

Number System

17) দুটি সংখ্যার গুণফল 128 এবং ভাগফল 2 হলে, বড়ো সংখ্যাটি কত?

a) 12

b) 14

c) 16

d) 18

$$\begin{aligned} & \textcircled{A} \times B = \underline{\underline{128}} \\ & \frac{\textcircled{A}}{B} = \underline{\underline{2}} \end{aligned} \quad \left. \begin{aligned} & A \times B \times \frac{A}{B} = 128 \times 2 \\ & A^2 = 256 \\ & A = \sqrt{256} \\ & A = \textcircled{16} \end{aligned} \right\}$$



18) দুটি সংখ্যার গুণফল 1575 এবং ভাগফল 7 হলে ছোটো সংখ্যাটি কত?

a) 9

b) 11

c) 13

☒ d) 15

$$\begin{array}{l} A \times B = 1575 \\ \frac{A}{B} = 7 \end{array}$$

$$\begin{array}{l} \frac{A \times B}{\frac{A}{B}} = \frac{1575}{7} \\ B^2 = 225 \\ B = \sqrt{225} \\ B = 15 \end{array}$$

23) 1800 -এর সকল উৎপাদকের যোগফল কত?

$$\begin{array}{r}
 2 \overline{) 1800} \\
 \underline{2 \overline{) 900}} \\
 \underline{2 \overline{) 450}} \\
 \underline{3 \overline{) 225}} \\
 \underline{3 \overline{) 75}} \\
 \underline{5 \overline{) 25}} \\
 5
 \end{array}$$

$$\begin{aligned}
 1800 &= 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5 \\
 &= \underline{2^3} \times \underline{3^2} \times \underline{5^2}
 \end{aligned}$$

$$\begin{aligned}
 & (2^0 + 2^1 + 2^2 + 2^3) \times (3^0 + 3^1 + 3^2) \times (5^0 + 5^1 + 5^2) \\
 &= (1 + 2 + 4 + 8) \times (1 + 3 + 9) \times (1 + 5 + 25) \\
 &= 15 \times 13 \times 31 \\
 &= 195 \times 31 \\
 &= \underline{6045}
 \end{aligned}$$

$$\begin{array}{r}
 27 \overline{) 9} \\
 \underline{27} \\
 0
 \end{array}$$

24) 1800 -এর সকল যুগ্ম এবং অযুগ্ম উৎপাদকের যোগফল কত?

$$1800 = 2^3 \times 3^2 \times 5^2$$

অযুগ্ম (odd) →

$$= (3^0 + 3^1 + 3^2) \times (5^0 + 5^1 + 5^2)$$

$$= (1 + 3 + 9) \times (1 + 5 + 25)$$

$$= 13 \times 31$$

$$= 403$$

যুগ্ম (Even) →

$$= (2^1 + 2^2 + 2^3) \times 403$$

$$= (2 + 4 + 8) \times 403$$

$$= 14 \times 403$$

$$= 5642$$

$$\begin{array}{r} 5642 \\ + 403 \\ \hline 6045 \end{array}$$

25) $2^{17} \times 6^{31} \times 7^5 \times 10^{11} \times 11^{10} \times (323)^{23}$ -এর মৌলিক উৎপাদকের সংখ্যা কত?

(a) 162

(b) 161

(c) 346

(d) 97

$$2^{17} \times 6^{31} \times 7^5 \times 10^{11} \times 11^{10} \times (323)^{23}$$

$$= (2)^{17} \times (2 \times 3)^{31} \times (7)^5 \times (2 \times 5)^{11} \times (11)^{10} \times (17 \times 19)^{23}$$

$$= 2^{17} \times 2^{31} \times 3^{31} \times 7^5 \times 2^{11} \times 5^{11} \times 11^{10} \times 17^{23} \times 19^{23}$$

$$17 + 31 + 31 + 5 + 11 + 11 + 10 + 23 + 23$$

$$= 40 + 50 + 72$$

$$= 162$$

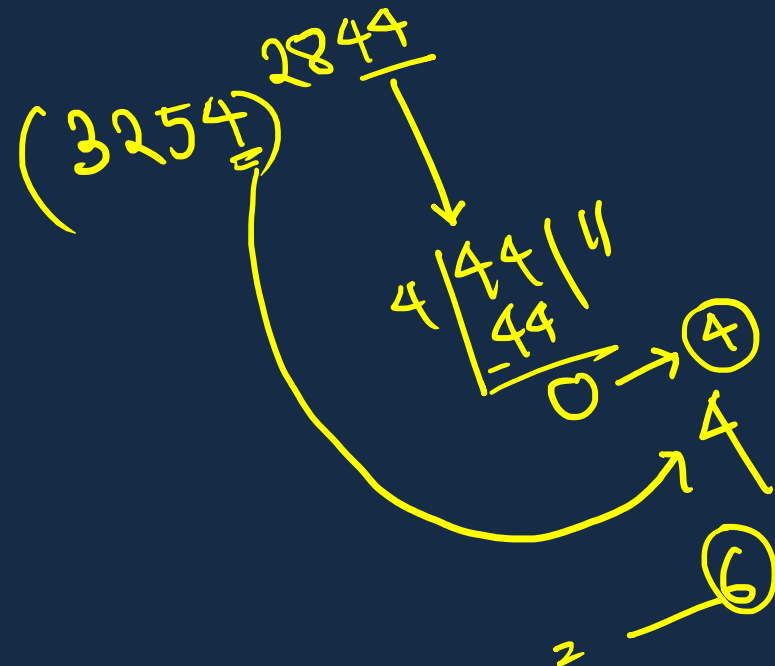
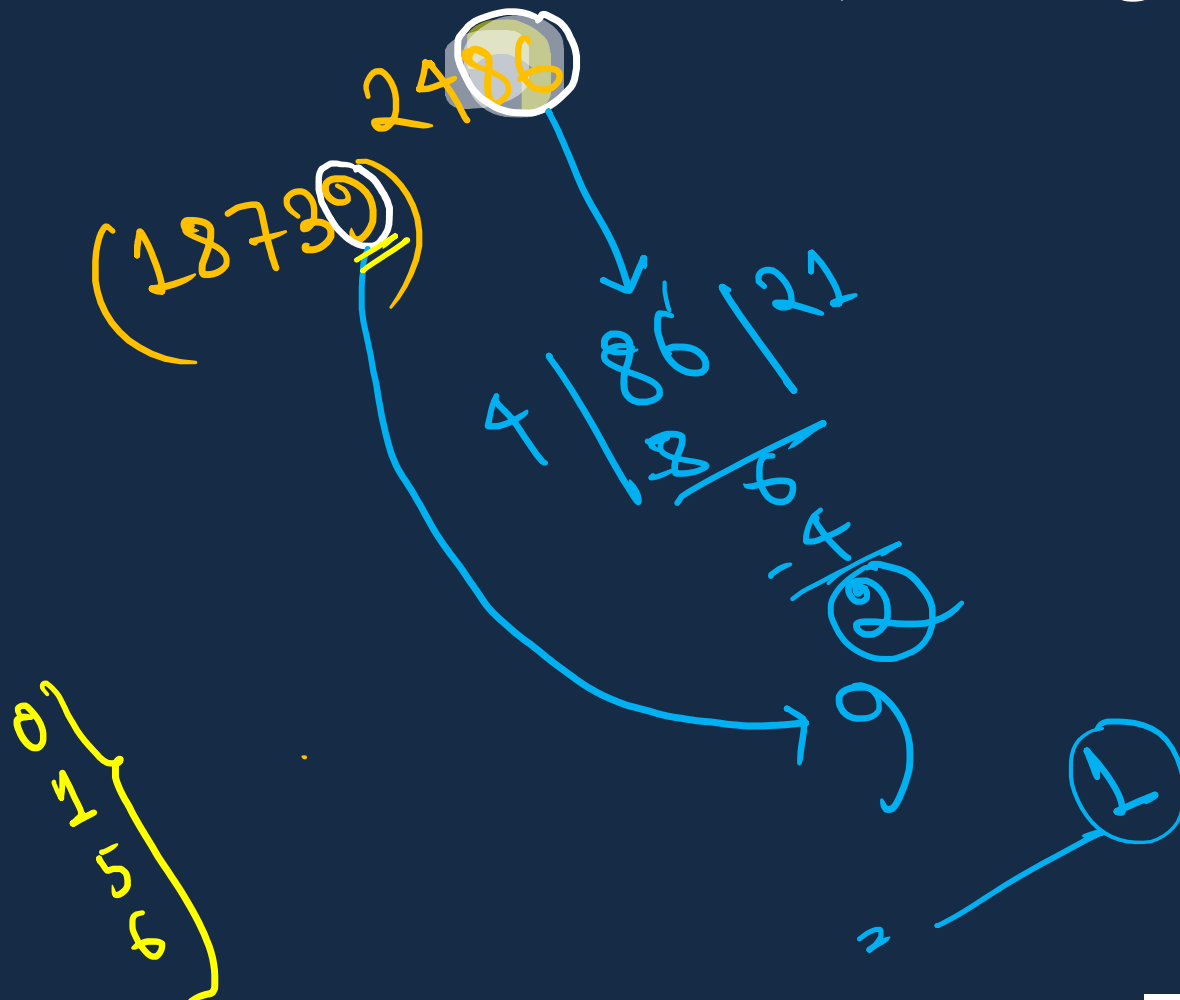


সংখ্যার এককের স্থানের অঙ্ক নির্ণয়

একটি সংখ্যাকে 10 দিয়ে ভাগ করলে যেই ভাগশেষ থাকে তাকে ওই সংখ্যাটির একক স্থানীয় অঙ্ক বলা। এটি আসলে সংখ্যাটির একদম ডান দিকের অঙ্কটিকে নির্দেশ করে।

$$\begin{aligned} 28 + 73 &= \text{---} 1 \\ 279 \times 73 \times 858 &= \text{---} 2 \end{aligned}$$

সংখ্যার এককের স্থানের অঙ্ক (Unit Digit) নির্ণয়:





26) $(337)^{337}$ -এর একক স্থানীয় অঙ্কটি কত?

a) 1

b) 3

c) 7

d) 9

$$\begin{array}{r} 4 \overline{) 379} \\ \underline{-36} \\ 19 \end{array}$$

$$7^2 = 49$$

27) $(222)^{222}$ -এর একক স্থানীয় অঙ্কটি কত?

- a) 2
- b) 4
- c) 6
- d) 8

HW



28) $[(264)^{102} + (264)^{103}]$ -এর একক স্থানীয় অঙ্কটি কত?

a) 0

b) 4

c) 6

d) 8

HW



29) $(312 \times 316 \times 291 \times 523 \times 329 \times 627)$ –এর একক স্থানীয় অঙ্কটি কত?

- a) 6
- b) 7
- c) 8
- d) 9

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30) $(212^{316} \times 323^{512} \times 727^{313})$ -এর একক স্থানীয় অঙ্কটি কত?

- a) 4
- b) 3
- c) 2
- d) 1

৫২

31) প্রথম 111টি অখন্ড সংখ্যার যোগফলের এককের অঙ্কটি কত?

Whole No. $\rightarrow$ Starting with 0

(a) 4

(b) 6

(c) 5

(d) 0

No. ① ② ③ ④ ①①① ①①①
0, 1, 2, 3, 109, 110

$n = 110$

$$\frac{n(n+1)}{2} = \frac{110 \times (110+1)}{2}$$

$$= \frac{110 \times 111}{2}$$

⑤

32) $1! + 2! + 3! + 4! + \dots + 100!$ -এর এককের অঙ্কটি কত?

a) 0

b) 3

c) 4

d) 7

$$1! + 2! + 3! + 4! + 5! + 6! + 7! + \dots$$

$$= 1 + 2 + 6 + 24 + 120 + 720 + \dots$$

$$= 3 + 0 + 0 + \dots$$

$$= 3$$

$$4! = 1 \times 2 \times 3 \times 4$$

$$5! = 4! \times 5$$

$$6! = 5! \times 6$$

সংখ্যার শেষে কতগুলো শূন্য হবে তা নির্ণয়

$$\underline{128} \times \underline{625} = ?$$

$$= (2^7) \times (5^4)$$

$$= \underbrace{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2}_{\text{7 times}} \times 5 \times 5 \times 5 \times 5_{\text{4 times}}$$

$$= \boxed{80000}$$

সংখ্যার শেষে কতগুলো শূন্য হবে তা নির্ণয়

✓ 33) $124 \times 33 \times 125 \times 28 \times 200 \times 30 = ? \dots \underline{000000}$

$\begin{matrix} 2 \times 2 \times 31 \\ \times \\ 5 \times 5 \times 5 \\ 2 \times 2 \times 7 \\ 2 \times 100 \\ 3 \times 10 \end{matrix}$

✓ 34) $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10 = ? \dots \underline{00}$

$\begin{matrix} 2 \times 2 \\ 2 \times 3 \\ 2 \times 2 \times 2 \end{matrix}$

✓ 35) $1 \times 2 \times 3 \times 4 \times 5 \times \dots \times 1000 = ?$

$200 + 40 + 8 + 1 = 249$

$\begin{matrix} 5 | 1000 | 200 \\ \times \\ 5 | 200 | 40 \\ \times \\ 5 | 40 | 8 \\ \times \\ 5 | 8 | 1 \\ \times \end{matrix}$

✓ 36) $1 \times 2 \times 3 \times 4 \times 5 \times \dots \times 587 = ?$

গুনফল কত অঙ্কের হবে তা নির্ণয়:

$$125^{12} \times 8^{12}$$

$$= (5^3)^{12} \times (2^3)^{12}$$

$$= (5)^{36} \times (2)^{36}$$

$$= (10)^{36}$$

$$= 1000 \dots 36 \text{ zeros}$$

37 digits

$$25873946 \times 854324$$

$$= (8+6) = 14 \text{ digits}$$

$$\text{or } (8+6)-1 = 13 \text{ digits}$$

$$(2 \times 8) \rightarrow 16$$

Remainder Theorem:

What is Negative Remainder?

$$35 \div 4 \rightarrow \text{Remainder ?..?}$$

$$\begin{array}{r} 4 \overline{) 35} \\ \underline{-32} \\ 3 \end{array}$$

$$\begin{array}{r} 4 \overline{) 35} \\ \underline{-36} \\ -1 \end{array}$$

$(3 + 1) = 4 \rightarrow \text{divisor}$

$$129 \div 7 \Rightarrow (+3) / (-4)$$

$$\begin{array}{r} 7 \overline{) 129} \\ \underline{-7} \\ 59 \\ \underline{-56} \\ 43 \end{array}$$

$$\begin{array}{r} 7 \overline{) 129} \\ \underline{-7} \\ 59 \\ \underline{-63} \\ -4 \end{array}$$

$$286 \div 9 \Rightarrow (+7) / (-2)$$

$$\begin{array}{r} 9 \overline{) 286} \\ \underline{-27} \\ 16 \\ \underline{-9} \\ 7 \end{array}$$

$$\begin{array}{r} 9 \overline{) 286} \\ \underline{-27} \\ 16 \\ \underline{-18} \\ -2 \end{array}$$

Remainder Theorem:

Find the Remainder of Addition, Subtraction, Multiplication?

$$\begin{array}{r} -4 \quad +1 \\ 2875 + 589 \\ \hline \end{array} \rightarrow \text{Remainder?!!}$$

12

$$= (-4) + (+1)$$

$$= -3 \rightarrow 12 - 3 = \textcircled{+9}$$

$$\begin{array}{r} +5 \quad -2 \\ 78549 - 2886 \\ \hline \end{array}$$

8

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

$$= +5 + 2$$

$$= \textcircled{+7}$$

$$\begin{array}{r} -14 \quad +4 \quad +10 \quad -5 \quad +6 \quad -9 \\ 289 \times 1225 \times 3876 \\ \hline \end{array}$$

15

$$= (+4) \times (-5) \times (+6)$$

$$= -120$$

$$= \textcircled{0} \checkmark$$



37

Find the remainder of: $\frac{9367 \times 8641 \times 2009 \times 571571 \times 3114}{315}$

$$\begin{array}{ccccccccc} & 2 & & 1 & & 2 & & 1 & & 1 \\ & \swarrow & & \swarrow & & \swarrow & & \swarrow & & \swarrow \\ 9367 & \times & 8641 & \times & 2009 & \times & 571571 & \times & 3114 \\ \hline & & & & & & & & & \end{array}$$

$\frac{315}{45} = 7$

$$\begin{aligned} &= 2 \times 1 \times 2 \times 1 \times 1 \\ &= 2 \times 63 = \boxed{126} \end{aligned}$$

$7 \times 9 = \boxed{63}$

39

The last two-digits in the multiplication $122 \times 123 \times 125 \times 127 \times 129$ will be

- (a) 20
- (b) 50
- (c) 30
- (d) 40

HW

40

The last three-digits in the multiplication $8993 \times 16004 \times 761001 \times 3705981$ will be:

- (a) 20
- (b) 50
- (c) 30
- (d) 40

HW

41

Find the remainder of: $\frac{1! + 2! + 3! + 4! + 5! + \dots + 880!}{120}$

$$\frac{1 + 2 + 6 + 24 + \cancel{120} + \cancel{6 \times 120} + \cancel{7 \times 6 \times 120} + \cancel{8 \times 7 \times 6 \times 120} + \dots}{120}$$

= 33 Remainder

42

2^{256} is divided by 17 the remainder would be

- (a) 1
- (b) 16
- (c) 14
- (d) None of these

$$\begin{aligned}
 2^1 &= 2 \\
 2^2 &= 4 \\
 2^3 &= 8 \\
 2^4 &= 16
 \end{aligned}$$

$$\frac{2^{256}}{4} = 2^{64}$$

$$\begin{array}{r}
 2^{256} \\
 \hline
 17
 \end{array}$$

$$\begin{array}{r}
 (2^4)^{64} \\
 \hline
 17
 \end{array}$$

$$\begin{array}{r}
 (16)^{64} \\
 \hline
 17 \\
 \hline
 -1 \\
 \hline
 (-1)^{64} \\
 \hline
 +1
 \end{array}$$

43

Find the remainder when 7^{99} is divided by 2400.

(a) 1

(b) 343

(c) 49

(d) 7

$$\begin{aligned}
 7^{99} &= \frac{(7^4)^{24} \times 7^3}{2400} \\
 &= \frac{(2401)^{24} \times 343}{2400} \\
 &= (1)^{24} \times 343 \\
 &= 343
 \end{aligned}$$

$$\begin{aligned}
 7^1 &= 7 \\
 7^2 &= 49 \\
 7^3 &= 343 \\
 7^4 &= 2401
 \end{aligned}$$

44

When $13^{911} + 3$ is divided by 12, what would be the remainder?

- a) 1
- b) 2
- c) 3
- d) 4

HW



45

What is the remainder when $(127^{97} + 97^{97})$ is divided by 32?

(a) 4

(b) 2

(c) 7

(d) 0

42

Thank You