

# Hist Roots Homework 3

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1. Give three numbers that might be represented by the symbols I don't know how to type

(a) 2, 120, 7200

(b) 12, 720, 2,592,000

2. Find a first, second, and third approximation to:

a)  $\sqrt{10}$

One:

$$3^2 = 9 < 10, \text{ so}$$

$$3 < \sqrt{10}$$

$$\frac{10}{3} > \sqrt{10}, \text{ so}$$

$$4 < \sqrt{10} < \frac{10}{3}, \text{ thus}$$

$$\sqrt{10} \approx \frac{4 + \frac{10}{3}}{2} = \frac{22}{6} = 3.\bar{6}$$

Two:

$$\frac{22}{6} \cdot \frac{60}{22} = 10, \text{ so}$$

$$\sqrt{10} \approx \frac{\frac{22}{6} + \frac{60}{22}}{2} = \frac{211}{66} = 3.19\bar{69}$$

Three:

$$\frac{211}{66} \cdot \frac{660}{211} = 10, \text{ so}$$

$$\sqrt{10} \approx \frac{\frac{211}{66} + \frac{660}{211}}{2} = 3.1624\dots$$

b)  $\sqrt{7}$

One:

$$2^2 = 4 < 7, \text{ so}$$

$$2 < \sqrt{7}$$

$$\frac{7}{2} > \sqrt{7}, \text{ so}$$

$$2 < \sqrt{7} < \frac{7}{2}, \text{ thus}$$

$$\sqrt{7} \approx \frac{2 + \frac{7}{2}}{2} = 11/4 = 2.75$$

Two:

$$\frac{11}{4} \cdot \frac{28}{11} = 7, \text{ thus}$$

$$\sqrt{7} \approx \frac{\frac{11}{4} + \frac{28}{11}}{2} = \frac{233}{88} = 2.647\bar{72}$$

Three:

$$\frac{233}{88} \cdot \frac{616}{233} = 7, \text{ thus}$$

$$\sqrt{7} \approx \frac{\frac{233}{88} + \frac{616}{233}}{2} = 2.64575\dots$$

3. skip

4. Let  $n = 2^a 3^b 5^c$ , where  $a, b, c \in \mathbb{N}$ . Prove that  $n$  is sexagesimally regular.

*Proof.* Let  $n = 2^a 3^b 5^c$  s.t.  $a, b, c \in \mathbb{N}$ . ■

5. Write in base-60:

(a)  $\frac{5}{6}$

$$\frac{5}{6} = \frac{\frac{5}{6}(60)}{60} = \frac{50}{\underline{60}}$$

(b)  $1\frac{4}{9}$

$$\begin{aligned}\frac{4}{9} &= \frac{\frac{4}{9}(60)}{60} = \frac{26}{60} + \frac{\frac{2}{3}}{60} \\ \frac{26}{60} + \frac{\frac{2}{3}(60)}{60^2} &= \frac{26}{60} + \frac{40}{60^2} \\ &\underline{1 + \frac{26}{60} + \frac{40}{60^2}}\end{aligned}$$

(c)  $86\frac{1}{90}$

$$\begin{aligned}86 &= 1, 26\frac{1}{90} = \frac{\frac{1}{90}(60)}{60} = \frac{\frac{2}{3}}{60} \\ &\frac{\frac{2}{3}(60)}{60^2} = \frac{40}{60^2} \\ &\underline{1, 26 + \frac{40}{60^2}}\end{aligned}$$