

Squares and Square Roots

Question Paper, Set 06

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 $p \times p$ in power form. [1 mark]
2. Find the value of 26^2 . [1 mark]
3. Find the value of $16^2 - 9^2$. [2 marks]
4. Find $30^2 + 40^2$. [1 mark]
5. Using the rule for numbers ending in 5, find 15^2 and 25^2 . [2 marks]
6. Given $167^2 = 27889$, write the square root of 27889. [1 mark]
7. Find the value of $\sqrt{324} + \sqrt{484}$. [2 marks]
8. Using the prime factorization method, find the square root of 3969. [3 marks]
9. Using the long division method, find the square root of 6241. [3 marks]
10. Find $\sqrt{9604}$ by (i) the prime factorization method (ii) the long division method. [5 marks]
11. Using the long division method, find the square root of 36864. [5 marks]
12. Simplify $\sqrt{12} \times \sqrt{27}$. [2 marks]
13. Find the value of $\sqrt{6} \times \sqrt{6}$. [1 mark]
14. Simplify $\frac{\sqrt{108}}{\sqrt{75}}$. [2 marks]
15. Show that $\frac{15}{\sqrt{15}} = \sqrt{15}$. [1 mark]
16. Verify that $\sqrt{289} - \sqrt{64} \neq \sqrt{289 - 64}$. [3 marks]
17. If $a = 20$ and $b = 21$, 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 0.0576. [2 marks]
19. Find the square root of 0.007225. [3 marks]
20. Find the square root of 67.24. [5 marks]

Key sheet

Q	Answer
1	p^2
2	676
3	175
4	2500
5	$15^2 = 225$, $25^2 = 625$
6	167
7	40
8	63
9	79
10	98
11	192
12	18
13	6
14	$\frac{6}{5}$
15	$\sqrt{15}$
16	LHS = 9, RHS = 15; LHS $\neq$ RHS
17	(i) $29 \neq 41$ (ii) $41 = 41$
18	0.24
19	0.085
20	8.2

Solutions

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

p is multiplied by itself 2 times.

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

Ans: p^2

2. Find the value of 26^2 . [1]

$$26^2 = 26 \times 26$$

$$= 676$$

Ans: 676

3. Find the value of $16^2 - 9^2$. [2]

$$16^2 - 9^2 = 256 - 81$$

$$= 175$$

Ans: 175

4. Find $30^2 + 40^2$. [1]

$$30^2 + 40^2 = 900 + 1600$$

$$= 2500$$

Ans: 2500

5. Using the rule for numbers ending in 5, find 15^2 and 25^2 . [2]

15: $1 \times 2 = 2$, write 25 after it: $15^2 = 225$

25: $2 \times 3 = 6$, write 25 after it: $25^2 = 625$

Ans: $15^2 = 225$, $25^2 = 625$

6. Given $167^2 = 27889$, write the square root of 27889. [1]

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

$$167^2 = 27889 \Rightarrow \sqrt{27889} = 167$$

Ans: 167

7. Find the value of $\sqrt{324} + \sqrt{484}$. [2]

From the table, $\sqrt{324} = 18$ and $\sqrt{484} = 22$

$$\sqrt{324} + \sqrt{484} = 18 + 22 = 40$$

Ans: 40

8. Using the prime factorization method, find the square root of 3969. [3]

Prime factorization method:

Divide by primes: $3969 \div 3 = 1323$, $1323 \div 3 = 441$, $441 \div 3 = 147$, $147 \div 3 = 49$, $49 \div 7 = 7$

$$\sqrt{3969} = \sqrt{(3 \times 3) \times (3 \times 3) \times (7 \times 7)}$$

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

$$= 63$$

Ans: 63

9. Using the long division method, find the square root of 6241. [3]

Long division method:

Pair the digits from the right: $\overline{62} \overline{41}$

$7 \times 7 = 49 \leq 62$: first digit 7, and $62 - 49 = 13$

Bring down 41: we get 1341. New divisor: $7 \times 2 = 14$; $149 \times 9 = 1341$; $1341 - 1341 = 0$

Remainder 0. $\therefore \sqrt{6241} = 79$

Ans: 79

10. Find $\sqrt{9604}$ by (i) the prime factorization method (ii) the long division method. [5]

(i) Prime factorization method:

Divide by primes: $9604 \div 2 = 4802$, $4802 \div 2 = 2401$, $2401 \div 7 = 343$, $343 \div 7 = 49$, $49 \div 7 = 7$

$$\sqrt{9604} = \sqrt{(2 \times 2) \times (7 \times 7) \times (7 \times 7)}$$

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

$$= 98$$

(ii) Long division method:

Pair the digits from the right: $\overline{96} \overline{04}$

$9 \times 9 = 81 \leq 96$: first digit 9, and $96 - 81 = 15$

Bring down 04: we get 1504. New divisor: $9 \times 2 = 18$; $188 \times 8 = 1504$ ($189 \times 9 = 1701$ is too big);
 $1504 - 1504 = 0$

Remainder 0. $\therefore \sqrt{9604} = 98$

Ans: 98

11. Using the long division method, find the square root of 36864. [5]

Long division method:

Pair the digits from the right: $\overline{3} \overline{68} \overline{64}$

$1 \times 1 = 1 \leq 3$: first digit 1, and $3 - 1 = 2$

Bring down 68: we get 268. New divisor: $1 \times 2 = 2$; $29 \times 9 = 261$; $268 - 261 = 7$

Bring down 64: we get 764. New divisor: $19 \times 2 = 38$; $382 \times 2 = 764$ ($383 \times 3 = 1149$ is too big);
 $764 - 764 = 0$

Remainder 0. $\therefore \sqrt{36864} = 192$

Ans: 192

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

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

$$\sqrt{12} \times \sqrt{27} = \sqrt{12 \times 27} = \sqrt{324}$$

$$= \sqrt{18 \times 18} = 18$$

Ans: 18

13. Find the value of $\sqrt{6} \times \sqrt{6}$. [1]

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

$$\therefore \sqrt{6} \times \sqrt{6} = \sqrt{6^2} = 6$$

Ans: 6

14. Simplify $\frac{\sqrt{108}}{\sqrt{75}}$. [2]

$$\begin{aligned}\frac{\sqrt{a}}{\sqrt{b}} &= \sqrt{\frac{a}{b}} \\ \frac{\sqrt{108}}{\sqrt{75}} &= \sqrt{\frac{108}{75}} = \sqrt{\frac{3 \times 36}{3 \times 25}} \\ &= \sqrt{\frac{36}{25}} = \frac{6}{5}\end{aligned}$$

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

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

$$\begin{aligned}15 &= \sqrt{15} \times \sqrt{15} \\ \frac{15}{\sqrt{15}} &= \frac{\sqrt{15} \times \sqrt{15}}{\sqrt{15}} = \sqrt{15}\end{aligned}$$

Ans: $\sqrt{15}$

16. Verify that $\sqrt{289} - \sqrt{64} \neq \sqrt{289 - 64}$. [3]

$$\text{LHS} = \sqrt{289} - \sqrt{64} = 17 - 8 = 9$$

$$\text{RHS} = \sqrt{289 - 64} = \sqrt{225} = 15$$

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

Ans: LHS = 9, RHS = 15; LHS $\neq$ RHS

17. If $a = 20$ and $b = 21$, show that (i) $\sqrt{a^2 + b^2} \neq a + b$ (ii) $\sqrt{(a + b)^2} = a + b$. [5]

$$\text{(i) LHS} = \sqrt{20^2 + 21^2} = \sqrt{400 + 441} = \sqrt{841} = 29$$

$$\text{RHS} = a + b = 20 + 21 = 41$$

$$29 \neq 41, \text{ so } \sqrt{a^2 + b^2} \neq a + b$$

$$\text{(ii) LHS} = \sqrt{(20 + 21)^2} = \sqrt{41^2} = 41$$

$$\text{RHS} = 20 + 21 = 41$$

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

Ans: (i) $29 \neq 41$ (ii) $41 = 41$

18. Find the square root of 0.0576. [2]

$$\sqrt{0.0576} = \sqrt{\frac{576}{10000}}$$

$$= \frac{\sqrt{576}}{\sqrt{10000}}$$

$$= \frac{24}{100}$$

$$= 0.24$$

Ans: 0.24

19. Find the square root of 0.007225. [3]

$$\sqrt{0.007225} = \sqrt{\frac{7225}{1000000}}$$

$$= \frac{\sqrt{7225}}{\sqrt{1000000}}$$

$$85^2 = 7225, \text{ so } \sqrt{7225} = 85$$

$$= \frac{85}{1000}$$

$$= 0.085$$

Ans: 0.085

20. Find the square root of 67.24. [5]

$$\sqrt{67.24} = \sqrt{\frac{6724}{100}} = \frac{\sqrt{6724}}{\sqrt{100}}$$

$\sqrt{6724}$ by the long division method:

Pair the digits from the right: $\overline{67} \overline{24}$

$8 \times 8 = 64 \leq 67$: first digit 8, and $67 - 64 = 3$

Bring down 24: we get 324. New divisor: $8 \times 2 = 16$; $162 \times 2 = 324$ ($163 \times 2 = 326$ is too big); $324 - 324 = 0$

$$\sqrt{6724} = 82$$

$$\therefore \sqrt{67.24} = \frac{82}{10} = 8.2$$

Ans: 8.2
