

## CHAPTER 12

# EXPONENTS AND POWERS

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### Points to Remember

- Exponent is used to express very large no. and very small numbers in standard form.
- Very large numbers can be expressed in standard form using positive exponents.  
*e.g.*, Distance between sun and moon =  $1.49 \times 10^{11}$  m
- Very small numbers can be expressed in standard form using negative exponents.

*e.g.*, 1 micron =  $10^{-6}m = \frac{1}{1000000}m$ .

- If  $x, y, a, b$  are rational no. then

(i)  $x^a \times x^b = x^{a+b}$

(ii)  $x^a \div x^b = x^{a-b}$

(iii)  $x^a \times y^a = (xy)^a$

(iv)  $x^a \div y^a = \left(\frac{x}{y}\right)^a$

(v)  $\left(\frac{x}{y}\right)^a = \frac{x^a}{y^a}$

(vi)  $(x^a)^b = x^{ab}$

(vii)  $x^a \times y^{-a} = \frac{x^a}{y^a} = \left(\frac{x}{y}\right)^a$

(viii)  $x^0 = 1$ .

(ix)  $x^{-a} = \frac{1}{x^a}$ .

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## QUESTIONS

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- 2 multiplied eleven times is written as \_\_\_\_\_.
- What is the base of the exponent  $9^6$ ?
- Simplify and give the answer.

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

- Find the missing number  $7^5 = \frac{1}{7\Box}$
- Find  $\left(\frac{-2}{5}\right)^2 \times \left(\frac{5}{2}\right)^2 = \text{_____}$ .
- Find the value of  $(3^2)^2$ .
- Calculate  $2^5 + 5^2$ .
- Find the value of  $x$ , when  $2^x = 4^3$
- How much is  $(\sqrt{5})^5 \div (\sqrt{5})^3$ ?
- Calculate and find the value of  $3^2 \times 2^3$ .
- If  $(x^5 \times x^{-2})^2 = 64$ , what is  $x$ ?
- $1^3 + 1^{-3} = ?$
- Find the value  $(2^{11} + 3^2 - 5^1)^0$ .
- The value of  $\frac{x^{21}}{x^{17}} = ?$
- Follow the pattern and complete.

*Pattern*

$$121 = 11^2$$

$$12321 = 111^2$$

*Complete*

$$123454321 = ?$$

- Find the value of  $a^2b^3$  when  $a = 2$  and  $b = 3$ .
- Find the value of  $x$ . If  $2^x = \frac{1}{32}$ .
- If  $2^x \times 5^x = 1000$ , then  $x = ?$
- If  $5^{2x-6} = 1$  then  $x = ?$
- Find the value of  $x$  if  $2^{3x} = 64$ .



33. Find  $8.469 \times 10^3$  in usual form.
34. Find  $724.9 \times 10^3$  in usual form.
35. Find  $72.49 \times 10^3$  in usual form.
36. Find  $72.48 \times 10^{-3}$  in usual form
37. Find  $5 \times 10^{-3}$  in usual form.
38. Find  $8465 \times 10^{-2}$  in usual form.
39. Find 0.000000 375 in standard form.
40. Find 418700000 in standard form.
41. Find  $87.34 \times 10^{-3}$  in standard form
42. Find  $72.48 \times 10^3$  in standard form.
43. Simplify in exponent form  $(3^4 \times 3^2) \div 3^{-4}$ .
44. Simplify in exponent form  $(2^{-3} \times 2^6) \div 2^5$ .
45. Simplify in exponent form  $2^{-3} \times 2^5 \times 5^2$ .
46. Simplify  $(-2)^4 \times \left(\frac{3}{2}\right)^4$ .
47. Find the value of  $a$  if  $(-2)^{3a+1} \times (-2)^4 = (-2)^8$ .
48. Find the value of  $(2^{-1} + 3^{-1})^2$ .
49. Find the value of  $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2}$ .
50. Find the value of  $\frac{6^7 - 6^9}{6^5}$ .

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## ANSWERS

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|-----------------------|------------|
| 1. $2^{11}$           | 2. 9       |
| 3. $\frac{4}{25}$     | 4. -5      |
| 5. 1                  | 6. 81      |
| 7. 57                 | 8. $x = 6$ |
| 9. $(\sqrt{5})^2 = 5$ | 10. 72     |
| 11. 2                 | 12. 2      |
| 13. 1                 | 14. $x^4$  |



7. Find the value of  $\left(\frac{3}{-2}\right)^2 \times \left(\frac{-2}{3}\right)^3$ .
8. Find the value of  $(125)^2$ .
9. Find the value of  $\left(2^{-1} + 3^2 + \frac{1}{4}\right)^\circ$ .
10. Find the value of  $ab^2c$  if  $a = 1$ ,  $b = 2$ ,  $c = 3$ .

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## ANSWERS

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1. 0.0372

2. 473.2

3.  $3.268 \times 10^5$

4.  $3.67 \times 10^{-4}$

5.  $a^{10}$

6.  $m = 1$

7.  $\frac{-2}{3}$

8. 15625

9. 1

10. 12