



DPM CLASSES & COMPUTERS

Special for Math's & Science

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MATHS -7 (CH-13-EXPONENTS & POWERS)

MATHS -7 (CH-13-13.1-EXPONENTS & POWERS)

Question 1:

Find the value of:

- (i) 2^6 (ii) 9^3
(iii) 11^2 (iv) 5^4

Answer 1:

- (i) $2^6 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$
(ii) $9^3 = 9 \times 9 \times 9 = 729$
(iii) $11^2 = 11 \times 11 = 121$
(iv) $5^4 = 5 \times 5 \times 5 \times 5 = 625$

Question 2:

Express the following in exponential form:

- (i) $6 \times 6 \times 6 \times 6$ (ii) $t \times t$
(iii) $b \times b \times b \times b$ (iv) $5 \times 5 \times 7 \times 7 \times 7$
(v) $2 \times 2 \times a \times a$ (vi) $a \times a \times a \times c \times c \times c \times c \times d$

Answer 2:

- (i) $6 \times 6 \times 6 \times 6 = 6^4$
(ii) $t \times t = t^2$
(iii) $b \times b \times b \times b = b^4$
(iv) $5 \times 5 \times 7 \times 7 \times 7 = 5^2 \times 7^3$
(v) $2 \times 2 \times a \times a = 2^2 \times a^2$
(vi) $a \times a \times a \times c \times c \times c \times c \times d = a^3 c^4 d$



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Question 3:

Express the following numbers using exponential notation:

(i) 512 (ii) 343

(iii) 729 (iv) 3125

Answer 3:

(i) $512 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^9$

(ii) $343 = 7 \times 7 \times 7 = 7^3$

(iii) $729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^6$

(iv) $3125 = 5 \times 5 \times 5 \times 5 \times 5 = 5^5$

Question 4:

Identify the greater number, wherever possible, in each of the following?

(i) 4^3 or 3^4 (ii) 5^3 or 3^5

(iii) 2^8 or 8^2 (iv) 100^2 or 2^{100}

(v) 2^{10} or 10^2

Answer 4:

(i) $4^3 = 4 \times 4 \times 4 = 64$

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

Therefore, $3^4 > 4^3$

(ii) $5^3 = 5 \times 5 \times 5 = 125$

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

Therefore, $3^5 > 5^3$

(iii) $2^8 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 256$

$8^2 = 8 \times 8 = 64$

Therefore, $2^8 > 8^2$

(iv) 100^2 or 2^{100}

$2^{10} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 1024$

$2^{100} = 1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024$

$100^2 = 100 \times 100 = 10000$

Therefore, $2^{100} > 100^2$

(v) 2^{10} and 10^2

$2^{10} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 1024$

$10^2 = 10 \times 10 = 100$

Therefore, $2^{10} > 10^2$



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Question 5:

Express each of the following as product of powers of their prime factors:

(i) 648 (ii) 405

(iii) 540 (iv) 3,600

Answer 5:

$$(i) 648 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 = 2^3 \cdot 3^4$$

$$(ii) 405 = 3 \times 3 \times 3 \times 3 \times 5 = 3^4 \cdot 5$$

$$(iii) 540 = 2 \times 2 \times 3 \times 3 \times 3 \times 5 = 2^2 \cdot 3^3 \cdot 5$$

$$(iv) 3600 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5 = 2^4 \cdot 3^2 \cdot 5^2$$

Question 6:

Simplify:

$$(i) 2 \times 10^3 \quad (ii) 7^2 \times 2^2$$

$$(iii) 2^3 \times 5 \quad (iv) 3 \times 4^4$$

$$(v) 0 \times 10^2 \quad (vi) 5^2 \times 3^3$$

$$(vii) 2^4 \times 3^2 \quad (viii) 3^2 \times 10^4$$

Answer 6:

$$(i) 2 \times 10^3 = 2 \times 10 \times 10 \times 10 = 2 \times 1000 = 2000$$

$$(ii) 7^2 \times 2^2 = 7 \times 7 \times 2 \times 2 = 49 \times 4 = 196$$

$$(iii) 2^3 \times 5 = 2 \times 2 \times 2 \times 5 = 8 \times 5 = 40$$

$$(iv) 3 \times 4^4 = 3 \times 4 \times 4 \times 4 \times 4 = 3 \times 256 = 768$$

$$(v) 0 \times 10^2 = 0 \times 10 \times 10 = 0$$

$$(vi) 5^2 \times 3^3 = 5 \times 5 \times 3 \times 3 \times 3 = 25 \times 27 = 675$$

$$(vii) 2^4 \times 3^2 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 = 16 \times 9 = 144$$

$$(viii) 3^2 \times 10^4 = 3 \times 3 \times 10 \times 10 \times 10 \times 10 = 9 \times 10000 = 90000$$



Question 7:

Simplify:

(i) $(-4)^3$ (ii) $(-3) \times (-2)^3$

(iii) $(-3)^2 \times (-5)^2$ (iv) $(-2)^3 \times (-10)^3$

Answer 7:

(i) $(-4)^3 = (-4) \times (-4) \times (-4) = -64$

(ii) $(-3) \times (-2)^3 = (-3) \times (-2) \times (-2) \times (-2) = 24$

(iii) $(-3)^2 \times (-5)^2 = (-3) \times (-3) \times (-5) \times (-5) = 9 \times 25 = 225$

(iv) $(-2)^3 \times (-10)^3 = (-2) \times (-2) \times (-2) \times (-10) \times (-10) \times (-10)$
 $= (-8) \times (-1000) = 8000$

Question 8:

Compare the following numbers:

(i) 2.7×10^{12} ; 1.5×10^8

(ii) 4×10^{14} ; 3×10^{17}

Answer 8:

(i) 2.7×10^{12} ; 1.5×10^8

$2.7 \times 10^{12} > 1.5 \times 10^8$

(ii) 4×10^{14} ; 3×10^{17}

$3 \times 10^{17} > 4 \times 10^{14}$

MATHS -7 (CH-13-13.2-EXPONENTS & POWERS)

Question 1:

Using laws of exponents, simplify and write the answer in exponential form:

(i) $3^2 \times 3^4 \times 3^8$ (ii) $6^{15} \div 6^{10}$ (iii) $a^3 \times a^2$

(iv) $7^x \times 7^2$ (v) $5^{23} \div 5^3$ (vi) $2^5 \times 5^5$

(vii) $a^4 \times b^4$ (viii) $(3^4)^3$

(ix) $(2^{20} \div 2^{15}) \times 2^3$ (x) $8^t \div 8^2$

Answer 1:

$$(i) 3^2 \times 3^4 \times 3^8 = (3)^{2+4+8} (a^m \times a^n = a^{m+n}) \\ = 3^{14}$$

$$(ii) 6^{15} \div 6^{10} = (6)^{15-10} (a^m \div a^n = a^{m-n}) \\ = 6^5$$

$$(iii) a^3 \times a^2 = a^{(3+2)} (a^m \times a^n = a^{m+n}) \\ = a^5$$

$$(iv) 7^x + 7^2 = 7^{x+2} (a^m \times a^n = a^{m+n})$$

$$(v) (5^2)^3 \div 5^3 \\ = 5^{2 \times 3} \div 5^3 (a^m)^n = a^{mn} \\ = 5^6 \div 5^3 \\ = 5^{(6-3)} (a^m \div a^n = a^{m-n}) \\ = 5^3$$

$$(vi) 2^5 \times 5^5 \\ = (2 \times 5)^5 [a^m \times b^m = (a \times b)^m] \\ = 10^5$$

$$(vii) a^4 \times b^4 \\ = (ab)^4 [a^m \times b^m = (a \times b)^m]$$

$$(viii) (3^4)^3 = 3^{4 \times 3} = 3^{12} (a^m)^n = a^{mn}$$

$$(ix) (2^{20} \div 2^{15}) \times 2^3 \\ = (2^{20-15}) \times 2^3 (a^m \div a^n = a^{m-n}) \\ = 2^5 \times 2^3 \\ = (2^{5+3}) (a^m \times a^n = a^{m+n}) \\ = 2^8$$

$$(x) 8^t \div 8^2 = 8^{(t-2)} (a^m \div a^n = a^{m-n})$$

Question 2:

Simplify and express each of the following in exponential form:

$$(i) \frac{2^3 \times 3^4 \times 4}{3 \times 32} \quad (ii) [5^{2^3} \times 5^4] \div 5^7 \quad (iii) 25^4 \div 5^3$$

$$(iv) \frac{3 \times 7^2 \times 11^8}{21 \times 11^3} \quad (v) \frac{3^7}{3^4 \times 3^3} \quad (vi) 2^0 + 3^0 + 4^0$$

$$(vii) 2^0 \times 3^0 \times 4^0 \quad (viii) (3^0 + 2^0) \times 5^0 \quad (ix) \frac{2^8 \times a^5}{4^3 \times a^3}$$

$$(x) \left(\frac{a^5}{a^3}\right) \times a^8 \quad (xi) \frac{4^5 \times a^8 b^3}{4^5 \times a^5 b^2} \quad (xii) (2^3 \times 2)^2$$

Answer 2:

(i)

$$\begin{aligned}\frac{2^3 \times 3^4 \times 4}{3 \times 32} &= \frac{2^3 \times 3^4 \times 2 \times 2}{3 \times 2 \times 2 \times 2 \times 2 \times 2} = \frac{2^3 \times 3^4 \times 2^2}{3 \times 2^5} \\ &= \frac{2^{3+2} \times 3^4}{3 \times 2^5} \quad (a^m \times a^n = a^{m+n}) \\ &= \frac{2^5 \times 3^4}{3 \times 2^5} \\ &= 2^{5-5} \times 3^{4-1} \quad (a^m \div a^n = a^{m-n}) \\ &= 2^0 3^3 = 1 \times 3^3 = 3^3\end{aligned}$$

$$\begin{aligned}\text{(ii)} \quad &[(5^2)^3 \times 5^4] \div 5^7 \\ &= [5^{2 \times 3} \times 5^4] \div 5^7 \quad (a^m)^n = a^{mn} \\ &= [5^6 \times 5^4] \div 5^7 \\ &= [5^{6+4}] \div 5^7 \quad (a^m \times a^n = a^{m+n}) \\ &= 5^{10} \div 5^7 \\ &= 5^{10-7} \quad (a^m \div a^n = a^{m-n}) \\ &= 5^3\end{aligned}$$

$$\begin{aligned}\text{(iii)} \quad &25^4 \div 5^3 = (5 \times 5)^4 \div 5^3 \\ &= (5^2)^4 \div 5^3 \\ &= 5^{2 \times 4} \div 5^3 \quad (a^m)^n = a^{mn} \\ &= 5^8 \div 5^3 \\ &= 5^{8-3} \quad (a^m \div a^n = a^{m-n}) \\ &= 5^5\end{aligned}$$

(iv)

$$\begin{aligned}\frac{3 \times 7^2 \times 11^8}{21 \times 11^3} &= \frac{3 \times 7^2 \times 11^8}{3 \times 7 \times 11^3} \\ &= 3^{1-1} \times 7^{2-1} \times 11^{8-3} \quad (a^m \div a^n = a^{m-n}) \\ &= 3^0 \times 7^1 \times 11^5 \\ &= 1 \times 7 \times 11^5 = 7 \times 11^5\end{aligned}$$

(v)

$$\begin{aligned}\frac{3^7}{3^4 \times 3^3} &= \frac{3^7}{3^{4+3}} \quad (a^m \times a^n = a^{m+n}) \\ &= \frac{3^7}{3^7} = 3^{7-7} \quad (a^m \div a^n = a^{m-n}) \\ &= 3^0 = 1\end{aligned}$$

$$(vi) 2^0 + 3^0 + 4^0 = 1 + 1 + 1 = 3$$

$$(vii) 2^0 \times 3^0 \times 4^0 = 1 \times 1 \times 1 = 1$$

$$(viii) (3^0 + 2^0) \times 5^0 = (1 + 1) \times 1 = 2$$

(ix)

$$\begin{aligned} \frac{2^8 \times a^5}{4^3 \times a^3} &= \frac{2^8 \times a^5}{(2 \times 2)^3 \times a^3} = \frac{2^8 \times a^5}{(2^2)^3 \times a^3} \\ &= \frac{2^8 \times a^5}{2^{2 \times 3} \times a^3} \quad \left[(a^m)^n = a^{mn} \right] \\ &= \frac{2^8 \times a^5}{2^6 \times a^3} \\ &= 2^{8-6} \times a^{5-3} \quad (a^m \div a^n = a^{m-n}) \\ &= 2^2 \times a^2 = (2 \times a)^2 \quad \left[a^m \times b^m = (a \times b)^m \right] \\ &= (2a)^2 \end{aligned}$$

(x)

$$\begin{aligned} \left(\frac{a^5}{a^3} \right) \times a^8 &= a^{5-3} \times a^8 \quad (a^m \div a^n = a^{m-n}) \\ &= a^2 \times a^8 \\ &= a^{2+8} = a^{10} \quad (a^m \times a^n = a^{m+n}) \end{aligned}$$

(xi)

$$\begin{aligned} \frac{4^5 \times a^8 b^3}{4^5 \times a^5 b^2} &= 4^{5-5} \times a^{8-5} \times b^{3-2} \quad (a^m \div a^n = a^{m-n}) \\ &= 4^0 \times a^3 \times b^1 = 1 \times a^3 \times b = a^3 b \end{aligned}$$

$$\begin{aligned} (xii) (2^3 \times 2)^2 &= (2^{3+1})^2 \quad (a^m \times a^n = a^{m+n}) \\ &= (2^4)^2 = 2^{4 \times 2} \quad (a^m)^n = a^{mn} \\ &= 2^8 \end{aligned}$$

Question 3:

Say true or false and justify your answer:

(i) $10 \times 10^{11} = 100^{11}$ (ii) $2^3 > 5^2$

(iii) $2^3 \times 3^2 = 6^5$ (iv) $3^0 = (1000)^0$

Answer 3:

(i) $10 \times 10^{11} = 100^{11}$

L.H.S. = $10 \times 10^{11} = 10^{11+1}$ ($a^m \times a^n = a^{m+n}$)
 $= 10^{12}$

R.H.S. = $100^{11} = (10 \times 10)^{11} = (10^2)^{11}$
 $= 10^{2 \times 11} = 10^{22}$ ($(a^m)^n = a^{mn}$)

As L.H.S. $\neq$ R.H.S.,

Therefore, the given statement is false.

(ii) $2^3 > 5^2$

L.H.S. = $2^3 = 2 \times 2 \times 2 = 8$

R.H.S. = $5^2 = 5 \times 5 = 25$

As $25 > 8$,

Therefore, the given statement is false.

(iii) $2^3 \times 3^2 = 6^5$

L.H.S. = $2^3 \times 3^2 = 2 \times 2 \times 2 \times 3 \times 3 = 72$

R.H.S. = $6^5 = 7776$

As L.H.S. $\neq$ R.H.S.,

Therefore, the given statement is false.

(iv) $3^0 = (1000)^0$

L.H.S. = $3^0 = 1$

R.H.S. = $(1000)^0 = 1 = \text{L.H.S.}$

Therefore, the given statement is true.

Question 4:

Express each of the following as a product of prime factors only in exponential form:

(i) 108×192 (ii) 270

(iii) 729×64 (iv) 768

Answer 4:

(i) 108×192

$= (2 \times 2 \times 3 \times 3 \times 3) \times (2 \times 2 \times 2 \times 2 \times 2 \times 3)$

$= (2^2 \times 3^3) \times (2^6 \times 3)$

$= 2^{6+2} \times 3^{3+1}$ ($a^m \times a^n = a^{m+n}$)

$= 2^8 \times 3^4$

(ii) $270 = 2 \times 3 \times 3 \times 3 \times 5 = 2 \times 3^3 \times 5$

(iii) $729 \times 64 = (3 \times 3 \times 3 \times 3 \times 3 \times 3) \times (2 \times 2 \times 2 \times 2 \times 2 \times 2)$

$= 3^6 \times 2^6$

(iv) $768 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 = 2^8 \times 3$

Question 5:

Simplify:

(i) $\frac{(2^5)^2 \times 7^3}{8^3 \times 7}$ (ii) $\frac{25 \times 5^2 \times t^8}{10^3 \times t^4}$ (iii) $\frac{3^5 \times 10^5 \times 25}{5^7 \times 6^5}$

Answer 5:

(i)

$$\begin{aligned} \frac{(2^5)^2 \times 7^3}{8^3 \times 7} &= \frac{2^{5 \times 2} \times 7^3}{(2 \times 2 \times 2)^3 \times 7} & [(a^m)^n &= a^{mn}] \\ &= \frac{2^{10} \times 7^3}{(2^3)^3 \times 7} = \frac{2^{10} \times 7^3}{2^{3 \times 3} \times 7} & [(a^m)^n &= a^{mn}] \\ &= \frac{2^{10} \times 7^3}{2^9 \times 7} = 2^{10-9} \times 7^{3-1} & (a^m \div a^n &= a^{m-n}) \\ &= 2^1 \times 7^2 = 2 \times 7 \times 7 = 98 \end{aligned}$$

(ii)

$$\begin{aligned} \frac{25 \times 5^2 \times t^8}{10^3 \times t^4} &= \frac{5 \times 5 \times 5^2 \times t^8}{(5 \times 2)^3 \times t^4} & (a \times b)^m &= (a^m \times b^m) \\ &= \frac{5^{1+1+2} \times t^8}{5^3 \times 2^3 \times t^4} & (a^m \times a^n &= a^{m+n}) \\ &= \frac{5^4 \times t^8}{5^3 \times 2^3 \times t^4} = \frac{5^{4-3} \times t^{8-4}}{2^3} & (a^m \div a^n &= a^{m-n}) \\ &= \frac{5^1 \times t^4}{2 \times 2 \times 2} = \frac{5t^4}{8} \end{aligned}$$

(iii)

$$\begin{aligned} \frac{3^5 \times 10^5 \times 25}{5^7 \times 6^5} &= \frac{3^5 \times (2 \times 5)^5 \times 5 \times 5}{5^7 \times 2^5 \times 3^5} \\ &= \frac{3^5 \times 2^5 \times 5^5 \times 5^2}{5^7 \times 2^5 \times 3^5} & (a \times b)^m &= (a^m \times b^m) \\ &= \frac{3^5 \times 2^5 \times 5^{5+2}}{5^7 \times 2^5 \times 3^5} & (a^m \times a^n &= a^{m+n}) \\ &= \frac{3^5 \times 2^5 \times 5^7}{5^7 \times 2^5 \times 3^5} \\ &= 3^{5-5} \times 2^{5-5} \times 5^{7-7} & (a^m \div a^n &= a^{m-n}) \\ &= 3^0 \times 2^0 \times 5^0 = 1 \times 1 \times 1 = 1 \end{aligned}$$



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MATHS -7 (CH-13-13.3-EXPONENTS & POWERS)

Question 1:

Write the following numbers in the expanded forms:

279404, 3006194, 2806196, 120719, 20068

Answer 1:

$$279404 = 2 \times 10^5 + 7 \times 10^4 + 9 \times 10^3 + 4 \times 10^2 + 0 \times 10^1 + 4 \times 10^0$$

$$3006194 = 3 \times 10^6 + 0 \times 10^5 + 0 \times 10^4 + 6 \times 10^3 + 1 \times 10^2 + 9 \times 10^1 + 4 \times 10^0$$

$$2806196 = 2 \times 10^6 + 8 \times 10^5 + 0 \times 10^4 + 6 \times 10^3 + 1 \times 10^2 + 9 \times 10^1 + 6 \times 10^0$$

$$120719 = 1 \times 10^5 + 2 \times 10^4 + 0 \times 10^3 + 7 \times 10^2 + 1 \times 10^1 + 9 \times 10^0$$

$$20068 = 2 \times 10^4 + 0 \times 10^3 + 0 \times 10^2 + 6 \times 10^1 + 8 \times 10^0$$

Question 2:

Find the number from each of the following expanded forms:

(a) $8 \times 10^4 + 6 \times 10^3 + 0 \times 10^2 + 4 \times 10^1 + 5 \times 10^0$

(b) $4 \times 10^5 + 5 \times 10^3 + 3 \times 10^2 + 2 \times 10^0$

(c) $3 \times 10^4 + 7 \times 10^2 + 5 \times 10^0$

(d) $9 \times 10^5 + 2 \times 10^2 + 3 \times 10^1$

Answer 2:

(a) $8 \times 10^4 + 6 \times 10^3 + 0 \times 10^2 + 4 \times 10^1 + 5 \times 10^0$
 $= 86045$

(b) $4 \times 10^5 + 5 \times 10^3 + 3 \times 10^2 + 2 \times 10^0$
 $= 405302$

(c) $3 \times 10^4 + 7 \times 10^2 + 5 \times 10^0$
 $= 30705$

(d) $9 \times 10^5 + 2 \times 10^2 + 3 \times 10^1$
 $= 900230$

Question 3:

Express the following numbers in standard form:

(i) 5, 00, 00, 000 (ii) 70, 00, 000

(iii) 3, 18, 65, 00, 000 (iv) 3, 90, 878

(v) 39087.8 (vi) 3908.78



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Answer 3:

- (i) $50000000 = 5 \times 10^7$
- (ii) $7000000 = 7 \times 10^6$
- (iii) $3186500000 = 3.1865 \times 10^9$
- (iv) $390878 = 3.90878 \times 10^5$
- (v) $39087.8 = 3.90878 \times 10^4$
- (vi) $3908.78 = 3.90878 \times 10^3$

Question 4:

Express the number appearing in the following statements in standard form.

- (a) The distance between Earth and Moon is 384, 000, 000 m.
- (b) Speed of light in vacuum is 300, 000, 000 m/s.
- (c) Diameter of the Earth is 1, 27, 56, 000 m.
- (d) Diameter of the Sun is 1, 400, 000, 000 m.
- (e) In a galaxy there are on an average 100, 000, 000, 000 stars.
- (f) The universe is estimated to be about 12, 000, 000, 000 years old.
- (g) The distance of the Sun from the centre of the Milky Way Galaxy is estimated to be 300, 000, 000, 000, 000, 000, 000 m.
- (h) 60, 230, 000, 000, 000, 000, 000, 000 molecules are contained in a drop of water weighing 1.8 gm.
- (i) The earth has 1, 353, 000, 000 cubic km of sea water.
- (j) The population of India was about 1, 027, 000, 000 in March, 2001.

Answer 4:

- (a) 3.84×10^8 m
- (b) 3×10^8 m/s
- (c) 1.2756×10^7 m
- (d) 1.4×10^9 m
- (e) 1×10^{11} stars
- (f) 1.2×10^{10} years
- (g) 3×10^{20} m
- (h) 6.023×10^{22}
- (i) 1.353×10^9 cubic km
- (j) 1.027×10^9