The Pileup
Newsletter of the CDXA

The Carolina DX Association

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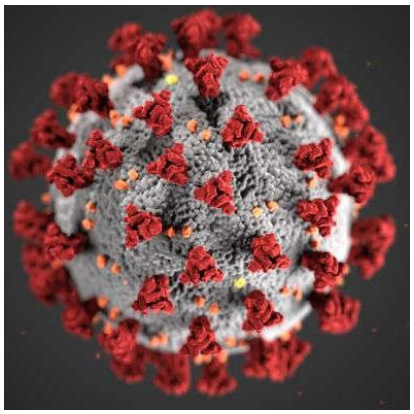
Corona Virus Slams the USA

By John Scott, K8YC

As I sit down to write this, I have in mind readers of The Pileup in the future who may be wandering into the archives of CDXA if we are fortunate enough to have our DX Club alive and well twenty or so years hence. The impact of the corona virus (officially designated as SARS-CoV-2) has been somewhat startling to people the world over. It is the first truly worldwide pandemic since the Spanish Flu of 1917-1918.

In early February, my XYL and I were skiing in Colorado when the news hit the wire that the Diamond Princess cruiseliner had put into port in Japan with a number of passengers ailing from what appeared to be a novel corona virus first seen near Wuhan, China sometime in December 2019. The entire ship was put into quarantine for 14 days—supposedly the incubation period for this virus to expose itself fully. Before month's end many of the passengers were released from quarantine and returned to their homes. Many of the US citizens quarantined were brought home but continued a quarantine period on U.S. military bases. President Trump ordered the border closed to visitors coming from China since Wuhan seemed to be in the grip of a local epidemic.

It wasn't long before "hot spots" of the illness started showing up in many parts of the world. Italy was hit very hard. South Korea was hit quite hard but had adopted extensive testing for the virus to a large number of its citizens. U.S. health authorities encouraged "social distancing" and frequent hand washing to slow the spread of the disease so that hospitals did not become overloaded with patients if a "spike" in contagion were to occur. Hot spots are now appearing in other parts of Europe, and the U.S. border has been closed to those traveling from Europe for a period.



Artificially colored image of the SARS-CoV-2 virus.

Since the first days of infection, we've learned that older people and/or people with medical complications are more susceptible to serious complications of the disease. Younger people supposedly not at too much risk were thought to primarily experience only mild flu-like symptoms. Too many college aged students reasoned that spring break in a warm climate was not risky.

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CDXA PacketCluster & Other Communication Systems	
K4MD (AR V.4 Cluster via Telnet)	k4md.no-ip.com:23
K4MD (AR V.6 Cluster via Telnet)	k4md.no-ip.com:7373
W4DXA (AR V.6 Cluster via Telnet)	w4dxa.no-ip.com:23
W3GQ (CC Cluster via Telnet)	w3gq.no-ip.com:7373
CDXA Repeater 147.18 MHz (+600)	W4DXA, Near Fort Mill, SC
World Wide Web Homepage	www.cdxa.org
Wednesday Luncheon (11:30 AM)	Skyland Family Restaurant, 4544 South Boulevard, Charlotte, NC

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Video television footage abounded showing thousands of youngsters in close proximity to each other on packed beaches in our southern states. Only time will tell at this writing as to whether those who went south will just be an excellent "vector" of the disease into extensive parts of the country.

In the last half of March, 2020 many major events have been curtailed. For hams, Dayton Hamvention was cancelled. NCAA's "March Madness" collegiate basketball tourney was cancelled. The NBA season was cancelled. Baseball's spring training was cancelled as was the beginning of the season. NHL suspended its season. The "Masters" golf tournament has been moved, and may be cancelled. Colleges, secondary schools, and elementary schools have been shut down. The International Olympic Committee has suspended the 2020 Summer Olympics until 2021. Locally, the Charlotte Hamfest was cancelled as was the CDXA Hamfest Banquet. The CDXA weekly luncheon which has been going on since at least the mid-1990s was suspended to minimize possibility of spreading the infection.

Meanwhile many parts of the country have told workers to stay home to effect social distancing. Restaurants and other gathering places are closed for a period, idling the people who earn their living in the service industry. Airplanes are running nearly empty on schedules with reduced numbers of flights. Each day reports are given of the newly found cases of the disease and the count of those who did not survive the disease. Family members and friends will have to grieve the loss of loved ones at a distance during a time when a hug would be most welcomed.

There is some goodness in all this as compared to what people must have experienced during the Spanish Flu pandemic of 1917-18. We have worldwide communication systems that allow health care professionals to track the progress of the disease. We have radio and television to advise us of cautions we should take and procedures we should perform to reduce the spread of the disease. We have a whole century of medical progress, microbiology, epidemiology and other skills to guide our medical professionals. Also, in the computer age, we have networked computers put to work trying to solve a way to attack the genetic structure of the SARS-CoV-2 virus with antiviral medications until a suitable vaccine can be produced.

Now we must wait, in relative isolation, with hope that social distancing and other directives will prevent overloading our healthcare facilities across the nation. Even prayer is helpful.

The Pileup
Official Newsletter of the Carolina DX Association

Published bimonthly 6 times per year.

The purpose of the Association is to secure for the members the pleasures and benefits of associating with persons having a common interest in Amateur Radio.

Members of the CDXA shall adhere to "The Amateur's Code" as published from time to time in *The ARRL Handbook for Radio Amateurs*, and shall consist of those valid licensed amateur operators having an interest in promoting amateur radio. Long distance communications (DX) is of special interest to members of the Association, but said interest is not a requirement of membership.

Yearly dues are $25.00. A second licensed Amateur family member living in the same household can join for $5.00 for a total family price of $30.00 per year. The total price for 3 or more licensed family members living in the same household is only $35.00 per year. All family members enjoy full member status. Dues are payable annually in December by check to the Secretary/Treasurer:

Ray Weeks,, N4APR
3017 Cutchin Drive
Charlotte, NC 28210

Address, telephone, and email address changes should be directed to the Secretary/Treasurer at the above address or via email at: rweeks1@carolina.rr.com.

What Is Contesting?

To someone not familiar with contesting, contesting might seem like a rather odd concept. We get on the radio for a certain period of time and put up with all manner of QRM in order to make as many contacts as we can. For those of us who enjoy contesting it is relaxing (mostly) and fun. This last statement begs the question—are contesters normal? I have no answer for that at this time.

There is an interesting video on YouTube at https://www.youtube.com/watch?v=AJwAPktbMic , when well known contester, author, and Contest University instructor Ed Muns, W0YK, was inducted into the CQ Contest Hall of Fame in 2014. Skip ahead to the 6 1/2 - minute mark and he makes this very profound statement:

> "Radiosport is amazing... it boggles my mind that with this sport, we take a competitor and he goes off and finds another competitor. Then, they form a team for a couple of seconds to create a QSO—has to be valid. They try and do it quickly. They're competitors, but they're working together. They are cooperating to build that QSO. Then they go off and repeat this. At the end, we line up everybody by who cooperated the most. These are competitors, but they're all lined up top-to-bottom by who produced the most cooperation. I think that's just amazing."

What a great description of contesting. Two people need to cooperate in order to have a QSO, exchange some piece of information, log it, then move on to find another QSO opportunity. We also need to keep in mind that not everyone is a serious competitor, but eve-

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ry participant has decided to turn their radio on and find a QSO opportunity.

Some stations start off by calling CQ and then wait for another competitor to hear their signal and respond. This is also referred to as "running". The concept is: call "CQ", wait for someone to respond, complete the QSO, and then call "CQ" again. Hopefully, a series of stations will respond to your CQs; in this way, you will be able to complete a series of QSOs, one after another.

Serious competitors tend to call "CQ" a lot in order to advertise their interest in having stations call them. When calling "CQ", you will do so on a single frequency—not moving the variable frequency oscillator (VFO)—the exception is ARRL Sprints. The other competitor is actively scanning the band moving their VFO and looking for stations that are calling "CQ". They are in effect searching for QSO opportunities, then pounce on the CQing station. This is referred to as "search and pounce". Once they have completed the QSO they will once again move the VFO and search for another QSO opportunity.

Stations hoping to do well in a contest "run" a lot, hoping that other stations will find them to complete a QSO. As part of finding a QSO opportunity, if some stations only call "CQ", they will miss other stations only calling "CQ". By the same token, stations that only search and pounce will miss other stations who only search and pounce. In this way, it is important that every station—even if they are operating for a short period of time should spend some time calling "CQ". This will advertise their interest in participating in a QSO.

What I have also found when calling "CQ" is that you can get surprise QSOs—stations you would not expect to respond to a station calling "CQ" will call you. Keep in mind that even serious competitors need to find stations calling "CQ". Many times I have put a rare station in the log that has never been spotted as calling CQ. (More on spotting and assisted vs. unassisted in a later issue.)

Contest sponsors appreciate it when participants—even casual contesters—submit a log. It not only helps with the scoring process, which allows the contest sponsor to crosscheck QSOs that various competitors are claiming, but it also helps gauge interest in the contest. Naturally, worldwide contests can attract greater interest. Greater activity levels also helps to generate additional interest from casual stations to make a few QSOs to help out various participants. So even if you only make a few QSOs, competitors do appreciate the QSOs. Contesting is fun and by both calling "CQ" and answering the "CQ" of other stations, we can all enjoy our favorite hobby.

Art Tolda – W1AJT / VE3UTT
CDXA Contest Manager

Ten and Twenty Years Ago in The Pileup

All items below have been extracted from the archives of the PILEUP available on the CDXA Website. If interested in wandering back in time, take a look—you might find it enjoyable.

Ten Years Ago

Charlotte Hamfest 2010 had just completed, and over 125 people celebrated at the steakhouse on South Boulevard. . . . . Thomas Wright, N4HN just finished submitting the logs to LoTW for all contests the club had entered using the W4DXA callsign. Over 18,000 QSOs resulted in over 2,000 matches and earned CDXA the Worked all States award. . . . .Gary Dixon, K4MQG, was presented the Roanoke Division's Vic Clark Award for his service to hams in the division. . . . Eric Sossoman joined the CDXA gang for the 2010 edition of the NC QSO Party operating from N4ZC's QTH using the callsign that his father, Larry had held. Eric was a somewhat new contester at that time. (Read more about Eric elsewhere in this 2020 issue.) . . . . Dick Genaille, W4UW (SK) provided an informative article on interconnecting two baluns to feed two dipoles on different bands, each having its own feedpoint impedance. (The article can be read in the March 2010 issue of the Pileup.)

Twenty Years Ago

CDXA pledged some funds to the A51A DXpedition to Bhutan being led by Bob Allphin, K4UEE. . . . there was quite a crowd at The Open Kitchen for the Hamfest banquet—so much so everyone couldn't fit in the assigned dining room. . . .representatives of Kachina Radio attended the Hamfest and remotely operated their radio in Amarillo, Texas over a telephone line, creating quite a pileup. . . . Bill Parris' antenna farm was pictured being disassembled in preparation for Bill's relocation to Frankfort, Michigan. . . . the short-lived "Milly and Mike" series made it's premier appearance in the Pileup but died a few months later. . . . . The "new millennium" callsign, WY2OOO, was still creating quite a stir and CDXA members were still turning a lot of QSOs using it. . . . The Pileup was being placed on the CDXA website in an archive for future reference. . . . . The "Roving Reporter" visited a tired Bill Tippett (W4ZV) just after he finished working the ARRL International DX contest. His relatively new 6 over 6 over 6 ten meter antenna system had netted him first place as SOOB in the recently completed CQWW SSB contest setting a new 10 meter record.

Contesting and Club Log

By John Scott, K8YC

I believe I saw a few new names as participants in ARRL International DX contests that recently completed. What's to be done next? After a contest submission to the contest sponsor is completed, create an ADIF file of your contest log (your contest logging software does do that doesn't it?), and upload your ADIF file to Logbook of the World. Right after that, upload the same file to Club Log.

Why do this? At least two reasons come to mind. First, many contesters use LoTW, and having your log uploaded to LoTW will allow you to get LoTW credit ASAP if any of your contacts were ATNOs (All Time New One(s)). Many contesters upload their logs to LoTW within a week after a contest is completed. This will help to quickly increase your DXCC count, and prepare you for your next submission to ARRL.

Second, by uploading to Club Log, those contesters that are using OQRS (Online QSL Request Service) will generally show a match for your QSOs with them and provide an easy way to get that desired QSL card for any that are ATNOs. Another reason to upload files to Club Log is that log data on Club Log from all over the world is used to determine which entities are "Most Wanted". Many DXpeditioners use that data to choose the target of their next DXpedition.

A little understood feature of Club Log is that it reports your DXCC progress for merely WORKING a new entity. Confirmations are not required. But, if you are also a participant in Club Leagues on Club Log, your newest "new ones" will increase your entity count. Since CDXA's standing in the Club Leagues is based on the AVERAGE entity count of ALL participants, the increase in your entity count will boost CDXA's standings, too! Everyone wins. If you're not interested in League participation, all you need do is disable participation in the settings for your ClubLog account.

So, by all means, give contesting a try. Have fun, and increase your DXCC entity count.

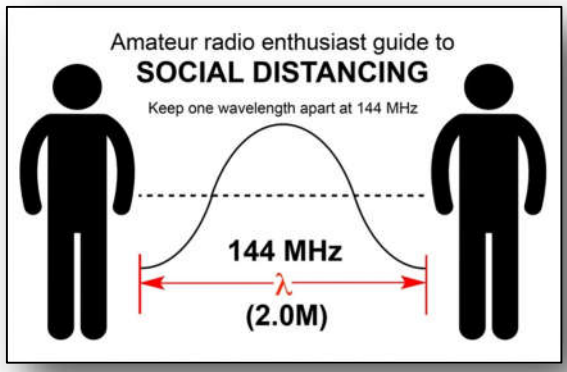
New Cluster Available

A number of CDXA members have found CC User to be a very useful way to interface with cluster software because it has some convenient ways to set filters and easily choose a specific band's spots using a series of "tabs" in the user interface. Unfortunately, while CC User works on AR Cluster Version 4, it does not interface well with the way filters are set in AR Cluster Version 6. Fortunately, AR Version 4 is being supported by K4MD, but the developer of AR Cluster is now deceased, so there will be no further enhancements to the AR Cluster software.

CC User was developed by Lee Sawkins,VE7CC. He also developed a cluster program called CC Cluster which, as you might suspect, interfaces perfectly with CC User software. Paul Sturpe has installed a version of CC Cluster and it is accessible by "telneting" to w3gq.no-ip.com and activating port 7373. Availability of this capability has been added to the list of clusters being operated by CDXA which appears on the front page of the Pileup. Those interested in the features of CC User can review them by going to the following website: http://www.bcdxc.org/ve7cc/ . CC User is easy to install and can be interfaced to most logging programs which use spotting to alert a ham to entities still needed for DXCC or WAZ credit.

Social Distancing--Ham Style

Health officials are suggesting that a distance of 6 feet be created between people until the Corona virus pandemic is deemed under control. Since six feet is approximately 2 meters in distance, the following amateur radio guideline has been established:



Revised Date for December Holiday Party

With the disruptive influence of the COVID-19 Coronavirus in the first quarter of 2020, and the flexibility of "73 & Main" restaurant in permitting us to cancel the Hamfest banquet, it seemed appropriate to schedule the 2020 Holiday Party at the "73 & Main" location. Several of the officers have been canvassing the membership about their preferences for the Holiday party. A number of members expressed having the holiday banquet during the afternoon to avoid the need for nighttime driving. The response has been positive.

Therefore, to provide you plenty of time for scheduling your calendar, please make note that the CDXA Holiday Party will be held at "73 & Main" on Saturday, December 5th at 2:00 P.M.

2019 ARRL DX Contest Preliminary Results

The two 2020 ARRL DX Contests are history. Final, official contest results will be available later in the year in QST and on the ARRL website, and will appear in a later Pileup issue. CDXA's aggregate member scores eclipsed last year's 8.45 million points by 1.6 million points for a total of almost 10.1 million points. Considering this year's propagation, this was a great accomplishment by all, especially since in 2019 there were 24 participants and this year there were 19 participants (Note: I did not count my 2020 VE3 score in these results). Officially, due to the ARRL "Circle" rules, we have an ARRL eligible total of 7.7 million points.

Here are the, as yet, unofficial results:

Top Combined CW + Phone score: K5EK repeats this year with 2,898,351 total points

Top CW score: K5EK with 2,064,042 points with W3GQ with 1,198,392 points as prize alternate

Top phone score: K5EK with 834,309 points with W3GQ with 580,482 points second and W3OA with 495,261 points as prize alternate

Top CW score, low power: N4IJ with 116,462 points

Top phone score, low power: N4APR with 23,400 points

Most Improved score: K2SD with an increase of 162,999 points over his previous high score

Other Categories:

1000 or more QSOs:

500-999 QSOs: AA4V, and K8YC

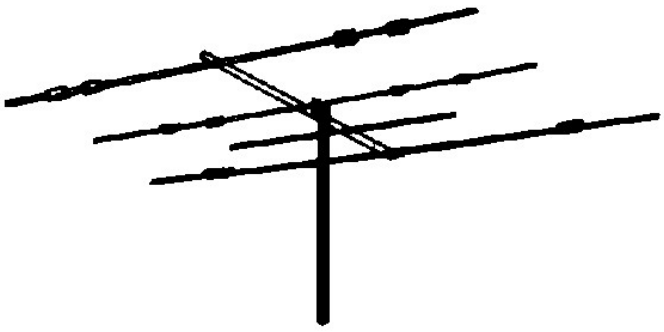
250-499 QSOs: N2TU, W4ZV, and AA4VT

Remember, awards are for members who, at the time of the contest, are in good standing.

Hopefully by the time reward cards are issued we will be able to use them.

See you in the next contest.

Art – W1AJT / VE3UTT
CDXA Contest Manager



March DX King Standings

By: Art Tolda, W1AJT/VE3UTT
Contest Manager

As we sequester ourselves in this critical time some members have taken to the challenging airwaves and generated some impressive totals. It's great to realize that despite the curtailment of DXpeditions and the less than great propagation there is still some interesting DX to work.

As a reminder, the standings are also duplicated in the "Contest Corner" tab on the CDXA.org homepage along with other contest related material. Presently, you can enter your DX King information on the CDXA home page or the "Contest Corner" tab—right column. This is the only way to get your DX King results entered for the monthly summaries.

You will also notice on the "Contest Corner" that in the left column there is a "CDXA Contesters 3830 Scores Tracker". I hope this generates some "buzz" about those participating in contests. To get your scores in the tracker all you have to do is report them on https://www.3830scores.com Some contest loggers such as N1MM even have a link built-in under the "Help" tab. Moving forward this will be the preferred method reporting contest scores as it keeps all the scores over the years so you can just search on your callsign and all of your activity will be presented.

Here are the DX King standings reported through March:

	Through March 2020		
Callsign	**Countries**	**Zones**	**Totals**
K5EK	223	40	263
K4ZO	213	40	253
K7BV	209	40	249
K3WA	192	39	231
VE3UTT	176	39	215
W1AJT	171	32	203
W3GQ	175	28	203
W4PNY	160	35	195
W4HG	155	34	189
K8YC	151	35	186
N4PQX	139	40	179
KZ2I	139	32	171
AA4R	127	36	163
W3OA	126	32	158

Keep safe and active. See you on the bands.

Roving Reporter visits K4CEB

The Roving Reporter didn't have to rove too far this time around. His destination was Concord, NC so that the membership could get to know our new Vice President Eric Sossoman, K4CEB.

Vice President Eric Sossoman (K4CEB) and son Nathan (N4CEB).

Roving Report: How did you become a ham, Eric?

K4CEB: Let's just say I was born in to ham radio. My Father (Larry - SK) was licensed in 1954. So, I just guess you could say I grew up around the radio, going to hamfests, and even going up to Roan Mountain for the VHF contests at age 8 or 9. Can't remember when there was not a radio in the house or a hamfest to go to, and as you know, Dad was a Charter Member of CDXA.

RR: In what year were you first licensed?

K4CEB: I got my licenses in 1991 (KD4DXA), and when my father (K4CEB) passed in 2008, I took his call to keep it in the family and then got active. I guess in some ways being on the radio is like I'm still connecting with my father.

RR: What part of ham radio do you enjoy most?

K4CEB: I enjoy working contests a lot. The fast pace reminds me of a job I had in our county 911 center. But I do love working DX, and try to chase DX as much as possible. As for VHF, I've been lucky enough to work with the AA4ZZ group in Boone, NC. Great bunch of guys with a competitive station.

RR: Do you do any award chasing?

K4CEB: I'm not much of an awards chaser. I just always try to do my best and whatever happens is the way it is. But, I have been lucky of the past couple

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years to win the NC QSO Party in the low power SSB category a couple of times. Also have worked 272 mixed mode for DXCC.

RR: Do you work all the contests, or primarily the big ones?

K4CEB: I try to work as many of the big contest as I can. But a 15-year-old son keeps me running and sometimes I just miss a contest. But everyone has their priories change with kids around. I figure I'll have my time to operate contests when Nathan is fully grown. My contesting skills are satisfactory, but I'm trying to learn as much as I can from the other club members and friends. But when I'm working a contest, I try to spend the max time I can in the chair. You can't put up the points if you're not in the chair trying to make contacts.

RR: Do you have a favorite rig?

K4CEB: I've been using an Icom IC 7700 and Expert 1kw amp for years and really enjoy them. But, like most of the guys, I do have other radios. Icom IC-746 pro, Yaesu FT-857D and even dad's old Kenwood TS-830S that I don't guess I'll ever get rid of. We all have equipment that we're attached to for one reason or another.

RR: Do you have a favorite mode?

K4CEB: I enjoy working FT8/ FT4, but I do like SSB just because you're actually speaking to someone and hear the expression in their voice or even the excitement sometimes.

RR: What's in your antenna farm?

K4CEB: For HF I have a Mosley Pro 67B (10-40m) up about 60ft, several wire antennas on 80m, 7 elements on 6m, and 11 elements on 2m.

RR: Do you have any notable experiences in your time as a ham?

K4CEB: When my son "Nathan", 10 years old at the time, passed his Technician Class test, that was a memorable moment. Then, the same year watching him work the NC QSO party for about an hour on 80m and, at that age, to be able to control the people calling was enough to make a father proud.. Of course, everyone wants to work a YL or Kid but he did it without coaching.

RR: In what ways would you say amateur radio has affected your life, if at all?

K4CEB: Amateur radio has always been a part of our family's life. From my father, to me, to my son Nathan (N4CEB) who was licensed in 2013 at age 10 we now have three generations of hams. The friends you make locally and all over the world stay with you forever. My father's passing was really hard on me but it was surprising how many hams would call or just tell me they were glad I had his call now. And the members of CDXA have been great and always willing to help with question(s) even if they were pretty basic. Gary Dixon (K4MQG), Ken Boyd (K4DXA-sk), Jeff Parker (WA1WXL) and Bill Fisher (W4GRW), just to name a few, were always available, and there are a lot more people out there willing to help if you're with the CDXA club. You just have to ask. Like a lot of hobbies, you make friends from all walks of life.

Larry Sossoman and Eric Sossoman (1969)

Was Pythagoras Correct?

By John Scott, K8YC

Anyone who has involvement with geometry, mathematics, or science soon comes across the Pythagorean Theorem. Even the radio amateur encounters the Pythagorean Theorem when it becomes necessary to compute an impedance given the resistance and reactance of a particular circuit configuration. You know the formula:

$$Z = \sqrt{R^2 + X^2}$$

We are taught early on that in a RIGHT triangle, if we are given the legs adjacent to the right angle, A and B, we can compute the hypotenuse, C, (the side opposite the right angle) as:

$$C^2 = A^2 + B^2$$

We accept that relationship as true. Yet, in all of my formal education and years in industry, I had never seen a proof that the theorem MUST be true. It just WAS! It is time that we understand why it is so.

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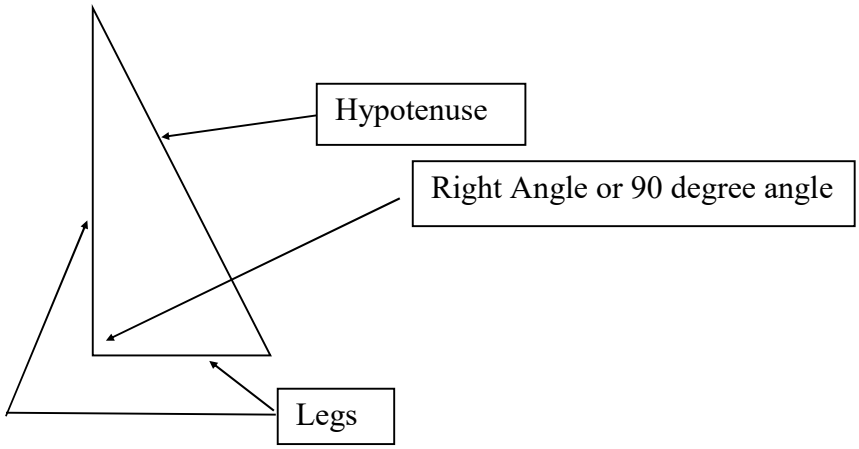
Pythagorean Theorem Proved

One of the early things we learn in geometry is the Pythagorean Theorem. This theorem relates to triangles with one 90 degree, or "right" angle. Such triangles are called "right triangles". The side opposite the right angle is called the hypotenuse and the other two sides are called the legs of a right triangle.

If we designate the hypotenuse by the letter C and each of the legs by the letters A and B, the Pythagorean Theorem states:

$$C^2 = A^2 + B^2$$

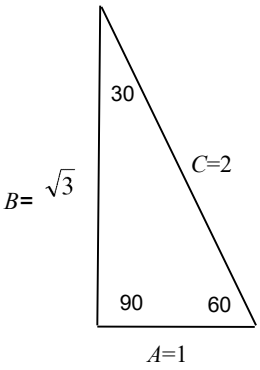
That is, for a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the two legs of the right triangle.

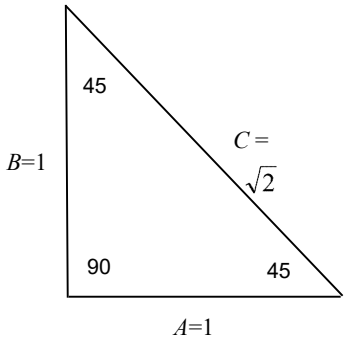


Early Greek geometricians felt there was some magic about the three numbers, and any three numbers that satisfied this equation were call Pythagorean numbers. One particular group of such whole numbers is 3, 4, and 5. Another group is 5, 12, and 13. These two triads of numbers are "nice" because they are whole numbers that satisfy the equation.

Indeed, craftsmen that want to ensure a perfect right angle when building a structure need only take the numbers 3, 4, and 5 or any multiple of them (9, 12, and 15 for example) place two lines of length 3 units and 4 units at a point and then adjust the other ends of the lines such that they are 5 units apart and they will have formed a perfect right angle!

Unfortunately, there are an uncountably infinite set of other numbers which are not whole numbers that also satisfy the equations. Indeed some numbers are what are called irrational numbers, meaning that they can only be represented by an infinite string of non-repeating decimal digits. Two such common triangles are the 30-60-90 right triangle and the 45-45-90 right triangle. (Note that the sum of the interior angles of ALL triangles always add to 180 degrees.) For the 30-60-90 right triangle, the sides are in the ratio 1, $\sqrt{3}$, and 2 where $\sqrt{3}$ = 1.7320508. . . . . For the 45-45-90 degree triangle, the sides are in the ratio 1, 1, $\sqrt{2}$ where $\sqrt{2}$ = 1.414213. . . . . Those square roots are but two examples of irrational numbers resulting from using the Pythagorean Theorem. Below is an illustration of the theorem in use for these two common triangles.





$$C^2 = A^2 + B^2$$
$$2^2 = 1^2 + \left(\sqrt{3}\right)^2$$
$$4 = 1 + 3$$

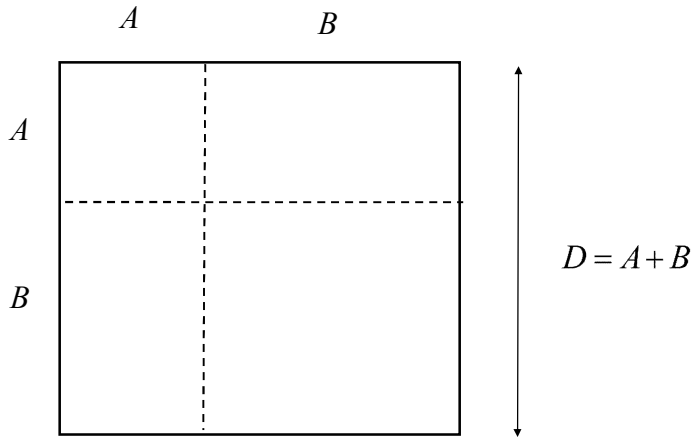
$$C^2 = A^2 + B^2$$
$$\left(\sqrt{2}\right)^2 = 1^2 + 1^2$$
$$2 = 1 + 1$$

So, with these strange numbers, how did anyone develop a theorem that works every time, for ***all*** numbers?

I had never seen a proof of the Pythagorean Theorem as I was growing up. I decided to see if I could reason through to a solution that satisfied me. Below are some mental gymnastics that can be done by anyone with a little background in algebra.

We are going to deal with two squares of the same size. We'll call the lengths of the sides D and arbitrarily say that these sides are made of two line segments of length A and length B where $D = A + B$. If the lengths of the sides of both squares are D, then the areas of both squares will be D^2 and the areas will be equal. We'll use this property to prove the Pythagorean Theorem.

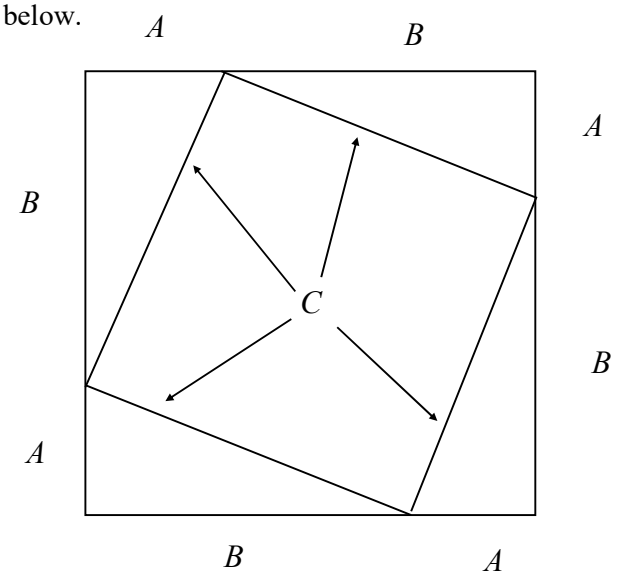
Consider the square below:



With $D = A + B$, we find the area, $D^2 = (A + B)^2 = A^2 + AB + AB + B^2 = A^2 + 2AB + B^2$ (This is simply algebraic manipulation.)

If you examine the square above, you'll find it consists of one smaller square that is A x A, another larger square that is B x B, and two smaller rectangles that are A x B. This is precisely what the algebra dictates. This, then, is the area of the first square in terms of A and B. Isn't it amazing that algebra and the real world coincide??!!

Now consider a second square of the same dimensions, but with the line segments of the sides arranged a little differently as shown below.



Note that the area of this new box is still $D^2 = (A + B)^2$, the same as before. Now let's look at what parts make up the area of the new square. Because of the way we've constructed the new square, we know the length of the new square now inside our original box has equal sides that we'll designate as C, but we don't know *anything* about the length of line segment C. Besides a square with sides of length C, we also note the area of the box includes four triangles with bases of A and altitudes of B.

The area of *each* of the four small triangles is ½ times the base times the altitude or,

$$\tfrac{1}{2} AB$$

Finally, the area of the redrawn box shown above is equal to the area of a square with sides C plus four small triangles:

$$C^2 + 4(\tfrac{1}{2} AB) = C^2 + 2AB$$

Now, because the sides of both our original square and the redrawn square are the same, the area must be the same. If we equate the areas of the two squares we have computed separately we get,

$$C^2 + 2AB = A^2 + B^2 + 2AB$$

If we subtract $2AB$ from both sides, we get,

$C^2 = A^2 + B^2$ We can easily see this relationship has resulted for any arbitrary lengths A and B.

Now, when we look back at our construction of the second box, we find that C is the hypotenuse of the triangles with legs A and B, and we have arrived at exactly what the Pythagorean Theorem states without placing any constraints on the length of A or B. Q.E.D.

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