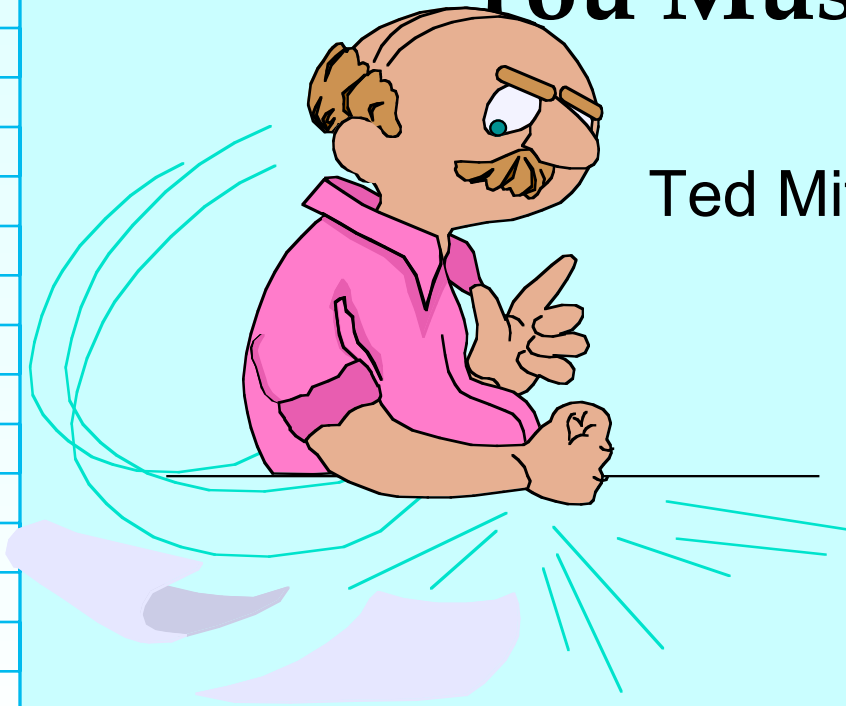


# Break-even Analysis

Ted Mitchell

# Four Breakeven Points You Must Know

Ted Mitchell



$$PQ - VQ - F = 0$$

### **Breakeven Quantity**

- $BEQ = F / (P - V)$

### **Breakeven Price**

- $BEP = V + F/Q$

### **Breakeven Revenue**

- $BER = F/M_p$

### **Breakeven Markup**

- $BEM_p = F/R$

# Basic Profit Equation

$$PQ - VQ - F = Z$$

- P = price
- V = variable cost per unit
- F = total fixed of period costs
- Q = quantity sold
- Z = profit

## Breakeven Means Zero Profit

$$PQ - VQ - F = Z$$

- P = price
- V = variable cost per unit
- F = total fixed of period costs
- Q = quantity sold
- **Z = profit set equal to zero = 0**

# Breakeven Equation

$$PQ - VQ - F = 0$$

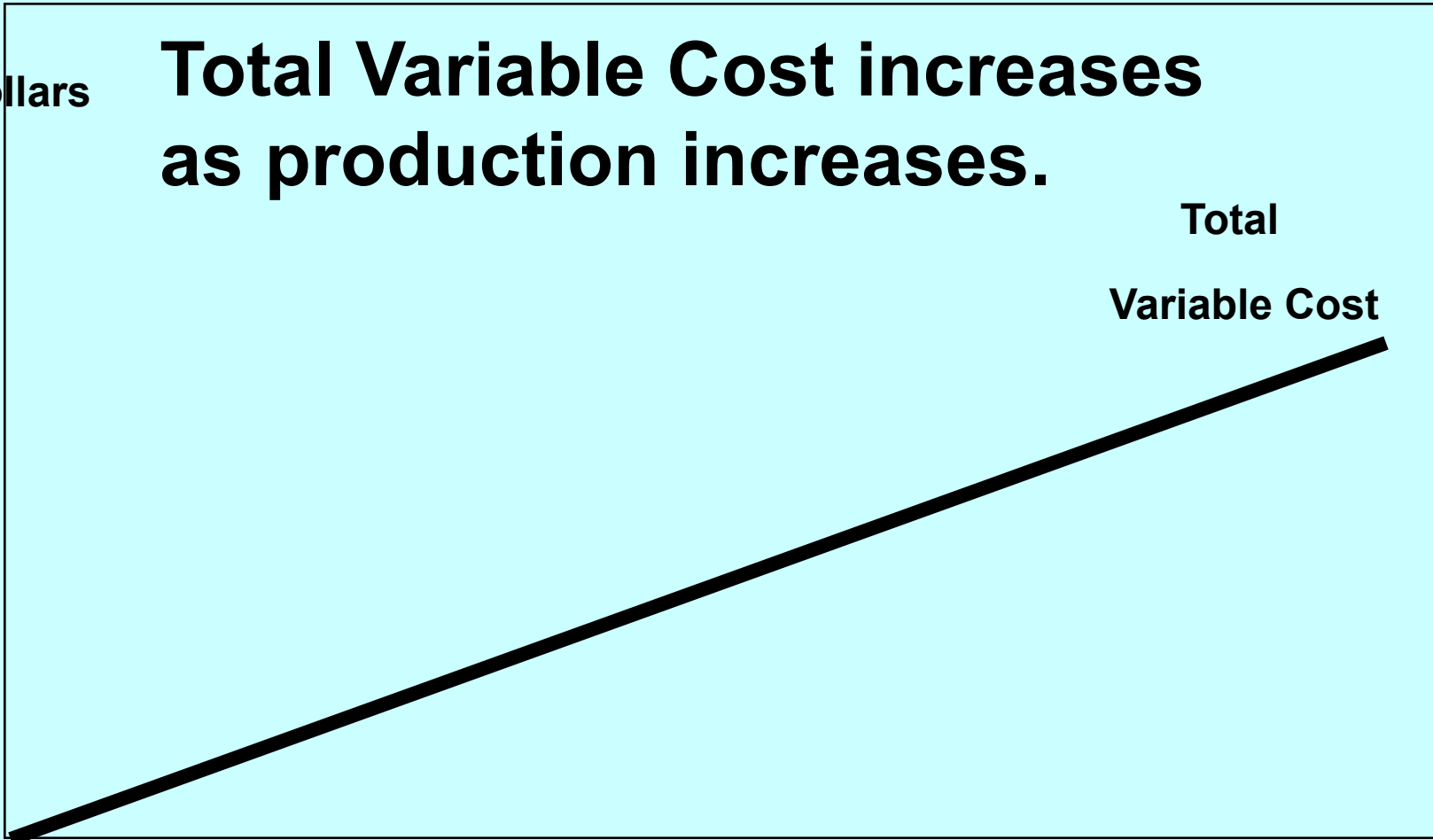
- P = price
- Q = quantity sold
- V = variable cost per unit
- F = total fixed of period costs
- **Z = profit set equal to zero = 0**

# Variable Cost

Dollars

**Total Variable Cost increases  
as production increases.**

Total  
Variable Cost



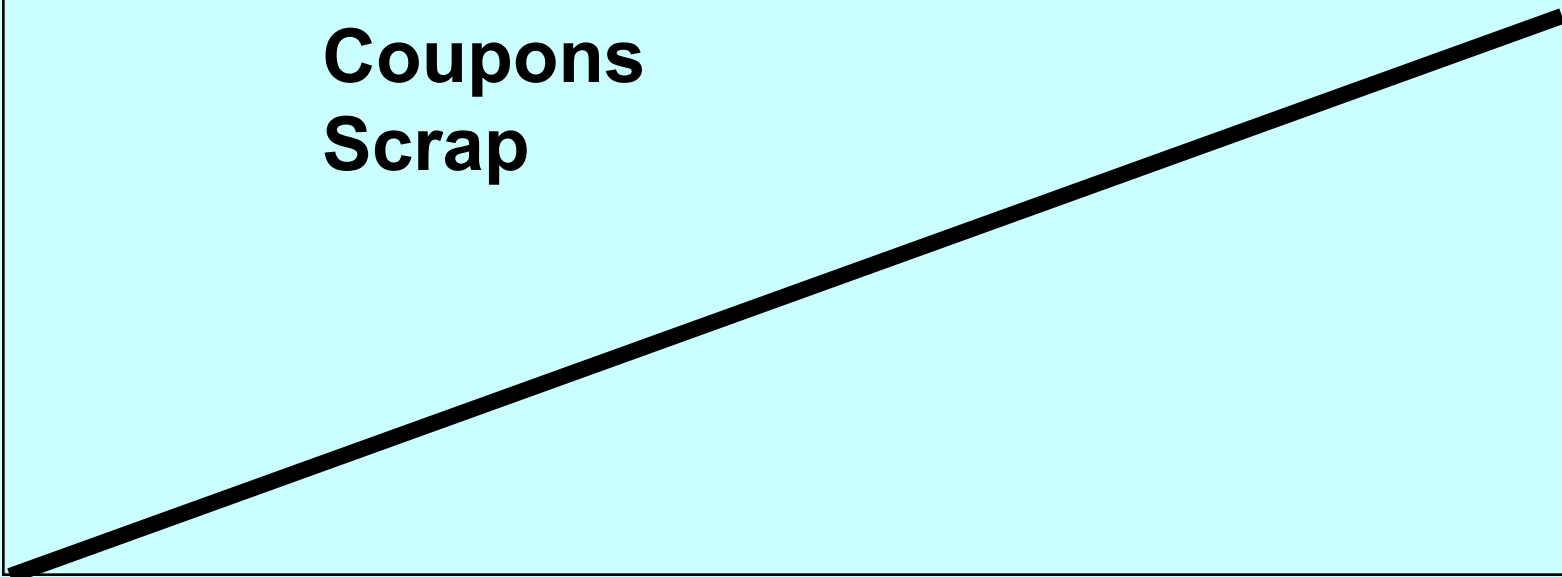
Quantity Produced

# Variable Costs

Dollars

**Direct Labor**  
**Direct Materials**  
**Direct Overheads**  
**Commissions**  
**Coupons**  
**Scrap**

**Total**  
**Variable Cost**

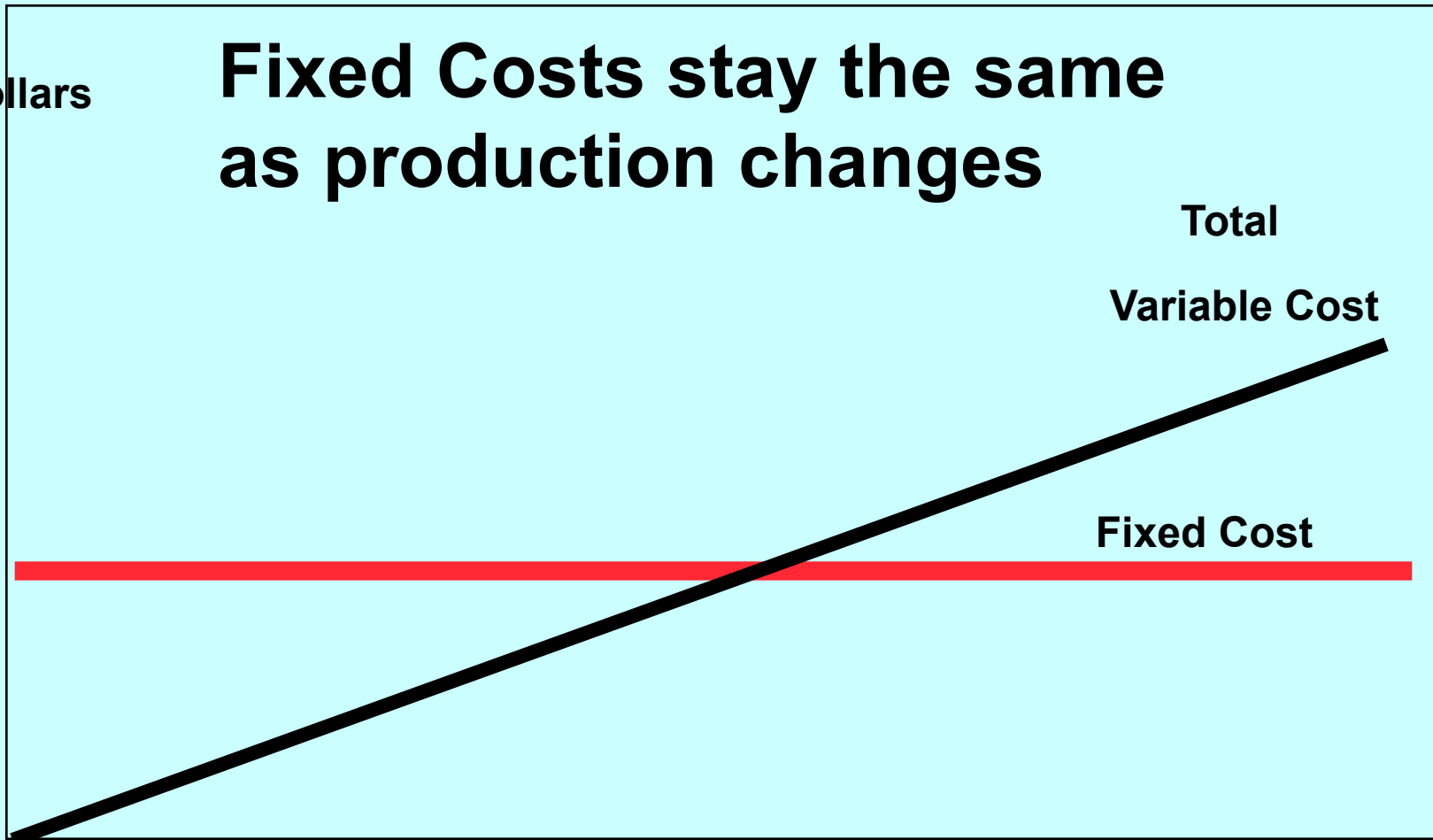


Quantity Produced

# Fixed or Period Cost

Dollars

**Fixed Costs stay the same  
as production changes**



Total

Variable Cost

Fixed Cost

Quantity Produced

# Fixed or Period Costs

Dollars

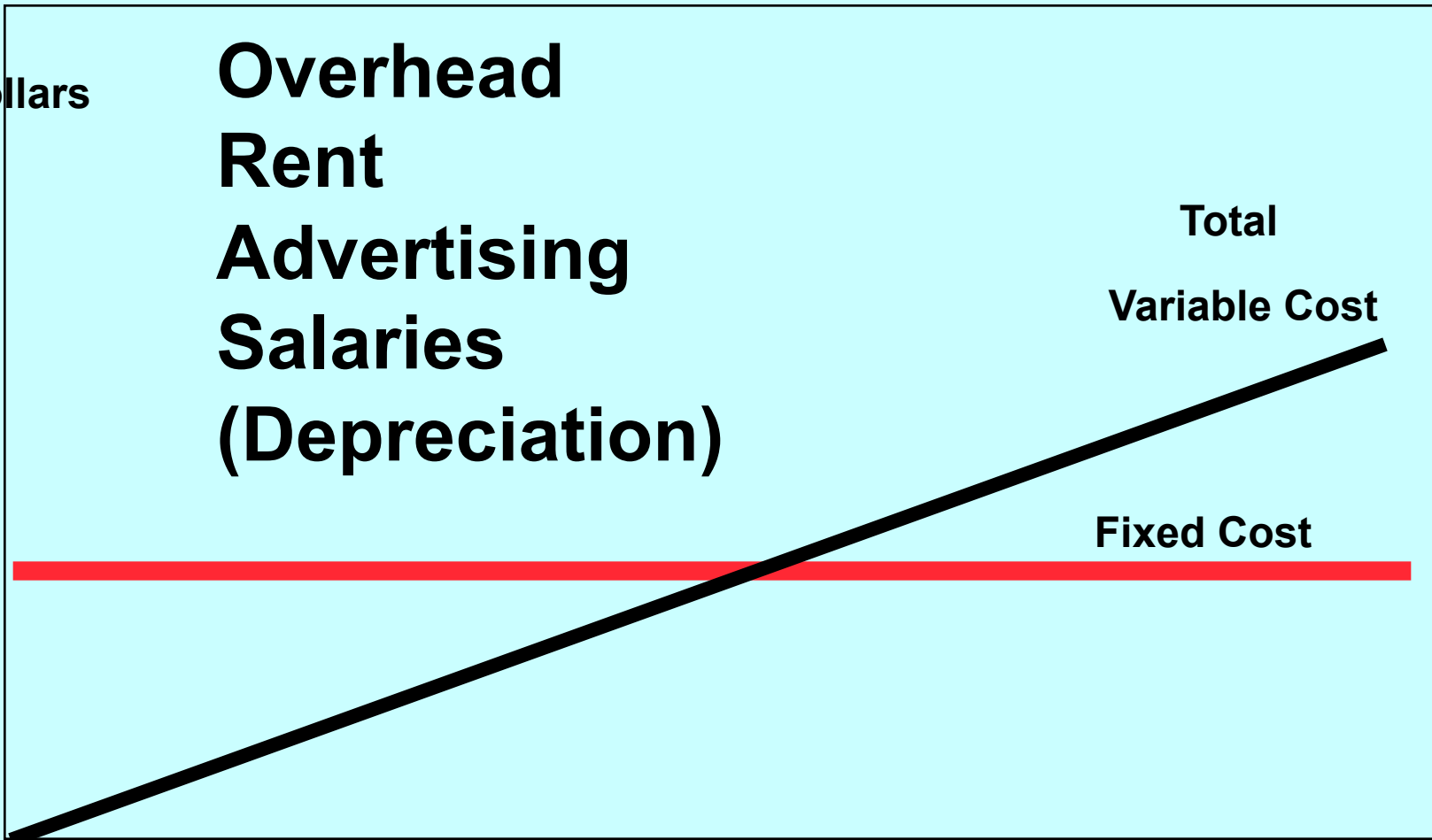
**Overhead  
Rent  
Advertising  
Salaries  
(Depreciation)**

**Total  
Variable Cost**

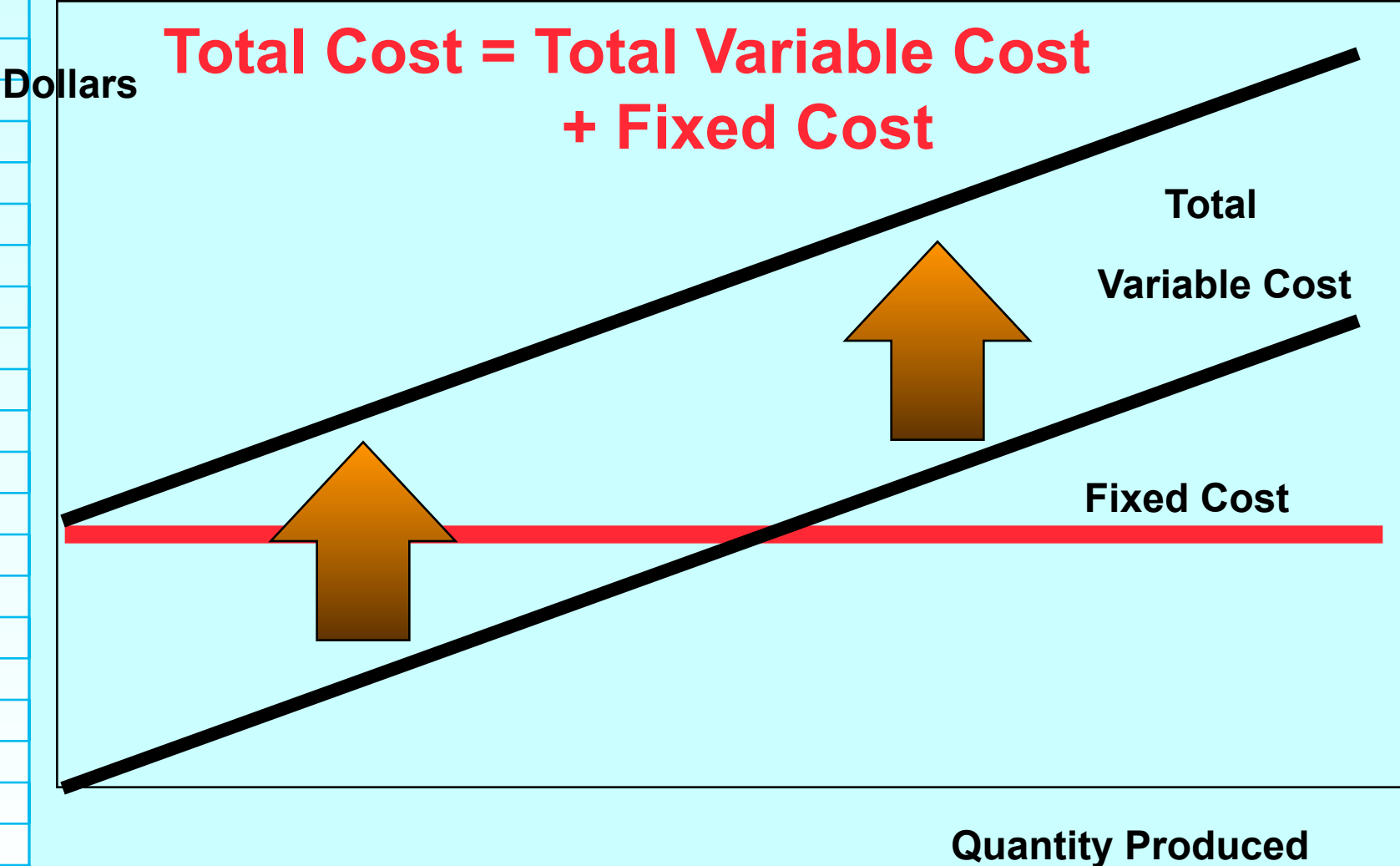
**Fixed Cost**

Quantity Produced

10



# Breakeven Total Cost



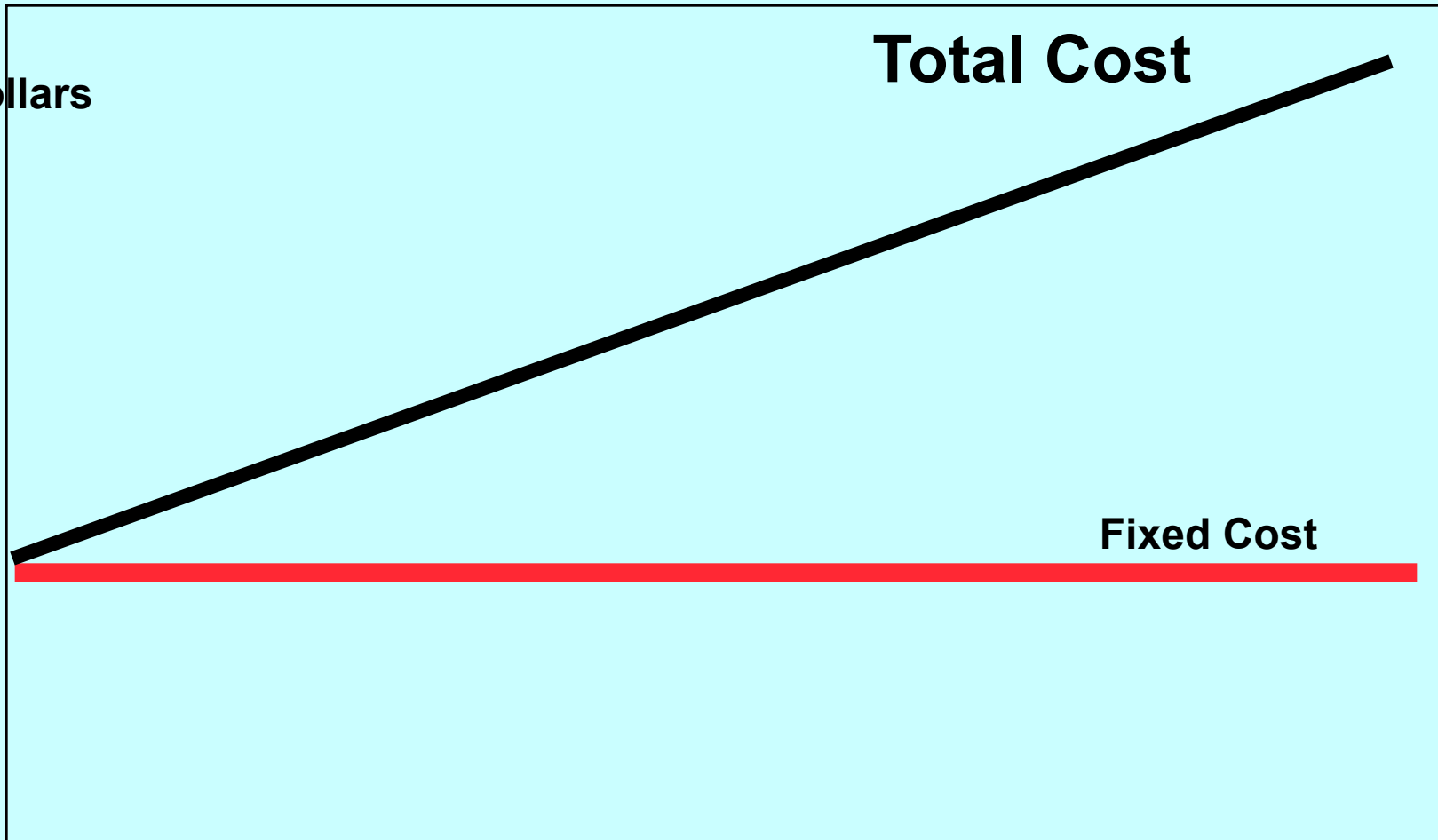
Dollars

**Total Cost**

**Fixed Cost**

Quantity Produced

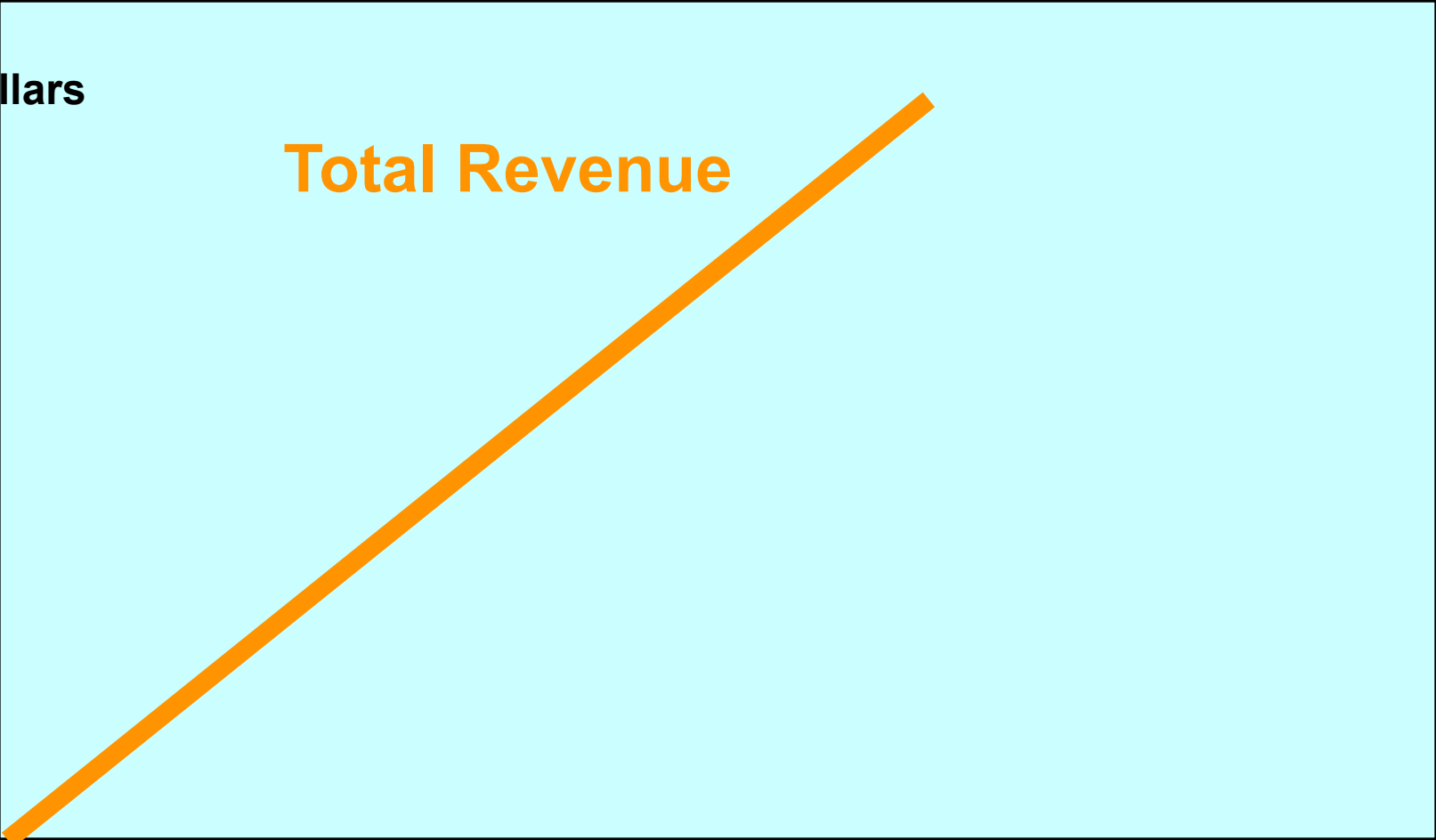
**12**



# Revenue

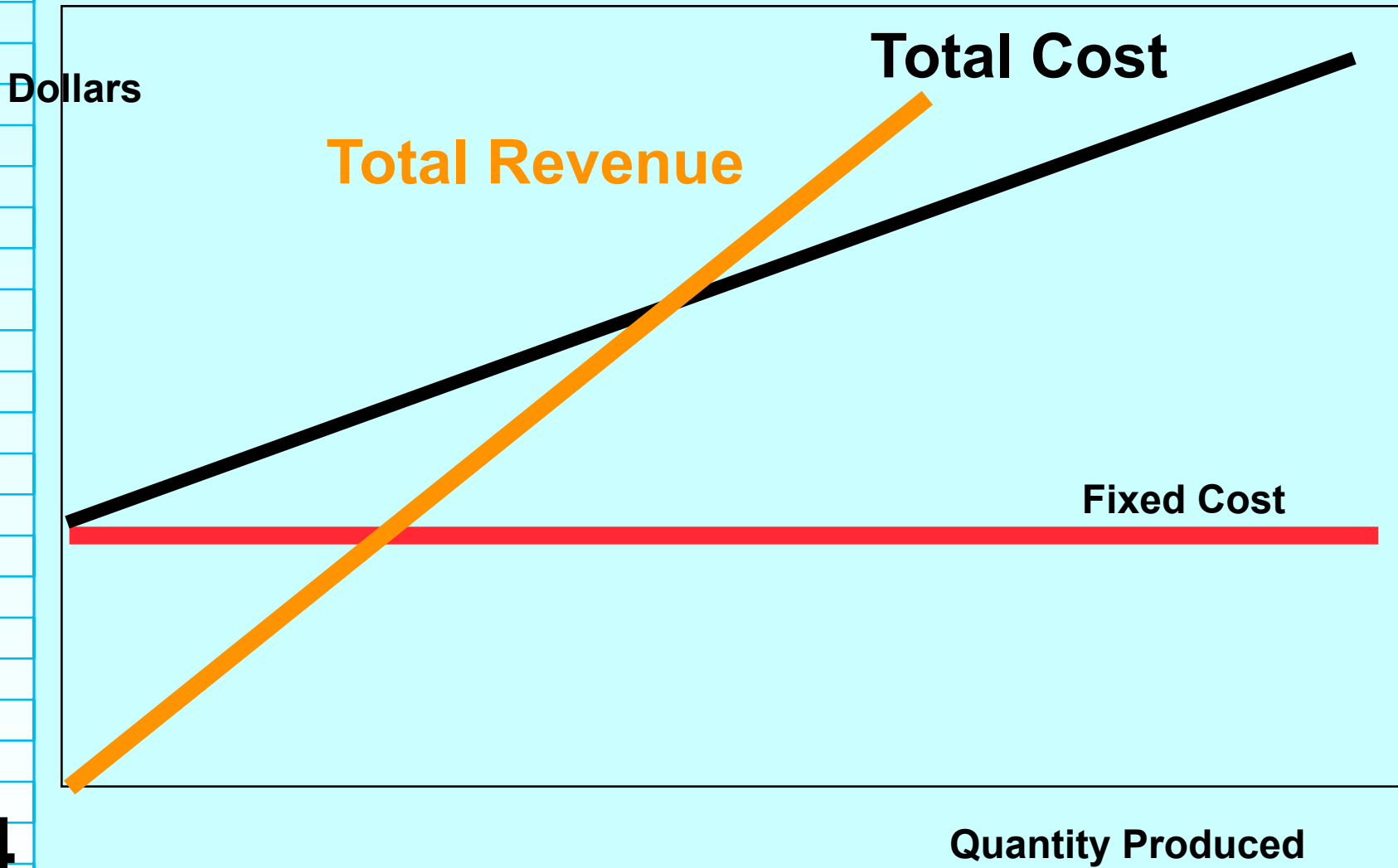
Dollars

Total Revenue

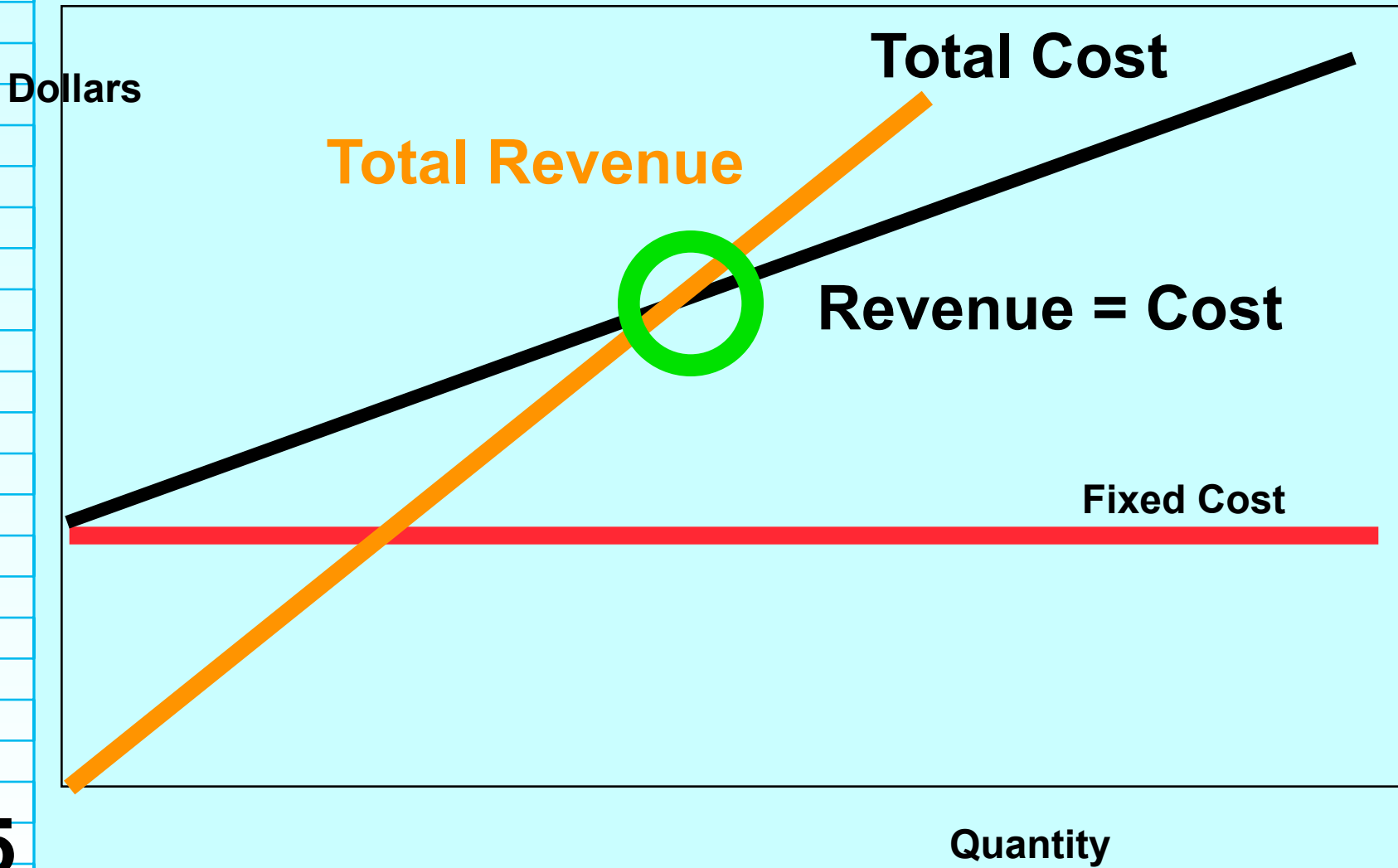


Quantity Sold

# Breakeven Point



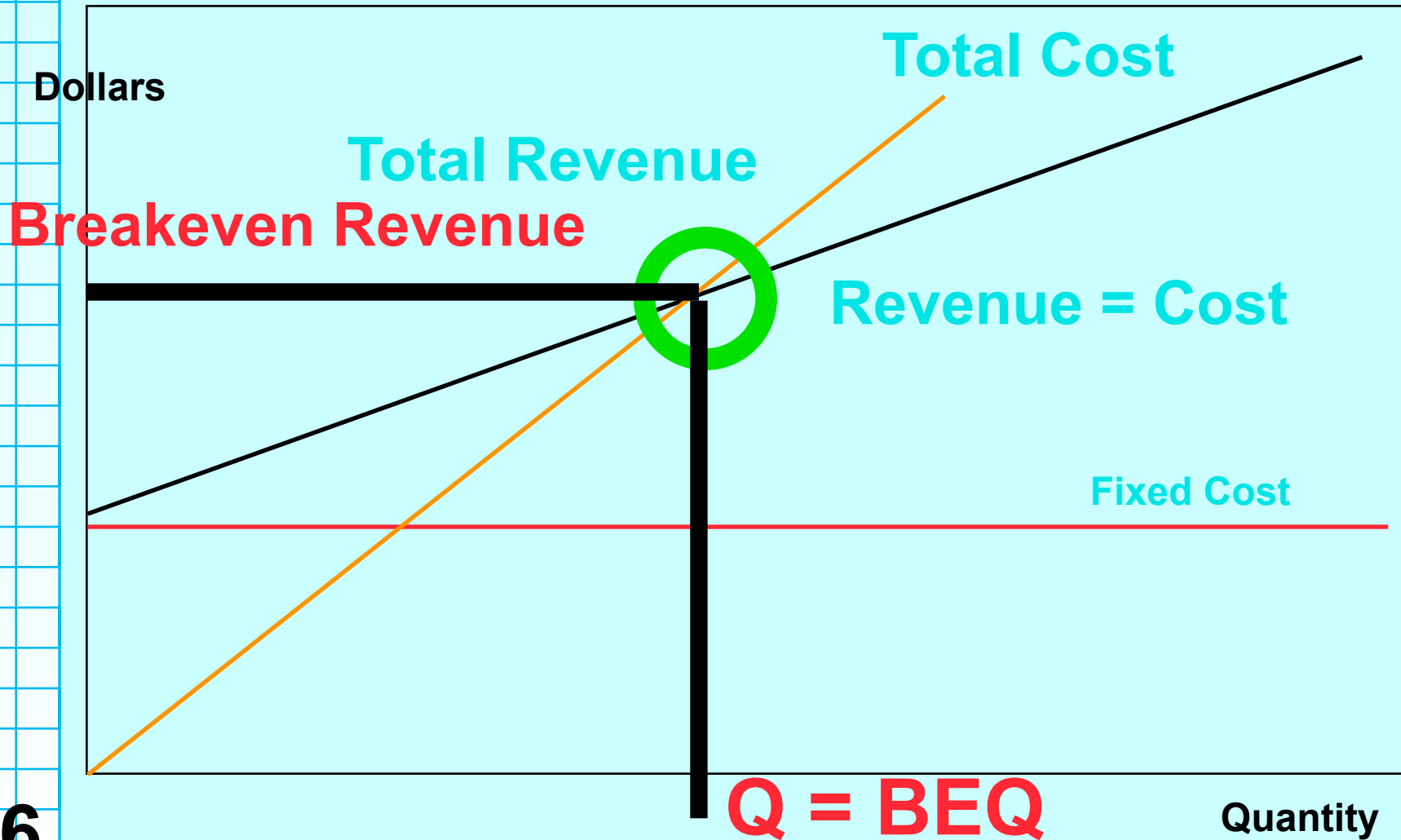
# Breakeven Point



15

Quantity

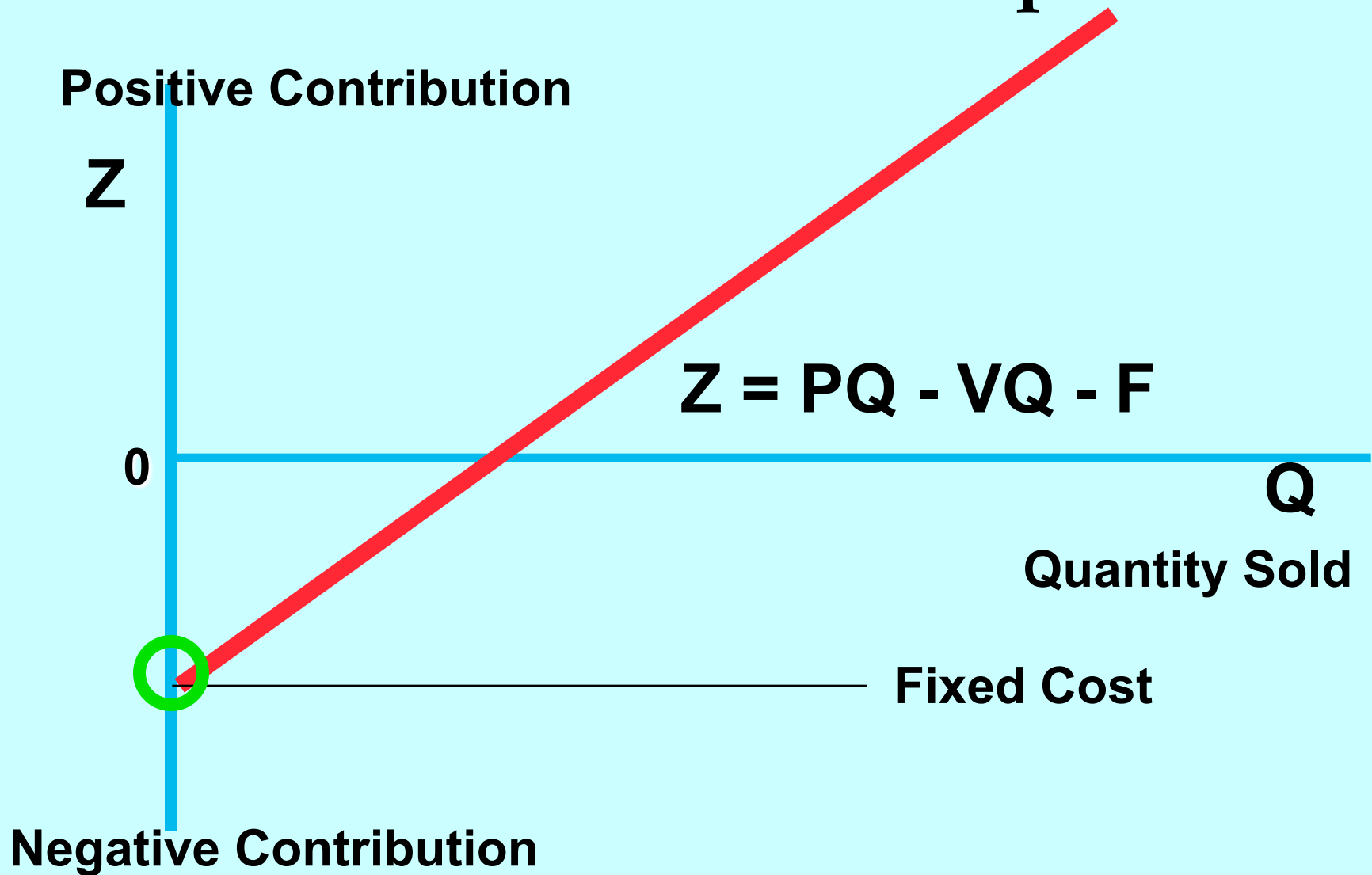
# Breakeven



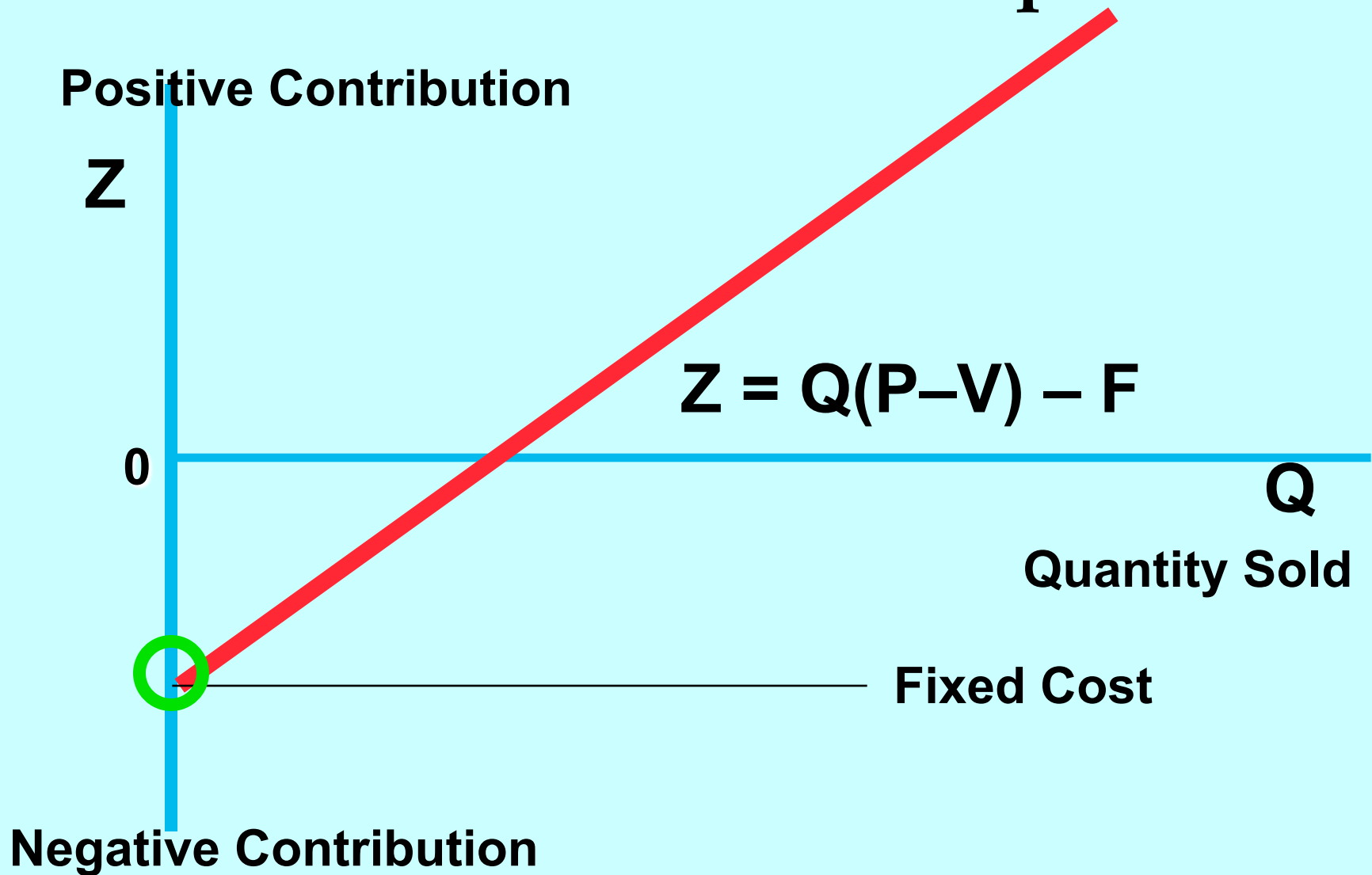
# Another way to graph Breakeven

Ted Mitchell

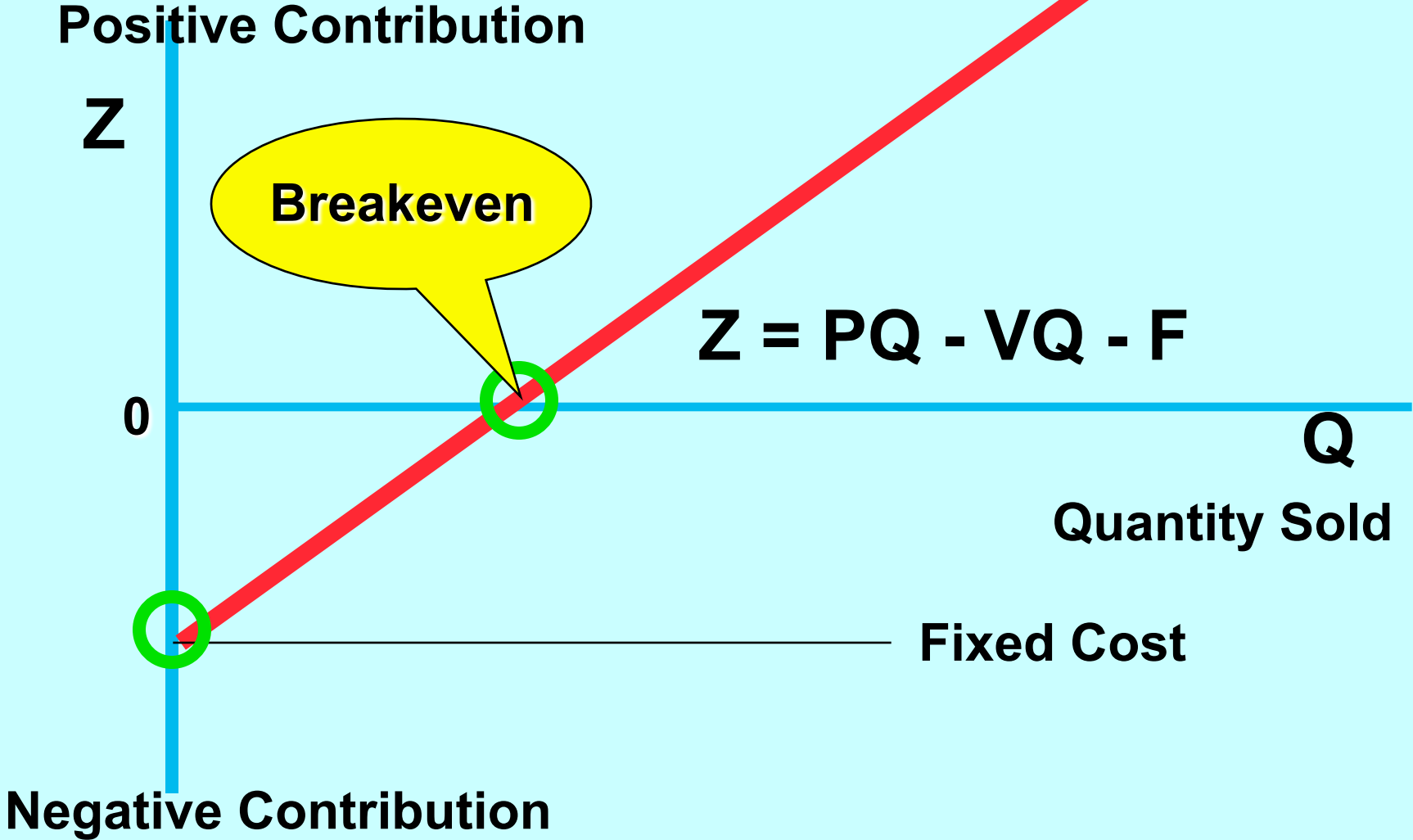
# Plot The Basic Profit Equation



# Plot The Basic Profit Equation



# Plot The Profit



# Calculating Breakeven Points

# Breakeven Equation

$$PQ - VQ - F = 0$$

- $P =$  **breakeven** price
- $Q =$  **breakeven** quantity sold
- $V =$  **breakeven** variable cost per unit
- $F =$  **breakeven** total fixed of period costs

# Many Breakeven Equations

$$PQ - VQ - F = 0$$

- $P = \text{breakeven price} = V + F/Q$
- $Q = \text{breakeven quantity sold} = F/(P-V)$
- $V = \text{breakeven variable} = P - F/Q$
- $F = \text{breakeven total fixed} = (P-V)Q$

# Two Classic Equations

$$PQ - VQ - F = 0$$

- $P = \text{breakeven price} = V + F/Q$
- $Q = \text{breakeven quantity sold} = F/(P-V)$

# Two Classic Breakevens

**Breakeven Price**

$$P = V + F/Q$$

**Breakeven Quantity**

$$Q = \frac{F}{P - V}$$

**Classi**

**Better known as  
average cost per unit  
or unit cost**

**Breakeven Price**

$$P = V + F/Q$$

**Breakeven Quantity**

$$Q = \frac{F}{P - V}$$

# Two More Other Breakevens

## Breakeven Revenue

$$R = (\text{Fixed cost}) \div \text{Markup}$$

$$R = F / M_p$$

## Breakeven Markup

$$M_p = F / R$$

# Other Classic Breakevens

## Breakeven Revenue

$$R = (\text{Fixed cost}) \div \text{Markup}$$

$$R = F / M_p$$

## Breakeven Markup

$$M_p = F / R$$

Where do these formulas come from?

# Other Lesser Known

- Breakeven Market Share (In Units) BES
- $BES = BEQ \div \text{Total Market Size}$
- and
- Breakeven Market Share (in Revenue)
- $BES = BER \div \text{Total Market Revenue}$
- “We need 2 points in share to breakeven. How likely is that our proposed advertising will generate 2 points in market share?”

## Basic Breakeven Formula

$$PQ - VQ - F = 0$$

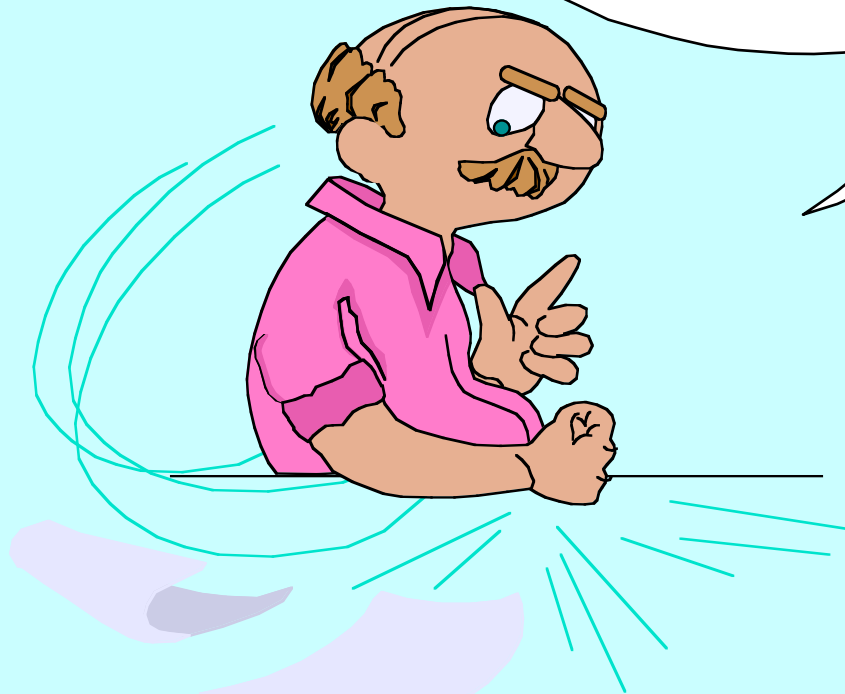
- Reorganize for breakeven quantity (a.k.a. BEQ)
- $Q(P-V) - F = 0$
- $Q(P-V) = F$
- $Q = F/(P-V)$

## Basic Breakeven Formula

- $BEQ = F / (P - V)$

$$Q = \frac{F}{P - V}$$

Make This into  
Breakeven  
Revenue



- Remember that Revenue = Price x Quantity
- **$R = PQ$**
- And
- **Markup on Price =  $(P-V)/P$**

$$Q = \frac{F}{P - V}$$

multiply both  
sides by P

$$PQ = \frac{F}{P - V} * P$$

$$Q = \frac{F}{P - V}$$

$$PQ = \frac{F}{P - V} * P$$

$$PQ = \frac{\frac{F}{P - V}}{P}$$

$$Q = \frac{F}{P - V}$$

$$PQ = \frac{F}{P - V} * P$$

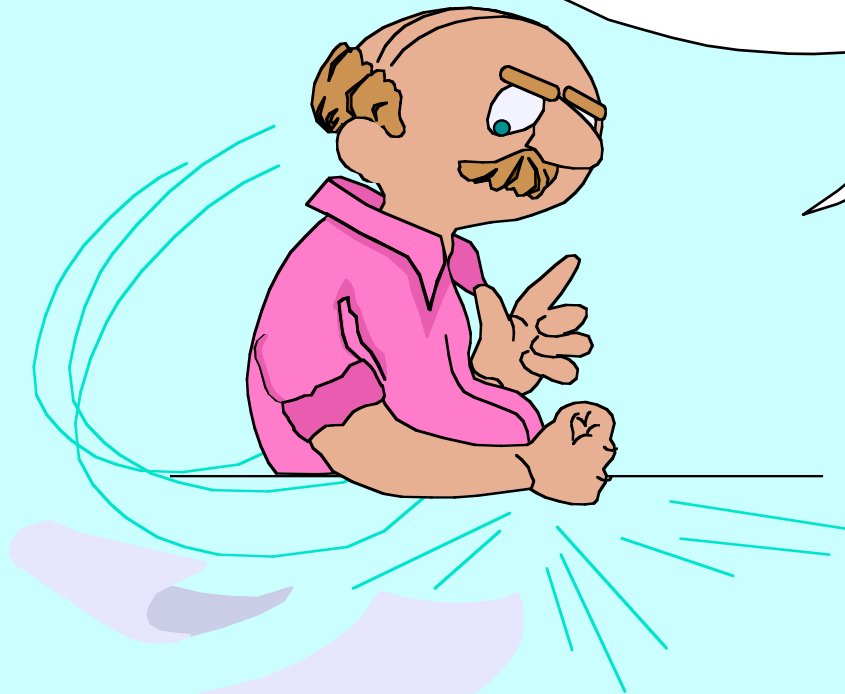
$$PQ = \frac{F}{\frac{P - V}{P}}$$


$$R = \frac{F}{Mp}$$

Breakeven  
Revenue

$$R = \frac{F}{Mp}$$

Make This into  
Breakeven  
Markup



$$R = \frac{F}{M_p}$$


$$M_p = F / R$$

# Breakeven Markup

- **$BEM_p = F/R$**
- **Initial Breakeven Markup with Spoilage, Shrinkage, Employee Discounts, etc. = D**
- **Initial  $BEM_p = (F + D)/(R + D)$**

Gross Revenue (List Price x Quantity Acquired), Rg	\$12,000	Percentage of Net Revenue
Cost of Customer Discounts and Spoilage, D	\$2,000	D/R = 20%
Net Revenue, R	\$10,000	
Cost of Goods Sold, COGS	\$6,000	
Gross Profit, G	\$4,000	BEMp = 40%
Fixed Cost for period, F	\$4,000	
Breakeven Profit, Z	0	

- **Initial BEMp = (F+D) / (R+D)**
- **Initial BEMp = (4,000 + 2,000) / (10,000 + 2,000)**
- **Initial BEMp = 6,000 / 12,000 = 50%**
- **Retailer must ask for a 50% discount of the suggested list price**

Gross Revenue (List Price x Quantity Acquired), R <sub>g</sub>	\$12,000	Percentage of Net Revenue
Cost of Customer Discounts and Spoilage, D	\$2,000	D/R = 20%
Net Revenue, R	\$10,000	
Cost of Goods Sold, COGS	\$6,000	
Gross Profit, G	\$4,000	BEM <sub>p</sub> = 40%
Fixed Cost for period, F	\$4,000	
Breakeven Profit, Z	0	

- **Initial BEM<sub>p</sub> = (M<sub>p</sub> + D/R) / (100% + 20%)**
- **Initial BEM<sub>p</sub> = (40% + 20%) / (100 + 20%)**
- **Initial BEM<sub>p</sub> = 60% / 120% = 50%**
- **Retailer must ask for a 50% discount of the suggested list price**

# Five Breakeven Points You Must Know

Ted Mitchell

$$PQ - VQ - F = 0$$

### 1) Breakeven Quantity

- $BEQ = F / (P - V)$

### 2) Breakeven Price

- $BEP = V + F/Q$

### 3) Breakeven Revenue

- $BER = F/M_p$

### 4) Breakeven Markup

- $BEM_p = F/R$

### 5) Initial Breakeven Markup =

- $\text{Initial } BEM_p = (F + D) / (R + D)$

# What is Marketing Leverage?

# Marketing leverage

- The spread between the firm's current breakeven quantity (BEQ) and the firm's current volume is an indicator of the firm's current strategic health.
- A trend that shows the distance between the firm's current breakeven quantity and the firm's current sales volume shrinking is a bad sign.
- A trend that shows the distance between the firm's breakeven quantity and the firm's current sales volume increasing is a good sign.

# Marketing leverage

- The total fixed or period cost of running the firm in the last period were
- Total Fixed Cost = Total Promotion + Overhead + Research and Development
- Breakeven for total operation =  
(Total Fixed Cost) / (price -variable cost)
- Firm's BEQ =  $F/P-V$
- Current Sales Volume = Leverage Index x BEQ  
where
- Leverage Index = Current Sales Volume/BEQ
- The leverage index should be greater than 1

- Your Current Fixed Costs for the Total Operation is  $F = \$100,000$
- Your Selling Price is  $P = \$5$  per Unit
- and Your Variable Cost per Unit =  $V = \$3$  per Unit
- **What is your Current Breakeven Quantity?**

- Your Current Fixed Costs for the Total Operation is  $F = \$100,000$
- Your Selling Price is  $P = \$5$  per Unit
- and Your Variable Cost per Unit =  $V = \$3$  per Unit
- What is your Current Breakeven Quantity?
- $BEQ = F/(P-V)$
- $BEQ = 100,000/(5-3) = 50,000$  units

- Your Current Fixed Costs for the Total Operation is  $F = \$100,000$
- Your Selling Price is  $P = \$5$  per Unit
- and Your Variable Cost per Unit =  $V = \$3$  per Unit
- What is your Current Breakeven Quantity?
- $BEQ = F/(P-V)$
- $BEQ = 100,000/(5-3) = 50,000$  units
- Your Current Sales volume is 60,000 units
- What is Your Marketing Leverage?

- Your Current Fixed Costs for the Total Operation is  $F = \$100,000$
- Your Selling Price is  $P = \$5$  per Unit
- and Your Variable Cost per Unit =  $V = \$3$  per Unit
- **What is your Current Breakeven Quantity?**
- **$BEQ = F/(P-V)$**
- **$BEQ = 100,000/(5-3) = 50,000$  units**
- Your Current Sales volume is 60,000 units
- What is Your Marketing Leverage?
- **$Leverage = Current\ Volume/BEQ$**
- **$Leverage = 60,000/50,000 = 120\%$**

- What is Advertising Leverage?

# Advertising Leverage

- The spread between the current number of units being sold for every \$1,000 of promotion and the quantity needed to breakeven for an additional \$1,000 of promotion is a measure of Advertising leverage
- Units sold per \$1,000 in advertising =  $(\text{SalesVolume}) / (\text{Advertising in thousands})$
- BEQ for \$1,000 in advertising =  $\$1,000 / (P - V)$
- Advertising leverage =  $(\text{Units sold per } \$1,000) / (\text{BEQ for a } \$1,000)$

# *A Key Point*

Remember: Variable Cost is  
not the UNIT COST

$$UNIT\ cost = Variable\ COST + \frac{Fixed\ COST}{Quantity\ SOLD}$$

$$UNIT\ cost = V + \frac{F}{Q}$$

**UNIT COST or Average Cost per Unit  
COMBINES AVERAGE FIXED COSTS  
AND VARIABLE COSTS and equals the  
Breakeven Price**

**Any Questions?**