Section A

1. Out of the following, the number which is not equal to $\frac{-8}{27}$ is

(a) - $\left(\frac{2}{3}\right)^3$ (b) $\left(\frac{-2}{3}\right)^3$ (c) $-\left(\frac{-2}{3}\right)^3$ (d) $\left(\frac{-2}{3}\right) x \left(\frac{-2}{3}\right) x \left(\frac{-2}{3}\right)$

Answer: (c) $-\left(\frac{-2}{3}\right)^3$

2. $(-7)^5 \times (-7)^3$ is equal to

(a) $(-7)^8$ (b) $-(7)^8$ (c) $(-7)^{15}$ (d) $(-7)^2$

Answer: (a) $(-7)^8$

By fundamental of exponents, we know $a^n \times a^m = a^{n+m}$

$\therefore (-7)^5 \times (-7)^3 = (-7)^{5+3} = (-7)^8$

3. For any two non-zero integers x and y, $x^3 \div y^3$ is equal to

(a) $\left(\frac{x}{y}\right)^0$ (b) $\left(\frac{x}{y}\right)^3$ (c) $\frac{x^6}{y}$ (c) $\frac{x^9}{y}$

Answer: $\left(\frac{x}{y}\right)^3$

Using law of exponents,

➔ $\frac{a^m}{y^m} = \left(\frac{a}{b}\right)^m = (a \div b)^m$

$\therefore x^3 \div y^3 = \left(\frac{x}{y}\right)^3$

4. $(5^7 \div 5^6)^2$ = _____

Answer: $(5^7 \div 5^6)^2$

➔ $\left(\frac{5^6 \, x \, 5^1}{5^6}\right)^2 = (5)^2 = 25$

5. $\frac{a^7\ b^3}{a^5 b}$ **=** _____

Answer: $\frac{a^7\ b^3}{a^5 b}$

➔ $\frac{(a^7\ x\ a^2)\ (b^2\ x\ b)}{a^5 b}$ = $a^2b^2 = (ab)^2$

6. The value of $(5^{30} \times 5^{20}) \div (5^5)^9$ in the exponential form is

(a) 5^{-5} (b) 5^5 (c) 5^{50} (d) 5^{95}

Answer:(b) 5^5

➔ $5^{30 + 20} \div 5^{45}$

➔ $\frac{5^{50}}{5^{45}} = 5^{50-45}$

➔ 5^5

7. The value of $5^{-1} – 6^{-1}$ is

(a) $\frac{1}{30}$ (b) $\frac{-1}{30}$ (c) 30 (d) -30

Answer: (a) $\frac{1}{30}$

$5^{-1} – 6^{-1} = \frac{1}{5} - \frac{1}{6} = \frac{6-5}{30} = \frac{1}{30}$

8. If $2^3 + 1^3 = 3^x$, then the value of x is

(a) 0 (b) 1 (c) 2 (d) 3

Answer: (c) 2

$2^3 + 1^3 = 3^x$

➔ $8 + 1 = 3^x$

➔ $9 = 3^x$

➔ $3^2 = 3^x$

➔ $x = 2$

9. if $\left[-\frac{3}{5}\right]^{x} = -\frac{27}{125}$, find the value of x

Answer:

➔ $\left[-\frac{3}{5}\right]^{x} = \left[-\frac{3}{5}\right]^{3}$

Comparing we get

➔ x = 3

Section B

10. Identify the greater number in each of the following:

(i) 4^3 or 3^4

(ii) 4^3 or 5^4

Answer:

(i) 4^3 or 3^4

$4^3 = 4 \times 4 \times 4 = 16$

$3^4 = 3 \times 3 \times 3 \times 3 = 81$

(ii) 4^3 or 5^4

$4^3 = 4 \times 4 \times 4 = 64$

$5^4 = 5 \times 5 \times 5 \times 5 = 125$

11. $\left(\frac{6}{13}\right)^{10} \div \left[\left(\frac{6}{13}\right)^{5}\right]^{2} = \left(\frac{6}{13}\right)^{--}$

Answer: Let (--) be x

$a^n \div a^m = a^{n-m}$, $(a^n)^m = a^{n \times m}$

$\therefore \left(\frac{6}{13}\right)^{10} \div \left[\left(\frac{6}{13}\right)^{5}\right]^{2} = \left(\frac{6}{13}\right)^{x}$

➔ $\left(\frac{6}{13}\right)^{10} \div \left(\frac{6}{13}\right)^{5 \, x \, 2} = \left(\frac{6}{13}\right)^{x}$

➔ $\left(\frac{6}{13}\right)^{10} \div \left(\frac{6}{13}\right)^{10} = \left(\frac{6}{13}\right)^{x}$

➔ $\left(\frac{6}{13}\right)^{10-10} = \left(\frac{6}{13}\right)^{x}$

➔ $\left(\frac{6}{13}\right)^{0} = \left(\frac{6}{13}\right)^{x}$

➔ x = 0

12. $(4x^2y^3)^3 \div (3x^2y^3)^3$

Answer:

➔ $\frac{4^3 \; x \; x^{2\,x\,3} \; x \; y^{3\,x\,3}}{3^3 \; x \; x^{2\,x\,3} \; x \; y^{3\,x\,3}} = \frac{4^3 \; x \; \cancel{x^6} \; x \; \cancel{y^9}}{3^3 \; x \; \cancel{x^6} \; x \; \cancel{y^9}} = \frac{4^3}{3^3} = \frac{64}{27}$

13. Simplify and express the Solution in the positive exponent form : $\frac{(2^3)^5 \; x \; 5^4}{4^3 \; x \; 5^2}$

Answer:

➔ $\frac{(2^3)^5 \; x \; 5^4}{4^3 \; x \; 5^2} = \frac{2^{3x\,5} \; x \; 5^4}{2^3 \; x \; 2^2 \; x \; 5^2} = 2^{15-6} \text{ x } 5^{4-2}$

➔ $2^9 \text{ x } 5^2$

Section C

14. If $m^2 = -2$ and $n = 2$; find the values of: $6m^{-3} + 4n^2$

Answer: $6m^{-3} + 4n^2$

m = -2, n = 2

➔ $6(-2)^{-3} + 4(2)^2$

➔ $6 \text{ x } \frac{1}{-2} \text{ x } \frac{1}{-2} \text{ x } \frac{1}{-2} + 4 \text{ x } 2 \text{ x } 2$

➔ $\frac{-3}{4} + 16 = \frac{-3+16x4}{4} = \frac{61}{4} = 15\frac{1}{4}$

15. Arrange in ascending order: 2^5, 3^3, $2^3 \times 2$, $(3^3)^2$, 3^5, 4^0, $2^3 \times 3^1$

Answer: $2^5 = 2 \text{ x } 2 \text{ x } 2 \text{ x } 2 \text{ x } 2 = 32$

$3^3 = 3 \times 3 = 9$

$2^3 \times 2 = 2 \times 2 \times 2 \times 2 = 16$

$3^5 = 3 \times 3 \times 3 \times 3 \times 3 = 243$

$4^0 = 1$

$2^3 \times 3^{1 =} 2 \times 2 \times 2 \times 3 = 24$

$\therefore 1 < 16 < 24 < 27 < 32 < 243 < 729$

$4^0 < 2^3 \times 2 < 2^3 \times 3^1 < 3^3 < 2^5 < 3^5 < (3^3)^2$

16. if $\frac{p}{q} = \left(\frac{3}{2}\right)^2 \div \left(\frac{9}{4}\right)^0$ find the value of p $\left(\frac{p}{q}\right)^3$

Answer: $\frac{p}{q} = \left(\frac{3}{2}\right)^2 \div \left(\frac{9}{4}\right)^0$

We know that ($a^0 = 1$)

Therefore,

➔ $\frac{p}{q} = \left(\frac{3}{2}\right)^2 \div \left(\frac{9}{4}\right)^0$

➔ $\frac{p}{q} = \left(\frac{3}{2}\right)^2 \div 1$

➔ $\frac{p}{q} = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$

➔ $\frac{p}{q} = \left(\frac{9}{4}\right)$

➔ Now $\left(\frac{p}{q}\right)^3 = \left(\frac{9}{4}\right)^3 = \frac{9\ x\ 9\ x\ 9}{4\ x\ 4\ x\ 4} = \frac{729}{64}$.

Section D

17. Express the numbers appearing in the following statements in scientific notation:

(i) The earth has 1,353,000,000 cubic km of water.

(ii) The population of India was about 1,027,000,000 in March, 2001.

(iii) 60,230,000,000,000,000,000,000 molecules are contained in a drop of water.

Answer:

(i) The earth has 1,353,000,000 cubic km of water.

= 1.353×10^9 cubic km.

(ii) The population of India was about 1,027,000,000 in March, 2001.

= 1.027×10^9

(iii) 60,230,000,000,000,000,000,000 molecules are contained in a drop of water.

= 6.023×10^{22} molecules