know how to control an LED using TACT switch and Two-way switch, try to take up the following challenge.

- Use a multimeter to measure the voltage and current in the circuit made for this activity and note the readings when the switch is turned ON and OFF.
- Connect a Tact Switch in between the Two-Way Switch and the LED Module. Create a table with two columns, one with Tact Switch being ON and OFF and second with Two-Way Switch being ON and OFF. Write what happens with the LED (will it Glow or Not) for each combination of switches being ON or OFF.



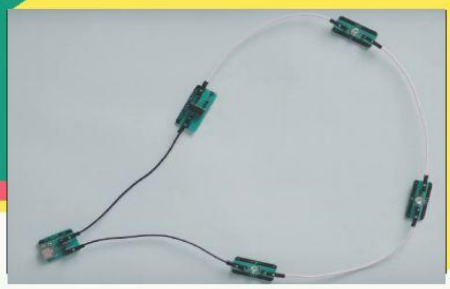
7 Research & Innovate

- Research about a more complex electronic device that uses multiple switches, such as a television remote or a computer keyboard. Explain how each switch operates and how they work together to control the device.
- During diwali do you see fairy lights? Can we connect the LEDs in our circuit together to glow them all together? Research about series connection in a circuit and check if we can connect the LEDs in series.
- Take apart a broken string of Christmas lights and analyze how the LEDs are connected with each other so that they all glow bright when we power them ON.

play tronix

Grade 6 & 7
Time : 60 min

Dim Story

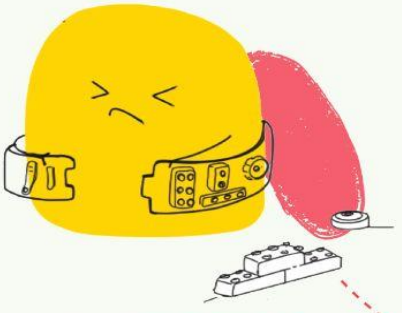


Do you love those beautiful serial lights that we use to decorate our homes during celebrations? Have you ever wondered how those tiny LEDs are connected together to make them all light up at once?

In this lesson, we are going to connect multiple LEDs in a row and create a series circuit and learn more about series connection.

1 Challenge of the day

Design and build a circuit with an array of LEDs to learn about series connection.



2 Gear Up

Hardware

LED	-	3
Two way switch	-	1
Power Module	-	1
Power Bank	-	1
USB Type C cable	-	1
Jumper Wires	-	5

Design Sheet

- Playtronix Circuit Design Sheet - 1

Software

- Playtronix Simulation Tool - 1

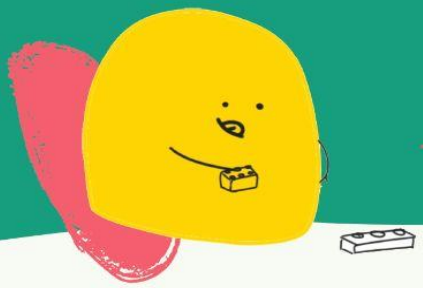
#

#electricity #circuit #LED #voltage #series connection
#ISTE_1.4.c_Innovative_Designer #NGSS_PS3.B_Conservation_of_Energy

3

Lets get started!

Let us get ready to explore and learn together!
Scan the QR code to watch the instructional video and get started, or wait for your mentor to play the instructional video for the whole class.



4

Test & Tweak

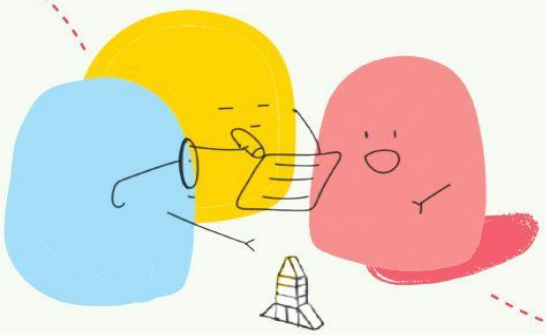
Uh-oh, roadblocks ahead? No worries, we have got you covered!
Take a look at the following tips for troubleshooting:

Series Connection

1. A series circuit is not functioning properly.

- ☐ Check the power source: Ensure that the power source is providing the correct voltage and is turned on.
- ☐ Check the connections: Make sure that all the components in the series circuit are connected in the correct order and that the wires are securely connected to the components.
- ☐ Check for a broken circuit: Use a multimeter to check for continuity in the circuit. If there is an open circuit, locate the break and repair it.
- ☐ Check the components: Verify that each component in the circuit is functioning properly. Use a multimeter to check for resistance, and replace any faulty components.
- ☐ Check for overload: Ensure that the circuit is not overloaded. Remove any unnecessary components and check that the total resistance of the circuit is within the rated value of the power source

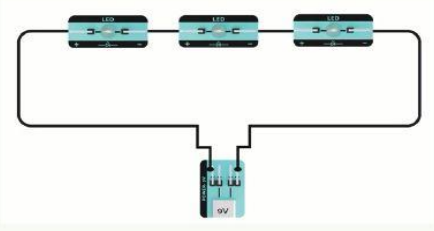
5 Think & Reflect



1. **Which of the following best describes the energy transfer that occurs when a switch is closed in a circuit with multiple LEDs connected in series?**
   A. Electrical energy is converted into mechanical energy.
   B. Electrical energy is converted into heat energy.
   C. Electrical energy is transferred from one LED to the next, resulting in the emission of light energy.
   D. Electrical energy is lost due to resistance in the circuit.

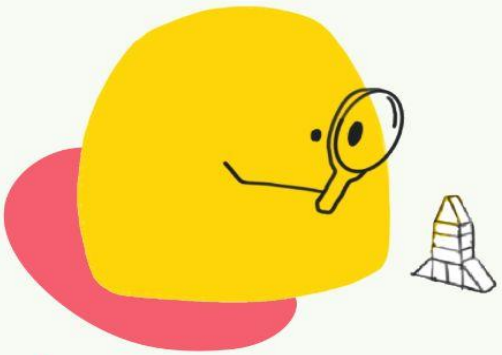
2. **When two or more LEDs are connected in series, which of the following statements is true?**
   A. The voltage across each LED is the same.
   B. The current through each LED keeps varying.
   C. The brightness of each LED is different.
   D. The resistance of each LED varies.

3. **How does the brightness of an LED change as you connect 3 LEDs in a circuit?**
   A. The brightness is reduced and divided across each LED equally.
   B. The brightness of each LED is increased.
   C. The brightness of each LED is the same.
   D. None of the Above.



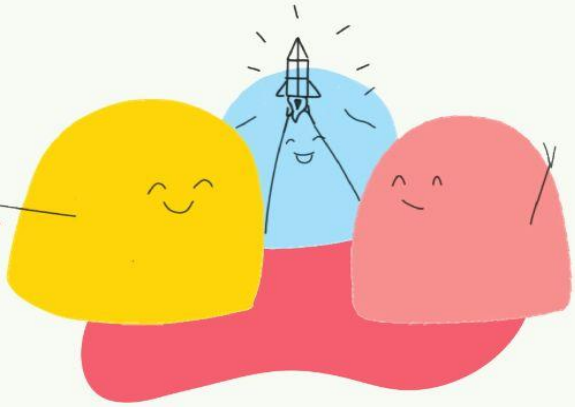
4. **What happens if one LED in a series LED array fails?**
   A. The entire LED array will stop working.
   B. Only the failed LED will stop working.
   C. The brightness of the LEDs will decrease.
   D. The other LEDs will become brighter.

6 Collab & Explore



We have learned about series connection and built a LED strip with it, now try to take up the following challenge:

- Build a circuit with an array of 3 beepers and see how it affects the loudness.
- Build two circuits with one LED in a circuit glowing with full brightness, and another circuit with two LEDs. Then use a multimeter to measure the voltage across the LED and current flowing in the circuit, compare both the values and check if there's any change.



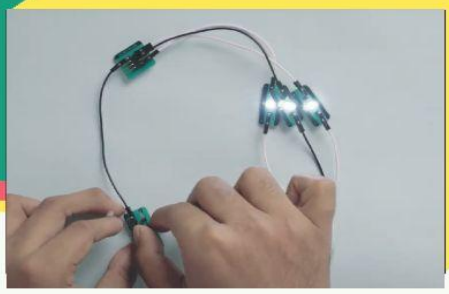
7 Research & Innovate

- Think of a real-life example where series connection is used? What device or object uses series connection, and why is it important for it to be connected that way? Discuss with the class.
- The array of our lights didn't turn out to be very bright!! What can be done to make all the LEDs glow bright? Do a research about what determines the brightness of an LED, also find out what are the different type circuit connections.

play tronix

Grade 8 & 9
Time : 40 min

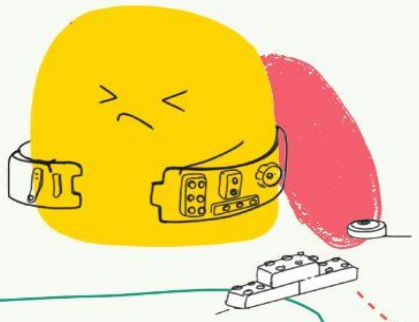
Bright Story



Welcome to the world of light and electricity! In this exciting lesson, you'll learn about a special way of connecting lights called "parallel connection". We'll be using colorful LED lights to create a beautiful and bright display that will light up your world! Get ready to learn how to connect LEDs in parallel and control them using switches. By the end of this lesson, you'll have the knowledge and skills to create your own stunning light show that will amaze your family and friends!

1 Challenge of the day

Design and build an array of LEDs connected in parallel to each other.



2 Gear Up

Hardware

LED	-	3
Two way switch	-	1
Power Module	-	1
Power Bank	-	1
Junction	-	2
USB Type C cable	-	1
Jumper Wires	-	9

Design Sheet

- Playtronix Circuit Design Sheet - 1

Software

- Playtronix Simulation Tool - 1

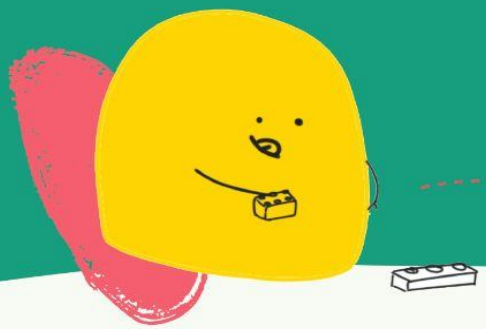
#circuit #parallel_connection
#ISTE_1.4.a_Innovative_Designer #NGSS_PS3.B_Conservation_of_Energy

3

Lets get started !

Let us get ready to explore and learn together!

Scan the QR code to watch the instructional video and get started, or wait for your mentor to play the instructional video.



4

Test & Tweak

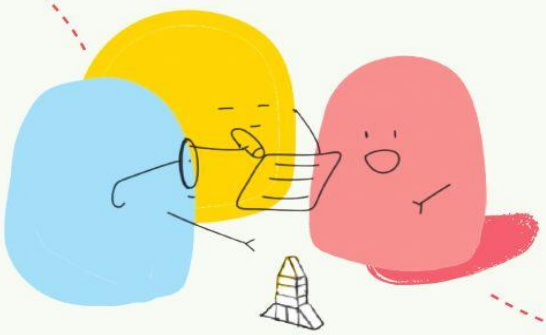
Uh-oh, roadblocks ahead? No worries, we have got you covered!
Take a look at the following tips for troubleshooting:

Junction

1. Is Junction not working?

- ☐ Check if all the circuits connected are complete.
- ☐ Check if the jumper cables are connected properly with Junction Module terminals.
- ☐ Check if you are using this Module as per the circuit diagram (to know how and where to connect this module, refer to the lesson videos)
- ☐ Junction splits the power provided to the left/right side of the junction into all terminals of the opposite side. Therefore connect the input & output module accordingly.

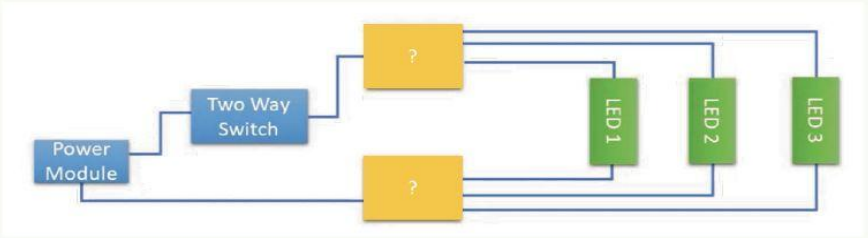
5 Think & Reflect



1. Which of the following statements is true about a parallel circuit?

A. The current through each component is the same.
B. The voltage across each component is the same.
C. The total resistance of the circuit is equal to the sum of the individual resistances.
D. The temperature of each of the components remains the same.

2. What Component is needed to make a parallel connection.



A. Junction
B. Beeper
C. Resistors
D. Dual Switch

3. In a parallel circuit what remains constant?

A. Current
B. Voltage
C. Power
D. Temperature

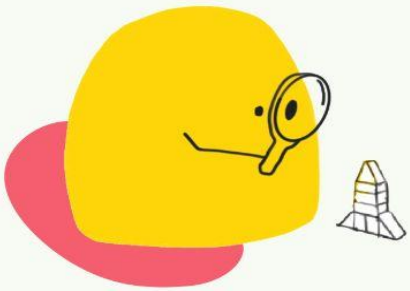
4. What happens if one LED in a parallel LED array fails?

A. The entire LED array will stop working.
B. Only the failed LED will stop working.
C. The brightness of the LEDs will decrease.
D. The other LEDs will become brighter.

5. **When connecting LEDs in parallel, each LED has?**

   A. ts own separate current path.
   B. Shared current path with other LEDs.
   C. No current path.
   D. Random current path.

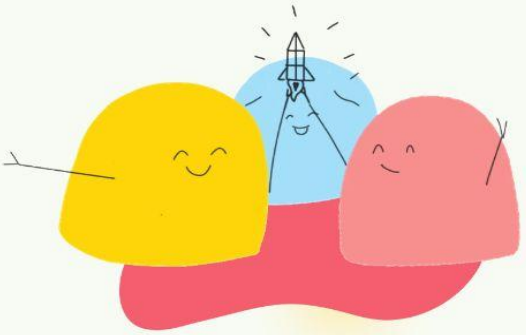
6 Collab & Explore



We have learned about parallel connection and built an array of parallel LEDs that light up all at once, now try to take up the following challenge:

- Design and build a traffic light circuit using LEDs and tact switches.
- The circuit should include three LEDs - one for red, one for yellow, and one for green - and should be set up to mimic the operation of a typical traffic light.
- Design and build a circuit that includes both a series and a parallel connection of LEDs to showcase how the brightness of the LEDs in each connection differ.

7 Research & Innovate

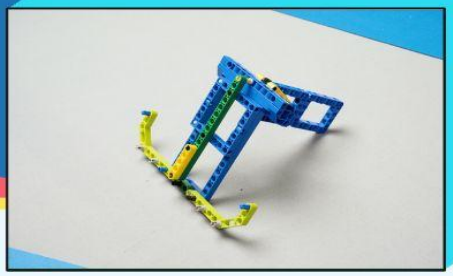


- How can we use parallel circuits to ensure that devices continue to work even if one part of the circuit fails? Can you think of any examples of devices or systems that use parallel circuits for this purpose?
- But what if sometimes we want to decrease the brightness of the LEDs? How can we do it? After you go home today, research and find out if there is any component that can be used in our circuit to reduce the brightness of an LED.
- Research online about what is electrical resistance. Also, recall how you can calculate resistance in a circuit using Ohm's law.

play dynamex

Inclinometer

Grade 8 & 9
Time : 30 min



Are you ready to become a master of measurement and conquer the mysteries of tall buildings and surface angles? Say goodbye to boring scales & protractors and get ready for an exciting adventure with our PlayDynamex kit!

We are about to embark on a journey to create a mind-blowing inclinometer that will revolutionize the way we measure surface inclinations. Together, we shall unlock the secrets of heights and angles as we construct this incredible device. So, buckle up and prepare for an epic activity that will leave you in awe of your own ingenuity. Let us dive into the world of inclinometers and conquer the challenge of measuring surface inclinations like true champions!

In this activity we will build an inclinometer that will measure the inclination of surfaces.

1 Challenge of the day

Build your own inclinometer using beams, blocks and pegs.

2 Gear Up

Design Sheets

- Structural Design Sheet - 1

Hardware

- Beam 15 - 1
- Beam 13 - 1
- 7x3x3 Angled Beam with axle hole - 2
- 14x7 block - 1
- 7x7 block - 1
- 7x5 block - 2
- 11x3x2 Angled Block - 2
- Beam/Block Joiner - 1
- Friction Pegs - 22
- Long Peg - 3
- Axle Pegs - 2
- Axle 2 - 2

#

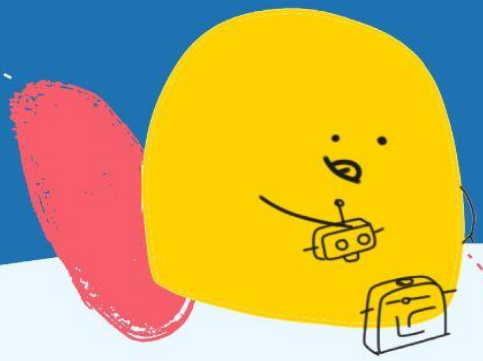
#inclination #distance_measurement #angle_measurement

#ISTE_1.1.d_Empowered_Learner #NGSS_K2-ETS1-3_Engineering_Design

3 Get Crafty

Let us get ready to explore and learn together!

Scan the QR code to watch our instructional video and get started, or wait for your mentor to play the instructional video for the whole class.

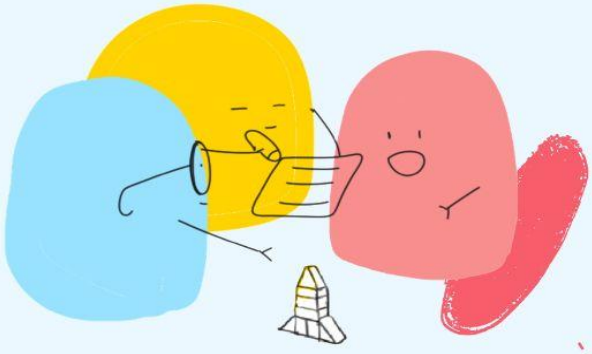


4 Test & Tweak

Uh-oh, roadblocks ahead? No worries, we have got you covered! Take a look at the following tips for troubleshooting:

1. **The inclination pendulum is not moving!**
   - ☐ Ensure that the top part of the 7x7 block attached here to beam 15 is properly inserted. If this is not properly attached, it will cause restriction to the movement of the pendulum.
2. **The handle of the inclinometer is not stable!**
   - ☐ When you are holding the inclinometer, make sure that you have locked the handle using the two beam 5s placed on the viewfinder.
3. **When we place the inclinometer on a surface using the surface mount, it tends to topple over!**
   - ☐ Make sure that the 7x5 block is attached properly to the 7x7 block such that it will balance the weight of the inclinometer.

5 Think & Reflect

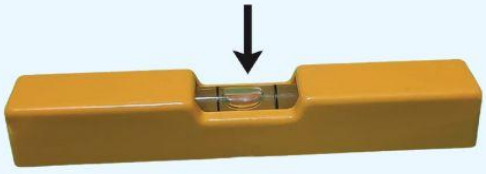


1. **The inclinometer determines the angle of inclination in relation to the _____.**
   a. Line of sight of the viewer.
   b. Sea level.
   c. Height at which the viewer is standing.
   d. One half of the viewers height.

2. **How does the size of the pendulum affect the inclinometer's performance?**
   a. Larger pendulum provides more stability and accurate measurements.
   b. Smaller pendulum allows for greater flexibility in measuring different angles.
   c. Pendulum size has no impact on the inclinometer's performance.
   d. The impact of pendulum size depends on the specific design of the inclinometer.

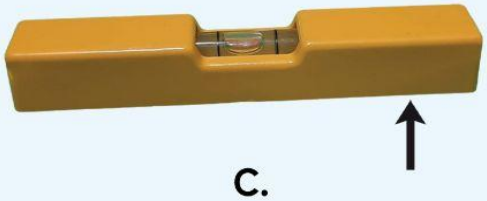
3. **What modifications are required to enable our inclinometer to measure surface inclinations when placed on different surfaces?**
   a. The pendulum has to be increased in size and a protractor has to be added.
   b. The pendulum has to be removed while a protractor has to be added.
   c. An arrangement has to be made on the handle to place it on the surface.
   d. No modification is needed as the handle can be used as a surface mount.

4. **Which part of this device helps us to check the inclination?**



A.

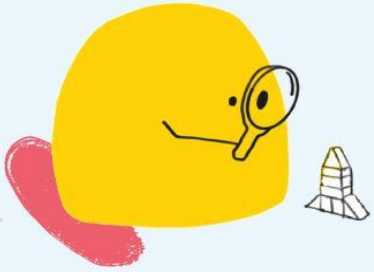
B.



C.

D.

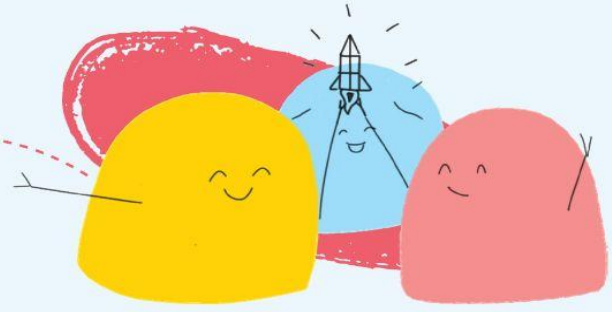
6 Collab & Explore



We have learned about the Inclinometer and how to build it! Now let us think out of the box and innovate.

- Find the height of the walls in your classroom using the inclinometer by measuring the angle of inclination at the point where the wall meets the ceiling.
- Construct a seesaw using long beams as plank and a pivot point. Use the inclinometer to measure and balance the inclinations on both sides of the seesaw. Experiment with different weights and positions to find the perfect balance.

7 Research & Innovate

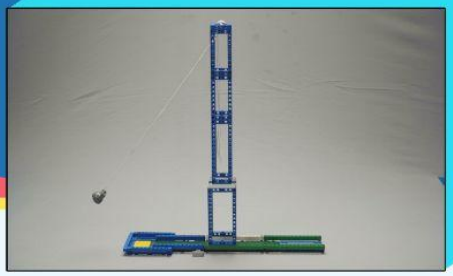


- Research and note down the significance of inclinometers in various fields such as construction, aviation, and engineering.
- Challenge yourself! Take a string and a small weight such as a paper clip. Tie the paper clip to one end of the string and attach the other end of the string to a high point and see how the clip swings. Try adjusting the length of the string and observe how it affects the motion of the paper clip attached to the end.

play dynamex

Bowling Cube

Grade 8 & 9
Time : 30 min



You are about to relax and play some games when you suddenly remember: TOMORROW IS YOUR SCIENCE TEST FOR THE TOPIC - FORCE AND MOTION!

Of course you could immediately start studying, but you are not sure if you would be able to remember the concepts very well.

Well, what if we build a game that would help us understand force & motion and help ace the test too?

That is exactly what we're going to do! In today's session, we shall build a bowling ball game and learn about the concepts of force and motion.

1 Challenge of the day

Build a bowling ball game using beams, blocks, plates, pegs and a ball.

2 Gear Up

Design Sheets

- Structural Design Sheet - 1

Hardware

• Beam 15	- 4	• 7x5 block	- 1
• Beam 13	- 2	• 11x3x2 angled block	- 2
• Beam 11	- 3	• 5x11 technic plate	- 3
• Beam 7	- 2	• 3x11 technic plate	- 1
• Beam 5	- 5	• Castor socket	- 1
• 3x3 T beam	- 2	• POM ball	- 1
• 14x7 block	- 2	• Strings	- 1
• 15x5 block	- 2	• 90 degree pegs	- 12
• 10x5 block	- 4	• Friction pegs	- 63
• 5x3 L beam	- 2	• 4x2 L beam	- 2

#

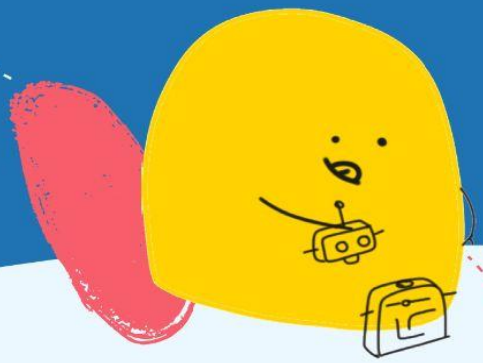
#bowling #linear_motion #oscillatory_motion

#ISTE_1.1.d_Empowered_Learner #NGSS_K-2-ETS2-2_Engineering_Design

3 Get Crafty

Let us get ready to explore and learn together!

Scan the QR code to watch our instructional video and get started, or wait for your mentor to play the instructional video for the whole class.

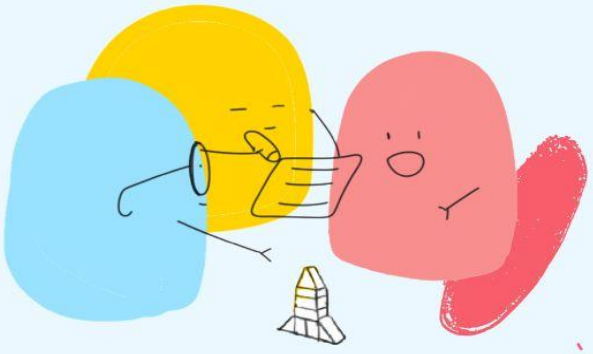


4 Test & Tweak

Uh-oh, roadblocks ahead? No worries, we have got you covered! Take a look at the following tips for troubleshooting:

1. **When the ball is swung, it touches the plates.**
   - ☐ Adjust the strings so that the ball barely touches the plates when not swinging.
2. **The ball is not hitting the pins when released from any position!**
   - ☐ Make sure that you have kept the support structure in the center of the bowling lane and the string is long enough to let the ball reach the pins.
3. **The ball always collides or hits the support towers!**
   - ☐ Make sure that the string is attached to the center of the axle on the support structure.

5 Think & Reflect



1. **How does the angle of release impact the motion of the bowling cube?**

   a. A smaller angle of release results in a faster swing.
   b. A larger angle of release results in a faster swing.
   c. The angle of release does not affect the swing of the pendulum.
   d. Both smaller angle and larger angle of release results in slower swing.

2. **Consider two bowling balls, one with a heavier ball than the other. When swung with the same force from the same height, which of the balls will come to a stop first?**

   a. The heavier ball will stop first.
   b. The lighter ball will stop first.
   c. Both of the bowling balls will come to a stop at the same time.
   d. This cannot be predicted

3. **Which of the following statements correctly describes the effect of the mass of the ball on the swinging motion?**

   a. Increasing the mass of the ball increases the speed of the swing.
   b. Decreasing the mass of the ball increases the speed of the swing.
   c. Increasing the mass of the ball decreases the speed of the swing.
   d. Mass of the ball does not affect the motion/swing of the ball.

4. **Which of the following images works on the same principle of the bowling cube?**

A. 

B. 

C. 

D. 

6 Collab & Explore

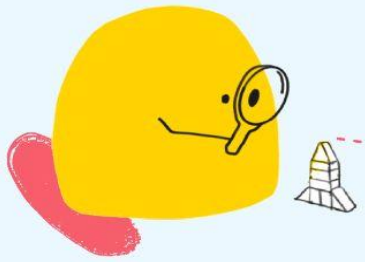
We now know how to build our very own bowling cube. Now let us think out of box and innovate,

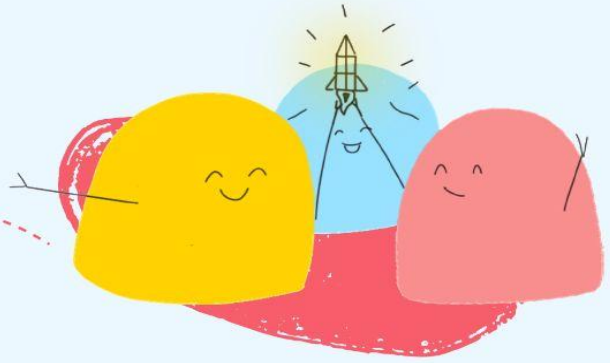
- In the existing project, test releasing the ball at different angles/heights and note down your observation in a table. Observe and evaluate the time taken in each case for the ball to come to stop. Find out the correct reason to support your observation.

- Design and build a bowling ball, with two swinging balls positioned perpendicular to each other, but you also need to ensure they do not collide.

  Hint: Employ various strategies to avoid collisions such as:

  1. Keeping the balls at different heights.
  2. Swinging the ball with different forces.
  3. Using balls of different weights.





7 Research & Innovate

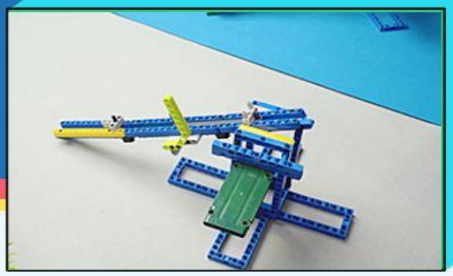
- Find out three things in your everyday life that exhibit linear and oscillatory motion.
- Understand and explain the working of the pendulum in clocks. Explain how it helps to measure time accurately and share these research details on Tinker Bunker.
- Take a look at these two images. Given your understanding of forces and motion, can you determine which of these setups would be better suited for using it like a catapult toy to throw a paper ball?

  To determine the effectiveness of shooting objects, construct two setups and test them and explore the properties that contribute to their effectiveness in shooting objects.

play dynamex

Grade 8 & 9
Time : 30 min

Rocket Launcher



A rocket launcher is a device used to launch a rocket into the air. But we do not have propellant to launch one! But we have a rubber band and its amazing property of elasticity.

In this lesson, we will build a rocket launcher and a rocket using PlayDynamex parts and it will help you understand basic engineering concepts like force and motion.

1 Challenge of the day

Build a rocket launcher and a rocket using beams, blocks and pegs.

2 Gear Up

Design Sheets

- Structural Design Sheet - 1

Hardware

- Beam 2 - 4
- Beam 3 - 1
- Beam 7 - 2
- Beam 11 - 3
- Beam 13 - 2
- Beam 15 - 4
- 5x3 L Beams - 2
- 3x3 T Beams - 1
- 7x3x3 Angled Beams - 1
- Perpendicular Axle joiner 3L with Pegs - 1
- 5x11 plate - 1
- 10x5 Block - 4
- 7x7 Block - 1
- 14x7 Block - 2
- 11x3x2 Angled Block - 1
- Rack 13 - 1
- Friction Pegs - 42
- 90 Degree Pegs - 12
- Long Pegs - 4

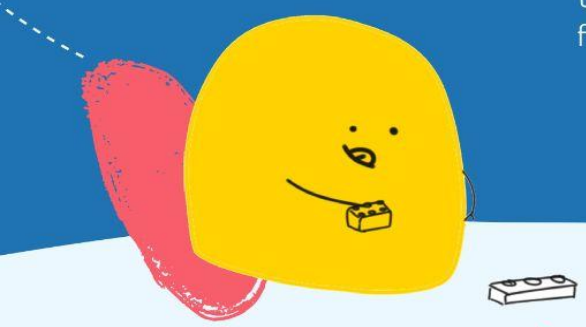
#elasticity #simple_machines

#ISTE_1.4.c_Innovative_Designer #NGSS_MS-PS2-2_Motion_and_Stability

3 Get Crafty

Let us get ready to explore and learn together!

Scan the QR code to watch our instructional video and get started, or wait for your mentor to play the instructional video for the whole class.

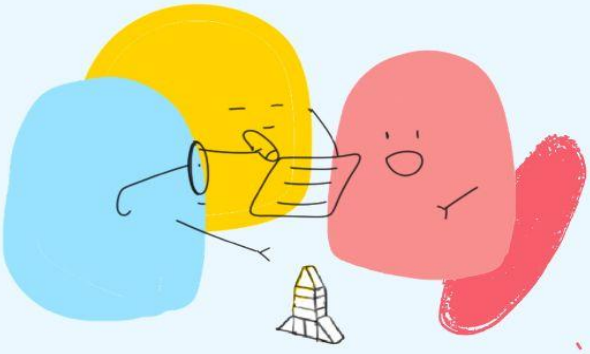


4 Test & Tweak

Uh-oh, roadblocks ahead? No worries, we have got you covered!
Take a look at the following tips for troubleshooting:

1. **The firing pin of the rocket launcher comes out of the launching pad when we pull it!**
   - ☐ Make sure that you have long pegs attached both on the front and back end of the firing pin and the perpendicular joiner 3L is fixed properly, so that it won't come out of the track.
2. **The firing pin travels along with the rocket after it is released!**
   - ☐ This also occurs when the perpendicular joiner 3L is not fixed properly at the correct place. Make sure that you attach it at the correct place.

5 Think & Reflect



1. **Which type of motion does the rocket experience during launch?**

   a. Linear motion
   b. Helical motion
   c. Circular motion
   d. Oscillatory motion

2. **If we modify our rocket launcher to stretch the rubber band even more, how does it affect the force applied on the rocket?**

   a. The force applied on the rocket gets decreased if the rubber band is stretched more.
   b. The force applied on the rocket gets increased if the rubber band is stretched more.
   c. The force applied on the rocket remains same if the rubber band is stretched more.
   d. The force applied on the rocket becomes unpredictable as it keeps varying each time.

3. **How is the concept of conservation of energy shown in our rocket launcher?**

   a. The rubber band stores energy in the form of kinetic energy and when released this energy is converted to potential energy of the rocket.
   b. The rubber band stores energy in the form of potential energy and when released this energy is converted to potential energy of the rocket.
   c. The rubber band stores energy in the form of potential energy and when released this energy is converted to kinetic energy of the rocket.
   d. The rubber band stores energy in the form of kinetic energy and when released this energy is converted to kinetic energy of the rocket.

4. Which of the following will be more aerodynamic?

A.

B.

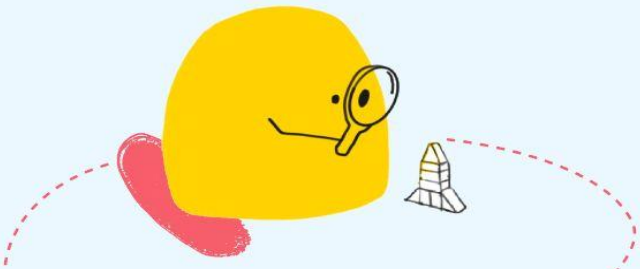
C.

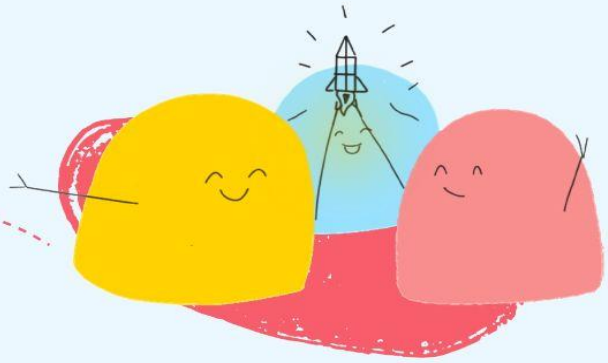
D.

6 Collab & Explore

We learned about the rocket launcher and how to build it in the get crafty session! Now let us think out of box and innovate:

- Modify the rocket launcher to have a locking mechanism and trigger.
- Modify the rocket launcher by adding a stronger rubber band to shoot heavier rockets.





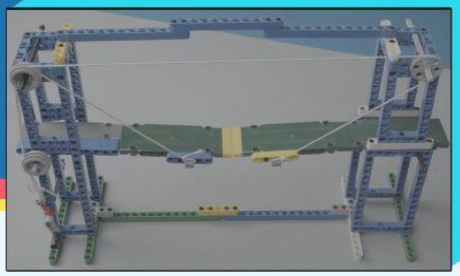
7 Research & Innovate

- Understand more about aerodynamicity and how it has been achieved in vehicles to enable it to travel faster.
- Find out how conservation of energy occurs in the case of rocket propulsion. Identify how one form of energy is converted to another.
- Let's make a box out of cardboard with an openable lid! We'll attach a string to the lid, but how can we open it? We'll put a bottle cap up high and wind the string around it. Then when we pull the string, the lid will open.

play dynamex

Grade 8 & 9
Time : 30 min

Bascule Bridge



Bridges are one of the most important innovations that helps us cross over rivers, valleys, and roads. There are different types of bridges, and we will be learning more about a special one called the Bascule bridge. These bridges are built in areas where large ships pass through. What makes them unique is that they can open and lift up in the middle to let the big boats go underneath.

In this lesson, we will build a bascule bridge using PlayDynamex parts and it will help you understand the concepts of pulleys and how pulley systems help to reduce effort.

1 Challenge of the day

Build a bascule bridge and understand the concepts of pulleys.

2 Gear Up

Design Sheets

- Structural Design Sheet - 1

Hardware

- Beam 5 - 5
- Beam 7 - 4
- Beam 11 - 1
- Beam 13 - 2
- Beam 15 - 6
- 15x5 block - 2
- 10x5 block - 4
- 14x7 block - 2
- 7x5 block - 2
- 5x11 plate - 3
- 3x11 plate - 1
- 3x3 T beam - 2
- Pole reversal handle - 1
- Lift Arm - 1
- Peg joiner - 1
- Technic pin with hole - 2
- Wheel rim 30 mm - 2
- Belt wheel - 1
- Axle 12 - 2
- Axle 10 - 2
- Axle 9 - 1
- Half bush - 3
- Full bush - 3
- Friction peg - 75
- Strings - 2
- Scissor - 1

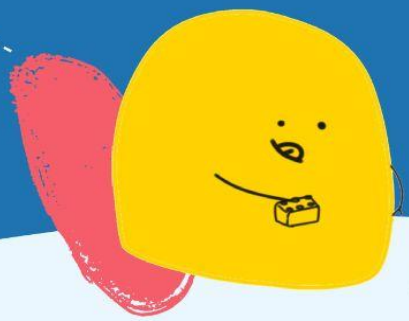
#simple_pulleys #compound_pulleys #bascule_bridge

#ISTE_1.6.c_Creative_Communicator #NGSS_K-2-ETS1-2_Engineering_Design

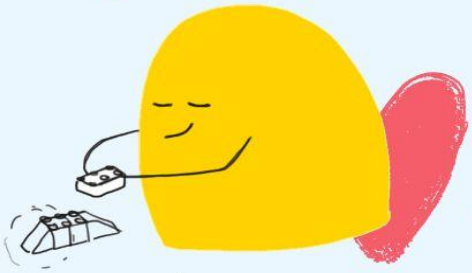
3 Get Crafty

Let us get ready to explore and learn together!

Scan the QR code to watch our instructional video and get started, or wait for your mentor to play the instructional video for the whole class.



4 Test & Tweak



Uh-oh, roadblocks ahead? No worries, we have got you covered!
Take a look at the following tips for troubleshooting:

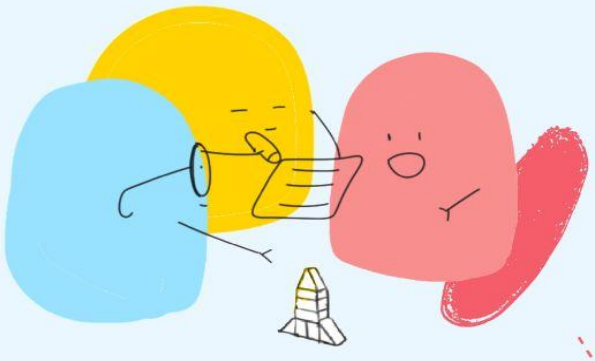
1. The decks are not opening together!

- ☐ This happens, when the tension is different for each of the strings. Pull the strings and ensure that the string tension is the same and then reattach it to the pole reversal handle.

2. Only one deck is opening when the handle is rotated!

- ☐ Ensure that the strings are properly passing through the pulleys. If the deck which is not opening is on the side of the belt wheel, double check that the string is passing properly over the belt wheel and not stuck in the gap between beltwheel and the block.

5 Think & Reflect



1. **What is the significance of the pivot point in a bascule bridge mechanism?**

   a. It is where the bridge connects to the ground.
   b. It is where the bridge connects to the counterweights.
   c. It is where the bridge rotates to open and close.
   d. It is where the pulley system is attached.

2. **How does the compound pulley system make it easier to lift the bascule bridge?**

   a. By reducing the weight of the parts of the bridge.
   b. By increasing the strength of the parts of the bridge.
   c. By increasing the area over which force needs to be applied.
   d. By decreasing the force needed to lift the bridge.

3. **Identify the system that does not utilize a compound pulley setup.**

A.

B.

C.

D.

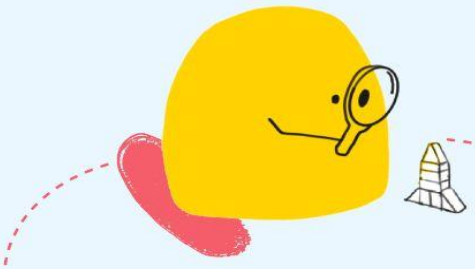
4 If we were to increase the diameter of the pulleys, how would it impact the bridge?

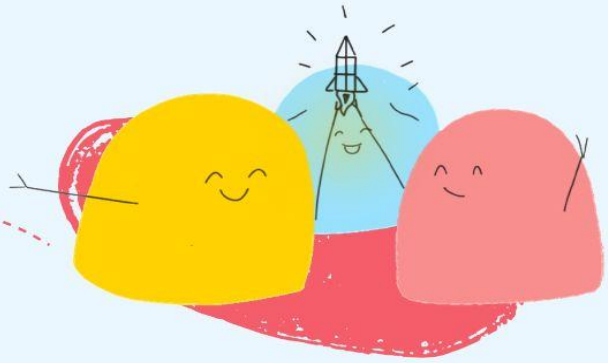
a. The force required to lift up the bridge increases.
b. The force required to lift up the bridge decreases.
c. It will make the bridge structure unstable.
d. It will not have any effect on the structure.

6 Collab & Explore

We have learned about pulleys and built a bascule bridge which has a compound pulley system, now let us think out of box and innovate:

- Modify the bridge into a two layer bridge where both layers can be opened together.
- Modify the bridge by increasing the length of the bridge. Also modify the pulley system accordingly to handle the increased weight of the bridge due to its elongation.





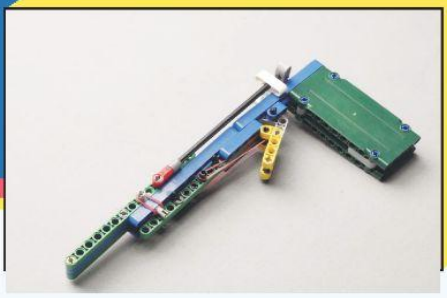
7 Research & Innovate

- Find out more about how a bascule bridge system works in real life and how it opens to allow passage of ships through.
- Find out more about the application of compound pulley systems and note down 3 major applications of it.
- The energy or force applied to the lift-arm, is conserved and transferred to the operation of opening and closing the bridge through the use of strings. What will happen to the bridge, if we have used rubber bands instead of strings. Find out how energy conservation and transfer differ in rubber bands compared to that in strings.

play dynamex

Grade 8 & 9
Time :40 min

Rubber Band Gun



Toy guns have long captivated the imaginations of children and adults alike, offering endless opportunities for thrilling make-believe adventures. As an engaging and safe alternative to traditional toy guns, we will be making a rubber band toy gun that can shoot beams and axles.

Not only that, we will be learning about the concept of elasticity as we make our own toy gun.

1 Challenge of the day

Build your own rubber band gun that can shoot beams and axles.

2 Gear Up

Hardware

Beam 15	-	1
Beam 13	-	4
Beam 11	-	2
Beam 5	-	4
5x3 L beam	-	3
3x5 H beam	-	1
Beam 2 with 1 axle hole	-	1
Plate 5x11	-	2
Axle 12	-	2
Axle 4	-	1
Angle Connector	-	2
Technic hole with pin	-	2
Axle peg	-	2
90 degree peg	-	4
Long peg	-	5
Perpendicular Axle Joiner 3L With Pegs	-	1
Rack 13	-	1
Perpendicular Axle Joiner	-	1
Peg	-	30
Rubber band (small)	-	2
Rubber band (big)	-	2

Design Sheet

- Structural Design Sheet - 1

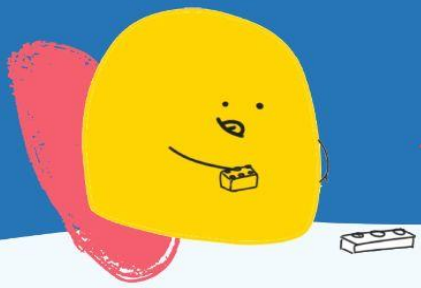
#elasticity #gun #firearm
#ISTE_1.1.c_Empowered_Learner #NGSS_MS-PS2-2_Motion_and_Stability

3

Lets get started!

Let us get ready to explore and learn together!

Scan the QR code to watch our instructional video and get started, or wait for your mentor to play the instructional video for the whole class.



4

Test & Tweak

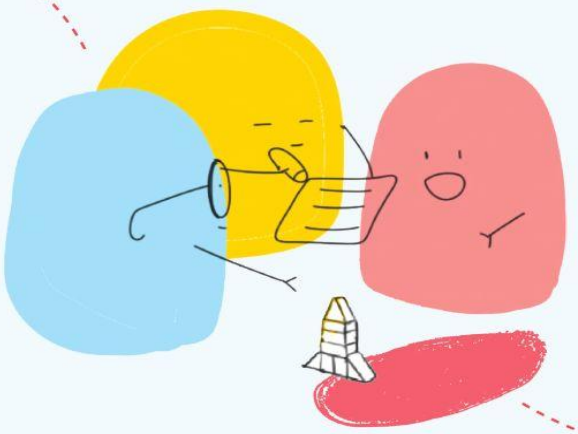
Uh-oh, roadblocks ahead? No worries, we have got you covered! Take a look at the following tips for troubleshooting:

1. **The slide of the gun rises up from the gun when the trigger is pressed!**
   - ☐ This occurs when the trigger is pulled too much. Pull the trigger, such that one end of the trigger only reaches till 5x11 plate.

2. **The slide of the gun goes back slanted when pulled backwards!**
   - ☐ This occurs when the axles are not placed in holes of the same level. The axles must be placed in holes on the same level.

5

Collab & Reflect



1. **What will happen if we add two more pulleys to the cable car system?**

   A. You will need more force to move the cable car with two additional pulleys.

   B. The force required to move the cable car will remain the same, even with addition of two more pulleys.

   C. The force required to move the cable car will decrease with the addition of two more pulleys.

   D. As you operate the car, the force needed to move it will gradually increase.

2. **Suppose we increase the tension on the string of the cable car. What could be a possible result of it?**

3. **Could you explain how a pulley system helps in transporting the car over the cable?**

   A. The pulley mechanism grips the cable and transfers the pulling force to the car.

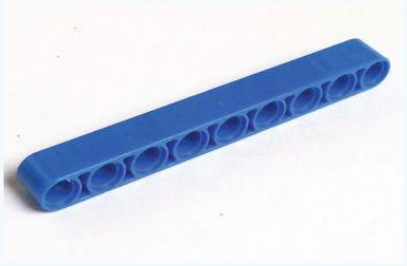
   B. The pulley mechanism reduces the weight of the cable car on the cable.

   C. The tension in the cable is reduced by the pulley system.

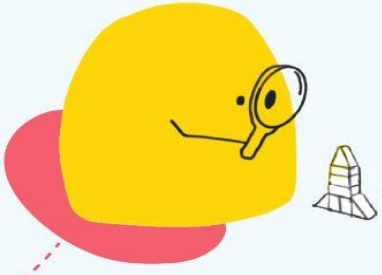
   D. The pulley system helps the cable car from crashing down .

4. **How does the following component help in the construction of our cable car?**

   A. The block is attached to the roof of the cable car so that pulleys can be attached to it.
   B. The block is attached to the roof of the cable car so that the string can be passed through it.
   C. The block is attached to the roof of the cable car so that the structure is more stable.
   D. The block is used in the cable car without much advantage on its usage.

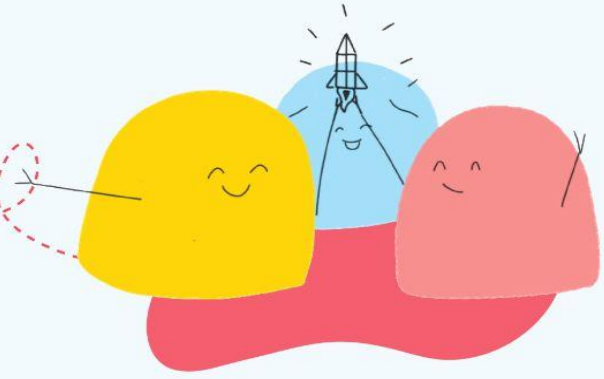


6 Collab & Explore



We now know how to build our very own Rubber band gun! Now let us think out of box and innovate,

- Modify the rubber band gun to shoot 2 rubber bands at the same time.
- Modify the rubber band gun to accommodate a sight for aiming purpose.

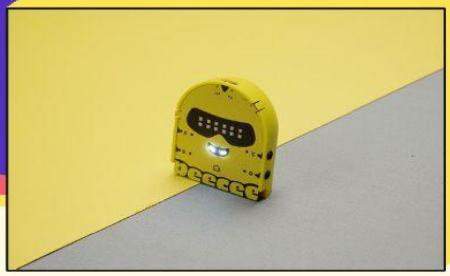


7 Research & Innovate

- Understand more about how launch angles and how it affects in getting maximum range in various sporting events like shot put, javelin throw etc.
- Find out how energy conservation helps devices like speaker, light bulbs work.
- Make a paper bird that can flap its wings! We can make the wings and figure out how to make it go up and down. Then we can try different wing shapes and sizes to see how it flies. Finally, we'll launch it and see how far our bird can fly.

Grade 8 & 9
Time: 30 min

Illuminate



Welcome to an exciting adventure where you will learn how to create mesmerising light patterns with the help of PeeCee, a cute codable computer. Together, we shall explore the vast possibilities of LEDs and how we can control them to produce beautiful patterns.

Get ready to unleash your creativity and dive into the world of microcontrollers and LEDs! By the end of this activity, you will have all the necessary skills needed to code LED modules and create stunning patterns.

1 Challenge of the day

Control the Smile LEDs and RGB LEDs on your PeeCee to create amazing patterns!

2 Gear Up

Hardware

PeeCee	-	1
USB Type C Cable	-	1
Power Bank	-	1

Software

- PLODE App - 1

Design Sheets

- PeeCee Circuit Design Sheet - 1
- PeeCee Algorithm Sheet - 1

#algorithm #sequential_programming #loop #color_mixing
#ISTE_1.1.d_Empowered_Learner #CSTA_1A-AP-10_Algorithms_&_Programming

3 Get Crafty

Let us get ready to explore and learn together!

Scan the QR code to watch our instructional video and get started, or wait for your mentor to play the instructional video for the whole class.

4 Test & Tweak

Uh-oh, roadblocks ahead? No worries, we have got you covered! Take a look at the following tips for troubleshooting:

1. PeeCee not turning ON!

- **Hardware:**
  - If you are using a PeeCee with a built-in battery,
    - ☐ Power the PeeCee with a Power Bank
  - If you are using a PeeCee without a built-in battery,
    - ☐ Contact the mentor/teacher to ensure that the Power Bank has enough charge.

2. Unable to connect PeeCee with Plode App!

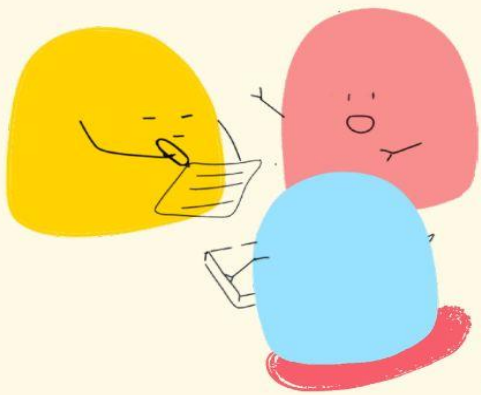
- **Hardware:**
  - ☐ Restart the PeeCee.
- **Software:**
  - ☐ Restart the Plode App on your device.

3. Plode App is unable to upload the code to PeeCee!

- **Software:**
  - ☐ For Mobile Device: Ensure that the PeeCee is connected with the PLODE App by verifying that the bluetooth icon on the top right corner of the app is green. If red, access the connection screen by tapping on it. Keep PeeCee close to your mobile or choose one from the nearby device list by tapping the top right icon.
  - ☐ For Desktop: Ensure that the PeeCee is connected with the Plode App using a USB Type C Cable. Also ensure that you have selected the right COM Port after clicking on SCAN DEVICE in the PLODE App. If red, tap on the icon and then to choose your device from the device list.

4. LEDs not lighting up!

- **Software:**
  - ☐ Check if all 4 LEDs are enabled in the Select section of the Plode App.
  - ☐ Check if the intensity of all four smile LEDs are set to 1 in the Action Block of the Code.



5 Think & Reflect

1. **Which of the following options explains how you can create patterns using a single RGB LED?**
   a. By modifying its colour.
   b. By adjusting its shape.
   c. By varying its blinking time.
   d. By adjusting its brightness.

2. **How can you create a custom orange colour using the RGB LED?**
   a. By mixing red and green components in equal proportions.
   b. By mixing blue and green components in equal proportions.
   c. By mixing red and blue components in equal proportions.
   d. By increasing the voltage supplied to the red component.

3. **Select the correct option that explains why RGB LEDs are referred to as "multiple argument components" while Smile LEDs are referred to as "single argument components"?**
   a. RGB LEDs require multiple inputs, such as R,G & B values while Smile LEDs only require a single input to turn on or off.
   b. There are 12 RGB LEDs present in the eyes of PeeCee whereas there are only 4 Smile LEDs placed on the face of PeeCee.
   c. RGB LEDs are advanced and require complex programming while Smile LEDs are simpler and require basic programming.
   d. RGB LEDs are more expensive than Smile LEDs, so they are considered higher-level components.

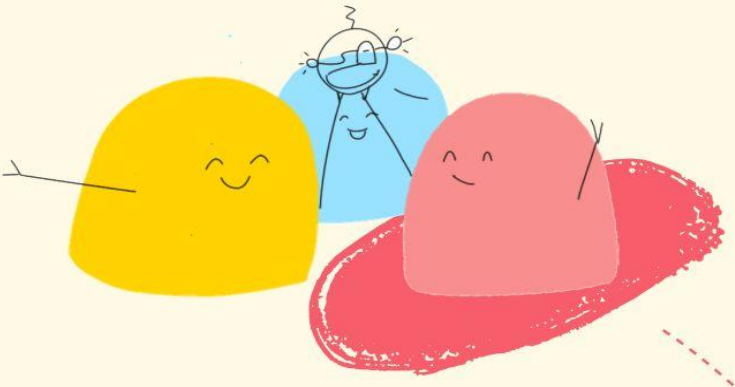
4. **Suppose you have programmed PeeCee to light up the Smile LEDs consecutively, but you notice that the previous LED is not turning off before the next one lights up. What might be causing this odd behaviour?**
   a. The time given inside Wait Block is too much.
   b. All the Smile LEDs are not enabled in Select section.
   c. All Smile LEDs are not enabled in all the Action Blocks.
   d. None of the Above.

6 Collab & Explore

After knowing the basics of the microcontroller and creating stunning patterns using LEDs, you now know how powerful our PeeCee is!. Now let us think out of the box and innovate.

- Use a single RGB LED of PeeCee to create the given colours and see how closely you can replicate them.
    1. White
    2. Cyan

- Illuminate all the RGB LEDs on PeeCee and create your individual pattern. Present your pattern and explain your code to the class.



7 Research & Innovate

- Create a table to display all the colours that can be created using PeeCee's RGB LEDs, including the new colours formed by combining the primary RGB colours. Furthermore, try and find out whether it is possible to produce the colours such as neon green, sparkling red, and beige using the existing RGB LEDs in the PeeCee.

- Create a tutorial on a chart paper that provides step-by-step instructions on how to use sequential programming to control the LEDs on PeeCee, including the Smile LEDs and RGB LEDs. Once complete, share your guide on TinkerBunker website so that others can learn from your expertise.

- Visit playcomputer.org and explore the website to find out more about the inbuilt components of PeeCee. Additionally, research how beepers work and write a brief summary explaining their function and how they can be used in different devices.

Grade 8 & 9
Time: 40 min

Weather Animator

Imagine you're standing near a window, watching raindrops fall and hearing the distant rumble of thunder. Have you ever wondered how you could recreate the magic of a thunderstorm using technology?

In our physical computing course, we are going to dive into the world of coding and electronics to create our very own rain and thunderstorm animation! Using our PeeCee's RGB LEDs, and the beeper, we'll learn how to control the colors and timing of the LEDs to mimic raindrops and lightning, while programming the beeper to produce the soothing sound of crickets.

Get ready to unleash creativity and bring the power of nature to life through code!

1 Challenge of the day

Use PeeCee's RGB LEDs and Beeper to create rain and thunderstorm animation.

2 Gear Up

Hardware

PeeCee	-	1
USB Type C Cable	-	1
Power Bank	-	1

Software

- PLODE App - 1

Design Sheets

- PeeCee Circuit Design Sheet - 1
- PeeCee Algorithm Sheet - 1

#animation #colors #complex_sequential_programming #frequency
#ISTE_1.5.d_Computational_Thinker #CSTA_1B-AP-08_Algorithms_&_Programming/Algorithms

3 Get Crafty

Let us get ready to explore and learn together!

Scan the QR code to watch our instructional video and get started, or wait for your mentor to play the instructional video for the whole class.

4 Test & Tweak

Uh-oh, roadblocks ahead? No worries, we have got you covered!
Take a look at the following tips for troubleshooting:

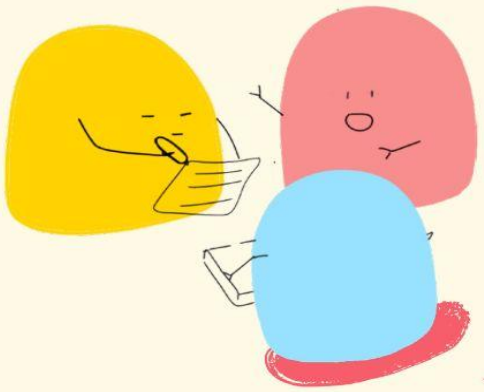
1. RGB LEDs are not lighting up as per requirement!

- **Software**
  - ☐ Check if you have enabled all the SMILE LEDs in all the ACTION Blocks used in the code.

2. Beeper is not producing any sound!

- **Software**
  - ☐ Ensure that you have set a Frequency value for beeper in the ACTION Block.
  - ☐ Check if the frequency value of beeper is almost 0. Increase the frequency value a little.

5 Think & Reflect



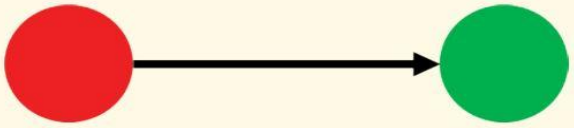
1. **I have coded PeeCee to light up the first row of RGB LEDs for only 1 second, followed by lighting up only the second row of RGB LEDs for another second. On uploading the program, the first row of RGB LED lights up for 1 second, but in the next second, both rows of RGB LEDs are lighting up. Why?**

   A. I have not turned ON my PeeCee using the in-built Battery/Power Bank.
   B. PeeCee's inbuilt Battery or the Power Bank is low on charge.
   C. I have not enabled the first row of RGB LEDs in the second ACTION Block.
   D. I have not selected the first row of RGB LEDs in the 'Select' Screen".

2. **When creating a smooth color transition from one primary color to another, what is the maximum number of intermediate colors you can include in the transition?**

   A. 100
   B. 99
   C. 98
   D. 20

3. **Which of the following represents a gradual transition between the below shown colors using RGB Values in PeeCee?**



   A. RGB(255, 0, 0) > RGB(255, 128, 0) > RGB(255, 255, 0) > RGB(128, 255, 0) > RGB(0, 255, 0)
   B. RGB(255, 0, 0) > RGB(255, 255, 0) > RGB(0, 255, 0)
   C. RGB(255, 0, 0) > RGB(255, 191, 0) > RGB(255, 255, 0) > RGB(64, 255, 0) > RGB(0, 255, 0)
   D. RGB(255, 0, 0) > RGB(0, 255, 0)

4. **Which statement accurately describes the relationship between frequency and pitch?**

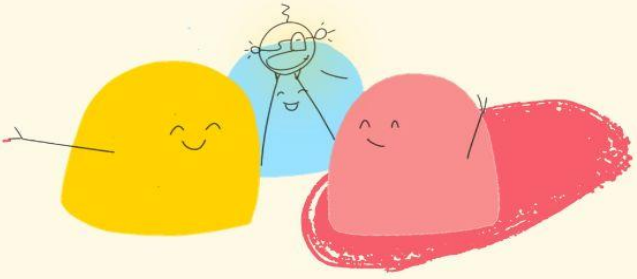
   A. The higher the frequency, the higher the perceived pitch.
   B. The lower the frequency, the higher the perceived pitch.
   C. Frequency and pitch are unrelated.
   D. Pitch is determined by volume of sound, not frequency.

6 Collab & Explore

Now that we have created a Weather Animator using PeeCee's inbuilt beeper and Smile LEDs, let us now think out of the box and innovate:

- Create a program using PeeCee and the RGB LEDs to smoothly transition between two simultaneous colors from the VIBGYOR spectrum, ensuring a gradual and visually pleasing blend.
- Create your own version of the popular poem, "Twinkle Twinkle Little Star," using PeeCee's built-in beeper. Adjust the beeper's pitch and add pauses of different lengths between each sound to compose your unique tune.

7 Research & Innovate



- Where did the term "VIBGYOR" come from and why is it important when studying colors? How do the different colors in the VIBGYOR spectrum behave and what do they tell us about the colors we see everyday? How does understanding the properties of these colors help us understand the world of visible light?
- Research about the impact of adjusting the frequency of beeper tones on the behavior of animals or insects, and how can this understanding be applied in areas such as pest control or animal behavior research?
- Research how indicator systems are utilized in buses, trains, and airports to guide passengers. This can include analyzing signage, digital displays, or audio announcements that indicate departure times, routes, and next stops.

Grade 8 & 9
Time: 40 min

Left or Right

In this activity, we shall dive into the world of turn indicators, just like the ones found on bikes and cycles.

Using switch, buzzer, RGB LEDs and PeeCee, we shall create our very own turn indicator system.We would be understanding the basic principles of circuit design and would learn the use of a tact switch as an input device.

Let us get crafty and explore the exciting world of circuit building and coding together!

1 Challenge of the day

Create a system to indicate Left or Right directions.

2 Gear Up

Hardware

PeeCee	-	1
TACT switch	-	1
Dual channel TACT switch	-	1
Port Connector	-	1
USB Type C Cable	-	1
Power Bank	-	1

Software

- PLODE App - 1

Design Sheets

- PeeCee Circuit Design Sheet - 1
- PeeCee Algorithm Sheet - 1

#circuits #tact_Switch #conditional_programming

#ISTE_1.5.a_Computational_Thinker #CSTA_1B-AP-08_Algorithms_&_Programming/Algorithms

3 Get Crafty

Let us get ready to explore and learn together!

Scan the QR code to watch our instructional video and get started, or wait for your mentor to play the instructional video for the whole class.

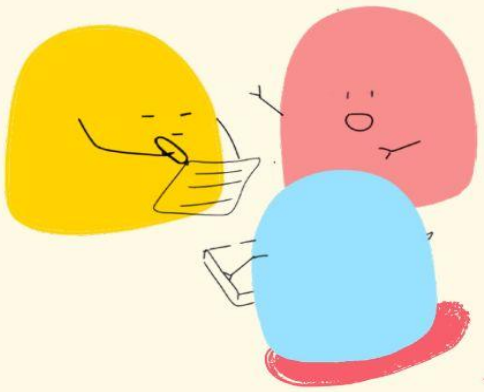
4 Test & Tweak

Uh-oh, roadblocks ahead? No worries, we have got you covered!
Take a look at the following tips for troubleshooting:

1. LEDs not lighting up when the Tact switch is pressed?

- **Software**
  - ☐ Check if the tact switch is connected to the same port as in the circuit design in the Assemble section of the Plode App.
- **Hardware**
  - ☐ Check if the tact switch is connected to the same PeeCee port as in the Assemble section of the Plode App.

5 Think & Reflect



1. **Which of the following options correctly explains why tact switches are called power-saving switches?**

   A. Tact switches have simple mechanisms and are small in size.
   B. Tact switches require very little force to be pressed, so they save energy.
   C. Tact switches have a special power-saving mode to help save energy.
   D. Tact Switches are only active when they are being pressed.

2. **To create a pattern with Beeper and RGB LEDs - where both the beeper and RGB LEDs turn ON at every 1 second. How many Action Blocks and Wait Blocks would you need in the code?**

   A. Four Action Blocks and Four Wait Blocks.
   B. One Action Block and One Wait Block.
   C. Two Action Blocks and One Wait Block.
   D. Two Action Blocks and Two Wait Blocks.

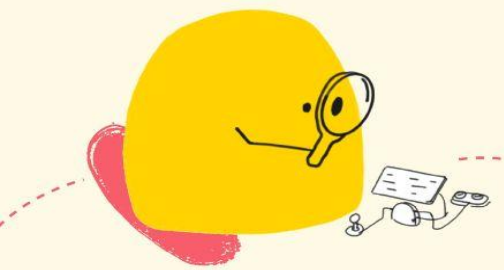
3. **How does sequential programming ensure the proper functioning of our Indicator system?**

   A. By synchronizing the colors of the RGB LEDs.
   B. By controlling the speed of the buzzer.
   C. By organizing the order of operations.
   D. By adjusting the sensitivity of the Tact switch.

4. **Which component of the Indicator system is responsible for detecting when the Tact switch is pressed?**

   A. Buzzer.
   B. RGB LEDs.
   C. Microcontroller.
   D. Resistor.

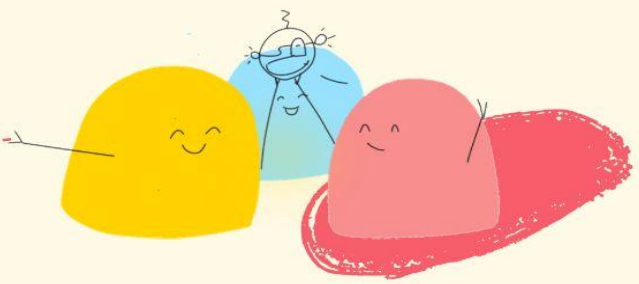
6 Collab & Explore



Now that we have created an indicator, let us now think out of the box and innovate:

- Develop a doorbell with multiple tones using the 'Tact' Switch and the built-in beeper of a PeeCee. The design should be such that a pleasant tune is played when the tact switch is pressed.
- Create a piano using only two Tact Switches. Assign different frequency sounds while pressing switches. Ensure that your chosen frequency is different from your classmates. Collaborate with your classmates and compose stunning music together.

7 Research & Innovate



- Find and list out 3 real-world applications, where tact switches are used instead of conventional switches. Explain the reason for using tact switches in each case.
- Have you ever wondered how the turn indicators in vehicles work? Do you think they use Tact Switches for this purpose? Explore and discover other types of switches besides Tact Switch and their practical applications.
- We learned how to automate the LED patterns with a switch. Have you ever wondered how your phone or computer automatically adjusts its brightness level? Research and find out how they automate the brightness?

Grade 8 & 9
Time: 40 min

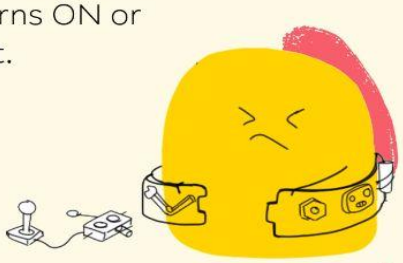
Street Lamp

Did you ever notice that as soon as the sun sets, all street lamps across your city light up, almost at the same time? Is it someone who lights up all of them together? Or each street lamp is lit up by a person at a time? Or, is it entirely a different technology?

We shall get to know answers to all our curious questions, in this lesson, where we will learn about using a special type of sensor called Light Sensor. We will also learn about a new type of switch called 'Dual Switch' and use it with our PeeCee.

1 Challenge of the day

Create an automated street lamp which turns ON or OFF based on the surrounding environment.



2 Gear Up

Hardware

PeeCee	-	1
Dual Switch module	-	1
External Dual Channel LED	-	1
External LDR module	-	1
Port Connector	-	2
USB Type C Cable	-	1
Power Bank	-	1

Software

- PLODE App - 1

Design Sheets

- PeeCee Circuit Design Sheet - 1
- PeeCee Algorithm Sheet - 1

#automation #sensors #light_intensity #dual_switch
#ISTE_1.5.d_Computational_Thinker #CSTA_2-AP-12_Algorithms_&_Programming/Control

3 Get Crafty

Let us get ready to explore and learn together!

Scan the QR code to watch our instructional video and get started, or wait for your mentor to play the instructional video for the whole class.

4 Test & Tweak

Uh-oh, roadblocks ahead? No worries, we have got you covered!
Take a look at the following tips for troubleshooting:

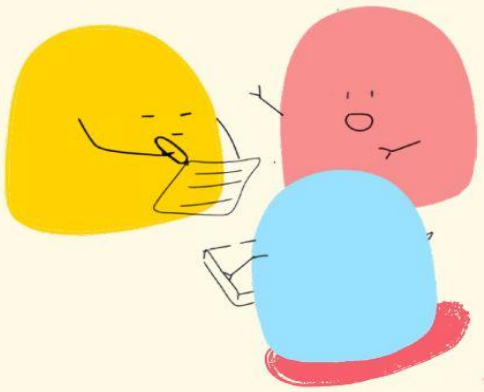
1. LED remains ON irrespective of Dual Switch's state!

- **Software**
  - ☐ Check if you have provided a Decision Block in the code and have set the right conditions inside it.
  - ☐ Check if the LED's ON or OFF state is specified in an Action Block, under a Decision Block.
- **Hardware**
  - ☐ Ensure that the DUAL Switch is connected properly to the Port of PeeCee.

2. LED's turn ON when it's bright outside and turn OFF when it's dark!

- **Software**
  - ☐ Check if the two Decision Blocks provided have the appropriate conditions inside them.
  - ☐ Ensure that Turn ON Action is provided under the decision of light intensity being less than a threshold value, and, Turn OFF Action is provided under the decision of light intensity being more than a threshold value.

5 Think & Reflect



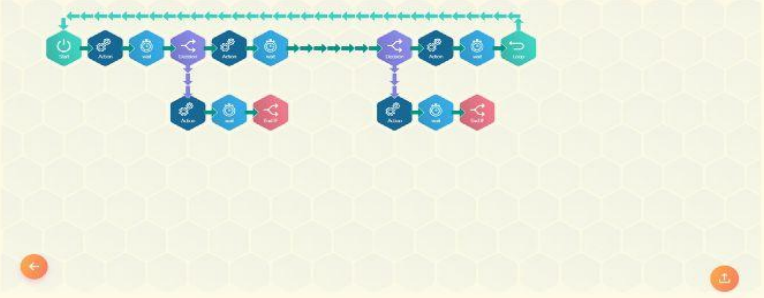
1. How does a dual switch differ from a traditional switch?

A. A dual switch can control multiple devices simultaneously, while a traditional switch can only control one device.
B. A dual switch has a more advanced design and better aesthetics compared to a traditional switch.
C. A dual switch requires specialized wiring and installation, whereas a traditional switch does not.
D. A dual switch is operated using digital controls, while a traditional switch uses mechanical mechanisms.

2. How does using a dual channel LED help save energy in lighting?

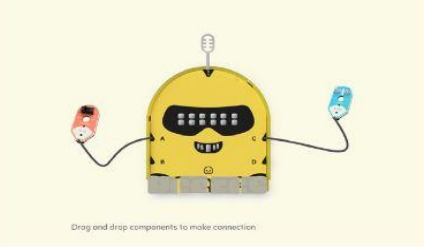
A. By turning on only the required LEDs based on lighting needs.
B. By producing more light for the same amount of power compared to single LEDs.
C. By adjusting the brightness and intensity of the LEDs to use less energy.
D. By distributing light efficiently to avoid waste.

3. Which type of programming is shown below?



A. Sequential Programming
B. Conditional Sequential Programming
C. Sequential Loop Programming
D. None of the Above

4. **Observe the below shown images, and find out the reason(s), why would the Dual LED not light up using the Dual Switch even when coded properly to do so?**



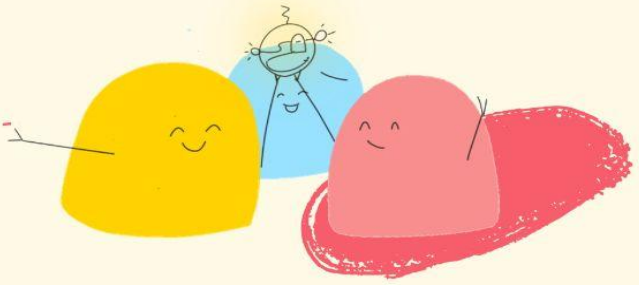
A. Because Dual LEDs cannot work with Dual Switch
B. Because the Dual LED is connected to a different port in Assemble Section than in real.
C. Because the Dual Switch is connected to a different port in Assemble Section than in real.
D. None of the above

6 Collab & Explore

Now that we have created a street lamp, let us now think out of the box and innovate:

- Create a morning alarm, which should wake you up as soon as the sun rises using the Light Sensor and in-built Beeper of PeeCee. Also look into the possibility of ringing the alarm at a specific time in morning by detecting the amount of light falling on the Light Sensor.
- Build a sun intensity tracking device, which can be used to determine the intensity of sunlight falling at various places, and represent the various light intensity values using RGB LEDs of PeeCee. Create an alarm system which would notify you if the sunlight intensity crosses the safety limit.

7 Research & Innovate



- Explore how light sensors are used in everyday devices such as automatic doors, security systems, or smart lighting systems. Research and present examples of their applications.
- Conduct a survey or interview with local officials or engineers responsible for street lighting. Ask them about the technology and mechanisms used to control street lamps in your city. Share your findings on www.tinkerbunker.com
- We have seen how light intensity can be measured. Just like that, find out different types of measuring instruments that are widely used, such as a Temperature Measuring Device. Also find out how they are being used devices like, digital thermometers or air conditioners.

Grade 8 & 9
Time: 40 min

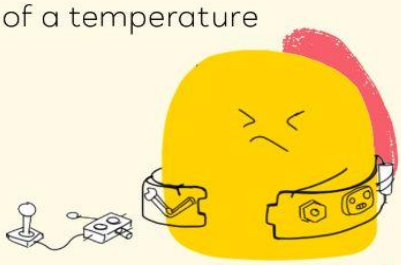
Smart Room

It would have been good if we had a system that can tell us the temperature around is rising. This would help us to how the temperature keeps on changing throughout the day and along with that, what if we had a lamp that will automatically turn as the light inside the room keeps changing.

In this lesson of PeeCee, we will build a smart room system comprising of a temperature meter and smart lamp.

1 Challenge of the day

Create a smart room system that consists of a temperature meter and a smart lamp.



2 Gear Up

Hardware

PeeCee	-	1
External Dual Channel LED	-	1
External LDR module	-	1
Port Connector	-	2
USB Type C Cable	-	1
Power Bank	-	1

Software

- PLODE App - 1

Design Sheets

- PeeCee Circuit Design Sheet - 1
- PeeCee Algorithm Sheet - 1

#automation #sensors #light_intensity #temperature
#ISTE_1.5.d_Computational_Thinker #CSTA_2-AP-12_Algorithms_&_Programming/Control

3 Get Crafty

Let us get ready to explore and learn together!

Scan the QR code to watch our instructional video and get started, or wait for your mentor to play the instructional video for the whole class.

4 Test & Tweak

Uh-oh, roadblocks ahead? No worries, we have got you covered!
Take a look at the following tips for troubleshooting:

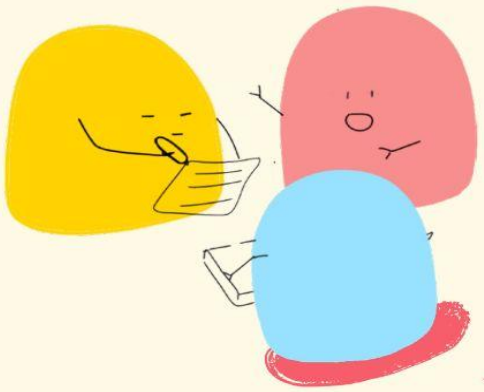
1. RGB LEDs are not changing color as the temperature is changing!

- **Software**
  - ☐ Check if you have enabled all the RGB LEDs, in all the ACTION Blocks used in the code.
  - ☐ Make sure the values in Action blocks have correct temperature values.

2. The LEDs are not turning ON when no light is falling on the light sensor!

- **Software**
  - ☐ Check the values added to the decision block and make sure that you have selected Less Than/Greater Than/In Between from the options for setting the threshold values.

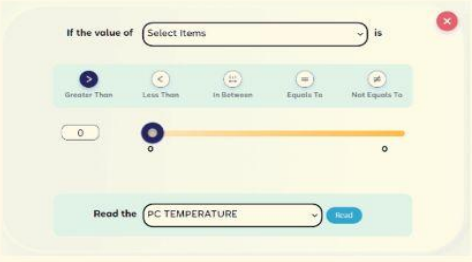
5 Think & Reflect



1. **To create a temperature level indicator using temperature sensor and RGB LEDs, which of the following type programming(s) is not required?**
   A. Conditional Programming
   B. Sequential Programming
   C. Loop Programming
   D. Random Programming

2. **How many Action Blocks would you need in the Plode App to display temperatures using the complete RGB Array? Assume that each column of the RGB LEDs in the array represents a certain amount of temperature rise?**
   A. Three
   B. Four
   C. Five
   D. Six

3. **Which image correctly represents that the conditions are being correctly set for the temperature sensor in the Decision block?**



A.

B.

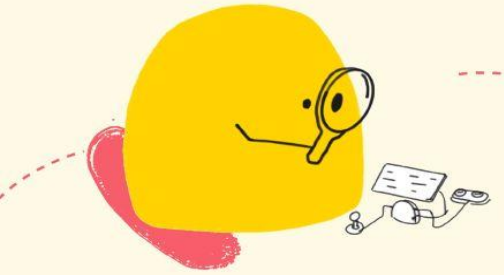
C.

D.

4. **If different ranges of light intensity were to be displayed using the RGB LED Array of PeeCee, which of the following Decision Block operators would be most suitable?**

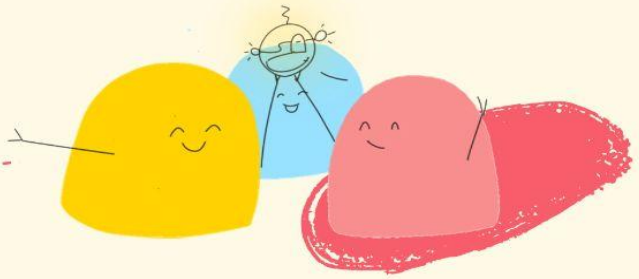
   A. Greater Than operator
   B. Less Than operator
   C. Equals To operator
   D. In Between operator

6 Collab & Explore



Now that we have created a smart room using PeeCee, let us now think out of the box and innovate:

- Create a program in Plode App that will activate the beeper producing a siren tone and turn on a red RGB LED if the temperature reading from the built-in temperature sensor exceeds a certain threshold.
- Use the LDR Module to vary the brightness of the external LED module based on the light intensity detected by the LDR Module.



7 Research & Innovate

- Explore and explain the differences between switches and sensors? Although they both provide an output based on detected input, there are distinct characteristics that set them apart.
- Did you know that you can control the lights in your room automatically by using a special type of technology called Home Automation? Research and find out about other types of home automation technologies that can make your life easier!
- Research ways to use soil moisture and environmental temperature to optimize irrigation schedules for different types of plants in order to conserve water and reduce water usage.

make

crazy

play

crazy

YUDU ROBOTICS

Evobi Automations Pvt Ltd
No. 29, Beratena Agrahara,
Hosur Main Road, Electronic City Post,
Bangalore - 560 100, Karnataka, India

+91 96067 55032

support@yudurobotcs.com