Age 9 Niharika Paul

The Olympic Torch Tour.

The routes using the 4 cities are:

R1: L Ca B Co L
R2: L Ca Co B L
R3: L B Ca Co L
R4: L B Co Ca L
R5: L Co B Ca L
R6: L Co Ca B L.

The distances on each tour are shown underneath:

R1:	R2:	R3:	R4:
50	50	96	96
120	70	120	80
+ 80	+ 80	70	70
86	96	86	50
336 miles	296 miles	372 miles	296 miles

~~R5~~

R5:	R6:
86	86
+ 80	70
120	120
50	96
336 miles	382 miles.

∴ The shortest routes are R2 and R4 as they are both equal.

Imagine that each of the cities are boxes

$\boxed{1}\ \boxed{3}\ \boxed{2}\ \boxed{1}\ \boxed{1}$

There are 5 boxes because the torch has to start and end in London.
∴ The 1st and last box can be filled in 1 way. As there are 3 cities left the 2nd can be filled in 3 ways. Now that one is used up the 3rd can only be filled in 2 ways and the 4th in 1 way.
∴ There are $1 \times 3 \times 2 \times 1 \times 1 = 6$ routes.

I can see that is between R2 and R4. If we can place Oxford between Coventry and Bath the least distance would be covered. As this can happen in both cases we are adding a constant to each route.
∴ The two routes are still equal.

In this case there are 6 boxes and can be filled as depicted

$\boxed{1}\ \boxed{4}\ \boxed{3}\ \boxed{2}\ \boxed{1}\ \boxed{1}$

∴ There are $1 \times 4 \times 3 \times 2 \times 1 \times 1 = 24$ routes.

However, I used only 2 routes and adapted my method of guesswork.

When there are n cities you would think that there are $\underline{\lfloor n-1}$ routes as the first box should be filled in 1 way the 2^{nd} in $n-1$; 3^{rd} in $n-2$ . . . and the last in 1 way. However, if you know the shortest 2 routes when there are $n-1$ cities you can apply my method of guesswork which I have shown before.