Guided Examples For Translations and Basic Word Problems.

Integer Problems

Notes regarding integer word problems

Although there are several methods for declaring variables for such problems, the method discussed in class makes every attempt to take advantage of given information. For example, all even integers are represented as a multiple of two and then it should follow that odd integers could be found by simply adding one. In some cases not enough information is given to declare for even or odd but it is known that the numbers will alternate back and forth. In those circumstances using the more general case of x will suit better.

Consecutive Even Integers		*Consecutive Odd Integers*		*Consecutive Integers*	
First:	*2n*	*First:*	*2n + 1*	*First:*	*x + 1*
Second:	*2n + 2*	*Second:*	*2n + 3*	*Second:*	*x + 2*
Third:	*2n + 4*	*Third:*	*2n + 5*	*Third:*	*x + 3*

Example 1: Find three consecutive **odd integers** whose sum is 87.

First: 2n + 1
Second: 2n + 3
Third: 2n + 5
6n + 9

First + Second + Third = 87

$6n + 9 = 87$

$6n = 87 - 9$

$6n = 78$

$\frac{6n}{6} = \frac{78}{6}$

$n = 13$

First:	2n + 1 = 27
Second:	2n + 3 = 29
Third:	2n + 5 = 31

Example 2: Find four consecutive **even integers** whose sum is –12

First: 2n
Second: 2n + 2
Third: 2n + 4
Fourth 2n + 6
8n + 12

First + Second + Third + Fourth = – 12

$8n + 12 = -12$

$8n = -12 - 12$

$8n = -24$

$\frac{8n}{8} = -\frac{24}{8}$

$n = -3$

First:	2n	= – 6
Second:	2n + 2	= – 4
Third:	2n + 4	= – 2
Fourth:	2n + 6	= 0

Example 3: Find four consecutive **integers** where twice the greatest, increased by three times the second smallest, is the same as, 201 minus the least of the integers.

First: x + 1
Second: x + 2
Third: x + 3
Fourth x + 4

2 [Fourth] + 3 [Second] = 201 – [First]

$2[x + 4] + 3[x + 2] = 201 - [x + 1]$

$2x + 8 + 3x + 6 = 201 - x - 1$

$5x + 14 = 200 - x$

$5x + x = 200 - 14$

$6x = 186$

$\frac{6x}{6} = \frac{186}{6}$

$x = 31$

First:	x + 1	= 32
Second:	x + 2	= 33
Third:	x + 3	= 34
Fourth:	x + 3	= 35

Example 4: Find three consecutive **even integers** such that twice the least increased by three times the greatest is 102. Find the integers.

First: 2n
Second: 2n + 2
Third: 2n + 4

2 (First) + 3 (Third) = 102

$2(2n) + 3(2n + 4) = 102$

$4n + 6n + 12 = 102$

$10n + 12 = 102$

$10n = 102 - 12$

$10n = 90$

$n = 9$

First:	2n	= 18
Second:	2n + 2	= 20
Third:	2n + 4	= *22*

Example 5: Five times the smallest of three consecutive **odd integers** is ten more than twice the largest. Find the integers.

First: $2n + 1$
Second: $2n + 3$
Third: $2n + 5$

5 (First) = 2 (Third) +10

$5(2n+1) = 2(2n+5) + 10$

$10n + 5 = 4n + 10 + 10$

$10n + 5 = 4n + 20$

$10n - 4n = 20 - 5$

$6n = 15$

$n = 2\frac{1}{2}$

Note: that the solution to the equation is not an integer. this should be a hint that there is no solution. It comes directly from the method chosen for declaring variables. Technically if one were to plug in 2.5 for n there are integer answers of 6 , 8, and 10 respectively but the definitely are not odd integers.

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Number Problems

Notes regarding number word problems

There are three key methods for declaring variables under this section. The first item to consider for each problem will usually be found in the last sentence. The reader needs to decide how many numbers need to be found. If it is a single number problem then declare a single variable and begin to write the equation immediately. If the problem asks for more than one number then the set up will follow one of two avenues. The first will be for "the sum of two numbers ..." while the second will be " the difference of two numbers..."

Example for Sum:
The sum of two numbers is 45.
One: X
Other: $45 - X$

Example for Difference:
The difference of two numbers is 15.
One: $X + 15$
Other: X

Notice that "sum" will use a subtraction sign and the X's will cancel out when the expressions are combined while the "difference" will use an addition sign and that the X's are canceled out through the operation of subtraction. In other words, the declared expressions should include the opposite signs to the operation indicated.

Example 6: The **sum of two numbers** is 17. Five times one number is one more than twice the other. Find the two numbers.

One: x
Other: $17 - x$

3 (One) = 2 (Other) + 1

$3(x) = 2(17 - x) + 1$

$3x = 34 - 2x + 1$

$3x = 35 - 2x$

$3x + 2x = 35$

$5x = 35$

$x = 7$

One: $x = 7$

Other: $17 - x = 10$

Example 7: The **difference of two numbers** is 11. Twice one number is six more than the other. Find the two numbers.

One: x + 11
Other: x

2 (One) = (Other) + 6

$2(x+11)=(x)+6$

$2x+22=x+6$

$2x-x=6-22$

$x=-16$

One:	x + 11 = –5
Other:	x = – 16

Note: If one were following the method taught in class then answers will match. Examples like problem 6 will always produce the same set of numbers when expressions are swapped. However, problem seven will lead to a different set of answers if the expressions are swapped. Those answers are equally correct but not pursued for the sake of simplicity.

Example 7.1
One: x + 11
Other: x

2 (Other) = (One) + 6

$2(x)=(x+11)+6$

$2x=x+17$

$2x-x=17$

$x=17$

One:	x + 11 = 28
Other:	x = 17

Example 8: Twice a number increased by twelve, is thirty five less than three times the number. Find the number.
Note: The question only wants a single value. So declare one variable, and write the equation.

Number: w

$2w + 12 = 3w - 35$

$12 + 35 = 3w - 2w$

$47 = w$

Number: w = 47

Example 9: Five times the difference, of three times a number and two, is, nine more than seven times the number. Find the number

Number: g

$5(3g - 2) = 7g + 9$

$15g - 10 = 7g + 9$

$15g - 7g = 9 + 10$

$8g = 19$

$g = 2\frac{3}{8}$

Number: g = $2\frac{3}{8}$

Example 10: The sum of a six times number and five, is, the same as five more than, six times the difference, of twice the number and nine. Find the number

Number: z

$6z + 5 = 6(2z - 9) + 5$

$6z + 5 = 12z - 54 + 5$

$6z + 5 = 12z - 49$

$5 + 49 = 12z - 6z$

$54 = 6z$

$9 = z$

Number: 9 = z

Attendance / Basic Mixture Problems

Example 10: The attendance at a basketball game was 500 people. Student tickets cost $2.50 and adult tickets cost $3.50. If $1550 was collected how many of each type of ticket was sold.

Type	Amount	Price $	Total
Adult	a	3.50	3.50a
Student	500 – a	2.50	2.50 (500 – a)
	500		1550

$Total_{Adult} + Total_{Student} = Total_{Money}$

$3.50a + 2.50(500 - a) = 1550$

$3.50a + 1250 - 2.50a = 1550$

$a + 1250 = 1550$

$a = 1550 - 1250$

$a = 300$

Adults:	a	= 300
Students:	500 – a	= 200

Note: With these type of problems the number of people at the event serves as "the Sum of adults and students." It then follows that the technique discussed for "the sum of two numbers" must be used when declaring variables for adults and students. Create a column for price and then multiply the across the row to create a column for money brought in from each type of ticket. The final equation subsequently is found in the last column where the total money for adults is combined with the total money for students and then set equal to the value indicated in the word problem itself.

Example 10: The attendance at a volleyball game was 90 people. Student tickets cost $2.00 and adult tickets cost $3.00. If $212 was collected how many of each type of ticket was sold.

Type	Amount	Price $	Total
Adult	a	3.00	3a
Student	90 – a	2.00	2 (90 – a)
	90		212

$Total_{Adult} + Total_{Student} = Total_{Money}$

$3a + 2(90 - a) = 212$

$3a + 180 - 2a = 212$

$a + 180 = 212$

$a = 212 - 180$

$a = 32$

Adults: a = 32
Students: 90 – a = 58