PEOPLES´ FRIENDSHIP UNIVERSITY OF RUSSIA NAMED AFTER PATRICE LUMUMBA

RUDN UNIVERSITY

Tests for RUDN University Open Olympiad for Foreign Citizens

MATHEMATICS (B)

Variant 1

Choose one or more correct answers in the test tasks.

Transfer the answer numbers to the answer sheet:

question	answers	question	answers
1		16	
2		17	
3		18	
4		19	
5		20	
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

1. **Which of the proposed values is the solution to the equation:**

$$4(3x-5)+7-2(6x-1)=3(2x+4)-10$$

1) $-\frac{13}{6}$
2) $\frac{6}{13}$
3) No solutions
4) 0

a. 1
b. 2
c. 3
d. 4

2. **Which of the proposed values is the solution to the equation:**

$$3x^2-4{,}5x+1{,}2=2x^2-5{,}3+0{,}7x+\frac{4}{9}x^2$$

1) $x_1 = 1, x_2 = 7$
2) $x_1 = \frac{234-3\sqrt{2834}}{50}, x_2 = \frac{234+3\sqrt{2834}}{50}$
3) $x_1 = -\frac{234+3\sqrt{2834}}{50}, x_2 = \frac{234+3\sqrt{2834}}{50}$
4) $x_1 = \frac{234-3\sqrt{2234}}{50}, x_2 = \frac{234+3\sqrt{2234}}{50}$

a. 1
b. 2
c. 3
d. 4

3. **Which of the proposed values is the solution to the equation:**

$$\frac{3x+2}{2x-5} - \frac{4x-1}{x+3} = \frac{-2{,}5x+7}{x-7}$$

1) no solutions
2) $x_1 = \frac{573+\sqrt{163801}}{226}, x_2 = \frac{573-\sqrt{163801}}{226}$
3) $x_1 = \frac{573+\sqrt{163801}}{113}, x_2 = \frac{573-\sqrt{163801}}{113}$
4) $x_1 = \frac{549+\sqrt{212809}}{226}, x_2 = \frac{549-\sqrt{212809}}{226}$

a. 1
b. 2
c. 3
d. 4

4. **Solve the equation and choose the correct answer:**

$$\log_8 2^{8x-4} = 4$$

a) $x = -2$
b) $x = 2$
c) $x = 1$
d) $x = 0$

5. **Solve the inequation and choose the correct answer:**

$$3^{x+2} + 3^{x-1} < 28$$

a) $x \leq 1$
b) $x \geq 1$
c) $x < 1$
d) $x > 1$

6. **A two-digit number was thought of. When this number was multiplied by the product of its digits, 255 was received. What number was thought of?**

a) 51
b) 15
c) 17
d) 71

7. **Alpha Company with the capital of $5,000 began investing in a promising industry in 2001. Every year since 2002, it has made a profit of 200% of the previous year's capital. And Beta Company with the capital of $10,000 began investing in another industry in 2003 and it has made an annual profit of 400% of the previous year's capital since 2004. By how many dollars was the capital of one of the companies greater than the capital of the other at the end of 2006 if the profits were not withdrawn from circulation?**
   a) 45000
   b) 60000
   c) 55000
   d) 35000

8. **Determine at what values of parameter c straight line $y = c$ has exactly one common point with the graph of the function $y = \frac{x^4-13x^2+36}{(x-3)(x+2)}$.**
   a) $c = 6, c = -4, c = -6{,}25$
   b) $c = -6, c = -4, c = -6{,}25$
   c) $c = -6, c = 4, c = -6{,}25$
   d) $c = 6, c = 4, c = 6{,}25$

9. **Find the largest value of the function $y = \ln(x+5)^5 - 5x$ on the interval [−4,5; 0] from the proposed answers,**
   a) -3
   b) 0
   c) 20
   d) $-1{,}5$

10. **Solve the equation and choose the largest negative root from the answers given:**

$$cos\frac{\pi(x-7)}{3} = \frac{1}{2}$$

   a) $x = -6$
   b) $x = -4$
   c) $x = -3$
   d) $x = -1$

11. **Find the value of the expression:**

$$\frac{8}{\sin\left(-\frac{27\pi}{4}\right)\cos\left(\frac{31\pi}{4}\right)}$$

a) -20
b) 16
c) -10
d) -16

12. **There are 26 students in the class, including two friends - Andrey and Sergey. Students are randomly divided into 2 equal groups. Which of the proposed values is the probability that Andrey and Sergey will be in the same group.**

1) $\frac{13}{26}$
2) $\frac{12}{25}$
3) $\frac{13}{25}$
4) $\frac{12}{26}$

a. 1
b. 2
c. 3
d. 4

13. **In triangle ABC, angle B is 90°, $AC = 2, sinA = \frac{\sqrt{17}}{17}$. Find BC.**

a) 2
b) 0.5
c) 4
d) 16

14. **How many times will the volume of the sphere increase if its radius is tripled?**

a) 3 times
b) 9 times
c) 27 times
d) 4 times

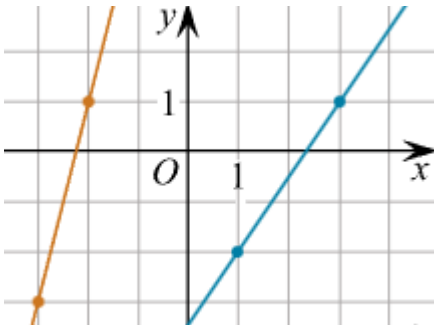
15. **2000 cm cubed of water was poured into a cylindrical vessel. The water level reaches the height of 12 cm. A part is completely immersed in the liquid. At the same time, the liquid level in the vessel rose by 9 cm. What is the volume of the part? Express your answer in cm cubed.**

a) 800 cm^3
b) 1500 cm^3
c) 1200 cm^3
d) 1500 cm^2

16. **Tangents AC and BC are drawn through the ends A, B of a 62° circular arc. Find angle ACB. Give your answer in degrees.**
    a) 100
    b) 56
    c) 118
    d) 62

17. **Straight line AD, which is perpendicular to median BM of triangle ABC, divides it in half. Find side AC if side AB is 4.**
    a) 6
    b) 10
    c) 7
    d) 8

18. **The figure shows the graphs of two linear functions. Find the ordinate of the intersection point of the graphs.**



    a) -5
    b) -11
    c) -4
    d) -7

19. **In a regular quadrangular pyramid SABCD, the side edge $SA = \sqrt{5}$, the side of the base is 2. Points B and S are equidistant from plane ADM, where M is the middle of edge SC. Find the distance from point B to plane ADM.**
    a) 1
    b) 2
    c) 4
    d) 5

20. **Find the inscribed angle subtended by an arc which is 1/5 of a circle. Give your answer in degrees.**
    a) 25
    b) 64
    c) 36
    d) 52