Exponents (Including Laws of Exponents)

EXERCISE 5 (A)

Question 1.

Find the value of: (i) 6² (ii) 7³ (iii) 4⁴ (iv) 5⁵ (v) 8³ (vi) 7⁵

Solution:

(i) $6^2 = 6 \times 6 = 36$ (ii) $7^3 = 7 \times 7 \times 7 = 343$ (iii) $4^4 = 4 \times 4 \times 4 \times 4 = 256$ (iv) $5^5 = 5 \times 5 \times 5 \times 5 \times 5 = 3125$ (v) $8^3 = 8 \times 8 \times 8 = 512$ (vi) $7^5 = 7 \times 7 \times 7 \times 7 \times 7 = 16807$

Question 2.

Evaluate: (i) 2³ x 4² (ii) 2³ x 5² (iii) 3³ x 5² (iv) 2² x 3³ (v) 3² x 5² (vi) 5³ x 2⁴ (vii) 3² x 4² (ix) (5 x 4)²

Solution:

(i) $2^3 \times 4^2$ = 2 x 2 x 2 x 4 x 4 = 8 x 16 = 128 (ii) $2^3 \times 5^2$ = 2 x 2 x 2 x 5 x 5 = 8 x 25 = 200 (iii) $3^3 \times 5^2$ = 3 x 3 x 3 x 5 x 5 = 27 x 25

= 675 (iv) 2² x 3³ $= 2 \times 2 \times 3 \times 3 \times 3$ = 4 x 27 = 108 (v) 3² x 5³ =3 x3 x 5 x 5 x 5 = 9 x 125 = 1125 (vi) 5³ x 2⁴ $= 5 \times 5 \times 5 \times 2 \times 2 \times 2 \times 2$ = 125 x 16 = 2000 (vii) 3² x 4² =3 x 3 x 4 x 4 = 9 x 16 =144 (viii) (4 x 3)³ $=4 \times 4 \times 4 \times 3 \times 3 \times 3$ = 64 x 27 = 1728 (ix) (5 x 4)² $=5 \times 5 \times 4 \times 4$ = 25 x 16 = 400

Question 3.

Evaluate:

$$(i) \left(\frac{3}{4}\right)^4 \qquad (ii) \left(-\frac{5}{6}\right)^5$$

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

Solution:

$$(i) \left(\frac{3}{4}\right)^{4} = \left(\frac{3}{4}\right) \times \left(\frac{3}{4}\right) \times \left(\frac{3}{4}\right) \times \left(\frac{3}{4}\right) \times \left(\frac{3}{4}\right)$$
$$= \frac{3 \times 3 \times 3 \times 3}{4 \times 4 \times 4 \times 4} = \frac{81}{256}$$
$$(ii) \left(-\frac{5}{6}\right)^{5}$$
$$= \left(\frac{-5}{6}\right) \times \left(\frac{-5}{6}\right) \times \left(\frac{-5}{6}\right) \times \left(\frac{-5}{6}\right) \times \left(\frac{-5}{6}\right) \times \left(\frac{-5}{6}\right)$$
$$= \frac{(-5) \times (-5) \times (-5) \times (-5) \times (-5)}{6 \times 6 \times 6 \times 6}$$
$$= -\frac{3125}{776}$$
$$(iii) \left(\frac{-3}{-5}\right)^{3} = \left(\frac{-3}{-5}\right) \times \left(\frac{-3}{-5}\right) \times \left(\frac{-3}{-5}\right)$$
$$= \frac{(-3) \times (-3) \times (-3)}{(-5) \times (-5) \times (-5)}$$
$$= \frac{27}{125}$$

Question 4.

Evaluate :

(i)
$$\left(\frac{2}{3}\right)^3 \times \left(\frac{3}{4}\right)^2$$
 (ii) $\left(-\frac{3}{4}\right)^3 \times \left(\frac{2}{3}\right)^4$
(iii) $\left(\frac{3}{5}\right)^2 \times \left(-\frac{2}{3}\right)^3$

Solution:

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

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

$$= \frac{8}{27} \times \frac{9}{16} = \frac{1}{6}$$

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

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

$$\times \left(\frac{2}{3}\right) \times \left(\frac{2}{3}\right)$$

$$= \frac{-27}{64} \times \frac{16}{81} = -\frac{1}{2}$$

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

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

$$= \frac{9}{25} \times \left(\frac{-8}{27}\right)$$

$$= -\frac{8}{75}$$

Question 5.

Which is greater : (i) 2³ or 3² (ii) 2⁵ or 5² (iii) 4³ or 3⁴ (iv) 5⁴ or 4⁵

Solution:

(i) 2³ or 3³ Since, $2^3 = 2 \times 2 \times 2 = 8$ and, $3^2 = 3 \times 3 = 9$:9 is greater than $8 \Rightarrow 3^2 > 2^3$ (ii) 2⁵ or 5² Since, $2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$ and, $5^2 = 5 \times 5 = 25$:32 is greater than $25 \Rightarrow 2^{35} > 5^{32}$ (iii) 4³ or 3⁴ Since, $4^3 = 4 \times 4 \times 4 = 64$ and, $3^4 = 3 \times 3 \times 3 \times 3 = 81$ \therefore 81 is greater than 64 \Rightarrow 3⁴ > 4³ (iv) 5⁴ or 4⁵ Since, $5^4 = 5 \times 5 \times 5 \times 5 = 625$ and, $4^5 = 4 \times 4 \times 4 \times 4 \times 4 = 1024$ \therefore 1024 is greater than 625 \Rightarrow 4⁵ > 5⁴

Question 6.

Express each of the following in exponential form : (i) 512 (ii) 1250 (iii) 1458 (iv) 3600 (v) 1350 (vi) 1176

Solution:

(i) 512

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

(ii) 1250

2	1250
5	625
5	125
5	25
5	5
	1

 $= 2 \times 5 \times 5 \times 5 \times 5 = 2 \times 5^4$

(iii) 1458

2	1458

 $\begin{array}{r}
 2 \\
 3 \\
 729 \\
 3 \\
 243 \\
 3 \\
 81 \\
 3 \\
 27 \\
 3 \\
 9 \\
 3 \\
 3 \\
 1
 \end{array}$

- 1

 $= 2 \times 3 = 2 \times 3^{6}$

(iv) 3600

2	3600
2	1800
2	900
2	450
3	225
3	75
5	25
5	5
	1

 $= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$ $= 2^4 \times 3^2 \times 5^2$

(v) 1350

2	1350
3	675
3	225
3	75
5	25
5	5
	1

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

(vi) 1176

 $\frac{2 | 1176}{2 | 588}$ $\frac{2 | 294}{3 | 147}$ $\frac{7 | 49}{7 | 7}$ $= 2 \times 2 \times 2 \times 3 \times 7 \times 7$ $= 2^{3} \times 3 \times 7^{2}$

Question 7. If a = 2 and b = 3, find the value of: (i) $(a + b)^2$ (ii) $(b - a)^3$ (iii) (a x b)a (iv) (a x b)b

Solution:

(i) $(a + b)^2$ = $(2 + 3)^2 = (5)^2 = 5 \times 5 = 25$

(ii) $(b - a)^2$ = $(3 - 2)^2 = (1)^3$ = 1 x 1 x 1 = 1

(iii) $(a \times b)^a$ = $(2 \times 3)^2 - (6)^2$ = $6 \times 6 = 36$

(iv) $(a \times b)^{b}$ = $(2 \times 3)^{3} = (6)^{3} = 6 \times 6 \times 6 = 216$

Question 8.

Express: (i) 1024 as a power of 2. (ii) 343 as a power of 7. (iii) 729 as a power of 3. Solution: (i) 1024 as a power of 2.

 $= 2^{10}$

(ii) 343 as a power of 7. = $7 \times 7 \times 7 = 7^3$

- $\begin{array}{r}
 7 & 343 \\
 \overline{7} & 49 \\
 \overline{7} & 7 \\
 1
 \end{array}$
- (iii) 729 as a power of 3. = $3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^{6}$

3	729
3	243
3	81
3	27
3	9
3	3
	1

Question 9.

If 27 x 32 = 3^x x 2^y; find the values of x and y. 27 × 32 = $3^x \times 2^y$ 27 = 3^x

 $\begin{array}{r}
 3 & 27 \\
 3 & 9 \\
 \overline{3} & 3 \\
 1
 \end{array}$

Solution:

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27 = 3 \times 3 \times 3
= 3<sup>3</sup> = 3<sup>x</sup>
\therefore x = 3^{x}
Also, 32 = 2<sup>y</sup>
\frac{2 | 32}{2 | 16}
\frac{2 | 4}{2 | 2}
32 = 2 \times 2 \times 2 \times 2 \times 2
= 2^{5} = 2^{y}
\therefore y = 5
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Question 10.

If $64 \times 625 = 2^a \times 5^b$; find : (i) the values of a and b. (ii) 2^b x 5^a

Solution:

(i) the values of a and b.

(i) $64 \times 625 = 2^a \times 5^b$ $64 = 2^{a}$ 1 $64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$ $64 = 2^6$ $\therefore a = 6$ Also, $625 = 5^{b}$ 5 6255 1255 255 5
 5
 5
 5
 5
 5ø. 1 $625 = 5 \times 5 \times 5 \times 5$ $625 = 5^4$ $\therefore b = 4$.

(ii)
$$2^{b} \times 5^{a}$$

(ii) $2^{b} \times 5^{a}$
 $= 2^{4} \times 5^{6}$
 $= 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 5 \times 5 \times 5$
 $= 16 \times 15625 = 250000$

EXERCISE 5 (B)

Question 1.

Fill in the blanks: In 5² = 25, base = and index = If index = 3x and base = 2y, the number =

Solution:

(i) In $5^2 = 25$, base = 5 and index = 2 (ii) If index = 3x and base = 2y, the number = $2y^{3x}$

Question 2.

Evaluate: (i) $2^8 \div 2^3$ (ii) $2^{3\div} 2^8$ (iii) $(2^6)^0$ (iv) $(3^\circ)^6$ (v) $8^3 \times 8^{-5} \times 8^4$ (vi) $5^4 \times 5^3 + 5^5$ (vii) $5^4 \div 5^3 \times 5^5$ (viii) $4^4 \div 4^3 \times 4^0$ (ix) $(3^5 \times 4^7 \times 5^8)^0$

Solution:

$$= \frac{4^4}{4^3} = 4^{4-3} = 4^1 = 4$$

(*ix*) $(3^5 \times 4^7 \times 5^8)^0 = 3^5 \times 0 \times 4^7 \times 0 \times 5^8 \times 0$
 $= 3^0 4^0 5^0 = 1 \times 1 \times 1 = 1$

(i)
$$2^{8} \div 2^{3} = \frac{2^{8}}{2^{3}} = 2^{8-3} = 2^{5}$$

(ii) $2^{3} \div 2^{8} = \frac{2^{3}}{2^{8}} = 2^{3-8} = 2^{-5} = \frac{1}{2^{5}}$
(iii) $(2^{6})^{0} = 2^{6 \times 0} = 2^{0} = 1$
(iv) $(3^{0})^{6} = 3^{0 \times 6} = 3^{0} = 1$
(v) $8^{3} \times 8^{-5} \times 8^{4} = 8^{3+4-5} = 8^{7-5} = 8^{2}$
(vi) $5^{4} \times 5^{3} \div 5^{5} = \frac{5^{4} \times 5^{3}}{5^{5}}$
 $= 5^{4+3-5} = 5^{7-5} = 5^{2}$
(vii) $5^{4} \div 5^{3} \times 5^{5} = \frac{5^{4}}{5^{3}} \times 5^{5} = 5^{4-3+5} = 5^{4}$

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(viii)
$$4^4 \div 4^3 \times 4^0 = \frac{4^4}{4^3 4^0} = \frac{4^4}{4^3 \times 1}$$

Question 3.

Simplify, giving Solutions with positive index: (i) $2b^6 \cdot b^3 \cdot 5b^4$ (ii) $x^2y^3 \cdot 6x^5y \cdot 9x^3y^4$ (*iii*) $(-a^5)(a^2)$ $(iv) (-y^2) (-y^3)$ (vi) (-4x) $(-5x^2)$ $(v) (-3)^2 (3)^3$ (vii) $(5a^2b) (2ab^2) (a^3b)$ (viii) $x^{2a+7} \cdot x^{2a-8}$ (*ix*) $3^{y} \cdot 3^{2} \cdot 3^{-4}$ (x) $2^{4a} \cdot 3^{3a} \cdot 2^{-a}$ (xi) $4x^2y^2 \div 9x^3y^3$ $(xii) (10^2)^3 (x^8)^{12}$ $(xiii) (a^{10})^{10} (1^6)^{10}$ $(xv) - (3ab)^2 (-5a^2bc^4)^2$ $(xiv) (n^2)^2 (-n^2)^2$ $(xvi) (-2)^2 \times (0)^3 \times (3)^3$ $(xvii) (2a^3)^4 (4a^2)^2$ $(xviii)(4x^2y^3)^3 \div (3x^2y^3)^3$

$$(xix) \left(\frac{1}{2x}\right)^{3} \times (6x)^{2}$$

$$(xx) \left(\frac{1}{4ab^{2}c}\right)^{2} \div \left(\frac{3}{2a^{2}bc^{2}}\right)^{4}$$

$$(xxi) \frac{(5x^{7})^{3} \cdot (10x^{2})^{2}}{(2x^{6})^{7}}$$

$$(xxii) \frac{(7p^{2}q^{9}r^{5})^{2} (4pqr)^{3}}{(14p^{6}q^{10}r^{4})^{2}}$$

Solution:
(i)
$$2b^6 \cdot b^3 \cdot 5b^4$$

 $= 2 \times 5 \times b^{6+3+4} = 10b^{13}$
(ii) $x^2y^3 \cdot 6x^5y \cdot 9x^3y^4$
 $= 6 \times 9 \times x^{2+5+3} y^{3+1+4} = 54x^{10}y^8$
(iii) $(-a^5) (a^2)$
 $= (-1 \times a)^5 \times a^2$
 $= (-1)^5 \times a^{5+2}$
 $= -1 \times a^7 = -a^7$
(iv) $(-y^2) (-y^3)$
 $= (-1 \times y)^2 \cdot (-1 \times y)^3$

$$= (-1)^{2} \cdot y^{2} \cdot (-1)^{3} \times y^{3}$$

$$= 1^{2+3} \cdot y^{2+3}$$

$$= 1^{5}y^{5} = y^{5}$$
(v) (-3)² (3)³

$$= (-1 \times 3)^{2} \cdot (3)^{3}$$

$$= (-1 \times 3)^{2} \cdot (3)^{3}$$

$$= (-1)^{2} \times 3^{2} \cdot 3^{3}$$

$$= -1^{2} \cdot 3^{2+3} = 1 \cdot 3^{5} = 3^{5}$$
(vi) (-4x) (-5x²)
$$= (-1 \times 4 \times x) \cdot (-1 \times 5 \times x^{2})^{1}$$

$$= -1 \times 4 \times x \cdot -1 \times 5 \times x^{2}$$

$$= -1 \times -1 \times 4 \times 5 \times x^{1+2}$$

$$= -1^{1+1} \cdot 4^{1} \cdot 5^{1} x^{3} = 20x^{3}$$
(vii) (5a²b) (2ab²) (a³b)
$$= 5 \cdot 2 \cdot a^{2+1+3}b^{1+2+1} = 10a^{6}b^{4}$$
(viii) $x^{2a+7} \cdot x^{2a-8}$

$$= x^{2a+7+2a-8} = x^{4a-1}$$
(ix) $3^{y} \cdot 3^{2} \cdot 3^{-4}$

$$= 3^{y} \cdot \frac{3^{2}}{3^{4}} = 3^{y} = \frac{3 \times 3}{3 \times 3 \times 3 \times 3}$$

$$= 3^{y} \times \frac{1}{3^{2}} = 3^{y-2}$$
(x) $2^{4a} \cdot 2^{3a} \cdot 2^{-a}$

$$= 2^{4a+3a-a} = 2^{7a-a} = 2^{6a}$$
(xi) $4x^{2}y^{2} \div 9x^{3}y^{3}$

$$= \frac{4x^{2}y^{2}}{9x^{3}y^{3}} = \frac{4x^{2-3}y^{2-3}}{9} = \frac{4x^{-1}y^{-1}}{9}$$

$$= \frac{4}{9xy}$$
 (Since index should by positive)

$$(\mathbf{x}\mathbf{x}) \left(\frac{1}{4ab^{2}c}\right)^{2} \div \left(\frac{3}{2a^{2}bc^{2}}\right)^{4}$$

$$= \left(\frac{1}{4ab^{2}c}\right)^{2} \times \left(\frac{2a^{2}bc^{2}}{3}\right)^{4}$$

$$= \frac{1^{2}}{4^{2}a_{1}^{2}b^{2\times2}c^{2}} \times \frac{2^{4}a^{2\times4}b^{4}c^{2\times4}}{3^{4}}$$

$$= \frac{1^{2}}{3^{4}} \times a^{8-2}b^{4-4}c^{8-2} \quad (\because 2^{4} = 4^{2})$$

$$= \frac{1}{3\times3\times3\times3}a^{6}b^{0}c^{6}$$

$$= \frac{1}{81}a^{6}c^{6} \quad (\because b^{0} = 1)$$

$$(\mathbf{x}xi) \frac{(5x^{7})^{3}\cdot(10x^{2})^{2}}{(2x^{6})^{7}} = \frac{5^{3}x^{7\times3}\cdot10^{2}\cdotx^{2\times2}}{2^{7}\cdotx^{6\times7}}$$

$$= 5^{3} \cdot 10^{2} \cdot 2^{-7}x^{21+4-42}$$

$$= \frac{5^{3}\times10^{2}}{2^{7}x^{17}} = \frac{5\times5\times5\times2\times5\times2\times5}{2\times2\times2\times2\times2\times2\times2\times2}$$

$$(\mathbf{x}xii) \frac{(7p^{2}q^{9}r^{5})^{2}(4pqr)^{3}}{(14p^{6}q^{10}r^{4})^{2}}$$

$$= \frac{(7^{2}p^{2\times2}q^{9\times2}r^{5\times2})(4^{3}p^{3}q^{3}r^{3})}{14^{2}p^{6\times2}q^{10\times2}r^{4\times2}}$$

$$= \frac{7\times7p^{4}q^{18}r^{10}\cdot4\times4\times4p^{3}q^{3}r^{3}}{2\times7\times2\times7\timesp^{12}q^{20}r^{8}}$$

$$= p^{4-12+3}q^{18-20+3}r^{10-8+3}4\times4$$

$$= 16p^{-5}qr^{5}$$

Question 4.

Simplify and express the Solution in the positive exponent form :

(i)
$$\frac{(-3)^3 \times 2^6}{6 \times 2^3}$$
 (ii) $\frac{(2^3)^5 \times 5^4}{4^3 \times 5^2}$
(iii) $\frac{36 \times (-6)^2 \times 3^6}{12^3 \times 3^5}$ (iv) $-\frac{128}{2187}$
(v) $\frac{a^{-7} \times b^{-7} \times c^5 \times d^4}{a^3 \times b^{-5} \times c^{-3} \times d^8}$
(vi) $(a^3b^{-5})^{-2}$

Solution:
(i)
$$\frac{(-3)^3 \times 2^6}{6 \times 2^3} = \frac{(-3)^3 \times 2^6}{2 \times 3 \times 2^3} = \frac{(-3)^3 \times 2^6}{3 \times 2^{3+1}}$$

 $= -(3)^{3-1} 2^{6-4} = -(3)^2 2^2 = -3^2 2^2$
(ii) $\frac{(2^3)^5 \times 5^4}{4^3 \times 5^2} = \frac{2^{3\times 5} \times 5^4}{2^3 \times 2^2 \times 5^2}$
 $= \frac{2^{15} \times 5^4}{2^6 \times 5^2} = 2^{15-6} \times 5^{4-2}$
 $= 2^9 \times 5^2$
(iii) $\frac{36 \times (-6)^2 \times 3^6}{12^3 \times 3^5} = \frac{6 \times 6 \times (-6)^2 \times 3^6}{3^3 \times 4^3 \times 3^5}$
 $= \frac{(6)^2 (-6)^2 \times 3^{6-3-5}}{4^3} = \frac{(6)^2 (-6)^2 3^{-2}}{4^3}$
 $= \frac{6^2 (-6)^2}{3^2 \times 4^3} = \frac{6 \times 6 \times -6 \times -6}{3 \times 3 \times 4 \times 4 \times 4}$
 $= \frac{9}{4} = \left(\frac{3}{2}\right)^2$

$$(iv) - \frac{128}{2187}$$

2	128	3	2187
2	64	3	729
2	32	3	243
2	16	3	81
2	8	3	27
2	4	3	9
2	2	3	3
	1		1

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$$= -\frac{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2}{3 \times 3 \times 3} = -\frac{2^{7}}{3^{7}}$$
(v) $\frac{a^{-7} \times b^{-7} \times c^{5} \times d^{4}}{a^{3} \times b^{-5} \times c^{-3} \times d^{8}}$

$$= a^{-7} - 3 \times b^{-7} + 5 \times c^{5} - (-3) \times d^{4} - 8$$

$$= a^{-10} \times b^{-2} \times c^{8} \times d^{-4}$$

$$= \frac{c^{8}}{a^{10} \times b^{2} \times d^{4}}$$
(vi) $(a^{3}b^{-5})^{-2} = a^{3} \times -2 b^{-5} \times -2$

$$= a^{-6} b^{10} = \frac{b^{10}}{a^{6}}$$

Evaluate
(i)
$$6^{-2} \div (4^{-2} \times 3^{-2})$$

(ii) $\left[\left(\frac{5}{6} \right)^2 \times \frac{9}{4} \right] \div \left[\left(-\frac{3}{2}^2 \right) \times \frac{125}{216} \right]$
(iii) $5^3 \times 3^2 + (17)^0 \times 7^3$
(iv) $2^5 \times 15^0 + (-3)^3 - \left(\frac{2}{7} \right)^{-2}$
(v) $(2^2)^0 + 2^{-4} \div 2^{-6} + \left(\frac{1}{2} \right)^{-3}$
(vi) $5^n \times 25^{n-1} \div (5^{n-1} \times 25^{n-1})$

Solution:
(i)
$$6^{-2} \div (4^{-2} \times 3^{-2})$$

 $= \left(\frac{1}{6}\right)^{2} \div \left(\frac{1}{4}\right)^{2} \times \left(\frac{1}{3}\right)^{2}$
 $= \frac{1}{36} \div \frac{1}{16} \times \frac{1}{9}$
 $= \frac{1}{36} \div \frac{1}{144}$
 $\frac{144}{\frac{144}{\frac{1}{x}}}$
 $= \frac{1}{36} \times \frac{144}{1} = 4$
(ii) $\left[\left(\frac{5}{6}\right)^{2} \times \frac{9}{4}\right] \div \left[\left(-\frac{3}{2}\right) \times \frac{125}{216}\right]$
 $= \left[\left(\frac{5\times5}{6\times6}\right) \times \frac{9}{4}\right] \div \left[\left(\frac{-3\times-3}{2\times2}\right) \times \frac{125}{216}\right]$
 $= \left[\frac{25}{36} \times \frac{9}{4}\right] \div \left[\frac{9}{4} \times \frac{125}{216}\right]$
 $= \left[\frac{25}{36} \times \frac{9}{4}\right] \div \left[\frac{9}{4} \times \frac{125}{216}\right]$
 $= \left[\frac{25}{16} \div \frac{1}{144} \div \frac{1}{14} \div \frac{125}{24}\right]$
 $= \left[\frac{25}{16}\right] \div \left[\frac{125}{96}\right]$
 $= \frac{25}{16} \times \frac{96}{125}$
 $= \frac{1}{1} \times \frac{6}{5} = 1\frac{1}{5}$
(iii) $5^{3} \times 3^{2} + (17)^{0} \times 7^{3}$
 $= 5 \times 5 \times 5 \times 3 \times 3 + (17)^{0} \times 7 \times 7 \times 7 \times 7 (\therefore a^{0} = 1))$
 $= 125 \times 9 + 1 \times 343$
 $= 1125 + 343 = 1468$
(iv) $2^{5} \times 15^{0} + (-3)^{3} - \left(\frac{2}{7}\right)^{-2}$
 $= 2 \times 2 \times 2 \times 2 \times 2 \times 1 + (-3) \times (-3) \times (-3) - \left(\frac{7}{2}\right) \times \left(\frac{7}{2}\right)$
 $= 32 \times 1 - 27 - \frac{49}{4}$ ($\therefore c^{0} = 1$)
 $= \frac{32 \times 4}{1 \times 4} - \frac{27 \times 4}{1 \times 4} - \frac{49}{4 \times 1}$ ($\therefore LCM = 4$)

$$= \frac{128 - 108 - 49}{4} = \frac{-29}{4} = -7\frac{1}{4}$$
(v) $(2^2)^0 + 2^{-4} \div 2^{-6} + \left(\frac{1}{2}\right)^{-3}$
 $(4)^0 + \left(\frac{1}{2}\right)^4 \div \left(\frac{1}{2}\right)^6 + \left(\frac{2}{1}\right)^3 \quad (\because a^0 = 1)$
 $1 + \left(\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}\right) \div$
 $\left(\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}\right) + \left(\frac{2}{1} \times \frac{2}{1} \times \frac{2}{1}\right)$
 $1 + \left(\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times 2 \times 2 \times 2 \times 2 \times 2\right) + 8$
 $= 1 + 4 + 8 = 13$
(vi) $5^n \times 25^{n-1} \div (5^{n-1} \times 25^{n-1})$
 $= 5^n \times 25^{n-1} \times \frac{1}{5^{n-1}} \times 25^{n-1}$

Question 6. If $m^2 = -2$ and n = 2; find the values of: (i) $m + r^2 - 2mn$ (ii) $m^n + n^m$ (iii) $6m^{-3} + 4n^2$ (iv) $2n^3 - 3m$

Solution:

(i) $m^2 + n^2 - 2mn$ m = -2, n = 2 $= (-2)^2 + (2)^2 - 2(-2) (2)$ = 4 + 4 - (-8) $= 8 + 8 = 16 = (2^4)$ (ii) $m^n + n^m$ m = -2, n = 2 $= (-2)^2 + (2)^{-2}$ $=4+\frac{1}{2}\times\frac{1}{2}$ $=\frac{4\times4}{1\times4}+\frac{1}{4}$ $=\frac{16+1}{4}=\frac{17}{4}=4\frac{1}{4}$ (*iii*) $6m^{-3} + 4n^2$ m = -2, n = 2 $= 6(-2)^{-3} + 4(2)^2$ $= 6 \times \frac{1}{-2} \times \frac{1}{-2} \times \frac{1}{-2} + 4 \times 2 \times 2$ $=\frac{-3}{4}+16$ $=\frac{-3+16\times4}{4}=\frac{-3+64}{4}=\frac{61}{4}=15\frac{1}{4}$ (*iv*) $2n^3 - 3m$ m = -2, n = 2 $= 2(2)^3 - 3(-2)$ $= 2 \times (2 \times 2 \times 2) - 3 \times (-2)$ $= 16 - 3 \times (-2)$ = 16 + 6 = 22