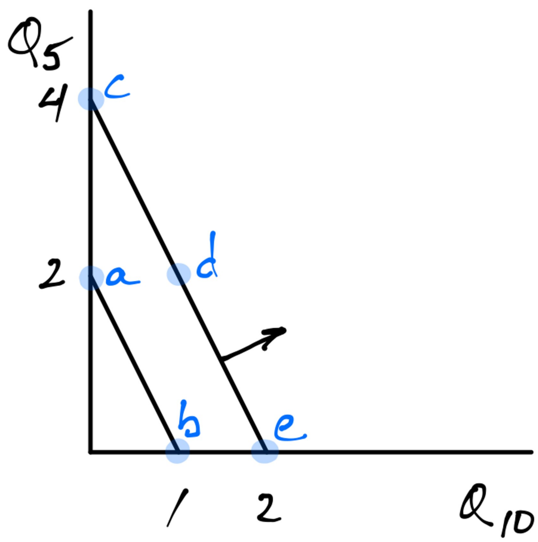
Indifference Curves: Special Cases

Perfect substitutes

Willing to trade any amount at a set rate
MRS constant, ICs are linear

Example: $5 and $10 bills



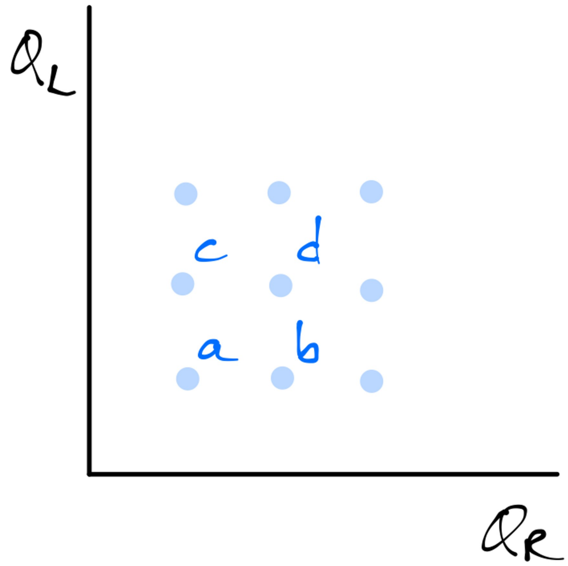
Ranking:
$a \sim b$
$c \sim d \sim e$
$c, d, e \succ a, b$

MRS:
2 fives for 1 ten

Perfect complements

Want goods in rigidly fixed proportions

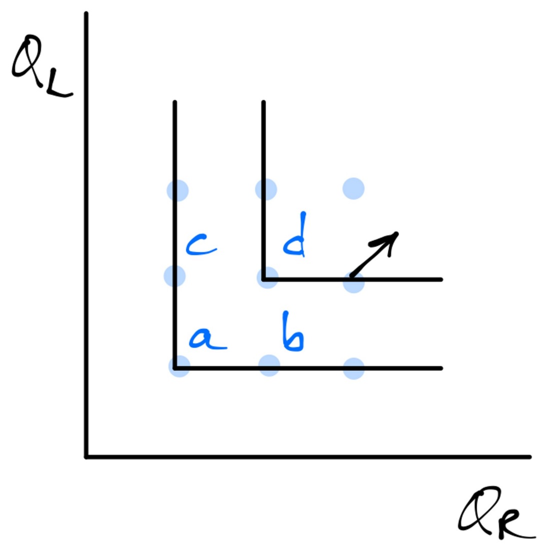
Example: right and left shoes



Ranking:
$c, b \sim a$
Extra shoe not better

$d \succ a, b, c$
Two pair beats one

Drawing the ICs:



Perfect complements
ICs are L-shaped

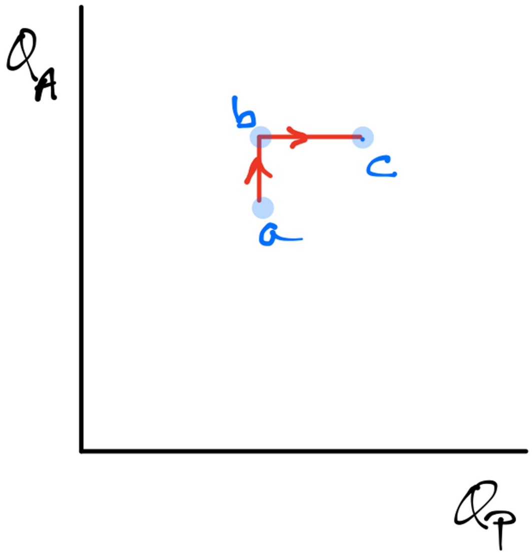
Corner shows
preferred ratio:

$$\frac{Q_L}{Q_R} = \frac{1}{1}$$

One good is undesirable

Example: pepperoni and anchovies

What could the IC look like?

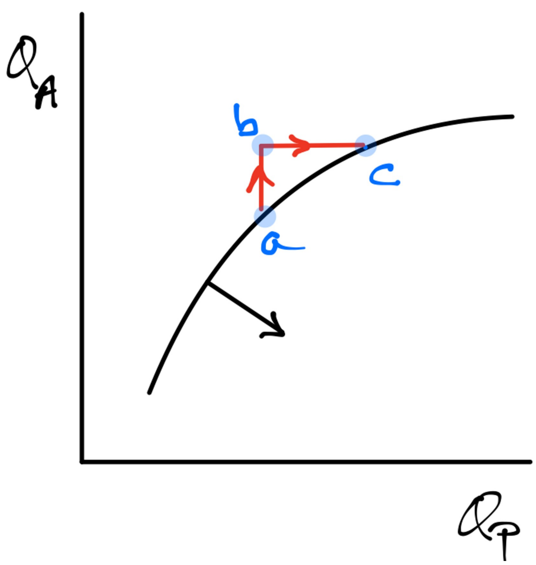


Impact of raising Y?
Worse off:
b≺a

Could raise X to restore:
c≻b

$c \sim a$

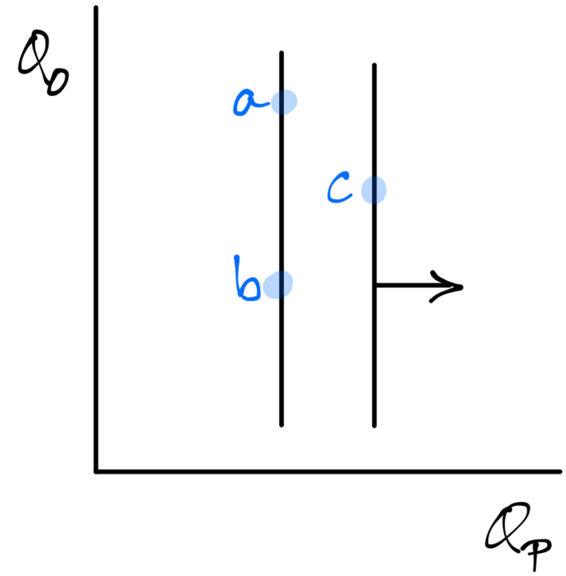
Filling in the curve:



Conclusion: IC has a positive slope

Indifferent to one good

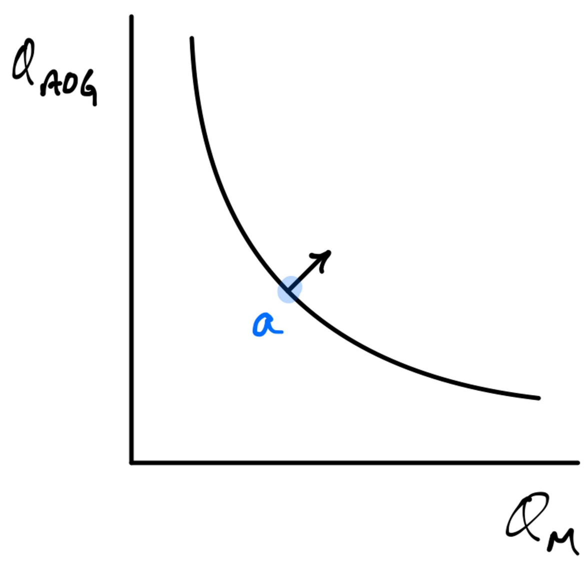
Example: pepperoni and onions



Ranking:
$a \sim b$
$c \succ a, b$

One good versus all others

Composite commodity *all other goods* (AOG)
Conventionally put on Y axis



Budget Constraints

Preferences: What people **want** to do

Constraints: What people **can** do

Example: books and DVDs

Define variables:

Amount to spend:	M
Price of a DVD:	P_D
Price of a book:	P_B
Quantity of DVDs:	Q_D
Quantity of books:	Q_B

Initial data:

$M = \$100$
$P_D = \$20$
$P_B = \$5$

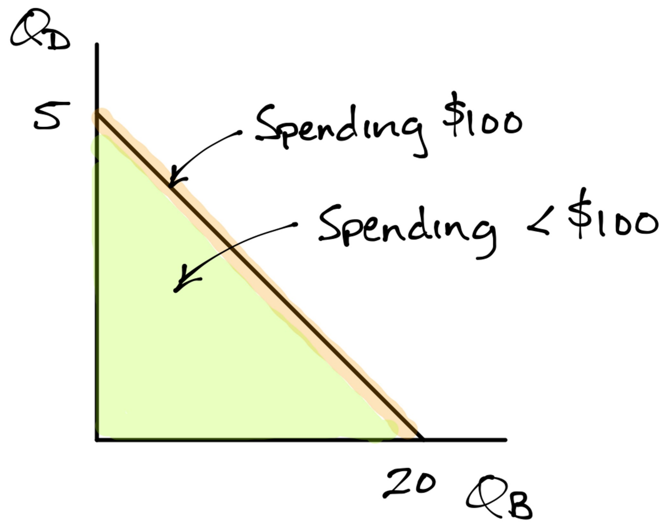
What combinations of Q's are possible?

Spending on books:	$\$5Q_B$
Spending on DVDs:	$\$10Q_D$
Total spending:	$\$5Q_B + \$10Q_D$

Can pick any combination where:

$\$5Q_B + \$20Q_D \leq \$100$ This is the budget constraint (BC) for the problem

Graphing:



Bundles on or below line are **feasible**

Together, bundles are the **feasible set**

Intercepts:

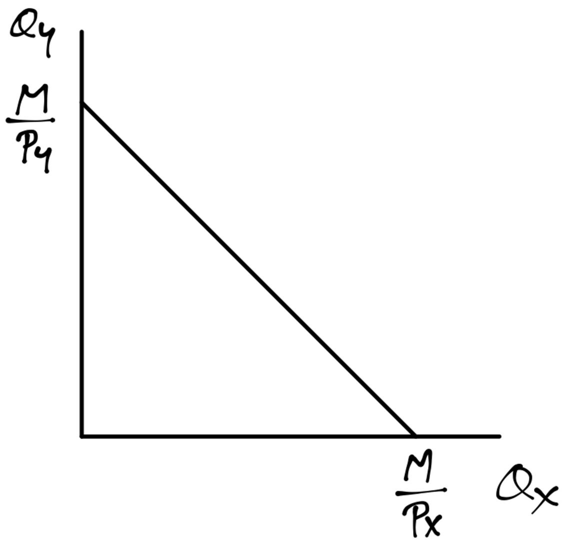
Y axis:	Maximum DVDs	\$100/\$20 = 5
X axis:	Maximum books	\$100/\$5 = 20

General case: goods X and Y

$$P_x Q_x + P_y Q_y \leq M$$

Intercepts:

Y axis ($Q_x = 0$)	$0 + P_y Q_y = M$	$Q_y = M/P_y$
X axis ($Q_y = 0$)	$P_x Q_x + 0 = M$	$Q_x = M/P_x$



Slope:

Line itself: $P_x Q_x + P_y Q_y = M$

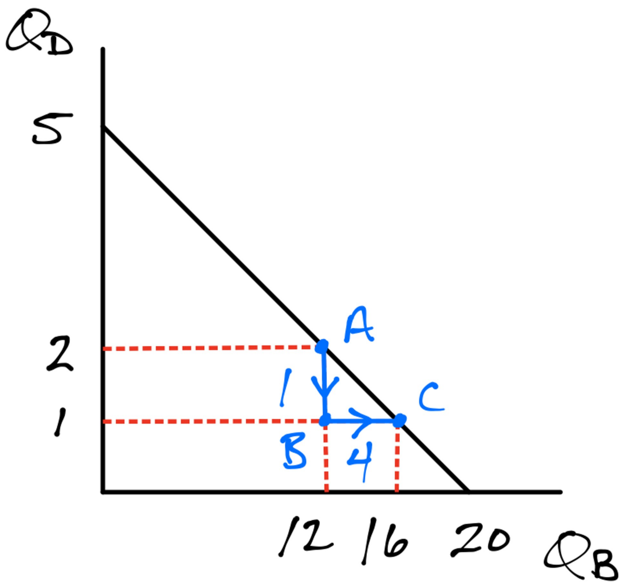
$P_y Q_y = -P_x Q_x + M$

$$Q_y = -\frac{P_x}{P_y} Q_x + \frac{M}{P_y}$$

Compare to:
$y = mx + b$

Slope		Intercept
$m = -\frac{P_x}{P_y}$		$b = \frac{M}{P_y}$

Example: books and DVDs



A to B: Save on 1 DVD: $20

B to C: Buy more books: $20/$5 = 4

$$\frac{\Delta y}{\Delta x} = \frac{-1}{+4}$$

$$-\frac{P_x}{P_y} = -\frac{\$5}{\$20} = -\frac{1}{4}$$

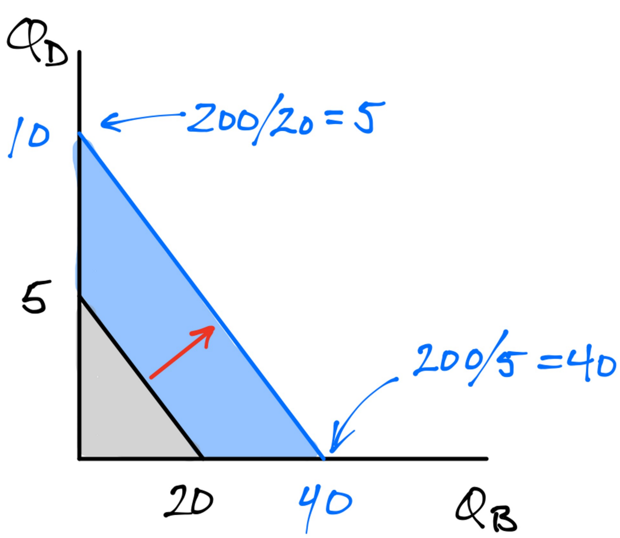
Slope shows person's **ability** to trade one good for the other

IC slope: person's **willingness** to trade one good for the other

Impact on BC of changes in prices or M?

Example 1: Increase in M

Suppose M rises to $200



Intercepts change since M changes:

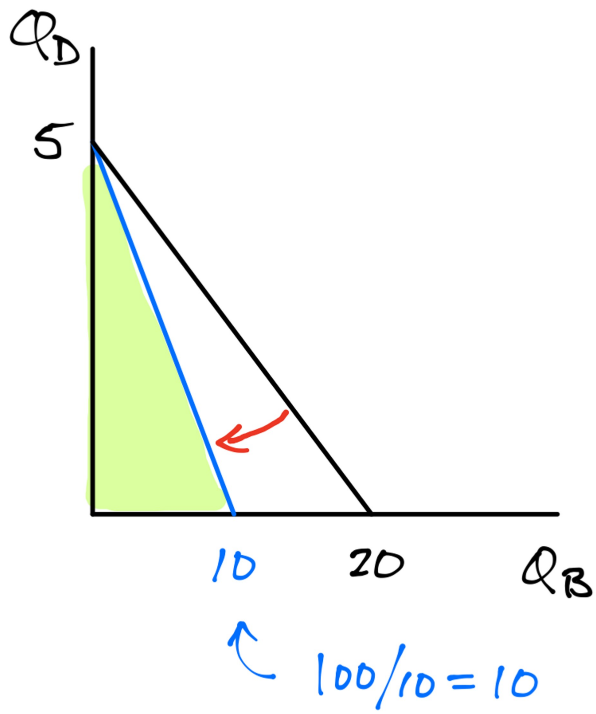
M/P_y = 200/20 = 10
M/P_x = 200/5 = 40

Slope same since prices don't change:

$-P_x/P_y$ = 5/20 = 0.25

Example 2: Increase in price of the X good

Suppose P_B increases to \$10



Y intercept does **not** change:

M/P_y = 100/20 = 5

X intercept **does** change:

M/P_x = 100/10 = 10

Slope changes:

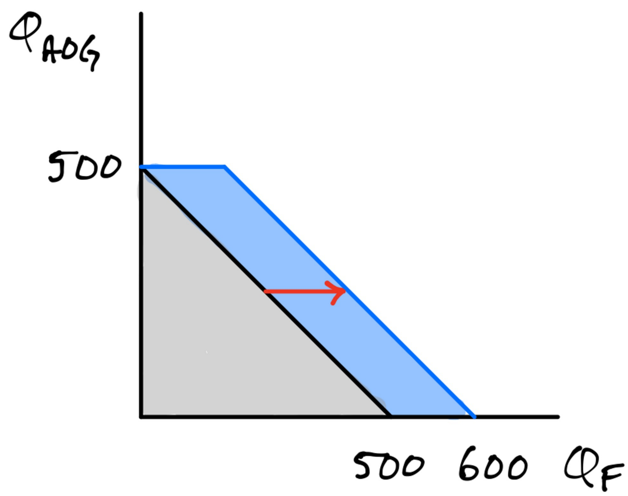
$-P_x/P_y$ = -10/20 = -0.5

Example 3: In-kind transfer of the X good

Goods:
- Food (F)
- All other goods (AOG)

BAU:
- M = \$500
- $P_F = \$1$
- $P_{AOG} = \$1$

Policy:
- SNAP: \$100 of vouchers for food



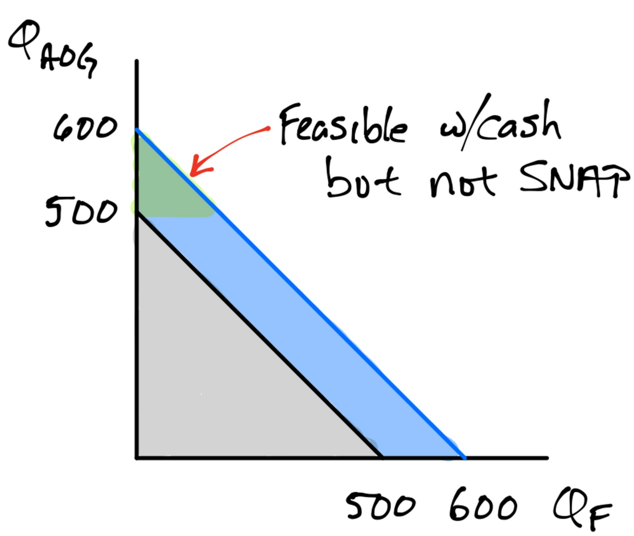
Gray:
BAU feasible set

Gray plus blue:
SNAP feasible set

Useful to contrast this with $100 cash transfer:

BAU:
Same as before

Policy:
M = $500 + $100 = $600



Gray:
BAU feasible set

Gray plus blue:
Feasible with cash

Adding Additional Constraints

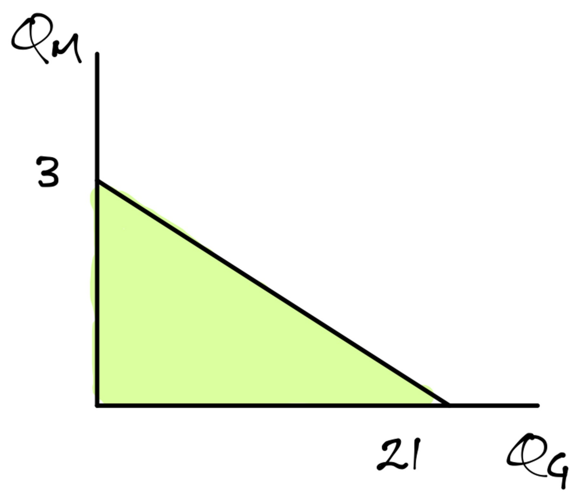
- Surprisingly straightforward to do
- Generally makes the feasible set smaller

Example 1: gas rationing

Goods:
Gallons of gas (G)
Movies (M)

BAU:
Money available: $M = \$21$
Price of a movie: $P_M = \$7$
Price of a gallon: $P_G = \$1$

Money BC: $\$1Q_G + \$7Q_M \leq \$21$



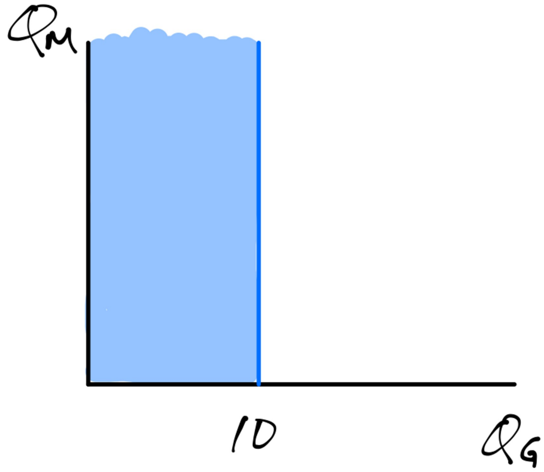
Intercepts:

$$Q_M = \frac{\$21}{\$7} = 3$$

$$Q_G = \frac{\$21}{\$1} = 21$$

Policy:
Limits gas to 10 gallons or less via coupons

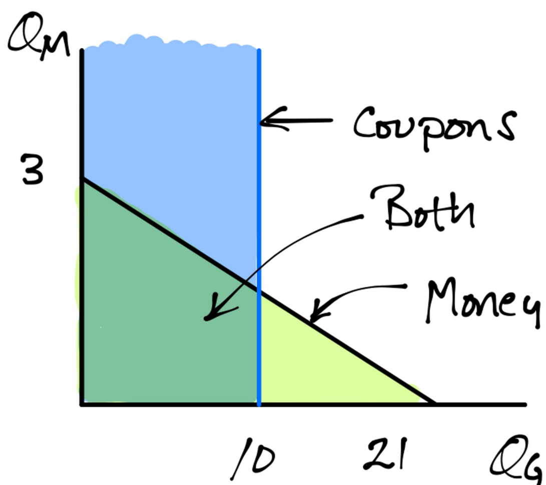
Coupon BC: $Q_G \leq 10$



Coupon constraint:

$Q_G \leq 10$

Overlaying the feasible sets:



Two sets:
- Money
- Coupons

Intersection:
- Jointly feasible

Example 2: time constraint

Goods:
- Same as last example
- Gas, movies

Money constraint:

Same as last example
$M = \$21, P_G = \$1, P_M = \$7$

Money BC: $\$1Q_C + \$7Q_M \leq \$21$

Time constraint:

Time available: $T = 6\ hr$

Time needed for a movie: $P_M^T = 1.5\ hr$

Time needed for a gallon of gas: $P_G^T = 0.5\ hr$

Which bundles (Q_G, Q_M) are feasible in time?

Time cost of Q_G gallons: $0.5\ hr\ Q_G$

Time cost of Q_M movies: $1.5\ hr\ Q_M$

Total time: $0.5\ hr\ Q_G + 1.5\ hr\ Q_M$

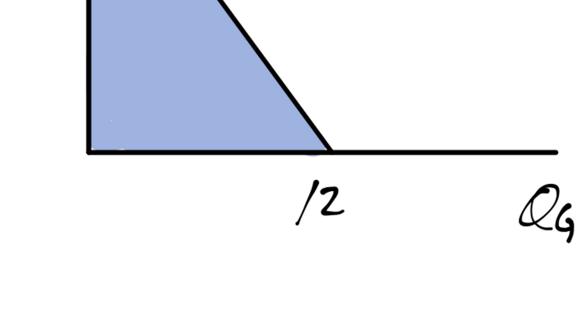
Time BC here:

$$0.5\ hr\ Q_G + 1.5\ hr\ Q_M \leq 6\ hr$$

General version:

$$P_G^T Q_G + P_M^T Q_M \leq T$$

Graphing:



Intercepts:

$$Q_M = \frac{6\ hr}{1.5\ hr} = 4$$

$$Q_G = \frac{6\ hr}{0.5\ hr} = 12$$

Slope:

$$m = -\frac{P_G^T}{P_M^T} = -\frac{0.5}{1.5} = -\frac{1}{3}$$

Overlaying it on the money constraint: