Exercise 1E

Question 8:

For rationalising the denominator of a number, we multiply its numerator and denominator by its rationalising factor.

If a and b are integers, then
$\left(a+\sqrt{b}\right)$ and $\left(a-\sqrt{b}\right)$ are rationalising factor of each other,
as $\left(a+\sqrt{b}\right)\left(a-\sqrt{b}\right)=\left(a^2-b\right)$, which is rational.

$$\frac{\sqrt{3}-1}{\sqrt{3}+1}=\frac{\sqrt{3}-1}{\sqrt{3}+1}\times\frac{\sqrt{3}-1}{\sqrt{3}-1}$$
$$=\frac{\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}\right)^2-(1)^2}$$
$$=\frac{\left(\sqrt{3}\right)^2-2\left(\sqrt{3}\right)(1)+1^2}{3-1}$$
$$=\frac{3-2\sqrt{3}+1}{2}=\frac{4-2\sqrt{3}}{2}$$
$$=\frac{2\left(2-\sqrt{3}\right)}{2}=\left(2-\sqrt{3}\right).$$

Question 9:

For rationalising the denominator of a number, we multiply its numerator and denominator by its rationalising factor.

If a and b are integers and x is a natural number, then
$\left(a+b\sqrt{x}\right)$ and $\left(a-b\sqrt{x}\right)$ are rationalising factor of each other,
as $\left(a+b\sqrt{x}\right)\left(a-b\sqrt{x}\right)=\left(a^2-b^2x\right)$, which is rational.

Therefore, we have,
$$\frac{3-2\sqrt{2}}{3+2\sqrt{2}}=\frac{3-2\sqrt{2}}{3+2\sqrt{2}}\times\frac{3-2\sqrt{2}}{3-2\sqrt{2}}$$
$$=\frac{\left(3-2\sqrt{2}\right)^2}{\left(3+2\sqrt{2}\right)\left(3-2\sqrt{2}\right)}$$
$$=\frac{9-12\sqrt{2}+8}{(3)^2-\left(2\sqrt{2}\right)^2}=\frac{17-12\sqrt{2}}{9-8}$$
$$=\frac{17-12\sqrt{2}}{1}=17-12\sqrt{2}.$$

*********** END **********