CLASS 4

Contents:

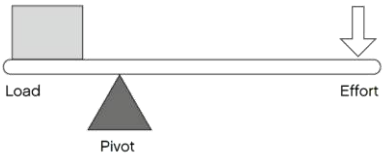
19. Spm- Inclined plane
20. Spm- Power car on Inclined plane
21. Scratch- Cat chasing mouse(Explanation)
22. Scratch-Cat chasing mouse (Practical)
23. 3d- 3D Slash- Construction of a
24. 3d- Measuring area with Keva
25. Spm- Flywheeler
26. Spm- Land yatch
27. Scratch- Hide and seek(Explanation)
28. Scratch- Hide and seek(Practical)
29. 3d- Construction of Big Ben
30. 3d- Keva- Tower and Bridge Relay

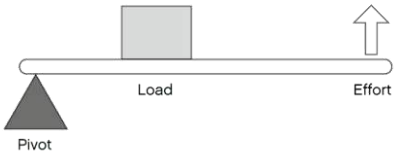
Class 1. Lever Mechanism(Introduction)

- The lever is a simple machine that can be used to change the force that is applied (effort), alter the direction, and change the distance of movement.

- **Simple Machines: Lever**
  The lever is probably the most commonly used simple machine. A lever is a rigid bar or solid object that is used to transfer force.
  With a pivot, the lever can be used to change the force that is applied (effort), alter the direction, and change the distance of movement. Effort, a pivot, and a load are three features that are common in every lever.
  Depending on the positions of these shared features, you can distinguish between first, second, and third class levers.

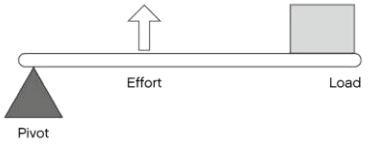
First class levers have the pivot positioned between the effort and the load. Common examples of first class levers include a seesaw, a crowbar, pliers, and scissors.





Second class levers have the pivot and the effort at opposite ends and the load positioned between the two. Common examples of second class levers include nutcrackers, wheelbarrows, and bottle openers.

Third class levers have the pivot and the load at opposite ends and the effort positioned between the two. Common examples of third class levers include tweezers and ice tongs.



Did you know?
The term lever derives from the French word levier which means ‘to raise’.

Class 2- Catapult

Explore and recognize that the effectiveness of a lever depends on the arrangement of the pivot point, effort and load

KEY OBJECTIVE

Students will investigate:

Pivot, effort and load
First class levers
Measure with standard units of measure
Predict outcomes of various trials

CONSTRUCTION

Which class of lever is the catapult?

The catapult is a first class lever, which has the pivot positioned between the effort and the load.

Then, look carefully at the pictures of the models and compare Catapult Model C3 to Catapult Model C4.

Count how many LEGO® studs or holes there are on the lever beam from the pivot to the load in the two models.

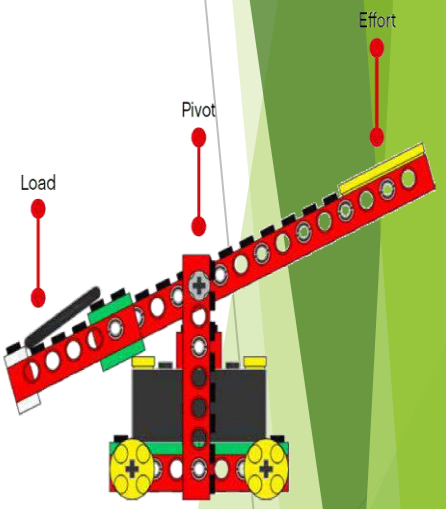
What do you notice? Explain how the two models are different.

Students should notice that even though both catapults are first class levers, the lengths from the load to the pivot differ in model C3 and model C4.

Next, look carefully at the pictures of the models and make a prediction.

If I compare model C3 to model C4, then I think Catapult Model (C3/C4) will throw the tire further.

Encourage students to discuss the effects the different lengths between the load and the pivot will have on the catapults in their own words. For the prediction, the correct answer is model C4; however, it does not matter whether students get the answer right or wrong at this point, only that they should make a prediction that can be checked later. Even though many variables will affect the catapult - especially the amount of effort used - model C4 should still throw further than C3, because the beam is longer from the load to the pivot in model C4



Test Catapult Model C3.

Have students observe the starting place of the lever, including the lever beam, the pivot and the load on the catapult. *Encourage them to try more than once, to ensure that their observations are correct. Students must write their measurements on the student worksheet.*

Test Catapult Model C4.

Encourage students to try more than once, to ensure that their observations are correct. Students must write their measurements on the student worksheet.

Finally, draw a conclusion and check your prediction.

Catapult Model C4 throws the furthest because of the distance between the pivot and the load.

Assessment

Students use the self-assessment rubric to evaluate their work. Each rubric includes four levels of achievement. The intention is to help students reflect on what they have done well and what they could have done better.

Continue

Students are encouraged to make a game with rules that they can play using the catapult.

Describe how you can win the game.
How will you make sure your rules are followed?
It is suggested that students create a sign explaining the rules and inviting people to play the game.

Optional

It is suggested that students should draw different items where they find levers used in everyday machines and mechanisms.

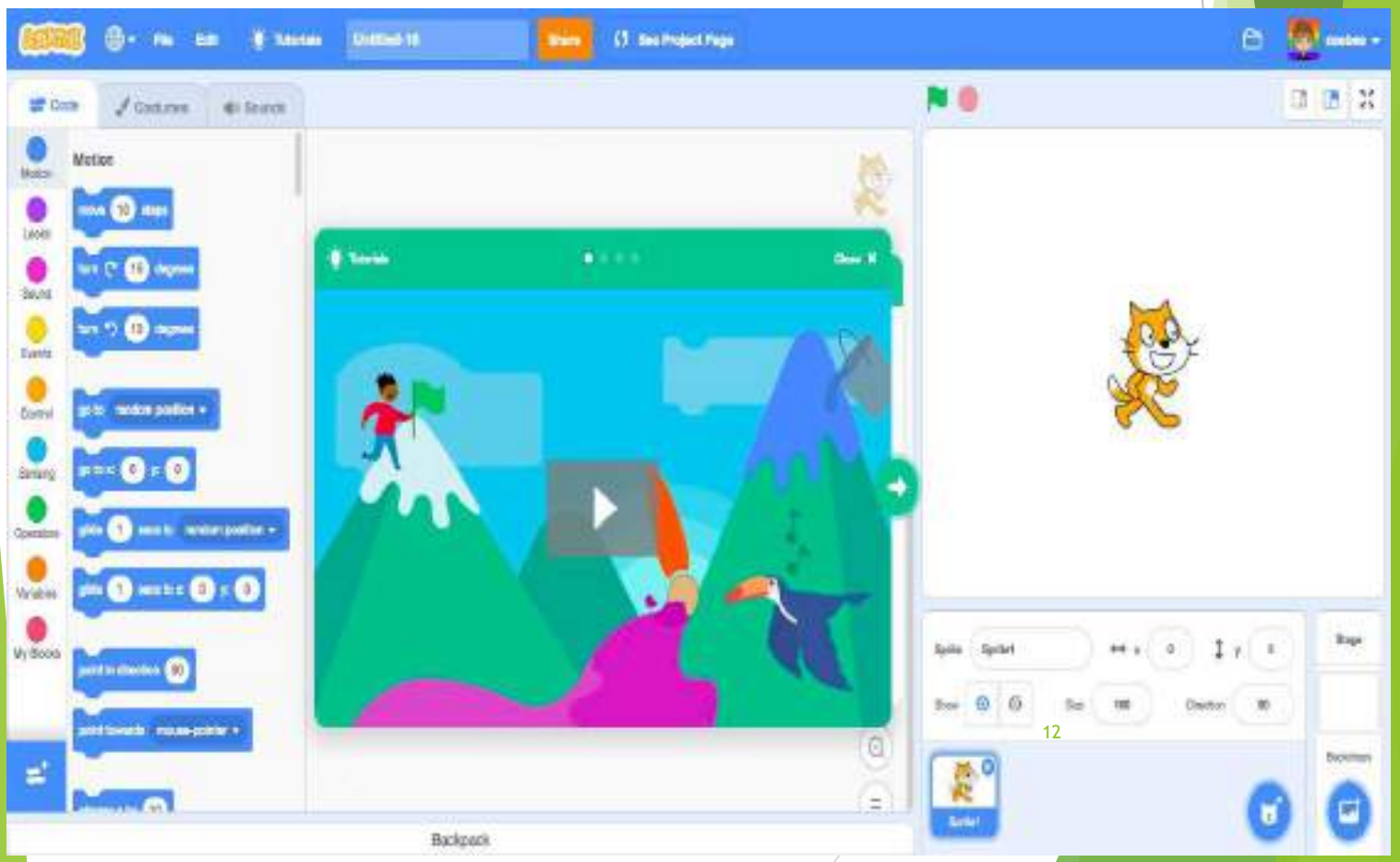
3. Scratch- Introduction to MIT Scratch

Scratch is a block-based visual programming language and online community targeted primarily at children. Users of the site can create online projects using a block-like interface. The service is developed by the MIT Media Lab, has been translated into 70+ languages, and is used in most parts of the world. Scratch is taught and used in after-school centers, schools, and colleges, as well as other public knowledge institutions. As of May 2019, community statistics on the language's official website show more than 40 million projects shared by over 40 million users, and almost 40 million monthly website visits.

Scratch takes its name from a technique used by disk jockeys called "scratching", where vinyl records are clipped together and manipulated on a turntable to produce different sound effects and music. Like scratching, the website lets users mix together different media (including graphics, sound, and other programs) in creative ways by "remixing" projects.[2][3]

User interface

The Scratch interface has three main sections: a *stage area*, *blocks palette*, and a coding area to place and arrange the blocks into runnable scripts. The *stage area* features the results (i.e., animations, turtle graphics, etc., either in a small or normal size, with a full-screen option also available) and all sprites thumbnails being listed in the bottom area. The stage uses x and y coordinates, with 0,0 being the stage center.



With a sprite selected at the bottom of the staging area, blocks of commands can be applied to it by dragging them from the blocks palette into the coding area. The Costumes tab allows users can change the look of the sprite in order to create various effects, including animation. The Sounds tab allows attaching sounds and music to a sprite. When creating sprites and backgrounds, users can draw their own sprite manually, choose a Sprite from a library, or upload an existing image.

Educators have their own online community for called ScratchEd, developed and supported by the Harvard Graduate School of Education. In this community, Scratch educators share stories, exchange resources, and ask questions.[221]

Category	Notes
Motion	Moves sprites, changes angles and position
Looks	Controls the visuals of the sprite
Sound	Plays audio files and effects
Events	Event handlers
Control	Conditionals and loops etc.

Category	Notes
Sensing	Sprites can interact with the surroundings
Operators	Mathematical operators, comparisons
Variables	Variable and List usage and assignment
My Blocks	Custom procedures

Why Scratch??

Scratch is popular in the United Kingdom and United States through Code Clubs. Scratch is used as the introductory language because the creation of interesting programs is relatively easy, and skills learned can be applied to other programming languages such as Python and Java.

Scratch is not exclusively for creating games. With the provided visuals, programmers can create animations, text, stories, music, and more. There are already many programs which students can use to learn topics in math, history, and even photography. Scratch allows teachers to create conceptual and visual lessons and science lab assignments with animations that help visualize difficult concepts. Within the social sciences, instructors can create quizzes, games, and tutorials with interactive elements. Using Scratch allows young people to understand the logic of programming and how to creatively build and collaborate.[12]

Scratch is taught to more than 800 schools and 70 colleges of DAV organization in India and across the world.

CLASS 4: SCRATCH- BASIC MOVEMENT

After getting introduced to all the blocks and options, the first thing students need to learn is the basic movements of a sprite with a appropriate background.
Events: When the right arrow is pressed
Motion: Change x by 5

Events: When the left arrow is pressed
Motion: Change x by 5

Events: When the up arrow is pressed
Motion: Change y by 5

Events: When the down arrow is pressed
Motion: Change y by -5

CLASS 5: 3D- KEVA PLANKS INTRODUCTION(TOWER)

KEVA Planks are cuboid wooden block toys for children and adults. Each block is sized approximately 1/4 inch (6.35 mm) x 3/4 inch (19.05 mm) x 4 1/2 inches (114.3 mm). The blocks are available for sale in maple, that is produced in the United States, and less expensive imported pine versions.

KEVA Planks started out as a simple construction set that is unusual because they only use one piece and no connectors in glue, in contrast to other building sets that often have specific instructions and require sorting. It has developed into a teaching tool used in classrooms and enjoyed in homes.

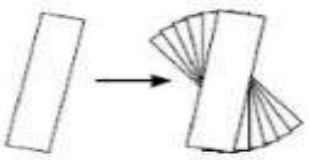
They have been used as "de-stressors" at libraries at Duke University and the University of Virginia.

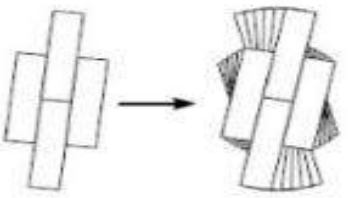
- KEVA Planks are used in schools, libraries, museums, and maker spaces. They are a teaching tool that can be used as a manipulative to teach subjects including math, science, geography, history, and humanities. They were featured at Destination Imagination Global Finals in Knoxville, Tennessee in 2011.
- Beginning in 2015, KEVA Planks traveled with Share Fair Nation STEMosphere events and was one of the most popular sessions in the professional development workshops. STEMosphere highlights innovative and creative teaching tools.

KEVA Planks were named number 3 in Worlds of Learning's Top Ten Makerspace Favorites of 2016.

SPIRALS:

- Spirals make beautiful accents and are easy to construct. Begin by laying a plank flat .Lay another plank flat directly on top of the first plank, but offset a tiny bit (about 10Degrees). Be sure that your spacing is the same at each end of the planks so your spiral willstay centered. Continue this process to create a spiral .Larger and more intricate spiralscan be made with 2, 3 or 4 planks on each layer. The basic steps are the same. Begin with oneflat layer. Line up the next layer exactly, with a slight twist .





- Angled or Zigzag Towers: These towers can be built by laying the planks flat or on edge. From your base, offset each successive layer by a small amount (several millimeters) in one direction. After several layers (4-6), before the tower begins to become unstable, offset the next 4 to 6 layers by several millimeters each in the opposite direction. This can be continued for several angles using decreasing numbers of layers before the tower loses stability.

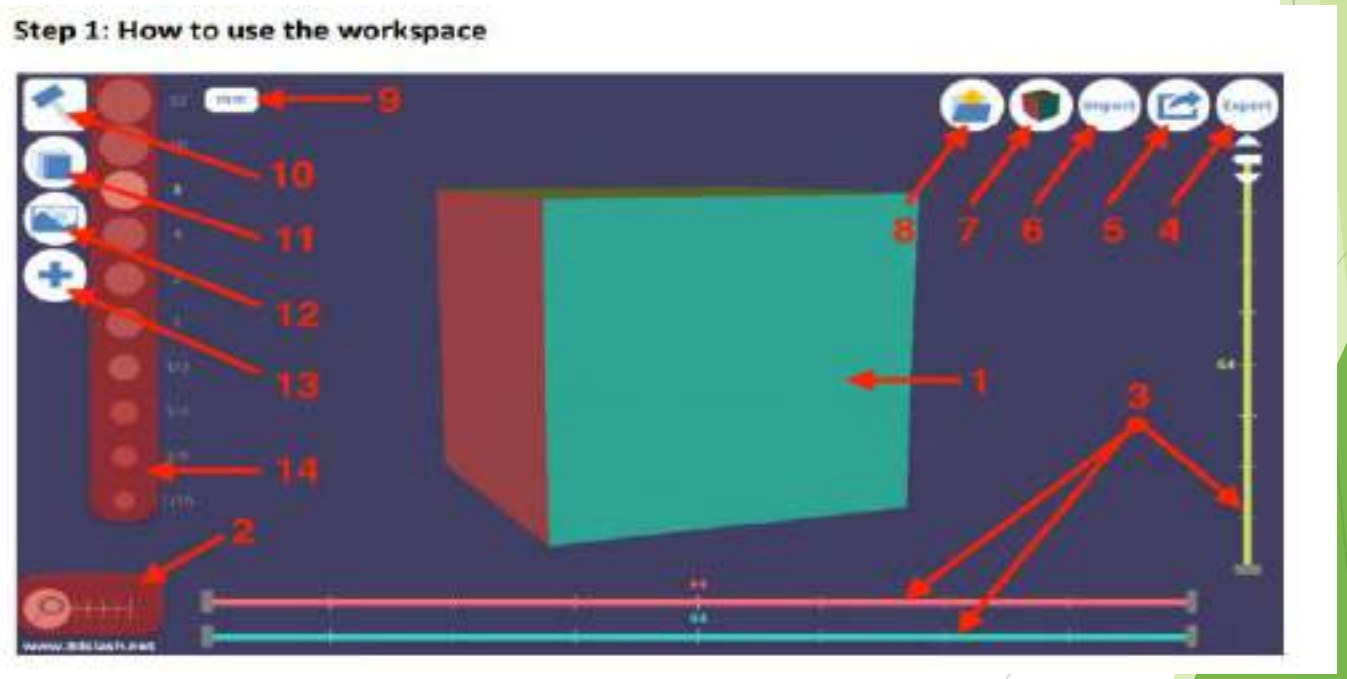
CLASS 6: Introduction to 3D Slash

- 3 Dimensional Shape Introduction: Dimension is a property of shapes which tells whether the shape has the height (or depth). A three dimensional shape also called as a breadth and height. They look different by observing them from different places angles. But whereas 2d-shapes have only two measurements length and breadth.

3D SLASH Software Introduction

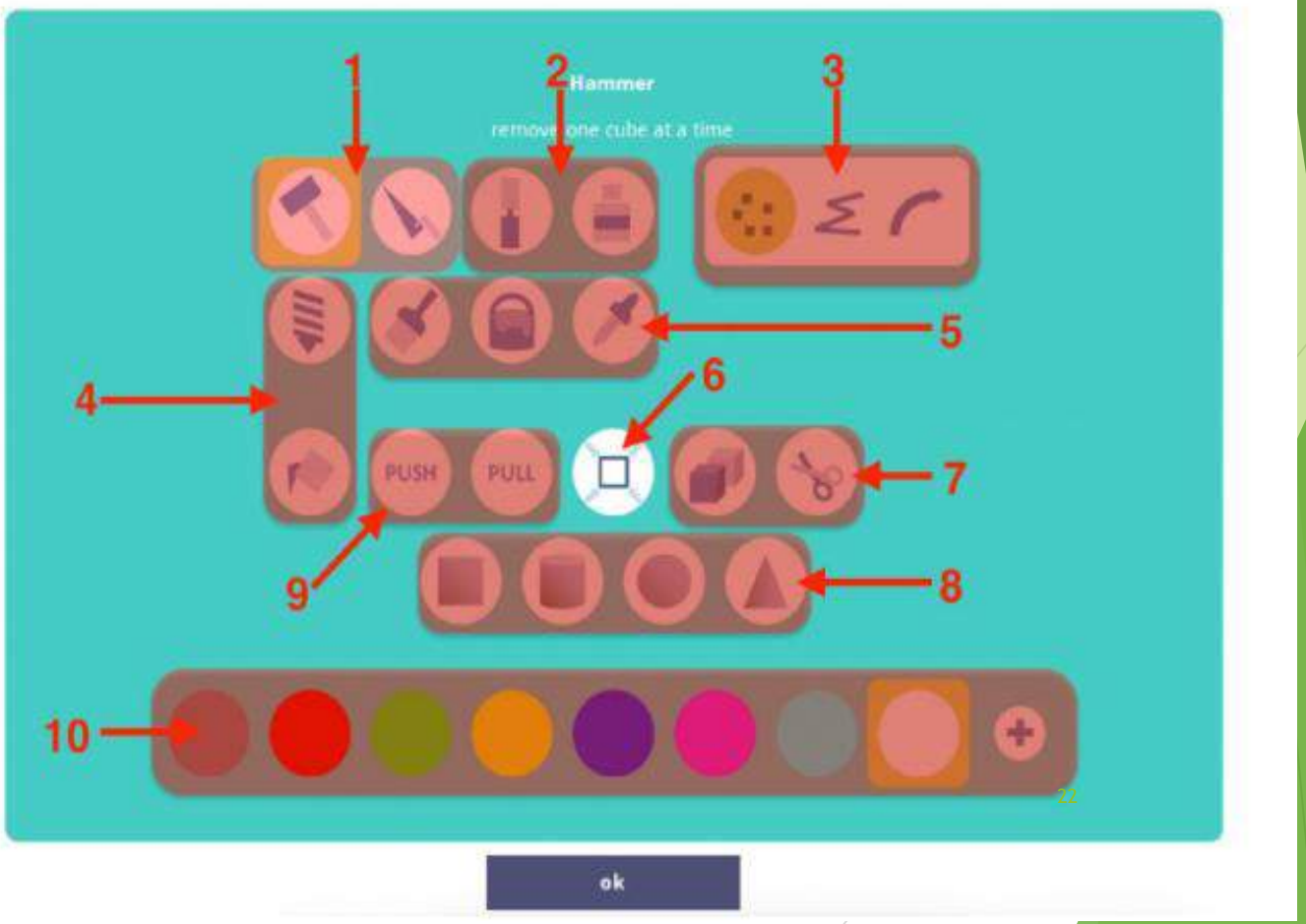
3D Slash software offers an original and intuitive experience to 3D model easily imitating the stone-cutter and block. 3D Slash develops its concept on preassembled Cuboid forms of different sizes.

1. Hold the left mouse key to change the point of view. Right-click and drag to move the object.
2. Zoom in or out.
3. Set the limits for Height, Width and Depth.
4. Switch to Expert or Basic mode.
5. Save and share your object.
6. Import .stl or image files (hold and drop on the workspace works as well).
7. Create a new model.
8. Open an existing model.
9. Change the unit and scale.
10. Open the Tool dialog to select a tool.
11. Change the rendering mode.
12. Add and place an image (for reference).
13. Set the Options.
14. Select the working size.



Step 2: Use the correct tool

1. Hammer (left): remove cubes; Trowel: rebuild cubes
2. Chisel (left): remove slices of cubes; Wood paste: rebuild slices of cubes.
3. Select plots, lines or curves for the currently selected tool.
4. Drill (top): remove everything inside the limits selected; the area you want fill or remove.
5. Brush, Bucket, Pipette: paint cubes or fill with color.
6. Compress the object to half its size.
7. Copy or Cut everything inside the limits.
8. Build or remove a Sphere, Cylinder or a cone inside the limits.
9. Push and Pull to look into an object.
10. Select a color.
11. After selecting tool, just press OK



CLASS 7: WHEEL AND AXLE

Wheel and Axle is a simple machine, often a big wheel and a small axle, which is secured to one another. A wheel and axle always rotate at the same speed.

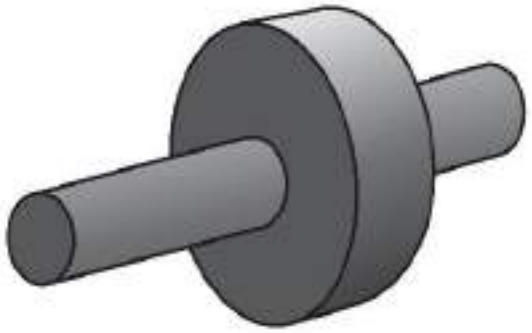
Connect

Simple Machines: Wheel and Axle

Wheels and axles are usually circular objects, often a big wheel and a smaller axle, rigidly secured to one another.

Did you know?

The first constructed wheel found so far was made by the Sumerians some 5,600 years ago.



The wheel and axle will always rotate at the same speed. Due to the bigger circumference of the wheel, the surface of the wheel will turn at a greater speed – and with a greater distance too.
Placing a load on a wheeled vehicle almost always reduces friction compared to dragging it over the ground. Wheels in science and engineering are not always used for transport. Wheels with grooves are called pulleys and wheels with teeth are called gears.

Common examples of wheels and axles are rolling pins, roller skates and pushcarts.

Construct

Build the following models. Use the Contemplate ideas below and on the Student Worksheet to learn about each model, one at a time

Contemplate

B1

This model shows a cart with split axles. It is very easy to steer both when driving in a straight line or when following zigzag patterns involving sharp turns. The split axles allow the wheels to turn at different speeds.

B2

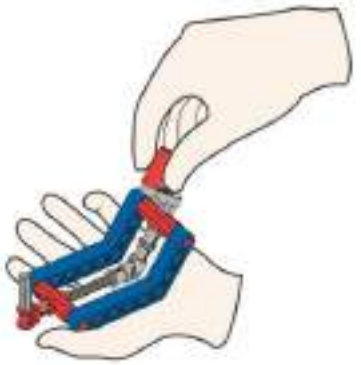
This model shows a cart with fixed axles. It is very easy to steer when driving in a straight line. However, it is hard to steer when following zigzag patterns involving sharp turns as the wheels cannot turn at differennt speeds. One wheel will always skid when turing corners.

B3

This model shows a cart with a steering system. It is very easy to steer both when driving in a straight line or when following zigzag patterns involving sharp turns. The split axles allow the wheels to turn at different speeds and the steering wheel provides good control.

B4

This model shows a universal joint. When the handle is turned the rotary motion is transmitted through the universal joint at an angle to the output. The speed ratio between input and output is 1:1.



Class 8: Crazy Floors

- Learn about the pulley drive and the gear train mechanisms.
- **KEY OBJECTIVE:**
- Students will investigate:
  Pulley wheels
  Models which will gear up and increase speed of rotation
  Models which will gear down and decrease speed of rotation
  Predict outcomes of various trials

Hint

Students should be reminded that the drive wheel is the pulley turned by an outside effort, in this case your hand cranking the yellow handle.

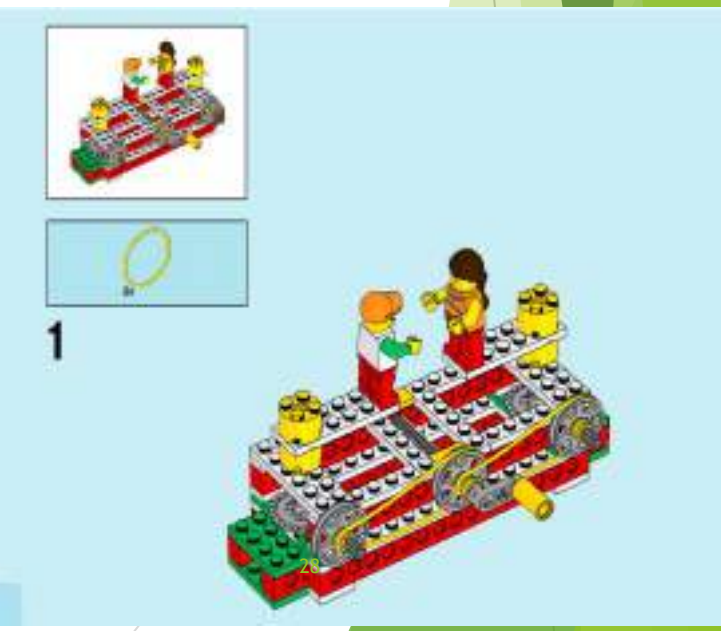
Count the number of pulley wheels on the model.

There are seven pulley wheels built into the model; three large gray pulley wheels and four small yellow pulley wheels.

Build Crazy Floors Model D7 and make it turn.

Gently grip one of the floor elements to stop it from turning, and you will feel the pulley belt slip.

Encourage students to identify parts while they are testing the model. Students can be made aware of "slip" (see Glossary) by gently gripping the floor element to prevent it from turning, as this causes the attached pulley belt to slip.



Test Crazy Floors Model D7.

Which side of Crazy Floors will move the fastest, Sam's side or Sally's side?

Have students pay attention to the starting positions of both the handle and the minifigures. Encourage them to try more than once, to ensure that their observations are correct. Students must write an F for fast and an S for slow. The different pulley arrangements produce different speeds of rotation for Sam and Sally. The drive wheel is attached to the handle, and there is thus a gearing up pulley arrangement to the side where Sam stands. Sam turns at a much faster pace (= F, for fast) than the gearing down pulley arrangement on the side where Sally stands, which turns at a much slower (= S, for slow) pace.

Finally, draw a conclusion and check your prediction.

Crazy Floors Model D7 has the larger difference in the speed of rotation of the crazy floors because of the different pulley arrangements.

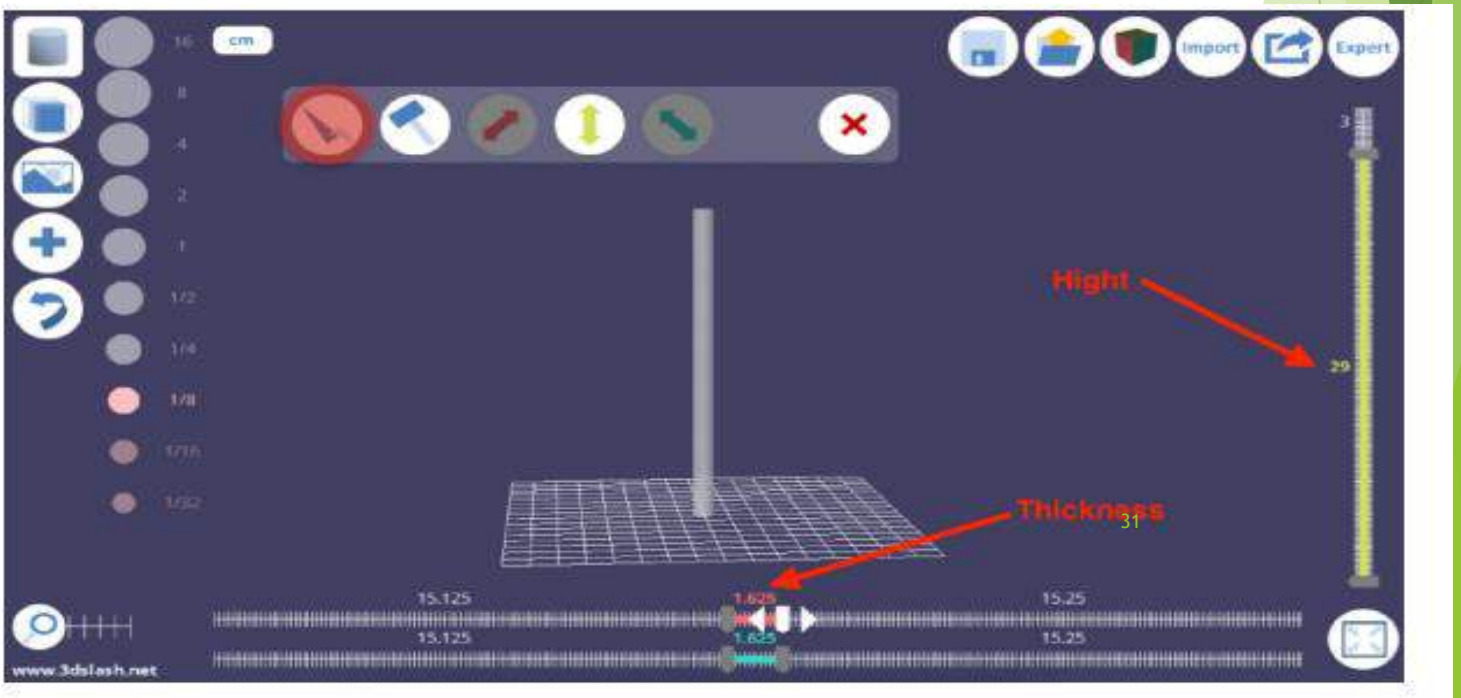
CLASS 9 & 10: SCRATCH- Flying Bird

This is the first animation they will do in which the bird will appear to fly by changing costume frequently the same way in a video the picture slides changes frequently. So, this will give them the idea of how a video or an animation works. From programming point of view students will understand the function of a loop also if then else condition.
Also, they can use the same concept in moving a sprite

CLASS 11: 3D SLASH- BUILD THE BASIC SHAPE

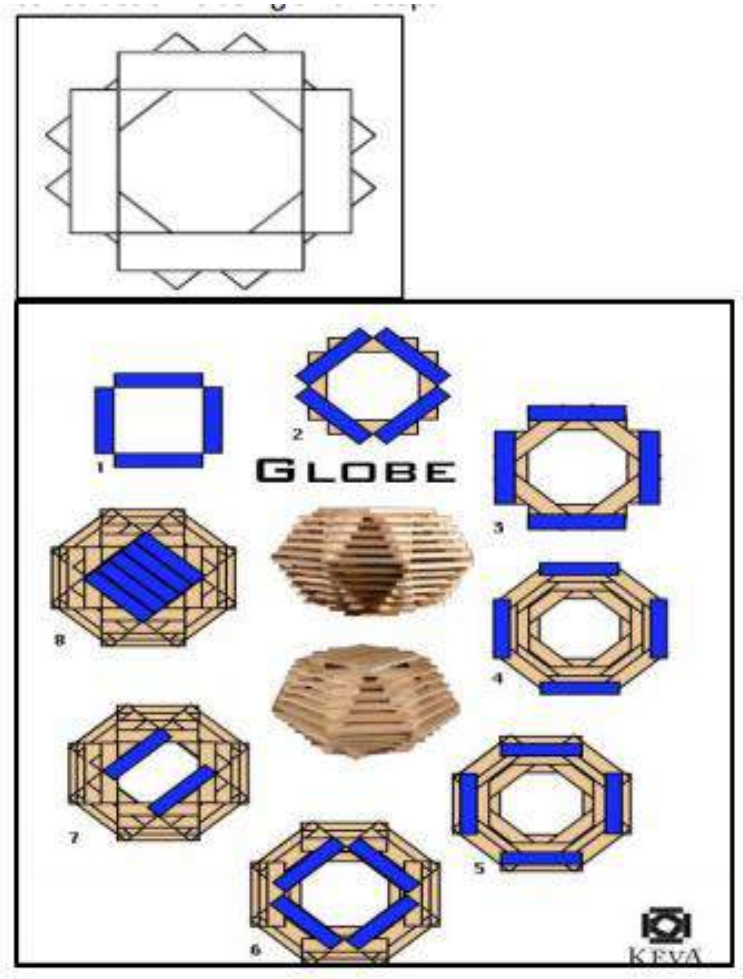
- BUILD THE BASIC SHAPE:

1. Switch on Expert mode.
2. Create new model sized 32 x 32 x 32 cm.
3. Use the Drill tool to get rid of the entire cube.
4. Create a cylinder of the thinnest part of the lightsaber using the Cylinder tool. Before you build the highlighted button, make sure you set the limits to the correct (1.6 cm) and the complete height (29 cm). 2018-2019 thing inside the limits; or click into tool. Before you build the to the correct thickness (1.6 cm) and the complete height (29cm).



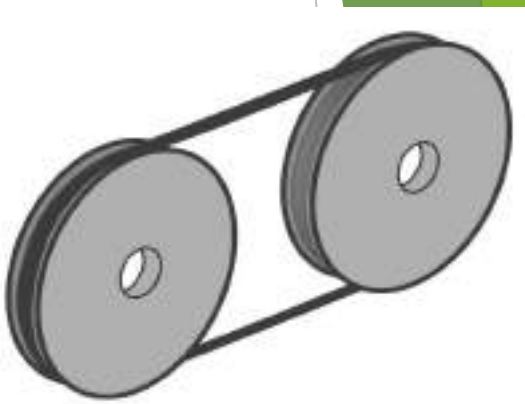
CLASS 12: 3D KEVA

- Bowls, Domes and Globes: Bowls, Domes and Globes Start with a square, hexagon, octagon or larger closed figure built by laying the KEVA planks flat in two rows, the second bisecting the first .Then, with each successive layer, place each plank a small (5mm) step outward. With each layer the figure will have a greater outer diameter. Eventually you will find you cannot move out any farther or the piece will topple. You may now build straight up or begin placing the planks a small step inward to create a dome. The key to this type of construction is using small steps



CLASS 13: PULLEY INTRODUCTION

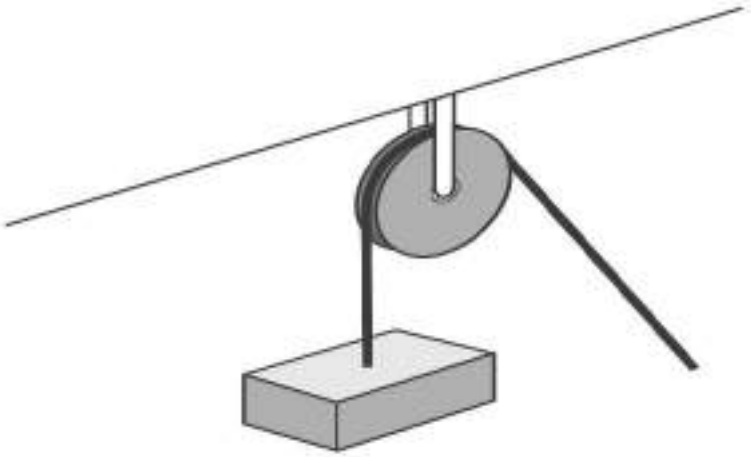
A pulley is a simple machine that can be used to lift objects and transmit motion. Pulleys can be either movable or fixed and multiple pulley wheels on one axle can be used ad block and tackle.



In a belt driven pulley a continuous belt joins two pulley wheels. The wheel to which an external force is applied (effort) is called the drive wheel, and the other the driven wheel. The drive pulley wheel provides the input force and the driven pulley wheel delivers the output force. When the drive wheel turns the belt moves and causes the driven wheel to turn in the same direction. If the drive wheel is smaller than the driven wheel, the driven wheel will turn more slowly than the drive wheel.

Belt driven pulleys rely on belt friction to transmit motion. If the belt is too tight the belt will create wasteful friction forces on the pulley axle and bearing. If too loose the belt will slip and the effort is not used efficiently. Slip is an overload protection safety feature of belt-operated machinery.

For heavy lifting jobs; multiple pulley wheels can be combined into a lifting system that makes lifting heavy objects easier.



Did you know?

Pulleys started the age of mass production in England, when they were produced at the beginning of the 19th century to supply the British Royal Navy with pulley blocks for their war ships during the Napoleonic Wars.

Using a single pulley to lift a load doesn’t make it easier, but it changes the direction of motion without any gains in speed or required effort. It only allows you to lift a load up by the pulling of the rope. Pulleys can be either movable or fixed. The difference between fixed and movable pulleys are that fixed pulleys do not move up or down when the load is being moved.

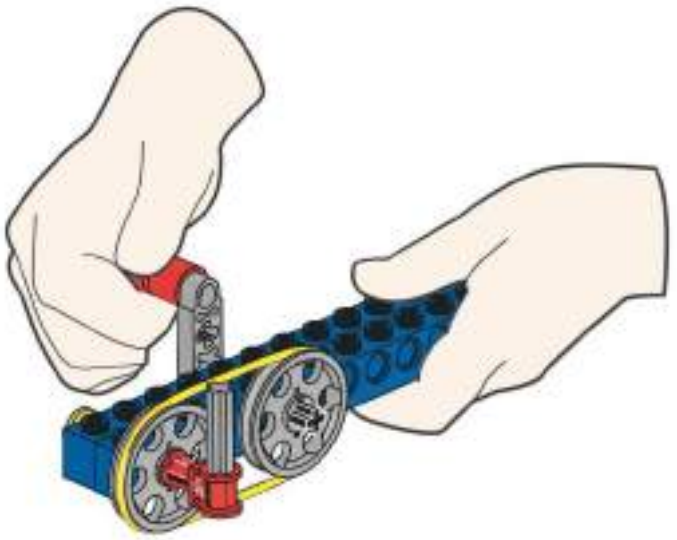
A fixed pulley is often fixed to an overhead beam or rafter and will only be able to rotate around its own axle. The use of multiple pulley wheels on one axle, in a lifting or dragging system, is called a Block and Tackle.

Common examples of pulleys are found in window blinds, curtains and flagpoles.

CLASS 14: SPM- PULLEY(Contd.)

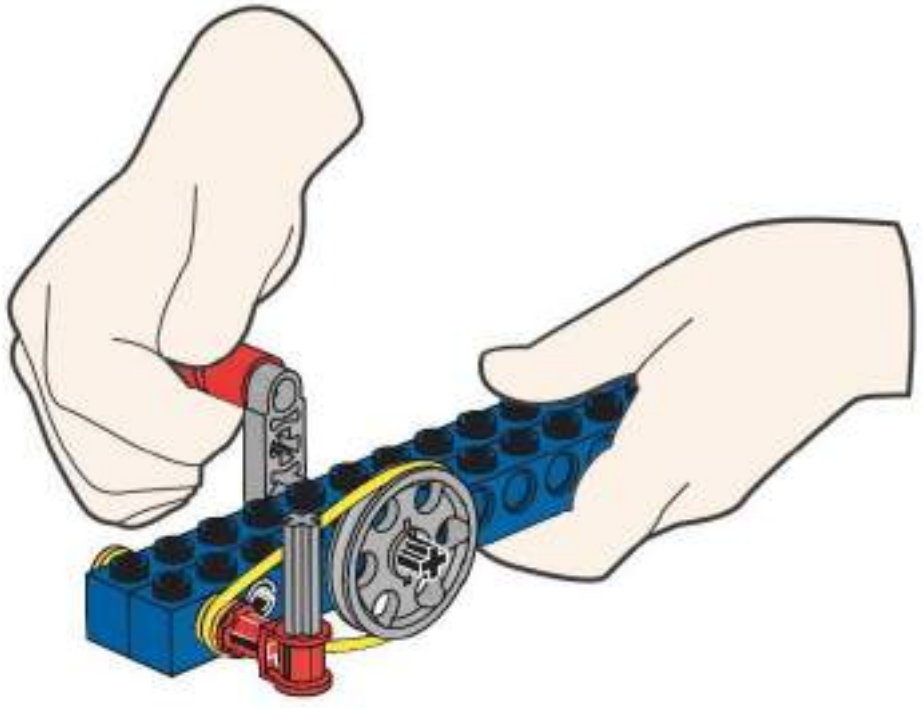
C1

This model has a mechanical advantage of 1. The model is a belt driven pulley where the speed and direction of the drive and driven pulley wheels are the same. A light grip on the output pointer will stop the driven pulley wheel from turning as this causes the belt to slip. The mechanical advantage of 1 represents the size ratio of the LEGO® components.



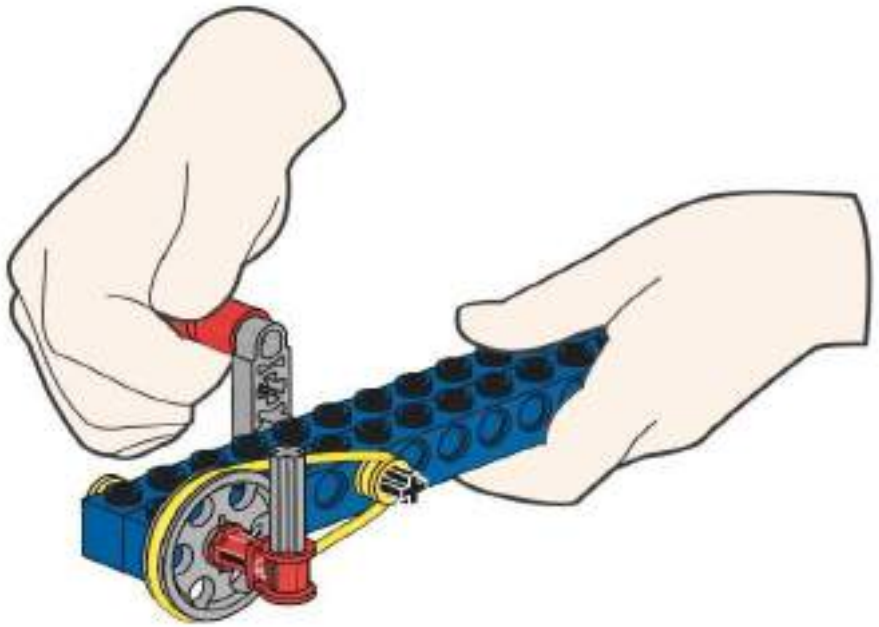
C2

This model has a mechanical advantage of 1:3.8 The model is a belt driven pulley where there is an increase in speed. The driven pulley wheel turns faster than the drive pulley wheel, but the output force is reduced plus the belt can more easily slip. The mechanical advantage of 1:3.8 represents the size ratio of the LEGO components.



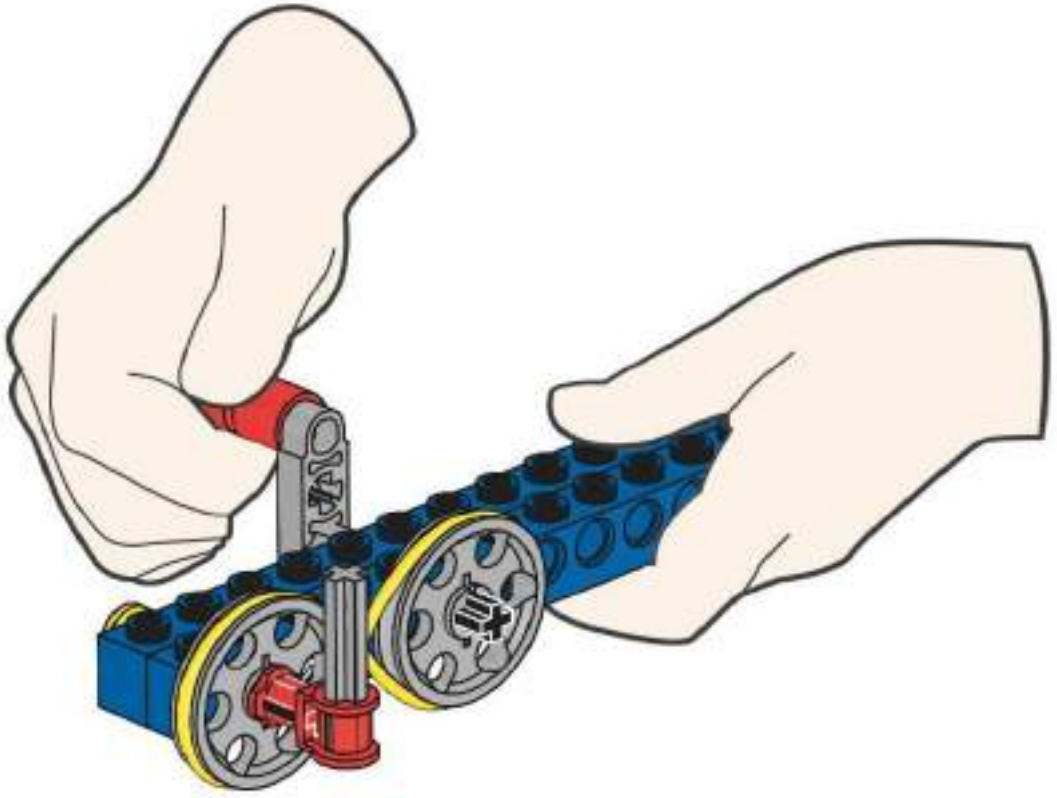
C3

This model has a mechanical advantage of 3.8:1 The model is a belt driven pulley where there is a decrease in speed. The driven pulley wheel turns slower than the drive pulley wheel. This increases the output force, but the belt slips with increasing load. The mechanical advantage of 3.8:1 represents the size ratio of the LEGO components.



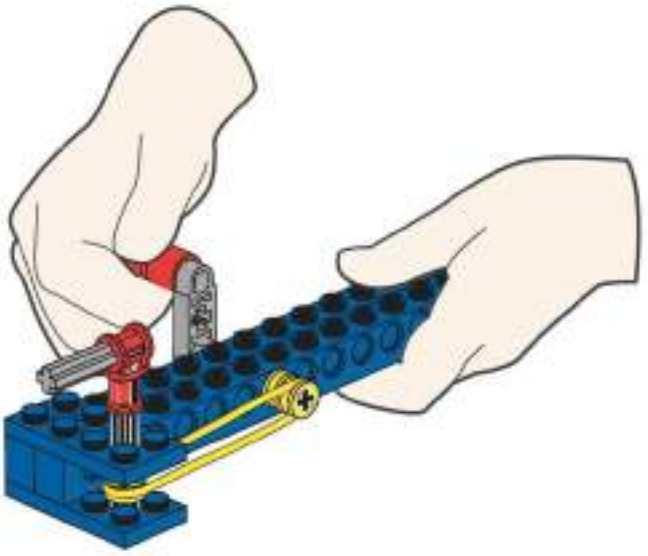
C4

This model has a mechanical advantage of 1. The model is a belt driven pulley where the speed of the drive and driven pulley wheels are the same, but they turn in opposite directions because the belt is crossed.

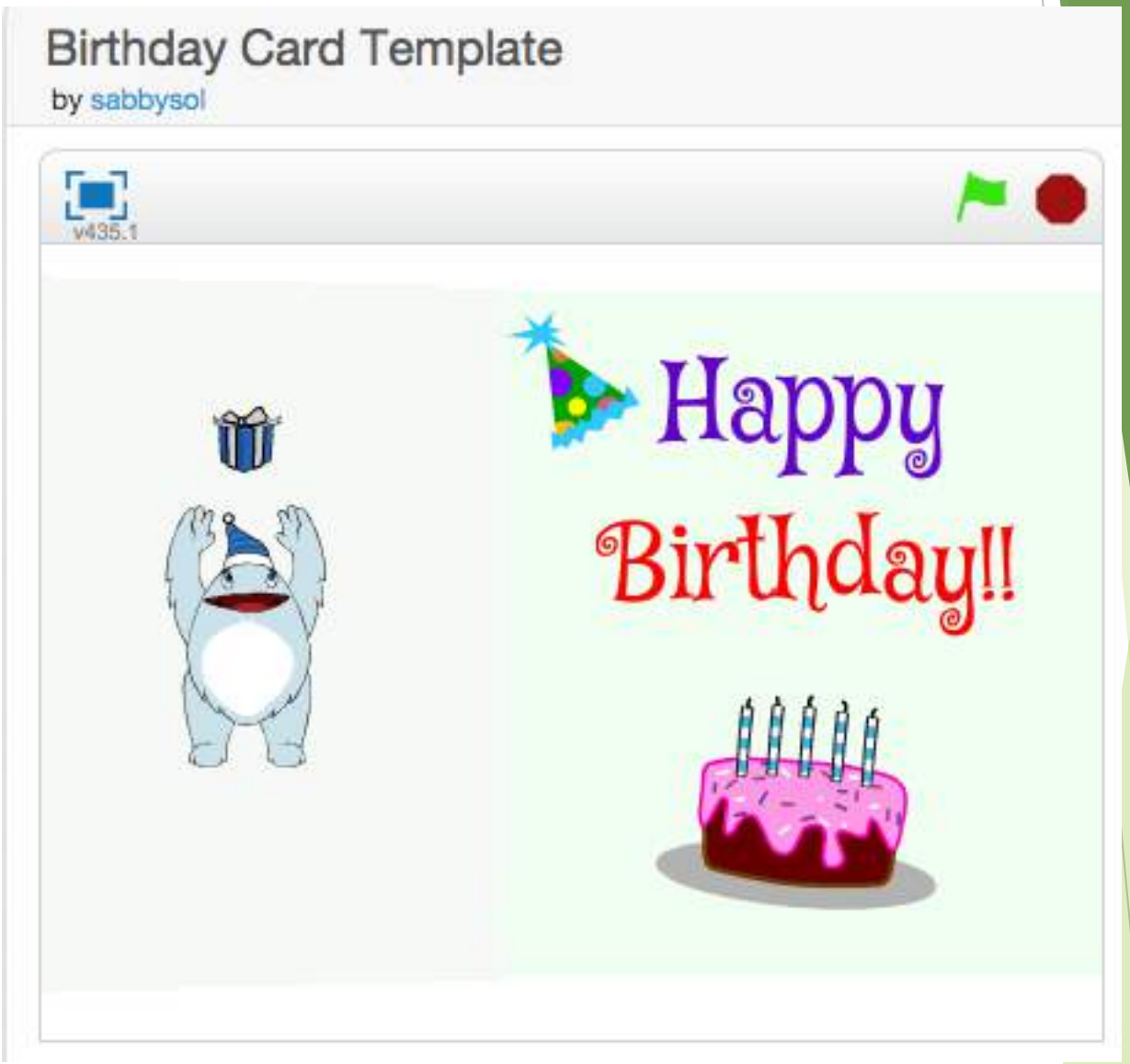


C5

This model has a mechanical advantage of 1. The model is a belt driven pulley where the speed of the drive and driven pulley wheels are the same, but there is a change in the angle of motion caused by the twist in the belt.



CLASS 15 & 16: SCRATCH-BIRTHDAY CARD



In this students will need to make an invitation or a birthday greeting card for a friend and also to send. They will learn about for loop, sound and continuous blinking of a cake or continuous change in any other sprite.

CLASS 17: 3D SLASH-CHAIR

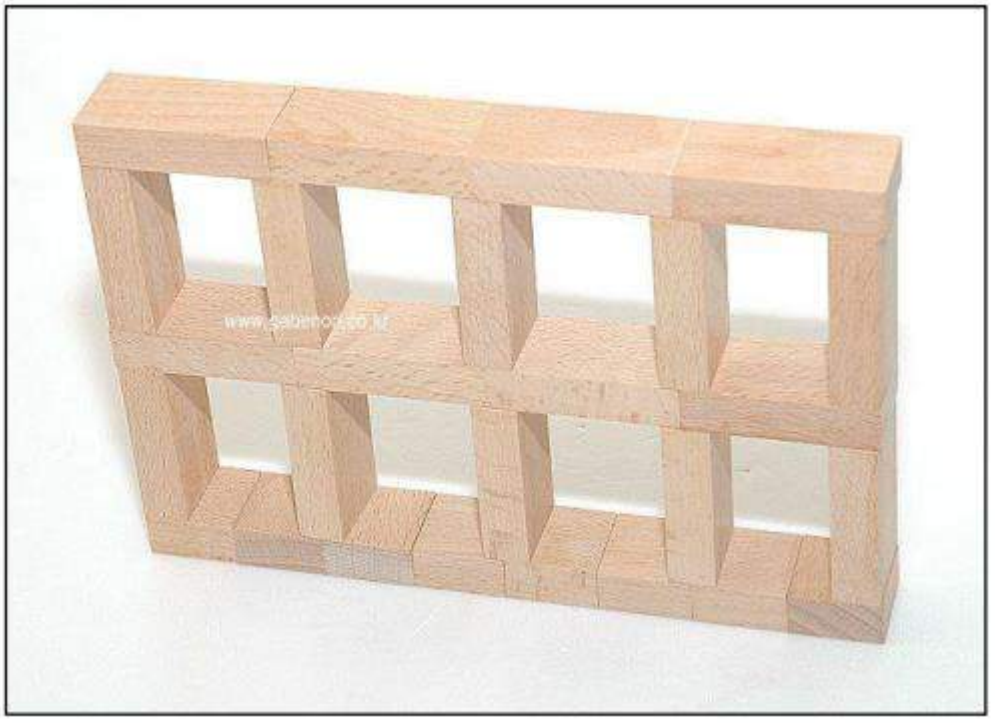
Objective: To make a basic model of Chair.

Learning Outcome:

1) Learn about the basic three dimensional view of square.
2) 2) Thoroughly understand about the Hammer, Chisel, Trowel and Wall options in 3D Slash software.

CLASS 18: KEVA- MEASURING PERIMETER WTH KEVA

Objectives: Students will determine perimeters with a non-standard unit of measurement. View of the Diagram:



- **PROCEDURE**:

1. Discuss the concept of perimeter being the distance around an object.

2. “Today we will be measuring with a unit of measurement that is uniform but not the standard, such as an inch or centimeter would be. We will be using a KEVA length as our unit.”

3. Show the class the KEVA yardstick. Show how you could tell how tall a table is with the KEVA yardstick.

4. Have the students construct a triangle using three KEVA planks. What is the perimeter measured with the KEVA yardstick.

5. Have the students construct a square with a perimeter of 4; with a perimeter of 8. Have the students construct a rectangle with a perimeter of 12; a perimeter of 24. Ask if all the rectangles look the same. Is there more than one way to make a rectangle with a perimeter of 20.

6. Write the formula for the perimeter of a rectangle on the board: $P = S + S + S + S$ or $P = (2 \times S1) + (2 \times S2)$ or $P = 2 \times (S1 + S2)$

7. Have the students construct rectangles for their neighbors to determine the perimeters.

8. Have students in small groups construct as many different rectangles as they can with perimeters = 16; perimeters = 20; perimeters = 24. (Remind them that a square is a type of rectangle.)

- **Learning Outcome:**

1) Discuss the concept of perimeter being the distance around an object.

2) Understanding of Mathematical knowledge i.e. perimeter.

CLASS 19: SPM- INCLINED PLANE

The inclined plane is a slanted surface used to raise objects.

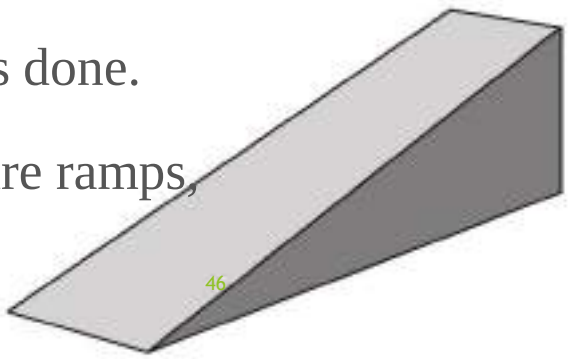
Connect

An inclined plane is a slanted surface used to raise objects, e.g. a ramp.

- **Did you know?**
  The advantage of using an inclined plane has been known and used for thousands of years. The ancient Egyptians used inclined planes made of earth to ease the transport of their giant stone blocks to the top of the pyramids.

Using an inclined plane to raise an object to a given height, the object must be moved a longer distance, but with less effort needed than if the object was to be raise straight up.
It is a trade-off either to use a lot of effort to raise a given load a short distance straight upwards or to apply much less force to raise it gradually over the longer distance of an inclined plane.
That means the same amount of work is done.

Common examples of inclined planes are ramps, ladders, and stairs.



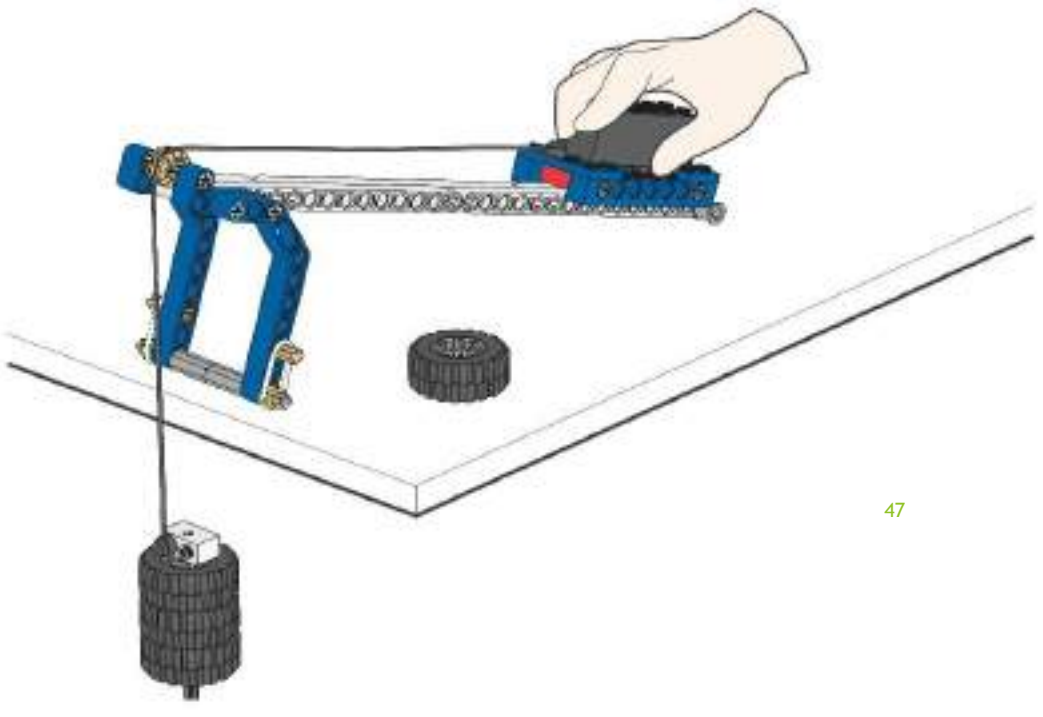
Construct

Build the following models. Use the Contemplate ideas below and on the Student Worksheet to learn about each model, one at a time.

Contemplate

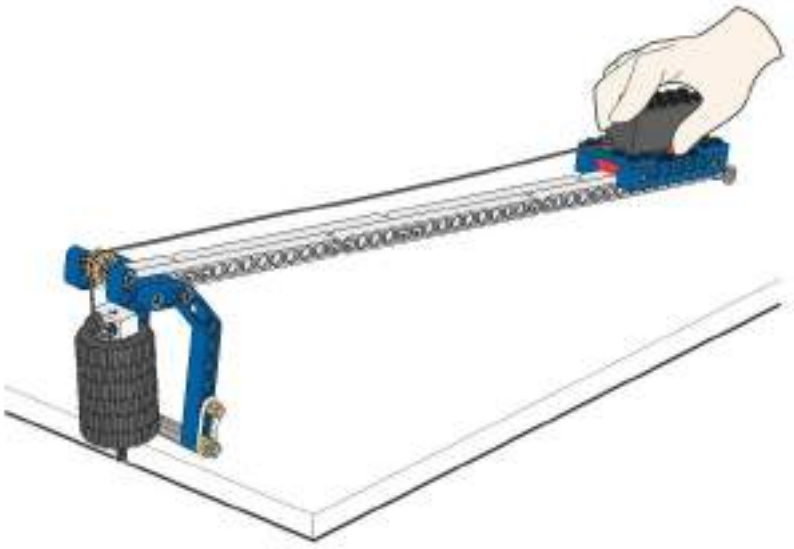
D1

This model shows a short inclined plane with a mechanical advantage of approximately 3. Nothing happens when the load is let go. The approximately 3N effort isn't enough to raise the approximately 6N load to the top of the inclined plane. This model thereby shows the difference between ideal and actual mechanical advantage. Under ideal circumstances an effort of more than 2N should be able to raise the load to the top, but the actual mechanical advantage is less due to friction. If another wheel is added as effort, it is able to raise the load.



D2

This model shows a long inclined plane with a mechanical advantage of 4.5. Because of the added distance to this inclined plane, and hence the reduced angle of the ramp, the effort is able to raise the load to the top of the inclined plane.

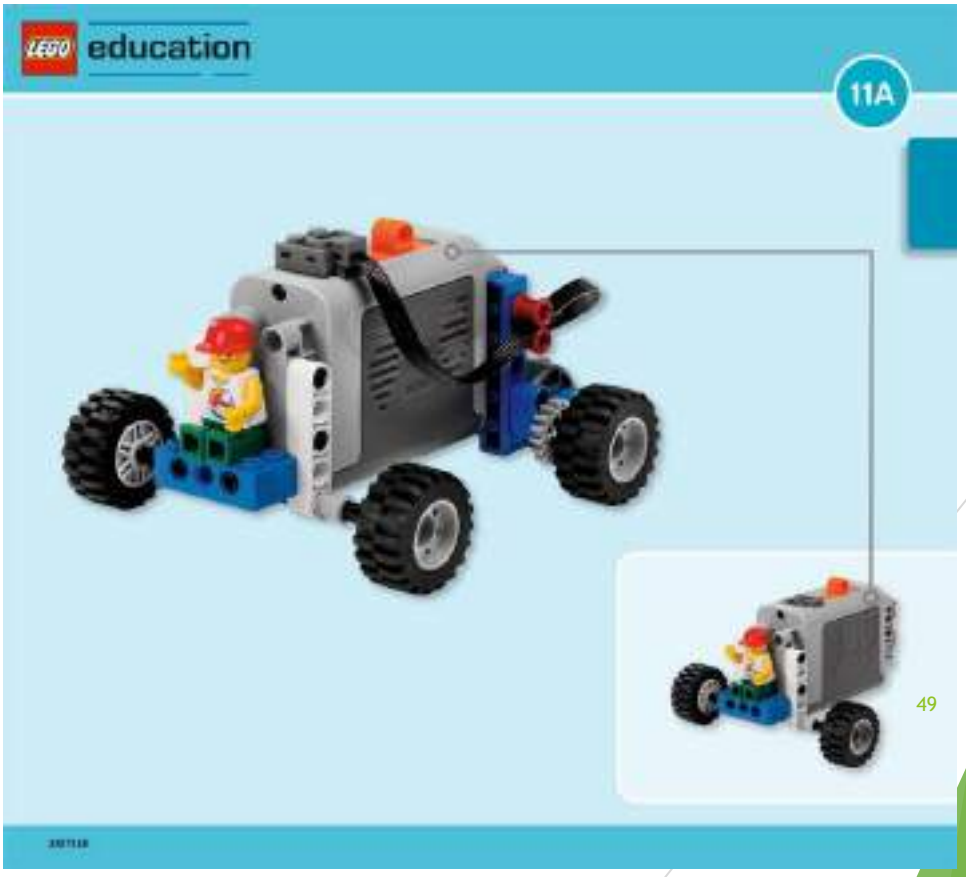


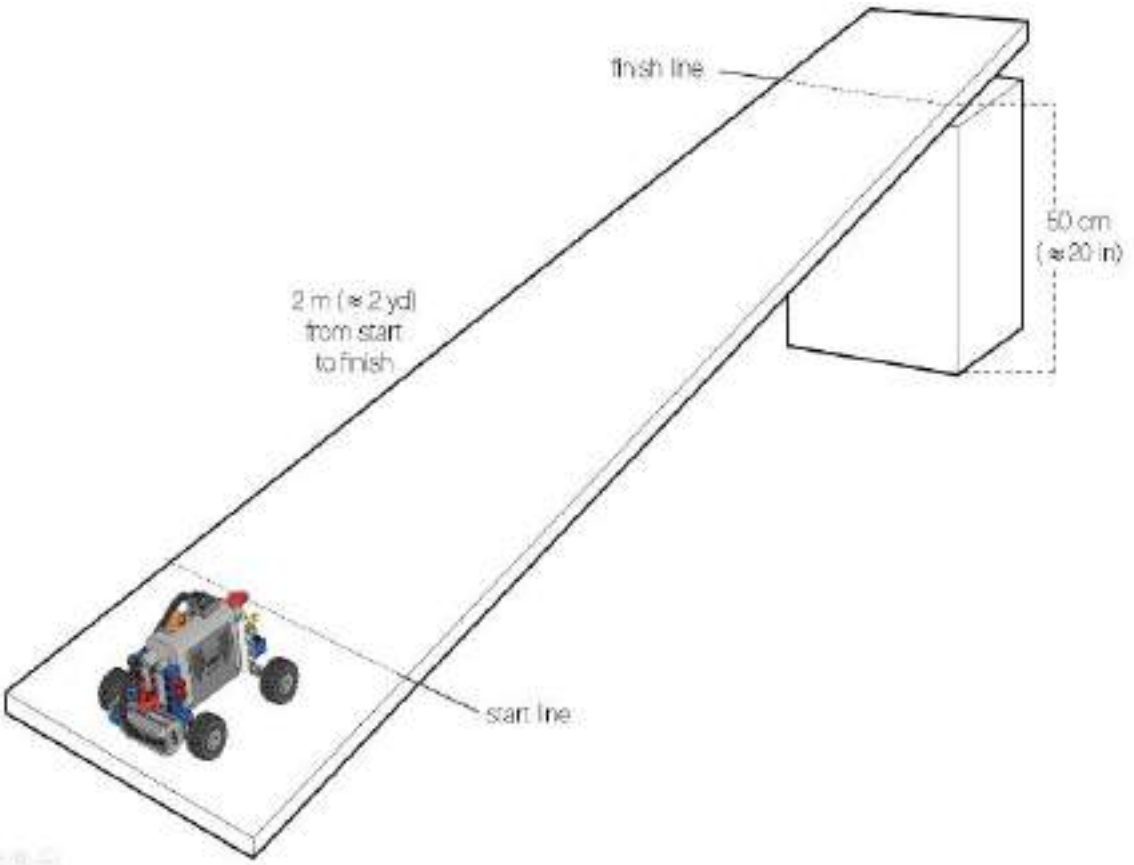
CLASS 20: POWER CAR ON INCLINED PLANE

Turn on the motor by pushing the battery box switch forward.
Make sure all the wheels turn freely and do not rub on the sides of the power car.

Build Your Test Hill
Mark a start and finish line on the plank, 2 m (≈ 2 yds) apart. Place the plank on an object so the finish line is 20 in (≈ 50 cm) higher than the floor.

Tip
The power car can travel very fast, even up hills, so it might be a good idea to put the ramp against the wall in a corner to prevent it going over the edge.





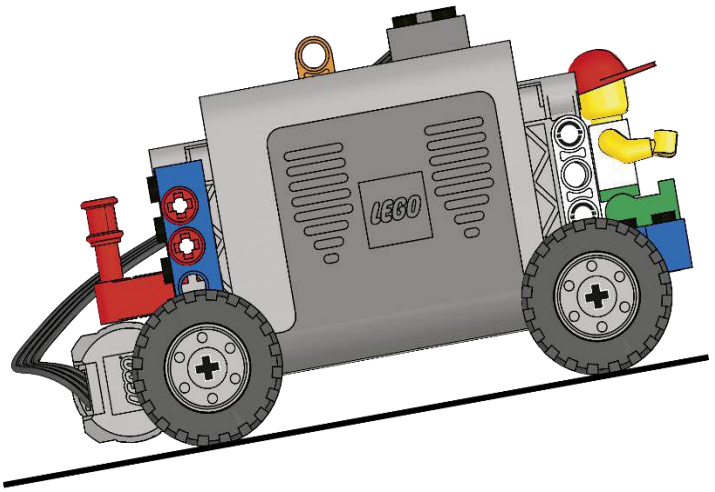
Contemplate

Which is the fastest uphill power car?

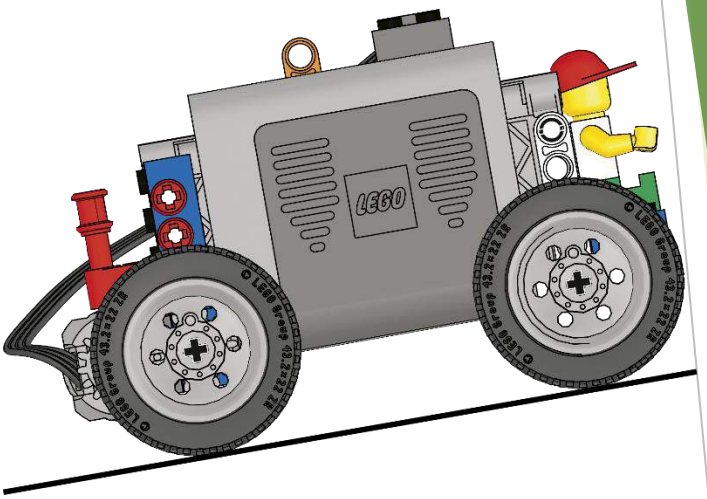
The power car needs to be as fast as possible when driving uphill.

First predict how fast power car A will travel 2m (≈ 2 yd) uphill. Then test your prediction. Next, follow the same procedure for power cars B, C and D.

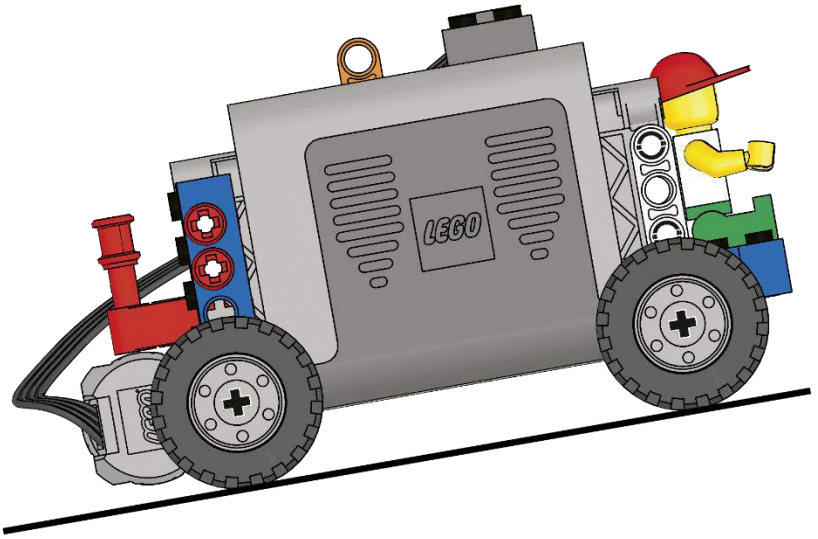
Test several times to make sure your results are consistent. Test results may vary depending on surface of the hill.



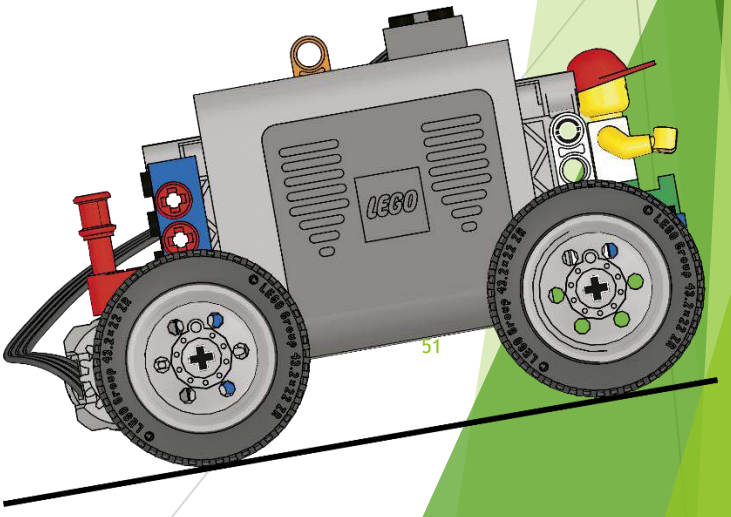
Power car A



Power car B



Power car C



Power car D

Did you know?

The circumference of the small wheel is 9.6 cm (≈ 3.77 in).
The circumference of the big wheel is 13.6 cm (≈ 5.35 in).

Power car A will need approximately 4 seconds to travel 2 m (≈ 2 yd) uphill.

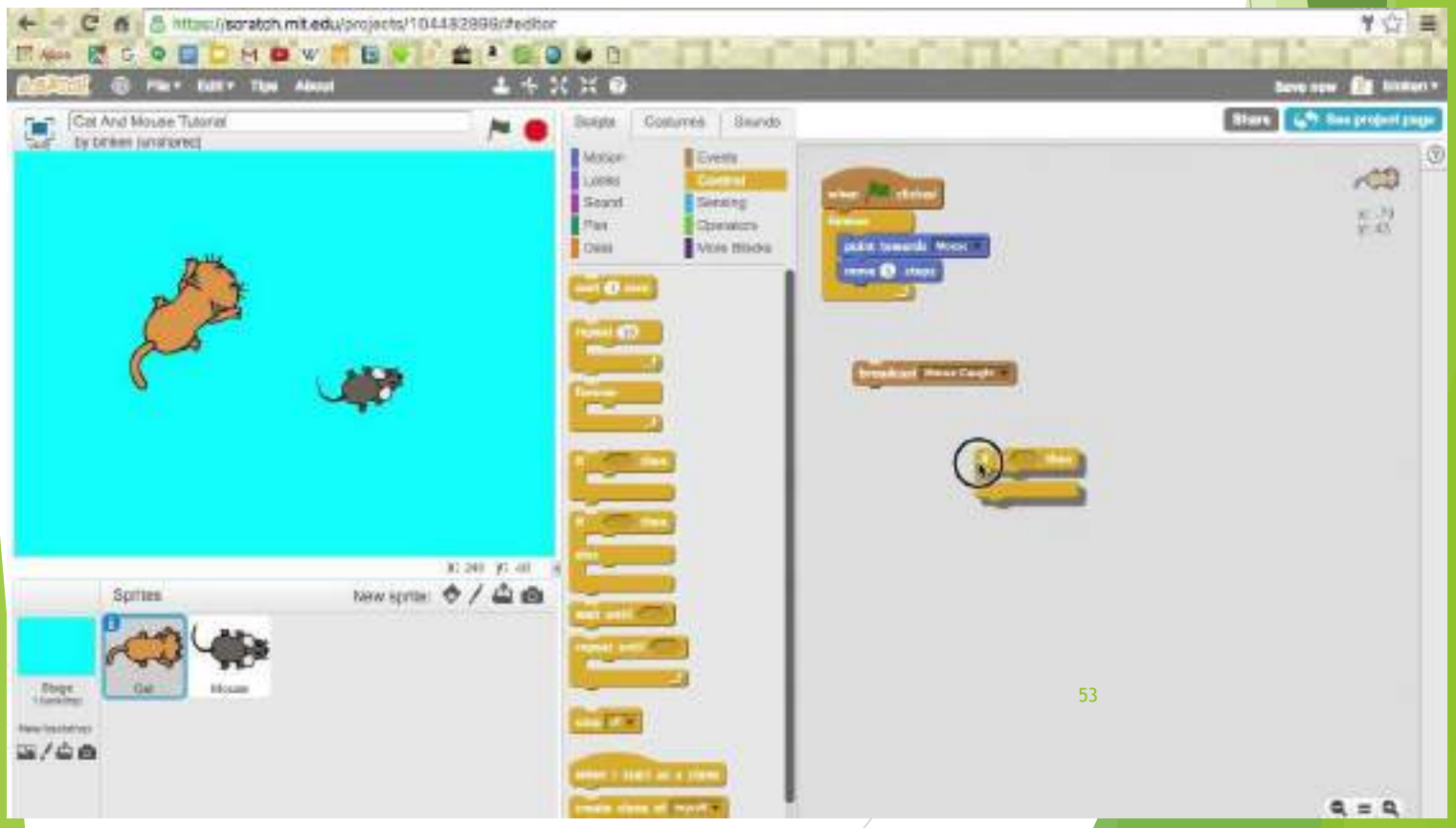
Power car B will need approximately 3 seconds to travel 2 m (≈ 2 yd) uphill.

Power car C will need approximately 10 seconds to travel 2 m (≈ 2 yd) uphill.

Power car D will need approximately 7 seconds to travel 2 m (≈ 2 yd) uphill.

CLASS 21 & 22: SCRATCH- CAT CHASING MOUSE

In this project they will have to make a mouse catching game the cat will have to eat the mouse and the mouse will keep running away. The one who do will succeed.
They will learn about for loop and variables(score) and how to vary it's value in a program. In one class trainer will explain the program and in next class student will do the practical.



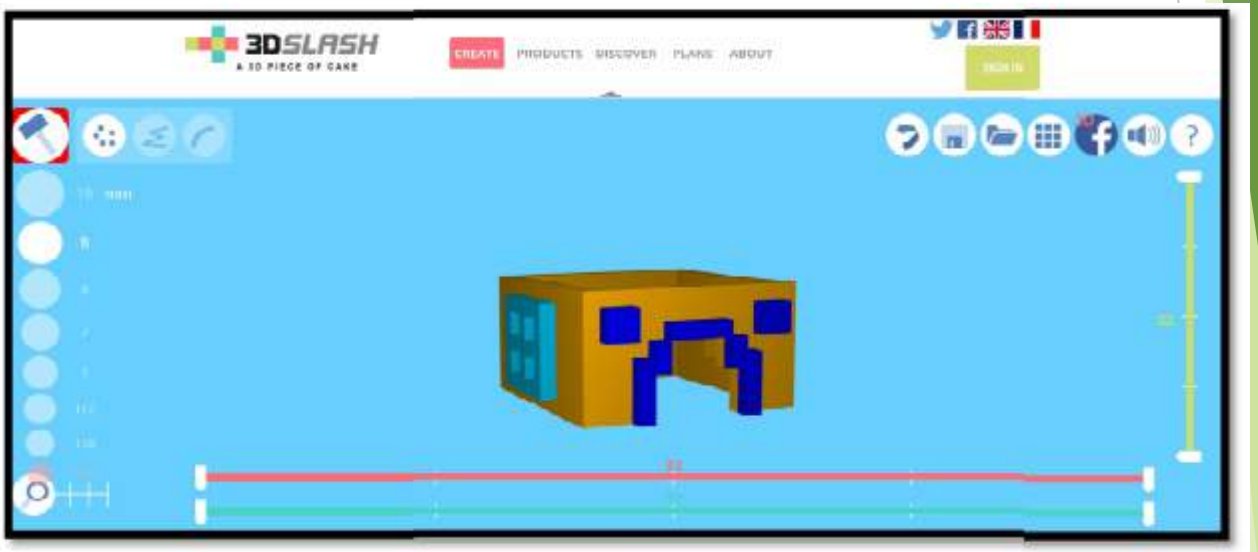
CLASS 23: 3D SLASH- CONSTRUCTION OF A HOUSE

Objective: To construct a house with proper door and window.

Learning Outcome:

1) Understanding the stair case structure by making roof using wall options.

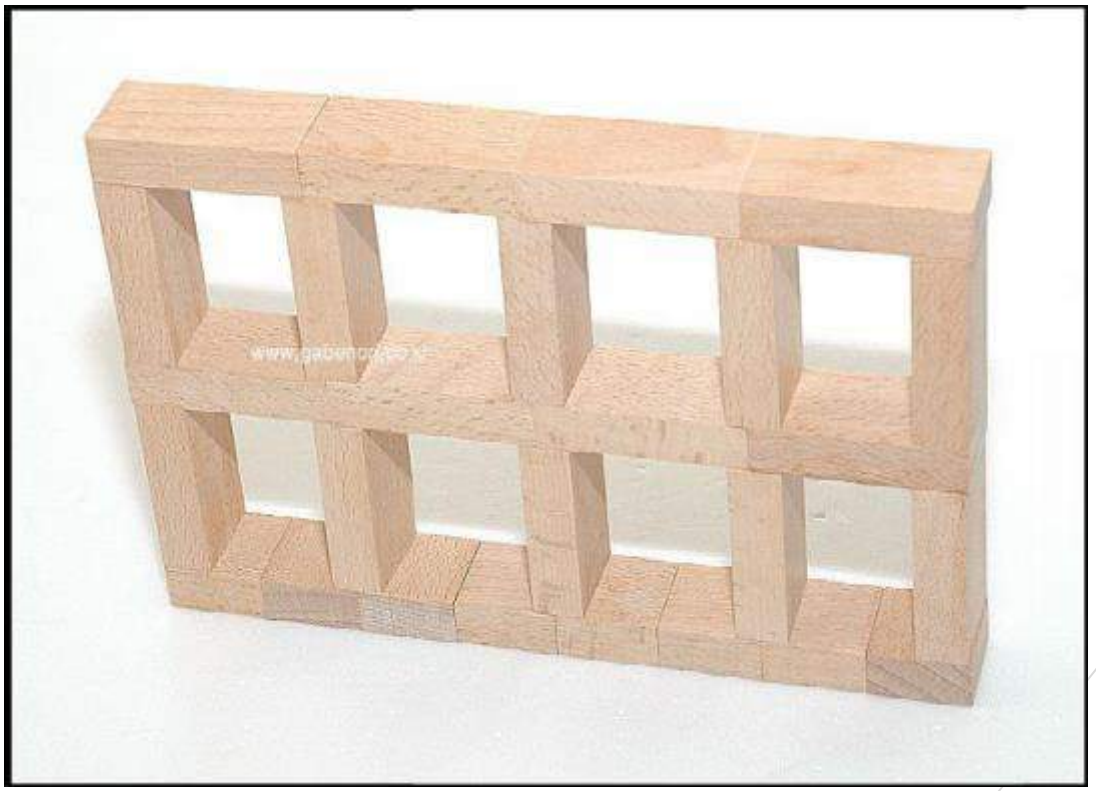
2) Making doors and windows usin STEM CURRICULUM 53 Construction of a house construct a house with proper door and window in 3D Slash Software.



CLASS 24: KEVA- MEASURING AREA WITH KEVA

Objectives: Students will calculate the areas of rectangles with keva planks.

View of the Diagram:



Procedure :

1. Discuss the concept of area being the space inside a two dimensional figure.

2. “Today we will be measuring with a unit of measurement that is uniform but not the standard, such as a cubic inch or square centimeter. We will be using a KEVA square as our unit for measuring area.”

3. Show the class a KEVA square. Show how you could measure the area of a table with the KEVA2 .

4. Have the students construct a square using planks that will have an area of 1 KEVA2 . Constructed on the flat or side edges, the KEVA2 will be the space enclosed inside the planks. Always measure the area on the inside of the KEVA figure.

5. Have the students construct a rectangle with an area of 4 KEVA2 . How many planks were used? [8 or 10] Did everyone's look the same? [No] Explain that rectangles can have different perimeters but equal areas or equal perimeters and different areas.

6. Write the formula for area on the board: S x S = A

7. As a class, construct rectangles with areas of 2 KEVA2 , 3 KEVA2 and 4 KEVA2 .

8. Have the students form small groups to construct as many rectangles as they can with areas of 6 KEVA2 , 8 KEVA2 , 12 KEVA2 , 24 KEVA2 .

Learning Outcome:

1) Discuss the concept of area being the distance around an object.
2) Understanding of Mathematical knowledge i.e. area.

CLASS 25: SPM- FLYWHEELER

Explore the scientific concepts of gearing up, measuring distance, forces, moving energy, friction and air.

Connect

Jack and Jill have had a little quarrel and have been sent outside to cool down. Jill gets Zog the Dog to pull her on the cart, but it is far too slow.

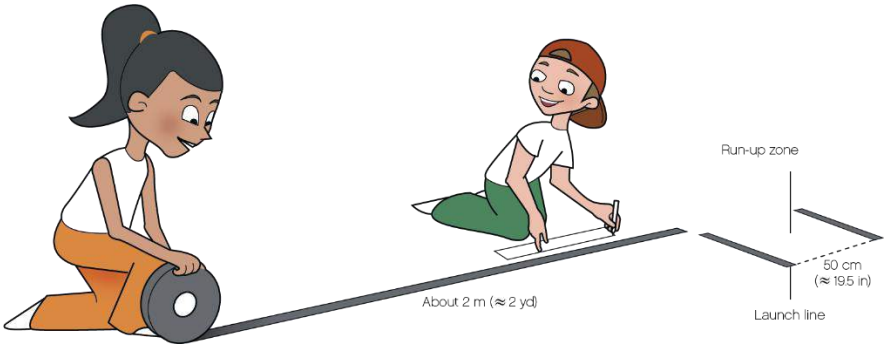
Jack plays with his spinning tops. They spin very fast, but really he would much rather be friends with Jill and play with her again. Jill feels exactly the same – it is much better when they are good friends, and quite frankly, they are bored playing games that are not fun.

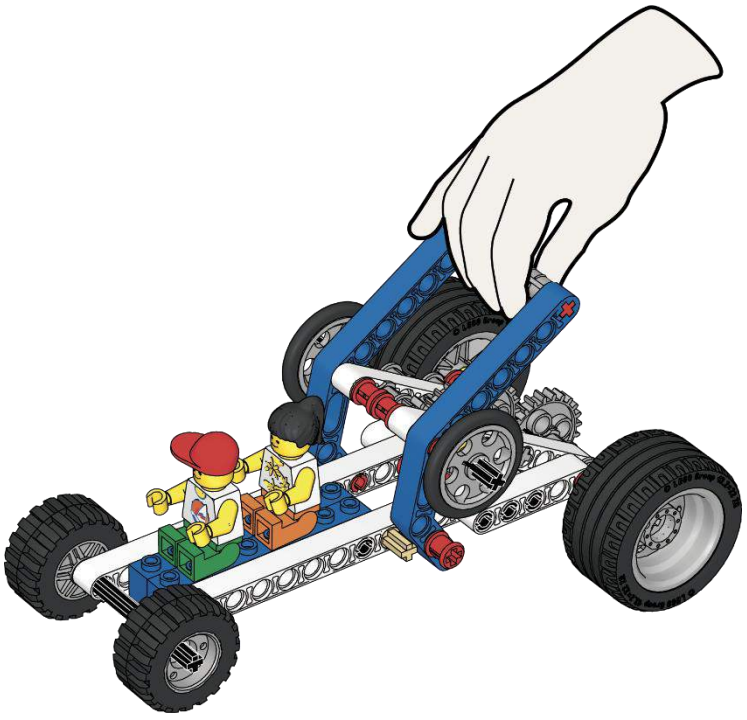
They look at each other and suddenly Jill gets an idea. How about a combined game using both the cart AND the power of the spinner? Will that work, do you think?

Construct

Make the Test Track

Mark out a 50 cm (≈ 19.5 in) section of run-up track. This is the run-up zone and in front of the launch line. Then stick a 2 m (≈ 2 yd) strip of masking tape along the floor and mark it off every 10 cm (≈ 4 in). Now we are ready to build models!





What makes a good flywheel?

The best flywheel will carry the model further, and roll for a longer time – with exactly the same run up! Try it without any flywheels at all!

Try the big hub with and without its tire. Invent your own combinations too.

Heavier flywheels work better than lighter ones, but they need a lot of arm energy to get up to speed, i.e. the amount of moving or kinetic energy it stores depends on its weight and on the speed it is travelling.

Did you know?

We use 8-tooth and 24-tooth gears to gear up. There are two gearing-up stages, each 1:3, i.e. one turn of the wheel on the ground gives 9 turns of the flywheel.

CLASS 26: SPM- LAND YATCH

Explore sail shape, area and angle to the wind needed for a wind powered vehicle to effectively capture wind energy.

Connect

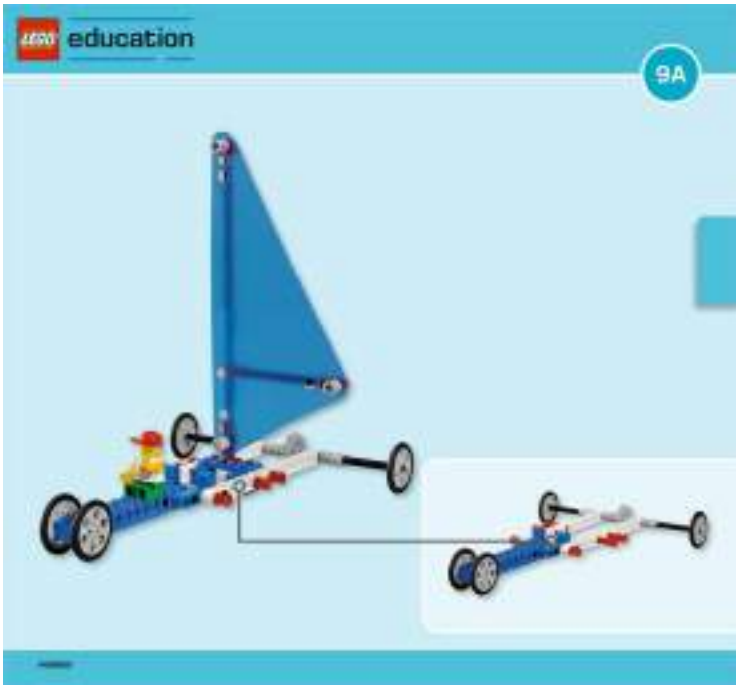
It is a windy weekend at the beach and Jack and Jill are out to have a bit of fun. They have this old cart they normally use, but today it's Jill's turn to push Jack and Zog the Dog, and the weather is really windy, which makes it very hard work for her.

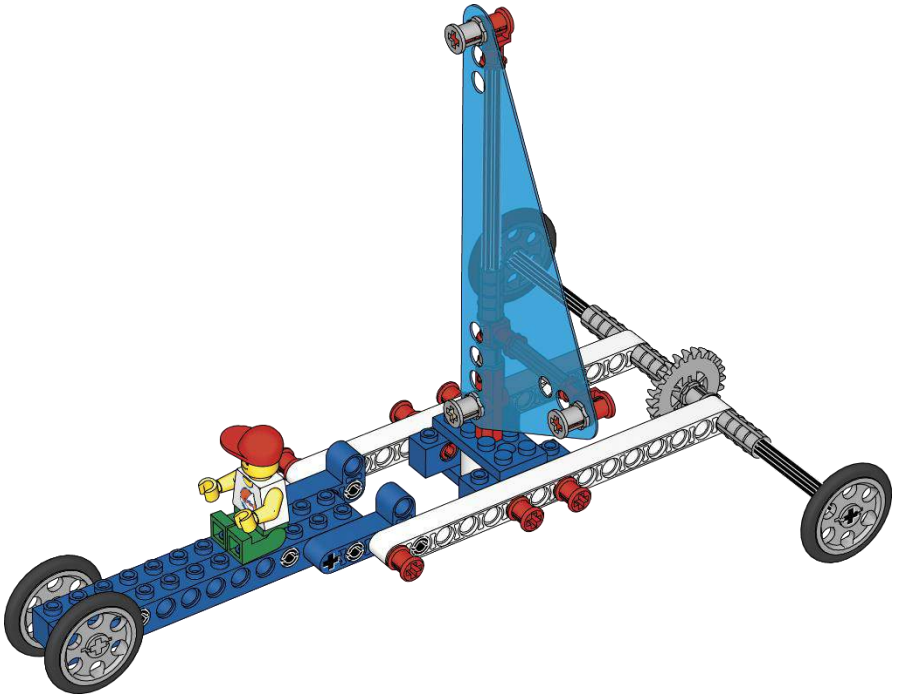
Jill gives up in the end and Jack can understand why. Zog the Dog does his best to help out and suddenly he sees an old towel half buried in the sand. Jill spots it at exactly the same time and they discuss between them how using the towel, the wind power, and a few other things, it may be possible to make a kind of land yacht that will safely take them all for a fun ride.

Construct

Make Your Test Track

Stick a 4-meter (≈ 4 yards) strip of masking tape across a stretch of floor and mark it off every 10 cm (≈ 4 in) from the fan. Now we are ready to build models!





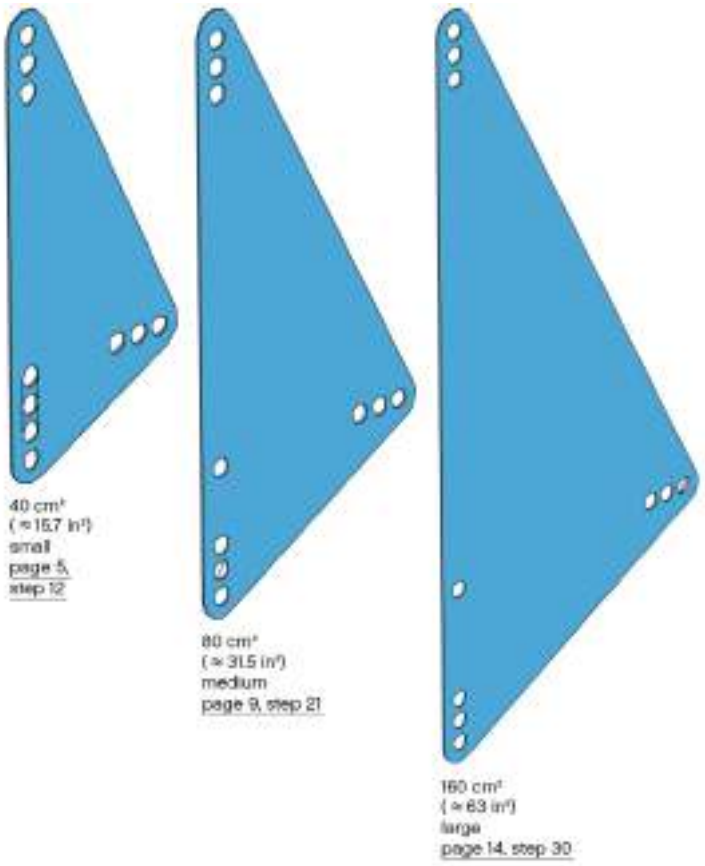
Contemplate

What difference does sail size make?

Predict and test: what difference could there be between the 40 cm2 (≈ 15 in2) (small), 80 cm2 (≈ 31.5 in2) (medium), and 160 cm2 (≈ 63 in2) (large) sails on the yacht. How far will each roll ... and (optional) how fast?

Test at least three times with each sail attached to obtain a scientifically valid answer.

In our tests, the small sail rolled about 1.5 m, the medium about 2 m and the large about 2.5 m. Double the area gathers more wind energy but does not double the distance.
Why? The further from the fan, the weaker the wind! Larger sails moved faster at first. But all the sail sizes stopped rolling after about 10 seconds. None of them sail faster than the wind!



Tip

Choose ONE speed setting to do all the tests. Any speed will do. We used high speed.

Note

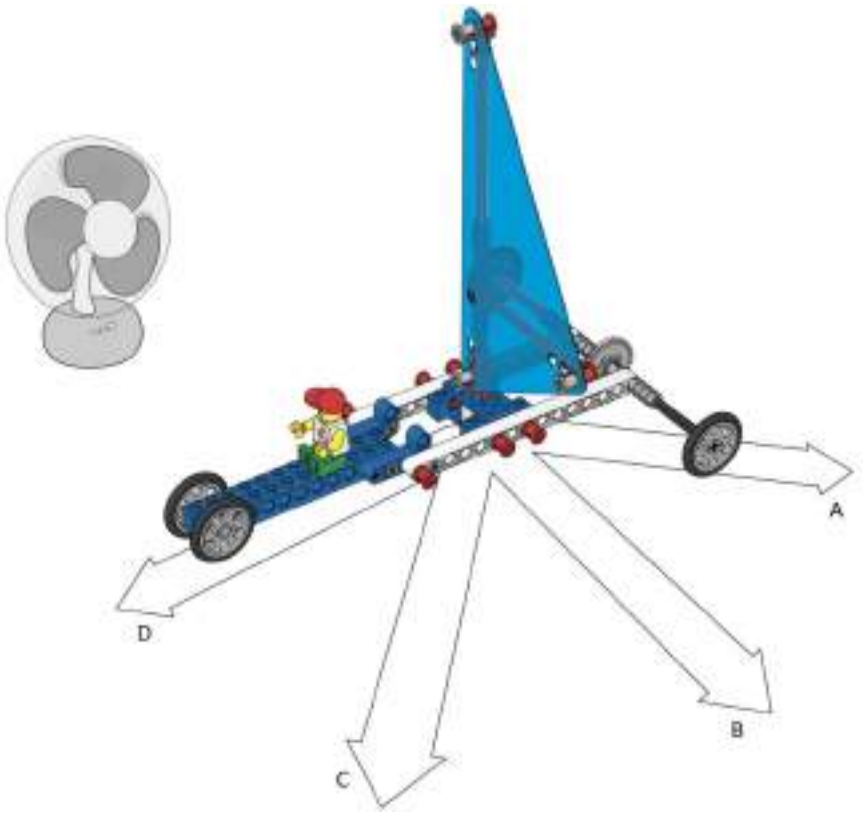
Your 'serious' scientists might also suggest testing the land yacht with just the bare mast, i.e. with no sail at all, so you might wish to try that as well.

What if the wind is blowing from an angle?

Launch your land yacht at different angles across the wind stream. Can you explain what happens?

At most angles except D the yacht still moves forward! One part of the wind's force is deflected off the sail, propelling it forward.

The other part of the force tries to blow it sideways. In fact a land yacht sailing across the wind at angles B and C can go very fast – but could also flip over.



Did you know?

The LEGO figure weighs 3 g (≈ 0.1 oz).
The yacht weighs about 55 g (≈ 1.94 oz).
The weight brick is 53 g (≈ 1.9 oz).
Predict and test how the yacht would perform with a weight brick load.

Does sail shape matter?

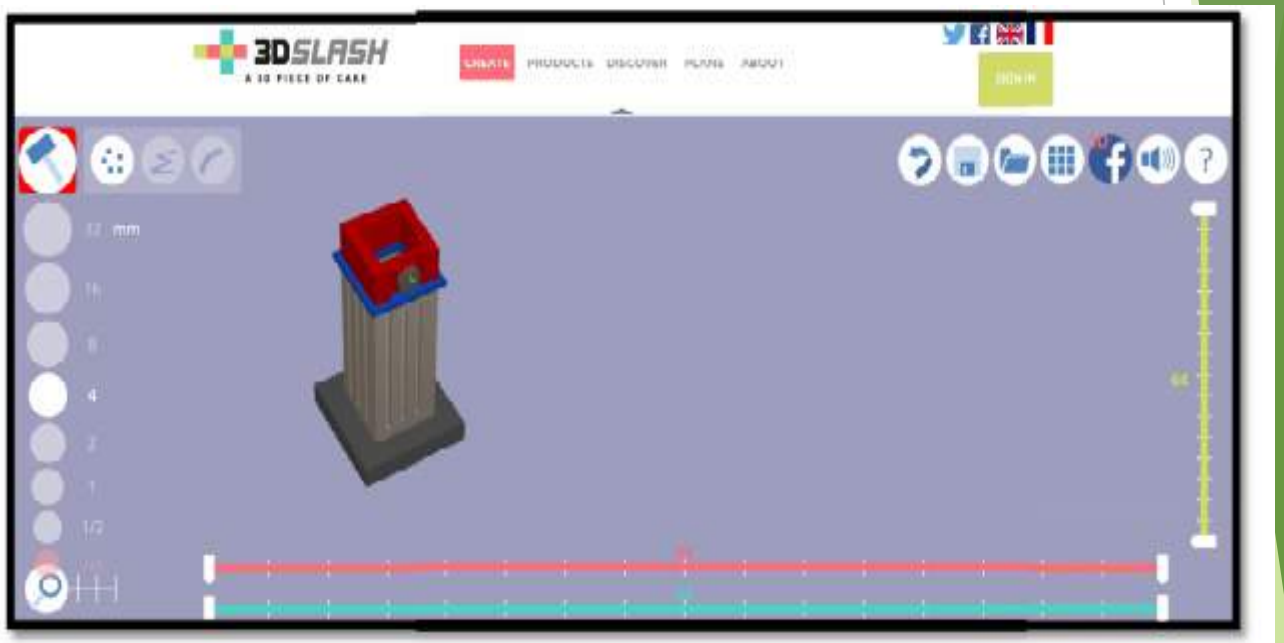
Try making card or paper sails with the same area but a different shape. Find out about Square Riggers, Kon-Tiki, Chinese Junks, and Arab Dhows from books or by searching the internet.

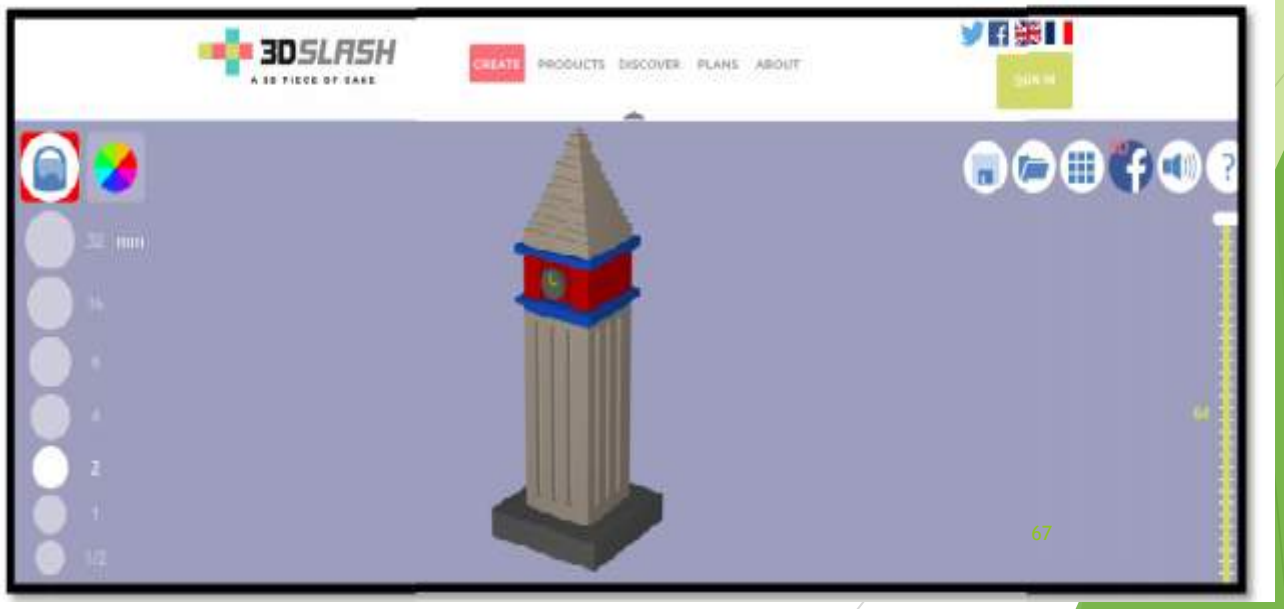
CLASS 27 & 28: SCRATCH- HIDE AND SEEK GAME (EXPLANATION & PRACTICAL)

In this game characters will appear and disappear continuously and we need to click on the appeared character in order to score. Student's concept about loop, if else condition and variable will be completely cleared in this.

CLASS 29: 3D SLASH- CONSTRUCTION OF BIG BEN

Objective: To construct BIG BEN Design





Learning Outcome:

1) Familiar with the historical details of BIG BEN

2) Understanding the geometrical shape i.e. cone by making upper part of BIG BEN using wall options. 3) Understanding the geometrical shape i.e. circle by making watch on BIG BEN using trowel option.

4) Making proper structure of BIG BEN using chisel options.

CLASS 30: KEVA- TOWER AND BRIDGE RELAY

Objective: Students will learn how to do team work by doing tower and bridge relay.

Tower Relay:

Give each team 200 KEVA planks. Have the students count out the exact amount; opposite teams can verify the counting. The relay will consist of each team building a tower of any shape with their planks. Once their tower is completed using all 200 planks, they will dismantle it without allowing it to topple and reassemble it on the opposite side of the room. They may use only their hands to carry the planks. No shirts can be used as buckets, and no pinning planks against their bodies. The first team to complete the second tower is the winner. The children will be most successful if they work as a team to build, disassemble and carry the KEVA planks. You may want to allow time for the children to discuss the division of labor before they begin, or you may wish for them to discover this along the way. A variation of this relay can be done by not allowing any talking.

Bridge Relay Give each team 200 KEVA planks. Have students count out the exact amount; opposite teams can verify the counting. The relay will consist of each team building a bridge of any shape with their planks. The bridge must span at least three columns. Once their bridge is completed using all 200 planks, they will dismantle it without allowing it to topple and reassemble it on the opposite side of the room. They may use only their hands to carry the planks. No shirts can be used as buckets, and no pinning planks against their bodies. The first team to complete the second bridge is the winner. The children will be most successful if they work as a team to build, disassemble and carry the KEVA planks. You may want to allow time for the children to discuss the division of labor before they begin, or you may wish for them to discover this along the way. A variation of this relay can be done by not allowing any talking.