In the previous section we studied linear equations in one unknown. In practice, real problems contain many equations in many unknowns. These are called *simultaneous equations*. In general, such equations are difficult to solve, and often we have no choice but to use a computer to obtain numerical solutions to them.

We will look at simultaneous linear equations in two unknowns.
Example 1.11 Revisited

David buys movie tickets for seven adults and one child for $92 and for ten adults and three children for $144. What is the cost of the tickets for three adults and two children?

Let $a$ be the cost of an adult ticket, and $c$ be the cost of a child’s ticket. Then the equations representing the information given are:

$$\begin{align*}
7a + c &= 92 \\
10a + 3c &= 144
\end{align*}$$
One way to solve the above equation is by *elimination*. We eliminate one of the variables from one equation using the operations listed below. This leaves an equation in one unknown to solve. Once we have solved this equation we substitute the value of the variable in the remaining equation, and then solve for the second variable.
Operations on equations

1. Multiply (or divide) an equation by a non-zero number.
2. Add (or subtract) two equations.
Example 1.11 Revisited

\[
\begin{align*}
7a + c &= 92 \\
10a + 3c &= 144
\end{align*}
\]
Example 1.13

Solve the following equations:

\[
\begin{align*}
2x + 3y &= 10 \quad (1) \\
x + 3y &= 8 \quad (2)
\end{align*}
\]
Exercises

Solve the following equations.

1. \( 3x - 2y = 10 \) \( (1) \)
2. \( 2x + 3y = 11 \) \( (2) \)
Exercises (ctd)

2. \[ 2x + 4y = 4 \] (1)
\[ 5x - 6y = 2 \] (2)
3. \[ 2x - 3y = 4 \]  \( (1) \)
\[ 2x + 3y = 16 \]  \( (2) \)
Exercises (ctd)

4. \[ 2x + 3y = 19 \] \hspace{1cm} (1)
\[ 5x - 6y = -20 \] \hspace{1cm} (2)