Doubt Clearing Session

Complete Course on General Aptitude for GATE 2023/2024

Saurabh Thakur • Lesson 14 • Oct 30, 2022


UNACADEMY
PLUS CLASS
Complete Course on General Aptitude for GATE 2023/ 24
Complete
Course on
GENERAL APTITUDE
for GATE 2023/ 24
USE CODE ST26
Saurabh Sir
unacademy


26M+
WATCH MINUTE
12+
YEARS TEACHING EXPERIENCE
SUBSCRIPTION
CODE : ST26
SAURABH THAKUR
IIM ROHTAK
unacademy


01

How many values can 'n' take, such that 2^n is exactly divisible by n^2?

R = 0

(A) 2

(B) 1

(C) 0

(D) Infinite

$2^0, 2^1, 2^2 \ldots 2^{\boxed{n}}$

	n	2^n	n^2	
$2^0 =$	1	2^1	1^2	$\Rightarrow 2^1/1^2 \Rightarrow$ ✓
$2^1 =$	2	2^2	2^2	$\Rightarrow 2^2/2^2$
	~~3~~	~~2^3~~	~~3^2~~	
2^2	4	2^4	4^2	
$2^3 = 8$		2^8	8^2	

2^0

ANS.- (D) If n = 1, 2^1 is divisible by 1^2

n = 2, 2^2 is divisible by 2^2

2^2 n = 4, 2^4 is divisible by 4^2

n = 8, 2^8 is divisible by 8^2

n = 16, 2^{16} is divisible by 16^2

And so on...

So, 'n' can take infinite values, such that 2^n is exactly divisible by n^2.

$\boxed{11pm}$

1. Hyper focus.
2. Flow.
3. GTD
4. Deep work

5am

YT

4p Express

x^0, x^1, x^2, x^3, x^4

24Hrs

NOTE

$$\frac{(a+1)^n}{a} \rightarrow \frac{27}{26} \rightarrow \boxed{1}$$

$$\boxed{R = 1}$$

$$\frac{27^{27}}{26} \rightarrow 1$$

$$\frac{3^1}{2} \Rightarrow \boxed{1}$$

$$\frac{27^{271}}{26} \rightarrow 1$$

$$\frac{3^2}{2} \rightarrow 1$$

$$\frac{3^3}{2} \rightarrow 1$$

$$\frac{27^{27^{27^{291}}}}{26} \Rightarrow 1$$

TEST

[1] $\dfrac{50^{200}}{49}$ $\dfrac{(a+1)^n}{a} \rightarrow 1$ 3 $\dfrac{7^{2000}}{48}$ $\Rightarrow \dfrac{(7^2)^{1000}}{48}$

1

2 $\dfrac{7^{100}}{48} \rightarrow \dfrac{7}{48}^{50} \rightarrow 7$

$\dfrac{(7^2)^{50}}{48} = \dfrac{49^{50}}{48} \Rightarrow 1$

TEST.

CAT

$$\frac{7^{84}}{342}$$

$$= \frac{\left(7^{3}\right)^{28}}{342}$$

$$\frac{R}{\ }$$

$$7^1 / 342 \longrightarrow 7$$

$$7^2 / 342 \longrightarrow 49/342 \Rightarrow 49$$

$$7^3 / 342 \longrightarrow \frac{343}{342} \Rightarrow 1.$$

$$1$$

$$\frac{(a+1)^n}{a} \rightarrow \boxed{R=1}$$

$$\frac{a^n}{a+1}$$

n-odd

1, 3, 5, 7, 9

$a-2$

$\frac{a^n}{(a+1)} \rightarrow a$

n-odd

$2^1/3 \rightarrow 2$

$2^3/3 \rightarrow 2$

n-even

1

$2^2/3$ 1

$2^4/3$ 1

$2^6/3$ 1

$\boxed{H}$

$\dfrac{(a+1)^n}{a}$

$\dfrac{a^n}{(a+1)}$

n-odd

n-even

a

1

Remainder

1

TEST

1.

$$\frac{2023^{2025}}{2022} = \left(\frac{a+1}{a}\right)^{n} \Rightarrow 1$$

2.

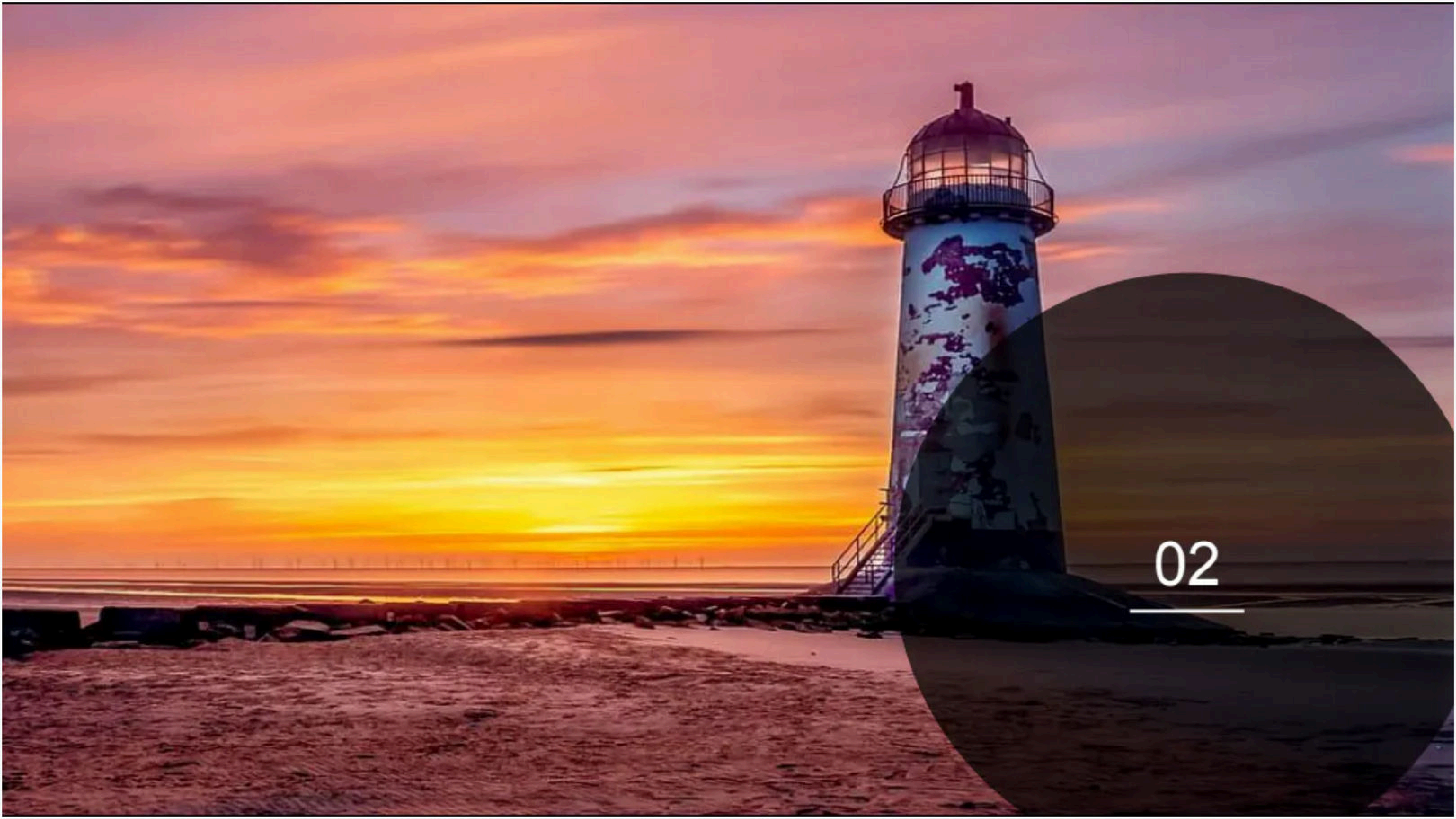
$$\frac{2023^{2025^{0}}}{2022} \quad \left(\frac{a+1}{a}\right)^{n} = 1$$

3.

$$\frac{2022^{2025}}{2023^{2022}} \qquad \frac{a^{n = \text{odd}}}{a+1}$$

4.

$$\frac{2022^{2025^{0}}}{2023} \qquad \frac{a^{n = \text{even}}}{a+1} \quad 1$$


02

$N! \geq 2!$ (Even)

GATE

What is the remainder when $1923^{1924^{1925}}$ is divided by 1924?

(A) 1922

(B) 1923

(C) 1

(D) 0

$$\frac{1923^{1924^{1925}}}{1924} = \frac{a^{\text{even}}}{a+1} \rightarrow 1$$

NOTE:

$11^2 = 121 \qquad 2 \times (1+2+3) = 12$

$111^2 = \boxed{12321} \qquad -3$

9

$1111^2 = 1234321 \qquad (1+2+3+4)$

-4

$(111\,111\,111)^2 = 12345678987654321$

$2(1+2+3+\dots+8+9) - 9$

ANS.- (C)

$$\frac{1923^{1924^{1925}}}{1924} = \frac{(1924-1)^{1924^{1925}}}{1924}$$

$$= \frac{(-1)^{1924^{1925}}}{1924}$$

$= 1$ (remainder) as $(-1)^{\text{even number}} = 1$


03

8871383926

If N = (11111111)^2, then what is the sum of the digits of N?

(A) 54

(B) 62

(C) 64

(D) 68

12345678 7654321

$2 \times (1+2+3+\dots+7) + 8$

$\cancel{2} \times \frac{1}{\cancel{2}} \cdot 7 \cdot 8 + 8 = 64$

ANS.- (C)

$1^2 = 1, 11^2 = 121, 111^2 = 12321, 1111^2 = 1234321$ and $11111^2 = 123454321$

$\Rightarrow 11111111^2 = 123456787654321$

The sum of the digits of given number is 64.

Answer: (3)

04

Find the last digit of the following expression.

$$(15)^{256} + (19)^{138} + (32)^{97} \Rightarrow 5^{256} + 9^{138} + 2^{97}$$

even

$$\cancel{5} + \cancel{1} + \cancel{2}$$

(A) 8 (B) 6

(C) 5 (D) 3

ANS.- (A)

Unit digit of $(15)^{256} = 5$.

As any number with 5 at the units place will always have a 5 at its units place, irrespective of the positive natural number power.

Now, $9^1 = 9$, $9^2 = 81$, $9^3 = 729$, $9^4 = 6561$

So, basically, a number with 9 at its units place raised to an even number, will have 1 at its units place and a number with 9 at its units place raised to an odd number, will have 9 at its units place.

Thus, the units digit of 19^{138} is a 1.

Now, $2^1 = 2$, $2^2 = 4$, $2^3 = 8$, $2^4 = 16$ and $2^5 = 32$

So, basically after every 4^{th} power, the units digit repeats itself.

Now, $97 = 96 + 1 = 24 \times 4 + 1$

Thus, we have 24 sets of 4 and then 1 more.

So, the number should have 2 at the units place.

Thus, the digit at the units place is $5 + 1 + 2 = 8$

Hence, option 1 is correct.


05

2

4, 6, 8, 100, 2000

Power = even

How many multiples of 32 are perfect squares, less than 10^4?

(A) 14

(B) 13

Prime Factors.

x^2

(C) 12

(D) 3

$(2^5) \times 2^1 \times 1 < 10{,}000$

2^2

3^2

4^2

$[2^5 \times \_\_\_] < 10{,}000$

Perf. Sq.

$x < \frac{100}{2^3}$

$x^2 < \frac{10{,}000}{2^6}$

$\leq \frac{100}{8}$

< 12

$$\underbrace{\left[(2^{5}) \times \_\_\_\right]}_{\text{Perfect Sq.}} < 10{,}000$$

$$(2^{5} \times 2) \times x^{2} < 10{,}000$$

$$x^{2} < \frac{10{,}000}{2^{6}}$$

$$x < 100/8$$

$$x < 12.5$$

$$12$$

ANS.- (C)

The least multiple of 32, which is a perfect square is $32 \times 2 = 64$.

So, all the numbers of the form 64k (where k is a perfect square) are perfect squares.

i.e. $64 \times 1^2, 64 \times 2^2, 64 \times 3^2, 64 \times 4^2, \ldots 64 \times 12^2$

If we take 64×13^2;

$64 \times 169 > 10^4$

So, total 12 numbers are there.

$$0.\overline{34} = \frac{34}{99}$$

$$0.3\overline{4}$$

$$\frac{(34-3)}{90} = \frac{31}{90}$$

06

Let D be a decimal of the form D = 0.abcdabcdabcd ..., where the digits a, b, c and d are integers lying between 0 and 9. At most three of these digits are zero. By what number should D be multiplied so that the result is a natural number?

(A) 999

(B) 9990

(C) 49995

(D) 499995

$D = 0.abcd$

$\frac{abcd}{9999} \times n$

$\frac{abcd}{9999} \times 49995 =$

ANS.- (C)

D = 0.abcdabcdabcd...

10000D = abcd.abcdabcd...

10000D - D = (abcd.abcdabcd...) - (0.abcdabcdabcd...)

9999D = abcd

D = $\frac{abcd}{9999}$

From the options, 49995 is the only multiple of 9999.

49995 = 9999 × 5

Hence, once we multiply D with 49995, we will get a natural number.

07

3 | 9 | 7

Find the last two digits of $25^{63} \times 63^{25}$.

(A) 85
(B) 75

(C) 55
(D) 45

$25^1 = 25$

$\boxed{25^n \Rightarrow 25}$

$(63^4)^6 \times 63^1$

$(61)^6 \times 63$

$\boxed{61 \times 63} \times 25$

$UDV = 3 \mid 19 \mid 7$

17^{29}

$(17^{4})^{7} \times 17^{1}$

$(21)^{7} \times 17$

$41 \times 17 \sim 97$

$3^4 = 81$

$7^4 = 2401$

$9^2 = 81$

TEST

1) 13^{100}

$(13^4)^{25}$

$(61)^{25}$

01

2) 17^{90}

$(17^4)^{22} \times 17^2$

$(21)^{22} \times 89$

41×89

$\underline{\underline{13^{23}}}$

UDU = $\frac{3|9|7}{}$

$(13^4)^5 \times 13^3$

$(3^4 = 81)$

$(81)^5 \times 97$

01×97

97

ANS.- (B)

The last two digits of 25^{63} are always 25.

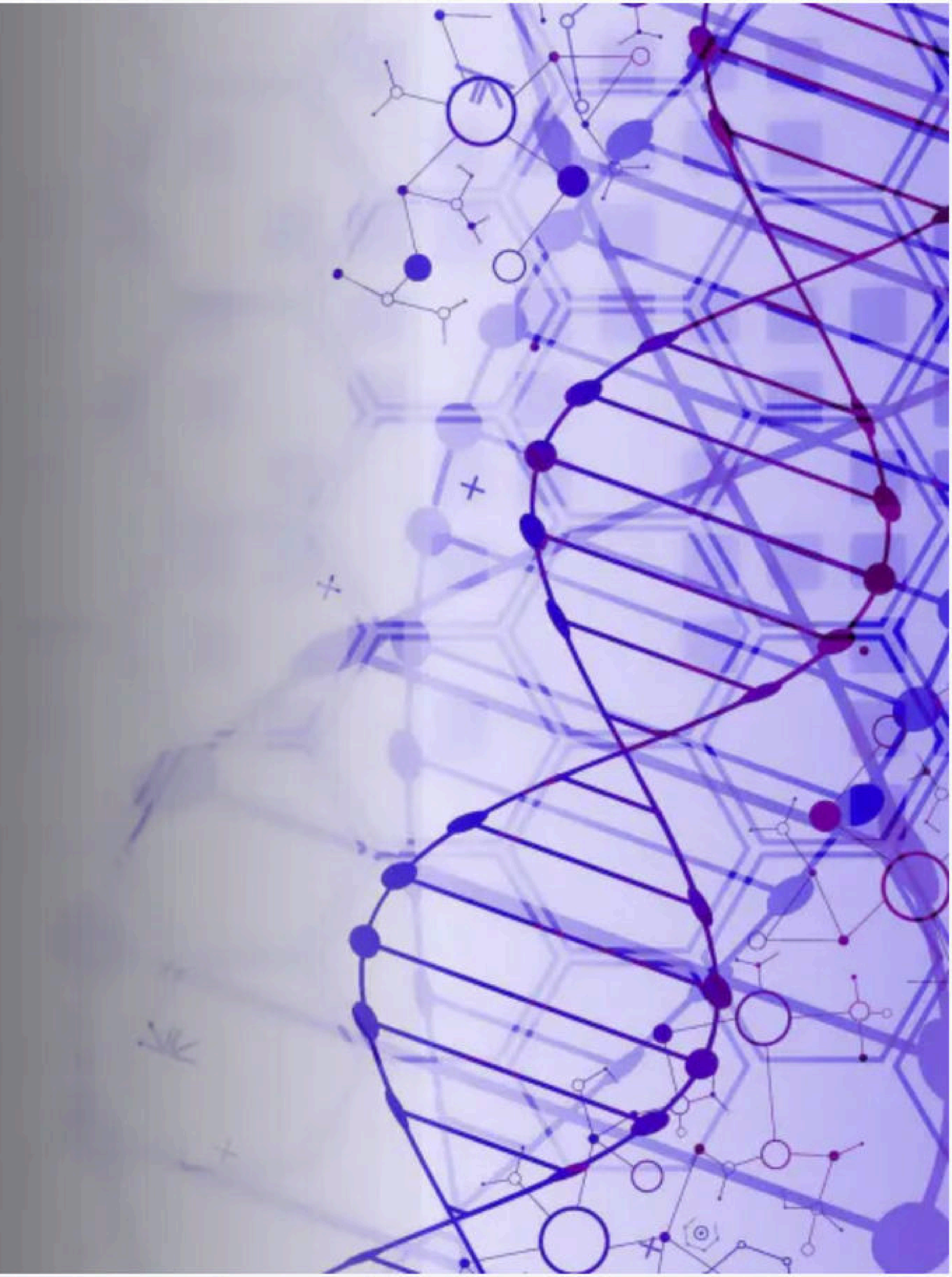
Last two digits of 63^{25} = $(3^{4 \times 6})3$ = $(81)^{6} \times 3$ = 481 × 3 = 243 (An even number digit) 3

(Tens digit of any power of a number, whose units digit is odd and tens digit is even, is always even.)

Thus, the last two digits of $25^{63} \times 63^{25}$ will be given by 25 × 43 (where a is even).

So, 75 is the required answer.

08



How many two-digit numbers have exactly five factors?

(A) 0

(B) 1

(C) 2

(D) 3

$N = a^{p} \times b^{q} \times c^{r}$

$n = (p+1)(q+1)(r+1)$

factors

factors = 05 — 1×5

$p+1 = 5$

$p = 4$

$a^4 =$

$2^4 = 16$

$3^4 = 81$

ANS.- (C)

The number which has five factors should be of the form a^4.

Such two-digit numbers are 2^4 and 3^4.


09

Mother: In order to learn effectively, students need to spend at least ten hours each week doing homework. However, my son Todd spends so much time playing video games that he barely has any time left for his homework. In order to improve Todd's academic performance, I will sell our family's video-game console.

The mother's plan to improve her son's academic performance depends on which of the following assumptions?

A. Video games are more addictive than television

B. Reading, writing, and arithmetic are more important than familiarity with 21st-century media

C. Adolescence is a crucial period in cognitive and emotional development.

D. In the absence of the video-game console, Todd will spend more time doing homework

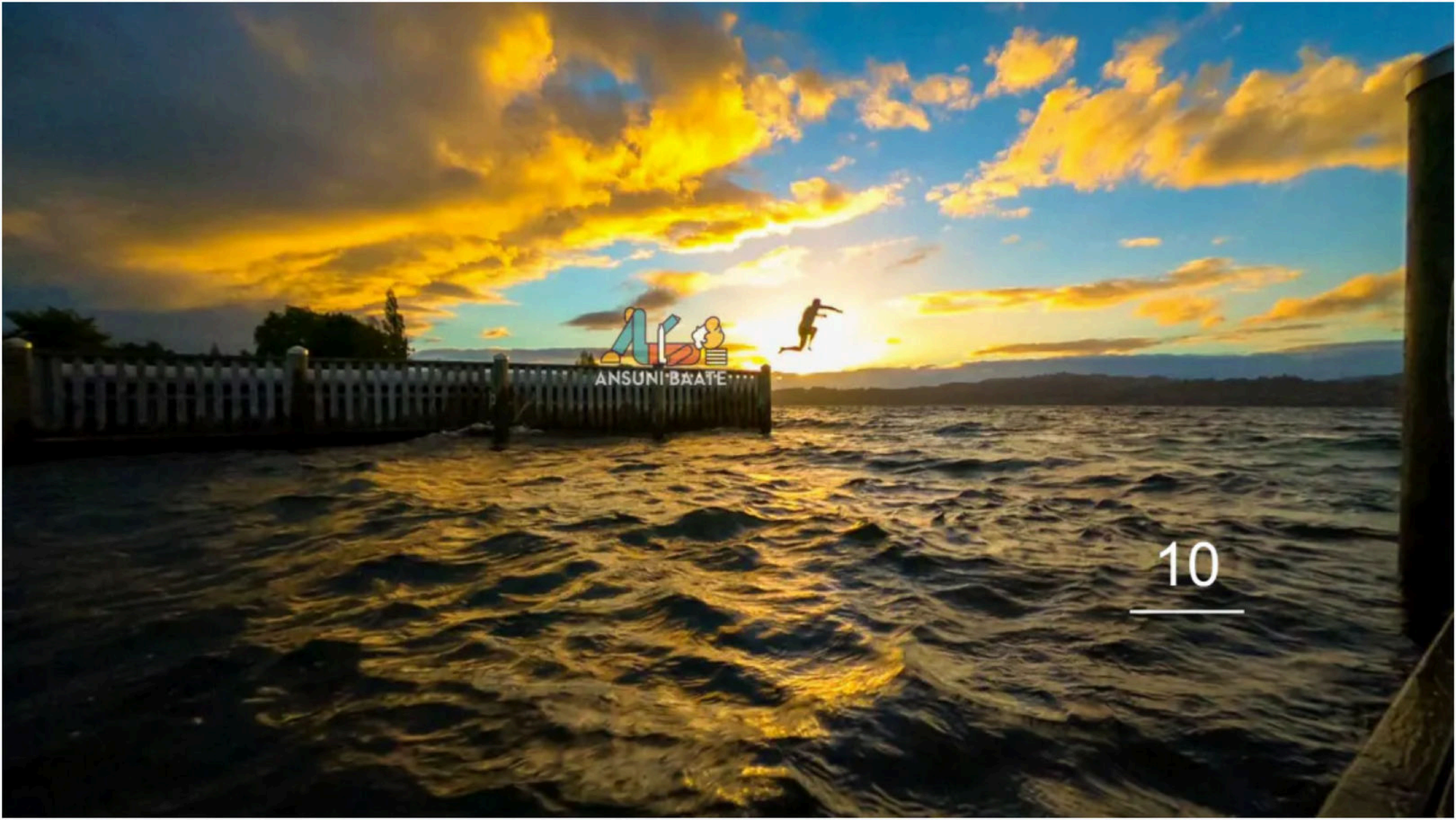
Explanation: The mother believes that her son's video-game habit is preventing him from doing enough homework. She plans to stimulate his academic performance by getting rid of the video-game console. Clearly, she must be assuming that her son will spend more time on homework once the video-game console is gone.

(A) The mother's argument does not mention television. We do not even know whether there is a television in the house. Therefore, her argument does not depend on any assumptions about television.

(B) We have no information about what subjects Todd is studying or about what subjects his mother values. Even if his mother is concerned about him spending too much time on video games, she does not necessarily believe that familiarity with "21st-century media" is unimportant; she may simply think that Todd has already played so many games as to be amply familiar with the genre.

(C) Todd's mother's argument does not depend on adolescence being a "crucial" period. Her argument about homework could be perfectly sound even if adolescence were of only average importance in a person's cognitive and emotional development.

(D) CORRECT. Todd's mother believes that the video-game console is preventing him from doing enough homework. Her plan to boost his academic performance by getting rid of the console depends on the idea that he will actually study more when the console is gone.


ANSUNI BAATE
10

A recent study demonstrated that parents living with children consume nearly five more grams of fat per day, on average, than do adults living without children. The higher fat intake among these parents is probably attributable to their snacking on the pizza and cookies that tend to be plentiful in households with children.

Which of the following, if true, would most seriously weaken this explanation of the parents' higher fat intake?

A. On an average, households with children spend $15 more per week on pizza and cookies than do households without children

B. Households with children purchase much more whole milk, which has a high fat content, than do households without children

C. Children consume most of the pizza and cookies in any given household

D. Parents ought to set a good example for their children, in dietary choices as in other matters

E. Not all parents living with children consume more grams of fat than do adults living without children

D | U X → Y

Explanation: The first sentence is a premise, which we can take as a statement of fact. The second sentence is a claim made by the author: that the source of the extra fat grams is pizza and cookies. We are asked to weaken this claim; note that we need to tear down the conclusion, not the premise.

(A) Strengthen. This choice supports the conclusion with evidence that households with children tend to have more pizza and cookies present.

(**B) CORRECT.** Weaken. This choice presents whole milk as an alternative source for the extra grams of fat, and thereby weakens the conclusion that the extra fat *must* be from pizza and cookies.

(C) Irrelevant. Children may consume most of the pizza and cookies, but the remainder could be consumed by their parents. This answer choice does not provide enough information to address the conclusion that the adults eat more pizza and cookies than they would if no children were present.

(D) Irrelevant. This argument starts with a premise about what parents actually do, and attempts to explain their behavior. Statements about what parents ought to be doing are not relevant to the argument.

(E) Irrelevant. This argument is about how to explain the higher fat intake of the average parent living with children. The fact that some parents are not average is both unsurprising and irrelevant.