

9. CYCLICITY

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Class: VII . MATHEMATICS

FOUNDATION SOLUTIONS

(T.T) JEE MAINS LEVEL 2025/26

01. $2^{1967} = \frac{4(491)+3}{2} = 2^{4n+3} \rightarrow \text{Unit digit} = 8$
Ans: C

02. $3^{1969} = \frac{4(492)+1}{3} = 3^{4n+1} \rightarrow \text{Unit digit} = 3$
Ans: A

03. $7^{295} \times 3^{158}$
 $= 7^{\frac{4(73)+3}{1}} \times 3^{\frac{4(39)+2}{1}}$
 $= 7^{4n+3} \times 3^{4n+2}$
 $= \boxed{3} \times \boxed{9}$
 $= \boxed{7} \rightarrow \text{Unit digit} = 7$ Ans: A

04. ~~$4^{1971} = 4^{\frac{4(492)+3}{1}} = 4^{4n+3} \rightarrow \text{Unit digit} = 8$~~
 $4^{1971} = 4^{\text{odd}} \rightarrow \text{Unit digit} = 4$

Ans: B

05 $5^{555} \rightarrow$ Unit digit = 5 (2)
Ans: B

06 $6^{1000} \rightarrow 6^n \rightarrow$ Unit digit = 6 Ans: C

07 Conceptual Ans: B

08 Conceptual Ans: B

09 $(15)^{550} \rightarrow$ Unit digit = 5 Ans: B

10 $4^{4n} \rightarrow 4^{\text{Even}} \rightarrow$ Unit digit = 6 Ans: C

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01. $3^n \rightarrow$ Unit digits Either 3 or 9 or 7 or 1 Ans: A, B, C, D

02 $4^n \rightarrow$ Unit digits Either 4 or 6 Ans: B, C

03 Statement I:
 $9^{743} = 9^{\text{odd}} \rightarrow$ Unit digit = 9 (True)
~~Ans:~~

Statement II: Conceptual (True) Ans: A

04 Statement I: $5^{2020} \rightarrow$ Unit digit = 5 (True)
Statement II: Conceptual (True) Ans: A

05 Assertion: Conceptual (True) mathematically true
Reason: Conceptual (True) Ans: A

06 Assertion: $(64)^5 = (\underline{64})^{\text{odd}} \rightarrow \text{unit digit} = 4$ (3) (True) Ans: A

Reason: Conceptual (True)

07 $2^{2007} = 2^{4(501)+3} = 2^{4n+3} \rightarrow \text{unit digit} = 8$ Ans: D

08 $3^{2006} = 3^{4(501)+2} = 3^{4n+2} \rightarrow \text{unit digit} = 9$ Ans: B

09 $19^{21} = 19^{\text{odd}} \rightarrow \text{unit digit} = 9$ Ans: A

10 $99^{1000} = 99^{\text{Even}} \rightarrow \text{unit digit} = 1$ Ans: B

11. 7 Ans: 7

12 $8^{97} = 8^{\text{odd}} \rightarrow \text{unit digit} = 9$ Ans: 9

13 a) $8^{4k+4} \rightarrow \text{unit digit} = 6 (S)$

b) $2010^5 \rightarrow \text{unit digit} = 0 (Q)$

c) $7^{407} \rightarrow 7^{4(101)+3} = 7^{4n+3} \rightarrow \text{unit digit} = 3 (P)$

d) $1^{2057} \rightarrow \text{unit digit} = 1 (R)$ Ans: S, Q, P, R

14 a) $(88)^{77} \rightarrow (88)^{4(19)+1} \rightarrow (88)^{4n+1} \rightarrow \text{unit digit} = 8 (R)$

b) $(39)^{1000} \rightarrow (39)^{\text{Even}} \rightarrow \text{unit digit} = 1 (S)$

c) $72^{24} = 72^{4(6)} = 72^{4n} \rightarrow \text{Unit digit} = 4(9) \text{ (4)}$

d) $83^{51} = (83)^{4(12)+3} = (83)^{4n+3} \rightarrow \text{Unit digit} = 7 \text{ (7)}$

Ans: 8, 5, 1, 9

LEARNERS TASK (CUES)

01.	$4^{993} = 4^{4(248)+1} = 4^{4n+1} \rightarrow \text{Unit digit} = 4$	Ans: D
02	Conceptual	Ans: A
03	Conceptual	Ans: D
04	Conceptual	Ans: A
05	Conceptual	Ans: C
06	Conceptual	Ans: B
07	Conceptual	Ans: B
08	Conceptual	Ans: C
09	Conceptual	Ans: C
10	Conceptual	Ans: A

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01	4	Ans: C
02	$7^{2012} = 7^{4(502)+4} = 7^{4n+4} \rightarrow \text{Unit digit} = 1$	Ans: D

03 $1729 = 8^{4(432)+1} = 8^{4n+1} \rightarrow \text{Unit digit} = 8$ (5)
Ans: D

04 $(1446)^{4n+3} \rightarrow \text{Unit digit} = 6$
Ans: C

05 $2^{2010} \times 3^{2010} \times 4^{2010} \times 5^{2010}$
 $= (2 \times 3 \times 4 \times 5)^{2010}$
 $= (120)^{2010} \rightarrow \text{Unit digit} = 0$
Ans: A

06 $79^8 = 79^{\text{Even}} \rightarrow \text{Unit digit} = 1$
Ans: A

07 $68^6 = 68^{4(1)+2} = 68^{4n+2} \rightarrow \text{Unit digit} = 4$
Ans: D
Ans: A, D

08 $47^5 = (47)^{4(1)+1} = (47)^{4n+1} \rightarrow \text{Unit digit} = 7$
Ans: A

09 $(36)^{78} \rightarrow \text{Unit digit} = 6$
Ans: B

10 $25^{999} \rightarrow \text{Unit digit} = 5$
Ans: C

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01 $9^n \rightarrow 9, 1$
Ans: C, D

02 A) $13^2 = \underline{\quad 9 \quad}$
B) $17^2 = \underline{\quad 9 \quad}$
C) $23^2 = \underline{\quad 9 \quad}$
D) $73^6 = \underline{\quad 9 \quad}$

Ans: A, B, C, D



03 Statement I:

$$8^{1729} = 8^{4(432)+1} = 8^{4n+1} \rightarrow \text{Unit digit} = 8 \text{ (True)}$$

Statement II: Conceptual (True)

Ans. A

04 Statement I: $12^2 = 14[4] \rightarrow \text{(True)}$

Statement II: $13^2 = 16[9] \rightarrow \text{unit digit} = 9 \text{ (True)}$
Ans. A

05 Assertion: $13^4 = \text{---}[1] \text{ (True)}$

Ans. A

Reason: Conceptual (True)

06 Assertion: $27^3 = \text{---}[3] \text{ (True)}$

Ans. A

Reason: Conceptual (True)

07 $6^{4068} = 6^n \rightarrow \text{unit digit} = 6$

Ans. B

08 $6^{2025} = 6^n \rightarrow \text{unit digit} = 6$

Ans. D

09 $95^{500} = 95^n \rightarrow \text{unit digit} = 5$

Ans. C

10 All the options have same unit digit i.e. 5
Ans. D

11 $7^{131} = 7^{4(32)+3} = 7^{4n+3} \rightarrow \text{unit digit} = 3$
Ans: 3

12 $87^{123} = 87^{4(30)+3} = 87^{4n+3} \rightarrow \text{unit digit} = 3$
Ans. 3

13 a) $7^{131} = 7^{4(32)+3} = 7^{4n+3} \rightarrow \text{unit digit} = 3 (q)$

b) $6^{999} \rightarrow \text{unit digit} = 6 (q)$

c) $8^{2009} = 8^{4(502)+1} = 8^{4n+1} \rightarrow \text{unit digit} = 8 (p)$

d) $9^{99999} = 9^{\text{odd}} \rightarrow \text{unit digit} = 9 ()$

Ans: $\boxed{q, p, \boxed{ }, \boxed{ }}$

14 a) $82^{45} = 82^{4(11)+1} = (82)^{4n+1} \rightarrow \text{unit digit} = 2 (p)$

b) $53^{100} = (53)^{4(24)+4} = (53)^{4n+4}$

$\rightarrow \text{unit digit} = 1 (r)$

c) $17^{101} \rightarrow 17^{4(25)+1} = 17^{4n+1} \rightarrow \text{unit digit} = 7 (s)$

d) $89^2 = \boxed{1} \rightarrow \text{unit digit} = 1 (r)$

Ans: p, r, s, r

$\Rightarrow \text{THE END} \Leftarrow$