



A1

Team
Maths
Challenge
2012

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Head-to-
Head
Round

A is the third cube number.

B is the fifth square number.

C is the seventh triangular number.

D is the ninth prime number.

Pass on the value of $A - B + C - D$.



A3

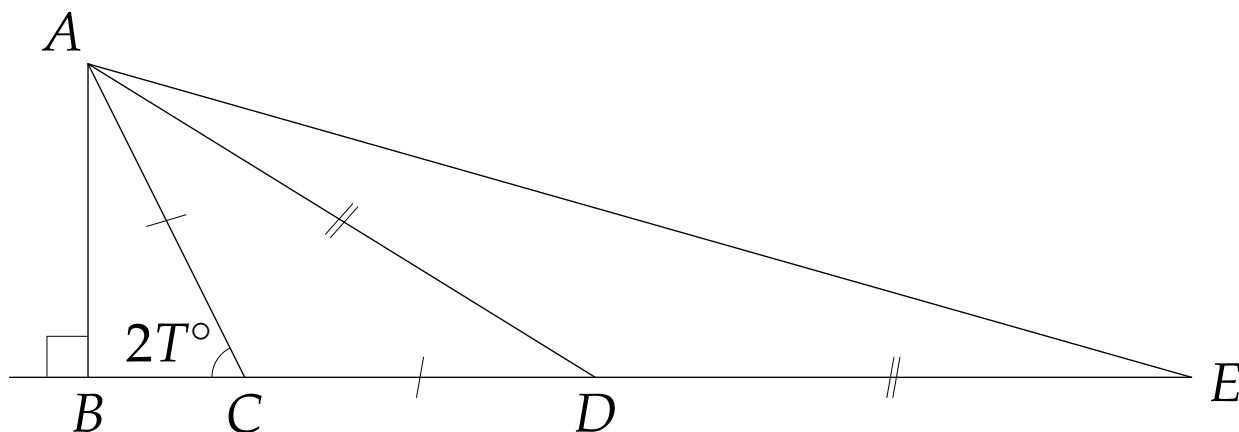
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Head-to-
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T is the number that you will receive.

In the diagram below, $AC = CD$ and $AD = DE$.
Angle $\angle BCA = 2T^\circ$.



Pass on the size of angle $\angle BAE$ in degrees.



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A2

$$T - \frac{T}{3} - \frac{T}{5} - \frac{T}{7} = a + \frac{b}{c}$$

where $\frac{b}{c}$ is a fraction in its lowest terms and $b < c$.

Pass on the value of $a + b + ac$.



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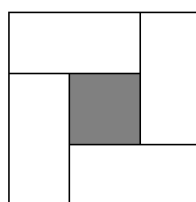
Head-to-
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T is the number that you will receive.

A4

The diagram below shows a large square made up of four identical rectangles and a small shaded square.

The area of the large square is $2T \text{ cm}^2$. The area of the shaded square is 16 cm^2 .



Find the perimeter of one of the small rectangles.



B1

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Bill and Bella have the same number of CDs. When they go out, Bill buys 5 more and Bella buys 1 more.

Bella then donates three of her CDs to Bill.

At this point they realise that the ratio of Bill's CDs to Bella's CDs is 3 : 2.

Pass on the number of CDs Bill now has.



B3

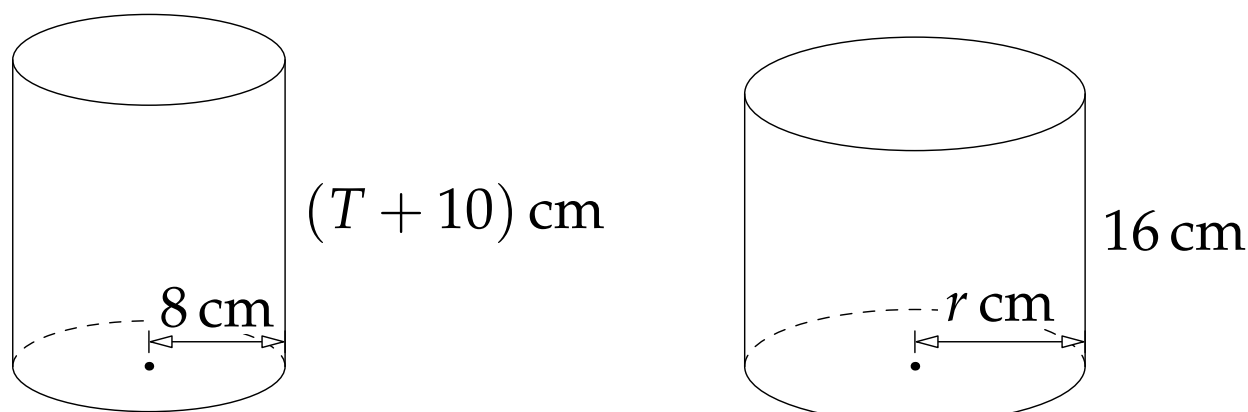
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T is the number that you will receive.

The two cylinders shown below have the same volume. One has radius 8 cm and height $(T + 10)$ cm and the other has radius r cm and height 16 cm.



Pass on the value of r .



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B2

The angles in a hexagon can be arranged in a sequence with each angle being T° larger than the previous one.

Pass on the sum of the digits of the largest angle.



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B4

Dean is doing a sponsored mountain climb. He gets:

- 2 pence per metre for the first 1000 m he climbs,
- X pence a metre for the next 2000 m, and
- $(X + 6)$ pence a metre for the final 3000 m.

When he was counting his sponsorship money, he realised he had raised T pence per metre on average for the whole climb.

Write down the value of X .



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C1

The highest common factor of 720 and 1080 can be written as

$$2^a \times 3^b \times 5^c.$$

Pass on the value of $a + b + c$.



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C3

T is the number that you will receive.

During Sammy's first downhill ski race, she took 15 s, 10 s, and 25 s for the three different stages.

On her second attempt, she made reductions of 20%, $T\%$ and 10%, respectively, to her three times.

The percentage reduction in her overall time between the two attempts is $R\%$.

Pass on the value of $\frac{R}{2}$.



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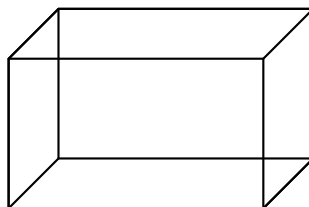
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C2

T is the number that you will receive.

A cuboid frame is made up of straws of three different lengths: $\frac{T}{2}$, $\frac{T}{3}$ and $(3T + 2)$.



Let L be the total length of all the straws.

Pass on the value of $\frac{L}{4}$.



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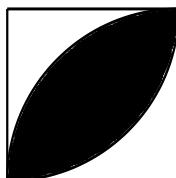
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C4

T is the number that you will receive.

Mrs Pythagoras has designed a new logo for her *Extreme Geometry* club. It is based on a square with side T cm, and contains two quarter-circles, centred at opposite corners of the square.



The area of the shaded area can be written as $(a\pi - b) \text{ cm}^2$, where a and b are whole numbers.

Write down the value of $a + b$.



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D1

$$B = 1 + 2 \times (3 - 4 \times 5 - 6) \times (7 - 8 \times 9) + 10.$$

Pass on the sum of the digits of B .



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D3

T is the number that you will receive.

If $a = 3$ and $b = -2$, pass on the value of

$$\frac{ab^a(b^{a-b} + a^a - b^a)}{bT}.$$



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D2

Pass on the value of

$$\frac{\sqrt{0.04} \times 0.054}{0.0003 \times T}.$$



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D4

Grandma's hot tap, on its own, fills the bath in 6 minutes. The cold tap takes T minutes to fill the bath.

From full, the bath takes 3 minutes to drain with the plug out.

On Wednesday, Grandma turned both taps on, but forgot to put the plug in.

Write down how many minutes it took to fill the bath.