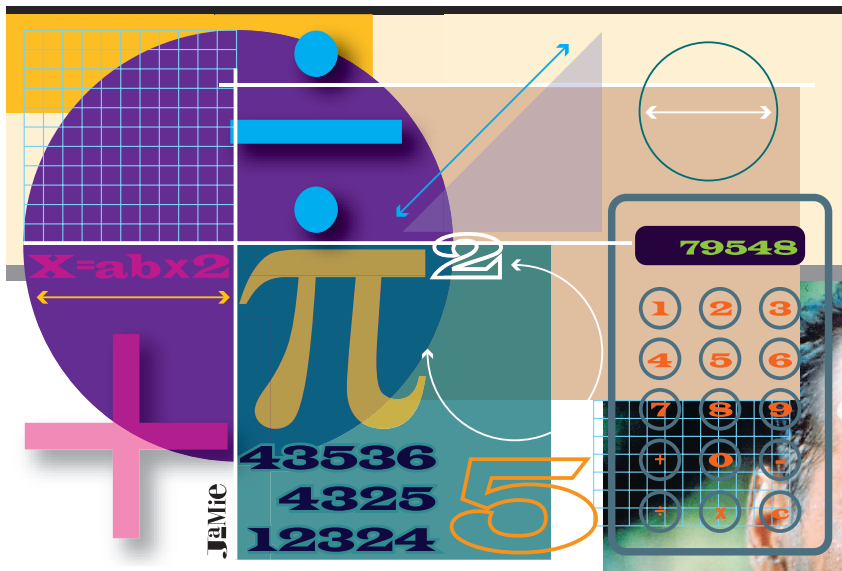
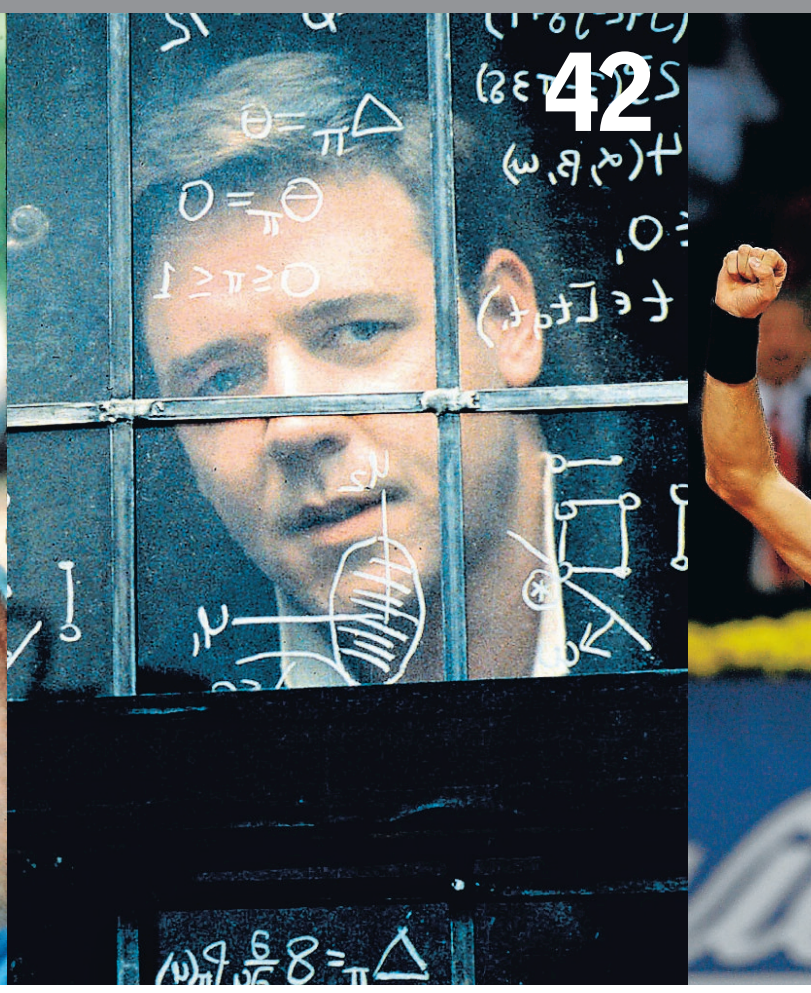


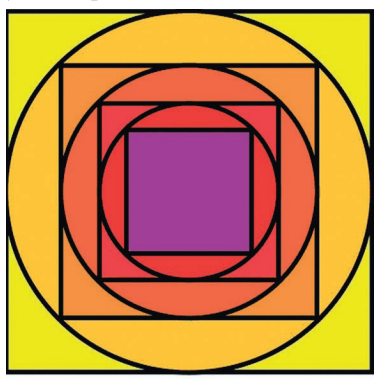
MATHS



Welcome to our last challenge — Maths. The 60 questions are pitched at three levels — worth one, two and three points. Some are classics from maths popularisers such as Martin Gardner, some are by our Maths Masters, and some are of uncertain origin. We'll publish the answers next week. Short answers will be available from tomorrow at the Maths Masters website — **www.qedcat.com** — and at **education.theage.com.au** Detailed solutions will appear on both websites next Monday.
Compiled by **Marty Ross** and **Burkard Polster**.

1 POINT QUESTIONS

1 If the purple square has area 1, what is the area of the outer yellow square?



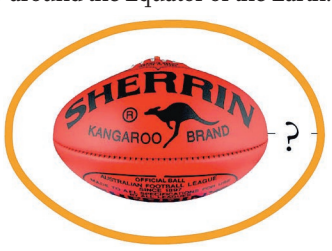
2 In *The World is Not Enough*, a bomb is traveling at 70 miles per hour, and is 106 miles from its target. James Bond immediately declares that they have 78 minutes to stop it. Is he correct?

3 How can you make sense of this strange sum?

$$\begin{array}{r} 3H0 \\ H37 \\ 7H813 \\ \hline H337 3H1H \end{array}$$

4 A die fits exactly into its cubical box. In how many different ways can you place the die in the box?

5 Imagine a loop that fits snugly around the Equator of the Earth.

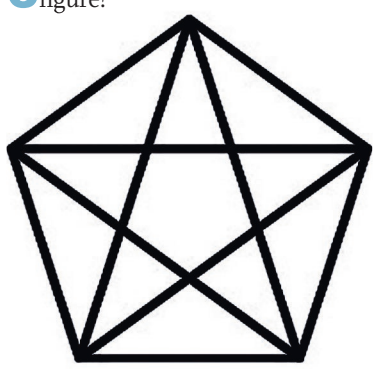


Now lengthen this loop by one meter and imagine the new loop hovering above the ground. How far is the loop above the ground? What if you do the same with a rope around a football?

6 Start with the number 2: then adding 2 gives 4, and also multiplying by 2 gives 4. Can you do this for any other number? For example, starting with 9 can you find a second number so that either adding or multiplying 9 by this second number gives the same answer?

7 Ken buys two cars, and then sells them for $6000 each. One car he has sold for a 25% profit and the other for a 25% loss. Overall, has Ken made a profit or a loss?

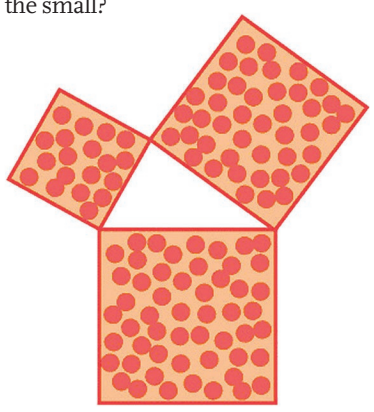
8 How many triangles are in this figure?



9 In the Futurama episode *A Fishful of Dollars*, Phillip Fry collects the compound interest on the 93 cents he left in his bank account 1000 years earlier. His annual interest rate has been 2.25%. The suggested balance is 4.3 billion dollars (all of which he blows on a can of anchovies). How close is this to the true value?

10 In the movie *Il Posto*, Domenico applies for a job, and has to solve the following problem. A roll of copper wire is 520 meters long. Three-quarters of it is cut off. Of the remainder, we cut off four-fifths. How many meters of wire are left on the roll? Domenico is given an hour to solve the problem (and gets it wrong). Can you do it?

11 Peter Thagoras's Pizza Shop sells square pizzas. A large pizza costs the same as a medium and a small pizza together. If your aim is to get value for money, how do you quickly decide whether to buy the large, or the medium and the small?



12 It is raining at midnight. Will we have sunny weather in 72 hours?

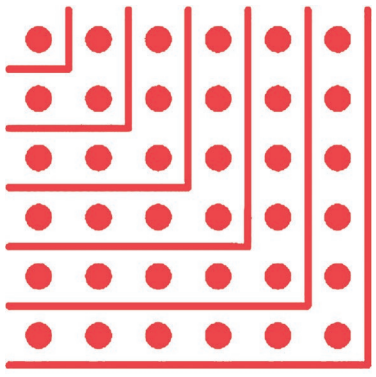
13
1=2+2–2–2/2,
2=2+2+2–2–2,
3=2+2–2+2/2
Can you similarly write 4, 5, 6, 7, 8, and 9 using exactly five 2s, and using only the basic arithmetic operations +, –, × and ÷ ?

14 If a coin rolls without slipping around another coin of the same size, how many times will it rotate while making one revolution? How many revolutions will the coin make if it rolls around 2 coins of the same size that are placed side by side?

15 In the horror movie *Cube*, the victims are trapped in a maze of rooms. The maths wiz of the group concludes that a room is booby-trapped if any of the three-digit numbers labeling the room is prime. Here are a few sets of these room numbers. Assuming the maths wiz is correct, determine (without a calculator!) if these rooms are safe: a) 565, 472, 737; b) 476, 809, 539; and c) 212, 373, 649.

16 In the movie *Little Big League*, the baseball team is presented with a word problem: If Joe can paint a house in 3 hours and Sam can paint it in 5 hours, how long does it take for them to do it together? The team struggles with it. Can you do it?

17 What is the sum 1+3+5+... of the first thousand odd numbers?



18 In the movie *Rules of Attraction*, Lara is discussing safe sex: "If a condom is 98% safe, and he wears two, then you're 196% safe." Hmm. How safe is it really to wear two condoms?

19 A gardener was instructed to plant four shrubs at equal distances from each other. How did she do it?

20 What's the next number?

2 POINT QUESTIONS

21 Wanted: a rectangle that when cut in half leaves two rectangles of the same shape as the original. What are its proportions? Have you ever seen a rectangle like this?

22 This square array of numbers is very special. Why?

96	11	89	68
88	69	91	16
61	86	18	99
19	98	66	81

23
0.1818181818... , 0.2727272727... , 0.3636363636...
What's the next number? What do all these numbers have in common? Of course there is an obvious answer, but can you see what lies underneath?

24 What is this number?

$$\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\cdots}}}}}$$