1. $333^{2013} = x(\text{mod}10)$

$$\begin{array}{r|l} 333 & 10 \\ \hline -\ 30 & 33 \\ \hline 33 & \\ -\ 30 & \\ \hline 3 & \end{array}$$

$3^{2013} \equiv x(\text{mod}10)$

3^1 in 10'a bölümünden kalan 3
3^2 in 10'a bölümünden kalan 9
3^3 in 10'a bölümünden kalan 7
3^4 in 10'a bölümünden kalan 1

$$\begin{array}{r|l} 2013 & 4 \\ \hline -\ 20 & 503 \\ \hline 0013 & \\ -\ 12 & \\ \hline 1 & \end{array}$$

$3^{2013} \equiv 3^1 \equiv 3\ (\text{mod}10)$

Cevap: C

2. $a_n = n.a_{n-1}$

$$\frac{a_n}{a_{n-1}} = n$$

$$\frac{a_2}{a_1}\cdot\frac{a_3}{a_2}\cdot\frac{a_4}{a_3}\cdot/\ldots/\cdot\frac{a_{20}}{a_{19}} = 2.3.4.\ \ldots\ .20$$

$$\frac{a_{20}}{a_1} = 20!$$

Cevap: A

3. $\sum_{n=-4}^{25}(2n+3) = \sum_{n=-4+5}^{25+5}(2(n-5)+3)$

$$= \sum_{n=1}^{30}(2n-10+3)$$

$$= \sum_{n=1}^{30} 2n-7$$

$$= 2.\sum_{n=1}^{30} n - \sum_{n=1}^{30} 7$$

$$= 2\cdot\frac{30.31}{2} - 7.30$$

$$= 930 - 210$$

$$= 720$$

Cevap: E

4. $17^{2013} = x(\text{mod}3)$

$$\begin{array}{r|l} 17 & 3 \\ \hline -\ 15 & 5 \\ \hline 2 & \end{array}$$

$2^{2013} \equiv x(\text{mod}3)$

2^1 in 3'e bölümünden kalan 2
2^2 in 3'e bölümünden kalan 1

O halde $2^{2013} \equiv 2(\text{mod}3)$

$x = 2$

Cevap: E

5. $\prod_{k=2}^{31}\log_k^{(k+1)} = \log_2^{\cancel{3}}.\log_{\cancel{3}}^{\cancel{4}}.\log_{\cancel{4}}^{\cancel{5}}.\ \ldots\ ./\log_{\cancel{31}}^{32}$

$$= \log_2^{32} = \log_2^{2^5}$$

$$= 5\log_2^2 = 5$$

Cevap: E

6. $5.(8)^{4k+2016} \equiv x \pmod 6$

8^1 in 6'ya bölümünden kalan 2

8^2 in 6'ya bölümünden kalan 4

8^3 in 6'ya bölümünden kalan 2

8^4 in 6'ya bölümünden kalan 4

Yani 8'in kuvvetleri tek ise kalan 2, çift ise kalan 4 olur.

4k + 2016 için kuvvet çift olup $8^{4k+2016}$nın 6'ya bölümünden kalan 4 olur.

$5.8^{4k+2016} \equiv x \pmod 6$

$5.4 \equiv x \pmod 6$

$20 \equiv x \pmod 6$

$$\begin{array}{r|l} 20 & 6 \\ \hline -\ 18 & 3 \\ \hline 2 & \end{array}$$

$20 \equiv 2 \pmod 6$

$x = 2$

Cevap: B

7. $\sum_{k=0}^{10} k.n^4 . \prod_{m=1}^{3} \frac{2m}{n}$

$\sum_{k=0}^{10} k.n^4 \left(\frac{2.1}{n} \cdot \frac{2.2}{n} \cdot \frac{2.3}{n}\right)$

$\sum_{k=0}^{10} k.n^4 \left(\frac{48}{n^3}\right) = \sum_{k=0}^{10} k.n.48$

$= 48.n \sum_{k=0}^{10} k$

$= 48n(0 + 1 + 2 + 3 + \ldots + 10)$

$= 48.n.\frac{10.11}{2} = 48.n.5.11$

$= 2640.n$

Cevap: A

8. $x^x \equiv 3 \pmod 7$

5^1 in 7'ye bölümünden kalan 5

5^2 in 7'ye bölümünden kalan 4

5^3 in 7'ye bölümünden kalan 6

5^4 in 7'ye bölümünden kalan 2

5^5 in 7'ye bölümünden kalan 3

5^6 in 7'ye bölümünden kalan 1

$x = 96$ olursa $5^{96} \equiv 1 \pmod 7$ dur.

$x = 101$ olursa $5^{101} \equiv 3 \pmod 7$ olur.

Cevap: E

9. $\sum_{i=1}^{5} \sum_{j=1}^{4} \sum_{k=1}^{3} \sum_{s=1}^{2} i.j.k.s$

$\sum_{i=1}^{5} \sum_{j=1}^{4} \sum_{k=1}^{3} (i.j.k.1 + i.j.k.2)$

$\sum_{i=1}^{5} \sum_{j=1}^{4} \sum_{k=1}^{3} 3ijk$

$\sum_{i=1}^{5} \sum_{j=1}^{4} (3ij.1 + 3ij.2 + 3ij.3)$

$\sum_{i=1}^{5} \sum_{j=1}^{4} (18ij)$

$\sum_{i=1}^{5} (18.i.1 + 18.i.2 + 18.i.3 + 18.i.4)$

$\sum_{i=1}^{5} 18i.10 = \sum_{i=1}^{5} 180i$

$= 180 \sum_{i=1}^{5} i$

$= 180 \cdot \frac{5.6}{2} = 180.15$

$= 2700$

Cevap: E

10. $|x| < 1 \sum_{n=1}^{\infty} x^n = x^1 + x^2 + x^3 + x^4 + \ldots$

$= x(1 + x + x^2 + \ldots)$

$= x \cdot \frac{1}{1-x} = \frac{x}{1-x}$

Cevap: C

11. $\prod_{k=4}^{12} \frac{k-3}{k-2} = \frac{1}{2} \cdot \frac{2}{3} \cdot \frac{3}{4} \cdot / \ldots / \cdot \frac{9}{10} = \frac{1}{10}$

Cevap: C

12. $a_1 = 4$

$a_n = 2^n . a_{n+1}$

$\frac{a_n}{a_{n+1}} = 2^n$

$\frac{a_1}{a_2} \cdot \frac{a_2}{a_3} \cdot \frac{a_3}{a_4} \cdot / \ldots / \cdot \frac{a_{19}}{a_{20}} = 2^1 . 2^2 . 2^3 . \ldots . 2^{19}$

$\frac{a_1}{a_{20}} = 2^{1+2+3+\ldots+19}$

$\frac{4}{a_{20}} = 2^{\frac{19.20}{2}} = 2^{190}$

$4 = 2^{190} . a_{20}$

$\frac{4}{2^{190}} = a_{20}$

$\frac{2^2}{2^{190}} = a_{20}$

$2^{-188} = a_{20}$

Cevap: B

13. $\sum_{k=5}^{16} (2k - 1 + p) = \sum_{k=5-4}^{16-4} (2(k+4) - 1 + p)$

$= \sum_{k=1}^{12} (2k + 8 - 1 + p)$

$= \sum_{k=1}^{12} 2k + p + 7$

$= 2 \sum_{k=1}^{12} k + \sum_{k=1}^{12} p + \sum_{k=1}^{12} 7$

$= 2 \cdot \frac{12.13}{2} + 12p + 12.7$

$= 156 + 12p + 84$

$= 12(p + 20)$

Cevap: D

14. $\sum_{m=3}^{43} \left(\prod_{n=2}^{27} n \right) = A.5^x$

$\sum_{m=3}^{43} (2.3.4.5.\ldots.27) = A.5^x$

$\sum_{m=3}^{43} 27! = A.5^x$

$41.27! = A.5^x$

$27 = 5 \cdot 5 + 2$

$5 = 5 \cdot 1 + 0$

$x_{max} = 5 + 1 = 6$

Cevap: C

15. $\sum_{k=1}^{5} \ln\left(\frac{k+1}{k}\right)$

$= \ln\frac{2}{1} + \ln\frac{3}{2} + \ln\frac{4}{3} + \ln\frac{5}{4} + \ln\frac{6}{5}$

$= \ln \frac{2}{1} \cdot \frac{3}{2} \cdot \frac{4}{3} \cdot \frac{5}{4} \cdot \frac{6}{5}$

$= \ln 6$

Cevap: E

16. $\sum_{n=-4}^{13} \prod_{k=1}^{n} \left(1+\frac{1}{k}\right) = \sum_{n=-4}^{13} \prod_{k=1}^{n} \left(\frac{k+1}{k}\right)$

$\sum_{n=-4}^{13} \left(\frac{2}{1}\cdot\frac{3}{2}\cdot\frac{4}{3}\cdot/\ldots/\cdot\frac{n+1}{n}\right)$

$\sum_{n=-4}^{13} (n+1) = \sum_{n=-4+5}^{13+5} (n-5+1)$

$\sum_{n=1}^{18} (n-4) = \sum_{n=1}^{18} n - \sum_{n=1}^{18} 4$

$= \frac{18.19}{2} - 18.4$

$= 9.19 - 72$

$= 171 - 72$

$= 99$

Cevap: A

17. $\prod_{n=1}^{x} a_n = 9^{x!}$

$x = 1 \quad \prod_{n=1}^{1} a_n = 9^{1!} \Rightarrow a_1 = 9$

$x = 2 \quad \prod_{n=1}^{2} a_n = 9^{2!} \Rightarrow a_1.a_2 = 9^2$

$9.a_2 = 9^2$

$\boxed{a_2 = 9}$

$x = 3 \quad \prod_{n=1}^{3} a_n = 9^{3!} \Rightarrow a_1.a_2.a_3 = 9^6$

$\Rightarrow 9.9.a_3 = 9^6$

$\boxed{a_3 = 9^4}$

$x = 4 \quad \prod_{n=1}^{4} a_n = 9^{4!} \Rightarrow a_1.a_2.a_3.a_4 = 9^{24}$

$\Rightarrow 9.9.9^4.a_4 = 9^{24}$

$\Rightarrow 9^6.a_4 = 9^{24}$

$\boxed{a_4 = 9^{18}}$

$a_4 = (3^2)^{18} = 3^{36}$

Cevap: D

18. $\prod_{k=-3}^{2n-3} \left(\frac{k+4}{k+5}\right) = \frac{1}{20}$

$\frac{1}{2}\cdot\frac{2}{3}\cdot\frac{3}{4}\cdot\frac{4}{5}\cdot\frac{5}{6}\cdot/\ldots/\cdot\frac{2n+1}{2n+2} = \frac{1}{20}$

$\frac{1}{2n+2} = \frac{1}{20}$

$2n + 2 = 20$

$2n = 18$

$n = 9$

Cevap: A

19. $a_1 = a - 1$

$a_2 = 2a + 5$

$a_3 = 5a + 1$

dizi aritmetik dizi olduğundan

$a_2 - a_1 = a_3 - a_2$ olmalı

$2a + 5 - (a - 1) = 5a + 1 - (2a + 5)$

$a + 6 = 3a - 4$

$10 = 2a$

$5 = a$

$a_1 : a - 1 = 4$

$a_2 = 2a + 5 = 15$

$a_3 = 5a + 1 = 26$

$a_4 = \quad = 37$

$a_5 = \quad = 48$

Cevap: D

20. $a_1 = x - 3$

$a_2 = 2x - 3$

$a_3 = 4x + 3$

a_n dizisi geometrik dizi olduğundan

$\frac{a_2}{a_1} = \frac{a_3}{a_2}$ olur.

$$\frac{2x-3}{x-3} = \frac{4x+3}{2x-3}$$

$(2x - 3)^2 = (x - 3)(4x + 3)$

$4x^2 - 12x + 9 = 4x^2 + 3x - 12x - 9$

$9 = 3x - 9$

$18 = 3x$

$\boxed{6 = x}$

$a_1 = x - 3 = 6 - 3 = 3 = 3^1$

$a_2 = 2x - 3 = 2.6 - 3 = 9 = 3^2$

$a_3 = 4x + 4 = 4.6 + 3 = 27 = 3^3$

$a_4 = \quad = 3^4$

$a_5 = \quad = 3^5$

$a_6 = \quad = 3^6$

$a_7 = \quad = 3^7$

$a_8 = \quad = 3^8$

Cevap: E