WARWICK
THE UNIVERSITY OF WARWICK

6 P, Q, and R are each mixtures of red and white paint.

The percentage by volume of red paint in P is 30%.

The percentage by volume of red paint in Q is 20%.

The mixtures P, Q, and R are combined in the proportion 12 : 5 : 3 respectively.

If the resulting mixture contains 25% by volume of red paint, what percentage by volume of mixture R is red paint?

A 25%

B 23%

C $13\frac{1}{3}\%$

D $19\frac{1}{2}\%$

E $9\frac{3}{4}\%$

F It is impossible to achieve this result.

We'll work in fractions and convert to a percentage at the end.
Let α be the proportion of R that is red paint. Then,

P is $\frac{3}{10}$ red paint and $\frac{7}{10}$ white paint
Q is $\frac{2}{10}$ red paint and $\frac{8}{10}$ white paint
R is α red paint and $1-\alpha$ white paint

We are told that P, Q and R are combined in the ratio 12:5:3 Let S be the resulting mixture.
We know that $\frac{1}{4}$ of S is red paint. This will be equivalent to the sum of the respective proportions of each of P, Q and R that are red paint.

① $\frac{3}{10} \times \frac{12}{20} = \frac{36}{200}$ is the proportion of red paint in S from P

② $\frac{2}{10} \times \frac{5}{20} = \frac{10}{100}$ ... red paint in S from Q

③ $\alpha \times \frac{3}{20} = \frac{3\alpha}{20}$ ... red paint in S from R

$$\frac{36}{200} + \frac{10}{200} + \frac{3\alpha}{20} = \frac{1}{4}$$

$$\alpha = \frac{20}{3}\left(\frac{4}{200}\right)$$

$$= \frac{2}{15}$$

$$= 13\tfrac{1}{3}\%$$

$\frac{2}{15} = \frac{2}{15} \times 100\%$

$15 \overline{)200.00\ldots}$ (13.33...)

so the correct answer is C