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 $= \{0, 1, 2, \dots\}$.

$\mathbb{Z}$ = integers $= \{\dots, -2, -1, 0, 1, \dots\}$. For the set $\{1, 2, 3, \dots\}$ 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 $[e \,..\, 2\pi] = \{3, 4, 5, 6\} = [3 \,..\, 6] = (2 \,..\, 6]$. 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 $|-5 + 2i| = \sqrt{29}$.

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 $\log(x) := \int_1^x \frac{dv}{v}$. Its inverse-fnc is $\exp()$.

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

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

SeLo [2017g] quizzes so far...

Q1: Wed. 11 Jan The **slope** of line $3[y - 5] = 2[x - 2]$ is ______.

Point $(-4, y)$ lies on this line, where $y=$ ______.

$[\sqrt{6}^{\sqrt{8}}]^{\sqrt{2}} =$ ______. $\log_{125}(5) =$ ______.

Q2: Fri. 13 Jan

May lightning ↯ strike this table! (I.e, please fill in.)

n	r_n	q_n	s_n	t_n
0	100	—	**1**	**0**
1	23		**0**	**1**
2				
3				
4				
5				

So GCD(100, 23) = ______ = [______ · 100] + [______ · 23].

Q3: Wed. 18 Jan

May lightning ↯ strike this table! (I.e, please fill in.)

n	r_n	q_n	s_n	t_n
0	109	—	**1**	**0**
1	21		**0**	**1**
2				
3				
4				

So $\text{GCD}(109, 21) =$ ______ $= [$ ______ $\cdot 109] + [$ ______ $\cdot 21]$.

And $x =$ ______ $\in (-50 .. 50]$ solves congr. $21x \equiv_{109} 3$.

Q4: Fri. 20 Jan LBolt: $\text{GCD}(70, 30) =$ ______ $\cdot 70 +$ ______ $\cdot 30$.

So (LBolt again) $G := \text{GCD}(70, 30, 42) =$ ______ and ______ $\cdot 70 +$ ______ $\cdot 30 +$ ______ $\cdot 42 = G$.

Q5: Fri. 03 Feb Coeff of $x^7 y^{15}$ in $[2x + y^3 + 5]^{20}$ is ______.

[You may leave your answer as a product of *posints*, or you may multiply-out.]

Q6: Wed. 22 Feb Below, G and Ω are sets. Then

$G^\Omega = \{$ ______ $|$ ______ $\}$.

Suppose R is a binrel from G to Ω. Then

$\text{CoRange}(R) = \{$ ______ $|$ ______ $\}$.

Q7: Wed. 22 Feb With $f(x) := x^2$ and $g(x) := x + 3$,

then $[f \triangleright g](5) =$ ______.

Circle those operators/relations which are chiral:

$\neq$ $\quad$ •| $\quad$ $\circ$ $\quad$ Max $\quad$ $\div$ $\quad$ $\leq$ $\quad$ $<$ $\quad$ $\wedge$

Q8: Fri. 24 Feb In Gale's game of CHOMP [whose $\mathbb{N}\times\mathbb{N}\times\mathbb{N}$ version is still unsolved], eating the Poison-Pill Circle: Wins Loses

CHOMP, with best-play on a *finite* rectangular board, is a first-player win: *T* *F*

Q9: Fri. 03 Mar To the interval $J := (-\frac{\pi}{2}, \frac{\pi}{2})$, define a bijection $g\colon (0,1) \hookrightarrow\!\!\!\rightarrow J$ by $g(x) :=$ ______.

Using this g and a trigonometric fnc, define a bijection $h\colon (0,1) \hookrightarrow\!\!\!\rightarrow \mathbb{R}$ by $h(x) :=$ ______.

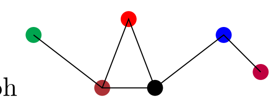
QA: Mon. 13 Mar A "Cantor's-Hotel" type bijection $f\colon (5,6] \hookrightarrow\!\!\!\rightarrow (0,1)$ is:

$f($ ______ $) :=$ ______, for *each* posint n;

and $f(x) :=$ ______, for *each* $x \in (5,6] \smallsetminus C$,

where $C :=$ ______.

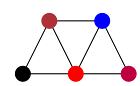
QB: Wed. 12 Apr



Bird with a broken wing: Graph has *Chromatic poly* $\mathcal{P}(x) =$ ______.

[Can be done by inspection. Do not bother to multiply out.]

QC: Mon. 17 Apr *Trapezoid*: Graph



has *Chromatic poly* $\mathcal{P}(x) =$ ______.

[Edge-glue three copies of K_3. Do not multiply out, but do write as a product of polynomials..]

Games Party!