

GRADE: 7

SUBJECT: Mathematics

LESSON: Exponents and Powers

DURATION: 2½ hrs

MAX MARKS: 80

Instructions:

1. The time given at the head of this Paper is the time allowed for writing the answers.
2. You will not be allowed to write during the first 10 minutes. Use this time to read the question paper carefully.
3. Attempt **all questions from Section A** and **any four questions from Section B**.
4. All working, including rough work, must be clearly shown.
5. Omission of essential working will result in loss of marks.

SECTION A ($4 \times 10 = 40$ marks)

(Answer all questions)

1. Choose the correct option:

a) The value of $(-2)^4$ is:

- (i) -16
- (ii) 16
- (iii) 8
- (iv) -8

b) The scientific notation of 3,430,000 is:

- (i) 3.43×10^6
- (ii) 34.3×10^5
- (iii) 3.43×10^5
- (iv) 3.43×10^7

c) The prime factorization of 512 in exponential form is:

- (i) 2^8
- (ii) 2^6

- (iii) 2^7
- (iv) 2^9

d) The value of 10^0 is:

- (i) 0
- (ii) 1
- (iii) 10
- (iv) 100

2. Solve the following:

a) Write the base and exponent for the following exponential forms:

- 5^3
- $(-3)^4$
- 7^5

b) Convert the following numbers into scientific notation:

- 573,000
- 9,812,700,000

c) Express the following numbers as powers of 2:

- 32
- 128
- 1024

3. Solve the following equations:

a) Find the value of x in each case:

- $3^x = 243$
- $(-5)^x = -125$

b) Simplify and write the answer in exponential form:

- $2^4 \times 2^3$
- $10^7 \div 10^3$

c) Express the following numbers in expanded exponential form:

- 753015
- 900230

4. State whether the following statements are TRUE or FALSE:

- $(-2)^3$ is equal to 8.
- The standard form of 7,000,000 is 7.0×10^6 .
- 10^{-2} is equal to 0.01.
- The exponent in 5^6 is 5.

5. Solve the following problems:

a) Write the prime factorization of the following numbers in exponential form:

- 48
- 360

b) Compare the following numbers using exponential notation:

- 4.3×10^{14} and 3.01×10^{17}
- 2.3×10^9 and 2.5×10^9

c) By what number should we multiply $(-6)^{-3}$ so that the product is 10^1 ?

SECTION B ($4 \times 10 = 40$ marks)

(Answer any four questions)

6. Graph-Based Question:

The table below shows population figures in scientific notation for different planets:

Planet	Population (approx.)
Earth	7.8×10^9
Mars	1.2×10^6
Venus	4.5×10^5

- a) Represent this data using a **bar graph**.
b) Which planet has the smallest population?

7. Exponential Form Calculations:

a) Simplify and express in exponential form:

- $(-3)^5 \times (-3)^3$
- $10^9 \div 10^4$

b) Find the value of x:

- $7^x = 49$
- $2^x = 64$

c) Write the following numbers as powers of 3:

- 81
- 729

8. Laws of Exponents Applications:

a) Using the laws of exponents, simplify:

- $(2^3)^4$
- $5^6 \div 5^2$

b) Express the following in standard form:

- 6000000
- 0.00042

c) Compare the numbers in standard form:

- 1.2×10^8 and 9.8×10^7

9. Application-Based Questions:

a) The speed of light is $3 \times 10^8 m/s$. If a spaceship travels at $1.5 \times 10^7 m/s$, how long will it take to travel 4.5×10^{12} meters?

- b) The mass of Jupiter is $1.9 \times 10^{27} \text{ kg}$, and the mass of Earth is $5.97 \times 10^{24} \text{ kg}$. How many times heavier is Jupiter than Earth?
- c) A scientist is working with atoms that have a diameter of 2.5×10^{-10} meters. How many atoms would fit in a 1 cm space?

10. Higher Order Thinking Skills (HOTS):

- a) A bacteria population doubles every hour. If the initial count is 2^5 , find the population after 6 hours in exponential form.
- b) A number is written as $6^x = 36$. Find x.
- c) The planet Kepler-22b is estimated to be 2.4×10^6 km from its star. Convert this into meters using exponential notation.

END OF THE QUESTION PAPER