

MATH WHERE YOU'D LEAST EXPECT IT, BUT THEN, IT'S FROM LEWIS CARROLL

Lewis Carroll, AKA Charles L Dodgson (CLD), was a math lecturer at Oxford University. Besides the Alice books, he also wrote about nearly every subject imaginable: politics, theatre, religion, university administration, and on and on, publishing 100s of small pamphlets, extensive diaries, and 1000's of letters, especially to children. The whimsical Lewis Carroll constantly influenced the serious Charles Dodgson. Throughout his writing, he'd use concepts from mathematics in amazingly creative ways. I've been collecting examples for a long time and when I discovered I could not even begin to share it all in a 6 minute presentation, I decided it'd make the perfect gift, to give all of you a sample of how he infused all branches of mathematics into non-mathematical topics. Enjoy!!

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J. F. HERRING PAINTER

THE SCANTY MEAL.
from the picture in the Vernon Gallery.

E. HACKER. ENGRAVER.

Made as a
teenager for his
family magazine,
RECTORY
UMBRELLA.

"to illustrate the
evils of
homeopathy"

Please'm cook says there's only a billionth of an ounce of bread left, and she must keep that for next week!

Go and order a trillionth more at the baker's.

Which did you say love! a thousandth, or a millionth of an atom?

I must really get stronger glasses, this is the second nonillionth. I've not seen

I'm afraid there's more than half a particle of beer here. If so, I haven't drunk it.

Ma! ought Sophy to have another molecule? I saw the last she had distinctly!

THE SCANTY MEAL

Fractions, Decimals, and Big Numbers

“Children are
three-fourths of my life”

as quoted by Isa Bowman in *The Story of Lewis Carroll*, by Isa Bowman

Here he uses repeating decimals seemingly just to get Dorothy's attention. In this case, $.99999... = 1$ is counterintuitive, but I'd guess that Dorothy will never forget it after this!

Nov 11, '96

There my dear Dorothy,
.....I write to ask whether you are disengaged for
next Saturday evening, and if so, whether I may
fetch you at $6\frac{1}{2}$, to one of my grand dinner -
parties.

Do not be alarmed at the *number* of the
guests: it will be $.99999\&c$. It *looks* alarming, I
grant: but circulating decimals lose much of their
grandeur when reduced to ... fractions!

$$.99999\&c = .\bar{9} = 1$$



He wrote so many letters that he invented a case for organizing stamps. And he included a little booklet with advice for writing letters. Here's three of the "wise words".

RULE #2: Don't fill more than a page and a half with apologies for not having written sooner.

RULE #3: *Don't repeat yourself.* When once you have said your say, fully and clearly, on a certain point, and have failed to convince your friend, *drop that subject*: to repeat your arguments, all over again, will simply lead to his doing the same; and so you will go on, like a Circulating Decimal. *Did you ever know a Circulating Decimal come to an end?*

RULE #5: If, in picking a quarrel, each party declined to go more than *three-eighths* of the way, and if, in making friends, each was ready to go *five-eighths* of the way, —why, there would be more reconciliations of quarrel!

July 21, 1876

My Dear Gertrude,
.....I send you seven kisses
(to last a week) and remain
Your loving friend
C. L. Dodgson.

My Dear Amy,

..... Also I send two kisses and a half,
for you to divide with Agnes, Emily, and
Godfrey. Mind you divide them fairly.

Yours affectionately,
C. L. Dodgson

April 19, 1878

My Dear Gertrude,
Your loving friend
C. L. Dodgson.
I send you $4\frac{3}{4}$ kisses.

April 13, 1878

My Dear Gertrude,
..... I send you 10,000,000 kisses, and remain
Your loving friend
C. L. Dodgson

August 15, 1892

My Dear Alice,
.....I send my best love, for you to
divide with your brother: and I
would advise you to give two-thirds
to him, and take three-quarters for
yourself
Yours affectionately,
C. L. Dodgson

Any form of exaggeration generally
called from him a reproof, though he
was sometimes content to make fun.
For instance, my sisters and I had sent
him "millions of kisses" in a letter.
Below you will find the letter that he
wrote in return.

Isa Bowman

I have included nearly the whole of his
response to Isa because of how clearly
he's able to explain why "millions of
kisses" is impossible.

seen.
Please give my kindest
regards to your mother, and
 $\frac{1}{2}$ of a kiss to Nellie, & $\frac{1}{200}$
of a kiss to Emie, & $\frac{1}{2000000}$
of a kiss to yourself
So, with fondest love, I am,
my Darling, your loving Uncle,
C. L. Dodgson

Ch. Ch. Oxford
Ap. 14. 1890.
My own Darling,
It's all very well for you
& Nellie & Emie to write in
millions of hugs & kisses, but
please consider the time it
would occupy your poor old
very busy Uncle! Try hugging
& kissing Emie for a minute
by the watch, & I don't think
you'll manage it more than
20 times a minute. "Millions"
must mean 2 millions at least.
$$\begin{array}{r} 20 \overline{) 2,000,000} \text{ hugs \& kisses} \\ 60 \overline{) 100,000} \text{ minutes} \\ 12 \overline{) 1,666} \text{ hours} \\ 6 \overline{) 138} \text{ days [at 12 hours a day]} \\ 23 \text{ weeks.} \end{array}$$

I couldn't go on hugging &
kissing more than 12 hours a
day. & I wouldn't like to spend
3 Sundays that way. So you see
it would take 23 weeks of
hard work. Really, my dear
(child), I cannot spare the time!

CLD was the 3rd of 11 children, a big family. We know that he was somewhat lonely and was bullied by other children. Not much is known about his mother. The letter below (I've included the whole letter), which she wrote to him while she was away caring for a sick relative, was something he treasured for his entire life. And it might explain what motivated him to sign his letters with so many different quantities of kisses. To keep his sisters from taking the letter, he immediately put a rather sad response on the back and treasured the letter his whole life.

My Dearest Charlie,

I have used you rather ill in not having written to you sooner, but I know you will forgive me, as your Grandpapa has liked to have me with him so much and I could not write and talk to him comfortably. All your notes have delighted me, my precious children, and show me you have not quite forgotten me. I am always thinking of you, and longing to have you all round me again more than words can tell. God grant that we may find you all well and happy on Friday evening. I am happy to say your dearest Papa is quite well—his cough is rather *tickling*, but is of no consequence. It delights me, my darling Charlie, to hear that you are getting on so well with you Latin, and that you make so few mistakes with your Exercises. You will be happy to hear that your dearest Grandpapa is going on nicely—indeed I hope he will soon be quite well again. He talks a great deal and most kindly about you all. I hope my sweetest Will says “Mama” sometimes, and that your precious Tish has not forgotten. Give them all my other treasures including yourself, 1,000,000,000 kisses from me, with my most affectionate love. I am sending you a shabby note, but I cannot help it. Give my kindest love to Aunt Dar, and believe me, my own dearest Charlie, to be your sincerely affectionate

MAMA

on the back he wrote:

“No one is to touch this note, for it belongs to C. L. D.
Covered with slimy pitch so that they will wet their fingers.”

MEASUREMENTS....

In a letter to Edith Denman:

....There is a rashness, which I can only deplore, in your assertion that I cannot be as fond of figure-drawing as yourself! The point cannot be settled till we have measured the two fondnesses by the same unit. Now the unit of pleasure (which I suggested years ago, and which Society hasn't yet adopted!) is "the pleasure felt in eating one penny-bun in one minute." Please to estimate the pleasure which *you* get from an hour of figure drawing, using that as a unit, and then we can compare numbers: my number is 235. Trying to settle it without a unit is like arguing about two rooms, each saying, "I'm sure *this* room is the hottest!" without ever referring to a thermometer

From no units to mixing up units:

"And on the dead level our pace is---?" the younger suggested; for he was weak in statistics, and left all such details to his aged companion. "Four miles in the hour," the other wearily replied. "Not an ounce more; he added, with that love of metaphor so common in old age, "and not a farthing less!"

Tangled Tale, Knot 1

Playing With Infinity

'The more noise you make, the less jam you will have, and *and vice versa*'.

And I thought they wouldn't know what 'vice versa' meant: so I explained it to them. I said 'If you make an infinite noise, you'll get no jam: and if you make no noise, you'll get an infinite lot of jam.'

A Tangled Tale, Knot 5

"Come to me, my little gentleman," said our hostess, lifting Bruno into her lap, "and tell me everything." "I ca'n't" said Bruno. "There wouldn't be time. Besides, I don't know everything."

Sylvie and Bruno, Concluded

Using Division by zero

in his report as keeper of the Oxford club's wine cellar:

The consumption of Madeira has been during the past year, zero. After careful calculation I estimate that, if this rate of consumption be steadily maintained, our present stock will last us an infinite number of years. (We) may yet cheer ourselves with the thought of how economically it can be done.

Twelve Months in a Curatorship. 1884

PLAYING WITH TIME

November 30, 1879

I have been awfully busy, and I've had to write heaps of letters-wheelbarrows full, almost. And it tires me so that generally I go to bed again the next minute after I get up: and sometimes I go to bed again before I get up! Do you ever hear of any one being so tired as that?

Your loving friend,
C. L. Dodgson

PROOF BY CONTRADICTION

You are quite correct in saying it is a long time since you have heard from me: in fact, I find that I have not written to you since the 13th of last November. But what of that? You have access to the daily papers. Surely you can find out negatively, that I am all right! Go carefully through the list of bankruptcies ; then run your eye down the police cases ; and, if you fail to find my name anywhere, you can say to your mother in a tone of calm satisfaction, " Mr. Dodgson is going on well."

ON USING STATISTICS

Long and painful experience has taught me one great principle in managing business for other people, viz., if you want to inspire confidence, *give plenty of statistics*. It does not matter that they should be accurate or even intelligible, so long as there is enough of them. A Curator who contents himself with simply *doing* the business of a Common Room, and who puts out no statistics, is sure to be distrusted. "He keeps us in the dark!" men will say. "He publishes no figures. What does it mean? Is he assisting himself?" But, only circulate some abstruse tables of figures, particularly if printed in lines and columns, so that ordinary readers can make nothing of them, and all is changed at once. "Oh, go on, go on!" they cry, stiated with facts. "Manage things as you like! We traust you entirely!"

Three Years in a Curatorship. 1886.

GEOMETRY

My Dear Ethel,
.....it was very nice of you to bring my dear old friend to see me, and when she had vanished from my gaze what had I but mathematical considerations to console me? “She may be limited and superficial,” I said to my myself. “She may even be without depth. But she is at least equilateral and equiangular—in one word, what is she but a Polygon?”!

Using Euclid to make fun of the 1865 Parliamentary elections

The Dynamics of a Parti-cle

CHAPTER 1: DEFINITIONS

- I. PLAIN SUPERFICIALITY is the character of a speech, in which any two points being taken, the speaker is found to lie wholly with regard to those two points.
- II. PLAIN ANGER is the inclination of two voters to one another, who meet together, but whose views are not in the same direction.
- III. When a Proctor, meeting another Proctor, makes the votes on one side equal to those on the other, the feeling entertained by each side is called Right Anger.
- IV. When two parties, coming together, feel a Right Anger, each is said to be COMPLEMENTARY to the other (though strictly speaking, this is very seldom the case.
- V. OBTUSE ANGER is that which is greater than Right Anger.

He used mathematics to explain nearly everything...

- On Saturday Isa had a Music Lesson, and learned to play on an American OrguINETTE. It is not a very handle round and round: so she did it nicely. You put a long piece of paper in, and it goes through the machine, and the holes in the paper make different notes play. They put one in wrong end first, and had a tune backwards, and soon found themselves in the day before yesterday: so they dared not go on, for fear of making Isa so young she would not be able to talk. The A.A.M. does not like visitors who only howl, and get red in the face, from morning to night.

• *from The Story of Lewis Carroll by Isa Bowman*

THE MONEY ACT

...The Professor brightened up again. “The Emperor started the thing, he said. “He wanted to make everybody in Outland twice as rich as he was before-just to make the new Government popular. Only there wasn’t nearly enough money in the Treasury to do it. So I suggested that he might do it by doubling the value of every coin and banknote in Outland. It’s the simplest thing possible. I wonder nobody ever thought of it before! And you never saw such universal joy. The shops are full from morning to night. Everybody’s buying everything....

From Sylvie and Bruno. 1889.

LOGIC

- My Dear Ella,
-Now when will you come? We have a college meeting at 1 ½ today, but not likely it will be over by 3, so you might take your chance if you happen to be walking this way. If it is over by 3, it will be; and if it isn't, it won't be. That's logic.

CHRIST CHURCH, OXFORD, Dec. 9, 1875.

My DEAR GERTRUDE,-This really will not do, you know, sending one more kiss every time by post : the parcel gets so heavy it is quite expensive. When the postman brought in the last letter, he looked quite grave. "Two pounds to pay, sir!" he said. "*Extra weight, sir!*" (I think he cheats a little, by the way. He often makes me pay two pounds, when I think it should be pence). "Oh, if you please, Mr. Postman!" I said, going down gracefully on one knee (I wish you could see me go down on one knee to a postman -it's a very pretty sight), "do excuse me just this once! It's only from a little girl!"

"Only from a little girl!" he growled. "What are little girls made of?" "Sugar and spice," I began to say, "and all that's ni-" but he interrupted me. "No! I don't mean that. I mean, what's the good of little girls, when they send such heavy letters?" "Well, they're not much good, certainly," I said, rather sadly.

"Mind you don't get any more such letters," he said, "at least, not from that particular little girl. I know her well, and she's a regular bad one ! " That's not true, is it? I don't believe he ever saw you, and you're not a bad one, are you? However, I promised him we would send each other very few more letters-" Only two thousand four hundred and seventy, or so," I said. "Oh ! " he said, "a little number like that doesn't signify. What I meant is, you mustn't send many."

So you see we must keep count now, and when we get to two thousand four hundred and seventy, we mustn't write any more, unless the postman gives us leave.

I sometimes wish I was back on the shore at Sandown ; don't you?

Your loving friend,
Lewis Carroll

Ch. Ch. May 18/57
My dear Hettie,
I forgot to mention that
my dinner-parties are always
"morning-dress" affairs. Do you
know the proverb "the less the
formality the more the hilarity"?
You don't? Nor do I.
Your loving friend (L.C.)
I'll come for you at 6 ¼.

Commutativity

My dear Mary,
.....why, Oxford is as near to
London as London is to Oxford.
If your geography-book doesn't
tell you that, it must be a
wretched affair....

Your loving friend,
Charles L. Dodgson



*Using Experiences from Math Class to reach children
during a rare public address in church.....*

...As you rub out the sums on your slate that
so leave behind the disobedience, or
selfishness, or ill-temper of last week, and
begin quite fresh to try your very best, every
day, to do what you can towards fulfilling
God's law of love.

Address by the Rev. C. L. Dodgson, St Mary Magdalen Church, Nov 1897

The Offer of the Clarendon Trustees

In 1868 he proposed a Mathematical Institute for Oxford University

Dear Senior Censor,

.....It may be sufficient for the present to enumerate the following requisites: others might be added as funds permitted.....

- A. A very large room for calculating Greatest Common Measure. To this a small one might be attached for Least Common Multiple.
- B. A piece of open ground for keeping Roots and practising their extraction: it would be advisable to keep Square Roots by themselves, as their corners are apt to damage others.
- C. A room for reducing Fractions to their Lowest Terms. This should be provided with a cellar for keeping the Lowest Terms.
- D. A large room, which might be darkened, and fitted up with a magic lantern, for the purpose of exhibiting Circulating Decimals in the act of circulation.
- E. A narrow strip of ground, railed off and carefully levelled, for investigating the properties of Asymptotes, and testing practically whether Parallel Lines meet or not: for this purpose it should reach, to use the expressive language of Euclid, "ever so far."

May I trust that you will give your immediate attention to this most important subject?

Believe me, Sincerely yours, MATHEMATICUS.

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