

Squares and Square Roots

Question Paper, Set 02

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 $y \times y$ in power form. [1 mark]
2. Write the square of 23. [1 mark]
3. Find the value of $18^2 + 7^2$. [2 marks]
4. Which number, when squared, gives 1600? [1 mark]
5. Using the rule for numbers ending in 5, find 35^2 . [2 marks]
6. Given $127^2 = 16129$, write the square root of 16129. [1 mark]
7. Find the value of $\sqrt{729} - \sqrt{256}$. [2 marks]
8. Using the prime factorization method, find the square root of 3136. [3 marks]
9. Using the long division method, find the square root of 4489. [3 marks]
10. Find $\sqrt{2704}$ by (i) the prime factorization method (ii) the long division method. [5 marks]
11. Using the long division method, find the square root of 26896. [5 marks]
12. Simplify $\sqrt{5} \times \sqrt{20}$. [2 marks]
13. Find the value of $\sqrt{13} \times \sqrt{13}$. [1 mark]
14. Simplify $\frac{\sqrt{147}}{\sqrt{75}}$. [2 marks]
15. Show that $\frac{11}{\sqrt{11}} = \sqrt{11}$. [1 mark]
16. Verify that $\sqrt{121} - \sqrt{49} \neq \sqrt{121 - 49}$. [3 marks]
17. If $a = 5$ and $b = 12$, 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 0.0676. [2 marks]
19. Find the square root of 0.002025. [3 marks]
20. Find the square root of 46.24. [5 marks]

Key sheet

Q	Answer
1	y^2
2	529
3	373
4	40
5	1225
6	127
7	11
8	56
9	67
10	52
11	164
12	10
13	13
14	$\frac{7}{5}$
15	$\sqrt{11}$
16	LHS = $4 = \sqrt{16}$, RHS = $\sqrt{72}$; LHS $\neq$ RHS
17	(i) $13 \neq 17$ (ii) $17 = 17$
18	0.26
19	0.045
20	6.8

Solutions

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

y is multiplied by itself 2 times.

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

Ans: y^2

2. Write the square of 23. [1]

$$23^2 = 23 \times 23$$

$$= 529$$

Ans: 529

3. Find the value of $18^2 + 7^2$. [2]

$$18^2 + 7^2 = 324 + 49$$

$$= 373$$

Ans: 373

4. Which number, when squared, gives 1600? [1]

$$40^2 = 40 \times 40 = 1600$$

$\therefore$ the number is 40

Ans: 40

5. Using the rule for numbers ending in 5, find 35^2 . [2]

The number before 5 is 3: $3 \times 4 = 12$

Write 25 after it.

$$\therefore 35^2 = 1225$$

Ans: 1225

6. Given $127^2 = 16129$, write the square root of 16129. [1]

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

$$127^2 = 16129 \Rightarrow \sqrt{16129} = 127$$

Ans: 127

7. Find the value of $\sqrt{729} - \sqrt{256}$. [2]

From the table, $\sqrt{729} = 27$ and $\sqrt{256} = 16$

$$\sqrt{729} - \sqrt{256} = 27 - 16 = 11$$

Ans: 11

8. Using the prime factorization method, find the square root of 3136. [3]

Prime factorization method:

Divide by primes: $3136 \div 2 = 1568$, $1568 \div 2 = 784$, $784 \div 2 = 392$, $392 \div 2 = 196$, $196 \div 2 = 98$, $98 \div 2 = 49$, $49 \div 7 = 7$

$$\begin{aligned}\sqrt{3136} &= \sqrt{(2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (7 \times 7)} \\ &= 2 \times 2 \times 2 \times 7 \\ &= 56\end{aligned}$$

Ans: 56

9. Using the long division method, find the square root of 4489. [3]

Long division method:

Pair the digits from the right: $\overline{44} \overline{89}$

$6 \times 6 = 36 \leq 44$: first digit 6, and $44 - 36 = 8$

Bring down 89: we get 889. New divisor: $6 \times 2 = 12$; $127 \times 7 = 889$ ($128 \times 8 = 1024$ is too big); $889 - 889 = 0$

Remainder 0. $\therefore \sqrt{4489} = 67$

Ans: 67

10. Find $\sqrt{2704}$ by (i) the prime factorization method (ii) the long division method. [5]

(i) Prime factorization method:

Divide by primes: $2704 \div 2 = 1352$, $1352 \div 2 = 676$, $676 \div 2 = 338$, $338 \div 2 = 169$, $169 \div 13 = 13$

$$\begin{aligned}\sqrt{2704} &= \sqrt{(2 \times 2) \times (2 \times 2) \times (13 \times 13)} \\ &= 2 \times 2 \times 13 \\ &= 52\end{aligned}$$

(ii) Long division method:

Pair the digits from the right: $\overline{27} \overline{04}$

$5 \times 5 = 25 \leq 27$: first digit 5, and $27 - 25 = 2$

Bring down 04: we get 204. New divisor: $5 \times 2 = 10$; $102 \times 2 = 204$ ($103 \times 3 = 309$ is too big); $204 - 204 = 0$

Remainder 0. $\therefore \sqrt{2704} = 52$

Ans: 52

11. Using the long division method, find the square root of 26896. [5]

Long division method:

Pair the digits from the right: $\overline{2} \overline{68} \overline{96}$

$1 \times 1 = 1 \leq 2$: first digit 1, and $2 - 1 = 1$

Bring down 68: we get 168. New divisor: $1 \times 2 = 2$; $26 \times 6 = 156$ ($27 \times 7 = 189$ is too big); $168 - 156 = 12$

Bring down 96: we get 1296. New divisor: $16 \times 2 = 32$; $324 \times 4 = 1296$ ($325 \times 5 = 1625$ is too big); $1296 - 1296 = 0$

Remainder 0. $\therefore \sqrt{26896} = 164$

Ans: 164

12. Simplify $\sqrt{5} \times \sqrt{20}$. [2]

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

$$\begin{aligned}\sqrt{5} \times \sqrt{20} &= \sqrt{5 \times 20} = \sqrt{100} \\ &= \sqrt{10 \times 10} = 10\end{aligned}$$

Ans: 10

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

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

$$\therefore \sqrt{13} \times \sqrt{13} = \sqrt{13^2} = 13$$

Ans: 13

14. Simplify $\frac{\sqrt{147}}{\sqrt{75}}$. [2]

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

$$\frac{\sqrt{147}}{\sqrt{75}} = \sqrt{\frac{147}{75}} = \sqrt{\frac{3 \times 49}{3 \times 25}}$$

$$= \sqrt{\frac{49}{25}} = \frac{7}{5}$$

Ans: $\frac{7}{5}$

15. Show that $\frac{11}{\sqrt{11}} = \sqrt{11}$. [1]

$$11 = \sqrt{11} \times \sqrt{11}$$

$$\frac{11}{\sqrt{11}} = \frac{\sqrt{11} \times \sqrt{11}}{\sqrt{11}} = \sqrt{11}$$

Ans: $\sqrt{11}$

16. Verify that $\sqrt{121} - \sqrt{49} \neq \sqrt{121 - 49}$. [3]

$$\text{LHS} = \sqrt{121} - \sqrt{49} = 11 - 7 = 4 = \sqrt{16}$$

$$\text{RHS} = \sqrt{121 - 49} = \sqrt{72}$$

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

Ans: $\text{LHS} = 4 = \sqrt{16}$, $\text{RHS} = \sqrt{72}$; $\text{LHS} \neq \text{RHS}$

17. If $a = 5$ and $b = 12$, show that (i) $\sqrt{a^2 + b^2} \neq a + b$ (ii) $\sqrt{(a + b)^2} = a + b$. [5]

$$\text{(i) LHS} = \sqrt{5^2 + 12^2} = \sqrt{25 + 144} = \sqrt{169} = 13$$

$$\text{RHS} = a + b = 5 + 12 = 17$$

$$13 \neq 17, \text{ so } \sqrt{a^2 + b^2} \neq a + b$$

$$\text{(ii) LHS} = \sqrt{(5 + 12)^2} = \sqrt{17^2} = 17$$

$$\text{RHS} = 5 + 12 = 17$$

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

Ans: (i) $13 \neq 17$ (ii) $17 = 17$

18. Find the square root of 0.0676. [2]

$$\begin{aligned}\sqrt{0.0676} &= \sqrt{\frac{676}{10000}} \\&= \frac{\sqrt{676}}{\sqrt{10000}} \\&= \frac{26}{100} \\&= 0.26\end{aligned}$$

Ans: 0.26

19. Find the square root of 0.002025. [3]

$$\begin{aligned}\sqrt{0.002025} &= \sqrt{\frac{2025}{1000000}} \\&= \frac{\sqrt{2025}}{\sqrt{1000000}} \\45^2 &= 2025, \text{ so } \sqrt{2025} = 45 \\&= \frac{45}{1000} \\&= 0.045\end{aligned}$$

Ans: 0.045

20. Find the square root of 46.24. [5]

$$\sqrt{46.24} = \sqrt{\frac{4624}{100}} = \frac{\sqrt{4624}}{\sqrt{100}}$$

$\sqrt{4624}$ by the long division method:

Pair the digits from the right: $\overline{46} \overline{24}$

$6 \times 6 = 36 \leq 46$: first digit 6, and $46 - 36 = 10$

Bring down 24: we get 1024. New divisor: $6 \times 2 = 12$; $128 \times 8 = 1024$ ($129 \times 9 = 1161$ is too big);

$$1024 - 1024 = 0$$

$$\sqrt{4624} = 68$$

$$\therefore \sqrt{46.24} = \frac{68}{10} = 6.8$$

Ans: 6.8
