Calculation of the solar PV energy output of a photovoltaic cell:

We construct a solar panel which is used for powering the controller. A dimension about 11.5cm × 6 cm rectangular solar plate is used to make the solar panel.

Global formula: $E = A \times r \times H \times PR$

E = Energy (kWh)	1 kWh/an
A = Total solar panel Area (m²)	0.0069 m²
r = solar panel yield (%)	15%
H = Annual average irradiation on tilted panel (shadings not included) *	1250 kWh/m².an
PR = Performance ratio, coefficient for losses (range between 0.9 and 0.5, default value =0.75)	0.75

* https://photovoltaic-software.com/principle-ressources/solar-radiation-databases

Relative Humidity Calculation using DHT11 Sensor:

If you know the temperature and the dewpoint, and want to obtain relative humidity, the formulas are as follows:

First, to convert the temperature and the dewpoint from Fahrenheit to Celsius, use the following formulas.

$$T_c = \frac{5 \times (T_f - 32.0)}{9} \quad (1)$$

$$T_{dc} = \frac{5 \times (T_{df} - 32.0)}{9} \quad (2)$$

T_c=air temperature in degrees Celsius, T_f=air temperature in degrees Fahrenheit

T_{dc}=dewpoint temperature in degrees Celsius

T_{df}=dewpoint temperature in degrees Fahrenheit

The next set of formulas assumes a standard atmospheric pressure. These formulas will calculate saturation vapor pressure (Es) and actual vapor pressure(E) in millibars.

$$E_s = 6.11 \times 10.0 \times \left(\frac{7.5 \times T_c}{237.7 + T_c}\right) \quad (3)$$

$$E = 6.11 \times 10.0 \times \left(\frac{7.5 \times T_{dc}}{237.7 + T_{dc}}\right) \quad (4)$$

Once the saturation vapor pressure and the actual vapor pressure, relative humidity can be computed by dividing the actual vapor pressure by the saturation vapor pressure and then multiplying by 100 to convert the quantity to a percent.

$$\text{Relative Humidity (RH) in percent} = \frac{E}{E_s} \times 100\% \qquad (5)$$

For example, a station report that included an air temperature of 85 degrees Fahrenheit and a dewpoint of 65 degrees Fahrenheit and you wanted to compute the relative humidity, you would proceed as follows.

First, convert the Fahrenheit values to Celsius using formulas. The values should be T_c=29.4 and T_{dc}=18.3

Next, calculate the saturation vapor pressure and the actual vapor pressure using formulas (3) and (4) respectively. The values should be E_s=40.9 and E =21.0

Finally, calculate relative humidity using formula (5). The final answer should be RH=51.3 %.