Institute of Physics

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"Sex and the City stars stay upright because h = Q.(12+3s/8)" say scientists

As Sex and the City's Carrie finally wanders off our television screens, physicists at the Institute of Physics have devised a formula that high-heel fans can use to work out just how high they can go. Based on your shoe size, the formula tells you the maximum height of heel you can wear without toppling over or suffering agonies.

h = Q.(12+3s /8)

h is the maximum height of the heel (in cm)
Q is a sociological factor and has a value between 0 and 1 (see below to work this out)
S is the shoe size (UK ladies sizes). This factor makes sure that the base of support is just good enough for an experienced and sober, high-heel wearer not to fall over.

"Although at first glance our formula looks scary" said Dr Paul Stevenson of the University of Surrey who carried out the research for the Institute, "It's actually pretty simple as it's based on the science you learnt at school and which you never thought you would use in real life, in this case Pythagoras' theorem [1] Applying this to shoes can tell us just how high the heel of the foot can be lifted above the ground."

Dr Stevenson went on to describe how 'Q' - the essential sociological factor had been worked out.

"Essentially this part of the formula explains what women have always known - that you don't buy shoes just because they are comfortable, you can afford them and they look good - many other variables come into play"

'Q' is defined as follows:

Q = [p.(y+9).L] / [(t+1).(A+1).(y+10).(L+£20)]

The variables are:

p - the probability that wearing the shoes will help you 'pull' (in a range from 0 to 1, where 1 is pwhooar and 0 is stick to carpet slippers). If the shoes are a turn-off, there's no point wearing them.

y - the number of years experience you have in wearing high heels. As you become more adept, you can wear a higher heel. Beginners should take it easy.

L - the cost of the shoes, in pounds. Clearly, if the shoe is particularly expensive, you can put up with a higher heel.

t - the time since the shoe was the height of fashion, in months (0 = it's the 'in thing' right now!). One has to suffer for one's art, and if the shoes are terribly fashionable, you should be prepared to put up with a little pain.

A - units of alcohol consumed. If you're planning on drinking, be careful to give yourself a little leeway for reduced co-ordination.

So using this formula, if Carrie Bradshaw, who is an experienced high-heel wearer (let's guess at 5 years experience) wears her latest drop-dead gorgeous designer originals when sober, she can cope with a heel height of a staggering

12.5 centimetres (just over 5 inches).[2] However, if she over-indulges in cocktails, the 'safe' heel height (and perhaps also Carrie) plummets. Using the same example as above, if she consumes 6 units of alcohol she would be better advised to stick to shoes with only 2cm heels[3].

Laura Grant, a physicist from Liverpool University welcomes the Institute's new formula commenting, "many of my physicist colleagues have no trouble understanding quantum mechanics but can't figure out how women can wear high heels. Now I can explain to them how I minimise the probability of tripping up".

The Institute of Physics website, physics.org has more fascinating facts on the physics of shoes, including high heels. Just type 'high heeled shoes' into the enquiry box.

[1] Pythagoras theorem: In a right-angled triangle the square on the hypotenuse (longest side) is equal to the sum of the squares on the other two sides.

[2] In this example, shoe size (s) is 6 p = 1, y = 5, L = £300, t = 0, A = 0 giving a Q factor of 0.88 so heel height is 12.54 cm

[3] As above but with A (alcohol) = 6, Q factor falls to 0.15, giving a heel height of 2.01cm

Ends

Notes for editors

1. For more information, contact Dianne Stilwell, Institute of Physics public relations manager (Tel +44 (0)20 7470 4875, mobile 07957 200214, e-mail dianne.stilwell@iop.org).

2. The research was carried out for the Institute by Dr Paul Stevenson from the University of Surrey (Tel +44(0)23 9229 8361 , mobile 07947 805 496, email paul@gleet.org.uk). Paul Stevenson is a lecturer at the University of Surrey, who usually pursues research investigating the structure of atomic nuclei. He is always keen to try and explain physics to the wider world, and recently discussed quantum mechanics with the general public at the Royal Institution. Paul lives in Portsmouth, Hampshire, with three rabbits who help to keep his mind away from science (they are more interested in carrots than nuclear physics).

3. Laura Grant (Tel +44(0)151 794 6795, mobile 07870 243931, e-mail l.grant@liv.ac.uk) is a physicist working at the University of Liverpool, and part of the NOISE (new outlooks in science and engineering) campaign to promote science, www.noisenet.ws. She owns over 100 pairs of shoes.

4. The Institute of Physics is a leading international professional body and learned society with over 37,000 members, which promotes the advancement and dissemination of a knowledge of and education in the science of physics, pure and applied. It has a world-wide membership and is a major international player in:

- scientific publishing and electronic dissemination of physics;
- setting professional standards for physicists and awarding professional qualifications;
- promoting physics through scientific conferences, education and science policy advice.

The Institute is a member of the Science Council, and a nominated body of the Engineering Council. The Institute works in collaboration with national physical societies and plays an important role in transnational societies such as the European Physical Society and represents British and Irish physicists in

international organisations. In Great Britain and Ireland the Institute is active in providing support for physicists in all professions and careers, encouraging physics research and its applications, providing support for physics in schools, colleges and universities, influencing government and informing public debate.
