MATHEMATICS

Chapter 6: Squares and Square Roots

Important Questions

Multiple Choice Questions-

Question 1. The square root of 169 is

(a) 13

(b) 1.3

(c) -1.3

(d) $\frac{13}{10}$

Question 2. What could be the possible "one's digit" of the square root of 625?

(a) 5

(b) 0

(c) 4

(d) 8

Question 3. Sum of squares of two numbers is 145. If square root of one number is 3, find the other number.

(a) 136

(b) 9

(c) 64

(d) 8

Question 4. The square root of 1.21 is

(a) 1.1

(b) 11

(c) 21

(d) 2.1

Question 5. How many numbers lie between square of 12 and 13

(a) 22

(b) 23

(c) 24

(d) 25

Question 6. Which is the greatest three-digit perfect square?

(a) 999

(b) 961

(c) 962

(d) 970

Question 7. How many natural numbers lie between 92 and 102?

(a) 15

(b) 19

(c) 18

(d) 17

Question 8. The largest perfect square between 4 and 50 is

(a) 25

(b) 36

(c) 49

(d) 45

Question 9. Sum of squares of two numbers is 145. If square root of one number is 3, find the other number.

(a) 136

(b) 8

(c) 9

(d) 64

Question 10. Find the square of 39.

(a) 1500

(b) 78

(c) 1521

(d) none of these

Very Short Questions:

1. Find the perfect square numbers between 40 and 50.
2. Which of the following 24^2, 49^2, 77^2, 131^2 or 189^2 end with digit 1?
3. Find the value of each of the following without calculating squares.

   (i) $27^2 - 26^2$

   (ii) $118^2 - 117^2$
4. Write each of the following numbers as difference of the square of two consecutive natural numbers.

   (i) 49

   (ii) 75

   (iii) 125

5. Write down the following as sum of odd numbers.

   (i) 7^2

   (ii) 9^2

6. Express the following as the sum of two consecutive integers.

   (i) 15^2

   (ii) 19^2

7. Find the product of the following:

   (i) 23×25

   (ii) 41×43

8. Find the squares of:

   (i) $\frac{-3}{7}$

   (ii) $\frac{-9}{17}$

Short Questions:

1. Check whether (6, 8, 10) is a Pythagorean triplet.
2. Using property, find the value of the following:

   (i) $19^2 - 18^2$

   (ii) $23^2 - 22^2$

3. Using the prime factorisation method, find which of the following numbers are not perfect squares.

   (i) 768

   (ii) 1296

4. Which of the following triplets are Pythagorean?

   (i) (14, 48, 50)

   (ii) (18, 79, 82)

5. Find the square root of the following using successive subtraction of odd numbers starting from 1.

   (i) 169

   (ii) 81

   (iii) 225

6. Find the square root of the following using prime factorisation.

   (i) 441

   (ii) 2025

(iii) 7056

(iv) 4096

7. Find the least square number which is divisible by each of the number 4, 8 and 12.

8. Find the square roots of the following decimal numbers

(i) 1056.25

(ii) 10020.01

Long Questions:

1. What is the least number that must be subtracted from 3793 so as to get a perfect square? Also, find the square root of the number so obtained.

2. Simplify: √900 + √0.09 + √0.000009

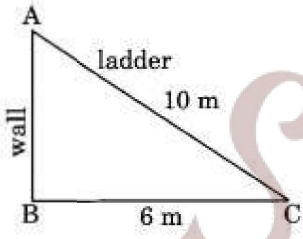
3. Find the value of x if

$$\sqrt{1369} + \sqrt{0.0615 + x} = 37.25$$

4. Simplify:

$$\sqrt{\frac{(0.105 + 0.024 - 0.008) \times 0.85}{1.7 \times 0.022 \times 0.25}}$$

5. A ladder 10 m long rests against a vertical wall. If the foot of the ladder is 6 m away from the wall and the ladder just reaches the top of the wall, how high is the wall?



6. Find the length of a diagonal of a rectangle with dimensions 20 m by 15 m.

7. The area of a rectangular field whose length is twice its breadth is 2450 m2. Find the perimeter of the field.

8. **Which of the following numbers are perfect squares? 11, 12, 16, 32, 36**

Answer Key-

Multiple Choice questions-

1. (a) 13
2. (a) 5
3. (d) 8
4. (a) 1.1
5. (c) 24
6. (b) 961
7. (c) 18
8. (c) 49
9. (b) 8
10. (c) 1521

Very Short Answer :

1. Perfect square numbers between 40 and 50 = 49.
2. Only 49^2, 131^2 and 189^2 end with digit 1.
3. (i) $27^2 - 26^2 = 27 + 26 = 53$

   (ii) $118^2 - 117^2 = 118 + 117 = 235$
4. (i) $49 = 2 \times 24 + 1$

   $49 = 25^2 - 24^2$

   (ii) $75 = 2 \times 37 + 1$

   $75 = 38^2 - 37^2$

   (iii) $125 = 2 \times 62 + 1$

   $125 = 63^2 - 62^2$
5. (i) 72 = Sum of first 7 odd numbers = 1 + 3 + 5 + 7 + 9 + 11 + 13

   (ii) 92 = Sum of first 9 odd numbers = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17
6. $(i)\ 15^2 = 225 = 112 + 113$

$$\left[\because 112 = \frac{15^2 - 1}{2} \text{ and } 113 = \frac{15^2 + 1}{2}\right]$$

$(ii)\ 19^2 = 361 = 180 + 181$

$$\left[\because 180 = \frac{19^2 - 1}{2} \text{ and } 181 = \frac{19^2 + 1}{2}\right]$$

7. (i) $23 \times 25 = (24 - 1)(24 + 1) = 24^2 - 1 = 576 - 1 = 575$

(ii) $41 \times 43 = (42 - 1)(42 + 1) = 42^2 - 1 = 1764 - 1 = 1763$

8.

$$(i)\ \left(-\frac{3}{7}\right)^2 = \left(-\frac{3}{7}\right)\left(-\frac{3}{7}\right) = \frac{9}{49}$$

$$(ii)\ \left(-\frac{9}{17}\right)^2 = \left(-\frac{9}{17}\right)\left(-\frac{9}{17}\right) = \frac{81}{289}$$

Short Answer :

1. $2m$, $m^2 - 1$ and $m^2 + 1$ represent the Pythagorean triplet.

Let $2m = 6 \Rightarrow m = 3$

$m^2 - 1 = (3)^2 - 1 = 9 - 1 = 8$

and $m^2 + 1 = (3)^2 + 1 = 9 + 1 = 10$

Hence (6, 8, 10) is a Pythagorean triplet.

Alternative Method:

$(6)^2 + (8)^2 = 36 + 64 = 100 = (10)^2$

$\Rightarrow$ (6, 8, 10) is a Pythagorean triplet.

2. (i) $19^2 - 18^2 = 19 + 18 = 37$

(ii) $23^2 - 22^2 = 23 + 22 = 45$

3.

(i)

2	768
2	384
2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

$768 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times 3$

Here, 3 is not in pair.

768 is not a perfect square.

(ii)

2	1296
2	648
2	324
2	162
3	81
3	27
3	9
3	3
	1

1296 = $\underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{3 \times 3}$

Here, there is no number left to make a pair.

1296 is a perfect square.

4. We know that 2m, $m^2 - 1$ and $m^2 + 1$ make Pythagorean triplets.

(i) For (14, 48, 50),

Put $2m = 14 \Rightarrow m = 7$

$m^2 - 1 = (7)^2 - 1 = 49 - 1 = 48$

$m^2 + 1 = (7)^2 + 1 = 49 + 1 = 50$

Hence (14, 48, 50) is a Pythagorean triplet.

(ii) For (18, 79, 82)

Put $2m = 18 \Rightarrow m = 9$

$m^2 - 1 = (9)^2 - 1 = 81 - 1 = 80$

$m^2 + 1 = (9)^2 + 1 = 81 + 1 = 82$

Hence (18, 79, 82) is not a Pythagorean triplet

5. (i) 169 – 1 = 168, 168 – 3 = 165, 165 – 5 = 160, 160 – 7 = 153, 153 – 9 = 144, 144 – 11 = 133, 133 – 13 = 120, 120 – 15 = 105, 105 – 17 = 88, 88 – 19 = 69,

69 – 21 = 48, 48 – 23 = 25, 25 – 25 = 0

We have subtracted odd numbers 13 times to get 0.

$\sqrt{169} = 13$

(ii) 81 – 1 = 80, 80 – 3 = 77, 77 – 5 = 72, 72 – 7 = 65, 65 – 9 = 56, 56 – 11 = 45, 45 – 13 = 32, 32 – 15 = 17, 17 – 17 = 0

We have subtracted 9 times to get 0.

$\sqrt{81} = 9$

(iii) 225 – 1 = 224, 224 – 3 = 221, 221 – 5 = 216, 216 – 7 = 209, 209 – 9 = 200, 200 – 11 = 189, 189 – 13 = 176, 176 – 15 = 161, 161 – 17 = 144, 144 – 19 = 125,

125 – 21 = 104, 104 – 23 = 81, 81 – 25 = 56, 56 – 27 = 29, 29 – 29 = 0

We have subtracted 15 times to get 0.

√225 = 15

6. (i) 441 = 3 × 3 × 7 × 7

√441 = 3 × 7 = 21

3	441
3	147
7	49
7	7
	1

(ii) 2025 = 3 × 3 × 3 × 3 × 5 × 5

√2025 = 3 × 3 × 5 = 45

3	2025
3	675
3	225
3	75
5	25
5	5
	1

(iii) 7056 = 2 × 2 × 2 × 2 × 3 × 3 × 7 × 7

√7056 = 2 × 2 × 3 × 7 = 84

2	7056
2	3528
2	1764
2	882
3	441
3	147
7	49
7	7
	1

(iv) 4096 = 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2

√4096 = 2 × 2 × 2 × 2 × 2 × 2 = 64

2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

7. LCM of 4, 8, 12 is the least number divisible by each of them.

LCM of 4, 8 and 12 = 24

24 = $\underline{2 \times 2} \times 2 \times 3$

To make it perfect square multiply 24 by the product of unpaired numbers, i.e., $2 \times 3 = 6$

Required number = $24 \times 6 = 144$

2	4, 8, 12
2	2, 4, 6
2	1, 2, 3
3	1, 1, 3
	1, 1, 1

8.

	32.5
3	$\overline{10}\,\overline{56}.\overline{25}$
	9
62	156
	124
645	3225
	3225
	0

Hence $\sqrt{1056.25} = 32.5$

(ii)

	100.1
1	$\overline{100}\,\overline{20}.\overline{01}$
	1
2001	002001
	2001
	0

Hence $\sqrt{10020.01} = 100.1$

Long Answer:

1. First, we find the square root of 3793 by division method.

	61
6	$\overline{37}\,\overline{93}$
	36
121	193
	121
	72

Here, we get a remainder 72

612 < 3793

Required perfect square number = 3793 – 72 = 3721 and √3721 = 61

2. Simplify: √900 + √0.09 + √0.000009

Solution:

We know that √(ab) = √a × √b

√900 = √(9 × 100) = √9 × √100 = 3 × 10 = 30

√0.09 = √(0.3 × 0.3) = 0.3

√0.000009 = √(0.003 × 0.003) = 0.003

√900 + √0.09 + √0.000009 = 30 + 0.3 + 0.003 = 30.303

3.

We have $\sqrt{1369} + \sqrt{0.0615 + x} = 37.25$

$\because \quad \sqrt{1369} = 37$

	37
3	$\overline{13}\,\overline{69}$
	9
67	469
	469
	0

$\therefore 37 + \sqrt{0.0615 + x} = 37.25$

$\Rightarrow \sqrt{0.0615 + x} = 37.25 - 37$

$\Rightarrow \sqrt{0.0615 + x} = 0.25$

Squaring both sides, we have

$0.0615 + x = 0.0625$

$\Rightarrow x = 0.0625 - 0.0615$

$\therefore x = 0.0010$

Hence $x = 0.001$

4.

$$\sqrt{\frac{(0.105 + 0.024 - 0.008) \times 0.85}{1.7 \times 0.022 \times 0.25}}$$

$$= \sqrt{\frac{(0.129 - 0.008) \times 0.85}{1.7 \times 0.022 \times 0.25}}$$

$$= \sqrt{\frac{0.121 \times 0.85}{1.7 \times 0.22 \times 0.25}}$$

$$= \sqrt{\frac{\cancel{121}^{11} \times \cancel{85}^{5}}{\cancel{17} \times \cancel{22}_{2} \times \cancel{25}_{5}}}$$

[Removing the decimals]

$$= \sqrt{\frac{11}{10}} = \sqrt{1.1}$$

Hence, the required result = $\sqrt{1.1}$.

5. Let AC be the ladder.

Therefore, AC = 10 m

Let BC be the distance between the foot of the ladder and the wall.

Therefore, BC = 6 m

ΔABC forms a right-angled triangle, right angled at B.

By Pythagoras theorem,

$AC^2 = AB^2 + BC^2$

$10^2 = AB^2 + 6^2$

or $AB^2 = 10^2 - 6^2 = 100 - 36 = 64$

or AB = √64 = 8m

Hence, the wall is 8 m high.

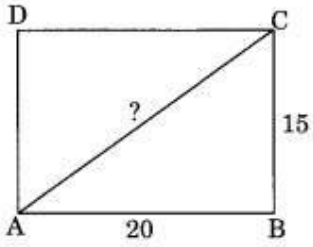
6. Using Pythagoras theorem, we have Length of diagonal of the rectangle = $\sqrt{l^2 + b^2}$ units

$= \sqrt{(20^2 + 15^2)}$ m

$= \sqrt{400 + 225}$ m

$= \sqrt{625}$ m

$= 25$ m



Hence, the length of the diagonal is 25 m.

7. Let the breadth of the field be x metres. The length of the field 2x metres.

Therefore, area of the rectangular field = length × breadth = (2x)(x) = ($2x^2$) m2

Given that area is 2450 m^2.

Therefore, $2x^2 = 2450$

$\Rightarrow x^2 = 1225$

$\Rightarrow x = \sqrt{1225}$ or $x = 35$ m

Hence, breadth = 35 m

and length = 35 × 2 = 70 m

Perimeter of the field = 2 (l + b) = 2(70 + 35) m = 2 × 105 m = 210 m.

8.

11 is not a perfect square because it is a prime number.
12 is not a perfect square because its units digit is 2.
16 is a perfect square because 16 = 4 x 4.
32 is not a perfect square because its units digit is 2.
36 is a perfect square because 36 = 6 x 6.