

Squares and Square Roots

Question Paper, Set 04

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 $m \times m$ in power form. [1 mark]
2. Find 28^2 . [1 mark]
3. Find the value of $26^2 - 11^2$. [2 marks]
4. Which number, when squared, gives 3600? [1 mark]
5. Using the rule for numbers ending in 5, find 45^2 . [2 marks]
6. Given $146^2 = 21316$, write the square root of 21316. [1 mark]
7. Find the value of $\sqrt{441} + \sqrt{289}$. [2 marks]
8. Using the prime factorization method, find the square root of 1296. [3 marks]
9. Using the long division method, find the square root of 8836. [3 marks]
10. Find $\sqrt{7744}$ by (i) the prime factorization method (ii) the long division method. [5 marks]
11. Using the long division method, find the square root of 170569. [5 marks]
12. Simplify $\sqrt{2} \times \sqrt{32}$. [2 marks]
13. Find the value of $\sqrt{19} \times \sqrt{19}$. [1 mark]
14. Simplify $\frac{\sqrt{125}}{\sqrt{45}}$. [2 marks]
15. Show that $\frac{13}{\sqrt{13}} = \sqrt{13}$. [1 mark]
16. Verify that $\sqrt{196} - \sqrt{81} \neq \sqrt{196 - 81}$. [3 marks]
17. If $a = 15$ and $b = 9$, show that (i) $\sqrt{a^2 - b^2} \neq a - b$ (ii) $\sqrt{(a - b)^2} = a - b$. [5 marks]
18. Find the square root of 0.0169. [2 marks]
19. Find the square root of 0.004225. [3 marks]
20. Find the square root of 50.41. [5 marks]

Key sheet

Q	Answer
1	m^2
2	784
3	555
4	60
5	2025
6	146
7	38
8	36
9	94
10	88
11	413
12	8
13	19
14	$\frac{5}{3}$
15	$\sqrt{13}$
16	LHS = $5 = \sqrt{25}$, RHS = $\sqrt{115}$; LHS $\neq$ RHS
17	(i) $12 \neq 6$ (ii) $6 = 6$
18	0.13
19	0.065
20	7.1

Solutions

1. Write $m \times m$ in power form. [1]

m is multiplied by itself 2 times.

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

Ans: m^2

2. Find 28^2 . [1]

$$28^2 = 28 \times 28$$

$$= 784$$

Ans: 784

3. Find the value of $26^2 - 11^2$. [2]

$$26^2 - 11^2 = 676 - 121$$

$$= 555$$

Ans: 555

4. Which number, when squared, gives 3600? [1]

$$60^2 = 60 \times 60 = 3600$$

$\therefore$ the number is 60

Ans: 60

5. Using the rule for numbers ending in 5, find 45^2 . [2]

The number before 5 is 4: $4 \times 5 = 20$

Write 25 after it.

$$\therefore 45^2 = 2025$$

Ans: 2025

6. Given $146^2 = 21316$, write the square root of 21316. [1]

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

$$146^2 = 21316 \Rightarrow \sqrt{21316} = 146$$

Ans: 146

7. Find the value of $\sqrt{441} + \sqrt{289}$. [2]

From the table, $\sqrt{441} = 21$ and $\sqrt{289} = 17$

$$\sqrt{441} + \sqrt{289} = 21 + 17 = 38$$

Ans: 38

8. Using the prime factorization method, find the square root of 1296. [3]

Prime factorization method:

Divide by primes: $1296 \div 2 = 648$, $648 \div 2 = 324$, $324 \div 2 = 162$, $162 \div 2 = 81$, $81 \div 3 = 27$, $27 \div 3 = 9$, $9 \div 3 = 3$

$$\begin{aligned}\sqrt{1296} &= \sqrt{(2 \times 2) \times (2 \times 2) \times (3 \times 3) \times (3 \times 3)} \\ &= 2 \times 2 \times 3 \times 3 \\ &= 36\end{aligned}$$

Ans: 36

9. Using the long division method, find the square root of 8836. [3]

Long division method:

Pair the digits from the right: $\overline{88} \overline{36}$

$9 \times 9 = 81 \leq 88$: first digit 9, and $88 - 81 = 7$

Bring down 36: we get 736. New divisor: $9 \times 2 = 18$; $18 \times 4 = 72$ ($18 \times 5 = 90$ is too big); $736 - 720 = 16$

Remainder 0. $\therefore \sqrt{8836} = 94$

Ans: 94

10. Find $\sqrt{7744}$ by (i) the prime factorization method (ii) the long division method. [5]

(i) Prime factorization method:

Divide by primes: $7744 \div 2 = 3872$, $3872 \div 2 = 1936$, $1936 \div 2 = 968$, $968 \div 2 = 484$, $484 \div 2 = 242$, $242 \div 2 = 121$, $121 \div 11 = 11$

$$\begin{aligned}\sqrt{7744} &= \sqrt{(2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (11 \times 11)} \\ &= 2 \times 2 \times 2 \times 11 \\ &= 88\end{aligned}$$

(ii) Long division method:

Pair the digits from the right: $\overline{77} \overline{44}$

$8 \times 8 = 64 \leq 77$: first digit 8, and $77 - 64 = 13$

Bring down 44: we get 1344. New divisor: $8 \times 2 = 16$; $16 \times 8 = 128$ ($16 \times 9 = 144$ is too big); $1344 - 1280 = 64$

Remainder 0. $\therefore \sqrt{7744} = 88$

Ans: 88

11. Using the long division method, find the square root of 170569. [5]

Long division method:

Pair the digits from the right: $\overline{17} \overline{05} \overline{69}$

$4 \times 4 = 16 \leq 17$: first digit 4, and $17 - 16 = 1$

Bring down 05: we get 105. New divisor: $4 \times 2 = 8$; $8 \times 1 = 8$ ($8 \times 2 = 16$ is too big); $105 - 80 = 25$

Bring down 69: we get 2469. New divisor: $41 \times 2 = 82$; $82 \times 3 = 246$ ($82 \times 4 = 328$ is too big); $2469 - 2460 = 9$

Remainder 0. $\therefore \sqrt{170569} = 413$

Ans: 413

12. Simplify $\sqrt{2} \times \sqrt{32}$. [2]

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

$$\begin{aligned}\sqrt{2} \times \sqrt{32} &= \sqrt{2 \times 32} = \sqrt{64} \\ &= \sqrt{8 \times 8} = 8\end{aligned}$$

Ans: 8

13. Find the value of $\sqrt{19} \times \sqrt{19}$. [1]

$$\begin{aligned}(\sqrt{a})^2 &= \sqrt{a} \times \sqrt{a} = \sqrt{a^2} = a \\ \therefore \sqrt{19} \times \sqrt{19} &= \sqrt{19^2} = 19\end{aligned}$$

Ans: 19

14. Simplify $\frac{\sqrt{125}}{\sqrt{45}}$. [2]

$$\begin{aligned}\frac{\sqrt{a}}{\sqrt{b}} &= \sqrt{\frac{a}{b}} \\ \frac{\sqrt{125}}{\sqrt{45}} &= \sqrt{\frac{125}{45}} = \sqrt{\frac{5 \times 25}{5 \times 9}} \\ &= \sqrt{\frac{25}{9}} = \frac{5}{3}\end{aligned}$$

Ans: $\frac{5}{3}$

15. Show that $\frac{13}{\sqrt{13}} = \sqrt{13}$. [1]

$$\begin{aligned}13 &= \sqrt{13} \times \sqrt{13} \\ \frac{13}{\sqrt{13}} &= \frac{\sqrt{13} \times \sqrt{13}}{\sqrt{13}} = \sqrt{13}\end{aligned}$$

Ans: $\sqrt{13}$

16. Verify that $\sqrt{196} - \sqrt{81} \neq \sqrt{196 - 81}$. [3]

$$\text{LHS} = \sqrt{196} - \sqrt{81} = 14 - 9 = 5 = \sqrt{25}$$

$$\text{RHS} = \sqrt{196 - 81} = \sqrt{115}$$

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

Ans: $\text{LHS} = 5 = \sqrt{25}$, $\text{RHS} = \sqrt{115}$; $\text{LHS} \neq \text{RHS}$

17. If $a = 15$ and $b = 9$, show that (i) $\sqrt{a^2 - b^2} \neq a - b$ (ii) $\sqrt{(a - b)^2} = a - b$. [5]

$$\text{(i) LHS} = \sqrt{15^2 - 9^2} = \sqrt{225 - 81} = \sqrt{144} = 12$$

$$\text{RHS} = a - b = 15 - 9 = 6$$

$$12 \neq 6, \text{ so } \sqrt{a^2 - b^2} \neq a - b$$

$$\text{(ii) LHS} = \sqrt{(15 - 9)^2} = \sqrt{6^2} = 6$$

$$\text{RHS} = 15 - 9 = 6$$

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

Ans: (i) $12 \neq 6$ (ii) $6 = 6$

18. Find the square root of 0.0169. [2]

$$\begin{aligned}\sqrt{0.0169} &= \sqrt{\frac{169}{10000}} \\ &= \frac{\sqrt{169}}{\sqrt{10000}} \\ &= \frac{13}{100} \\ &= 0.13\end{aligned}$$

Ans: 0.13

19. Find the square root of 0.004225. [3]

$$\begin{aligned}\sqrt{0.004225} &= \sqrt{\frac{4225}{1000000}} \\ &= \frac{\sqrt{4225}}{\sqrt{1000000}} \\ 65^2 &= 4225, \text{ so } \sqrt{4225} = 65 \\ &= \frac{65}{1000} \\ &= 0.065\end{aligned}$$

Ans: 0.065

20. Find the square root of 50.41. [5]

$$\sqrt{50.41} = \sqrt{\frac{5041}{100}} = \frac{\sqrt{5041}}{\sqrt{100}}$$

$\sqrt{5041}$ by the long division method:

Pair the digits from the right: $\overline{50} \overline{41}$

$7 \times 7 = 49 \leq 50$: first digit 7, and $50 - 49 = 1$

Bring down 41: we get 141. New divisor: $7 \times 2 = 14$; $141 \times 1 = 141$ ($142 \times 2 = 284$ is too big); $141 - 141 = 0$

$$\sqrt{5041} = 71$$

$$\therefore \sqrt{50.41} = \frac{71}{10} = 7.1$$

Ans: 7.1
