Generalized parentheses. **Common:**
( ) *Parentheses.* [ ] *Brackets.* ⟨ ⟩ *Angle-brackets.*
{ } *Braces.* | | *Vertical bars* (abs.value, cardinality).

Less common: ⌊ ⌋ *Floor.* ⌈ ⌉ *Ceiling.* ‖ ‖ *Norm-of.*
⟦ ⟧ *Double-bracket.* ⟪ ⟫ *Double-angle-bracket.*

Number Sets. Expression $k \in \mathbb{N}$ [read as "k is an element of $\mathbb{N}$" or "k in $\mathbb{N}$"] means that k is a natural number; a ***natnum***. Expression $\mathbb{N} \ni k$ [read as "$\mathbb{N}$ ***owns*** k"] is a synonym for $k \in \mathbb{N}$.

$\mathbb{N}$ = natural numbers $= \{0, 1, 2, \ldots\}$.

$\mathbb{Z}$ = integers $= \{\ldots, -2, -1, 0, 1, \ldots\}$. For the set $\{1, 2, 3, \ldots\}$ of positive integers, the ***posints***, use $\mathbb{Z}_+$. Use $\mathbb{Z}_-$ for the negative integers, the ***negints***.

$\mathbb{Q}$ = rational numbers $= \{\frac{p}{q} \mid p \in \mathbb{Z} \text{ and } q \in \mathbb{Z}_+\}$. Use $\mathbb{Q}_+$ for the positive rationals and $\mathbb{Q}_-$ for the negative rationals.

$\mathbb{R}$ = reals. The ***posreals*** $\mathbb{R}_+$ and the ***negreals*** $\mathbb{R}_-$.

$\mathbb{C}$ = complex numbers, also called the ***complexes***.

For $\omega \in \mathbb{C}$, let "$\omega > 5$" mean "ω *is* ***real*** *and* $\omega > 5$". [Use the same convention for $\geq, <, \leq$, and also if 5 is replaced by any real number.]

Use $\overline{\mathbb{R}} = [-\infty, +\infty] := \{-\infty\} \cup \mathbb{R} \cup \{+\infty\}$, the ***extended reals***.

An "***interval of integers***" $[b \,..\, c)$ means the intersection $[b, c) \cap \mathbb{Z}$; ditto for open and closed intervals. So $[\mathrm{e} \,..\, 2\pi] = \{3, 4, 5, 6\} = [3 \,..\, 6] = (2 \,..\, 6]$. We allow b and c to be $\pm\infty$; so $(-\infty \,..\, -1]$ is $\mathbb{Z}_-$. And $[-\infty \,..\, -1]$, is $\{-\infty\} \cup \mathbb{Z}_-$.

Floor function: $\lfloor \pi \rfloor = 3$, $\lfloor -\pi \rfloor = -4$. Ceiling fnc: $\lceil \pi \rceil = 4$. Absolute value: $|-6| = 6 = |6|$ and $|-5 + 2\mathrm{i}| = \sqrt{29}$.

Mathematical objects. Seq: '*sequence*'. poly(s): '*polynomial(s)*'. irred: '*irreducible*'. Coeff: '*coefficient*' and var(s): '*variable(s)*' and parm(s): '*parameter(s)*'. Expr.: '*expression*'. Fnc: '*function*' (so ratfnc: means rational function, a ratio of polynomials). trnfn: '*transformation*'. cty: '*continuity*'. cts: '*continuous*'. diff'able: '*differentiable*'. CoV: '*Change-of-Variable*'. CoI: '*Constant of Integration*'. LoI: '*Limit(s) of Integration*'. RoC: '*Radius of Convergence*'.

Soln: '*Solution*'. Thm: '*Theorem*'. Prop'n: '*Proposition*'. CEX: '*Counterexample*'. eqn: '*equation*'. RhS: '*RightHand side*' of an eqn or inequality. LhS: '*lefthand side*'. Sqrt or Sqroot: '*square-root*', e.g, "the sqroot of 16 is 4". Ptn: '*partition*', *but* pt: '*point*' as in "a fixed-pt of a map".

Binop: '*Binary operator*'. Binrel: '*Binary relation*'. FTC: '*Fund. Thm of Calculus*'. IVT: '*intermediate-Value Thm*'. MVT: '*Mean-Value Thm*'.

The ***logarithm*** function, defined for $x>0$, is $\log(x) := \int_1^x \frac{\mathrm{d}v}{v}$. Its inverse-fnc is $\exp()$.

For $x>0$, then, $\exp(\log(x)) = x = \mathrm{e}^{\log(x)}$. For real t, naturally, $\log(\exp(t)) = t = \log(\mathrm{e}^t)$.

PolyExp: '*Polynomial-times-exponential*', e.g, $[3 + t^2]\cdot\mathrm{e}^{4t}$. PolyExp-sum: '*Sum of polyexps*'. E.g, $f(t) := 3t\mathrm{e}^{2t} + [t^2]\cdot\mathrm{e}^t$ is a polyexp-sum.

Phrases. WLOG: '*Without loss of generality*'. IFF: '*if and only if*'. TFAE: '*The following are equivalent*'. ITOf: '*In Terms Of*'. OTForm: '*of the form*'. FTSOC: '*For the sake of contradiction*'. And ※="Contradiction".

IST: '*It Suffices To*', as in ISTShow, ISTExhibit.

Use w.r.t: '*with respect to*' and s.t: '*such that*'.

Latin: e.g: *exempli gratia*, '*for example*'. i.e: *id est*, '*that is*'. N.B: *Nota bene*, '*Note well*'. inter alia: '*among other things*'. QED: *quod erat demonstrandum*, meaning "end of proof".

Sequence notation. A *sequence* $\vec{x}$ abbreviates $(x_0, x_1, x_2, x_3, \ldots)$. For a set Ω, expression "$\vec{x} \subset \Omega$" means $[\forall n\colon x_n \in \Omega]$. Use $\mathrm{Tail}_N(\vec{x})$ for the subsequence

$$(x_N,\, x_{N+1},\, x_{N+2}, \ldots)$$

of $\vec{x}$. Given a fnc $f\colon\Omega\to\Lambda$ and an Ω-sequence $\vec{x}$, let $f(\vec{x})$ be the Λ-sequence $(f(x_1), f(x_2), f(x_2), \ldots)$.

Suppose Ω has an addition and multiplication. For Ω-seqs $\vec{x}$ and $\vec{y}$, then, let $\vec{x} + \vec{y}$ be the sequence whose n^{th} member is $x_n + y_n$. I.e

$$\vec{x} + \vec{y} \quad = \quad [n \mapsto [x_n + y_n]] \,.$$

Similarly, $\vec{x} \cdot \vec{y}$ denotes seq $[n \mapsto [x_n \cdot y_n]]$.

SeLo quizzes during Add/Drop. *These do* *not* *count for a grade.*

DNC 1: Fri. 12 Jan Let $\boldsymbol{\tau}()$ be the divisor-count function.

So $\boldsymbol{\tau}(98,000) =$ ....

[Write your answer as the appropriate product of integers.]

The sum $\sum_{k=0}^{\infty} \left[\frac{-1}{3}\right]^k =$ ....

SeLo [2024t] quizzes

(The lowest MQ score is dropped. In consequence, there is *no make-up* for the first missed MQ.)

[Monday, 15Jan2024: MLK Day, *No class*]

P1: Wed. 17 Jan $\left[\left[\sqrt{5}\right]^{\sqrt{2}}\right]^{\sqrt{8}} =$ ________. $\log_8(4) =$ ________.

The four solutions to $[y-2]\cdot y\cdot[y+2] = -1/y$ are $y =$ ________________________________.

[*Hint:* Apply the Quadratic Formula to y^2.]

P2: Mon. 22 Jan $\mathcal{P}(\mathcal{P}(\text{3-stooges}))$ has ________________ elements.

Given sets with cardinalities $|B| = 8$ & $|E| = 5$, the number of *non-constant fncs* in B^E is ________________.

[Write in form Something − SomethingElse.]

P3: ?Wed. 24 Jan Multinomial coefficient $\binom{9}{4,2,3} =$ ________ $=$ ________.

[*Note:* Write your ans. ITOf factorials, then **also** write it as a single integer, or product of two, **without** factorials.]

P4: Wed. 07 Feb The coeff of $x^7 y^{12}$ in $[5x + y^3 + 1]^{30}$ is ________________________.

[Write your answer as a product of powers and a multinomial. Optionally, you can expand the multinomial as a product of binomials.]

BonusA: Mon. 12 Feb In $\left[5x^2 + 4y + z^3 + 7\right]^{20}$, compute these coefficients:

$\text{Coeff}(x^6 z^8) =$ ________________________.

$\text{Coeff}(y^5 z^6) =$ ________________________

[An integer, or a product of powers and multinomial-coeffs.]

P5: ?Wed. 14 Feb $\mathbf{A} := \{(6,2), (2,7), (5,2), (7,3), (7,5), (3,4), (1,3), (1,5)\}$ is a binrel on $[1..7]$, with transitive closure $\mathbf{R}$. Then:

$2\mathbf{R}2$ is *T F*. $4\mathbf{R}6$ is *T F*. $7\mathbf{R}7$ is *T F*.

P6: Mon. 18 Mar Mimicking what we did in class: From the $987{\times}200$ game-board, cut-out (remove) the $(35,150)$-cell and one other cell at $P = (x,y)$. Circle those choices for P,

$(150,160)$, $(14,35)$, $(66,77)$, $(195,15)$, $(123,4)$

which, if removed, would leave a board that *definitely* can**not** be domino-tiled.