

MATHEMATICS
WORKSHEET_090526
CHAPTER 02 POWER PLAY (Ganita Prakashan)
(ANSWERS)

SUBJECT: MATHEMATICS

MAX. MARKS : 40

CLASS : VIII

DURATION : 1½ hr

General Instructions:

- (i). All questions are compulsory.
- (ii). This question paper contains 20 questions divided into five Sections A, B, C, D and E.
- (iii). **Section A** comprises of 10 MCQs of 1 mark each. **Section B** comprises of 4 questions of 2 marks each. **Section C** comprises of 3 questions of 3 marks each. **Section D** comprises of 1 question of 5 marks each and **Section E** comprises of 2 Case Study Based Questions of 4 marks each.
- (iv). There is no overall choice.
- (v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. What is the value of $3^0 + 4^0 + 5^0$?
(a) 3 (b) 1 (c) 12 (d) 0
Ans. (a) 3
 $3^0 + 4^0 + 5^0 = 1 + 1 + 1 = 3$.
2. The planet Mars is approximately 22,80,00,000 km away from the Sun. What is this distance in standard form?
(a) 22.8×10^7 km (b) 2.28×10^8 km (c) 2.28×10^7 km (d) 2.28×10^{-8} km
Ans. (b) 2.28×10^8 km
3. The value of $(-2)^3 \times (-2)^{-5}$ is:
(a) 2^2 (b) $1/4$ (c) -4 (d) 4
Ans. (b) $1/4$
Using the rule $n^a \times n^b = n^{a+b}$, we get
 $(-2)^3 \times (-2)^{-5} = (-2)^{3+(-5)} = (-2)^{-2}$.
Now, $(-2)^{-2} = 1/(-2)^2 = 1/4$.
4. If $3^{2x} = 81$, what is the value of x?
(a) 2 (b) 3 (c) 4 (d) 1
Ans. (a) 2
 $3^{2x} = 81 = 3^4$. Since the bases are equal, the exponents must be equal. $2x = 4 \Rightarrow x = 2$.
5. Simplify the expression: $(p^5 \times q^6) / (p^2 \times q^3)$
(a) p^3q^3 (b) $(pq)^7$ (c) p^7q^9 (d) p^3/q^3
Ans. (a) p^3q^3
6. A virus's DNA is 0.0000000021 meters long. In scientific notation, this length is:
(a) 2.1×10^{-9} m (b) 2.1×10^{-8} m (c) 2.1×10^9 m (d) 2.1×10^8 m
Ans. (a) 2.1×10^{-9} m
7. A magic potion doubles its quantity every minute. If you start with a single drop, how many minutes will it take for the quantity to be 2^{15} drops?
(a) 15 minutes (b) 30 minutes (c) 10 minutes (d) 2 minutes
Ans. (a) 15 minutes
The quantity doubles every minute. This means after 't' minutes, the quantity will be 2^t drops. We need to find 't' such that $2^t = 2^{15}$.

Equating the exponents, we get $t = 15$ minutes.

8. Which of the following is equivalent to 5^{100} ?

(a) $(5^{10})^9$

(b) $(5^{20})^5$

(c) $(5^{10})^{100}$

(d) $(5^5)^{10}$

Ans. (b) $(5^{20})^5$

Using the law of exponents $(n^a)^b = n^{a \times b}$, we can check the options:

(a) $(5^{10})^9 = 5^{10 \times 9} = 5^{90}$

(b) $(5^{20})^5 = 5^{20 \times 5} = 5^{100}$

(c) $(5^{10})^{100} = 5^{10 \times 100} = 5^{1000}$

(d) $(5^5)^{10} = 5^{5 \times 10} = 5^{50}$

So, the correct option is (b).

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- (a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

9. **Assertion (A):** The value of $(-1)^{500}$ is 1.

Reason (R): When a negative number is raised to an even power, the result is positive.

Ans. (a) Both A and R are true, and R is the correct explanation of A.

The assertion is true because (-1) raised to an even power results in 1. The reason is also true and correctly explains the assertion.

10. **Assertion (A):** The value of 2^{-3} is $1/8$.

Reason (R): For any non-zero integer 'n', $n^{-a} = 1/n^a$.

Ans. (a) Both A and R are true, and R is the correct explanation of A.

The assertion states that $2^{-3} = 1/8$, which is true. The reason states the general rule for negative exponents,

$n^{-a} = 1/n^a$. This rule is correct and directly explains why 2^{-3} equals $1/8$.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find the value of (i) $(3^2 \times 3^4) \div 3^6$ (ii) $(5^8 \div 5^3) \times 5^2$

Ans. (i) $(3^2 \times 3^4) \div 3^6 = 3^{2+4} \div 3^6 = 3^6 \div 3^6 = 3^{6-6} = 3^0 = 1$

(ii) $(5^8 \div 5^3) \times 5^2 = 5^{8-3} \times 5^2 = 5^5 \times 5^2 = 5^{5+2} = 5^7$

12. Simplify: $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2}$

Ans. Using the rule $n^{-a} = 1/n^a$, we have:

$$\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2} = 2^2 + 3^2 + 4^2 = 4 + 9 + 16 = 29$$

13. If $3^x = 9^2 \times 27$, find the value of x .

Ans. $3^x = 9^2 \times 27$

$$\Rightarrow 3^x = (3^2)^2 \times 3^3$$

$$\Rightarrow 3^x = 3^{2 \times 2} \times 3^3$$

$$\Rightarrow 3^x = 3^4 \times 3^3 \Rightarrow 3^x = 3^{4+3} \Rightarrow 3^x = 3^7$$

Equating the exponents, we get $x = 7$.

14. A country's GDP is Rs. 3.5×10^{12} . The population is 7×10^8 . What is the GDP per person? Express your answer in standard form.

Ans. GDP = Rs. 3.5×10^{12}

Population = 7×10^8

$$\text{GDP per person} = \text{GDP/Population} = \frac{3.5 \times 10^{12}}{7 \times 10^8} = 0.5 \times 10^{12-8} = 0.5 \times 10^4 = 5 \times 10^3$$

So, the GDP per person is Rs. 5×10^3

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Simplify: $\frac{6^3 \times 12^2 \times 9}{18^2 \times 24}$

$$\begin{aligned} \text{Ans. } \frac{6^3 \times 12^2 \times 9}{18^2 \times 24} &= \frac{(2 \times 3)^3 \times (2^2 \times 3)^2 \times 3^2}{(2 \times 3^2)^2 \times 2^3 \times 3} \\ &= \frac{2^3 \times 3^3 \times (2^2)^2 \times 3^2 \times 3^2}{2^2 \times (3^2)^2 \times 2^3 \times 3} = \frac{2^3 \times 3^3 \times 2^4 \times 3^2 \times 3^2}{2^2 \times 3^4 \times 2^3 \times 3} \\ &= 2^{3+4-2-3} \times 3^{3+2+2-4-1} = 2^2 \times 3^2 = 4 \times 9 = 36 \end{aligned}$$

16. Find the value of x for which $\left(\frac{5}{7}\right)^{2x-1} \div \left(\frac{5}{7}\right)^3 = \left(\frac{5}{7}\right)^{-4}$

$$\begin{aligned} \text{Ans. } \left(\frac{5}{7}\right)^{2x-1} \div \left(\frac{5}{7}\right)^3 &= \left(\frac{5}{7}\right)^{-4} \Rightarrow \left(\frac{5}{7}\right)^{2x-1-3} = \left(\frac{5}{7}\right)^{-4} \\ \Rightarrow \left(\frac{5}{7}\right)^{2x-4} &= \left(\frac{5}{7}\right)^{-4} \Rightarrow 2x-4 = -4 \Rightarrow 2x = 0 \Rightarrow x = 0 \end{aligned}$$

17. By what number should $\left(\frac{-3}{4}\right)^{-2}$ be multiplied so that the product is 3^{-2} ?

Ans. Let x should $\left(\frac{-3}{4}\right)^{-2}$ be multiplied so that the product is 3^{-2} , then we have

$$\begin{aligned} x \times \left(\frac{-3}{4}\right)^{-2} &= 3^{-2} \Rightarrow x = 3^{-2} \times \left(\frac{-3}{4}\right)^2 \\ \Rightarrow x &= 3^{-2} \times \frac{(-3)^2}{4^2} = \frac{1}{9} \times \frac{9}{16} = \frac{1}{16} \end{aligned}$$

SECTION – D

Questions 18 carry 5 marks each.

18. Find the value of x and y such that $5^x = 125$ and $7^y = 1/343$. Hence, evaluate the expression $(x - y)^{x+y}$.

Ans. **Find the value of x:**

$$5^x = 125 \Rightarrow 5^x = 5^3$$

Equating exponents, $x=3$.

Find the value of y: $7^y = 1/343$

$$\Rightarrow 7^y = 1/7^3$$

Using the rule $n^{-a} = 1/n^a$, we get $7^y = 7^{-3}$.

Equating exponents, $y = -3$.

Evaluate the expression $(x + y)^{x-y}$:

$$x + y = 3 + (-3) = 0$$

$$\text{and } x - y = 3 - (-3) = 3 + 3 = 6$$

The expression is $(6)^0 = 1$.

SECTION – E (Case Study Based Question)

Question 19 to 20 carry 4 mark

19. Case Study-1: The King's Gold Coins:

A king distributes his gold coins to his three ministers. Each minister receives three large chests. Each chest contains three medium-sized boxes. Each medium-sized box contains three small pouches, and each small pouch contains three gold coins. The king asks his ministers to calculate the total number of gold coins, but they must use exponential notation to present their answer.



- (i) Express the number of gold coins each minister receives in exponential form. (1)
- (ii) How many gold coins were distributed in total by the king? Express your answer in exponential form. (1)
- (iii) If the number of ministers was four instead of three, and the number of chests, boxes, pouches, and coins per pouch remained the same, how many total coins would have been distributed? Express your answer in exponential form. (1)
- (iv) The king takes back a portion of the total coins equal to 3^4 . What is the number of coins remaining with the ministers? Express your answer in exponential form. (1)

Ans. (i) The number of gold coins each minister receives is:

Number of chests $\times$ Number of boxes $\times$ Number of pouches $\times$ Number of coins

$$= 3 \times 3 \times 3 \times 3 = 3^4 \text{ coins. (1)}$$

(ii) The total number of gold coins distributed is the number of ministers multiplied by the coins each minister receives: $3 \times 3^4 = 3^{1+4} = 3^5$ coins. (1)

(iii) If there were 4 ministers, the total coins would be: $4 \times 3^4 = 4 \times 81 = 324$ coins. (1)

(iv) Coins taken back = 3^4

Total coins = 3^5 Coins

$$\text{Remaining} = 3^5 - 3^4 = (3 \times 3^4) - 1 \times 3^4 = (3 - 1) \times 3^4 = 2 \times 3^4. (1)$$

20. Case Study-2 The Virus Spread:

A new virus strain is discovered that infects people at an alarming rate. Initially, there is only one person infected on Day 0. The number of infected people doubles every day. The government wants to track the spread of this virus using exponential notation to manage resources efficiently.



- (i) Write the number of infected people at the end of Day 5 in exponential form. (1)
- (ii) On which day will the number of infected people reach 256? (1)
- (iii) If the number of infected people tripled every day instead of doubling, how many people would be infected at the end of Day 3? Express your answer in exponential form. (1)
- (iv) The number of infected people after 'x' days can be represented by 2^x . What is the ratio of the number of infected people on Day 8 to Day 4? Express in exponential form. (1)
- Ans. (i) The number of infected people doubles every day. The number of infected people after 'n' days is 2^n (starting with $2^0 = 1$ person on Day 0). At the end of Day 5, the number of infected people is 2^5 . (1)
- (ii) We need to find the day 'n' when the number of infected people is 256.
 $2^n = 256$ Since $2^8 = 256$, the number of infected people will reach 256 on Day 8. (1)
- (iii) If the number tripled, the number of infected people after 'n' days would be 3^n (starting with $3^0 = 1$ on Day 0). At the end of Day 3, the number of infected people would be 3^3 . (1)
- (iv) The ratio of infected people on Day 8 to Day 4 is $2^8/2^4$.
 Using the rule $n^a \div n^b = n^{a-b}$, the ratio is $2^{8-4} = 2^4$. (1)
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