hewlett-packard 45 advanced scientific pocket calculators

STATS CALCS **UN**INSTALLED

· For those of you who haven't noticed, the third-floor calculator room (MC 3047) has been closed. This action was taken following the theft of 7 HP-45's, 5 within the last few weeks. As a result of the permanent closure of this room, several of the calculators have been placed in the EMS library on the fourth floor. You can borrow one from the circulation desk in exchange for you ID card. Of course, this service is only available during circulation hours.

- These thefts bring to light an interesting point on the subject of security. You may recall that back in the last week of September the security guards of all faculties were

released following a joint decision of the deans. This action was taken in order to reduce costs, following the cutbacks in educational spending. Since that time over $3,000.00 worth of goods have been stolen from the math building alone. The theft of the HP-45's which resulted in the subsequent discontinuation of the calculator service is just one example of the inconveniences which have resulted from that decision.

- Three thousand dollars in less than two months? That works out to more than $18,000.00 a year. How much do you think a security guard earns? No doubt the administration is also impressed by all the "savings"...

Friday, November 28, 1975.
Issue 9.10

math NEWS

Faculty Curriculum Committee

·On Tuesday, November 25, the Faculty Curriculum Committee put its final touches to a document to change your B.Math. requirements. It has proceeded through 6 or 7 revisions and 2 other committees since its introduction by associate dean K. D. Fryer in Summer 1974. The proposal goes before Faculty Council for final approval on Tuesday, December 15.

Pass math people are having their minimum math credits increased, by suggestion of student reps (after all they are supposed to be mathematicians). All time requirements (e.g. previously you had to complete a general degree in 5 years) are being replaced by a "maximum course attempts" ruling, a course attempt being something that you don't drop. This is a very reasonable change, allowing persons that like the university environment to stay up to 24 years (if you are in general) rather than get kicked out after 5 (this, of course, means you have a very light course load so you're bound to pass (actually this isn't the intent of the change, but it is possible)). The overall and cumulative average requirements are replaced by a "best n courses must be greater than v%" rule, where all faculty and department requirements are included in "n". The actual percentages needed are being raised slightly but this is offset by the possibility of ignoring a couple of poor marks by replacing them with more attempts. These changes will strengthen the degree and are better defining the rules.

- Along with them the Faculty is slipping in a very serious change to the drop/add period. The proposal is that our add period be reduced to 2 weeks from 3 and our drop period be cut in half to 4 weeks (originally they wanted 3 weeks). It is not unreasonable that the add

period be shortened since it is quite difficult to pick up on lectures after such a duration but whence the idea behind dropping? Faculty's complaint is that a student is able to take almost a full term without being accountable for it. While an 8 week drop period may indeed be a bit excessive anything shorter than 6 will, no doubt, increase hardships. It is usually after a month or so that profs accelerate teaching rates and assignments. There is little indeed that we can do about this - become angered, talk to our profs, MathSoc, the chevron, the deans ... C'est la vie?

BLOOD DONOR CLINIC

Last week's Blood Donor Clinic was a complete success as 1035 pints were collected. Most of the drippings were blood but the engineers donated 81 pints of half proof tap water.

The collection of information to determine the winner of the Circle-K Blood Bowl (which is based on percentage turn-out) was poorly managed as only 586 people signed the lists. One of the nurses running the clinic suggested to a mathNEWS reporter that the lists could have been filled out as the students were being processed.

The results are as follows:

Rank	Faculty	Pints
1	Math	210
2	HKLS	73
3	Sci	99
4	Eng	81
5	Arts	73
6	ESS	44
7	IS	1
8	Staff	6

Referendum

on Mathsoc constitutional amendments begins Mon., Dec. 1.

Pick up your ballot in MC 3038.

1

THE ANSWER
BURLOAF

Dear Burloaf:

I would like to propose an INTEGER_OF_THE_WEEK, or better still, the INTEGER_OF_THE_YEAR. I feel that this particular number is one of the most important numbers in Mathematics, Physics and the Social Sciences.

The number in question is 17. Seventeen, you ask? The significance of 17 has shown in nearly every subject from (ugh) Statistics to (bleah) Algebra. One example is a choice quote from a certain professor of the Statistics Department:

"For an experiment with a Binomial distribution, how do you get the number of trials, knowing the number of failures? Multiply by 17!"

This integer also occurs in the area of Pure Math. For example, the cube of 17 is 4913 - not too important, except for the fact that 4+9+1+3 = 17! Seventeen is also the <u>seventh</u> prime, another significant fact. Some more interesting properties: Did you know that the hyperbolic tangent of 17 is 1? The 24th ordered prime is 89, whose digits add to 17. The 41st ordered prime is 179, whose digits also add to 17. Now for the cruncher: 41-24 is none other than our magic number, 17 ! (Note that that the 24th and 41st primes are the first two primes whose digits add to 17.)

Seventeen also occurs frequently in the sciences. Some miscellaneous facts:

- The eccentricity of the Earth's orbit is .017 or 17 times 10 raised to the power -3.
- Neptune's mass is approximately 17 times that of the earth.

- The orbit of Pluto is inclined 17.17 degrees to the plane of the ecliptic (significantly above the inclination of any other planet).

- Seventeen is the atomic weight of hydroxide (OH), the ion necessary to form many bases (e.g., NaOH).

- Lastly, 17 appears a few times in the Bible. The age of Methuselah was 969, which happens to be the 17th tetrahedral number. (With 969 balls, one could build a tetrahedral pyramid with 17 balls to the side.) Also, in John 21.11, there were 153 fishes caught by the unbroken net. The sum of the integers 1 through 17 is 153.*

For the final and most convincing proof of the significance of 17 - by law, the elevators in the mathematics building can carry a maximum of 17 people.

I rest my case.

Robert Williams
2A Math

* This was obtained from "Mathematical Games", <u>Scientific American</u>, September, 1975, pp. 174,175.

Very true, Robert. However, you missed this very important property: 17 is the number of the mathNEWS building (with the net result that keys that open doors in this building all have 17 stamped on them). Together with this property, 17 joins the ranks of collectible integers (I hope you readers are collecting them, if you miss an issue, your set of integers will not be complete.), for it truly deserves to be 1975's last INTEGER_OF_THE_WEEK.

Mark Brader scouted around for the Answer Burloaf and found out the elevator manufacturer and the Ontario license giver arbitrarily set elevator capacities to 15 or 17 people (the two don't always agree with each other about the same elevator).

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the 9E12 names of
BURLOAF

The paper "Ontario Student", which appeared about a week and a half ago, surpassed the Chevron with flying colors when it came to name-calling and printing one-sided unsupported garbage. But the quote which I really think is golden is:

"The biggest problem on my campus is that students don't think they have problems."

This was said by a delegate to a conference of NUS ("National Union of Students"). This represents the mentality of a typical union organizer. These are the sort of people who could walk into paradise, and though persistent talking, convince everyone there that they have endless problems and should have an uprising immediately.

*   *   *

November, 1975, is not a month like most months. Most months have their days numbered with sequential natural numbers. However, according to my calendar, last Sunday was November the .766666... It is written on my calendar as the fractional day 23/30. These rational, but nonnatural days seem to come up every few months or so, often featuring such days as 23/30 or 24/31.

As most dedicated Life enthusiasts know, The Burloaf is a Pretty Important Pattern. A Burloaf features many salient Life properties that make it truly beautiful with a beauty that a non-Life-enthusiast cannot understand. Here is an example:

The Eater is a seven bit pattern that can "eat" many simple patterns. Many patterns phase the eater, with the result that the patterns mutually mutilate themselves. What the eater can eat, though, it almost always eats with one bite, except for a few patterns that require two munches. However, the eater takes a full three chomps on the Burloaf before fully ingesting it. Here is the initial configuration for this three course meal:

```
   ▨
    ▨
    ▨     ▨
     ▨ ▨     ▨ ▨
          ▨     ▨
          ▨   ▨
           ▨
```

*   *   *

This week, as our last INTEGER_OF_THE_WEEK for the term (and the year (1975)), we are using an integer suggested by a reader. This week's number is 17. See the Answer Burloaf column.

THE MATHSOC PRESENTS
Christmas Party

SEE SANTA & his Reindeer

In the FACULTY LOUNGE (MC 5136)

CASH BAR FREE EGGNOG

MEET the ELVES and FAIRIES

WEDNESDAY, DEC. 3, 8 p.m. – 1 a.m.

Presents!

FREE TICKETS Available in MathSoc (MC 3038)

T-shirt (maybe) Report

It was during the second week of October that the discussion about who to order the T-shirts from began. If you haven't heard, the debate was based on the fact that Tiger brand suppliers were taking too long in processing the shirts. Therefore we opted to go to Double-Bull brand through one Geoff E.

Inspiring new designs were submitted, including the new symbol Σ, a Descartes T-shirt, and a new co-op design. Orders were placed. All was concluded before Thanksgiving. All that remained to do was wait.

And wait we did!

We were given an estimate of one and a half weeks before a few would trickle in, and 3 to 4 weeks before they began to arrive in force. That would place their arrival between the third and tenth of November. On or about the seventh, one stalwart member of MathSoc called Mr. E. and found out that the screens for the silkscreening had just been cut. We were fervently promised that they would be done by the middle of the week.

After this period of time had expired, and still no sign of the T-shirts, Mr. E. was called repeatedly, and repeatedly we were assured that they would be in shortly. On a couple of occasions we were told that the shirts would be in that selfsame day! Needless to say, no T-shirts have arrived.

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fed REPort

On Tuesday, December 2, at 8:30 pm, Fed council will meet in Needless Hall Room 3005. A Christmas party will be held for council members before the meeting. Though the party is not being paid for out of Federation funds, the fact that it is reportedly being held in the CC pub may have an adverse effect on council members' performance at the meeting. The agenda, which had not been published by early Wednesday, will likely deal with student aid, the CC pub, the NUS, and proposed changes in the Board of Entertainment.

It seems that there is a lack of communication between the Executive, the Council, and the students, which is causing problems in this Federation. I am concerned myself about the direction in which the Federation has been moving, as it seems remote from the students. Now I believe the President and Education Director are doing a great job in important areas such as student aid, in conjunction with the OFS and the NUS. However, I feel the Federation is more than just a member of OFS and should try to improve its position on campus. The Federation should be more involved with the societies and student groups on campus and should try out new and innovative ideas.

Agreement with the University regarding management of the CC pub seems near. A decision must be made about personnel working in the pub. Regardless of my feelings about these personnel, I think that the Federation executive owes the present pub personnel an indication of their future status in a Federation-controlled pub. These persons have devoted a great deal of time to the Federation and should not have their future left up in the air.

There will be Federation Presidential and Council elections this winter, giving you a chance to affect the future of your Federation. Run, or convince someone you know to run.

You've probably noticed the altered Federation symbol that has appeared near my article recently. The symbol was not of my doing, but was a rather feeble attempt at humour by the mathNEWS editor. To those in the Federation who have complained about the symbol, and all others, I apologize for the actions of those responsible for a poor joke that has overrun its course.

It was then revealed at the MathSoc meeting of November 25 that, while Mr. E. was assuring us that the T-shirts would arrive in a few days, he in fact was aware all the time that the cresters had a tremendous backlog of orders and that there would be considerable delay.

This prompted a motion to be passed to the effect that a full report be made to the Committee of Presidents of the societies warning them of the great delays incurred by Mr. E. Another motion was passed to the effect that in future dealings with suppliers, etc., there should be a penalty clause included in the contract, to guard against such delays.

In closing, all that can be said is that the T-shirts will arrive when Anti-Cal does. (and vice versa!)

This event may take place before or after Christmas.

-son of 'bun

3

son of Full Duplex:

HALF DUPLEX

Beware the boughs of ilex!
-Christmas is coming!

The signs are everywhere...the weather has finally become cold, stores are proclaiming holiday sales (after raising prices beforehand), and the University has announced its gift-giving schedule.

What gifts, you ask, is it giving? Exams.

Although the topic that follows has been discussed before, it is being raised again for two reasons: for the edification of the frosh, and the fact of much of what was said previously is now drastically out of date. The topic is: Should calculators be allowed on exams?

I shall start with the university's official rules and regulations: unless prior approval is obtained from the professor(s) who set the exam, no aids whatsoever shall be allowed. None.

But, say you, what about slide rules? Log tables? Very simple. The University adopts and adapts an old programming pitfall. They redefine the meaning of a keyword; in this case, the word "aids". Immediately after stating that no aids are allowed, they say that slide rules, trig tables and log tables are not to be considered aids.

So much for the official regulations. Clearly, one must persuade one's prof if one wants to use a calculator. Therefore, we examine the arguments pro and con.

Pro: Calculators relieve a student of time-consuming mechanical arithmetic, allowing more accurate judgment on the student's knowledge of the course material covered by the test.

Calculators are nothing more than high speed slide rules - if you ban calculators, you should ban slide rules (more on this later).

Calculators are now inexpensive enough that they are not financially prejudicial.

And, an argument which is implicit but rarely stated:

Calculators do not give a significant mark advantage to their users.

And now, the other side of the chip (in the same order):

Con: If the professor believes a majority are using calculators, he may give questions that do not follow the "nice number" rule (i.e. the computations involved will not be in nice round numbers). In this way, calculator usage is detrimental to non-users.

2) The "high speed slide rule" may have been valid in the deep dark past (three years ago). However, the advent of programmable calculators that weren't horrendously expensive (for instance, the HP-25 as opposed to the HP-65) have made this argument totally fallacious. A programmable calculator, especially for courses such as statistics, give a very large advantage to the people using them over people with slide rules or even normal calculators. Thanks to the ubiquitous bell curve, this again hurts the person without one.

3) This argument is more valid than in previous years. A four function, floating decimal, six or eight figure readout is now in the ten to twenty dollar range, whereas in mid-1972, the equivalent calculator cost close to two hundred dollars. But "pocket slide rules", capable of the above and simple trig, logs, etc., are still eighty-plus dollars; programmables are still at least twice that amount. To someone on a reasonably tight budget, this is not overly affordable.

4) Aside from the observation that this more or less negates the whole purpose of using calculators on an exam, this can only be answered in the following way:

Take an entire, large, class, give half of them identical calculators of the "pocket slide rule" capability. Give the other half of the class identical slide rules. Let them practice with their respective implements for at least a month, and them give them an exam and see what mark differential, if any, exists. For monetary reasons, the University is not likely to sponsor such a venture, even under reasonable assurances of retrieving all the equipment on loan. I have only ever been involved in writing one test and/or exam in which we were asked (NOT required) to indicate on our papers whether or not we used a calculator. It was a relatively small class, with many different types of calculators being used. There was a difference at the end of about ten percent (in favour of the calculators). This, however, could easily be due to the better students being more adept at realizing the advantages of a calculator, and being more prone to obtaining one.

The foregoing list for "Pro" and "Con" is by no means exhaustive. However, there is one question that is still important (and usually not mentioned)...is it still ethically correct to allow the usage of any form of calculator, unless they are all supplied and/or standardized in some manner? Even down to slide rules? Consider the following:

Few people will disagree that allowing an HP-65 (with suitable program cards) on a statistics exam would give its user a large boost. Very well, no programmable calculators. But what of other exams in which large numbers of trig and log evaluations must be performed? Would not this speed advantage over slide rules or tables be largely detrimental to non-users? If so, we ban them and go all the way down to four-function calculators. However, one can still draw the parallel with trig and logs to multiply and divisions. Out they go.

In fact, one can even extend this argument to include slide rules. A fifty dollar slipstick is going to have a lot more going for its user than a four dollar slide rule. Mind you, you can obtain slide rules (and tables) for exam usage from the University (most of the time, anyway).

Granted, the above line of reasoning is very critical and cynical, as well as being cheesy to boot! But it does show that it is not very easy to say where one should draw the line. It is doubtful that any such division of implements will be fair to everybody (unless EVERYTHING is banned).

I note that last week's BURLOAF's list of habitual tool users did not include hacks (psycho, psychic, or otherwise), though one of them is apparently close enough to human to contract both bronchitis AND pneumonia. Fortunately, said hack is now out of hospital, and recovering well. Mind you, it took a large effort to interrupt the insane chirring of the fourth floor hack brood long enough to inform them of (they didn't notice) the absence of one of their number. Apparently, their psychic powers do not extend to such trivialities. Of course, psychic powers only work when a mind is involved. I worry not about the BURLOAF's fears he stated last week.

On to more trivia before the good news. There seems to be a race developing in the hollowed realm of MATHSAC. Which will arrive first? The T-shirts? Antical (suit and all)? Or Christmas?

4

(cont'd on p7)

WHAT'S THE GRIDWORD?

GRIDCOMMENT

As an added feature to this week's gridcomment we are presenting not just the name of this week's T-shirt winner, but the entire list of names (in alphabetical order) of every single person who submitted a correct solution to last week's gridword:

--> LORNE GERSHUNY <--

From this vast collection of names was chosen, completely at random (by flipping a one-sided coin), this week's winner, who is:

--> LORNE GERSHUNY <--

In order to be absolutely complete, we will now formally exhibit -to view the full list of all those people who submitted _incorrect_ solutions:

--> D. MCINROY <--

Of all the incorrect submissions, probably the worst was that of

--> D. MCINROY <--

who succeeded in getting all but one of the thirty-two clues wrong. Mr. McInroy also reminds us that this is the last chance of the term to submit a gridword solution. Therefore, included in this issue are _two_ gridwords. That's right, now you the reader have _two_ chances to win a MathSoc T-shirt.

Not only that, but one of the gridwords is probably the simplest grid ever. The solution isn't in the form of words, letters, or even Roman Numerals. The answers to this gridword are mere binary numbers (1, 10, 11, 100, 101,...). All the arithmetic required to obtain the solutions to the clues is therefore also in binary. What could be simpler?

SOLUTION TO LAST WEEK'S GRIDWORD

SIRIUS BUSINESS

On Thursday November 20th, the Sci-Fi club held its first meeting. The club is currently being run by Mike Wallis of Scisoc. This meeting was eagerly attended by 33 science-fiction nuts.

Discussion centred around activities the members would like to see the club run. The formation of a lending library of members books with a listing of all books owned by the members was agreed to be of top priority. Other functions worth noting are: a writer workshop with a guest writer visiting, a fanzine (SF magazine and newsletter), and SF movies. Committees have been formed to look into all these activities.

Most of these activities will not get underway until next term, with the exception of the movies. A movie (THX-1138 or Silent Running) will hopefully be shown December 4th. A constitution is currently in the process of being drawn up and should be finished by the end of the term. Meetings are held every Monday and Thursday at the Campus Centre in rooms 113 and 135 respectively at 7 pm.

For information contact Mike Wallis at the Scisoc office in the Chemistry-Biology Link, or on the 'bun (userid scisoc).

See ya there.

All answers are positive _binary_ integers with no leading zeros.

CLUES

4 horizontal	=	4 vertical + 1 vertical
10 horizontal	=	3 vertical ** 30 horizontal
20 horizontal	=	35 horizontal x 16 horizontal
33 horizontal	=	23 horizontal + 31 horizontal
33 horizontal	=	8 vertical + 11 vertical
2 vertical	=	4 horizontal + 1 vertical
9 vertical	=	24 vertical + 13 horizontal
12 vertical	=	15 vertical + 19 vertical
17 vertical	=	6 vertical x 25 horizontal
21 vertical	=	17 vertical + 14 horizontal

NAME _____ ID _____ PHONE NO. _____

5
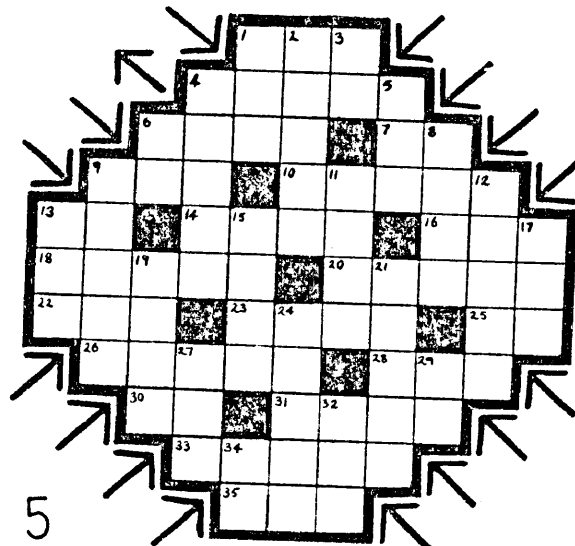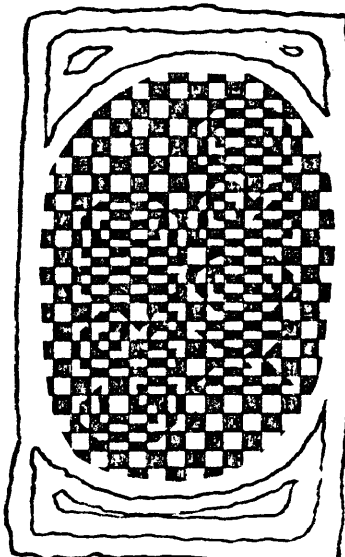
This will be the last problems section of the year so the solutions to this week's problems will not be printed until next January so you should have a bit more time to work on these than usual. You'll be happy to know (we hope) that the problems section will still be around next term. Solutions or new problems can be placed in the mail box outside the 3rd floor lounge or can be sent to userid "mathnews" via mail on the Honeywell. It is preferable, though not compulsory, that proposed problems be accompanied by a solution if one is known. We are receiving many more solutions than new problems so if you know of any interesting problems you would like to see printed, please send them on in.

This Week's Useless Fact: Did you know that Funkcialaj Ekvacioj is "functional equations" in Esperanto?

We have learned the names of all the winners of the Special K and Big E contests held recently so here they are. The Special K contest was won by David Petroff and Peter Peng who tied for 1st place and Misha Sandberg placed 3rd. Honourable mention goes to Peter Laengert, Peter Walker and John Neilfor. As mentioned last week, the Big E was won by Rick Cameron, with Greg Fee and Greg Barnes placing 2nd and 3rd respectively. Congratulations to all the winners from mathNEWS. (It should be noticed that most of the winners are regular or part-time contributors to this section). Notice to all students interested in writing the Putnam on Dec.6: Since the results of the Big E were not sufficient to decide on a Putnam team, there will be a short contest (approx. 2 hrs. and 4 questions) held Nov.29 (that's tomorrow) starting at 10:00 a.m. to determine who will be on the team. It will probably be held on the first floor in the same rooms in which the Special K and Big E were written, but if you can't find anyone there, try outside Prof. Klamkin's door (MC 5187). Try to be there 10 min. early to give everyone a chance to get set up.

And now, on with...

Some uneasy

Problems

Q22. Submitted by S.C.L.
Let $A = \sqrt[4]{2 + \sqrt{5}} + \sqrt[4]{2 - \sqrt{5}}$.
Evaluate $\int_{-1}^{A}(\sin \pi x)(\cos \pi x^2)dx$.

Q23. Let P be a point inside $\triangle ABC$. From P drop 3 perpendiculars to the sides BC, CA and AB to get the points A', B' and C' respectively. Then drop 3 perpendiculars to the sides B'C', C'A' and A'B' of $\triangle A'B'C'$ to get A", B" and C" respectively. Finally, let the perpendiculars to the sides of $\triangle A"B"C"$ intersect B'C', C'A' and A'B" in A"', B"' and C"' respectively.
Show that $\triangle ABC \sim \triangle A"'B"'C"'$.

Q24. Factor $x^{2n} - a^{2n}$ into n real factors.
Also factor $x^{2n} + a^{2n}$ into n real factors.

Q19. Solution by Rob Tibshirani.
We have defined $s_n = a_1 + a_2 + \ldots + a_n$, where the a_i's are real numbers. Consider the n real numbers $1 + a_i$, for $i = 1,2,\ldots,n$. Using the arithmetic-geometric mean inequality on these, we get
$$[(1+a_1)(1+a_2)\ldots(1+a_n)]^{1/n} \leqslant \frac{(1+a_1) + (1+a_2) + \ldots + (1+a_n)}{n}$$
Note: This only holds if $a \geqslant -1$ for all i, something we forgot to mention in the original problem but which several of our astute readers were able to recognize nevertheless.
Hence, $(1+a_1)(1+a_2)\ldots(1+a_n) \leqslant ((n + s_n)/n)^n$
$$= (1 + s_n/n)^n = \sum_{k=0}^{n}\binom{n}{k}\left(\frac{s_n}{n}\right)^k$$
$$= \sum_{k=0}^{n}\left(\frac{1}{k!}\right)\frac{n(n-1)(n-2)\ldots(n-k+1)}{n^k} s_n^k$$
$$= \sum_{k=0}^{n}1(1-1/n)(1-2/n)\ldots(1-(k-1)/n)[s_n^k/k!]$$
$$\leqslant \sum_{k=0}^{n}\frac{s_n^k}{k!}$$
There is equality only when $a_i = 0$ for all i. Solutions were also submitted by A. Many Fold using the above method, and by Greg Fee and S.C.L. by comparison of terms.

Q20. Solution:
$$1 + x + x^2 + \ldots + x^{n-1} =$$
$$\frac{x^n - 1}{x - 1} = \prod(x - \cos\frac{2k\pi}{n} - i\sin\frac{2k\pi}{n})$$
Putting x= 1 gives $n = \prod_{k=1}^{n-1}(1 - \cos\frac{2k\pi}{n} - i\sin\frac{2k\pi}{n})$
$= \prod(2\sin^2\frac{k\pi}{n} - 2i\sin\frac{k\pi}{n}\cos\frac{k\pi}{n})$
$= \prod 2\sin\frac{k\pi}{n}(\sin\frac{k\pi}{n} - i\cos\frac{k\pi}{n}) = \prod 2\sin\frac{k\pi}{n}(-i)(\cos\frac{k\pi}{n} + i\sin\frac{k\pi}{n})$
$= (\prod 2\sin\frac{k\pi}{n})(-i)\; cis\frac{\pi}{n}cis\frac{2\pi}{n}\ldots cis\frac{(n-1)\pi}{n}$
$= (\prod 2\sin\frac{k\pi}{n})(-i)\;(cis\pi)^k(cis\pi)^{2/n}(cis\pi)^{3/n}\ldots(cis\pi)^{\frac{n-1}{n}}$
$= (-i)^{n-1}(cis\pi)^{\sum\frac{k}{n}}\prod 2\sin\frac{k\pi}{n} = (-i(cis\frac{\pi}{2}))^{n-1}\prod 2\sin\frac{k\pi}{n}$
$= \prod 2\sin\frac{k\pi}{n} = 2^{n-1}\prod\sin\frac{k\pi}{n}$

Solutions also submitted by Greg Fee and A. Many Fold (using Gauss' multiplication formula-why do you use gamma functions to solve everything?????)

Q21. Solution for Heron's formula
$(area)^2 = (ah)^2/4$, $x^2 + h^2 = c^2$ and $(a-x)^2 + h^2 = b^2$
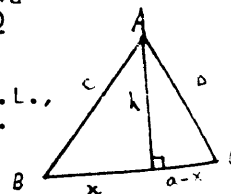Hence $x = (a^2 - b^2 + c^2)/2a$
$h^2 = c^2 - x^2 = \frac{4(ac)^2 - (a^2-b^2+ c^2)^2}{4a^2}$
$= \frac{(b^2 - (a-c)^2)((a+c)^2 - b^2)}{4a^2} = \frac{(b-a+c)(b+a-c)(a+c-b)(a+b+c)}{4a^2}$
Thus $area = \frac{(b+c-a)(a+b-c)(a+c-b)(a+b+c)}{16}$
$= s(s-a)(s-b)(s-c)$. qed.
Elegant solutions also submitted by S.C.L., Greg Fee, Greg Barnes and Rob Tibshirani.

Q13. Finally, the anxiously awaited solution to Q13:
Show that $\prod_{k=1}^{\infty}\frac{8k(2k+1)}{16k^2+8k+1} = \frac{1}{2}\int_{0}^{\frac{\pi}{2}}\frac{d\theta}{\sqrt{1-\frac{1}{2}\sin^2\theta}}$

$\int_{0}^{\frac{\pi}{2}}\frac{d\theta}{\sqrt{1-\frac{1}{2}\sin^2\theta}} = \sqrt{2}\int_{0}^{1}\frac{dx}{\sqrt{1-x^4}}$ (let $x = \cos\theta$)

$= \frac{\sqrt{2}}{4}\int_{0}^{1}t^{-3/4}(1-t)^{-\frac{1}{2}}dt$ (let $t = x^4$)

$= \frac{\sqrt{2}}{4}B\left(\frac{1}{4},\frac{1}{2}\right) = \frac{\sqrt{2}}{4}\frac{\Gamma(\frac{1}{4})\Gamma(\frac{1}{2})}{\Gamma(\frac{3}{4})} = \frac{\sqrt{2}}{4}\frac{\Gamma(\frac{1}{4})\sqrt{\pi}\sin\frac{\pi}{4}\Gamma(\frac{1}{4})}{\pi}$

$= \frac{[\Gamma(\frac{1}{4})]^2}{4\sqrt{\pi}} = \frac{4}{\sqrt{\pi}}(\Gamma(\frac{5}{4}))^2 = \frac{4}{\sqrt{\pi}}\lim_{n\to\infty}\left(\frac{n!\;n^{1/4}}{\frac{5}{4}\cdot\frac{9}{4}\cdot\frac{13}{4}\cdots\frac{4n+1}{4}}\right)^2$

$= \frac{4}{\sqrt{\pi}}\lim_{n\to\infty}\frac{4^n\;4^n\;n!\;n!\;n^{1/2}}{5\cdot5\cdot9\cdot9\cdots(4n+1)^2}$

6

$$$$$$$$$$$$$$$.¢¢

It is my solemn duty to report upon the embarassing success of the coffee & donut stand located in the 3rd floor math lounge. This Math Society "sponsored" venture employs over thirty persons, distributing over $250/week to them. The intent is a non-profit service but good management (at least not bad management) can turn a fairly respectable profit. This term my costs went up, I raised wages and salaries, left prices at previous levels, and business increased about 40% over last winter (which was itself a record). Several reasons can be cited for the rise in business - #1 is the fact that prices are reasonable, if not low (the others won't be alluded to for the sake of modesty).

Preference is given to math people for c&d positions - manager gets $35/week, assistant $20, workers $2.25/hour (usually 3 or 4 hours/week). The salaried positions are appointed by the Math Society Council and workers are signed up and scheduled at the responsibility of the manager. ("Manager and assistant for next term have just been elected - Joe Lifshitz & Liz Alldrick.)

For aspiring corporate executives c&d operation provides an excellent opportunity for self-training. Everything can, will, and does go wrong. More than several classes had to wait for culmination of some emergency.

Returning to this term's events, I confess to having earned a profit of $1200 (3% of gross revenue). Some of this will be redistributed in the form of end-of-employment bonuses but the rest will be spent, on my direction, for the improvement of the music piped into the lounges. I must thank my clientel for their business, on their honesty (this issue contains the only indication of improbity I've come across this term, I guess that you realize that we're not trying to rip you off), and their understanding when things went wrong. My only criticism is that my customers rarely complained. Without feedback it is difficult to improve (for instance how do you like the new kaisers just introduced?).

Anyway, academically I took a beating, but gained a great deal of sought after experience. c&d will continue operations until Dec 12 on the same schedule and resume first week of classes in the new year.

<div align="right">hugh</div>

$$ = \frac{4}{\sqrt{\pi}} \lim_{n\to\infty} \frac{4\cdot 8\cdot 12\cdots 4n}{5^2\cdot 9^2\cdots (4n+1)^2}\cdot n^{1/2}\cdot \frac{2^n\, n!\,(2^n\,3\cdot 5\cdot 7\cdots (2n+1)}{3\cdot 5\cdot 7\cdots (2n+1)} $$

$$ = \frac{4}{\sqrt{\pi}} \lim_{n\to\infty} \frac{4\cdot 6\cdot 8\cdot 10\cdots (4n+2)}{5^2\,9^2\cdots (4n+1)^2}\cdot \frac{2\cdot 4\cdot 6\cdots (2n)}{3\cdot 5\cdot 7\cdots (2n+1)}\, n^{1/2} $$

$$ = \frac{4}{\sqrt{\pi}}\cdot \frac{\sqrt{\pi}}{2} \prod_{k=1}^{\infty} \frac{8k\,(2k+1)}{16k^2+8k+1} $$

Using Wallis' Product $\sqrt{\pi} = \lim_{n\to\infty} \frac{2\cdot 4\cdot 6\cdots (2n)}{1\cdot 3\cdot 5\cdots (2n-1)\sqrt{n}}$

This solution is from Greg Fee (since no one submitted a more elementary solution). Solution also submitted by A. many Fold (using results Gauss, Legendre and gauss again)

It's too late to do anyone any good, but the Computer Science Club (by the time you read this) will have actually done something for a change. The CSC has organized a tour of the Computer Research Facility at the University of Toronto, which is heavily involved with computer graphics and animation. For one, REAL S*P*A*C*E*W*A*R ! And the tour will meet none other than (are you ready?) FULLDUPLEX! When the CSC finally comes up with something, it's a real winner.

Finally, some good news for all of you who have waded through this long article.
- This will be the last HALFDUPLEX column to grace this otherwise horrible rag in the foreseeable future.
- I am leaving for parts unknown at the end of this term, and I am not sure if and when I am returning. I am not leaving campus for a work term or anything so mundane. Hopefully, you will get a reasonable replacement (a column of blank paper should suffice) for my somewhat irregular articles. And now, some closing GROOKS by Piet Hein:

TO THE HACKS:
> The human spirit sublimates
> the impulses it thwarts.
> A healthy sex life mitigates
> the lust for other sports.

TO MAMALCOLM AND HIS ELECTRIC CHOOCHOOS:
> It ought to be plain
> How little you gain
> by getting excited
> and vexed.
> You'll always be late
> for the previous train,
> and always in time
> for the next.

TO AMZADOR:
> Those
> who can write
> have a
> lot to
> Learn from those
> bright
> enough
> not to.

TO MY GHOSTWRITER:
> We ought to live
> each day as though
> It were our last day
> here below.
> But if I did, alas, I know
> it would have killed me
> long ago.

TO LUDWIG:
> Philosophers
> must ultimately find
> their true perfection
> In knowing all the follies of mankind
> By introspection.

<div align="center">Auf Wiedersehen.</div>

<div align="right">Ludwig von Zopffaull</div>

unclassifiable
ADS

Waterloo Pubs in Toronto

As is traditional, Waterloo'ers (especially co-op) residing in Toronto will be having their weekly pubs again next term. Contrary to tradition, though, we are trying a switch to Wednesday night (from thursday) since most pubs do not have cover charges that night. The first gathering will be held Jan. 7, 1976 at the Nickelodeon on Yonge Street (just south of Dundas subway station). Names and phone numbers will be taken then, and pub preferences for future dates discussed. Come dressed recognizable as from Waterloo if you don't know any regulars. Ron (Wloo 745-2027)

Free Bed
Absolutely No Chicanery
309 Glenridge Dr.
Waterloo Phone 884-2306

LOST calculator (Texas Instruments) at about noon Tuesday Nov. 18, possibly in Math building. If you have found one, please contact Dave at 884-9668 or send note to Village 1 W5-108.
David Morton 72016500

Attention Persons Buying C.A. T-Shirts

Due to unforseen circumstances T-shirts will not be ordered this term!
To get your money refunded, bring your I.D. card to the Accounting Lab (Humanities Rm 236) at one of the following times:
  Mon Dec 1   9-10 am
- Mon Dec 1   7-10 pm
  Wed Dec 3   9-10 am
- Wed Dec 3   7-10 pm
· Thu Dec 4   7-10 pm
If you cannot come at any of these times, either see Larry Hancock (if you can find him) or call 885-0108 and arrange to pick it up somewhere.
Note: Refund will only be given if I.D. card is presented.
These same shirts (with slight modifications) will probably be ordered next summer!

Science Fiction Club Meetings -- Campus Centre -- mondays rm. 113 -- thursdays rm. 135 -- 7 pm.

LOCKER$

Because of the scramble for lockers each term, MathSoc is planning to put in more of them. Some of the prices we've been quoted are in the neighbourhood of $2400 + installation for 162 more lockers. MathSoc can afford to install a certain number of lockers per year, but at those prices it will take about 10 years before we can provide enough lockers for everyone. Are you willing to rent your locker for a $1 a term to generate more money for more lockers? WE NEED FEED-BACK!! Send mail to mathsoc, mathnews, or come into the office and tell us.

SIR RISTO REPORTS

(THE WHITE KNIGHT RIDES AGAIN)

Well, if any of you caught the November issue of n-gin-ooze (I hope that none of you read that smut, it's just that we at Mathsoc are forced to read it in order to be kept aware of enemy troop movements), you will have seen that the n-gineers have apparently completely given up trying to put a newspaper together by themselves. Instead they are stealing articles from class newspapers of the highest calibre such as the #1 newspaper on campus. I am of course referring to their reprint of the "October Crisis '75" which appeared on the front page of mathNEWS three weeks ago.

I wonder where they will stop. Next month they'll probably publish our gridword! It must also be noted that their typist made several major typing mistakes. Not only did they commit the penultimate sin of spelling "mathNEWS" as "MathNEWS", but they went even further and capitalized the "a" in "artsoc". When will these guys ever learn?

You may also have noticed in that particular issue of n-gin-ooze an article in which the n-gineers claim that they are controlling U of T's well-known n-gineering newspaper "Toike Oike". The reality is that in fact n-gin-ooze is virtually a subsidiary of the Toike Oike. Most of each month's n-gin-ooze has already appeared in the Toronto paper; very little comes from the bowels of n-gineering 4. I'd go on cutting up n-gin-ooze, but how much can you say about an n-gineer? Not much.

Moving on to other topics, those of you who missed Mathsoc's wine-and-cheese parties, pubs, and semi-formal this term will get one final chance. Next Wednesday (December 3) from 8 pm to 1 am, Mathsoc is holding its annual Christmath party in the faculty lounge (MC 5136). The tickets are free and can be picked up at the Mathsoc office. It should be a good time and there are rumors that Santa and his reindeer are going to show up to distribute gifts to lucky celebrants.

Note to anybody who catches the reindeer with the red nose: please dump him in the nearest on-campus mailbox addressed to John Shortall, c/o Federation of Students.

In a more serious vein (yes, I can be serious sometimes), the news file on the Honeywell tells us of a Varian paper shortage. It seems that MFCF is just about out of this specially treated paper which costs $50/roll. Every supplier of this non-recyclable paper with whom we have dealt with in the past is also out of it. Math 474a has an important assignment in the near future which has to be done on the varian. From honeybun it is possible to display your plot on a tektronix terminal, of which there are only five in the building - two behind locked doors, one in the statistics classroom (you know, the 3rd floor classroom with all the funny looking t.v.'s), one hardwired to the Computing Centre (thus forget it), and one in the mini-computer lab. So the outlook is bleak. Wonder how it will resolve itself.

And now for something completely different: intense investigation has revealed the brown liquid which was dripping into MC 2066 was in fact not C&D coffee as was first suspected. A team of five investigators from Physical Resources discovered that the cause was a leaking sewage pipe, which has since been repaired. On this cheerful note I'll see you next summer unless I can rig it otherwise.

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.

COUNCIL FAILS

Antical '75 (fall courses), as far as I am concerned is completed, done, finished - like my hopes of graduating at the end of this my 5th year. Starting Sun. Nov. 19 I drew up a schedule for surveying classes. On Tues. Nov. 11 Math council ratified my position as Antical coordinator and by this asserted their participation in the operation. Thus they were reminded of their obligations to help and get the survey done.

Wed. Nov. 12 began with my 8am arrival at Mathsoc (the usual time I open the office). During the next 20 min. I frantically stuffed large, manilla envelopes with the DO-IT-YOURSELF Antical Kit (kindly put by one of my profs) complete with heaven knows (the master time schedule) how many questionaires, umpteen pencils, a qualified number of mark-sense cards (with exceptions) and a restructured prof questionaire (thanks to Peter Lee). Catching my breath at 8:20, I was off and running to deliver the first of the survey to seven classes. It was from this I was to discover the apathy of the math council and the little concern they had for getting Antical done was evident in the following days as the popularity for 9-5-2 (a card game) blossomed in the office. This left me with a lot to do and very little time to do other things (especially school work).

I am really grateful to those profs and students who did assist me. A special mention to Prof Graham and Prof Cowan who surveyed their 600 132a students on the same day; Steve Risto and Kevin Willis who helped with all aspects of the organization.

I give my regrets to those profs who refused to let their class participate in the survey. The complaints were numerous and these classes were encouraged to complete the survey without the prof's approval.

If possible all classes were given three chances to complete the survey or give a reasonable alternative date to do it, otherwise action would be taken. I believe I was fair and polite about everything. If your class was not done at all three reasons are given (a) it was too small a class (b) it was too far to walk e.g. E4 2387b (c) no one around to do it.

To those profs who were put out because of nasty things said about them in the last Antical and possibly this one being printed, I say that the comments made by a tired, overworked, frustrated, irate co-ordinator are far more damaging.

For example: class 464a with prof Davis on Tues and Thurs in MC3011 were under the impression that if I found no Antical package in the room after class that I would forget about them or believe it wasn't delivered in the first place. Wrong!! The survey was delivered on 2 separate days yet was not found after class nor did it find its way back to Mathsoc. When this happens I take this childish attitude seriously. There are only 6 in the class and if they refuse to complete the questionaire, there is not much I can or will do. No student is forced to do Antical. It is for those students who find it important that it is done. If you have a beef about Antical I want to see you in a Mathsoc office, otherwise refusing to answer the questionaire for someone else's benefit is meaningless to me. I have never used Antical nor have I taken the time to carefully study the contents of any one of them in my four years here. However I have answered the questionaire each time it came to my classes, long before my involvement with Mathsoc in 4b. I completed Antical because I was asked to do for others who found it useful and wanted the information of which I was a part.

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Antical results of '74 now at the printers will be completed by next week (that is the news as of Tues. Nov. 25) as we are going ahead and printing the book as planned.

Direct all questions, complaints, comments, suggestions to Gary Prudence - Antical Coordinator, Mathsoc vice-president, Creative Arts Board Chairperson.

CLOSE CALL

I would like to congratulate the two "young gentlemen" (and I use the term very loosely) who STOLE the six kaisers from the coffee & donut stand today (Nov. 20 12:30). They hunched over the containers as if to select the desired variety & quickly stuffed their jackets with 5 or 6 sandwiches. One kaiser was paid for just to make it look good, and the "job" was pulled off very successfully. I wonder if these two idiots are as ingenious in their course work!

It's so refreshing to see assholes like this around abusing every system possible. My only regret is that I didn't make a scene and expose the two thieves.

A dogged WISH

I wish the Society for the Prevention of Cruelty to Aspiring Mathematicians would find the goodness in their collective heart - and the cash in their coffers - to present Prof. J.G. Kalbfleisch with a pocket flashlight so that future generations of second year statistics classes will never again suffer the indignity of calculating the probability of his finding a matching pair of socks in the dark.

Plebeian Dog

9

Questionnaire

Following this paragraph is a list of mathNEWS's regular (or semi-regular) features. Now, you're probably sitting in your Friday class bored out of your skull. Well, here's an opportunity to have some fun! Simply rate the different sections on a scale from 0 to 10. 10 implies that you love the feature and always read it. 0 implies that you hate it and never read it. Please feel free to comment on any section that you wish. What fun gang! Just pop it in the mathNEWS mail box, on the 3rd floor opposite the lounge, and you're done! Now let's get some response on this one so that we'll know what you want! So without further ado, let's play the mathNEWS rating game!

BURLOAF ___

FEEDBACK ___

GRIDWORD ___

JJLONG REPORTS ___

MASTHEAD ___

MATHLETICS ___

MYTHLETICS ___

SIR RISTO (October Crisis '75) ___

SOME UNEASY PROBLEMS ___

THE DAY STOCKER ___

UNCLASSIFIED ADS ___

WOMEN IN MATH ___

Would you like to see any of these features expanded?

Would you like to see any of the features deleted or shortened?

Is there any other feature which you would like to see in mathNEWS?

The Day Stocker

I was horrified to read in the last issue of mathNEWS of the terrible thing that is being done to our pigeons; turning them into the "guts" of the 'bun. It really started me thinking, and the more I thought - the more worried I became.

Assuming pigeons have souls (I'm not going to try to define "soul"), then pigeon-brained-computers (like the 'bun) should have electric souls. I'm wondering what would happen in the event of a power failure. Conceivably these electric souls would become disembodied (electric pigeon ghosts, in other words) (electrifying news!) flitting around the campus dropping ghostly electric pigeon fertilizer (how shocking!).

I can see it now: pigeon ghosts would fly through the walls and dive bomb us as we sit at the 'bun terminals straining our minds at messages like

c
 r
  a
   s
    h

This of course would short out the terminal (the dive bombing, not the crash).

So rally 'round the flag; arise and save our pigeons from a fate worse than death! Maybe it's already too late. That might explain some things around here.

To our illustrous (ie. without lustre or not bright) editor: farewell until the spring term. To BANANACEKMATE: thanx too much for last week's article. To all my readers: see you in May (if you're still here).

Donna: here's your name in print (at last).

---> DONNA <---
Beware the fearsome four G's.

Coldstack

This is the masthead of the term, as a matter of fact the last hmm..let me start again....this is the last masthead this term. be sur and fill in the questionaire to the left...it might help us improve our issues when we start our 4th year of publication Let us not waste space on such major details as the fact that mathNEWS is the only all-volub-teer staffed weekly paper on campus. With a bit of luck 1300copies of this issue will come forth from Graphic Services(the Speedy King of last week). .....Now for our trivia, rumour and stuff we forgot department... recent acclamations to mathSoc Council were Ron Hipfner; Ingrid Splettstosselesser; Jim Supple and Jackie Hearne......Positions are still open for C&D manager & asst manager in the summer time....special note to those who wrote into mathNEWS feedback....we normally publish only feedback for which we know the authors name....for the results of the K & E tests see page 6....the math council will be meeting on dec 16 to discussio/ cahnges in the drop/add period and changes in the academic requirements....show up if you aren't wriiting an exam....mathSoc & mathNEWS currently do not have any material to correct my spelling efforts at this hour of 749am.....we present the masthead awards....one to Gary Prudence to his excellent and often lonely efforts in doing this term's survey for antical......one to Randall S McDougall for his excellent paint job of the mathSoc wall.....flash---the second gridword in this issue is on page 14.....the C&D manager for the winter term is Joe Lifshitz ...the C&D asst for winter is Liz Alldrick....there is a method of using algol on the bun without quotes.... oh well lets get around to this issue...we started off with 5 dozen donuts and then went thru a dozen hot dogs which still did statisfy no the mob of....RICK SIMPSON this week's rookie; BuN MILLS need i say less; RON all-night-filler-generator HIPFNER; BILL FLOWERS who has just dashed off to a great Village breakfast; TOM KEITH a binary editor; STEVE RISTOzero;GARY watch what you say PRUDENCE; PETER picked a peck of pickled RAYNHAMs; hexad; DAVE luckless GILLETT; MIKE scifi DILLON; Gary locked DRYDEN; J.J. mentally absent LONG; MATTHEW its all his fault SMITH; MARK out front BRADER; RANDY an all-night-diseasy-problem MORRISON; RANDALL waS up a tree McDOUGALL; and(your choice mark) DENNIS you-can-do-me MULLIN our intrepid editor..... ....now for some more odds and ends... the person we kept leaving out of mastheads is(was) JWAUSTIN(who was quite a cast at the time)...the correct spelling last week was Cathy Potter....the proposed math averages to get a degree in math are.......... .. Pass-50%...General-60%...Honours-70%.....well another term is over and I'd like to thank all 37 people who worked on mathNEWS this term at one time or another...plus all are contributors...and for the good work from Graphics Services....its certainly been an interesting term as we were flooded with new workers....for those of you who wish to remain up to date then you may do the following on the bun----1 mathnoos/news ----it gives you the latest news....special thanks go out to Mark Brader and Randall McDougall for their great help...thanks also go to ACP,Ingrid,Don,torch,JJ,GG,Randy,Mike,Dave,Peter,Gary,Cathy,Kathy-X Jody,Keith,Tom,Bill,Kathleen,Diane,Bob,Ron alias....,Silenius alias....,Paul,Sylvia,Lloyd,Frank,Rick,Bruce,Matthew,Steve,Rick, John alias face,Jane,Chris,et all
It is now 903am and the <u>final</u> line. Nite all.

10

Good luck to the mathNEWS workers next term(they'll need it).