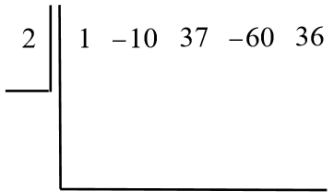
Exercise 32

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

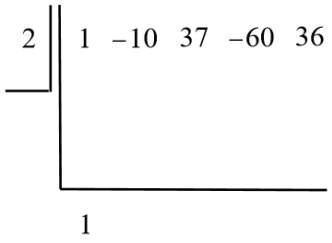
$$(x^4 - 10x^3 + 37x^2 - 60x + 36) \div (x - 2)$$

Solution

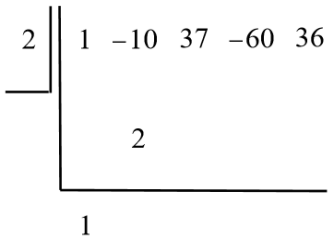
Solving $x - 2 = 0$ gives $x = 2$; this is the number that goes on the top left. Write out all the coefficients of the dividend to the right.



Bring down the leading coefficient.



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



Add the numbers in the second column.

$$\begin{array}{r|rrrrr} 2 & 1 & -10 & 37 & -60 & 36 \\ & & 2 & & & \\ \hline & 1 & -8 & & & \end{array}$$

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

$$\begin{array}{r|rrrrr} 2 & 1 & -10 & 37 & -60 & 36 \\ & & 2 & -16 & & \\ \hline & 1 & -8 & & & \end{array}$$

Add the numbers in the third column.

$$\begin{array}{r|rrrrr} 2 & 1 & -10 & 37 & -60 & 36 \\ & & 2 & -16 & & \\ \hline & 1 & -8 & 21 & & \end{array}$$

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

$$\begin{array}{r|llll} 2 & 1 & -10 & 37 & -60 & 36 \\ & & 2 & -16 & 42 & \\ \hline & 1 & -8 & 21 & & \end{array}$$

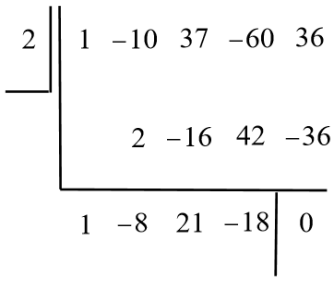
Add the numbers in the fourth column.

$$\begin{array}{r|llll} 2 & 1 & -10 & 37 & -60 & 36 \\ & & 2 & -16 & 42 & \\ \hline & 1 & -8 & 21 & -18 & \end{array}$$

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

$$\begin{array}{r|llll} 2 & 1 & -10 & 37 & -60 & 36 \\ & & 2 & -16 & 42 & -36 \\ \hline & 1 & -8 & 21 & -18 & \end{array}$$

Add the numbers in the fifth column.



This final result is the remainder, and the numbers to the left are the coefficients of the quotient, which is $x^3 - 8x^2 + 21x - 18$.

$$(x^4 - 10x^3 + 37x^2 - 60x + 36) \div (x - 2) = x^3 - 8x^2 + 21x - 18$$