Here are the full, or partial solutions.

Year 8 and below

Some molten rhenium is being poured into three containers, A, B and C. Container A gets 1 litre plus one third of what is left. Container B then receives 6 litres plus one third of what remains, then Container C gets the rest which is 40 litres. What is the volume of rhenium poured into Container B?

Solution

Let R be the total volume of rhenium in litres.

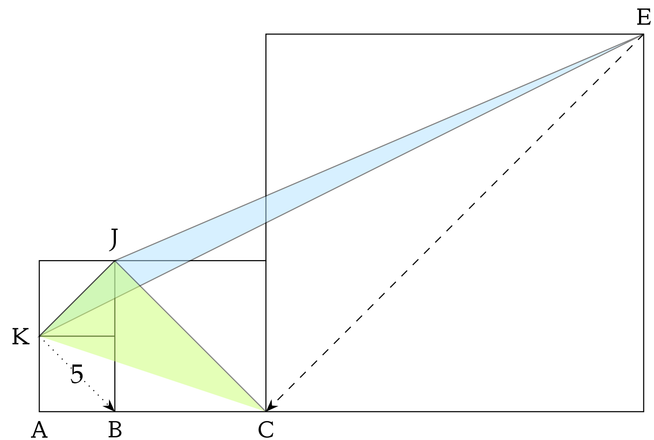
Step	A	B	C	Remainder	
1	$1+\frac{R-1}{3}$	?	40	$R-\left(1+\frac{R-1}{3}\right)$	Simplify the remainder,
				$\frac{2R-2}{3}$	simplify A and work out B in Step 2:
2	$\frac{R+2}{3}$	$6+\frac{\frac{2R-2}{3}-6}{3}$	40	0	Simplify:
3	$\frac{R+2}{3}$	$6+\frac{2R-20}{9}$	40	0	Now we can equate the sum of A, B & C to R.

$$R = \frac{R+2}{3} + 6 + \frac{2R-20}{9} + 40$$
$$R = \frac{3R+6}{9} + \frac{2R-20}{9} + 46$$
$$R = \frac{5R-14}{9} + 46$$
$$9R - 5R = -14 + 414$$
$$4R = 400$$
$$R = 100\,\text{L}$$

Alternatively, we can attack the problem from the end, begin with Container C with 40 and work backwards: We know that C is 40 and from the question, this is $\frac{2}{3}$ of the quantity that B got $\frac{1}{3}$ of. So $40 \times \frac{1}{2} = 20$. But we know that B got this plus 6, so B got 26. Then for Container A: it has $\frac{1}{2}$ of 66, (Container B and Container C's volume) plus 1 more litre, that is 34 litres. There is less algebra this way but perhaps it is trickier to think about. So the total volume of rhenium is $34 + 26 + 40 = 100\,\text{L}$.

Year 8 and above

The diagram contains four squares. The smallest square has an area of $5\,\text{cm}^2$. Find the area of the shaded triangle.



Solution

If you remember that the area of a triangle is half the base times the height, this problem becomes easier. Can you see that the dashed line EC is parallel to the side of the triangle JK? This is because they are both the diagonals in squares so their slope must be the same.

If we move the vertex of the blue triangle at E along the dotted line to C, the base JK stays the same and so does its height, thus its area also stays the same. In other words, we have shown that $\triangle KEJ$ has the same area as the green $\triangle CJK$.

Now we can do the same trick again. Line BK is parallel to line JC, so if we now move vertex K of the green triangle along the dotted line BK to B, we end up with $\triangle BCJ$.

The triangle fills half of the square, which has area four times that of the smallest square. So the triangle has an area of $10\,\text{cm}^2$.