OCTOBER CRISIS '75

Well, at last it's all over and the true and whole story can be revealed. Yes, at exactly 1:47 p.m. on the past Monday, the October Crisis of 1975 came to a dramatic conclusion as MathSoc recovered intact their stolen T-shirts. It was a sudden and startling end to a drama which had for the past several weeks, held the entire campus in an atmosphere of tense fear, terror and shock, and which had ultimately caused Prime Minister Pierre Trudeau to once again invoke the War Measures Act. Indeed, now that it is over, many Mathies will find it both strange and difficult to resume their normal patterns of life.

It was during a quiet evening in the first weekend of October when the underhanded, conniving, and lower than dirt in the hierarchy of the planet, jineers (n of them) broke through the security system of MathSoc and entered into the sacred and hallowed confines of the MathSoc office. Causing much havoc they painted their dreaded insignia, the flaccid tool, in liquid paper on the walls, desks, and windows. They then proceeded to make off with sixty of MathSoc's most prized T-shirts.

Upon entering the office the next morning, the MathSoc members and workers were shocked, nauseated, and disgusted by the treachery of the n-jineers. The first rumors that circulated the halls of the Math building led to the grave fear that the hallowed Pink Tie had been stolen.

However, these fears were quickly put to rest when the highest authorities in MathSoc assured the trembling Mathies that although the moronic n-jineers had been very close to the Pink Tie, they had failed to realize this fact and had only taken the T-shirts. However all the Mathies could do was to wait in terror of what the n-jineer's intentions were. Their worst fears were realized in the early afternoon of that very day when Sir Risto received a phone call from the thieves, in which they demanded two cases of beer by that Thursday, in exchange for the safe return of the shirts. The Mathies thought the situation over carefully, considering every detail and option, and finally decided to wait for further developments.

However, that night, the campus was once again stunned when the bastards struck again. This time they hit artsoc and made off with their hockey sweaters and the artsoc banner, which they placed in the scisoc office to cover up the truth of who was behind the operations.

Tense days passed as the Thursday deadline approached. MathSoc decided to wait the situation out. The deadline passed and still nothing happened. And then, during the next week, the dastardly n-jineers called again to reaffirm their demand, adding that the brew had to be Labatt's Blue. They set the new deadline that Friday. Once again the brave Mathies decided to remain solid and unyeilding, and once again the deadline passed.

mathNEWS

take it easy

Tragedy struck mathSoc this week when one of our most dedicated members met with an accident. Ron Hipfner, manager of the coffee & donut stand, while on his bicycle Sunday afternoon was abruptly cut off by a car. He was thrown to the ground face first.

On Monday he talked to Gary Dryden, our president, just several hours after surgery. He stated that his face was covered in bandages and he would no longer have his beaming smile.

Shortly after the accident he got word to his roommate to contact a first year student, Bruce Mills, that day and ask him to take over the operation of the coffee & donut stand in his absence. Bruce had been helping Ron with the accounting, odd jobs, and worked at the stand. This appointment was okayed at the executive meeting Tuesday.

It was also reported by the nurses that next to his exams his greatest worry was the Curriculum Committee. He had got involved with this group the week before the accident.

So though he had just suffered enormous personal injury he gave time and thought to his MathSoc activities and duties. MathSoc is honoured to have Ron Hipfner as one of its members.

MATHSOC ELECTIONS

The following people have been acclaimed to the mathSoc council. Three first year seats have been left vacant. These new council members should come to the meeting in MC 3052 on Tuesday, November 11, at 4:30 p.m.

1A Co-op (B stream)
David Gillett
Bruce Mills
Andy Mueller

1A Regular
Kenneth Lynch
Doug McDougall

2A Co-Op
Steve Risto

2A Regular
Vivienne LaPointe
Gordon Swaters

4A Co-op
Gord Harris

The following week the situation dramatically changed, when a local newspaper (the Gazette) received an ad offering both the Math and art's T-shirts for sale. At this point the Mathies quickly jumped into action. Several leading (RJHipfner) and trailing (jjlong) figures phoned the n-jsoc office and tricked the gullible n-jineers into believing that they were students interested in buying some of the T-shirts. The stupid, idiotic jineers then foolishly revealed that the shirts were in fact not for sale, but in reality the ad was just to force the Mathies to take action. With this information, MathSoc yet again decided to wait.

Weeks passed and the situation remained unchanged. Then, suddenly, events began to rapidly unfold. First the artsies decided that they needed their hockey sweaters, since the new hockey season was approaching. So, instead of continuing this dispute, which shortly promised to blossom into a full scale war of attrition between the societies, mediation talks began. The United Nations stepped in and arranged a peace conference in Geneva. The result of these talks was that MathSoc and artsoc each agreed to give to the n-jineers a ticket to their semi-formal (to be held on Nov. 1 at the Concordia Club...tickets available at MathSoc and artsoc---$10 for Mathies & artsies, $12 for others....get your tickets now--it's tomorrow!!!) as a token gesture for settlement. Both MathSoc and artsoc sent the tickets to n-jsoc and awaited the return of their shirts.

Last week the artsies got a phone call informing them to send a representative to njsoc to pick up their sweaters. Upon his arrival, he was given a sheet of instructions. Each instruction told him to go to a different place in the building, where a new instruction was located. After chasing all over the building looking for instructions, (located in such places as urinals and under toilet seats) , he came to the sweaters.

Then at high noon last Monday, MathSoc got their call, telling them to go to n-jineering 4 where instructions would be posted on a bulletin board. Vice-President Gary Prudence and Sir Steve L. Risto sprang into action immediately. They lost no time in rushing over to n-jineering 4, fully aware of the deadly and uncertain perils which awaited them. They boldy went where no man has gone before, into the n-jineering lounge (sty) and grabbed the sheet of instructions from the bulletin board. The sheet had four mathematical problems on it, each of which yielded a single digit. When the digits were put together they formed a room number were the T-shirts would be found in the middle cupboard.

Prudence and Risto rushed back to the Math building and went to work solving the problems using the HP-45's in the calculator room. Upon attaining the answer, Risto daringly returned to n-jineering to look for the room. After searching for a lengthy period of time, risking his irreplaceble life all the while, he alertly concluded that no such room with that number existed. After returning to the Math building and once again conferring with Prudence, an error in the calculation of the last digit was discovered. They also discovered that the n-jineers count digits in a room number backwards. With this new information Sir Risto, risking enormous dangers returned to n-jineering, where he found the sixty T-shirts located in room 3027.

So the dispute was ended and peace and tranquility returned to the campus. However, the Mathies are planning retaliatory action for the near future.

CAREERS

The department of Career Planning and Placement will be offering the following series of career information talks from now to Nov. 17:

Career Talk	Speaker	Time & Place
Investments	David Patterson Toronto Society, Investment Dealers Association of Canada	Tues Nov 4 3:30 p.m. NH 1021
Real Estate	R. T. Lawrie, R. T. Lawrie Real Estate	Wed Nov 3 3:30 p.m. NH 1021
Teaching	Bev Thompson O.S.S.T.F.	Thurs Nov 6 3:30 p.m. B1 167
Journalism	Bob Trotter Conestoga College Doon Campus	Mon Nov 10
Canadian Armed Forces	Captain McMenemy Canadian Armed Forces	Wed Nov 12
Law	W. J. Weylie Weilie & Wilson Barristers & Solicitors	Date to be announced
Insurance	Speaker to be announced	Date to be announced

Anyone interested in attending these talks is requested to indicate his intention by phoning ext. 3675 or signing up in the Department of Career Planning & Placement. An insufficient number of interested persons will result in an information talk being cancelled.

DESCARTES HUNTs
O.H.I.P. (?)

All Rene Descartes fellows, prize winners and scholarship holders are invited to a social evening to be held on November 13 (Thursday), commencing at 8:00 p.m. in room M.C. 5158.

Speaker   Dr. F. Hoffman
                Florida Atlantic University

Topic   "The Ontario Highway Inspector Problem"

Please contact Ken Hunt M.C. 5197 (local 2592) if you propose to attend.

"Thus number may be said to rule the whole world of quantity, and the four rules of arithmetic may be regarded as the complete equipment of the mathematician."
- James Clerk Maxwell

primordial, secund, turbid

BURLOAF

Last week's Chevron featured an article about a meeting that was held by a group of people who are determined that people should be paid for doing housework. I would just like to say I agree with what they want.

As soon as people start getting paid for doing housework, then I'll quit whatever job I am at, housekeep the place I live in, and live off the salary. After all, I already have to look after the place I live in, so if I can get paid to do it, why not? I mean, why not! (It sounds better than unemployment, because there you have to make like you are looking for a job.)

These people also decided that the state should pay houseworkers for their toil and labour. This is because what they do benefits the state (in an indirect way). I have been using the same argument to try to get the government to pay me to play dominoes. After all, while I play this game, I am kept off the street and out of mischief, therefore the state benefits by me biding my time in this way, therefore they should be paying me to play dominoes.

*   *   *

It is fairly well known that a large part of many university students' literary diets consists of comic books. There is the same drive as is in little kids to read them, however students can much more easily afford them. After reading a few, I have noticed the advertisements in them fall into three classes: One class consists of ads for novelty like items such as onion flavoured gum and a record of ghost sounds. These are usually very cheap (in price) as if to appeal to young people with a dearth of money. The second class has ads from various institutions urging you to learn something (finish high school education, learn to fix TV's, find out how to clean carpets) in order that you can escape your low-pay no-future dead-end boring job for an exciting career (fixing TV's and cleaning carpets) that pays lots and has a real future. Thirdly, there are ads for institutions that will make you physically a better person. This department has been traditionally dominated by such body building courses as the famous Charles Atlas method, but nowadays a large part is devoted to courses in oriental martial arts.

Most of the ads from the second and third class, as well as those of the first class to a lesser degree, make fantastic claims as to the success you will have in the future after having invested a minimal fee into their enterprise. Ads for electronics courses picture you as a successful technician working in a progressive company making bundles of cash as you go about your stimulating career, which you realize is in high demand these days. Karate course ads, put in by members of secret societies, show how, by only training seven minutes a day, you will soon be able to take on five attackers at once. After a while, you begin to wander what kind of readership the advertisers think comics have...

*   *   *

This week's INTEGER_OF_THE_WEEK is the long awaited number

7

7 doesn't have several interesting properties. To name a few, it is not a perfect square, or cube, or similar shape of higher dimension; it is not a triangle, or tetrahedron, or similar shape of higher dimension (except for the trivial case where it forms a 6-d tetrahedron of sides of 2, but then every integer larger than one forms a tetrahedron of sides 2 in some order of dimension.); it does not appear in the Fibonacci sequence, there are no two perfect squares that add to give it (or three for that matter); it isn't of the form 4x+1, x being an integer.

However, there are some properties it does have. For instance, it is the first composite hexagonal number (a hexagon of objects such that each side is two long has seven objects in it), a Burloaf is made up of 7 cells (this makes 7 particularly important) and there are constantly 7 days in a week. While other units of time vary (a month can be 28, 29, 30 or 31 days, a year can be 365 or 366 days, even the length of a day varies with the rotation of the earth by a fraction of a second), there are forever seven days in a week. The Russians tried tinkering with the week, making it five days and then eight days, but they came back to 7. 7 is also a gaussian prime (i.e., a prime complex integer). Other traditional primes, like 2 and 5, are not gaussian primes. It is embodied in fairy tales, for example, Snow White and the Seven Dwarfs. Also, seven is the smallest positive digit that takes two syllables to say.

*   *   *

If you tried working out the sequence of factor sums generated by 138, presented last week, you should have ended up with the numbers listed at the end of this article as the beginning of your chain.

*   *   *

I have heard that Canteen of Canada is becoming ecology minded. In order to help save paper and avoid pollution from disposable items, cups are no longer being used in soft drink vending machines.

I think I'll go away now. I'm getting tired of seeing the subscription manager, sitting next to me, smirking all the time and saying the postal strike is the best thing that's happened yet.

*   *   *

138 150 222 234 312 528 960 2088 3762 5598 6570
10746 13254 13830 19434 20886 21606 25098 26742
26754 40446 63234 77406 110754 171486 253458
295740 647748 1077612 1467588 1956812 2109796
1889486 953914 668966 353578 176792 254123
308832 502104 753216 1240176 2422288 2697920
3727264 3655076 2760844 2100740 2310856 2455544
3212776 3751064 3282196 2723020 3035684 2299240
2988440 5297320 8325080 11222920 15359480
19199440 28875608 25266172 19406148 20552604
40541052 54202884 72270540 147793668 228408732
348957876 508132204 404465636 303708376
290504024 312058216 294959384 290622016
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7278382 3660794 1855066 927536 932464 1013592
1546008 2425752 5084088 8436192 13709064
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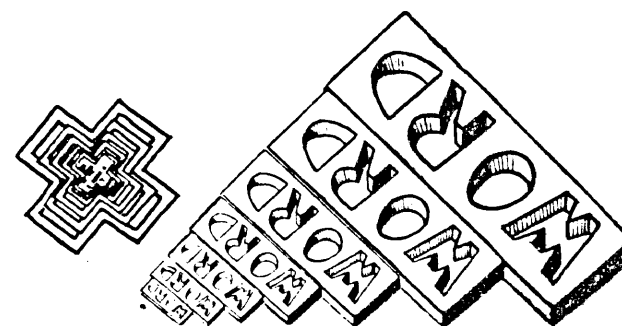
   After receiving only a few solutions last week, we have been swamped by them this week. There were 16 right and 11 wrong solutions. Out of 27 entrants there is only one who made the mistake of believing that mathNEWS does not go to press without any errors. Last week we left two block squares unblacked, resulting in great confusion for at least one reader.
   Out of this melee Pete "Nemesis" Schneider has emerged victorious (actually we flipped some coins). You may appear (magically or otherwise) at the MathSoc office and collect your T-shirt anytime that you can find it open.
   Now for the section of the gridcomment that you all are waiting for: the snarky comments. To Doug McI. - we are holding our breaths for your submission. To Bob T. - you finally got one in on time and it was correct, but you lost. To Cathy M. - the answer to H13 across is GONAD and you have a dirty mind. To Tom K. - the Great Pumpkin liked your grid, I didn't.
   This week there is no gridword. We have no suitable gridwords to print. Instead we are printing a coded version of a filler article. Hand in solution as usual.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	C	H	A	R	I	Ø	T	S		Ø	X	Y	G	E	N
2	Ø		B	U	R	L	A	P		P	E	T	A	L	S
3	M	E	M	Ø	R	Y		Ø	V	E	R	T		M	
4	P		S		A	M		T	E	N	Ø	R		S	Ø
5	U	N		F		P	P		D	I	X	I	E		X
6	T	E	A	R	F	U	L		A	N		U	L	N	A
7	E		P	E	R	S	Ø	N		G	A	M	E		L
8	R	A	T	I	Ø			Ø	P	S			P	Ø	I
9	S	T	A	N	D	A	R	D	S		A	D	H	Ø	C
10	C			D	Ø	N	E			T	Ø	P	A	Z	
11	I	D	E	S			S	T	A	R	R		N	E	W
12	E	R	A		P	Ø	T		P	E	T	I	T		Ø
13	N		G	L	A	D		G	Ø	N	A	D		A	M
14	C	A	L	Ø	R	I	E	S		D		L	I	R	A
15	E	L	E	G	A	N	T		E	S	T	E	V	A	N

CREATED BY HOWARD RUSSO

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Math ETICS

MATHSOC'ERS vs. ST. JEROMES

Sunday afternoon after almost an hour delay, Math squeeked into the A League soccer finals by a close, hard fought victory over St. Jeromes. Jim Valliant opened the scoring by putting a penalty shot into the corner. St. Jerry's tied it up in the first half with a long shot that got past Bill. In the second half, Bernie Sander got his second play off goal on a great rush down the wing. Math just couldn't capitalize on a number of near break-aways, thanks to the good range of St. J.'s goalie. Although the Mathsoc'ers weren't quite up to par, they managed to turn back the St. J.'s offense. Paul Schalm and Al Watson were the conerstones of the defense. Now the team is looking forward to the final game which is on Wednesday night, 9:30 p.m. at Seagrams, under the lights. Once again it is the traditional clash between Math and the Greeks. Feel free to come out and help our spectators give vocal support.

MATHSOC'ERS vs. CHEVRON

Saturday afternoon at 12:30, amidst strong cold winds and occasional rain, Mathsoc'ers opened its playoff schedule against a tenacious and determined but slightly short-handed Chevron team. Math took advantage of the wind in the first half by tallying with 4 goals. Scorers were PAUL MORGAN, Bernie Sander, Steve Duncan (I can't believe it either) and Martin Harris. In the second half, the Mathsoc'ers continued to keep the Chevron's team bottled up, but were unable to score a goal and stay on-side at the same time. Altogether 3 goals were called back. Jim V. kept control up the centre as usual. Bill Lexmond kept the shut-out by virtue of stopping one shot on goal and nine passes back to the goalie. Great team effort.

MYTH ETICS

Volleyball

Due to the fact that I have a combinatorics mid-term tomorrow morning it has been decided to keep this article short this week. Another factor which entered into this decision is that no volleyball game was played last week. However we did play this week on Wednesday night but since this is being written on Tuesday night I don't know what happened yet. However I'm sure we all had a great time and that our team never played better (Confused?... I am). The next game will be on Wednesday, November 5, at 8:30 on Court 2. Be sure to turn out.

Now that this business has been taken care of I shall make a few comments on life in general but nothing in particular. I tried to get the problem section people (they've got Problems all right) to publish my combinatorics assignment last week as their problems. Unfortunately they declined. Too bad... we could have gotten a kick out of it.

You may notice that there is no "Kathy X's Quote of the Week" this week. This is because Miss. X didn't say anything quotable this week except for some blabbering this afternoon but I forget what it was. However this feature is sure to return next week because that broad can't keep her mouth shut for very long. Also next week we will publish her phone number and address. Be sure to look for this exciting feature under the heading, "For a Good Time, Call..."

SEAWHORES TIE IN TOUGH ONE

A yell emerged from the crowd. Another Math Seahorses goal!

No, just the announcement from the team captain that Scrooge (who is really Ebenezer Clark) and Dryden would not be playing this game: word had come down from league president Peter Hopkins that they were demoted to the minors (i.e. Hotdogs) for the remainder of the season.

Buoyed by the absence of Dryden and Scrooge, the Seahorses surged to an early lead. But for a massive defection of Math players to the not-so-holy St. Paul's team (we started with 12 players to their 8, but ended behind 10-12) and the stellar goaltending of Gary "Sieve" Prudence, we could've had a romp instead of an 8-8 tie.

J.J. led the Mathies with 4 goals, while captain Steve Jarvis (of Kathy-X fame) garnered a hat-trick from his position on the left point. Even the MISSterious X lucked out a goal and was back to her old form attacking the opposition instead of our team. Irene was throwing passes again but could not receive them. She told J.J. she wouldn't talk to him again (if he was only so lucky) if he didn't feed her a pass. So J.J. gave up goal #5 only to pass off to Irene, who was right at the net, and shot the ball out of play.

All in all, the team played one of its most together games, being rough when we had to, thanks to the absence of Ken the lifeguard who fights everyone but preaches non-violence. However, our defense, especially Willy and Andy, should be playing waterpolo instead of playing with the stacked chick in the white bathing suit (while they were admiring and enjoying her attacks, she was pumping goals in).

Thanks to the other two girls, Wanda and the other one (I forget her name), for bringing our total to 4, the highest ever this term. The captain is ordering more broads to come next week. After all, the guys on the opposition need someone to attack them!

Resignation.

This week in the problems section I will announce my resignation as editor of the problems section. I am the originator and have been editor since its creation this term in issue 9.1 (or was it 9.2?). I am being succeded by R. Morrison as editor and I think that the section will flourish under him.

At first the problems section had received very little response from the students of the math building and so we had to submit problems in again. My second problem (Q2 if you forgot) was never solved by anybody which requied me to submit my own solution. The three original problems were submitted by F.J.A.Pinteric (Q1, Q2) and R. Morrison (Q3 dummy!).

Now we recieved ten responses just for the last issue! That is great! I hope that with my resignation you, the reader, will not resign from reading the problems section. I eventually had to give up the post as I am only a first year student with only a smattering of higher math (that is years two and up).

We had a few problems; most have been corrected. Thanks very much for your patience and good responses.

F. Pinteric.

Q12. Solution by K.C. Liu and M. Sandberg

If n = 0, L.S. = $(f \cdot g)^{(0)}$ = fg (no differentiation)

R.S. = $\binom{0}{0} f^{(0)} g^{(0)}$ = fg = L.S.

If n = 1, L.S. = $(f \cdot g)^{(1)}$ = $f^{(1)}g + f \cdot g^{(1)}$ = R.S.

Hence formula is true for n = 0, 1

Invoke the induction hypothesis :

Suppose $(fg)^{(k)} = \sum_{i=0}^{k} \binom{k}{i} \cdot f^{(i)} g^{(k-i)}$

Then $(fg)^{(k+1)} = \frac{d}{dx}((fg)^{(k)}) = \frac{d}{dx}\left[\sum_{i=0}^{k} \binom{k}{i} f^{(i)} g^{(k-i)}\right]$

$= \sum_{i=0}^{k}\left[\frac{d}{dx}\binom{k}{i} f^{(i)} g^{(k-i)}\right]$

$= \sum_{i=0}^{k}\left[\binom{k}{i} \cdot f^{(i+1)}g^{(k-i)} + \binom{k}{i} \cdot f^{(i)} g^{(k-i+1)}\right]$ Let j = i + 1

$= \sum_{j=1}^{k+1}\binom{k}{j-1} f^{(j)} g^{(k-j+1)} + \sum_{j=0}^{k}\binom{k}{j} f^{(j)} g^{(k-j+1)}$

$= \binom{k}{0} f^{(0)} g^{(k+1)} + \sum_{j=1}^{k}\left(\binom{k}{j-1} + \binom{k}{j}\right) f^{(j)} g^{(k-j+1)} + \binom{k}{k} f^{(k+1)}g^{(0)}$

$= \binom{k+1}{0} f^{(0)} g^{(k+1)} + \sum_{j=1}^{k}\binom{k+1}{j} f^{(j)} g^{(k-j+1)} + \binom{k+1}{k+1} f^{(k+1)}g^{(0)}$

$= \sum_{j=0}^{k+1}\binom{k+1}{j} f^{(j)} g^{(k-j+1)}$

And the theorem is proved.

Now let $f(x) = e^{ax}$, $g(x) = e^{bx}$

so $f(x)g(x) = e^{(a+b)x}$

$f^{(i)}(x) = a^i e^{ax}$, $g^{(n-i)}(x) = b^{n-i}e^{bx}$,

and $(fg)^{(n)} = (a + b)^n e^{(a+b)x}$

Thus our formula gives $(a + b)^n e^{(a+b)x} = \sum_{i=0}^{n}\binom{n}{i} a^i e^{ax} b^{n-i} e^{bx}$

$= e^{(a+b)x}\sum_{i=0}^{n}\binom{n}{i} \cdot a^i \cdot b^{n-i}$

Dividing by $e^{(a+b)x}$ gives the Binomial Theorem.

We ran out of space for the problem's section so we'll have to publish the solution to Q5 next week, which is just as well since we haven't received any correct solutions to it. We want to find the ratio of the areas of the following triangles. (Hint:Determine ∠DFE and ∠DEF) Due to the fact that this problem has been kicking around for about a month now, a solution will be published next week regardless of whether or not we receive any solutions.

ΔABC is isosceles.

$$\frac{\Delta AFE + \Delta DBC}{\Delta BDF + \Delta DEC}$$
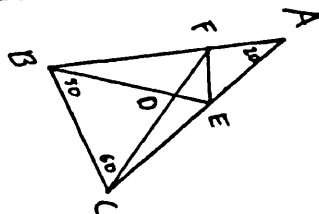
Problems

Q13. Submitted by Greg Fee:

Show that:

$$\prod_{k=1}^{\infty} \frac{8k(2k+1)}{16k^2+8k+1} = \frac{1}{2}\int_0^{\pi/2} \frac{d\theta}{\sqrt{1-\frac{1}{2}\sin^2\theta}}$$

Q14. Define a multiplicatively perfect number as one where $\prod_{d|n} d = n^2$ where the product is over all divisors of n.

e.g. n = 12 then $\prod_{d|n} d$ = 1.2.3.4.6.12 = 1728 so 12 is not multiplicatively perfect whereas if n = 15 then $\prod d$ = 1.3.5.15 = 15 so 15 is multiplicatively perfect.

Find all multiplicatively perfect numbers. Can you generalize e.g. $\prod_{d|n} d = n^k$?

Q15. Prove: $\sum_{h=1}^{\infty} \frac{1}{h(n+1)(n+2)\cdots(n+h)} = \frac{1}{k \cdot k!}$

¡ ITS PREREGISTRATION time !

All co-op students currently on campus who will be returning for classes in the spring '76 term should pre-register during the period November 5-7/75 with an appropriate Faculty Advisor at the times indicated below. Regular students who wish to pre-register for the Spring '76 term are requested to wait until March '76.

(1) All 1A and 2A (except 2A Co-op Teaching Option) pre-registering for 1B and 2B respectively: Wed, Thurs and Fri, Nov 5, 6, 7 9:30 a.m. - 11:30 a.m. and 1:30 p.m. - 3:30 p.m. in MC 5158.

(2) All 2A Co-Op Teaching Option students (Honours and General) will pre-register as a group during the MTHEL 206A classes on Nov 3/75 and Nov 10/75.

(3) All students pre-registering for years 3 and 4 should see one of the following Advisors according to area of interest.

Computer Science - J. D. Lawson
Nov 5, 6, 7   1:30 - 3:30   MC 5100A

C. A. and Business Options - J. D. Kalbfleisch
Wed Nov 5   1:30 - 4:30   MC 6092A
Thurs Nov 6   2:30 - 5:30   MC 6092A

Combinatorics & Optimization - C. Haff
Wed Nov 5   9:00 - 11:00   MC 5025
Fri Nov 7   9:00 - 10:00   MC 5025

Statistics - C. Springer
Wed Nov 5   10:30 - 12 noon   MC 5039
Thurs Nov 6   2:00 - 3:30   MC 5039
Fri Nov 7   10:30 - 11:15   MC 5039

Actuarial Science - F. Reynolds
Wed Nov 5   2:30 - 4:30   MC 6092B
Fri Nov 7   9:00 - 12:00   MC 6092B
                    2:30 - 4:30   MC 6092B

The Joys of Mathematics...

Q4. Well, John Herzig dropped by tonight to explain his solution and we discovered that one step was in error. Since no one else has submitted a solution to Q4, we publish the solution given by S.C.L. when he proposed the problem.

We were given a natural number N, a complex number α such that $\alpha^N = 1$ and for $0 < i < N$, $\alpha^i \neq 1$, and a polynomial p(x) with integer coefficients.

We want to prove that $R = \prod^N p(\alpha^i)$ is an integer.
Solution: Note that R is symmetric in the α^i's (ie. changing the order of α^i and α^j doesn't change the product), and that R is a polynomial in the α^i's with integer coefficients. *Therefore, R can be represented as a polynomial with integer coefficients, in terms of the elementary symmetric functions of the α^i s(ie. the coefficients of $x^N - 1$, which are integers) and the coefficients of R which are integers.
(Note: The symmetric functions of a set of n variables $x_1, x_2, \ldots, x_n$ are defined by
$T_1 = \sum x_i$, $T_2 = \sum\sum x_i x_j$, $T_3 = \sum\sum\sum x_i x_j x_k$, ...
$T_n = x_1 x_2 x_3 \ldots x_n$).
$\therefore$ R is a polynomial with integer coefficients and integer arguments. $\therefore$ R is an integer.
*We sort of glossed over the proof of the fact that any polynomial S which is symmetric in $x_1, x_2, \ldots, x_n$ is equal to a polynomial, with integral coefficients, in the coefficients of S and the elementary symmetric functions $T_1, T_2, \ldots, T_n$. For the inquisitive reader, a proof of this can be found in L.E. Dickson, A New 1st Course in the Theory of Equations, pp.177-179.

Q7. Solution submitted by S.C.L. (what, again!)
If $a \neq 0$ then using Rolle's Theorem n + 1 times we get that $f^{(n+1)}(x)$ has a root. But
$f^{(n+1)}(x) = a^x (\log(a))^{n+1}$, and $a^x > 0$
Thus $\log(a) = 0$ and $a = 1$
So $f(x) = 1 + p(x)$ which has at most n real roots unless $p(x) \equiv -1$ and $f(x) \equiv 0$
If $a = 0$ then $f(x) \equiv p(x) \equiv 0$ since if $p(x) \neq 0$ then it has at most n roots.
In both cases $f(x) = 0$ so $f(x)$ has every real x as a solution.
Solutions also submitted by Greg Fee (using interpolation polynomials) and J.I.M. (who failed to see the misprint in last week's issue namely $a + p(x)$ should have been $a^x + p(x)$)

Q11. Solution submitted by John Herzig.
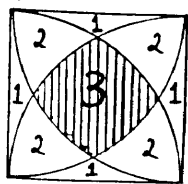
By symmetry the areas can be labelled as shown.
Call the area of each "1": A_1
Similarly for A_2, A_3.
Consider the following areas:
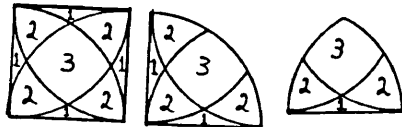
Call them S_0, S_1, S_2 respectively.
Then: $4S_1 = 4(2A_1 + 3A_2 + A_3) = 8A_1 + 12A_2 + 4A_3$
$4S_2 = 4(A_1 + 2A_2 + A_3) = 4A_1 + 8A_2 + 4A_3$
$S_0 = 4A_1 + 4A_2 + A_3$
Hence: $4S_2 - (4S_1 - S_0) = A_3$
But: $S_0 = a^2$
$S_1 = \pi a^2 / 4$
$S_2 = \frac{\sqrt{3}}{4}a^2 + 2(\frac{\pi/3}{2\pi}\pi a^2 - \frac{\sqrt{3}}{4}a^2)$*
Thus: $A_3 = a^2(\pi/3 - \sqrt{3} + 1)$
*By sector formulae:
$\qquad$ Area = 2(area of sector - area of equilateral triangle) + area of equilateral triangle
$\qquad$ = 2(area of sector) - area of triangle
$\qquad$ = $2(\frac{\pi/3}{2\pi}\pi a^2) - \frac{1}{2} \cdot a \cdot \frac{\sqrt{3}}{2}a = \frac{\pi}{3}a^2 - \frac{\sqrt{3}}{2}a^2$
Solutions also submitted by S.C.L., J.I.M., and K.C. Liu (last two used inelegant integral formulae)

Q10. This proved to be one of the more interesting problems that we've published and we have two very nice solutions to it. Since each is much too elegant to neglect, we publish, as a public service, both solutions.
Solution by the proposer.

Let $a_s = \sum_{n=1}^{\infty} \frac{1}{n^s} = 1 + \frac{1}{2^s} + \frac{1}{3^s} + \frac{1}{4^s} + \frac{1}{5^s} + \frac{1}{6^s} + \ldots$

then $2^{-s}a_s = \frac{1}{2^s} + \frac{1}{4^s} + \frac{1}{6^s} + \frac{1}{8^s} + \ldots$

$\therefore (1 - 2^{-s})a_s = 1 + \frac{1}{3^s} + \frac{1}{5^s} + \frac{1}{7^s} + \frac{1}{9^s} + \frac{1}{11^s} + \ldots = 1 + \sum_{2 \nmid n} \frac{1}{n^s}$

(ie. the sum is taken over all integers n which aren't divisible by 2)

$\therefore 3^{-s}(1 - 2^{-s})a_s = \frac{1}{3^s} + \frac{1}{9^s} + \frac{1}{15^s} + \ldots$

$\therefore (1 - 3^{-s})(1 - 2^{-s})a_s = 1 + \frac{1}{5^s} + \frac{1}{7^s} + \frac{1}{11^s} + \frac{1}{13^s} + \ldots = 1 + \sum_{2,3 \nmid n}\frac{1}{n^s}$

(where the sum is taken over all n which aren't divisible by 2 or 3)

$\therefore 5^{-s}(1 - 3^{-s})(1 - 2^{-s})a_s = \frac{1}{5^s} + \frac{1}{25^s} + \frac{1}{35^s} + \ldots$

$\therefore (1 - 5^{-s})(1 - 3^{-s})(1 - 2^{-s})a_s = 1 + \frac{1}{7^s} + \frac{1}{11^s} + \frac{1}{13^s} + \ldots$
$= 1 + \sum_{2,3,5 \nmid n} \frac{1}{n^s}$

(where the sum is taken over all n which aren't divisible by 2,3 or 5)
Continuing in like manner, we get, for some prime p

$(1 - p^{-s}) \ldots (1 - 5^{-s})(1 - 3^{-s})(1 - 2^{-s})a_s = 1 + \sum \frac{1}{n^s}$

(where the sum is taken over all integers n which aren't divisible by any prime less than p)

$(1 - p^{-s}) \ldots (1 - 3^{-s})(1 - 2^{-s})a_s - 1 = \sum_{2,3,\ldots-p \nmid n}\frac{1}{n^s} < \sum_{n > p}^{\infty}\frac{1}{n^s} = \sum_{n=1}^{\infty}\frac{1}{n^s} - \sum_{n=1}^{p}\frac{1}{n^s}$

But as $p \to \infty$, $\sum_{n=1}^{p}\frac{1}{n^s} \to \sum_{n=1}^{\infty}\frac{1}{n^s}$)

so $(1 - p^{-s}) \ldots (1 - 5^{-s})(1 - 3^{-s})(1 - 2^{-s})a_s \to 1$, and the result easily follows.
And now for S.C.L.'s solution:

$$\prod_p \frac{p^s}{p^s - 1} = \prod_p \left(\frac{1}{1 - p^{-s}}\right) = \prod_p (1 - p^{-s})^{-1}$$

$$= \prod_p (1 + (p^{-s}) + (p^{-s})^2 + (p^{-s})^3 + \ldots)$$

$$= \prod_p (1 + (p)^{-s} + (p^2)^{-s} + (p^3)^{-s} + \ldots)$$

(where the product is taken over all primes p)

But $\prod_p (1 + (p)^{-s} + (p^2)^{-s} + (p^3)^{-s} + \ldots)$

$= \sum (p_1^{\alpha_1}) (p_2^{\alpha_2}) (p_3^{\alpha_3}) \ldots$

where p_k is the kth prime and $\alpha_1, \alpha_2, \ldots$ are integers. But because every integer n can be uniquely expressed as the product of powers of distinct primes

$\therefore \sum (p_1^{\alpha_1})^{-s}(p_2^{\alpha_2})^{-s}(p_3^{\alpha_3})^{-s} \ldots = \sum (p_1^{\alpha_1}p_2^{\alpha_2}p_3^{\alpha_3}\ldots)^{-s}$
$= \sum_{n=1}^{\infty}\frac{1}{n^s}$

Q.E.D.
Also solved by Greg Fee using a method quite similar to the above.

We have received our first wonderful proof of Fermat's Last Theorem however we cannot print it this week as the margin is too small to contain it.

fed REPort

Presently the Feds are faced with another request from Radio Waterloo. The request involves about $3800.00, of which about $2000.00 may be justified. As Treasurer (besides the signing of checks and helping the permanent employee Business Manager Peter Yates with the monitoring of Federation spending) it is my job to review such requests as made by R-W. I am considering this request with Steve Howard of R-W and Fed president Shortall. I am against much more being allocated because the council has already overbudgeted by about $20,000.00 over its $250,000.00 budgetary limit.

It seems that Shortall is doing a lot of work these days. However some of the work which he devotes to OFS and the National Union of students could be better spent in working with the issues at Waterloo. This is not to say that OFS is not important, but as well as improving inter-university relations, President Shortall should also try to maintain Federation-Society relations. I do realize while he does not have the dynamic personality, charisma or drive of past presidents, he is probably one of our most diplomatic presidents in dealing with the administration. He could be more forceful, however, in speaking for the students. When he does take a stand he should inform the students more fully regarding the issues so that he could call upon them for support.

Art Ram seems to be trying his best. Many people misunderstand the man. Of course he has his faults but he is improving over time. It could be considered as partially his fault that we don't have a pub agreement like other universities. Most of the problem, however, lies in the fact that our university administration isn't as responsive to student needs as those at other universities. Art could be advised to try to change the philosophy of the CC pub. Though the Garfield band is well worth the admission price, that type of group and others could go better in the South Campus Hall. At least Art is now trying some of my advice and is printing a pub information sheet.

Hopefully, if you haven't already, you will vote in the Senator-at-Large elections. Ballots can be returned by on-campus mail. If you didn't receive a ballot go to the third floor of Needles Hall at the Secretariat office for help. B- conducting a mail-out vote the university spent money they could've saved with an on-campus election and allowed the postal strike to affect the elction.

Shortall says that the next Fed meeting will probably be on Nov. 7 and 8 (a Friday - Saturday session because he wants a mini OFS meeting as well). I feel we should have shorter meetings more often rather than long, all-day affairs. Perhaps new councillors could impress upon Shortall to do such a thing. With new councillors we may start making quorum more often.

J.D. Long

NOT DEAD YET

Your raving mathNEWS reporter attended the Math Standings and Promotions meeting last October 22. Opposition was met from faculty members who felt that changing to a four-course rule would give academic harm to the honours program in Math. Part of the problem is that honours students can take one less course per term than required while general students can't. The problem will not be resolved by the end of the drop period (Nov 3rd) so if you are in a bind and can't find a sympathetic faculty advisor you are somewhat out of luck and will have to work your collective asses off (or withdraw) to survive.

Part of the faculty's rationale was that the government does not fund programmes on a per course basis and we'd be ripping off the taxpayers by giving students too easy a course load. However it is also true that students pay the same fee whether they take three courses or seven courses. Members of the committee felt they shouldn't rush the subject.

K.D. Fryer had some suggestions on revising course requirements. Such things as a fee per course attempt (instead of a time) limit to get a degree were suggested. Developments will be reported as they occur.

For those who are interested we need Math representatives for the following committees -- Campus Centre Board (1 elected member), Student Advisory Committee (2 appointed members), Curriculum Committee (1 member to replace the mending Ron Hipfner). Dean Forbes said that the reason we don't have student reps on the Standing and Promotion, Tenure, and Admissions committees is that we don't fill the positions we have on other committees. If you are interested in becoming a committee member come to the Mathsoc office (MC3038) and volunteer.
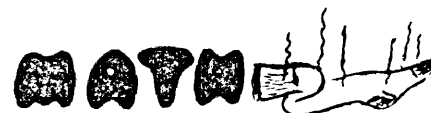
MATH

At the executive meeting Tuesday it was decided to fund the dinner being given in honor of Earl Bowman, former security guard for The Building and a personal friend of Mathsoc. A gift would also be given in appreciation of all the things he had done for the society, of which he was recently made an honorary member.

Bruce Mills was okayed as the temporary manager for coffee & donuts during Ron Hipfner's absence. A new second signature for the signing of checks would be the vice-president.

Antical 74/75 master pages are to be put together by cutting up the computer printout and pasting it onto the sheets, from Wed. Nov. 5, until done.

All decisions of the executive must be ratified by the council.

a comment

I would like to take this opportunity, on behalf of all the candidates who were recently acclaimed to mathsoc positions, to thank all those who made our acclamations possible by not running. As a result, political campaigns were run on a zero-cost basis, the halls were not desecrated by my fellow candidates' posters, and we were all spared the embarassment of losing.

Apathy, like Franco, is not dead yet!!!

FEED BACK

mathNEWS welcomes your criticisms, comments, suggestions, etc. All letters should be signed, but if requested, a pen name will be used. Put your Feedback articles in our MAILBOX on the 3rd floor outside the lounge, or mail it to us on the 'Bun (userid mathNEWS), or take it to M&C3038 and have it put in our mail slot or put it in the mail addressed to mathNEWS. M&C3038.

UP and COMING

CKCO TV got wind of the Math Faculty's use of the computer in the newly-equipped classroom 3008. As a result, they have just finished shooting scenes of my 223A class in session in 3008. They shot pictures of the terminal, the monitors, the students, and the prof. These will be shown on some Wednesday night (probably in two to four weeks) on their program News Scope. Amusing note: Hugh Greenwood, who interviewed me October 22nd, said he was glad to see us using such high-quality TV monitors. He then explained that CKCO-TV is owned by Electrohome.

News Scope is on Wednesday nights on Channel 13, from 10:00 to 10:30 P.M., if there is no hockey game.

Jane Gentleman

FOR STUDENTS?

Many people have noticed the recent upsurge in terminal usage on the Honeywell, particularly those with computer assignments due. Those hardest hit seem to be the 3rd and 4th year students, who, as 1st and 2nd year students, were caught in a similar "computer access" problem two years ago on Debug. But this seems to be only the most painfully obvious of a large series of developing problems.

Perhaps the most difficult problem to resolve is removing the aura of unreality which surrounds many early computer science courses. There seems to be an effort made to keep the student away from "real" production languages and assemblers, and to hide complications and difficulties which, naturally, they expect you to know about the next time you run afoul of them.

However, the most infuriating thing to come up in recent history is the current version of math 340A. This course has (since last term) been stripped of ALL useful and/or interesting material, and introduced a programming style that would get you fired from any computer company on the face of the earth, including IBM. Furthermore, this new programming style happens to invoke (2 out of 3 times) a heretofore highly obscure compiler bug, which Honeywell will not correct in the near future, and the fudging of which is completely impossible if the "style" is to be retained.

All in all it's easy to see the direction C.S. is taking here at UW... makes you wish you were in Pure Math doesn't it?

The Soothsayer

WOMEN in mathematics

WOMEN IN MATHEMATICS: SONYA KOVALEVSKY (1850-1891)

Perhaps the most dazzling woman mathematical genius was the Russian Sonya Corvin-Krukovsky Kovalevsky born in Moscow, Jan. 15, 1850. She had a strong-willed nature, was given to extravagent affection and astonishing jealousy. Her tensions and whims made it difficult for her to live in harmony with others as she very often required a devotion from her friends beyond human capacity.

When a child, a wall of a room of her family's house was partially covered with pages from a book on differential and integral calculus which soon attracted Sonya's attention. She spent hours before the mysterious wall searching for order in the pages and trying to decipher the formulae. Incomprehensible then, she quickly grasped these concepts when she studied calculus later. Her father was reluctant to allow Sonya to study mathematics and in addition, Russian universities were closed to women. To gain freedom of travel and to leave Russia, Sonya married Vladimir Kovalevsky in 1868, he being much impressed with her mathematical talents, fluency in languages and remarkable beauty.

They soon moved to Heidelberg where Sonya was able to attend university. Learning of Weierstrass she went to Berlin to become his student, however the university did not accept women but by direct appeal to Weierstrass she became his pupil for four years. During this time she completed the university course of mathematics and wrote several papers on partial differential equations. In 1874 she was granted her doctorate from the University of Gottingen. After this she returned to Russia to relax. Her struggle for an education had made her a strong advocate of women's rights and much of her literary work centred on this. Her only child was born in October 1878 and later that year she wrote to Weierstrass that she was anxious to return to mathematics. Her marriage shaky, she left on her own for Berlin to work with Weierstrass on the refraction of light in a crystal. In the spring of 1878 her husband took his own life and Sonya reproached herself relentlessly for not remaining in Moscow with him. Later that year she left for a university in Stockholm. The high point of her career came in 1888 when she received a prize from the French Academy for her memoir on the rotation of a solid body about a fixed point. After a heart-breaking love affair with an unknown man, and her beloved sister dying, Sonya made her last journey to Moscow in February 1891. Bone tired and frozen from the intense cold she contracted influenza and died.

Although her scientific life was brief, it was brilliant and the mathematical world owes her more than a passing reference.
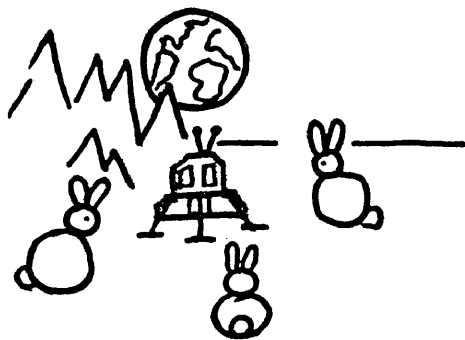
Science fiction, although not universally recognised, has reached reasonable acceptance by a large number of people. This can partially be accredited to the widespread circulation of magazines like IF, ANALOG and others. This can also be seen in the large increase in the number of quality science fiction movies.

Science Fiction is a form of media that has the greatest appeal to those who like to contemplate what the future of mankind will be. A group of hard core Sci-Fi addicts would like to bring this form of media onto Campus, in the form of a Science Fiction Club or Society.

This club would be open to any member of the University and would sponsor a Sci-Fi night every other Monday. This meeting could show a recent motion picture, or present a Guest Author or Panel to discuss science fiction, and could provide an information and story clearing house for members.

If you are interested in this club and would like to find out more, contact me. If there is sufficient interest within SciSoc, a meeting will be set up and other societies informed.

MIKE WALLIS (884-5173)

The preceding is reprinted from the last issue of SciSoc News. If you are interested in a Sci-Fi club we suggest you contact Mike Wallis or send mail to "scisoc" on the 'bun.

SPELLING BEE

Math trounced Arts in the orthographizing match of Tuesday, October 28, a feature of the Math-Art Week celebrations. In groups of three, contestants advanced to the blackboard erected in the undergraduate lounge in Humanities. A word was articulated; it was then defined or given in a sentence. At the judge's signal, the contestants printed the word on their blackboards in some fashion. The first person who finished with the word correct scored it; whoever obtained the most words out of 5 won the round. After 3 such rounds, a final was played: two math students against one last hope of arts.

She lost.

As an exhibit, two Mathsoc executives and two Artsoc executives put in a brilliant illustration of conjecture as they muddled through a list of words. In all the event there was tremendous entertainment and fun.

CHESS TOURNEY

Chess 4.4, running on a Cyber 175, won the annual computer chess tournament of the Association for Computing Machinery, in Minneapolis. The second-place finisher was UW's own Treefrog by Ron Hansen, running on a dual-processor Honeywell 66-80 in Phoenix. Third place went to Etaoin Shrdlu, running on a Data General Nova, fourth was Chaos, on an Amdahl 470. There had been a three-way tie for second, but Treefrog won the tiebreaker.

LAST CHANCE
to drop courses   NOV 3

POLICY

Exam room