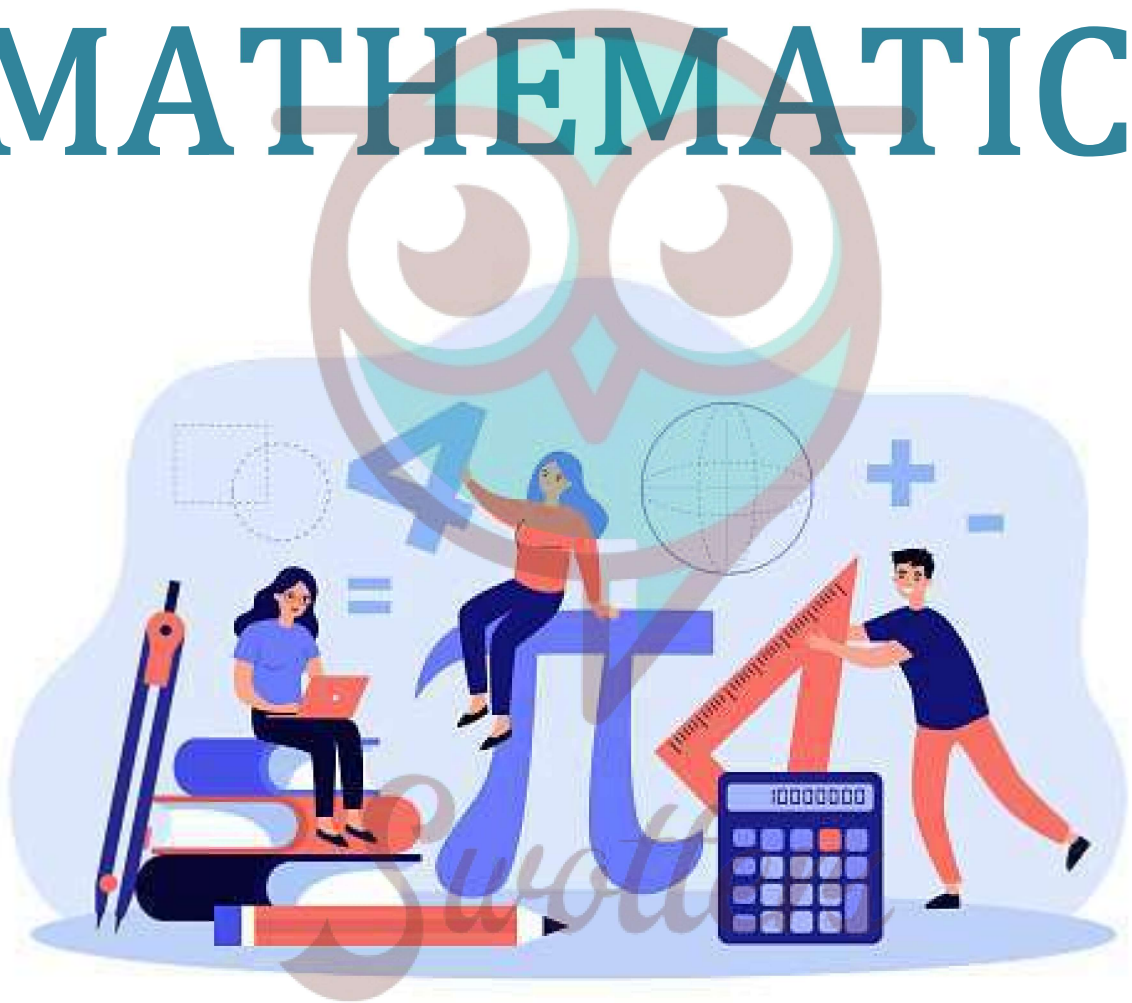


MATHEMATICS



Important Questions

Multiple Choice questions-

Question 1. Can we write 0 in the form of p/q ?

- a. Yes
- b. No
- c. Cannot be explained
- d. None of the above

Question 2. The three rational numbers between 3 and 4 are:

- a. $5/2, 6/2, 7/2$
- b. $13/4, 14/4, 15/4$
- c. $12/7, 13/7, 14/7$
- d. $11/4, 12/4, 13/4$

Question 3. In between any two numbers there are:

- a. Only one rational number
- b. Many rational numbers
- c. Infinite rational numbers
- d. No rational number

Question 4. Every rational number is:

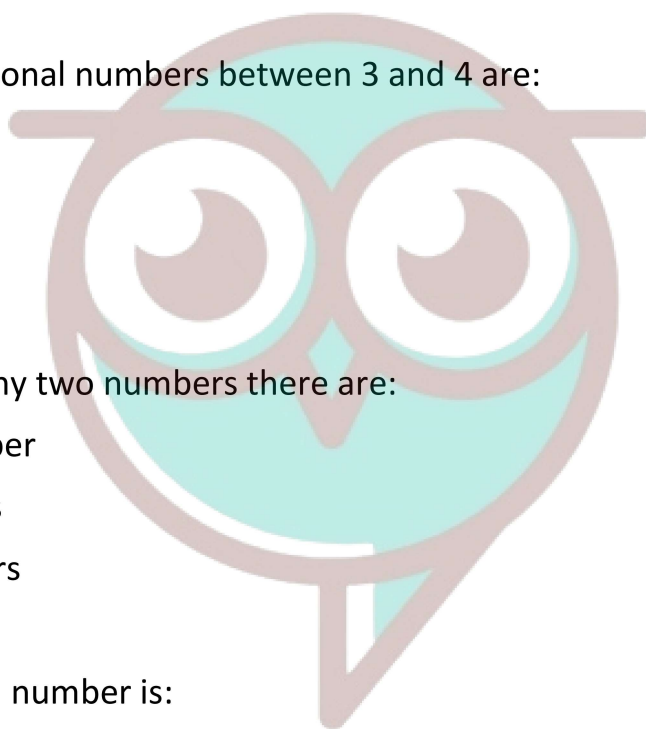
- a. Whole number
- b. Natural number
- c. Integer
- d. Real number

Question 5. $\sqrt{9}$ is a _____ number.

- a. Rational
- b. Irrational
- c. Neither rational or irrational
- d. None of the above

Question 6. Which of the following is an irrational number?

- a. $\sqrt{16}$
- b. $\sqrt{(12/3)}$



Swotters

- c. $\sqrt{12}$
- d. $\sqrt{100}$

Question 7. $3\sqrt{6} + 4\sqrt{6}$ is equal to:

- a. $6\sqrt{6}$
- b. $7\sqrt{6}$
- c. $4\sqrt{12}$
- d. $7\sqrt{12}$

Question 8. $\sqrt{6} \times \sqrt{27}$ is equal to:

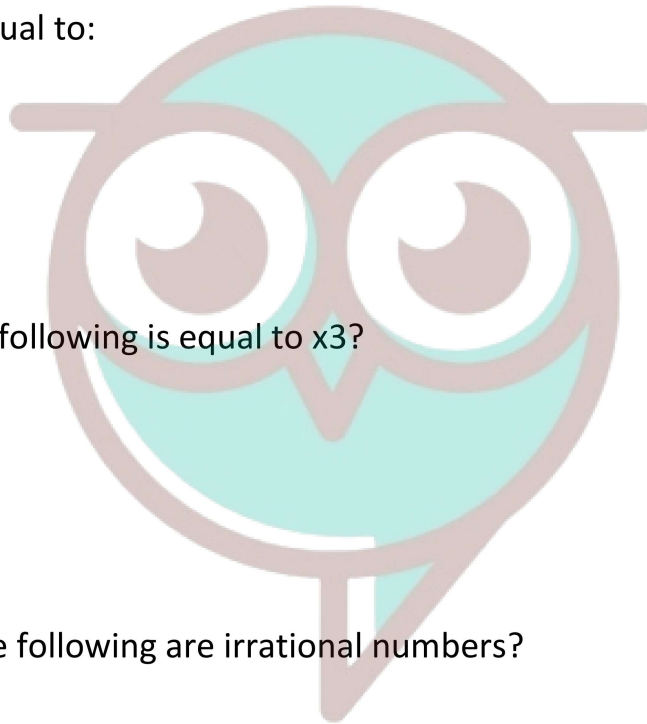
- a. $9\sqrt{2}$
- b. $3\sqrt{3}$
- c. $2\sqrt{2}$
- d. $9\sqrt{3}$

Question 9. Which of the following is equal to x^3 ?

- a. $x^6 - x^3$
- b. $x^6 \cdot x^3$
- c. x^6 / x^3
- d. $(x^6)^3$

Question 10. Which of the following are irrational numbers?

- a. $\sqrt{23}$
- b. $\sqrt{225}$
- c. 0.3796
- d. 7.478478



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Very Short:

1. Simplify: $(\sqrt{5} + \sqrt{2})^2$.
2. Find the value of $\sqrt{(3)^{-2}}$.
3. Identify a rational number among the following numbers:
4. Express 1.8181... in the form $\frac{p}{q}$ where p and q are integers and $q \neq 0$.
5. Simplify: $\sqrt{45} - 3\sqrt{20} + 4\sqrt{5}$
6. Find the value of'

$$\frac{(0.6)^0 - (0.1)^{-1}}{\left(\frac{3}{8}\right)^{-1} \left(\frac{3}{2}\right)^3 + \left(-\frac{1}{3}\right)^{-1}}$$

7. Find the value of.

$$\frac{4}{(216)^{\frac{-2}{3}}} - \frac{1}{(256)^{\frac{-3}{4}}}$$

Short Questions:

- Evaluate: $(\sqrt{5} + \sqrt{2})^2 + (\sqrt{8} - \sqrt{5})^2$
- Express 23.43 in $\frac{p}{q}$ Form, where p, q are integers and q ≠ 0.
- Let 'a' be a non-zero rational number and 'b' be an irrational number. Is 'ab' necessarily an irrational? Justify your answer with example.
- Let x and y be a rational and irrational numbers. Is x + y necessarily an irrational number? Give an example in support of your answer.
- Represent $\sqrt{3}$ on the number line.
- Represent $\sqrt{3.2}$ on the number line.
- Express $1.32 + 0.35$ as a fraction in the simplest form.

Long Questions:

1. If $x = \frac{\sqrt{p+q} + \sqrt{p-q}}{\sqrt{p+q} - \sqrt{p-q}}$, then prove that $q^2 - 2px + 9 = 0$.

2. If $a = \frac{1}{3 - \sqrt{11}}$ and $b = \frac{1}{a}$, then find $a^2 - b^2$

3. Simplify

$$\frac{3\sqrt{2}}{\sqrt{6} - \sqrt{3}} - \frac{4\sqrt{3}}{\sqrt{6} - \sqrt{2}} + \frac{2\sqrt{3}}{\sqrt{6} + 2}$$

4. Prove that:

$$\frac{1}{1 + \sqrt{2}} + \frac{1}{\sqrt{2} + \sqrt{3}} + \frac{1}{\sqrt{3} + \sqrt{4}} + \dots + \frac{1}{\sqrt{8} + 3} = 2.$$

5. Find a and b, if

$$\frac{2\sqrt{5} + \sqrt{3}}{2\sqrt{5} - \sqrt{3}} + \frac{2\sqrt{5} - \sqrt{3}}{2\sqrt{5} + \sqrt{3}} = a + \sqrt{15}b$$

Assertion and Reason Questions-

1. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
- b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
- c) Assertion is correct statement but reason is wrong statement.
- d) Assertion is wrong statement but reason is correct statement.

Assertion: 0.271 is a terminating decimal and we can express this number as $\frac{271}{1000}$ which is of the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

Reason: A terminating or non-terminating decimal expansion can be expressed as rational number.

2. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
- b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
- c) Assertion is correct statement but reason is wrong statement.
- d) Assertion is wrong statement but reason is correct statement.

Assertion: Every integer is a rational number.

Reason: Every integer 'm' can be expressed in the form $\frac{m}{1}$.

Answer Key:

MCQ:

- 1. (a) Yes
- 2. (b) $\frac{13}{4}, \frac{14}{4}, \frac{15}{4}$
- 3. (c) Infinite rational numbers
- 4. (d) Real number
- 5. (a) Rational
- 6. (c) $\sqrt{12}$
- 7. (b) $7\sqrt{6}$
- 8. (a) $9\sqrt{2}$

9. (c) x^6/x^3

10.(a) $\sqrt{23}$

Very Short Answer:

1. Here, $(\sqrt{5} + \sqrt{2})^2 = (\sqrt{5})^2 + 2\sqrt{5}\sqrt{2} + (\sqrt{2})^2$
 $= 5 + 2\sqrt{10} + 2 = 7 + 2\sqrt{10}$

2. $\sqrt{(3)^{-2}} = (3^{-2})^{\frac{1}{2}} = 3^{-2 \times \frac{1}{2}} = 3^{-1} = \frac{1}{3}$.

3. 0 is a rational number.

4. Let $x = 1.8181... \dots$ (i)

$100x = 181.8181... \dots$ (ii) [multiplying eqn. (i) by 100]

$99x = 180$ [subtracting (i) from (ii)]

$x = \frac{180}{99}$

Hence, $1.8181... = \frac{180}{99} = \frac{20}{11}$

5. $\sqrt{45} - 3\sqrt{20} + 4\sqrt{5} = 3\sqrt{5} - 6\sqrt{5} + 4\sqrt{5} = \sqrt{5}$.

6. $\frac{(0.6)^0 - (0.1)^{-1}}{\left(\frac{3}{8}\right)^{-1} \left(\frac{3}{2}\right)^3 + \left(-\frac{1}{3}\right)^{-1}} = \frac{1 - \frac{1}{0.1}}{\frac{8}{3} \times \frac{27}{8} + (-3)} = \frac{1 - 10}{9 - 3} = \frac{-9}{6} = -\frac{3}{2}$

7.

$\frac{4}{(216)^{\frac{-2}{3}}} - \frac{1}{(256)^{\frac{-3}{4}}} = 4 \times (216)^{\frac{2}{3}} - (256)^{\frac{3}{4}} = 4 \times (6 \times 6 \times 6)^{\frac{2}{3}} - (4 \times 4 \times 4 \times 4)^{\frac{3}{4}}$
 $= 4 \times 6^{3 \times \frac{2}{3}} - 4^{4 \times \frac{3}{4}} = 4 \times 6^2 - 4^3$
 $= 4 \times 36 - 64 = 144 - 64 = 80$

Short Answer:

Ans: 1. $(\sqrt{5} + \sqrt{2})^2 + (\sqrt{8} - \sqrt{5})^2 = 5 + 2 + 2\sqrt{10} + 8 + 5 - 2\sqrt{40}$
 $= 20 + 2\sqrt{10} - 4\sqrt{10} = 20 - 2\sqrt{10}$

Ans: 2. Let $x = 23.\overline{43}$

or $x = 23.4343... \dots$ (i)

$100x = 2343.4343... \dots$ (ii) [Multiplying eqn. (i) by 100]

$99x = 2320$ [Subtracting (i) from (ii)]

$\Rightarrow x = \frac{2320}{99}$

Hence, $23.\overline{43} = \frac{2320}{99}$

Ans: 3. Yes, 'ab' is necessarily an irrational.

For example, let $a = 2$ (a rational number) and $b = \sqrt{2}$ (an irrational number)

If possible let $ab = 2\sqrt{2}$ is a rational number.

Now $\frac{ab}{a} = \frac{2\sqrt{2}}{2} = \sqrt{2}$ is a rational number.

[∵ The quotient of two non-zero rational number is a rational]

But this contradicts the fact that $\sqrt{2}$ is an irrational number.

Thus, our supposition is wrong.

Hence, ab is an irrational number.

Ans: 4. Yes, $x + y$ is necessarily an irrational number.

For example, let $x = 3$ (a rational number) and $y = \sqrt{5}$ (an irrational number)

If possible, let $x + y = 3 + \sqrt{5}$ be a rational number.

Consider $\frac{p}{q} = 3 + \sqrt{5}$, where $p, q \in \mathbb{Z}$ and $q \neq 0$.

Squaring both sides, we have

$$\begin{aligned} \frac{p^2}{q^2} &= 9 + 5 + 6\sqrt{5} \Rightarrow \frac{p^2}{q^2} = 14 + 6\sqrt{5} \\ \Rightarrow \frac{p^2}{q^2} - 14 &= 6\sqrt{5} \Rightarrow \frac{p^2 - 14q^2}{6q^2} = \sqrt{5} \\ \because \frac{p}{q} \text{ is a rational} &\Rightarrow \frac{p^2 - 14q^2}{6q^2} \text{ is a rational} \end{aligned}$$

∵ $\frac{p}{q}$ is a rational

⇒ $\sqrt{5}$ is a rational

But this contradicts the fact that $\sqrt{5}$ is an irrational number.

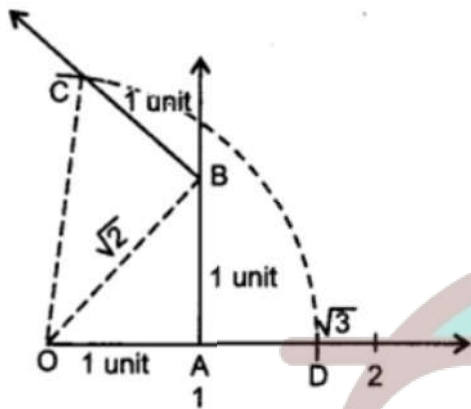
Thus, our supposition is wrong.

Hence, $x + y$ is an irrational number.

Ans: 5.

Here, $\sqrt{3} = \sqrt{1+2} = \sqrt{(1)^2 + (\sqrt{2})^2}$

And, $\sqrt{2} = \sqrt{1+1} = \sqrt{(1)^2 + (1)^2}$



On the number line, take $OA = 1$ unit. Draw $AB = 1$ unit perpendicular to OA . Join OB .

Again, on OB , draw $BC = 1$ unit perpendicular to OB . Join OC .

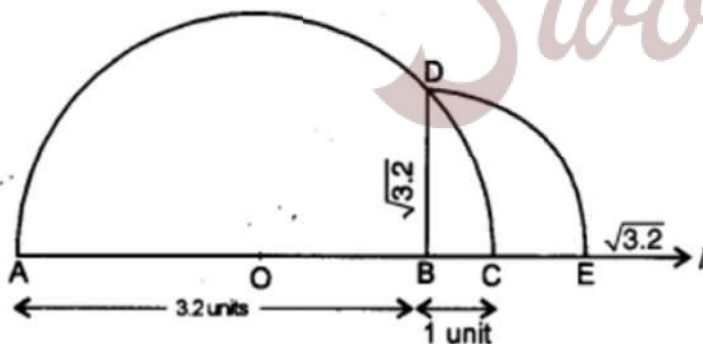
By Pythagoras Theorem, we obtain $OC = \sqrt{3}$. Using

compasses, with Centre O and radius OC , draw an arc, which intersects the number line at point

D . Thus, $OD = \sqrt{3}$ and D corresponds to $\sqrt{3}$.

Ans: 6. First of all draw a line of length 3.2 units such that $AB = 3.2$ units. Now, from point B , mark distance of 1 unit. Let this point be ' C '. Let ' O ' be the mid-point of the distance AC . Now, draw a semicircle with Centre ' O ' and radius OC . Let us draw a line perpendicular to AC passing through the point ' B ' and intersecting the semicircle at point ' D '.

\therefore The distance $BD = \sqrt{3.2}$



Now, to represent $\sqrt{3.2}$ on the number line. Let us take the line BC as number line and point ' B ' as zero, point ' C ' as ' 1 ' and so on. Draw an arc with Centre B and radius BD , which intersects the number line at point ' E '.

Then, the point ' E ' represents $\sqrt{3.2}$.

Ans: 7. Let. $x = 1.32 = 1.3222\dots$ (i)

Multiplying eq. (i) by 10, we have

$$10x = 13.222\dots$$

Again, multiplying eq. (i) by 100, we have

$$100x = 132.222\dots \dots(\text{iii})$$

Subtracting eq. (ii) from (iii), we have

$$100x - 10x = (132.222\dots) - (13.222\dots)$$

$$90x = 119$$

$$\Rightarrow x = \frac{119}{90}$$

Again, $y = 0.35 = 0.353535\dots$

Multiply (iv) by 100, we have ... (iv)

$$100y = 35.353535\dots \dots (\text{v})$$

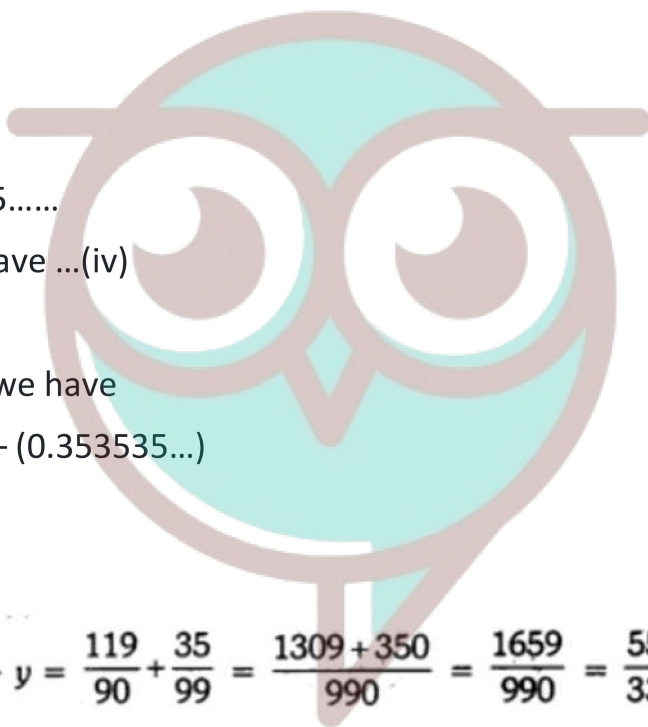
Subtracting (iv) from (u), we have

$$100y - y = (35.353535\dots) - (0.353535\dots)$$

$$99y = 35$$

$$y = \frac{35}{99}$$

$$\text{Now, } 1.\overline{32} + 0.\overline{35} = x + y = \frac{119}{90} + \frac{35}{99} = \frac{1309 + 350}{990} = \frac{1659}{990} = \frac{553}{330}$$



Long Answer:

Ans: 1.

$$\begin{aligned} x &= \frac{\sqrt{p+q} + \sqrt{p-q}}{\sqrt{p+q} - \sqrt{p-q}} = \frac{\sqrt{p+q} + \sqrt{p-q}}{\sqrt{p+q} - \sqrt{p-q}} \times \frac{\sqrt{p+q} + \sqrt{p-q}}{\sqrt{p+q} + \sqrt{p-q}} \\ &= \frac{(\sqrt{p+q} + \sqrt{p-q})^2}{(\sqrt{p+q})^2 - (\sqrt{p-q})^2} = \frac{p+q+p-q+2 \times \sqrt{p+q} \times \sqrt{p-q}}{(p+q) - (p-q)} \\ &= \frac{2p+2\sqrt{p^2-q^2}}{2q} = \frac{p+\sqrt{p^2-q^2}}{q} \end{aligned}$$

$$\Rightarrow qx = p + \sqrt{p^2 - q^2}$$

$$\Rightarrow qx - p = \sqrt{p^2 - q^2}$$

Squaring both sides, we have

$$\Rightarrow q^2x^2 + p^2 - 2pqx = p^2 - q^2$$



$$\Rightarrow q^2x^2 - 2pqx + q^2 = 0$$

$$\Rightarrow q (q^2 - 2px + q) = 0$$

$$\Rightarrow qx^2 - 2px + q = 0 (\because q \neq 0)$$

Ans: 2

Here, $a = \frac{1}{3-\sqrt{11}} \times \frac{3+\sqrt{11}}{3+\sqrt{11}} = \frac{3+\sqrt{11}}{9-11} = \frac{3+\sqrt{11}}{-2}$

$$b = \frac{1}{a} = 3 - \sqrt{11}$$

Now, $a^2 - b^2 = (a + b)(a - b)$

$$\begin{aligned} &= \left(\frac{3+\sqrt{11}}{-2} + 3 - \sqrt{11} \right) \left(\frac{3+\sqrt{11}}{-2} - 3 + \sqrt{11} \right) \\ &= \left(\frac{-3 - \sqrt{11} + 6 - 2\sqrt{11}}{2} \right) \left(\frac{-3 - \sqrt{11} - 6 + 2\sqrt{11}}{2} \right) \\ &= \left(\frac{3 - 3\sqrt{11}}{2} \right) \left(\frac{-9 + \sqrt{11}}{2} \right) = \frac{-27 + 3\sqrt{11} + 27\sqrt{11} - 33}{4} \\ &= \frac{-60 + 30\sqrt{11}}{4} = \frac{-30 + 15\sqrt{11}}{2} = \frac{1}{2}(15\sqrt{11} - 30) \end{aligned}$$

Ans: 3

$$\begin{aligned} &\frac{3\sqrt{2}}{\sqrt{6}-\sqrt{3}} - \frac{4\sqrt{3}}{\sqrt{6}-\sqrt{2}} + \frac{2\sqrt{3}}{\sqrt{6}+2} \\ &= \frac{3\sqrt{2}}{\sqrt{6}-\sqrt{3}} \times \frac{\sqrt{6}+\sqrt{3}}{\sqrt{6}+\sqrt{3}} - \frac{4\sqrt{3}}{\sqrt{6}-\sqrt{2}} \times \frac{\sqrt{6}+\sqrt{2}}{\sqrt{6}+\sqrt{2}} + \frac{2\sqrt{3}}{\sqrt{6}+2} \times \frac{\sqrt{6}-2}{\sqrt{6}-2} \\ &= \frac{3\sqrt{12}+3\sqrt{6}}{(\sqrt{6})^2-(\sqrt{3})^2} - \frac{4\sqrt{18}+4\sqrt{6}}{(\sqrt{6})^2-(\sqrt{2})^2} + \frac{2\sqrt{18}-4\sqrt{3}}{(\sqrt{6})^2-(2)^2} \\ &= \frac{6\sqrt{3}+3\sqrt{6}}{6-3} - \frac{12\sqrt{2}+4\sqrt{6}}{6-2} + \frac{6\sqrt{2}-4\sqrt{3}}{6-4} \\ &= \frac{6\sqrt{3}+3\sqrt{6}}{3} - \frac{12\sqrt{2}+4\sqrt{6}}{4} + \frac{6\sqrt{2}-4\sqrt{3}}{2} \\ &= \frac{24\sqrt{3}+12\sqrt{6}-36\sqrt{2}-12\sqrt{6}+36\sqrt{2}-24\sqrt{3}}{12} = \frac{0}{12} = 0. \end{aligned}$$

Ans: 4.

$$\begin{aligned} & \frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \dots + \frac{1}{\sqrt{8}+3} \\ &= \frac{1}{1+\sqrt{2}} \times \frac{1-\sqrt{2}}{1-\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} \times \frac{\sqrt{2}-\sqrt{3}}{\sqrt{2}-\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} \times \frac{\sqrt{3}-\sqrt{4}}{\sqrt{3}-\sqrt{4}} + \dots + \frac{1}{\sqrt{8}+3} \times \frac{\sqrt{8}-3}{\sqrt{8}-3} \\ &= \frac{1-\sqrt{2}}{-1} + \frac{\sqrt{2}-\sqrt{3}}{-1} + \frac{\sqrt{3}-\sqrt{4}}{-1} + \dots + \frac{\sqrt{8}-3}{-1} \\ &= -1 + \sqrt{2} - \sqrt{2} + \sqrt{3} - \sqrt{3} + \sqrt{4} - \dots - \sqrt{8} + 3 \\ &= -1 + 3 = 2 \end{aligned}$$

Ans: 5.

Here, $\frac{2\sqrt{5}+\sqrt{3}}{2\sqrt{5}-\sqrt{3}} + \frac{2\sqrt{5}-\sqrt{3}}{2\sqrt{5}+\sqrt{3}} = a + \sqrt{15}b$

$$\frac{(2\sqrt{5}+\sqrt{3})^2 + (2\sqrt{5}-\sqrt{3})^2}{(2\sqrt{5}-\sqrt{3})(2\sqrt{5}+\sqrt{3})} = a + \sqrt{15}b$$

$$\frac{20+3+4\sqrt{15}+20+3-4\sqrt{15}}{20-3} = a + \sqrt{15}b$$

$$\frac{46}{17} = a + \sqrt{15}b$$

Comparing rational and irrational parts, we have

$$a = \frac{46}{17} \text{ and } b = 0$$

Assertion and Reason Answers-

1. c) Assertion is correct statement but reason is wrong statement.
2. a) Assertion and reason both are correct statements and reason is correct explanation for assertion.