

Squares and Square Roots

Question Paper, Set 07

Time: 1 hour 30 minutes

Maximum marks: 50

Name: _____ Class: _____ Date: _____

1. Answer all 20 questions. The marks for each question are shown in brackets.
2. Show your working for the 2, 3 and 5 mark questions.
3. The key sheet and worked solutions are at the end of this paper.

1. Write 61×61 in power form. [1 mark]
2. Find 12^2 . [1 mark]
3. Find $21^2 + 8^2$. [2 marks]
4. Find the number whose square is 900. [1 mark]
5. Find 55^2 using the rule for numbers ending in 5. [2 marks]
6. If $174^2 = 30276$, find $\sqrt{30276}$. [1 mark]
7. Find $\sqrt{676} - \sqrt{196}$. [2 marks]
8. Find $\sqrt{9216}$ by the prime factorization method. [3 marks]
9. Find $\sqrt{7396}$ by the long division method. [3 marks]
10. Find $\sqrt{9801}$ by (i) the prime factorization method (ii) the long division method. [5 marks]
11. Find $\sqrt{77284}$ by the long division method. [5 marks]
12. Find $\sqrt{8} \times \sqrt{18}$. [2 marks]
13. Find $(\sqrt{17})^2$. [1 mark]
14. Find $\frac{\sqrt{96}}{\sqrt{150}}$. [2 marks]
15. Simplify $\frac{14}{\sqrt{14}}$. [1 mark]
16. Show that $\sqrt{121} + \sqrt{9} \neq \sqrt{121 + 9}$. [3 marks]
17. Taking $a = 7$ and $b = 24$, verify that (i) $\sqrt{a^2 + b^2} \neq a + b$ (ii) $\sqrt{(a + b)^2} = a + b$. [5 marks]
18. Find $\sqrt{0.0361}$. [2 marks]
19. Find $\sqrt{0.009025}$. [3 marks]
20. Find $\sqrt{86.49}$. [5 marks]

Key sheet

Q	Answer
1	61^2
2	144
3	505
4	30
5	3025
6	174
7	12
8	96
9	86
10	99
11	278
12	12
13	17
14	$\frac{4}{5}$
15	$\sqrt{14}$
16	$\text{LHS} = 14 = \sqrt{196}$, $\text{RHS} = \sqrt{130}$; $\text{LHS} \neq \text{RHS}$
17	(i) $25 \neq 31$ (ii) $31 = 31$
18	0.19
19	0.095
20	9.3

Solutions

1. Write 61×61 in power form. [1]

61 is multiplied by itself 2 times.

$\therefore 61 \times 61 = 61^2$ (read as '61 squared')

Ans: 61^2

2. Find 12^2 . [1]

$$12^2 = 12 \times 12$$

$$= 144$$

Ans: 144

3. Find $21^2 + 8^2$. [2]

$$21^2 + 8^2 = 441 + 64$$

$$= 505$$

Ans: 505

4. Find the number whose square is 900. [1]

$$30^2 = 30 \times 30 = 900$$

$\therefore$ the number is 30

Ans: 30

5. Find 55^2 using the rule for numbers ending in 5. [2]

The number before 5 is 5: $5 \times 6 = 30$

Write 25 after it.

$\therefore 55^2 = 3025$

Ans: 3025

6. If $174^2 = 30276$, find $\sqrt{30276}$. [1]

$$a^2 = b \Rightarrow \sqrt{b} = a$$

$$174^2 = 30276 \Rightarrow \sqrt{30276} = 174$$

Ans: 174

7. Find $\sqrt{676} - \sqrt{196}$. [2]

From the table, $\sqrt{676} = 26$ and $\sqrt{196} = 14$

$$\sqrt{676} - \sqrt{196} = 26 - 14 = 12$$

Ans: 12

8. Find $\sqrt{9216}$ by the prime factorization method. [3]

Prime factorization method:

Divide by primes: $9216 \div 2 = 4608$, $4608 \div 2 = 2304$, $2304 \div 2 = 1152$, $1152 \div 2 = 576$, $576 \div 2 = 288$, $288 \div 2 = 144$, $144 \div 2 = 72$, $72 \div 2 = 36$, $36 \div 2 = 18$, $18 \div 2 = 9$, $9 \div 3 = 3$

$$\sqrt{9216} = \sqrt{(2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (3 \times 3)}$$

$$= 2 \times 2 \times 2 \times 2 \times 2 \times 3$$

$$= 96$$

Ans: 96

9. Find $\sqrt{7396}$ by the long division method. [3]

Long division method:

Pair the digits from the right: $\overline{73} \overline{96}$

$$8 \times 8 = 64 \leq 73: \text{ first digit } 8, \text{ and } 73 - 64 = 9$$

Bring down 96: we get 996. New divisor: $8 \times 2 = 16$; $166 \times 6 = 996$ ($167 \times 7 = 1169$ is too big);

$$996 - 996 = 0$$

$$\text{Remainder } 0. \therefore \sqrt{7396} = 86$$

Ans: 86

10. Find $\sqrt{9801}$ by (i) the prime factorization method (ii) the long division method. [5]

(i) Prime factorization method:

Divide by primes: $9801 \div 3 = 3267$, $3267 \div 3 = 1089$, $1089 \div 3 = 363$, $363 \div 3 = 121$, $121 \div 11 = 11$

$$\sqrt{9801} = \sqrt{(3 \times 3) \times (3 \times 3) \times (11 \times 11)}$$

$$= 3 \times 3 \times 11$$

$$= 99$$

(ii) Long division method:

Pair the digits from the right: $\overline{98} \overline{01}$

$$9 \times 9 = 81 \leq 98: \text{ first digit } 9, \text{ and } 98 - 81 = 17$$

Bring down 01: we get 1701. New divisor: $9 \times 2 = 18$; $189 \times 9 = 1701$; $1701 - 1701 = 0$

$$\text{Remainder } 0. \therefore \sqrt{9801} = 99$$

Ans: 99

11. Find $\sqrt{77284}$ by the long division method. [5]

Long division method:

Pair the digits from the right: $\overline{7} \overline{72} \overline{84}$

$$2 \times 2 = 4 \leq 7: \text{ first digit } 2, \text{ and } 7 - 4 = 3$$

Bring down 72: we get 372. New divisor: $2 \times 2 = 4$; $47 \times 7 = 329$ ($48 \times 8 = 384$ is too big); $372 - 329 = 43$

Bring down 84: we get 4384. New divisor: $27 \times 2 = 54$; $548 \times 8 = 4384$ ($549 \times 9 = 4941$ is too big); $4384 - 4384 = 0$

$$\text{Remainder } 0. \therefore \sqrt{77284} = 278$$

Ans: 278

12. Find $\sqrt{8} \times \sqrt{18}$. [2]

$$\sqrt{a} \times \sqrt{b} = \sqrt{a \times b}$$

$$\begin{aligned}\sqrt{8} \times \sqrt{18} &= \sqrt{8 \times 18} = \sqrt{144} \\ &= \sqrt{12 \times 12} = 12\end{aligned}$$

Ans: 12

13. Find $(\sqrt{17})^2$. [1]

$$\begin{aligned}(\sqrt{a})^2 &= \sqrt{a} \times \sqrt{a} = \sqrt{a^2} = a \\ \therefore \sqrt{17} \times \sqrt{17} &= \sqrt{17^2} = 17\end{aligned}$$

Ans: 17

14. Find $\frac{\sqrt{96}}{\sqrt{150}}$. [2]

$$\begin{aligned}\frac{\sqrt{a}}{\sqrt{b}} &= \sqrt{\frac{a}{b}} \\ \frac{\sqrt{96}}{\sqrt{150}} &= \sqrt{\frac{96}{150}} = \sqrt{\frac{6 \times 16}{6 \times 25}} \\ &= \sqrt{\frac{16}{25}} = \frac{4}{5}\end{aligned}$$

Ans: $\frac{4}{5}$

15. Simplify $\frac{14}{\sqrt{14}}$. [1]

$$\begin{aligned}14 &= \sqrt{14} \times \sqrt{14} \\ \frac{14}{\sqrt{14}} &= \frac{\sqrt{14} \times \sqrt{14}}{\sqrt{14}} = \sqrt{14}\end{aligned}$$

Ans: $\sqrt{14}$

16. Show that $\sqrt{121} + \sqrt{9} \neq \sqrt{121 + 9}$. [3]

$$\text{LHS} = \sqrt{121} + \sqrt{9} = 11 + 3 = 14 = \sqrt{196}$$

$$\text{RHS} = \sqrt{121 + 9} = \sqrt{130}$$

$$\therefore \text{LHS} \neq \text{RHS}$$

Ans: $\text{LHS} = 14 = \sqrt{196}$, $\text{RHS} = \sqrt{130}$; $\text{LHS} \neq \text{RHS}$

17. Taking $a = 7$ and $b = 24$, verify that (i) $\sqrt{a^2 + b^2} \neq a + b$ (ii) $\sqrt{(a + b)^2} = a + b$. [5]

$$\text{(i) LHS} = \sqrt{7^2 + 24^2} = \sqrt{49 + 576} = \sqrt{625} = 25$$

$$\text{RHS} = a + b = 7 + 24 = 31$$

$$25 \neq 31, \text{ so } \sqrt{a^2 + b^2} \neq a + b$$

$$\text{(ii) LHS} = \sqrt{(7 + 24)^2} = \sqrt{31^2} = 31$$

$$\text{RHS} = 7 + 24 = 31$$

$$\text{LHS} = \text{RHS}, \text{ so } \sqrt{(a + b)^2} = a + b$$

Ans: (i) $25 \neq 31$ (ii) $31 = 31$

18. Find $\sqrt{0.0361}$. [2]

$$\begin{aligned}\sqrt{0.0361} &= \sqrt{\frac{361}{10000}} \\ &= \frac{\sqrt{361}}{\sqrt{10000}} \\ &= \frac{19}{100} \\ &= 0.19\end{aligned}$$

Ans: 0.19

19. Find $\sqrt{0.009025}$. [3]

$$\begin{aligned}\sqrt{0.009025} &= \sqrt{\frac{9025}{1000000}} \\ &= \frac{\sqrt{9025}}{\sqrt{1000000}} \\ 95^2 &= 9025, \text{ so } \sqrt{9025} = 95 \\ &= \frac{95}{1000} \\ &= 0.095\end{aligned}$$

Ans: 0.095

20. Find $\sqrt{86.49}$. [5]

$$\sqrt{86.49} = \sqrt{\frac{8649}{100}} = \frac{\sqrt{8649}}{\sqrt{100}}$$

$\sqrt{8649}$ by the long division method:

Pair the digits from the right: $\overline{86} \overline{49}$

$9 \times 9 = 81 \leq 86$: first digit 9, and $86 - 81 = 5$

Bring down 49: we get 549. New divisor: $9 \times 2 = 18$; $183 \times 3 = 549$ ($184 \times 4 = 736$ is too big); $549 - 549 = 0$

$$\sqrt{8649} = 93$$

$$\therefore \sqrt{86.49} = \frac{93}{10} = 9.3$$

Ans: 9.3
