



# Introduction to programming with CanSat

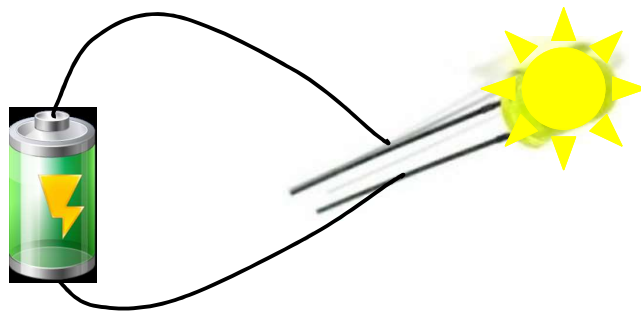
Arduino - BLINK



Bente Jensen



## 1. task: turn on a light diode



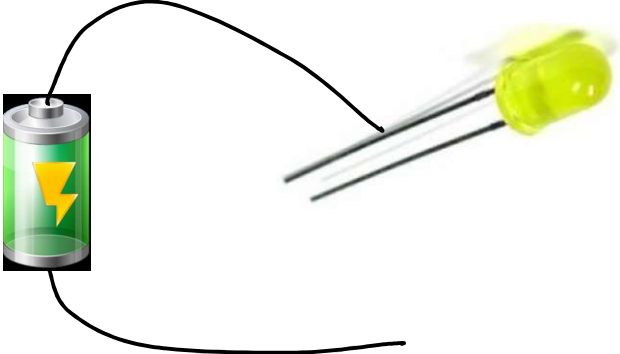
*NB: In most cases you'll need a resistor in series with the diode...*



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## 2. oppgave: få lysdiode til å blinke

No Voltage across the light diode



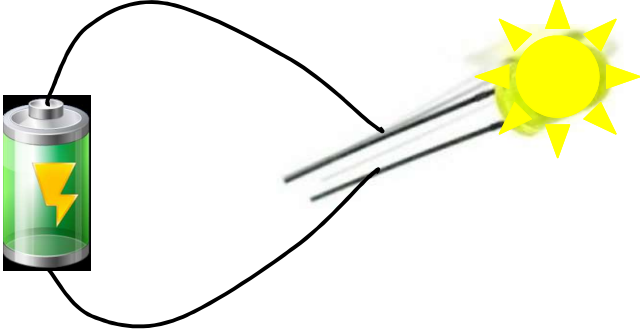
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Detailed description: This slide illustrates a circuit where a battery is connected to a yellow light diode. The diode is shown as a simple component with two leads, but it is not emitting light, indicating that no voltage is being applied across it. The text 'No Voltage across the light diode' is positioned to the left of the circuit. The slide includes the NAROM logo in the top left, the title '2. oppgave: få lysdiode til å blinke' at the top center, and logos for 'Nordic esero' and 'NTNU Kunnskap for en bedre verden' at the bottom right.

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## 2. task: make a light diode blink

Voltage across the light diode

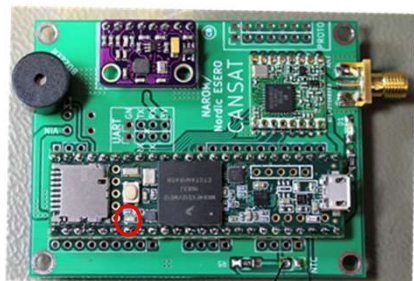


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Detailed description: This slide illustrates a circuit where a battery is connected to a yellow light diode. The diode is shown as a simple component with two leads, and it is emitting light, indicating that voltage is being applied across it. The text 'Voltage across the light diode' is positioned to the left of the circuit. The slide includes the NAROM logo in the top left, the title '2. task: make a light diode blink' at the top center, and logos for 'Nordic esero' and 'NTNU Kunnskap for en bedre verden' at the bottom right.



## The Arduino can do the job



The Arduino has a built in light diode  
The Arduino can turn the voltage across this light diode on and off

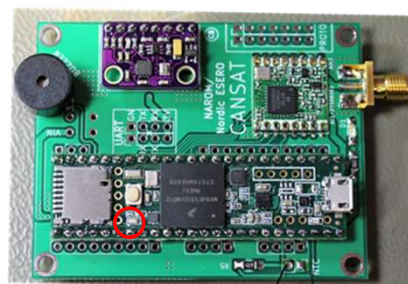


## Lets start with Arduino programming.

(Task: make a light diode blink and change the blinking)

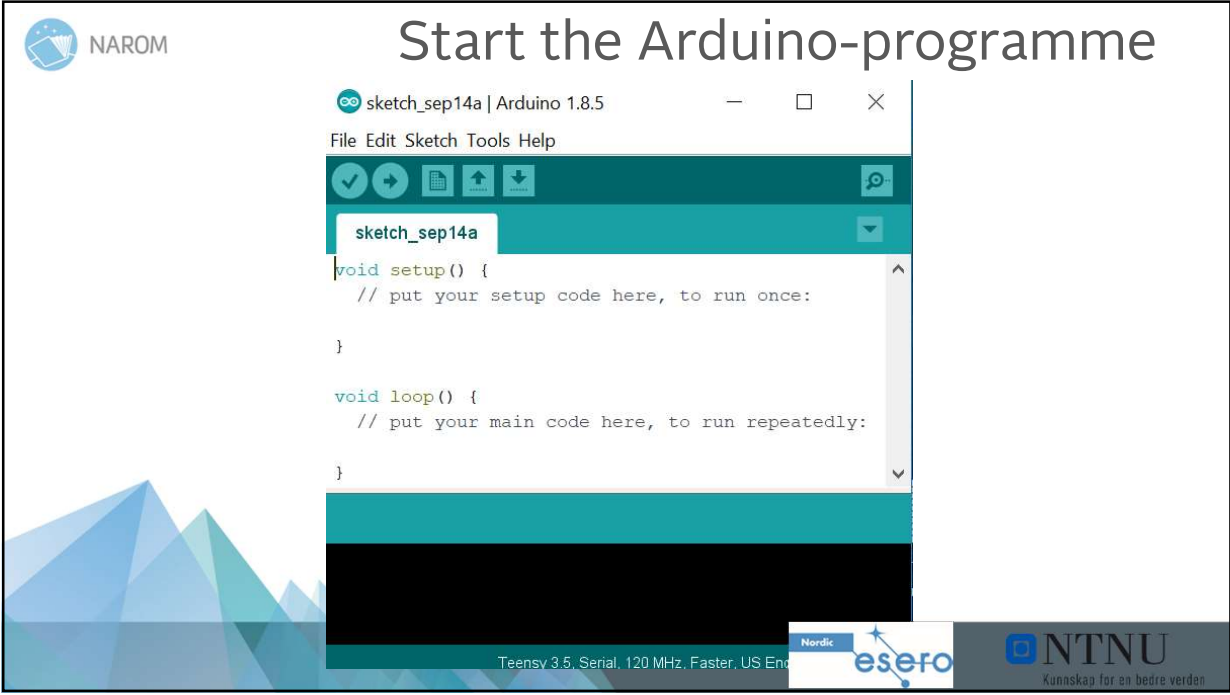
You need:

- 1 Teensy 3.5
- 1 micro USB cable
- 1 PC with Arduino and Teensy add-on programme installed



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## Start the Arduino-programme



The screenshot shows the Arduino IDE window titled 'sketch\_sep14a | Arduino 1.8.5'. The menu bar includes 'File', 'Edit', 'Sketch', 'Tools', and 'Help'. The toolbar contains icons for check, run, save, upload, and download. The sketch editor shows the following code:

```
void setup() {  
  // put your setup code here, to run once:  
  
}  
  
void loop() {  
  // put your main code here, to run repeatedly:  
  
}
```

At the bottom of the IDE, the board is set to 'Teensy 3.5, Serial, 120 MHz, Faster, US End'. Logos for 'Nordic esero' and 'NTNU Kunnskap for en bedre verden' are visible in the footer.

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## STRUCTURE

When a new Arduino sketch starts up:

```
void setup() {  
  // put your setup code here, to run once:  
  
}  
  
void loop() {  
  // put your main code here, to run repeatedly:  
  
}
```

The code structure is shown with the function signatures `void setup() {` and `void loop() {` circled in red. Logos for 'Nordic esero' and 'NTNU Kunnskap for en bedre verden' are visible in the footer.

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# Examples in the Arduino-program

sketch\_sep29a | Arduino 1.6.13

- File
- Edit
- Sketch
- Tools
- Help

- New Ctrl+N
- Open... Ctrl+O
- Open Recent
- Sketchbook
- Examples
  - Built-in Examples
    - 01.Basics
      - AnalogReadSerial
      - BareMinimum
      - Blink
      - DigitalReadSerial
      - Fade
      - ReadAnalogVoltage
    - 02.Digital
    - 03.Analog
    - 04.Communication
    - 05.Control
    - 06.Sensors
    - 07.Display
    - 08.Strings
    - 09.USB
    - 10.StarterKit\_BasicKit
    - 11.ArduinoISP
  - Examples for any board
    - Bridge
    - Esplora
    - Ethernet
    - Firmata
    - GSM
    - LiquidCrystal
    - Robot Motor
- Close Ctrl+W
- Save Ctrl+S
- Save As... Ctrl+Shift+S
- Page Setup Ctrl+Shift+P
- Print Ctrl+P
- Preferences Ctrl+Comma
- Quit Ctrl+Q

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# Blink

sketch\_sep29a | Arduino 1.6.13

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- Quit Ctrl+Q

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## The Blink Programme – the first lines

```
/*
  Blink
  Turns on an LED on for one second, then off for one
  second, repeatedly.
```

This example code is in the public domain.

```
*/
```

```
// Pin 13 has an LED connected on most Arduino boards.
// Pin 11 has the LED on Teensy 2.0
// Pin 6 has the LED on Teensy++ 2.0
// Pin 13 has the LED on Teensy 3.0
// give it a name:
```

```
int led = 13;
```



## The Blink Programme

```
// the setup routine runs once when you press reset:
```

```
void setup() {
  // initialize the digital pin as an output.
  pinMode(led, OUTPUT);
}
```

```
void loop() {
  digitalWrite(led, HIGH); // turn the LED on (HIGH is the voltage
  level)
  delay(1000); // wait for a second
  digitalWrite(led, LOW); // turn the LED off by making the voltage
  LOW
  delay(1000); // wait for a second
}
```



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## The Blink Programme

*(Pin number 13 on Teensy 3.5)*

```
void setup() {  
  // initialize digital pin led as an output.  
  pinMode(led, OUTPUT);  
}  
  
void loop() {  
  digitalWrite(led, HIGH); // turn the LED on (HIGH is the voltage  
  level)  
  delay(1000); // wait for a second  
  digitalWrite(led, LOW); // turn the LED off by making the voltage  
  LOW  
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}
```

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## The Blink Programme

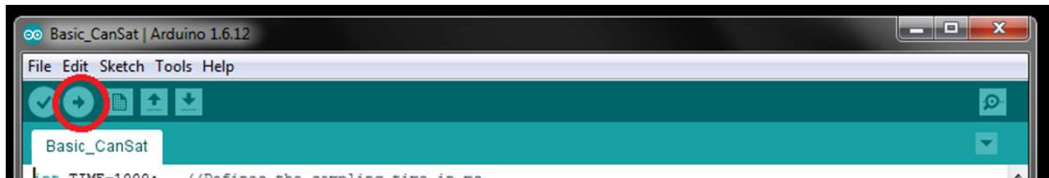
```
void setup() {  
  // initialize digital pin LED_BUILTIN as an output.  
  pinMode(LED_BUILTIN, OUTPUT);  
}  
  
void loop() {  
  digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the  
  voltage level)  
  delay(1000); // wait for a second  
  digitalWrite(LED_BUILTIN, LOW); // turn the LED off by making  
  the voltage LOW  
  delay(1000); // wait for a second  
}
```

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## Upload the programme to the Arduino



Does the built-in diode blink now?



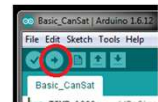
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## The Blink Programme

```
void setup() {
  // initialize digital pin as an output.
  pinMode(led, OUTPUT);
}

void loop() {
  digitalWrite(led, HIGH); // turn the LED on (HIGH is the voltage
  level)
  delay(1000); // wait for a second
  digitalWrite(led, LOW); // turn the LED off by making the voltage
  LOW
  delay(1000); // wait for a second
}
```


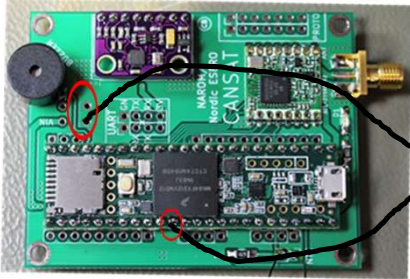
Write 250 in stead of 1000 here  
 Upload the programme again.  
 What happens?  
 Write different values  
 In the two



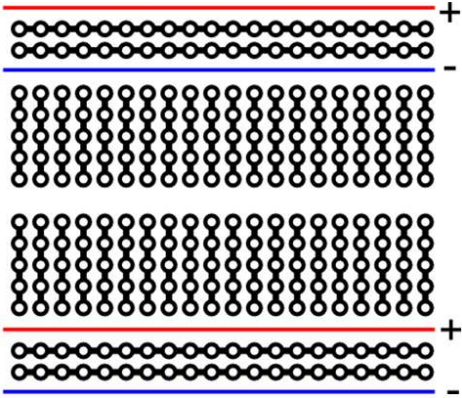


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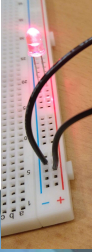
## Connect an external light diode



Diode long leg: +




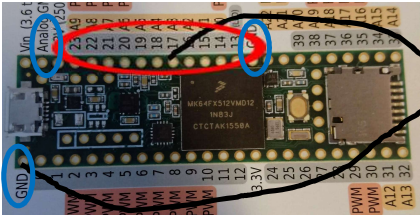
NB: In most cases you'll need a resistor in series with the diode...



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## Challenges for you...



1. Connect the external light diode to another digital pin (no. 13-23) and make it blink. (Write pin no. in stead of «led»)
2. Connect 2 light diodes and make them blink in/out of line.
3. Connect even more light diodes to own digital pins (no. 13-23) and make a light show 😊

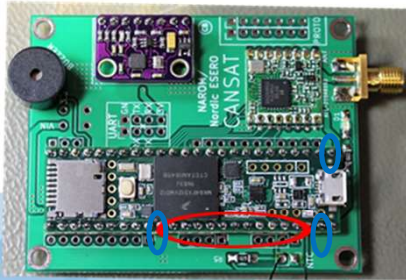
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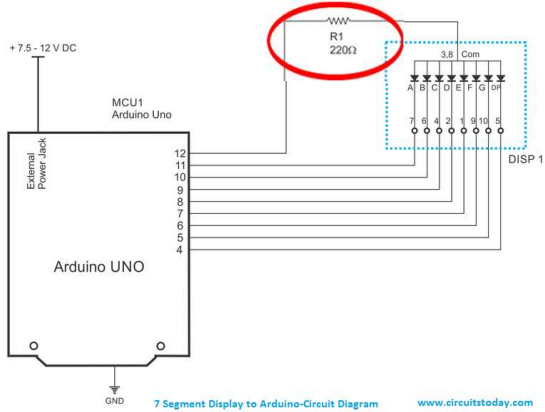
# Extra task: Count down to rocket launch

Remember: 220 Ohms resistor in series for current limitation

7 segment display



7 Segment Display - Pin Out Diagram



7 Segment Display to Arduino-Circuit Diagram [www.circuitstoday.com](http://www.circuitstoday.com)

