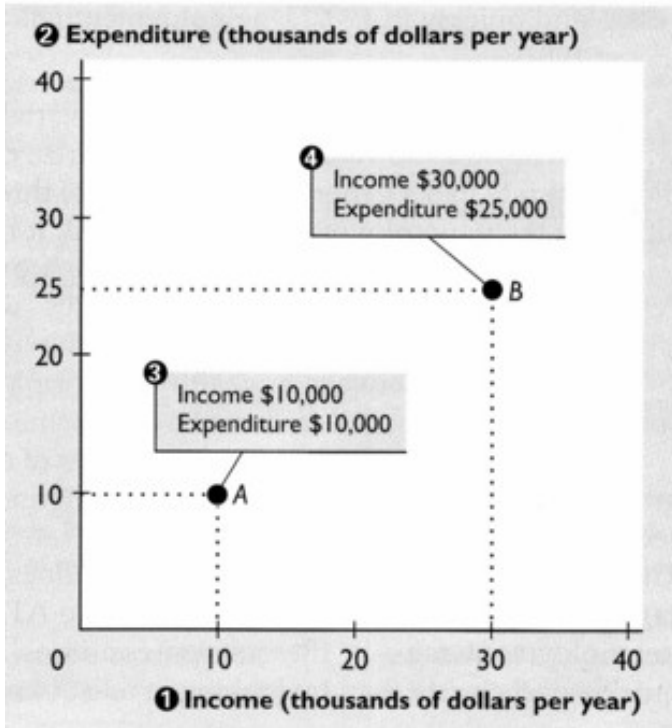


Making a graph :

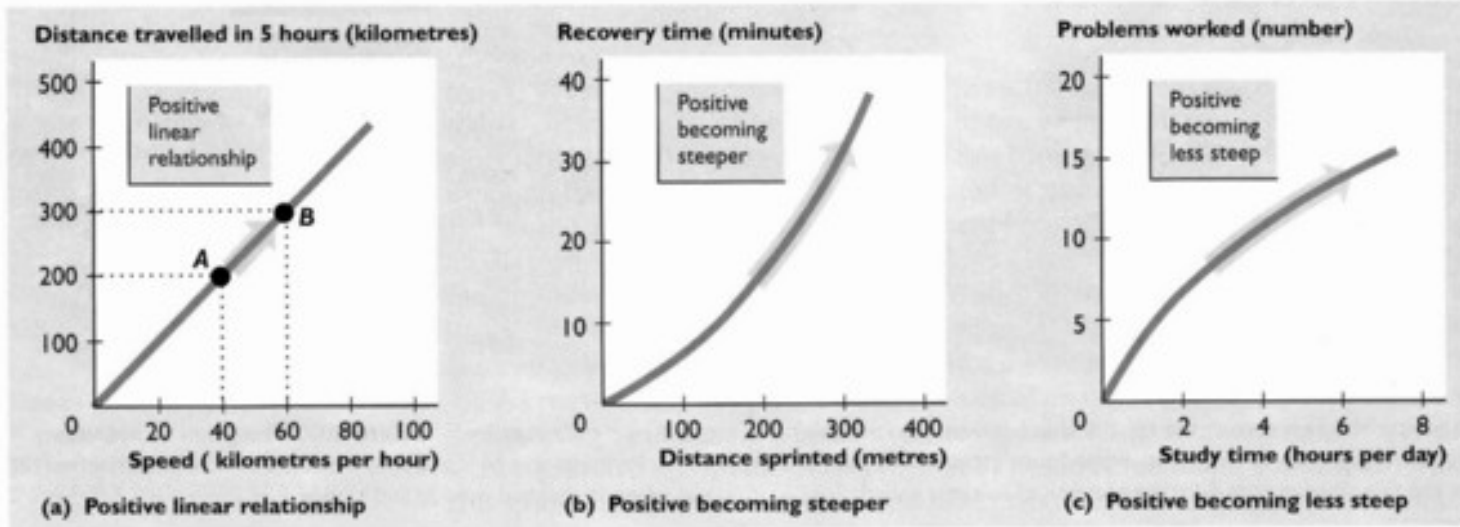


All graphs have axes that measure quantities as distances.

- 1** The horizontal axis (*x*-axis) measures income. A movement to the right shows an increase in income.
- 2** The vertical axis (*y*-axis) measures expenditure. A movement upward shows an increase in expenditure.
- 3** Point *A* shows that when income is \$10,000 a year, expenditure is \$10,000 a year.
- 4** Point *B* shows that when income is \$30,000 a year, expenditure is \$25,000 a year.

Interpreting graphs

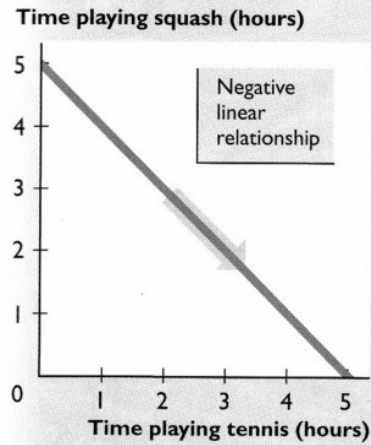
Positive (Direct) Relationships



Part (a) shows that as speed increases, the distance travelled increases along a straight line.

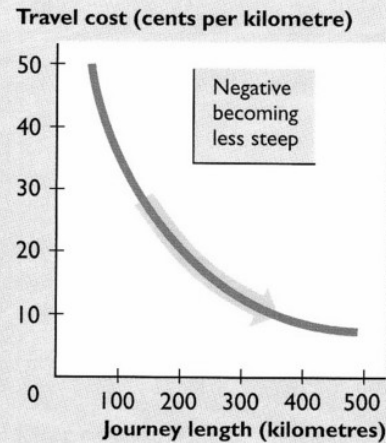
Part (b) shows that as the distance sprinted increases, recovery time increases along a curve that becomes steeper.

Part (c) shows that as study time increases, the number of problems worked increases along a curve that becomes less steep.



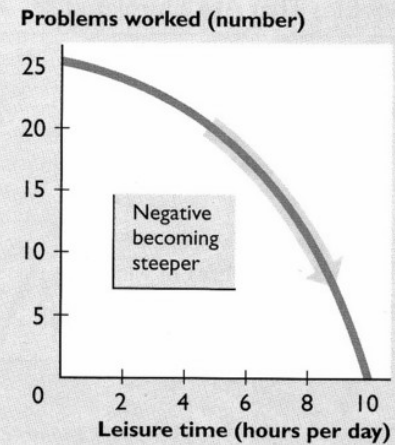
(a) Negative linear relationship

Part (a) shows that as the time playing tennis increases, the time playing squash decreases along a straight line.



(b) Negative becoming less steep

Part (b) shows that as the journey length increases, the travel cost falls along a curve that becomes less steep.



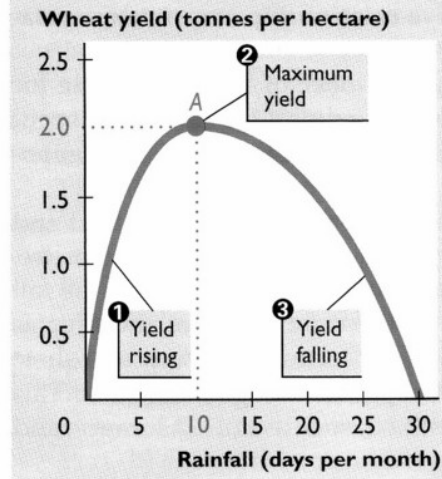
(c) Negative becoming steeper

Part (c) shows that as leisure time increases, the number of problems worked decreases along a curve that becomes steeper.

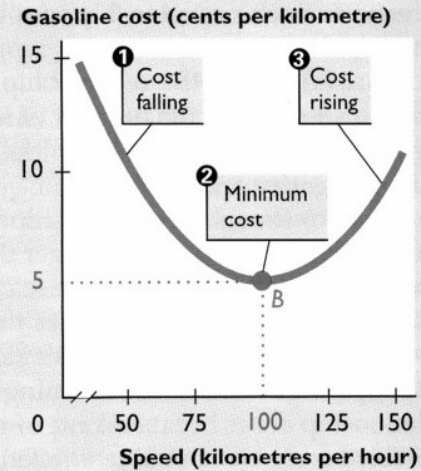
Maximum and Minimum Points

In part (a) as the rainfall increases, the curve ① slopes upward as the yield per hectare rises, ② is flat at point A, the maximum yield, and then ③ slopes downward as the yield per hectare falls.

In part (b) as the speed increases, the curve ① slopes downward as the cost per kilometre falls, ② is flat at the minimum point B, and then ③ slopes upward as the cost per kilometre rises.



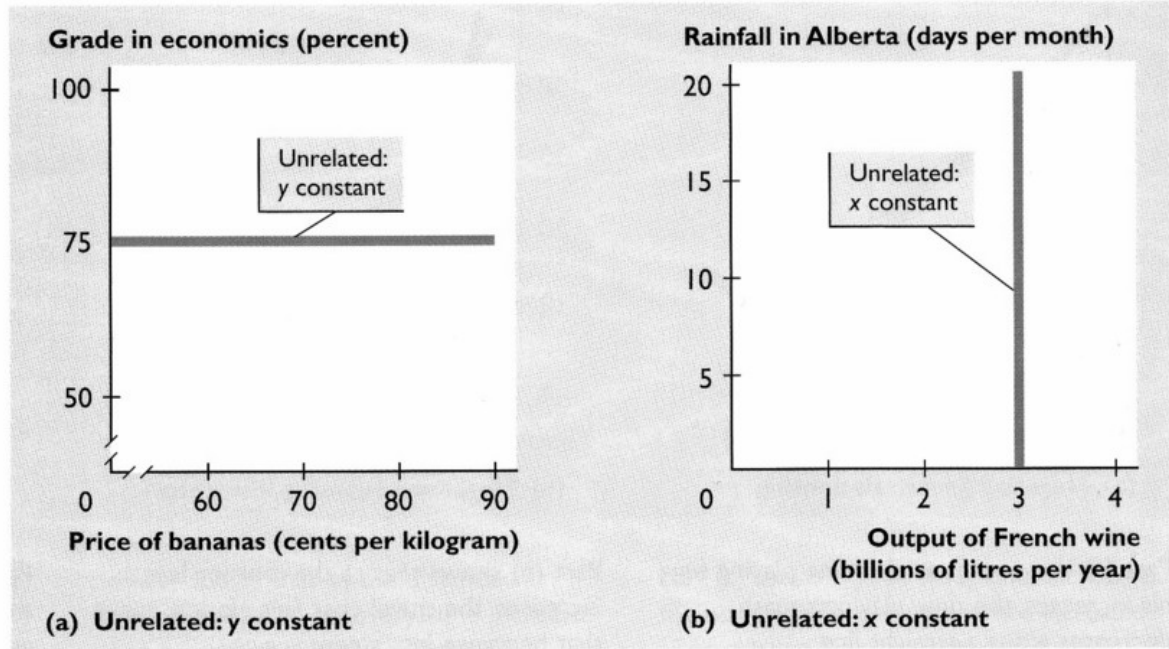
(a) Relationship with a maximum



(b) Relationship with a minimum

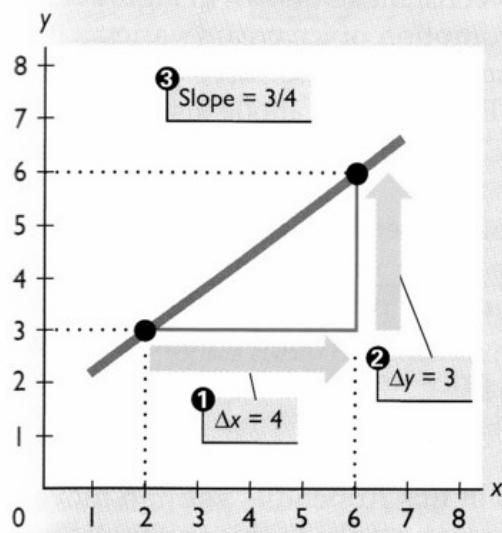
In part (a), as the price of bananas increases, the student's grade in economics remains at 75 percent. These variables are unrelated and the curve is horizontal.

In part (b), the vineyards of France produce 3 billion litres of wine a year no matter what the rainfall in Alberta is. These variables are unrelated and the curve is vertical.



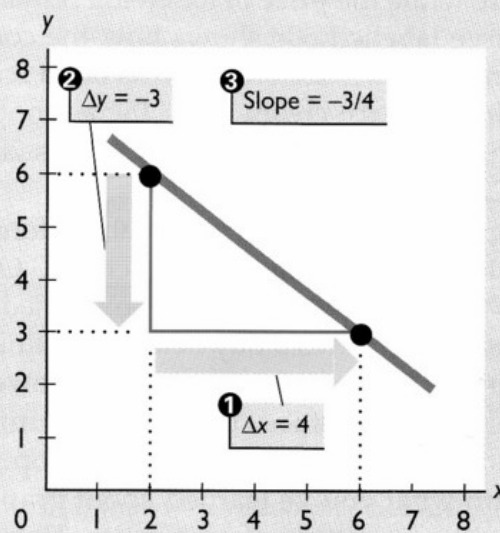
The slope of a relationship

Calculating Slope



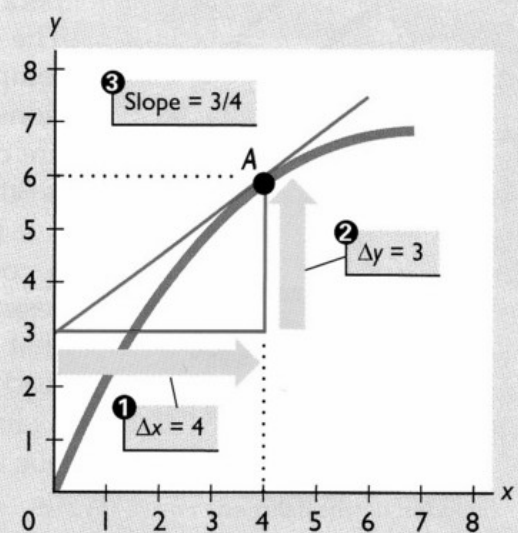
(a) Positive slope

In part (a), ① when Δx is 4, ② Δy is 3, so ③ the slope ($\Delta y/\Delta x$) is $3/4$.



(b) Negative slope

In part (b), ① when Δx is 4, ② Δy is -3 , so ③ the slope ($\Delta y/\Delta x$) is $-3/4$.



(c) Slope at a point

In part (c), the slope of the curve at point A equals the slope of the red line. ① When Δx is 4, ② Δy is 3, so ③ the slope ($\Delta y/\Delta x$) is $3/4$.

Exercises

Draw a graph to show the relationship between the two variables x and y :

x	0	1	2	3	4	5	6	7	8
y	0	1	4	9	16	25	36	49	64

- Is the relationship positive or negative?
- Calculate the slope of the relationship between x and y when x equals 2 and when x equals 4.
- How does the slope of the relationship change as the value of x increases?
- Think of some economic relationships that might be similar to this one.

Draw a graph to show the relationship between the two variables x and y :

x	0	1	2	3	4	5	6	7	8
y	60	49	39	30	22	15	9	4	0

- Is the relationship positive or negative?
- Calculate the slope of the relationship between x and y when x equals 2 and when x equals 4.
- How does the slope of the relationship change as the value of x increases?
- Think of some economic relationships that might be similar to this one.