# Speed Maths

# Square & Square root

1. Find the square of 207.

    **Solution:**

    $207^2$

    (1) $7^2 = 49$, write down 9 as the last digit and carry over 4.

    (2) $2 \times 0 \times 7 + 4 = 4$, write it down in the next position.

    (3) $2 \times 2 \times 7 + 0^2 = 28$, write down 8 in the third position and carry over 2.

    (4) $2 \times 0 \times 2 + 2 = 2$ write down 2 in the fourth place.

    (5) $2^2 = 4$ write down 4

    $\therefore 207^2 = 42849$

2.  Find the square of 897.

**Solution:**

(1) $7^2 = 49$, write down 9 in the last place and carry over 4.

(2) $2 \times 9 \times 7 + 4 = 130$, write down 0 in the next place and carry over 13.

(3) $2 \times 8 \times 7 + 9^2 + 3 = 206$, write down 6 in the next place and carry over 20.

(4) $2 \times 8 \times 9 + 20 = 164$, write down 4 and carry over 16.

(5) $8^2 + 16 = 80$, write it down.

$\therefore (897)^2 = 804609$

3. Find the square of 8432.

**Solution:**

(1) $2^2 = 4$, write down 4 as the last digit.

(2) $2 \times 3 \times 2 = 12$, write down 2 as the next digit and carry over 1.

(3) $2 \times 4 \times 2 + 3^2 + 1 = 26$, write down 6 as the next digit and carry over 2.

(4) $2 \times 8 \times 2 + 2 \times 4 \times 3 + 2 = 58$, write down 8 as the next digit and carry over 5.

(5) $2 \times 8 \times 3 + 4^2 + 5 = 69$, write down 9 as the next digit and carry over 6.

(6) $2 \times 8 \times 4 + 6 = 70$, write down 0 as the next digit and carry over 7.

(7) $8^2 + 7 = 71$, write down 71.

$$\therefore (8432)^2 = 71098624$$

$$(51)^2 = 25 + 1 / 1^2 = 26 / 01 = 2601$$

$$(52)^2 = 25 + 2 / 2^2 = 27 / 04 = 2704$$

$$(53)^2 = 25 + 3 / 3^2 = 28 / 09 = 2809$$

$$(54)^2 = 25 + 4 / 4^2 = 29 / 16 = 2916$$

$$(55)^2 = 25 + 5 / 5^2 = 30 / 25 = 3025$$

$$(59)^2 = 25 + 9 / 9^2 = 34 / 81 = 3481$$

1.  $$57^2 = 25 + 7 / 7^2 = 32 / 49 = 3249$$

1. $15^2 = 1 \times (1+1)/5^2 = 2/25 = 225$

2. $35^2 = 3 \times (3+1)/5^2 = 12/5^2 = 1225$

3. $85^2 = 8 \times 9/25 = 7225$

4. $225^2 = 22 \times 23/25 = 506/25 = 50625$

Here the algebraic formula is used.

$$x^2 = (x^2 - y^2) + y^2 = (x + y)(x - y) + y^2$$

1. $$98^2 = (98 + 2)(98 - 2) + 2^2$$

$$= 9600 + 4 = 9604$$

2. $$(104)^2 = (104 + 4)(104 - 4) + 4^2$$

$$= 10800 + 16 = 10816$$

3. $$(1007)^2 = (1007 + 7)(1007 - 7) + 7^2$$

$$= 1014000 + 49 = 1014049$$

Exercise

1. Find the square of 307.

2. Find the squares of numbers 61 – 69.

3. Find the square of numbers 45 and 235.

4. Find the squares of numbers 96 and 106.

# Square root

If $y = x^2$, then $x = \sqrt{y}$ is called the square root of y.

Square roots of numbers can be found out

(i) by factorisation method (ii) by division method

1.    Evaluate $\sqrt{6084}$ by factorisation method.

**Solution:**

$6084 = 2 \times 2 \times 3 \times 3 \times 13 \times 13$

$\qquad = 2^2 \times 3^2 \times 13^2$

$\therefore \sqrt{6084} = \sqrt{2^2 \times 3^2 \times 13^2}$

$\qquad = 2 \times 3 \times 13 = 78$

$\therefore \sqrt{6084} = 78$

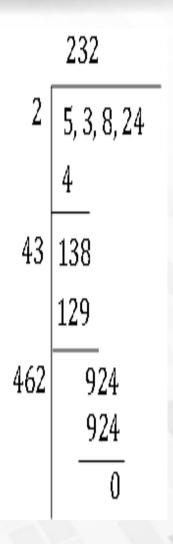| 2 | 6084 |
|---|------|
| 2 | 3042 |
| 3 | 1521 |
| 3 | 507 |
| 13 | 169 |
| | 13 |

2. Find the square root of 53824 by division method.

**Solution:**

(i) Mark off all the digits in pairs starting from the unit's digit.

(ii) $2^2 = 4$, remainder 1, bring down the next pair. The dividend is 138.

(iii) Double 2 and put 3 as the unit's digit. The divisor is 43.

(iv) Bring down 24, continue the process.

$$\therefore \sqrt{53824} = 232$$

```
            2 3 2
      ┌─────────────
   2  │  5, 3, 8, 24
      │  4
      │  ─────
  43  │  138
      │  129
      │  ─────
 462  │    924
      │    924
      │   ─────
      │      0
```

3. Evaluate: $\sqrt{248 + \sqrt{51 + \sqrt{169}}}$

**Solution:**

$$\sqrt{248 + \sqrt{51 + \sqrt{169}}} = \sqrt{248 + \sqrt{51 + 13}}$$

$$= \sqrt{248 + \sqrt{64}} = \sqrt{248 + 8} = \sqrt{256} = 16$$

$$\therefore \sqrt{248 + \sqrt{51 + \sqrt{169}}} = 16$$

4.  Evaluate: $\sqrt{\dfrac{95 \times 85 \times 18900}{17 \times 19 \times 21}}$

**Solution:**

$$\sqrt{\frac{95 \times 85 \times 18900}{17 \times 19 \times 21}} = \sqrt{5 \times 5 \times 900} = \sqrt{5 \times 5 \times 30 \times 30} = 5 \times 30 = 150$$

Exercise

1. Evaluate: $\sqrt{248 + \sqrt{51 + \sqrt{169}}}$

2. Evaluate: $\sqrt{\dfrac{0.289}{0.00121}}$

3. Find the greatest number of 4 digits which is a perfect square.