

# Quizes

## Welfare Analysis

Conduct welfare analysis using the setting below. In other words, calculate the equilibrium price and the area between the price and demand curb.

Hint; use `uniroot()`, `integrate()` and `plot()` (option).

Price:  $P$

Goods:  $D, S$

Demand Curb:  $P = 90 - D$  or  $D = 90 - P$

Supply Curb:  $P = 2S$  or  $S = \frac{1}{2}P$

## Sample Answer

Firstly, we need to get the equilibrium price. To solve this formula, it is common to define functions.

```
demand_c<-function(x){
  return(90-x)
}

supply_c<-function(x){
  return(2x)
}

solver<-function(p){
  return(supply_c(x)-demand_c(x))
}
```

The last function `solver` is for solving the equilibrium. Calculating the price means solve

$$90 - D - 2S = 0 \quad D = S$$

R provides a function to solve equation as other popular languages do. In this sample answer, we use `uniroot()`.

```
equil <- uniroot(solver, c(0, 90))
```

The second argument the range in which a solution exist. As you might assume, it is sometime difficult for use to set the range. However, we can use basic economics knowledge. As seeing the demand and supply curb, you can easily find the price is more than zero. Beside, when the price is over 90, no one would buy goods because demand is zero. So, we can set the range `c(0,90)`. `equil$root` enable you to get the equilibrium price.

Next, we will calculate the area between the demand curb and price line. `integrate()` provides us the method to get the area.

```
equil_price <- demand_c(equil$root)
area <- integrate(demand_c, 0, equil$root)
consumer_welfare <- area$value - equil_price * equil$root
```