```
"Day 8 Exercise"

"Combustion of Isooctane in air with phi = 0.9"

"Specs on the fuel"

alpha = 8
beta = 18
a_s = alpha+beta/4

"Fuel air equivalence ratio"

phi =0.9

"Balance equations"

alpha = b
2*a_s/phi = 2*b+c+2*e
beta=2*c
3.773*(2*a_s/phi)=2*d

"Molar fractions - mixture"

n_fuel = 1
n_O2 = a_s/phi
n_N2 = 3.773*n_O2
n_mix = n_fuel+n_O2+n_N2
y_O2 = n_O2/n_mix
y_N2 = n_N2/n_mix
y_fuel = n_fuel/n_mix
Mw_mix = y_fuel*MOLARMASS(C8H18)+y_O2*MOLARMASS(O2)+y_N2*28.16

"Molar Fractions burned gas"

n_bg = b+c+d+e
y_exCO2 = b/n_bg
y_exH2O= c/n_bg
y_exN2 = d/n_bg
y_exO2 = e/n_bg
Mw_bg=y_exO2*MOLARMASS(O2)+y_exN2*28.16+y_exCO2*MOLARMASS(CO2)+y_exH2O*MOLARMASS(H2O)
```

Day 8 Exercise

Combustion of Isooctane in air with phi = 0.9

Specs on the fuel

$\alpha = 8$

$\beta = 18$

$a_s = \alpha + \frac{\beta}{4}$

Fuel air equivalence ratio

$\phi = 0.9$

Balance equations

$\alpha = b$

$2 \cdot \frac{a_s}{\phi} = 2 \cdot b + c + 2 \cdot e$

$\beta = 2 \cdot c$

$3.773 \cdot 2 \cdot \frac{a_s}{\phi} = 2 \cdot d$

Molar fractions - mixture

$n_{fuel} = 1$

$n_{O2} = \frac{a_s}{\phi}$

$n_{N2} = 3.773 \cdot n_{O2}$

$n_{mix} = n_{fuel} + n_{O2} + n_{N2}$

$y_{O2} = \frac{n_{O2}}{n_{mix}}$

$y_{N2} = \frac{n_{N2}}{n_{mix}}$

$y_{fuel} = \frac{n_{fuel}}{n_{mix}}$

$Mw_{mix} = y_{fuel} \cdot \mathbf{MolarMass}['C8H18'] + y_{O2} \cdot \mathbf{MolarMass}['O2'] + y_{N2} \cdot 28.16$

Molar Fractions burned gas

$n_{bg} = b + c + d + e$

$y_{exCO2} = \frac{b}{n_{bg}}$

$y_{exH2O} = \frac{c}{n_{bg}}$

$y_{exN2} = \frac{d}{n_{bg}}$

$y_{exO2} = \frac{e}{n_{bg}}$

$Mw_{bg} = y_{exO2} \cdot \mathbf{MolarMass}['O2'] + y_{exN2} \cdot 28.16 + y_{exCO2} \cdot \mathbf{MolarMass}['CO2'] + y_{exH2O} \cdot \mathbf{MolarMass}['H2O']$

Unit Settings: [kJ]/[K]/[kPa]/[kg]/[radians]

α = 8	β = 18	a_s = 12.5	ϕ = 0.9	b = 8	c = 9
e = 1.389	d = 52.4	n_{fuel} = 1	n_{O2} = 13.89	n_{N2} = 52.4	n_{mix} = 67.29
y_{O2} = 0.2064	y_{N2} = 0.7787	y_{fuel} = 0.01486	Mw_{mix} = 30.23	n_{bg} = 70.79	y_{exCO2} = 0.113
y_{exH2O} = 0.1271	y_{exN2} = 0.7402	y_{exO2} = 0.01962	Mw_{bg} = 28.74		