

TERM FIRST ASSIGNMENT

(Continued)

CLASSMATE

Date:

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7th

Standard

EXPONENTS AND POWERS

Ex 5.1

Qno 1 Write the following repeated addition as multiplication

a $2 + 2 + 2 + 2$
 $2 \times 4 = 8$

b $(-3) + (-3) + (-3) + (-3) + (-3)$
 $-3 \times 5 = -15$

c $a + a + a + a + a + a$
 $a \times 6 = 6a$

d $\frac{2}{7} + \frac{2}{7} + \frac{2}{7}$
 $= \frac{2}{7} \times 3 = \frac{6}{7}$

Qno 2 Calculate

a $4 \times 4 = 16$

b $5 \times 5 \times 5 \times 5$
 $= 25 \times 25$
 $= 625$

Qno 3 Find the value of the following at $x=1$ and

$y = -2$

a $4x + 3y$
 $4(1) + 3(-2)$
 $= 4 + (-6)$
 $= 4 - 6$
 $= -2$

d $(x \times x) + (y \times y)$
 $= (1 \times 1) + [(-2) \times (-2)]$
 $= 1 + [4]$
 $= 5$

e $5x \times 6y$
 $5(1) \times 6(-2)$
 $5 \times (-12)$
 $= -60$

Ex 5.2

Q no 1 Express the following in exponential form

a $4 \times 4 \times 4 \times 4$
 $= [4]^4$

b. $a \times a \times a$
 $= a^3$

d $5 \times 5 \times 7 \times 7 \times 7$
 $(5)^2 \times (7)^3$

f $a \times a \times a \times b \times b$
 $(a)^3 \times (b)^2$

Q no 2 Find the value of

a $(-3)^6$
 $= (-3) \times (-3) \times (-3) \times (-3) \times (-3) \times (-3)$
 $= \underline{9} \times \underline{9} \times \underline{9}$
 $= 81 \times 9$
 $= 729$

b 9^5
 $9 \times 9 \times 9 \times 9 \times 9$
 $= 81 \times 81 \times 9$
 $= 6561 \times 9$
 $= 59,049$

c $(-25)^3$
 $= (-25) \times (-25) \times (-25)$
 $= 625 \times (-25)$
 $= -15625$

Q no 3 Express in power notation

-125

$$\begin{array}{r} 5 \overline{) 125} \\ 5 \overline{) 25} \\ 5 \overline{) 5} \\ 1 \end{array}$$

$$125 = -5 \times -5 \times -5$$

$$= (-5)^3$$

b

$$\begin{array}{r|l} 2 & 256 \\ \hline 2 & 128 \\ \hline 2 & 64 \\ \hline 2 & 32 \\ \hline 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline 2 & 2 \\ \hline & 1 \end{array}$$

$$\begin{aligned} 256 &= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \\ &= \underbrace{4 \times 4 \times 4}_{16} \times 4 \\ &= 16 \times 16 \\ &= (16)^2 \end{aligned}$$

c

$$\begin{array}{r|l} 7 & 343 \\ \hline 7 & 49 \\ \hline 7 & 7 \\ \hline & 1 \end{array}$$

$$\begin{aligned} -343 &= -7 \times -7 \times -7 \\ &= (-7)^3 \end{aligned}$$

d

$$\frac{81}{49}$$

$$\begin{array}{r|l} 3 & 81 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$$\begin{array}{r|l} 7 & 49 \\ \hline 7 & 7 \\ \hline & 1 \end{array}$$

$$\begin{aligned} 81 &= 3 \times 3 \times 3 \times 3 \times 1 = \frac{3^2 \times 3^2 \times 1}{7^2} = \frac{9^2}{7^2} \\ 49 &= 7 \times 7 \times 1 = \frac{7^2 \times 1}{7^2} \\ & \text{or } \left(\frac{9}{7}\right)^2 \end{aligned}$$

f do your self

Q5 Express each of the following as product of powers or their prime factors

$$\begin{array}{r}
 2 \overline{) 648} \\
 \underline{2 \quad 324} \\
 2 \overline{) 162} \\
 \underline{3 \quad 81} \\
 3 \overline{) 27} \\
 \underline{3 \quad 9} \\
 3 \overline{) 3} \\
 \underline{1}
 \end{array}$$

$$\begin{aligned}
 648 &= 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 1 \\
 &= 2^3 \times 3^2 \times 3^2 \times 1 \\
 &= 2^3 \times 9^2
 \end{aligned}$$

$$\begin{array}{r}
 2 \overline{) 3600} \\
 \underline{2 \quad 1800} \\
 3 \overline{) 900} \\
 \underline{3 \quad 300} \\
 2 \overline{) 100} \\
 \underline{2 \quad 50} \\
 5 \overline{) 25} \\
 \underline{5 \quad 5} \\
 \underline{1}
 \end{array}$$

$$\begin{aligned}
 3600 &= 2 \times 2 \times 3 \times 3 \times 2 \times 2 \times 5 \times 5 \\
 &= 2^2 \times 3^2 \times 2^2 \times 5^2 \\
 &= 2^2 \times 2^2 \times 3^2 \times 5^2 \\
 &= 4^2 \times 3^2 \times 5^2
 \end{aligned}$$

Ex 5.3

Qno1 Simplify and express each of the following products in exponential form

$$\begin{aligned}
 a \quad & 2^3 \times 2^6 \\
 &= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \\
 &= 2^9 \quad \begin{matrix} a^m \\ a \times a^n \\ = a^{m+n} \end{matrix}
 \end{aligned}$$

In multiplication when bases are same powers are added

$$\begin{aligned}
 b \quad & (-4)^5 \times (-4)^2 \\
 &= -4 \times -4 \times -4 \times -4 \times -4 \times -4 \times -4 \\
 &= (-4)^7
 \end{aligned}$$

$$a^m \times a^n = a^{m+n}$$

$$\text{OR } (-4)^{5+2} = (-4)^7$$

$$\begin{aligned}
 f \quad & x \times x^2 \times x^3 \\
 &= x \times x \times x \times x \times x \times x \times x \\
 &= x^6
 \end{aligned}$$

$$\begin{aligned}
 \text{OR } & (x)^{1+2+3} \\
 &= x^6 \quad \begin{matrix} a^m \\ a \times a^n \\ = a^{m+n} \end{matrix}
 \end{aligned}$$

$$\text{iv } \left(-\frac{5}{7}\right)^3 \times \left(-\frac{5}{7}\right)^2 \times \left(-\frac{5}{7}\right)^8 \quad a^m \times a^n = a^{m+n}$$

$$= -\frac{5}{7} \times -\frac{5}{7} \times -\frac{5}{7} \times -\frac{5}{7} \times -\frac{5}{7} \times -\frac{5}{7} \times -\frac{5}{7} \times -\frac{5}{7} \times -\frac{5}{7} \times -\frac{5}{7} \times -\frac{5}{7} \times -\frac{5}{7} \times -\frac{5}{7} \times -\frac{5}{7} \times -\frac{5}{7} \times -\frac{5}{7}$$

$$= \left(-\frac{5}{7}\right)^{13}$$

Q2 Simplify and express each of the following in exponent form

a $5^9 \div 5^4$ OR $5^9 \div 5^4$

$$= \frac{5^9}{5^4}$$

$$5^{9-4} \quad a^m \div a^n = a^{m-n}$$

$$= 5^5$$

$$= \frac{\cancel{5} \times \cancel{5} \times \cancel{5} \times \cancel{5} \times 5 \times 5 \times 5 \times 5 \times 5}{\cancel{5} \times \cancel{5} \times \cancel{5} \times \cancel{5}}$$

$$= 5^5 \quad a^m \div a^n = a^{m-n}$$

\therefore In division when bases are same powers are subtracted

b $(-2)^6 \div (-2)^2 \quad a^m \div a^n = a^{m-n}$

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

Q3 Express each of the following with a single exponent

$$\begin{aligned}
 a \quad & \left[(3)^2 \right]^3 && \text{OR} && \left[(3)^2 \right]^3 && (a^m)^n \\
 & = (3)^2 \times (3)^2 \times (3)^2 && && (3)^{3 \times 2} && = a^{m \times n} = a^{mn} \\
 & = (3)^{2+2+2} && a^m \times a^n = a^{m+n} && (3)^6 && \\
 & = (3)^6 && && &&
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad & \left[(-8)^3 \right]^3 && \text{OR} && \left[(-8)^3 \right]^3 && (a^m)^n \\
 & = (-8)^3 \times (-8)^3 \times (-8)^3 && a^m \times a^n = a^{m+n} && = a^{m \times n} = a^{mn} \\
 & = (-8)^{3+3+3} && && = (-8)^9 && \\
 & = (-8)^9 && && &&
 \end{aligned}$$

$$\begin{aligned}
 c \quad & \left[\left(\frac{1}{3} \right)^2 \right]^7 \\
 & \left[\frac{1}{3} \right]^{14} (a^m)^n = a^{m \times n} \\
 & = a^{mn}
 \end{aligned}$$

$$\begin{aligned}
 d \quad & \left[(-3)^2 \right]^3 \times \left[(-3)^3 \right]^2 \\
 & \left[(-3)^6 \times (-3)^6 \right] (a^m)^n = a^{mn} \\
 & (-3)^{6+6} \quad a^m \times a^n = a^{m+n} \\
 & = (-3)^{12}
 \end{aligned}$$