CLASS 9 MATHS · 2026-27

Number systems

Number systems

34	25	3
QUESTIONS	MINUTES	EXERCISES

This belongs to _____ **Date** _____

WHAT YOU'LL GET GOOD AT

- Decides whether a number is rational or irrational and gives the reason
- Rationalises a denominator using the conjugate
- Converts a recurring decimal into a fraction
- Applies the laws of exponents to fractional powers

Take your time, and have a go at every one. If you get stuck, look at the orange box — Ollie has already done one for you.

Number systems

Number systems · 34 questions · tick each box as you finish

Exercise 1 of 3 · 12 questions Rational or irrational? Give the reason.

WRITE THE ANSWER

HERE'S ONE DONE FOR YOU

2 × 8 is rational, and that surprises most children. Combining the roots gives 16 = 4. The lesson is that a number is not irrational because it has a root sign in it - it is irrational because it cannot be written as a fraction. Simplify first, then judge.

1) 25

2) 7

3) 0.3333...

4) À

5) 2 + 3

6) 2 × 8

7) 16

8) 11

9) 0.1010010001000001...

10) 22/7

11) 5 × 5

12) 3 - 2

Exercise 2 of 3 · 10 questions Rationalise the denominator.

WRITE THE ANSWER

HERE'S ONE DONE FOR YOU

For 1/(2 + 3), multiply top and bottom by (2 - 3). The denominator becomes (2 + 3)(2 - 3) = 4 - 3 = 1, so the answer is simply 2 - 3. This is the Class 8 identity (a + b)(a - b) = a² - b² doing all the work. Once a child recognises that, rationalising stops being a separate technique and becomes an application of something they already know.

1) 1/5

2) 1/(7 - 6)

3) 5/(3 - 1)

4) 1/(2 + 3)

5) 7/(3 + 22)

6) 1/3

7) 1/(5 + 2)

8) 3/(2 - 3)

9) 1/(7 + 2)

10) 4/(3 - 5)

Exercise 3 of 3 · 12 questions Simplify, or convert as asked.

WRITE THE ANSWER

HERE'S ONE DONE FOR YOU

To convert 0.474747... multiply by 100 rather than by 10, because two digits repeat. Then 100x - x = 47, so x = 47/99. The rule follows from that rather than needing to be memorised: multiply by 10 for one repeating digit, 100 for two, 1000 for three - enough to line the repeating part up so it cancels.

1) 2^(2/3) × 2^(1/3)

2) (3^(1/5))^5

3) 64^(1/2) × 64^(1/3)

4) Express 0.666... as a fraction.

5) Express 0.474747... as a fraction.

6) Simplify 1/(3 - 2) + 1/(3 + 2).

7) 5^(1/2) × 5^(1/2)

8) (2^3)^(1/3)

9) 27^(2/3)

10) Express 0.777... as a fraction.

11) Express 0.363636... as a fraction.

12) Simplify 1/(2 - 3) + 1/(2 + 3).

All done? How did that feel?

Colour in a star. Three stars means you could teach it to someone else.

☆ ☆ ☆ Tricky · Getting there · Easy now

Answer key

For grown-ups

Number systems · keep this page back until your child has finished.

1. Rational or irrational? Give the reason.

1) Rational - it equals 5, which can be written as 5/1.
2) Irrational - 7 is not a perfect square, so its root cannot be written as a fraction.
3) Rational - a recurring decimal, equal to 1/3.
4) Irrational - its decimal expansion is non-terminating and non-recurring. Note that 22/7 is an approximation, not Àself.
5) Irrational - a rational number added to an irrational one is always irrational.
6) Rational - it equals 16, which is 4.
7) Rational. 16 = 4, which can be written as 4/1.
8) Irrational. 11 is not a perfect square, so its root is non-terminating and non-repeating.
9) Irrational. The decimal never terminates and never settles into a repeating block.
10) Rational. It is a ratio of two integers, and it is an approximation of Àrather than Àself.
11) Rational. 5 × 5 = 5.
12) Irrational. A rational number minus an irrational number is always irrational.

2. Rationalise the denominator.

1) 5/5. Multiply top and bottom by 5.
2) 7 + 6. Multiply by the conjugate (7 + 6); the denominator becomes 7 - 6 = 1.
3) 5(3 + 1)/2. Multiply by (3 + 1); the denominator becomes 3 - 1 = 2.
4) 2 - 3. Multiply by (2 - 3); the denominator becomes 4 - 3 = 1.
5) 21 - 142. Multiply by (3 - 22); the denominator becomes 9 - 8 = 1.
6) 3/3. Multiply top and bottom by 3.
7) (5 - 2)/3. Multiply by the conjugate: the denominator becomes 5 - 2 = 3.
8) 3(2 + 3) = 6 + 33. The denominator becomes 4 - 3 = 1.
9) (7 - 2)/3. The denominator becomes 7 - 4 = 3.
10) (3 + 5). The denominator becomes 9 - 5 = 4, and 4(3 + 5)/4 = 3 + 5.

3. Simplify, or convert as asked.

1) 2. Adding the powers gives 2^1.
2) 3. Multiplying the powers gives 3^1.
3) 32. That is 8 × 4, or equivalently 64^(5/6).
4) 2/3. Let x = 0.666...; then 10x = 6.666...; subtracting gives 9x = 6, so x = 2/3.
5) 47/99. Let x = 0.474747...; then 100x = 47.4747...; subtracting gives 99x = 47.
6) 6/7. The two fractions combine to give ((3 + 2) + (3 - 2))/(9 - 2) = 6/7.
7) 5. The powers add: 1/2 + 1/2 = 1.
8) 2. The powers multiply: 3 × 1/3 = 1.
9) 9. 27^(1/3) = 3, and $3^2 = 9$.
10) 7/9. Let x = 0.777..., then 10x = 7.777..., so 9x = 7.
11) 36/99 = 4/11. Let x = 0.3636..., then 100x = 36.3636..., so 99x = 36.
12) 4. The two denominators are conjugates, so the terms become (2 + 3) + (2 - 3).

WHILE YOUR CHILD WORKS

- Simplify before judging whether a number is irrational. 2 × 8 looks irrational and is 4.
- Rationalising is just $(a + b)(a - b) = a^2 - b^2$ from Class 8. Say that once and the technique stops feeling new.
- This chapter is short and reliably scored. It is a good place to start the year, and a good place to regain confidence mid-year.