# Exercise MS-101

Deriving supply from willingness to accept

The Economic Skills Project

## 1 Problem

**Problem**

Given the equation below for individual $i$'s willingness to accept, derive the corresponding individual supply curve $Q_i(P^s)$.

**Equation** $WTA_i = 60 + \frac{1}{4}Q_i$

## 2 Answer

**Answer**

Here's the solution:

- $Q_i = 4P^s - 240$

## 3 Method

**Solution method**
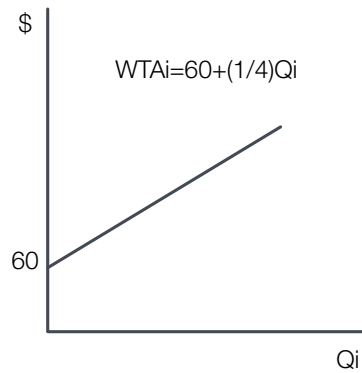
Here's one approach:

1. Draw the graph
2. Use the choice rule for sellers
3. Solve for $Q_i$
4. Check the result

# 4  Solution

## 4.1  Step 1

**Draw the graph**

Here's how it looks:

```
$ |
  |     WTAi=60+(1/4)Qi
  |
  |                    /
  |                  /
  |                /
  |              /
60|            /
  |          /
  |_____
                          Qi
```

## 4.2  Step 2

**Use the choice rule for sellers**

Seller $i$ facing price $P^s$ chooses $Q_i$ where:

- $WTA_i = P^s$

Thus we have two equations and three variables:

1. $WTA_i = 60 + \frac{1}{4}Q_i$
2. $WTA_i = P^s$

By combining the equations we can derive a single equation giving $Q_i$ in terms of $P^s$.

## 4.3 Step 3

**Solving for** $Q_i$

Using the decision rule (equation 2) to eliminate $WTA_i$ from the WTA equation (equation 1) and then solving for $Q_i$:

- $P^s = WTA_i = 60 + \frac{1}{4}Q_i$
- $P^s = 60 + \frac{1}{4}Q_i$
- $\frac{1}{4}Q_i = P^s - 60$
- $Q_i = 4P^s - 240$

## 4.4 Step 4

**Checking the result**

The supply curve should have the same Y intercept as the WTA curve. Checking:

$P^s = 60$: $Q_i = 4(60) - 240 = 0$

That works!

As an algebraic matter it would be possible to check the X intercept as well. However, it's probably better to skip that since the intercept would be at a negative quantity. As explained on the next page, that part of the diagram isn't economically meaningful.

**What's up with the negative** $Q_i$?

Taken literally the supply equation would say that if $P^s = 0$ then $Q_i = -240$: that is, the supplier is selling *less than zero* units. However, WTA curves are really only defined when $Q_i$ is zero or positive. If the seller is offered a price less than the Y intercept of the WTA curve ($60 in this case) they simply sell 0, not a negative amount.

Strictly speaking, a more formal version of the supply curve is:

- $Q_i = \begin{cases} 4P^s - 240 & P^s \geqslant 60 \\ 0 & P^s < 60 \end{cases}$

Everything checks - done!