

## Exercise 22

For the following exercises, use synthetic division to find the quotient.

$$(3x^3 - 5x^2 + 2x + 3) \div (x + 2)$$

### Solution

Solving  $x + 2 = 0$  gives  $x = -2$ ; this is the number that goes on the top left. Write out all the coefficients of the dividend to the right.

$$\begin{array}{r|rrrr} -2 & 3 & -5 & 2 & 3 \\ \hline & & & & \end{array}$$

Bring down the leading coefficient.

$$\begin{array}{r|rrrr} -2 & 3 & -5 & 2 & 3 \\ \hline & 3 & & & \end{array}$$

Multiply the top left number by the number brought down and put the result under the second coefficient of the dividend.

$$\begin{array}{r|rrrr} -2 & 3 & -5 & 2 & 3 \\ \hline & 3 & -6 & & \end{array}$$

Add the numbers in the second column.

$$\begin{array}{r|rrrr} -2 & 3 & -5 & 2 & 3 \\ & & -6 & & \\ \hline & 3 & -11 & & \end{array}$$

Multiply this sum of the second column by the top left number and put it in the next column.

$$\begin{array}{r|rrrr} -2 & 3 & -5 & 2 & 3 \\ & & -6 & 22 & \\ \hline & 3 & -11 & & \end{array}$$

Add the numbers in the third column.

$$\begin{array}{r|rrrr} -2 & 3 & -5 & 2 & 3 \\ & & -6 & 22 & \\ \hline & 3 & -11 & 24 & \end{array}$$

Multiply this sum of the third column by the top left number and put it in the next column.

$$\begin{array}{r|rrrr}
 -2 & 3 & -5 & 2 & 3 \\
 & & -6 & 22 & -48 \\
 \hline
 & 3 & -11 & 24 & 
 \end{array}$$

Add the numbers in the fourth column.

$$\begin{array}{r|rrrr|r}
 -2 & 3 & -5 & 2 & 3 \\
 & & -6 & 22 & -48 \\
 \hline
 & 3 & -11 & 24 & -45
 \end{array}$$

This final result is the remainder, and the numbers to the left are the coefficients of the quotient, which is  $3x^2 - 11x + 24$ .

$$(3x^3 - 5x^2 + 2x + 3) \div (x + 2) = 3x^2 - 11x + 24 + \frac{-45}{x + 2}$$