# Problems about Engineer and cat

1. There is an Engineer, and he has a cat. A cat is a wonderful creature but unfortunately, it's always hungry. That's why the Engineer has to feed the cat even at night. In order to do this, it's necessary to go to the kitchen, where the cats' plate is and fill it with food. But at night it's always dark, so the Engineer sees nothing and has to turn on the light. So there appears another problem: the light turns on too harshly and dazzles the Engineer. He asks you to create the device, which will turn on the light gradually. The Engineer says that the device is similar to a voltage indicator with several levels.
    a. **You have:** a switch, pack of resistors and capacitors of various capacities, 3 LEDs
    b. **It's necessary:** to make a scheme, which turns on the LEDs in series, one by one. It'll be great if there'll be a little delay between turning on the LEDs.
    c. It's forbidden to use the microcontrollers.
    d. The criteria:
        i. The scheme works correctly: 5 points
        ii. Neatness of assembly: 5 points

2. The Engineer is very excited with the light turning on gradually, but it's still too complicated to wake up at night. "If only the cat could feed itself!", - thought the Engineer and decided to make an auto-feeder for his pet. The Engineer taught his cat a little focus: in order to receive some food, the cat should press a special button. Then a portion of food falls into the bowl and the LED turns on on the board. This way the Engineer knows how many times the cat was fed. He will make the device himself but asks you to help him with the electronic part of the device. And, by the way, the Engineer reminds you of some "shift register".

How many times have you fed the cat?
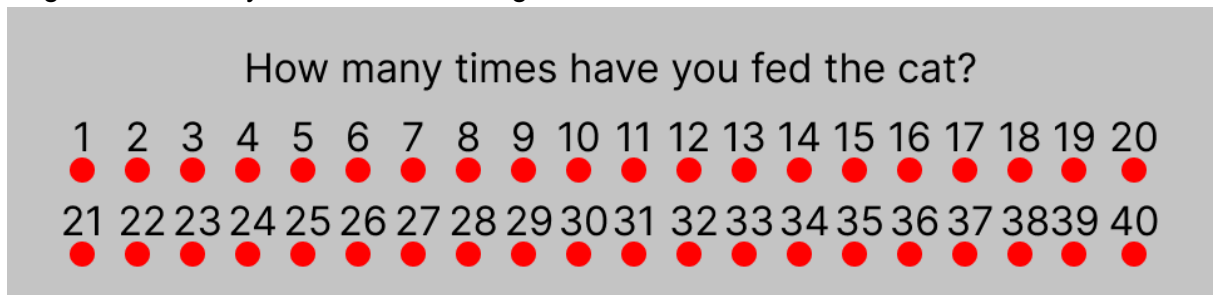
The count on the device moves from 1 to 40. In case, if there's 40 on the board and the cat presses the button again there should turn on the LED 1 again.
    a. **You have:** Arduino microcontroller, 40 LEDs, resistors, circuit 74HC595.
    b. **It's necessary:** to make a device, which turns on the LEDs in series when the button is pressed. When one LED turns on the previous should turn off. Namely, at the beginning there are no turned-on LEDs, when the button is pressed for the first time, the LED number 1 turns on. When the button is pressed for the second time, the first LED turns off and the second turns on. When the button is pressed 41 times, the first LED turns on again etc.
    c. The criteria:
        i. The scheme works correctly with 18 LEDs: 5 points
        ii. Neatness of assembly: 5 points
        iii. The scheme works correctly with 19 or more LEDs: 5 points

iv.   Neatness of programme: 5 points

3. And what do you think? The cat with such a feeder has become too plump and the Engineer has to update the auto-feeder for this reason. He hasn't figured out yet the way he will do that, but he knows for sure the details that should be in the device:

    a. It's necessary to define that the cat has got around the feeder and not to fill it with food without reason.

    b. The cat should be weighed. The heavier the cat is the less amount of food should fall into the bowl.

    c. The amount of food should be weighed either. If there's not enough food, the device should give an alarm.

    d. The cat should be fed not earlier than in 4 hours after the previous time.

    e. The criteria:

        i.   The realization of each task gives 5 points. So, maximum is 20 points

        ii.   Neatness of assembly: 5 points

        iii.   Neatness of programme: 5 points

You can use all elements from Tinkercad. Downloading additional sets is prohibited. The comments in the code is required.