MATHS

BOOKS - CALCUTTA BOOK HOUSE MATHS (BENGALI ENGLISH)

REAL NUMBERS

Examples

1. How many natural numbers are less than 8 ? Write down the numbers.

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2. If $-5 < x < 5$ and x is a negative integer , then find the value of x .

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3. If two integers a and b be such that $-2 < a < 0$ and $0 < b < 2$, then show that

(i) (a +b) belongs to the set of whole numbers W :

(ii) (b-a) belongs to the set of natural numbers N :

(iii) (a-b) belongs to the set of integers Z .

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4. If two negative integers n_1 and n_2 be such that $n_2 \neq -1, n_2 \neq -2$ and $-3 < n_v, n_2 < 3$ then find the values of

A. $n_1 + n_2$

B. $n_1 - n_2$

C. $n_1 n_2$

D. $\frac{n_1}{n_2}$

Answer: c

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5. 0 is a rational number. The rational number just next to it is-

A. 1

B. $\frac{1}{2}$

C. $\frac{1}{10}$

D. Undetermined

Answer: c

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6. Give 4 examples of rational number.

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7. Insect one rational in between the following two given rational numbers is each case :

(i) 4 and 5 (ii) - 1 and $\frac{1}{2}$ (iii) $\frac{1}{4}$ and $\frac{1}{3}$ (iv) -2 and -1

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8. What type of number will be resulted when the sum, subtraction , product and division (divisor is not zero) of two rational numbers are taken ?

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9. $\frac{p}{q}$ is a rational number, where p and q , are both integers and $q \neq 0$ The decimal expansion of $\frac{p}{q}$ gives a terminating decimal fraction. Then what property q must satisfy ?

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10. Insect 3 rational numbers between each pair of rational numbers given below :

(i) 4 and 5 (ii) $\frac{1}{5}$ and $\frac{1}{4}$

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11. Insect 5 rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$

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12. Express the following rational numbers in decimal form and what type of numbers the resulting decimal fractions are : (i) $\frac{3}{13}$ (ii) $4\frac{1}{8}$ (iii) $\frac{2}{11}$ (iv) $\frac{329}{400}$

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13. Express the following fractions in the form of $\frac{p}{q}$ where p,q $\in Z$ and $q \neq 0$

(i) $0.\bar{6}$ (ii) $0.4\bar{7}$ (iii) $0.\overline{001}$ (iv) 0.999....

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14. If $\frac{1}{7} = 0.\overline{142857}$ then what will be the reults of the rational fractions $\frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{5}{7}$ and $\frac{6}{7}$ when without preforming actual divsions, they are expressed as decimal fractions. Give reasons in favour of you anwer.

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15. If $\sqrt{3} = 1.732\ldots. And \sqrt{27} = 5.196\ldots.$ then $\left(\sqrt{27} - \sqrt{3}\right)^2 =$

A. $(3.464)^2$

B. $3.464\ldots^2$

C. 24

D. 12

Answer: b

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16. What do you mean by irrational numbers ? Give 4 examples of irrational number.

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17. Give 4 examples of irrational number.

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18. Write 4 numbers, the decimal expansion of which are non-terminating and non recurring

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19. Are the square roots of all positive integers irrational ? If not, then give an example of such a positive integer, the square root of which is a rational number.

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20. Find out which one of the following numbers is a rational and which one is an irrational numbers :

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21. Determine whether the following given numbers are rationals or irrationals :

(i) $\sqrt{2}$ (ii) $\sqrt{625}$

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22. π is the proportion of the cirumference (let c) of a circle to the diamter (let d) of it, i.e, $\pi = \frac{c}{d}$ where c and d are both terminting , then how is π an irrational number ? Explain.

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23. Insert 2 rational and 2 irrational numbers in between each pair of numbers given below :

(i) $\frac{3}{7}$ and $\frac{4}{7}$ (ii) $\frac{1}{13}$ and $\frac{1}{11}$

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24. Solve the following 4/10 = ?

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25. (a) (i) By taking any two irrational numbers, prove that their sum is a rational number.

(ii) By taking any two irrational numbers, prove that their difference is a rational number.

(b) Insert in between $\frac{1}{7}$ and $\frac{2}{7}$

(i) a rational number : (ii) an irrational number.

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26. Represent the number $\sqrt{9.3}$ on the number line.

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27. Which one of the following is false :

(i) Every rational number is a real number

(ii) Every integer is a real number

(iii) $\sqrt{2}$ is a rational number

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28. Do the sum : $(i)\sqrt{12}+\sqrt{108}(ii)\sqrt{8}+\sqrt{50}$

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29. Subtract : $\sqrt{175}-\sqrt{112}$

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30. Do the product : (i) $\sqrt{7} \times 3\sqrt{7}(ii)\sqrt{18} \times \sqrt{72}$

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31. Solve : $\sqrt{243} - \sqrt{108}$

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32. Rationalise the denominator of

(i) $\frac{1}{\sqrt{7}}$ (ii) $\frac{1}{\sqrt{5}+\sqrt{3}}$ (iii) $\frac{1}{\sqrt{7}-1}$ (iv) $\frac{1}{\sqrt{7}-\sqrt{6}}$

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33. If a + b = $\sqrt{10}$ and a - b = $\sqrt{8}$, then the value of $a^2 + b^2$ is

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34. If $x = a^{\frac{1}{3}}b^{-\frac{1}{3}} + a^{-\frac{1}{3}}b^{\frac{1}{3}}$ then prove that $a\left(bx^3 - 3bx - a\right) = b^2$

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35. If x = $\frac{1}{2}\left\{\left(\sqrt{\frac{a}{b}} - \sqrt{\frac{b}{a}}\right\}\right.$ then find value of $\frac{2a\sqrt{1+x^2}}{x+\sqrt{1+x^2}}$

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36. If x = $\frac{4\sqrt{15}}{\sqrt{5}+\sqrt{3}}$ then find the value of $\frac{x+\sqrt{20}}{x-\sqrt{20}} + \frac{x+\sqrt{12}}{x-\sqrt{12}}$

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37. If a $\left(2+\sqrt{3}\right) = b\left(2-\sqrt{3}\right) = 1$ then find the value of $\frac{1}{a^2+1} + \frac{1}{b^2+1}$

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38. If a = $\frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $b = \frac{\sqrt{5}-1}{\sqrt{5}+1}$ the find the value of $\left(4a^2 - 3ab + 4b^2\right)$

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39. If a + b = $\sqrt{13}$ and a - b = $\sqrt{9}$, then the value of $4ab$ is

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40. (a) If $x = \frac{\sqrt{5}+1}{\sqrt{5}-1}$ then find the value of $\left(x - \frac{1}{x}\right)$

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41. If $x = \frac{1}{2-\sqrt{3}}$ then find the value of $\left(x^3 - 2x^2 - 7x + 4\right)$

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42. If A.M and G.M of two positive real numbers are 100 and 5 respectively, then find their H.M.

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43. If $x = \frac{\sqrt{3}}{2}$ then find the value of $\frac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}}$

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44. If x = $\frac{\sqrt{a+2b} + \sqrt{a-2b}}{\sqrt{a+2b} - \sqrt{a-2b}}$ then prove that $bx^2 - ax + b = 0$

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45. Find the value of 8xy $\left(x^2 + y^2\right)$ when x +y = $\sqrt{3}$, and $x - y = \sqrt{2}$

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46. If $x = \frac{\sqrt{5}-1}{\sqrt{5}+1}$ and $y\frac{\sqrt{5}+1}{\sqrt{5}-1}$ then find the value of $\left(\frac{x^2}{y}+\frac{y^2}{x}\right)$

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47. If x =1 + $\sqrt{2}+\sqrt{3}$ and $y = 1+\sqrt{2}-\sqrt{3}$ then find the value of $\frac{x^2+4xy+y^2}{x+y}$

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48. If $a^2+b+2a\sqrt{b} = 7+4\sqrt{3}$ and $c^2+d-2c\sqrt{d} = 1$ then find the value of (a + b +c +d) .

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Exercise 1 1 Mcq

1. If n is an integer and -3 < n <3 , then the values of n .

A. belong to N

B. belong to W

C. belong to Z^-

D. belong to Z

Answer: D

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2. The number of integers which are common to both Z^- and Z^+ is

A. 0

B. 1

C. 2

D. 3

Answer: A

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3. 1-71 belongs to

A. Z^-

B. N

C. both in (a) and (b)

D. None of these

Answer: B

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4. Which of the following is correct ?

A. $N > W > Z$

B. $N < W < Z$

C. $N < W > Z$

D. $N > W < Z$

Answer: C

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Short Answer Type Questions

1. Write down the numbers which is the least positive integer and the greatest negative integer.

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2. (a) Give examples of a whole number and a negative integer.

(b) If p and q be two integers, find the condition for which p +q =0

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3. Write down the two properties of integers .

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4. If the least natural number be x and the greatest negative integer be y, then find

(a) x +y (b) x-y

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5. Insert in between $\sqrt{5}$ and $\sqrt{7}-(a)$ a rational number, (b) an irrational number ,

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6. By taking two examples of irrational numbers prove that (a) the sum of them is a rational number, (b) the product of them is a rational number.

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7. Insert in between $\frac{5}{7}$ and $\frac{9}{11}$

(a) a rational number (b) an irrational number

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8. Give two such examples of numbers, the decimal expansion of which are non- terminating and non-recurring .

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9. Mean of the prime numbers between 3 and 15 is?

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10. Find out whether the following numbers are rational or irrational :

(a) 2.42857314 (b) 2.02002000....

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11. What should be subracted from the number $\left(\sqrt{e}+1\right)\left(\sqrt{e}-1\right)$ to get a rational number ?

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Long Answer Typoe Questions

1. If a and b be two integers such that -3

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2. If x_1 and x_2 be two integers such that $x_1 \neq 0, x_2 \neq 0$ and $-2 < x_1, x_2 < 2$ then find the values of (i) $x_1 + x_2$ (ii) $x_1 - x_2$ (iii) $x_1 x_2$ (iv) $\frac{x_1}{x_2}$

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Exercise 1 2 Mcq

1. If r and s be two positive rational numbers and n is a positive integer, then which one of the following is correct?

A. nr=s

B. $nr > s$

C. r = n =s

D. $nr < s$

Answer: B

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2. A is a circle containing the numbers $-\frac{1}{2}, -\frac{1}{3}, 0, \frac{1}{4}$, B is another circle containing the numbers $\frac{1}{2}, \frac{1}{3}, 0, -\frac{1}{4}$ Then the rational number common to both the circles A and B is

A. $-\frac{1}{2}$

B. $-\frac{1}{3}$

C. 0

D. $-\frac{1}{4}$

Answer: C

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3. The decimal expansion of $\frac{1}{9}$ is

A. recuring non- terminating

B. non-reecurring non-terminating

C. Terminating

D. None of these

Answer: A

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4. Which one of the followings is the transitivity law ?

A. $x > y \Rightarrow x + z > y + z, \forall x, y, z, \in Z$

B. x +y = y +x , $\forall x, y, \in Z$

C. Either $x > y$ or $x = y$ or $x < y$, $\forall x, y, z \in Z$

D. $x > y$ and $y > z \Rightarrow x > z, \forall x, y, z, \in Z$

Answer: D

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5. If x,y,z $\in Z$ then (x +y) z = x, z +y , z - this law is called

A. commutative law for addition

B. commutative law for multiplication

C. Disrtibutive law

D. Associative law of addition .

Answer: C

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6. On the number line, the number of rational numbers between any two rational numbers is

A. 0

B. 1

C. Terminating

D. Non-terminating

Answer: D

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7. $0.4\overline{23}$ = (.·. Sign denotes recurring)

A. $\frac{423}{990}$

B. $\frac{419}{990}$

C. $\frac{427}{990}$

D. $\frac{423}{900}$

Answer: B

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8. $\frac{2.\overline{415}}{3.\overline{043}} =$

A. $\frac{2413}{3040}$

B. $\frac{2417}{3043}$

C. $\frac{2417}{3046}$

D. $\frac{2415}{3043}$

Answer: A

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9. A rational number in between $\frac{1}{3}$ and $\frac{1}{6}$ is

A. $\frac{1}{2}$

B. $\frac{1}{4}$

C. $\frac{1}{7}$

D. $\frac{5}{6}$

Answer: B

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10. The addition of two rational number is a

A. Irrational number

B. Rational of Irrational number

C. Rational number

D. May or may not be a ration number

Answer: C

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Short Answer Type Questions

1. what is rational numbers ? Give two examples.

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2. Is 0 is rational number ? So , express, 0 in the form of $\frac{p}{q}$ where p and q are both integers and $q \neq 0$

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3. Insert one rational number in between $\frac{1}{6}$ and $\frac{1}{5}$

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4. what is meaning of the statement - the rational numbers are dense on the number line ?

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5. If $\frac{a}{b}$ and $\frac{c}{d}$ be two rational numbers and if a = nc, b = nd,when n is a natural number , then what type of rational numbers are the numbers $\frac{a}{b}$ and $\frac{c}{d}$ and why ?

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6. Plot the rational numbers $\frac{2}{3}$ and $\frac{3}{4}$ on the same number line. State which one of them is greater ?

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7. In the case of irrational numbers -

(i) State the commutative law for addition . By . Taking any 2 irrational numbers, prove the law,

State the commutative law of multiplication By taking any 2 irrational numbers, prove the law,

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8. Express $\frac{1}{3}$ in the form of a decimal fraction. Then state what type of decimal fraction it is .

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Long Answer Type Questions

1. Insert 4 rational numbers in between each pair of the following pairs of rational numbers ?

(i) $\frac{1}{7}$ and $\frac{1}{8}$ (ii) $\frac{1}{10}$ and $\frac{1}{11}$ (iii) 8 and 9 (iv) -3 and -2

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2. Insert 8 rational numbers in between each pair of rational numbers given below :

(i) 17 and 18

(ii) $\frac{3}{5}$ and $\frac{5}{6}$

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3. Plot the following rational numbers on the number line :

(i) $-\frac{13}{4}$ (ii) $\frac{11}{5}$ (iii) $\frac{3}{5}$ (iv) $\frac{2}{9}$

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4. What do you mean by equivalent rational numbers ? Explain with examples ?

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5. State the left distributive law. By choosing any three rational numbers , prove the law.

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6. What do you mean by transitivity law?

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7. Transform the following decimal fractions in the form $\frac{p}{q}$ where both p and q are intergers and $q \neq 0$

(i) $0.1\bar{6}$ (ii) $0.\overline{78}$ (iii) $1.\overline{27}$ (iv) $0.\overline{230769}$

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8. Express the following numbers in the form $\frac{p}{q}$ where both p and q are integers and $q \neq 0$

(i) 0.7777.... (ii) 0.888...

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9. For rational numbers

(i) state the associative law on addition, By choosing and three rational numbers prove the law.

(ii) State the associative law on multiplication . By choosing any three rational numbers prove the law.

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10. IF n $\in N$ and 998 < n < 1000, then express the rational number $\frac{1}{n}$ in the form of a decimal fraction and state what type of decimal fraction it is

.

(b) If n $\in N$ and 18 < n < 20. then express the rational number $\frac{1}{n}$ in the form of decimal fraction and state what type of decimal fraction it is .

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Exercise 1 3 Mcq

1. The decimal expansion of the irrational numbers are

A. Terminating

B. Non-terminating recurring

C. Non - terminating non-recurring

D. None of these

Answer: C

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2. The number of irrational numbers in between any two irrational numbers is

A. 0

B. 1

C. not infinity

D. infinity

Answer: D

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3. The product of two irrational numbers is

A. an irrational number

B. a rational number

C. an integer

D. a rational or irrational number

Answer: D

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4. π is

A. an integer

B. an irrational number

C. a rational number

D. None of these

Answer: B

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5. π is

A. a non-algebric irrational number

B. an algebric irrational number

C. an algebric natural number

D. an algebric rational number

Answer: A

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6. Every irrational number

A. cannot be represented on the number line

B. can be represented on the number line

C. can or cannot be represented on the number line

D. None of these

Answer: B

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7. On the number line just next irrational number of $\sqrt{2}$ is

A. $\sqrt{3}$

B. 1.415

C. 1.514

D. undetermined

Answer: D

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8. The decimal expansion of $\sqrt{2}$ is

A. a terminating decimal number

B. a non- terminating non-recurring number

C. a terminating or recurring decimal number

D. none of these

Answer: B

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9. If $\sqrt{2} = 1.414...$ and $\sqrt{8} = 2.828....$ then $\left(\sqrt{2} + \sqrt{8}\right)^2$ =

A. 17.994

B. $(4.242)^2$

C. 18

D. none of these

Answer: C

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Exercise 1 3 Mcq

1. If $2^{x^2} = 1, \text{then} \sqrt{x}$ =

A. 2.24

B. 2.23606...

C. 2.449

D. undetermined

Answer: B

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Long Answer Type Questions

1. Examine, whether the following numbers are rational or irrational: (i) 0.3796 (ii) 7.478478.. (iii) 1.101001000100001

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2. Examine, whether the following numbers are rational or irrational: (i) 0.9842796 (ii) 6.125125125.. (iii) 1.101001000100000.....

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3. Locate the number 3.26 on the number line by the method of successive magnification (Give only the signs of construction, description is not necessary) .

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4. Locate the number 2.54 on the number line by the method of successive magnification.

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5. If H.M and G.M of two positive real numbers are 13 and 9 respectively, then find their A.M.

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6. Find out which one of the following numbers is rational and which one is irrational

(i) $\sqrt{127}$(ii) $\sqrt{1521}$ (iii) 0.285714285714...

(iv) 0.101001000.... (v) $\frac{7}{\sqrt{5}}$ (vi) 0.00010001

(vii) $\sqrt{2}+21$ (viii) $\pi-2$

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7. Give 4 examples of such numbers , the decimal expansion of which are non-terminating and non- recuring .

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8. Insert 2 rational and 2 irrational numbers in between each pair of numbers given below :

(i) $\frac{3}{7}$ and $\frac{4}{7}$ (ii) $\frac{1}{13}$ and $\frac{1}{11}$

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9. What is called an irrational number ? Give 2 examples.

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10. In the case of irrational numbers

(i) State the associative law for addition . By taking any three- irrational numbers, prove the law.

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11. In the case of irrational numbers -

(i) State the commutative law for addition . By . Taking any 2 irrational numbers, prove the law,

State the commutative law of multiplication By taking any 2 irrational numbers, prove the law,

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12. (i) Prove that $\sqrt{2}$ is an irrational number.

(ii) Prove that $\sqrt{3}$ is an irrational number.

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13. If the greatest lower limit and the lowest upper limit of the serices $\frac{1}{n}$ where , $n \in N, \quad \text{be}\lambda \text{ and } \omega$ respectively , then find the value of $(\lambda + \omega)$

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14. Give an example of non-algebraic irrational number ? If irrational what type of irrational $(\pi - n)$ is an irrational number.

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15. Find the hypotenuses of an isosceles right triangle whose side is 6 cm.

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Exercise 1 4 Mcq

1. Which one of the following number is not a real number ?

A. 0

B. $\sqrt{11}$

C. $2 + \sqrt{3}$

D. $I\left(i=\sqrt{-1}\right)$

Answer: D

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2. Which one of the following numbers is a non-real number ?

A. $\frac{p}{q}, p, q \in N$

B. $-\sqrt{3}$

C. $\sqrt{-3}$

D. $p+\sqrt{q}, p, q, \in N$

Answer: C

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3. If the natural numbers, the integers , the rational numbers and the real numbers are denoted by N,Z,Q and R respectively , then which one of the followings is correct ?

A. $N > Z > Q > R$

B. $N < Z < Q < R$

C. $N < Z < Q > R$

D. $N < Z > Q > R$

Answer: B

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4. Which pair of the followings is called real numbers ?

A. Rational and Irrational numbers together

B. Integers and Rational number together

C. Integers and Irrational numbers together

D. Natural numbers and integers together

Answer: A

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5. The conjugate irrational number of $a + \sqrt{b}$, where b is not a perfect square, is

A. $b + \sqrt{a}$

B. $b - \sqrt{a}$

C. $a - \sqrt{b}$

D. $a + \sqrt{-b}$

Answer: C

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6. If $p + \sqrt{q} = r + \sqrt{s}$, then

A. p=s , q =r

B. p=-s, q = r

C. p= -r , q = -s

D. p=r , q =s

Answer: D

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7. If $p + \sqrt{q} = 0$ then

A. p =1 , q = 0

B. p=0 , q =1

C. p=-1 , q =0

D. p=0 , q =0

Answer: D

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8. In between and two real numbers on the number line

A. there exists one non-real number

B. there exists infinitely many real numbers

C. there exists a rational number

D. there exists an irrational number

Answer: B

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9. If $i = \sqrt{-1}$ then $4 + 5\left(-\frac{1}{2} + \frac{i\sqrt{3}}{2} \right)^{334} + 3\left(-\frac{1}{2} + \frac{i\sqrt{3}}{2} \right)^{365}$ is equal to

A. a natural number

B. an irrational number

C. a real number

D. a non-real number

Answer: C

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10. If a and b be two real numbers and b > 0. then which one of the followings is false ?

A. $a^2 > b^2 \Leftrightarrow a > b$

B. $a^2 > b^2 \Leftrightarrow a > b \text{ or } a < -b$

C. $a.\ b > 0 \Leftrightarrow a > 0$

D. $a.\ b < 0 \Leftrightarrow a < 0$

Answer: A

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11. which one of the following is false ?

A. if x and y be two negative real numbers, then xy will be also a negtive real number

B. If x be any real number, then $x \geq 0$ or $x < 0$

C. If x and y be two non-negative real numbers, then xy will be positive

D. If x be a positive real number and y be a negative real number , then (x-y) will be positive

Answer: A

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12. Which one of the followings is true ?

A. N is bounded on one side

B. Z is bounded

C. Q is bounded

D. R is bounded

Answer: A

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Exercise 1 4 Short Answer

1. State two important characteristics of real numbers .

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2. Prove that $\sqrt{2}$ is an irrational number.

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3. Find the value of $\left(\sqrt{2}+\sqrt{8}\right)^2$

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4. Find the value of $\left(\sqrt{11}+\sqrt{7}\right)\left(\sqrt{11}-\sqrt{7}\right)$

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5. Find the value of $\sqrt{13+\sqrt{7+\left(\sqrt{4}\right)}}$

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6. What should the number $\left(3+\sqrt{5}\right)$ be multiplied, by to get a positive integer ? Find the integer .

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7. What are the numbers usually denoted by Q and R ?

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8. Do the sum $\sqrt{18}+\sqrt{128}$

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9. Do the product $\left(\sqrt{3}+\sqrt{5}\right)\left(\sqrt{6}+\sqrt{15}\right)$

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10. (a) Divide 1 by $\left(\sqrt{7}-1\right)$ (b) Divide $3\sqrt[4]{5}$ by $6\sqrt[4]{5}$

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11. find the value of $\sqrt{x\sqrt{x\sqrt{x\ldots\ldots}}}$

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Exercise 1 4 Long Answer

1. If E be a random experiment or rolling a dice and S be its sample space, then if one dice is rolled then find the sample space of it and also find the probability of not getting 4.

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2. If $\sqrt{\frac{\sqrt{10}+1}{\sqrt{10}-1}}$ then find the value of $\left(x\frac{1}{x}\right)$

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3. IF x =13 + $2\sqrt{42}$ then find the value of $\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)$

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4. simplify : (a) $\sqrt{98}+\sqrt{8}-2\sqrt{32}$ (b) $\left(\sqrt{3}+\sqrt{5}+\sqrt{6}\right)\left(\sqrt{3}-\sqrt{5}+\sqrt{6}\right)$

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5. Find the value of $(a)\dfrac{3\sqrt{2}}{\sqrt{3}+\sqrt{6}}-\dfrac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}}+\dfrac{\sqrt{6}}{\sqrt{2}+\sqrt{3}}$ (b) $1+\dfrac{6\sqrt{2}}{\sqrt{3}+\sqrt{6}}-\dfrac{8\sqrt{3}}{\sqrt{6}+\sqrt{2}}+\dfrac{2\sqrt{6}}{\sqrt{2}+\sqrt{3}}$

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6. Simplify : (a) $\sqrt{y+\sqrt{2xy-x^2}}+\sqrt{y-\sqrt{2xy-x^2}}$ (b) $\dfrac{x+\sqrt{x^2-1}}{x-\sqrt{x^2-1}}-\dfrac{x-\sqrt{x^2-1}}{x+\sqrt{x^2-1}}$

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7. If a = $\sqrt{5}+2$ then find the value of : $a^2+\dfrac{1}{a^2}$

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8. If $x = \frac{1}{2-\sqrt{3}}$ then find the value of $\left(x^3 - 2x^2 - 7x + 2\right)$

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9. If a $x = 2 + \sqrt{3}$ then evaluate $\left(x^3 - 5x^2 + 5x + 9\right)$

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10. If $a = \frac{\sqrt{3}-1}{\sqrt{3}+1}$ and ab=1 , then find $\left(a^3 + b^3\right)$

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11. If $a = \frac{\sqrt{3}+1}{\sqrt{3}-1}$ and ab=1 , then find $\left(a^2 + ab + b^2\right)$

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12. If $a = \frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $b = \frac{\sqrt{5}-1}{\sqrt{5}+1}$ then determine the value of $\frac{a^2+ab+b^2}{a^2-ab+b^2}$

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13. If $x = \frac{2\sqrt{15}}{\sqrt{5}+\sqrt{3}}$ then evaluate $\frac{x+\sqrt{3}}{x-\sqrt{3}} + \frac{x+\sqrt{5}}{x-\sqrt{5}}$

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14. If $x = \frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $x = \frac{1}{y}$ then find the value of $\left(3x^2 - 7xy + 3y^2\right)$

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15. If $a = \frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $b = \frac{\sqrt{5}-1}{\sqrt{5}+1}$ then find the value of $\left(5a^2 - 3ab + 5b^2\right)$

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16. If x= $\frac{1}{2+\sqrt{3}}$ and $y=\frac{1}{2-\sqrt{3}}$ then evalue $\left(\frac{1}{x+1}+\frac{1}{y+1}\right)$

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17. Prove that $\frac{\sqrt{x}}{\sqrt{x}+\sqrt{y}}+\frac{\sqrt{y}}{\sqrt{x}-\sqrt{y}}+\frac{2\sqrt{xy}}{x-y}=\frac{\sqrt{x}+\sqrt{y}}{\sqrt{x}-\sqrt{y}}$

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18. Prove that

$$\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+\frac{1}{\sqrt{4}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{6}}+\frac{1}{\sqrt{6}+\sqrt{7}}$$

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