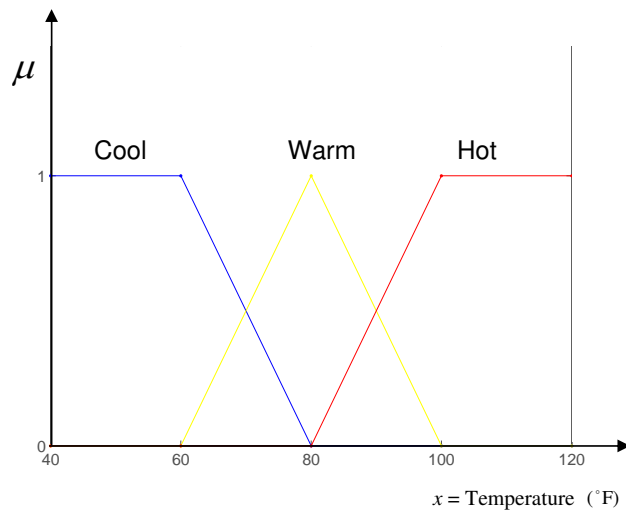
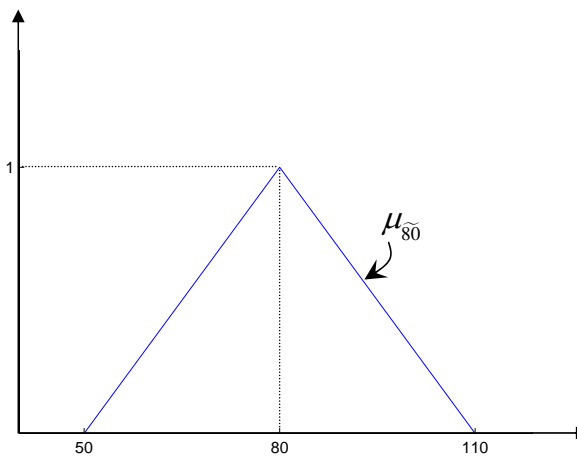


1. Solve the following fuzzy applications.

(a) Consider the following definitions:

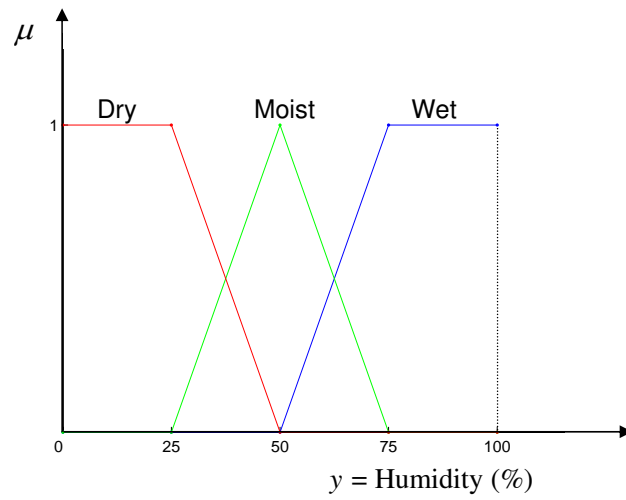


- (i) When $x = 50^{\circ}\text{F}$, how cool is it? how warm is it? how hot is it?
- (ii) When $x = 90^{\circ}\text{F}$, how cool is it? how warm is it? how hot is it?
- (iii) Given

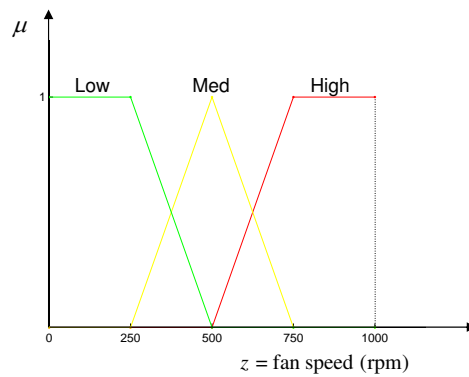


When $x = \tilde{80}^{\circ}\text{F}$, how cool is it? how warm is it? how hot is it?

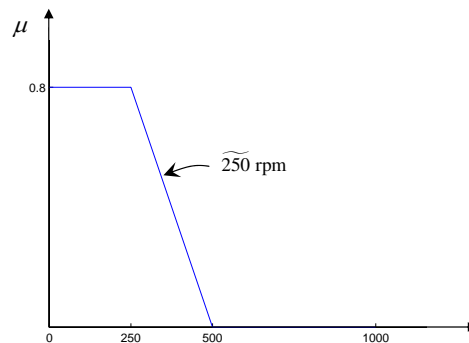
(b) Consider the following definitions:



When $y = 50\%$, how dry is it? how moist is it? how wet is it?
(c) Consider the following definitions:



Given



When $z = \widetilde{250}$ rpm, how low is it? how med is it? how high is it?

2. We now design a fuzzy controller for the fan speed in your bathroom. The control table is as below:

Fan		Temperature		
		Cool	W arm	Hot
Hum idity	D ry	Low	M ed	M ed
	M oist	Low	M ed	H igh
	W et	M ed	M ed	H igh

We use the Mamdani's implication formula for the fuzzy inference rule “If (temperature = x and humidity = y) then (fan speed = z).”

- (i) When $x = 60^{\circ}\text{F}$, $y = 25\%$, what is the fuzzy fan speed?
- (ii) When $x = 60^{\circ}\text{F}$, $y = 30\%$, what is the fuzzy fan speed?
- (iii) When $x = 60^{\circ}\text{F}$, $y = 50\%$, what is the fuzzy fan speed?
- (iv) When $x = 60^{\circ}\text{F}$, $y = 55\%$, what is the fuzzy fan speed?
- (v) When $x = 60^{\circ}\text{F}$, $y = 80\%$, what is the fuzzy fan speed?
- (vi) When $x = \tilde{80}^{\circ}\text{F}$, $y = 50\%$, what is the fuzzy fan speed?

In order to get a crisp fan speed, you have to defuzzyify the “fuzzy fan speeds.”

- (vii) Use the “Max-Max” and “Max-Min” methods for the results obtained in (i) and (ii).
 - (viii) Use the “Max-Med” method for (i).
 - (ix) Use the “Centroid” method for (ii).
3. Read the following paper: *An Efficient and Flexible Mechanism for Constructing Membership Functions*, by A. L. Medaglia, S.-C. Fang, H. L. W. Nuttle and J. R. Wilson, European Journal of Operational Research, 139(2002), 84-95.
- Point out the weakness of this work and your ideas to mend the weakness.**