WATTS

04-2011

Year 81 + 4m

Monthly newsletter of the Pretoria Amateur Radio Club
Maandelikse nuusbrief van die Pretoria Amateur Radio Klub.

PARC, PO Box 73696 Lynnwood Ridge 0040, RSA

web http://www.parc.org.za mail: zs6pta@zs6pta.org.za

Bulletins: 145,725 MHz 08:45 Sundays/Sondae
Relays: 1.840, 3.700, 7.066, 10.135, 14.235, 51.400, 438.825, 1297 MHz
Activated frequencies are announced prior to bulletins

Swapshop: 2m and 7.066 MHz Live on-air after bulletins
Bulletin repeats Mondays | herhalings : Maandae 2m 19:45

ZR6FD logo

Papier / Paper ZS6JPL

Drukwerk printing ZS6JPL

Hamnet Gesimuleerde Noodgeval 40m Stasie opgestel deur Pierre ZS6PJH by laerskool Rooihuiskraal 6 Maart 2011

In this issue / In hierdie uitgawe

Next Meeting

Date: Sat 9 Apr 2011
Time: 13:30 for 14:00

Building #4
University of Pretoria.
S/E corner University and Lynnwood roads

PARC Management team / Bestuurspan Aug. 2010 - Aug. 2011

Committee members					
Chairman, SARL liaison	Pierre Holtzhausen	ZS6PJH	chairman@zs6pta.org.za	012-655-0726	082-575-5799
Viice-Chairman, Fleamarket	Alméro Dupisani	ZS6LDP	fleamarket@zs6pta.org.za	012-567-3722	083-938-8955
Secretary, Treasurer	Richard Peer	ZS6UK	treasurer@zs6pta.org.za	012-333-0612	082-651-6556
Repeaters, Technical	Craig Symington	ZS6RH	technical@zs6pta.org.za		072-724-9695
Rally co-ordinator	Johan de Bruyn	ZS6JHB	rally@zs6pta.org.za	012-803-7385	082-492-3689
Web co-ordinator, Secretary	Graham Reid	ZR6GJR	webmaste@zs6pta.org.za		083-701-0511
Social co-ordinator	Doréén de Bruyn	ZR6DDB		012-803-7385	082-857-9691
	Willie Greyling	ZR6WGR	social@zs6pta.org.za		082-940-2490

Co-opted / Geko-opteer:					
Auditor	Elma Basson				
WATTS newsletter/Kits	Hans Kappetijn	ZS6KR	editor@zs6pta.org.za	012-333-2612	072-204-3991
Asset control	Andre van Tonder	ZS6BRC	andreh.vtonder@absamail.co.za	361-3292	082-467-0287
Klubfasiliteite, Vlooimark	Willie Greyling	ZR6WGR	facility@zs6pta.org.za		082-940-2490
Rallies	Johann de Beer	ZR6YV		011-918-1060	082-857-1561
Contest co-ordinator	Pieter Human	ZS6PA	contest@zs6pta.org.za	012-800-2888	082-565-6081
Training co-ordinator	Fritz Sutherland	ZS6ASF	training@zs6pta.org.za	012-811-3875	083-304-0028
Historian, Awards	Tjerk Lammers	ZS6P	zs6p@iafrica.com	012-809-0006	
Public relations	Alméro Dupisani	ZS6LDP	fleamarket@zs6pta.org.za	12-567-3722	083-938-8955

Minutes of the monthly club meeting of the Pretoria Amateur Radio Club held at the South Campus of the University of Pretoria on 9 March 2011.

Welcome: The chairman welcomed all present.
Present: See register, 12 members plus 1 visitor.
Apologies: See register, 11 apologies.
Joys & Sorrows: Nico ZS6AQ is recovering from his stroke, Molly ZR6MOL is back in Weskoppies..
Minutes: The minutes of the January meeting were published.
Web site: Graham ZS6GJR had confirmed that the web site is up and fine.
Finances: We have a bank balance of R3669.47 after payment for the web site hosting was made.
Membership: There are 105 paid up members of the total of 129 for 2010/11.

Activities

Flea Market: The date of the next flea market is 28 May, and will be held at PMC at 08:00.

Meeting Dates: A poll will be arranged on the web site, and after that has run the results will be evaluated and implemented.

Rallies: The 2011 season has started. The first event is a regional rally in the Belfast area on 12 February.

Contests: Pierre ZS6PJH is looking for help for the upcoming SARL VHF/UHF contest.

Technical: The repeater is operating without the voting system at 50W from Radcliffe. The voting system has been problematical. Gary ZS6YI has had a similar problem and may have a solution. Alex ZS6MVA has provided a DTMF controller.

Rallies: During this coming weekend there is a regional rally in Belfast, and the Sasol will be on 15/16 April.

Fox hunt: This was held on 19 February. The fox hid in Colbyn. Pierre ZS6PJH, Vince ZS6BTY and ED ZR6RAS took part. The next will be held on 26 March. Pieter ZS6PA has the doppler antenna and the scanner. Vince will attempt to get the system working.

Licenses: As ICASA has not gazetted new licence fees, the old fees will apply from 1 April 2011 to 31 March 2012.

Presentation: Mark ZS6USA showed his umbrella multi band HF antenna system which was used on the HF field day.

Next meeting: The next meeting will be on Saturday 8 April 2011 at about 14:00.

Birthdays April Verjaarsdae

01 Melanie, daughter of Peggy and Ed ZS6UT
04 Joe ZS6AIC
04 Dino ZS6DNO
07 Tamzyn daughter of Gary ZR6GK
08 Ronell ZS6BRX, dogter van Susan en Freddie ZS6JC
08 Bertha lv van Hans ZS6KR
08 Klasie, seun van Sylvia en Tjerk ZS6P
10 Callan, son of Phil and Craig ZS6RH
11 Susan, dogter van Susan en Freddie ZS6JC
12 Jan ZS2LJ
13 Liam ZR6RAF, son of Heather and Vince ZS6BTY
16 Tobie, seun van Margriet en Tobie ZS6ZX
21 Wynand ZS6RF
22 Marieta, lv van Roy ZS6MI
25 Erna, dogter van Susan en Freddie ZS6JC
25 Gerhard, son of Sander ZS6SSW
28 Tracey, daughter of Rita and Victor ZS6VG
29 Heather, sw of Vince ZS6BTY

April Anniversaries Herdenkings

02 Pieter ZS6PVW en Magda ZS6MVW (28)
06 Lynn and Andre ZS6BRC ( )
08 Merilyn and Deryck ZS6KQ (50)
12 Rika and Errol ZR6VDR (42)
14 Carol en Hein ZS6Q ( )
30 Joey and Graham ZR6GJR (28)

Joys and Sorrows | Lief en Leed

Molly ZR6MOL in is hospital for an undefined time.

Diary | Dagboek (UTC times)

Apr 09 PARC meeting Sat 14:00
15-16 SARL National Convention, Vaal University

Region I preferred Emergency Frequencies
7110 kHz
and
7120 kHz Maritime Mobile

Snippets|Brokkies

Lesotho EME Dx-pedition: Pine ZS6OB reported that this event will now take place in September. ZS's are invited to come and take part in 6m, 2m 70cm and 1296MHz activities.
Phone Pine ZS6OB 082-447-7823

Club meeting preferences: members will soon be invited to (again) put forward their preference as to what day/time our monthly meetings should take place. Watch our website where the poll will take place. Else let any committee member know by other means.

2m long distance frequencies

SSB: 144,200 calling
FM: 144,400 calling

Shack of Danny ZS6AW and Antoinette ZS6D

March Fleamarket

was very well attended and many bargains changed hands.

Visitors from far and wide were seen and camaraderie flourished.

The next page shows some random shots taken by your editor.


2011/03/05 07:40

2011/03/05 06:39

2011/03/05 06:41

2011/03/05 06:41

2011/03/05 06:41

2011/03/05 06:41

CHAIRMAN
2011/03/05 07:19

2011/03/05 07:32

"My Feed Line Tunes My Antenna!"†

Plain talk about a fancy subject.

By Byron Goodman, W1DX
Former Assistant Technical Editor,
now retired

Maybe we could stop running this QST classic if ham misunderstandings about feed-line length and SWR vanished forever. But doing so would also deny newer hams a chance to enjoy the inimitable style of one of *QST's* masters of the technical tutorial. Reality itself reveals our only true alternative: Enough hams keep eluding a solid understanding of the basic relationship between an antenna and its feed line to justify our letting Goodman have the floor again.

You don't have to be in ham radio very long before you hear some self-styled antenna expert talking about "cutting the line to reduce the standing-wave ratio." An allied problem—and misconception—is exemplified by the card that came in the mail some time ago:

"I carefully cut an antenna for 7 MHz according to the formula in the *ARRL Handbook* and fed it in the center with 300-Ω Twin-Lead. Using a dip meter, I found the frequency was 5 MHz instead of 7. And it also had dips at 10, 20 and 25 MHz. Adding more 300-Ω Twin-Lead brought the frequency up to 7 MHz, but what I don't understand is why the feed-line length affects the resonant frequency of the dipole. If it is supposed to, how can I check the resonant frequency of the dipole itself?"

This is a good subject. If you know the correct answers to all of the questions in the quote above, you aren't likely to have trouble understanding most of the common feed-line problems. Let's see what it's all about.

Transmission Lines

Ask any amateur if he knows all about coaxial cables and he will probably say, "Sure, RG-8 and -58 are 50-Ω lines, and RG-11 and -59 are 75-Ω lines. What else is there to know?" The answer to that one is "Everything."

In the first place, RG-8 is *not* 50-Ω line. It has a "characteristic impedance" of 50 Ω.[1] This fancy language can best be illuminated by Fig 1. Here we show a long length of RG-8 with a 50-Ω resistor connected at one end (we'll call that end the "load" end). If we measure the impedance at the input end (by using an impedance bridge), it will measure 50 Ω. This, of course, is just what you expect, and you're probably wondering what we're driving at. Patience, please.

Now suppose we take this same piece of RG-8 and connect a 100-Ω resistor at the load end, as shown in Fig 2. Measuring the impedance at the input end, what should we get for an answer? 50 Ω? 100 Ω? 200 Ω?

If you came up with an answer, any answer, you had better continue reading this article, because there isn't any answer to the question in the preceding paragraph! There isn't any answer because the problem isn't definite enough to be capable of solution. In order to know what the input end of the 50-Ω line looks like when a 100-Ω resistor is connected at the load end, you must also know the *electrical length* of the line. This is another way of saying that you have to know the operating frequency and the physical length, from which you can compute the electrical length. (Electrical length is measured in wavelengths [λ], so any given length of line has an electrical length that varies with the frequency. A line 1 λ long at a given frequency is 2 λ long at twice that frequency, etc.)

Actually, with the "50-Ω" line terminated in 100 Ω, some interesting things happen along the line. Take the lines shown in Fig 3. If the line is ¼ λ long, we find that the impedance bridge would measure the input impedance as 25 Ω. If the line is ½ λ long, the bridge would come up with an answer of 100 Ω. If the line is 1/8 λ long, the bridge would measure the input as a 40-Ω resistance in series with a capacitor, and a 3/8-λ line would be measured as 40 Ω in series with an inductor! These effects repeat every half wavelength along the line, as shown in Fig 4A.

The example we just discussed used a load for the transmission line that was higher than the characteristic impedance of the line. When the termination is lower than the characteristic impedance of the line, the impedance varies along the line in the manner shown in Fig 4B.

Now let's get back to that "characteristic impedance" thing again. Here's what it is: *The characteristic impedance of a transmission line is the value of resistance that, when used as a termination for the line, makes the input impedance of the line independent of the electrical length of the line.*[2]

Measuring Antenna Impedance

By now you may begin to see where the card-sender of the opening paragraph went astray. He connected an antenna to a length of "300-Ω line" and expected that the line

[1]Notes appear on page 35.

Fig 1—A length of RG-8 with 50 Ω connected across one end will look like 50 Ω at the input end of the line.

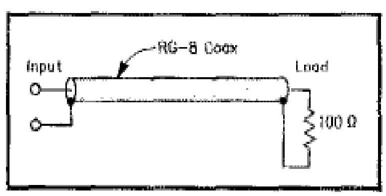


Fig 2—With 100 Ω connected at the load end of a length of RG-8, the problem is to determine what the line looks like at the input end.

†Reprinted from B. Goodman, "My Feedline Tunes My Antenna!," *QST*, Mar 1956, pp 49-51 and 124; also in *QST*, Apr 1977, pp 40-42.

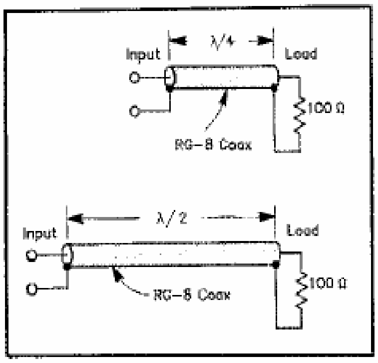


Fig 3—Part of the answer to the problem posed in Fig 2. When the line is ¼ λ long, it looks like 25 Ω at the input end when the load is 100 Ω. When the line is ½ λ long, the input end shows an impedance equal to that connected at the load end.

was acting as a direct connection between the antenna center and the shack, adding no effects of its own. It wasn't, of course. The antenna was probably resonant at 7 MHz, and a ½-λ antenna looks like 70 Ω at its center. Hence, this was the same as connecting a 70-Ω resistor to the end of the 300-Ω line, for measurements made at 7 MHz. At other frequencies, the antenna becomes a complex termination, involving both resistance and reactance. From the previous discussion, you know that the 300-Ω line terminated in something other than 300 Ω is going to show various values of resistance and reactance at the input end, depending upon the electrical length of the line. Consequently, the resonant frequencies checked with the dip meter (these would be the frequencies where pure resistance showed at the input end of the line) have no bearing whatsoever on the resonant frequency of the antenna proper. By changing the physical length of the line our friend was able to get a length that showed "resonance" at the frequency for which he cut the antenna, but all this means is that his electrical line length at 7 MHz is now a multiple of a quarter wavelength, since it takes that length to show pure resistance at the input end when the load is a pure resistance (we're assuming it is).

Okay, how do you measure the resonant frequency of the antenna? Well, it isn't too easy, but fortunately, it isn't too important.

(WHAT?!!! It isn't important that the antenna be resonant? What kind of sacrilege is this?)

Our friend of the postcard is using what is known as a "tuned antenna system." He is terminating a 300-Ω line with a load other than the characteristic impedance, and consequently, what the impedance looks like at the input end of the line depends upon the electrical length of the line (see Fig 4). To put power into the antenna, the line is connected to the transmitter through a network that compensates for any reactance showing at the input end of the line, and a resistive load is presented to the transmitter. In plain language, the "network" is the output-stage plate, collector or drain tuned circuit(s) or, to handle a wider range of conditions, the plate, collector or drain tuned circuit(s) plus an antenna tuner (sometimes called a Transmatch, antenna coupler, antenna tuning unit [ATU] or antenna-system tuning unit [ASTU]).

Perhaps we should mention at this point that only resistance can use up power; reactance can't. You know this from practical work; you can pass ac through a capacitor, but the capacitor never gets hot (if it's a pure capacitor) or uses power in any other way. The same is true of a pure inductance, but they are harder to come by because the conductor of the coil has some resistance. When a coil heats up, it is the resistance of the coil that causes this, not the reactance.

Since only resistance can use up power, what difference does it make if the antenna is resonant or not? When the antenna is resonant it appears as a pure resistance (made up of the conductor resistance plus the antenna's *radiation resistance*), but when it isn't resonant it looks like a resistance and a reactance. Only the resistive part can use up power, so we don't throw anything away. We do want the antenna to be resonant and look like a resistance if we are planning to use it as a load for an "untuned" transmission line, but to do this we have to use a line with a characteristic impedance equal or close to the value of resistance the resonant antenna shows. We can't feed a 70-Ω antenna with a 300-Ω line and expect it to be anything but a "tuned antenna system," exhibiting the variations shown in Fig 4. We can feed a 70-Ω antenna with 70-Ω line, and then no matter how long we make the line, it will always look like 70 Ω at the input end, and we won't have to use an antenna tuner if 70 Ω will load the transmitter satisfactorily. But the antenna *has* to be a 70-Ω antenna, resonant at the frequency we're interested in.

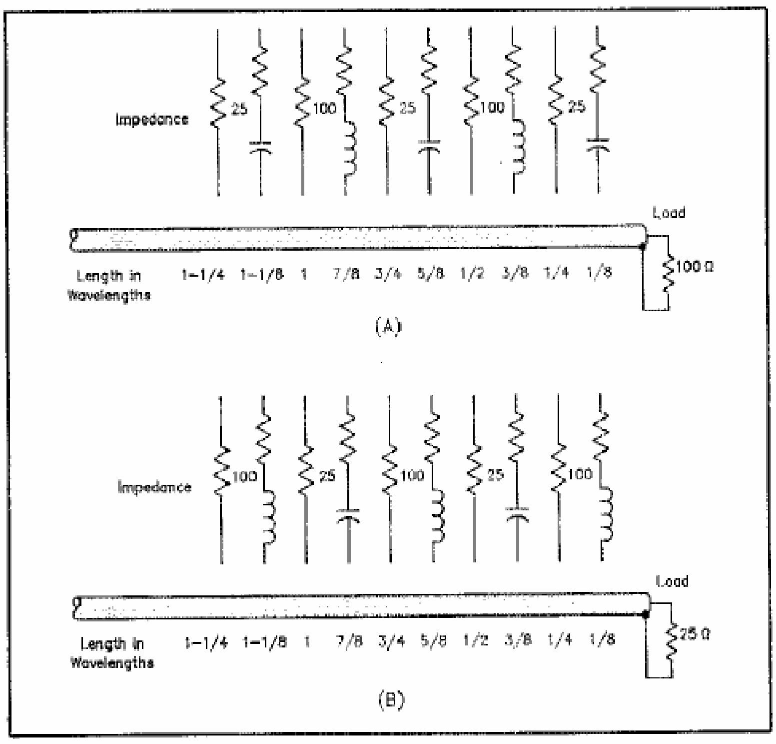


Fig 4—These two examples show how the input impedance of a 50-Ω line varies with the length of the line when the line is terminated in something other than the characteristic impedance of the line. It should be realized that the impedance is continually changing along the line, repeating every half wavelength. The impedance is purely resistive only at the ¼-λ (and multiples) point, and it becomes reactive either side of this point. When the load includes reactance as well as resistance, the impedance along the line varies in the same manner as shown here, but the purely resistive points do not occur at multiples of ¼ λ from the load.

Standing-Wave Ratio

By this time it may or may not have occurred to you that all this talk about the way the input impedance varies with a mismatched line may have something to do with that old conversation piece, the "standing-wave ratio." It does. Since the power at any point along the line must be constant, you can see that as the resistance and reactance vary along the line, so must the voltage and current. Take the line of

Fig 4A. Let's say we're putting 100 W into that 100-Ω load. The current at that point is 1 A and the voltage is 100; P = I^2R = $E^2 \div R$. A quarter wavelength from the load, the line looks like 25 Ω, and 100 W at this resistance level is a current of 2 A and a voltage of 50. At the half-wave point from the load we're back to 1 A and 100 V. Thus you can see that the current and voltage vary along the line, and of course they can be measured and that will give us something called the "standing-wave ratio." This SWR is the ratio of a current maximum to a current minimum, or the ratio of the voltage maximum to the voltage minimum, and in this case it is equal to 2.0. We say, "The SWR of the line is 2.0." Note that this ratio of 2.0 is also the ratio of the resistive load to the characteristic impedance of the line (100 ÷ 50 = 2). It always works out this way; the SWR of the line is equal to the ratio of mismatch between load and line, for resistive loads. (When the load is smaller than the characteristic impedance, you divide by the load, because the SWR is normally stated as a ratio larger than 1.0) The solution is more complicated with some reactance in the load.

And now you can see why those "brains" who change the SWR on the line by changing the line length just don't know what they're talking about. What they are doing is adjusting the length of the line so that at the input end it looks like a resistance and hence becomes a little easier to couple to. But *the SWR is determined by the load*, and don't you forget it.

That's about it. If you've learned that the SWR is determined by the load and not by the line length, and if you've learned that the antenna resonant frequency isn't important when you're using a tuned line, you've come a long way. Of course, the latter doesn't mean you can use a very short (less than 1/8-λ) antenna and get out just as well as with a full-sized one. In this latter case, the ohmic resistance of the antenna and loading devices may be greater than the radiation resistance of the antenna, and much of your power goes into heating the loading devices and the feed line.

Other Considerations

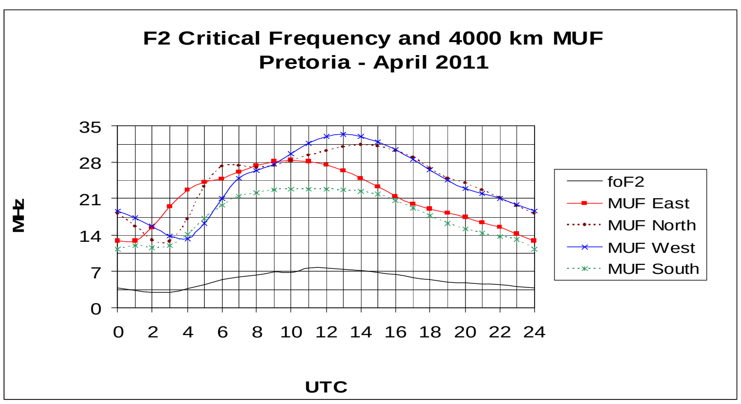
To keep this discussion simple, we have of necessity left out a number of points that often must be considered. For example, a piece of open-wire transmission line and a piece of Twin-Lead (or coaxial line) of the same physical length do not have the same electrical length. The reason for this is that the radio waves travel slower through the solid dielectric of the Twin-Lead than they do through the air dielectric of the open line, so a wavelength in air (for a given frequency) is longer than a wavelength in solid dielectric. The "velocity of propagation" in air is considered to be 1.0 and the "VP" (also called *VF*, for *velocity factor*) in a solid dielectric will be something less, depending upon the material. VP values for various lines are given in any good antenna book, and they must be considered when you compute the electrical length of a line.

Another aspect that was not considered was the loss in a transmission line. If the line itself had no loss, then the SWR value would make no difference where losses are concerned. However, any practical line does have some loss, and this loss increases with the SWR, and the inherent loss of the line. This is a consideration in any antenna system requiring a long run of line, and is the reason that one shoots for a low SWR with coax or Twin-Lead but doesn't worry too much about it (from a loss standpoint) with open-wire line.

Notes

[1]Since this article first appeared in 1956, *RG-8* has come to specify a *class* of cables more than a type. Depending on the particular product involved, cable marked *RG-8* may exhibit a characteristic impedance from 50 to 57 Ω. This article assumes the 50-Ω variety. A similar fate has befallen RG-58, 59 and several other RG designators.—*Ed.*

[2]This is strictly true only for a lossless line, where the input impedance will be equal to the characteristic impedance for any length of line. Lines with appreciable loss will show a gradual variation in input impedance, depending upon the length, as a result of the cumulative effects of series resistance and shunt conductance.—*Ed.*



Long Term HF Propagation Prediction for April 2011

courtesy ZS6BTY

(see also our website propagation tab)

DX Operating

The graph shows the 4000 km maximum useable frequency (MUF) to the East, North, West and South from Pretoria for the first hop using the F2 layer.

Local Operating

The F2 critical frequency (foF2) is the maximum frequency that will reflect when you transmit straight up. E-layer reflection is not shown.

- But Ham??? Where's that from?

"Ham: a poor operator. A 'plug.'" That's the definition of the word given in G. M. Dodge's The Telegraph Instructor even before radio. The definition has never changed in wire telegraphy.

The first wireless operators were landline telegraphers who left their offices to go to sea or to man the coastal stations. They brought with them their language and much of the tradition of their older profession. In those early days, spark was king and every station occupied the same wavelength--or, more accurately perhaps, every station occupied the whole spectrum with its broad spark signal.

Government stations, ships, coastal stations and the increasingly numerous amateur operators all competed for time and signal supremacy in each other's receivers.

Many of the amateur stations were very powerful. Two amateurs, working across town, could effectively jam all the other operators in the area. When this happened, frustrated commercial operators would call the ship whose weaker signals had been blotted out by the amateurs and say "SRI OM THOSE #&$!@ HAMS ARE JAMMING YOU."

Amateurs, possibly unfamiliar with the real meaning of the term, picked it up and applied it to themselves in true "Yankee Doodle" fashion and wore it with pride. As the years advanced, the original meaning has completely disappeared.

The above was contributed by Roger ZS6RJ.

Onderstaande was ingestuur deur Pieter ZS6PVW.

Moontlik 'n Engelse Gentleman as ons so kyk na sy klere?

A wife asks her Software Programmer husband:

"Can you please buy one carton of milk, and if they have eggs, get 6!"

A short time later he comes back with 6 cartons of milk.

The wife asks him, "Why did you buy 6 cartons of milk?"

He replied, "They had eggs."