



Critical Numeracy

Dr Rex Stoessiger
Quality Educational Services



Introductions

Please introduce yourself:

- Your name
- Your school
- Some mathematics you like
- Some mathematics you personally found hard to learn

What is Numeracy





What is Numeracy

- Being numerate, at the very least, is about having the competence and disposition to use mathematics to meet the general demands of life at home, in paid work, and for participation in community and civic life. (Sue Willis 1992)
- Numeracy involves the functional, social, and cultural dimensions of mathematics. (Withnall 1995)



What is Numeracy

- To be numerate is to have and be able to use appropriate mathematical knowledge, understanding, skills, intuition and experience whenever they are needed in everyday life (Tasmanian Department of Education, 1995,p.6).



Critical Literacy

- Critical literacy has been defined as an emphasis on how language and literacy, texts and discourses are implicated in the power relationships and face-to-face politics of everyday life. In other words, a focus on how language in all its forms is involved in our relationships to each other and the world.

(Allan Luke et al. 1994)



Critical Numeracy

- Critical numeracy sets out to encourage students to see that mathematical practice is morally and politically loaded – and that when mathematics is used in practical situations students should understand and reflect on the world position of those using it.



Critical Numeracy

- Critical numeracy is a focus on the ways in which practical mathematical situations are implicated in the power relationships and face-to-face politics of everyday life. **It is a focus on how numeracy in all its forms is involved in our relationships to each other and the world.**



Numeracy

- Numeracy is culturally based and socially constructed.
- Math(s) reflects a particular way of thinking.
- Numeracy reflects cultural values.
- Numeracy is not just about numbers.
- Math(s) evolves and changes.
- Numeracy is about procedural, practical knowledge.
- Numeracy involves different ways of solving problems.

(Not Just a Number: Critical Numeracy for Adults Sandra Kerka)

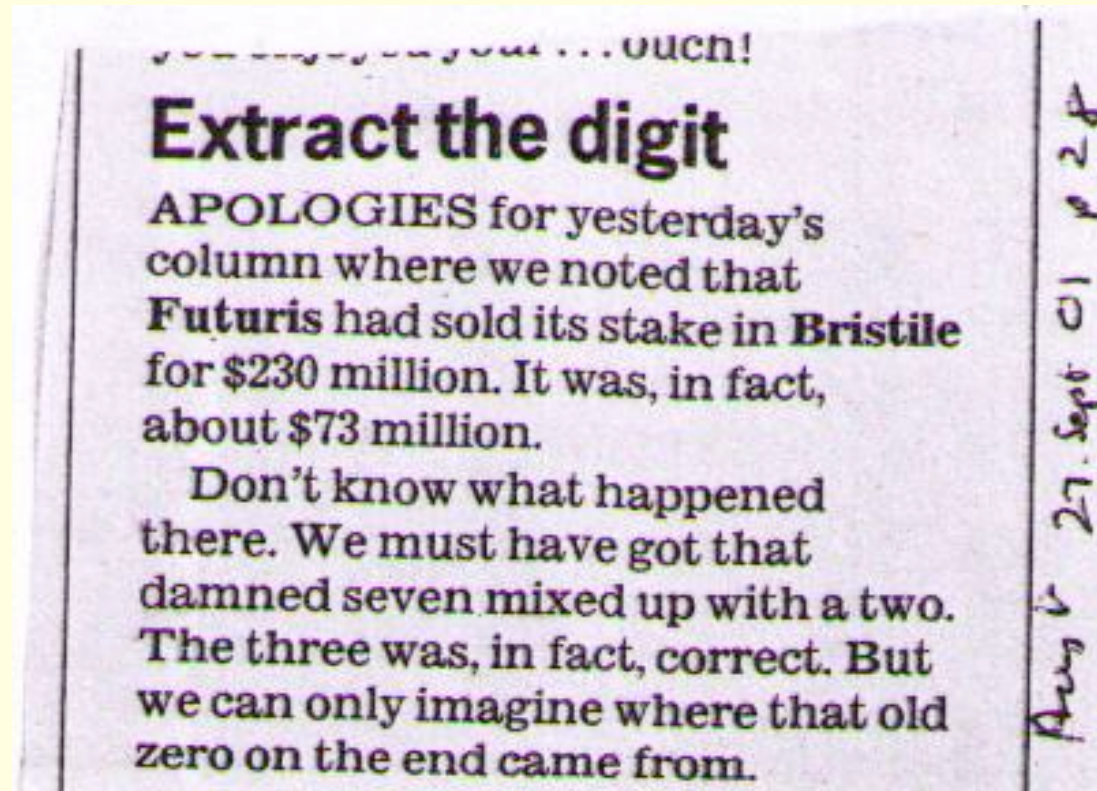


Critical numeracy is about:

- Going behind the mathematics to understand it's real purpose.
- Understanding that numeracy is made by people for people.
- Being critical and sceptical about how mathematics is used.
- Using popular texts and materials from everyday life as a source of numeracy.
- Helping students understand how numerical materials are used to manipulate them.

What sort of numeracy do we find in everyday life?

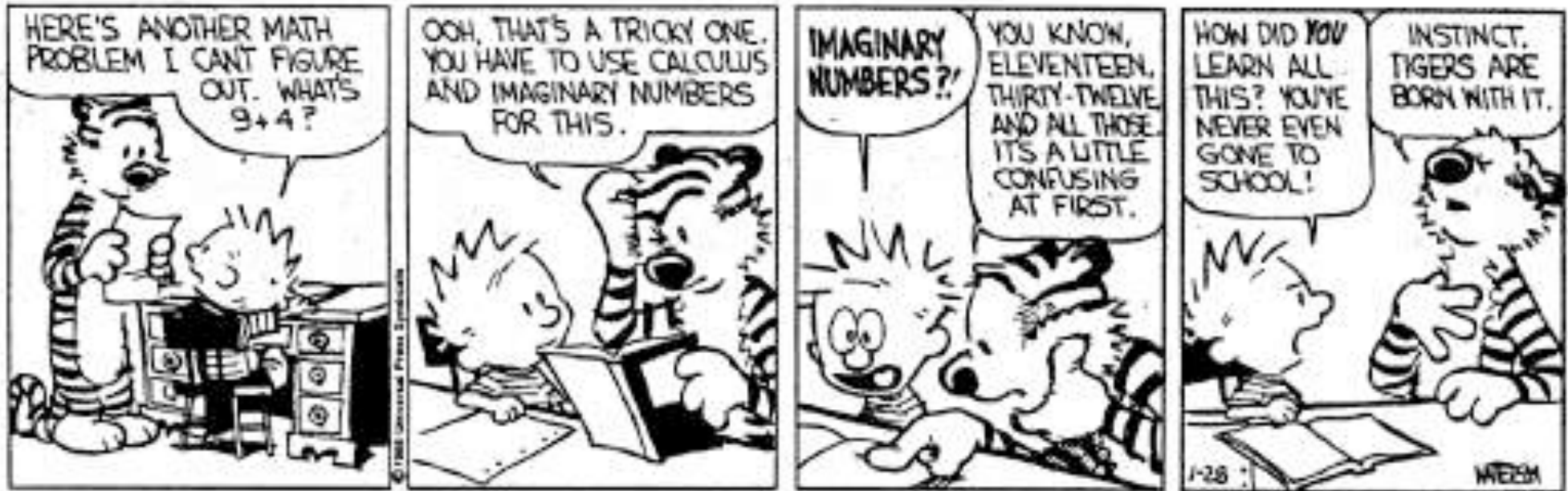
Extract the digit



Even Calvin has a go!

Calvin and Hobbes

by Bill Watterson



Car prices (CARSGuide.com.au)

2006 ALFA ROMEO 147 JTD 190

6 speed Manual Hatchback 4 door 5 seats

110kW @ 4000rpm, 60 Fuel tank capacity (litres) From \$39,990

2006 ALFA ROMEO 147 TI 190

5 speed Manual Hatchback 2 door 5 seats

110kW @ 6300rpm, 60 Fuel tank capacity (litres) From \$39,990

2006 ALFA ROMEO 147 TI 190

5 speed Manual Hatchback 2 door 5 seats

110kW @ 6300rpm, 60 Fuel tank capacity (litres) From \$42,990

2005 ALFA ROMEO 147 190

5 speed Manual Hatchback 2 door 5 seats

110kW @ 6300rpm, 60 Fuel tank capacity (litres) From \$35,990

2005 ALFA ROMEO 147 190

5 speed Manual Hatchback 4 door 5 seats

110kW @ 6300rpm, 60 Fuel tank capacity (litres) From \$37,490

Epharmacy

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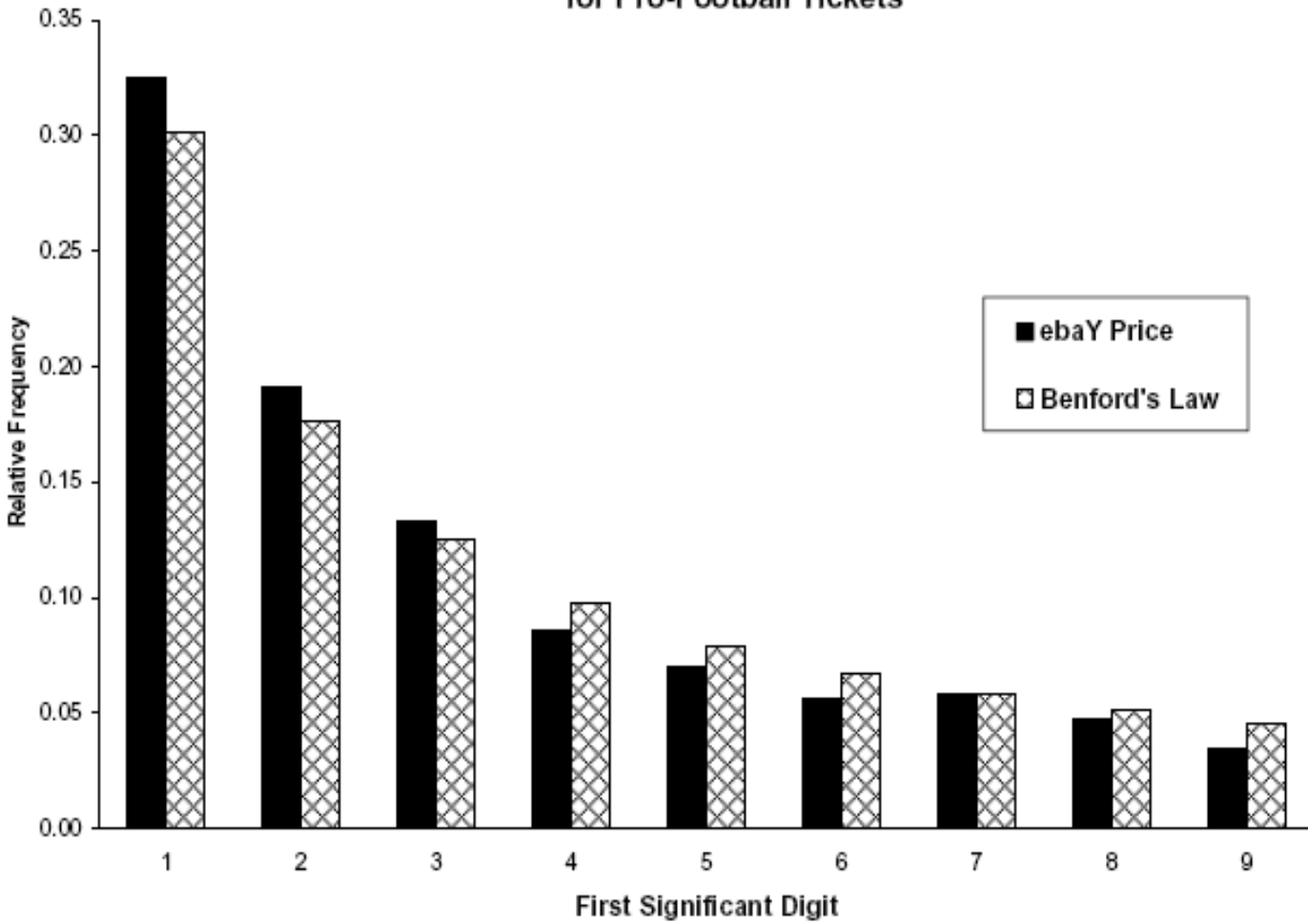
Featured Products [View All](#)

	Red Deer by Elizabeth Arden Eau De Toilette Spray 100ml L	142.00 110.00	BUY
	Lancome Eau De Toilette Spray 100ml L	316.00 264.00	BUY
	Yves Saint Laurent Opium Eau De Toilette Spray 50ml L	152.00 120.00	BUY
	Elizabeth Arden Prevocative Woman 30ml L	550.00 450.00	BUY
	Jilco & Sabina Classic EDT Spray 100ml L	330.00 280.00	BUY

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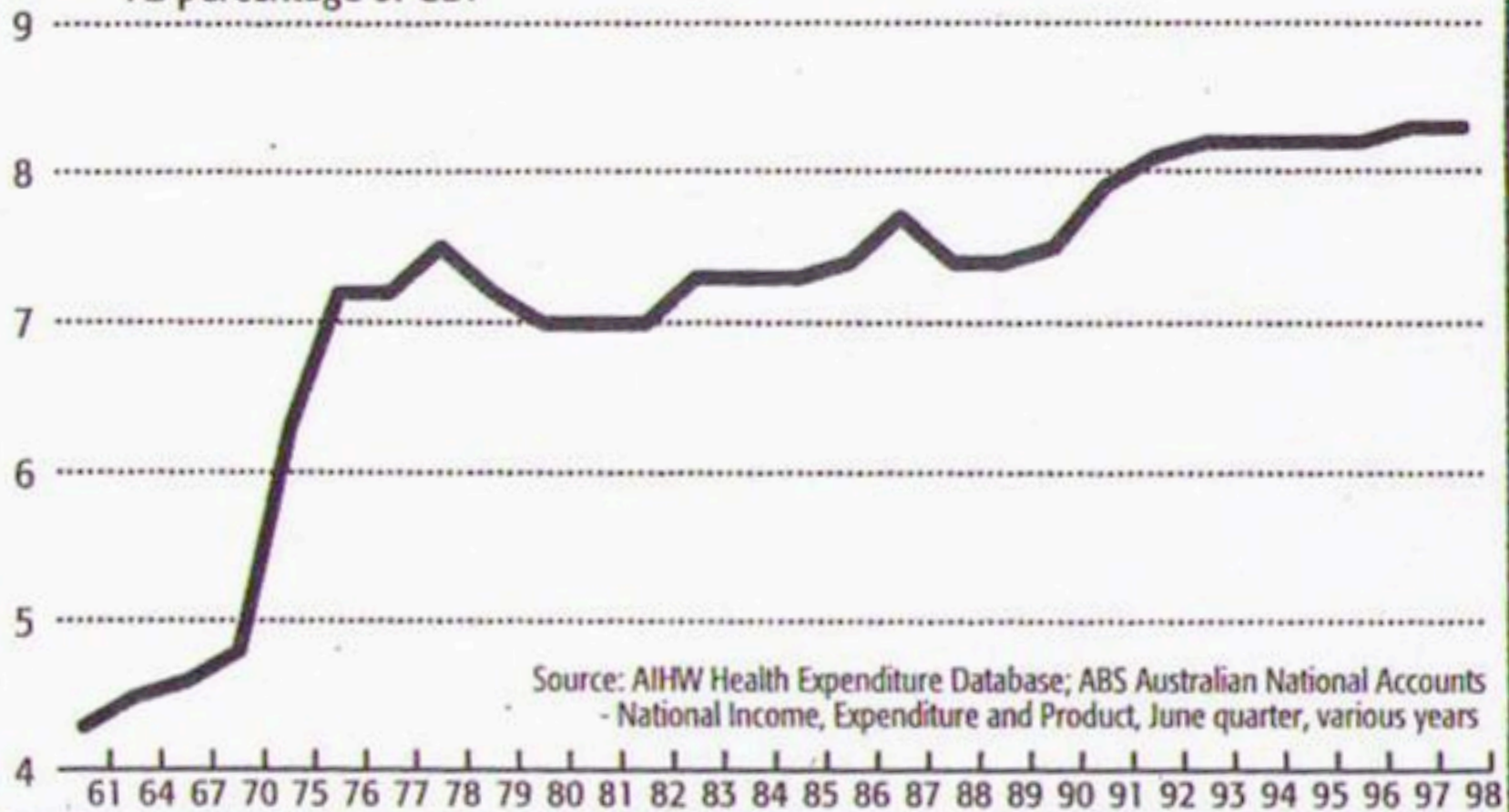
ebaY Auction Results

Figure 2: Relative Frequency Distributions for ebaY Auction Prices for Pro-Football Tickets



Health expenditure

As percentage of GDP



Source: AIHW Health Expenditure Database; ABS Australian National Accounts
- National Income, Expenditure and Product, June quarter, various years

Paying the price for saving - an article on a central Queensland shopper

- It was reported that a shopper spent 45 minutes in the supermarket checkout buying each item individually so he could maximise the benefit of rounding down the prices that the supermarket used.
- Evidently the customer saved \$2.85 by getting each item rounded down. The supermarket claimed it cost them \$12.27 in additional labour to process the goods.
- The supermarket has refused to serve the customer in this way again.



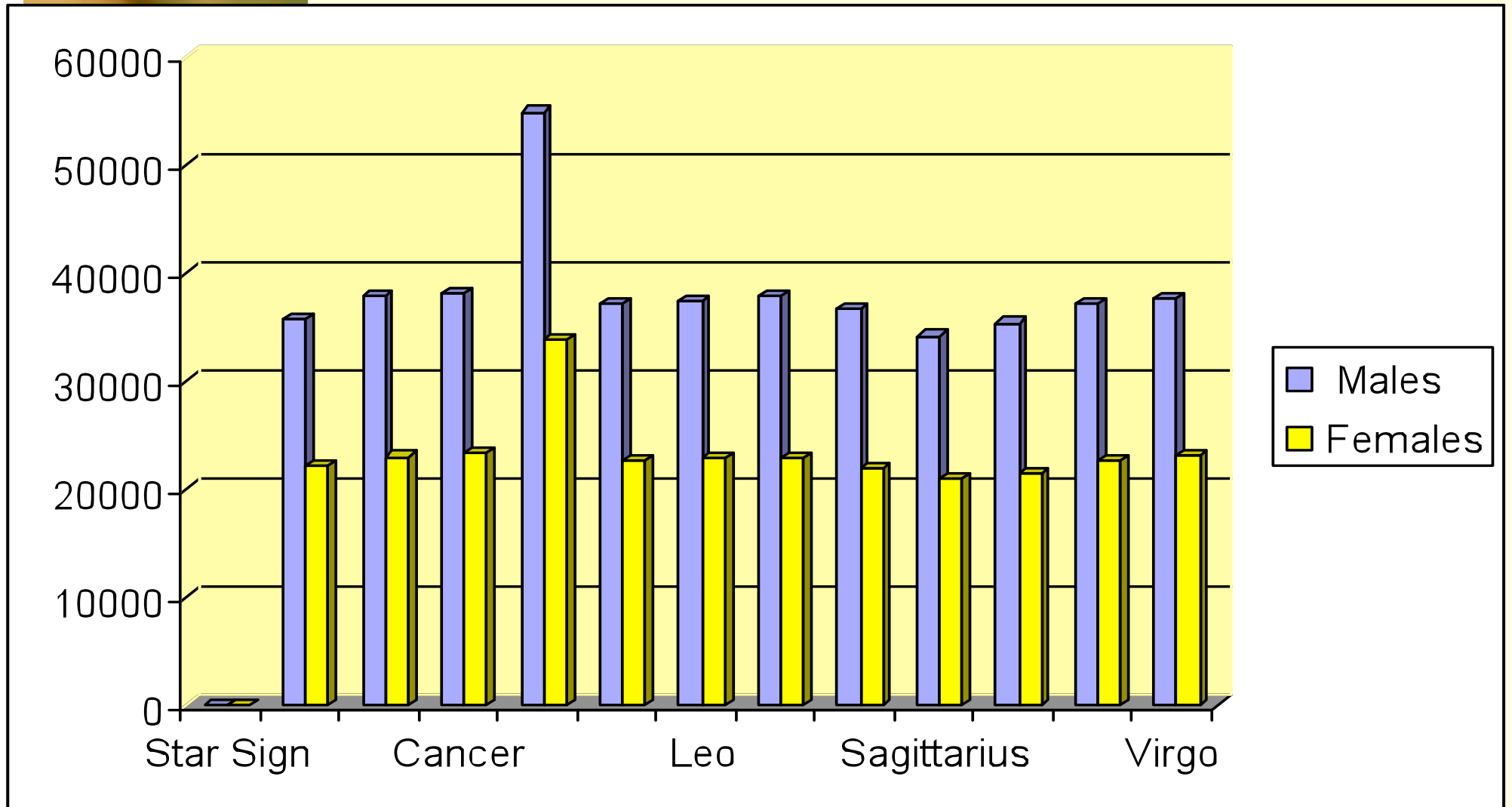
Capricorns crash through

For these questions use the article and the data set below.

AAMI Data Set: Policy holders and percentage accident rate by Star Sign

Star Sign	Males		Females	
	Policy Holders	Accident Rate	Policy Holders	Accident Rate
Aquarius	35,666	14.33	22,067	14.69
Aries	37,926	13.93	22,959	15.13
Cancer	38,126	13.78	23,329	14.67
Capricorn	54,906	14.82	33,720	15.37
Gemini	37,179	14.02	22,587	14.57
Leo	37,354	13.91	22,747	15.00
Libra	37,910	14.04	22,755	14.58
Pisces	36,677	13.90	21,967	14.95
Sagittarius	34,175	13.70	20,928	14.73
Scorpio	35,352	14.34	21,407	14.95
Taurus	37,179	14.32	22,715	14.85
Virgo	37,718	13.70	23,133	14.41

Policy Holders



Numeracy in the News

Numeracy in the News

Crime Down 8%

Overview

Close Shave 2028

Traffic and Transport

Close Shave 2036

Capricorns Crash Through

Data

**McNICOLL**

Just a minute, it's symmetrical

NUMERICAL types may already be aware of this — but 8.02pm next Wednesday will be a historic moment, one which has had no equivalent for the past 1001 years and which will not happen again. As the clock ticks over from 8.01 pm on February 20, time will, for 60 seconds only, read in perfect symmetry — 2002, 2002, 2002 — or to be more precise — 20:02, 20/02, 2002. My source for this information says the last occasion that time read in such a symmetrical pattern was long before the days of the digital watch and the 24-hour clock — 10.01 am on January 10, 1001. He further points out that because the clock only goes up to 23:59, this will never happen again.

Sequential times

The perfect time

By John Hand

BBC News

For those working through the night or just staying up late, it promises to be a time when clockwatching should be positively encouraged.

In the early hours of Thursday morning, the clock ticks past a time which is sure to appeal to the statistically-minded or just those who like a little bit of order in their lives.

For just a second - naturally - the time will be exactly 01:02:03 on 04/05/06.

Or at least it will be in the UK and the majority of countries which list dates in day and month order. In the US, the same phenomenon was observed on 5 April.

And, boy, was it observed. Hundreds of American bloggers took the opportunity to pay their own tribute to this segment of time, with many aiming to upload updates at the precise second it occurred.

The blogs also prompted plenty of debate as to how often such times come about.

(BBC News 3 May 2006)

Play TAskeno's exciting NEW game



It's as easy as tossing a coin

TAskeno's new game is an even money bet, so you can double your money on every game and you can play for as little as one dollar per game.

It's as easy as tossing a coin. All you have to do is correctly forecast whether the result of the game will be 'HEADS' or 'EVENS' or 'TAILS'.

'HEADS' = Eleven or more numbers drawn in the top half (or 'head') of the TAskeno grid.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40

'EVENS' = Ten numbers drawn in both the top half and the bottom half of the TAskeno grid.

41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80

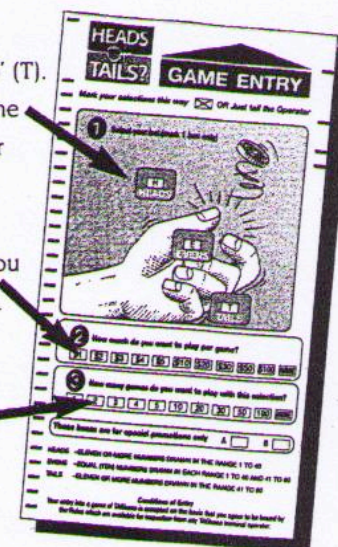
'TAILS' = Eleven or more numbers drawn in the bottom half (or 'tail') of the TAskeno grid.

How to play

You don't have to play a regular game of TAskeno to play 'HEADS OR TAILS?' All you have to do is choose whether you want to bet on 'HEADS', 'TAILS' or 'EVENS', then tell the operator how much you want to bet per game and how many games you want to play. You don't even need to

Or, if you prefer, you can also place your bet by using the 'HEADS OR TAILS?' Entry Form.

- 1 Select 'HEADS' (H), 'EVENS' (E) or 'TAILS' (T). You can only make one selection per game or per group of games.
- 2 Indicate how much you wish to bet per game.
- 3 Indicate how many consecutive games you want to play.

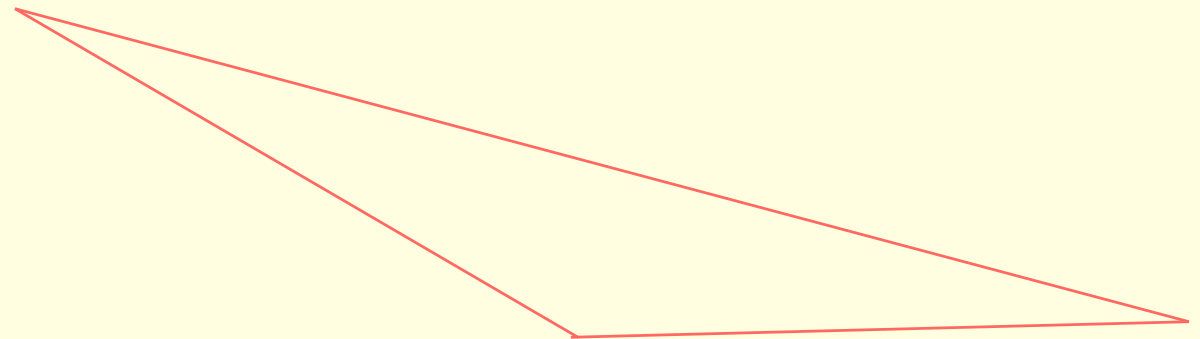
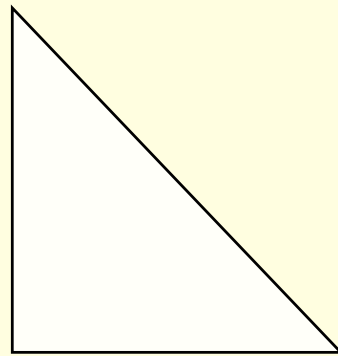


Prize table

Correctly Select	\$1 Bet	\$5 Bet	\$20 Bet	\$50 Bet
HEADS	Win \$2	Win \$10	Win \$40	Win \$100
EVENS	Win \$4	Win \$20	Win \$80	Win \$200
TAILS	Win \$2	Win \$10	Win \$40	Win \$100

The maximum 'HEADS OR TAILS?' bet is \$500 per game for each entry.

What is the biggest angle you can make in a triangle



NZ jet forced to land in ...

The ...

August 11, 2001

An Air New Zealand flight was forced to divert to ... yesterday when a passenger became gravely ill.

The man died in hospital later.

The Air New Zealand 767 was traveling from Auckland to Perth but was diverted to ... Airport, where it landed about 3.45pm.

The ... Ambulance Service ferried the man to the Royal ... Hospital but he was pronounced dead a short time later.

The man, whose name has not been released, was a 58-year-old New Zealand citizen.

It is believed his wife and daughter were also on the flight.

They were headed to Western Australia for family reasons.

No more details were available last night. The coroner is investigating.



NZ jet forced to land in Hobart

The Mercury

August 11, 2001

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Numeracy Across the Curriculum

- Activities should be developed collaboratively by Maths and subject area teachers
- They must be mathematically challenging
- A balance between explorative, open activities and computation practice
- Real world activities including popular texts
- Understand the importance of context
- Value the informal methods students demonstrate
- Real world tools, calculators spreadsheets, graphs
- Critical and empowering

Harvey Norman

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GOLD COAST	ONEWAY FROM \$205*
ADD 1 nights accommodation from \$25*	
PERTH	ONEWAY FROM \$255*
ADD 1 nights accommodation from \$34*	
SINGAPORE	ONEWAY FROM \$718*
ADD 1 nights accommodation from \$36*	



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POLY-TARP
 1.6m x 1.0m. With eyelets. F/L3332220

2 FOR \$3



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The Science Show - Are you feeling lucky?

Richard Wiseman: Skibbereen has an amazing reputation for being lucky and the reason for that is that it has lots of Lotto winners, so it's had about ten of them, jackpot winners, it's brought around 13 million Euros in winnings to the town and when you go there it's absolutely amazing. You walk down the street, you pass one newsagent that says, you know, I've sold five of the winning tickets, the next one has sold six – I mean it's unbelievable. ...

Robyn Williams: And so you look at that by doing what sort of experiment?

Richard Wiseman: Well I went to Skibbereen and bought 50 lottery tickets, the numbers of the tickets were randomly chosen and then came up to Dublin as a kind of control city and found a newsagent that wasn't especially lucky and bought another 50 tickets there, and then compared to the two sets of tickets.

Robyn Williams: And the results just out?

Richard Wiseman: The results just out is I didn't win anything at all. So, a massively unsuccessful 100 lottery tickets and no difference between the two towns. So in terms of winnings, winning numbers even, no difference between Skibbereen and Dublin. So it suggests the probability theory is still with us and still alive.

<http://www.abc.net.au/rn/science/ss/stories/s1489994.htm>

The great grocery rip-off

Fri 15/09/06

Products at the supermarket are shrinking — but we are paying the same price.

The new Tim Tams have gone from 11 biscuits to nine, Schweppes soft drinks have decreased from 315ml to 300ml, Dolmio vegetable sauce has lost 20 grams in weight, Coca Cola's new can is 75ml less and Kellogg's Mini Wheats have shed 55 grams.

Cadbury Schweppes, Coca-Cola and Kellogg's say the smaller sizes are in line with consumer demand, but were unavailable for interview.

"It's funny, manufacturer's say it's about improving their packaging. They tell us it's about making a product easier to use or longer lasting, when really if you're paying the same price as you did previously, and now you're getting less, you're being ripped off," says Dr Con Stavros, a marketing lecturer from Royal Melbourne Institute of Technology.

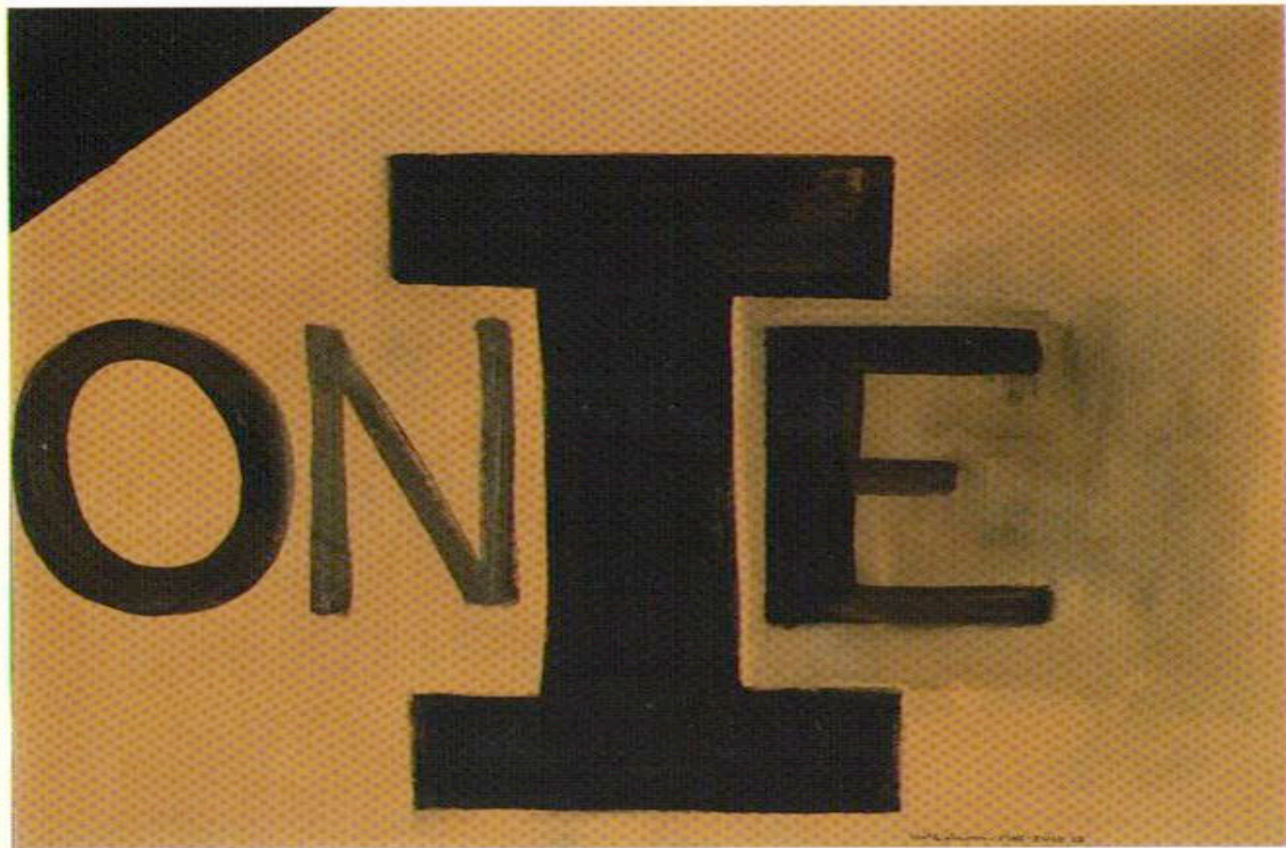
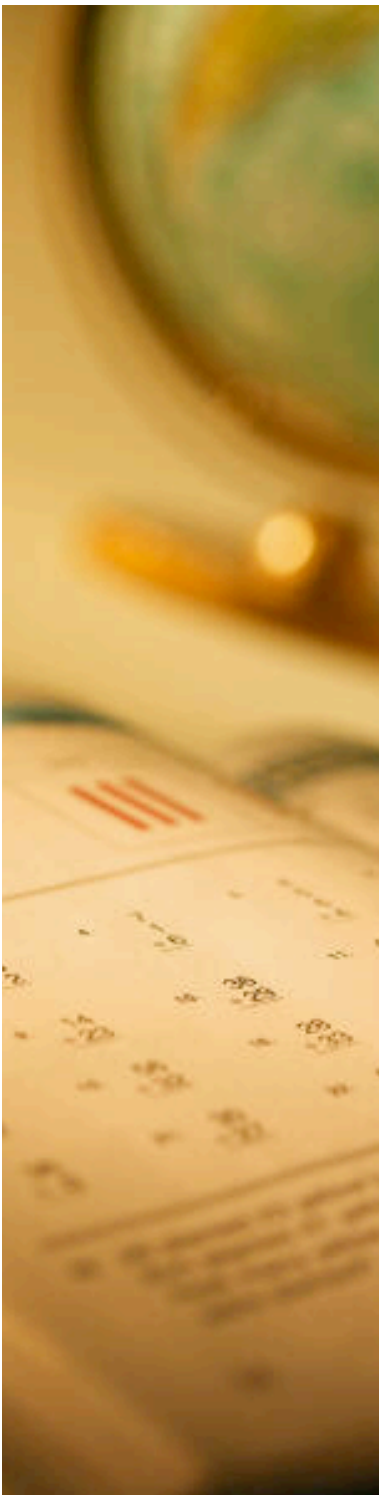
A 15ml reduction, or five percent, may not sound much but every time Schweppes sells a million cluster packs of soft drink there's a \$150,000 saving for the company. When Wrigley shaved 0.3 grams off each PK pellet the company pocketed 15 percent more.

Barry Flanagan from Retail World says a constant price hike should not be surprising.

"People need to understand there's a 'price point' for a product. The manufacturers assess a product's worth and instead of pushing the price over the 'price point' they will downsize the product to keep the price at the same level," he says.

"It's best for everyone if the price stays at the same level. You're not being ripped off, they have to do it. Distribution has significantly attributed to the rise in prices.

Transport and packaging the product has changed because of fuel increase so it shouldn't come as a surprise that these prices have risen."



Jesus story 'gets it 97% right'

By Barney Zwartz

Religion Editor

July 19, 2005

Illustration: *Wilcox*

It is 97 per cent certain that God raised Jesus Christ from the dead - based on sheer logic and mathematics, not faith - according to Oxford professor Richard Swinburne.

"*New Testament* scholars say the only evidence is witnesses in the four gospels.

That's only 5 per cent of the evidence," Professor Swinburne, one of the world's leading Philosophers of religion, said last night. "We can't judge the question of the resurrection unless we ask first whether there's reason to suppose there is a God, second if we have reason to suppose he would become incarnate and third, if he did, whether he would live the sort of life Jesus did."

Professor Swinburne, in Melbourne to give several seminars and a public lecture at the Australian Catholic University last night, said the mathematics showed a probability of 97 per cent.

This conclusion was reached after a complex series of calculations. In simplified terms, it began with a single proposition: the probability was one in two that God exists. That is God either did or didn't.

Next, if God exists, the probability was one in two that he became incarnate. Further, there was a one in 10 probability that the gospels would report the life and resurrection of Jesus in the form they do.

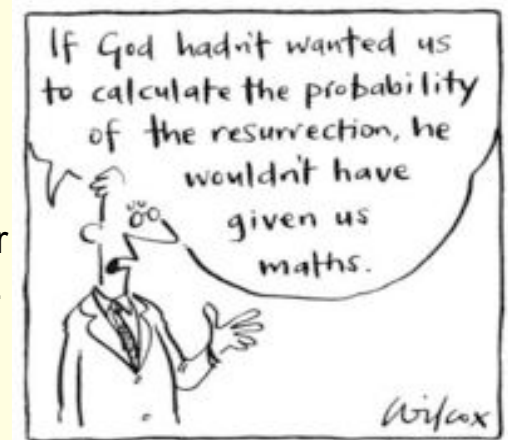
Finally, the clincher: the probability that we would have all this evidence if it wasn't true was one in 1000.

He argued that any evidence for the existence of God was an argument for the resurrection, and any evidence against the existence of God was an argument against the resurrection.

"Does he have reason to become incarnate? Yes, to make atonement, identify with our suffering and to teach us things," Professor Swinburne said.

Even Jesus' life is not enough proof, he said. God's signature was needed, which the resurrection was, showing his approval of Jesus' teaching.

The mathematical equations appear in the professor's book, *The Resurrection of God Incarnate* (OUP, 2003).



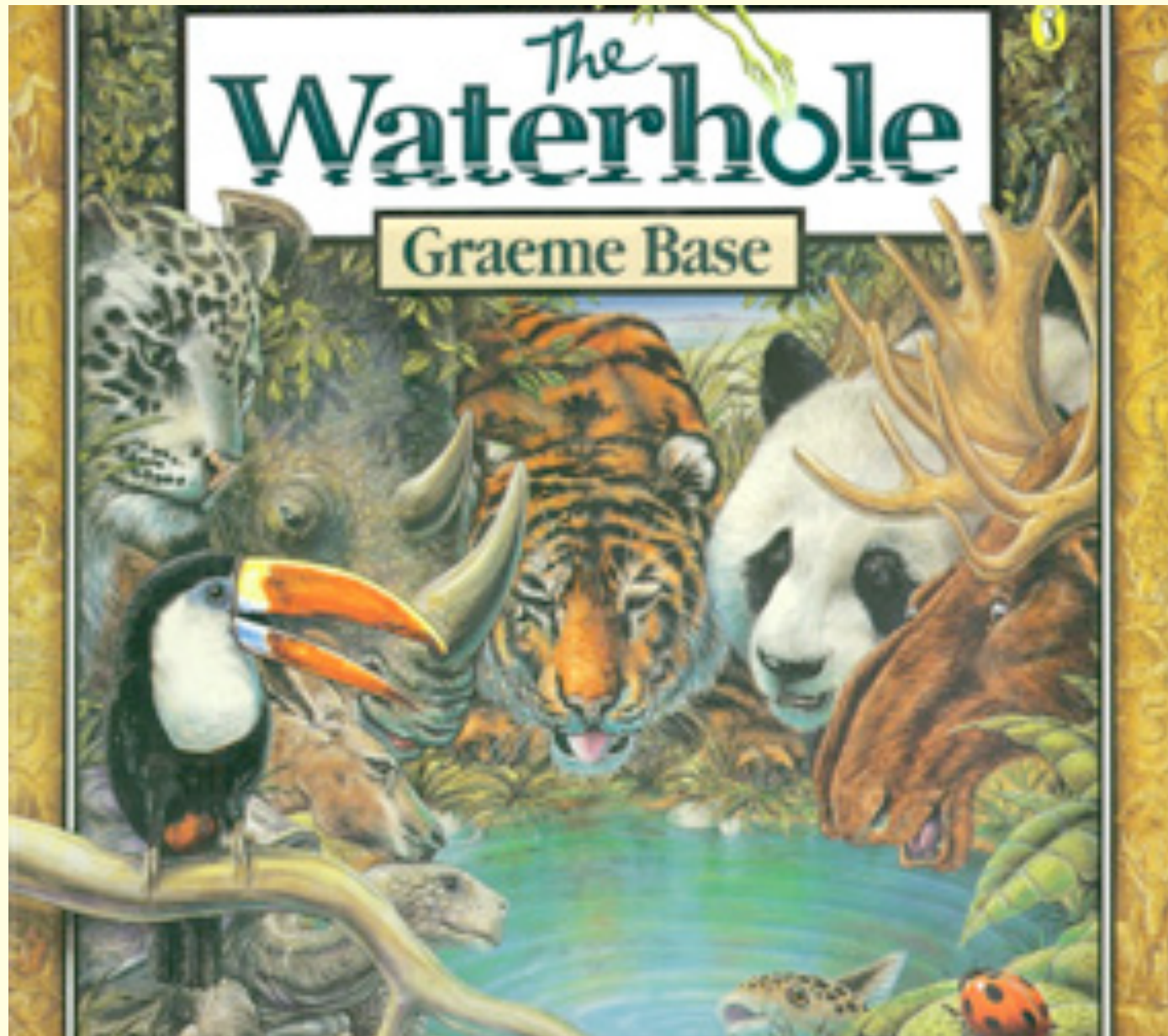


Open ended questions

- My rule is: To add 4 consecutive numbers you add the first and the last and multiply by 2.
- $2+3+4+5 =$
- Add $2 + 5 =$
- Multiply by 2: $7 \times 2 = 14$

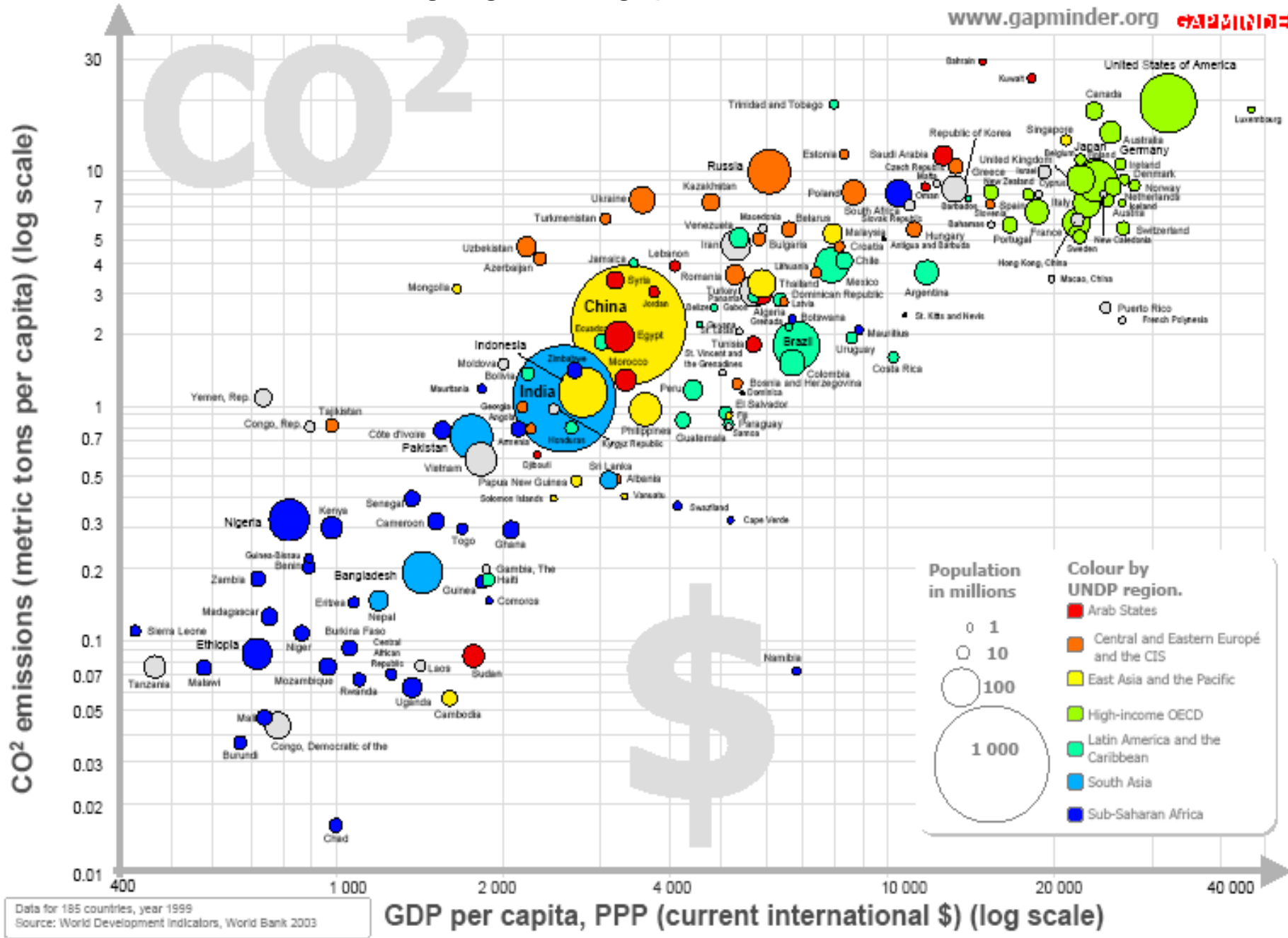
What patterns can you find?

1	1	1	1	1	1
1	2	3	4	5	6
1	3	6	10		
1	4	10	20		
1	5	15	35		
1	6				



The Waterhole by Graeme Base

Quality Educational Services



If size zero fits, you really could be something

ero fits, you really could be something

By BROOKE WILLIAMSON
in Sydney

WOMEN'S bodies have been downsized to nothing.

While the average woman is a size 14, fashion designers have now introduced a size zero, which is so small it's no size at all.

Downsizing is one of the latest marketing tricks to get customers to buy clothes, because if you're flattering them you'll get the sale.

It's not exactly a new concept as today's average size 10 has the approximate measurements of a size 18 in a Sears Roebuck (a US department store) catalogue from the turn of the century.

Simone Zimmermann, who owns Zimmermann with her designer sister Nikki, said they started

clothes (1, 2, 3, 4 instead of 10, 12, 14 etc) when they started out a decade ago.

"There was no standard and we wanted to build up our size ratios in the way we wanted to," she said.

"We wanted to take away the stigma of being a size 10 or a 12 or a 14, which is really just a number."

Zimmermann said they introduced size zero, which is equivalent to a 6-8, out of demand for a smaller size than their size 1 — which is their most popular, and outsells every other size 3-1.

"Due to demand, we've also had to introduce another size that is smaller than zero, and it's petite," she said.

But it's not just clothing which is being downsized. The shapes are changing as well, as fitness trends and figure types change over time

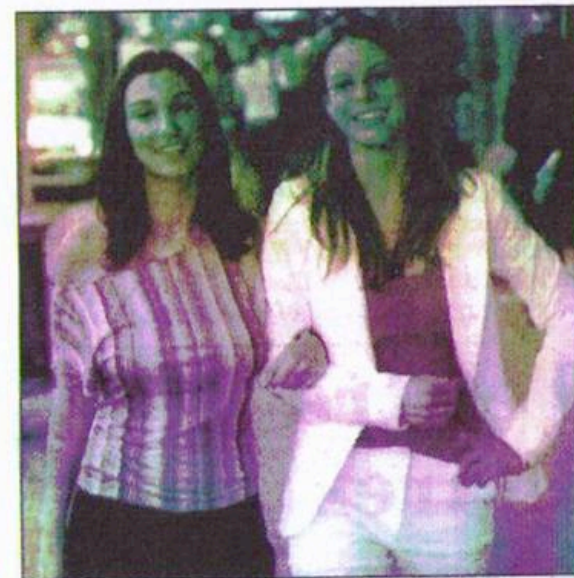
More women are focusing on exercise and weight training, while other factors such as cosmetic surgery mean women's hips are smaller and their breasts larger.

But, as women are bombarded with emaciated images that are supposed to represent beauty, what does slimming down to size zero say about the way we view ourselves?

University of Sydney psychologist Diana Kenny said it was ridiculous to use zero as a size to measure women's bodies.

"It's sending a really bad message to women that in order to be considered beautiful they have to be nothing," Dr Kenny said.


"To be valued you have to be a nothing. It's almost like, if you're a size zero, you've physically vanished into the ether."



DOWNSIDED: Rachel Armeni, 25, left, wears size 10 with Harriet Martin, 16, in zero.

Most Popular Dog Breeds

Rank	Breed	Number*
1.	Labrador Retriever	146,692
2.	Golden Retriever	52,550
3.	German Shepherd	46,046
4.	Beagle	44,555
5.	Yorkshire Terrier	43,522
6.	Dachshund	40,770
7.	Boxer	37,741
8.	Poodle	32,671
9.	Shih Tzu	28,958
10.	Chihuahua	24,850



Using numbers to get a message across

- How could you use the table of popular dog breeds to show:
 1. That most dog breeds are similar in popularity.
 2. There is a great difference in the popularity of dog breeds.
 3. The average dog owner has a Golden Retriever.
 4. The average dog owner has a Yorkshire Terrier.



A Scripture Reading

The text for today describes the building of Solomon's temple.

Then he made the molten sea; it was round, ten cubits from brim to brim, and five cubits high and a line of thirty cubits measured its circumference. (RSV)

... did compass it round about. (King James)
(I Kings 7:23)



A Scripture Reading

Academic Controversy

A US state (Arkansas?) legislated to make pi equal to three.

Debate:

That in Australia we should take pi equal to 3.



One in a million

- It was reported in a Tasmanian newspaper (The Advocate, 20/2/89) that Mike Dolega wrote the numbers from one to one million just for the experience of it.
- The newspaper claimed he had written 5878936 digits in the process and used 40 96-page exercise books and it took 1292 hours.



Einstein's View

As far as the laws of mathematics refer to reality, they are not certain; as far as they are certain, they do not refer to reality.

Albert Einstein, *Geometry and Experience*, January 27, 1921

Calvin and Hobbes

by Bill Watterson

