DIVISIBILITY TESTS, SQUARES, CUBES, SQUARE AND CUBE ROOTS

Class-7 CBSE Math Worksheets with Solutions

Practice Question & worksheet for chapter 2

Example: Find the H.C.F. of 540 and 1008.

2	540
2	270
3	135
3	45
3	15
5	5
	1

2	1008
2	504
2	252
2	126
3	63
3	21
7	7
	1

Solution: Resolving each of the given numbers into prime factors, we get :

$540 = 2^2 \times 3^3 \times 5$

$1008 = 2^4 \times 3^2 \times 7$

$\therefore$ H.C.F. = Product of terms containing least powers of common prime factors

$= 2^2 \times 3^2 = (4 \times 9) = 36.$

Example: Find the H.C.F. of 324, 288 and 360.

Solution: Resolving each of the given Numbers into prime factors, we get :

2	324
2	162
3	81
3	27
3	9
3	3
	1

2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

2	360
2	180
2	90
3	45
3	15
5	5
	1

$324 = 2^2 \times 3^4$

$288 = 2^5 \times 3^2$

$360 = 2^3 \times 3^2 \times 5$

$\therefore$ H.C.F. = Product of terms containing least powers of common Prime factors

$= 2^2 \times 3^2 = (4 \times 9) = 36.$

Example: Find the L.C.M. of 72 and 84 by prime factorisation method.

Solution : Resolving each of the given numbers into prime factors, we get :

2	72
2	36
2	18
3	9
3	3
	1

2	84
2	42
3	21
7	7
	1

$72 = 2^3 \times 3^2$

$84 = 2^2 \times 3 \times 7$

L.C.M. = Product of terms containing the highest powers of all prime factors

$= 2^3 \times 3^2 \times 7 = 504$.

Example: Find the square root of $204 \cdot 089796$.

Solution: Here, the number of decimal places is already even. So, mark the periods and proceed as follows:

$$
\begin{array}{r|llllll}
1 & \overline{2} & \overline{04} & \cdot\overline{08} & \overline{97} & \overline{96} & (14.286 \\
 & 1 & & & & & \\
\hline
24 & 1 & 04 & & & & \\
 & & 96 & & & & \\
\hline
282 & & 8 & 08 & & & \\
 & & 5 & 64 & & & \\
\hline
2848 & & 2 & 44 & 97 & & \\
 & & 2 & 27 & 84 & & \\
\hline
28566 & & & 17 & 13 & 96 & \\
 & & & 17 & 13 & 96 & \\
\hline
 & & & & \times & & \\
\end{array}
$$

$\therefore \sqrt{204 \cdot 089796} = 14.286.$

Example: Find the value of $\sqrt{0.56423}$ upto 3 places of decimal.

Solution: In order to make an even number of decimal places, we affix a zero at the end of the given decimal.

Now, mark off the periods and extract the square root as shown below.

$$
\begin{array}{r|l}
7 & 0\cdot\overline{56}\ \ \overline{42}\ \ \overline{30}\ \ (0.751 \\
 & \ \ \ 49 \\
\hline
145 & \ \ \ 7\ \ 42 \\
 & \ \ \ 7\ \ 25 \\
\hline
1501 & \ \ \ \ \ 17\ \ 30 \\
 & \ \ \ \ \ 15\ \ 01 \\
\hline
 & \ \ \ \ \ \ 2\ \ 29
\end{array}
$$

$$\therefore \quad \sqrt{0.56423} = \sqrt{0.564230} = 0.751.$$

Example: Find the value of $\sqrt{0.9}$ upto 3 places of decimal.

Solution : For finding the square root of 0.9 upto 3 decimal places, we need 3 pairs of decimal places in the given decimal.

So, we write, 0.9 = 0.900000.

Now, mark off periods and extract the square root as shown below.

$$
\begin{array}{r|l}
9 & 0\cdot\overline{90}\ \ \overline{00}\ \ \overline{00}\ \ (0.948 \\
 & \ \ \ 81 \\
\hline
184 & \ \ \ \ 9\ \ 00 \\
 & \ \ \ \ 7\ \ 36 \\
\hline
1888 & \ \ \ \ 1\ \ 64\ \ 00 \\
 & \ \ \ \ 1\ \ 51\ \ 04 \\
\hline
 & \ \ \ \ \ \ \ 12\ \ 96
\end{array}
$$

$$\therefore \sqrt{0.9} = \sqrt{0.900000} = 0.948.$$

Example: Find the value of $\sqrt{\frac{3}{7}}$ upto four decimal places.

Solution: To make the denominator a perfect square, we multiply it by 7 and therefore, we multiply the numerator also by 7.

$$\therefore \sqrt{\frac{3}{7}}=\sqrt{\frac{3\times 7}{7\times 7}}=\frac{\sqrt{21}}{\sqrt{7\times 7}}=\frac{\sqrt{21}}{7}.$$

Now, we evaluate $\sqrt{21}$ up to four places of decimal as given below:

$$\begin{array}{r|lllll}
4 & \overline{21} & \cdot\overline{00} & \overline{00} & \overline{00} & \overline{00}\ (4.5825 \\
 & 16 & & & & \\
\hline
85 & 5 & 00 & & & \\
 & 4 & 25 & & & \\
\hline
908 & & 75 & 00 & & \\
 & & 72 & 64 & & \\
\hline
9162 & & 2 & 36 & 00 & \\
 & & 1 & 83 & 24 & \\
\hline
91645 & & & 52 & 76 & 00 \\
 & & & 45 & 82 & 25 \\
\hline
 & & & 6 & 93 & 75
\end{array}$$

Thus, $\sqrt{\frac{3}{7}}=\frac{\sqrt{21}}{7}=\frac{4.5825}{7}=0.6546.$

Example: Find the value of $\sqrt{372\cdot 49}+\sqrt{3\cdot 7249}$

Solution:

$$\begin{array}{r|lll}
1 & \overline{3} & \overline{72} & \overline{49}\ (193 \\
 & 1 & & \\
\hline
29 & 2 & 72 & \\
 & 2 & 61 & \\
\hline
383 & & 11 & 49 \\
 & & 11 & 49 \\
\hline
 & & \times &
\end{array}$$

$\therefore \quad \sqrt{37249}=193.$

So, $\sqrt{372\cdot 49}+\sqrt{3\cdot 7249}=\sqrt{\frac{37249}{100}}+\sqrt{\frac{37249}{10000}}=\frac{\sqrt{37249}}{\sqrt{100}}+\frac{\sqrt{37249}}{\sqrt{10000}}$

$=\frac{193}{10}+\frac{193}{100}=19\cdot 3+1\cdot 93=21\cdot 23.$

Example: Find the value of : $\sqrt{72} \times \sqrt{338}$.

Solution : $\sqrt{72 \times 338}$ = $\sqrt{72 \times 338}$

= $\sqrt{2 \times 2 \times 2 \times 3 \times 3 \times 2 \times 13 \times 13} = (2 \times 2 \times 3 \times 13) = 156.$

Example: Observe the following pattern and find the missing digits:

$11^2 = 121$

$101^2 = 10201$

$1001^2 = 1002001$

$10001^2 = 100020001$

$100001^2 = 1 \ldots 2 \ldots 1$

$10000001^2 = \ldots\ldots\ldots\ldots$

Solution: We observe that the square of the number on RHS of the equality has an odd number of digits such that the middle digit is 2 and first and last digit are both equal to 1. Also, the number of zeros between left-most digit 1 and the middle digit 2 or between the middle digit 2 and the right-most digit 1 is same as the number of zeros in the given number. Therefore,

$100001^2 = 10000200001$ and, $10000001^2 = 100000020000001$.

Example: Observe the following pattern and supply the missing numbers:

$11^2 = 121$

$101^2 = 10201$

$10101^2 = 102030201$

$1010101^2 = \ldots\ldots\ldots\ldots$

$\ldots\ldots\ldots = 10203040504030201$

Solution: We observe that the middle digit in the square of the given number is equal to the number of one's in the number. Also, the square is symmetric about the middle digit. If the middle digit is 4 (say), then the number to be squared is 1010101 and its square is 1020304030201. Similarly, by observing the pattern, We have

$$101010101^2 = 10203040504030201$$

$$10101010101^2 = 102030405060504030201 \text{ etc.}$$

Hence,

$$1010101^2 = 1020304030201$$

and, $101010101^2 = 10203040504030201$

Example: Using the given pattern, find the missing numbers:

$$1^2 + 2^2 + 2^2 = 3^2$$

$$2^2 + 3^2 + 6^2 = 7^2$$

$$3^2 + 4^2 + 12^2 = 13^2$$

$$4^2 + 5^2 + (\ldots)^2 = 21^2$$

$$5^2 + (\ldots)^2 + 30^2 = 31^2$$

$$6^2 + 7^2 + (\ldots)^2 = (\ldots)^2$$

Solution: We have,

$$1^2 + 2^2 + 2^2 = 3^2$$

i.e., $1^2 + 2^2 + (1 \times 2)^2 = (1^2 + 2^2 - 1 \times 2)^2$

$$2^2 + 3^2 + 6^2 = 7^2$$

i.e., $2^2 + 3^2 + (2 \times 3)^2 = (2^2 + 3^2 - 2 \times 3)^2$

$$3^2 + 4^2 + 12^2 = 13^2$$

i.e., $3^2 + 4^2 + (3 \times 4)^2 = (3^2 + 4^2 - 3 \times 4)^2$

$\therefore$ $4^2 + 5^2 + \underline{(4 \times 5)}^2 = (4^2 + 5^2 - 4 \times 5)^2$

$$5^2 + 6^2 + (5 \times 6)^2 = (5^2 + 6^2 - 5 \times 6)^2$$

and, $6^2 + 7^2 + \underline{(6 \times 7)}^2 = (6^2 + 7^2 - 6 \times 7)^2$

or, $6^2 + 7^2 + 42^2 = 43^2$.

Example: Find the squares of the following numbers:

(i) 65 (ii) 85 (iii) 95

Solution: (i) Here, we have

$a = 6 \Rightarrow a\ (a + 1) = 6 \times 7 = 42$

Hence, $65^2 = 4225$

(ii) Here, we have

$a = 8 \Rightarrow a\ (a + 1) = 8 \times 9 = 72$

Hence, $85^2 = 7225$

(iii) Here, we have

$a = 9 \Rightarrow a\ (a + 1) = 9 \times 10 = 90$ $\therefore$ $95^2 = 9025$

Example: Find the squares of the following numbers:

(i) 56 (ii) 58 (iii) 59

Solution: (i) Here, we have

$a = 6$

$\therefore (56)^2 = (25 + 6) \times 100 + 6^2 = 3100 + 36 = 3136$

(ii) Here, we have

$a = 8$

$\therefore (58)^2 = (25 + 8) \times 100 + 8^2 = 3300 + 64 = 3364$

(iii) Here, we have

$a = 9$

$\therefore (59)^2 = (25 + 9) \times 100 + 9^2 = 3400 + 81 = 3481$

Example: Find the squares of the following numbers:

(i) 527 (ii) 514 (iii) 525

Solution: (i) Given number = 527

$\therefore$ a = 2 and b = 7

Hence, $(527)^2 = (250 + 27) \times 1000 + (27)^2 = 277000 + 729 = 277729$

(ii) Given number = 514

$\therefore$ a = 1 and b = 4

Hence, $(514)^2 = (250 + 14) \times 1000 + (14)^2 = 264000 + 196 = 264196$

(iii) Given number = 525

$\therefore$ a = 2 and b = 5

Hence, $(525)^2 = (250 + 25) \times 1000 + (25)^2 = 275000 + 625 = 275625$

Example: Find the square of the following numbers:

(i) 125 (ii) 215 (iii) 1235

Solution: (i) Here n = 12

$\therefore$ n (n + 1) 12 $\times$13 = 156

Hence, $125^2 = 15625$

(ii) Here, n = 21

$\therefore$ n (n + 1) = 21 $\times$22 = 462

Hence, $215^2 = 46225$

(iii) Here, n = 123

$\therefore$ n (n + 1) = 123 $\times$124 = 15252

Hence, $1235^2 = 1525225$

Example: Find the cube root of 17576.

Solution: Resolving the given number into prime factors, we get

2	17576
2	8788
2	4394
13	2197
13	169
13	13
	1

$17576 = \underline{2\times2\times2}\times\underline{13\times13\times13}$

$\therefore \quad \sqrt[3]{17576} = 2\times13 = 26.$