ЧЕТВРТА МАКЕДОНСКА ЕКОНОМСКА ОЛИМПИЈАДА МЕО 2026

FOURTH MACEDONIAN ECONOMICS OLYMPIAD

30.04.2026

Time limit 150 minutes!

Check the correct answer or fill in the blanks to make it correct.

1.(4) Which of these sequences best captures the liquidity continuum?

a) Checking accounts, precious metal, real estate, share of stock

b) Checking accounts, precious metal, share of stock, real estate

c) Checking accounts, share of stock, real estate, precious metal

d) Checking accounts, share of stock, precious metal, real estate

Explanation: Liquidity refers to how quickly and easily an asset can be converted into cash without a significant loss in value. This sequence captures the liquidity continuum from most liquid to least liquid.

2.(4) A method of financing the government budget deficit is not:

a) a loan from the Central Bank

b) a loan from commercial banks

c) a loan from the Ministry of Finance

d) an open market operations by the Central Bank

Explanation: Deficit financing involves obtaining funds from external sources or creating new money to cover a shortfall in revenue.

3.(4) Which of the following is not a reason why an unexpected episode of inflation is harmful to an economy?

a) It wipes out the value of people's savings

b) It redistributes wealth from debtors to creditors

c) It hurts people on fixed incomes, such as retired people who receive non-indexed pensions

d) It creates menu costs

Explanation: In the event of unexpected (unanticipated) inflation, the real value of money decreases faster than lenders or borrowers expected. This redistributes wealth from creditors (lenders) to debtors (borrowers), not the other way around.

4.(4) Which of the following represents a combination of different factors of production in the classical economy (not taking entrepreneurship in account), without repeating the same factor?

a) oil, oil worker, owner of an oil company, gas

b) carpenter, bus, field, farm owner

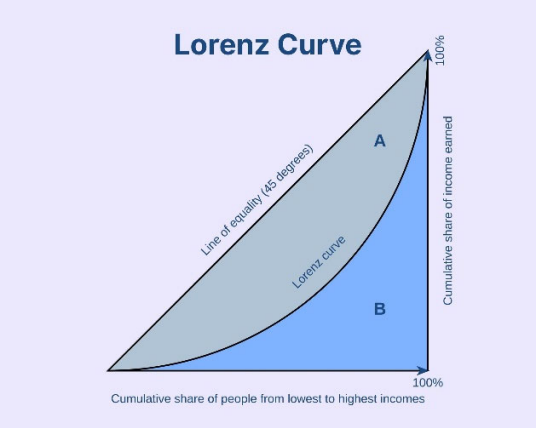
c) banker, computer, money

d) river, sailor, ship

Explanation: This option represents a unique combination of distinct factors of production without repetition: labour (human effort), land (natural resources), goods used for production. In the neoclassical synthesis, some authors add a fourth factor, in the first half of the 20th century, entrepreneurship. But in markets, entrepreneurs combine the other factors of production, land, labor, and capital, to make a profit.

5.(4) Balance of payments represents a systematic recording of the results of all economic transactions between the residents of a given country and the rest of the world over a specific period of time.

6.(5) The greater the inequality in income distribution, the further the Lorenz curve is from the line of equality and the higher the value of the Gini coefficient.



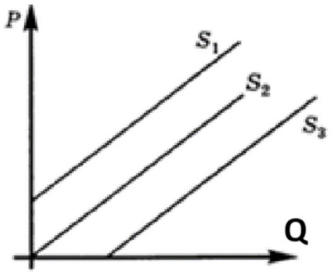
Explanation: The Lorenz curve compares actual income distribution with perfect equality. If income distribution becomes more unequal, the Lorenz curve moves further away from the 45-degree line of perfect equality, and the Gini coefficient rises.

7.(4) Which of the following statements about the price elasticity of supply curves S_1, S_2 and S_3 is correct?

a) Supply curves S_1, S_2 and S_3 are price elastic

b) Supply curves S_1, S_2 and S_3 are not price elastic

c) Curve S_1 is price elastic, curve S_2 has unitary elasticity, and curve S_3 is price inelastic



d) It is impossible to assess the elasticity of supply curves S_1, S_2 and S_3 because there is no data to calculate price elasticity

Explanation: For a straight-line supply curve drawn with price on the vertical axis and quantity on the horizontal axis, elasticity depends on where the curve intercepts the axes. A supply curve passing through the origin has unitary elasticity. A supply curve that intercepts the price axis above the origin is elastic, while a curve that intercepts the quantity axis is inelastic. In the diagram, S1 is elastic, S2 passes through the origin and has unitary elasticity, and S3 is inelastic.

In the following questions, check and then explain the correct answer. Both parts of the question are scored separately.

8.(2+3) If a bond sells at a high premium, then which of the following relationships hold true? (P_0 represents the price of a bond and YTM is the bond's yield to maturity.)

a) P_0 < par (face value) and YTM > the coupon rate

b) P_0 > par (face value) and YTM > the coupon rate

c) P_0 > par (face value) and YTM < the coupon rate

d) P_0 < par (face value) and YTM < the coupon rate

Explanation: A bond sells at a premium when its price is above its face value ($P_0 >$ par). This occurs because the bond's coupon rate is higher than the market's required yield (YTM), making the bond more valuable to investors. Since the bond pays more interest than comparable bonds in the market, buyers are willing to pay extra, which reduces the effective yield (YTM) below the coupon rate. Therefore, for a bond sold at a high premium, $P_0 >$ par and YTM < coupon rate.

9. (2+4) In a hypothetical economy, the consumption function is $C = 40 + 0.9Y_d$ where Y_d is disposable personal income. If government purchases increase by 10, everything else equal, then the equilibrium GDP:

a) will increase by 9

b) will increase by 100

c) will decrease by 9

d) will decrease by 100

Explanation. In this economy, the consumption function is given by $C = 40 + 0.9Y_d$, where Y_d is disposable income. The marginal propensity to consume (MPC) is therefore 0.9. When government purchases increase by 10 units, the equilibrium GDP will change according to the spending multiplier. The spending multiplier is calculated as $1/(1-MPC) = 1/(1-0.9) = 10$. Using the multiplier, the total change in GDP is $\Delta Y = \text{Multiplier} \times \Delta G = 10 \times 10 = 100$. Thus, the increase in government spending leads to a rise in equilibrium GDP by 100 units.

10.(2+4) Which of the following statements about the inflation tax is not true?

a) The rate of the inflation tax is represented by the rate of inflation

b) The recipients of the inflation tax are commercial banks

c) The size of the inflation tax is greater the larger the amount of money the public holds in cash

d) The recipient of the inflation tax is the issuer of additional money, i.e., the government

Explanation. Inflation tax is a term for the loss in purchasing power that people experience when the government creates new money, leading to rising prices. The rate of the tax corresponds to the rate of inflation and the total size of the tax is larger when people hold more money. The beneficiary of this tax is the government, which gains the real value of newly issued money. It is not received by commercial banks.

Show the complete solution procedure and explain in detail.

11.(10) Jordan is thinking about buying a corporate bond from Beta Corp through his broker. The bond has a face value of $1000 and promises to pay an annual coupon of 10%, with coupons distributed semiannually. The bond will mature in 8 years. Currently, the bond is selling on the secondary market for $1100. Recently, interest rates in the economy have risen, and Jordan now requires a 14% annual return on bonds with similar risk. He wants to determine at what price he would value this bond and whether he should buy it at the current market price of $1100.

Solution. Jordan is considering a corporate bond with a face value of $1,000 that pays a 10% annual coupon, distributed semiannually, and matures in 8 years. With interest rates rising, he now requires a 14% annual return. Total present bond value (coupons plus face value) for 14% annual return with similar risk equals to:

$$P = \frac{C}{m}\cdot(r^{-1}+r^{-2}+\ldots+r^{-nm})+Nr^{-nm} = \frac{C}{m}\cdot\frac{r^{nm}-1}{r^{nm}(r-1)}+Nr^{-nm} =$$
$$= \frac{100}{2}\cdot\frac{1.07^{16}-1}{1.07^{16}(1.07-1)}+1000\cdot 1.07^{-16} = 472{,}33+338.73 = 811.06 \quad \ldots \textbf{(8)}$$

Since this is below the current market price of $1,100, the bond is overpriced relative to his required return, and he should not buy it at the market price. …**(2)**

12.(10) On the market for chocolate bars there are three groups of buyers with the following demand curves. The first group has a demand curve $P_1 = 5 - 0.25Q$, the second group has a demand curve $P_2 = 10 - 0.5Q$ and the third group has a demand curve $P_3 = 8 - 0.5Q$. The total market supply of chocolate bars is given by $Q_s = 4P$. The government has introduced a tax of 4 per unit on producers. Determine how the quantity of bars sold changes and by how much.

Solution. To determine the effect of a 4 per unit tax on the chocolate bar market, we first derive the total market demand by summing the individual demand curves of the three buyer groups. Converting each price equation into quantity form gives $Q_1 = 20 - 4P$, $Q_2 = 20 - 2P$, and $Q_3 = 16 - 2P$. Summing these yields the total market demand curve $Q_D = Q_1 + Q_2 + Q_3 = 56 - 8P.$

The market supply is given as $Q_S = 4P$. **...(3)** Before the tax, equilibrium occurred where $4P = 56 - 8P$, yielding $P \approx 4.667$ and $Q \approx 18.667$. **...(1)** Introducing a per-unit tax of 4 shifts the supply curve leftward, since the price received by producers is the consumer price minus the tax, giving $Q_S = 4(P-4) = 4P - 16$. Setting the post-tax supply equal to market demand, $56 - 8P = 4P - 16$, and solving for the consumer price gives $P_c = 6$. **...(3)** The quantity sold at this price is determined from either the demand or adjusted supply curve, resulting in $Q = 8$. Comparing the two equilibria shows that the tax reduces the quantity of chocolate bars sold by approximately 10.667 units, illustrating the substantial contraction in market activity caused by the tax.....**(2)**

But it is closer to practice if we notice that for $P_c = 6$, the first group with $Q_1 = 20 - 4P$ is no longer active. The total demand is gained by groups 2 and 3, and far more realistic scenario is $Q_D = Q_2 + Q_3 = 36 - 4P$. In this case the equilibrium is set at $36 - 4P = 4P - 16 \Leftrightarrow P_c = 6,5$ and $Q = 36 - 4 \cdot 6,5 = 10$. Hereby the quantity is reduced by 8,667 units. ...**(1)**

13.(10) A unit of labor in Country A can produce 10 units of good X or 8 units of good Y, while in Country B a unit of labor can produce 24 units of good X or 30 units of good Y. Assume that Country A has 400 units of labor and Country B has 1000 units of labor.

Determine:

a) The opportunity cost of producing good X in each country.

b) The equation of the production possibility curve (PPC) for each country.

c) What the production possibility curve would look like if the countries decide to combine their resources.

d) The production quantities of X and Y at the point of full specialization.

Solution. Country A can produce 10 units of good X or 8 units of good Y per unit of labor, while Country B can produce 24 units of good X or 30 units of good Y per unit of labor.

a) The opportunity cost of producing 1 unit of X is the amount of Y lost. For Country A, $OC_X^A = \frac{8}{10} = 0.8$ units of Y per unit of X. For Country B, $OC_X^B = \frac{30}{24} = 1.25$ units of Y per unit of X. **...(2)**

b) The production possibility curve (PPC) shows the maximum combinations of X and Y. For Country A, with 400 units of labor, maximum output is $X_{\max} = 400 \cdot 10 = 4000$ and

$Y_{\max} = 400 \cdot 8 = 3200$, giving the PPC equation $Y = 3200 - 0.8X$, $0 \le X \le 4000$. For Country B, ith 1000 units of labor, $X_{\max} = 1000 \cdot 24 = 24000$ and $Y_{\max} = 1000 \cdot 30 = 30000$, giving $Y = 30000 - 1.25X$, $0 \le X \le 24000$. **...(4)**

c) If the countries combine resources, total maximum output is $X_{\max} = 4000 + 24000 = 28000$ and $Y_{\max} = 3200 + 30000 = 33200$. **The combined PPC would be a piecewise linear curve, reflecting the different opportunity costs of the two countries**. (Namely, $Y = 33200 - 0.8X$, $0 \le X \le 4000$ and $Y = 35000 - 1.25X$, $4000 \le X \le 28000$.)**...(2)**

d) At full specialization, each country produces only the good in which it has a comparative advantage. Country A has a lower opportunity cost for X ($0.8 < 1.25$), so it specializes in X, producing $X_A = 400 \cdot 10 = 4000$, $Y_A = 0$. Country B has a lower opportunity cost for Y ($\frac{1}{1.25} < \frac{1}{1.08}$), so it specializes in Y, producing $X_B = 0$, $Y_B = 1000 \cdot 30 = 30000$. Total production at full specialization is $X = 4000$, $Y = 30000$. **...(2)**

14.(12) The table below shows the data on the average monthly nominal wage and the Consumer Price Index (CPI) in a country for several years.

Year	**Consumer Price Index (CPI, in 2020 is 100)**	**Average Monthly Nominal Wage (currency units)**
2020	100	1200
2021	110	1350
2022	125	1600
2023	140	1850

a) Calculate the annual inflation rate for each year.

b) Calculate the overall change in the price level for the entire period.

c) Calculate the real average monthly wage for each year.

d) Calculate how the real wage changed (in %) over the entire period.

Solution. a) The annual inflation rate is calculated as

$$\text{Inflation} = \frac{\text{CPI}_t - \text{CPI}_{t-1}}{\text{CPI}_{t-1}} \cdot 100\%. \textbf{ ...(1)}$$

For 2021, $\frac{110-100}{100}\cdot 100\% = 10\%$. For 2022, $\frac{125-110}{110}\cdot 100\% \approx 13.64\%$. For 2023, $\frac{140-125}{125}\cdot 100\% = 12\%$. **...(2)**

b) The overall change in the price level from 2020 to 2023 is $\frac{140-100}{100}\cdot 100\% = 40\%$. **...(2)**

c) The real average monthly wage is calculated as $\text{Real Wage} = \frac{\text{Nominal Wage}}{\text{CPI}}\cdot 100$. **...(3)**

For 2020, $\frac{1200}{100}\cdot 100 = 1200$. For 2021, $\frac{1350}{110}\cdot 100 \approx 1227.27$. For 2022, $\frac{1600}{125}\cdot 100 = 1280$. For 2023, $\frac{1850}{140}\cdot 100 \approx 1321.43$. **...(2)**

d) The overall percentage change in real wage from 2020 to 2023 is $\frac{1321.43-1200}{1200}\cdot 100 \approx 10.12\%$, indicating that real wages increased by roughly 10.12% over the period. **...(2)**

15.(12) Singapore is home to some of the world's biggest oil processing plants, with total capacity of about 1.5 million barrels of oil per day. It plans to introduce a carbon tax, from 2019, of between SGD 10 (Singapore dollar) (US$7) and SGD 20 (US$14) per tone of greenhouse gas emissions.

Operating costs for Singapore refiners could rise by US$3.50-US$7 per barrel as a result of the tax, the government estimates. The proposed tax is the latest indication that countries in Asia, the world's biggest oil market, are moving to limit greenhouse gas emissions. China, the world's biggest emitter of greenhouse gases, was preparing to introduce a national emissions trading system in 2017. South Korea launched an emissions trading scheme in 2015, overcoming strong industry opposition. Explain and using diagram show how:

a) a carbon tax could help correct an environmental market failure

ACTIVITY 1 SKILLS REASONING, COMMUNICATION, CRITICAL THINKING

CASE STUDY: IMPOSITION OF A CARBON TAX

Singapore is home to some of the world's biggest oil processing plants, with total capacity of about 1.5 million barrels of oil per day. It plans to introduce a carbon tax, from 2019, of between SGD 10 (Singapore dollar) (US$7) and SGD 20 (US$14) per tonne of greenhouse gas emissions. Operating costs for Singapore refiners could rise by US$3.50–US$7 per barrel as a result of the tax, the government estimates.

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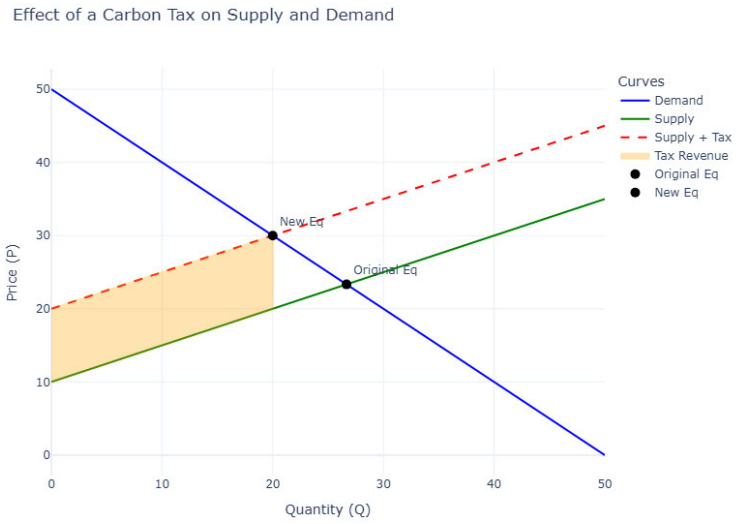
Explain, using a diagram, how:

(a) a carbon tax could help correct an environmental market failure

(b) the imposition of a carbon tax could increase market failure.

b) the imposition of a carbon tax could increase market failure.

Solution. a) A carbon tax is a government-imposed fee on the emission of greenhouse gases, intended to internalize the negative externality of pollution. In the oil refining industry, emissions impose costs on society, such as climate change and health impacts, which are not reflected in the market price of oil. This leads to a market failure, where the private market produces more than the socially optimal quantity of oil. By imposing a carbon tax, the government increases the marginal cost of production, shifting the supply curve upward by the amount of the tax. In a diagram with Price (P) on the vertical axis and Quantity (Q) on the horizontal axis, the original supply curve (S) shifts to $S + \text{Tax}$, reducing the equilibrium quantity from Q_{market} to Q_{social} and increasing the price from P_{market} to P_{social} . This reduces emissions and aligns the private cost with the social cost, correcting the market failure. **...(8)**



b) A carbon tax could also increase market failure if not implemented carefully. For instance, if the tax is set too high, it may raise production costs significantly (estimated at US$3.50–US$7 per barrel in Singapore), causing refiners to reduce output or pass costs onto consumers. This could lead to supply shortages, higher prices, and potential economic inefficiencies if the market cannot adjust smoothly. In the diagram, an excessively high tax could shift supply too far left, creating a larger gap between demand and supply, which may result in unintended consequences such as higher reliance on imports, production relocation, or black-market activities. **...(4)**