

Challenge 2016 Maths 3 solutions

- 1) $\frac{3.2m}{s}$
- 2) $\frac{2}{3}$
- 3) a) Coprime so $LCM = 34 \times 35 = 1190$
b) i) $20 + 28 \times 35 = 1000$
 $14 + 29 \times 34 = 1000$
ii) Since 1190 is the LCM, going down from 1000 the next number appearing in both sequences will be $1000 - 1190 = -190$ (if we continue below 20 and 14) so before the beginning of the sequences.
iii) 2190
iv) 120,000
- 4) 32m
- 5) 9
- 6) Numbers are $a, b, a+6$ (in ascending order), assuming statement 2.
Statement 3 says:
 $\frac{a+b+a+6}{3} + b = 23$
 $\frac{2}{3}a + \frac{4}{3}b = 21$
 $2a + 4b = 63$
 $2(a + 2b) = 63$
But LHS even and RHS odd so it doesn't work.
- 7) $x = 10.5, y = 5.5$
- 8) a) i) 3 litres
ii) 1 litre
b) 4 litres
- 9) 15kg
- 10) a) i) $14a + 4b - 12c$
ii) 25
b) i) 4
ii) Let the missing number be x .
Consider the b 's: $2x + 4 = 18$ so $x = 7$.
Consider the c 's: $x + 12 = -5$ so $x = -17$. Different so no solution for x .
iii) 2 and 5 respectively.
c) 40

$$\begin{aligned}
11) \quad & 1+2+\dots+N + (N+1) + (N+2) + \dots + 2N \\
& = 1+2+\dots+N + (1+N) + (2+N) + \dots + (N+N) \\
& = (1+2+\dots+N) + (1+2+\dots+N) + N \times N \\
& = 2 \times (1+2+\dots+N) + N^2 \\
& = (2+4+\dots+2N) + N^2
\end{aligned}$$

Now cross off all the even numbers from the top line.

Also cross off all the even numbers at the beginning of the bottom line.

So the sum of all the odd numbers between 1 and 2N is N^2 .

12)a) 30

b) Pentagon angles add to 540

$$a+b+c+d+e=540$$

$$a+b+2(a+b)=540$$

$$3(a+b)=540$$

$a+b=180$ hence BC and AE parallel by co-interior/allied angles.

13) Cut 2 boys and 3 girls

14)a) $x^2 + 2xh + h^2$

b) i) 2h

ii) $2x + 2\sqrt{4h^2 + x^2}$

iii) $x = \frac{3}{2}h$

15) 6cm