

Squares and Square Roots

Question Paper, Set 01

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 37×37 in power form. [1 mark]
2. Find 17^2 . [1 mark]
3. Find $11^2 + 16^2$. [2 marks]
4. Find the number whose square is 4900. [1 mark]
5. Find 65^2 using the rule for numbers ending in 5. [2 marks]
6. If $113^2 = 12769$, find $\sqrt{12769}$. [1 mark]
7. Find $\sqrt{361} + \sqrt{144}$. [2 marks]
8. Find $\sqrt{1764}$ by the prime factorization method. [3 marks]
9. Find $\sqrt{5329}$ by the long division method. [3 marks]
10. Find $\sqrt{1936}$ by (i) the prime factorization method (ii) the long division method. [5 marks]
11. Find $\sqrt{56169}$ by the long division method. [5 marks]
12. Find $\sqrt{3} \times \sqrt{27}$. [2 marks]
13. Find $(\sqrt{7})^2$. [1 mark]
14. Find $\frac{\sqrt{50}}{\sqrt{72}}$. [2 marks]
15. Simplify $\frac{5}{\sqrt{5}}$. [1 mark]
16. Show that $\sqrt{324} + \sqrt{576} \neq \sqrt{324 + 576}$. [3 marks]
17. Taking $a = 10$ and $b = 6$, verify that (i) $\sqrt{a^2 - b^2} \neq a - b$ (ii) $\sqrt{(a - b)^2} = a - b$. [5 marks]
18. Find $\sqrt{0.0441}$. [2 marks]
19. Find $\sqrt{0.001225}$. [3 marks]
20. Find $\sqrt{54.76}$. [5 marks]

Key sheet

Q	Answer
1	37^2
2	289
3	377
4	70
5	4225
6	113
7	31
8	42
9	73
10	44
11	237
12	9
13	7
14	$\frac{5}{6}$
15	$\sqrt{5}$
16	LHS = 42, RHS = 30; LHS $\neq$ RHS
17	(i) $8 \neq 4$ (ii) $4 = 4$
18	0.21
19	0.035
20	7.4

Solutions

1. Write 37×37 in power form. [1]

37 is multiplied by itself 2 times.

$\therefore 37 \times 37 = 37^2$ (read as '37 squared')

Ans: 37^2

2. Find 17^2 . [1]

$$17^2 = 17 \times 17$$

$$= 289$$

Ans: 289

3. Find $11^2 + 16^2$. [2]

$$11^2 + 16^2 = 121 + 256$$

$$= 377$$

Ans: 377

4. Find the number whose square is 4900. [1]

$$70^2 = 70 \times 70 = 4900$$

$\therefore$ the number is 70

Ans: 70

5. Find 65^2 using the rule for numbers ending in 5. [2]

The number before 5 is 6: $6 \times 7 = 42$

Write 25 after it.

$$\therefore 65^2 = 4225$$

Ans: 4225

6. If $113^2 = 12769$, find $\sqrt{12769}$. [1]

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

$$113^2 = 12769 \Rightarrow \sqrt{12769} = 113$$

Ans: 113

7. Find $\sqrt{361} + \sqrt{144}$. [2]

From the table, $\sqrt{361} = 19$ and $\sqrt{144} = 12$

$$\sqrt{361} + \sqrt{144} = 19 + 12 = 31$$

Ans: 31

8. Find $\sqrt{1764}$ by the prime factorization method. [3]

Prime factorization method:

Divide by primes: $1764 \div 2 = 882$, $882 \div 2 = 441$, $441 \div 3 = 147$, $147 \div 3 = 49$, $49 \div 7 = 7$

$$\sqrt{1764} = \sqrt{(2 \times 2) \times (3 \times 3) \times (7 \times 7)}$$

$$= 2 \times 3 \times 7$$

$$= 42$$

Ans: 42

9. Find $\sqrt{5329}$ by the long division method. [3]

Long division method:

Pair the digits from the right: $\overline{53} \overline{29}$

$$7 \times 7 = 49 \leq 53: \text{first digit } 7, \text{ and } 53 - 49 = 4$$

Bring down 29: we get 429. New divisor: $7 \times 2 = 14$; $143 \times 3 = 429$ ($144 \times 4 = 576$ is too big); $429 - 429 = 0$

Remainder 0. $\therefore \sqrt{5329} = 73$

Ans: 73

10. Find $\sqrt{1936}$ by (i) the prime factorization method (ii) the long division method. [5]

(i) Prime factorization method:

Divide by primes: $1936 \div 2 = 968$, $968 \div 2 = 484$, $484 \div 2 = 242$, $242 \div 2 = 121$, $121 \div 11 = 11$

$$\sqrt{1936} = \sqrt{(2 \times 2) \times (2 \times 2) \times (11 \times 11)}$$

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

$$= 44$$

(ii) Long division method:

Pair the digits from the right: $\overline{19} \overline{36}$

$$4 \times 4 = 16 \leq 19: \text{first digit } 4, \text{ and } 19 - 16 = 3$$

Bring down 36: we get 336. New divisor: $4 \times 2 = 8$; $84 \times 4 = 336$ ($85 \times 5 = 425$ is too big); $336 - 336 = 0$

Remainder 0. $\therefore \sqrt{1936} = 44$

Ans: 44

11. Find $\sqrt{56169}$ by the long division method. [5]

Long division method:

Pair the digits from the right: $\overline{5} \overline{61} \overline{69}$

$$2 \times 2 = 4 \leq 5: \text{first digit } 2, \text{ and } 5 - 4 = 1$$

Bring down 61: we get 161. New divisor: $2 \times 2 = 4$; $43 \times 3 = 129$ ($44 \times 4 = 176$ is too big); $161 - 129 = 32$

Bring down 69: we get 3269. New divisor: $23 \times 2 = 46$; $467 \times 7 = 3269$ ($468 \times 8 = 3744$ is too big); $3269 - 3269 = 0$

Remainder 0. $\therefore \sqrt{56169} = 237$

Ans: 237

12. Find $\sqrt{3} \times \sqrt{27}$. [2]

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

$$\begin{aligned}\sqrt{3} \times \sqrt{27} &= \sqrt{3 \times 27} = \sqrt{81} \\ &= \sqrt{9 \times 9} = 9\end{aligned}$$

Ans: 9

13. Find $(\sqrt{7})^2$. [1]

$$\begin{aligned}(\sqrt{a})^2 &= \sqrt{a} \times \sqrt{a} = \sqrt{a^2} = a \\ \therefore \sqrt{7} \times \sqrt{7} &= \sqrt{7^2} = 7\end{aligned}$$

Ans: 7

14. Find $\frac{\sqrt{50}}{\sqrt{72}}$. [2]

$$\begin{aligned}\frac{\sqrt{a}}{\sqrt{b}} &= \sqrt{\frac{a}{b}} \\ \frac{\sqrt{50}}{\sqrt{72}} &= \sqrt{\frac{50}{72}} = \sqrt{\frac{2 \times 25}{2 \times 36}} \\ &= \sqrt{\frac{25}{36}} = \frac{5}{6}\end{aligned}$$

Ans: $\frac{5}{6}$

15. Simplify $\frac{5}{\sqrt{5}}$. [1]

$$\begin{aligned}5 &= \sqrt{5} \times \sqrt{5} \\ \frac{5}{\sqrt{5}} &= \frac{\sqrt{5} \times \sqrt{5}}{\sqrt{5}} = \sqrt{5}\end{aligned}$$

Ans: $\sqrt{5}$

16. Show that $\sqrt{324} + \sqrt{576} \neq \sqrt{324 + 576}$. [3]

$$\text{LHS} = \sqrt{324} + \sqrt{576} = 18 + 24 = 42$$

$$\text{RHS} = \sqrt{324 + 576} = \sqrt{900} = 30$$

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

Ans: LHS = 42, RHS = 30; LHS $\neq$ RHS

17. Taking $a = 10$ and $b = 6$, verify that (i) $\sqrt{a^2 - b^2} \neq a - b$ (ii) $\sqrt{(a - b)^2} = a - b$. [5]

$$\text{(i) LHS} = \sqrt{10^2 - 6^2} = \sqrt{100 - 36} = \sqrt{64} = 8$$

$$\text{RHS} = a - b = 10 - 6 = 4$$

$$8 \neq 4, \text{ so } \sqrt{a^2 - b^2} \neq a - b$$

$$\text{(ii) LHS} = \sqrt{(10 - 6)^2} = \sqrt{4^2} = 4$$

$$\text{RHS} = 10 - 6 = 4$$

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

Ans: (i) $8 \neq 4$ (ii) $4 = 4$

18. Find $\sqrt{0.0441}$. [2]

$$\begin{aligned}\sqrt{0.0441} &= \sqrt{\frac{441}{10000}} \\ &= \frac{\sqrt{441}}{\sqrt{10000}} \\ &= \frac{21}{100} \\ &= 0.21\end{aligned}$$

Ans: 0.21

19. Find $\sqrt{0.001225}$. [3]

$$\begin{aligned}\sqrt{0.001225} &= \sqrt{\frac{1225}{1000000}} \\ &= \frac{\sqrt{1225}}{\sqrt{1000000}} \\ 35^2 &= 1225, \text{ so } \sqrt{1225} = 35 \\ &= \frac{35}{1000} \\ &= 0.035\end{aligned}$$

Ans: 0.035

20. Find $\sqrt{54.76}$. [5]

$$\sqrt{54.76} = \sqrt{\frac{5476}{100}} = \frac{\sqrt{5476}}{\sqrt{100}}$$

$\sqrt{5476}$ by the long division method:

Pair the digits from the right: $\overline{54} \overline{76}$

$7 \times 7 = 49 \leq 54$: first digit 7, and $54 - 49 = 5$

Bring down 76: we get 576. New divisor: $7 \times 2 = 14$; $144 \times 4 = 576$ ($145 \times 5 = 725$ is too big); $576 - 576 = 0$

$$\sqrt{5476} = 74$$

$$\therefore \sqrt{54.76} = \frac{74}{10} = 7.4$$

Ans: 7.4
