Section 1 (Math Review):

- Z is the set of integers {-3, -2, -1, 0,1...}
- N is the set of non-negative integers (natural numbers) {0,1,2,3..}
- Z+ is the set of positive integers {**0**,1,2,3...} (INCLUDES ZERO)
- R is the real numbers
- Q is the rational numbers

• in the form  $\frac{p}{q}$ , where p and q are integers and q can't be 0

- C is the complex numbers
- $x \in R$  means x is part of reals ( $y \notin R$  means y is not a part of the reals)
- closed interval: [a,b] is the set from a to b INCLUDING a and b
- open interval: (a,b) is the set from a to be EXCLUDING a and b
- half open intervals: [a,b) or (a,b] includes only one of the endpoints
- $R^2$  is the set of all **PAIRS** of reals
- $z \in (x,y)$  means z is in the interval from x to y
- basic exponent rules:

$$\begin{array}{rcl} b^x b^y &=& b^{x+y} \\ a^x b^x &=& (ab)^x \\ (b^x)^y &=& b^{xy} \\ b^{(x^y)} &\neq& (b^x)^y \end{array}$$

basic log rules:

$$egin{array}{rcl} b^{\log_b(x)}&=&x\ \log_b(xy)&=&\log_bx+\log_by\ \log_b(x^y)&=&y\log_bx\ \log_bx&=&\log_ax\log_ba \end{array}$$

- ceiling function:
- [3.75] = 4[3] = 3[-3.75] = -3
- floor function:
- $\lfloor 3.75 \rfloor = 3$  $\lfloor 3 \rfloor = 3$  $\lfloor -3.75 \rfloor = -4$

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• important closed forms to know:

$$\begin{split} \sum_{i=1}^{n} \frac{1}{2^{i}} &= 1 - \frac{1}{2^{n}} \qquad \sum_{i=0}^{n} \frac{1}{2^{i}} = 2 - \frac{1}{2^{n}} \qquad \sum_{i=1}^{n} i = \frac{n(n+1)}{2} \\ \sum_{i=1}^{n} i^{2} &= \frac{n(n+1)(2n+1)}{6}, \\ \sum_{i=0}^{n} r^{i} &= \frac{1 - r^{n+1}}{1 - r}, \quad r \neq 1 \quad \text{(geometric sum).} \end{split}$$

- bit string: string consisting of the characters 0 and 1
- **a|b** means either one of the characters a and b
- a\* means zero or more copies of the character a

- $\circ$  ab\* can be a, ab, abb, abbbbbb, etc.
- c(b|a)\*c means all strings consisting of one c, followed by zero of more characters that are either a's or b's follow by one c (cc, cac, cbbac, etc.)