

## Real Numbers

### MATHEMATICAL REASONING

1. Which of the following numbers have terminating decimal expansion?  
 (a)  $\frac{8}{225}$  (b)  $\frac{5}{18}$   
 (c)  $\frac{11}{21}$  (d)  $\frac{21}{150}$
  
2. A positive integer  $n$  when divided by 9, gives 7 as remainder. What will be the remainder when  $(3n - 1)$  is divided by 9?  
 (a) 1 (b) 2  
 (c) 3 (d) 4
  
3. The fraction  $\frac{2(\sqrt{2} + \sqrt{6})}{3(\sqrt{2} + \sqrt{3})}$  is equal to \_\_\_\_\_.  
 (a)  $\frac{2\sqrt{2}}{3}$  (b) 1  
 (c)  $\frac{2\sqrt{3}}{3}$  (d)  $\frac{4}{3}$
  
4.  $1.\overline{224}$  can be expressed as a fraction in simplest form as \_\_\_\_\_.  
 (a)  $\frac{450}{551}$  (b)  $\frac{1224}{1000}$   
 (c)  $\frac{551}{450}$  (d)  $\frac{1000}{1224}$
  
5. Given that H.C.F. (306, 954, 1314) = 18, find L.C.M. (306, 954, 1314).  
 (a) 1183234  
 (b) 1123238  
 (c) 1183914  
 (d) 1123328
  
6. If 'a' and 'b' are rational numbers and  $\frac{2+\sqrt{3}}{2-\sqrt{3}} = a+b\sqrt{3}$ , then  $(a+b)^2 =$  \_\_\_\_\_.  
 (a) 121 (b) 171  
 (c) 116 (d) 198
  
7. The descending order of the surds  $\sqrt[3]{2}, \sqrt[6]{3}, \sqrt[9]{4}$  is, \_\_\_\_\_.  
 (a)  $\sqrt[6]{4}, \sqrt[6]{3}, \sqrt[3]{2}$  (b)  $\sqrt[9]{4}, \sqrt[3]{2}, \sqrt[6]{3}$   
 (c)  $\sqrt[3]{2}, \sqrt[6]{3}, \sqrt[9]{4}$  (d)  $\sqrt[6]{3}, \sqrt[9]{4}, \sqrt[3]{2}$
  
8. The product of two consecutive natural numbers is always \_\_\_\_\_.  
 (a) An even number  
 (b) An odd number  
 (c) A prime number  
 (d) Divisible by 3
  
9. The value of  $\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \frac{1}{\sqrt{4}+\sqrt{5}}$   
 $+ \frac{1}{\sqrt{5}+\sqrt{6}} + \frac{1}{\sqrt{6}+\sqrt{7}} + \frac{1}{\sqrt{7}+\sqrt{8}}$   
 $+ \frac{1}{\sqrt{8}+\sqrt{9}}$  is \_\_\_\_\_.  
 (a) 0 (b) 1  
 (c) 2 (d) 4
  
10. The 100th root of  $10^{(10^{10})}$  is \_\_\_\_\_.  
 (a)  $10^{8^{10}}$  (b)  $10^{10^8}$   
 (c)  $(\sqrt{10})^{(\sqrt{10})^{10}}$  (d)  $10^{(\sqrt{10})^{\sqrt{10}}}$
  
11. The value of  $\frac{a+\sqrt{a^2-b^2}}{a-\sqrt{a^2-b^2}} + \frac{a-\sqrt{a^2-b^2}}{a+\sqrt{a^2-b^2}}$  is \_\_\_\_\_.  
 (a)  $\frac{a^2}{b^2}$  (b)  $\frac{b^2}{a^2}$   
 (c)  $\frac{a}{b}$  (d)  $\frac{2(2a^2-b^2)}{b^2}$
  
12. The rationalising factor of  $\sqrt[7]{x^3y^5z^2}$  is \_\_\_\_\_.  
 (a)  $\sqrt[7]{z^5y^2x^4}$  (b)  $\sqrt[47]{x^3y^2z}$   
 (c)  $\sqrt{x^4y^2z^5}$  (d)  $\sqrt[3]{y^2x^4z^3}$

**13.** Which of the following is an irrational number?

- (a)  $\pi$
- (b)  $\frac{22}{7}$
- (c) Both (a) and (b)
- (d) Neither (a) nor (b)

**14.** A real number  $\frac{2^2 \times 3^2 \times 7^3}{2^2 \times 5^3 \times 3^5 \times 7^4}$  will have \_\_\_\_\_.

- (a) Terminating decimal expansion
- (b) Non-terminating decimal expansion
- (c) Repeating decimal expansion
- (d) Both (b) and (c)

**15.** According to the Fundamental Theorem of Arithmetic, if p (a prime number) divides  $b^2$  and b is positive, then \_\_\_\_\_.

- (a) b divides p
- (b)  $b^2$  divides p
- (c) p divides b
- (d) None of these

### EVERYDAY MATHEMATICS

**16.** In a seminar the number of participants in Mathematics, Physics and Biology are 192, 240 and 168. Find the minimum number of rooms required if in each room same number of participants is to be seated and all of them being in the same subject.

- (a) 20
- (b) 25
- (c) 28
- (d) 30

**17.** Sam, Advik and Trishu go for a morning walk. They step off together and their steps measure 35 cm, 32 cm and 40 cm, respectively. What is the minimum distance each should walk so that each can cover the same distance in complete steps?

- (a) 1109
- (b) 1102
- (c) 1100
- (d) 1120

**18.** A boy multiplied 987 by a certain number and obtained 559981 as his answer. If in the answer both 9s are wrong and the other digits are correct, then the correct answer would be \_\_\_\_\_.

- (a) 553681
- (b) 555181
- (c) 555681
- (d) 556581

**19.** A boy was asked to multiply a given number by  $(8/17)$ . Instead, he divided the given number by  $(8/17)$  and got the result 225 more than what he should have got if he had multiplied the number by  $(8/17)$ . The given number was \_\_\_\_\_.

- (a) 8
- (b) 17
- (c) 64
- (d) 136

**20.** Four different electronic devices make a beep after every 30 minutes, 1 hour,  $1\frac{1}{2}$  hour and 1 hour 45 minutes respectively. All the devices beeped together at 12 noon. They will again beep together at \_\_\_\_\_.

- (a) 12 midnight
- (b) 3 a.m.
- (c) 6 a.m.
- (d) 9 a.m.

### ACHIEVERS SECTION (HOTS)

**21.** Which of the following statements is INCORRECT?

- (a) For natural numbers a and b, if a divides  $b^2$  then a divides b.
- (b) For any natural number  $n$ ,  $\sqrt{n-1} + \sqrt{n+1}$  is irrational.
- (c) Product of distinct prime numbers is always equal to their L.C.M.
- (d) For any natural number n,  $6^n$  never ends with digit zero.

- 22.** Fill in the blanks.  
 (i) Every point on the number line is a **P** number which may either **Q** or **R**.  
 (ii) **S** numbers have either terminating or non-terminating repeating decimal expansion.

	<b>P</b>	<b>Q</b>	<b>R</b>	<b>S</b>
(a)	Real	Integer	Natural	Irrational
(b)	Rational	Integer	Real	Irrational
(c)	Irrational	Rational	Integers	Natural
(d)	Real	Rational	irrational	Rational

- 23.** Match the following.

Column-I	Column-II
(P) Rational form of $0.\overline{32}$ is	(i) $\frac{14}{55}$
(Q) Rational form of $0.\overline{254}$ is	(ii) $\frac{11}{45}$
(R) Rational form of $0.\overline{12}$ is	(iii) $\frac{32}{99}$
(S) Rational form of $0.\overline{24}$ is	(iv) $\frac{11}{90}$

- (a) (P) → (iii); (Q) → (iv); (R) → (i); (S) → (ii)  
 (b) (P) → (iv); (Q) → (i); (R) → (ii); (S) → (iii)  
 (c) (P) → (iii); (Q) → (i); (R) → (iv); (S) → (ii)  
 (d) (P) → (i); (Q) → (iii); (R) → (iv); (S) → (ii)

- 24.** A charitable trust donates 28 different; books of Maths, 16 different books of Science and 12 different books of Social Science to poor students. Each student. is given maximum number of books of only one subject of their interest and each student got equal number of books.  
 (a) Find the number of books each student got.  
 (b) Find the total number of students who got books.

	A	B
(a)	4	14
(b)	3	10
(c)	4	10
(d)	3	15

- 25.** Read the statements carefully and state 'T' for true and 'F' for false.

- (a)  $\frac{501}{25}$  is a terminating decimal,  
 (ii)  $\frac{621}{125}$  is a non-terminating decimal.  
 (iii)  $\frac{6805}{27 \times 5^2}$  is a non-terminating decimal.  
 (iv)  $\frac{7105}{7 \times 5^2}$  is a terminating decimal.

	(i)	(ii)	(iii)	(iv)
(a)	F	T	T	F
(b)	T	F	T	T
(c)	T	T	F	F
(d)	F	T	F	T

#### ANSWER KEY

<b>1.</b> D	<b>2.</b> B	<b>3.</b> D	<b>4.</b> C	<b>5.</b> C
<b>6.</b> A	<b>7.</b> C	<b>8.</b> A	<b>9.</b> C	<b>10.</b> B
<b>11.</b> D	<b>12.</b> A	<b>13.</b> A	<b>14.</b> D	<b>15.</b> C
<b>16.</b> B	<b>17.</b> D	<b>18.</b> C	<b>19.</b> D	<b>20.</b> D
<b>21.</b> A	<b>22.</b> D	<b>23.</b> C	<b>24.</b> A	<b>25.</b> B

#### HITS AND SOLUTIONS

- 1.** (d) : If the prime factorisation of q in rational number  $\frac{p}{q}$  is of the form of  $2^n \times 5^m$ , where m and n are non-negative integers, then the number has a terminating decimal expansion.
- 2.** (b) : We have,  $n = 9q + 7$ , where q is the quotient.  
 $\Rightarrow 3n = 27q + 21$  (Multiply by 3)  
 $\Rightarrow 3n - 1 = 27q + 20 = 9(3q + 2) + 2$   
 So, remainder is 2, when  $(3n - 1)$  is divided by 9.
- 3.** (d) :
- 4.** (c) : Given number is  $1.\overline{224}$   
 Let  $x = 1.\overline{224}$  ... (i)

Multiplying (i) by 10, we get  $10x = 12.2\bar{4}$   
....(ii)

$$9x = 12.2\bar{4} - 1.22\bar{4} = 11.02$$

$$\Rightarrow x = \frac{1102}{900} = \frac{551}{450}$$

5. (c) : LCM (306, 954, 1314) =  

$$\frac{306 \times 954 \times 1314 \cdot \text{HCF}(306, 954, 1314)}{\text{HCF}(306, 954) \times \text{HCF}(954, 1314) \times \text{HCF}(306, 1314)}$$
  

$$= \frac{306 \times 954 \times 1314 \times 18}{18 \times 18 \times 18} = 1183914$$

6. (a) :

7. (c) : L.C.M. of 3, 6, 9 is 18.

$$\sqrt[3]{2} = (2)^{1/3} = (2)^{6/18} = -(64)^{\frac{1}{18}}$$

$$\sqrt[3]{6} = (3)^{1/6} = (3)^{3/18} = (27)^{\frac{1}{18}}$$

Descending order is,  $\sqrt[3]{2} > \sqrt[6]{3} > \sqrt[9]{4}$

8. (a) : Let n be a natural number, then (n+1) will be a consecutive natural number.

$\Rightarrow$  Their product =  $n(n+1)$

So, the product would always be an even number.

If n is odd, then  $n+1$  would be even, their product is even.

If n is even, then  $n+1$  would be odd, again their product is even.

9. (c) : We have,

$$\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \frac{1}{\sqrt{4}+\sqrt{5}} +$$

$$\frac{1}{\sqrt{5}+\sqrt{6}} + \frac{1}{\sqrt{6}+\sqrt{7}} + \frac{1}{\sqrt{7}+\sqrt{8}} + \frac{1}{\sqrt{8}+\sqrt{9}}$$

On rationalising all the terms, we get

$$\sqrt{2}-1 + \sqrt{3}-\sqrt{2} + \sqrt{4}-\sqrt{3} + \sqrt{5}-\sqrt{4} +$$

$$\sqrt{6}-\sqrt{5} + \sqrt{7}-\sqrt{6} + \sqrt{8}-\sqrt{7} + \sqrt{9}-\sqrt{8}$$

$$= \sqrt{9}-1 = 3-1 = 2$$

10. (b) : 100th root of  $10^{10^{19}} = (10^{10^{19}})^{\frac{1}{100}}$   

$$= 10^{10^{19}} \times 10^{-2} = 10^{10^{10-2}}$$

11. (d) : We have,  $\frac{a+\sqrt{a^2-b^2}}{a-\sqrt{a^2-b^2}} + \frac{a-\sqrt{a^2-b^2}}{a+\sqrt{a^2-b^2}}$

Rationalising both terms, we get

$$\frac{(a+\sqrt{a^2-b^2})^2}{a^2-a^2+b^2} + \frac{(a-\sqrt{a^2-b^2})^2}{a^2-a^2+b^2}$$

$$= \frac{1}{b^2} \left[ \begin{array}{l} a^2+a^2-b^2+2a\sqrt{a^2-b^2}+a^2+a^2 \\ -b^2-2a\sqrt{a^2-b^2} \end{array} \right]$$

$$= \frac{2}{b^2} (2a^2-b^2)$$

12. (a) :

13. (a) :

14. (d) : Given number,

$$\frac{2^2 \times 3^2 \times 7^3}{2^2 \times 5^3 \times 3^5 \times 7^4} = \frac{1}{3^3 \times 5^3 \times 7}$$

If the prime factorisation of denominator has power of 2, power of 5 or both, then the number should always be terminating decimals. So, it is a non-terminating and repeating decimal expansion.

15. (c) : If p divides  $b^2$ , then p also divides b.

16. (b) : HCF of

$$(192, 240, 168) = 2 \times 2 \times 2 \times 3 = 24$$

Number of rooms for participants in Mathematics, Physics and Biology respectively is

$$\frac{192}{24} = 8, \frac{240}{24} = 10 \text{ and } \frac{168}{24} = 7$$

$\therefore$  Total minimum number of required rooms = 25

17. (d) : L.C.M. (35, 32, 40) =  $2^5 \times 5 \times 7 = 1120$

So, each should walk 1120cm so that each can cover the same distance in complete steps.

18. (c) :  $987 = 3 \times 7 \times 47$

So, the required number must be divisible by each one of 3, 7, 47.

19. (d) : Let the number be  $x$ .  $= 7 + 4 + 3 = 14$   
 Then, according to question.  

$$\frac{x}{8/17} = 225 + x \times \frac{8}{17} \Rightarrow \frac{17x}{8} - \frac{8x}{17} = 225$$

$$\Rightarrow 225x = 8 \times 17 \times 225 \Rightarrow x = 136$$
20. (d): L.C.M. (30, 60, 90, 105) =  $2^2 \times 3^2 \times 5 \times 7$   
 $= 1260 \text{ mins} = 21 \text{ hours}$
21. (a) : If  $a$  (any prime number) divides  $b^2$  and  $b$  is natural number, then  $a$  divides  $b$ .
22. (d) :
23. (c) : (P) Let  $x = 0.\overline{32}$   
 $\Rightarrow x = 0.323232\ldots \quad \dots(1)$   
 $\Rightarrow 100x = 32.3232\ldots \quad \dots(2)$   
 Subtracting (1) from (2), we get  

$$99x = 32 \Rightarrow x = \frac{32}{99}$$
  
 (Q) Let  $x = 0.\overline{254}$   
 $\Rightarrow x = 0.25454\ldots \quad \dots(1)$   
 $\Rightarrow 100x = 25.45454\ldots \quad \dots(2)$   
 Subtracting (1) from (2), we get  

$$99x = 25.2 \Rightarrow x = \frac{252}{990} = \frac{14}{55}$$
  
 (R) Let  $x = 0.\overline{12}$   
 $\Rightarrow x = 0.1222\ldots \quad \dots(1)$   
 $\Rightarrow 10x = 1.222\ldots \quad \dots(2)$   
 Subtracting (1) from (2), we get  

$$\Rightarrow 9x = 2.2 \Rightarrow x = \frac{22}{90} = \frac{11}{45}$$
24. (a) (a) H.C.F. (28, 16, 12) =  $2 \times 2 = 4$   
 $\therefore$  Number of books each student got = 4  
 (b) No. of students who got Maths books  

$$= \frac{28}{4} = 7$$
  
 No. of students who got Science books  

$$= \frac{16}{4} = 4$$
  
 No. of students who got Science books  

$$= \frac{12}{4} = 3$$
  
 $\therefore$  Total no. of students who got books
25. (b) :