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Chapter 1
Student Solutions Manual

Answers to Chapter Problems

1.1 Practice Problems

1.

a) The smoker is not behaving rationally because of a physical addiction that has led them to continue engaging in an action they wish to stop.
b) By providing themselves with small rewards for abstaining from smoking and penalizing themselves when they do smoke, the smoker is much more likely to be able to quit.

3. Rent is a payment to owners of natural resources, interest is paid to owners of capital resources, and human resources receive wages for their labour and profit for their entrepreneurship. A loan repayment is not a resource income because loans are not an economic resource. (Recall that interest on a loan can be a resource income. But repayment of the principal is not income.)

1.2 Practice Problems

1.

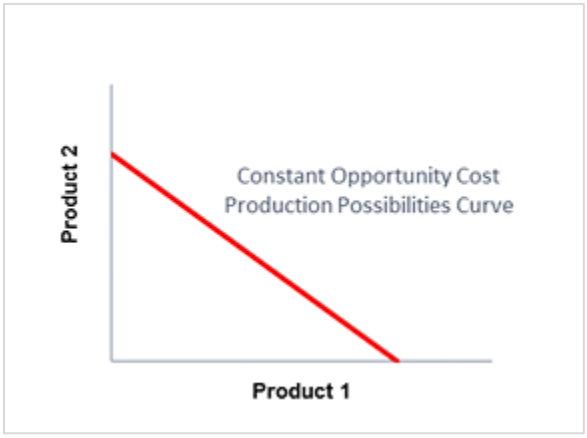
a) The opportunity cost of the first fish is 4 coconuts, since coconut production is reduced from 24 to 20 when the first fish is caught. Similarly, the opportunity costs of the second and third fish are 8 (= 20 − 12) and 12 (= 12 − 0) coconuts.
b) These results conform with the law of increasing opportunity costs, because as fish production is increased, so does the opportunity cost of each newly caught fish.
c) The curve is bowed outward from the origin, reflecting the law of increasing opportunity costs.
d) Besides the assumption that only two goods are produced, we must assume that the quantity of the castaway's resources and the technology they use are fixed, and that their resources are employed to their full capacity.
e) With 12 instead of eight hours of labour devoted each day to acquiring coconuts and fish, the castaway's production possibilities curve shifts outwards, with both its vertical and horizontal intercepts increasing. If there are six instead of eight hours devoted each day by the castaway, the production possibilities curve shifts inwards.
f) With a new capital asset that can be used to acquire fish (a fishing rod), the castaway's production possibilities curve shifts outwards, with its horizontal or fish intercept (but not its vertical coconut intercept) increasing.

3. In the case of constant costs, the production possibilities curve will be a downward-sloping straight line. Because the slope of the production possibilities curve is based on the two

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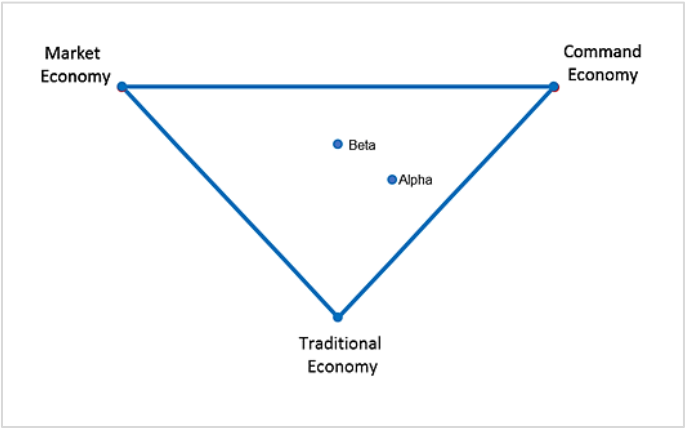
products' opportunity costs, if both these opportunity costs are constant, then the slope of the production possibilities curve will be constant as well.



1.3 Practice Problems

1.

a) Beta is likely to have more economic freedom, given the greater importance of Beta's private sector and the consumer sovereignty it promotes.
b) Alpha is likely to have more economic stability because of the relative importance of its traditional and public sectors. Both of these sectors tend to reduce economic instability.
c) In Alpha, traditional culture and national planners are more likely to conflict, given its relatively large traditional and public sectors.
d) In terms of this triangle, Alpha will be southeast of Beta because it has stronger elements of both a traditional economy and a command economy.



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End of Chapter Problems

1.

a) Paying $10 per visit is most logical. Given your past behaviour of "not always following through with your plans," there is a good chance that you will not increase your visits to the gym. Therefore, the cost of the $60 monthly contract is likely to be more than the cost of visiting the club two or three times a month at $10 per visit − $60 per month is greater than $20 or $30.

b) Your past behaviour is an important factor. If you could be sure that you would follow through with your plans, the $60 per month might be less than the monthly cost of $10 per visit.

3.

a) The two variables are the price of digitally streamed music and the quantity of CDs purchased. The price of digitally streamed music is the independent variable, since it is the cause, and the quantity of CDs purchased is the dependent variable, since it is the effect.

b) The two variables are Canadian household incomes and transfer payments to households. Canadian household incomes is the independent variable, since it is the cause, and transfer payments to households is the dependent variable, since it is the effect.

c) The two variables are the average salary of AI experts and the number of people seeking a career in artificial intelligence. The average salary of AI experts is the independent variable, since it is the cause, and the number of people seeking a career in AI is the dependent variable, since it is the effect.

d) The two variables are the price of wheat fertilizer and the amount of wheat planted by farmers. The price of wheat fertilizer is the independent variable, since it is the cause, and the amount of wheat planted by farmers is the dependent variable, since it is the effect.

e) The two variables are output per worker in the Canadian economy and Canada's rate of economic growth. Output per worker in the Canadian economy is the independent variable, since it is the cause, and Canada's rate of economic growth is the dependent variable, since it is the effect.

f) The two variables are the number of cases of an infectious disease in Canada and Canada's economic output. The number of cases of the infectious disease in Canada is the independent variable, since it is the cause, and Canada's economic output is the dependent variable, since it is the effect.

5.

a) The statement deals with a topic in microeconomics because it focuses on a particular market − in this case, the one associated with collectibles.

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b) The statement deals with a topic in microeconomics because it focuses on a particular market − in this case, the one associated with high fashion clothing.

c) The statement deals with a topic in macroeconomics because it focuses on an entire economic sector and the economy as a whole.

d) The statement deals with a topic in microeconomics because it focuses on a particular market − in this case, the one associated with painkillers.

e) The statement deals with a topic in macroeconomics because it focuses on an entire economic sector and the economy as a whole.

f) The statement deals with a topic in microeconomics because it focuses on a particular market – in this case, the one associated with a city's mass transit system.

7.

a) The two variables are average income and the number of unhoused people. Average income is the independent variable, since it is the cause, and the number of unhoused people is the dependent variable, since it is the effect. The relationship is inverse because the two variables move in the opposite direction.

b) The two variables are the number of electric vehicles sold and the price of electricity. The price of electricity is the independent variable, since it is the cause, and the number of electric vehicles sold is the dependent variable, since it is the effect. The relationship is inverse because the two variables move in the opposite direction.

c) The two variables are the supply of available farming land and the annual level of precipitation. The annual level of precipitation is the independent variable, since it is the cause, and the supply of available farming land number is the dependent variable, since it is the effect. The relationship is direct because the two variables move in the same direction.

d) The two variables are the rate of economic growth and the amount of subsidies the government provides to businesses. The rate of economic growth is the independent variable, since it is the cause, and the amount of subsidies provided to businesses is the dependent variable, since it is the effect. The relationship is inverse because the two variables move in the opposite direction.

e) The two variables are the number of smokers and the amount of taxes imposed on cigarettes. The amount of taxes imposed on cigarettes is the independent variable, since it is the cause, and the number of smokers is the dependent variable, since it is the effect. The relationship is inverse because the two variables move in the opposite direction.

f) The two variables are the number of immigrants who choose to come to Canada and the Canadian standard of living. The Canadian standard of living is the independent variable, since it is the cause, and the number of immigrants who choose to come to Canada is the dependent variable, since it is the effect. The relationship is direct because the two variables move in the same direction.

9.

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a) The opportunity cost of the first sword is 3 loaves of bread, since bread production is reduced from 18 to 15 when the first sword is made. Similarly, the opportunity costs of the second and third swords are 6 (= 15 − 9) and 9 (= 9 − 0) loaves of bread.
b) The results in part a conform with the law of increasing opportunity costs, because as sword production is increased, so does the opportunity cost of each newly made sword, from 3 to 6 to 9 loaves of bread.
c) With twice as many loaves of bread made at each level of sword production, bread production at scenario A is now 36 (= 2 × 18). Similarly, bread production at scenarios B, C and D is now 30 (= 2 × 15), 18 (= 2 × 9) and 0 (= 2 × 0). The opportunity cost of the first sword is therefore now 6 loaves of bread, since bread production is reduced from 36 to 30 loaves when the first sword is made. Similarly, the opportunity costs of the second and third swords are 12 (= 30 − 18) and 18 (= 18 − 0) loaves.
d) The results in part c conform with the law of increasing opportunity costs, because as sword production is increased, so does the opportunity cost of each newly made sword, from 6 to 12 to 18 loaves of bread.

11.

a) In moving from points *a* to *b*, the output of lithium-ion batteries increases by 1 (=1 − 0) while solar panel production decreases by 8 (= 50 − 42). Therefore, the first lithium-ion battery has an opportunity cost of 8 solar panels.
In moving from points *b* to *c*, lithium-ion battery production continues to rise by 1 (= 2 − 1) while solar panel output declines by 18 (= 42 − 24). Therefore, an additional lithium-ion battery has an opportunity cost of 18 solar panels.
In moving from points *c* to *d*, lithium-ion battery production continues to rise by 1 (= 3 − 2) while solar panel output declines by 24 (= 24 − 0). Therefore, an additional lithium-ion battery has an opportunity cost of 24 solar panels.
These answers illustrate the law of increasing opportunity costs, because as more lithium-ion batteries are produced, there is a rise in the opportunity cost of this product.
b) In moving from points *e* to *f*, the output of lithium-ion batteries increases by 1 (= 1 − 0) while solar panel production decreases by 12 (= 70 − 58). Therefore, a new lithium-ion battery has an opportunity cost of 12 solar panels.
In moving from points *f* to *g*, the output of lithium-ion batteries increases by 1 (= 2 − 1) while solar panel production decreases by 24 (= 58 − 34). Therefore, an additional lithium-ion battery has an opportunity cost of 24 solar panels.
In moving from points *g* to *d*, the output of lithium-ion batteries increases by 1 (= 3 − 2) while solar panel production decreases by 34 (= 34 − 0). Therefore, an additional lithium-ion battery has an opportunity cost of 34 solar panels.
These opportunity costs are higher than those in part a. (i.e., 12, 24, 34 vs. 8, 18, 24).
c) The figure depicts a technological improvement in the production of solar panels. As such, the production possibilities curve rotates rightward, with the vertical intercept shifting outward but the horizontal intercept staying constant. Meridian is now better at producing solar panels. Now, when resources are moved away from making solar panels,

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the opportunity cost of making batteries is higher. This simply reflects the fact that Meridian is now better at making solar panels, so when resources are allocated to the other sector, they must give up more solar panels.

13.

a) The most stable culture is likely to be found in the country with the largest traditional sector (Country B), since a traditional sector tends to promote stability.
The most equal distribution of income is likely to be found in the country with the largest public sector (Country C), since one of the main functions of government is to redistribute income.
The greatest economic freedom is likely to be found in the country with the largest private sector (Country A), since private markets provide individuals with the liberty to pursue their own self-interest.

b) With a larger private sector, Country B will move up and to the left as it becomes more like a pure market economy. With a larger public sector, Country C will move up and to the right as it becomes more like a pure command economy.

15.

Because households cannot keep any income above $60,000, those that could earn more by supplying their resources are unlikely to do so, reducing the overall amount of resources available to the economy.

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Chapter 1

Teaching Tips

An Example from Behavioural Economics

Behavioural economics is mentioned in a text footnote. Instructors may wish to give an illustration of the types of irrational behaviour highlighted in this emerging field of study. One of the best-known is the endowment effect. This refers to the fact that people value an item they own more highly than the exact same item when they do not own it. In other words, the mere fact of ownership raises one's utility from an item, which is a sign of irrationality.

Distinguishing Among Resources

The definitions of natural, capital and human resources seem straightforward but can be challenging in practice. The fuzziest boundaries are between natural and capital resources and between labour and entrepreneurship.

Natural and Capital Resources Natural resources are defined as gifts of nature while capital resources are the processed materials, equipment, and buildings used in production. In some real-world cases the distinction between these two definitions is not immediately clear. Consider the case of livestock farming. The animals used in this industry might be viewed as natural resources, given that these animals are part of nature. However, given the intensive tending they require − not least in terms of daily food required to prepare them for market − they are a capital resource. In other words, animal husbandry is a form of production processing.

Labour and Entrepreneurship The distinction between these two types of human resources is hardest for entrepreneurs themselves when trying to categorize the time they put into a business. These individuals tend to expend large amounts of time in human effort (i.e., labour) as well as engaging in initiative and risk-taking. In practice, apportioning the business's net revenues into wages from labour and profit from risk-taking is extremely hard.

Extensions of the Production Possibilities Model

The production possibilities model can be extended in two main ways.

Constant-Cost Production Possibilities The text's treatment focuses on an economy subject to the law of increasing costs, which causes the production possibilities curve to bow out from the origin. It is also possible to sketch out the case where resources are perfectly transferable between production of the two items and constant costs apply. As shown in Practice Problem 2 at the end of chapter section 1.2 and problem 12 at the end of the chapter, the production possibilities curve in this case is a downward-sloping straight line.

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Asymmetric Growth The text's treatment of economic growth stresses the case where an economy's ability to produce each item on the graph's axes increases by the same extent. It is possible this assumption is not met. As shown in problem 11 at the end of the chapter, it may be that there is an increase in the economy's ability to produce only one of the items on the axes. In this case, the economy's production possibilities curve rotates around either the intercept on the horizontal or vertical axis, rather than shifting out in a parallel fashion.

Answers to Thinking about Economics Questions

TAE I, Section 1.1: At one time, communist countries, such as China, tried to persuade their citizens to reduce their selfish material wants. However, such attempts to change mass behaviour were not successful and have now largely ended in these countries.

TAE II, Section 1.2: Charitable organizations use strategies such as public acknowledgement of donors. For example, charitable performance companies often list the names of donors in their show programs.

TAE III, Section 1.2: The information revolution seems to have had some impact on rates of economic growth in industrialized countries. For example, between 2013 and 2023, the information and communication technology (ICT) sector in the 27 industrialized countries of the Organization for Economic Cooperation and Development (OECD) grew by an average of 6.3%, about three times faster than the nations' total economies. (The sector is currently about 7% of the Canadian economy.) This has helped increase overall rates of economic growth.[1]

Answers to Chapter Problems

1.1 Practice Problems

1.
   a) The smoker is not behaving rationally because of a physical addiction that has led them to continue engaging in an action they wish to stop.
   b) By providing themselves with small rewards for abstaining from smoking and penalizing themselves when they do smoke, the smoker is much more likely to be able to quit.

2.
   a) The two variables are (i) the economic welfare of the country's citizens, and (ii) the quantity of the country's resources. The quantity of the country's resources is the

[1] See OECD, "Growth of Digital Economy Outperforms Overall Growth Across OECD". May 14, 2024.

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independent variable (since it is the cause), and the economic welfare of the country's citizens is the dependent variable (since it is the effect).

b) The relationship is direct because a movement in the independent variable's value leads to a movement of the dependent variable's value in the same direction.

c) The statement is positive, since it is a description of reality that does not depend on value judgments.

d) This statement is an illustration of the economic problem, because it shows how the quantity of economic resources constrains economic welfare.

3. Rent is a payment to owners of natural resources, interest is paid to owners of capital resources, and human resources receive wages for their labour and profit for their entrepreneurship. A loan repayment is not a resource income because loans are not an economic resource. (Recall that interest on a loan can be a resource income. But repayment of the principal is not income.)

1.2 Practice Problems

1.

a) The opportunity cost of the first fish is 4 coconuts, since coconut production is reduced from 24 to 20 when the first fish is caught. Similarly, the opportunity costs of the second and third fish are 8 (= 20 − 12) and 12 (= 12 − 0) coconuts.

b) These results conform with the law of increasing opportunity costs, because as fish production is increased, so does the opportunity cost of each newly caught fish.

c) The curve is bowed outward from the origin, reflecting the law of increasing opportunity costs.

d) Besides the assumption that only two goods are produced, we must assume that the quantity of the castaway's resources and the technology they use are fixed, and that their resources are employed to their full capacity.

e) With 12 instead of eight hours of labour devoted each day to acquiring coconuts and fish, the castaway's production possibilities curve shifts outwards, with both its vertical and horizontal intercepts increasing. If there are six instead of eight hours devoted each day by the castaway, the production possibilities curve shifts inwards.

f) With a new capital asset that can be used to acquire fish (a fishing rod), the castaway's production possibilities curve shifts outwards, with its horizontal or fish intercept (but not its vertical coconut intercept) increasing.

2.

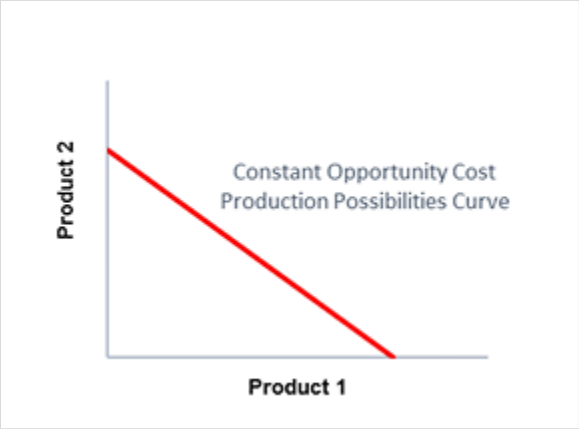
a) Hot dog production falls from 300 to 250 hot dogs as the first smartphone is produced while moving from point a to b. The opportunity cost of this first smartphone is therefore 50 (= 300 − 250) hot dogs. Similarly, the opportunity costs of the second and third smartphones are 100 (= 250 − 150) and 150 (= 150 − 0) hot dogs.

b) These results illustrate the law of increasing opportunity costs, because each new smartphone that is produced has a higher opportunity cost than the one before.

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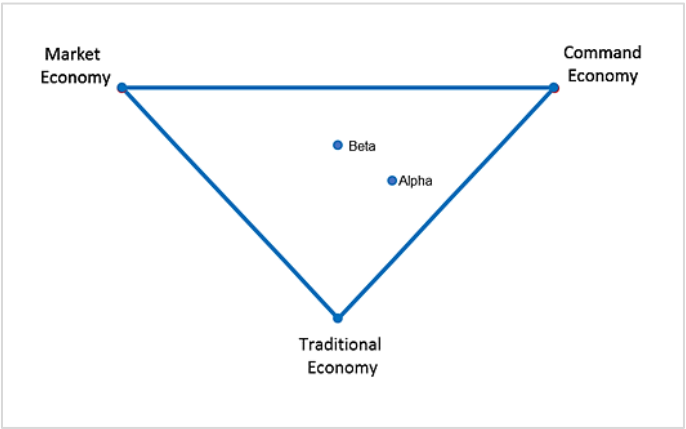
3. In the case of constant costs, the production possibilities curve will be a downward-sloping straight line. Because the slope of the production possibilities curve is based on the two products' opportunity costs, if both these opportunity costs are constant, then the slope of the production possibilities curve will be constant as well.



1.3 Practice Problems

1.

a) Beta is likely to have more economic freedom, given the greater importance of Beta's private sector and the consumer sovereignty it promotes.
b) Alpha is likely to have more economic stability because of the relative importance of its traditional and public sectors. Both of these sectors tend to reduce economic instability.
c) In Alpha, traditional culture and national planners are more likely to conflict, given its relatively large traditional and public sectors.
d) In terms of this triangle, Alpha will be southeast of Beta because it has stronger elements of both a traditional economy and a command economy.



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2. As expanding employment tends to push up economic growth at the same time as it stimulates inflation, government policies that promote economic growth will tend to lessen price stability. That means economic growth and price stability tend to be conflicting goals.

End of Chapter Problems

1.

a) Paying $10 per visit is most logical. Given your past behaviour of "not always following through with your plans," there is a good chance that you will not increase your visits to the gym. Therefore, the cost of the $60 monthly contract is likely to be more than the cost of visiting the club two or three times a month at $10 per visit − $60 per month is greater than $20 or $30.

b) Your past behaviour is an important factor. If you could be sure that you would follow through with your plans, the $60 per month might be less than the monthly cost of $10 per visit.

2.

a) The main indication that your friend is not behaving rationally is that by making impulse purchases that exhaust their monthly paycheque, they are unable to meet a goal they have already set for themselves.

b) By setting up a separate savings plan with automatic withdrawal as soon as their paycheque is deposited in their account, they are less likely to engage in impulse purchases that would otherwise use up these funds.

3.

a) The two variables are the price of digitally streamed music and the quantity of CDs purchased. The price of digitally streamed music is the independent variable, since it is the cause, and the quantity of CDs purchased is the dependent variable, since it is the effect.

b) The two variables are Canadian household incomes and transfer payments to households. Canadian household incomes is the independent variable, since it is the cause, and transfer payments to households is the dependent variable, since it is the effect.

c) The two variables are the average salary of AI experts and the number of people seeking a career in artificial intelligence. The average salary of AI experts is the independent variable, since it is the cause, and the number of people seeking a career in AI is the dependent variable, since it is the effect.

d) The two variables are the price of wheat fertilizer and the amount of wheat planted by farmers. The price of wheat fertilizer is the independent variable, since it is the cause, and the amount of wheat planted by farmers is the dependent variable, since it is the effect.

e) The two variables are output per worker in the Canadian economy and Canada's rate of economic growth. Output per worker in the Canadian economy is the independent

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variable, since it is the cause, and Canada's rate of economic growth is the dependent variable, since it is the effect.

f) The two variables are the number of cases of an infectious disease in Canada and Canada's economic output. The number of cases of the infectious disease in Canada is the independent variable, since it is the cause, and Canada's economic output is the dependent variable, since it is the effect.

4.

a) The relationship is inverse because the changes in the two variables are in the opposite direction.

b) The relationship is direct because the changes in the two variables are in the same direction.

c) The relationship is direct because the changes in the two variables are in the same direction.

d) The relationship is direct because the changes in the two variables are in the same direction.

e) The relationship is inverse because the changes in the two variables are in the opposite direction.

f) The relationship is direct because the changes in the two variables are in the same direction.

5.

a) The statement deals with a topic in microeconomics because it focuses on a particular market − in this case, the one associated with collectibles.

b) The statement deals with a topic in microeconomics because it focuses on a particular market − in this case, the one associated with high fashion clothing.

c) The statement deals with a topic in macroeconomics because it focuses on an entire economic sector and the economy as a whole.

d) The statement deals with a topic in microeconomics because it focuses on a particular market − in this case, the one associated with painkillers.

e) The statement deals with a topic in macroeconomics because it focuses on an entire economic sector and the economy as a whole.

f) The statement deals with a topic in microeconomics because it focuses on a particular market – in this case, the one associated with a city's mass transit system.

6.

a) The statement is normative, since it is a statement of how the world ought to be.

b) The statement is positive, since it is a description of reality that does not depend on value judgments.

c) The statement is positive, since it is a description of reality that does not depend on value judgments.

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d) The statement is normative, since it is a statement of how the world ought to be.

e) The statement is normative, since it is a statement of how the world ought to be.

f) The statement is normative, since it is a statement of how the world ought to be.

7.

a) The two variables are average income and the number of unhoused people. Average income is the independent variable, since it is the cause, and the number of unhoused people is the dependent variable, since it is the effect. The relationship is inverse because the two variables move in the opposite direction.

b) The two variables are the number of electric vehicles sold and the price of electricity. The price of electricity is the independent variable, since it is the cause, and the number of electric vehicles sold is the dependent variable, since it is the effect. The relationship is inverse because the two variables move in the opposite direction.

c) The two variables are the supply of available farming land and the annual level of precipitation. The annual level of precipitation is the independent variable, since it is the cause, and the supply of available farming land number is the dependent variable, since it is the effect. The relationship is direct because the two variables move in the same direction.

d) The two variables are the rate of economic growth and the amount of subsidies the government provides to businesses. The rate of economic growth is the independent variable, since it is the cause, and the amount of subsidies provided to businesses is the dependent variable, since it is the effect. The relationship is inverse because the two variables move in the opposite direction.

e) The two variables are the number of smokers and the amount of taxes imposed on cigarettes. The amount of taxes imposed on cigarettes is the independent variable, since it is the cause, and the number of smokers is the dependent variable, since it is the effect. The relationship is inverse because the two variables move in the opposite direction.

f) The two variables are the number of immigrants who choose to come to Canada and the Canadian standard of living. The Canadian standard of living is the independent variable, since it is the cause, and the number of immigrants who choose to come to Canada is the dependent variable, since it is the effect. The relationship is direct because the two variables move in the same direction.

8.

a) The consumer will choose the gaming console because its utility is higher than the utility associated with the flat screen TV.

b) Yes, utility does relate to the concept of opportunity cost. The opportunity cost of either item is the utility sacrificed by not consuming the other item. Because the utility derived by this consumer from the flat-screen TV is lower than for the gaming console, the opportunity cost of the console is less than that of the TV.

9.

a) The opportunity cost of the first sword is 3 loaves of bread, since bread production is reduced from 18 to 15 when the first sword is made. Similarly, the opportunity costs of the second and third swords are 6 (= 15 − 9) and 9 (= 9 − 0) loaves of bread.

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b) The results in part a conform with the law of increasing opportunity costs, because as sword production is increased, so does the opportunity cost of each newly made sword, from 3 to 6 to 9 loaves of bread.
c) With twice as many loaves of bread made at each level of sword production, bread production at scenario A is now 36 (= 2 × 18). Similarly, bread production at scenarios B, C and D is now 30 (= 2 × 15), 18 (= 2 × 9) and 0 (= 2 × 0). The opportunity cost of the first sword is therefore now 6 loaves of bread, since bread production is reduced from 36 to 30 loaves when the first sword is made. Similarly, the opportunity costs of the second and third swords are 12 (= 30 − 18) and 18 (= 18 − 0) loaves.
d) The results in part c conform with the law of increasing opportunity costs, because as sword production is increased, so does the opportunity cost of each newly made sword, from 6 to 12 to 18 loaves of bread.

10.

a) In moving from points *b* to *c*, Dynamia's output of bicycles increases by 1 (= 2 − 1) while skateboard production decreases by 6 (= 32 − 38). Therefore, a new bicycle has an opportunity cost of 6 skateboards.
In moving from points *c* to *d*, bicycle production continues to rise by 1 (= 3 − 2) while skateboard output declines by 12 (= 20 − 32). Therefore, a new bicycle now has an opportunity cost of 12 skateboards.
These answers illustrate the law of increasing opportunity costs, because as more bicycles are produced, there is a rise in the opportunity cost of this product.
b) An output of 38 skateboards and 2 bicycles cannot be produced, since it lies beyond the production possibilities curve.
c) An output of 32 skateboards and 1 bicycle is within the production possibilities curve. It represents a situation where resources are not being used effectively, either because they are unemployed or used at less than their full capacity.
d) The technological improvement in the assembly of bicycles would cause the production possibilities curve to rotate rightward, with the horizontal intercept shifting outward but the vertical intercept staying constant. This shows that the economy's potential output of bicycles has increased while the potential output of skateboards has stayed the same.
e) An increase in Dynamia's supply of labour would cause the production possibilities curve to shift to the right, with both the vertical and horizontal intercepts increasing. This shows that the economy's potential output of both bicycles and skateboards has increased.

11.

a) In moving from points *a* to *b*, the output of lithium-ion batteries increases by 1 (=1 − 0) while solar panel production decreases by 8 (= 50 − 42). Therefore, the first lithium-ion battery has an opportunity cost of 8 solar panels.
In moving from points *b* to *c*, lithium-ion battery production continues to rise by 1 (= 2 − 1) while solar panel output declines by 18 (= 42 − 24). Therefore, an additional lithium-ion battery has an opportunity cost of 18 solar panels.

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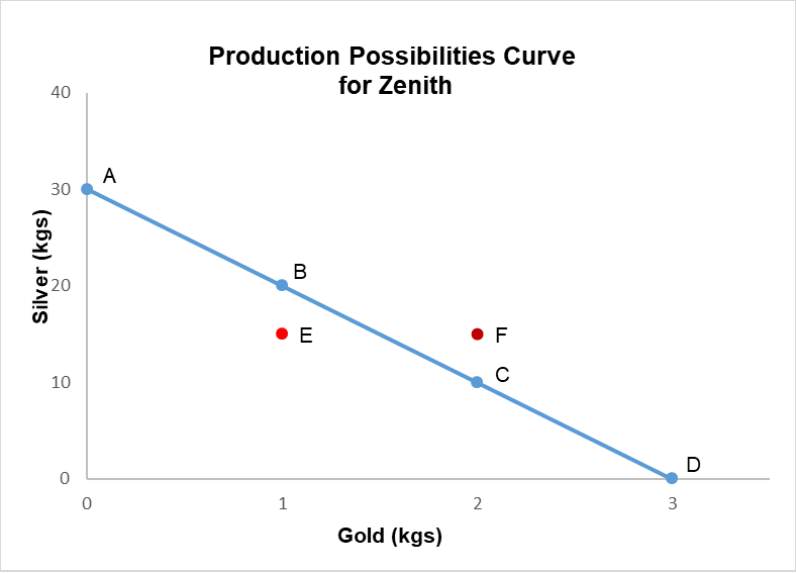
In moving from points *c* to *d*, lithium-ion battery production continues to rise by 1 (= 3 − 2) while solar panel output declines by 24 (= 24 − 0). Therefore, an additional lithium-ion battery has an opportunity cost of 24 solar panels.
These answers illustrate the law of increasing opportunity costs, because as more lithium-ion batteries are produced, there is a rise in the opportunity cost of this product.

b) In moving from points *e* to *f*, the output of lithium-ion batteries increases by 1 (= 1 − 0) while solar panel production decreases by 12 (= 70 − 58). Therefore, a new lithium-ion battery has an opportunity cost of 12 solar panels.
In moving from points *f* to *g*, the output of lithium-ion batteries increases by 1 (= 2 − 1) while solar panel production decreases by 24 (= 58 − 34). Therefore, an additional lithium-ion battery has an opportunity cost of 24 solar panels.
In moving from points *g* to *d*, the output of lithium-ion batteries increases by 1 (= 3 − 2) while solar panel production decreases by 34 (= 34 − 0). Therefore, an additional lithium-ion battery has an opportunity cost of 34 solar panels.
These opportunity costs are higher than those in part a. (i.e., 12, 24, 34 vs. 8, 18, 24).

c) The figure depicts a technological improvement in the production of solar panels. As such, the production possibilities curve rotates rightward, with the vertical intercept shifting outward but the horizontal intercept staying constant. Meridian is now better at producing solar panels. Now, when resources are moved away from making solar panels, the opportunity cost of making batteries is higher. This simply reflects the fact that Meridian is now better at making solar panels, so when resources are allocated to the other sector, they must give up more solar panels.

12.

a)



b) In moving from scenarios A to B, the output of gold increases by 1 (= 1 − 0) kg while silver production decreases by 10 (= 20 − 30) kgs. Therefore, a new kg of gold has an opportunity cost of 10 kgs of silver.

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When moving from scenarios B to C, gold production continues to rise by 1 (= 2 − 1) kg while silver production declines by another 10 (= 10 − 20) kgs. Therefore, a new kg of gold still has an opportunity cost of 10 kgs of silver.
From scenarios C to D, gold production keeps rising by 1 (= 3 − 2) kg while silver output decreases by 10 (= 0 − 10) kgs. This means a new kg of gold still has an opportunity cost of 10 kgs of silver.

c) The answers in part b do not illustrate the law of increasing opportunity costs. Because the production possibilities curve is a straight line rather than a curve bowed away from the origin, the opportunity cost of gold is constant at 10 kgs of silver.

d) When plotted on the graph**,** scenario E is within the production possibilities curve. Therefore, Zenith's resources are sufficient to attain it, and this output combination is feasible.

e) When plotted on the graph, scenario F is outside the production possibilities curve. Zenith's resources are therefore insufficient to reach it. and this output combination is unattainable.

13.

a) The most stable culture is likely to be found in the country with the largest traditional sector (Country B), since a traditional sector tends to promote stability.
The most equal distribution of income is likely to be found in the country with the largest public sector (Country C), since one of the main functions of government is to redistribute income.
The greatest economic freedom is likely to be found in the country with the largest private sector (Country A), since private markets provide individuals with the liberty to pursue their own self-interest.

b) With a larger private sector, Country B will move up and to the left as it becomes more like a pure market economy. With a larger public sector, Country C will move up and to the right as it becomes more like a pure command economy.

14.

a) In moving from points *a* to *b*, the output of industrial robots increases by 2 (= 2 − 0) while ice-cream soda production decreases by 5,000 (= 45,000 − 50,000). Therefore, the two new industrial robots each have an opportunity cost of 2,500 (= 5,000 / 2) ice-cream sodas.
In moving from points *b* to *c*, the production of industrial robots continues to rise by 2 (= 4 − 2) while ice-cream soda output declines by 10,000 (= 35,000 − 45,000) sodas. Therefore, the two new industrial robots each have an opportunity cost of 5,000 (= 10,000 / 2) sodas.
In moving from point *e* to point *d*, the output of ice-cream sodas increases by 20,000 (= 20,000 − 0) while industrial robot production decreases by 2 (= 6 − 8). Therefore, the 20,000 new sodas each have an opportunity cost of 0.0001 = 2 / 20,000 industrial robots.
In moving from points *d* to *c*, the output of ice-cream sodas increases by 15,000 (= 35,000 − 20,000) while industrial robot production decreases by 2 (= 4 − 6). Therefore, the

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15,000 new sodas each have an opportunity cost of 0.00013 = 2 / 15,000 industrial robots. Yes, these answers illustrate the law of increasing opportunity costs.
As the production of industrial robots increases (from a to b and from b to c) so does the opportunity cost of the new robots produced, and when the production of ice-cream sodas increases (from points *e* to *d* and from points *d* to *c*) so does the opportunity cost of the new sodas produced.

b) The technological improvement in the assembly of industrial robots would cause the production possibilities curve to rotate rightward, with the horizontal intercept shifting outward but the vertical intercept staying constant. This shows that the economy's potential output of robots has increased while the potential output of sodas has stayed the same.

c) If this economy produces more industrial robots, which are capital goods, then the economy will increase its amount of available resources and therefore shift out its future production possibilities curve, with both the vertical and horizontal intercepts increasing. This shows that the economy's future potential output of both sodas and industrial robots will increase.

15. Because households cannot keep any income above $60,000, those that could earn more by supplying their resources are unlikely to do so, reducing the overall amount of resources available to the economy.

16.

a)

Year	Inflation (%)	Unemployment (%)	Misery Index	Above, below, or at the average?	Year	Inflation (%)	Unemployment (%)	Misery Index	Above, below or at the average?
2005	2.2	6.8	[*9.0*]	[*equal*]	2015	1.1	6.9	[*8.0*]	[*below*]
2006	2.0	6.3	[*8.3*]	[*below*]	2016	1.4	7.0	[*8.4*]	[*below*]
2007	2.2	6.0	[*8.2*]	[*below*]	2017	1.6	6.3	[*7.9*]	[*below*]
2008	2.3	6.1	[*8.4*]	[*below*]	2018	2.3	5.8	[*8.1*]	[*below*]
2009	0.3	8.3	[*8.6*]	[*below*]	2019	1.9	5.7	[*7.6*]	[*below*]
2010	1.8	8.1	[*9.9*]	[*above*]	2020	0.7	9.7	[*10.4*]	[*above*]
2011	2.9	7.5	[*10.4*]	[*above*]	2021	3.4	7.5	[*10.9*]	[*above*]
2012	1.5	7.3	[*8.8*]	[*below*]	2022	6.8	5.3	[*12.1*]	[*above*]
2013	0.9	7.1	[*8.0*]	[*below*]	2023	3.9	5.4	[*9.3*]	[*above*]
2014	2.0	6.9	[*8.9*]	[*below*]	2024	2.4	6.3	[*8.7*]	[*below*]

b) The average value during the years from 2005 to 2024 was 9.0%. The misery index was below the average from 2006 to 2009 and then again from 2012 to 2019 and in 2024. It

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was above the average in 2010 and 2011 and then again from 2020 to 2023. It was the same as the average in 2005.

c) The misery index is an indicator of the distress to Canadians caused by both inflation and unemployment. In this index, the inflation rate and the unemployment rate are each given the same weighting. Not everyone would agree with this weighting. For example, it could be argued that a percentage point of unemployment causes more hardship and distress that a percentage point of inflation.

Advancing Economic Thought Problems

1. As workers become more specialized, repetition helps them perform tasks more efficiently and without a break from one task to another. Hence, the same number of workers in a pin-making factory will be able to produce a greater output if they perform separate rather than similar tasks.
2.
   a) The exorbitant profits made in the production of Good W cause the invisible hand of competition to operate by enticing new entrepreneurs to enter the market. As they do, they push up the amount of Good W offered to consumers and push down the price. Price keeps falling until all suppliers in the market make only a moderate profit. In this case, the selfish actions of entrepreneurs hoping to make excess profits ensure that, over time, excess profits are eradicated.
   b) By taking advantage of the cost-savings associated with the new innovation, businesses that produce Good X now make higher-than-normal profits. This causes the invisible hand of competition to operate, through the appearance of new entrepreneurs in the market for Good X. The result is a rise in the amount supplied for this good, pushing down its price until all businesses producing this good are earning moderate profits. The selfishness of entrepreneurs seeking out excess profits causes price to fall to match the reduction in business costs.
   c) With the free flow of goods between countries A and B, some businesses in each country now find they can underprice competitors in the other country's market. As trade occurs between the two countries, prices of affected goods fall. Due to the self-interested behaviour of profit-seeking business-owners, consumers in both countries can buy certain goods more cheaply than they could before.
3.
   a) It is because hungry stadium-goers have no choice but to purchase food from the catering company that the company can charge prices greater than those charged on comparable food outside the stadium.
   b) The corporations may try to cooperate with one another to set Good Y's price above what it would be in a fully competitive market. The absence of full competition in this market could therefore lead to the self-interested actions of the corporations' managers harming the interests of the consumer.
   c) It is impossible for Good Z to be made by workers who are not members of the union. As a result, of the new union contract, wage costs for all firms producing the good rise, which

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pushes up Good Z's price. The lack of competition between unionized and nonunionized workers in this labour market means that the self-interested actions of union members harm the interests of the consumer.

In-class Activities

1. Introductory Information

-2-2	http://ezto-demo.n

Time:
a minimum of 30 minutes to complete all the parts of the simulation. Parts A, B, and C each have a 3-minute time limit.

Materials:
toothpicks,
several packages of small marshmallows,
several packages of large marshmallows.

Division of Students:
Divide the class evenly into three teams (A, B, C). Push the desks together creating three long tables. Have each team sit at their respective table. You can have as many students participate as you like.

Key Concepts Covered:
circular flow diagram
division of labour
economic efficiency
economic problem
economics
law of increasing opportunity costs
opportunity cost
product markets
production possibilities curve
resource markets

Learning Objectives:
Part A:
- Analyze and apply the concepts of economic efficiency and the division of labour.
- Participate in and examine a simulated mini-economy, while gaining insights into how this economy can incorporate product markets, resource markets and the circular flow diagram.

Part B:
- Identify and evaluate specific examples of opportunity cost.
- Understand and apply the economic problem and the definition of economics to concrete

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examples.

Part C:

- Explain and evaluate the effects of technology on the production possibilities curve as depicted by an outward shift in the curve.
- Create and evaluate a production possibilities curve based on hands-on experience.
- Apply the law of increasing opportunity costs.

2. Part A Exercise

-2-2

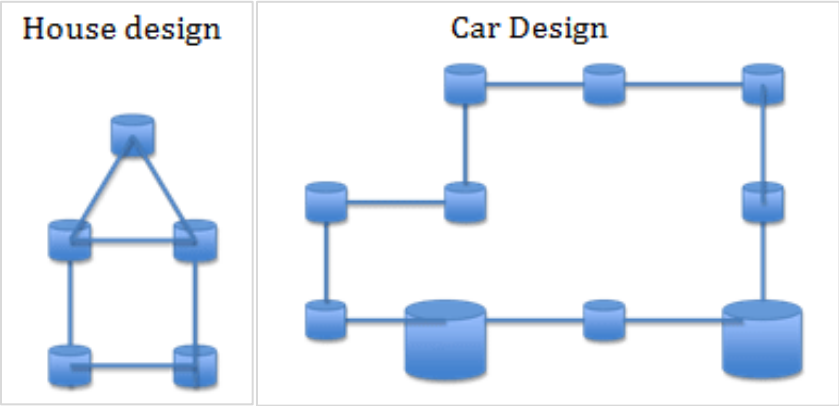
Recall that the class has been divided evenly into three teams (A, B, and C), and that each team is sitting at their respective tables.

Team A: makes only houses out of toothpicks and small marshmallows using the pattern shown below.

Team B: makes only cars out of toothpicks, small marshmallows, and large marshmallows using the pattern shown below.

Team C: observes the other two teams to count, and keep track of, the number of each product that is made by each team.

Timekeeper: the students will be given three minutes to make as many units of their product as they can.



Were more houses or cars produced?

The number of houses made by team A was [*fill in appropriate value*], and the number of cars made by team B was [*fill in appropriate value*].

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Were some students faster than the other students at putting the models together? How could production have been more efficient?

Explanation:

Count the number of units of each product that were made during the allotted time. More houses than cars should have been produced because houses are easier to build, using the given patterns.

Some students will have been faster at putting the models together than others. Because not all people are created equal some will be more efficient at this task than others.

Some ways the teams could have been more efficient is by having the fastest students assigned to build models, or by breaking the model building process down into smaller tasks like a production line.

Follow-up areas of learning:

- Discuss the division of labour and its role in production.
- Introduce product markets and resource markets.
- Refer to the circular flow diagram by looking at what would be needed to make this a complete mini-economy including both households and businesses.

3. Part B Exercise

-2-2

Teams A and B merge as one company, called AB, that serves a town. This town has 50% more families than there are students in the room. Each family must have at least one house and one car produced by the company AB. Coincidentally the total number of cars and houses demanded by this town is approximately double the number produced in Part A.

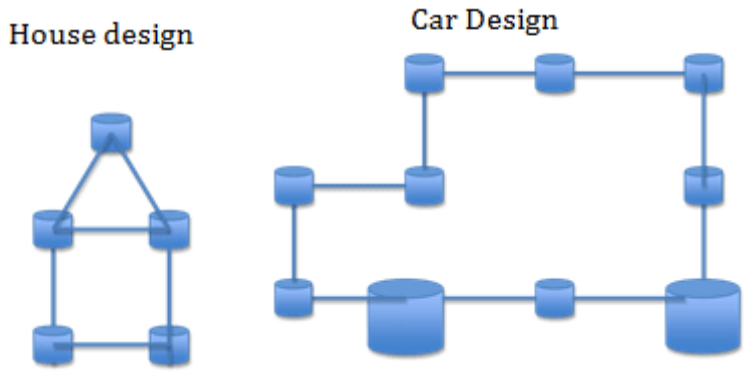
Team A and Team B, now company AB: All members of AB will make houses or cars out of toothpicks and marshmallows using the patterns below (same patterns as in Part A). Teams A and B will decide together which of their members will make cars, houses, or some of both products. The goal is to make approximately double the number of houses and cars that were produced in Part A. Company AB must find the best way to reach that goal.

Team C: observes the other two teams to count, and keep track of, the number of each product that is made.

Timekeeper: the students will be given three minutes to make as many units of their product as they can.

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Were more houses or cars produced than in Part A?

The number of houses made by team A was [*fill in appropriate value*], and the number of cars made by team B was [*fill in appropriate value*].

Were more students producing houses or cars?

More students were producing [*cars*; houses*] because

cars take longer to make than houses.*
houses take longer to make than cars.
more families want a car.
more families want a house.

Explanation:

It should have already been discovered from Part A that it takes longer to make cars than houses. Teams A and B, or company AB, should assign their fastest workers to produce cars. They should also assign more workers to produce cars than houses, or eventually some students will have to switch to making cars in order to obtain an identical number of units of both products.

Follow-up areas of learning:

- Reiterate the concepts of division of labour and economic efficiency.
- Discuss the scarcity of economic resources, the unlimited nature of wants and needs, and the way these two concepts merge to create the economic problem.

4. Part C Exercise

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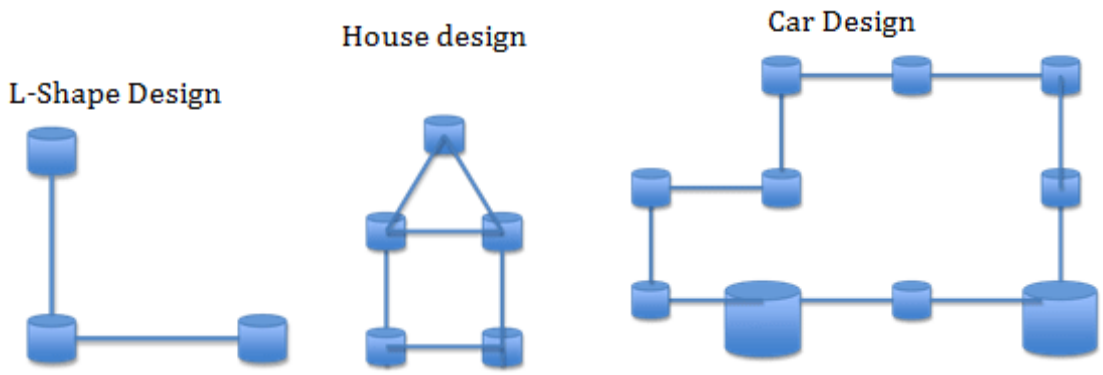
-2-2

Teams A and B continue as one company, called AB, that serves a town with 50% more families as there are students in the room. And, as in Part B, the total number of cars and houses demanded by this town is approximately double the number produced in Part A.

Team A and Team B, now company AB: Like in Part B, all members of AB will make houses or cars out of toothpicks and marshmallows using the patterns below (same patterns as in Part A). The goal is to make approximately double the number of houses and cars that were produced in Part A.

Team C: becomes Team Technology. Team Technology builds L-shaped pieces as shown below. These pieces can, and should, then be used by company AB to build cars and houses using the same patterns as in Part A.

Timekeeper: the students will be given three minutes to make as many units of their product as they can.



Were more houses and cars produced than were produced in Parts A and B?

The number of houses made by team A was [*fill in appropriate number*] and the number of cars made by team B was [*fill in appropriate numbe*r].

How does Part C provide evidence of an outward shift in the economy's production possibilities curve?

AB was able to produce more houses.

AB was able to produce more cars.

There was an increase in the production of both houses and cars after the addition of technology.*

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There was a decrease in the production of both houses and cars after the addition of technology.

Explanation:

The production of both houses and cars should be greater in Part C than in Parts A or B. The simulation in Part C provides evidence for an outward shift in the economy's production possibilities curve as shown by the increase in the production of both cars and houses with the addition of technology.

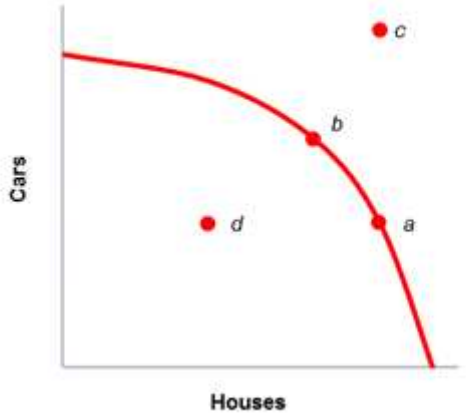
Follow-up areas of learning:

- Discuss points of less than full production inside the production possibilities curve and the unattainable points outside the curve.

5. Discussion Questions

-2-2

1. a. Based on the pair of total output combinations achieved in Parts A and B, identify the points on the production possibilities curve for cars and houses shown below.



Point *a* shows

the number of houses and cars produced in Part A.*

the number of houses and cars produced in Part B.

the number of houses and cars produced in Part C.

none of the results shown in Parts A, B or C.

the number of houses produced in part A and the number of cars produced in Part B.

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Point *b* shows

the number of houses and cars produced in Part A.
the number of houses and cars produced in Part B.*
the number of houses and cars produced in Part C.
none of the results shown in Parts A, B or C.
the number of houses produced in Part A and the number of cars produced in Part C.

Point *c* shows

the number of houses and cars produced in Part A.
the number of houses and cars produced in Part B.
the number of houses and cars produced in Part C.*
none of the results shown in Parts A, B or C.
the number of houses produced in Part B and the number of cars produced in Part C.

b. Explain how the shape of the curve in the graph above is affected by the law of increasing opportunity cost in terms of cars given up to achieve greater production of houses.

Houses do not have to be given up to obtain more cars.
More and more cars must be given up to obtain more houses.*
Fewer and fewer cars must be given up to obtain more houses.
Cars do not have to be given up to obtain more houses.

2. a. Using the production possibilities curve above, a point of less than full production is [*a; b; c; d**] and an unattainable point is [*a; b; c**; *d*].

b. Referring to the production possibilities curve above, the opportunity cost of cars in terms of houses given up can be described as:

the decrease in the production of houses on the horizontal axis when producing one more house.
the decrease in the production of cars on the vertical axis when producing one more house.
the decrease in the production of houses on the horizontal axis when producing one more car.*
the decrease in the production of cars on the vertical axis when producing one more car.

c. What caused your production possibilities curve to shift outwards in the simulation in Part C?

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An increase in supply.

The addition of a new product.

A reduction in demand.

The addition of technology.

3. What was the impact of technology on the production of cars and houses?

There was no change in production.

There was greater production of houses but not cars.

There was greater production of both cars and houses.*

There was greater production of cars but not houses.

4. Referring to the simulation in Part B, explain the key role of scarcity in the economic problem.

There were sufficient labour resources, but not other resources to produce houses and cars.

Wants of the town's inhabitants were scarce, but resources to produce houses and cars were unlimited.

Both the wants of the town's inhabitants and resources to produce houses and cars were scarce.

Resources to produce houses and cars were scarce but wants were unlimited.*

Explanation:

1.

a) The production possibilities curve passes through points *a* and *b*. At point *a,* more houses are produced as shown by the point's horizontal intercept than cars as shown by the point's vertical intercept. It therefore corresponds to the result in Part A. At point *b*, an identical number of houses and cars are produced, corresponding to Part B. At point c, more houses and cars are produced than at point *b*, corresponding to Part C.
b) The production possibilities curve in the graph, which is bowed outward from the origin, reflects the increasing opportunity cost of houses as more of them of produced. The further to the up one moves to the right along the horizontal axis, the decrease on the vertical axis needed to move a given length on the horizontal axis continues to rise, showing that more cars must be given up to produce each extra house.

2.

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a) The point *d* represents less than full production because given the initial technology and supply of resources because one could produce more of both houses and cars, thereby moving upwards and to the right towards the production possibilities curve. The point *c* is unattainable given the initial technology and supply of resources because it lies outside the production possibilities curve.
b) The opportunity cost of houses in terms of cars is represented on the graph by the decrease in the production of houses (i.e., leftward movement on the horizontal axis) when producing one more car (i.e., the upward movement along the vertical axis).
c) In Part C, the addition of technology increased the production of both cars and houses, shifting the production possibilities curve out to the right.

3. The impact of technology in Part C was to allow for an increase in the production of both houses and cars, as shown by the movement from points *a* to *c*.

4. In Part B, it was necessary to employ scarce resources − in particular scarce labour − as efficiently as possible to meet the wants of the town's inhabitants.

6. Multiple Choice Questions

1. The possible output combinations of houses and cars expressed as a graph is called a(n)
   a) opportunity cost curve.
   b) decreasing opportunity cost curve.
   c) full production curve.
   d) production possibilities curve.*
   e) increasing opportunity cost curve.

2. If several cars are being given up to produce an extra house, then the opportunity cost of this extra house is:
   a) impossible to determine.
   b) the number of houses given up to produce an extra car.
   c) the fraction found by dividing 1 by the number of houses sacrificed to produce an extra car.
   d) the fraction found by dividing 1 by the number of cars sacrificed to produce the extra house.
   e) the number of cars given up to produce the house.*

3. The fact that the production possibilities curve for cars and houses is bowed outward from the origin illustrates
   a) the point of economic growth.
   b) the point of economic efficiency.
   c) the law of demand.

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d) the law of increasing opportunity costs.*
e) the law of decreasing opportunity costs.

4. In the circular flow diagram, the markets for cars and houses would be considered
   a) resource markets.
   b) business markets.
   c) traditional markets.
   d) household markets.
   e) product markets.*

5. The economic system represented in this set of simulations is best described as a
   a) traditional mixed economy.
   b) traditional economy.
   c) market economy.*
   d) command economy.
   e) modern mixed economy.

Explanation:

1. This graph of possible output combinations of the two products is called a production possibilities curve.
2. Because the opportunity cost of one product is the number of units of another product that must be sacrificed to gain an extra unit of this product, the opportunity cost of this extra house is the number of cars given up to produce the house.
3. This bowed shape illustrates the law of increasing opportunity costs because it depends on the fact that resources are not perfectly transferable between cars and houses.
4. In the circular flow diagram, the markets for cars and houses would be considered product markets.
5. The economic system represented in this set of simulations is best described as a market economy.

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