

# Exercise MD-101

Deriving demand from willingness to pay

The Economic Skills Project

## 1 Problem

### Problem

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

**Equation**  $WTP_i = 400 - 2Q_i$

## 2 Answer

### Answer

Here's the solution:

- $Q_i = 200 - \frac{1}{2}P^d$

## 3 Method

### Solution method

Here's one approach:

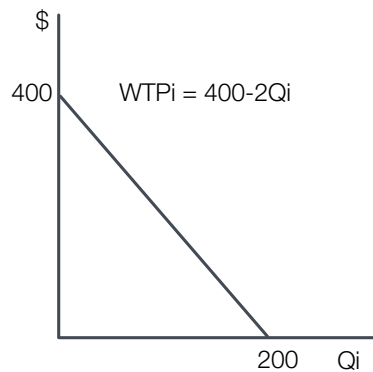
1. Draw the graph
2. Use the choice rule for buyers
3. Solve for  $Q_i$
4. Check the result

## 4 Solution

### 4.1 Step 1

Draw the graph

Here's how it looks:



### 4.2 Step 2

Use the choice rule for buyers

Buyer  $i$  facing price  $P^d$  chooses  $Q_i$  where:

- $WTP_i = P^d$

Thus we have two equations and three variables:

1.  $WTP_i = 400 - 2Q_i$
2.  $WTP_i = P^d$

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

### 4.3 Step 3

#### Solving for $Q_i$

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

- $P^d = WTP_i = 400 - 2Q_i$
- $P^d = 400 - 2Q_i$
- $2Q_i = 400 - P^d$
- $Q_i = 200 - \frac{1}{2}P^d$

### 4.4 Step 4

#### Checking the result

The demand curve should have the same intercepts as the WTP curve. Checking:

$$P^d = 0: Q_i = 200 - \frac{1}{2}(0) = 200$$

$$P^d = 400: Q_i = 200 - \frac{1}{2}(400) = 0$$

Everything checks - done!