Question:1

Write each of the following in power notation:

i $\frac{5}{7} \times \frac{5}{7} \times \frac{5}{7} \times \frac{5}{7}$

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

iii $\left(\frac{-1}{6}\right) \times \left(\frac{-1}{6}\right) \times \left(\frac{-1}{6}\right)$

iv $-8 \times -8 \times -8 \times -8 \times -8$

Solution:

i $\frac{5}{7} \times \frac{5}{7} \times \frac{5}{7} \times \frac{5}{7} = \left(\frac{5}{7}\right)^4$

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

iii $\left(\frac{-1}{6}\right) \times \left(\frac{-1}{6}\right) \times \left(\frac{-1}{6}\right) = \left(\frac{-1}{6}\right)^3$

iv $(-8) \times (-8) \times (-8) \times (-8) \times (-8) = (-8)^5$

Question:2

Express each of the following in power notation:

i $\frac{25}{36}$

ii $\frac{-27}{64}$

iii $\frac{-32}{243}$

iv $\frac{-1}{128}$

Solution:

i $\frac{25}{36} = \frac{5^2}{6^2}$ [since 25 = 5^2 and 36 = 6^2]

   $= \left(\frac{5}{6}\right)^2$

ii $\frac{-27}{64} = \frac{(-3)^3}{4^3}$ [since –27 = $(-3)^3$ and 64 = 4^3]

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

iii $\frac{-32}{243} = \frac{(-2)^5}{3^5}$ [since –32 = $(-2)^5$ and 243 = 3^5]

   $= \left(\frac{-2}{3}\right)^5$

$iv \ \frac{-1}{128} = \frac{(-1)^7}{2^7}$ [since $(-1)^7 = -1$ and $128 = 2^7$]

$= \left(\frac{-1}{2}\right)^7$

Question:3

Express each of the following as a rational number:

$i \ \left(\frac{2}{3}\right)^5$

$ii \ \left(\frac{-8}{5}\right)^3$

$iii \ \left(\frac{-13}{11}\right)^2$

$iv \ \left(\frac{1}{6}\right)^3$

$v \ \left(\frac{-1}{2}\right)^5$

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

$vii \ \left(\frac{-4}{7}\right)^3$

$viii \ -1_9$

Solution:

$i \ \left(\frac{2}{3}\right)^5 = \frac{(2)^5}{(3)^5} = \frac{2\times2\times2\times2\times2}{3\times3\times3\times3\times3} = \frac{32}{243}$

$ii \ \left(\frac{-8}{5}\right)^3 = \frac{(-8)^3}{(5)^3} = \frac{(-8)\times(-8)\times(-8)}{5\times5\times5} = \frac{-512}{125}$

$iii \ \left(\frac{-13}{11}\right)^2 = \frac{(-13)^2}{(11)^2} = \frac{(-13)\times(-13)}{11\times11} = \frac{169}{121}$

$iv \ \left(\frac{1}{6}\right)^3 = \frac{(1)^3}{(6)^3} = \frac{1\times1\times1}{6\times6\times6} = \frac{1}{216}$

$v \ \left(\frac{-1}{2}\right)^5 = \frac{(-1)^5}{(2)^5} = \frac{(-1)\times(-1)\times(-1)\times(-1)\times(-1)}{2\times2\times2\times2\times2} = \frac{-1}{32}$

$vi \ \left(\frac{-3}{2}\right)^4 = \frac{(-3)^4}{(2)^4} = \frac{(-3)\times(-3)\times(-3)\times(-3)}{2\times2\times2\times2} = \frac{81}{16}$

$vii \ \left(\frac{-4}{7}\right)^3 = \frac{(-4)^3}{(7)^3} = \frac{(-4)\times(-4)\times(-4)}{7\times7\times7} = \frac{-64}{343}$

$viii \ (-1)^9 = -1$ [Since (-1) $^{\text{an odd natural number}}$ = -1]

Question:4

Express each of the following as a rational number:

i 4^{-1}

ii -6^{-1}

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

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

Solution:

i $(4)^{-1} = \left(\frac{4}{1}\right)^{-1} = \left(\frac{1}{4}\right)^{1} = \frac{1}{4}$ [since $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^{n}$]

ii $(-6)^{-1} = \left(\frac{-6}{1}\right)^{-1} = \left(\frac{1}{-6}\right)^{1} = \frac{-1}{6}$ [since $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^{n}$]

iii $\left(\frac{1}{3}\right)^{-1} = \left(\frac{3}{1}\right)^{1} = \frac{3}{1}$ [since $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^{n}$]

iv $\left(\frac{-2}{3}\right)^{-1} = \left(\frac{3}{-2}\right)^{1} = \frac{-3}{2}$ [since $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^{n}$]

Question:5

Find the reciprocal of each of the following:

i $\left(\frac{3}{8}\right)^{4}$

ii $\left(\frac{-5}{6}\right)^{11}$

iii 6^{7}

iv -4^{3}

Solution:

We know that the reciprocal of $\left(\frac{a}{b}\right)^{m}$ is $\left(\frac{b}{a}\right)^{m}$.

i Reciprocal of $\left(\frac{3}{8}\right)^{4} = \left(\frac{8}{3}\right)^{4}$

ii Reciprocal of $\left(\frac{-5}{6}\right)^{11} = \left(\frac{-6}{5}\right)^{11}$

iii Reciprocal of 6^{7} = Reciprocal of $\left(\frac{6}{1}\right)^{7} = \left(\frac{1}{6}\right)^{7}$

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

Question:6

Find the value of each of the following:

$i \; 8^0$

$ii \; -3^0$

$iii \; 4^0 + 5^0$

$iv \; 6^0 \times 7^0$

Solution:

$i \; 8^0 = 1$

$ii \; -3^0 = 1$

$iii \; 4^0 + 5^0 = 1 + 1 = 2$

$iv \; 6^0 \times 7^0 = 1 \times 1 = 1$

Note: $a^0 = 1$

Question:7

Simplify each of the following and express each as a rational number:

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

ii

iii

iv

v

Solution:

i

ii

$=$

iii

$=$

iv

v

Question:8

Simplify and express each as a rational number:

i
ii
iii

Solution:

i

$$= =$$

(ii)

$$=$$

$$=$$

$$=$$

iii

$$=$$

$$=$$

$$=$$

Question:9

Express each of the following as a rational number:

i 5^{-3}

ii -2^{-5}

iii

iv

v

vi

vii $(5^{-1}-7^{-1})^{-1}$

viii

ix

x

Solution:

Note:

i $5^{-3} =$

ii $-2^{-5} =$

iii

iv $=$

v

vi

vii

$=$

viii $=$

ix

x   [since $a^0 = 1$ for every integer a]

Question:10
Simplify:

i

ii

iii

iv

Solution:

i

ii

$$=$$

$$= \qquad \text{[since } (-2)^6 = 64 \text{ and } 3^6 = 729]$$

iii

$$=$$

iv

$$=$$

Question:11

By what number should -5^{-1} be multiplied so that the product is 8^{-1}?

Solution:

Let the required number be x.

$-5^{-1} x = 8^{-1}$

$\Rightarrow$

$\therefore x = =$

Hence, the required number is .

Question:12

By what number should 3^{-3} be multiplied to obtain 4?

Solution:

Let the required number be x.

$3^{-3} \times x = 4$

$\Rightarrow$

$\Rightarrow$

$\therefore x = 4 \times 27 = 108$

Hence, the required number is 108.

Question:13

By what number should -30^{-1} be divided to get 6^{-1}?

Solution:

Let the required number be x.

$-30^{-1} \div x = 6^{-1}$

$\Rightarrow$

$\Rightarrow$

$\therefore x =$

         $=$

Hence, the required number is .

Question:14

Find x such that .

Solution:

$\Rightarrow$

$\Rightarrow$

On equating the exponents:

$-3 = 2x - 1$

$\Rightarrow 2x = -3 + 1$

$\Rightarrow 2x = -2$

$\therefore x =$

Question:15

Simplify: .

Solution:

Question:16

Simplify: .

Solution:

⇒

⇒

⇒

⇒

Question:17

Find the value of *n* when:

i $5^{2n} \times 5^3 = 5^9$

ii $8 \times 2^{n+2} = 32$

iii $6^{2n+1} \div 36 = 6^3$

Solution:

i $5^{2n} \times 5^3 = 5^9$

$5^{2n+3} = 5^9$　　　[since $a^n \times a^m = a^{m+n}$]

On equating the coefficients:

2n + 3 = 9

⇒ 2n = 9 – 3

⇒ 2n = 6

∴ n =

ii $8 \times 2^{n+2} = 32$

⇒ $2^3 \times 2^{n+2} = 2^5$　　[since $2^3 = 8$ and $2^5 = 32$]

⇒ $2^{3+ n+2} = 2^5$

On equating the coefficients:

3 + n + 2 = 5

⇒ n + 5 = 5

⇒ n = 5 – 5

∴ n = 0

iii $6^{2n+1} \div 36 = 6^3$

$\Rightarrow 6^{2n+1} \div 6^2 = 6^3$ [since $36 = 6^2$]

$\Rightarrow$

$\Rightarrow$ [since]

$\Rightarrow 6^{2n-1} = 6^3$

On equating the coefficients:

$2n - 1 = 3$

$\Rightarrow 2n = 3 + 1$

$\Rightarrow 2n = 4$

$\therefore n =$

Question:18

If $2^{n-7} \times 5^{n-4} = 1250$, find the value on n.

Solution:

$\Rightarrow$ [since $1250 = 2 \times 5^4$]

$\Rightarrow$

$\Rightarrow$ using cross multiplication

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

$\Rightarrow$

$\Rightarrow$ [since $a^n \times b^n = a \times b^n$]

$\Rightarrow$

$\Rightarrow n = 8$

Question:19

Express each of the following numbers in standard form:

i 538

ii 6428000

iii 82934000000

iv 940000000000

v 23000000

Solution:

i $538 = 5.38 \ 10^2$ since the decimal point is moved 2 places to the left

ii $6428000 = 6.428 \ 10^6$ since the decimal point is moved 6 places to the left

iii $82934000000 = 8.2934 \ 10^{10}$ since the decimal point is moved 10 places to the left

iv $940000000000 = 9.4 \times 10^{11}$ since the decimal point is moved 11 places to the left

v $23000000 = 2.3 \times 10^{7}$ since the decimal point is moved 7 places to the left

Question:20

Express each of the following numbers in standard form:

i Diameter of Earth = 12756000 m.
ii Distance between Earth and Moon = 384000000 m.
iii Population of India in March 2001 = 1027000000.
iv Number of stars in a galaxy = 100000000000.
v The present age of universe = 12000000000 years

Solution:

i Diameter of the Earth = 1.2756×10^{7} m

    since the decimal point is moved 7 places to the left

ii Distance between the Earth and the Moon = 3.84×10^{8} m

    since the decimal point is moved 8 places to the left

iii Population of India in March 2001 = 1.027×10^{9}

    since the decimal point is moved 9 places to the left

iv Number of stars in a galaxy = 1.0×10^{11}

    since the decimal point is moved 11 places to the left

v Present age of the universe = 1.2×10^{10} years

    since the decimal point is moved 10 places to the left

Question:21

Write the following numbers in expanded form:

i 684502
ii 4007185
iii 5807294
iv 50074

Solution:

i $684502 = 6 \times 10^{5} + 8 \times 10^{4} + 4 \times 10^{3} + 5 \times 10^{2} + 0 \times 10^{1} + 2 \times 10^{0}$

ii $4007185 = 4 \times 10^6 + 0 \times 10^5 + 0 \times 10^4 + 7 \times 10^3 + 1 \times 10^2 + 8 \times 10^1 + 5 \times 10^0$

iii $5807294 = 5 \times 10^6 + 8 \times 10^5 + 0 \times 10^4 + 7 \times 10^3 + 2 \times 10^2 + 9 \times 10^1 + 4 \times 10^0$

iv $50074 = 5 \times 10^4 + 0 \times 10^3 + 0 \times 10^2 + 7 \times 10^1 + 4 \times 10^0$

Note: $a^0 = 1$

Question:22

Write the numeral whose expanded form is given below:

i $6 \times 10^4 + 3 \times 10^3 + 0 \times 10^2 + 7 \times 10^1 + 8 \times 10^0$

ii $9 \times 10^6 + 7 \times 10^5 + 0 \times 10^4 + 3 \times 10^3 + 4 \times 10^2 + 6 \times 10^1 + 2 \times 10^0$

iii $8 \times 10^5 + 6 \times 10^4 + 4 \times 10^3 + 2 \times 10^2 + 9 \times 10^1 + 6 \times 10^0$

Solution:

i $6 \times 10^4 + 3 \times 10^3 + 0 \times 10^2 + 7 \times 10^1 + 8 \times 10^0$

   = 6 x 10000 + 3 x 1000 + 0 x 100 + 7 x 10 + 8 x 1 = 63078

ii $9 \times 10^6 + 7 \times 10^5 + 0 \times 10^4 + 3 \times 10^3 + 4 \times 10^2 + 6 \times 10^1 + 2 \times 10^0$

   = 9 x 1000000 + 7 x 100000 + 0 x 10000 + 3 x 1000 + 4 x 100 + 6 x 10 + 2 x 1 = 9703462

iii $8 \times 10^5 + 6 \times 10^4 + 4 \times 10^3 + 2 \times 10^2 + 9 \times 10^1 + 6 \times 10^0$

   = 8 x 100000 + 6 x 10000 + 4 x 1000 + 2 x 100 + 9 x 10 + 6 x 1 = 864296

Question:23

Mark ✓ against the correct answer

$(6^{-1} - 8^{-1})^{-1} = ?$

a

b –2

c

d 24

Solution:

d 24

$\quad$ = $\quad$ since L.C.M. of 6 and 8 is 24

$\quad$ =

$\quad$ =

Question:24

Mark ✓ against the correct answer

$(5^{-1} \times 3^{-1})^{-1}$ =?

a

b

c 15

d −15

Solution:

c 15

We have:

=

=

Question:25

Mark ✓ against the correct answer

$(2^{-1} - 4^{-1})^2$ = ?

a 4

b −4

c

d

Solution:

c

We have:

=   since L.C.M. of 2 and 4 is 4

=

=

Question:26

a

b 29

c

d none of these

Solution:

b 29

We have:

$$= (2^2 + 3^2 + 4^2)$$
$$= 4 + 9 + 16$$
$$= 29$$

Question:27

Mark ✓ against the correct answer

a

b

c

d none of these

Solution:

c

We have:

=   since L.C.M. of 3 and 6 is 6

=

=

Question:28

Mark ✓ against the correct answer

a –64

b 64

c

d

Solution:

b 64

We have:

Question:29

Mark ✓ against the correct answer

a

b

c

d

Solution:

b

=	since L.C.M. of 1 and 3 is 3	
=		
=		
=		

Question:30

Mark ✓ against the correct answer

a

b 16

c

d −16

Solution:

a

Question:31

Mark ✓ against the correct answer

a

b 0

c 1

d none of these

Solution:

c 1

$a^0 = 1$

∴

Question:32

Mark ✓ against the correct answer

a

b

c

d

Solution:

b

=

Question:33

Mark ✓ against the correct answer

a

b

c

d

Solution:

b

Question:34

Mark ✓ against the correct answer

a

b

c

d none of these

Solution:

b

We have:

=

Question:35

Mark ✓ against the correct answer

a

b

c

d

Solution:

d

= =

Question:36
Mark ✓ against the correct answer

a
b
c
d none of these

Solution:

a

We have:

=

=

=

=

=

Question:37
Mark ✓ against the correct answer

a
b
c -5^5
d

Solution:

c -5^5

We have:

=

Question:38

Mark ✓ against the correct answer

a

b

c

d

Solution:

a

=

Question:39

Mark ✓ against the correct answer

a

b

c

d

Solution:

c

Question:40

Mark ✓ against the correct answer

a

b

c

d none of these

Solution:

b

We have:

Question:41
Mark ✓ against the correct answer

If , then $x = $?

a

b

c

d

Solution:

c

⇒   [since]

⇒

On equating the coefficients:

$6 = 8x$

∴ $x = $

Question:42
Mark ✓ against the correct answer

By what number should -8^{-1} be multiplied to get 10^{-1}?

a

b

c

d none of these

Solution:

c

Let the required number be x.

$-8^{-1} \times x = 10^{-1}$

⇒

∴ $x = = $

Hence, the required number is .

Question:43

Mark ✓ against the correct answer

Which of the following numbers is in standard form?

a 21.56×10^5

b 215.6×10^4

c 2.156×10^6

d none of these

Solution:

c 2.156×10^6

A given number is said to be in standard form if it can be expressed as $k \times 10^n$, where k is a real number such that $1 \le k < 10$ and n is a positive integer.

For example: 2.156×10^6

Question:44

Write the reciprocal of:

i

ii

iii 2^5

iv -5^6

Solution:

We know that the reciprocal of is .

i Reciprocal of =

ii Reciprocal of

iii Reciprocal of 2^5 = Reciprocal of

iv Reciprocal of -5^6 = Reciprocal of

Question:45

By what number should we multiply -6^{-1} to obtain a product equal to 9^{-1}?

Solution:

Let the required number be x.

$-6^{-1} \times x = 9^{-1}$

⇒

∴ $x =$

Hence, the required number is .

Question:46

By what number should -20^{-1} be divided to obtain -10^{-1}?

Solution:

Let the required number be x.

$-20^{-1} \div x = -10^{-1}$

⇒

⇒

∴ $x =$

Hence, the required number is 2^{-1}.

Question:47

i Express 2000000 in standard form.

ii Express 6.4×10^5 in usual form.

Solution:

i $2000000 = 2.000000 \times 10^6$ since the decimal point is moved 6 places to the left

$= 2 \times 10^6$

ii $6.4 \times 10^5 = 6.4 \times 100000$

$= 640000$

Question:48

Simplify:

Solution:

We have:

⇒

⇒

⇒

⇒

Question:49

If $2^{n-7} \times 5^{n-4} = 1250$, find the value of n.

Solution:

We have:

⇒   [since $1250 = 2 \times 5^4$]

⇒

⇒   using cross multiplication

⇒   [since $a^m \times a^n = a^{m+n}$]

⇒

⇒   [since $a^n \times b^n = a \times b^n$]

⇒

⇒ $n = 8$

Question:50

Mark ✓ against the correct answer

a 0

b

c 1

d none of these

Solution:

c   1

We know:

$a^0 = 1$

∴

Question:51

Mark ✓ against the correct answer

a

b

c

d

Solution:

d

     =

     =

     =

Question:52

Mark ✓ against the correct answer

a
b
c
d

Solution:

b

     =

Question:53

Mark ✓ against the correct answer

a 19
b
c −19
d

Solution:

a 19

$=$

$= 27 - 8 = 19$

Question:54
Mark ✓ against the correct answer

a

b

c

d none of these

Solution:

a

$=$

$=$

$=$

Question:55
Which of the following numbers is in standard form?

a 32.63×10^4

b 326.3×10^3

c 3.263×10^5

d none of these

Solution:

c 3.263×10^5

A given number is said to be in standard form if it can be expressed as $k \times 10^n$, where k is a real number such that $1 \le k < 10$ and n is a positive integer.

For example: 3.263×10^5

Question:56
Fill in the blanks.

i If $9 \times 3^n = 3^6$, then $n = $ ....

ii $8^0 = ?$

iii

iv $-2^{-5} = $ ......

Solution:

i If $9 \times 3^n = 3^6$, then $n = \underline{4}$.

Explanation:

If $9 \times 3^n = 3^6$

$\Rightarrow 3^2 \times 3^n = 3^6$

$\Rightarrow 3^{(2 + n)} = 3^6$

Equating the powers:

$\Rightarrow (2 + n) = 6$

$\Rightarrow n = 6 - 2 = 4$

ii $8^0 = \underline{1}$

Explanation:

By definition, we have $a^0 = 1$ for every integer a.

$\therefore 8^0 = 1$

iii $=$

Explanation:

We know:

iv $-2^{-5} = $

Explanation:

$-2^{-5} = $

$=$

Question:57

Write 'T' for true and 'F' for false for each of the following.

i 645 in standard form is 6.45×10^2.

ii 27000 in standard form is 27×10^3.

iii $(3^0 + 4^0 + 5^0) = 12$.

iv Reciprocal of 5^6 is 6^5.

v If $5^{-1} \times x = 8^{-1}$, then $x = $.

Solution:

i True

$645 = 6.45 \times 10^2$ since the decimal point is moved 2 places to the left

ii False

$27000 = 2.7 \times 10^4$ since the decimal point is moved 4 places to the left

iii False

$(3^0 + 4^0 + 5^0) = 1$ [since $a^0 = 1$ for every integer a]

iv False

Reciprocal of 5^6 = Reciprocal of

v False

$5^{-1} \times x = 8^{-1}$

$\Rightarrow$

$\Rightarrow x =$

Typesetting math: 21%