

Number Systems

Mathematics · Class 9 · Topic-wise Practice Worksheet

TIME 45 minutes	QUESTIONS 18	TOTAL MARKS 24	MAX. SCORE ____ / 24
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Name: _____ Class/Sec: _____ Date: _____

INSTRUCTIONS

- There are **18 questions** in this worksheet. All questions are compulsory.
- Each question has four options (A), (B), (C) and (D). Exactly **one** option is correct.
- Questions 1–15 carry **1 mark** each. Questions 16–18 (Achievers Section) carry **3 marks** each.
- There is no negative marking. Use of a calculator is **not** allowed.
- Rough work may be done on the blank space at the side of each page.

Section A — Mathematical Reasoning

Q1–Q8 · 1 mark each

1. Which of the following is an **irrational** number?

- (A) $\sqrt{16}$ (B) $\sqrt{225}$
(C) $\sqrt{0.04}$ (D) $\sqrt{50}$

2. The decimal expansion of $\frac{17}{8}$ is _____.

- (A) Terminating (B) Non-terminating and repeating
(C) Non-terminating and non-repeating (D) Not defined

3. The value of $(\sqrt{5} + \sqrt{2})(\sqrt{5} - \sqrt{2})$ is _____.

- (A) $\sqrt{3}$ (B) 7
(C) 3 (D) $2\sqrt{10}$

4. The value of $16^{3/4}$ is _____.

- (A) 8 (B) 12
(C) 32 (D) 64

5. The rationalising factor of $(\sqrt{7} - \sqrt{3})$ is _____.

- (A) $\sqrt{7} - \sqrt{3}$ (B) $7 + 3$
(C) $\sqrt{21}$ (D) $\sqrt{7} + \sqrt{3}$

6. How many irrational numbers lie between 2 and 3?

- (A) Infinitely many (B) Exactly one
(C) Exactly ten (D) None

7. The recurring decimal 0.777... expressed in the form $\frac{p}{q}$ is _____.

- (A) $\frac{7}{10}$ (B) $\frac{7}{9}$
(C) $\frac{77}{100}$ (D) $\frac{7}{11}$

8. $\sqrt{10} \times \sqrt{15} = \underline{\hspace{2cm}}$.

(A) 25

(B) $5\sqrt{5}$

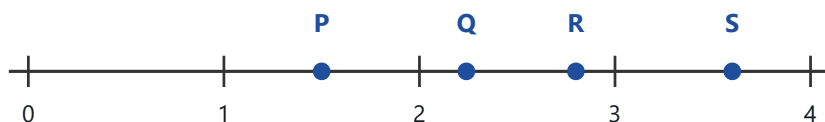
(C) $5\sqrt{6}$

(D) $\sqrt{25}$

Section B — Everyday Mathematics and Reasoning

Q9–Q15 · 1 mark each

9. Four points P, Q, R and S are marked on the number line below. Which point represents $\sqrt{5}$?



Points P, Q, R and S on the number line from 0 to 4

(A) P

(B) Q

(C) R

(D) S

10. On rationalising the denominator, $\frac{1}{3 - \sqrt{5}}$ becomes $\underline{\hspace{2cm}}$.

(A) $3 + \sqrt{5}$

(B) $\frac{3 - \sqrt{5}}{4}$

(C) $\frac{3 + \sqrt{5}}{14}$

(D) $\frac{3 + \sqrt{5}}{4}$

11. A square plot of land has an area of 72 m^2 . The length of its side, in simplest surd form, is $\underline{\hspace{2cm}}$.

(A) $6\sqrt{2} \text{ m}$

(B) $8\sqrt{2} \text{ m}$

(C) 36 m

(D) $2\sqrt{18} \text{ m}$

12. The value of $5^{-3} \times 5^5$ is $\underline{\hspace{2cm}}$.

(A) 5^{-15}

(B) 25

(C) 1

(D) 125

13. A shopkeeper divides 3 by 13 on a long-division sheet. The decimal expansion he obtains is $\underline{\hspace{2cm}}$.

(A) Terminating after 3 places

(B) Non-terminating and non-repeating

(C) Non-terminating with a repeating block of 6 digits

(D) Terminating after 13 places

14. One row of the table below is **incorrectly** matched. Which row is it?

Row	Number	Nature of its decimal expansion
(A)	$\sqrt{9}$	Non-terminating, non-repeating
(B)	$5/12$	Non-terminating, repeating
(C)	$3/8$	Terminating
(D)	$7/20$	Terminating

Table 1.1 — Numbers and their decimal expansions

(A) (A)

(B) (B)

(C) (C)

(D) (D)

15. The number 2.333... written in the form $\frac{p}{q}$, where p and q are integers in lowest terms with $q \neq 0$, is _____.

(A) $\frac{23}{10}$

(B) $\frac{21}{10}$

(C) $\frac{233}{100}$

(D) $\frac{7}{3}$

Achievers Section

Q16–Q18 · 3 marks each

16. If $x = 2 + \sqrt{3}$, then the value of $x + \frac{1}{x}$ is _____.

(A) 4

(B) $2\sqrt{3}$

(C) 2

(D) $4 + 2\sqrt{3}$

17. Consider the three statements below.

(i) The sum of two irrational numbers is always irrational.

(ii) The product of a non-zero rational number and an irrational number is always irrational.

(iii) Every point on the number line represents a real number.

Which of them are **true**?

(A) (i) and (ii) only

(B) (ii) and (iii) only

(C) (i) and (iii) only

(D) All three

18. The value of $\frac{1}{\sqrt{2} + \sqrt{1}} + \frac{1}{\sqrt{3} + \sqrt{2}} + \frac{1}{\sqrt{4} + \sqrt{3}} + \frac{1}{\sqrt{5} + \sqrt{4}}$ is _____.

(A) $\sqrt{5} + 1$

(B) $\sqrt{5} - 1$

(C) $\sqrt{5}$

(D) 1

Answer Key

1	D	2	A	3	C	4	A	5	D
6	A	7	B	8	C	9	B	10	D
11	A	12	B	13	C	14	A	15	D
16	A	17	B	18	B				

Solutions

1. Answer: (D) $\sqrt{50}$

A square root is rational only when the number under it is the square of a rational. Here $\sqrt{16} = 4$, $\sqrt{25} = 5$ and $\sqrt{0.04} = 0.2$, all rational. But $50 = 25 \times 2$, so $\sqrt{50} = 5\sqrt{2}$, and $\sqrt{2}$ is irrational. Hence **$\sqrt{50}$** is irrational.

2. Answer: (A) Terminating

In lowest terms the denominator is $8 = 2^3$, which has only the prime factor 2. A fraction whose denominator has only the primes 2 and 5 always has a terminating expansion: $\frac{17}{8} = 2.125$.

3. Answer: (C) 3

Use $(a + b)(a - b) = a^2 - b^2$ with $a = \sqrt{5}$ and $b = \sqrt{2}$: the product is $5 - 2 = 3$. The irrational parts cancel, which is exactly why this pairing is used to rationalise denominators.

4. Answer: (A) 8

Write 16 as a power of 2: $16 = 2^4$. Then $16^{3/4} = (2^4)^{3/4} = 2^{4 \times 3/4} = 2^3 = 8$.

5. Answer: (D) $\sqrt{7} + \sqrt{3}$

Multiplying by the conjugate turns the surds into whole numbers: $(\sqrt{7} - \sqrt{3})(\sqrt{7} + \sqrt{3}) = 7 - 3 = 4$, a rational number. Multiplying by $(\sqrt{7} - \sqrt{3})$ itself gives $10 - 2\sqrt{21}$, which is still irrational.

6. Answer: (A) Infinitely many

Between any two distinct real numbers there are **infinitely many** irrational numbers — for instance $\sqrt{5}$, $\sqrt{6}$, $\sqrt{7}$, $\sqrt{8}$ and endlessly many non-repeating decimals such as 2.1010010001... all lie between 2 and 3.

7. Answer: (B) $\frac{7}{9}$

Let $x = 0.777...$. Then $10x = 7.777...$. Subtracting, $9x = 7$, so $x = \frac{7}{9}$. Check by division: $7 \div 9$ gives the repeating decimal 0.777... as required.

8. Answer: (C) $5\sqrt{6}$

$\sqrt{a} \times \sqrt{b} = \sqrt{ab}$, so $\sqrt{10} \times \sqrt{15} = \sqrt{150}$. Now $150 = 25 \times 6$, hence $\sqrt{150} = 5\sqrt{6} \approx 12.25$.

9. Answer: (B) Q

$\sqrt{5}$ lies between $\sqrt{4} = 2$ and $\sqrt{9} = 3$, and since $2.2^2 = 4.84$ while $2.3^2 = 5.29$, $\sqrt{5} \approx 2.24$. The only marked point just past 2 is **Q**, about a quarter of the way from 2 to 3. P is near 1.5, R near 2.8 and S near 3.6.

10. Answer: (D) $\frac{3 + \sqrt{5}}{4}$

Multiply numerator and denominator by the conjugate $(3 + \sqrt{5})$. The denominator becomes $3^2 - (\sqrt{5})^2 = 9 - 5 = 4$, so the value is $\frac{3 + \sqrt{5}}{4}$. Check numerically: $3 - \sqrt{5} \approx 0.76$ and $1 \div 0.76 \approx 1.31$, matching $(3 + 2.24) \div 4 \approx 1.31$.

11. Answer: (A) $6\sqrt{2}$ m

Side = $\sqrt{\text{area}} = \sqrt{72}$. Since $72 = 36 \times 2$, $\sqrt{72} = 6\sqrt{2}$ m ≈ 8.49 m. The form $2\sqrt{18}$ has the same value but is not simplest, because 18 still contains the square factor 9.

12. Answer: (B) 25

When powers of the same base are multiplied the indices are added: $5^{-3} \times 5^5 = 5^{-3+5} = 5^2 = 25$. The indices are added, not multiplied.

13. Answer: (C) Non-terminating with a repeating block of 6 digits

13 is neither 2 nor 5, so the expansion cannot terminate; but every fraction repeats sooner or later. Dividing gives $3 \div 13 = 0.230769230769...$, in which the block **230769** of 6 digits repeats. For denominator 13 the repeating block can never exceed 12 digits.

14. Answer: (A) (A)

$\sqrt{9} = 3$ exactly, a whole number, so its expansion terminates — row **(A)** is wrong. The others are correct: $8 = 2^3$ and $20 = 2^2 \times 5$ give terminating expansions, while $12 = 2^2 \times 3$ contains the prime 3, giving the repeating expansion $5/12 = 0.41666\dots$ instead.

15. Answer: (D) $\frac{7}{3}$

Let $x = 2.333\dots$, so $10x = 23.333\dots$. Subtracting gives $9x = 21$, hence $x = \frac{21}{9} = \frac{7}{3}$ in lowest terms. The decimals 2.3 and 2.33 are only approximations that stop early.

16. Answer: (A) 4

First rationalise $\frac{1}{x}$: $\frac{1}{2 + \sqrt{3}}$ multiplied above and below by $(2 - \sqrt{3})$ gives $\frac{2 - \sqrt{3}}{4 - 3} = 2 - \sqrt{3}$. Adding, $x + \frac{1}{x} = (2 + \sqrt{3}) + (2 - \sqrt{3}) = 4$. The surd parts cancel, which is what makes such an expression rational.

17. Answer: (B) (ii) and (iii) only

Statement (i) fails: $(2 + \sqrt{3}) + (2 - \sqrt{3}) = 4$, a rational sum of two irrationals. Statement (ii) holds — if a rational $r \neq 0$ times an irrational s were rational, then $s = (rs) \div r$ would itself be rational, a contradiction. Statement (iii) holds, since the real numbers fill the number line completely. So only **(ii) and (iii)** are true.

18. Answer: (B) $\sqrt{5} - 1$

Rationalise each term: $\frac{1}{\sqrt{(n+1)} + \sqrt{n}} = \frac{1}{\sqrt{(n+1)} + \sqrt{n}} \times \frac{\sqrt{(n+1)} - \sqrt{n}}{\sqrt{(n+1)} - \sqrt{n}} = \frac{\sqrt{(n+1)} - \sqrt{n}}{(n+1) - n} = \sqrt{(n+1)} - \sqrt{n}$, because the denominator becomes $(n + 1) - n = 1$. The sum therefore telescopes to $(\sqrt{2} - \sqrt{1}) + (\sqrt{3} - \sqrt{2}) + (\sqrt{4} - \sqrt{3}) + (\sqrt{5} - \sqrt{4}) = \sqrt{5} - 1 \approx 1.236$, so the value is **$\sqrt{5} - 1$** .