

UPDAAN



2025

Real Numbers

Mathematics

Lecture - 05

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Topics

to be covered



1

Miscellaneous Questions

Proof of Irrationality (Continued)

Badhiya Questions





WORK HARD
DREAM BIG
NEVER GIVE UP !!



$a = \text{integer}$

$b = 11$

$$\frac{a}{b} = R$$

$$\frac{2a}{b} = R$$

$$\frac{2a-b}{3b} = R$$



#Q. Show that $7 - \sqrt{5}$ is irrational, given that $\sqrt{5}$ is irrational. [SQP 2018-19]

Let $7 - \sqrt{5}$ be rational.

$$\therefore 7 - \sqrt{5} = \frac{p}{q} \quad [p \text{ and } q \text{ coprime integers}]$$

$$7 - \frac{p}{q} = \sqrt{5}$$

Rational. $\frac{7q - p}{q} = \sqrt{5}$ Irrational

This is not possible.

\therefore Our assumption was wrong.

Hence, $7 - \sqrt{5}$ is irrational.

#Q. Given that $\sqrt{5}$ is irrational, prove that $2\sqrt{5} - 3$ is an irrational number.

[CBSE SQP - 2020]

Let $2\sqrt{5} - 3$ be rational

$$\therefore 2\sqrt{5} - 3 = \frac{p}{q} \quad [p \text{ and } q \rightarrow \text{coprime integers}]$$

$$2\sqrt{5} = \frac{p}{q} + 3$$

$$2\sqrt{5} = \frac{p+3q}{q}$$

$$\sqrt{5} = \frac{p+3q}{2q} \quad \text{Rational}$$

✗

This is not possible

\therefore Our assumption was wrong

$\Rightarrow 2\sqrt{5} - 3$ is irrational

#Q. Prove that $7\sqrt{5}$ is an irrational number.

[NCERT]

H.w

Ty 5 Marks. - -

First $\rightarrow \sqrt{5}$ is irrational.

$\rightarrow 7\sqrt{5}$ is irrational.

#Q. Prove that $(\sqrt{2} + \sqrt{3})$ is an irrational number.

$$(a+b)^2 = a^2 + b^2 + 2ab$$

Irrational

$$\sqrt{6} = \frac{p^2 - sq^2}{2q^2}$$

Rational

LSH

Let $\sqrt{2} + \sqrt{3}$ be rational.

$$\therefore \sqrt{2} + \sqrt{3} = \frac{p}{q} \quad [p \text{ and } q \rightarrow \text{coprime integers}]$$

$$(\sqrt{2} + \sqrt{3})^2 = \left(\frac{p}{q}\right)^2$$

$$(\sqrt{2})^2 + (\sqrt{3})^2 + 2(\sqrt{2})(\sqrt{3}) = \frac{p^2}{q^2}$$

$$2 + 3 + 2\sqrt{6} = \frac{p^2}{q^2}$$

$$2\sqrt{6} = \frac{p^2}{q^2} - 5$$

$$2\sqrt{6} = \frac{p^2 - 5q^2}{q^2}$$

class 10th



CBSE Boards



Maths



#Q. If p, q are prime positive integers, prove that $\sqrt{p} + \sqrt{q}$ is an irrational number.

Let $\sqrt{p} + \sqrt{q}$ be rational.

$$\therefore \sqrt{p} + \sqrt{q} = \frac{a}{b} \quad [\text{'a' and 'b' coprime integers}]$$

Squaring both sides...

$$(\sqrt{p} + \sqrt{q})^2 = \left(\frac{a}{b}\right)^2$$

$$(\sqrt{p})^2 + (\sqrt{q})^2 + 2(\sqrt{p})(\sqrt{q}) = \frac{a^2}{b^2}$$

$$p + q + 2\sqrt{pq} = \frac{a^2}{b^2}$$

$$2\sqrt{pq} = \frac{a^2}{b^2} - p - q$$

$$2\sqrt{pq} = \frac{a^2}{b^2} - p - q$$

Same steps

$$\sqrt{pq} = \frac{a^2 - pb^2 - qb^2}{2b^2}$$

Isosational

Rational no.

$$\sqrt{2 \times 5} = \sqrt{10}$$

$$\sqrt{2 \times 3} = \sqrt{6}$$

$$\sqrt{2 \times 11} = \sqrt{22}$$

ALU

4663

4680-17

#Q. Find the smallest number which when increased by 17 is exactly divisible by both 520 and 468.

1) 4663

2) 4720

3) 4680

4) None of the above.

$$\begin{array}{r|l} 2 & 520 \\ \hline 2 & 260 \\ 2 & 130 \\ 5 & 65 \\ 13 & 13 \\ & 1 \end{array}$$

$$\begin{array}{r|l} 2 & 468 \\ \hline 2 & 234 \\ 3 & 117 \\ 3 & 39 \\ 13 & 13 \\ & 1 \end{array}$$

$$520 = 2^3 \times 5^1 \times 13^1 \times 3^0$$

$$468 = 2^2 \times 3^2 \times 13^1 \times 5^0$$

$$\text{LCM} = 2^3 \times 5^1 \times 3^2 \times 13^1 = 4680$$

4663 + 17

520, 468

#Q. Find the greatest number of 6 digits exactly divisible by 24, 15 and 36.

$$\text{LCM}(24, 15 \text{ and } 36) = 360.$$

greatest 6 digits no. = 999999

$$\begin{array}{r} 2777 \\ 360 \overline{) 999999} \\ \underline{720} \downarrow \\ 2799 \downarrow \\ \underline{2520} \downarrow \\ 02799 \downarrow \\ \underline{2520} \downarrow \\ 2799 \end{array}$$

$$\begin{array}{r} 2799 \\ \underline{2520} \\ 0279 \end{array} \text{--- R}$$

$$\begin{array}{r} 999999 \\ \underline{279} \\ 999720 \end{array}$$

★ greatest 6 digit no.
★ divisible by 24, 15 and 36
★ will also be divisible by
★ their LCM.

Ans //

#Q. On a morning walk, three persons step off together and their steps measure 40 cm, 42 cm and 45 cm, respectively. What is the minimum distance each should walk, so that each can cover the same distance in complete steps?

1) 2520

2) 2540

3) 2560

4) Not A

Flw //

#Q. In a school 437 girls and 342 boys have been divided into groups so that each group has the same number of students and no group has boys and girls mixed. What is the least number of groups needed?

Chota \rightarrow Factor \rightarrow HCF

1) 42

2) 43

~~3) 41~~

4) NOTA

$$\begin{array}{r|l} 19 & 437 \\ \hline 23 & 23 \\ & 1 \end{array}$$

$$\begin{array}{r|l} 2 & 342 \\ \hline 3 & 171 \\ 3 & 57 \\ 19 & 19 \\ & 1 \end{array}$$

$$437 = 19^1 \times 23^1 \times 2^0 \times 3^0$$

$$342 = 2^1 \times 3^2 \times 19^1 \times 23^0$$

$$\text{HCF} = 2^0 \times 3^0 \times 19^1 \times 23^0$$

$$= 19 \rightarrow \text{Students.}$$

$$\text{no. of groups (boys)} = \frac{342}{19} = 18$$

$$\text{no. of " (girls)} = \frac{437}{19} = 23$$



Direction: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as.

- (a) Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A).
- (b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
- (c) Assertion (A) is true, but Reason (R) is false.
- (d) Assertion (A) is false, but Reason (R) is true.

#Q. Assertion (A): If a and b are Coprime numbers, then a^3 and b^3 are Co-prime numbers

Reason (R): HCF of a^3 and b^3 is 1.

Ex

a, b — coprime H.W

$3, 8$

$27, 512$

Topic : Assertion-Reason



#Q. Assertion (A): 5^n can never end with digit 0 for any Natural number n .

Reason (R): The prime factorisation of 5^n do not contain the prime number 2 and 5.

True

True

$$5^n = (5 \times 1)^n \\ = 5^n \times 1^n$$

Since 5^n does not contain '2' as a prime factor, $\therefore 5^n$ can never end with the digit 0

$$5^n \\ \rightarrow 5^1 = 5 \\ \rightarrow 5^2 = 25 \\ \rightarrow 5^3 = 125 \\ \rightarrow 5^4 = 625$$

#Q. The product of two 2 digits numbers is 2160 and their H.C.F is 12. Then find the sum of the number

let the no. be $12x$ and $12y$

coprime

$$12x \times 12y = 2160$$

$$xy = \frac{2160}{12 \times 12}$$

$$xy = 15$$

$$xy = 15$$

Possible values of x and y =

3, 5

15, 1

Ignore

$$12x + 12y = ?$$

$$12(3) + 12(5)$$

$$= 36 + 60$$

$$= 96 \text{ Ans.}$$

#Q. If the LCM and HCF of two numbers are 168 and 28 respectively, then find the number of possible such pairs.

Let the nos be $28x$ and $28y$

coprime no.

$$\text{HCF}(a,b) \times \text{LCM}(a,b) = a \times b$$

HCF \times LCM = product

$$28 \times 168 = 28x \times 28y$$

$$\frac{28 \times 168}{28 \times 28} = xy$$

$$xy = 6$$

$$(6,1), (2,3)$$

2 possible pairs

#Q. 4 bells ring together at 9.00 a.m. They ring after 7, 8, 11 and 12 seconds respectively. How many times will they ring together again in the next 3 hours?

H.W

#Q. Pooja multiplied a number 484 with a certain number to obtain the result 3823a. Find the value of a.

Pooja ben:-

$$484 \times \bigcirc = 3823a$$

$$2 \times 2 \times 11 \times 11 \times \bigcirc = 3823a$$

$$\begin{array}{r|l} 2 & 484 \\ \hline 2 & 242 \\ 11 & 121 \\ 11 & 11 \\ & 1 \end{array}$$

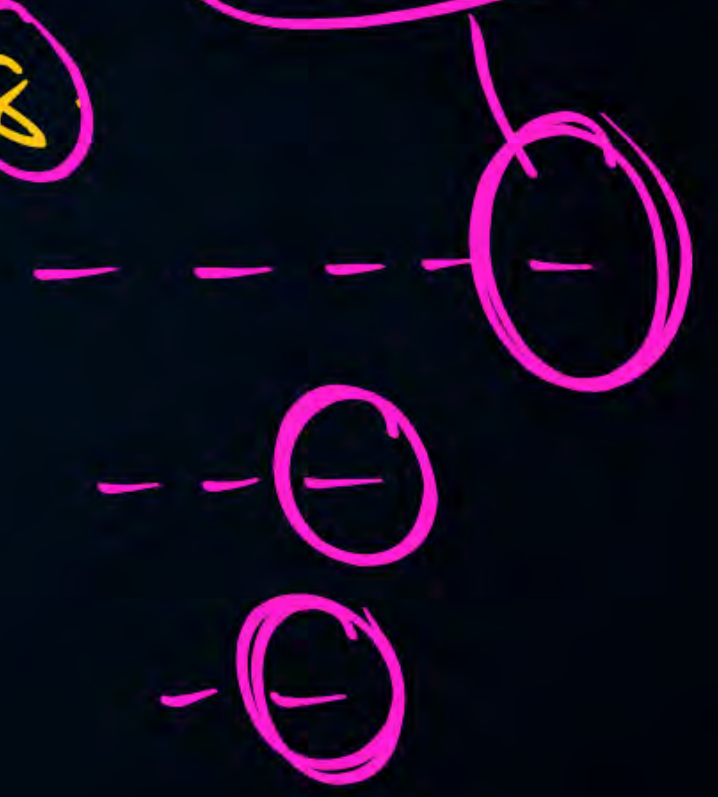
484 is a factor of 3823a.

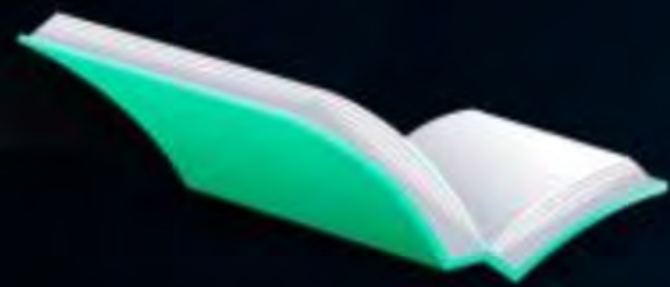
2 and 11 Factor 38239

38230, 38232, 38234, 38236, 38238

Ans

0, 2, 4, 6, 8





THANK
YOU

