

Problem 1 (Ch. 12)

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Productivity: the amount of goods and services a worker can produce per hour.

(a) Complete the table below.

Year	Physical Capital (Looms)	Labor Force (Workers)	Physical Capital per Worker (Looms)	Labor Hours (Hours)	Output (Garments)	Labor Productivity (Garments per hour of labor)
2026	40	20	<input type="text"/>	1,000	6,000	<input type="text"/>
2027	120	40	<input type="text"/>	1,400	12,600	<input type="text"/>

(b) A(n) [*increase or decrease*] in physical capital per worker is associated with a(n) [*increase or decrease*] in labor productivity from.

(c) Which of the following policies would lead to greater productivity in the weaving industry?

- Sharply increasing the interest rate on student loans to people pursuing advanced degrees in weaving
- Encouraging saving by allowing workers to set aside a portion of their earnings in tax-free retirement accounts
- Imposing restrictions on foreign ownership of domestic capital
- Imposing a tax on looms

Problem 1 Answers

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2026 40 capital with 20 workers means each worker has 2 capital to work with. It takes 1000 labor hours to create 6000 garments, so that's $6000/1000 = 6$ garments per hour of labor.

2027 120 capital with 40 workers means each worker has 3 capital to work with. It takes 1400 labor hours to create 12600 garments, so that's $12600/1400 = 9$ garments per hour of labor.

Physical Capital per Worker (Looms)		Labor Productivity (Garments per hour of labor)	
2	✓	6	✓
3	✓	9	✓

There is an *increase* in physical capital per worker and an *increase* in labor productivity.

Productivity is determined by

- Human capital per worker (e.g. health and education)
- Natural resources per worker
- Physical capital per worker
- Technological knowledge

Encouraging saving will expand the pool of savings available for investment in physical capital.

Problem 2 (Ch. 13)

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GDP in this closed-economy country is \$900 million. Find consumption. (Recall: $GDP = C + I + G + XM$. A closed economy means $XM = 0$.)

National Income Account	Value <i>(Millions of dollars)</i>
Government Purchases (G)	250
Taxes minus Transfer Payments (T)	325
Consumption (C)	<input type="text"/>
Investment (I)	275

- **Private saving** is defined as $Y - T - C$.
- **Public saving** is defined as $T - G$.
- **National saving**, denoted S , is defined as $S = Y - C - G$. Notice that national saving is private saving plus public saving:

$$(Y - T - C) + (T - G) = Y - C - G = S.$$

Find each type of saving. Is the government running a budget surplus or deficit?

Problem 2 Answers

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Consumption

Because $Y = C + I + G$ in a closed economy, it follows that $C = Y - I - G$.
Therefore,

$$C = 900 - 275 - 250 = 375.$$

Private Saving $Y - T - C = 900 - 325 - 375 = 200$

Public Saving $T - G = 325 - 250 = 75$

National Saving $Y - C - G = 900 - 375 - 250 = 275$

Notice that in a closed economy, we can also write $I = Y - C - G$. Therefore, in a closed economy, it is always the case that $S = I$. (This is an *accounting identity*.)

Public saving is positive, so the government is running a *budget surplus*.

Problem 3 (Ch. 14)

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OMG YOU WON TEH LOTTERY!!!!11 Yeah, um, you can receive the money either

- as a lump sum – you receive \$2,850 today, or
 - you get \$1,000 today, \$1,000 a year from today, and \$1,000 two years from today.
- (a) The interest rate is 5% per year. Assuming you want the option that gives you the most purchasing power, would you rather take the lump sum or the payments over time?
- (b) What about if the interest rate is 8% per year?

Problem 3 Answers

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At 5% Interest Rate

- The present value of \$1,000 received one year from now is $\$1000/1.05 = \952.38 .
- Present value of \$1,000 received two years from now is $\$1000/(1.05^2) = \907.03 .
- Therefore the three payments discounted at an interest rate of 5% is

$$\$1000 + \$952.38 + \$907.03 = \$2859.41.$$

- This is more than the lump sum of \$2850, so better off taking the three payments.

At 8% Interest Rate

- The present value of \$1,000 received one year from now is $\$1000/1.08 = \925.93 .
- Present value of \$1,000 received two years from now is $\$1000/(1.08^2) = \857.34 .
- Therefore the three payments discounted at an interest rate of 8% is

$$\$1000 + \$925.93 + \$857.34 = \$2783.26.$$

- This is less than the lump sum of \$2850, so better off taking the lump sum.

Future Value, Present Value, and Discounting

Future Value

- Suppose you have the choice of receiving \$100 today or \$105 tomorrow. Which would give you more purchasing power? *It depends on the interest rate.*
- Suppose the interest rate is 2%. Then you could accept \$100 today, invest it for a year at 2%, and have \$102 one year from now—this is the **future value** of the \$100. But you would have been better off just accepting the second option of \$105 one year from now.
- Suppose the interest rate is 10%. Then you could accept \$100 today, invest it for a year at 10%, and have \$110 one year from now—again, this is the future value. This is more than the \$105 you'd have received if you'd chosen the second option.

Present Value

Instead of figuring out what \$100 is worth one year from now, we can figure out what amount of money today is equivalent to \$100 one year from now—this is called **discounting**. Solve

$$\text{\$}x \times (1 + r) = \$100 \implies \text{\$}x = \frac{\$100}{1 + r},$$

where r is the interest rate. This gives the **present value** of \$100 one year from now. We can apply the same logic to any number of years. For instance, \$100 ten years from now is today worth

$$\text{\$}x \times (1 + r)^{10} = \$100 \implies \text{\$}x = \frac{\$100}{(1 + r)^{10}}$$