Expressions
\[3y, \ 2x + 1, \ \frac{9}{4}\]

Equation (solvable)
\[3x + 2 = 14\]

Formulae (more than one variable)
\[v = u + at \quad \text{solvable if we know the value of some of the variables}\]
\[s = \frac{d}{t}\]

Solving Equations
\[\Rightarrow \text{Use SAMDEB!}\]

Unwrap the variable by using opposite operations.

Example: solve and verify
\[4x - 3 = 15\]
\[4x - 3 + 3 = 15 + 3\]
\[4x = 18\]
\[x = \frac{18}{4}\]
\[x = 4.5\]

Check (verify)
\[4(4.5) - 3 = 15\]
\[18 - 3 = 15 \checkmark\]
Smudger cuts grass and charges $6.50 per hour plus $4 for showing up.

a) Create a formula to model this.

Define the variables:
- \( P \) = Price he charges.
- \( n \) = # of hours worked.

\[ P = 6.5n + 4 \]

b) How much does he charge for 6 hours work?

Sub in \( n = 6 \)

\[ P = 6.5(6) + 4 \]
\[ P = 39 + 4 \]
\[ P = 43 \]

Charges $43

c) How many hours did he work if he earned $62.50

Sub in \( P = 62.50 \)

\[ 62.50 = 6.5n + 4 \]
\[ 62.50 - 4 = 6.5n + 4 - 4 \]
\[ 58.50 = 6.5n \]
\[ \frac{58.50}{6.5} = \frac{6.5n}{6.5} \]
\[ a = n \]

\[ \Rightarrow a \text{ hours} \]
Inequalities

- $3 > 1$ [3 is greater than 1]
- $2 < 6$ [2 is less than 6]
- $x \geq 2$ [x is greater than or equal to 2]
- $y \leq 4$ [y is less than or equal to 4]

Patterning and Equations Review

Page 412 #s 1 - 22 NOT 8, 11, 13, 19
Solutions

**Key Words**

*Match each example with the correct term.*

1. ≥
2. ÷ and ×
3. For $x < 3$, this would be 0, 1, 2.
4. 0, 1, 2, 3, 4, ...
5. $y$ in $7y \leq 9y$
6. $x > 100$
7. ≤

A variable
B inequality
C greater than
D less than or equal to
E whole number solution set
F greater than or equal to
G opposite operations
H whole numbers
9. Model each equation. Then, solve using the opposite operation.
   a) \( w + 9 = 15 \)
   \[ w + 9 = 15 \]
   \[ w + 9 - 9 = 15 - 9 \]
   \[ w = 6 \]
   b) \( 26 = 4x \)
   \[ \frac{26}{4} = \frac{4x}{4} \]
   \[ 6.5 = x \]
   c) \( 40 = y \div 5 \)
   \[ 40 \times 5 = y \div 5 \times 5 \]
   \[ 200 = y \]
   d) \( 1 = z - 4 \)
   \[ 1 + 4 = z - 4 + 4 \]
   \[ 5 = z \]

10. Solve each equation. Verify your solution.
   a) \( 2m = 62 \)
   \[ \frac{2m}{2} = \frac{62}{2} \]
   \[ m = 31 \]
   Check
   \[ 2(31) = 62 \checkmark \]
   b) \( c \div 3 = 7 \)
   \[ c \div 3 \times 3 = 7 \times 3 \]
   \[ c = 21 \]
   Check
   \[ 21 \div 3 = 7 \checkmark \]
   c) \( 16.5 = 8.25y \)
   \[ \frac{16.5}{8.25} = \frac{8.25}{y} \]
   \[ 2 = y \]
   Check
   \[ 16.5 = 8.25(2) \checkmark \]
   d) \( d - 10 = 15 \)
   \[ d - 10 + 10 = 15 + 10 \]
   \[ d = 25 \]
   Check
   \[ 25 - 10 = 15 \checkmark \]
   e) \( 9 = 4 + k \)
   \[ 9 - 4 = 4 + k - 4 \]
   \[ 5 = k \]
   Check
   \[ 9 = 4 + 5 \checkmark \]
   f) \( 6.3 = x \div 4 \)
   \[ 6.3 \times 4 = x \div 4 \times 4 \]
   \[ 25.2 = x \]
   Check
   \[ 6.3 = 25.2 \div 4 \]
12. A photocopy company charges $3.40 per copy. A recent bill for a large customer came to $40,851. This can be modelled using the equation $3.4p = 40,851$, where $p$ represents the number of photocopies. How many photocopies were made?

Formula should be:

\[
0.034p = 40851
\]

\[
\frac{0.034p}{0.034} = \frac{40851}{0.034}
\]

\[
p = 1,201,500 \text{ copies.}
\]

14. For each equation, what operation will you undo first? Why?

a) $2k + 5 = 19$

b) $20.9 = 3y - 1$

c) $16 = 1 + 6n$

d) $12x - 7 = 29$

Use SAMDEB

a) Add 5

b) Subtract 1

c) Add 1

d) Subtract 7
15. Solve each equation in question 14.
Verify your solution.

a) \(2k + 5 = 19\)
\[2k + 5 - 5 = 19 - 5\]
\[2k = 14\]
\[\frac{2k}{2} = \frac{14}{2}\]
\[k = 7\]

Check:
\[2(7) + 5 = 19\]
\[14 + 5 = 19\]

b) \(20.9 = 3y - 1\)
\[20.9 + 1 = 3y - 1 + 1\]
\[21.9 = 3y\]
\[\frac{21.9}{3} = \frac{3y}{3}\]
\[7.3 = y\]

Check:
\[20.9 = 3(7.3) - 1\]
\[20.9 = 21.9 - 1\]

\[c) \quad 16 = 1 + 6n\]
\[16 - 1 = 1 + 6n - 1\]
\[15 = \frac{6n}{6}\]
\[2.5 = n\]

Check:
\[16 = 1 + 6(2.5)\]
\[16 = 1 + 15\]

\[d) \quad 12x - 7 = 29\]
\[12x - 7 + 7 = 29 + 7\]
\[12x = \frac{36}{12}\]
\[x = 3\]

Check:
\[12(3) - 7 = 29\]
\[36 - 7 = 29\]

16. A hawk is hunting its prey. It begins its descent from a height of 63 m. This can be modelled using the formula \(63 - h = 5.4t\), where \(t\) represents the time, in seconds, and \(h\) represents the height, in metres, above the ground. After how many seconds will the hawk reach a height of 5 m? Round your answer to the nearest 0.1 s.

\[63 - h = 5.4t\]

Sub in \(h = 5\)

\[63 - 5 = 5.4t\]
\[58 = 5.4t\]
\[\frac{58}{5.4} = \frac{5.4}{5.4}\]
\[10.74 = t\]

\(\Rightarrow\) After 10.7 seconds.
17. Annie charges $35 per month plus $9.50 per hour to cut grass. Annie charges one customer $63.50 for July.
   a) Write an equation to model this situation. Define your variables.
   b) How many hours did Annie spend cutting grass in July for this customer?

\[
\begin{array}{c|c}
\text{# hours} & \text{cost} \\
1 & 44.50 \\
2 & 54.00 \\
3 & 63.50 \\
\end{array}
\]

**Cost Equation:**

\[
\begin{align*}
C &= \text{fixed charge} + \text{charge per hour} \\
C &= 9.50n + 35 \\
\end{align*}
\]

\[
\begin{align*}
b) \ C &= 9.50n + 35 \\
63.50 &= 9.50n + 35 \\
63.50 - 35 &= 9.50n + 35 - 35 \\
28.50 &= 9.50n \\
\frac{28.50}{9.50} &= n \\
3 &= n \\
\Rightarrow \text{Annie spent 3 hours cutting grass.}
\end{align*}
\]

18. The fence around Toni’s tree is in the shape of an equilateral triangle. Toni wants to increase the length of each side by 5 cm. The perimeter of her new fence will be 66 cm. What is the original perimeter?

\[
\begin{align*}
\Rightarrow P &= 3x \\
P_{\text{new}} &= 3x \\
66 &= 3x \\
\frac{66}{3} &= \frac{3x}{3} \\
22 &= x \\
\Rightarrow \text{new side length} &= 22 \text{ cm}
\end{align*}
\]

Yes, it must be a very small tree!

\[
\begin{align*}
P &= \text{perimeter} \\
x &= \text{side length} \\
\text{Original side length} &= 22 - 5 \\
\text{Side length} &= 17 \text{ cm} \\
P_{\text{old}} &= 3(17) \\
&= 51 \text{ cm} \\
\Rightarrow \text{old perimeter is 51 cm}
\end{align*}
\]
20. Model each situation using an inequality.
   a) There are fewer than 20 horses on the farm.
   b) He invites up to four people to his cottage.
   c) At least 35% of the music played on the radio is by a Canadian.

\[ a) \quad n = \# \text{ horses} \quad \Rightarrow \quad n < 20 \]
\[ b) \quad x = \# \text{ people} \quad \Rightarrow \quad x \leq 4 \]
\[ c) \quad m = \text{ music radio on} \quad c = \text{ Canadian music} \quad \Rightarrow \quad c \geq 0.35m \]

21. Find the whole number solution set for each inequality.
   a) \[ j + 4 > 35 \]
   \[ j + 4 - 4 > 35 - 4 \]
   \[ j > 31 \]
   \[ \Rightarrow \quad j = 32, 33, 34, \ldots \]

   b) \[ 17 < w - 3 \]
   \[ 17 + 3 < w - 3 + 3 \]
   \[ 20 < w \]
   \[ \Rightarrow \quad w = 19, 18, 17, \ldots \]

   c) \[ \frac{2g}{2} \leq \frac{12}{2} \]
   \[ 9 \leq 6 \]
   \[ \Rightarrow \quad 9 = 6, 5, 4, 3, \ldots \]

   d) \[ 5 + 3 \geq m \]
   \[ 8 \geq m \]
   \[ \Rightarrow \quad m = 8, 7, 6, \ldots \]
22. A family has a monthly budget of $1800 for food, rent, and clothing. They spend $1050 per month on rent and $630 for food. Develop an inequality modelling the money available for clothing each month.

<table>
<thead>
<tr>
<th>Monthly Budget</th>
<th>$1800</th>
</tr>
</thead>
<tbody>
<tr>
<td>food</td>
<td>$630</td>
</tr>
<tr>
<td>rent</td>
<td>$1050</td>
</tr>
<tr>
<td>clothing</td>
<td></td>
</tr>
</tbody>
</table>

\[
f = \text{food} \\
 r = \text{rent} \\
 c = \text{clothing} \\
 f + r + c \leq 1800 \\
 1050 + 630 + c \leq 1800 \\
 1680 + c \leq 1800 \\
 1680 + c - 1680 \leq 1800 - 1680 \\
 c \leq 120
\]

\[\Rightarrow \text{Can spend a maximum of }$120 \text{ per month on clothing.}\]