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Quizzes Q Tuesday 03Jan2017

Number Sets. An expression such as $k \in \mathbb{N}$ (read as "k is an element of $\mathbb{N}$" or "k in $\mathbb{N}$") means that k is a natural number; a ***natnum***.

$\mathbb{N}$ = 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 ***ratnums*** and $\mathbb{Q}_-$ for the negative ratnums.

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

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

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 $\mathbb{Z}_-$.

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*'. CoI: '*Constant of Integration*'. LoI: '*Limit(s) of Integration*'.

Fnc: '*function*' (so ratfnc: means rational function, a ratio of polynomials). cty: '*continuity*'. cts: '*continuous*'. diff'able: '*differentiable*'.

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*', <u>*but*</u> pt: '*point*', as in "a fixed-pt of a map".

FTC: '*Fund. Thm of Calculus*'. IVT: '*intermediate-Value Thm*'. MVT: '*Mean-Value Thm*'. CoV: '*Change-of-Variable*'.

Phrases. WLOG: '*Without loss of generality*'. TFAE: '*The following are equivalent*'. ITOf: '*In Terms Of*'. OTForm: '*of the form*'. FTSOC: '*For the sake of contradiction*'. Use iff: '*if and only if*'.

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*'. 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 Gcd(109, 21)= ______ =[______ · 109] + [______ · 21].

And x= ______ $\in [0\,..\,109)$ solves congr. $21x \equiv_{109} 3$.

Q4: Fri. 20 Jan LBolt: Gcd(70, 30)= ______ ·70 + ______ ·30.

So (LBolt again) $G :=$ Gcd(70, 30, 42)= ______ and ______ · 70 + ______ · 30 + ______ · 42 = G.

Q5: Fri. 03 Feb Coeff of $x^7 y^{15}$ in $\left[2x + y^3 + 5\right]^{20}$ 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 $\left[f \triangleright g\right](5) =$ ______.

Circle those operators/relations which are chiral:

$\neq \quad \bullet\!| \quad \circ \quad \text{Max} \quad \div \quad \leqslant \quad < \quad \wedge$

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 $h(x) :=$ ______

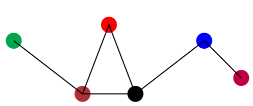
QA: Mon. 13 Mar A "Cantor's-Hotel" type bijection $f\colon (5,6] \hookrightarrow\!\!\!\rightarrow (0,1)$ is:

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

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

where $C :=$ ______.

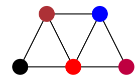
QB: Wed. 12 Apr



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!