

Squares and Square Roots

Question Paper, Set 09

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 74×74 in power form. [1 mark]
2. Find the value of 29^2 . [1 mark]
3. Find $13^2 + 19^2$. [2 marks]
4. Find the number whose square is 400. [1 mark]
5. Find 105^2 using the rule for numbers ending in 5. [2 marks]
6. If $191^2 = 36481$, find $\sqrt{36481}$. [1 mark]
7. Find $\sqrt{529} + \sqrt{121}$. [2 marks]
8. Find $\sqrt{4356}$ by the prime factorization method. [3 marks]
9. Find $\sqrt{9409}$ by the long division method. [3 marks]
10. Find $\sqrt{6084}$ by (i) the prime factorization method (ii) the long division method. [5 marks]
11. Find $\sqrt{69169}$ by the long division method. [5 marks]
12. Find $\sqrt{10} \times \sqrt{40}$. [2 marks]
13. Find $(\sqrt{23})^2$. [1 mark]
14. Find $\frac{\sqrt{175}}{\sqrt{112}}$. [2 marks]
15. Simplify $\frac{19}{\sqrt{19}}$. [1 mark]
16. Show that $\sqrt{144} - \sqrt{25} \neq \sqrt{144 - 25}$. [3 marks]
17. Taking $a = 26$ 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 $\sqrt{0.0256}$. [2 marks]
19. Find $\sqrt{0.001936}$. [3 marks]
20. Find $\sqrt{26.01}$. [5 marks]

Key sheet

Q	Answer
1	74^2
2	841
3	530
4	20
5	11025
6	191
7	34
8	66
9	97
10	78
11	263
12	20
13	23
14	$\frac{5}{4}$
15	$\sqrt{19}$
16	LHS = $7 = \sqrt{49}$, RHS = $\sqrt{119}$; LHS $\neq$ RHS
17	(i) $10 \neq 2$ (ii) $2 = 2$
18	0.16
19	0.044
20	5.1

Solutions

1. Write 74×74 in power form. [1]

74 is multiplied by itself 2 times.

$\therefore 74 \times 74 = 74^2$ (read as '74 squared')

Ans: 74^2

2. Find the value of 29^2 . [1]

$$29^2 = 29 \times 29$$

$$= 841$$

Ans: 841

3. Find $13^2 + 19^2$. [2]

$$13^2 + 19^2 = 169 + 361$$

$$= 530$$

Ans: 530

4. Find the number whose square is 400. [1]

$$20^2 = 20 \times 20 = 400$$

$\therefore$ the number is 20

Ans: 20

5. Find 105^2 using the rule for numbers ending in 5. [2]

The number before 5 is 10: $10 \times 11 = 110$

Write 25 after it.

$$\therefore 105^2 = 11025$$

Ans: 11025

6. If $191^2 = 36481$, find $\sqrt{36481}$. [1]

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

$$191^2 = 36481 \Rightarrow \sqrt{36481} = 191$$

Ans: 191

7. Find $\sqrt{529} + \sqrt{121}$. [2]

From the table, $\sqrt{529} = 23$ and $\sqrt{121} = 11$

$$\sqrt{529} + \sqrt{121} = 23 + 11 = 34$$

Ans: 34

8. Find $\sqrt{4356}$ by the prime factorization method. [3]

Prime factorization method:

Divide by primes: $4356 \div 2 = 2178$, $2178 \div 2 = 1089$, $1089 \div 3 = 363$, $363 \div 3 = 121$, $121 \div 11 = 11$

$$\sqrt{4356} = \sqrt{(2 \times 2) \times (3 \times 3) \times (11 \times 11)}$$

$$= 2 \times 3 \times 11$$

$$= 66$$

Ans: 66

9. Find $\sqrt{9409}$ by the long division method. [3]

Long division method:

Pair the digits from the right: $\overline{94} \overline{09}$

$$9 \times 9 = 81 \leq 94: \text{first digit } 9, \text{ and } 94 - 81 = 13$$

Bring down 09: we get 1309. New divisor: $9 \times 2 = 18$; $187 \times 7 = 1309$ ($188 \times 8 = 1504$ is too big);
 $1309 - 1309 = 0$

$$\text{Remainder } 0. \therefore \sqrt{9409} = 97$$

Ans: 97

10. Find $\sqrt{6084}$ by (i) the prime factorization method (ii) the long division method. [5]

(i) Prime factorization method:

Divide by primes: $6084 \div 2 = 3042$, $3042 \div 2 = 1521$, $1521 \div 3 = 507$, $507 \div 3 = 169$, $169 \div 13 = 13$

$$\sqrt{6084} = \sqrt{(2 \times 2) \times (3 \times 3) \times (13 \times 13)}$$

$$= 2 \times 3 \times 13$$

$$= 78$$

(ii) Long division method:

Pair the digits from the right: $\overline{60} \overline{84}$

$$7 \times 7 = 49 \leq 60: \text{first digit } 7, \text{ and } 60 - 49 = 11$$

Bring down 84: we get 1184. New divisor: $7 \times 2 = 14$; $148 \times 8 = 1184$ ($149 \times 9 = 1341$ is too big);
 $1184 - 1184 = 0$

$$\text{Remainder } 0. \therefore \sqrt{6084} = 78$$

Ans: 78

11. Find $\sqrt{69169}$ by the long division method. [5]

Long division method:

Pair the digits from the right: $\overline{6} \overline{91} \overline{69}$

$$2 \times 2 = 4 \leq 6: \text{first digit } 2, \text{ and } 6 - 4 = 2$$

Bring down 91: we get 291. New divisor: $2 \times 2 = 4$; $46 \times 6 = 276$ ($47 \times 7 = 329$ is too big); $291 - 276 = 15$

Bring down 69: we get 1569. New divisor: $26 \times 2 = 52$; $523 \times 3 = 1569$ ($524 \times 4 = 2096$ is too big);
 $1569 - 1569 = 0$

$$\text{Remainder } 0. \therefore \sqrt{69169} = 263$$

Ans: 263

12. Find $\sqrt{10} \times \sqrt{40}$. [2]

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

$$\begin{aligned}\sqrt{10} \times \sqrt{40} &= \sqrt{10 \times 40} = \sqrt{400} \\ &= \sqrt{20 \times 20} = 20\end{aligned}$$

Ans: 20

13. Find $(\sqrt{23})^2$. [1]

$$(\sqrt{a})^2 = \sqrt{a} \times \sqrt{a} = \sqrt{a^2} = a$$

$$\therefore \sqrt{23} \times \sqrt{23} = \sqrt{23^2} = 23$$

Ans: 23

14. Find $\frac{\sqrt{175}}{\sqrt{112}}$. [2]

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

$$\begin{aligned}\frac{\sqrt{175}}{\sqrt{112}} &= \sqrt{\frac{175}{112}} = \sqrt{\frac{7 \times 25}{7 \times 16}} \\ &= \sqrt{\frac{25}{16}} = \frac{5}{4}\end{aligned}$$

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

15. Simplify $\frac{19}{\sqrt{19}}$. [1]

$$19 = \sqrt{19} \times \sqrt{19}$$

$$\frac{19}{\sqrt{19}} = \frac{\sqrt{19} \times \sqrt{19}}{\sqrt{19}} = \sqrt{19}$$

Ans: $\sqrt{19}$

16. Show that $\sqrt{144} - \sqrt{25} \neq \sqrt{144 - 25}$. [3]

$$\text{LHS} = \sqrt{144} - \sqrt{25} = 12 - 5 = 7 = \sqrt{49}$$

$$\text{RHS} = \sqrt{144 - 25} = \sqrt{119}$$

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

Ans: $\text{LHS} = 7 = \sqrt{49}$, $\text{RHS} = \sqrt{119}$; $\text{LHS} \neq \text{RHS}$

17. Taking $a = 26$ and $b = 24$, verify that (i) $\sqrt{a^2 - b^2} \neq a - b$ (ii) $\sqrt{(a - b)^2} = a - b$. [5]

$$\text{(i) LHS} = \sqrt{26^2 - 24^2} = \sqrt{676 - 576} = \sqrt{100} = 10$$

$$\text{RHS} = a - b = 26 - 24 = 2$$

$$10 \neq 2, \text{ so } \sqrt{a^2 - b^2} \neq a - b$$

$$\text{(ii) LHS} = \sqrt{(26 - 24)^2} = \sqrt{2^2} = 2$$

$$\text{RHS} = 26 - 24 = 2$$

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

Ans: (i) $10 \neq 2$ (ii) $2 = 2$

18. Find $\sqrt{0.0256}$. [2]

$$\begin{aligned}\sqrt{0.0256} &= \sqrt{\frac{256}{10000}} \\ &= \frac{\sqrt{256}}{\sqrt{10000}} \\ &= \frac{16}{100} \\ &= 0.16\end{aligned}$$

Ans: 0.16

19. Find $\sqrt{0.001936}$. [3]

$$\begin{aligned}\sqrt{0.001936} &= \sqrt{\frac{1936}{1000000}} \\ &= \frac{\sqrt{1936}}{\sqrt{1000000}} \\ 44^2 &= 1936, \text{ so } \sqrt{1936} = 44 \\ &= \frac{44}{1000} \\ &= 0.044\end{aligned}$$

Ans: 0.044

20. Find $\sqrt{26.01}$. [5]

$$\sqrt{26.01} = \sqrt{\frac{2601}{100}} = \frac{\sqrt{2601}}{\sqrt{100}}$$

$\sqrt{2601}$ by the long division method:

Pair the digits from the right: $\overline{26} \overline{01}$

$5 \times 5 = 25 \leq 26$: first digit 5, and $26 - 25 = 1$

Bring down 01: we get 101. New divisor: $5 \times 2 = 10$; $101 \times 1 = 101$ ($102 \times 2 = 204$ is too big); $101 - 101 = 0$

$$\sqrt{2601} = 51$$

$$\therefore \sqrt{26.01} = \frac{51}{10} = 5.1$$

Ans: 5.1
