How would a manager hire the most possible number of workers on $100 vs How would a manager minimize the cost of hiring 3 workers

The **Objective function** specifies what the agent cares about (e.g. do managers care about increasing profits or increasing their power)

Constraints include time, budget, technical capabilities, resource limits, the market place, rules/regulations and laws

Institutions can stop us from taking certain choices, for example the government prevents us from selling our kidneys, so preventing us from making this choice if we so wished

\[
S(F, C) = (FxC) \\
S(10, 10) = (10\times10) = 10 \\
S(25,4) = (25\times4) = 10
\]

- F - quantity of food
- C - quantity of clothes
- Pf - price of food
- Pc - price of clothes

Constraint - Income of I:

\[
I = C + F \times Pf
\]

Indifference curves represent the level of satisfaction. At every point on the curve the level of satisfaction (utility) is the same. The satisfaction is greater as the curve shifts outwards to the right from S0 to S1 to S2

Under the line the income (I) is greater than the cost of their consumption, meaning that they haven’t spent all of their disposable income

The **marginal impact** of a change in the exogenous variable is the **incremental impact of the last unit** of the exogenous variable on the endogenous variable.
Mathematically:

\[ Q_d = 500 - 4p \]  \( p \) = price of cranberries ($ per barrel)

\[ Q_s = -100 + 2p \]  \( Q \) = demand/supply in millions of barrels

\[ Q_d = Q_s \]
\[ 500 - 4p = -100 + 2p \]
\[ 600 = 600 \cdot 6p \]
\[ 100 = p \]

Excess demand - when demand at a given price > quantity supplied, so prices tend to rise

Excess supply - when quantity supplied > quantity demanded, so prices tend to fall

Excess Supply

Price > Equilibrium = excess supply

Price < Equilibrium = excess demand
Marginal Utility - additional utility gained from 1 more unit
\[ M_U = \Delta U / \Delta Y \]
Shape of the utility function with respect to \( Y \)

\[ U = \gamma \]

Diminishing marginal utility - marginal utility falls as you consume more of a good

Think about Mac example, the first is great, the second is good and the third is ok and so on

Marginal utility of a good, \( X \), is the additional utility when consuming 1 more of \( X \) and the same of the other goods in the basket

\[ \Delta U / \Delta X = MU_X \]

(other goods held constant)

Indifference curves - the set of baskets for which the consumer is indifferent
The consumer wants to consume -X values, but can't, so will have to settle for no X and being at a lower IC curve

Perfect Complements

\[ U = \min(x, y) \]

\( \star \) Consuming here is pointless as it is on a lower IC

100 = X + Y

Kink of curve at X = Y

100 = X + X

100 = 2X

50 = X so Y = 50
The decomposition bundle $b$ is the same as bundle $a$
Even though the price of $x$ has fallen, you still want the same ratio of $x$ and $y$
With compliments there is no substitution effect
It is a pure income effect
The price per unit of capital is \( r \) because the opportunity cost of capital is the interest rate

\( Q \) is the desired level of output

\( F(L,K) \) is the production function

**Isocost lines** - the set of combinations of labour and capital that yield the same total cost for the firm given prices of labour and capital

\[
TC = wL + rK
\]

**Long run cost minimisation**

The firm's problem is to minimise \( K + wL \) subject to \( Q_0 = F(L,K) \)

We produce at a point where the isoquant is tangential to the isocost line.

Points B and C are also technically efficient, but don't minimise costs. D is technically inefficient.

The slope of the isoquant is the negative of the MRTS, \( k = -\frac{MPL}{MPK} \)

Slope of isocost = \( -\frac{w}{r} \)

At point c  \( \frac{MPL}{MPK} > \frac{w}{r} \)

\( \frac{MPL}{w} > \frac{MPK}{r} \)
The slope of the isoquant is the negative of the MRTS
The slope of the isocost is the negative of w/r

A change in the relative price of inputs changes the slope of the isocost line

With diminishing MRTS, ceteris paribus, an increase in w must decrease the cost minimising quantity of labour and increase the cost minimizing quantity of capital
Ceteris paribus, an increase in r must decrease the cost minimising quantity of capital and increase the cost minimizing quantity of labour
If r remains constant, an increase in w makes the isocost line steeper (the slope decreases)
Since MRTS is diminishing, this implies that employment of L decreases

Q = 50L^1/2 K ^1/2
MPL = 25K^1/2 / L^1/2
MPK = 25L^1/2 / K^1/2
W = 1
R = 16
Q = 1000
suppose w increases to 4, what happens to cost minimizing values of K and L?

MRTS = K/L
w/r = 1/16

K/L = 1/16
16K = L

1000 = 50(16K)^1/2 K^1/2
1000 = 50 x 4 x K^1/2 x K^1/2
1000 = 200 x K
1000 = 200K
K = 5
L = 16 (5)
L = 80

w/r = 4/16 = 1/4
K/L = 1/4
4K = L

1000 = 50(4K)^1/2 K^1/2
1000 = 50 x 2 x K^1/2 x K^1/2
1000 = 100K
K = 10
L = 4(10) = 40

As the price of labour has increases, the firm has increased its use of capital and used less labour
In the short run, the firm is not able to minimize costs as one of the inputs is fixed.

- Long run: all variables are variable and the expansion path is from A → B → C.
- Short run: some variables are fixed (capital)—the expansion path is from D → E → F.