Tinkercad Lesson 1: Introduction to Basic Tools and Arch Creation

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Lesson Objectives:

- Students will navigate and identify key parts of the Tinkercad interface, including menus, the workplane, and navigation tools.
- Students will use white and black boxes to resize shapes and arrows to rotate shapes.
- Students will practice aligning and snapping shapes using cruising mode and the manual "C" key function.
- Students will use the cone to adjust the height of shapes.
- Students will apply learned skills to create an arch using multiple shapes, practicing rotation, resizing, alignment, and snapping.

Materials:

- Computers with internet access
- Tinkercad accounts (set up prior to the lesson)
- Teacher-created Tinkercad tutorial (optional)

Lesson Plan:

1. Introduction to Tinkercad Interface (5-7 minutes)

- **Teacher Action:**
    - Project Tinkercad on the screen and explain key parts:
        - **Project Title**: Instruct students to rename their project.
        - **Workplane**: Explain this as the space where they'll design.
        - **Shape Menu**: Show where to find shapes to drag onto the workplane.
        - **Side Icons**: Briefly introduce these (ruler, group, ungroup, etc.) and explain that these will be covered in later lessons.
    - Highlight that this lesson will focus on specific tools, with more features introduced in upcoming classes.

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2. Resizing Shapes (White and Black Boxes) (7-10 minutes)

- **Activity:**
  - Have students drag a cube onto the workplane.
  - Demonstrate the **white boxes** to resize in different directions (length, width, height).
  - Demonstrate the **black boxes** and ask students to observe the difference between resizing with white and black boxes.
  - Show students how to adjust the size by entering numbers in the boxes that appear when clicking on the white boxes.
- **Guiding Questions:**
  - "What happens when you use the white boxes compared to the black boxes?"
  - "How can changing the height of a shape affect your design?"
- **Practice:**
  - Students practice resizing their cubes into various dimensions using the white and black boxes as well as the number input boxes.

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3. Rotating Shapes (Arrows) (5-7 minutes)

- **Activity:**
  - Show the **rotation arrows** and explain the difference:
    - **Outer Bar (Bigger):** Rotates in finer increments.
    - **Inner Bar (Smaller):** Rotates in larger increments.
  - Demonstrate rotating a shape from different angles (e.g., flipping it 90 degrees).
  - Show how changing the view using the **view cube** allows different rotation perspectives.
- **Guiding Questions:**
  - "What happens when you use the outer bar compared to the inner bar?"
  - "How might rotating a shape help when building something like a tower or a robot?"
  - "How does changing the view angle affect how you rotate the shape?"
- **Practice:**
  - Students practice rotating their cubes and changing the rotation view using the **view cube** (e.g., front, right, left).

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4. Snapping Shapes (Cruising Mode) (5 minutes)

- **Activity:**
    - Bring out a second shape (e.g., triangular prism) and show how it can snap to the side of the cube using **cruising mode**.
    - Demonstrate enabling cruising mode manually by pressing the "C" key.
- **Practice:**
    - Students snap the triangular prism to the top of the cube and practice snapping other shapes.
- **Guiding Questions:**
    - "What makes snapping shapes easier than placing them freely?"
    - "How does the cruising mode help when designing complex structures?"

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5. Using the Cone to Adjust Height (5 minutes)

- **Activity:**
    - Demonstrate the **cone** to raise or lower shapes on the Z-axis.
    - Show how raising a shape can help when stacking or aligning objects.
- **Guiding Question:**
    - "How can raising or lowering a shape make your design more dynamic?"
- **Practice:**
    - Students practice raising and lowering their cubes and snapping other shapes underneath or on top.

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6. Arch Creation Task (15 minutes)

- **Task Instructions:**
    - Students will use the cube, triangular prism, and cylinder as a starting point for creating an arch.
    - Their goal is to complete the arch using shapes from the shape menu.
    - Each shape must touch the one next to it, and they can resize, rotate, and change the color of their shapes.
- **Teacher Action:**
    - Demonstrate starting an arch and discuss how to use the view cube and home icon to navigate different angles while building.
    - Show a completed arch example or a partially completed arch in a separate project to inspire students.
- **Guiding Questions:**
    - "How can you make sure all your shapes fit together?"

    - "What tools will help you place your shapes exactly where you want them?"

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7. Gallery Walk and Reflection (5-7 minutes)

- **Activity:**
    - Once students finish their arches, they will participate in a gallery walk.
    - Students can rotate around the room (or view peers' designs on shared screens) and observe each other’s work.
- **Guiding Questions for Reflection:**
    - "What techniques did you find most helpful for creating your design?"
    - "What challenges did you face, and how did you solve them?"
    - "What is one thing you learned today that you think will help in future designs?"

Assessment:

- Observation during practice activities.
- Completion of the arch task with correct use of resizing, rotation, snapping, and raising shapes.
- Participation in the gallery walk and reflection discussion.

Extension Ideas:

- Students can experiment with adding decorative elements to their arch using additional shapes and colors.
- Faster learners can try creating a double arch or combining multiple arches into a larger structure.