Mini-Lecture 1.2
An Introduction to Problem Solving
Learning Objectives:

1. Translate English sentences into mathematical statements.
2. Model and solve direct translation problems.
3. Model and solve mixture problems.
4. Model and solve uniform motion problems.

Preparing for Problem Solving:
Express each English phrase as an algebraic expression.
i) $\quad 9$ less than a number, $t$

$$
t-9
$$

ii) 2 more than 4 times the height, $h$

$$
2+4 h
$$

Examples:

1. Translate each of the following English statements into a mathematical statement. Then solve the equation.
a) The difference between -12 and a number, $x$, is 20 .

$$
\begin{aligned}
& -12-x=20 \\
& +12 \\
& -x=32
\end{aligned} \longrightarrow x=-32
$$

b) Twice the sum of a number, $z$, and 3 is the same as 5 times the number.

$$
\begin{gathered}
2(z+3)=5 z \\
2 z+6=5 z \\
6=3 z
\end{gathered} \quad \rightarrow z=2
$$

2. Consecutive Integers The sum of three consecutive odd integers is $\mathbf{- 1 4 7}$. Find the integers.

$$
\begin{aligned}
& \text { (2) } x+x+2+x+4=-147 \\
& \begin{aligned}
& 3 x+6=-147 \\
& 3 x=-153 \\
& \text { (4) The integers } \\
& \text { (3) } x=-51 \quad \text { are }-51, \\
&-49 \text { and } \\
&-47 .
\end{aligned}
\end{aligned}
$$

3. Sales Tax Cheryl purchased a new 4 GB iPod nano for $\$ 268.75$. If this price includes sales tax at the rate of (1) $7.5 \%$, what is the price of IPod without taxes?

$$
p=\text { orig. price }
$$

(2)

$$
p+.075 p=268.75
$$



SIMPLE INTEREST FORMULA
If a principal of $P$ dollars is borrowed for a period of $t$ years at an annual interest rate $r$, expressed as a decimal, the interest $I$ charged is

$$
I=P r t
$$

Interest charged according to this formula is called simple interest.
4. Investments Amelia just received a $\$ 9000$ bonus. She has been advised to invest her bonus in two accounts, one yielding $3 \%$ per annum and the other $8 \%$ per annum. If Amelia wants to earn $\$ 580$ in interest, how much
(1) should she put in each account?
(2)
$x=$ principle in $3 \%$

$$
9000-x=\text { pron. in } 8 \%
$$

$$
.03 x+.08(9000-x)=580
$$

(4)

\$ $6200 @ 8 \%$
5. Candy Store Valentine's Day is coming up so Andy decided to buy chocolates for his co-workers at $\$ 4.50$ per pound and truffles for his girlfriend at $\$ 7.50$ per pound. If he purchased a total of 11 pounds of candy and spent
(1) $\$ 58.50$, how many pounds of each type did he buy?
(
(2)

$$
\mathrm{O}_{11}-x=\text { pounds of truffles }
$$

$4.5 x+7.50(11-x)=58.50$

$$
\left\{\begin{array}{l}
3 \text { ) } x=8 \\
\text { (4) } 8 \mathrm{lbs} . \text { choc. } \\
3 \mathrm{lbs} . \text { truffles }
\end{array}\right.
$$

UNIFORM MOTION FORMULA
If an object moves at an average speed $r$, the distance $d$ covered in time $t$ is given by the formula

$$
d=r t
$$

6. Boats Two boats are traveling towards the same port from opposite directions. They are 63 miles apart and one boat is traveling 6 mph faster than the other. If the boats both reach the port in 4 hours and 30 minutes, find the speed for each.
$r=$ rate 1 st .
$r+6=$ rate $2 n d$.

(3) $r=4 \mathrm{mph}$
(4) $r+6=10 \mathrm{mph}$
