# Logic and Maths Puzzles # 66 January 2018

1. Burning ten candles leaves enough wax behind to make one new candle. If you started with 1000 candles, how many more candles could you make by recycling the leftover wax?

2. Betty is twice as old as Ann and four years younger than Chris. When Ann is as old as Betty is now, Chris will be twice as old as Ann. How old are Ann, Betty and Chris now?

3. Add these following Roman numerals and give your answer as a Roman numeral.

LXI IV XXXVIII

4. This is a logic problem. Look at these statements.

(a) *Some guitar players eat quiche*.

(b) *All quiche eaters are surfers*.

Given these statements, is this statement true or false?

"*All guitar players are surfers*."

(Don't worry about whether the original statements are true or not; just assume they are and apply the logic.)

5. Which temperature in degrees Fahrenheit is numerically the same temperature in degrees Celsius?
You may wish to use the relationship for conversion of Fahrenheit to Celsius

**F = 1.8 C + 32**

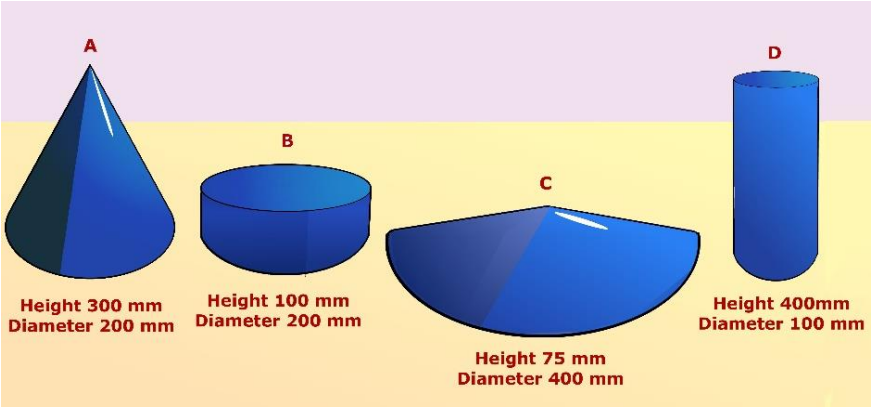
6. Jack, Jill and Joan went shopping at their friendly neighbourhood fruit shop. Each paid with a ten dollar note.

Jack bought three avocados, two bananas and a pineapple and got $1.50 in change.
Jill bought two avocados, four bananas and two pineapples and got one dollar back.
Joan bought one avocado, five bananas and four pineapples and got 25 c in change.

How much did each avocado cost?
How much did each banana cost?
How much did each pineapple cost?

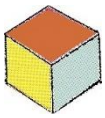
7. The diagram shows two cones and two cylinders resting on a table. Which is correct?

A. A is biggest
B. B is biggest
C. C is biggest
D. D is biggest
E. All have the same volume.

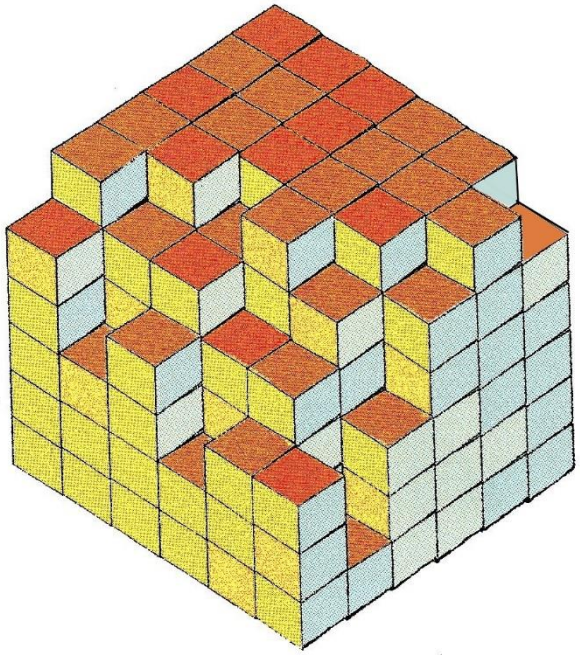


8. Which five consecutive even numbers add up to 500?

9. Small cubes of this size



are being used to assemble this large cube.



How many more small cubes are required to finish the job?
You can assume that any cubes hidden in the drawing are there.

10. Five years ago Kate was five times as old as her son.

Five years hence (that is, five years into the future) her age will be 8 less than three times the corresponding age of her son.

Find the current ages of Kate and her son.

**Solutions:**

1. 111

Burning 1000 candles leaves enough wax to make 100 new candles. Burning those candles leaves enough wax to make 10 new candles. Burning those ten candles leaves enough wax to make 1 candle. Overall, 111 candles can be made from recycled wax.

2. Ann is 4, Betty is 8, Chris is 12

This is a trial & error solution: The aim is to keep trying possible ages for Ann until Chris's future age, calculated as (Betty's Age + 4)
and Chris's future age, calculated as twice Ann's future age are equal.

| Ann's age now | Betty's Age now | Chris's age now | Ann's age future | Betty's age (future) | Chris's age Future (Betty's age future + 4) | Chris age future (2 x Ann future) | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 6 | 2 | 3 | 6 | 4 | x |
| 2 | 4 | 8 | 4 | 6 | 8 | 8 | x |
| 3 | 6 | 10 | 6 | 9 | 10 | 12 | x |
| 4 | 8 | 12 | 8 | 12 | **16** | **16** | ✓ |

3. CIII

Although Romans were capable of addition using Roman numerals, it will be easier to convert the three numbers to the Indo-European base 10 system we're familiar with, add them up and convert the answer back to Roman numerals.
LXI = 61
IV = 4
XXXVIII = 38
61 + 4 + 38 = 103 which is CIII in Roman numerals

4. false

5. - $40^0$

$$F = 1.8\ C + 32$$

But in this one case, F and C are equal

$$F = 1.8\ F + 32$$

$$-0.8\ F = 32$$

Or

$$0.8\ F = -32$$

$$F = -\frac{32}{0.8} = \mathbf{-40}$$

6. Avocados $2, bananas 75 c, pineapples $1

Let the cost of avocados be $a each
Let the cost of bananas be $b each
Let the cost of pineapples be $p each

Then

$3a + 2b + p = 8.5$ - (1)

$2a + 4b + 2p = 9.0$ - (2)

$a + 5b + 4p = 9.75$ - (3)

Multiply equation (1) by 2 gives

$6a + 4b + 2p = 17.0$ - (4)

Subtract equation (2) from equation (4)

$6a - 2a = 17 - 9$

$4a = 8$

$a = 2$ (**avocados cost $2 each**)

substituting 2 for a in equations (2) and (3) gives

$4b + 2p = 9 - 4 = 5$ - (5)
$5b + 4p = 9.75 - 2 = 7.75$ - (6)

Multiply equation (5) by 2 gives

$8b + 4p = 10$ - (7)

Subtract equation (6) from equation (7)

$3b = 2.25$

$b = 0.75$ (**bananas cost 75 cents each**)

substituting 0.75 for b in equation (5) gives

$3 + 2p = 5$

$2p = 2$

$P = 1$ (**pineapples cost $1 each**)

7. E All have the same volume

A and C are cones. B and D are cylinders.
The volume of a cone is given by

$$V = \frac{\prod r^2 h}{3}$$

The volume of cone A is therefore $\frac{\prod \times 100 \times 100 \times 300}{3}$

$= \prod \times 100 \times 100 \times 100 =$ **$10^6\prod$**

The volume of cone C is

$\frac{\prod \times 200 \times 200 \times 75}{3} = \prod \times 200 \times 200 \times 25 =$ **$10^6\prod$**

The volume of a cylinder is given by

$$V = \prod r^2 h$$

The volume of cylinder B = ∏ X 100 X 100 X 100 = $\mathbf{10^6\pi}$

The volume of cylinder D = ∏ X 50 X 50 X 400 = $\mathbf{10^6\pi}$

NOTE: For the purposes of comparison, it is not strictly necessary to calculate all volumes; since all dimensions are given in mm and are all multiples of 100 it would be convenient just to consider 100 mm as being 1 unit of length. All four shapes would have a volume of ∏ units$^3$)

8. 96, 98, 100, 102, 104

The average of the five numbers must be 100. If the numbers are consecutive, and there are five of them, then the middle number must be 100

9. 32 cubes

10. Kate is 35. Her son is 11

Let Kate's age now be k years
Let her son's age now be s years

Five years ago:

$(k-5) = 5(s-5)$ - (1)
$k - 5 = 5s - 25$
$k - 5s = -20$

Five years from now:

$(k + 5) = 3(s + 5) - 8$ - (2)
$k + 5 = 3s + 15 - 8$
$k - 3s = 2$

Subtracting equation (1) from equation (2)

$-3s - (-5s) = 2 - (-20)$
$-3s + 5s = 2 + 20$
$2s = 22$
$s = 11$ (**Kate's son's age now is 11**)

Substituting 11 for s in equation (1)

$k - (5 \times 11) = -20$
$k - 55 = -20$
$k = -20 + 55$
$k = 35$ (**Kate's age now = 35**)