

How can we tell if a Rational Number is a Terminating or a Non-Terminating Recurring Decimal?

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In the previous segment, we saw how to **convert fractions to decimals**. In this segment let us see if we can tell whether a Rational Numbers is a Terminating or Non-Terminating Recurring Decimal.

Classifying rational numbers as terminating or non-terminating recurring decimal

Rational numbers are either terminating decimals or non-terminating recurring decimal numbers. They can be expressed as $\frac{p}{q}$, where $q \neq 0$.

For example,

Rational Numbers	$\frac{5}{2}$	$\frac{17}{5}$	$\frac{8}{15}$	$\frac{9}{20}$	$\frac{17}{6}$	$\frac{11}{21}$
Decimal	2.5	3.4	0.53333 ...	0.45	2.8333 ...	0.5238095238095 ...
Terminating decimal/Non-terminating recurring decimal	Terminating decimal	Terminating decimal	Non-terminating recurring decimal	Terminating decimal	Non-terminating recurring decimal	Non-terminating recurring decimal

Another way to decide whether the rational numbers are terminating or non terminating recurring decimals is by reducing the denominators to their prime factors.

If the prime factors of the denominator are 2 or 5 or both, then the decimal is Terminating. If the denominator contains any prime factor other than 2 or 5, then is a Non-terminating recurring decimal.

Rational Numbers	$\frac{5}{2}$	$\frac{7}{5}$	$\frac{8}{15}$	$\frac{9}{20}$	$\frac{17}{6}$	$\frac{11}{21}$
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Denominators reduced to Prime factors	2	5	3×5	$2^2 \times 5$	2×3	3×7
Terminating decimal/Non-terminating recurring decimal	Terminating decimal	Terminating decimal	Non-terminating recurring decimal	Terminating decimal	Non-terminating recurring decimal	Non-terminating recurring decimal

If a number is in the form $\frac{p}{q}$, then reduce q to its prime factors.

For Terminating decimals,

$$q = 2^m \times 5^n$$

where m and n are integers.

For Non-terminating recurring decimal,

$$q = 2^m \times 5^n \times k$$

where k is a prime factor other than 2 or 5 and m and n are integers.

Summary

Terminating Decimals	$q = 2^m \times 5^n$
Non-terminating recurring decimal	$q = 2^m \times 5^n \times k$

What's next?

In the next segment of Class 10 Maths, we will see **Polynomials**.