

# STEM from Home

## Design Your Body!

What do you feel when you tap the top of your head? Is the feeling similar when you tap the front of your leg? Yes, in both the places you feel something hard when you tap! Isn't the human body incredible? Some places are soft while some feel hard. What you feel hard are your bones. Our body consists of 206 bones, without which you would just be a lump of flesh!

Why do you think you are able to bend your arms, wrists, legs or grip with your fingers? What makes you turn your head sideways or nod up and down? Bones are connected together at places called joints. Some **joints** are immovable while some allow you to move. The immovable joints are present in the skull, slightly movable joints present in the vertebrae and freely movable joints in the knee, elbow, neck etc.

In this STEM pack you will learn about the structure and function of movable joints by designing 3D models of these joints. For designing 3D models you will be using Autodesk Tinkercad Web App.

## Main Activity: Designing Ball and Socket Joint

### Introduction

In this project, you will investigate how Ball and socket joint works and then you will be designing your own 3D model of ball and socket joint using Tinkercad web app.

Ball-and-socket joint, also called spheroidal joint, in vertebrate anatomy, is a joint in which the rounded surface of a bone moves within a depression on another bone, allowing greater freedom of movement than any other kind of joint. It is highly developed in the large shoulder and hip joints of mammals, including humans.

### What you will learn

1. How to Sign in Tinkercad Web App.
2. Place a shape on the workplane to add or remove material.
3. Use pre-existing shapes or import your own.
4. Adjust shapes freely by moving or rotating the workplane.
5. Combine shapes together to create a custom shape.

Weblink: [Sign in Tinkercad](#)

Weblink: [Creating a 3D Model of Ball & Socket joint.](#)

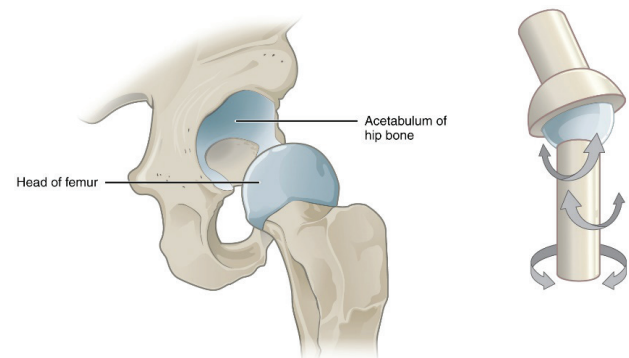
### What You Will Need

#### Hardware

A device with Internet connectivity, capable of opening a web page.

#### Software

Access Tinkercad online from here: [www.tinkercad.com](http://www.tinkercad.com)



**Ball-and-socket joint**

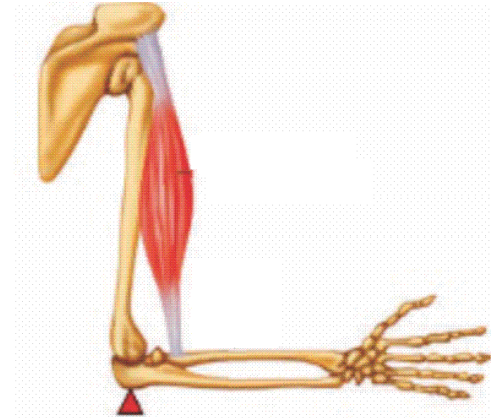
# Bonus Activities

## Activity 1: Designing Hinge Joint

### Introduction

You must have experienced the process of opening and closing of the door. Have you closely observed the structure and working of the hinges present on the door? Let us explore some more movable joints present in human body i.e. Hinge Joint. It allows bones to move in one direction back and forth with limited motion. The fingers, toes, elbows, knees, and ankles contain hinge joints. Let's design 3D Model of Hinge Joint using Tinkercad Web App.

Let's see how quickly you can crack the clues!



**Elbow Joint (Hinge Joint)**

### What Will You Need

#### Hardware

A device with Internet connectivity, capable of opening a web page.

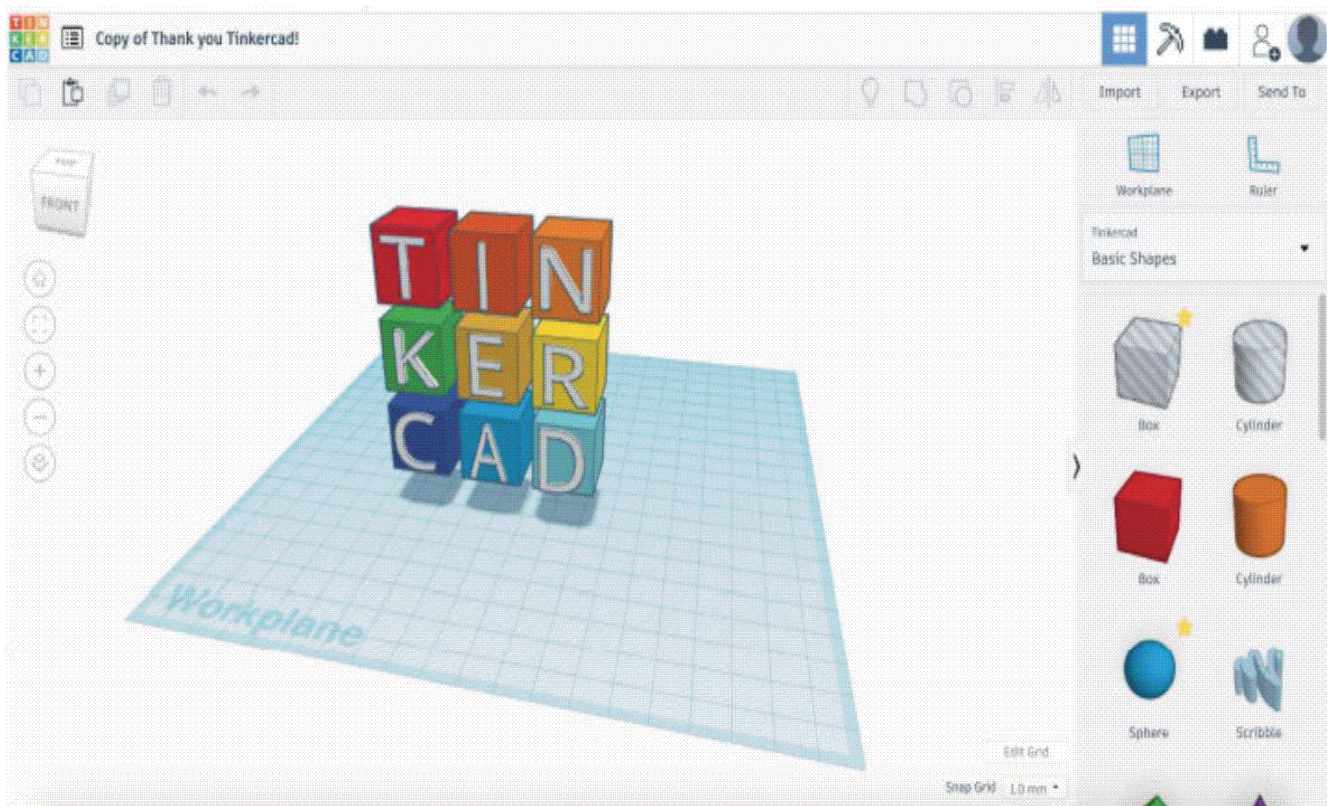
#### Software

Access Tinkercad online from here: [www.tinkercad.com](http://www.tinkercad.com)

### What Will You Learn

Placing, Adjusting and Combining shapes, to create a customised shape in 3D modelling.

Weblink: [Creating a 3D model of Hinge joint](https://www.tinkercad.com/projects/3d-model-of-hinge-joint)



# Challenge Activity :

## Introduction

As you know by now COVID-19 is very contagious and is rapidly spreading across the globe. Many people are staying home to protect our community, but there are many who need to work still because they are needed on the frontlines.

### **Let's meet Rita.**

Rita works in a hospital and encounters many patients every day. She wants to protect herself, her co-workers, and the hospital patients by doing her best to reduce transmission. She knows one common way to spread and contract the virus is by touching surfaces so she needs to think of a way to combat this.

### **So what's the problem?**

You'll be tasked with helping Rita limit the spread of coronavirus in the hospital. You will need to design a quick and easy way to reduce touching all types of door handles. Your device should be something that allows you to open the door without touching the handle with your hand. You should also consider the type of door handle your device will be used on (i.e. round doorknob vs. lever). You will use Design Thinking to help you come up with those ideas.

### **Create your first virtual prototype of your solution to the problem on Tinkercad!**

Key things to consider:

1. Is your solution functional for people with a range of abilities?
2. Will your solution work on multiple types of door handles or is your solution designed for one specific type of handle?

### **Advanced Prototyping:**

Make a 3D model of your virtual prototype in Tinkercad to plan out the design and then build a physical prototype to test your solution. Final Design Challenge: