1. Real Number System

Exercise 1.1

1 A. Question

Choose the correct answer:

The additive identity of rational numbers is _____.

A. 0

B. 1

C. -1

D. 2

Answer

Let, additive identity of rational number is = x

Let, a rational number is = p/q, where q ≠ 0

According to problem,

⇒ p/q + x = p/q

⇒ x = 0

∴ The additive identity of rational number is = 0

1 B. Question

Choose the correct answer:

The additive inverse of $\frac{-3}{5}$ is _____.

A. $\frac{-3}{5}$

B. $\frac{5}{3}$

C. $\frac{3}{5}$

D. $\frac{-5}{3}$

Answer

Let, additive inverse of -3/5 is = x

According to problem,

⇒ -3/5 + x = 0

⇒ x = 3/5

∴ The additive inverse of -3/5 is = 3/5

1 C. Question

Choose the correct answer:

The reciprocal of $\frac{-5}{13}$ is _____.

A. $\frac{5}{13}$

B. $\frac{-13}{5}$

C. $\frac{13}{5}$

D. $\frac{-5}{13}$

Answer

Let, reciprocal of $-\frac{5}{13}$ is = x

According to problem,

$$\Rightarrow x = \frac{1}{-\frac{5}{13}}$$

$$\Rightarrow x = -\frac{13}{5}$$

∴ The reciprocal of $-\frac{5}{13} = -\frac{13}{5}$.

1 D. Question

Choose the correct answer:

The multiplicative inverse of -7 is _____.

A. 7

B. 1/7

C. -7

D. -1/7

Answer

Let, multiplicative inverse of -7 is = x

According to problem,

⇒ (-7) × x = 1

⇒ x = -1/7

∴ The multiplicative inverse of -7 is = -1/7

1 E. Question

Choose the correct answer:

_____ has no reciprocal.

A. 0

B. 1

C. -1

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

Answer

Among the following numbers 0 has no reciprocal.

∵ reciprocal of 0 = 1/0, which is not possible.

∴ Denominator of a fraction cannot be equal to 0.

2 A. Question

Name the property under addition used in each of the following:

$$\left(\frac{-3}{7}\right)+\frac{1}{9}=\frac{1}{9}+\left(\frac{-3}{7}\right)$$

Answer

It is under Commutative property of addition.

Where change in the positions of the operands does not change the result.

$$\therefore \left(-\frac{3}{7}\right)+\frac{1}{9}=\frac{1}{9}+\left(-\frac{3}{7}\right)$$

2 B. Question

Name the property under addition used in each of the following:

$$\frac{4}{9}+\left(\frac{7}{8}+\frac{1}{2}\right)=\left(\frac{4}{9}+\frac{7}{8}\right)+\frac{1}{2}$$

Answer

It is under Associative property of addition.

Where change in the grouping of numbers does not change the result.

$$\therefore \frac{4}{9}+\left(\frac{7}{8}+\frac{1}{2}\right)=\left(\frac{4}{9}+\frac{7}{8}\right)+\frac{1}{2}$$

2 C. Question

Name the property under addition used in each of the following:

$$8+\frac{7}{10}=\frac{7}{10}+8$$

Answer

It is under Commutative property of addition.

Where change in the positions of the operands does not change the result.

$$\therefore 8+\frac{7}{10}=\frac{7}{10}+8$$

2 D. Question

Name the property under addition used in each of the following:

$$\left(\frac{-7}{15}\right)+0=\frac{-7}{15}=0+\left(\frac{-7}{15}\right)$$

Answer

It is under the property Additive identity.

The sum of 0 and any rational number is the rational number itself.

$$\therefore \left(-\frac{7}{15}\right)+0=-\frac{7}{15}=0+\left(-\frac{7}{15}\right)$$

2 E. Question

Name the property under addition used in each of the following:

$$\frac{2}{5}+\left(\frac{-2}{5}\right)=0$$

Answer

It is under the property additive inverse.

Where addition of two rational numbers is 0.

$$\therefore \frac{2}{5}+\left(-\frac{2}{5}\right)=0$$

3 A. Question

Name the property under multiplication used in each of the following:

$$\frac{2}{3}\times\frac{4}{5}=\frac{4}{5}\times\frac{2}{3}$$

Answer

It is under Commutative property of multiplication.

Where change in the positions of the operands does not change the result.

$$\therefore \frac{2}{3}\times\frac{4}{5}=\frac{4}{5}\times\frac{2}{3}$$

3 B. Question

Name the property under multiplication used in each of the following:

$$\left(\frac{-3}{4}\right)\times 1=\frac{-3}{4}=1\times\left(\frac{-3}{4}\right)$$

Answer

It is under the property multiplicative identity.

The product of any rational number and 1 is the rational number itself.

$$\therefore \left(-\frac{3}{4}\right)\times 1=-\frac{3}{4}=1\times\left(-\frac{3}{4}\right)$$

3 C. Question

Name the property under multiplication used in each of the following:

$$\left(\frac{-17}{28}\right)\times\left(\frac{-28}{17}\right)=1$$

Answer

It is under the property Multiplicative inverse.

When multiplication of two rational number is = 1.

$$\therefore \left(-\frac{17}{28}\right)\times\left(-\frac{28}{17}\right)=1$$

3 D. Question

Name the property under multiplication used in each of the following:

$$\frac{1}{5}\times\left(\frac{7}{8}\times\frac{4}{3}\right)=\left(\frac{1}{5}\times\frac{7}{8}\right)\times\frac{4}{3}$$

Answer

It is under Associative property of multiplication.

Where change in the grouping of numbers does not change the result.

$$\therefore \frac{1}{5}\times\left(\frac{7}{8}\times\frac{4}{3}\right)=\left(\frac{1}{5}\times\frac{7}{8}\right)\times\frac{4}{3}$$

3 E. Question

Name the property under multiplication used in each of the following:

$$\frac{2}{7}\times\left(\frac{9}{10}+\frac{2}{5}\right)=\frac{2}{7}\times\frac{9}{10}+\frac{2}{7}\times\frac{2}{5}$$

Answer

It is under the Distributive property of multiplication over addition.

Where ⇒ a × (b + c) = a × b + a × c

$$\therefore \frac{2}{7}\times\left(\frac{9}{10}+\frac{2}{5}\right)=\frac{2}{7}\times\frac{9}{10}+\frac{2}{7}\times\frac{2}{5}$$

4 A. Question

Verify whether commutative property is satisfied for addition, subtraction, multiplication and division of the following pairs of rational numbers.

4 and $\frac{2}{5}$

Answer

A. Commutative property for addition:

We have to prove,

⇒ 4 + 2/5 = 2/5 + 4

LHS,

$\Rightarrow 4+\frac{2}{5}$

$\Rightarrow \frac{20+2}{5}$

$\Rightarrow \frac{22}{5}$

RHS,

$\Rightarrow \frac{2}{5}+4$

$\Rightarrow \frac{2+20}{5}$

$\Rightarrow 22/5$

∴ LHS= RHS

∴ Commutative property for addition is satisfied.

B. Commutative property for subtraction:

We have to prove,

⇒ 4 – 2/5 = 2/5 – 4

LHS,

$\Rightarrow 4-\frac{2}{5}$

$\Rightarrow \frac{20-2}{5}$

$\Rightarrow \frac{18}{5}$

RHS,

$\Rightarrow \frac{2}{5}-4$

$\Rightarrow \frac{2-20}{5}$

$\Rightarrow -\frac{18}{5}$

∴ LHS ≠ RHS

∴ Commutative property for subtraction is not satisfied.

C. Commutative property for multiplication:

We have to prove,

⇒ 4 × 2/5 = 2/5 × 4

LHS,

$\Rightarrow 4 \times \frac{2}{5}$

$\Rightarrow \frac{8}{5}$

RHS,

$\Rightarrow \frac{2}{5} \times 4$

$\Rightarrow \frac{8}{5}$

∴ LHS= RHS

∴ Commutative property for multiplication is satisfied.

D. Commutative property for division:

We have to prove that,

$\Rightarrow 4 \div \frac{2}{5} = \frac{2}{5} \div 4$

LHS,

$\Rightarrow 4 \div \frac{2}{5}$

$\Rightarrow 4 \times \frac{5}{2}$

⇒ 10

RHS,

$\Rightarrow \frac{2}{5} \div 4$

$\Rightarrow \frac{2}{5} \times \frac{1}{4}$

$\Rightarrow \frac{1}{10}$

∴ LHS ≠ RHS

∴ Commutative property for division is not satisfied.

4 B. Question

Verify whether commutative property is satisfied for addition, subtraction, multiplication and division of the following pairs of rational numbers.

$\frac{-3}{4}$ and $\frac{-2}{7}$

Answer

A. Commutative property for addition:

We have to prove,

$$\Rightarrow -\frac{3}{4}+-\frac{2}{7}=-\frac{2}{7}+-\frac{3}{4}$$

LHS,

$$\Rightarrow -\frac{3}{4}+-\frac{2}{7}$$

$$\Rightarrow \frac{-21-8}{28}$$

$$\Rightarrow -\frac{29}{28}$$

RHS,

$$\Rightarrow -\frac{2}{7}+-\frac{3}{4}$$

$$\Rightarrow \frac{-8-21}{28}$$

$$\Rightarrow -\frac{29}{18}$$

∴ LHS= RHS

∴ Commutative property for addition is satisfied.

B. Commutative property for subtraction:

We have to prove,

$$\Rightarrow \left(-\frac{3}{4}\right)-\left(-\frac{2}{7}\right)=\left(-\frac{2}{7}\right)-\left(-\frac{3}{4}\right)$$

LHS,

$$\Rightarrow \left(-\frac{3}{4}\right)-(-\frac{2}{7})$$

$$\Rightarrow -\frac{3}{4}+\frac{2}{7}$$

$$\Rightarrow \frac{-21+8}{28}$$

$\Rightarrow -\frac{13}{28}$

RHS,

$\Rightarrow \left(-\frac{2}{7}\right)-\left(-\frac{3}{4}\right)$

$\Rightarrow -\frac{2}{7}+\frac{3}{4}$

$\Rightarrow \frac{-8+21}{28}$

$\Rightarrow \frac{13}{28}$

∴ LHS ≠ RHS

∴ Commutative property for subtraction is not satisfied.

C. Commutative property for multiplication:

We have to prove,

$\Rightarrow \left(-\frac{3}{4}\right)\times\left(-\frac{2}{7}\right)=\left(-\frac{2}{7}\right)\times\left(-\frac{3}{4}\right)$

LHS,

$\Rightarrow \left(-\frac{3}{4}\right)\times\left(-\frac{2}{7}\right)$

$\Rightarrow \frac{3}{14}$

RHS,

$\Rightarrow \left(-\frac{2}{7}\right)\times\left(-\frac{3}{4}\right)$

$\Rightarrow \frac{3}{14}$

∴ LHS= RHS

∴ Commutative property for multiplication is satisfied.

D. Commutative property for division:

We have to prove that,

$\Rightarrow \left(-\frac{3}{4}\right)\div\left(-\frac{2}{7}\right)=\left(-\frac{2}{7}\right)\div\left(-\frac{3}{4}\right)$

LHS,

$\Rightarrow \left(-\frac{3}{4}\right)\div\left(-\frac{2}{7}\right)$

$\Rightarrow \left(-\frac{3}{4}\right)\times\left(-\frac{7}{2}\right)$

⇒ 21/8

RHS,

$$\Rightarrow \left(-\frac{2}{7}\right) \div \left(-\frac{3}{4}\right)$$

$$\Rightarrow \left(-\frac{2}{7}\right) \times \left(-\frac{4}{3}\right)$$

$$\Rightarrow \frac{8}{21}$$

∴ LHS ≠ RHS

∴ Commutative property for division is not satisfied.

5 A. Question

Verify whether associative property is satisfied for addition, subtraction, multiplication and division of the following pairs of rational numbers.

$$\frac{1}{3}, \frac{2}{5} \text{ and } \frac{-3}{7}$$

Answer

A. Associative property for addition:

We have to prove that,

$$\Rightarrow \frac{1}{3} + \left[\frac{2}{5} + \left(-\frac{3}{7}\right)\right] = \left(\frac{1}{3} + \frac{2}{5}\right) + \left(-\frac{3}{7}\right)$$

LHS,

$$\Rightarrow \frac{1}{3} + \left[\frac{2}{5} + \left(-\frac{3}{7}\right)\right]$$

$$\Rightarrow \frac{1}{3} + \left(\frac{14-15}{35}\right)$$

$$\Rightarrow \frac{1}{3} - \frac{1}{35}$$

$$\Rightarrow \frac{35-3}{105}$$

$$\Rightarrow \frac{32}{105}$$

RHS,

$$\Rightarrow \left(\frac{1}{3} + \frac{2}{5}\right) + \left(-\frac{3}{7}\right)$$

$$\Rightarrow \frac{5+6}{15} - \frac{3}{7}$$

$$\Rightarrow \frac{11}{15} - \frac{3}{7}$$

$$\Rightarrow \frac{77-45}{105}$$

$$\Rightarrow \frac{32}{105}$$

∴ LHS = RHS

∴ Associative property for addition is satisfied.

B. Associative property for Subtraction:

We have to prove that,

$$\Rightarrow \frac{1}{3}-\left[\frac{2}{5}-\left(-\frac{3}{7}\right)\right]=\left(\frac{1}{3}-\frac{2}{5}\right)-\left(-\frac{3}{7}\right)$$

LHS,

$$\Rightarrow \frac{1}{3}-\left[\frac{2}{5}-\left(-\frac{3}{7}\right)\right]$$

$$\Rightarrow \frac{1}{3}-\left(\frac{14+15}{35}\right)$$

$$\Rightarrow \frac{1}{3}-\frac{29}{35}$$

$$\Rightarrow \frac{35-87}{105}$$

$$\Rightarrow \frac{-52}{105}$$

RHS,

$$\Rightarrow \left(\frac{1}{3}-\frac{2}{5}\right)-\left(-\frac{3}{7}\right)$$

$$\Rightarrow \frac{5-6}{15}+\frac{3}{7}$$

$$\Rightarrow -\frac{1}{15}+\frac{3}{7}$$

$$\Rightarrow \frac{-7+45}{105}$$

$$\Rightarrow \frac{38}{105}$$

∴ LHS ≠ RHS

∴ Associative property for Subtraction is not satisfied.

C. Associative property for multiplication:

We have to prove that,

$$\Rightarrow \frac{1}{3}\times\left[\frac{2}{5}\times\left(-\frac{3}{7}\right)\right]=\left(\frac{1}{3}\times\frac{2}{5}\right)\times\left(-\frac{3}{7}\right)$$

LHS,

$$\Rightarrow \frac{1}{3}\times\left[\frac{2}{5}\times\left(-\frac{3}{7}\right)\right]$$

$$\Rightarrow \frac{1}{3} \times \left(-\frac{6}{35}\right)$$

$$\Rightarrow -\frac{2}{35}$$

RHS,

$$\Rightarrow \left(\frac{1}{3} \times \frac{2}{5}\right) \times \left(-\frac{3}{7}\right)$$

$$\Rightarrow \frac{2}{15} \times \left(-\frac{3}{7}\right)$$

$$\Rightarrow -\frac{2}{35}$$

∴ LHS= RHS

∴ Associative property for multiplication is satisfied.

D. Associative Property for division:

We have to prove that,

$$\Rightarrow \frac{1}{3} \div \left[\frac{2}{5} \div \left(-\frac{3}{7}\right)\right] = \left(\frac{1}{3} \div \frac{2}{5}\right) \div \left(-\frac{3}{7}\right)$$

LHS,

$$\Rightarrow \frac{1}{3} \div \left[\frac{2}{5} \div \left(-\frac{3}{7}\right)\right]$$

$$\Rightarrow \frac{1}{3} \div \left[\frac{2}{5} \times \left(-\frac{7}{3}\right)\right]$$

$$\Rightarrow \frac{1}{3} \div \left(-\frac{14}{15}\right)$$

$$\Rightarrow \frac{1}{3} \times \left(-\frac{15}{14}\right)$$

$$\Rightarrow -\frac{5}{14}$$

RHS,

$$\Rightarrow \left(\frac{1}{3} \div \frac{2}{5}\right) \div \left(-\frac{3}{7}\right)$$

$$\Rightarrow \left(\frac{1}{3} \times \frac{5}{2}\right) \div \left(-\frac{3}{7}\right)$$

$$\Rightarrow \frac{5}{6} \div \left(-\frac{3}{7}\right)$$

$$\Rightarrow \frac{5}{6} \times \left(-\frac{7}{3}\right)$$

$$\Rightarrow -\frac{35}{18}$$

∴ LHS ≠ RHS

∴ Associative property for Division is not satisfied.

5 B. Question

Verify whether associative property is satisfied for addition, subtraction, multiplication and division of the following pairs of rational numbers.

$\frac{2}{3}, \frac{-4}{5}$ and $\frac{9}{10}$

Answer

A. Associative property for addition:

We have to prove that,

$$\Rightarrow \frac{2}{3}+\left[\left(-\frac{4}{5}\right)+\frac{9}{10}\right]=\left[\frac{2}{3}+\left(-\frac{4}{5}\right)\right]+\frac{9}{10}$$

LHS,

$$\Rightarrow \frac{2}{3}+\left[\left(-\frac{4}{5}\right)+\frac{9}{10}\right]$$

$$\Rightarrow \frac{2}{3}+\left(\frac{-8+9}{10}\right)$$

$$\Rightarrow \frac{2}{3}+\frac{1}{10}$$

$$\Rightarrow \frac{20+3}{30}$$

$$\Rightarrow \frac{23}{30}$$

RHS,

$$\Rightarrow \left[\frac{2}{3}+\left(-\frac{4}{5}\right)\right]+\frac{9}{10}$$

$$\Rightarrow \frac{10-12}{15}+\frac{9}{10}$$

$$\Rightarrow -\frac{2}{15}+\frac{9}{10}$$

$$\Rightarrow \frac{-4+27}{30}$$

$$\Rightarrow \frac{23}{30}$$

∴ LHS = RHS

∴ Associative property for addition is satisfied.

B. Associative property for Subtraction:

We have to prove that,

$$\Rightarrow \frac{2}{3}-\left[\left(-\frac{4}{5}\right)-\frac{9}{10}\right]=\left[\frac{2}{3}-\left(-\frac{4}{5}\right)\right]-\frac{9}{10}$$

LHS,

$$\Rightarrow \frac{2}{3}-\left[\left(-\frac{4}{5}\right)-\frac{9}{10}\right]$$

$$\Rightarrow \frac{2}{3}-\left(\frac{-8-9}{10}\right)$$

$$\Rightarrow \frac{2}{3}+\frac{17}{10}$$

$$\Rightarrow \frac{20+51}{30}$$

$$\Rightarrow \frac{71}{30}$$

RHS,

$$\Rightarrow \left[\frac{2}{3}-\left(-\frac{4}{5}\right)\right]-\frac{9}{10}$$

$$\Rightarrow \left(\frac{2}{3}+\frac{4}{5}\right)-\frac{9}{10}$$

$$\Rightarrow \frac{10+12}{15}-\frac{9}{10}$$

$$\Rightarrow \frac{22}{15}-\frac{9}{10}$$

$$\Rightarrow \frac{44-27}{30}$$

$$\Rightarrow \frac{17}{30}$$

∴ LHS ≠ RHS

∴ Associative property for Subtraction is not satisfied.

C. Associative property for multiplication:

We have to prove that,

$$\Rightarrow \frac{2}{3}\times\left[\left(-\frac{4}{5}\right)\times\frac{9}{10}\right]=\left[\frac{2}{3}\times\left(-\frac{4}{5}\right)\right]\times\frac{9}{10}$$

LHS,

$$\Rightarrow \frac{2}{3}\times\left[\left(-\frac{4}{5}\right)\times\frac{9}{10}\right]$$

$$\Rightarrow \frac{2}{3}\times\left(-\frac{18}{25}\right)$$

$$\Rightarrow -\frac{12}{25}$$

RHS,

$$\Rightarrow \left[\frac{2}{3}\times\left(-\frac{4}{5}\right)\right]\times\frac{9}{10}$$

$$\Rightarrow \left(-\frac{8}{15}\right)\times\frac{9}{10}$$

$\Rightarrow -\frac{12}{25}$

$\therefore$ LHS= RHS

$\therefore$ Associative property for multiplication is satisfied.

D. Associative Property for division:

We have to prove that,

$\Rightarrow \frac{2}{3} \div \left[\left(-\frac{4}{5}\right) \div \frac{9}{10}\right] = \left[\frac{2}{3} \div \left(-\frac{4}{5}\right)\right] \div \frac{9}{10}$

LHS,

$\Rightarrow \frac{2}{3} \div \left[\left(-\frac{4}{5}\right) \div \frac{9}{10}\right]$

$\Rightarrow \frac{2}{3} \div \left[\left(-\frac{4}{5}\right) \times \frac{10}{9}\right]$

$\Rightarrow \frac{2}{3} \div \left(-\frac{8}{9}\right)$

$\Rightarrow \frac{2}{3} \times \left(-\frac{9}{8}\right)$

$\Rightarrow -\frac{3}{4}$

RHS,

$\Rightarrow \left[\frac{2}{3} \div \left(-\frac{4}{5}\right)\right] \div \frac{9}{10}$

$\Rightarrow \left[\frac{2}{3} \times \left(-\frac{5}{4}\right)\right] \div \frac{9}{10}$

$\Rightarrow \left(-\frac{5}{6}\right) \div \frac{9}{10}$

$\Rightarrow \left(-\frac{5}{6}\right) \times \frac{10}{9}$

$\Rightarrow -\frac{25}{27}$

$\therefore$ LHS $\neq$ RHS

$\therefore$ Associative property for Divission is not satisfied.

6 A. Question

Use distributive property of multiplication of rational numbers and simplify:

$\frac{-5}{4} \times \left(\frac{8}{9} + \frac{5}{7}\right)$

Answer

According to distributive property of multiplication of rational numbers,

$$\Rightarrow -\frac{5}{4}\times\left(\frac{8}{9}+\frac{5}{7}\right)$$

$$\Rightarrow -\frac{5}{4}\times\frac{8}{9}+\left(-\frac{5}{4}\right)\times\frac{5}{7}$$

$$\Rightarrow -\frac{10}{9}+\left(-\frac{25}{28}\right)$$

$$\Rightarrow -\frac{10}{9}-\frac{25}{28}$$

$$\Rightarrow \frac{-280-225}{252}$$

$$\Rightarrow -\frac{505}{252}$$

6 B. Question

Use distributive property of multiplication of rational numbers and simplify:

$$\frac{2}{7}\times\left(\frac{1}{4}-\frac{1}{2}\right)$$

Answer

According to distributive property of multiplication of rational numbers,

$$\Rightarrow \frac{2}{7}\times\left(\frac{1}{4}-\frac{1}{2}\right)$$

$$\Rightarrow \frac{2}{7}\times\frac{1}{4}-\frac{2}{7}\times\frac{1}{2}$$

$$\Rightarrow \frac{1}{14}-\frac{1}{7}$$

$$\Rightarrow \frac{1-2}{14}$$

$$\Rightarrow -\frac{1}{14}$$

Exercise 1.2

1 A. Question

Find one rational number between the following pairs of rational numbers.

$\frac{4}{3}$ and $\frac{2}{5}$

Answer

Let, q is the rational number between 4/3 and 2/5.

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

$$\Rightarrow q=\frac{1}{2}\times\frac{20+6}{15}$$

$$\Rightarrow q = \frac{1}{2} \times \frac{26}{15}$$

$$\Rightarrow q = \frac{13}{15}$$

∴ one rational number between 4/3 and 2/5 is = 13/15

1 B. Question

Find one rational number between the following pairs of rational numbers.

$\frac{-2}{7}$ and $\frac{5}{6}$

Answer

Let, q is the rational number between -2/7 and 5/6

$$\therefore q = \frac{1}{2} \times \left[\left(-\frac{2}{7}\right) + \frac{5}{6}\right]$$

$$\Rightarrow q = \frac{1}{2} \times \frac{-12 + 35}{42}$$

$$\Rightarrow q = \frac{1}{2} \times \frac{23}{42}$$

$$\Rightarrow q = \frac{23}{84}$$

∴ one rational number between -2/7 and 5/6 is = 23/84

1 C. Question

Find one rational number between the following pairs of rational numbers.

$\frac{5}{11}$ and $\frac{7}{8}$

Answer

Let, q is the rational number between 5/11 and 7/8

$$\therefore q = \frac{1}{2} \times \left(\frac{5}{11} + \frac{7}{8}\right)$$

$$\Rightarrow q = \frac{1}{2} \times \frac{40 + 77}{88}$$

$$\Rightarrow q = \frac{1}{2} \times \frac{117}{88}$$

$$\Rightarrow q = \frac{117}{176}$$

∴ one rational number between 5/11 and 7/8 is = 117/176

1 D. Question

Find one rational number between the following pairs of rational numbers.

$\frac{7}{4}$ and $\frac{8}{3}$

Answer

Let, q is the rational number between 7/4 and 8/3

$\therefore q = \frac{1}{2} \times \left(\frac{7}{4} + \frac{8}{3}\right)$

$\Rightarrow q = \frac{1}{2} \times \frac{21 + 32}{12}$

$\Rightarrow q = \frac{1}{2} \times \frac{53}{12}$

$\Rightarrow q = \frac{53}{24}$

∴ one rational number between 7/4 and 8/3 is = 53/24

2 A. Question

Find two rational numbers between

$\frac{2}{7}$ and $\frac{3}{5}$

Answer

Let, p and q are two rational numbers between 2/7 and 3/5

$\therefore p = \frac{1}{2} \times \left(\frac{2}{7} + \frac{3}{5}\right)$

$\Rightarrow p = \frac{1}{2} \times \frac{10 + 21}{35}$

⇒ p = 31/70

$\therefore q = \frac{1}{2} \times \left(\frac{2}{7} + \frac{31}{70}\right)$

$\Rightarrow q = \frac{1}{2} \times \frac{20 + 31}{70}$

⇒ q = 51/140

∴ Two rational numbers between 2/7 and 3/5 is = 31/70 and 51/140

2 B. Question

Find two rational numbers between

$\frac{6}{5}$ and $\frac{9}{11}$

Answer

Let, p and q are two rational numbers between 6/5 and 9/11

$\therefore p = \frac{1}{2} \times \left(\frac{6}{5} + \frac{9}{11}\right)$

$$\Rightarrow p = \frac{1}{2} \times \frac{66 + 45}{55}$$

$$\Rightarrow p = \frac{111}{110}$$

$$\therefore q = \frac{1}{2} \times \left(\frac{6}{5} + \frac{111}{110}\right)$$

$$\Rightarrow q = \frac{1}{2} \times \frac{132 + 111}{110}$$

$$\Rightarrow q = \frac{243}{220}$$

∴ Two rational numbers between 6/5 and 9/11 is = 111/110 and 243/220

2 C. Question

Find two rational numbers between

$\frac{1}{3}$ and $\frac{4}{5}$

Answer

Let, p and q are two rational numbers between 1/3 and 4/5

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

$$\Rightarrow p = \frac{1}{2} \times \frac{5 + 12}{15}$$

$$\Rightarrow p = \frac{1}{2} \times \frac{17}{15}$$

$$\Rightarrow p = \frac{17}{30}$$

$$\therefore q = \frac{1}{2} \times \left(\frac{1}{3} + \frac{17}{30}\right)$$

$$\Rightarrow q = \frac{1}{2} \times \frac{10 + 17}{30}$$

$$\Rightarrow q = \frac{1}{2} \times \frac{27}{30}$$

$$\Rightarrow q = \frac{9}{20}$$

∴ Two rational numbers between 1/3 amd 4/5 is = 17/30 and 9/20

2 D. Question

Find two rational numbers between

$\frac{-1}{6}$ and $\frac{1}{3}$

Answer

Let, p and q are two rational numbers between -1/6 and 1/3

$$\therefore p = \frac{1}{2} \times \left(-\frac{1}{6} + \frac{1}{3}\right)$$

$$\Rightarrow p = \frac{1}{2} \times \frac{-1+2}{6}$$

$$\Rightarrow p = \frac{1}{2} \times \frac{1}{6}$$

$$\Rightarrow p = \frac{1}{12}$$

$$\therefore q = \frac{1}{2} \times \left(-\frac{1}{6} + \frac{1}{12}\right)$$

$$\Rightarrow q = \frac{1}{2} \times \frac{-2+1}{12}$$

$$\Rightarrow q = \frac{1}{2} \times \left(-\frac{1}{12}\right)$$

$$\Rightarrow q = -\frac{1}{24}$$

∴ Two rational numbers between -1/6 and 1/3 is = 1/12 and -1/24

3 A. Question

Find three rational numbers between

$\frac{1}{4}$ and $\frac{1}{2}$

Answer

Let, p, q and r are three rational numbers between 1/4 and 1/2

$$\therefore p = \frac{1}{2} \times \left(\frac{1}{4} + \frac{1}{2}\right)$$

$$\Rightarrow p = \frac{1}{2} \times \frac{1+2}{4}$$

$$\Rightarrow p = \frac{1}{2} \times \frac{3}{4}$$

$$\Rightarrow p = \frac{3}{8}$$

$$\therefore q = \frac{1}{2} \times \left(\frac{1}{4} + \frac{3}{8}\right)$$

$$\Rightarrow q = \frac{1}{2} \times \frac{2+3}{8}$$

$$\Rightarrow q = \frac{1}{2} \times \frac{5}{8}$$

$$\Rightarrow q = \frac{5}{16}$$

$$\therefore r = \frac{1}{2} \times \left(\frac{1}{4} + \frac{5}{16}\right)$$

$$\Rightarrow r = \frac{1}{2} \times \frac{4+5}{16}$$

$$\Rightarrow r = \frac{1}{2} \times \frac{9}{16}$$

$$\Rightarrow r = \frac{9}{32}$$

∴ Three rational numbers between 1/4 and 1/2 is = 3/8, 5/16 and 9/32

3 B. Question

Find three rational numbers between

$\frac{1}{10}$ and $\frac{2}{3}$

Answer

Let, p, q and r are three rational numbers between 1/10 and 2/3

$$\therefore p = \frac{1}{2} \times \left(\frac{1}{10} + \frac{2}{3}\right)$$

$$\Rightarrow p = \frac{1}{2} \times \frac{3+20}{30}$$

$$\Rightarrow p = \frac{1}{2} \times \frac{23}{30}$$

$$\Rightarrow p = \frac{23}{60}$$

$$\therefore q = \frac{1}{2} \times \left(\frac{1}{10} + \frac{23}{60}\right)$$

$$\Rightarrow q = \frac{1}{2} \times \frac{6+23}{60}$$

$$\Rightarrow q = \frac{1}{2} \times \frac{29}{60}$$

$$\Rightarrow q = \frac{29}{120}$$

$$\therefore r = \frac{1}{2} \times \left(\frac{1}{10} + \frac{29}{120}\right)$$

$$\Rightarrow r = \frac{1}{2} \times \frac{12+29}{120}$$

$$\Rightarrow r = \frac{1}{2} \times \frac{41}{120}$$

$$\Rightarrow r = \frac{41}{240}$$

∴ Three rational numbers between 1/10 and 2/3 is = 23/60, 29/120, 41/240

3 C. Question

Find three rational numbers between

$\frac{-1}{3}$ and $\frac{3}{2}$

Answer

Let, p, q and r are three rational numbers between -1/3 and 3/2

$$\therefore p = \frac{1}{2} \times \left(-\frac{1}{3} + \frac{3}{2}\right)$$

$$\Rightarrow p = \frac{1}{2} \times \frac{-2+9}{6}$$

$$\Rightarrow p = \frac{1}{2} \times \frac{7}{6}$$

$$\Rightarrow p = \frac{7}{12}$$

$$\therefore q = \frac{1}{2} \times \left(-\frac{1}{3} + \frac{7}{12}\right)$$

$$\Rightarrow q = \frac{1}{2} \times \frac{-4+7}{12}$$

$$\Rightarrow q = \frac{1}{2} \times \frac{3}{12}$$

$$\Rightarrow q = \frac{1}{8}$$

$$\therefore r = \frac{1}{2} \times \left(-\frac{1}{3} + \frac{1}{8}\right)$$

$$\Rightarrow r = \frac{1}{2} \times \frac{-8+3}{24}$$

$$\Rightarrow r = \frac{1}{2} \times \left(-\frac{5}{24}\right)$$

$$\Rightarrow r = -\frac{5}{48}$$

∴ Three rational numbers between -1/3 and 3/2 is = 7/12, 1/8 and -5/48

3 D. Question

Find three rational numbers between

$\frac{1}{8}$ and $\frac{1}{12}$

Answer

Let, p, q and r are three rational numbers between 1/8 and 1/12

$$\therefore p = \frac{1}{2} \times \left(\frac{1}{8} + \frac{1}{12}\right)$$

$$\Rightarrow p = \frac{1}{2} \times \frac{3+2}{24}$$

$$\Rightarrow p = \frac{1}{2} \times \frac{5}{24}$$

$$\Rightarrow p = \frac{5}{48}$$

$$\therefore q = \frac{1}{2} \times \left(\frac{1}{8} + \frac{5}{48}\right)$$

$$\Rightarrow q = \frac{1}{2} \times \frac{6+5}{48}$$

$$\Rightarrow q = \frac{1}{2} \times \frac{11}{48}$$

$$\Rightarrow q = \frac{11}{96}$$

$$\therefore r = \frac{1}{2} \times \left(\frac{1}{8} + \frac{11}{96}\right)$$

$$\Rightarrow r = \frac{1}{2} \times \frac{12+11}{96}$$

$$\Rightarrow r = \frac{1}{2} \times \frac{23}{96}$$

$$\Rightarrow r = \frac{23}{192}$$

∴ Three rational numbers between 1/8 and 1/12 is = 5/48, 11/96 and 23/192

Exercise 1.3

1 A. Question

Choose the correct answer:

$2 \times \frac{5}{3}$ = _____

A. $\frac{10}{3}$

B. $2\frac{5}{6}$

C. $\frac{10}{6}$

D. $\frac{2}{3}$

Answer

$$2 \times \frac{5}{3} = \frac{2}{1} \times \frac{5}{3}$$

$$\left(\because \frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}\right)$$

$$\Rightarrow 2 \times \frac{5}{3} = \frac{2 \times 5}{1 \times 3}$$

$$\Rightarrow 2 \times \frac{5}{3} = \frac{10}{3}$$

(B) doesn't match the solution.

(C) doesn't match the solution.

(D) doesn't match the solution.

1 B. Question

Choose the correct answer:

$\frac{2}{5} \times \frac{4}{7}$ = _____

A. $\frac{14}{20}$

B. $\frac{8}{35}$

C. $\frac{20}{14}$

D. $\frac{35}{8}$

Answer

$$\frac{2}{5} \times \frac{4}{7} = \frac{2 \times 4}{5 \times 7}$$

$$\left(\because \frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}\right)$$

$$\Rightarrow \frac{2}{5} \times \frac{4}{7} = \frac{8}{35}$$

(A) doesn't match the solution.

(C) doesn't match the solution.

(D) doesn't match the solution.

1 C. Question

Choose the correct answer:

$\frac{2}{5} + \frac{4}{9}$ is _____

A. $\frac{10}{23}$

B. $\frac{8}{45}$

C. $\frac{38}{45}$

D. $\frac{6}{13}$

Answer

$\frac{2}{5} + \frac{4}{9} = \frac{(2 \times 9) + (4 \times 5)}{45}$

($\because \frac{a}{b} + \frac{c}{d}$

$= \frac{a \times \frac{LCM(b,d)}{b} + c \times \frac{LCM(b,d)}{d}}{LCM(b,d)}$, where LCM is least common multiple)

$\Rightarrow \frac{2}{5} + \frac{4}{9} = \frac{18 + 20}{45}$

$\Rightarrow \frac{2}{5} + \frac{4}{9} = \frac{38}{45}$

(A) doesn't match the solution.

(B) doesn't match the solution.

(D) doesn't match the solution.

1 D. Question

Choose the correct answer:

$\frac{1}{5} \div 2\frac{1}{2}$ is _____

A. $\frac{2}{25}$

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

C. $\frac{10}{7}$

D. $\frac{3}{10}$

Answer

$\frac{1}{5} \div 2\frac{1}{2} = \frac{1}{5} \div \frac{(2 \times 2) + 1}{2}$

($\because a\frac{b}{c} = \frac{(a \times c) + b}{c}$)

$$\Rightarrow \frac{1}{5} \div 2\frac{1}{2} = \frac{1}{5} \div \frac{4+1}{2}$$

$$\Rightarrow \frac{1}{5} \div 2\frac{1}{2} = \frac{1}{5} \div \frac{5}{2}$$

$$\Rightarrow \frac{1}{5} \div 2\frac{1}{2} = \frac{\frac{1}{5}}{\frac{5}{2}}$$

$$\Rightarrow \frac{1}{5} \div 2\frac{1}{2} = \frac{1}{5} \times \frac{2}{5}$$

$$\left(\because \frac{\frac{a}{b}}{\frac{c}{d}} = \frac{a}{b} \times \frac{d}{c}\right)$$

$$\Rightarrow \frac{1}{5} \div 2\frac{1}{2} = \frac{2}{25}$$

$$\left(\because \frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}\right)$$

(B) doesn't match the solution.

(C) doesn't match the solution.

(D) doesn't match the solution.

1 E. Question

Choose the correct answer:

$$\left(1-\frac{1}{2}\right)+\left(\frac{3}{4}-\frac{1}{4}\right)$$

A. 0

B. 1

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

D. $\frac{3}{4}$

Answer

$$\left(1-\frac{1}{2}\right)+\left(\frac{3}{4}-\frac{1}{4}\right) = \left(\frac{1}{1}-\frac{1}{2}\right)+\left(\frac{3}{4}-\frac{1}{4}\right)$$

$$\Rightarrow \left(1-\frac{1}{2}\right)+\left(\frac{3}{4}-\frac{1}{4}\right) = \frac{(1\times 2)-(1\times 1)}{2}+\frac{(3\times 1)-(1\times 1)}{4}$$

$\left(\because \frac{a}{b}-\frac{c}{d} = \frac{a\times\frac{LCM(b,d)}{b}-c\times\frac{LCM(b,d)}{d}}{LCM(b,d)}\right.$, where LCM is least common multiple)

$$\Rightarrow \left(1-\frac{1}{2}\right)+\left(\frac{3}{4}-\frac{1}{4}\right) = \frac{2-1}{2}+\frac{3-1}{4}$$

$$\Rightarrow \left(1-\frac{1}{2}\right)+\left(\frac{3}{4}-\frac{1}{4}\right)=\frac{1}{2}+\frac{2}{4}$$

$$\Rightarrow \left(1-\frac{1}{2}\right)+\left(\frac{3}{4}-\frac{1}{4}\right)=\frac{1\times 2\ +\ 2\times 1}{4}$$

$\left(\because \frac{a}{b}+\frac{c}{d}=\frac{a\times\frac{LCM(b,d)}{b}+c\times\frac{LCM(b,d)}{d}}{LCM(b,d)}\right.$, where LCM is least common multiple)

$$\Rightarrow \left(1-\frac{1}{2}\right)+\left(\frac{3}{4}-\frac{1}{4}\right)=\frac{2\ +\ 2}{4}$$

$$\Rightarrow \left(1-\frac{1}{2}\right)+\left(\frac{3}{4}-\frac{1}{4}\right)=\frac{4}{4}$$

$$\Rightarrow \left(1-\frac{1}{2}\right)+\left(\frac{3}{4}-\frac{1}{4}\right)=1$$

(A) doesn't match the solution.

(C) doesn't match the solution.

(D) doesn't match the solution.

2 A. Question

Simplify:

$$\frac{11}{12}\div\left(\frac{5}{9}\times\frac{18}{25}\right)$$

Answer

$$\frac{11}{12}\div\left(\frac{5}{9}\times\frac{18}{25}\right)=\frac{11}{12}\div\frac{5\times 18}{9\times 25}$$

$$\left(\because \frac{a}{b}\times\frac{c}{d}=\frac{a\times c}{b\times d}\right)$$

$$\Rightarrow \frac{11}{12}\div\left(\frac{5}{9}\times\frac{18}{25}\right)=\frac{11}{12}\div\frac{5\times 2\times 9}{9\times 5\times 5}$$

$$\Rightarrow \frac{11}{12}\div\left(\frac{5}{9}\times\frac{18}{25}\right)=\frac{11}{12}\div\frac{2}{5}$$

$$\Rightarrow \frac{11}{12}\div\left(\frac{5}{9}\times\frac{18}{25}\right)=\frac{\frac{11}{12}}{\frac{2}{5}}$$

$$\left(\because \frac{\frac{a}{b}}{\frac{c}{d}}=\frac{a}{b}\times\frac{d}{c}\right)$$

$$\Rightarrow \frac{11}{12}\div\left(\frac{5}{9}\times\frac{18}{25}\right)=\frac{11}{12}\times\frac{5}{2}$$

$$\left(\because \frac{a}{b}\times\frac{c}{d}=\frac{a\times c}{b\times d}\right)$$

$$\Rightarrow \frac{11}{12}\div\left(\frac{5}{9}\times\frac{18}{25}\right)=\frac{55}{24}$$

$$\Rightarrow \frac{11}{12} \div \left(\frac{5}{9} \times \frac{18}{25}\right) = \frac{2 \times 24 + 7}{24}$$

$$\Rightarrow \frac{11}{12} \div \left(\frac{5}{9} \times \frac{18}{25}\right) = 2\frac{7}{24}$$

$$\left(\because a\frac{b}{c} = \frac{(a \times c) + b}{c}\right)$$

$$\Rightarrow \frac{11}{12} \div \left(\frac{5}{9} \times \frac{18}{25}\right) = 2\frac{7}{24}$$

2 B. Question

Simplify:

$$\left(2\frac{1}{2} \times \frac{8}{10}\right) \div \left(1\frac{1}{2} + \frac{5}{8}\right)$$

Answer

$$\left(2\frac{1}{2} \times \frac{8}{10}\right) \div \left(1\frac{1}{2} + \frac{5}{8}\right) = \left(\frac{2 \times 2 + 1}{2} \times \frac{8}{10}\right) \div \left(\frac{1 \times 2 + 1}{2} + \frac{5}{8}\right)$$

$$\left(\because a\frac{b}{c} = \frac{(a \times c) + b}{c}\right)$$

$$\Rightarrow \left(2\frac{1}{2} \times \frac{8}{10}\right) \div \left(1\frac{1}{2} + \frac{5}{8}\right) = \left(\frac{5}{2} \times \frac{8}{10}\right) \div \left(\frac{3}{2} + \frac{5}{8}\right)$$

$$\Rightarrow \left(2\frac{1}{2} \times \frac{8}{10}\right) \div \left(1\frac{1}{2} + \frac{5}{8}\right) = \left(\frac{5 \times 8}{2 \times 10}\right) \div \left(\frac{3}{2} + \frac{5}{8}\right)$$

$$\left(\because \frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}\right)$$

$$\Rightarrow \left(2\frac{1}{2} \times \frac{8}{10}\right) \div \left(1\frac{1}{2} + \frac{5}{8}\right) = \left(\frac{40}{20}\right) \div \frac{(3 \times 4 + 5 \times 1)}{8}$$

$$\left(\because \frac{a}{b} + \frac{c}{d} = \frac{a \times \frac{LCM(b,d)}{b} + c \times \frac{LCM(b,d)}{d}}{LCM(b,d)}, \text{where LCM is least common multiple}\right)$$

$$\Rightarrow \left(2\frac{1}{2} \times \frac{8}{10}\right) \div \left(1\frac{1}{2} + \frac{5}{8}\right) = \left(\frac{40}{20}\right) \div \frac{17}{8}$$

$$\Rightarrow \left(2\frac{1}{2} \times \frac{8}{10}\right) \div \left(1\frac{1}{2} + \frac{5}{8}\right) = \frac{\left(\frac{40}{20}\right)}{\frac{17}{8}}$$

$$\left(\because \frac{\frac{a}{b}}{\frac{c}{d}} = \frac{a}{b} \times \frac{d}{c}\right)$$

$$\Rightarrow \left(2\frac{1}{2} \times \frac{8}{10}\right) \div \left(1\frac{1}{2} + \frac{5}{8}\right) = \left(\frac{40}{20}\right) \times \frac{8}{17}$$

$$\left(\because \frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}\right)$$

$$\Rightarrow \left(2\frac{1}{2}\times\frac{8}{10}\right)\div\left(1\frac{1}{2}+\frac{5}{8}\right)=\left(\frac{40\times 8}{20\times 17}\right)$$

$$\Rightarrow \left(2\frac{1}{2}\times\frac{8}{10}\right)\div\left(1\frac{1}{2}+\frac{5}{8}\right)=\frac{2\times 8}{17}$$

$$\Rightarrow \left(2\frac{1}{2}\times\frac{8}{10}\right)\div\left(1\frac{1}{2}+\frac{5}{8}\right)=\frac{16}{17}$$

2 C. Question

Simplify:

$$\frac{15}{16}\text{of}\left(\frac{5}{6}-\frac{1}{2}\right)\div\frac{10}{11}$$

Answer

$$\frac{15}{16}\text{ of }\left(\frac{5}{6}-\frac{1}{2}\right)\div\frac{10}{11}=\frac{15}{16}\times\left(\left(\frac{5}{6}-\frac{1}{2}\right)\div\frac{10}{11}\right)$$

$$\Rightarrow \frac{15}{16}\text{ of }\left(\frac{5}{6}-\frac{1}{2}\right)\div\frac{10}{11}=\frac{15}{16}\times\left(\frac{5\times 1-1\times 3}{6}\div\frac{10}{11}\right)$$

$$\left(\because \frac{a}{b}-\frac{c}{d}=\frac{a\times\frac{LCM(b,d)}{b}-c\times\frac{LCM(b,d)}{d}}{LCM(b,d)},\text{ where LCM is least common multiple}\right)$$

$$\Rightarrow \frac{15}{16}\text{ of }\left(\frac{5}{6}-\frac{1}{2}\right)\div\frac{10}{11}=\frac{15}{16}\times\left(\frac{2}{6}\div\frac{10}{11}\right)$$

$$\Rightarrow \frac{15}{16}\text{ of }\left(\frac{5}{6}-\frac{1}{2}\right)\div\frac{10}{11}=\frac{15}{16}\times\left(\frac{\frac{2}{6}}{\frac{10}{11}}\right)$$

$$\left(\because \frac{\frac{a}{b}}{\frac{c}{d}}=\frac{a}{b}\times\frac{d}{c}\right)$$

$$\Rightarrow \frac{15}{16}\text{ of }\left(\frac{5}{6}-\frac{1}{2}\right)\div\frac{10}{11}=\frac{15}{16}\times\left(\frac{2}{6}\times\frac{11}{10}\right)$$

$$\left(\because \frac{a}{b}\times\frac{c}{d}=\frac{a\times c}{b\times d}\right)$$

$$\Rightarrow \frac{15}{16}\text{ of }\left(\frac{5}{6}-\frac{1}{2}\right)\div\frac{10}{11}=\frac{15}{16}\times\frac{22}{60}$$

$$\Rightarrow \frac{15}{16}\text{ of }\left(\frac{5}{6}-\frac{1}{2}\right)\div\frac{10}{11}=\frac{15\times 22}{16\times 60}$$

$$\left(\because \frac{a}{b}\times\frac{c}{d}=\frac{a\times c}{b\times d}\right)$$

$$\Rightarrow \frac{15}{16}\text{ of }\left(\frac{5}{6}-\frac{1}{2}\right)\div\frac{10}{11}=\frac{15\times 2\times 11}{2\times 8\times 4\times 15}$$

$$\Rightarrow \frac{15}{16}\text{ of }\left(\frac{5}{6}-\frac{1}{2}\right)\div\frac{10}{11}=\frac{11}{32}$$

2 D. Question

Simplify:

$$\frac{9}{8} \div \frac{3}{5} \text{ of } \left(\frac{3}{4} + \frac{3}{5} \right)$$

Answer

$$\frac{9}{8} \div \frac{3}{5} \text{ of } \left(\frac{3}{4} + \frac{3}{5} \right) = \frac{9}{8} \div \frac{3}{5} \times \left(\frac{3}{4} + \frac{3}{5} \right)$$

$$\Rightarrow \frac{9}{8} \div \frac{3}{5} \text{ of } \left(\frac{3}{4} + \frac{3}{5} \right) = \frac{9}{8} \div \frac{3}{5} \times \frac{(3 \times 5 + 3 \times 4)}{20}$$

$$\left(\because \frac{a}{b} + \frac{c}{d} \right.$$

$$\left. = \frac{a \times \frac{LCM(b,d)}{b} + c \times \frac{LCM(b,d)}{d}}{LCM(b,d)}, \text{where LCM is least common multiple} \right)$$

$$\Rightarrow \frac{9}{8} \div \frac{3}{5} \text{ of } \left(\frac{3}{4} + \frac{3}{5} \right) = \frac{9}{8} \div \frac{3}{5} \times \frac{(27)}{20}$$

$$\Rightarrow \frac{9}{8} \div \frac{3}{5} \text{ of } \left(\frac{3}{4} + \frac{3}{5} \right) = \frac{9}{8} \div \frac{3 \times 27}{5 \times 20}$$

$$\left(\because \frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d} \right)$$

$$\Rightarrow \frac{9}{8} \div \frac{3}{5} \text{ of } \left(\frac{3}{4} + \frac{3}{5} \right) = \frac{\frac{9}{8}}{\frac{3 \times 27}{5 \times 20}}$$

$$\left(\because \frac{\frac{a}{b}}{\frac{c}{d}} = \frac{a}{b} \times \frac{d}{c} \right)$$

$$\Rightarrow \frac{9}{8} \div \frac{3}{5} \text{ of } \left(\frac{3}{4} + \frac{3}{5} \right) = \frac{9}{8} \times \frac{5 \times 20}{3 \times 27}$$

$$\Rightarrow \frac{9}{8} \div \frac{3}{5} \text{ of } \left(\frac{3}{4} + \frac{3}{5} \right) = \frac{(9 \times 5 \times 4 \times 5)}{2 \times 4 \times 3 \times 3 \times 9}$$

$$\left(\because \frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d} \right)$$

$$\Rightarrow \frac{9}{8} \div \frac{3}{5} \text{ of } \left(\frac{3}{4} + \frac{3}{5} \right) = \frac{25}{18}$$

$$\Rightarrow \frac{9}{8} \div \frac{3}{5} \text{ of } \left(\frac{3}{4} + \frac{3}{5} \right) = 1\frac{7}{18}$$

$$\left(\because a\frac{b}{c} = \frac{(a \times c) + b}{c} \right)$$

2 E. Question

Simplify:

$$\frac{2}{5} \div \left\{ \frac{1}{5} \text{ of } \left[\frac{3}{4} - \frac{1}{2} \right] - 1 \right\}$$

Answer

$$\frac{2}{5} \div \left\{\frac{1}{5} \text{of} \left[\frac{3}{4} - \frac{1}{2}\right] - 1\right\} = \frac{2}{5} \div \left\{\frac{1}{5} \times \left[\frac{3}{4} - \frac{1}{2}\right] - 1\right\}$$

$$\Rightarrow \frac{2}{5} \div \left\{\frac{1}{5} \text{of} \left[\frac{3}{4} - \frac{1}{2}\right] - 1\right\} = \frac{2}{5} \div \left\{\frac{1}{5} \times \left[\frac{3 \times 1 - 1 \times 2}{4}\right] - 1\right\}$$

$$\left(\because \frac{a}{b} - \frac{c}{d} = \frac{a \times \frac{\text{LCM}(b,d)}{b} - c \times \frac{\text{LCM}(b,d)}{d}}{\text{LCM}(b,d)}, \text{where LCM is least common multiple}\right)$$

$$\Rightarrow \frac{2}{5} \div \left\{\frac{1}{5} \text{of} \left[\frac{3}{4} - \frac{1}{2}\right] - 1\right\} = \frac{2}{5} \div \left\{\frac{1}{5} \times \left[\frac{1}{4}\right] - 1\right\}$$

$$\Rightarrow \frac{2}{5} \div \left\{\frac{1}{5} \text{of} \left[\frac{3}{4} - \frac{1}{2}\right] - 1\right\} = \frac{2}{5} \div \left\{\frac{1 \times 1}{5 \times 4} - 1\right\}$$

$$\left(\because \frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}\right)$$

$$\Rightarrow \frac{2}{5} \div \left\{\frac{1}{5} \text{of} \left[\frac{3}{4} - \frac{1}{2}\right] - 1\right\} = \frac{2}{5} \div \left\{\frac{1}{20} - \frac{1}{1}\right\}$$

$$\Rightarrow \frac{2}{5} \div \left\{\frac{1}{5} \text{of} \left[\frac{3}{4} - \frac{1}{2}\right] - 1\right\} = \frac{2}{5} \div \left\{\frac{1 \times 1 - 1 \times 20}{20}\right\}$$

$$\left(\because \frac{a}{b} - \frac{c}{d} = \frac{a \times \frac{\text{LCM}(b,d)}{b} - c \times \frac{\text{LCM}(b,d)}{d}}{\text{LCM}(b,d)}, \text{where LCM is least common multiple}\right)$$

$$\Rightarrow \frac{2}{5} \div \left\{\frac{1}{5} \text{of} \left[\frac{3}{4} - \frac{1}{2}\right] - 1\right\} = \frac{2}{5} \div \left\{\frac{-19}{20}\right\}$$

$$\Rightarrow \frac{2}{5} \div \left\{\frac{1}{5} \text{of} \left[\frac{3}{4} - \frac{1}{2}\right] - 1\right\} = \frac{\frac{2}{5}}{\left\{\frac{-19}{20}\right\}}$$

$$\Rightarrow \frac{2}{5} \div \left\{\frac{1}{5} \text{of} \left[\frac{3}{4} - \frac{1}{2}\right] - 1\right\} = -\frac{2}{5} \times \frac{20}{19}$$

$$\left(\because \frac{\frac{a}{b}}{\frac{c}{d}} = \frac{a}{b} \times \frac{d}{c}\right)$$

$$\Rightarrow \frac{2}{5} \div \left\{\frac{1}{5} \text{of} \left[\frac{3}{4} - \frac{1}{2}\right] - 1\right\} = -\frac{2 \times 4 \times 5}{5 \times 19}$$

$$\left(\because \frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}\right)$$

$$\Rightarrow \frac{2}{5} \div \left\{\frac{1}{5} \text{of} \left[\frac{3}{4} - \frac{1}{2}\right] - 1\right\} = -\frac{8}{19}$$

2 F. Question

Simplify:

$$\left(1\frac{3}{4}\times 3\frac{1}{7}\right)-\left(4\frac{3}{8}\div 5\frac{3}{5}\right)$$

Answer

$$\left(1\frac{3}{4}\times 3\frac{1}{7}\right)-\left(4\frac{3}{8}\div 5\frac{3}{5}\right)$$

$$=\left(\frac{1\times 4\ +\ 3}{4}\times\frac{3\times 7\ +\ 1}{7}\right)-\left(\frac{4\times 8\ +\ 3}{8}\div\frac{5\times 5\ +\ 3}{5}\right)$$

$$\left(\because a\frac{b}{c}=\frac{(a\times c)\ +\ b}{c}\right)$$

$$\Rightarrow\left(1\frac{3}{4}\times 3\frac{1}{7}\right)-\left(4\frac{3}{8}\div 5\frac{3}{5}\right)=\left(\frac{7}{4}\times\frac{22}{7}\right)-\left(\frac{35}{8}\div\frac{28}{5}\right)$$

$$\Rightarrow\left(1\frac{3}{4}\times 3\frac{1}{7}\right)-\left(4\frac{3}{8}\div 5\frac{3}{5}\right)=\left(\frac{7\times 2\times 11}{2\times 2\times 7}\right)-\left(\frac{\frac{35}{8}}{\frac{28}{5}}\right)$$

$$\left(\because\frac{a}{b}\times\frac{c}{d}=\frac{a\times c}{b\times d}\right)$$

$$\Rightarrow\left(1\frac{3}{4}\times 3\frac{1}{7}\right)-\left(4\frac{3}{8}\div 5\frac{3}{5}\right)=\left(\frac{11}{2}\right)-\left(\frac{35}{8}\times\frac{5}{28}\right)$$

$$\left(\because\frac{\frac{a}{b}}{\frac{c}{d}}=\frac{a}{b}\times\frac{d}{c}\right)$$

$$\Rightarrow\left(1\frac{3}{4}\times 3\frac{1}{7}\right)-\left(4\frac{3}{8}\div 5\frac{3}{5}\right)=\left(\frac{11}{2}\right)-\left(\frac{5\times 7\times 5}{8\times 4\times 7}\right)$$

$$\left(\because\frac{a}{b}\times\frac{c}{d}=\frac{a\times c}{b\times d}\right)$$

$$\Rightarrow\left(1\frac{3}{4}\times 3\frac{1}{7}\right)-\left(4\frac{3}{8}\div 5\frac{3}{5}\right)=\left(\frac{11}{2}\right)-\frac{25}{32}$$

$$\Rightarrow\left(1\frac{3}{4}\times 3\frac{1}{7}\right)-\left(4\frac{3}{8}\div 5\frac{3}{5}\right)=\frac{11\times 16-25\times 1}{32}$$

$$\left(\because\frac{a}{b}-\frac{c}{d}\right.$$

$$\left.=\frac{a\times\frac{LCM(b,d)}{b}-c\times\frac{LCM(b,d)}{d}}{LCM(b,d)},\text{ where LCM is least common multiple}\right)$$

$$\Rightarrow\left(1\frac{3}{4}\times 3\frac{1}{7}\right)-\left(4\frac{3}{8}\div 5\frac{3}{5}\right)=\frac{176-25}{32}$$

$$\Rightarrow\left(1\frac{3}{4}\times 3\frac{1}{7}\right)-\left(4\frac{3}{8}\div 5\frac{3}{5}\right)=\frac{151}{32}$$

$$\Rightarrow\left(1\frac{3}{4}\times 3\frac{1}{7}\right)-\left(4\frac{3}{8}\div 5\frac{3}{5}\right)=4\frac{23}{32}$$

$$\left(\because a\frac{b}{c}=\frac{(a\times c)\ +\ b}{c}\right)$$

2 G. Question

Simplify:

$$\left(\frac{1}{6}+2\frac{3}{4}\text{ of }1\frac{7}{11}\right)\div 1\frac{1}{6}$$

Answer

$$\left(\frac{1}{6}+2\frac{3}{4}\text{of}1\frac{7}{11}\right)\div 1\frac{1}{6}=\left(\frac{1}{6}+2\frac{3}{4}\times\left(1\frac{7}{11}\right)\right)\div 1\frac{1}{6}$$

$$\Rightarrow\left(\frac{1}{6}+2\frac{3}{4}\text{of}1\frac{7}{11}\right)\div 1\frac{1}{6}$$

$$=\left(\frac{1}{6}+\frac{2\times 4+3}{3}\times\left(\frac{(1\times 11+7)}{11}\right)\right)\div\frac{(1\times 6+1)}{6}$$

$$\left(\because a\frac{b}{c}=\frac{(a\times c)+b}{c}\right)$$

$$\Rightarrow\left(\frac{1}{6}+2\frac{3}{4}\text{of}1\frac{7}{11}\right)\div 1\frac{1}{6}=\left(\frac{1}{6}+\frac{11}{4}\times\left(\frac{18}{11}\right)\right)\div\frac{7}{6}$$

$$\Rightarrow\left(\frac{1}{6}+2\frac{3}{4}\text{of}1\frac{7}{11}\right)\div 1\frac{1}{6}=\left(\frac{1}{6}+\frac{11\times 2\times 9}{2\times 2\times 11}\right)\div\frac{7}{6}$$

$$\Rightarrow\left(\frac{1}{6}+2\frac{3}{4}\text{of}1\frac{7}{11}\right)\div 1\frac{1}{6}=\left(\frac{1}{6}+\frac{9}{2}\right)\div\frac{7}{6}$$

$$\Rightarrow\left(\frac{1}{6}+2\frac{3}{4}\text{of}1\frac{7}{11}\right)\div 1\frac{1}{6}=\frac{(1\times 1+9\times 3)}{6}\div\frac{7}{6}$$

$$\left(\because\frac{a}{b}+\frac{c}{d}\right.$$

$$\left.=\frac{a\times\frac{\text{LCM}(b,d)}{b}+c\times\frac{\text{LCM}(b,d)}{d}}{\text{LCM}(b,d)},\text{where LCM is least common multiple}\right)$$

$$\Rightarrow\left(\frac{1}{6}+2\frac{3}{4}\text{of}1\frac{7}{11}\right)\div 1\frac{1}{6}=\left(\frac{28}{6}\right)\div\frac{7}{6}$$

$$\Rightarrow\left(\frac{1}{6}+2\frac{3}{4}\text{of}1\frac{7}{11}\right)\div 1\frac{1}{6}=\left(\frac{2\times 14}{2\times 3}\right)\div\frac{7}{6}$$

$$\Rightarrow\left(\frac{1}{6}+2\frac{3}{4}\text{of}1\frac{7}{11}\right)\div 1\frac{1}{6}=\frac{\left(\frac{14}{3}\right)}{\frac{7}{6}}$$

$$\Rightarrow\left(\frac{1}{6}+2\frac{3}{4}\text{of}1\frac{7}{11}\right)\div 1\frac{1}{6}=\frac{14}{3}\times\frac{6}{7}$$

$$\left(\because\frac{\frac{a}{b}}{\frac{c}{d}}=\frac{a}{b}\times\frac{d}{c}\right)$$

$$\Rightarrow\left(\frac{1}{6}+2\frac{3}{4}\text{of}1\frac{7}{11}\right)\div 1\frac{1}{6}=\frac{2\times 7\times 2\times 3}{3\times 7}$$

$$\Rightarrow\left(\frac{1}{6}+2\frac{3}{4}\text{of}1\frac{7}{11}\right)\div 1\frac{1}{6}=4$$

2 H. Question

Simplify:

$$\left(-\frac{1}{3}\right)-\left\{1\div\left(\frac{2}{3}\times\frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}$$

Answer

$$\left(-\frac{1}{3}\right)-\left\{1\div\left(\frac{2}{3}\times\frac{5}{7}\right)+8\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}=$$

$$\left(-\frac{1}{3}\right)-\left\{1\div\left(\frac{2}{3}\times\frac{5}{7}\right)+8-\left[5-\frac{1\times2-1\times1}{4}\right]\right\}$$

$$\Rightarrow\left(-\frac{1}{3}\right)-\left\{1\div\left(\frac{2}{3}\times\frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}$$

$$=\left(-\frac{1}{3}\right)-\left\{\frac{1}{\left(\frac{2}{3}\times\frac{5}{7}\right)}+8-\left[5-\frac{1}{4}\right]\right\}$$

$$\Rightarrow\left(-\frac{1}{3}\right)-\left\{1\div\left(\frac{2}{3}\times\frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}=\left(-\frac{1}{3}\right)-\left\{\frac{1}{\frac{10}{21}}+8-\left[5-\frac{1}{4}\right]\right\}$$

$$\Rightarrow\left(-\frac{1}{3}\right)-\left\{1\div\left(\frac{2}{3}\times\frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}=\left(-\frac{1}{3}\right)-\left\{\frac{21}{10}+8-\left[5-\frac{1}{4}\right]\right\}$$

$$\left(\because\frac{1}{\frac{a}{b}}=\frac{b}{a}\right)$$

$$\Rightarrow\left(-\frac{1}{3}\right)-\left\{1\div\left(\frac{2}{3}\times\frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}$$

$$=\left(-\frac{1}{3}\right)-\left\{\frac{21}{10}+8-\left[\frac{5\times4-1\times1}{4}\right]\right\}$$

$$\left(\because\frac{a}{b}-\frac{c}{d}\right.$$

$$\left.=\frac{a\times\frac{LCM(b,d)}{b}-c\times\frac{LCM(b,d)}{d}}{LCM(b,d)},\text{where LCM is least common multiple}\right)$$

$$\Rightarrow\left(-\frac{1}{3}\right)-\left\{1\div\left(\frac{2}{3}\times\frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}=\left(-\frac{1}{3}\right)-\left\{\frac{21}{10}+8-\left[\frac{19}{4}\right]\right\}$$

$$\Rightarrow\left(-\frac{1}{3}\right)-\left\{1\div\left(\frac{2}{3}\times\frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}=\left(-\frac{1}{3}\right)-\left\{\frac{21}{10}+\frac{8}{1}-\frac{19}{4}\right\}$$

$$\Rightarrow\left(-\frac{1}{3}\right)-\left\{1\div\left(\frac{2}{3}\times\frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}$$

$$=\left(-\frac{1}{3}\right)-\left\{\frac{21\times2+8\times20-19\times5}{20}\right\}$$

$$\left(\because\frac{a}{b}+\frac{c}{d}-\frac{e}{f}\right.$$

$$\left.=\frac{a\times\frac{LCM(b,d,f)}{b}+c\times\frac{LCM(b,d,f)}{d}-e\times\frac{LCM(b,d,f)}{f}}{LCM(b,d,f)},\text{where LCM is least common multiple}\right)$$

$$\Rightarrow \left(-\frac{1}{3}\right)-\left\{1 \div \left(\frac{2}{3} \times \frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}=\left(-\frac{1}{3}\right)-\left\{\frac{42+160-95}{20}\right\}$$

$$\Rightarrow \left(-\frac{1}{3}\right)-\left\{1 \div \left(\frac{2}{3} \times \frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}=\left(-\frac{1}{3}\right)-\left\{\frac{107}{20}\right\}$$

$$\Rightarrow \left(-\frac{1}{3}\right)-\left\{1 \div \left(\frac{2}{3} \times \frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}=-\left\{\frac{1}{3}+\frac{107}{20}\right\}$$

$$\Rightarrow \left(-\frac{1}{3}\right)-\left\{1 \div \left(\frac{2}{3} \times \frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}=-\left\{\frac{1 \times 20+107 \times 3}{60}\right\}$$

$$\left(\because \frac{a}{b}+\frac{c}{d}=\frac{a \times \frac{LCM(b,d)}{b}+c \times \frac{LCM(b,d)}{d}}{LCM(b,d)}, \text{where LCM is least common multiple}\right)$$

$$\Rightarrow \left(-\frac{1}{3}\right)-\left\{1 \div \left(\frac{2}{3} \times \frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}=-\left\{\frac{20+321}{60}\right\}$$

$$\Rightarrow \left(-\frac{1}{3}\right)-\left\{1 \div \left(\frac{2}{3} \times \frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}=-\left\{\frac{341}{60}\right\}$$

$$\Rightarrow \left(-\frac{1}{3}\right)-\left\{1 \div \left(\frac{2}{3} \times \frac{5}{7}\right)+8-\left[5-\overline{\frac{1}{2}-\frac{1}{4}}\right]\right\}=-5\frac{41}{60}$$

$$\left(\because a\frac{b}{c}=\frac{(a \times c)+b}{c}\right)$$

Exercise 1.4

1 A. Question

Choose the correct answer for the following:

$a^m \times a^n$ is equal to

A. $a^m + a^n$

B. a^{m-n}

C. a^{m+n}

D. a^{mn}

Answer

$a^m \times a^n$ = (a×a×a×a×……m times)×(a×a×a×a×……n times)

= a× a× a× a× ……m + n times

$\Rightarrow a^m \times a^n = a^{m+n}$

(Also, Product Rule: $a^m \times a^n = a^{m+n}$, where 'a' is a real no. and m, n are positive integers.)

(A) Doesn't match the solution.

(B) Doesn't match the solution.

(D) Doesn't match the solution.

1 B. Question

Choose the correct answer for the following:

p^0 is equal to

A. 0

B. 1

C. -1

D. p

Answer

For $p \neq 0$,

$p^0 = p^n \div p^n$

$$= \frac{p \times p \times p \times \ldots \ldots n \text{ times}}{p \times p \times p \times \ldots \ldots n \text{ times}}$$

$\Rightarrow p^0 = 1$

(Also, Number with zero exponent rule:If 'a' is a rational no. other than zero, then $a^0 = 1$)

(A) Doesn't match the solution.

(C) Doesn't match the solution.

(D) Doesn't match the solution.

1 C. Question

Choose the correct answer for the following:

In 10^2, the exponent is

A. 2

B. 1

C. 10

D. 100

Answer:(D)

Answer

$10^2 = 10 \times 10$ ($\because a^n = a \times a \times a \times \ldots\ldots$ n times, where n is a positive integer)

$\Rightarrow 10^2 = 100$

1 D. Question

Choose the correct answer for the following:

6^{-1} is equal to

A. 6

B. -1

C. $-\frac{1}{6}$

D. $\frac{1}{6}$

Answer:(D)

Answer

$6^{-1} = \frac{1}{6^1}$

$\Rightarrow 6^{-1} = \frac{1}{6}$

(∵ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

(A) doesn't match the solution.

(B) doesn't match the solution.

(C) doesn't match the solution.

1 E. Question

Choose the correct answer for the following:

The multiplicative inverse of 2^{-4} is

A. 2

B. 4

C. 2^4

D. -4

Answer:(C)

Answer

Let a be the multiplicative inverse of 2^{-4}

$\Rightarrow 2^{-4} \times a = 1$ (by definition of multiplicative inverse)

$\Rightarrow a = \frac{1}{2^{-4}}$

$\Rightarrow a = \frac{1}{\frac{1}{2^4}}$

(∵ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

$\Rightarrow a = 2^4$

(A) doesn't match the solution.

(B) doesn't match the solution.

(D) doesn't match the solution.

1 F. Question

Choose the correct answer for the following:

$(-2)^{-5} \times (-2)^6$ is equal to

A. -2

B. 2

C. -5

D. 6

Answer

$$(-2)^{-5} \times (-2)^6 = \frac{1}{(-2)^5} \times (-2)^6$$

(∵ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

$$\Rightarrow (-2)^{-5} \times (-2)^6 = \frac{1}{(-2)^5} \times (-2)^{5+1}$$

$$\Rightarrow (-2)^{-5} \times (-2)^6 = \frac{1}{(-2)^5} \times (-2)^5 \times (-2)^1$$

(Product Rule: $a^m \times a^n = a^{m+n}$, where 'a' is a real no. and m, n are positive integers.)

$\Rightarrow (-2)^{-5} \times (-2)^6 = -2$

(B) doesn't match the solution.

(C) doesn't match the solution.

(D) doesn't match the solution.

1 G. Question

Choose the correct answer for the following:

$(-2)^{-2}$ is equal to

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

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

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

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

Answer

$$(-2)^{-2} = \frac{1}{(-2)^2}$$

(∵ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

$$\Rightarrow (-2)^{-2} = \frac{1}{((-1)^2\,(2)^2)}$$

$$\Rightarrow (-2)^{-2} = \frac{1}{1 \times 2 \times 2} (\because -1^2 = -1 \times -1 = 1)$$

$$\Rightarrow (-2)^{-2} = \frac{1}{4}$$

(A) doesn't match the solution.

(C) doesn't match the solution.

(D) doesn't match the solution.

1 H. Question

Choose the correct answer for the following:

$(2^0 + 4^{-1}) \times 2^2$ is equal to

A. 2

B. 5

C. 4

D. 3

Answer

$(2^0 + 4^{-1}) \times 2^2 = (1 + 4^{-1}) \times 2^2$

(∵ Number with zero exponent rule:If 'a' is a rational no. other than zero, then $a^0 = 1$)

$$\Rightarrow (2^0 + 4^{-1}) \times 2^2 = \left(1 + \frac{1}{4}\right) \times 2^2$$

(∵ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

$$\Rightarrow (2^0 + 4^{-1}) \times 2^2 = \frac{(1 \times 4 + 1 \times 1)}{4} \times 2 \times 2$$

$$(\because \frac{a}{b} + \frac{c}{d} = \frac{a \times \frac{LCM(b,d)}{b} + c \times \frac{LCM(b,d)}{d}}{LCM(b,d)}, \text{where LCM is least common multiple})$$

$$\Rightarrow (2^0 + 4^{-1}) \times 2^2 = \left(\frac{5}{4}\right) \times 4$$

$$\Rightarrow (2^0 + 4^{-1}) \times 2^2 = 5$$

(A) doesn't match the solution.

(C) doesn't match the solution.

(D) doesn't match the solution.

1 I. Question

Choose the correct answer for the following:

$\left(\frac{1}{3}\right)^{-4}$ is equal to

A. 3

B. 3^4

C. 1

D. 3^{-4}

Answer

$\left(-\frac{1}{3}\right)^{-4} = \frac{1}{\left(-\frac{1}{3}\right)^4}$

(∵ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

$\Rightarrow \left(-\frac{1}{3}\right)^{-4} = (-1)^4(3)^4$

$\Rightarrow \left(-\frac{1}{3}\right)^{-4} = 1 \times 3^4 \ (\because -1^4 = -1 \times -1 \times -1 \times -1 = 1)$

$\Rightarrow \left(-\frac{1}{3}\right)^{-4} = 3^4$

(A) doesn't match the solution.

(C) doesn't match the solution.

(D) doesn't match the solution.

1 J. Question

Choose the correct answer for the following:

$(-1)^{50}$ is equal to

A. -1

B. 50

C. -50

D. 1

Answer:(D)

Answer

$(-1)^{50}$ = -1×-1×-1×-1……50 times

$\Rightarrow (-1)^{50} = 1$ (∵ 50 is even no.)

(∵ $(-1)^n$ = -1, if n is odd and $(-1)^n$ = 1, if n is even)

(A) doesn't match the solution.

(B) doesn't match the solution.

(C) doesn't match the solution.

2 A. Question

Simplify:

$(-4)^5 \div (-4)^8$

Answer

$$(-4)^5 \div (-4)^8 = \frac{(-4)^5}{(-4)^8}$$

$\Rightarrow (-4)^5 \div (-4)^8 = (-4)^{5-8}$

$$\left(\text{Quotient Rule: } \frac{a^m}{a^n} = a^{m-n}\right.,$$

where 'a' is a non-zero real no. and m, n are positive integers.)

$\Rightarrow (-4)^5 \div (-4)^8 = (-4)^{-3}$

$$\Rightarrow (-4)^5 \div (-4)^8 = \frac{1}{(-4^3)}$$

($\because$ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

$$\Rightarrow (-4)^5 \div (-4)^8 = \frac{1}{(-1)^3 \times 4^3)}$$

$$\Rightarrow (-4)^5 \div (-4)^8 = -\frac{1}{64}$$

2 B. Question

Simplify:

$$\left(\frac{1}{2^3}\right)^2$$

Answer

$$\left(\frac{1}{2^3}\right)^2 = \frac{1^2}{(2^3)^2}$$

$$\left(\because \text{ Power of quotient rule: } \left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}\right.,$$

where $b \neq 0$, a and b are real numbers, m is an integer)

$$\Rightarrow \left(\frac{1}{2^3}\right)^2 = \frac{1}{2^6} \ (\because 1^2 = 1)$$

$$\Rightarrow \left(\frac{1}{2^3}\right)^2 = \frac{1}{64}$$

2 C. Question

Simplify:

$$(-3)^4 \times \left(\frac{5}{3}\right)^4$$

Answer

$$(-3)^4 \times \left(\frac{5}{3}\right)^4 = (-1)^4 \times (3)^4 \times \frac{5^4}{3^4}$$

($\because$ Power of quotient rule: $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$,

where b≠0, a and b are real numbers, m is an integer)

$$\Rightarrow (-3)^4 \times \left(\frac{5}{3}\right)^4 = 5^4 \ (\because (-1)^4 = 1)$$

$$\Rightarrow (-3)^4 \times \left(\frac{5}{3}\right)^4 = 625$$

2 D. Question

Simplify:

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

Answer

$$\left(\frac{2}{3}\right)^5 \times \left(\frac{3}{4}\right)^2 \times \left(\frac{1}{5}\right)^2 = \frac{2^5}{3^5} \times \frac{3^2}{4^2} \times \frac{1^5}{5^5}$$

($\because$ Power of quotient rule: $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$,

where b≠0, a and b are real numbers, m is an integer)

$$\Rightarrow \left(\frac{2}{3}\right)^5 \times \left(\frac{3}{4}\right)^2 \times \left(\frac{1}{5}\right)^2 = \left(\frac{2^5}{3^5} \times \frac{3^2}{2^4} \times \frac{1^5}{5^5}\right) \ (\because 4 = 2^2)$$

$$\Rightarrow \left(\frac{2}{3}\right)^5 \times \left(\frac{3}{4}\right)^2 \times \left(\frac{1}{5}\right)^2 = \frac{2^{5-4} \times 1}{3^{5-2} \times 5^5}$$

(Quotient Rule: $\frac{a^m}{a^n} = a^{m-n}$,

where 'a' is a non-zero real no. and m, n are positive integers.)

$$\Rightarrow \left(\frac{2}{3}\right)^5 \times \left(\frac{3}{4}\right)^2 \times \left(\frac{1}{5}\right)^2 = \frac{2^1 \times 1}{3^3 \times 5^5}$$

$$\Rightarrow \left(\frac{2}{3}\right)^5 \times \left(\frac{3}{4}\right)^2 \times \left(\frac{1}{5}\right)^2 = \frac{2}{675}$$

2 E. Question

Simplify:

$(3^{-7} \div 3^{10}) \times 3^{-5}$

Answer

$(3^{-7} \div 3^{10}) \times 3^{-5} = \left(\frac{1}{3^7} \div 3^{10}\right) \times \frac{1}{3^5}$

(∵ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

$$\Rightarrow (3^{-7} \div 3^{10}) \times 3^{-5} = \left(\frac{1}{3^7} \times \frac{1}{3^{10}}\right) \times \frac{1}{3^5}$$

$$\Rightarrow (3^{-7} \div 3^{10}) \times 3^{-5} = \frac{1}{3^{7+10+5}}$$

(Product Rule: $a^m \times a^n = a^{m+n}$, where 'a' is a real no. and m, n are positive integers.)

$$\Rightarrow (3^{-7} \div 3^{10}) \times 3^{-5} = \frac{1}{3^{22}}$$

2 F. Question

Simplify:

$$\frac{2^6 \times 3^2 \times 2^3 \times 3^7}{2^8 \times 3^6}$$

Answer

$$\frac{2^6 \times 3^2 \times 2^3 \times 3^7}{2^8 \times 3^6} = \frac{2^6 \times 2^3 \times 3^2 \times 3^7}{2^8 \times 3^6}$$

$$\Rightarrow \frac{2^6 \times 3^2 \times 2^3 \times 3^7}{2^8 \times 3^6} = \frac{2^{6+3} \times 3^{2+7}}{2^8 \times 3^6}$$

(Product Rule: $a^m \times a^n = a^{m+n}$, where 'a' is a real no. and m, n are positive integers.)

$$\Rightarrow \frac{2^6 \times 3^2 \times 2^3 \times 3^7}{2^8 \times 3^6} = \frac{2^9 \times 3^9}{2^8 \times 3^6}$$

$$\Rightarrow \frac{2^6 \times 3^2 \times 2^3 \times 3^7}{2^8 \times 3^6} = 2^{9-8} \times 3^{9-6}$$

$\left(\text{Quotient Rule: } \frac{a^m}{a^n} = a^{m-n},\right.$

where 'a' is a non-zero real no. and m, n are positive integers.)

$$\Rightarrow \frac{2^6 \times 3^2 \times 2^3 \times 3^7}{2^8 \times 3^6} = 2^1 \times 3^3$$

$$\Rightarrow \frac{2^6 \times 3^2 \times 2^3 \times 3^7}{2^8 \times 3^6} = 2 \times 3 \times 3 \times 3$$

$$\Rightarrow \frac{2^6 \times 3^2 \times 2^3 \times 3^7}{2^8 \times 3^6} = 54$$

2 G. Question

Simplify:

$y^{a-b} \times y^{b-c} \times y^{c-a}$

Answer

$y^{a-b} \times y^{b-c} \times y^{c-a} = y^{(a-b+b-c+c-a)}$

(Product Rule: $a^m \times a^n = a^{m+n}$, where 'a' is a real no. and m, n are positive integers.)

$\Rightarrow y^{a-b} \times y^{b-c} \times y^{c-a} = y^{(a-a+b-b-c+c)}$

$\Rightarrow y^{a-b} \times y^{b-c} \times y^{c-a} = y^0$

$\Rightarrow y^{a-b} \times y^{b-c} \times y^{c-a} = 1$

(∵ Number with zero exponent rule: If 'a' is a rational no. other than zero, then $a^0 = 1$)

2 H. Question

Simplify:

$(4p)^3 \times (2p)^2 \times p^4$

Answer

$(4p)^3 \times (2p)^2 \times p^4 = 4^3 \times p^3 \times 2^2 \times p^2 \times p^4$

$\Rightarrow (4p)^3 \times (2p)^2 \times p^4 = 4 \times 4 \times 4 \times p^3 \times 2 \times 2 \times p^2 \times p^4$

$\Rightarrow (4p)^3 \times (2p)^2 \times p^4 = 256\ p^{3+2+4}$

(Product Rule: $a^m \times a^n = a^{m+n}$, where 'a' is a real no. and m, n are positive integers.)

$\Rightarrow (4p)^3 \times (2p)^2 \times p^4 = 256\ p^9$

2 I. Question

Simplify:

$$9^{\frac{5}{2}} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}}$$

Answer

$$9^{\frac{5}{2}} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}} = 9^{\frac{5}{2}} - 3 \times 1 - \left(\frac{1}{81}\right)^{-\frac{1}{2}}$$

(∵ Number with zero exponent rule: If 'a' is a rational no. other than zero, then $a^0 = 1$)

$$\Rightarrow 9^{\frac{5}{2}} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}} = 9^{\frac{5}{2}} - 3 - \frac{1}{\left(\frac{1}{81}\right)^{\frac{1}{2}}}$$

(∵ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

$$\Rightarrow 9^{\frac{5}{2}} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}} = 9^{\frac{5}{2}} - 3 - 81^{\frac{1}{2}}$$

$$\Rightarrow 9^{\frac{5}{2}} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}} = 9^{\frac{5}{2}} - 9^{\frac{1}{2}} - 9^1$$

$$(\because\ 3 = \sqrt{9} = 9^{\frac{1}{2}}, \text{and } 81^{\frac{1}{2}} = \sqrt{81} = 9\ )$$

$$\Rightarrow 9^{\frac{5}{2}} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}} = 9^{\frac{1}{2}} \times 9^2 - 9^{\frac{1}{2}} - 9^{\frac{1}{2}} \times 9^{\frac{1}{2}}$$

(Product Rule: $a^m \times a^n = a^{m+n}$, where 'a' is a real no. and m, n are positive integers.)

Now, taking $9^{1/2}$ common, we get-

$$\Rightarrow 9^{\frac{5}{2}} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}} = 9^{\frac{1}{2}}(9^2 - 1 - 9^{\frac{1}{2}})$$

$$\Rightarrow 9^{\frac{5}{2}} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}} = 3(81 - 1 - 3)$$

$$(\because 9^{\frac{1}{2}} = \sqrt{9} = 3, \text{and } 9^2 = 9 \times 9 = 81)$$

$$\Rightarrow 9^{\frac{5}{2}} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}} = 3 \times 77$$

$$\Rightarrow 9^{\frac{5}{2}} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}} = 231$$

2 J. Question

Simplify:

$$\left(\frac{1}{4}\right)^{-2} - 3 \times 8^{2/3} \times \times 4^0 + \left(\frac{9}{16}\right)^{-1/2}$$

Answer

$$\left(\tfrac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^0 + \left(\tfrac{9}{16}\right)^{-\frac{1}{2}} = \left(\tfrac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 1 + \left(\tfrac{9}{16}\right)^{-\frac{1}{2}}$$

(∵ Number with zero exponent rule: If 'a' is a rational no. other than zero, then $a^0 = 1$)

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^0 + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = \frac{1}{\left(\frac{1}{4}\right)^2} - 3 \times 8^{\frac{2}{3}} \times 1 + \frac{1}{\left(\frac{9}{16}\right)^{\frac{1}{2}}}$$

(∵ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^0 + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = 4^2 - 3 \times 8^{\frac{2}{3}} \times 1 + \left(\frac{16}{9}\right)^{\frac{1}{2}}$$

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^0 + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = 4^2 - 3 \times 8^{\frac{2}{3}} \times 1 + \left(\frac{16^{\frac{1}{2}}}{9^{\frac{1}{2}}}\right)$$

$$(\because \text{ Power of quotient rule: } \left(\frac{a}{b}\right)^m = \frac{a^m}{b^m},$$

where b≠0, a and b are real numbers, m is an integer)

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^{0} + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = 4^{2} - 3 \times 8^{\frac{2}{3}} + \left(\frac{4}{3}\right)$$

$$\left(\because 16^{\frac{1}{2}} = \sqrt{16} = 4, \text{and } 9^{\frac{1}{2}} = \sqrt{9} = 3\right)$$

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^{0} + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = 4^{2} - 3 \times 8^{1-\frac{1}{3}} + \left(\frac{4}{3}\right)$$

$$(\because \text{Quotient Rule:} \frac{a^{m}}{a^{n}} = a^{m-n},$$

where 'a' is a non-zero real no. and m, n are positive integers.)

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^{0} + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = 4^{2} - 3 \times \frac{8^{1}}{8^{\left(\frac{1}{3}\right)}} + \left(\frac{4}{3}\right)$$

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^{0} + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = 16 - 3 \times \frac{8}{2} + \left(\frac{4}{3}\right)$$

$$\left(\because 4^{2} = 4 \times 4 = 16, \text{and } 8^{\left(\frac{1}{3}\right)} = \sqrt[3]{8} = 2\right)$$

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^{0} + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = 16 - 3 \times 4 + \frac{4}{3}$$

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^{0} + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = 16 - \left(12 - \frac{4}{3}\right)$$

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^{0} + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = 16 - \frac{12 \times 3 - 4 \times 1}{3}$$

$$(\because \frac{a}{b} + \frac{c}{d}$$

$$= \frac{a \times \frac{LCM(b,d)}{b} + c \times \frac{LCM(b,d)}{d}}{LCM(b,d)}, \text{where LCM is least common multiple)}$$

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^{0} + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = 16 - \frac{32}{3}$$

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^{0} + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = \frac{16 \times 3 - 32 \times 1}{3}$$

$$(\because \frac{a}{b} - \frac{c}{d}$$

$$= \frac{a \times \frac{LCM(b,d)}{b} - c \times \frac{LCM(b,d)}{d}}{LCM(b,d)}, \text{where LCM is least common multiple)}$$

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^{0} + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = \frac{48 - 32}{3}$$

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^{0} + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = \frac{16}{3}$$

$$\Rightarrow \left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^{0} + \left(\frac{9}{16}\right)^{-\frac{1}{2}} = 5\frac{1}{3}$$

$$\left(\because a\frac{b}{c} = \frac{(a \times c) + b}{c}\right)$$

3 A. Question

Find the value of:

$(3^0 + 4^{-1}) \times 2^2$

Answer

$(3^0 + 4^{-1}) \times 2^2 = (1 + 4^{-1}) \times 2^2$

(∵ Number with zero exponent rule: If 'a' is a rational no. other than zero, then $a^0 = 1$)

$$\Rightarrow (3^0 + 4^{-1}) \times 2^2 = (1 + \frac{1}{4}) \times 2^{1+1}$$

(∵ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

$$\Rightarrow (3^0 + 4^{-1}) \times 2^2 = \left(1 + \frac{1}{4}\right) \times 2 \times 2$$

$$\Rightarrow (3^0 + 4^{-1}) \times 2^2 = \frac{(1 \times 4 + 1 \times 1)}{2} \times 2 \times 2$$

$$\Rightarrow (3^0 + 4^{-1}) \times 2^2 = \frac{5}{2} \times 2$$

$\Rightarrow 3^0 + 4^{-1} \times 2^2 = 5$

3 B. Question

Find the value of:

$(2^{-1} \times 4^{-1}) \div 2^{-2}$

Answer

$$(2^{-1} \times 4^{-1}) \div 2^{-2} = \left(\frac{1}{2^1} \times \frac{1}{4^1}\right) \div \frac{1}{2^2}$$

(∵ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

we can write it as, $\Rightarrow (2^{-1} \times 4^{-1}) \div 2^{-2} = \frac{\frac{1}{2} \times \frac{1}{4}}{\frac{1}{2} \times \frac{1}{2}}$

$$\Rightarrow (2^{-1} \times 4^{-1}) \div 2^{-2} = \left(\frac{1}{2} \times \frac{1}{4} \times 2 \times 2\right)$$

$\Rightarrow (2^{-1} \times 4^{-1}) \div 2^{-2} = \frac{1}{2}$Answer.

3 C. Question

Find the value of:

$$\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{-2}$$

Answer

$$\left(\tfrac{1}{2}\right)^{-2}+\left(\tfrac{1}{3}\right)^{-2}+\left(\tfrac{1}{4}\right)^{-2}=\frac{1}{\left(\frac{1}{2}\right)^{2}}+\frac{1}{\left(\frac{1}{3}\right)^{2}}+\frac{1}{\left(\frac{1}{4}\right)^{2}}$$

(∵ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m}=\frac{1}{a^{m}}$)

$$\Rightarrow\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{-2}=2^{2}+3^{2}+4^{2}\ (\because 1^{2}=1)$$

$$\Rightarrow\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{-2}=4+9+16$$

$$\Rightarrow\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{-2}=29$$

3 D. Question

Find the value of:

$(3^{-1}+4^{-1}+5^{-1})^{0}$

Answer

Consider $(3^{-1}+4^{-1}+5^{-1})^{0}$, Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m}=\frac{1}{a^{m}}$ So,$(3^{-1}+4^{-1}+5^{-1})^{0}=\left(\frac{1}{3}+\frac{1}{4}+\frac{1}{5}\right)^{0}$

Take the L.C.M of 3, 4 and 5 = 60

$$\Rightarrow(3^{-1}+4^{-1}+5^{-1})^{0}=\left(\frac{1\times20+1\times15+1\times12}{60}\right)^{0}$$

$\Rightarrow(3^{-1}+4^{-1}+5^{-1})^{0}=\left(\frac{47}{60}\right)^{0}$ Number with zero exponent rule: If 'a' is a rational no. other than zero, then $a^{0}=1$

$$\Rightarrow(3^{-1}+4^{-1}+5^{-1})^{0}=1$$

3 E. Question

Find the value of:

$$\left[\left(\frac{-2}{3}\right)^{-2}\right]^{2}$$

Answer

$$\left[\left(-\tfrac{2}{3}\right)^{-2}\right]^{2}=\left(-\tfrac{2}{3}\right)^{-2\times2}$$

(∵ if 'a' is a real no. and m, n are integers, then $(a^{m})^{n}=a^{mn}$)

$$\Rightarrow\left[\left(-\frac{2}{3}\right)^{-2}\right]^{2}=\left(-\frac{2}{3}\right)^{-4}$$

$$\Rightarrow \left[\left(-\frac{2}{3}\right)^{-2}\right]^2 = \frac{1}{(-1)^4} \times \frac{1}{\frac{2}{3}\times\frac{2}{3}\times\frac{2}{3}\times\frac{2}{3}}$$

($\because$ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

$$\Rightarrow \left[\left(-\frac{2}{3}\right)^{-2}\right]^2 = \frac{81}{16}$$

$$\Rightarrow \left[\left(-\frac{2}{3}\right)^{-2}\right]^2 = 5\frac{1}{16}$$

($\because a\frac{b}{c} = \frac{(a\times c) + b}{c}$)

3 F. Question

Find the value of:

$7^{-20} - 7^{-21}$

Answer

$$7^{-20} - 7^{-21} = \frac{1}{7^{20}} - \frac{1}{7^{21}}$$

$$\Rightarrow 7^{-20} - 7^{-21} = \frac{1}{7^{20}}\left(1 - \frac{1}{7}\right)$$

$$\Rightarrow 7^{-20} - 7^{-21} = \frac{1}{7^{20}} \times \frac{(1\times 7 - 1)}{7}$$

($\because \frac{a}{b} + \frac{c}{d}$
$= \frac{a \times \frac{LCM(b,d)}{b} + c \times \frac{LCM(b,d)}{d}}{LCM(b,d)}$, where LCM is least common multiple)

$$\Rightarrow 7^{-20} - 7^{-21} = \frac{6}{7^{21}}$$

4 A. Question

Find the value of m for which

$5^m \div 5^{-3} = 5^5$

Answer

$5^m \div 5^{-3} = 5^5$

$$\Rightarrow 5^m \div \frac{1}{5^3} = 5^5$$

($\because$ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

$$\Rightarrow 5^m \times 5^3 = 5^5$$

$$\Rightarrow 5^m = \frac{5^5}{5^3}$$

$$\Rightarrow 5^m = 5^{5-3}$$

$\left(\text{Quotient Rule:}\frac{a^m}{a^n} = a^{m-n},\right.$

where 'a' is a non-zero real no. and m, n are positive integers.)

$\Rightarrow 5^m = 5^2$

$\Rightarrow$ m = 2 ($\because$ base is same)

4 B. Question

Find the value of m for which

$4^m = 64$

Answer

$4^m = 64$

$\because 4^3 = 64$

$\Rightarrow 4^m = 4^3$

$\Rightarrow$ m = 3 ($\because$ base is same)

4 C. Question

Find the value of m for which

$8^{m-3} = 1$

Answer

$8^{m-3} = 1$

$\Rightarrow \frac{8^m}{8^3} = 1$

$\left(\text{Quotient Rule:}\frac{a^m}{a^n} = a^{m-n},\right.$

where 'a' is a non-zero real no. and m, n are positive integers.)

$\Rightarrow 8^m = 1 \times 8^3$

$\Rightarrow 8^m = 8^3$

$\Rightarrow$ m = 3 ($\because$ base is same)

4 D. Question

Find the value of m for which

$(a^3)^m = a^9$

Answer

$(a^3)^m = a^9$

$\Rightarrow a^{3m} = a^9$

($\because$ if 'a' is a real no. and m, n are integers, then $(a^m)^n = a^{mn}$)

$\Rightarrow$ 3m = 9 ($\because$ base is same)

$\Rightarrow m = \frac{9}{3}$

$\Rightarrow m = 3$

4 E. Question

Find the value of m for which

$(5^m)^2 \times (25)^3 \times 125^2 = 1$

Answer

$(5^m)^2 \times (25)^3 \times 125^2 = 1$

$\Rightarrow (5^2)^m \times (25)^3 \times 125^2 = 1$

$\Rightarrow 5^{2m} \times (5^2)^3 \times (5^3)^2 = 1$

($\because 125 = 5\times 5\times 5 = 5^3$, and $25 = 5\times 5 = 5^2$)

$\Rightarrow (5)^{2m} \times (5)^6 \times (5)^6 = 1$

($\because$ if 'a' is a real no. and m, n are integers, then $(a^m)^n = a^{mn}$)

$\Rightarrow 5^{2m+3+6} = 25^0$ ($\because 25^0 = 1$)

$\Rightarrow 2m + 6 + 6 = 0$ ($\because$ base is same)

$\Rightarrow 2m + 12 = 0$

$\Rightarrow 2m = -12$

$\Rightarrow m = -\frac{12}{2}$

$\Rightarrow m = -6$

4 F. Question

Find the value of m for which

$$2m = (8)^{\frac{1}{3}} \div \left(2^3\right)^{2/3}$$

Answer

$$2m = (8)^{\frac{1}{3}} \div (2^3)^{\frac{2}{3}}$$

$$\Rightarrow 2m = (8)^{\frac{1}{3}} \div (2\times 2\times 2)^{\frac{2}{3}}$$

$$\Rightarrow 2m = (8)^{\frac{1}{3}} \div (8)^{\frac{2}{3}}$$

$$\Rightarrow 2m = (8)^{\frac{1}{3}-\frac{2}{3}}$$

$$\Rightarrow 2m = (8)^{-\frac{1}{3}}$$

$$\Rightarrow 2m = \frac{1}{(8)^{\frac{1}{3}}}$$

$\Rightarrow 2m = \frac{1}{2}$ ($\because 8^{\frac{1}{3}} = 2$)

$\Rightarrow m = \frac{1}{2 \times 2}$

$\Rightarrow m = \frac{1}{4}$

5 A. Question

If $2^x = 16$, find

i. x

ii. $2^{\frac{x}{2}}$

iii. 2^{2x}

iv. 2^{x+2}

v. $\sqrt{2^{-x}}$

Answer

i. $2^x = 16$

$\Rightarrow 2^x = 2^4$

$\Rightarrow x = 4$ ($\because$ base is same)

ii. $2^{\frac{x}{2}} = 2^{\frac{4}{2}}$

$\Rightarrow 2^{\frac{x}{2}} = 2^2$

$\Rightarrow 2^{\frac{x}{2}} = 2 \times 2$

$\Rightarrow 2^{\frac{x}{2}} = 4$

iii. $2^{2x} = 2^{2\times 4}$

$\Rightarrow 2^{2x} = 2^8$

$\Rightarrow 2^{2x} = (2\times 2\times$ ……8 times)

$\Rightarrow 2^{2x} = 256$

iv. $2^{x+2} = 2^{4+2}$

$\Rightarrow 2^{x+2} = 2^6$

$\Rightarrow 2^{x+2} = 2\times 2\times 2\times 2\times 2\times 2$

$\Rightarrow 2^{x+2} = 64$

v. $\sqrt{2^{-x}} = \sqrt{2^{-4}}$

$\Rightarrow \sqrt{2^{-x}} = \sqrt{\frac{1}{2^4}}$

$$\Rightarrow \sqrt{2^{-x}} = \sqrt{\frac{1}{2 \times 2 \times 2 \times 2}}$$

$$\Rightarrow \sqrt{2^{-x}} = \frac{1}{\sqrt{16}}$$

$$\Rightarrow \sqrt{2^{-x}} = \frac{1}{4}$$

5 B. Question

If $3^x = 81$, find

i. x

ii. 3^{x+3}

iii. $3^{x/2}$

iv. 3^{2x}

v. 3^{x-6}

Answer

i. $3^x = 81$

$\Rightarrow 3^x = 3^4$ ($\because 3^4 = 81$)

$\Rightarrow x = 4$ ($\because$ base is same)

ii. $3^{x+3} = 3^{4+3}$

$\Rightarrow 3^{x+3} = 3^7$

$\Rightarrow 3^{x+3} = 3\times 3\times 3\times 3\times 3\times 3\times 3$

$\Rightarrow 3^{x+3} = 2187$

iii. $3^{\left(\frac{x}{2}\right)} = 3^{\left(\frac{4}{2}\right)}$

$\Rightarrow 3^{\left(\frac{x}{2}\right)} = 3^2$

$\Rightarrow 3^{\left(\frac{x}{2}\right)} = 3 \times 3$

$\Rightarrow 3^{\left(\frac{x}{2}\right)} = 9$

iv. $3^{2x} = 3^{2\times 4}$

$\Rightarrow 3^{2x} = 3^8$

$\Rightarrow 3^{2x} = 3 \times 3\times 3\times 3\times 3\times 3\times 3\times 3$

$\Rightarrow 3^{2x} = 6561$

v. $3^{x-6} = 3^{4-6}$

$\Rightarrow 3^{x-6} = 3^{-2}$

$$\Rightarrow 3^{x-6} = \frac{1}{3^2}$$

(∵ Reciprocal law: If 'a' is a real no. and m is a positive integer, then $a^{-m} = \frac{1}{a^m}$)

$$\Rightarrow 3^{x-6} = \frac{1}{3 \times 3}$$

$$\Rightarrow 3^{x-6} = \frac{1}{9}$$

6 A. Question

Prove that

$$\frac{3^{x+1}}{3^{x(x+1)}} \times \left(\frac{3^x}{3}\right)^{x+1} = 1,$$

Answer

Taking L.H.S,

$$\Rightarrow \frac{3^{x+1}}{3^{x(x+1)}} \times \left(\frac{3^x}{3}\right)^{x+1} = \frac{3^{x+1}}{(3^x)^{(x+1)}} \times \left(\frac{3^x}{3}\right)^{x+1}$$

(∵ if 'a' is a real no. and m, n are integers, then $(a^m)^n = a^{mn}$)

$$\Rightarrow \frac{3^{x+1}}{3^{x(x+1)}} \times \left(\frac{3^x}{3}\right)^{x+1} = \left(\frac{3}{3^x}\right)^{(x+1)} \times \left(\frac{3^x}{3}\right)^{x+1}$$

(∵ Power of quotient rule: $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$,

where b≠0, a and b are real numbers, m is an integer)

$$\Rightarrow \frac{3^{x+1}}{3^{x(x+1)}} \times \left(\frac{3^x}{3}\right)^{x+1} = \left(\frac{3}{3^x} \times \frac{3^x}{3}\right)^{(x+1)}$$

(By Power of Product Rule)

$$\Rightarrow \frac{3^{x+1}}{3^{x(x+1)}} \times \left(\frac{3^x}{3}\right)^{x+1} = (1)^{(x+1)}$$

$$\Rightarrow \frac{3^{x+1}}{3^{x(x+1)}} \times \left(\frac{3^x}{3}\right)^{x+1} = 1 \ (\because 1^n = 1, \text{where n is real no.})$$

Hence, proved.

6 B. Question

Prove that

$$\left(\frac{x^m}{x^n}\right)^{m+n} \cdot \left(\frac{x^n}{x^l}\right)^{n+l} \cdot \left(\frac{x^l}{x^m}\right)^{l+m} = 1$$

Answer

Taking L.H.S,

$$\Rightarrow \left(\frac{x^m}{x^n}\right)^{m+n} \times \left(\frac{x^n}{x^l}\right)^{n+l} \times \left(\frac{x^l}{x^m}\right)^{l+m} = \left(\frac{x^{m(m+n)}}{x^{n(m+n)}}\right) \times \left(\frac{x^{n(n+l)}}{x^{l(n+l)}}\right) \times \left(\frac{x^{l(l+m)}}{x^{m(l+m)}}\right)$$

(∵ Power of quotient rule: $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$,

where b≠0, a and b are real numbers, m is an integer)

$$\Rightarrow \left(\frac{x^m}{x^n}\right)^{m+n} \times \left(\frac{x^n}{x^l}\right)^{n+l} \times \left(\frac{x^l}{x^m}\right)^{l+m} = \left(\frac{x^{m^2+mn}}{x^{nm+n^2}}\right) \times \left(\frac{x^{n^2+nl}}{x^{nl+n^2}}\right) \times \left(\frac{x^{l^2+lm}}{x^{ml+m^2}}\right)$$

(∵ if 'a' is a real no. and m, n are integers, then $(a^m)^n = a^{mn}$)

$$\Rightarrow \left(\frac{x^m}{x^n}\right)^{m+n} \times \left(\frac{x^n}{x^l}\right)^{n+l} \times \left(\frac{x^l}{x^m}\right)^{l+m} = \left(\frac{x^{m^2+mn+n^2+nl+l^2+lm}}{x^{nm+n^2+nl+n^2+ml+m^2}}\right)$$

(Product Rule: $a^m \times a^n = a^{m+n}$, where 'a' is a real no. and m, n are positive integers.)

$$\Rightarrow \left(\frac{x^m}{x^n}\right)^{m+n} \times \left(\frac{x^n}{x^l}\right)^{n+l} \times \left(\frac{x^l}{x^m}\right)^{l+m} = \left(x^{m^2+mn+n^2+nl+l^2+lm-(nm+n^2+nl+n^2+ml+m^2)}\right)$$

(Quotient Rule: $\frac{a^m}{a^n} = a^{m-n}$,

where 'a' is a non-zero real no. and m, n are positive integers.)

$$\Rightarrow \left(\frac{x^m}{x^n}\right)^{m+n} \times \left(\frac{x^n}{x^l}\right)^{n+l} \times \left(\frac{x^l}{x^m}\right)^{l+m} = \left(x^{((m^2-m^2)+(mn-mn)+(n^2-n^2)+(nl-nl)+(l^2-l^2)+(lm-lm)}\right)$$

$$\Rightarrow \left(\frac{x^m}{x^n}\right)^{m+n} \times \left(\frac{x^n}{x^l}\right)^{n+l} \times \left(\frac{x^l}{x^m}\right)^{l+m} = x^0$$

$$\Rightarrow \left(\frac{x^m}{x^n}\right)^{m+n} \times \left(\frac{x^n}{x^l}\right)^{n+l} \times \left(\frac{x^l}{x^m}\right)^{l+m} = 1$$

(∵ Number with zero exponent rule: If 'a' is a rational no. other than zero, then $a^0 = 1$)

Hence, proved.

Exercise 1.5

1. Question

Just observe the unit digits and state which of the following are not perfect squares.

i. 3136

ii. 3722

iii. 9348

iv. 2304

v. 8343

Answer

We know that perfect squares end with the digits 0, 1, 4, 6, 9. Anything other than these in the unit's place does not qualify to be a perfect square.

Therefore (ii) 3722 is not a perfect square

(iii) 9348 is not a perfect square

(v) 8343 is not a perfect square

2 A. Question

Write down the unit digits of the following:

78^2

Answer

78 × 78

Let us only consider the unit's digits of 78, which is 8.

8 × 8 = 64, which has 4 in its unit's place.

This number is retained in the unit's place when the digit is squared.

Hence the answer is 4.

2 B. Question

Write down the unit digits of the following:

27^2

Answer

27 × 27

Let us only consider the unit's digits of 27, which is 7.

7 × 7 = 49, which has 9 in its unit's place.

This number is retained in the unit's place when the digit is squared.

Hence the answer is 9.

2 C. Question

Write down the unit digits of the following:

41^2

Answer

41 × 41

Let us only consider the unit's digits of 41, which is 1.

1 × 1 = 1, which has 1 in its unit's place.

This number is retained in the unit's place when the digit is squared.

Hence the answer is 1.

2 D. Question

Write down the unit digits of the following:

35^2

Answer

35 × 35

Let us only consider the unit's digits of 35, which is 5.

5 × 5 = 25, which has 5 in its unit's place.

This number is retained in the unit's place when the digit is squared.

Hence the answer is 5.

2 E. Question

Write down the unit digits of the following:

42^2

Answer

42 × 42

Let us only consider the unit's digits of 42, which is 2.

2 × 2 = 4, which has 4 in its unit's place.

This number is retained in the unit's place when the digit is squared.

Hence the answer is 4.

3 A. Question

Find the sum of the following numbers without actually adding the numbers.

1 + 3 + 5 + 7 + 9 + 11 + 13 + 15

Answer

We know that the sum of first n odd numbers is n^2

Since there are 8 odd numbers starting from 1 to 15,

Sum = 8^2

= 64

3 B. Question

Find the sum of the following numbers without actually adding the numbers.

1 + 3 + 5 + 7

Answer

We know that the sum of first n odd numbers is n^2

Since there are 4 odd numbers starting from 1 to 7,

Sum = 4^2

= 16

3 C. Question

Find the sum of the following numbers without actually adding the numbers.

1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17

Answer

We know that the sum of first n odd numbers is n^2

Since there are 9 odd numbers starting from 1 to 17,

Sum = 9^2

= 81

4 A. Question

Express the following as a sum of consecutive odd numbers starting with 1

7^2

Answer

We know that any square can be expressed as the sum of consecutive odd numbers starting from 1.

n^2 = 1 + 3 + 5 + … + (2n-1)

Therefore, 7^2 = 1 + 3 + 5 + … + (2 × 7-1)

= 1 + 3 + 5 + … + 13

= 1 + 3 + 5 + 7 + 9 + 11 + 13

4 B. Question

Express the following as a sum of consecutive odd numbers starting with 1

9^2

Answer

We know that any square can be expressed as the sum of consecutive odd numbers starting from 1.

n^2 = 1 + 3 + 5 + … + (2n-1)

Therefore, 7^2 = 1 + 3 + 5 + … + (2 × 9-1)

= 1 + 3 + 5 + … + 17

= 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17

4 C. Question

Express the following as a sum of consecutive odd numbers starting with 1

5^2

Answer

We know that any square can be expressed as the sum of consecutive odd numbers starting from 1.

$n^2 = 1 + 3 + 5 + \ldots + (2n-1)$

Therefore, $7^2 = 1 + 3 + 5 + \ldots + (2 \times 5-1)$

$= 1 + 3 + 5 + \ldots + 9$

$= 1 + 3 + 5 + 7 + 9$

4 D. Question

Express the following as a sum of consecutive odd numbers starting with 1

11^2

Answer

We know that any square can be expressed as the sum of consecutive odd numbers starting from 1.

$n^2 = 1 + 3 + 5 + \ldots + (2n-1)$

Therefore, $11^2 = 1 + 3 + 5 + \ldots + (2 \times 11-1)$

$= 1 + 3 + 5 + \ldots + 21$

$= 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21$

5 A. Question

Find the squares of the following numbers

$\frac{3}{8}$

Answer

We know that $\left(\frac{x}{y}\right)^2 = \frac{x^2}{y^2}$ for all real values of x and y.

Therefore, $(\frac{3}{8})^2 = \frac{3^2}{8^2}$

$= \frac{9}{64}$

5 B. Question

Find the squares of the following numbers

$\frac{7}{10}$

Answer

We know that $(\frac{x}{y})^2 = \frac{x^2}{y^2}$ for all real values of x and y.

Therefore, $(\frac{7}{10})^2 = \frac{7^2}{10^2}$

$= \frac{49}{100}$

5 C. Question

Find the squares of the following numbers

$\frac{1}{5}$

Answer

We know that $(\frac{x}{y})^2 = \frac{x^2}{y^2}$ for all real values of x and y.

Therefore, $(\frac{1}{5})^2 = \frac{1^2}{5^2}$

$= \frac{1}{25}$

5 D. Question

Find the squares of the following numbers

$\frac{2}{3}$

Answer

We know that $(\frac{x}{y})^2 = \frac{x^2}{y^2}$ for all real values of x and y.

Therefore, $(\frac{2}{3})^2 = \frac{2^2}{3^2}$

$= \frac{4}{9}$

5 E. Question

Find the squares of the following numbers

$\frac{31}{40}$

Answer

We know that $(\frac{x}{y})^2 = \frac{x^2}{y^2}$ for all real values of x and y.

Therefore, $(\frac{31}{40})^2 = \frac{31^2}{40^2}$

$= \frac{961}{1600}$

6 A. Question

Find the values of the following:

$(-3)^2$

Answer

$(-3)^2$ can be written as (-3) × (-3)

= + (3 × 3) = 9 (negative × negative = positive)

6 B. Question

Find the values of the following:

$(-7)^2$

Answer

$(-7)^2$ can be written as (-7) × (-7)

= + (7 × 7) = 49 (negative × negative = positive)

6 C. Question

Find the values of the following:

$(-0.3)^2$

Answer

$(-0.3)^2$ can be written as (-0.3) × (-0.3)

= + (0.3 × 0.3) = 0.09 (negative × negative = positive)

6 D. Question

Find the values of the following:

$$\left(-\frac{2}{3}\right)^2$$

Answer

$(-\frac{2}{3})^2$ can be written as $(-\frac{2}{3}) \times (-\frac{2}{3})$

= + $(\frac{2}{3} \times \frac{2}{3}) = \frac{4}{9}$ (negative × negative = positive)

6 E. Question

Find the values of the following:

$$\left(-\frac{3}{4}\right)^2$$

Answer

$(-\frac{3}{4})^2$ can be written as $(-\frac{3}{4}) \times (-\frac{3}{4})$

= + $(\frac{3}{4} \times \frac{3}{4}) = \frac{9}{16}$ (negative × negative = positive)

6 F. Question

Find the values of the following:

$(-0.6)^2$

Answer

$(-0.6)^2$ can be written as (-0.6) × (-0.6)

= + (0.6 × 0.6) = 0.36 (negative × negative = positive)

7 A. Question

Using the given pattern, find the missing numbers:

$1^2 + 2^2 + 2^2 = 3^2$,

$2^2 + 3^2 + 6^2 = 7^2$

$3^2 + 4^2 + 12^2 + 13^2$

$4^2 + 5^2 + \_\_\_\_ = 21^2$

$5^2 + \_\_\_ + 30^2 = 31^2$

$6^2 + 7^2 + \_\_\_ = \_\_\_\_$

Answer

In every line, the third number (without any power) is the product of first two numbers.

i.e, 1 × 2 = 2, 2 × 3 = 6 and so on.

Using the same logic,

4 × 5 = 20, therefore the missing number is 20^2

5 × y = 30, therefore y = 6 and the missing number is 6^2

6 × 7 = 42, therefore the missing number is 42^2

We also see that the right-hand side of every equation is one more than the last number on the left hand side (without any power)

So $6^2 + 7^2 + 42^2 = 43^2$

7 B. Question

Using the given pattern, find the missing numbers:

$11^2 = 121$

$101^2 = 10201$

$1001^2 = 1002001$

$100001^2 = 10000200001$

$10000001^2 = 100000020000001$

Answer

The number of zeroes in the answer is twice the number of zeroes in the base of the square, separated by the digit 2.

Exercise 1.6

1 A. Question

Find the square root of each expression given below:

3 × 3 × 4 × 4

Answer

We have $\sqrt{3 \times 3 \times 4 \times 4}$

$= \sqrt{9 \times 16}$

$= \sqrt{9} \times \sqrt{16}$ (Property of roots)

= 3 × 4

= 12

1 B. Question

Find the square root of each expression given below:

2 × 2 × 5 × 5

Answer

We have $\sqrt{2 \times 2 \times 5 \times 5}$

= $\sqrt{4 \times 25}$

= $\sqrt{4} \times \sqrt{25}$ (Property of roots)

= 2 × 5

= 10

1 C. Question

Find the square root of each expression given below:

3 × 3 × 3 × 3 × 3 × 3

Answer

We have $\sqrt{3 \times 3 \times 3 \times 3 \times 3 \times 3}$

= $\sqrt{9 \times 9 \times 9}$

= $\sqrt{9} \times \sqrt{9} \times \sqrt{9}$ (Property of roots)

= 3 × 3 × 3

= 27

1 D. Question

Find the square root of each expression given below:

5 × 5 × 11 × 11 × 7 × 7

Answer

We have $\sqrt{5 \times 5 \times 11 \times 11 \times 7 \times 7}$

= $\sqrt{25 \times 121 \times 49}$

= $\sqrt{25} \times \sqrt{121} \times \sqrt{49}$ (Property of roots)

= 5 × 11 × 7

= 385

2 A. Question

Find the square root of the following:

$\frac{9}{64}$

Answer

We know that $\sqrt{\frac{x}{y}} = \frac{\sqrt{x}}{\sqrt{y}}$ for all real values of x and y.

Therefore, $\sqrt{\frac{9}{64}} = \frac{\sqrt{9}}{\sqrt{64}}$

$= \frac{3}{8}$

2 B. Question

Find the square root of the following:

$$\frac{1}{16}$$

Answer

We know that $\sqrt{\frac{x}{y}} = \frac{\sqrt{x}}{\sqrt{y}}$ for all real values of x and y.

Therefore, $\sqrt{\frac{1}{16}} = \frac{\sqrt{1}}{\sqrt{16}}$

$= \frac{1}{4}$

2 C. Question

Find the square root of the following:

49

Answer

$\sqrt{49} = \sqrt{7 \times 7}$

$= \sqrt{7^2}$

= 7

2 D. Question

Find the square root of the following:

16

Answer

$\sqrt{16} = \sqrt{4 \times 4}$

$= \sqrt{4^2}$

= 4

3 A. Question

Find the square root of each of the following by Long division method:

2304

Answer

	4 8
4 + 4	$\overline{23}\,\overline{04}$ 16
88	7 04 7 04
	0

$\therefore \sqrt{2304} = 48$

3 B. Question

Find the square root of each of the following by Long division method:

4489

Answer

	6 7
6 + 6	$\overline{44}\,\overline{89}$ 36
127	8 89 8 89
	0

$\therefore \sqrt{4489} = 67$

3 C. Question

Find the square root of each of the following by Long division method:

3481

Answer

	5 9
5 + 5	$\overline{34}\,\overline{81}$ 25
109	9 81 9 81
	0

$\therefore \sqrt{3481} = 59$

3 D. Question

Find the square root of each of the following by Long division method:

529

Answer

	2 3
2 + 2	$\overline{5}\,\overline{29}$ 4
43	1 29 1 29
	0

$\therefore \sqrt{529} = 23$

3 E. Question

Find the square root of each of the following by Long division method:

3249

Answer

	5 7
5 + 5	32 49 25
107	7 49 7 49
	0

$\therefore \sqrt{3249} = 57$

3 F. Question

Find the square root of each of the following by Long division method:

1369

Answer

	3 7
3 + 3	13 69 9
67	4 69 4 69
	0

$\therefore \sqrt{1369} = 37$

3 G. Question

Find the square root of each of the following by Long division method:

5776

Answer

	7 6
7 + 7	57 76 49
146	8 76 8 76
	0

$\therefore \sqrt{5776} = 76$

3 H. Question

Find the square root of each of the following by Long division method:

7921

Answer

	8 9
8 + 8	79 21 64
169	15 21 15 21
	0

$\therefore \sqrt{7921} = 89$

3 I. Question

Find the square root of each of the following by Long division method:

576

Answer

	2 4
2 + 2	5 76 4
44	1 76 1 76
	0

$\therefore \sqrt{576} = 24$

3 J. Question

Find the square root of each of the following by Long division method:

3136

Answer

	5 6
5 + 5	31 36 25
106	6 36 6 36
	0

$\therefore \sqrt{3136} = 56$

4 A. Question

Find the square root of the following numbers by the factorization method:

729

Answer

3	729
3	243
3	81
3	27
3	9
3	3

∴ 729 = 3 × 3 × 3 × 3 × 3 × 3

So, $\sqrt{729} = \sqrt{3 \times 3 \times 3 \times 3 \times 3 \times 3}$ = 3 × 3 × 3 = 27

4 B. Question

Find the square root of the following numbers by the factorization method:

400

Answer

2	400
2	200
2	100
2	50
5	25
	5

∴ 400 = 2 × 2 × 2 × 2 × 5 × 5

So, $\sqrt{400} = \sqrt{2 \times 2 \times 2 \times 2 \times 5 \times 5}$ = 2 × 2 × 5 = 20

4 C. Question

Find the square root of the following numbers by the factorization method:

1764

Answer

2	1764
2	882
3	441
3	147
7	49
	7

∴ 1764 = 2 × 2 × 3 × 3 × 7 × 7

So, $\sqrt{1764} = \sqrt{2 \times 2 \times 3 \times 3 \times 7 \times 7}$ = 2 × 3 × 7 = 42

4 D. Question

Find the square root of the following numbers by the factorization method:

4096

Answer

2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2

∴ 4096 = 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2

So, $\sqrt{4096} = \sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2}$ = 2 × 2 × 2 × 2 × 2 × 2 = 64

4 E. Question

Find the square root of the following numbers by the factorization method:

7744

Answer

2	7744
2	3872
2	1936
2	968
2	484
2	242
11	121
	11

∴ 7744 = 2 × 2 × 2 × 2 × 2 × 2 × 11 × 11

So, $\sqrt{7744} = \sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 11 \times 11}$ = 2 × 2 × 2 × 11 = 88

4 F. Question

Find the square root of the following numbers by the factorization method:

9604

Answer

2	9604
2	4802
7	2401
7	343
7	49
	7

∴ 9604 = 2 × 2 × 7 × 7 × 7 × 7

So, $\sqrt{9604} = \sqrt{2 \times 2 \times 7 \times 7 \times 7 \times 7}$ = 2 × 7 × 7 = 98

4 G. Question

Find the square root of the following numbers by the factorization method:

5929

Answer

7	5929
7	847
11	121
	11

∴ 5929 = 7 × 7 × 11 × 11

So, $\sqrt{5929} = \sqrt{7 \times 7 \times 11 \times 11}$ = 7 × 11 = 77

4 H. Question

Find the square root of the following numbers by the factorization method:

9216

Answer

2	9216
2	4608
2	2304
2	1152
2	576
2	288
12	144
	12

∴ 9216 = 2 × 2 × 2 × 2 × 2 × 2 × 12 × 12

So, $\sqrt{9216} = \sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 12 \times 12}$ = 2 × 2 × 2 × 12 = 96

4 I. Question

Find the square root of the following numbers by the factorization method:

529

Answer

23	529
	23

∴ 529 = 23 × 23

So, $\sqrt{529} = \sqrt{23 \times 23}$ = 23

4 J. Question

Find the square root of the following numbers by the factorization method:

8100

Answer

10	8100
10	810
9	81
	9

∴ 8100 = 10 × 10 × 9 × 9

So, $\sqrt{8100} = \sqrt{10 \times 10 \times 9 \times 9}$ = 10 × 9 = 90

5 A. Question

Find the square root of the following decimal numbers:

2.56

Answer

	1. 6
1 + 1	2. 56 1
26	1 56 1 56
	0

∴ $\sqrt{2.56}$ = 1.6

5 B. Question

Find the square root of the following decimal numbers:

7.29

Answer

	2. 7
2 + 2	7. 29 4
47	3 29 3 29
	0

$\therefore \sqrt{7.29} = 2.7$

5 C. Question

Find the square root of the following decimal numbers:

51.84

Answer

	7. 2
7 + 7	51. 84 49
142	2 84 2 84
	0

$\therefore \sqrt{51.84} = 7.2$

5 D. Question

Find the square root of the following decimal numbers:

42.25

Answer

	6. 5
6 + 6	42. 25 36
125	6 25 6 25
	0

$\therefore \sqrt{42.25} = 6.5$

5 E. Question

Find the square root of the following decimal numbers:

31.36

Answer

	5. 6
5 + 5	31. 36 25
106	6 36 6 36
	0

$\therefore \sqrt{31.36} = 5.6$

5 F. Question

Find the square root of the following decimal numbers:

0.2916

Answer

	0. 54
0 + 0	0. 29 16 0
05 + 5	0 29 0 25
104	0 04 16 0 04 16
	0

$\therefore \sqrt{0.2916} = 0.54$

5 G. Question

Find the square root of the following decimal numbers:

11.56

Answer

	3. 4
3 + 3	11. 56 9
64	2 56 2 56
	0

$\therefore \sqrt{11.56} = 3.4$

5 H. Question

Find the square root of the following decimal numbers:

0.001849

Answer

	0. 043
0 + 0	0. 00 18 49 0
00 + 0	0 00 0 00
04 + 4	0 00 18 0 00 16
163	0 00 02 49 0 00 02 49
	0

$\therefore \sqrt{0.001849} = 0.043$

6 A. Question

Find the least number which must be subtracted from each of the following numbers so as to get a perfect square:

402

Answer

	2 0
2 + 2	$\overline{4}\,\overline{02}$ 4
40	0 02 0 02
	2

$402-2 = 400 = 20^2$

∴ 2 must be subtracted from 402 to get a perfect square.

6 B. Question

Find the least number which must be subtracted from each of the following numbers so as to get a perfect square:

1989

Answer

	4 4
4 + 4	$\overline{19}\,\overline{89}$ 16
84	3 89 3 36
	53

$1989-53 = 1936 = 44^2$

∴ 53 must be subtracted from 1989 to get a perfect square.

6 C. Question

Find the least number which must be subtracted from each of the following numbers so as to get a perfect square:

3250

Answer

	5 7
5 + 5	$\overline{32}\,\overline{50}$ 25
104	7 50 7 49
	1

$3250-1 = 3249 = 57^2$

∴ 1 must be subtracted from 3250 to get a perfect square.

6 D. Question

Find the least number which must be subtracted from each of the following numbers so as to get a perfect square:

825

Answer

	2 6
2 + 2	$\overline{8}\,\overline{25}$ 4
46	3 25 2 76
	49

825-49 = 776 = 26^2

∴ 49 must be subtracted from 825 to get a perfect square.

6 E. Question

Find the least number which must be subtracted from each of the following numbers so as to get a perfect square:

4000

Answer

	63
6 + 6	$\overline{40}\,\overline{00}$ 36
123	4 00 3 69
	31

4000-31 = 3969 = 63^2

∴ 31 must be subtracted from 4000 to get a perfect square.

7 A. Question

Find the least number which must be added to each of the following numbers so as to get a perfect square:

525

Answer

	23
2 + 2	$\overline{5}\,\overline{25}$ 4
43	1 25 1 29
	-4

525 + 4 = 529 = 23^2

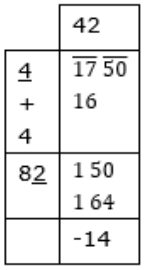
∴ 4 must be added to 525 to get a perfect square.

7 B. Question

Find the least number which must be added to each of the following numbers so as to get a perfect square:

1750

Answer



	42
4 + 4	$\overline{17}\,\overline{50}$ 16
82	1 50 1 64
	-14

$1750 + 14 = 1764 = 42^2$

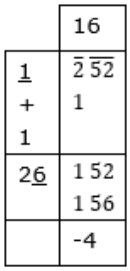
∴ 14 must be added to 1750 to get a perfect square.

7 C. Question

Find the least number which must be added to each of the following numbers so as to get a perfect square:

252

Answer



	16
1 + 1	$\overline{2}\,\overline{52}$ 1
26	1 52 1 56
	-4

$252 + 4 = 256 = 16^2$

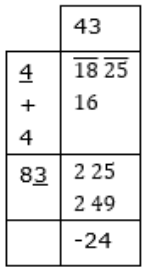
∴ 4 must be added to 252 to get a perfect square.

7 D. Question

Find the least number which must be added to each of the following numbers so as to get a perfect square:

1825

Answer



	43
4 + 4	$\overline{18}\,\overline{25}$ 16
83	2 25 2 49
	-24

$1825 + 24 = 1849 = 43^2$

∴ 24 must be added to 1825 to get a perfect square.

7 E. Question

Find the least number which must be added to each of the following numbers so as to get a perfect square:

6412

Answer

	81
8 + 8	$\overline{64}\ \overline{12}$ 64
161	0 12 0 161
	-149

$6412 + 149 = 6561 = 81^2$

∴ 149 must be added to 6412 to get a perfect square.

8 A. Question

Find the square root of the following correct to two places of decimals:

2

Answer

	1. 41
1 + 1	$\overline{2}.\ \overline{00}\ \overline{00}$ 1
24 + 4	1 00 96
281	4 00 2 81

∴ $\sqrt{2} = 1.41$

8 B. Question

Find the square root of the following correct to two places of decimals:

5

Answer

	2. 23
2 + 2	$\overline{5}.\ \overline{00}\ \overline{00}$ 4
42 + 2	1 00 84
443	16 00 13 29

∴ $\sqrt{5} = 2.23$

8 C. Question

Find the square root of the following correct to two places of decimals:

0.016

Answer

	0.12
0 + 0	$\overline{0}.\ \overline{01}\ \overline{60}$ 0
01 + 1	0 01 0 01
22	0 00 60 0 00 44

$\therefore \sqrt{0.016} = 0.12$

8 D. Question

Find the square root of the following correct to two places of decimals:

$$\frac{7}{8}$$

Answer

	0. 93
0 + 0	$\overline{0}.\ \overline{87}\ \overline{50}$ 0
09 + 9	0 87 0 81
183	6 50 5 49

$\therefore \sqrt{\frac{7}{8}} = 0.93$

8 E. Question

Find the square root of the following correct to two places of decimals:

$$1\frac{1}{12}$$

Answer

	1. 04
1 + 1	$\overline{1}.\ \overline{08}\ \overline{33}$ 1
20 + 0	0 08 0 00
204	8 33 8 16

$\therefore \sqrt{1\frac{1}{12}} = 1.04$

9. Question

Find the length of the side of a square where area is 441 m^2.

Answer

Let the length of the side be x m.

So Area = x × x = x^2 = 441 m^2

x = $\sqrt{441}$

= 21 m

10 A. Question

Find the square root of the following:

$$\frac{225}{3136}$$

Answer

We know that $\sqrt{\frac{x}{y}} = \frac{\sqrt{x}}{\sqrt{y}}$ for all real values of x and y.

Therefore, $\sqrt{\frac{225}{3136}} = \frac{\sqrt{225}}{\sqrt{3136}}$

= $\frac{15}{3136}$

10 B. Question

Find the square root of the following:

$$\frac{2116}{3481}$$

Answer

We know that $\sqrt{\frac{x}{y}} = \frac{\sqrt{x}}{\sqrt{y}}$ for all real values of x and y.

Therefore, $\sqrt{\frac{2116}{3481}} = \frac{\sqrt{2116}}{\sqrt{3481}}$

= $\frac{46}{59}$

10 C. Question

Find the square root of the following:

$$\frac{529}{1764}$$

Answer

We know that $\sqrt{\frac{x}{y}} = \frac{\sqrt{x}}{\sqrt{y}}$ for all real values of x and y.

Therefore, $\sqrt{\frac{529}{1764}} = \frac{\sqrt{529}}{\sqrt{1764}}$

$= \frac{23}{42}$

10 D. Question

Find the square root of the following:

$$\frac{7921}{5776}$$

Answer

We know that $\sqrt{\frac{x}{y}} = \frac{\sqrt{x}}{\sqrt{y}}$ for all real values of x and y.

Therefore, $\sqrt{\frac{7921}{5776}} = \frac{\sqrt{7921}}{\sqrt{5776}}$

$= \frac{89}{76}$

Exercise 1.7

1 A. Question

Choose the correct answer for the following:

Which of the following numbers is a perfect cube?

A. 125

B. 36

C. 75

D. 100

Answer

A. 125

Prime factorization of 125:

5|125
5|25
5|5
1

$\Rightarrow 125 = 5 \times 5 \times 5 = 5^3$

$\therefore$ 125 is a perfect cube.

B. 36

Prime factorization:

2|36
2|18
3|9
3|3
1

⇒ 36 = 2 × 2 × 3 × 3

There are only two 2's and two 3's.

∴ 36 is not a perfect cube.

C. 75

Prime Factorization:

5|75
5|15
3|3
1

⇒ 75 = 5 × 5 × 3

There are only two 5's and one 3.

∴ 75 is not a perfect cube.

D. 100

Prime Factorization:

2|100
2|50
5|25
5|5
1

⇒ 100 = 2 × 2 × 5 × 5

There are only two 2's and two 5's.

Hence, 100 is not a perfect cube.

1 B. Question

Choose the correct answer for the following:

Which of the following numbers is not a perfect cube?

A. 1331

B. 512

C. 343

D. 100

Answer

A. 1331

Prime Factorization:

11|1331
11|121
11|11
1

⇒ 1331 = 11 × 11 × 11 = 11^3

∴ 1331 is a perfect cube.

B. 512

Prime Factorization:

2|512
2|256
2|128
2|64
2|32
2|16
2|8
2|4
2|2
1

⇒ 512 = 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2

= $2^3 \times 2^3 \times 2^3$

= 8^3

∴ 512 is a perfect cube.

C. 343

Prime Factorization:

7|343
7|49
7|7
1

⇒ 343 = 7 × 7 × 7 = 7^3

∴ 343 is a perfect cube.

D. 100

Prime Factorization:

2|100
2|50
5|25
5|5
1

⇒ 100 = 2 × 2 × 5 × 5

There are only two 2's and two 5's.

Hence, 100 is not a perfect cube.

1 C. Question

Choose the correct answer for the following:

The cube of an odd natural number is

A. Even

B. Odd

C. May be even, May be odd

D. Prime number

Answer

We know that cubes of odd number are all odds.

1 D. Question

Choose the correct answer for the following:

The number of zeros of the cube root of 1000 is

A. 1

B. 2

C. 3

D. 4

Answer

Prime Factorization:

2|1000
2|500
2|250
5|125
5|25
5|5
1

$\Rightarrow \sqrt[3]{1000} = (1000)^{1/3}$

$(1000)^{1/3} = ((2 \times 2 \times 2) \times (5 \times 5 \times 5))^{1/3}$

$= (2^3 \times 5^3)^{1/3}$

$= (10^3)^{1/3}$

We know that by law of exponents, $(a^m)^n = a^{mn}$.

$\therefore (1000)^{1/3} = 10$

Hence, there is only one zero in the cube root of 1000.

1 E. Question

Choose the correct answer for the following:

The unit digit of the cube of the number 50 is

A. 1

B. 0

C. 5

D. 4

Answer

We know that the cubes of the numbers with 0 as unit digit will have the same unit digit i.e. 0.

∴ The unit digit of the cube of the number 50 is 0.

1 F. Question

Choose the correct answer for the following:

The number of zeros at the end of the cube of 100 is

A. 1

B. 2

C. 4

D. 6

Answer

Cube of 100 = 100^3

= 100 × 100 × 100

= 1000000

∴ There are 6 zeros at the end of the cube of 100.

1 G. Question

Choose the correct answer for the following:

Find the smallest number by which the number 108 must be multiplied to obtain a perfect cube

A. 2

B. 3

C. 4

D. 5

Answer

Prime Factorization:

2|108
2|54
3|27
3|9
3|3
1

⇒ 108 = 2 × 2 × 3 × 3 × 3

In the above Factorization, 2 × 2 remains after grouping the 3's in triplets.

∴ 108 is not a perfect cube.

To make it a perfect cube, we multiply it by 2.

Prime Factorization:

2|216
2|108
2|54
3|27
3|9
3|3
1

⇒ 108 × 2 = 2 × 2 × 2 × 3 × 3 × 3

⇒ 216 = $2^3 \times 3^3$

= $(2 \times 3)^3$

= 6^3 which is a perfect cube.

∴ The smallest number by which the number 108 must be multiplied to obtain a perfect cube is 2.

1 H. Question

Choose the correct answer for the following:

Find the smallest number by which the number 88 must be divided to obtain a perfect cube

A. 11

B. 5

C. 7

D. 9

Answer

Prime Factorization:

2 |88
2 |44
2 |22
11|11
1

⇒ 88 = 2 × 2 × 2 × 11

The prime factor 11 does not appear in triplet.

∴ 88 is not a perfect cube.

Since in factorization, 11 appear only one time, we should divide the number 80 by 11.

⇒ 88 ÷ 11 = 8

= 2 × 2 × 2

= 2^3

∴ The smallest number by which the number 88 must be divided to obtain a perfect cube is 11.

1 I. Question

Choose the correct answer for the following:

The volume of a cube is 64 cm^3. The side of the cube is

A. 4 cm

B. 8 cm

C. 16 cm

D. 6 cm

Answer

We know that the Volume of a cube = a^3 where a is the side of the cube.

But given Volume of cube = 64 cm^3

⇒ $a^3 = 64$

Prime Factorization of 64:

2|64
2|32
2|16
2|8
2|4
2|2
1

⇒ 64 = 2 × 2 × 2 × 2 × 2 × 2

= $2^3 \times 2^3$

= 4^3

∴ $a^3 = 4^3$

Powers are equal, so bases must be equated.

∴ a = 4 cm (Side of the cube)

1 J. Question

Choose the correct answer for the following:

Which of the following is false?

A. Cube of any odd number is odd.

B. A perfect cube does not end with two zeros.

C. The cube of a single digit number may be a single digit number.

D. There is no perfect cube which ends with 8.

Answer

A. We know that cubes of odd numbers are all odd numbers.

∴ This is true.

B. For example:

Cube of 10 = 10^3

= 10 × 10 × 10

= 1000

Which ends in 3 zeros.

∴ It is true that a perfect cube does not end with two zeros.

C. For example:

Cube of 2 = 2^3

= 2 × 2 × 2

= 8 (single digit)

While cube of 3 = 3^3

= 3 × 3 × 3

= 27 (double digit)

∴ It can be concluded that the cube of a single digit number may be a single digit number.

D. For example:

2^3 = 8; 12^3 = 1728; 22^3 = 10648

Here, we can see that there are cubes which end with the digit 8.

∴ It is false that there is no perfect cube which ends with 8.

2 A. Question

Check whether the following are perfect cubes?

400

Answer

400

Prime Factorization:

2|400
2|200
2|100
2|50
5|25
5|5
1

⇒ 400 = 2 × 2 × 2 × 2 × 5 × 5

= 2^3 × 2 × 5^2

There is only one 1 and two 5's.

∴ 400 is not a perfect cube.

2 B. Question

Check whether the following are perfect cubes?

216

Answer

216

Prime Factorization:

2|216
2|108
2|54
3|27
3|9
3|3
1

⇒ 216 = 2 × 2 × 2 × 3 × 3 × 3

$= 2^3 \times 3^3$

$= (2 \times 3)^3$

$= 6^3$

∴ 216 is a perfect cube.

2 C. Question

Check whether the following are perfect cubes?

729

Answer

729

Prime Factorization:

3|729
3|243
3|81
3|27
3|9
3|3
1

⇒ 729 = 3 × 3 × 3 × 3 × 3 × 3

$= 3^3 \times 3^3$

$= (3 \times 3)^3$

$= 9^3$

∴ 729 is a perfect cube.

2 D. Question

Check whether the following are perfect cubes?

250

Answer

250

Prime Factorization:

2|250
5|125
5|25
5|5
1

⇒ 250 = 2 × 5 × 5 × 5

There is only one 2 in the factorization.

∴ 250 is not a perfect cube.

2 E. Question

Check whether the following are perfect cubes?

1000

Answer

1000

Prime Factorization:

2|1000
2|500
2|250
5|125
5|25
5|5
1

⇒ 1000 = (2 × 2 × 2) × (5 × 5 × 5)

$= 2^3 \times 5^3$

$= (2 \times 5)^3$

$= 10^3$

∴ 1000 is a perfect cube.

2 F. Question

Check whether the following are perfect cubes?

900

Answer

900

Prime Factorization:

3|900
3|300
2|100
2|50
5|25
5|5
1

⇒ 900 = 3 × 3 × 2 × 2 × 5 × 5

There are only two 3's, 2's and 5's.

∴ 900 is not a perfect cube.

∴ ii, iii and v are perfect cubes.

3 A. Question

Which of the following numbers are not perfect cubes?

128

Answer

128

Prime Factorization:

2|128
2|64
2|32
2|16
2|8
2|4
2|2
1

⇒ 128 = 2 × 2 × 2 × 2 × 2 × 2 × 2

$= 2^3 \times 2^3 \times 2$

There is only one 2.

∴ 128 is not a perfect cube.

3 B. Question

Which of the following numbers are not perfect cubes?

100

Answer

100

Prime Factorization:

2|100
2|50
5|25
5|5
1

⇒ 100 = 2 × 2 × 5 × 5

There are only two 2's and two 5's.

Hence, 100 is not a perfect cube.

3 C. Question

Which of the following numbers are not perfect cubes?

64

Answer

64

Prime Factorization:

2|64
2|32
2|16
2|8
2|4
2|2
1

⇒ 64 = 2 × 2 × 2 × 2 × 2 × 2

$= 2^3 \times 2^3$

$= 4^3$

∴ 64 is a perfect cube.

3 D. Question

Which of the following numbers are not perfect cubes?

125

Answer

125

Prime factorization:

5|125
5|25
5|5
1

⇒ $125 = 5 \times 5 \times 5 = 5^3$

∴ 125 is a perfect cube.

3 E. Question

Which of the following numbers are not perfect cubes?

72

Answer

72

Prime Factorization:

2|72
2|36
2|18
3|9
3|3
1

⇒ 72 = 2 × 2 × 2 × 3 × 3

$= 2^3 \times 3^2$

There are only two 3's.

∴ 72 is not a perfect cube.

3 F. Question

Which of the following numbers are not perfect cubes?

625

Answer

625

Prime Factorization:

5|625
5|125
5|25
5|5
1

⇒ 625 = 5 × 5 × 5 × 5

$= 5^3 \times 5$

There is only one 5.

∴ 625 is not a perfect cube.

∴ i, ii, v, vi are not perfect cubes.

4 A. Question

Find the smallest number by which each of the following number must be divided to obtain a perfect cube.

81

Answer

81

Prime Factorization:

3|81
3|27
3|9
3|3
1

⇒ 81 = 3 × 3 × 3 × 3

$= 3^3 \times 3$

There is only one 3.

∴ 81 is not a perfect cube.

Since in factorization, 3 appear only one time, we should divide the number 81 by 3.

$\Rightarrow 81 \div 3 = 27$

$= 3 \times 3 \times 3$

$= 3^3$ which is a perfect cube

∴ The smallest number by which the number 81 must be divided to obtain a perfect cube is 3.

4 B. Question

Find the smallest number by which each of the following number must be divided to obtain a perfect cube.

128

Answer

128

Prime Factorization:

2|128
2|64
2|32
2|16
2|8
2|4
2|2
1

$\Rightarrow 128 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$= 2^3 \times 2^3 \times 2$

There is only one 2.

∴ 128 is not a perfect cube.

Since in factorization, 2 appear only one time, we should divide the number 128 by 2.

$\Rightarrow 128 \div 2 = 64$

$= 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$= 2^3 \times 2^3$

$= 4^3$ which is a perfect cube

∴ The smallest number by which the number 128 must be divided to obtain a perfect cube is 2.

4 C. Question

Find the smallest number by which each of the following number must be divided to obtain a perfect cube.

135

Answer

135

Prime Factorization:

3|135
3|45
3|15
5|5
1

⇒ 135 = 3 × 3 × 3 × 5

= 3^3 × 5

There is only one 5.

∴ 135 is not a perfect cube.

Since in factorization, 5 appear only one time, we should divide the number 135 by 5.

⇒ 135 ÷ 5 = 27

= 3 × 3 × 3

= 3^3 which is a perfect cube

∴ The smallest number by which the number 135 must be divided to obtain a perfect cube is 5.

4 D. Question

Find the smallest number by which each of the following number must be divided to obtain a perfect cube.

192

Answer

192

Prime Factorization:

2|192
2|96
2|48
2|24
2|12
2|6
3|3
1

⇒ 192 = 2 × 2 × 2 × 2 × 2 × 2 × 3

= 2^3 × 2^3 × 3

There is only one 3.

∴ 192 is not a perfect cube.

Since in factorization, 3 appear only one time, we should divide the number 192 by 3.

$\Rightarrow 192 \div 3 = 64$

$= 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$= 2^3 \times 2^3$

$= 4^3$ which is a perfect cube

∴ The smallest number by which the number 192 must be divided to obtain a perfect cube is 3.

4 E. Question

Find the smallest number by which each of the following number must be divided to obtain a perfect cube.

704

Answer

704

Prime Factorization:

2 |704
2 |352
2 |176
2 |88
2 |44
2 |22
11|11
1

$\Rightarrow 704 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 11$

$= 2^3 \times 2^3 \times 11$

There is only one 11.

∴ 704 is not a perfect cube.

Since in factorization, 11 appear only one time, we should divide the number 704 by 11.

$\Rightarrow 704 \div 11 = 64$

$= 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$= 2^3 \times 2^3$

$= 4^3$ which is a perfect cube

∴ The smallest number by which the number 704 must be divided to obtain a perfect cube is 11.

4 F. Question

Find the smallest number by which each of the following number must be divided to obtain a perfect cube.

625

Answer

625

Prime Factorization:

5|625
5|125
5|25
5|5
1

⇒ 625 = 5 × 5 × 5 × 5

= 5^3 × 5

There is only one 5.

∴ 625 is not a perfect cube.

Since in factorization, 5 appear only one time, we should divide the number 625 by 5.

⇒ 625 ÷ 5 = 125

= 5 × 5 × 5

= 5^3

∴ The smallest number by which the number 625 must be divided to obtain a perfect cube is 5.

5 A. Question

Find the smallest number by which each of the following number must be multiplied to obtain a perfect cube.

243

Answer

243

Prime Factorization:

3|243
3|81
3|27
3|9
3|3
1

⇒ 243 = 3 × 3 × 3 × 3 × 3

= 3^3 × 3^2

There are only two 3's.

∴ 243 is not a perfect cube.

To make it a perfect cube, we multiply it with 3.

⇒ 243 × 3 = 729

= 3 × 3 × 3 × 3 × 3 × 3

= 3^3 ×3^3 which is a perfect cube

∴ The smallest number by which the number 243 must be multiplied to obtain a perfect cube is 3.

5 B. Question

Find the smallest number by which each of the following number must be multiplied to obtain a perfect cube.

256

Answer

256

Prime Factorization:

2|256
2|128
2|64
2|32
2|16
2|8
2|4
2|2
1

⇒ 256 = 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2

$= 2^3 \times 2^3 \times 2^2$

There are only two 2's.

∴ 256 is not a perfect cube.

To make it a perfect cube, we multiply with 2.

⇒ 256 × 2 = 512

= 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2

$= 2^3 \times 2^3 \times 2^3$

$= 8^3$ which is a perfect cube

∴ The smallest number by which the number 256 must be multiplied to obtain a perfect cube is 2.

5 C. Question

Find the smallest number by which each of the following number must be multiplied to obtain a perfect cube.

72

Answer

72

Prime Factorization:

2|72
2|36
2|18
3|9
3|3
1

⇒ 72 = 2 × 2 × 2 × 3 × 3

= $2^3 \times 3^2$

There are only two 3's.

∴ 72 is not a perfect cube.

To make it a perfect cube, we have to multiply with 3.

⇒ 72 × 3 = 2 × 2 × 2 × 3 × 3 × 3

⇒ 216 = $2^3 \times 3^3$

= 6^3 which is a perfect cube.

∴ The smallest number by which 72 must be multiplied to obtain a perfect cube is 3.

5 D. Question

Find the smallest number by which each of the following number must be multiplied to obtain a perfect cube.

675

Answer

675

Prime Factorization:

5|675
5|135
3|27
3|9
3|3
1

⇒ 675 = 5 × 5 × 3 × 3 × 3

= $3^3 \times 5^2$

There are only two 5's.

∴ 675 is not a perfect cube.

To make it a perfect cube, we multiply with 5.

⇒ 675 × 5 = 3375

= 5 × 5 × 5 × 3 × 3 × 3

= $3^3 \times 5^3$

= 15^3 which is a perfect cube

∴ The smallest number by which the number 675 must be multiplied to obtain a perfect cube is 5.

5 E. Question

Find the smallest number by which each of the following number must be multiplied to obtain a perfect cube.

100

Answer

100

Prime Factorization:

2|100
2|50
5|25
5|5
1

⇒ 100 = 2 × 2 × 5 × 5

There are only two 2's and two 5's.

Hence, 100 is not a perfect cube.

To make it a perfect cube, we have to multiply it with 2 × 5 = 10.

⇒ 100 × 2 × 5 = 2 × 2 × 2 × 5 × 5 × 5

⇒ 1000 = $2^3 \times 5^3$

= 10^3 which is a perfect cube.

∴ The smallest number by which 100 must be multiplied to obtain a perfect cube is 10.

6 A. Question

Find the cube root of each of the following numbers by prime Factorization method:

729

Answer

729

Prime Factorization:

3|729
3|243
3|81
3|27
3|9
3|3
1

⇒ $\sqrt[3]{729} = (729)^{1/3}$

= $((3 \times 3 \times 3) \times (3 \times 3 \times 3))^{1/3}$

= $(3^3 \times 3^3)^{1/3}$

$= (9^3)^{1/3}$

We know that by laws of exponents, $(a^m)^n = a^{mn}$.

$\therefore \sqrt[3]{729} = 9$

6 B. Question

Find the cube root of each of the following numbers by prime Factorization method:

343

Answer

343

Prime Factorization:

7|343
7|49
7|7
1

$\Rightarrow \sqrt[3]{343} = (343)^{1/3}$

$= (7 \times 7 \times 7)^{1/3}$

$= (7^3)^{1/3}$

We know that by laws of exponents, $(a^m)^n = a^{mn}$.

$\therefore \sqrt[3]{343} = 7$

6 C. Question

Find the cube root of each of the following numbers by prime Factorization method:

512

Answer

512

Prime Factorization:

2|512
2|256
2|128
2|64
2|32
2|16
2|8
2|4
2|2
1

$\Rightarrow \sqrt[3]{512} = (512)^{1/3}$

$= ((2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2))^{1/3}$

$= (2^3 \times 2^3 \times 2^3)^{1/3}$

$= (8^3)^{1/3}$

We know that by laws of exponents, $(a^m)^n = a^{mn}$.

$\therefore \sqrt[3]{512} = 8$

6 D. Question

Find the cube root of each of the following numbers by prime Factorization method:

0.064

Answer

0.064

$\Rightarrow \sqrt[3]{0.064} = \sqrt[3]{\frac{64}{1000}}$

$= \sqrt[3]{\frac{(2 \times 2 \times 2) \times (2 \times 2 \times 2)}{(2 \times 2 \times 2) \times (5 \times 5 \times 5)}}$

$= \sqrt[3]{\frac{2^3 \times 2^3}{2^3 \times 5^3}}$

$= \sqrt[3]{\frac{4^3}{10^3}}$

$= \frac{\sqrt[3]{4^3}}{\sqrt[3]{10^3}}$

$= \frac{4}{10}$

$= 0.4$

$\therefore \sqrt[3]{0.064} = 0.4$

6 E. Question

Find the cube root of each of the following numbers by prime Factorization method:

0.216

Answer

0.216

$\Rightarrow \sqrt[3]{0.216} = \sqrt[3]{\frac{216}{1000}}$

$= \sqrt[3]{\frac{(2 \times 2 \times 2) \times (3 \times 3 \times 3)}{(2 \times 2 \times 2) \times (5 \times 5 \times 5)}}$

$= \sqrt[3]{\frac{2^3 \times 3^3}{2^3 \times 5^3}}$

$= \sqrt[3]{\frac{6^3}{10^3}}$

$= \frac{\sqrt[3]{6^3}}{\sqrt[3]{10^3}}$

$= \frac{6}{10}$

= 0.6

$\therefore \sqrt[3]{0.216} = 0.6$

6 F. Question

Find the cube root of each of the following numbers by prime Factorization method:

$5\frac{23}{64}$

Answer

$5\frac{23}{64}$

$5\frac{23}{64}$ can be written as $\frac{343}{64}$

$\Rightarrow \sqrt[3]{\frac{343}{64}} = \sqrt[3]{\frac{(7\times7\times7)}{(2\times2\times2)\times(2\times2\times2)}}$

$= \sqrt[3]{\frac{7^3}{2^3\times2^3}}$

$= \sqrt[3]{\frac{7^3}{4^3}}$

$= \frac{\sqrt[3]{7^3}}{\sqrt[3]{4^3}}$

$= \frac{7}{4}$

= 1.75

$\therefore \sqrt[3]{\frac{343}{64}} = 1.75$

6 G. Question

Find the cube root of each of the following numbers by prime Factorization method:

– 1.331

Answer

-1.331

$\Rightarrow \sqrt[3]{-1.331} = \sqrt[3]{-\frac{1331}{1000}}$

$= \sqrt[3]{-\frac{(11\times11\times11)}{(2\times2\times2)\times(5\times5\times5)}}$

$= \sqrt[3]{-\frac{11^3}{2^3\times5^3}}$

$= \sqrt[3]{-\frac{11^3}{10^3}}$

$= \frac{\sqrt[3]{-11^3}}{\sqrt[3]{10^3}}$

We know that cube root of a negative number is negative.

$= \frac{-11}{10}$

= -1.1

$\therefore \sqrt[3]{-1.331}$ = -1.1

6 H. Question

Find the cube root of each of the following numbers by prime Factorization method:

– 27000

Answer

-27000

-27000 can be written as -27 × 1000.

Prime Factorization of 27:

3|27
3|9
3|3
1

⇒ 27 = 3 × 3 × 3

$= 3^3$

Prime Factorization of 1000:

2|1000
2|500
2|250
5|125
5|25
5|5
1

⇒ 1000 = (2 × 2 × 2) × (5 × 5 × 5)

$= (2^3 \times 5^3)$

$= 10^3$

$\Rightarrow \sqrt[3]{-27000} = (-27 \times 1000)^{1/3}$

$= (-3^3 \times 10^3)^{1/3}$

$= (-30^3)^{1/3}$

We know that by laws of exponents, $(a^m)^n = a^{mn}$.

We know that cube root of a negative number is negative.

$\therefore \sqrt[3]{-27000}$ = -30

7. Question

The volume of a cubical box is 19.683 cu. cm. Find the length of each side of the box.

Answer

We know that the Volume of a cube = a^3 where a is the side of the cube.

But given Volume of cube = 19.683 cm^3

$\Rightarrow a^3 = 19.683$

$\Rightarrow a = \sqrt[3]{19.683}$

$\Rightarrow \sqrt[3]{19.683} = \sqrt[3]{\frac{19683}{1000}}$

$= \sqrt[3]{\frac{(3\times3\times3)\times(3\times3\times3)\times(3\times3\times3)}{(2\times2\times2)\times(5\times5\times5)}}$

$= \sqrt[3]{\frac{3^3\times3^3\times3^3}{2^3\times5^3}}$

$= \sqrt[3]{\frac{9^3}{10^3}}$

$= \frac{\sqrt[3]{9^3}}{\sqrt[3]{10^3}}$

$= \frac{9}{10}$

$= 0.9$

$\therefore \sqrt[3]{19.683} = 0.9 = a$

$\therefore$ The length of each side of the box = 0.9 cm.

Exercise 1.8

1 A. Question

Express the following correct to two decimal places:

12.568

Answer

12.568

It is 12.57 correct to two decimal places.

Since the last digit 8 > 5, we add 1 to 6 and make it 7.

$\therefore$ 12.568 $\approx$ 12.57 (correct to two decimal places)

1 B. Question

Express the following correct to two decimal places:

25.416 kg

Answer

25.416 kg

It is 25.42 kg correct to two decimal places.

Since the last digit 6 > 5, we add 1 to 1 and make it 2.

$\therefore$ 25.416 $\approx$ 25.42 kg (correct to two decimal places)

1 C. Question

Express the following correct to two decimal places:

39.927 m

Answer

39.927 m

It is 39.93 m correct to two decimal places.

Since the last digit 7 > 5, we add 1 to 2 and make it 3.

∴ 39.927 ≈ 39.93 m (correct to two decimal places)

1 D. Question

Express the following correct to two decimal places:

56.596 m

Answer

56.596 m

It is 56.60 m correct to two decimal places.

Since the last digit 6 > 5, we add 1 to 59 and make it 60.

∴ 56.596 ≈ 56.60 m (correct to two decimal places)

1 E. Question

Express the following correct to two decimal places:

41.056 m

Answer

41.056 m

It is 41.06 m correct to two decimal places.

Since the last digit 6 > 5, we add 1 to 5 and make it 6.

∴ 41.056 ≈ 41.06 m (correct to two decimal places)

1 F. Question

Express the following correct to two decimal places:

729.943 km

Answer

729.943 km

It is 729.94 km correct to two decimal places.

Since the last digit 3 < 5, so we leave 4 as it is.

∴ 729.943 ≈ 729.94 km (correct to two decimal places)

2 A. Question

Express the following correct to three decimal places:

0.0518 m

Answer

0.0518 m

It is 0.052 m correct to three decimal places.

Since the last digit 8 > 5, we add 1 to 1 and make it 2.

∴ 0.0518 ≈ 0.052 m (correct to three decimal places)

2 B. Question

Express the following correct to three decimal places:

3.5327 km

Answer

3.5327 km

It is 3.533 km correct to three decimal places.

Since the last digit 7 > 5, we add 1 to 2 and make it 3.

∴ 3.5327 ≈ 3.533 km (correct to three decimal places)

2 C. Question

Express the following correct to three decimal places:

58.2936l

Answer

58.2936 l

It is 58.294 l correct to three decimal places.

Since the last digit 6 > 5, we add 1 to 3 and make it 4.

∴ 58.2936 ≈ 58.294 l (correct to three decimal places)

2 D. Question

Express the following correct to three decimal places:

0.1327 gm

Answer

0.1327 gm

It is 0.133 gm correct to three decimal places.

Since the last digit 7 > 5, we add 1 to 2 and make it 3.

∴ 0.1327 ≈ 0.133 gm (correct to three decimal places)

2 E. Question

Express the following correct to three decimal places:

365.3006

Answer

365.3006

It is 365.301 correct to three decimal places.

Since the last digit 6 > 5, we add 1 to 0 and make it 1.

∴ 365.3006 ≈ 365.301 (correct to three decimal places)

2 F. Question

Express the following correct to three decimal places:

100.1234

Answer

100.1234

It is 100.123 correct to three decimal places.

Since the last digit 4 < 5, so we leave 3 as it is.

∴ 100.1234 ≈ 100.123 (correct to three decimal places)

3 A. Question

Write the approximate value of the following numbers to the accuracy stated:

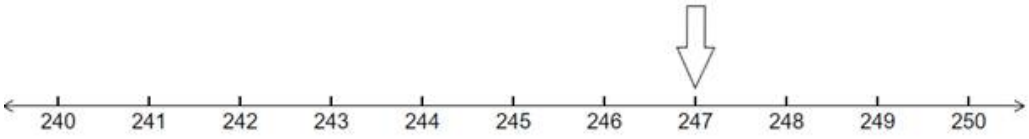
247 to the nearest ten.

Answer

247 to the nearest ten.

Consider multiples of 10 before and after 247 (i.e. 240 and 250).

We find that 247 is nearer to 250 than to 240.



∴ The approximate value of 247 is 250.

3 B. Question

Write the approximate value of the following numbers to the accuracy stated:

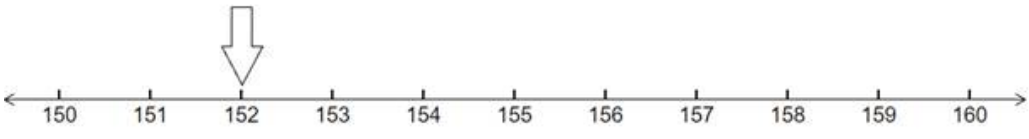
152 to the nearest ten.

Answer

152 to the nearest ten.

Consider multiples of 10 before and after 152 (i.e. 150 and 160).

We find that 152 is nearer to 150 than to 160.



∴ The approximate value of 152 is 150.

3 C. Question

Write the approximate value of the following numbers to the accuracy stated:

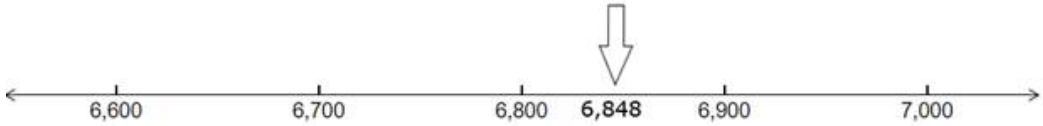
6848 to the nearest hundred.

Answer

6848 to the nearest hundred.

Consider multiples of 100 before and after 6848 (i.e. 6800 and 6900).

We find that 6848 is nearer to 6800 than to 6900.



∴ The approximate value of 6848 is 6800.

3 D. Question

Write the approximate value of the following numbers to the accuracy stated:

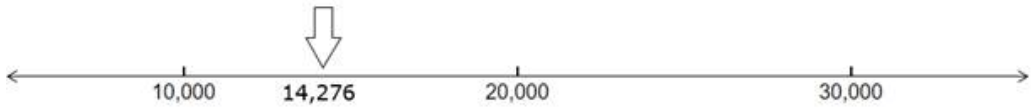
14276 to the nearest ten thousand.

Answer

14276 to the nearest ten thousand.

Consider multiples of 10, 000 before and after 14276 (i.e. 10, 000 and 20, 000).

We find that 14276 is nearer to 10, 000 than to 20, 000.



∴ The approximate value of 14276 is 10, 000.

3 E. Question

Write the approximate value of the following numbers to the accuracy stated:

3576274 to the nearest Lakhs.

Answer

3576274 to the nearest Lakhs.

Consider multiples of 1 lakh (1, 00, 000) before and after 3576274 (i.e. 35 lakhs and 36 lakhs).

We find that 3576274 is nearer to 36, 00, 000 than to 35, 00, 000.

∴ The approximate value of 3576274 is 36, 00, 000 i.e. 36 lakhs.

3 F. Question

Write the approximate value of the following numbers to the accuracy stated:

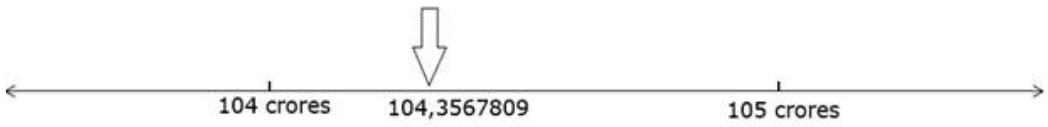
104, 3567809 to the nearest crore

Answer

104, 3567809 to the nearest crore

Consider multiples of 1 crore (1, 00, 00, 000) before and after 104, 3567809 (i.e. 104 crores and 105 crores).

We find that 104, 3567809 is nearer to 104 crores than to 105 crores.



∴ The approximate value of 104, 3567809 is 104 crores.

4 A. Question

Round off the following numbers to the nearest integer:

22.266

Answer

i. 22.266

Here, the hundredth place 2 < 5, so the number is left as it is.

∴ 22.266 ≈ 22

4 B. Question

Round off the following numbers to the nearest integer:

777.43

Answer

777.43

Here, the tenth place 4 < 5, so the number is left as it is.

∴ 777.43 ≈ 777

4 C. Question

Round off the following numbers to the nearest integer:

402.06

Answer

402.06

Here, the tenth place 0 < 5, so the number is left as it is.

∴ 402.06 ≈ 402

4 D. Question

Round off the following numbers to the nearest integer:

305.85

Answer

305.85

Here, the tenth place 8 > 5, so the integer value is increased by 1.

∴ 305.85 ≈ 306

4 E. Question

Round off the following numbers to the nearest integer:

299.77

Answer

299.77

Here, the tenth place 7 > 5, so the integer value is increased by 1.

∴ 299.77 ≈ 300

4 F. Question

Round off the following numbers to the nearest integer:

9999.9567

Answer

9999.9567

Here, the thousandth place 9 > 5, so the integer value is increased by 1.

∴ 9999.9567 ≈ 10000

Exercise 1.9

1 A. Question

Complete the following patterns:

40, 35, 30, ___, ___, ___.

Answer

40, 35, 30, ___, ___, ___.

Here, each term is 5 less than the previous term.

⇒ The next three terms are: 30 – 5 = 25

25 – 5 = 20

20 – 5 = 15

∴ The pattern is 40, 35, 30, 25, 20, 15.

1 B. Question

Complete the following patterns:

0, 2, 4, ___, ___, ___.

Answer

0, 2, 4, ___, ___, ___.

Here, the terms are even numbers.

⇒ The next three terms are: 6, 8, 10.

∴ The pattern is 0, 2, 4, 6, 8, 10.

1 C. Question

Complete the following patterns:

84, 77, 70, ___, ___, ___.

Answer

84, 77, 70, ___, ___, ___.

Here, each term is 7 less than the previous term (or) multiples of 7 in decreasing order starting from 12.

⇒ The next three terms are: 70 – 7 = 63

63 – 7 = 56

56 – 7 = 49

∴ The pattern is 84, 77, 70, 63, 56, 49.

1 D. Question

Complete the following patterns:

4.4, 5.5, 6.6, ___, ___, ___.

Answer

4.4, 5.5, 6.6, ___, ___, ___.

Here, each term is 1.1 more than the previous term.

⇒ The next three terms are: 6.6 + 1.1 = 7.7

7.7 + 1.1 = 8.8

8.8 + 1.1 = 9.9

∴ The pattern is 4.4, 5.5, 6.6, 7.7, 8.8, 9.9.

1 E. Question

Complete the following patterns:

1, 3, 6, 10, ___, ___, ___.

Answer

1, 3, 6, 10, ___, ___, ___.

Here, each term is (n + 1) more than the previous term starting from n = 2.

⇒ The next three terms are: 10 + 5 = 15

15 + 6 = 21

21 + 7 = 28

∴ The pattern is 1, 3, 6, 10, 15, 21, 28.

1 F. Question

Complete the following patterns:

1, 1, 2, 3, 5, 8, 13, 21, ___, ___, ___

(This sequence is called FIBONACCI SEQUENCE)

Answer

1, 1, 2, 3, 5, 8, 13, 21, ___, ___, ___

(This sequence is called FIBONACCI SEQUENCE)

Here, the series starts with 1 and the sum of every subsequent term is the sum of previous two.

⇒ The next three terms are: 21 + 13 = 34

34 + 21 = 55

55 + 34 = 89

∴ The pattern is 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89.

1 G. Question

Complete the following patterns:

1, 8, 27, 64, ___, ___, ___.

Answer

1, 8, 27, 64, ___, ___, ___.

Here, the terms are cubes of natural numbers.

⇒ The next three terms are: $5^3 = 125$

$6^3 = 216$

$7^3 = 343$

∴ The pattern is 1, 8, 27, 64, 125, 216, 343.

2. Question

A water tank has steps inside it. A monkey is sitting on the top most step. (ie, the first step) The water level is at the ninth step.

A. He jumps 3 steps down and then jumps back 2 steps up. In how many jumps will he reach the water level?

B. After drinking water, he wants to go back. For this, he jumps 4 steps up and then jumps back 2 steps down in every move. In how many jumps will he reach back the top step?

Answer

Let the steps moved down be represented by positive integers and the steps moved up be the negative integers.

A. First, the monkey is at = 1^{st} step

Jump	Step
1	1 + 3 = 4
2	4 + (-2) = 2
3	2 + 3 = 5
4	5 + (-2) = 3
5	3 + 3 = 6
6	6 + (-2) = 4
7	4 + 3 = 7
8	7 + (-2) = 5
9	5 + 3 = 8
10	8 + (-2) = 6
11	6 + 3 = 9

∴ The monkey will be at water level i.e. 9^{th} step after 11 jumps.

B. Now, the monkey is at = 9^{th} step

Jump	Step
1	9 + (-4) = 5
2	5 + 2 = 7
3	7 + (-4) = 3
4	3 + 2 = 5
5	5 + (-4) = 1

∴ The monkey will reach back at the top step after 5 jumps.

3. Question

A vendor arranged his apples as in the following pattern:

A. If there are ten rows of apples, can you find the total number of apples without actually counting?

B. If there are twenty rows, how many apples will be there in all?

Can you recognize a pattern for the total number of apples? Fill this chart and try!

Rows	1	2	3	4	5	6	7	8	9
Total apples	1	3	6	10	15				

Answer

Given in the pattern of apples arranged,

1^{st} row = 1 apple, 2^{nd} row = 2 apples, 3^{rd} row = 3 apples and 4^{th} row = 4 apples and so on.

So, this can be expressed as 1 + 2 + 3 + 4 + ...

We know that sum of numbers from 1 to n is $\frac{n(n+1)}{2}$.

A. We have to find the total number of apples in 10 rows.

Here n = 10.

∴ Number of apples in 10 rows = $\frac{10(10+1)}{2} = \frac{110}{2}$ = 55 apples

B. We have to find the total number of apples in 20 rows.

Here n = 20.

∴ Number of apples in 20 rows = $\frac{20(20+1)}{2} = \frac{420}{2}$ = 210 apples

Here, the series starts with 1 and the sum of every subsequent term is the sum of previous two. (Fibonacci series)

Rows	Total apples
1	1
2	3 (1 + 2)
3	6 (3 + 3)
4	10 (6 + 4)
5	15 (10 + 5)
6	15 + 6 = 21
7	21 + 7 = 28
8	28 + 8 = 36
9	36 + 9 = 45