Section 2.4 Solutions

1. Directly $\Rightarrow$ multiply, with one letter after $k$,
   square of $x$ is the same as $x^2$
   \[ \text{Answer: } W = kx^2 \]

3. Inversely $\Rightarrow$ fraction, with $k$ in the numerator,
   cube of $x$ is the same as $x^3$
   \[ \text{Answer: } y = \frac{k}{x^3} \]

5. Directly proportional to the square of $x$ $(x^2) \Rightarrow kx^2$
   Inversely proportional to the cube of $y$ $(y^3) \Rightarrow \frac{k}{y^3}$
   Write answer with a single $k$
   \[ \text{Answer: } Q = \frac{kx^2}{y^3} \]

7. Jointly $\Rightarrow$ multiply with two letters after $k$,
   square of $x$ is the same as $x^2$,
   cube of $y$ is the same as $y^3$
   \[ \text{Answer: } M = kx^2y^3 \]

9. Directly $\Rightarrow$ multiply with one letter after $k$,
   square of Time $(T)$ is the same as $T^2$
   \[ \text{Answer: } D = kT^2 \]
11. Inversely \(\rightarrow\) fraction, with \(k\) in the numerator
Answer: \(W = \frac{k}{L}\)

13. Directly as temperature \(\rightarrow\) \(kT\)
Inversely as pressure \(\rightarrow\) \(\frac{k}{p}\)
Write answer with a single \(k\)
Answer: \(V = \frac{kt}{p}\)

15. Create an equation with \(k\):
\[y = kx^2\]
let \(y = 45\) and \(x = 3\)
\[45 = k(3)^2\]
\[45 = 9k\]
\[\frac{45}{9} = \frac{9k}{9}\]
\[5 = k\]

Answer: \(k = 5\)

17. Create an equation with \(k\):
\[T = \frac{k}{Q}\]
let \(Q = 5\) and \(T = 10\)
\[10 = \frac{k}{5}\]
\[\frac{10}{1} = \frac{k}{5}\]
\[1 \cdot k = 10 \cdot 5\]
\[k = 50\]

Answer: \(k = 50\)
19. Create an equation with $k$:

$N = kxy$

let $x = 2$, $y = 3$, and $N = 42$

$42 = k \cdot 2 \cdot 3$

$42 = 6k$

$\frac{42}{6} = \frac{6k}{6}$

$7 = k$

**Answer: $k = 7$**

21. Create an equation with $k$:

$Y = kx^3$

let $Y = 24$ and $x = 2$

$24 = k(2)^3$

$24 = 8k$

$\frac{24}{8} = \frac{8k}{8}$

$3 = k$

Now let $k = 3$ and $x = 5$

$Y = 3 \cdot (5)^3$

$Y = 375$

**Answer: $Y = 375$**
23. Create an equation with \( k \):

\[ W = \frac{k}{q} \]

Let \( W = 10 \) and \( q = 5 \)

\[ 10 = \frac{k}{5} \]

\[ \frac{10}{1} = \frac{k}{5} \]

\[ 50 = k \]

Let \( k = 50 \) and \( q = 3 \)

\[ W = \frac{50}{3} \]

Answer: \( W = \frac{50}{3} \)

25. Create an equation with \( k \):

\[ Y = kxz^2 \]

Let \( Y = 48 \), \( z = 2 \), and \( x = 3 \)

\[ 48 = k(3)(2)^2 \]

\[ 48 = k(3)(4) \]

\[ 48 = 12k \]

\[ \frac{12}{12} \]

\[ 4 = k \]

Let \( k = 4 \), \( x = 3 \), and \( z = 4 \)

\[ Y = 4(3)(4)^2 \]

\[ Y = 4(3)(16) \]

\[ Y = 192 \]

Answer: \( Y = 192 \)
27. Create an equation with $K$:
\[
D = \frac{K}{p}
\]
Let $p = 2.75$ and $D = 156$
\[
156 = \frac{K}{2.75}
\]
\[
\frac{156}{1} = \frac{K}{2.75}
\]
\[
1 \cdot K = (2.75)(156)
\]
\[
K = 429
\]
Let $K = 429$ and $p = 3.00$
\[
D = \frac{429}{3.00}
\]
\[
D = 143
\]

Answer: $D = 143$ bags of candy

29. Create an equation with $K$:
\[
V = \frac{KT}{p}
\]
Let $p = 0.75$, $T = 294$ and $V = 8000$
\[
8000 = \frac{K(294)}{0.75}
\]
\[
8000 = \frac{392K}{392}
\]
\[
\frac{8000}{392} = K
\]
Note: Use $K = 2041$

Let $K = 20.41$, $p = 1.5$, and $T = 300$
\[
V = \frac{(20.41)(300)}{1.5}
\]
\[
V = 4082
\]

Answer: $V = 4082$ cubic centimeters
31. Create an equation with K:

\[ D = K + a \]

let \( t = 1 \) and \( D = 8 \)

\[ 8 = K(1)^2 \]

\[ 8 = K \]

let \( K = 8 \) and \( t = 3 \)

\[ D = 8(3)^2 \]

\[ D = 8(9) \]

\[ D = 72 \]

Answer: \( D = 72 \) feet

33. Create an equation with K:

\[ D = kV^2 \]

let \( V = \frac{1}{4} \) and \( D = 0.02 \)

\[ 0.02 = K \left( \frac{1}{4} \right)^2 \]

\[ 0.02 = K \left( \frac{1}{16} \right) \]

\[ 0.02 = 0.00625K \]

\[ \frac{0.02}{0.00625} = \frac{0.00625K}{0.00625} \]

\[ 0.32 = K \]

let \( K = 0.32 \) and \( V = 2 \)

\[ D = 0.32(2)^2 \]

\[ D = 0.32(4) \]

\[ D = 1.28 \]

Answer: \( D = 1.28 \) inches in diameter