NUMBER SYSTEM-2_EXPLANATION

Answer 1: (B)

8 can't be the unit digit of a perfect square.
(2, 3, 7, 8) are the digits that can't be the unit digit of a perfect square.

Answer 2: (C)

$71 \times 72 \times 73 \times 75 \times 79$
Unit digit: 1, 2, 3, 5, 9
Multiply the unit digit = $1 \times 2 \times 3 \times 5 \times 9$
$\Longrightarrow 1\times2 = 2$
$\Longrightarrow 2\times3 = 6$
$\Longrightarrow 6\times5 = 30$
$\Longrightarrow 0\times9 = 0$
$\therefore$ Unit digit = 0

Answer 3: (C)

Sum of the first 111 whole numbers = 0 + 1 + 2 + 3 +........+ 110

Sum of 'n' natural numbers= $\frac{n(n+1)}{2}$

Where, n = 110 [$\therefore$ 0 is not the natural number]

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

$$=\frac{110\times111}{2}=55\times111$$

$\therefore$ Unit digit = 5

Answer 4: (D)

$$\frac{12^{55}}{3^{11}}+\frac{8^{48}}{16^{18}}$$

$$\frac{(3\times4)^{55}}{3^{11}}+\frac{(2^3)^{48}}{(2^4)^{18}}$$

$$=\frac{3^{55}\times4^{55}}{3^{11}}+\frac{2^{144}}{2^{72}}$$

$$=3^{44}\times4^{55}+2^{72}$$

Unit digit $=(......1)\times(......4)+6$

$=4+6$

$=10$

Unit digit $=0$

Answer 5: (B)

2^{51}

$\frac{51}{4} \Longrightarrow$ remainder = 3

$2^3=8$

$\therefore$ Unit digit = 8

Answer 6: (C)

The last digit of $2^{32^{32}}$

$2^{32^{32}} = 2^{32\times32\times32............\times32 \text{ times}}$

$= 2^{4\times8\times(32............\times31 \text{ times})}$

$= 2^{4n}$

Where n = 8 × (32 × 32.......× 31 times)

Again $2^{4n} = 16^n$

$\therefore$ Unit digit is 6, for every $n \in N$

Hence, the required unit digit = 6

Answer 7: (C)

5	400
5	80
5	16
	3

$\left.\begin{matrix}80\\16\\3\end{matrix}\right\} = 99$

Number of zeroes = 80 + 16 + 3 = 99

Answer 8: (D)

$1^1\times2^2\times3^3\times4^4\times..........10^{10}$

Count the no. of 5's:

In 5^5 no. of fives = 5

In 10^{10} no. of fives = 10

No of zeroes = 5 + 10

= 15

Answer 9: (B)

$2 \times 4 \times 6 \times 8 \times ....\times 360$

$2^{180}\,(1 \times 2 \times 3 \times 4 \times ..... \times 180)$

$2^{180} \times 180!$

5	180
5	36
5	7
	1

$\left.\begin{matrix}36\\7\\1\end{matrix}\right\} = 44$

Number of 5's in 180 = 36 + 7 + 1 = 44

$\therefore$ Number of zeroes = 44

Answer 10: (C)

$10^1 \times 10^2 \times 10^3 \times 10^4 \times .... \times 10^{10}$

$10^{(1+2+3+4+........+10)} = 10^{55}$

[$\because$ 1+2+3+4+5+..........10 are the natural numbers]

Sum of the natural numbers $= \frac{n(n+1)}{2}$

$= \frac{10(10+1)}{2}$

$= 55$

Number of zeroes = 55

Answer 11: (B)

$2^{222} \times 5^{555}$

Number of 2's = 222

Number of 5's = 555

Number of 2's are less than number of 5's

Pair (2's & 5's) = 222

$\therefore$ Number of zeroes = 222

Answer 12: (B)

$\frac{\text{Remainder of number}}{43} = \frac{48}{43}$

Remainder $= 5$

Answer 13: (B)

$$\begin{array}{r} 27\overline{)2055} \\ \underline{189} \\ 165 \\ \underline{162} \\ 3 \end{array}$$

$\therefore$ Required number = 27 – 3 = 24

Answer 14: (D)

78 * 39 45

Odd place = 7 + * + 9 + 5 = 21 + *

Even place = 8 + 3 + 4 = 15

(21 + *) – (15) = either 11 or 0

$\Rightarrow$ (21 + *) – 15 = 11

$\Rightarrow$ 21 + * = 26

$\Rightarrow$ * = 5

Answer 15: (C)

Dividend = Divisor × quotient + remainder

First no. = (17 × n) + 13

Let n = 1

= (17 × 1) + 13

= 30

Second No. = (17 × n) + 11

= (17 × 1) + 11

= 28

According to question,

$\frac{30+28}{17} = \frac{58}{17} \rightarrow \text{Remainder} = 7$

Alternate method:

Divisor = remainder 1 + remainder 2 – remainder 3

17 = 13 + 11 – Remainder 3

$\therefore$ Remainder 3 = 24–17

= 7

Answer 16: (B)

Six-digit Number = xyxyxy

= xy × 10000 + xy × 100 + xy

= xy[10000 + 100 + 1]

= xy(10101)

Hence, option (B) will divide xyxyxy.

Answer 17: (A)

We know that $(a^n + b^n)$ is always divisible by (a + b), then, where n = odd power

(23^3+31^3) is always divisible by (23 + 31) = 54

So, remainder is 0.

Answer 18: (A)

$2^{71}+2^{72}+2^{73}+2^{74}$

$= 2^{71}(2^0+2^1+2^2+2^3)$

$=2^{71}(1+2+4+8)$

$= 2^{71}(15)$

$= 2^{70} \times 30$

$\therefore$ It is divisible by 10.

Answer 19: (D)

Total numbers that are divisible by 5 or 7

$$=\left(\frac{800}{5}-\frac{199}{5}\right)+\left(\frac{800}{7}-\frac{199}{7}\right)-\left(\frac{880}{35}-\frac{199}{35}\right)$$

= (160 – 39) + (114 – 28) – (22 – 5)

= 121 + 86 – 17

= 190

Now,

Total number = 800 – 200 + 1

= 601

∴ Required number = 601 – 190

= 411

Answer 20: (B)

72 = 8 × 9

Now

78y ÷ 8 is possible when y = 4

Again,

(9 + 8 + 5 + x + 3 + 6 + 7 + 8 + 4) ÷ 9 is possible when x = 4

∴ 4x – 3y = 4 × 4 – 3 × 4

= 16 – 12

= 4