

Square Roots & Perfect Squares

KEY IDEAS

Square a number: multiply it by itself: $6^2 = 6 \times 6 = 36$. Numbers like 36 are **perfect squares**.

Square root: $\sqrt{36}$ asks, "what number times itself gives 36?" The answer is **6**. Squaring and square-rooting undo each other.

Squares and area: a square with area A has side length $\sqrt{A}$; a square with side s has area s^2 .

Estimate: $5^2 = 25$ and $6^2 = 36$, so $\sqrt{30}$ is between 5 and 6, a bit closer to 5. Perfect squares to know: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225.

A Square each number

4 marks

1. $7^2 =$ _____ 2. $12^2 =$ _____

3. $15^2 =$ _____ 4. $20^2 =$ _____

B Find each square root

4 marks

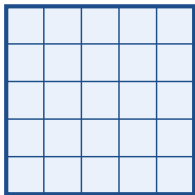
5. $\sqrt{81} =$ _____ 6. $\sqrt{169} =$ _____

7. $\sqrt{400} =$ _____ 8. $\sqrt{1.44} =$ _____

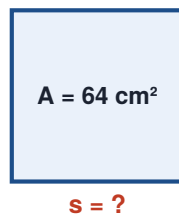
C Squares and area

4 marks

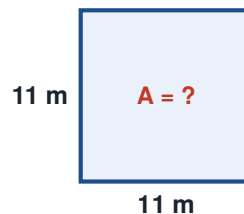
9. Each small square is 1 unit². How long is one side of the big square?



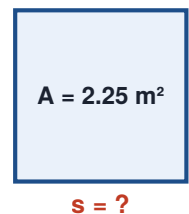
10. Find the side length s .



11. Find the area A .



12. Find the side length s .



D Perfect square or not?

2 marks

$\frac{1}{2}$ mark each. Show the squares you used to decide.

	Number	Perfect square? (Yes / No)	Show how you know
13.	144		
14.	200		
15.	361		
16.	50		

E Estimate square roots

4 marks

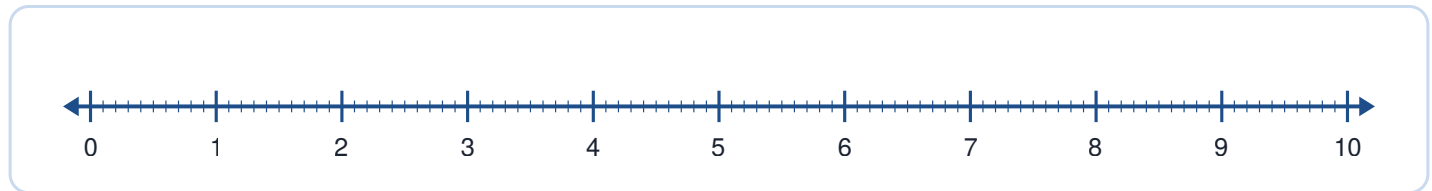
Use perfect squares to estimate first, then check with a calculator. 1 mark per row.

	Square root	Between which two whole numbers?	Closer to?	Calculator check (1 decimal)
17.	$\sqrt{45}$			
18.	$\sqrt{85}$			
19.	$\sqrt{18}$			
20.	$\sqrt{135}$			

F Square roots on a number line

4 marks

21. Estimate each value, then mark and label it on the number line: $\sqrt{3}$, $\sqrt{10}$, $\sqrt{50}$, $\sqrt{80}$



G Real-world problems

6 marks

Show your work and give units. 2 marks each.

22. A square garden has an area of 196 m^2 . How much fencing is needed to go all the way around it?

23. A square floor tile has an area of 0.25 m^2 . How many tiles fit side by side along a wall that is 3 m long?

24. A square patio has an area of 30 m^2 . Between which two whole numbers is its side length? Estimate the side length to one decimal place.

H Spot the mistake

2 marks

25. A student writes $\sqrt{16} = 8$. Explain the error and write the correct answer.

26. A student writes $\sqrt{(9 + 16)} = \sqrt{9} + \sqrt{16} = 3 + 4 = 7$. Explain the error and write the correct answer.

Square Roots & Perfect Squares

ANSWER KEY

Date: _____ Score: ____ / 30

KEY IDEAS

Square a number: multiply it by itself: $6^2 = 6 \times 6 = 36$. Numbers like 36 are **perfect squares**.

Square root: $\sqrt{36}$ asks, "what number times itself gives 36?" The answer is **6**. Squaring and square-rooting undo each other.

Squares and area: a square with area A has side length $\sqrt{A}$; a square with side s has area s^2 .

Estimate: $5^2 = 25$ and $6^2 = 36$, so $\sqrt{30}$ is between 5 and 6, a bit closer to 5. Perfect squares to know: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225.

A Square each number

4 marks

1. $7^2 = 49$

2. $12^2 = 144$

3. $15^2 = 225$

4. $20^2 = 400$

B Find each square root

4 marks

5. $\sqrt{81} = 9$

6. $\sqrt{169} = 13$

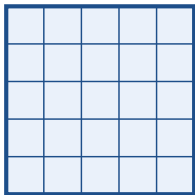
7. $\sqrt{400} = 20$

8. $\sqrt{1.44} = 1.2$

C Squares and area

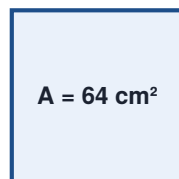
4 marks

9. Each small square is 1 unit². How long is one side of the big square?



$\sqrt{25} = 5$ units

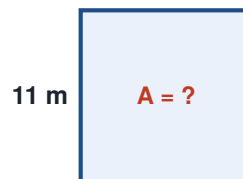
10. Find the side length s.



$s = ?$

$\sqrt{64} = 8$ cm

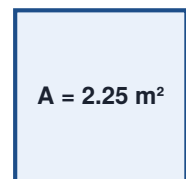
11. Find the area A.



$11^2 = 121$ m²

$11^2 = 121$ m²

12. Find the side length s.



$s = ?$

$\sqrt{2.25} = 1.5$ m

D Perfect square or not?

2 marks

$\frac{1}{2}$ mark each. Show the squares you used to decide.

	Number	Perfect square? (Yes / No)	Show how you know
13.	144	Yes	$12^2 = 144$
14.	200	No	between $14^2 = 196$ and $15^2 = 225$
15.	361	Yes	$19^2 = 361$
16.	50	No	between $7^2 = 49$ and $8^2 = 64$

E Estimate square roots

4 marks

Use perfect squares to estimate first, then check with a calculator. 1 mark per row.

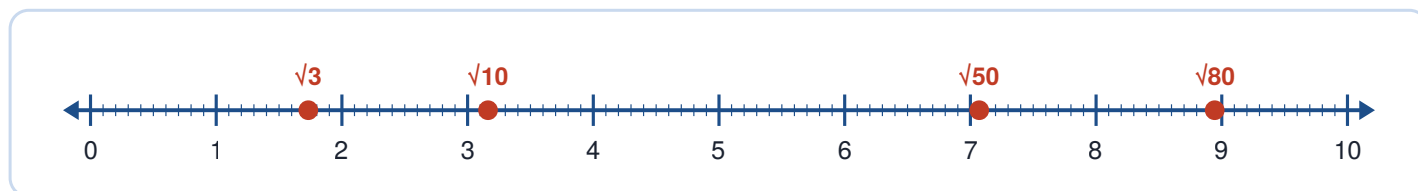
	Square root	Between which two whole numbers?	Closer to?	Calculator check (1 decimal)
17.	$\sqrt{45}$	6 and 7	7	6.7
18.	$\sqrt{85}$	9 and 10	9	9.2
19.	$\sqrt{18}$	4 and 5	4	4.2
20.	$\sqrt{135}$	11 and 12	12	11.6

How to decide: $\sqrt{45}$ is closer to 7 because 45 is 4 away from 49 but 9 away from 36.

F Square roots on a number line

4 marks

21. Estimate each value, then mark and label it on the number line: $\sqrt{3}$, $\sqrt{10}$, $\sqrt{50}$, $\sqrt{80}$



G Real-world problems

6 marks

Show your work and give units. 2 marks each.

22. A square garden has an area of 196 m^2 . How much fencing is needed to go all the way around it?

Side = $\sqrt{196} = 14 \text{ m}$. Perimeter = $4 \times 14 = 56 \text{ m}$ of fencing

23. A square floor tile has an area of 0.25 m^2 . How many tiles fit side by side along a wall that is 3 m long?

Side = $\sqrt{0.25} = 0.5 \text{ m}$. $3 \div 0.5 = 6$ tiles

24. A square patio has an area of 30 m^2 . Between which two whole numbers is its side length? Estimate the side length to one decimal place.

$5^2 = 25$ and $6^2 = 36$, so the side is between 5 m and 6 m. $\sqrt{30} \approx 5.5 \text{ m}$

H Spot the mistake

2 marks

25. A student writes $\sqrt{16} = 8$. Explain the error and write the correct answer.

8 is half of 16, not its square root. The square root is the number that times itself gives 16: $\sqrt{16} = 4$, because $4 \times 4 = 16$.

26. A student writes $\sqrt{(9 + 16)} = \sqrt{9} + \sqrt{16} = 3 + 4 = 7$. Explain the error and write the correct answer.

You can't split a square root over addition. Add first: $\sqrt{(9 + 16)} = \sqrt{25} = 5$.