01.Use a weather forecast website, and utilize the psychrometric chart and the formula we went through in the class to determine the absoloute humidity, the wetbulb temperature and the mass of water vapour in the air in ClassRoom A (Aula A) of Piacenza campus in the moment that you are solving this exercise (provide the inputs that you utilized)

Il tempo oggi in Piacenza Lunedi, 02 Dicembre 2019							
	13:00	14:00	16:00	18:00	20:00	21:00	22:00
	PartlyCloud	PartlyCloud	LightCloud	LightCloud	PartlyCloud	Cloud	PartlyCloud
Temperatura effettiva	10°C	10°C	9°C	6°C	7°C	7°C	8°C
Temperatura percepita	10°C	10°C	8°C	5°C	7°C	6°C	7°C
Precipitazioni	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm
Umidità	79 %	77 %	89 %	90 %	90 %	92 %	91 %
Pressione atmosferica	1016 hPa	1015 hPa	1016 hPa	1017 hPa	1019 hPa	1019 hPa	1020 hPa

Humidity: 90%

Relative humidity (φ): 90% Total air pressure: 101,9 KPa Atmospheric Pressure: 1019 hPa

Temperature: 7°C = 230 K

Starting from a pychrometric chart we can see 4 different values:

Humidity ratio

I.E.

absolute humidity (ω) = 0,0055 web-bulb temperature Twb = 6 °C

$$\omega = 0.622 \frac{P_v}{P_a}$$

$$P_v = 0.893 \text{ kP}_a$$

As we have learn in class we already know that Rsp= 0.4615 so we can use this data (and the previous ones) in the following formula:

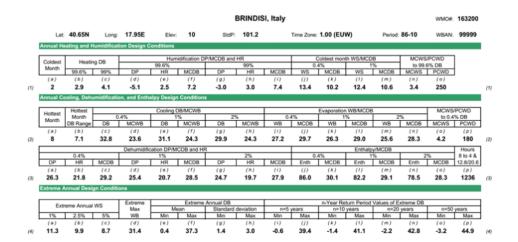
$$M = \frac{PV}{Rsp T}$$

$$M = \frac{0.893 \text{ V}}{0.4615 * 230} = 8,41 \text{ X } 10^{-3} \text{ V}$$

Remember that
$$\Phi = \frac{Mv}{Mg} = 90\%$$

So we can find the inverse formula
$$M_g = \frac{Mv}{90\%} = 9,34 \times 10^{-3} \text{ v}$$

02.Utilize the same methodology we went through in the class and determine the sensible and latent load corresponding to internal gains, the ventilation, and the infiltration in a house with a good construction quality and with the same geometry as that of the example which is located in Brindisi, Italy



Internal gains

$$q_{ig,s} = 136 + 2.2 A_{cf} + 22 N_{oc} = 136 + 2.2 \times 200 + 12 \times 2 = 620 W$$

 $q_{ig,l} = 20 + 0.22 A_{cf} + 12 N_{oc} = 20 + 0.22 \times 200 + 12 \times 2 = 88 W$

House with high construction quality unit leakage area

$$A_{ul} = 1.4 \text{ cm}^2 / \text{m}^2$$

$$A_{es} = A_{wall} + A_{roof} = 200 + 144 = 344 \text{ m}^2$$

$$A_L = A_{es} \times A_{ul} = 344 \times 1,4 = 481,6 \text{ cm}^2$$

BRINDISI DATAS:

 $T_{cooling} = 24 \, ^{\circ}C$

 $T_{heating} = 20 \, ^{\circ}C$

$$\Delta T_{cooling} = 31,1 \,^{\circ}C - 24 \,^{\circ}C = 7,1 \,^{\circ}C = 7,1 \,^{K}$$

 $\Delta T_{heating} = 20 \,^{\circ}C + 4,1 \,^{\circ}C = 24,1 \,^{\circ}C = 24,1 \,^{K}$

$$IDF_{heating} = 0.073 L/s x cm^2$$

$$IDF_{cooling} = 0.033 L/s x cm^2$$

$$Q_{i,heating} = A_L \times IDF_{heating} = 481,6 \times 0,073 = 35,1568 \text{ L/s}$$

$$Q_{i,cooling} = A_L \times IDF_{cooling} = 481,6 \times 0,033 = 15,8928 L/s$$

$$Q_v = 0.05 A_{cf} + 3.5 (N_{br} + 1) = 0.05 \times 200 + 3.5 \times (1 + 1) = 17 L/s$$

$$Q_{i-v,heating} = Q_{i,heating} + Q_v = 35,1568 + 17 = 52,1568 L/s$$

$$Q_{i-v,cooling} = Q_{i,cooling} + Q_v = 15,8928 + 17 = 32,8928 L/s$$

 $C_{\text{sensible}} = 0,0039$

$$Q_{inf-ventilation_coolingsensible} = C_{sensible}Q_{i-v,cooling} \Delta T_{cooling} = 1,23 \times 32,8928 \times 7,1$$

$$Q_{inf-ventilation_coolinglatent} = C_{sensible}Q_{i-v,cooling} \ \Delta\omega_{cooling} = 3010 \ x \ 32,8928 \ x \ 0,0039 \ x \ 0$$

$$Q_{inf-ventilation_heatingsensible} = C_{sensible}Q_{i-v,heating} \Delta T_{heating} = 1,23 \text{ x } 52,1568 \text{ x } 24,1$$