

Kyiv School of Economics
Kyiv School of Economics
Admission Exam in Mathematics
Version A

General instructions (read carefully!):

- You should NOT open the exam before your proctor says so.
- The exam has 15 problems and 8 pages. All problems will be weighted equally.
 - You have 75 minutes for this exam.
 - The answer to each problem is a number or a short expression. Write down your answers in the Answer sheet. However, please, provide, in the exam book, detailed explanations of how the answers have been attained.
 - In the case of a wrong answer, a partial credit may be given based on your explanations.
 - Please, write legibly (readably).
 - Cheating on any exam automatically invalidates all your admission tests!
 - You can use the back of any page for your draft notes.

YOUR NAME _____

Answer Sheet

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

1. Suppose a coin is flipped 5 times. What is the probability of getting at least 2 heads?

2. An urn contains 4 red marbles and 5 black marbles. Three marbles are drawn without replacement from the urn. What is the probability that all the marbles are black?

3. Evaluate the following integral

$$\int_0^{\infty} e^{-x} x^n dx \quad (n \in \{0, 1, 2, 3, \dots\})$$

4. Compute $\lim_{x \rightarrow 0} \frac{(x+1) \cos x - 1}{x}$

5. In a competitive market where the supply price (in hryvnias) is $p = 3 + 0.25q$ and the demand price (in hryvnias) is $p = 15 - 0.75q$, the government imposes a per-unit tax of 4 hryvnias. What will be the tax revenue raised?

6. Evaluate the following integral:

$$\int_1^4 \frac{(\sqrt{x}+2)^3}{\sqrt{x}} dx$$

7. Solve the following equation $x^2 - 2|x| - 3 = 0$.

8. Find the intervals where the following function is increasing:

$$y = 4x - 5 \ln(x^2 + 1).$$

9. A company uses inputs K and L to manufacture goods A and B . It has available 200 units of K and 180 units of L and the input requirements are:

10 units of K plus 30 units of L for each unit of A ,

25 units of K plus 15 units of L for each unit of B .

If the per-unit profit is 80 hryvnias for A and 30 hryvnias for B , what combination of A and B should it produce to maximize profit?

10. Let x denote the temperature in degrees Centigrade and let y denote the temperature in degrees Fahrenheit. We know that x and y are linearly related, that 0° Centigrade or 32° Fahrenheit is the freezing temperature of water and that 100° Centigrade or 212° Fahrenheit is the boiling temperature of water. Find the equation ($y = f(x)$) which relates degrees Fahrenheit to degrees Centigrade.