Challenge 2016 Maths 2 solutions

1) 26 miles per gallon

2) 21

3) a) i) $\frac{3}{a}$
ii) $10 - x$
b) a+1

4) a) $P = 2\pi r + 4r$
b) $r = \frac{P}{2\pi+4}$

5) $1.81cm$

6) $x = 3, y = 2.5$

7) a) £234
b) £459.27
c) £218.25
d) 8.5%

8) Josh eats 3 sausage rolls, Kai eats 9 and a muffin contains 340 calories

9) $y < 1$

10) $585cm^2$

11)a) i) $2x$
ii) $180 - 4x$
b) $36°$

12) 54%

13)a) (1,2,10), (1,3,9), (1,4,8), (2,3,8), (2,4,7), (2,5,6), (3,4,6)
b) i) Let a>b>c.
c can be 2 at the most if we are to get the lowest scorer as 6 (2,2,2). In which case the other participants must have got (6,6,5) and (5,5,6) ((7,7,3); (3,3,7) and others don't work).
c can be 1, in which case a and b could be (3,2) to make 6 (doesn't work with achieving the higher scores for the other players) so the lowest scorer gets 1,1,4. The other scorers must get (4,4,8) and (8,8,1) (easy checks).
ii) (a,b,c)=(8,4,1)

14)a) $AQ = \sqrt{65}, QB = \sqrt{65}$

b) (4,7). $CQ = \sqrt{65}$ so looked for points with translations from C involving 1 and 8 or 4 and 7. From C up one and left 8 worked as equidistant from A and B.