

Math 2303
Fall 2009
Test 2 Review

Topic 1: Sets of Numbers

Example 1: Which of the following are properties of the number 37?

- ~~even~~
- ✓ prime
- ✓ positive
- ✓ integer
- ~~irrational~~
- ~~undefined~~
- ✓ odd
- ~~composite~~
- ~~negative~~
- ✓ whole number
- ✓ real number
- ✓ natural number

Which of the following are properties of the number 91?

- ~~even~~
- ~~prime~~
- ✓ positive
- ✓ integer
- ~~irrational~~
- ~~undefined~~
- ✓ odd
- ✓ composite
- ~~negative~~
- ✓ whole number
- ✓ real number
- ✓ natural number

$91 = 7 \times 13$

Example 2: Given the following list of numbers:

- $\{-3, \frac{2}{3}, 5^{-2}, 1.44 \times 10^3, 25^{1/2}, 3.44, -2^0, \frac{0}{19}, \frac{19}{0}, .12122122212222122222\dots, 0.\overline{34}\}$
- Handwritten annotations:*
 - Above 5^{-2} : 115
 - Above $25^{1/2}$: 115
 - Above $\frac{0}{19}$: 110
 - Above $\frac{19}{0}$: 110
 - Above $.12122122212222122222\dots$: irrational
 - Below $\frac{0}{19}$: -1
 - Below $\frac{19}{0}$: undefined
 - Below 1.44×10^3 : 1440
 - Below 5^{-2} : 112
 - Below $25^{1/2}$: 112
 - Below $0.\overline{34}$: 112

$5^{-2} = \frac{1}{5^2} = \frac{1}{25}$

Which of these are rational numbers?

$7^{1/2}$
 $-3^{1/2}$

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Which of these are integers?

Which of these are natural numbers?

Which of these are real numbers?

Topic 2: Exponents

Example 3: Simplify

$$\frac{(3^2)(4^{-2})(5^{\frac{1}{2}})}{(3^{-1})(4^{-4})(5^{\frac{3}{2}})} = 3^{2-(-1)} 4^{-2-(-4)} 5^{\frac{1}{2}-\frac{3}{2}}$$

$$= 3^3 \cdot 4^2 \cdot 5^{-1} = \frac{3^3 \cdot 4^2}{5^1} = \frac{27 \cdot 16}{5}$$

$$7^{\frac{2}{3}}(7^{-\frac{5}{3}}) = 7^{\frac{2}{3} + (-\frac{5}{3})} = 7^{-\frac{3}{3}} = 7^{-1} = \frac{1}{7}$$

$$-\sqrt{7} \quad 7^{-\frac{1}{2}}$$

$$\sqrt{27} = \sqrt{9 \cdot 3} = \sqrt{9} \cdot \sqrt{3} = 3\sqrt{3}$$

$$= \sqrt{3^3} = 3^{\frac{3}{2}} = 3^{1+\frac{1}{2}} = 3^1 \cdot 3^{\frac{1}{2}} = 3\sqrt{3}$$

$$3\sqrt{7} - 2\sqrt{7} = (3-2)\sqrt{7} = 1 \times \sqrt{7} = \sqrt{7}$$

$$3 \times \sqrt{7} - 2 \times \sqrt{7}$$

$3\sqrt{2} - 4\sqrt{3}$ does not simplify

$$\left(\frac{1}{3}\right)^{-1} = \left(\frac{3}{1}\right) = 3$$

$$\left(\frac{1}{3}\right)^{-1} = \frac{1}{\frac{1}{3}} = 1 \div \frac{1}{3} = 1 \times \frac{3}{1} = 3$$

$$3^{-1} = \frac{1}{3}$$

$$3^{-1} = \left(\frac{3}{1}\right)^{-1} = \frac{1}{3}$$

Topic 3: Scientific Notation

Example 4: Write the following numbers in scientific notation

32 3.2×10^1

300 3×10^2

0.0045 $= 4.5 \times 10^{-3}$

$$.0625 = 6.25 \times 10^{-2}$$

$1/16 = .0625$

$1/6 = 16 \overline{) 1.0000}$

$1/6 = .1\overline{6}$

$$\begin{array}{r} 16 \overline{) 1.0000} \\ \underline{96} \\ 40 \\ \underline{32} \\ 800 \\ \underline{800} \\ 0 \end{array}$$

1.67×10^{-1}

$$\begin{array}{r} 6 \overline{) 1.00} \\ \underline{6} \\ 40 \\ \underline{36} \\ 40 \\ \underline{36} \\ 40 \end{array}$$

Example 5: Write the following numbers in Hindu-Arabic base ten notation:

$$2.3 \times 10^{-4} = \underbrace{0002} \cdot 3 = .00023$$

$$-1.4 \times 10^2 = \leftarrow 4 - 140$$

$$1.001 \times 10^5 = \underbrace{1.001000} \cdot 100,000$$

Example 6: Simplify:

$$\frac{4.2 \times 10^{-2}}{14} = \frac{4.2 \times 10^{-2}}{1.4 \times 10^1} = \frac{4.2}{1.4} \times 10^{-2-1}$$

$$\frac{4.2}{1.4} = \frac{42}{14} = 3 = 3 \times 10^{-3} = .003$$

$$\frac{3^{-1}(2^2)(5^{\frac{2}{3}})}{9(2^{-1})(5^{\frac{1}{3}})} = 3^{-1-2} \cdot 2^{2-(-1)} \cdot 5^{\frac{2}{3}-(-\frac{1}{3})}$$

$$3^2 = 3^{-3} \cdot 2^3 \cdot 5^1 = \frac{2^3 \cdot 5}{3^3} = \frac{40}{27}$$

Topic 4: Comparing Numbers

Example 7: Place the correct inequality symbol between the numbers.

$$\frac{1}{25} \quad 5^{-2} < 5 \times 10^{-1} = .5 = \frac{1}{2}$$

$$\sqrt{7} < 3 = \sqrt{9}$$

$$-30024^0 < 1$$

$$\frac{1}{2} = \frac{1}{\sqrt{4}} = 4^{\frac{1}{2}} < 2$$

$$\frac{-1}{5} < \frac{-3}{5} \quad \frac{-1}{3} < \frac{-1}{5}$$

$$\frac{-1}{3} < \frac{-1}{5}$$

$$-5 < -3$$

Topic 5: Primes, GCF and LCM

Example 8: Find the GCF and LCM for the numbers 48, 60 and 70

$$48 = 2^4 \times 3$$

$$GCF = 2^1 = 2$$

$$60 = 2^2 \times 3 \times 5$$

$$LCM = 2^4 \times 3 \times 5 \times 7$$

$$70 = 2^1 \times 5 \times 7$$

$$2^3 \times 3 \times 2 \times 5 \times 7$$

$$24 \times 70$$

$$LCM = 70 \times 24 = 1680$$

Topic 6: Properties of real number operations:

Example 9: Which property is illustrated with each equation?

$$6 \cdot 8 = 8 \cdot 6 \quad \text{commutative}$$

$$3 + (3 + 4) = (3 + 3) + 4 \quad \text{associative}$$

$$3\sqrt{2} - 4\sqrt{2} = (3 - 4)\sqrt{2} \quad \text{distributive}$$

Example 10: Is the set of whole numbers closed under the operation of addition?

YES

Close can you add any combo of whole
 answer whole number - YES member? yes

What is the identity for addition of whole numbers?

0

Topic 7: Another look at how we express a quantity as a written number

Example 11: Find at least 5 ways to represent each of the following number: 81

$$81$$

$$8.1 \times 10^1$$

$$81 = 3^4$$

$$\frac{81}{1} = \frac{162}{2}$$

$$9^2 = \sqrt{6561}$$

$$81 = 100 - 19$$