

A

1 The first term of a sequence is 1 and every term after the first one is 1 more than the square of the preceding term. What is the fifth term?

- A) 676
- B) 25
- C) 256
- D) 26
- E) 677

2 Which of the following is the simplified form of the expression

$$\frac{x^2 - x}{2x - 6} \cdot \frac{x^2 - 2x - 3}{x^2 - 1} \quad ?$$

- A)  $\frac{x-1}{2x-6}$
- B)  $\frac{(x+3)}{2(x-3)}$
- C)  $\frac{x^2 - 3x - 3}{2x - 7}$
- D)  $\frac{x}{2}$
- E)  $\frac{x^2 - x - 3}{-7}$

3 If the sum of all the positive integers less than 1000 is  $A$ , what is the sum of all the positive odd integers less than 1000?

- A)  $A+1$
- B)  $A-499$
- C)  $A+500$
- D)  $A-998$
- E)  $\frac{A}{2} + 999$

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4  $A(2, -3)$  and  $B(8, 5)$  are the end points of a diameter of a circle. What are the coordinates of the centre of the circle?

- A) (3,1)
- B) (5,1)
- C) (5,4)
- D) (3,4)
- E) (10,2)

5 Each integer from 1 to 50 whose units digit is 7 is written on a separate slip of paper. If the slips are placed in a box and one is picked at random, what is the probability that the number picked is prime?

- A)  $\frac{2}{5}$
- B)  $\frac{3}{5}$
- C)  $\frac{1}{5}$
- D)  $\frac{4}{5}$
- E) 1

6 Aidan is doing a multiple-choice test with 20 questions. He scores 3 marks for a correct answer and losses 1 mark if the answer is incorrect. Aidan answers all the questions and scores 40 marks. How many questions has he got right?

- A) 5
- B) 8
- C) 12
- D) 10
- E) 15

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7 Given that

$$a = \sqrt{2} \cdot 2^{\frac{3}{2}} \cdot 2^{-1} \text{ and } b = (-2\sqrt{3})^2$$

Find the result of  $b \cdot a^{-1}$

- A) 8
- B) 6
- C) 3
- D)  $2\sqrt{3}$
- E)  $\frac{\sqrt{3}}{2}$

8 Solve the equation  $\frac{12x}{x^2+4} = 3$

- A) 2
- B) 4
- C)  $\mp 2$
- D) -2
- E) 0

9  $\sum_{k=2}^{14} \prod_{k=1}^{12} \frac{k+1}{k+2}$  ?

- A) 4
- B)  $\frac{24}{7}$
- C) 2
- D) 3
- E)  $\frac{15}{7}$

10 2, 1, x, y,  $\frac{1}{8}$  are the first five members of a geometric sequence. Find x.y.

- A) 0
- B)  $\frac{1}{6}$
- C)  $\frac{1}{8}$
- D)  $\frac{1}{4}$
- E) 2

11 In a triangle OAB, C is a point which divides the side AB in the ratio 3:1. Given that  $\overrightarrow{OA} = 2a$  and  $\overrightarrow{OB} = 2b$  find an expression for  $\overrightarrow{OC}$ , in terms of  $a$  and  $b$ .

- A)  $a - 2b$
- B)  $\frac{1}{2}(a + 3b)$
- C)  $2a + 2b$
- D)  $\frac{1}{3}(4b + 2a)$
- E)  $3a - 2b$

12 A test tube whose overall length is  $h$  and whose radius is  $r$  has a hemi-spherical end. A formula for its volume is

- A)  $\pi r^2(2+h-r)$
- B)  $\pi r^2(h - \frac{1}{3}r)$
- C)  $2\pi r(r+h)$
- D)  $\pi r^2(\frac{2}{3}r+h)$
- E) None

A

13 Which of the following properties satisfied by the operation "+" that is defined on natural numbers?

- A) Closed property
- B) Associative Property
- C) Commutative property
- D) Inverse member property
- E) Identity member property

14 If  $f(x) = x^2 + \sqrt{x}$  and  $g(x) = f(4x)$

What is the value of  $g(4)$  ?

- A) 144
- B) 72
- C) 3
- D) 260
- E) 18

15 If one of the roots of the equation

$$2x^2 - (m-3)x + m + 7 = 0 \text{ is } -2,$$

find the other.

- A) 1
- B) -1
- C) -2
- D) 0
- E) 2

A

16 Find m such that the equation

$$3x^2 + 3y^2 - 6x + 9y - 13m = 0$$

determine a point.

- A)  $\frac{1}{2}$
- B)  $\frac{4}{3}$
- C) 1
- D) -2
- E)  $-\frac{3}{4}$

17 The number  $0.1\bar{6}$  correct to 4 significant figures is:

- A) 0.1667
- B) 0.1617
- C) 0.1666
- D) 0.1616
- E) 0.167

18 Given that  $\cos \theta = \frac{3}{4}$  and that  $\theta$  is reflex, find the exact value of  $\tan \theta$ .

- A)  $\frac{\sqrt{7}}{3}$
- B)  $\frac{\sqrt{7}}{4}$
- C)  $\frac{3}{\sqrt{7}}$
- D)  $-\frac{\sqrt{7}}{3}$
- E) None

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19 Line  $l$  is tangent to a circle whose centre is at  $(3,2)$ . If the point of tangency is  $(6,6)$ , what is the slope of the line  $l$ ?

- A)  $\frac{3}{4}$   
B)  $0$   
C)  $-\frac{3}{4}$   
D)  $-\frac{4}{3}$   
E)  $\frac{4}{3}$

20 Let  $x, y \in \mathbb{Z}^+$  and  $132x^2 = y^3$ .

Find  $x - y$  for the possible smallest values of  $x$  and  $y$ .

- A)  $0$   
B)  $-1$   
C)  $2$   
D)  $1$   
E)  $3$

21  $\lim_{x \rightarrow e} \frac{\ln x - 1}{x - e} = ?$

- A)  $e$   
B)  $2$   
C)  $\frac{1}{e}$   
D)  $1$   
E)  $\frac{1}{e^2}$

A

22 Five people including Ali and Veli sit A straight bench randomly. What is the probability of Ali and Veli sit side by side?

- A)  $\frac{1}{3}$   
B)  $\frac{2}{5}$   
C)  $\frac{2}{3}$   
D)  $\frac{3}{5}$   
E)  $\frac{1}{2}$

23 The matrix  $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$  is given.

Find  $A^9$ .

- A)  $\begin{bmatrix} 1 & 2^9 \\ 0 & 1 \end{bmatrix}$   
B)  $\begin{bmatrix} 1 & 18 \\ 0 & 1 \end{bmatrix}$   
C)  $\begin{bmatrix} 10 & 11 \\ 0 & 10 \end{bmatrix}$   
D)  $\begin{bmatrix} 9 & 18 \\ 0 & 9 \end{bmatrix}$   
E)  $I$

A

A

24 A quadrilateral has diagonals which bisect at right-angles. It is therefore a:

- A) rectangle
- B) trapezium
- C) rhombus
- D) parallelogram
- E) kite

25 If  $2 - 3\sqrt{x} = 7$ , What is the value of  $x$ ?

- A) 9
- B) 4
- C) 0
- D) 2
- E) There is no value of  $x$  that satisfies the equation.

26 Simplify the expression

$$\frac{1}{\log_x(xy)} + \frac{1}{\log_y(xy)}$$

- A)  $xy$
- B)  $y$
- C)  $x$
- D) 1
- E) 2

27  $\sum_{k=1}^4 (5-3k) = ?$

- A) -1
- B) 0
- C) 2
- D) 1
- E) 3

28 Given that  $\log_2 3 = t$ , express  $\log_3 12$  in terms of  $t$ .

- A)  $\frac{3+t}{t}$
- B)  $\frac{2+t}{2}$
- C)  $\frac{2+t}{t}$
- D)  $\frac{2-t}{t}$
- E)  $t-2$

29 The remainder when

$$1^7 + 2^7 + 3^7 + \dots + 18^7 + 19^7$$

is divided by 20 ?

- A) 9
- B) 18
- C) 6
- D) 16
- E) 0

30 Find the set of values of  $k$  for which

$$2x^2 + kx + 8 = 0 \text{ has no real roots.}$$

- A)  $-8 < k < 8$
- B)  $k < -8$
- C)  $-8 \leq k \leq 8$
- D)  $k > 8$
- E)  $k < -8$  or  $k > 8$

A

31 Given that  $\log_3 4 = x$  and  $81^y = 64$  find  $y$  in terms of  $x$ .

- A)  $\frac{2}{3}x$   
B)  $\frac{3}{8}x$   
C)  $\frac{9}{4}x$   
D)  $\frac{3}{2}x$   
E)  $\frac{3}{4}x$

32  $a \otimes b$  means multiply the first number by 5 and subtract the second number multiplied by 3.  $6 \otimes 4$  is equal to :

- A) 26  
B) 6  
C) 2  
D) 18  
E) 78

33 Find the gradient of the curve with equation  $y = 2^x$  at the point (2,4).

- A)  $\ln 8$   
B) 4  
C)  $\ln 4$   
D)  $\ln 2$   
E)  $\ln 16$

A

34 What is the value of the number  $\frac{86}{5}$  on the base 5?

- A)  $(23,2)_5$   
B)  $(33,1)_5$   
C)  $(30,1)_5$   
D)  $(32,1)_5$   
E)  $(24,0)_5$

35 For a certain curve  $\frac{dy}{dx} = 2x$  and the curve passes through the point (4, 9). Hence the equation of the curve is:

- A)  $y = x^2 - 7$   
B)  $y = x^2 + 7$   
C)  $y = x^2 - 65$   
D)  $y = x^2$   
E)  $y = 2x + 1$

36 The  $n^{\text{th}}$  term of a sequence is  $4(1 - n^2)$ . Find  $n$  for the term that has a value of  $-192$ .

- A) 9  
B) 7  
C) 8  
D) 10  
E) 6

A

37 A rectangle has a perimeter equal to the circumference of a circle of radius 3. If the width of the rectangle is 3, what is its length?

- A)  $3\pi - 3$
- B)  $6\pi - 3$
- C)  $9\pi - 3$
- D)  $4.5\pi$
- E) It cannot be determined from the information given.

38 
$$\lim_{x \rightarrow +\infty} \frac{3x + \sqrt{4x^2 + 7x - 12}}{x + \sqrt{x^2 - x + 6}} = ?$$

- A) 3
- B) 2
- C) 2,5
- D) 3,5
- E) 1,5

39 
$$\lim_{x \rightarrow 0} \left( \frac{x^2}{1 - \cos x} \right) = ?$$

- A) -1
- B) 1
- C) 2
- D) 0
- E) does not exist

A

40 Let P and Q be points 2 cm apart, and let A be the area, in  $\text{cm}^2$ , of a circle that passes through P and Q. Which of the following is the set of all possible values of A?

- A)  $0 < A \leq \pi$
- B)  $0 < A$
- C)  $A = \pi$
- D)  $A > \pi$
- E)  $A \geq \pi$

41 For the given

$$f(x) = (m-1)x^2 + 2mx + m + 1,$$

the roots of the equation

$$f(x) = 0 \text{ is } x_1 \text{ and } x_2. \text{ For}$$

what value of  $m$ , the roots

$$\text{satisfy } x_1 < -2 < x_2.$$

- A)  $-\infty < m < 1$
- B)  $-3 < m < 0$
- C)  $0 < m < 1$
- D)  $1 < m < 3$
- E)  $3 < m < \infty$

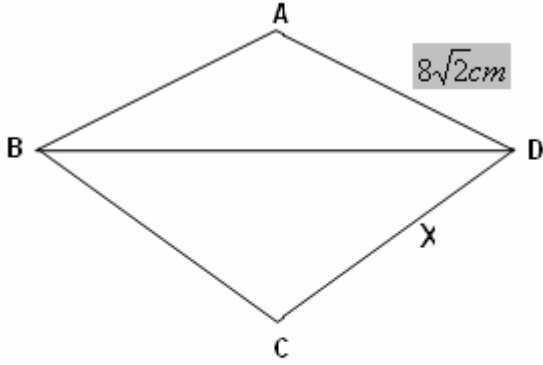
42 Find the solution set of the inequality

$$\frac{e^{2x} |x+2|}{x^2 - 3x + 2} < 0$$

- A)  $(-\infty, 1)$
- B)  $(1, \infty)$
- C)  $(1, 2)$
- D)  $(-\infty, 2)$
- E)  $(2, \infty)$

A

43



If  $m(\widehat{BAD}) = 105^\circ$ ,  $m(\widehat{BCD}) = 75^\circ$ ,  
 $m(\widehat{ADB}) = m(\widehat{DBC}) = 45^\circ$  and  $|AD| = 8\sqrt{2}$   
then find  $|CD|$ .

- A)  $12\sqrt{2}$
- B)  $16\sqrt{3}$
- C) 18
- D) 16
- E)  $20\sqrt{2}$

44 The measures of the three angles of a triangle are in the ratio of 5:5:10, and the length of the longest side is 10. From this information, which of the following can be determined?

- I. The area of the triangle
- II. The perimeter of the triangle
- III. The length of each of the three altitudes

- A) III only
- B) I only
- C) I and II only
- D) II only
- E) I, II, and III

A

45 A chord is drawn in a circle 5 cm radius. If it is 4 cm from the centre of the circle, find its length.

- A) 3 cm
- B) 4 cm
- C) 5 cm
- D) 6 cm
- E) 7 cm

46 Find the value of the integral

$$\int_{-1}^0 (x^3 + 3x + 1)^2 (x^2 + 1) dx$$

- A)  $\frac{7}{6}$
- B)  $\frac{5}{4}$
- C)  $\frac{28}{9}$
- D)  $\frac{18}{7}$
- E)  $\frac{31}{9}$

47 Simplify the expression

$$\sqrt{(3 - \sqrt{10})^2} + \sqrt[3]{(\sqrt{10} - 3)^3} - 2\sqrt{10}$$

- A) -6
- B) 0
- C)  $-3\sqrt{10}$
- D) 3
- E) 1



A

48 Find the  $x$ -coordinate of the maximum point of the curve

$$y = 2x^3 - 21x^2 + 72x + 5.$$

- A) -3
- B) -4
- C) 4
- D) 3
- E) 0

49 The angles  $A$  and  $B$  are given as

$$m(\hat{A}) = 25G, \quad m(\hat{B}) = \frac{\pi}{16}R.$$

Find the sum of this two angles in degree.

- A)  $32^{\circ}45'45''$
- B)  $33^{\circ}40'45''$
- C)  $33^{\circ}45'00''$
- D)  $32^{\circ}30'15''$
- E)  $33^{\circ}55'00''$

50 The number 0.075538 correct to 2 significant figures is:

- A) 0.07
- B) 0.076
- C) 0.075
- D) 0.08
- E) 0.01

A

51 Evaluate the integral

$$\int \frac{x}{2} \sin(x^2 + 6) dx$$

- A)  $-\cos(x^2 + 6) + c$
- B)  $\cos(x^2 + 6) + c$
- C)  $\frac{1}{4} \cos(x^2 + 6) + c$
- D)  $\frac{1}{2} \cos(x^2 + 6) + c$
- E)  $-\frac{1}{4} \cos(x^2 + 6) + c$

52 Which of the following is the simplified form of the expression

$$\frac{3\sqrt{2} - \sqrt{8}}{\sqrt{2}\sqrt{12}} ?$$

- A)  $\frac{3 - \sqrt{2}}{\sqrt{3}}$
- B)  $\frac{1}{6}$
- C)  $\frac{2\sqrt{2}}{\sqrt{3}}$
- D)  $\frac{1}{\sqrt{16}}$
- E)  $\frac{\sqrt{3}}{6}$

A

53 If  $x^x$  is odd, and  $x$  is an integer, then the value of  $x$  must be

- A) irrational
- B) even
- C) odd
- D) prime
- E) none

54 A sphere just fits inside a cylindrical tube of diameter 10 cm. Calculate the volume, in  $\text{cm}^3$ , of the space between the sphere and the tube.

- A) 1047
- B)  $83\frac{1}{3}\pi$
- C)  $41\frac{2}{3}\pi$
- D) 523
- E) 79

55 The curve  $C$  has equation

$$x^2 + 4y^2 - 4x - 12y - 12 = 0$$

Find the gradient of  $C$  at the point (6,3).

- A)  $\frac{3}{2}$
- B)  $\frac{2}{3}$
- C)  $-\frac{3}{2}$
- D)  $-\frac{2}{3}$
- E) 2

A

56 If  $\lim_{x \rightarrow 2} \frac{f(x)-1}{x-2} = 4$ , then find the value of

$$\lim_{x \rightarrow 2} f(x).$$

- A) -2
- B) 0
- C) 5
- D) 1
- E) 7

57 Find the equation of the normal line drawn to the curve  $y = 2x^2 - 3x + 5$  at the point where  $x = 2$ .

- A)  $x + 5y - 37 = 0$
- B)  $5x - y = 3$
- C)  $x - 5y - 37 = 0$
- D)  $x + 5y - 35 = 0$
- E) None

58 Find the area of the region bounded by the curve  $y = x^2 - x - 6$ , the  $x$ -axis and the lines  $x_1 = 2$  and  $x_2 = 4$ .

- A) 2
- B) 3
- C) 5
- D) 4
- E) 1

59 10% more than 10% less than  $x$  is what percentage of  $10x$  ?

- A) 100%
- B) 9.9%
- C) 99%
- D) 10%
- E) 9%

**A**

60 Find the derivative of the function

$$f(x) = x^{\frac{1}{x}}$$

- A)  $\frac{1}{x} x^{\frac{1}{x}-1}$   
B)  $\frac{1}{x^x} (1 - \ln x)$   
C)  $\frac{1}{x^{x-2}} (1 - \ln x)$   
D)  $\ln \frac{1}{x} x^{\frac{1}{x}-1}$   
E)  $\frac{1}{x^2} (1 - \ln x)$

**TEST BİTTİ**

**CEVAPLARINIZI KONTROL EDİNİZ**