

LECTURE 1: THE NUMBER SYSTEM

QUESTIONS

1. Classify each of the following numbers using the symbols N (Natural numbers), N_0 (Whole numbers); Z (Integers); Q (Rational numbers), Q' (Irrational numbers), R (Real numbers), C (Unreal numbers).

1.1 47

1.2 - 5

1.3 $\sqrt{3}$

1.4 $\sqrt{-25}$

1.5 $\sqrt{36}$

1.6 π

1.7 $\frac{22}{7}$

1.8 πr^2 if $r = 7$

QUESTION: What is $\sqrt{36}$?

Is it 6; - 6 or ± 6 ?

The answer is $\sqrt{36} =$

This is quite different from: Solve for x : $x^2 = 36$.

The answer here is

So remember $\sqrt{\quad}$ denotes the positive root only.

FACTORISATION

Calculate:

1. $2005^2 - 2004^2$

2. $987654321 \times 987654321$
 $- 987654323 \times 987654319$

Factorise

(a) $8x^3 - 18x$

(b) $x^3 + 2x^2 - x - 2$

(c) $(3x - 2)^2 - (2x + 1)^2$

Solve for x :

(a) $x^2 - 2x - 3 = 0, x \in Z$

(b) $-3 < x \leq 6$ and $x \in \mathbb{N}$ (3)

QUESTION: What is the difference between “undefined” and unreal? Give examples of each.

EXAMINATION PROBLEMS

1. Without using a calculator, evaluate $\sqrt[3]{(0,125 \times 59) + 0,625}$ (3)

2. For what real, integral values of x will the expression $\frac{\sqrt{25-x^2}}{x}$ be rational? (2)

3. Find the rational roots of the equation $2x^2 - x - 3 = 0$ (3)

4. For the equation $x^2 - 7 = 0$, determine the
5.1 real roots

5.2 rational roots

5. Find $\sqrt{1,04^2 - 0,04^2}$ w.a.c. (4)

6. Consider $f = \sqrt{\frac{1}{x-4}}$.
For what value/s of x is f
6.1 undefined? (2)

6.2 unreal? (2)

7.1 Solve for x : $\frac{x^2 + 2}{3 - x} \leq 0$ (3)

7.2 For what values of x is $\sqrt{\frac{x^2 + 2}{3 - x}}$

7.2.1 undefined? (2)

7.2.2 unreal? (2)

8. If $x = -2 \pm \sqrt{9 - 4a}$ and $a \in \{0; 2; 3\}$, for which values of a will x be

8.1 real

8.2 rational

8.3 integral (3)

9. If $x - \frac{1}{x} = 3$ find the value of

$x^2 + \frac{1}{x^2}$? (3)