Exponents and Power: Exercise 13.3

Q.1 Write the following numbers in the expanded forms:
279404, 3006194, 2806196, 120719, 20068
Sol:
(a) Given: 279404
Expanded form of the number 279404:
$= (2 \times 100000) + (7 \times 10000) + (9 \times 1000) + (4 \times 100) + (0 \times 10) + (4 \times 1)$
$= (2 \times 10^5) + (7 \times 10^4) + (9 \times 10^3) + (4 \times 10^2) + (0 \times 10^1) + (4 \times 10^0)$

(b) Given: 3006194
Expanded form of the number 3006194:
$= (3 \times 1000000) + (0 \times 100000) + (0 \times 10000) + (6 \times 1000) + (1 \times 100) + (9 \times 10) + 4$
$= (3 \times 10^6) + (0 \times 10^5) + (0 \times 10^4) + (6 \times 10^3) + (1 \times 10^2) + (9 \times 10^1) + (4 \times 10^0)$

(c) Given: 2806196
Expanded form of the number 2806196:
$= (2 \times 1000000) + (8 \times 100000) + (0 \times 10000) + (6 \times 1000) + (1 \times 100) + (9 \times 10) + 6$
$= (2 \times 10^6) + (8 \times 10^5) + (0 \times 10^4) + (6 \times 10^3) + (1 \times 10^2) + (9 \times 10^1) + (6 \times 10^0)$

(d) Given: 120719
Expanded form of the number 120719:
$= (1 \times 100000) + (2 \times 10000) + (0 \times 1000) + (7 \times 100) + (1 \times 10) + (9 \times 1)$
$= (1 \times 10^5) + (2 \times 10^4) + (0 \times 10^3) + (7 \times 10^2) + (1 \times 10^1) + (9 \times 10^0)$

(e) Given: 20068
Expanded form of the number 20068:
$= (2 \times 10000) + (0 \times 1000) + (0 \times 100) + (6 \times 10) + (8 \times 1)$
$= (2 \times 10^4) + (0 \times 10^3) + (0 \times 10^2) + (6 \times 10^1) + (8 \times 10^0)$

Q.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) $(9 \times 10^5) + (2 \times 10^2) + (3 \times 10^1)$
Sol:
(a) Given expended form: $(8 \times 10^4) + (6 \times 10^3) + (0 \times 10^2) + (4 \times 10^1) + (5 \times 10^0)$
$= 8 \times 10000) + (6 \times 1000) + (0 \times 100) + (4 \times 10) + (5 \times 1)$
$= 80000 + 6000 + 0 + 40 + 5$
$= 86045$

(b) Given expended form: $(4 \times 10^5) + (5 \times 10^3) + (3 \times 10^2) + (2 \times 10^0)$
$= (4 \times 100000) + (0 \times 10000) + (5 \times 1000) + (3 \times 100) + (0 \times 10) + (2 \times 1)$
$= 400000 + 0 + 5000 + 300 + 0 + 2$
$= 405302$

(c) Given expended form: $(3 \times 10^4) + (7 \times 10^2) + (5 \times 10^0)$
$= (3 \times 10000) + (0 \times 1000) + (7 \times 100) + (0 \times 10) + (5 \times 1)$
$= 30000 + 0 + 700 + 0 + 5$
$= 30705$

(d) Given expended form: $(9 \times 10^5) + (2 \times 10^2) + (3 \times 10^1)$

= (9 × 100000) + (0 × 10000) + (0 × 1000) + (2 × 100) + (3 × 10) + (0 × 1)
= 900000 + 0 + 0 + 200 + 30 + 0
= 900230

Q.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**
Sol:
(i) Given expression: 5,00,00,000
Standard form = 5×10^7

(ii) Given expression: 70,00,000
Standard form = 7×10^6

(iii) Given expression: 3,18,65,00,000
Standard form = 3.1865×10^9

(iv) Given expression: 3,90,878
Standard form = 3.90878×10^5

(v) Given expression: 39087.8
Standard form = 3.90878×10^4

(vi) Given expression: 3908.78
Standard form = 3.90878×10^3

Q.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.
Sol:
(a) Given: The distance between Earth and Moon is 384,000,000 m.

Standard form: 3.84×10^8m

(b) Given: Speed of light in vacuum is 300,000,000 m/s.
Standard form: 3×10^8m/s

(c) Given: Diameter of the Earth is 1,27,56,000 m.
Standard form: 1.2756×10^7m

(d) Given: Diameter of the Sun is 1,400,000,000 m.
Standard form: 1.4×10^9m

(e) Given: In a galaxy there are on an average 100,000,000,000 stars.
Standard form: 1×10^{11} stars

(f) Given: The universe is estimated to be about 12,000,000,000 years old.
Standard form: 1.2×10^{10} years old

(g) Given: 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.
Standard form: 3×10^{20}m

(h) Given: 60,230,000,000,000,000,000,000 molecules are contained in a drop of water weighing 1.8 gm.
Standard form: 6.023×10^{22} molecules

(i) Given: The earth has 1,353,000,000 cubic km of sea water.
Standard form: 1.353×10^{9} cubic km

(j) Given: The population of India was about 1,027,000,000 in March, 2001.
Standard form: 1.027×10^{9}