Study Guide
Chapter 3 Test

3.1: Solve One-Step Equations
- Be able to use inverse operations to isolate the variable and solve one-step equations

Ex: \( \frac{7}{2} \cdot \frac{2}{7} n = -5 \cdot \frac{7}{2} \)

\[
\begin{align*}
  n &= -17 \frac{1}{2} \\
  \text{or } n &= -\frac{35}{2}
\end{align*}
\]

Ex: \(-5 + x = -4\)

\[
\begin{align*}
  +5 & \quad +5 \\
  x &= 1
\end{align*}
\]

Ex: \(1 - x = -2\)

\[
\begin{align*}
  -1 & \quad -1 \\
  -x &= -3 \\
  x &= 3
\end{align*}
\]

3.2/3.3: Solve 2/Multi-Step Equations
- Be able to use inverse operations and reverse PEMDAS to solve multi-step equations

Ex: \(4w + 2w = 24\)

\[
\begin{align*}
  6w &= 24 \\
  \frac{6w}{6} &= \frac{24}{6} \\
  w &= 4
\end{align*}
\]

Ex: \(\frac{x}{2} + 5 = 11\)

\[
\begin{align*}
  -5 & \quad -5 \\
  \frac{x}{2} &= 6 \\
  x &= 12
\end{align*}
\]

Ex: \(5x - 4(x - 3) = 17\)

\[
\begin{align*}
  5x - 4x + 12 &= 17 \\
  1x + 12 &= 17 \\
  x &= 5
\end{align*}
\]

Ex: \(\frac{4}{3} \cdot \frac{3}{4} (z - 6) = 12 \cdot \frac{4}{3}\)

\[
\begin{align*}
  z - 6 &= 16 \\
  z &= 22
\end{align*}
\]

Ex: \(-4 = 2(x - 2) - 3(1 - x)\)

\[
\begin{align*}
  -4 &= 2x - 4 - 3 + 3x \\
  -4 &= 5x - 7 \\
  +7 & \quad +7 \\
  3 &= 5x \\
  \frac{3}{5} &= x
\end{align*}
\]

*Start by multiplying by the reciprocal rather than distributing to help avoid fractions
3.4: Solve equations with variables on both sides

- Be able to solve equations with variables on both sides by moving variable terms together

Ex: \(3m - 25 - 8m = m - 14\)

\[
\begin{align*}
-5m - 25 &= m - 14 \\
+5m &= +5m \\
-25 &= 6m - 14 \\
+14 &= +14 \\
-11 &= 6m \\
\phantom{-11} &= \frac{6}{6} m
\end{align*}
\]

\[m = -\frac{11}{6}\]

Ex: \(4(m - 3) = 2(6 - 2m)\)

\[
\begin{align*}
4m - 12 &= 12 - 4m \\
+4m &= +4m \\
8m - 12 &= 12 \\
+12 &= +12 \\
8m &= 24
\end{align*}
\]

\[m = 3\]

- Be able to identify when an equation has no solution, infinite solutions or 0 as the solution

Ex: \(-5(3a - 4) = 7a + 27 - 7\)

\[
\begin{align*}
-15a + 20 &= 7a + 20 \\
+15a &= +15a \\
20 &= 22a + 20 \\
-20 &= -20 \\
0 &= 22a \\
\phantom{0} &= \frac{22}{22} a
\end{align*}
\]

\[a = 0\]

Ex: \(4(3x + 2) = 2(6x + 4)\)

\[
\begin{align*}
12x + 8 &= 12x + 8 \\
-12x &= -12x \\
8 &= 8
\end{align*}
\]

\[\text{any number} \] *don’t forget to say what \(x\) can be

Ex: \(5z - 6 = (z - 1)5\)

\[
\begin{align*}
5z - 6 &= 5z - 5 \\
-5z &= -5z \\
-6 &= -5
\end{align*}
\]

No solution

3.2-3.4: Solve Real-World Problems Involving Equations

For each problem, be able to set up an equation to represent the situation, then solve the equation. Be sure to identify a variable.

Ex: John’s family is moving and he needs to rent a U-Haul truck. The truck costs $250. He also wants to hire movers to help that cost $40 per hour. If he can only spend $750, how many hours could he hire movers for?

a) Write an equation to represent the situation. Be sure to identify a variable and what it represents.

\[x: \# \text{ hours} \]

\[250 + 40x = 750\]

b) Solve your equation.

\[
\begin{align*}
250 + 40x &= 750 \\
-250 &= -250 \\
40x &= 500 \\
\phantom{40x} &= \frac{500}{40} \phantom{x} \quad x = 12.5 \text{ hours}
\end{align*}
\]
Ex: A major league baseball pitcher pitches from a distance of 60 feet 6 inches (*6 inches = how many feet?*). The pitcher can throw a ball at 90 miles per hour (132 feet per second). How long (in seconds) does it take the pitch to reach the batter?

\[
d = rt
\]

\[
\frac{60.5}{132} = t
\]

*Need to use 60.5 because this is feet, and 132 ft/s because it wants to know how long in seconds.

0.46 sec = t

Ex: Amy wants to join a movie theater club where should would pay $150 up front and then get to see as many movies as she wants in theaters for $5 each. A non-member must pay $12.50 for each movie. Amy wants to set up an equation to figure out when the cost of a member and a non-member would be equal.

a) Set up and solve an equation to represent the situation. Be sure to identify a variable and what it represents.

\[x: \text{# movies}
150 + 5x = 12.5x
\]

b) Solve your equation.

\[
150 + 5x = 12.5x
-5x -5x
150 = 7.5x
7.5 \quad 7.5
20 = x
\]

c) Explain the meaning of the solution as well as when Amy should choose to become a member and when she should choose to remain a non-member.

It will take 20 movies for the cost of a member and non-member to be the same. If Amy wants to go to more than 20 movies, she should be a member, and she wants to go to less than 20 movies, she should be a non-member.

Ex: You want to make and sell holiday scarves. Your goal is to earn a profit of $500. You plan to sell each scarf for $5 and the cost of materials to make all scarves will be $200. Set up and solve a profit equation to determine how many scarves you will need to sell in order to meet your goal of a $500 profit.

\[x: \text{# Scarves}
\]

\[P = I - E
\]

\[
500 = 5x - 200
+200 +200
700 = 5x
5 \quad 5
x = 140 \text{ Scarves}
\]
3.5/3.6: Write ratios and write/solve proportions

- Be able to set up and solve ratios and proportions

Ex: \[ \frac{34}{6} = \frac{2z + 1}{2} \]

Ex: \[ \frac{-4a - 1}{-10a} = \frac{3}{8} \]

\[ \begin{align*}
68 &= 6(2z + 1) \\
68 &= 12z + 6 \\
-6 &= 12z \\
62 &= 12z \\
12 &= 12 \\

\end{align*} \]

\[ \begin{align*}
8(-4a - 1) &= -30a \\
-32a - 8 &= -30a \\
+32a &= +32a \\
-8 &= 2a \\

\end{align*} \]

\[ z = \frac{31}{6} \]

\[ a = -4 \]

Ex: There are 10 girls and 12 boys in Mr. Taliaferro’s Social Studies class.

a) What is the ratio of boys to girls?

\[ \frac{12}{10} = \frac{6}{5} \]

b) What is the ratio of girls to all students?

\[ \frac{10}{22} = \frac{5}{11} \]

Ex: You can read 20 pages of Fahrenheit 451 in 45 minutes. How many pages can you read in 1.5 hours? Set up a proportion and solve.

\[ \frac{20}{45} = \frac{x}{90} \quad \text{*90 minutes is 1.5 hours} \]

\[ 1800 = 45x \]

\[ x = 40 \text{ pages} \]

3.7: Set up and solve percent problems

- Be able to set up and solve percent and percent of change problems using the percent proportion

Ex: What is 42.5% of 380?

\[ \frac{x}{380} = \frac{42.5}{100} \]

\[ x = 161.5 \]

Ex: 90 is what percent of 250?

\[ \frac{90}{250} = \frac{x}{100} \]

\[ x = 36\% \]
A survey asks high school seniors whether they would be willing to pay $5 for their yearbook. 198 students said “yes.” This is 88% of the senior class. How many seniors are there in the high school?

\[
\frac{198}{x} = \frac{88}{100}
\]

225

### 3.8: Rewrite equations and formulas

- Be able to solve a literal equation for a variable

**Ex:** The area of a circular ring is found by using the formula \( A = 4\pi w \)

a) Solve for \( p \).

b) Find \( p \) when the area is 905 square feet and the width is 9 feet

\[ p = \frac{A}{4\pi w} \]

About 8 feet

- Be able to write equations in function form

**Ex:** \( 4x - 2y = -18 \)

\[
\begin{align*}
-4x &\quad -4x \\
-2y &= -18 - 4x \\
-2 &\quad -2
\end{align*}
\]

\[ y = 2x + 9 \]

**Ex:** \( 4y - x = 20 \)

\[
\begin{align*}
+x &\quad +x \\
4y &= 20 + x \\
4 &\quad 4
\end{align*}
\]

\[ y = \frac{1}{4} x + 5 \]