**Code conversation full solution - Intelligent cooling fan**

**Code for the program is here:** https://tinyurl.com/2wtkdh2d

**Describe what the whole program is doing in a couple of sentences:**

The intelligent cooling fan turns on if the ambient temperature is warm and the solar store is more than half full, then off if the temperature is cold or the solar store is not full enough. In addition the program puts a message on the micro:bit which says YES when the fan is on and NO when the fan is off. Buttons A and B are provided for an override that allows you to request the fan manually. B overrides and A cancels the override.

**Fill in the blanks**

| ***Line*** | ***Code*** | ***What is this line doing?*** |
| --- | --- | --- |
| 1 | from microbit import | imports the micro:bit module to give you access to all the hardware that is built-in into your board |
| 2 |  |  |
| 3 | CHARGED = 818/2 | sets a variable called CHARGED. CHARGED is the maximum charge on the supercapacitor (approx 818) divided by 2. This means that as long as the solar store is holding half charge you can use some of it, rather than waiting for a full charge. |
| 4 | DISCHARGED = 220 | sets a variable called DISCHARGED. DISCHARGED is a low reading, which equates to the solar store being about a quarter charged. |
| 5 | HOT = 23 | sets a variable called HOT. HOT is the ambient temperature at which you might need a fan to cool down. |
| 6 | COLD = 20 | sets a variable called COLD. COLD is a temperature at which it is becoming too cold and you might want to turn the fan on to cool down. |
| 7 | override = False | sets a variable called override which is initially set to the boolean value False. The override variable ensures that the fan\_needed and fan\_not\_needed functions are overridden by the button pressed functions to allow the user to ignore the readings of storage and temperature and simply switch the fan on and off. |
| 8 | temp = 0 | sets a variable called temp, which is initially set to 0. |
| 9 |  |  |
| 10 | def read\_temp(): | defines a Python function called read\_temp () |
| 11 | global temp | specifies that the temp variable that is set inside this function should be available to the rest of the programme i.e. globally and not just inside the function. |
| 12 | temp = temperature() | sets temp to be what is returned from the inbuilt temperature () function which measures the temperature of the microchip in the micro:bit which is roughly the same as the ambient (air) temperature. |
| 13 | if override: | if override is True then... |
| 14 | temp = HOT | temp is set to HOT |
| 15 |  |  |
| 16 | def fan\_needed(): | defines a Python function called fan\_needed(). The function determines when the cooling fan is needed only when there is sufficient stored charge in your Solar Store to allow the fan to run for a long time, as well as it being hot enough to need some cooling action. |
| 17 | return stored >= CHARGED and temp >= HOT | Returns the value of stored>=CHARGED (which is max charge/2) and temp>=HOT |
| 18 |  |  |
| 19 | def fan\_not\_needed(): | defines a Python function called fan\_not\_needed(). The function decides when the cooling fan is not needed only when the charge in the Solar Store is low or temperature is cold. |
| 20 | return stored <= DISCHARGED or temp <= COLD | value is returned only when stored (charge on solar store) is less than discharged (low charge level on solar store) or temperature is the same as or less than the lower level set at 20. |
| 21 |  |  |
| 22 | def fan\_on(): | defines a function called fan\_on which activates the fan and shows a specific message on the micro:bit when the fan is on. |
| 23 | pin2.write\_digital(1) | pin2 is switched to 1 i.e. the “Enable” pin on the Solar Store is activated so that any stored energy can be used by the attached device. |
| 24 | display.show(Image.YES) | inbuilt function which shows a specific image on the micro:bit, in this case the word YES to mean that the fan is on. |
| 25 |  |  |
| 26 | def fan\_off(): | defines a function called fan\_off which turns off the fan and shows a specific message on the micro:bit when the fan is off. |
| 27 | pin2.write\_digital(0) | pin2 is switched to 0 i.e. the “Enable” pin on the Solar Store is de-activated so that any stored energy cannot be used by the attached device. |
| 28 | display.show(Image.NO) | inbuilt function which shows a specific image on the micro:bit, in this case the word NO to mean that the fan is off. |
| 29 |  |  |
| 30 | # main program |  |
| 31 | while True: | loop forever |
| 32 | # sensing |  |
| 33 | stored = pin0.read\_analog() | sets the value in the variable stored to the reading from pin0, which is the pin attached to the solar store. |
| 34 | if button\_a.was\_pressed(): | if button a is pressed then… |
| 35 | override = True | set override variable to boolean value True i.e. override the other functions which are responding to the temperature and storage and allow the buttons to switch the fan on and off. |
| 36 | if button\_b.was\_pressed(): | if button b is pressed then… |
| 37 | override = False | set override variable to boolean value False |
| 38 | read\_temp() | call read\_temp function |
| 39 |  |  |
| 40 | # control |  |
| 41 | if fan\_needed(): | if the function fan\_needed() is true then... |
| 42 | fan\_on() | call function fan\_on() (as defined earlier in programme) |
| 43 | elif fan\_not\_needed(): | otherwise if fan\_not\_needed is true then…. |
| 44 | fan\_off() | call function fan\_off() |
| 45 |  |  |
| 46 | print(stored, temp) | the current reading for stored and temp is stored in the program |
| 47 | sleep(1000) | programme pauses for 1000 milliseconds i.e. 1 second. |
|  |  |  |