Solving Linear Equations and Inequalities

This booklet belongs to:_____

LESSON #	DATE	QUESTIONS FROM NOTES	Questions that I find difficult
1.		Pg.	
2.		Pg.	
3.		Pg.	
4.		Pg.	
5.		Pg.	
6.		Pg.	
7.		Pg.	
8.		Pg.	
9.		Pg.	
10.		Pg.	
11.		REVIEW	
12.		**TEST**	

Your teacher has important instructions for you to write down.

Solving Linear Equations and Inequalities

Objective	#	Daily Topic	Key Ideas
P&R3 model and solve problems using linear equations of the form: $ax = b$* $\frac{x}{a} = b,\ a \neq 0$* $ax + b = c$* $\frac{x}{a} + b = c,\ a \neq 0$* $a(x + b) = c$* $ax + b = cx + d$* $a(bx + c) = d(ex + f)$ *where a, b, c, d, e, and f [C, CN, PS, V]	1.	Introduction to Solving Linear Equations (pg. 4-7) • Model the solution of a given linear equation using concrete or pictorial representations, and record the process.	Algebra stones and Algebra Tiles. Solve $x + 5 = 10$, $x - 7 = 10$, $2x = 10$, $\frac{x}{3} = 10$
	2.	Solving equations of the form ax+b=c and a/c +b=c (pg. 8-10) • Solve a given linear equation symbolically. • Solve a given problem using a linear equation and record the process.	Solve. 4m+3=31 & $\frac{2}{5}m - 5 = 3$
	3.	Solving equations of the form a(x+b)=c and ax+b=cx+d(pg. 11-14) • Determine, by substitution, whether a given rational number is a solution to a given linear equation.	Solve. 4(m+3)=40 & 6m+3=2m+15 Is m=5 a solution to the equation $2(m + 2) = 14$?
	4.	More practice with ax+b=cx+d (Pg. 15-18) • Identify and correct an error in a given incorrect solution of a linear equation	Solve. 2(m+1)+4m=4(m-2)+6.
	5.	Solve equation with fractions. (Pg. 19-23) • Solve a given linear equation symbolically.	Solve $\frac{m}{3} + \frac{2m}{5} - \frac{1}{2} = 2$
	6.	Solve Linear equations without numbers. (Pg. 24-28) • Solve a given linear equation symbolically.	Solve for m. $A(m + n) = B$
P&R4 explain and illustrate strategies to solve single variable linear inequalities with rational coefficients within a problem-solving context.	7.	Introduction to linear inequalities (Pg. 29-33) • Translate a given problem into a single variable linear inequality using the symbols ≥, >, <, or ≤. • Determine if a given rational number is a possible solution of a given linear inequality.	Write an expression to represent the following statement: Melanie needs at least $280 for snow boarding.
	8.	Inequalities that Include Addition and Subtraction (Pg. 34-37) • Generalize and apply a rule for subtracting a positive or negative number to determine the solution of a given inequality. • Generalize and apply a rule for multiplying or dividing by a positive or negative number to determine the solution of a given inequality. • Solve a given linear inequality algebraically and explain the process orally or in written form. • Verify the solution of a given linear inequality using substitution for multiple elements in the solution.	Solve $2x + 5 < 25$ and verify your solution. True or False. If $-2x > -10$ then $x > 5$.
	9.	Solving Problems with Linear Inequalities (Pg. 38-41) • Compare and explain the process for solving a given linear equation to the process for solving a given linear inequality. • Graph the solution of a given linear inequality on a number line. • Compare and explain the solution of a given linear equation to the solution of a given linear inequality. • Solve a given problem involving a single variable linear inequality and graph the solution.	Vertical Wireless charges $50/ month plus $0.25 for all minutes above 400 minutes per month. Frue Gal has decided that she does not want to pay more than $70 per month. Write an inequality to represent how many minutes she can use per month without going over her $70 limit. Approximate your solution on the number line
	10.	Chapter Review and Practice Test • Help students develop sound study habits. • Many students will graduate high school saying they do not know how to study for math tests.	
	11.	Go over Practice Test	
	12.	Unit Evaluation	

***Pages 22-28 are extentions.

Key Terms

	Definition	Example
Binomial	A polynomial consisting of two terms.	$2b^3+5$ Is a binomial
Coefficient	A number in front of a variable.	$2b^3+5$ The 2 is the coefficient.
Constant	A number that does not change.	$2b^3+5$ The 5 is the constant.
Equation	A statement where two expressions are equal.	$2b^3+5=2b+1$ is an equation. $A=\pi r^2$ Is an equation.
Evaluate	Determine the answer.	Evaluate 2+3→5
Expand	A direction to multiply the number in front of the brackets by each of the terms inside the brackets.	$2m(3m-5n)=6m^2-10mn$
Expression	A collection of variables and or numbers that represents a quantity.	$2b^3+5$ Is an expression. πr^2 Is also an expression.
Inequality	A statement where two expressions are not equal.	$6>1$, $2x+3<5$ and $x\neq 4$ are examples of inequalities.
Inverse operation	Inverse operations have opposite effects.	Adding and subtracting are inverse operations.
Like Term	Terms that have the same variables to the same exponents.	5m,3m and m are like terms. 2n & 5m are not like terms.
Monomial	An algebraic expression consisting of one term.	$2b^3$ is a monomial. 5 is a monomial.
Simplify	A direction to combine or reduce terms.	$4m+5m-3m$ can be simplified to 6m.
Solve	A direction to determine the value of a variable.	The solution to $x+8=18$ is x=10.
Substitute	A direction to replace the variable(s) with specific values.	If 3 were substituted for x in $2x+1$, the value of the expression would be 7.
Term	A quantity. A constant, a variable or the product of a constant and a variable could represent this quantity.	$2b^3+5$ $2b^3$ is a term. 5 is a term.
Trinomial	A polynomial consisting of three terms.	$2b^3+2m+5$
Variable	A letter that is used to represent a number.	$2b^3+5$ The b is the variable.

Introduction to Solving Linear Equations

Challenge #1: Solve each riddle using any strategy that works.

1. Five less than ten times a number is equal to fifty-five. What is the number?
   $10m - 5 = 55$

   Rate the riddle:
   Easy, Medium, Hard

2. Three times the sum of two and a number is equal to twenty-one. What is the number? $3(m + 2) = 21$

   Rate the riddle:
   Easy, Medium, Hard

3. A number is divided by four, increased by two and the result is 8. What is the number? $\frac{m}{4} + 2 = 8$

   Rate the riddle:
   Easy, Medium, Hard

4. One more than four times a number is the same as two times a number increased by seven. What is the number?
   $4m + 1 = 2m + 7$

   Rate the riddle:
   Easy, Medium, Hard

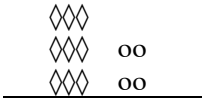
What made certain riddles harder than others?

Introduction to Algebra Stones and Algebra Tiles

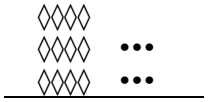
Challenge #2: Write an expression to represent each set of algebra stones.

Let ◊= x, ♦=-x, o=1 and •=-1

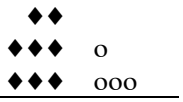
5. Expression:



6. Expression:



7. Expression:



8. Expression:

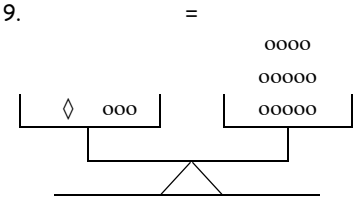
One of the major contributions of mathematics to our world has been to provide tools to solve complex problems in an orderly, repeatable and understandable way. Do you think you can figure out what x equals in $\frac{2}{3}x + 7 = 5\left(x + 1\right) - 7$ quickly?

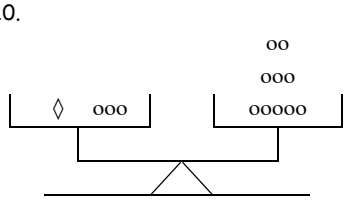
Could you explain to a friend how to solve it?
Could you create a system to solve this problem?

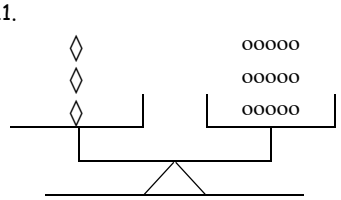
Challenge #3: Write an equation to represent each set of algebra stones.

Let ◊= x, ♦=-x, o=1 and •=-1

Write an equation:

9. 

10. 

11. 

12. Modify the picture to show how many o would be needed to balance one ◊?

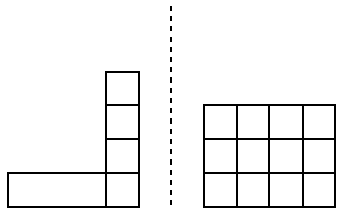
13. Modify the picture to show how many o would be needed to balance one ◊?

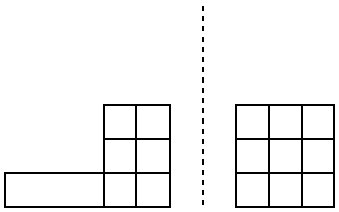
14. Modify the picture to show how many o would be needed to balance one ◊?

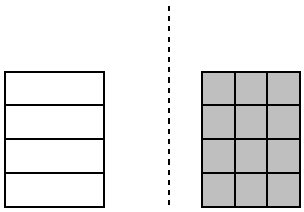
Write an equation to represent each set of algebra tiles and solve the equation.

Let clear bars equal x and the each clear little square equal 1. Shading denotes negative numbers.

Write an equation for each set of algebra tiles:

15. 

16. 

17. 

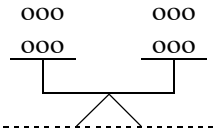
18. Modify the algebra tiles to show how many one tiles would be needed to balance one x tile?

19. Modify the algebra tiles to show how many one tiles would be needed to balance one x tile?

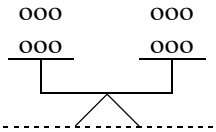
20. Modify the algebra tiles to show how many one tiles would be needed to balance one x tile?

Will the scales be balanced after each change? Modify each drawing to support your answer.

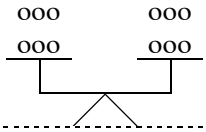
21. If 5 is added to both sides, will the scales be balanced?



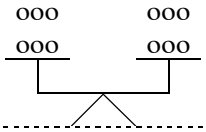
22. If 5 is subtracted from both sides, will the scales be balanced?



23. If both sides are multiplied by 2, will the scales be balanced?



24. If both sides are divided by 2, will the scales be balanced?



25. What happens to $m-5=6$ if both sides of the equation are increased by 5?

26. What happens to $m+5=6$ if both sides of the equation are decreased by 5?

27. What happens to $\frac{m}{2}=5$ if both sides of the equation are multiplied by 2?

28. What happens to $2m=6$, if both sides of the equation are divided by 2?

Definition: Inverse Operations

29. The inverse of adding 5 is _____5.
30. The inverse of subtracting 7 is _____7.
31. The inverse of multiplying by 2 is _____by 2.
32. The inverse of dividing by 2 is _____by 2.

33. Additive inverses, $(+,-)$, add to [ ] and multiplicative inverses, $(\times,\div)$, multiply to, [ ].

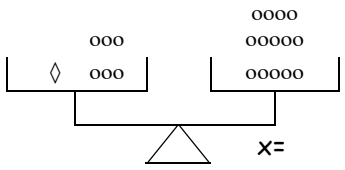
Perform the inverse operation to isolate x.

34. $x+5=10$	35. $x-7=10$	36. $2x=10$	37. $\frac{x}{3}=10$

Write an equation and use algebra stones to solve the equation.

Let ◊= x, ♦=-x, o=1 and •=-1

38.



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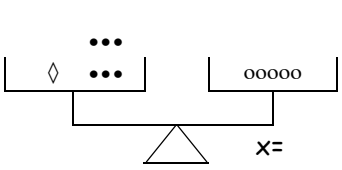

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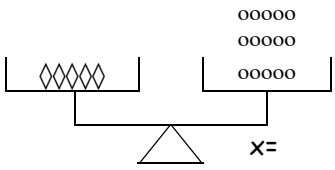


What specific operation must be performed to isolate x?

41. $x+3=14$	42. $x-6=10$	43. $3x=15$	44. $\frac{x}{4}=20$
45. $-5x=30$	46. $7+x=16$	47. $\frac{x}{-3}=-9$	48. $-18=-3x$

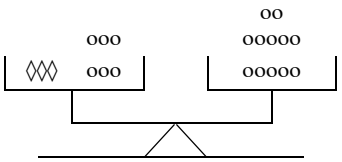
Important note

49. It is very possible to do the above problems without showing any work. These are warm up questions and practicing these skills now, will make solving questions like $2(m+1)+4m=4(m-2)+6$ & $2(m-1)+\frac{5m}{2}=\frac{2}{3}(m+3)$, possible. By the way the answers are m=-2 and m=24/23. It took me about 1 minute and ten seconds to solve both☺ Can you beat my time?

Challenge #4: Write an equation to represent each set of algebra stones.

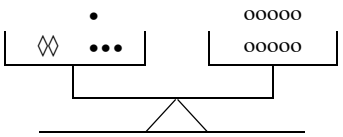
Let ◊= x, ♦=-x, o=1 and •=-1

50.



Modify the picture to show how many o would be needed to balance one ◊?

51.



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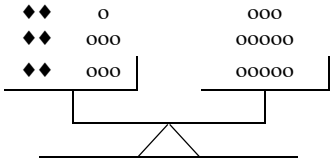
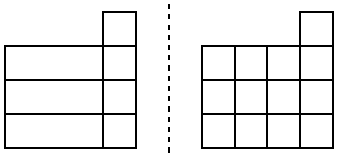
52.



Modify the picture to show how many o would be needed to balance one ◊?

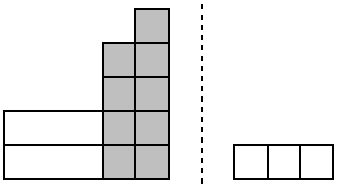
Challenge #5: Write an equation to represent each set of algebra tiles and solve the equation.

53. =



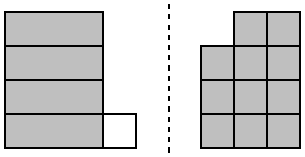
Modify the algebra tiles to show how many one tiles would be needed to balance one x tile?

54. =



Modify the algebra tiles to show how many one tiles would be needed to balance one x tile?

55. =



Modify the algebra tiles to show how many one tiles would be needed to balance one x tile?

Challenge #6:

56. Solve. 4m+3=31

How could you check to make sure your solution is right?

Write down the steps to solve the challenge to the left.

Solve for m.

57. Solve. $4m+3=31$

Subtract 3 from both sides.

$4m+3\mathbf{-3}=31\mathbf{-3}$

$4m=28$

Divide both sides by 4.

$$\frac{4m}{4}=\frac{28}{4}$$

$m=7$

Check your answer by substituting m=7 into the original equation.

$4(7)+3=28$

m=7 is the solution.

58. $3m-5=25$

59. $5m-15=40$

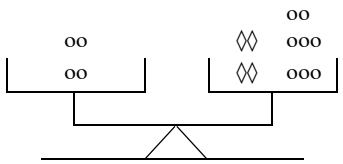
60. $6m-5=-25$

61. $-2m-5=25$

How many o are needed to balance one ◊?

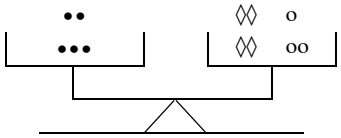
Let ◊= x, ♦=-x, o=1 and •=-1

62.



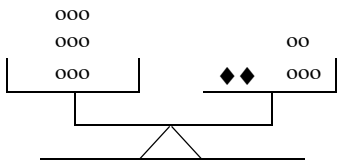
How many o are needed to balance one ◊?

63.



How many o are needed to balance one ◊?

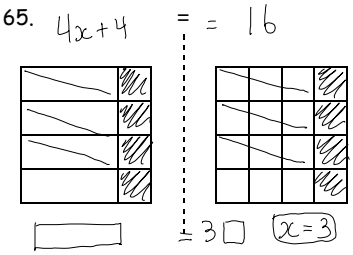
64.



How many o are needed to balance one ◊?

Modify the algebra tiles to show how many one tiles would be needed to balance one x tile?

65.



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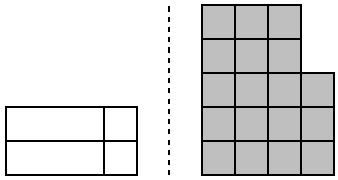

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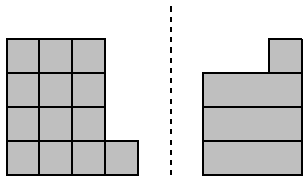


Challenge #7:

68. Solve. $\frac{2}{5}m-5=3$

Write down the steps to solve the challenge to the left.

Solve equations involving fractions.

69. Solve. $\frac{2}{5}m-5=3$

Eliminate the fractions by multiplying both sides by five.

$$\left(\frac{2}{5}m-5=3\right)5$$

Multiply every term by five.

$$\frac{10}{5}m-25=15$$

Reduce, add 25 to both sides and divide both sides by two.

$$2m-25+25=15+25$$

$$2m=40$$

$$\frac{2m}{2}=\frac{40}{2}$$

$$m=20$$

Check your answer by substituting m=20 into the original equation.

$$\frac{2}{5}(20)-5\stackrel{?}{3}$$

$$8-5=3$$

m=20 is the solution.

70. Solve. $\frac{3}{2}m-5=25$

71. Solve. $\frac{5m}{2}-15=10$

72. Solve. $\frac{6m}{5}-5=-17$

73. Solve. $-\frac{2m}{3}-5=25$

74. Solve. $-10=\frac{-3m}{4}+5$

75. Solve. $\frac{m}{3}-2=-29$

76. Solve. $-2m-5=39$

77. Solve. $-\frac{4m}{3}-4=5$

78. Solve. $-25=-4m+15$

79. Solve. $\frac{5m}{3}-7=10$

80. $\frac{3m}{5}-5=-3$

81. Spot the error and solve. $-33=3m+3$

-30=3m
-10=m

82. Spot the error and solve.

$$-\frac{m}{3}-5=25$$

-m-5=75
-m=80
m=-80

83. Is the solution to $3m+6=-30$ correct?

Divide by 3
m+2=-10
m=-12

Write an equation and solve the equation.

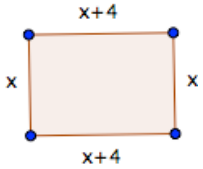
84. A number is multiplied by negative two and then decreased by five and the result is twenty-nine. Find the number.

85. The sum of three times a number and three is negative twenty-seven. Find the number.

86. Three times the opposite of a positive number increased by five is negative twenty-five. Find the number.

Write an equation and solve the equation.

87. Bock Sout has 68 meters of fencing to build a fence. He wants the length to be 4 meters longer than the width. Write an algebraic equation and determine the dimensions of the rectangular fence.



88. Guud Riter received $400 dollars in advance plus $2 for every Internet download of his EBook. How many downloads are needed for Guud to make $4200?

89. The formula to convert degrees Celsius to degrees Fahrenheit is $F = \frac{9}{5}C + 32$.

Use this formula to convert 102 Fahrenheit to degrees Celsius.

Challenge #8:

90. Solve. 4(m+3)=40

Write down the steps to solve the challenge to the left.

Solving Linear Equations that include Brackets

91. Solve. 4(m+3)=40

Expand the left side.

4m+12=40

Subtract 12 from both sides

4m+12**-12**=40**-12**

4m=28

Divide both sides by 4.

$$\frac{4m}{4}=\frac{28}{4}$$

m=7

Check your answer by substituting m=7 into the original equation.

4(7+3)=40

m=7 is the solution.

92. $3(m-5)=25$

93. $-5(m-1)=20$

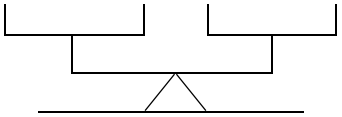
94. $6(m-5)=-6$

95. $-2(m-5)=25$

Challenge #9: Draw a picture to represent the equation and solve.

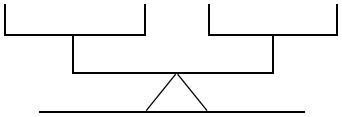
Let ◊= x, ♦=-x, o=1 and •=-1

96. $3(x+2)=9$



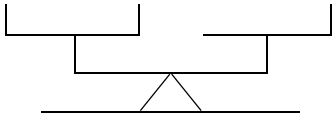
Solve for x.

97. $4(2-x)=12$



Solve for x.

98. $3(x-7)=-9$



Solve for x.

Challenge #10:

99. Which of the following number(s) is a solution to $m+5=2m+4$; -1,5

Explain how to answer the question.

Solutions to Equations

Definition:

A number is a **solution** to an equation if it can be substituted into the equation and make the left side of the equation equal to the right side of the equation.

Rewrite the above definition using your own words or an example.

100. Is m=1 a solution to $m+5=2m+4$?

Let's check. When m=1 is substituted into the equation, the left side is equal to the right side.

$(1)+5=6$ *and* $2(1)+4=6$

Since $6=6$ ***, m=1 is a solution.***

101. Is m=5 a solution to $m+5=2m+4$?

Let's check. When m=5 is substituted into the equation, the left side does not equal the right side.

$(5)+5=10$ *and* $2(5)+4=14$

Since $10\neq 14$ ***, m=5 is not a solution.***

State whether each number is a solution to each equation.

102. Is m=12 a solution to the equation $m+2=14$?

103. Is m=8 a solution to the equation $m-2=10$?

104. Is m=5 a solution to the equation $4m+2=22$?

105. Is m=5 a solution to the equation $2(m+2)=14$?

106. Is m=-2 a solution to the equation $m+2=2m-8$?

107. Is m=1 a solution to the equation $4m+2=2m-8$?

Solve each equation and check your answer.

108. $-2(m-5)=24$

109. $-27=3(m+3)$

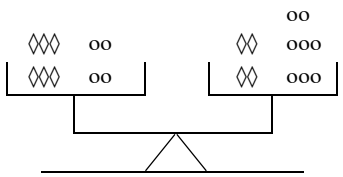
110. $-25=-3(m-5)$

111. $3(m-2)=-21$

Challenge #11: How many o are needed to balance one ◊?

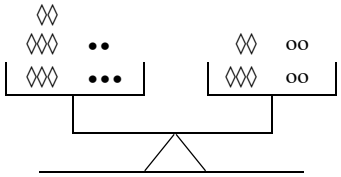
Let ◊= x, ♦=-x, o=1 and •=-1

112.



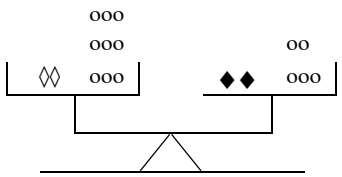
How many o are needed to balance one ◊?

113.



How many o are needed to balance one ◊?

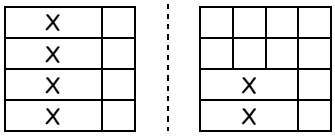
114.



How many o are needed to balance one ◊?

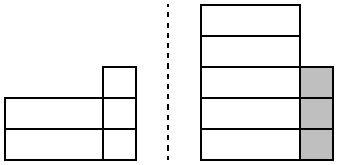
Challenge #12: Write an equation and solve it by rearranging the algebra tiles.

115.



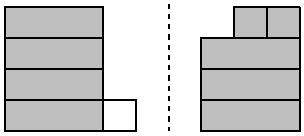
Modify the algebra tiles to show how many one tiles would be needed to balance one x tile?

116.



Modify the algebra tiles to show how many one tiles would be needed to balance one x tile?

117.



Modify the algebra tiles to show how many one tiles would be needed to balance one x tile?

Challenge #13:

118. Solve. 6m+3=2m+15

Write down the steps to solve the challenge to the left.

Check your answer

Solve equations that have variables on both sides.

119. Solve. $6m+3=2m+15$

Subtract 2m from both sides.

$6m-2m+3=2m-2m+15$

$4m+3=15$

Subtract three from both sides.

$4m+3-3=15-3$

$4m=12$

Divide both sides by 4.

$$\frac{4m}{4}=\frac{12}{4}$$

$m=3$

Check your answer by substituting m=3 into the original equation.

$6(3)+3=21 \qquad 21=2(3)+15$

m=3 is the solution.

120. Solve. $5m+1=3m-7$

121. Solve. $13m+5=11m-7$

122. Solve. $2m+10=7m-15$

123. Solve. $-3m+18=6m-6$

124. $2m+3=-7m-15$

125. Solve. $2m+20=-7m-15$

126. Solve. $-3m-10=-7m-14$

127. Spot the error and solve.

$3m+3=7m-12$

-4m+3=-12
-4m=-15
m=4/15

128. Spot the error and solve.

$-24 = 3(m+2)$

-24m=3m+2
-27m=2
m=-2/27

129. Spot the error and solve.

$-5m+20=-7m-15$

+20=-2m-15
5=-2m
-5/2=m

Challenge #14:

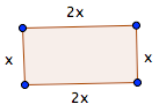
130. A square sheet of paper is folded in half to form a rectangle. The perimeter of the rectangle is 33 cm. Determine the dimension of the square if the length of the rectangle is twice as long as the width?

Solve using algebraic equations.

131. A square sheet of paper is folded in half to form a rectangle. The perimeter of the rectangle is 33 cm. Determine the dimensions of the square if the length of the rectangle is twice as long as the width?

Possible solution strategy:

Let the width=x and the length =2x



Perimeter=33
2x+2x+x+x=33
6x=33
x=5.5
The dimensions of the rectangle are 5.5cm by 11cm. Therefore, the dimensions of the square are 11cm by 11cm.

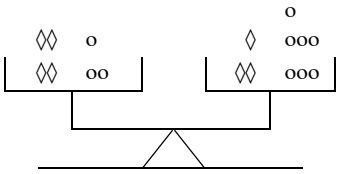
132. Jon cycles 3 times further than he runs. Yesterday he biked and ran a total of 56 kilometers. How far did he run?

133. Daniel is going to spend at least $200 at his favourite clothing store. He knows the owner will give him a 20% discount on anything he spends. How much can he spend before the discount, if the total bill after the discount cannot pass $500?

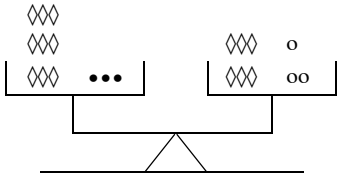
Solve for ◊ using algebra stones.

Let ◊= x, ♦=-x, o=1 and •=-1

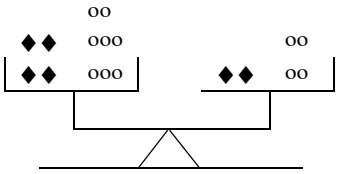
134. Solve for ◊.



135. Solve for ◊.

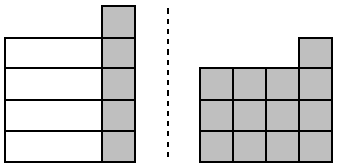


136. Solve for ◊.

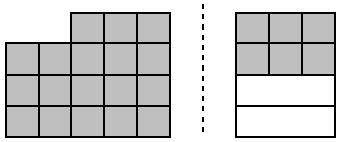


Solve for x using algebra tiles.

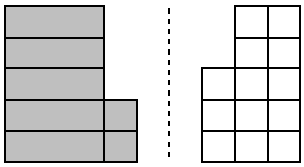
137. 4x − 5 = − 13



138. =



139. =



A Strategy to Consider

Now that the equations are getting more complex, it may helpful to review these steps.

- Eliminate Fractions by multiplying both sides by the common denominator.
- Eliminate brackets by Expanding.
- Collect Like Terms on each side of the equal sign.
- Get variables to same side by Subtracting or Adding variables to each side.
- Get constants to same side by Subtracting or Adding constants to each side.
- Isolate the variable by Dividing both sides by the coefficient.

The acronym is FELTSAD*. Some people have felt sad☹ until they figure out how to solve the equation. *(Apply from left to right. The F and E can be applied in any order. The S and A can be applied in any order). Here is an example of this.

	$2\left(m-1\right)+\frac{5m}{2}=\frac{2}{3}\left(m+3\right)$	***This is a very difficult question. You will be able to do this at the end of this unit.***
F	$\left[2\left(m-1\right)+\frac{5m}{2}=\frac{2}{3}\left(m+3\right)\right]\times 6$	F. Fractions. Multiply each side by 6.
E	$12\left(m-1\right)+\frac{30m}{2}=\frac{12}{3}\left(m+3\right)$ $12\left(m-1\right)+15m=4\left(m+3\right)$	E. Expand. Eliminate the brackets.
LT	$12m-12+15m=4m+12$	LT. Like Terms. Collect like terms on the left side.
S	$27m-12=4m+12$	S. Subtract. Subtract 4m from both sides.
A	$23m-12=12$	A. Add. Add 12 to both sides.
D	$23m=24$	D. Divide. Divide both sides by 23.
	$m=\frac{24}{23}$	Check your answer. This answer would be best checked with a calculator.

Challenge #15:

140. Solve. 2(m+1)+4m=4(m-2)+6.

Write down the steps to solve the challenge to the left.

141. Solve. $2(m+1)+4m=4(m-2)+6$.

F.**E.LT.S.A.D.**

Expand both sides.

$2m+2+4m=4m-8+6$.

Collect like terms on both sides.

$6m+2=4m-2$

Subtract 4m from both sides.

$6m-4m+2=4m-4m-2$

$2m+2=-2$

Subtract two from both sides and divide both sides by two.

$2m+2-2=-2-2$

$2m=-4$

$$\frac{2m}{2}=\frac{-4}{2}$$

$m=-2$

Check your answer.

$M=-2$

142. Solve. $4(m-1)-6m=-10(2m-1)-1$

143. Solve. $3(m-1)+6m=5(2m-1)+1$

144. Solve. $3(m-1)+m=5(m-1)+3m$

145. Spot the error: $4(m-1)+2=3(2m-1)+1$

4(m-1)+2=3(2m-1)+1
4m-4+2=6m-1+1
4m-2=6m+0
-2=2m
-1=m
m=-1

Solve.

146. $2(m-1)+m=5(m-1)+3m$

147. $-2(m-1)+2=3(2m-1)+1$

148. $5+5m-15=30-10$

Solve for m.

149. Solve.

$4m-2+3m=-24+4$

150. Solve.

$10-5m-20=20-10$

151. Spot the error and solve.

$4\left(m-1\right)+2=2\left(5m-1\right)+1$

4m-4+2=10m-2+1
4m-2=10m+1
-6m-2=1
-6m=3
m=-3/6
m=-1/2

Challenge #16: Eliminating Fractions

152. Do not solve $\frac{m}{3}=5$. In words explain what you could do to eliminate the fraction.

153. Do not solve $\frac{2m}{5}=4$. In words explain what you could do to eliminate the fraction.

154. Do not solve $\frac{m}{3}+\frac{2m}{5}=2$. In words explain what you could do to eliminate the fractions.

Challenge #17:

155. Solve $\frac{m}{3}+\frac{2m}{5}-\frac{1}{2}=2$.

Write down the steps to solve the challenge to the left.

Solving equations that require eliminating more than one fraction.

156. Solve $\frac{m}{3}+\frac{2m}{5}-\frac{1}{2}=2$.

F.E.LT.S.A.D.

Multiply both sides by 30.

$$\left(\frac{m}{3}+\frac{2m}{5}-\frac{1}{2}=2\right)\times 30$$

Multiply every term by 30.

$$\frac{30m}{3}+\frac{60m}{5}-\frac{30}{2}=60$$

Reduce.

$$10m+12m-15=60$$

Collect like terms on the left side.

$$22m-15=60$$

Add 15 to both sides.

$$22m=75$$

Divide both sides by 22

$$m=\frac{75}{22}$$

157. $\frac{m}{2}+\frac{2m}{3}-\frac{1}{2}=2$

158. $\frac{5m}{2}+\frac{m}{3}=\frac{1}{2}m+5$

159. $\frac{m}{3}+5m=\frac{1}{2}m+2$

160. $m-\frac{m}{3}=\frac{1}{4}m+4$

Challenge #18:

161. Solve $\frac{m+2}{3}=\frac{2m-1}{5}$.

Write down the steps to solve the challenge to the left.

Solve for m.

162. Solve $\frac{m+2}{3}=\frac{2m-1}{5}$*.

F.E.L.T.**S**.**A**.**D**.

Multiply both sides by 15.

$$\left(\frac{m+2}{3}=\frac{2m-1}{5}\right)\times 15$$

Multiply every term by 15.

$$\frac{15(m+2)}{3}=\frac{15(2m-1)}{5}$$

Reduce and expand.

$$5(m+2)=3(2m-1)^*$$

$$5m+10=6m-3$$

Subtract 5m from both sides.

$$10=m-3$$

$$m=13$$

*This step could be achieved by cross-multiplying at the beginning.

163. Solve. $\frac{5m+2}{2}=\frac{3m-1}{3}$

164. Solve. $\frac{m+5}{4}=\frac{2m+4}{5}$

165. Solve. $\frac{2m-2}{5}=\frac{-2m+1}{3}$

166. Solve. $\frac{3m+2}{3}=\frac{m+1}{5}$

167. Spot the error and solve.

$$\frac{m}{4}+5m=\frac{1}{2}m+2$$

$$\frac{4m}{4}+5m=\frac{4}{2}m+8$$

$$m+5m=2m+8$$

$$6m=2m+8$$

$$4m=8$$

$$m=2$$

168. Spot the error and solve.

$$\frac{3m-2}{4}=\frac{-m+1}{3}$$

$$\frac{36m-24}{4}=\frac{-12m+12}{3}$$

$$12m-6=-4m+3$$

$$16m=9$$

$$m=9/16$$

169. Solve. $\frac{5m}{2}+\frac{m}{5}=\frac{1}{2}m+5$

Solve for m.

170. Solve. $\frac{m-2}{5}=\frac{-2m+1}{4}$

171. Solve. $\frac{m}{2}+\frac{2m}{3}-\frac{1}{4}=1$

172. Solve. $\frac{m+1}{5}=\frac{-3m+2}{3}$

What should you do first? Expand or eliminate fractions? Does it matter?

Challenge #19:

173. Solve $\frac{2}{3}(m+5)+1=6$.

Write down the steps to solve the challenge to the left.

Challenge #20: Use a different strategy than above.

174. Solve $\frac{2}{3}(m+5)+1=6$.

Write down the steps to solve the challenge to the left.

Solve.

175. Solve $\frac{2}{3}(m+5)+1=6$

F.E.LT.S.A.D.

Expand the left side.

$$\frac{2}{3}m+\frac{10}{3}+1=6$$

Multiply both sides by 3.

$$\left(\frac{2}{3}m+\frac{10}{3}+1=6\right)\times 3$$

$$\frac{6}{3}m+\frac{30}{3}+3=18$$

Reduce and collect like terms on the left side.

$$2m+10+3=18$$

$$2m+13=18$$

Subtract 13 and divide by two.

$$2m=5$$

$$m=2.5$$

176. Expand and then solve.

$$\frac{2}{3}(m+4)-1=6$$

177. Expand and then solve.

$$\frac{2}{3}(m+2)+3=9$$

Eliminate fractions first!

178. Solve $\frac{2}{3}(m+5)+1=6$

F.E.LT.S.A.D.

Eliminate fractions by multiplying both sides by three.

$$\left(\frac{2}{3}(m+5)+1=6\right)\times 3$$

Multiply each term by three.

$$\frac{6}{3}(m+5)+3=18$$

Reduce, expand and collect like terms.

$$2(m+5)+3=18$$

$$2m+10+3=18$$

$$2m+13=18$$

Subtract 13 and divide by two.

$$2m=5$$

$$m=2.5$$

179. Eliminate fractions and then solve.

$$\frac{4}{6}(m+4)-1=6$$

180. Eliminate fractions and then solve.

$$\frac{1}{2}(m-2)+4=6$$

*Which way do you like better? Expanding first or getting rid of fractions first?

Solve.

181. Spot the error and solve

$$\frac{1}{3}(m-2)+4=6$$

$\left(\frac{1}{3}(m-2)+4=6\right)3$

$\frac{3}{3}(3m-6)+12=18$

$3m-6+12=18$

$3m+6=18$

$3m=12$

$m=4$

$$\frac{1}{3}(m-2)+4=6$$

182. $\frac{3}{4}(m-1)+4=6$

183. $\frac{5}{2}(m-2)+2=5$

184. Solve.

$$\frac{1}{2}(m-1)+2=\frac{1}{3}(m-2)$$

185. Solve.

$$\frac{1}{3}(3m-2)+2=\frac{1}{2}(m-4)$$

186. Spot the error and solve.

$$\frac{1}{2}(m-1)+2=\frac{1}{5}(m-3)$$

$\frac{m}{2}-\frac{1}{2}+\frac{2}{2}=\frac{m}{5}-\frac{3}{5}$

$\left(\frac{m}{2}-\frac{1}{2}+\frac{2}{2}=\frac{m}{5}-\frac{3}{5}\right)10$

$\frac{10m}{2}-\frac{10}{2}+\frac{20}{2}=\frac{10m}{5}-\frac{30}{5}$

$5m-5+10=2m-6$

$5m+5=2m-6$

$3m=-11$

$m=-\frac{11}{3}$

Solving Linear Equations Without Numbers

Challenge #21:

187. Show that the solution to $a(m+n)=h$ is $m=\frac{h-an}{a}$.

188. Is $m=\frac{h-an}{a}$ the same as $m=\frac{h}{a}-n$? How do you know?

Solve for m.

189. $m+5=30$	190. $m-5=30$	191. $5m=30$	192. $\frac{m}{2}=30$
193. $m+n=30$	194. $m-n=30$	195. $nm=30$	196. $\frac{m}{n}=30$
197. $m+n=x$	198. $m-n=x$	199. $nm=x$	200. $\frac{m}{n}=x$
201. $m+ng=x$	202. $m-ng=x$	203. $ngm=x$	204. $\frac{m}{ng}=x$

Solve for m.

205. $2m + 5 = 35$	206. $2m - 5 = 35$	207. $2(m + 1) = 30$	208. $\frac{m}{2} + 10 = 30$
209. $2m + n = 35$	210. $2m - n = 35$	211. $2(m + n) = 30$	212. $\frac{m}{2} + n = 30$
213. $Am + n = B$	214. $Am - n = B$	215. $A(m + n) = B$	216. $\frac{m}{A} + n = B$

Challenge #22:

217. The formula $F = \frac{9}{5}C + 32$ converts degrees Celsius to degrees Fahrenheit. Solve for C and write a formula that converts Fahrenheit to Celsius.

Write down the steps to solve the challenge to the left.

Rearrange a formula to solve equations

218. The formula $F = \frac{9}{5}C + 32$ converts degrees Celsius to degrees Fahrenheit. Solve for c and write a formula that converts Fahrenheit to Celsius.

Possible solutions strategy:
Subtract 32 from both sides.

$F - 32 = \frac{9}{5}C$

Multiply both sides by 5

$\left(F - 32 = \frac{9}{5}C\right)5$

$5(F - 32) = 9C$

Divide both sides by 9.

$\frac{5}{9}(F - 32) = C$

Other strategies could lead to:

$\frac{5F}{9} - \frac{160}{9} = C$

219. The formula for the area of a triangle is $A = \frac{bh}{2}$. Annie knows the value of the area and the height. Write a formula to find the base value. (Solve for b.)

220. Determine the length of the base if the Area is $46cm^2$ and the height is 10cm long.

221. The formula for the perimeter of a rectangle is $P = 2(w + l)$, Sonil knows the perimeter and the length, write a formula to help him find the value of w. (Solve for w.)

222. Determine the width if the perimeter is 59cm and the length is 12cm long.

Challenge #23:

223. Solve. $\frac{M}{2} = \frac{3}{5}$

Write down the steps to solve the challenge to the left.

224. Solve. $\frac{1}{M} = \frac{3}{5}$.

Write down the steps to solve the challenge to the left.

Solve for M.

225. $\frac{M}{2}=\frac{3}{5}$

Solution:
Multiply by lowest common denominator.

$\left(\frac{M}{2}=\frac{3}{5}\right)\times 10$

$\frac{10M}{2}=\frac{30}{5}$

$5M=6$

Divide both sides by 5.

$M=\frac{6}{5}$

226. $\frac{1}{M}=\frac{3}{5}$

Solution:
Multiply by lowest common denominator.

$\left(\frac{1}{M}=\frac{3}{5}\right)\times 5m\rightarrow$

Divide both sides by 3.

$\frac{5M}{M}=\frac{15M}{5}$

$5=3M$

Divide both sides by 3.

$M=\frac{5}{3}$

227. $\frac{5}{2}=\frac{M}{5}$

228. $\frac{1}{2}=\frac{3}{M}$

229. $\frac{M}{3}=\frac{3}{2}$

230. $\frac{5}{M}=\frac{3}{2}$

231. $\frac{4}{3}=\frac{M}{5}$

232. $\frac{2}{3}=\frac{5}{M}$

Solve for the given variable.

233. Solve for M.
$ABM=C$

234. Solve for B.
$ABM=C$

235. Solve for M.
$\frac{M}{AB}=C$

236. Solve for B.
$\frac{M}{AB}=C$

Hint: Cross multiply
$M=ABC$
Divide both sides by AC.

$B=\frac{M}{AC}$

237. Solve for M.
$\frac{AB}{M}=C$

238. Solve for B.
$\frac{AB}{M}=C$

239. Solve for M.
$\frac{M}{A}=\frac{C}{B}$

240. Solve for B.
$\frac{M}{A}=\frac{C}{B}$

Solve for m.

241. $A(M+N)=AB$	242. $5M+2N=6B$	243. $2A(M-N)=8$
244. $4N(A+M)=10$	245. $A(N-M)=AB$	246. $5M-2N=6B$

Introduction to Linear Inequalities

Challenge #24:

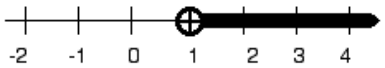
247. Melanie is planning a snowboarding trip. She needs at least $280 to go on the trip. Her know-it-all big brother writes a mathematical statement to express this situation.

Here is what he came up with:

- ***Let*** m = *money needed* ***and*** m = $280

She really wants to correct him, but his answer seems right. Would you make any changes to the above statements?

248. What does this picture mean?



Which of the following are true?

A. 50 is a solution
B. -10 is a solution
C. 1 is a solution
D. X is greater than 1.
E. X is greater than or equal to one.
F. $x < 1$
G. $x \leq 1$
H. $x > 1$
I. $x \geq 1$

249. Which letter or letters is(are) the best answer(s)?

Inequality notes:

Use one of the symbols $>$ *or* $<$ to complete each inequality.

250. 5 < 9	251. 20 -4	252. 5 -10	253. 11 -13	254. -3 -2
255. -4 -7	256. -3 10	257. -7 3	258. 24 12	259. 5 5.1

Define a variable and use one of the symbols; $=, \neq, >, \geq, <, \& \leq$, to represent each situation

260. Melanie needs at least $280 for snow boarding.

Let x=money needed*
x≥280
*Any variable could be used as long as you define it

261. Dave makes less than $15 in tips per night

262. Al makes more than $100 a day

263. Baby David weighs less than 12 pounds

264. Joni makes at least $100 more per year than Jerry

265. Sall's minimum height is 148cm tall.

266. Hal makes $210 per day

267. Ray doesn't make more than $120 a day.

268. Rita's maximum vertical leap is 20 inches

Which of the statements is the given number a solution to?

269. 3.5
- A. $x > 2$
- B. $x \geq 4$
- C. $x \leq 3$
- D. $x < -2$

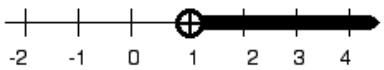
270. 4
- A. $x > 4$
- B. $x \geq 4$
- C. $x \neq 100$
- D. $x < 4$

271. 7
- A. $x > 6.99$
- B. $x \geq 7.01$
- C. $x \neq 7$
- D. $x \leq 7$

272. -2
- A. $x > -1$
- B. $x \geq 3$
- C. $x \neq 7$
- D. $x \leq -1$

Challenge #25: Write each graph in words and as an equation or an inequality.

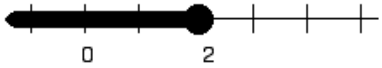
273.



Word Statement:

Inequality: Use symbols.

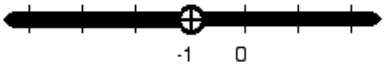
274.



Word Statement:

Inequality: Use symbols.

275.



Word Statement:

Inequality: Use symbols.

Graph each of the following statements on the number line.

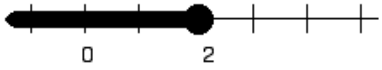
- A solid dot is used on the number line for the following $=, \leq, \geq$.
- A hollow dot is used on the number line for the following $>, <, \neq$.

276.

Word Statement:
X is greater than 1.

Inequality: $x > 1$
(The hollow dot means not equal to, so ≥ is not used)

277.



Word Statement:
X is less than or equal to 2.

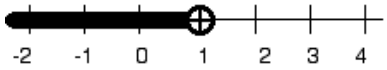
Inequality: $x \leq 2$

278.

Word Statement:
X does not equal -1

Inequality: $x \neq -1$

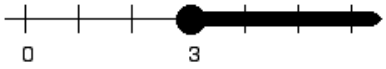
279.



Word Statement:

Inequality:

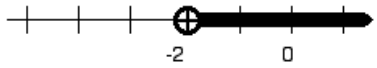
280.



Word Statement:

Inequality:

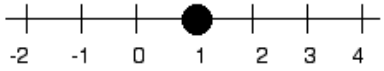
281.



Word Statement:

Inequality:

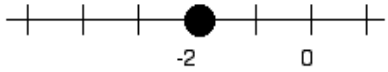
282.



Word Statement:

Inequality:

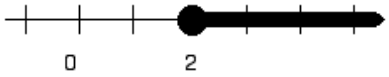
283.



Word Statement:

Inequality:

284.



Word Statement:

Inequality:

Sketch a line graph to represent each inequality.

285. $x > 3$	286. $x \neq -1$	287. $1 > x$	288. $x \geq 3$	289. $x \neq 2$
3	-1	1	3	2

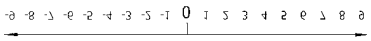
Sketch each inequality

290. $x < -1$	291. $x \leq -3$	292. $x \leq -2$

Use a symbol to write an inequality that corresponds to each statement

293. X is greater than 7.	294. 3.2 is less than or equal to x.	295. m is at most 7.	296. n is positive
297. y does not equal 2.	298. X is at least 4.	299. X is negative.	300. Y is equal to 4.

Challenge #26:

301. Write an inequality for all the numbers bigger than or equal to negative 4 and less than 11.	302. Sketch $-7 < x \leq -1$. 	303. Sellotz earns a 9% commission on all sales over $5000. Write an inequality to represent all the dollar values that allows Sellotz to earn a commission. Define the variable: Inequality:

Sketch a line graph to represent each inequality.

304. $x > -2.7$	305. $x \neq \frac{2}{5}$	306. $7.8 > x$	307. $x \geq -1.33$

Write a compound inequality.

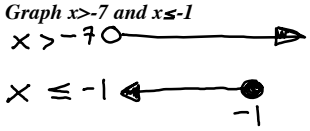
308. Write an inequality for all the numbers bigger than or equal to negative 4 and less than 11. ***Possible solution strategy*** • ***Bigger than or equal to -4 → x≥-4*** • ***Less than 11 → x<11*** • ***Combine -4≤x<11***	309. Write an inequality for all the numbers less than negative two and greater than negative ten.	310. Write an inequality for all the numbers that are at least -1 and less than 3.

For each inequality, graph the possible values of x on the number line.

311. $-7 < x \leq -1$

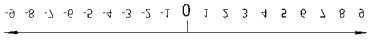
Possible solution Strategy:

- ***Graph x>-7 and x≤-1***

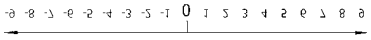


- ***The solution is the overlap.***

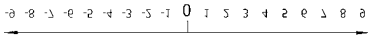
312. $-5 < x < 3$



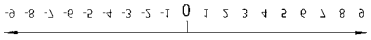
313. $7 \geq x > 3$



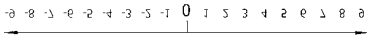
314. Approximate $-4 < x < 3.8$ on the number line.



315. Approximate $-7.2 \leq x \leq 0$ on the number line.



316. Approximate $-1 \geq x > -8$ on the number line.



Define a variable and write an inequality to express each situation.

317. Sellotz earns a 9% commission on all sales over $5000. Write an inequality to represent all the dollar values that allows Sellotz to earn a commission.

Possible solution Strategy:

Define the variable: C= Commission

Inequality: C>$5000

318. Bill cans pickled green beans. The mass must be between 220 grams and 229 grams inclusively or his supervisor will reject the can. Express the inequality algebraically.

319. Insurance companies charge more money for drivers who drive further. The rate is increased for those drivers who live more than 15km from their job. Express all the distances that will not lead to an insurance rate increase.

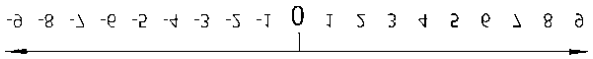
320. Grissinda is building a square pen for her pet hedge hog in her back yard. She has no more than 20m of fencing available. Write an inequality to represent all the possible side lengths.

321. William wants to build a square patio for summer BBQs. The patio can be at most $16m^2$. Write an inequality to represent all the possible side lengths.

Inequalities that Include Addition and Subtraction

Challenge #27:

322. List three solutions to $x+5\geq 7$. Solve $x+5\geq 7$ on the number line.



Write $x+5\geq 7$ in a more efficient way.

Check three solutions from the simplified inequality with the initial inequality to test your answer.

Generalize a rule for adding and subtracting rational numbers.

323. Given $x+a>5$ or $x+a\geq 5$ explain what you need to do to isolate x.	324. Given $x-a>5$ or $x-a\geq 5$ explain what you need to do to isolate x.

Solve for x and verify your solution by substituting 2 different numbers into the inequality.

325. $x+5\geq 7$ Possible solution strategy: • ***X+5≥7*** ***Subtract five from both sides.*** • ***X+5-5≥7-5 → <u>X≥2</u>*** ***Test three numbers that are greater than or equal to 2. E.g. 2,3, &10*** ***(2)+5=7≥7 (3)+5=8≥7, & (10)+5=15≥7***	326. $x-5<-4$	327. $2x>8$
328. $2x+5<25$	329. $3x-2\neq -20$	330. $2\left(x+5\right)<18$

Challenge #28:

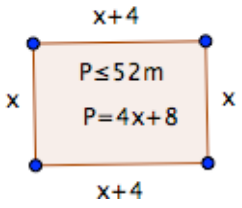
331. Sargent has up to 52 meters of fencing material available to build a rectangular fence. He wants his fence to be 4 meters longer than it is wide. Write and solve an inequality to represent the possible side lengths.	332. A golf club charges a yearly fee of $2000 plus $100 for each round of golf. Ty Ger cannot afford anymore than $4500 per year for golf. Express the number of rounds of golf he can play as an inequality.

Define a variable, write an inequality and solve the inequality.

333. Sargent has up to 52 meters of fencing material available to build a fence. He wants his fence to be 4 meters longer than it is wide. Write and solve an inequality to represent the possible side lengths.

Possible solution strategy:
Draw a picture! Many students forget that a rectangle has 4 sides☺
Let width = x and Length =x+4.

Write an inequality:
4x+8≤52
4x≤44
x≤11
∴The width must be less than or equal to 11 and the length must be 4 or more and less than or equal to 15.



334. A rectangle has a length of x+4 cm and a width of x-1 cm. Determine the possible values of x if the perimeter can be at most 48 cm long.

335. A golf club charges a yearly fee of $2000 plus $100 for each round of golf. Ty Ger cannot afford anymore than $4500 per year for golf. Express the number of rounds of golf he can play this year as an inequality.

Possible solution strategy:
Let x=number of rounds Ty can play.

Write an inequality:
100x+2000≤4500
100x≤2500
x≤25
Ty can play no more than 25 rounds of golf this year.

336. When a number is tripled and then decreased by 7 the result is less than 29. Determine all the solutions.

Challenge #29:

337. By observation circle all the numbers that are solutions to $2x > 4$.

$$\ldots, -4, -3, -2, -1, 0, 1, 2, 3, 4, \ldots$$

338. Now solve $2x > 4$.

339. Are the numbers you circled solutions to the simplified inequality?

340. By observation circle all the numbers that are solutions to $-3x > 6$.

$$\ldots, -4, -3, -2, -1, 0, 1, 2, 3, 4, \ldots$$

341. Now solve $-3x > 6$.

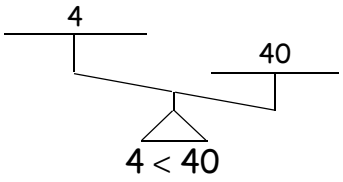
342. Are the numbers you circled solutions to the simplified inequality?

When an inequality is multiplied or divided by a negative number, the inequality symbol changes direction. For example if $-2x > 8$, then $x < -4$.

343. Create a rule for multiplying or dividing by a negative number to determine the solution of an inequality:

Challenge #30:

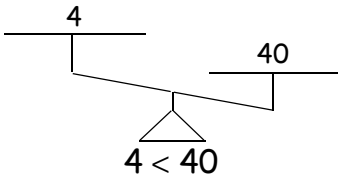
344.



Increase both sides by 100.

Is the inequality still true?

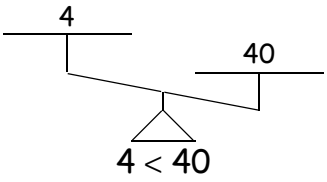
345.



Decrease both sides by 100.

Is the inequality still true?

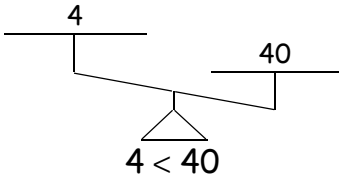
346.



Multiply both sides by 5.

Is the inequality still true?

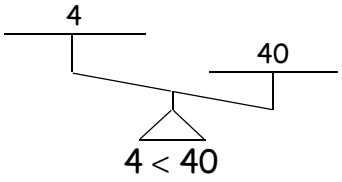
347.



Divide both sides by 4.

Is the inequality still true?

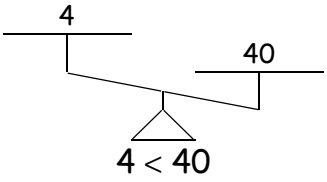
348.



Multiply both sides by -10.

Is the inequality still true?

349.



Divide both sides by -1.

Is the inequality still true?

350. When an inequality is multiplied or divided by a negative number what do you have to remember to do?

Describe what was done to the first inequality to result in the second inequality.

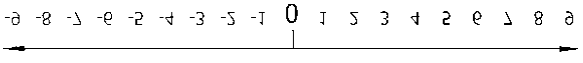
351. $x + 4.5 > 7.8$ $x > 3.3$	352. $-2x < 18$ $x > -9$	353. $5x - 1 \le 19$ $x \le 4$

True or false? If it is false, correct it.

354. T or F. If $x - 5 > 12$ then $x > 17$.	355. T or F. If $x + 5 > -4$ then $x < -9$.	356. T or F. If $-2x > -10$ then $x > 5$.	357. T or F. If $-3x > -30$ then $10 > x$.
358. T or F. If $2(x - 5) > -14$ then $(x - 5) < -7$.	359. T or F. If $-3x + 6 > -9$ then $x - 2 < 3$.	360. T or F. If $-2(x + 6) > 16$ then $-8 > x + 6$.	361. T or F. If $x - 10 > 20$ then $30 < x$.

Challenge #31:

362. Solve -6m+3>2m+19 and graph your solution on a number line.



Write down the steps to solve the challenge to the left.

Solving Problems with Linear Inequalities

Solve each inequality.

363. Solve $-6m+3>2m+19$.

Subtract 2m from both sides.

$-6m-2m+3>2m-2m+19$

$-8m+3>19$

Subtract three from both sides.

$-8m+3-3>19-3$

$-8m>16$

Divide both sides by –8 and flip the inequality.

$$\frac{-8m}{-8} < \frac{16}{-8}$$

$m < -2$

Check your answer by substituting any number less than –2 into both sides of the equation.

364. $-5m + 3 \leq -7$

365. $-24m + 5 \geq -7$

366. $5m - 1 > -3m + 2$

367. $-13m + 5 \geq 11m - 3$

Pay close attention! Bonnie thinks she has a really cool way of solving inequalities.

368. Solve. $6m - 2 < 3m - 2$

Convert $6m - 2 < 3m - 2$ ***to*** $6m - 2 = 3m - 2$.

$6m - 2 = 3m - 2$

$3m - 2 = -2$

$3m = 0$

$m = 0$

Convert back

$m = 0$ convert back $m < 0$

369. Solve. $-3m - 8 < 1m - 4$

Convert $-3m - 8 < 1m - 4$ ***to*** $-3m - 8 = 1m - 4$.

$-3m - 8 = 1m - 4$

$-4m - 8 = -4$

$-4m = 4$

$m = -1$

Convert back

$m = -1$ convert back $m < -1$

370. Does her strategy work? Why or why not?

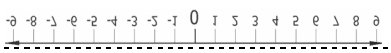
371. Does her strategy work? Why or why not?

372. Which has more solutions $2x + 7 = 9$ or $2x + 7 > 9$.

Explain your answer.

Solve each inequality and graph the solution on the number line.

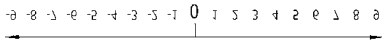
373. $-2x-5 \geq 7$



374. $2(x+5)-3<12$

375. $-12x+30>8x+50$

376. $-\frac{2x}{5}-3<x+7$

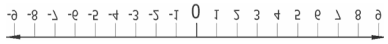


377. Spot the error.

$$-7(x+2) \geq 5(x-1)$$

-7x-14≥5x-5
-12x-14≥-5
-12x≥9
x≥9/12→x≥0.75

378. $-\frac{2}{3}(x+6)<2$



Challenge #32:

379. Many banks now allow you to invest up to $5000 per year in high interest savings accounts without being taxed. Saevmor, has already invested $2320 this year. He is trying to put as much money as possible in this account. Write and solve an inequality to represent how much he can still invest without being taxed.

380. Tok Alut, is trying to decide between two phone plans. His options include:

- Chatzilla economy plan: $20/ month and $0.80 for every minute above 300 minutes.
- Chatzilla premium plan: $70/ month and $0.10 for every minute above 300 minutes.

Write and solve an inequality to explain when it costs less to use the premium plan.

Define a variable, write an inequality and solve each problem.

381. Many banks now allow you to invest up to $5000 per year in high interest savings accounts without being taxed. Saevmor, has already invested $2320 this year. He is trying to put as much money as possible in this account. Write and solve an inequality to represent how much he can still invest without being taxed.

Possible solution strategy:

Let x= the amount of money he can still invest $x+2320 \leq 5000$
$x \leq 2680$
Saevmore can invest at most an additional $2680.

382. Suzy's Shoe Store pays their employees an hourly rate plus a bonus for sales over $2500 per week. Niakee sold $1882.75 in the first three days of the week. Write and solve an inequality to represent what sale amounts will lead to a bonus for this week.

383. Tok Alut, is trying to decide between to phone planes. His options include:

- Chatzilla economy plan: $20/ month and $0.80 for every minute above 300 minutes.
- Chatzilla premium plan: $70/ month and $0.10 for every minute above 300 minutes.

Write an inequality to explain when it costs less to use the premium plan.

Possible solution strategy:

Let m=number of additional minutes.
Economy plan → $20 + 0.8m$
Premium plan → $70 + 0.1m$

Economy costs less than premium when:
$20 + 0.8m > $70 + 0.1m$
$20 + 0.7m > 70
$0.7m > 50
$m > 71.4285$
The premium plan is a better deal if Tok plans to use more than 71 additional minutes or a total of 371 monthly minutes.

384. Gabmore Wireless charges $40/ month plus $0.50 for all minutes above 500 minutes per month. Budd Jet has decided that he does not want to pay more than $60 per month. Write and solve an inequality to represent how many minutes he can use per month without going over he $60 limit

Define a variable, write an inequality and solve each problem.

385. When the difference of a number and seven is tripled, the result is bigger than 45. Write an inequality to represent all the numbers that are answers to this question.

386. Wondorf has 64 meters of fencing material available to build a rectangular fence. He wants his fence to be 8 meters longer than it is wide. Write and solve an inequality to represent the possible side lengths.

387. Vertical Wireless charges $50/ month plus $0.25 for all minutes above 400 minutes per month. Frue Gal has decided that she does not want to pay more than $70 per month. Write and solve an inequality to represent how many minutes she can use per month without going over her $70 limit. Approximate your solution on the number line.

388. Bes Deel, is trying to decide between two phone plans. Her options include:

- Vertical budget plan: $30/month and $0.75 for every minute above 400 minutes.
- Vertical premium plan: $60/ month and $0.20 for every minute above 400 minutes.

Write and solve an inequality to explain when it costs less to use the premium plan. Approximate your solution on the number line.

Solve each inequality to one decimal.

389. Solve. $5.2m - 8.4 < 1.3m - 1.6$

390. Solve. $2(m - 1.4) < -7.3m + 8.5$

391. Solve. $-1.8m - 2.4 < 10(m - 2.6)$

Review Check List

Definitions:		Pg #	Face it ☺☹*
Go to page 3 and write down any definitions that you are unsure of.	Define each word and be able to show your understanding with examples.	3	

		Pg #	Face it ☺☹
Model the solution of a given linear equation using concrete or pictorial representations, and record the process.	Write an expression using algebra stones or algebra tiles to solve equations	4-7	
Determine, by substitution, whether a given rational number is a solution to a given linear equation.	Is m=5 a solution to the equation $2(m+2)=14$?	12	
Solve a given linear equation symbolically.	Solve. 6m+3=2m+15.	13	
Identify and correct an error in a given incorrect solution of a linear equation	Spot the error and solve. -5m+20=-7m-15 20=-2m-15 →5=-2m → -5/2=m	14,17 & 20	
Represent a given problem using a linear equation.	A number is multiplied by negative two and then decreased by five and the result is twenty-nine. Find the number.	21	
Solve a given problem using a linear equation and record the process.	Bock Sout has 68 meters of fencing to build a fence. He wants the length to be 4 meters longer than the width. Write an algebraic equation and determine the dimensions of the rectangular fence.	10	
Translate a given problem into a single variable linear inequality using the symbols ≥, >, < , or ≤ .	Write an expression to represent the following statement: Melanie needs at least $280 for snow boarding.	30	
Determine if a given rational number is a possible solution of a given linear inequality.	Which of the statements is 3.5 a solution to? $x>2$, $x\geq 4$, $x\leq 3$, $x<-2$	30	
Generalize and apply a rule for subtracting a positive or negative number to determine the solution of a given inequality.	Given $x+a>5$ or $x+a\geq 5$ explain what you need to do to isolate x.	34	
Generalize and apply a rule for multiplying or dividing by a positive or negative number to determine the solution of a given inequality.	Create a rule for multiplying or dividing by a negative number to determine the solution of an inequality:	35	
Solve a given linear inequality algebraically and explain the process orally or in written form.	Solve -6m+3>2m+19.	37	
Compare and explain the process for solving a given linear equation to the process for solving a given linear inequality.	Convert $-3m-5<1m-4$ to $-3m-5=1m-4$ and solve the equation. Can this strategy be used to solve the inequality?	38	
Graph the solution of a given linear inequality on a number line.	Solve $-2x+5\geq -17$ on the number line.	39	
Compare and explain the solution of a given linear equation to the solution of a given linear inequality.	Which has more solutions $2x+7=9$ or $2x+7>9$. Explain your answer.	38	
Verify the solution of a given linear inequality using substitution for multiple elements in the solution.	Solve $x+5\geq 7$ for x and verify your solution by substituting 3 different numbers into the inequality.	34	
Solve a given problem involving a single variable linear inequality and graph the solution.	Vertical Wireless charges $50/ month plus $0.25 for all minutes above 400 minutes per month. Frue Gal has decided that she does not want to pay more than $70 per month. Write an inequality to represent how many minutes she can use per month without going over her $70 limit. Approximate your solution on the number line.	41	

*Face it. When you have mastered the content draw a ☺ OR if you are unsure, draw a ☹ and ask for help.

Score:_____33

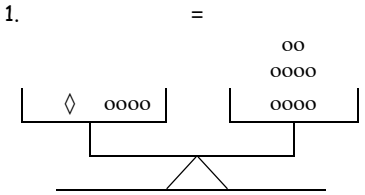
Practice Test

- Write this test and do not look at the answers until you have completed the entire test.
- Mark the test and decide whether or not you are happy with the result. FACE IT!
- Successful students will go back in the guidebook and review any questions they got wrong on this test.

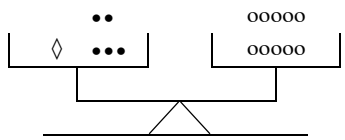
Write an equation to represent each set of algebra stones.

Let ◊= x, ♦=-x, o=1 and •=-1

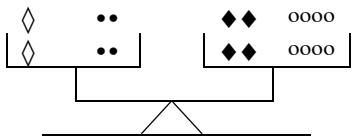
Write an equation:

1. 

Solve for ◊?

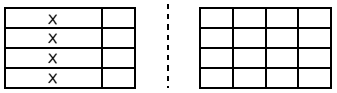
2. 

Solve for ◊?

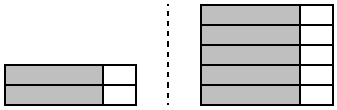
3. 

Solve for ◊?

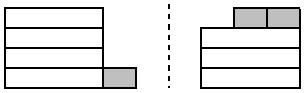
Write an equation and solve it by rearranging the algebra tiles.

4. 

Modify the algebra tiles to show how many one tiles would be needed to balance one x tile?

5. 

Modify the algebra tiles to show how many one tiles would be needed to balance one x tile?

6. 

Modify the algebra tiles to show how many one tiles would be needed to balance one x tile?

Solve for the unknown.

7. $5m - 15 = 40$

8. $-\frac{2m}{3} - 5 = 25$

9. $-2(m-5) = 25$

10. Which of the following number(s) is a solution to $m + 5 = 2m + 6$; -1,1,5

11. Do not solve $\frac{m}{3} + \frac{2m}{5} = 2$. Explain what you could do to eliminate the fractions.

12. Solve. -3m-10=-7m-14

Solve for m.

13. $2(m+1)+4m=4(m-2)+6$.

14. Solve. $m-\frac{m}{3}=\frac{1}{4}m+4$

15. Solve. $\frac{m+2}{3}=\frac{2m-1}{5}$

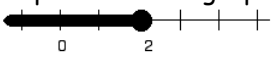
16. Solve $\frac{2}{3}(m+5)+1=6$

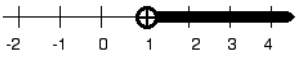
17. Solve for m. $2(m+n)=a$

18. Solve for m. $\frac{c}{m}=\frac{ad}{b}$.

19. Which of the following is 4 one of the solutions to:
    A. $x>4$
    B. $x\geq 4$
    C. $x\neq 100$
    D. $x<4$

20. Write an inequality to represent each graph.

A. 

B. 

21. Write an inequality for all the numbers bigger than or equal to negative 4 and less than 11.

22. Solve each inequality and state three rational numbers that are solutions to $2x+5<25$.

23. Solve $-3x-4<29$

24. Solve $-\frac{2x}{5}-3<x+7$

Spot the error.

25. Spot the error and solve.

$$-\frac{m}{3}-5=25$$

-m-5=75
-m=80
m=-80

26. Spot the error and solve.

$$-7(x+2)\geq 5(x-1)$$

-7x-14≥5x-5
-12x-14≥-5
-12x≥9
x≥9/12→x≥0.75

27. T or F.

If $-2(x+6)>16$ then $-8>x+6$.

28. T or F.

If $-3x>-30$ then $10>x$.

29. Three times the opposite of a positive number increased by five is negative twenty-five. Find the number.

30. An author received $6000 dollars in advance plus $3 for sale of his new book. How many books must be sold for the author to make a total of $9600?

31. A square sheet of paper is folded in half to form a rectangle. The perimeter of the rectangle is 60 cm. Determine the dimension of the square if the length of the rectangle is twice as long as the width?

32. Sargent has up to 50 meters of fencing material available to build a fence. He wants his fence to be 4 meters longer than it is wide. Define a variable, write and solve an inequality to represent the possible side lengths.

33. Tok Lesh, is trying to decide between to phone plans. His options include:

- Chatzilla economy plan: $30/ month and $0.70 for every minute above 400 minutes.
- Chatzilla premium plan: $80/ month and $0.05 for every minute above 400 minutes.

Write and solve an inequality to explain when it is cheaper to choose the premium plan.

Solving Equations Answer Key

1. 6
2. 5
3. 24
4. 3
5. 9x+4
6. 12x-6
7. -8x+4
8. -7x-2
9. x+3=14
10. x+3=10
11. 3x=15
12. x=11
13. x=7
14. x=5
15. x+4=12
16. x+6=9
17. 4x=-12
18. x=8
19. x=3
20. x=-3
21. yes
22. yes
23. yes
24. yes
25. m=11
26. m=1
27. m=10
28. m=3
29. subtracting
30. adding
31. dividing
32. multipling
33. zero (+5-5=0), one (2x1/2=1)
34. 5
35. 17
36. 5
37. 30
38. x+6=14, 8
39. x-6=5, 11
40. 5x=15, 3
41. -3
42. +6
43. divide by 3
44. multiply by 4
45. divide by -5
46. -7
47. mulitply by -3
48. divide by -3
49. -2, 24/23
50. 3x+6=12, 2
51. 2x-4=10, 7
52. -6x+7=13, -1
53. 3x+4=13, 3
54. 2x-9=3, 6
55. -4x+1=-11, 3
56. 7, Plug m=7 into 4m+3=31 and confirm that it is true.
57. 7
58. 10
59. 11
60. $\frac{-10}{3}$
61. -15
62. -1
63. -2
64. -2
65. 3
66. -10
67. 4
68. 20
69. m= 20
70. m= 20
71. m= 10
72. m= -10
73. m= -45
74. m= 20
75. m= -81
76. m= -22
77. m= $\frac{-27}{4}$
78. m= 10
79. m= $\frac{51}{5}$
80. m= $\frac{10}{3}$
81. Incorrect: m= -12
82. Incorrect: m= -90
83. Correct: -12
84. m= -17
85. m= -10
86. m= 10
87. 15 by 19
88. 1900
89. 38.888° or $38\frac{8}{9}°$
90. 7
91. m= 7
92. m= $\frac{40}{3}$
93. m= -3
94. m= 4
95. m= $\frac{-15}{2}$
96. 1
97. -1
98. 4
99. 1 is the only solution
100. Yes
101. No
102. yes
103. no
104. yes
105. yes
106. no
107. no
108. m= -7
109. m= -12
110. m= $\frac{40}{3}$
111. m= -5
112. 2
113. 3
114. -1
115. 3
116. 2
117. 3
118. m= 3
119. m= 3
120. m= -4
121. m= -6
122. m= 5
123. m= $\frac{8}{3}$
124. m= -2
125. $-\frac{35}{9}$
126. m= -1
127. m= $\frac{15}{4}$
128. m= -10
129. m= $\frac{-35}{2}$
130. 11cm by 11cm
131. 11cm by 11cm
132. 14km
133. $625
134. 4
135. 2
136. 2
137. -2
138. -6
139. -3
140. -2
141. m= -2
142. m= $\frac{13}{18}$
143. m= 1

144. m= $\frac{1}{2}$
145. m= 0
146. m= $\frac{3}{5}$
147. m= $\frac{3}{4}$
148. m= 6
149. m= $\frac{-18}{7}$
150. m= -4
151. m= $\frac{-1}{6}$
152. Multiply both sides by 3.
153. Multiply both sides by 5.
154. Multiply both sides by 15.
155. m= $\frac{75}{22}$
156. m= $\frac{75}{22}$
157. m= $\frac{15}{7}$
158. m= $\frac{15}{7}$
159. m= $\frac{12}{29}$
160. m= $\frac{48}{5}$
161. m= 13
162. m= 13
163. m= $\frac{-8}{9}$
164. m= 3
165. m= $\frac{11}{16}$
166. m= $\frac{-7}{12}$
167. m= $\frac{8}{19}$
168. m= $\frac{10}{13}$
169. m= $\frac{25}{11}$
170. m= $\frac{13}{14}$
171. m= $\frac{15}{14}$
172. m= $\frac{7}{18}$
173. m= 2.5 or 5/2
174. m= 2.5 or 5/2
175. m= 2.5 or 5/2
176. m= $\frac{13}{2}$
177. m= 7
178. m= 2.5
179. m= $\frac{13}{2}$
180. m= 6
181. m= 8
182. m= $\frac{11}{3}$
183. m= $\frac{16}{5}$
184. m= -13
185. m= $\frac{-20}{3}$
186. m= -7
187. $a(m+n) = h$
$am + an = h$
$am = h - an$
$m = \frac{h-an}{a}$
188. $m = \frac{h-an}{a}$
$m = \frac{h}{a} - \frac{an}{a}$
$m = \frac{h}{a} - n$
189. m= 25
190. m= 35
191. m= 6
192. m= 60
193. m= 30 - n
194. m= 30 + n
195. m= $\frac{30}{n}$
196. m= 30n
197. m= x - n
198. m= x + n
199. m= $\frac{x}{n}$
200. m= xn
201. m= x – ng
202. m= x + ng
203. m= $\frac{x}{ng}$
204. m= ngx
205. m= 15
206. m= 20
207. m= 14
208. m= 40
209. m= $\frac{35-n}{2}$ or $17.5-\frac{n}{2}$
210. m= $\frac{35+n}{2}$ or $17.5+\frac{n}{2}$
211. m= 15 – n
212. m= 60 – 2n
213. m= $\frac{B-n}{A}$ or $\frac{B}{A}-\frac{n}{A}$
214. m= $\frac{B+n}{A}$ or $\frac{B}{A}+\frac{n}{A}$
215. m= $\frac{B}{A}-n$ or $\frac{B+An}{A}$
216. m= (B-n)A OR AB, An
217. $\frac{5}{9}(F-32) = C$ or
$\frac{5F}{9} - \frac{160}{9} = C$
218. Same as 217
219. 2A/h
220. 9.2
221. $w = \frac{P-2l}{2}$ or $\frac{P}{2}-l$
222. 17.5cm
223. M= $\frac{6}{5}$
224. M= $\frac{5}{3}$
225. M= $\frac{6}{5}$
226. M= $\frac{5}{3}$
227. M= $\frac{25}{2}$
228. M= 6
229. M= $\frac{9}{2}$

230. M= $\frac{10}{3}$

231. M= $\frac{20}{3}$

232. M= $\frac{15}{2}$

233. M= $\frac{C}{AB}$

234. B= $\frac{C}{AM}$

235. M= CAB

236. B= $\frac{M}{AC}$

237. M= $\frac{AB}{C}$

238. B= $\frac{CM}{A}$

239. M= $\frac{AC}{B}$

240. B= $\frac{AC}{M}$

241. M= B - N

242. M= $\frac{6B-2N}{5}$

243. M= $\frac{4}{A}+N$

244. M= $\frac{5}{2N}-A$

245. M = N – B

246. M= $\frac{6B+2N}{5}$

247. m≥$280

248. A,D,H

249. D & H

250. <

251. >

252. >

253. >

254. <

255. >

256. <

257. <

258. >

259. <

260. m≥$280

261. t<15

262. A>100

263. D<12

264. J≥100

265. S≥148

266. H=210

267. R≤120

268. R≤20

269. A

270. B,C

271. A,D

272. C,D

273. X is greater than 1, $x > 1$

274. X is less than or equal to 2 $x \leq 2$

275. X does not equal -1, $x \neq -1$

276. X is greater than 1, $x > 1$

277. X is less than or equal to 2, $x \leq 2$

278. X does not equal -1, $x \neq -1$

279. X is less than 1, $x < 1$

280. X is greater than or equal to 3, $x \geq 3$

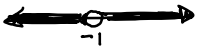
281. X is greater than -2, $x > -2$

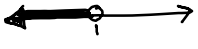
282. X is equal to 1, $x = 1$

283. X is equal to -2, $x = -2$

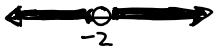
284. X is greater than or equal to 2, $x \geq 2$

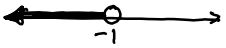
285. 

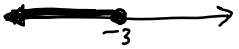
286. 

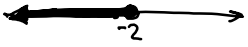
287. 

288. 

289. 

290. 

291. 

292. 

293. X>7

294. X≥3.2

295. m≤7

296. n>0

297. y≠2

298. x≥4

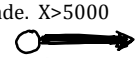
299. x<0

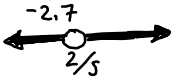
300. y=4

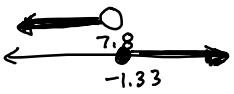
301. -4 ≤ x<11

302. 

303. x=$amount that a commission is made. X>5000

304. 

305. 

306. 

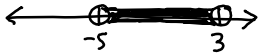
307.

308. -4≤x<11

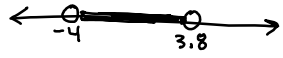
309. -10<x<-2

310. -1≤x<3

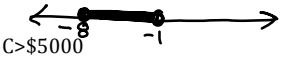
311. 

312. 

313. 

314. 

315. 

316. 

317. C>$5000

318. 220≤B≤229, for B=mass in grams

319. L≤15 for L= Distances that get lower rate.

320. 0<L≤5 for L=possible side lengths

321. 0<L≤4 for L=possible side lengths

322. x≥2

323. Subtract a from both sides

324. Add a to both sides

325. X≥2

326. X<1

327. X>4

328. X<10

329. x≠-6

330. x<4

331. 0<W≤11 and 4<L≤15,

332. He plays at most 25 rounds of golf. $x \leq 25$

333. 0<W≤11 and 4<L≤15,

334. 0<W≤9.5 and 5<L≤14.5,

335. He play at most 25 rounds of golf.

336. All numbers less than 12.

337. 3,4,…

338. x>2

339. Answers will vary

340. …,-4,-3

341. x<-2

342. Answers will vary

343. Change the direction of the inequality when the dividing or multiplying by a negative number.

344. Yes

345. Yes

346. Yes

347. Yes

348. No, -40>-400

349. No, -4>-40

350. Change the direction

351. Subtract 4.5

352. Divide by -2

353. Add 1 and then divide by5

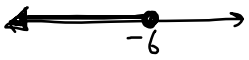
354. T

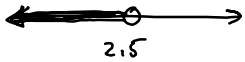
355. F, x>-9

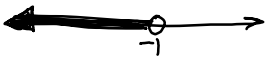
356. F, x<5

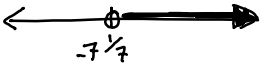
357. T
358. F, x-5>-7
359. T
360. T
361. T
362. , $m < -2$
363. $m < -2$
364. $m \geq 2$
365. $m \leq \frac{1}{2}$
366. $m > \frac{3}{8}$
367. $m \leq \frac{1}{3}$
368. $m < 0$
369. m>-1

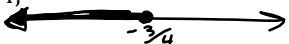
370. Yes. Division by a positive number does not change the direction of the inequality.
371. No. Division by a negative number changes the direction of the inequality.
372. 2x+7=9 simplifies to x=1. 2x+7>9 simplifies to x>1. X>1 has infinitely more solutions than x=1.

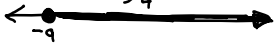
373. x≤-6, 

374. x<2.5, 

375. x<-1, 

376. x>-50/7, 

377. x≤-3/4, 

378. x>-9, 

379. x≤2680
380. m<71.43min, The economy is the better deal if you talk at most 71 minutes
381. x≤2680
382. x≥617.25
383. The Econoplan is better if you talk at most 71 minutes.
384. He can use up to 40 additional minutes for a total of 540 minutes.
385. X>22
386. 0<W≤12 and 8<L≤20,

387. m≤80 min, She can talk at most 80 additional minutes
388. m>54.55 min, Premium is the best deal if she talks at least 55 minutes above 400 minutes.
389. m<1.7
390. m<1.2
391. m>2

Practice test.
1. X+4=10, 6
2. X-5=10, 15
3. 2x-4=-4x+8, 2
4. 4x+4=16, 3
5. -2x+2=-5x+5, 1
6. 4x-1=3x-2, -1
7. 11
8. -45
9. -15/2 or -7.5
10. -1 is the only solution.
11. Multiply both sides by 15.
12. -1
13. -2
14. 48/5
15. 13
16. 5/2
17. $\frac{a-2n}{2}$
18. $\frac{bc}{ad}$
19. B,C
20. X≤2, X>1
21. -4≤X<11
22. x<10, i.e. 7,8,9 AMV
23. X>-11
24. X>-50/7
25. M=-90
26. X≤-0.75
27. T
28. T
29. 10
30. 1200
31. 20 by 20
32. 0<w≤10.5, 4<L≤14.5
33. Premium is better after 77 minutes or more additional minutes.