(iv) $8^\circ + 10^\circ - 11^\circ = 1+1-1 = 1$

$49^\circ + 29^\circ - 19^\circ = 1+1-1 = 1$

$\therefore 8^\circ + 10^\circ - 11^\circ = 49^\circ + 29^\circ - 19^\circ$

(v) $\left\{\left[\left(\frac{4}{3}\right)^2\right]^3\right\}^4 = \left(\frac{4}{3}\right)^{2\times3\times4} = \left(\frac{4}{3}\right)^{24}$

$\left\{\left[\left(\frac{4}{3}\right)^3\right]^4\right\}^2 = \left(\frac{4}{3}\right)^{3\times4\times2} = \left(\frac{4}{3}\right)^{24}$

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

2. Evaluate :

(i) $5^2 + 12^2 - 13^2 = 25 + 144 - 169$

$= 169 - 169$

$= 0$

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

$= 27 \times 81 = 2187$

(iii) $(25)^2 \times \left(\frac{1}{125}\right)^3 = (25)^2 \times \left(\frac{1}{125}\right)^2 \times \left(\frac{1}{125}\right)$

$= \left(25 \times \frac{1}{125}\right)^2 \times \frac{1}{125}$

$= \left(\frac{1}{5}\right)^2 \times \frac{1}{125} = \frac{1}{25} \times \frac{1}{125}$

$= \frac{1}{3125}$

iv, $\left(\frac{-2}{3}\right)^2 \times \left(\frac{27}{64}\right)^3 = \frac{4}{9} \times \frac{27^3}{64} \times \left(\frac{27}{64}\right)^2$

$= \frac{3}{16} \times \left(\frac{27}{64}\right)^2$

$= \frac{3 \times 27 \times 27}{16 \times 64 \times 64}$

$= \frac{2187}{65,536}$

v, $\left\{\left\{(5)^2\right\}^3 \times 5^3\right\} \div \left[5^2\right]^4$

$= \left\{5^{2\times3} \times 5^3\right\} \div 5^{2\times4}$

$= \left\{5^6 \times 5^3\right\} \div 5^8$

$= 5^{6+3} \div 5^8$

$= 5^{9-8} = 5^1 = 5$

3: Simplify:

i, $\frac{5^7 \times 2^6 \times 18^0}{4^3 \times 25^2} = \frac{5^7 \times 2^6 \times 1}{(2^2)^3 \times (5^2)^2}$

$= \frac{5^7 \times 2^6 \times 1}{2^{2\times3} \times 5^{2\times2}}$

$= \frac{5^7 \times 2^6 \times 1}{2^6 \times 5^4} = \frac{5^7}{5^4} = 5^{7-4}$

$= 5^3 = 125$

(ii) $\left(\frac{2}{3}\right)^3 \times \left(\frac{9}{4}\right)^2 \times \frac{8}{15}$

$= \frac{2^3}{3^3} \times \frac{9^2}{4^2} \times \frac{8}{15}$

$= \frac{4}{1} \times \frac{3}{1} \times \frac{1}{5}$

$= \frac{4 \times 1 \times 1}{1 \times 1 \times 5} = \frac{4}{5}$

(iii) $\left[26^{30} \div 26^{28}\right] \div (-1)^{2002}$

$= 26^{30-28} \div 1$

$= 26^2 = 676$

(iv) $\left[\left(\frac{3}{5}\right)^3 \times \frac{25}{9}\right] + \left(\frac{4}{5}\right)^2$

$= \left[\frac{3}{5} \times \frac{3}{5} \times \frac{3}{5} \times \frac{25}{9}\right] + \frac{16}{25}$

$= \frac{3}{5} + \frac{16}{25} = \frac{15 + 16}{25}$

$= \frac{31}{25}$

(v) $\left[\frac{16}{7} - \left(\frac{-2}{3}\right)^5\right] \times \left(\frac{-3}{4}\right)^2$

$= \left[\frac{16}{7} - \left(\frac{-8}{27}\right)\right] \times \frac{9}{16}$

$$= \left[\frac{16}{7} + \frac{8}{27}\right] \times \frac{9}{16}$$

$$= \left(\frac{\cancel{16}^{1}}{7} \times \frac{9}{\cancel{16}_{1}}\right) + \left(\frac{\cancel{8}^{1}}{\cancel{27}_{3}} \times \frac{\cancel{9}^{1}}{\cancel{16}_{2}}\right)$$

$$= \left(\frac{1 \times 9}{7 \times 1}\right) + \left(\frac{1 \times 1}{3 \times 2}\right)$$

$$= \frac{9}{7} + \frac{1}{6} = \frac{54+7}{42}$$

$$= \frac{61}{42}$$

vi) $\left[\left(\frac{1}{2}\right)^3 - \left(\frac{3}{4}\right)^2\right] \times \left(\frac{4}{7}\right)^2 \times (-1)^{47}$

$$= \left(\frac{1}{8} - \frac{9}{16}\right) \times \frac{16}{49} \times (-1)$$

$$= \left(\frac{2-9}{16}\right) \times \frac{16}{49} \times (-1)$$

$$= \frac{-1\cancel{(-7)}}{1\cancel{16}} \times \frac{\cancel{16}^{1}}{49_{7}} \times (-1) = \frac{(-1) \times (-1)}{7}$$

$$= \frac{1}{7}$$

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

4. Express in exponential notation:

i) $\frac{625}{49} = \frac{5 \times 5 \times 5 \times 5}{7 \times 7} = \frac{25 \times 25}{7 \times 7}$

$= \left(\frac{25}{7}\right)^2$

5 | 625
5 | 125
5 | 25
5

7 | 49
7 | 7
1

(ii) $\frac{-64}{27} = \frac{-2\times2\times2\times2\times2\times2}{3\times3\times3}$

$= \frac{(-4)\times(-4)\times(-4)}{3\times3\times3}$

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

2	64
2	32
2	16
2	8
2	4
	2

3	27
3	9
	3

(iii) $\frac{4}{169} = \frac{2\times2}{13\times13} = \left(\frac{2}{13}\right)^2$

(iv) $\frac{-243}{32} = \frac{(-3)\times(-3)\times(-3)\times(-3)\times(-3)}{2\times2\times2\times2\times2}$

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

3	243
3	81
3	27
3	9
3	3
	1

2	32
2	16
2	8
2	4
2	2
	1

(v) $\frac{-256}{25} = \frac{-(16)\times(16)}{5\times5}$

$= -\left(\frac{16}{5}\right)^2$

2	256
2	128
2	64
2	32
2	16
2	8
2	4
	2

5	25
5	5
	1

5. Find the sum and express in power notation:

(i) $4^2 + 3^2 = 16 + 9 = 25 = 5^2$.

(ii) $8^2 + 15^2 = 64 + 225 = 289 = 17^2$

(iii) $5^2 + 12^2 = 25 + 144 = 169 = 13^2$

(iv) $15^2 + 20^2 = 225 + 400$

$= 625 = 25^2$

6. Express each of the following in exponential form with different bases.

(i) $16 = 2^4, 4^2$

(ii) $64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$= 2^6$

$= (2 \times 2) \times (2 \times 2) \times (2 \times 2)$

$= 4 \times 4 \times 4$

$= 4^3$

$= (2 \times 2 \times 2) \times (2 \times 2 \times 2)$

$= 8 \times 8$

$= 8^2$

$\therefore 64 = 2^6, 4^3, 8^2$

2	64
2	32
2	16
2	8
2	4
2	2
	1

(iii) $625 = 5 \times 5 \times 5 \times 5 = 5^4$

$= (5 \times 5) \times (5 \times 5)$

$= 25 \times 25$

$= 25^2$

$\therefore 625 = 5^4, 25^2$

5	625
5	125
5	25
5	5
	1

(iv) $81 = 3\times3\times3\times3 = 3^4$

$= (3\times3)\times(3\times3)$

$= 9\times9$

$= 9^2$

$\therefore 81 = 3^4, 9^2$

3	81
3	27
3	9
3	3
	1

(v) $512 = 2\times2\times2\times2\times2\times2\times2\times2\times2$

$= 2^9$

$= 2^{3\times3}$

$= (2^3)^3$

$= 8^3$

$\therefore 512 = 2^9, 8^3$

2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

(vi) $256 = 2\times2\times2\times2\times2\times2\times2\times2$

$= 2^8$

$= 2^{2\times4}$ or $2^{4\times2}$

$= (2^2)^4$ or $(2^4)^2$

$= 4^4$ or 16^2

$\therefore 256 = 2^8, 4^4, 16^2$

2	256
2	128
2	64
2	32
2	16
2	8
2	4
	2

7) units digit of $9^1 = 9$

" " of $9^2 = 1$

" " " $9^3 = 9$

units digit of $9^4 = 1$

As we see here if power is odd number then unit digit is 9 and if power is even number then unit digit is 1.

$\therefore 9^{99} = 9^{\text{odd number}}$

$\therefore$ units digit in $9^{99} = 9$

8. Simplify:

i, $\left(\frac{9}{8}\right)^2 \times (-1)^{42} = \frac{9 \times 9}{8 \times 8} \times 1 = \frac{81}{64}$

ii, $\left[\left(\frac{5}{7}\right)^3 + \left(\frac{2}{7}\right)^2\right] \div (-1)^{88}$

$= \left[\frac{5 \times 5 \times 5}{7 \times 7 \times 7} + \frac{2 \times 2}{7 \times 7}\right] \div (1)$

$= \left[\frac{125}{343} + \frac{4}{49}\right] \times 1$

$= \frac{125 + 28}{343}$

$= \frac{153}{343}$

iii, $\frac{3^3 \times 64 \times 81}{18 \times 4^2 \times 3^5} = \frac{3^{\overset{2}{3}} \times \overset{2}{8} \times \overset{2}{8} \times 9 \times \overset{1}{9}}{\underset{1}{9} \times \underset{1}{2} \times \underset{14}{4^2} \times 3^5}$

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

$$= \frac{2}{3^{6-3-2}} = \frac{2}{3^0} = \frac{2}{1} = 2$$

iv) $\left(\frac{-3}{7}\right)^2 \times \left(\frac{-35}{9}\right)^2 = \left(\frac{(-3) \times (-35)}{7 \times 9}\right)^2$

$$= \left(\frac{(-1) \times (-5)}{3}\right)^2 = \left(\frac{5}{3}\right)^2 = \frac{25}{9}$$

v) $\left(\frac{-2}{25}\right)^3 \times \left(\frac{-5}{8}\right)^3 \times \left(\frac{16}{5}\right)^3$

$$= \left(\frac{(-2) \times (-5) \times 16}{25 \times 8 \times 5}\right)^3$$

$$= \left(\frac{(-2) \times (-1) \times 2}{25 \times 1 \times 1}\right)^3$$

$$= \left(\frac{4}{25}\right)^3 = \frac{64}{15,625}$$

Multiple choice Questions

Tick (✓) the correct option:

1. $2 \times 2 \times 2 \times (-3) \times (-3) \times (-3) \times (-3)$

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

∴ Answer : (b)

2. $(-2)^6 \times (-2)^4 = 2^x$

$(-2)^{6+4} = 2^x$

$(-2)^{10} = 2^x$

$(-2)^{10} = (2)^{10} = 2^x$

$\Rightarrow x = 10$

Answer : (b)

3). $(-3^2)^3 =$ $= (-3^2) \times (-3^2) \times (-3^2)$

$= -3^{2+2+2} = -3^6$

∴ Answer : (c)

(4). $(-1)^{105} = -1$

∴ Answer : (b)

5. $2^3 = 2 \times 2 \times 2 = 8$

$3^2 = 3 \times 3 = 9$

$9 > 8 \Rightarrow 3^2 > 2^3$

∴ Answer : (b)

(6) $\left(\frac{-1}{2}\right)^3 = \frac{-1}{2} \times \frac{-1}{2} \times \frac{-1}{2} = \frac{-1}{8}$

∴ Answer : (a)

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

∴ Answer : (c)

8. $\frac{x^6}{x^4} \times x^{10} = x^{6-4} \times x^{10}$

$= x^2 \times x^{10}$

$= x^{2+10} = x^{12}$

∴ Answer : (b)

9. $(5^0 + 7^0) \times 1^0 = (1+1) \times 1$

$= 2 \times 1$

$= 2$

Answer : (c)

10. $4.07 \times 10^7 = 4.07 \times 10000000$

$= 40700000$

∴ Answer : (d)

Value Based Questions

(a) $12,36,000 = 1.236 \times 10^6$

$10,07,000 = 1.007 \times 10^6$

$8,06,000 = 8.06 \times 10^5$

$2,15,000 = 2.15 \times 10^5$

$93,000 = 9.3 \times 10^4$

(b) Reading newspaper is a very good habit. it gives a lot of knowledge.

Mental Maths

Write T for true and F for false statements:

1) In a^5, Base = a, Exponent = 5

∴ Answer : T

2) $x^y \neq y^x$

for example $2^3 = 8$

But $3^2 = 9$

∴ $2^3 \neq 3^2$

∴ Answer : F

3. $(-4) \times (-4) \times (-4) \times (-4) \times (-7) \times (-7)$

$= (-4)^4 \times (-7)^2$

∴ Answer : T

4. $(-5)^6 = (-5) \times (-5) \times (-5) \times (-5) \times (-5) \times (-5)$

$= 25 \times 25 \times 25$

$= 5 \times 5 \times 5 \times 5 \times 5 \times 5$

$= 5^6$

∴ Answer : T

5. $(-1)^{25} = -1$

But $(-1)^{50} = 1$

$\therefore (-1)^{25} \neq (-1)^{50}$

Answer : F

$(-1)^{50} = (-1)^{2 \times 25} = ((-1)^2)^{25}$

$= (1)^{25}$

$\neq (-1)^{25}$

$\therefore (-1)^{50} \neq (-1)^{25}$

6. $(2^5)^2 = 2^{5\times 2} = 2^{10} \neq 2^7$

∴ Answer : F

7. Reciprocal of $\left(\frac{-5}{7}\right)^4 = \frac{1}{\left(\frac{-5}{7}\right)^4} = \left(\frac{-5}{7}\right)^{-4}$

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

∴ Answer : T

8. $1^\circ + 2^\circ + 3^\circ + 4^\circ + 5^\circ = 1+1+1+1+1$

$= \overline{5}$

$\neq 0$

∴ Answer : F

9. $65,38,000 = 6.\overline{5}38 \times 1000000$

$\approx 6.\overline{5}38 \times 10^6$

∴ Answer : T

10. $7.0\overline{5}912 \times 10^{\overline{5}} = 70\overline{5}912$

$\neq 70,59,12,00,000$

∴ Answer : F

—x—