

STD 9 Maths [Manjari]
World of numbers

*** Choose the right answer from the given options. [1 Marks Each]**

[34]

1. $0.6 + 0.\overline{7} + 0.4\overline{7}$ is equal to:
(A) $\frac{155}{90}$ (B) $\frac{147}{90}$ (C) $\frac{167}{90}$ (D) none of these
2. When written in decimal form, which of the following will be a non-terminating and non-repeating number?
(A) $1^{1/9}$ (B) $2^{1/9}$ (C) 2^{-9} (D) $9^{1/2}$
3. Which of these can definitely be expressed as a product of primes?
(i) $\sqrt{n}$
(ii) n
(iii) $\frac{\sqrt{n}}{2}$
(A) only (ii)
(B) only (i) and (ii)
(C) all (i), (ii) and (iii)
(D) cannot be determined without knowing n
4. Every rational number is:
(A) a natural number (B) an integer
(C) a real number (D) a whole number
5. Between two rational numbers:
(A) there is no rational number
(B) there is exactly one rational number
(C) there are infinitely many rational numbers
(D) there are only rational numbers and no irrational numbers
6. $2\sqrt{3} + \sqrt{3} - 2\sqrt{3}$ is equal to:
(A) $2\sqrt{6}$ (B) $\sqrt{3}$ (C) $4\sqrt{6}$ (D) 5
7. $\sqrt{10} \times \sqrt{15}$ is equal to:
(A) $6\sqrt{5}$ (B) $5\sqrt{6}$ (C) $\sqrt{25}$ (D) $10\sqrt{5}$
8. The value of $\frac{\sqrt{32} + \sqrt{48}}{\sqrt{8} + \sqrt{12}}$ is equal to:
(A) $\sqrt{2}$ (B) 2 (C) 4 (D) 8
9. The simplest form of $1.\overline{6}$ is:

- (A) $\frac{5}{3}$ (B) $\frac{7}{4}$ (C) $\frac{11}{9}$ (D) $\frac{15}{13}$
10. For rationalising the denominator of the expression $\frac{x}{\sqrt{12}}$, we multiply by:
- (A) $\sqrt{2}$ (B) $\frac{\sqrt{3}}{\sqrt{3}}$ (C) $\sqrt{3}$ (D) $\frac{\sqrt{2}}{\sqrt{2}}$
11. If $x = 0.\overline{473}$, then $1000x$ is equal to:
- (A) $473.\overline{473}$ (B) $0.473\dots$ (C) $0.473473473\overline{473}$ (D) $0.4737473\overline{}$
12. If p is prime number, then $\sqrt{p}$ is a/an:
- (A) irrational number (B) whole number
(C) real number (D) natural number
13. If $x = \sqrt{5} + 2$, then $x - \frac{1}{x}$ equals:
- (A) 4 (B) 3 (C) 2 (D) 1
14. If $\sqrt{13 - a\sqrt{10}} = 2\sqrt{2} + \sqrt{5}$, then $a^2 + a^{-1}$ is:
- (A) 64 (B) $\frac{-63}{4}$ (C) $\frac{1}{4}$ (D) 0
15. $\sqrt{45} - 3\sqrt{20} + 4\sqrt{5} =$
- (A) $\sqrt{3}$ (B) $\sqrt{2}$ (C) $\sqrt{5}$ (D) $2\sqrt{5}$
16. $\frac{6-4\sqrt{2}}{6+4\sqrt{2}} =$
- (A) $15 + 12\sqrt{2}$ (B) $17 - 12\sqrt{2}$ (C) $19 + 2\sqrt{2}$ (D) $18 + 3\sqrt{2}$
17. $\frac{p}{q}$ form of $0.000\overline{2}$ is:
- (A) $\frac{1}{4500}$ (B) $\frac{1}{3200}$ (C) $\frac{1}{3600}$ (D) $\frac{1}{9000}$
18. $0.6 + 0.\overline{7} + 0.4\overline{7}$ is equal to :
- (A) $\frac{155}{90}$ (B) $\frac{147}{90}$ (C) $\frac{167}{90}$ (D) none of these
19. $2\sqrt{3} + \sqrt{3} - 2\sqrt{3}$ is equal to :
- (A) $2\sqrt{6}$ (B) $\sqrt{3}$ (C) $4\sqrt{6}$ (D) 5
20. Between two rational numbers :
- (A) there is no rational number
(B) there is exactly one rational number
(C) there are infinitely many rational numbers
(D) there are only rational numbers and no irrational numbers
21. Every rational number is :
- (A) a natural number (B) an integer
(C) a real number (D) a whole number
22. For rationalising the denominator of the expression $\frac{x}{\sqrt{12}}$, we multiply by:

- (A) $\sqrt{2}$ (B) $\frac{\sqrt{3}}{\sqrt{3}}$ (C) $\sqrt{3}$ (D) $\frac{\sqrt{2}}{\sqrt{2}}$
23. $\frac{6-4\sqrt{2}}{6+4\sqrt{2}} =$
 (A) $15 + 12\sqrt{2}$ (B) $17 - 12\sqrt{2}$ (C) $19 + 2\sqrt{2}$ (D) $18 + 3\sqrt{2}$
24. $\frac{p}{q}$ form of $0.000\bar{2}$ is:
 (A) $\frac{1}{4500}$ (B) $\frac{1}{3200}$ (C) $\frac{1}{3600}$ (D) $\frac{1}{9000}$
25. If p is prime number, then $\sqrt{p}$ is a/an:
 (A) irrational number (B) whole number
 (C) real number (D) natural number
26. If $\sqrt{13 - a\sqrt{10}} = 2\sqrt{2} + \sqrt{5}$, then $a^2 + a^{-1}$ is :
 (A) 64 (B) $\frac{-63}{4}$ (C) $\frac{1}{4}$ (D) 0
27. If $x = 0.\overline{473}$, then $1000x$ is equal to :
 (A) $473.\overline{473}$ (B) $0.473\ldots$ (C) $0.473473473\overline{473}$ (D) 0.4737473
28. If $x = \sqrt{5} + 2$, then $x - \frac{1}{x}$ equals :
 (A) 4 (B) 3 (C) 2 (D) 1
29. $\sqrt{10} \times \sqrt{15}$ is equal to :
 (A) $6\sqrt{5}$ (B) $5\sqrt{6}$ (C) $\sqrt{25}$ (D) $10\sqrt{5}$
30. $\sqrt{45} - 3\sqrt{20} + 4\sqrt{5} =$
 (A) $\sqrt{3}$ (B) $\sqrt{2}$ (C) $\sqrt{5}$ (D) $2\sqrt{5}$
31. $\sqrt{n}$ is a natural number such that $n > 1$.
 Which of these can definitely be expressed as a product of primes?
 (i) $\sqrt{n}$
 (ii) n
 (iii) $\frac{\sqrt{n}}{2}$
 (A) only (ii)
 (B) only (i) and (ii)
 (C) all (i), (ii) and (iii)
 (D) cannot be determined without knowing n
32. The simplest form of $1.\bar{6}$ is :
 (A) $\frac{5}{3}$ (B) $\frac{7}{4}$ (C) $\frac{11}{9}$ (D) $\frac{15}{13}$
33. The value of $\frac{\sqrt{32} + \sqrt{48}}{\sqrt{8} + \sqrt{12}}$ is equal to :
 (A) $\sqrt{2}$ (B) 2 (C) 4 (D) 8

34. When written in decimal form, which of the following will be a non-terminating and non-repeating number?

(A) $1^{1/9}$

(B) $2^{1/9}$

(C) 2^{-9}

(D) $9^{1/2}$

* A statement of Assertion (A) is followed by a statement of Reason (R). [12]
Choose the correct option.

Directions: In each question below, there are two statements labelled as Assertion (A) and Reason (R). Choose the correct answer as per the options given below:

(a) Both (A) and (R) are true and (R) is the correct explanation of (A)

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(c) (A) is true but (R) is false

(d) (A) is false but (R) is true

35. Assertion (A) : Sum of $0.\overline{4}$ and $\sqrt{2}$ is an irrational number.

Reason (R) : Sum of an irrational number with a rational number is always an irrational number.

36. Assertion (A) : $\frac{4}{\sqrt{7}-\sqrt{3}}$ is equal to $\sqrt{7} + \sqrt{3}$.

Reason (R) : Rationalization of denominator.

37. Assertion (A) : Sum of 2 and $\sqrt{3}$ is an irrational number.

Reason (R) : Sum of any two real numbers is always irrational number.

38. Assertion (A) : Three rational number between $\frac{2}{5}$ and $\frac{3}{5}$ are $\frac{9}{20}$, $\frac{10}{20}$ and $\frac{11}{20}$.

Reason (R) : A rational number between two rational numbers p and q is $\frac{p+q}{2}$.

39. Assertion (A) : $\sqrt{p}$ is an irrational number, where p is a prime number.

Reason (R) : Square root of any prime number is an irrational number.

40. Assertion (A) : $\sqrt{5}$ is an irrational number.

Reason (R) : If m is an odd number greater than 1, then $\sqrt{m}$ is irrational.

41. Directions : In each question below, there are two statements labelled as Assertion (A) and Reason (R). Choose the correct answer as per the options given below:

Assertion (A) : $\frac{4}{\sqrt{7}-\sqrt{3}}$ is equal to $\sqrt{7} + \sqrt{3}$.

Reason (R) : Rationalization of denominator.

42. Directions : In each question below, there are two statements labelled as Assertion (A) and Reason (R). Choose the correct answer as per the options given below:

Assertion (A): $\sqrt{5}$ is an irrational number.

Reason (R) : If m is an odd number greater than 1, then $\sqrt{m}$ is irrational.

43. Directions : In each question below, there are two statements labelled as Assertion (A) and Reason (R). Choose the correct answer as per the options given below:

Assertion (A): $\sqrt{p}$ is an irrational number, where p is a prime number.

Reason (R) : Square root of any prime number is an irrational number.

44. Directions : In each question below, there are two statements labelled as Assertion (A) and Reason (R). Choose the correct answer as per the options given below:

Assertion (A): Sum of $0.\overline{4}$ and $\sqrt{2}$ is an irrational number.

Reason (R) : Sum of an irrational number with a rational number is always an irrational number.

45. Directions : In each question below, there are two statements labelled as Assertion (A) and Reason (R). Choose the correct answer as per the options given below:

Assertion (A) : Sum of 2 and $\sqrt{3}$ is an irrational number.

Reason (R) : Sum of any two real numbers is always irrational number.

46. Directions : In each question below, there are two statements labelled as Assertion (A) and Reason (R). Choose the correct answer as per the options given below:

Assertion (A) : Three rational number between $\frac{2}{5}$ and $\frac{3}{5}$ are $\frac{9}{20}$, $\frac{10}{20}$ and $\frac{11}{20}$.

Reason (R) : A rational number between two rational numbers p and q is $\frac{p+q}{2}$.

*** Answer the following short questions. [2 Marks Each]**

[80]

47. The temperature in the high-altitude desert of Ladakh is recorded as 4°C at noon. By midnight, it drops by 15°C . What is the midnight temperature?

48. Find three distinct rational numbers that lie strictly between $-1/2$ and $1/4$.

49. Simplify the expression: $(-1/4) + (5/12)$

50. Rationalise the following :

$$\frac{16}{\sqrt{41}-5}$$

51. Rationalise the following :

$$\frac{2+\sqrt{3}}{2-\sqrt{3}}$$

52. Rationalise the following :

$$\frac{\sqrt{6}}{\sqrt{2}+\sqrt{3}}$$

53. Classify the following number as rational or irrational with justification.

$$\sqrt{196}$$

54. Simplify:

$$12\sqrt{18} + 6\sqrt{20} - 6\sqrt{147} + 3\sqrt{50}$$

55. Locate $3 - \sqrt{3}$ on the number line.

56. Locate $\sqrt{3}$ on the number line.

57. All irrational numbers are included in the category of rational numbers. State whether the given statement is true or false. Justify.

58. Write the following rational numbers as decimals:

$$\frac{-6}{11}$$

59. Express the following in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.
0.2555...

60. Express the following in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.
0.404040...

61. Express the following as a fraction in simplest form.

$$0.\overline{0001}$$

62. Express the following in the form of $\frac{p}{q}$, where p and q are integers, $q \neq 0$.

$$5.\overline{3}$$

63. Express $1.\overline{32} + 0.\overline{35}$ as a fraction in the simplest form.

64. Write the following rational numbers in the decimal form:

$$\frac{1}{3}$$

65. Write the following rational numbers in the decimal form:

$$\frac{17}{9}$$

66. Find three rational numbers lying between $\frac{1}{3}$ and $\frac{1}{5}$

67. Find a rational number between $\frac{1}{3}$ and $\frac{1}{4}$

68. Find the additive inverse of :

$$-2$$

69. Find the additive inverse of :

$$\frac{-4}{9}$$

70. Evaluate :

$$\left[\frac{35}{18} \times \left(\frac{-9}{5} \right) \right] \div \left[\frac{-49}{63} \times \left(\frac{-18}{21} \right) \right]$$

71. Evaluate :

$$\left(\frac{-7}{11} + \frac{6}{5} \right) \div \left(-4 + \frac{-2}{5} \right)$$

72. Evaluate :

$$\left(\frac{1}{3} + \frac{3}{4} \right) \times \left(\frac{6}{5} + \frac{2}{3} \right)$$

73. Evaluate :

$$\left[\frac{22}{-9} \times \left(\frac{-6}{11} \right) \right] - \left[\frac{3}{22} \times \frac{8}{11} \right]$$

74. Evaluate :

$$\left[\frac{6}{11} - \left(\frac{-2}{55} \right) \right] \times \left[\frac{7}{5} + \left(\frac{-3}{10} \right) \right]$$

75. Simplify :

$$\frac{27}{16} \times \left(\frac{-24}{9} \right)$$

76. Evaluate :

$$\frac{-5}{7} - \frac{15}{14} + \left(\frac{-9}{28} \right)$$

77. Evaluate :

$$\frac{-6}{13} + \frac{7}{13} + \frac{1}{26}$$

78. Subtract :

$$\frac{-14}{5} \text{ from } \frac{-7}{20}$$

79. Subtract :

$$\frac{3}{7} \text{ from } \frac{-5}{14}$$

80. Subtract :

$$\frac{-9}{16} \text{ from } \frac{-5}{24}$$

81. Represent the following on a separate number line :

$$\frac{-3}{2}$$

82. Represent the following on a separate number line :

$$\frac{3}{8}$$

83. Reduce to lowest terms (standard form) :

$$\frac{25}{-35}$$

84. Reduce to lowest terms (standard form) :

$$\frac{-52}{-24}$$

85. Write three rational number equivalent to :

$$\frac{-5}{8}$$

86. Verify:

$$\left| \frac{-7}{4} \right| + \left| \frac{-2}{3} \right| = \left| \frac{-7}{4} - \frac{2}{3} \right|$$

*** Answer the following questions. [3 Marks Each]**

[180]

87. Ancient Indians used the joints of their fingers to count, a practice still seen today. Each finger has 3 joints, and the thumb is used to count them. How many can you count on one hand? How does this relate to the ancient base-12 counting systems?

88. A spice trader takes a loan (debt) of ₹850. The next day, he makes a profit (fortune) of ₹1,200. The following week, he incurs a loss of ₹450. Write this sequence as an equation using integers and calculate his final financial standing.
89. Explain, using a real-world example of debt, why subtracting a negative number is the same as adding a positive number (e.g., $10 - (-5) = 15$).
90. Find the product:
 (i) $\frac{2}{3} \times \frac{3}{10}$
 (ii) $\frac{7}{11} \times \frac{5}{8}$
 (iii) $-\frac{4}{7} \times \frac{5}{14}$
91. Find the quotient:
 (i) $\frac{2}{3} \div \frac{3}{10}$
 (ii) $\frac{7}{11} \div \frac{5}{8}$
 (iii) $-\frac{4}{7} \div \frac{5}{14}$
92. Show that: $(\frac{1}{2} + \frac{3}{4}) \times \frac{8}{3} = \frac{1}{2} \times \frac{8}{3} + \frac{3}{4} \times \frac{8}{3}$
93. A tailor has $15\frac{3}{4}$ metres of fine silk. If making one kurta requires $2\frac{1}{4}$ metres of silk, exactly how many kurtas can he make?
94. Can you think of other way(s) to find a rational number between any two rational numbers?
95. Classify the following numbers as rational or irrational:
 (i) $\sqrt{81}$
 (ii) $\sqrt{12}$
 (iii) 0.33333 ...
96. The number $0.\overline{9}$ (which means 0.99999...) is a rational number. Using algebra (let $x = 0.\overline{9}$, multiply by 10 , and subtract), explain why $0.\overline{9}$ is exactly equal to 1.
97. We have seen that the repeating block of $\frac{1}{7}$ is a cyclic number. Try to find more numbers (n) whose reciprocals ($\frac{1}{n}$) produce decimals with repeating blocks that are cyclic.
98. Convert the following decimal numbers in the form of $\frac{p}{q}$.
 (i) 12.6
 (ii) 0.0120
 (iii) $3.0\overline{52}$
99. Find 6 rational numbers between 3 and 4.
100. Find 5 rational numbers between $\frac{2}{5}$ and $\frac{3}{5}$.
101. Find 5 rational numbers between $\frac{1}{6}$ and $\frac{2}{5}$.
102. If $\frac{x}{3} + \frac{x}{5} = \frac{16}{15}$, find the rational number x .

103. Without performing division, determine whether the decimal expansion of $\frac{18}{125}$ is terminating or non-terminating. If it terminates, state the number of decimal places.

104. A rational number in its lowest form has denominator $2^3 \times 5$. How many decimal places will its decimal expansion have? Explain your answer.

105. Prove that $3 + 2\sqrt{5}$ is irrational.

106. Prove that $3\sqrt{2}$ is irrational.

107. Find the value of a in each of the following :

$$\frac{3-\sqrt{5}}{3+2\sqrt{5}} = a\sqrt{5} - \frac{19}{11}$$

108. Find the value of a in each of the following :

$$\frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a - 6\sqrt{3}$$

109. Evaluate : $\left\{ \sqrt{5-2\sqrt{6}} \right\} + \left\{ \sqrt{3+2\sqrt{2}} \right\}$

110. Represent $2 - \sqrt{2}$ on the number line.

111. Locate $\sqrt{13}$ on the number line.

112. Locate $\sqrt{2}$ on the number line.

113. If $x = 1 - \sqrt{2}$, find $x^2 + \frac{1}{x^2}$.

114. If $x = \frac{\sqrt{2}-1}{\sqrt{2}+1}$, $y = \frac{\sqrt{2}+1}{\sqrt{2}-1}$, then find $x^2 + xy + y^2$.

115. Rationalise the denominator :

$$\frac{2\sqrt{6}-\sqrt{5}}{3\sqrt{5}-2\sqrt{6}}$$

116. Rationalise the denominator :

$$\frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}} + \frac{\sqrt{12}}{\sqrt{3}-\sqrt{2}}$$

117. Rationalise the denominator :

$$\frac{\sqrt{3}+1}{\sqrt{3}-1} + \frac{\sqrt{3}-1}{\sqrt{3}+1}$$

118. Rationalise the denominator :

$$\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}} + \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$$

119. Rationalise the denominator of the following.

$$\frac{3+\sqrt{2}}{4-\sqrt{2}}$$

120. Rationalise the denominator of the following.

$$\frac{3\sqrt{2}}{\sqrt{6}-\sqrt{3}}$$

121. Rationalise the denominator of the following.

$$\frac{4+\sqrt{5}}{4-\sqrt{5}}$$

122. Rationalise the denominator of the following.

$$\frac{\sqrt{7}-1}{\sqrt{7}+1}$$

123. Rationalise the denominator of the following.

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

124. Rationalise the denominator of the following.

$$\frac{\sqrt{2}}{2+\sqrt{2}}$$

125. Find the values of a and b in the following :

$$\frac{2\sqrt{6}-\sqrt{5}}{\sqrt{45}-\sqrt{24}} = a + b\sqrt{30}$$

126. Find the values of a and b in the following :

$$\frac{3+\sqrt{7}}{3-\sqrt{7}} = a + b\sqrt{7}$$

127. Find the values of a and b in the following :

$$\frac{5+\sqrt{3}}{7-4\sqrt{3}} = a + \sqrt{3}b$$

128. Find the values of a and b in the following :

$$\frac{5+\sqrt{6}}{5-\sqrt{6}} = a + b\sqrt{6}$$

129. Evaluate : $\left\{ \sqrt{5+2\sqrt{6}} \right\} + \left\{ \sqrt{8-2\sqrt{15}} \right\}$

130. Show that $7.4\overline{78}$ can be expressed in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

131. Insert eight rational numbers between x and $|x|$, where $x = \frac{-5}{11}$

132. Find five rational numbers between :

$$\frac{1}{4} \text{ and } \frac{7}{5}$$

133. Find five rational numbers between :

$$\frac{-2}{7} \text{ and } \frac{1}{11}$$

134. Find five rational numbers between :

$$-\frac{3}{2} \text{ and } \frac{5}{3}$$

135. Find ten rational numbers between $-\frac{5}{6}$ and $\frac{3}{8}$

136. Insert three rational numbers lying between $-\frac{1}{2}$ and $-\frac{3}{4}$

137. Find four rational numbers between -6 and $\frac{4}{5}$

138. Verify that $(x+y)+z = x+(y+z)$ by taking :

$$x = \frac{2}{3}, y = \frac{3}{4}, z = \frac{4}{5}$$

139. Verify that $(x + y) + z = x + (y + z)$ by taking :

$$x = \frac{-2}{5}, y = \frac{6}{11}, z = \frac{-3}{2}$$

140. Verify that $x + y = y + x$ by taking :

$$x = \frac{11}{13}, y = \frac{12}{26}$$

141. Verify that $x + y = y + x$ by taking :

$$x = \frac{2}{3}, y = \frac{5}{6}$$

142. Verify that $x + y = y + x$ by taking :

$$x = \frac{-6}{5}, y = \frac{3}{7}$$

143. A chef mixes $\frac{2}{3} kg$ flour with $\frac{1}{6} kg$ more. Is total still rational?

144. A delivery van covers $\frac{7}{9} km$ of its route in morning. No extra distance is added due to diversion (0 km). What is total distance covered?

145. A student gains $\frac{9}{10}$ marks in bonus but loses the same due to penalty. Find net change.

146. One notebook costs $\frac{5}{4}$ rupees (discounted rate). A student buys $\frac{3}{2}$ dozens for class A and $\frac{1}{2}$ dozen for class B. Use distributive property to find total cost.

*** Questions with calculation. [4 Marks Each]**

[76]

147. Calculate the following using Brahmagupta's laws:

(i) $(-12) \times 5$

(ii) $(-8) \times (-7)$

(iii) $0 - (-14)$

(iv) $(-20) \div 4$

148. Represent the rational numbers $\frac{2}{3}, -\frac{5}{4}$ and $1\frac{1}{2}$ on a single number line.

149. Convert the following decimal numbers in the form of $\frac{p}{q}$.

(i) $1.\overline{235}$

(ii) $0.\overline{23}$

(iii) $2.0\overline{5}$

150. Convert the following decimal numbers in the form of $\frac{p}{q}$.

(i) $2.1\overline{25}$

(ii) $3.1\overline{25}$

(iii) $2.\overline{1625}$

151. Locate the following rational numbers on the number line.

(i) 0.532

(ii) $1.1\overline{5}$

152. A rational number has a terminating decimal expansion whose last non-zero digit occurs in the 4th decimal place. Show that such a number can be written in the form $\frac{p}{10^4}$, where p is an integer not divisible by 10. Is it necessary that the denominator of this rational number, when written in the lowest form, is divisible by 2^4 or 5^4 ? Give reasons.
153. Three rational numbers x, y, z satisfy $x + y + z = 0$ and $xy + yz + zx = 0$. Show that all the rational numbers x, y, z must be simultaneously zero.
154. Prove that $\sqrt{3} + \frac{5}{\sqrt{3}}$ is irrational.
155. If $x = \frac{3-\sqrt{2}}{3+\sqrt{2}}$ and $y = \frac{3+\sqrt{2}}{3-\sqrt{2}}$ find the value of $x^2 + xy + y^2$.
156. If $x = 7 - 4\sqrt{3}$, then find the value of $\sqrt{x} + \frac{1}{\sqrt{x}}$.
157. Represent $5\sqrt{2}$ on the number line.
158. Represent $2 + \sqrt{3}$ on number line.
159. If $a = 2 + \sqrt{3} + \sqrt{5}$ and $b = 3 + \sqrt{3} - \sqrt{5}$, find $(a-2)^2 + (b-3)^2$.
160. If $x = \frac{-2}{3}$, $y = \frac{1}{4}$, $z = \frac{-5}{8}$ verify that :
 $x(y+z) = xy + xz$
161. Verify the following : $\frac{3}{4} \times (\frac{2}{7} \times \frac{1}{5}) = (\frac{3}{4} \times \frac{2}{7}) \times \frac{1}{5}$
162. Verify that : $(\frac{-9}{20}) \times (\frac{56}{-36}) = (\frac{56}{-36}) \times (\frac{-9}{20})$
163. A shopkeeper sold rice in three transactions: Morning: $\frac{1}{4}$ quintal, Afternoon: $\frac{2}{5}$ quintal, Evening: $\frac{3}{20}$ quintal. Check whether grouping changes total sale.
164. A student runs $\frac{3}{5} km$ in one round of the park. If she runs $\frac{4}{3}$ rounds in warm-up stretching equivalent distance, show that order of multiplication does not affect total distance.
165. A water tank is filled by two pipes. Pipe A fills $\frac{3}{8}$ of the tank and Pipe B fills $\frac{5}{8}$. Show that total water filled is same whether Pipe A works first or Pipe B.

*** Answer the following questions. [5 Marks Each]**

[135]

166. Prove that the following rational numbers are equal:
 (i) $\frac{2}{3}$ and $\frac{4}{6}$
 (ii) $\frac{5}{4}$ and $\frac{10}{8}$
 (iii) $-\frac{3}{5}$ and $-\frac{6}{10}$
 (iv) $\frac{9}{3}$ and 3
167. Find the sum:
 (i) $\frac{2}{5} + \frac{3}{10}$

(ii) $\frac{7}{12} + \frac{5}{8}$

(iii) $-\frac{4}{7} + \frac{3}{14}$

168. Find the difference:

(i) $\frac{5}{6} - \frac{1}{4}$

(ii) $\frac{11}{8} - \frac{3}{4}$

(iii) $-\frac{7}{9} - (-\frac{2}{3})$

169. Without performing long division, determine which of the following rational numbers will have terminating decimals and which will be repeating: $\frac{7}{20}$, $\frac{4}{15}$ and $\frac{13}{250}$. Then check your answers by explicitly performing the long divisions and expressing these rational numbers as decimals.

170. Perform the long division for $\frac{1}{13}$. Identify the repeating block of digits. Does it show cyclic properties if you evaluate $\frac{2}{13}$? Now compute $\frac{3}{13}$, $\frac{4}{13}$, etc. What do you notice?

171. Classify the following numbers as rational or irrational:

(i) 0.123451234512345 ...

(ii) 1.01001000100001 ... (Notice the pattern: Is it repeating a single block?)

(iii) 23.560185612239874790120

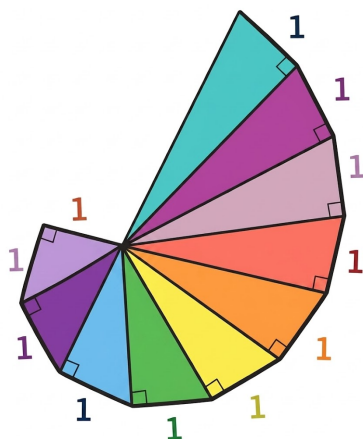
Find the explicit fractions in case they are rational.

172. Prove that $\sqrt{5}$ is an irrational number.

173. Let $a = \frac{7}{12}$ and $b = \frac{5}{6}$. Express both a and b in the form $\frac{k_1}{m}$ and $\frac{k_2}{m}$ where k_1, k_2 and m are integers and $k_2 - k_1 > 6$. Using the same denominator m , write exactly five distinct rational numbers lying between a and b keeping an integer numerator. Explain why the condition $k_2 - k_1 > n + 1$ is necessary to find n such rational numbers between the two rational numbers a and b using this method.

174. Show that the rational number $\frac{(a+b)}{2}$ lies between the rational numbers a and b .

175. Find the lengths of the hypotenuses of all the right triangles in Fig. which is referred to as the square root spiral.



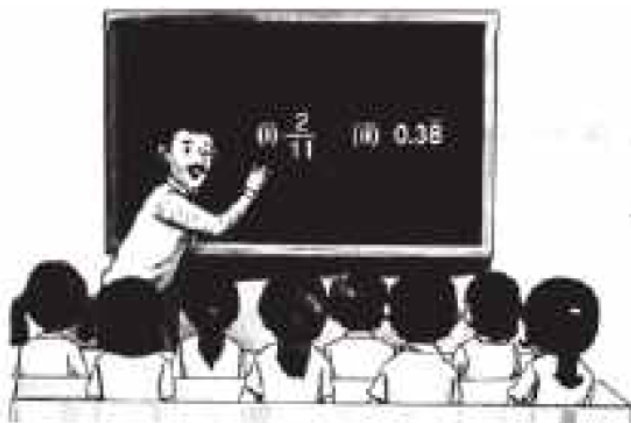
176. Prove that $\frac{1}{\sqrt{2}}$ is irrational.
177. Prove that $\sqrt{2} + \sqrt{5}$ is irrational.
178. Prove that $\sqrt{3}$ is an irrational number.
179. Prove that $\sqrt{2}$ is an irrational number.
180. If $a = \frac{3+\sqrt{5}}{2}$, then find the value of $a^2 + \frac{1}{a^2}$.
181. Express $\sqrt{5}, \sqrt{6}$ and $\sqrt{7}$ on a real number line.
182. Prove that $\frac{2}{\sqrt{7}}$ is an irrational number.
183. Prove that $\frac{1}{\sqrt{3}}$ is an irrational number.
184. Prove that $7 - 6\sqrt{5}$ is an irrational number.
185. Write whether $\frac{2\sqrt{45}+3\sqrt{20}}{2\sqrt{5}}$ on simplification gives an irrational or a rational number.
186. Given that $\sqrt{2}$ is irrational, prove that $(5 + 3\sqrt{2})$ is an irrational number.
187. Prove that $3 + \sqrt{2}$ is an irrational number.
188. Prove that $\sqrt{5}$ is an irrational number.
189. Prove that $3 - \sqrt{5}$ is an irrational number.
190. Prove that $\sqrt{5} + \frac{2}{\sqrt{5}}$ is irrational.
191. Prove that $5 + \sqrt{2}$ is an irrational number.
192. If $x = \frac{-2}{3}$, $y = \frac{1}{4}$, $z = \frac{-5}{8}$ verify that :

$$y(x-z) = yx-yz$$

*** Case study based questions.**

[4]

To judge the preparation of students of class IX on topic 'Number System', Mathematics teacher writes two numbers on blackboard (as shown in figure), and asks some questions about the two numbers. Can you answer the questions?



193. Write the decimal form of $\frac{2}{11}$.

194. Write the $\frac{p}{q}$ form of $0.3\overline{8}$.

195. If $\frac{p}{q}$ form of $0.3\overline{8}$ is $\frac{m}{n}$, then find the value of $(m + n)$.

196. The decimal number $0.3\overline{8}$ is a terminating decimal. Is it true?
