

Chapter 5

Criteria For Evaluation

- To choose an alternative that best achieves an objective, some criteria is required to evaluate each alternative with respect to the objective
- Objectives must be prioritized;
 - The relationships between Objectives and constraints must be determined
 - If an objective with multiple elements is used, the weight assigned to each must be determined

Ends and Means

- Both ends and means must be evaluated
- **Ethics** is process by which ends and means are judged “good and bad” or “right and wrong”
- **Efficiency** is a measure of the extent to which an objective has been achieved
(An immoral objective can be achieved efficiently)

Ethics

- Deontological ethics
 - Based on duty – duty is determined by the social institutions, individual values and expectations
- Consequentialist ethics
 - Right and wrong are based on the consequences of an act – Neoclassical economics is based on a consequentialist ethic called “Utilitarianism”

Efficiency

- Efficiency is a measure of the extent to which an objective has been achieved
 - Technical efficiency
 - Allocative or economic efficiency
 - Pareto efficiency

- Objective is to maximize the satisfaction of wants – to maximize the utility of the members of society – produce the goods that have the Highest value to the individuals

Technical Efficiency

- Technical efficiency is a ratio of output to input

$$\text{Technical Efficiency} = \frac{\text{output}}{\text{input}} = \frac{Q_X + Q_Y}{L + K + R}$$

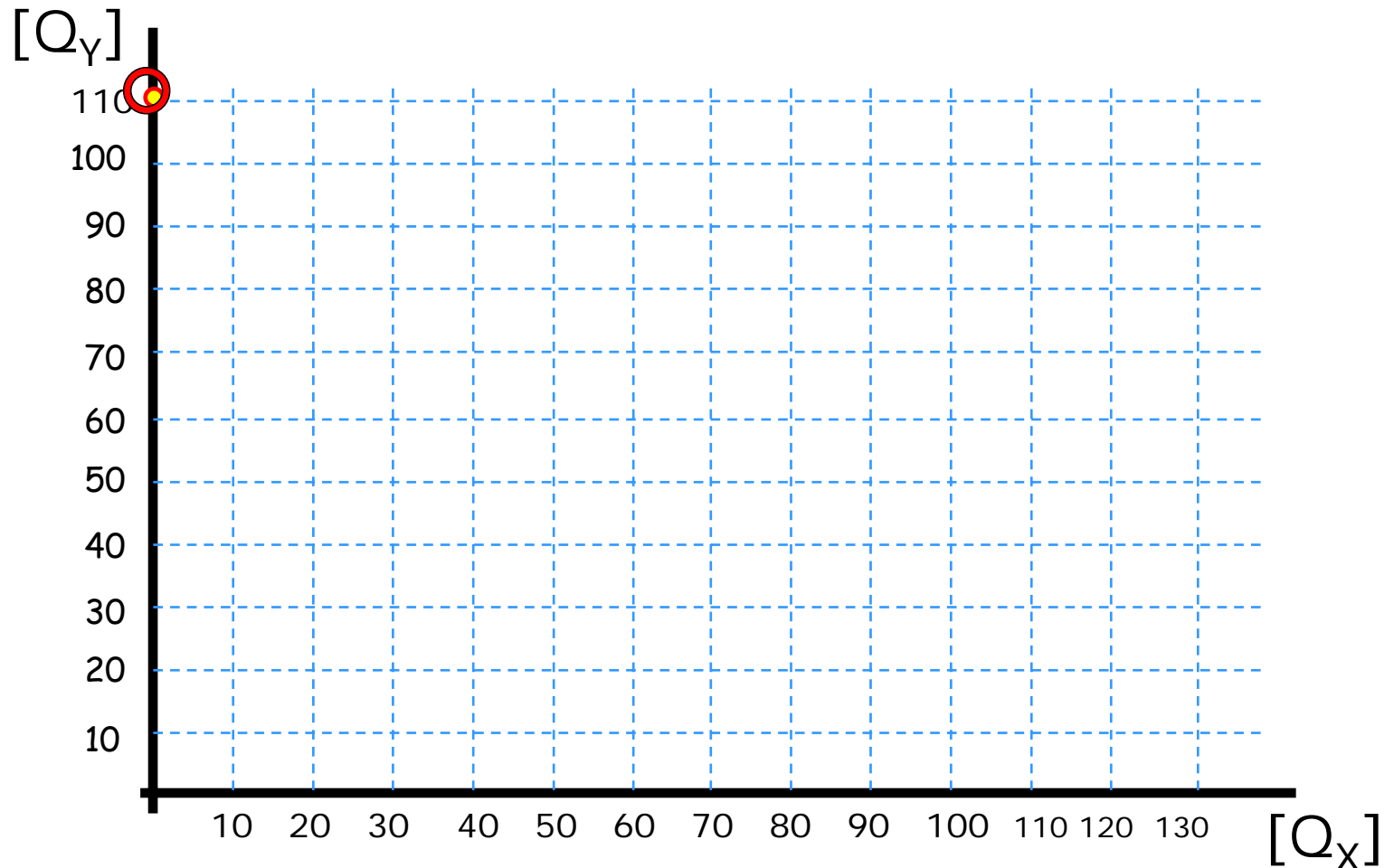
- Any output combination that lies on the production possibilities frontier is “technically efficient”
- Any output combination that lies inside the PPF is “inefficient”

Production Possibilities Frontier or Function (PPF)

- Given a set of finite inputs (L, K, R) and a state of technology a finite set of outputs (Q_x and Q_y) can be produced
- PPF shows all possible output combinations of (in this case) the two goods given the inputs and technology
- PPF can be developed for a society, an organization or an individual

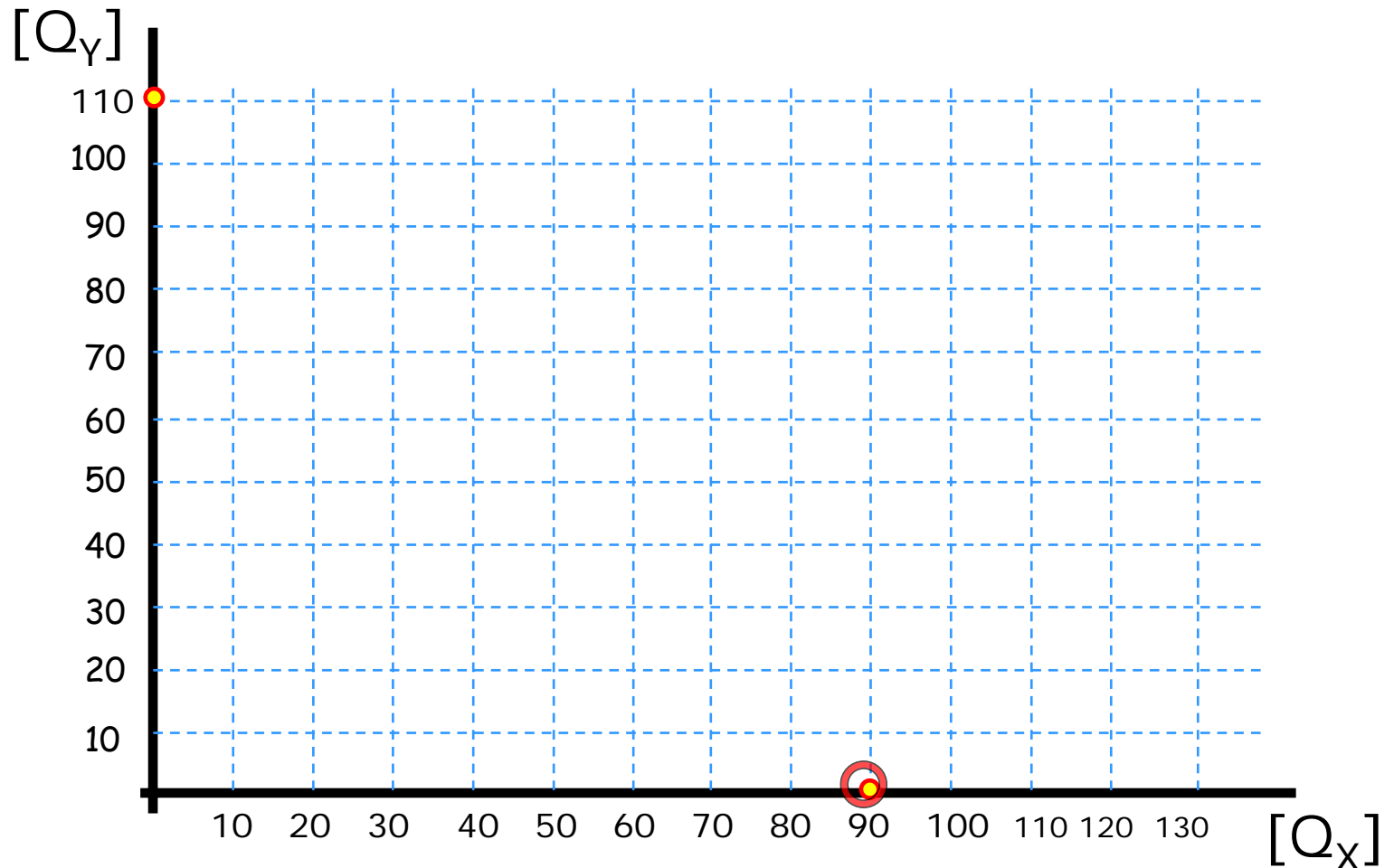
Production Possibilities Frontier or Transformation Function

If all inputs are devoted to the production of good Y (Q_Y), a maximum of 110 units of Y ($Q_Y = 110$) can be produced given the current technology.



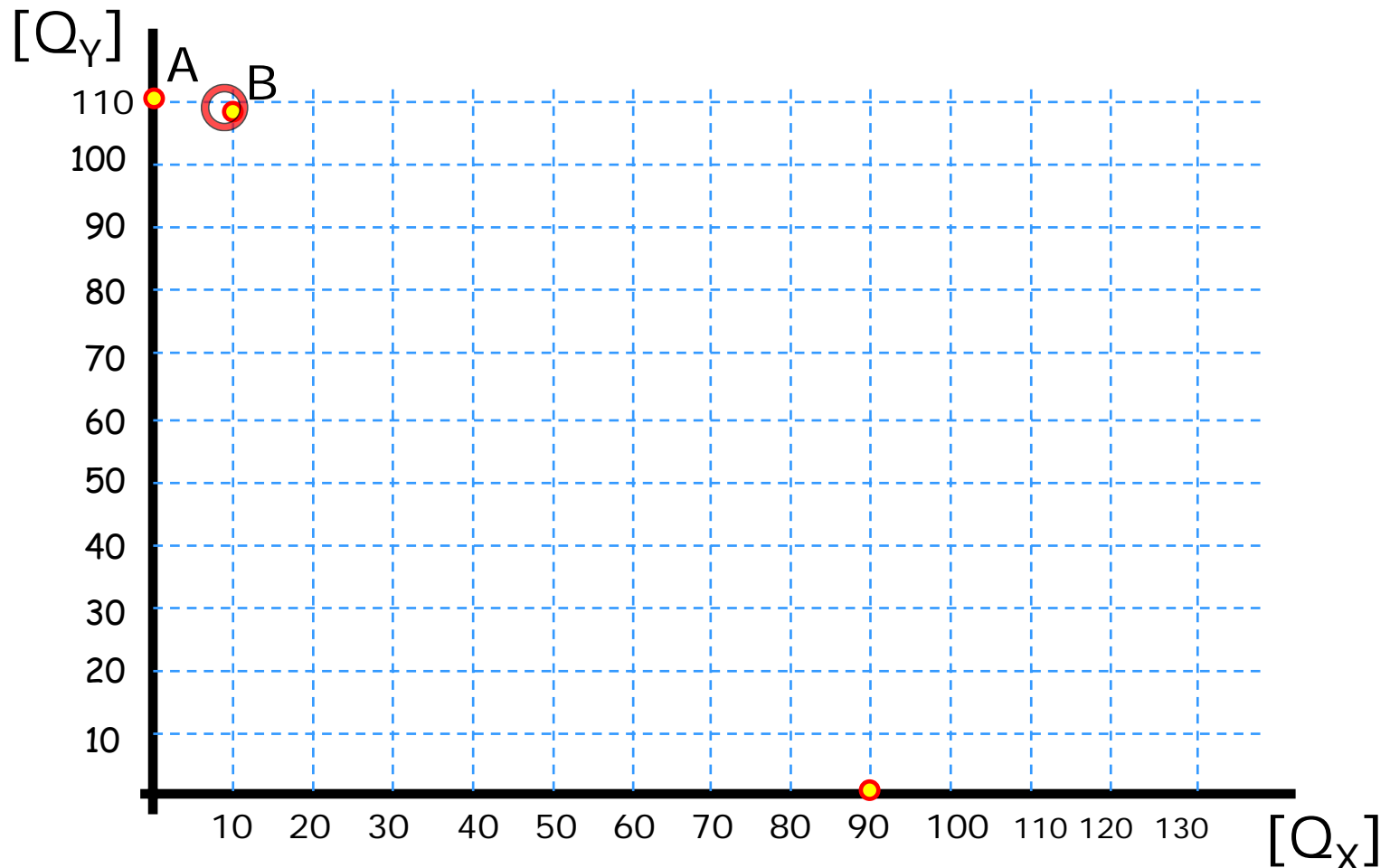
Production Possibilities Frontier or Transformation Function

If all inputs are devoted to the production of good X (Q_X), a maximum of 90 units of X ($Q_X = 90$) can be produced given the current technology.



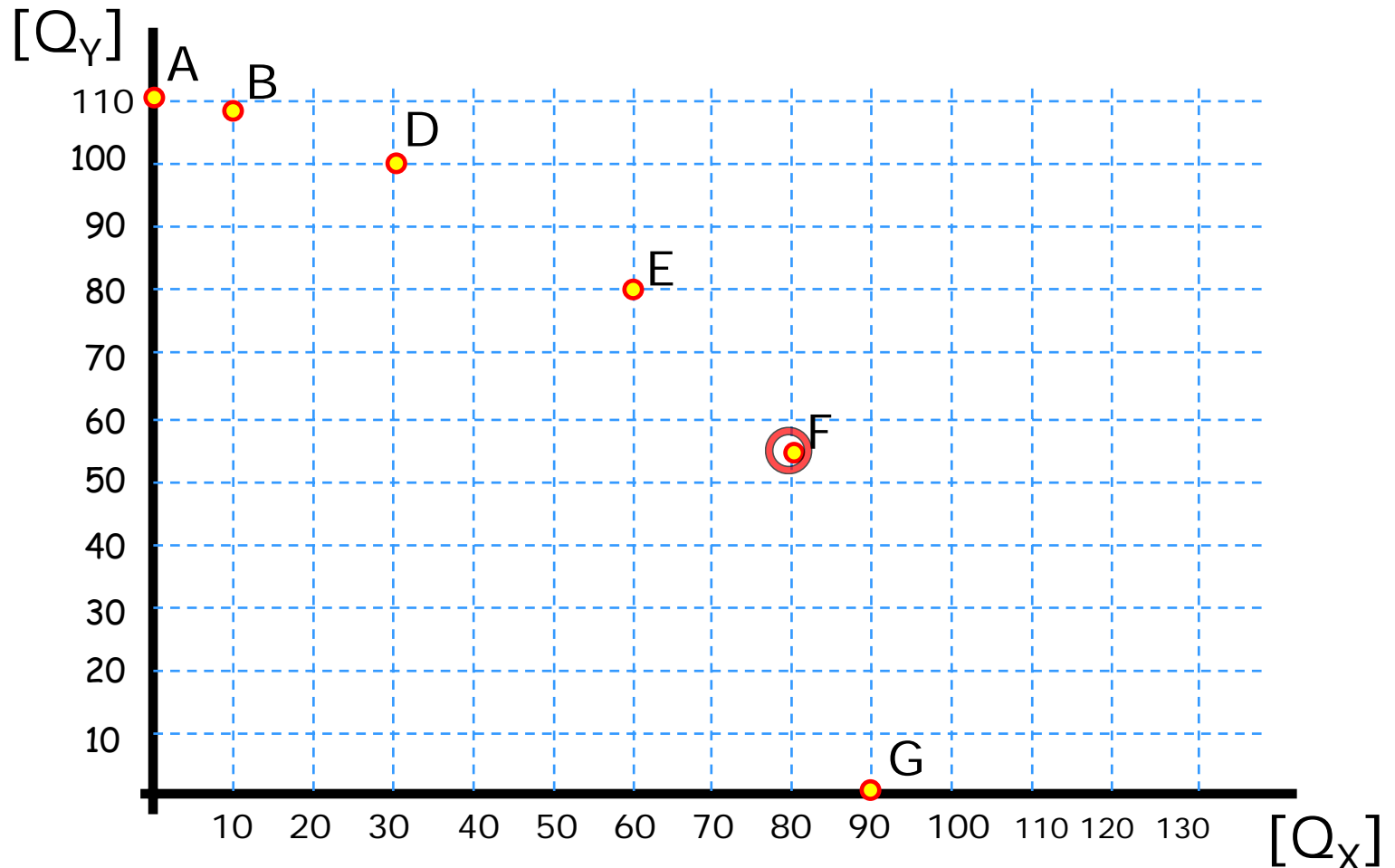
Production Possibilities Frontier or Transformation Function

If production were at point A ($Q_Y = 110, Q_X = 90$) and it was decided to produce 10 unit of good X (reallocate resources to produce $Q_Y = 109, Q_X = 10$ at point B), the opportunity cost of 10 units of X (10X) is one unit of Y (1Y). Alternatively, a reallocation of inputs from B to A implies an opportunity cost of 10X for 1Y



Production Possibilities Frontier or Transformation Function

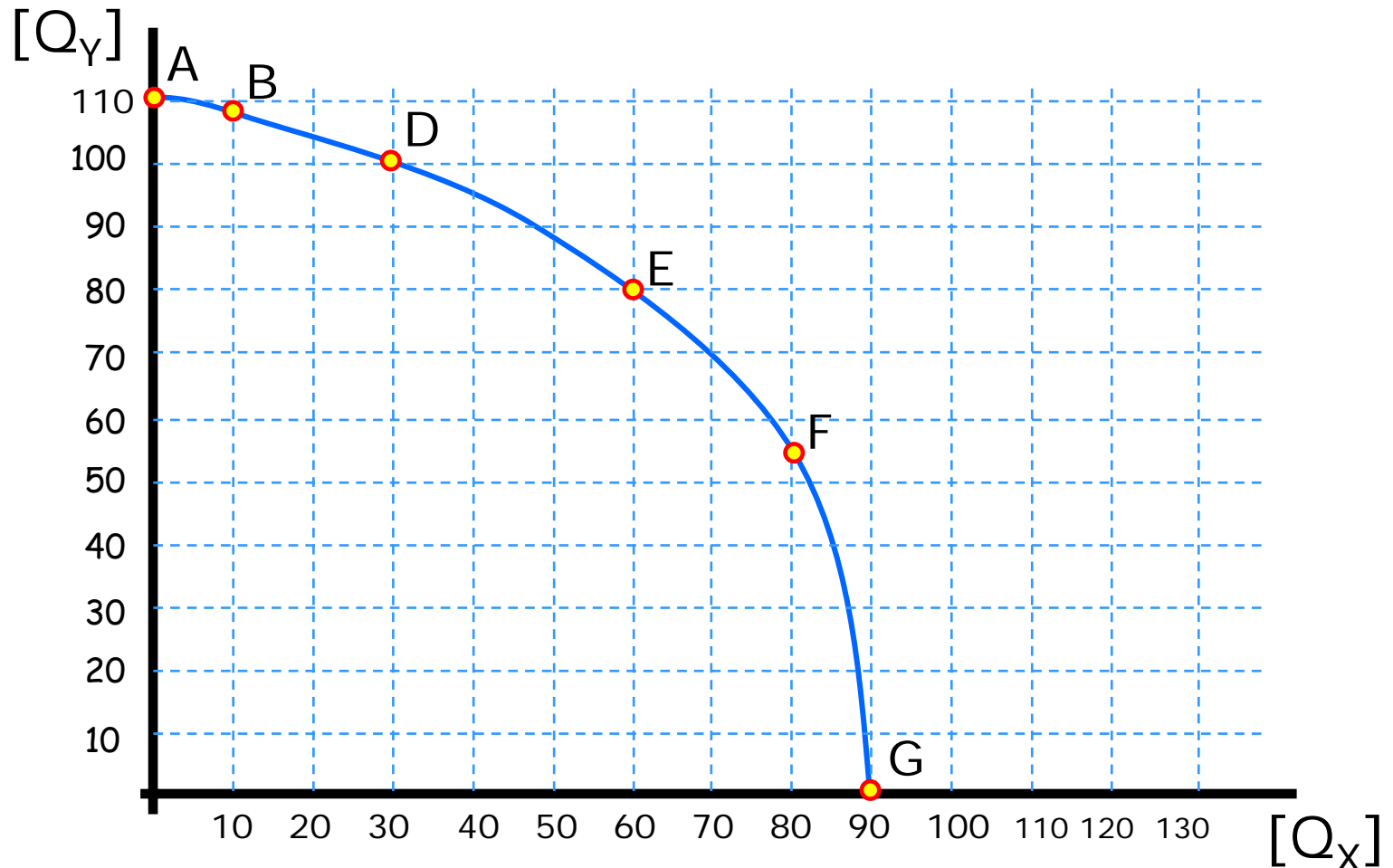
As more and more units of good X are produced, larger and larger quantities of good Y must be sacrificed. This is the law of increasing relative cost. The inputs are not homogeneous, and some of those that are more useful in the production of Y and less useful in the production of X are transferred to the production of X.



Production Possibilities Frontier or Transformation Function

All output combinations that lie along the PPF (Line ABCDEFG) are technically efficient.

Notice that the first 10 units of X required a sacrifice (opportunity cost) of 1Y. The Last 10 units of X (from point F to G or 80 to 90 units of X) required a sacrifice of 55Y. This is "increasing relative cost."



Technical Efficiency and Optimization

$$\text{Tech Efficiency} = \frac{\text{output}}{\text{input}} = \frac{Q_X + Q_Y}{L + K}$$

The ratio of output to inputs can be optimized by:

- a) Maximize the output ($Q_X + Q_Y$) given inputs ($L + K$) (an output combination on the PPF)
- b) Minimize the inputs ($L + K$) for a given output ($Q_X + Q_Y$), "Cost effectiveness"

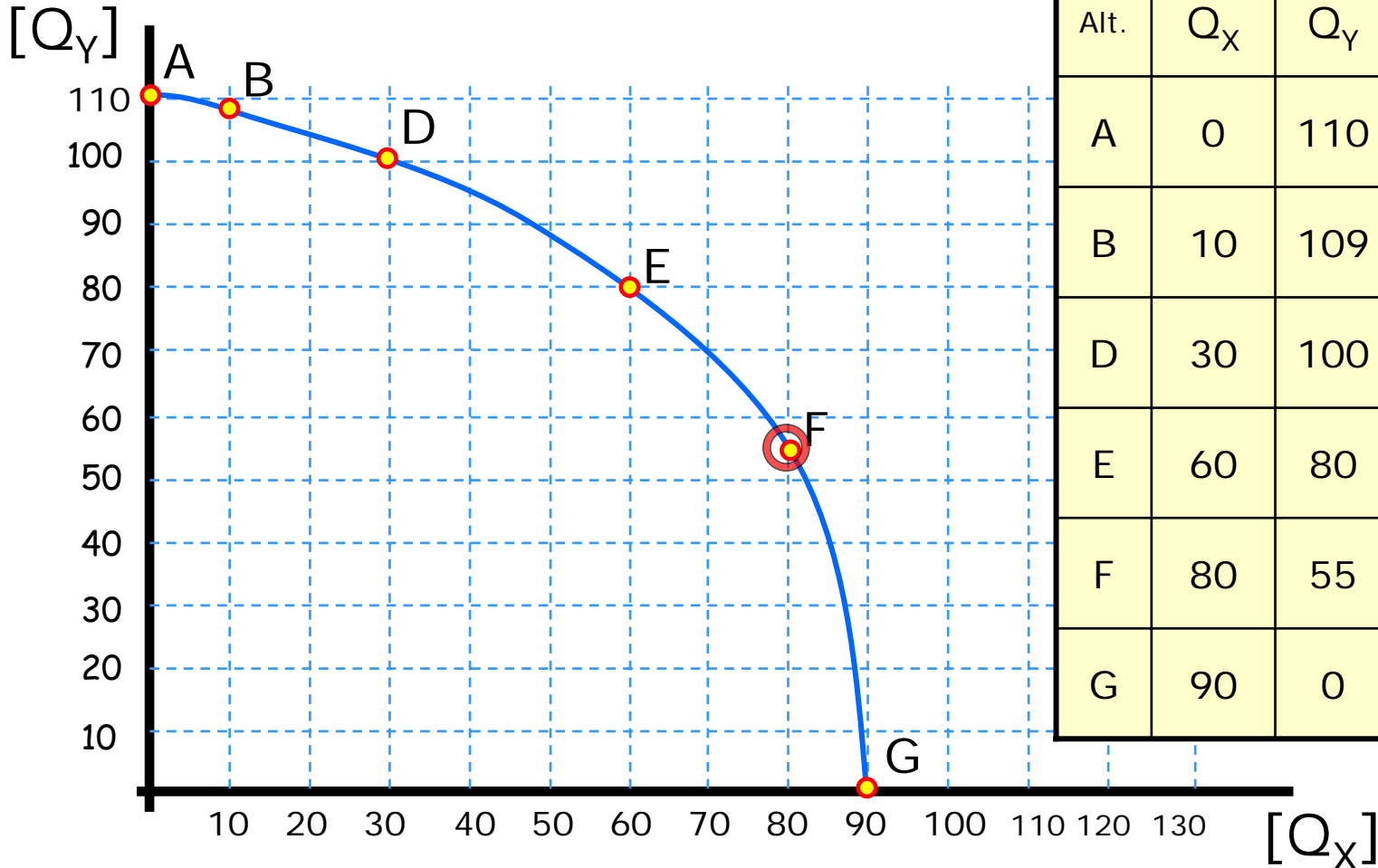
Allocative Efficiency

- Allocative efficiency or Economic Efficiency is the output combination that has the “highest value.” (“Highest value” is defined here as the revenue associated with each output combination)
- Highest valued output combination is dependent on relative outputs of X and Y and the relative prices of X (P_X) and Y (P_Y)
- The relative prices (P_X and P_Y) must be used as proxies for the values of the two goods

Production Possibilities Frontier or Transformation Function

If the price of good Y is \$1 ($P_Y = \1) and $P_X = \$2$, The "value" (or amount of revenue associated with each output combination can be calculated:

The output combination with the maximum "value" is \$215 at F. There may be other combinations with a greater value but they are not labeled.

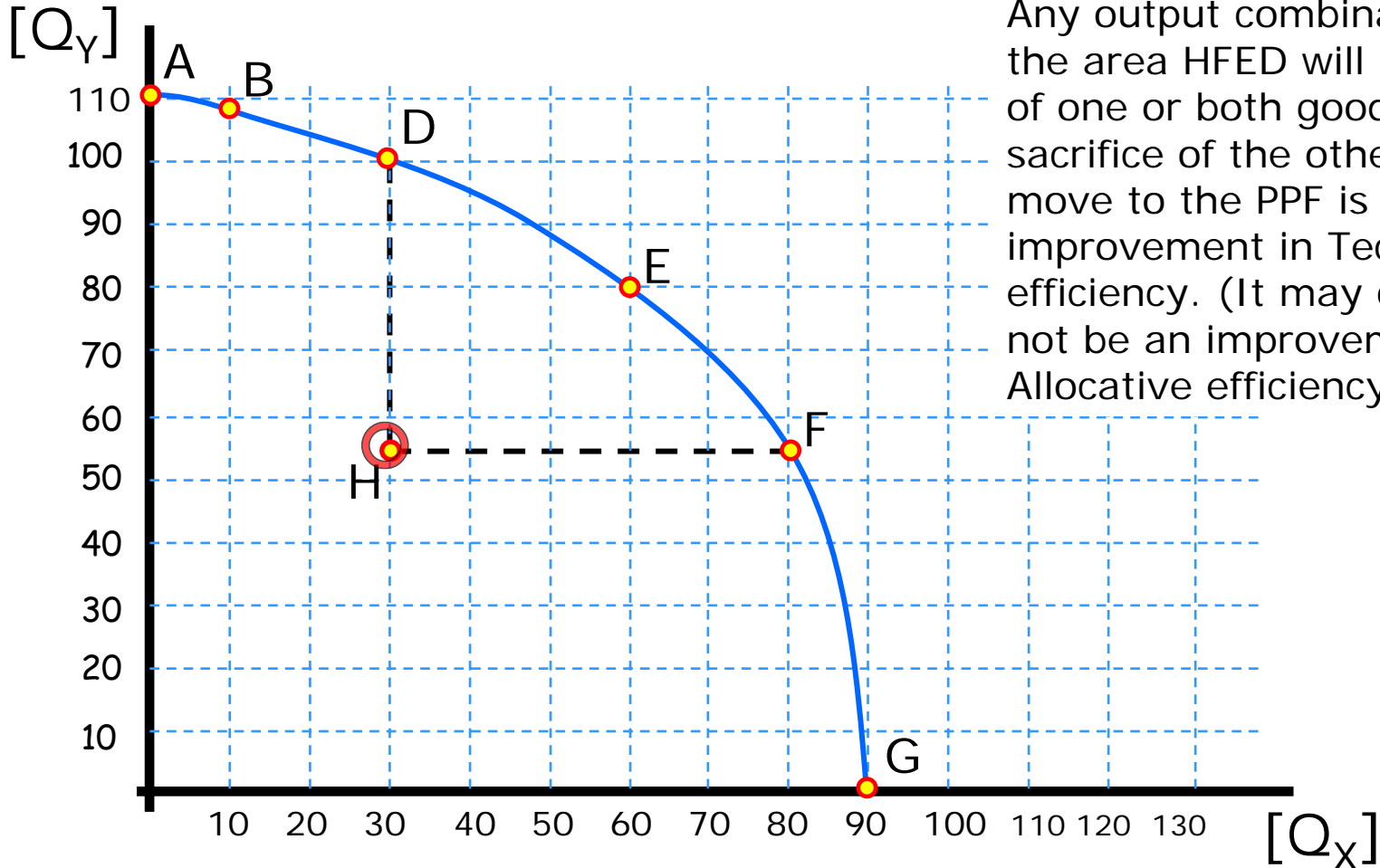


Revenue Associated with each alternative			
Alt.	Q_X	Q_Y	\$
A	0	110	\$110
B	10	109	\$129
D	30	100	\$160
E	60	80	\$200
F	80	55	\$215
G	90	0	\$180

Production Possibilities Frontier or Transformation Function

If output were at point H ($Q_X=30, Q_Y=55$), the criteria for neither technical nor allocative efficiency is met. Output of X can be increased (to point F) with no sacrifice of Y.

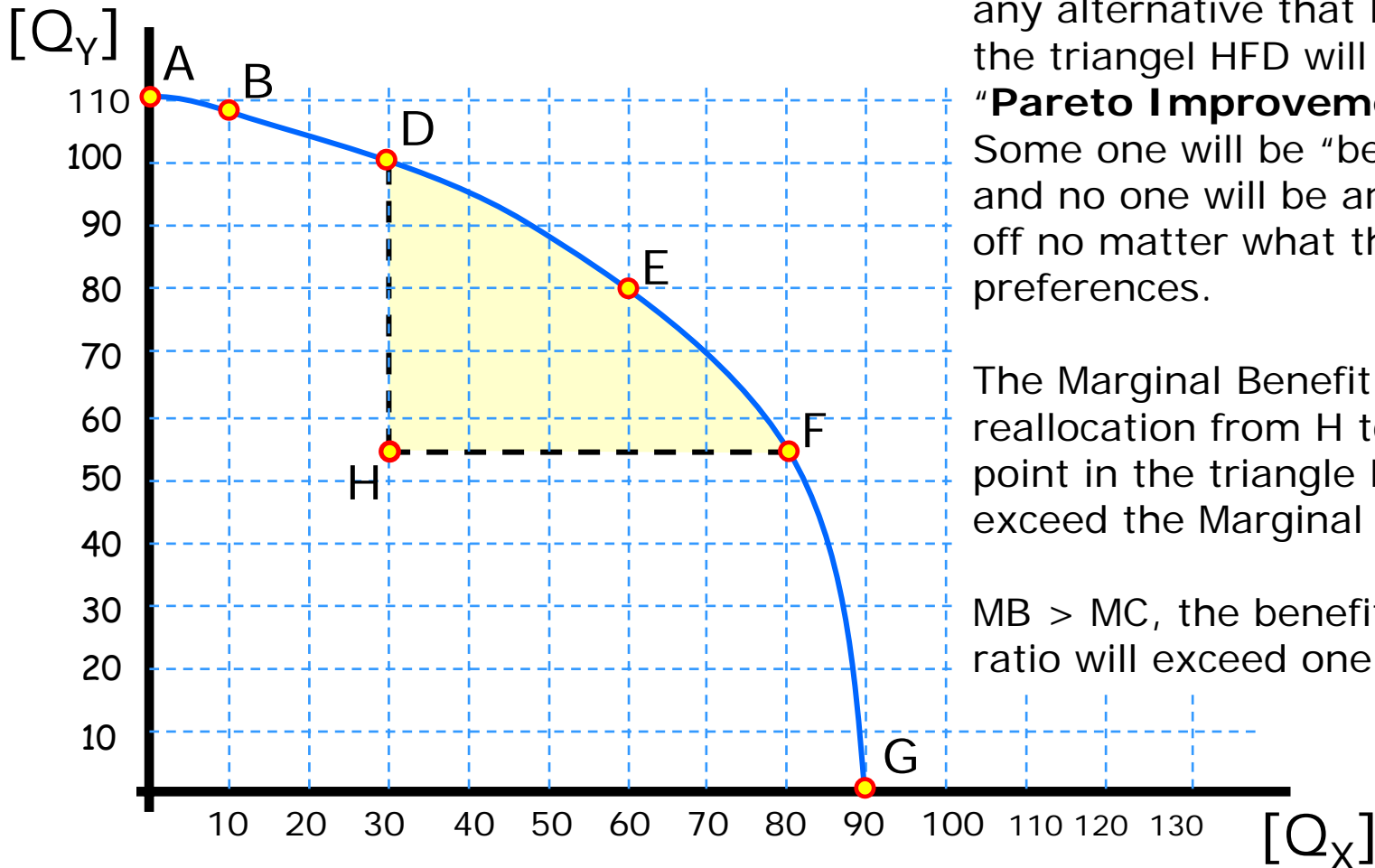
Similarly, the output of Y can be increased (to point D) with no sacrifice of X.



Any output combination in the area HFED will be more of one or both goods with no sacrifice of the other. A move to the PPF is an improvement in Technical efficiency. (It may or may not be an improvement in Allocative efficiency.)

Production Possibilities Frontier or Transformation Function

Pareto efficiency exists when there are no alternatives that will improve the welfare of at least one person without making at least one other person “worse off.” Once Output has reached the PPF, it is “Pareto Efficient,” you cannot make someone “better off” without making someone else “worse off.”



If we state at alternative H, any alternative that lies in the triangle HFD will be a “**Pareto Improvement.**” Some one will be “better off” and no one will be any worse off no matter what their preferences.

The Marginal Benefit of a reallocation from H to any point in the triangle HFD, will exceed the Marginal cost;

$MB > MC$, the benefit/cost ratio will exceed one.

Optimization

- Only one objective can be optimized at a time, all other desired outcomes become constraints.
- Any constraint can become an objective
 - We can maximize income subject to the constraint that we get a given amount of leisure
 - we maximize leisure subject to the constraint that we get a given income
- If several elements are included as a single objective that can be optimized, each element must be prioritized through a system of weighting elements