MATH 1B
CHAPTER 1

EQUATIONS

SECTION 1.1: EQUATIONS + THEIR SOLUTIONS

A LOT of time is spent in Algebra learning how to solve equations and then solving them for various purposes. So, it goes without saying that we really need to understand what it means for something to "solve" an equation. First, let's make sure we understand what an equation is:

EQUATION DEFINITION

An equation is simply a statement about the **equality** of two expressions. In other words, anything that takes this form:

Expression #1 = Expression #2

***Exercise* #1:** Which of the following is **not** an equation?

(1) $3+1=4+0$

(2) $x^2-2x=8$

(3) $2(4x+1)$

(4) $1+3=6$

Equations can be either true, like (1) above, or false, like (4) above, depending on whether the two expression are equal (true) or not equal (false).

***Exercise* #2:** Consider the equation $2x-8=10-x$.

(a) Why can't you determine whether this equation is true or false?

(b) If $x=5$, will the equation be true? How can you tell?

(c) Show that $x=6$ makes the equation true. Remember to think very carefully always about your order of operations.

SOLUTIONS TO EQUATIONS

A value for a variable is called a **solution to the equation** if, when substituted into both expressions, results in the equation being **true**.

This concept of the solution to an equation is **amazingly important**. It implies that you can always know when you have solved an equation correctly. As long as you can check the truth of the equation with arithmetic, then you will know if your value (of x often) is correct.

***Exercise* #3:** Determine whether each of the following values for the given variable is a solution to the given equation. Show the calculations that lead to your final conclusions.

(a) $2x+3=17$ and $x=7$

(b) $\frac{x-20}{5}=-4$ and $x=10$

(c) $2(x+5)=6(x-1)$ and $x=4$

(d) $x^2-1=2x+2$ and $x=-1$

(e) $\frac{3(x+2)}{4}-1=5$ and $x=2$

(f) $\frac{3}{4}x-1=-\frac{1}{2}x+9$ and $x=8$

So, this is no excuse land. If you solve an equation, you should always be able to check to see if your solution is correct. Sometimes, mistakes happen, and it is good to be able to spot them.

***Exercise* #4:** Kirk was checking to see if $x=7$ was a solution to the equation $4x-3=2x+11$. He concluded that it was not a solution based on the following work. Was he correct?

$4x-3=2x+11$

$4\cdot7-3=2\cdot7+11$

$4\cdot4=2\cdot18$

$16=36$ No!

Name: ____________________ Date: ____________

EQUATIONS AND THEIR SOLUTIONS
COMMON CORE ALGEBRA I HOMEWORK

FLUENCY

1. Decide if each of the following are **equations** or **expressions**. You do not need to solve the equations or evaluate the expressions.

(a) $5x+13$

(b) $4x+3=12$

(c) $\frac{6(x-1)}{4}+1=5$

(d) $3(x+2)^2-(45)^3$

(e) $3^2-5|2x-15|$

(f) $3[(x+2)^2+2(x-4)]=3\sqrt{4(2x+1)}$

2. Determine whether each of the following values for the given variable is a solution to the given equation. Show the calculations that lead to your final conclusions.

(a) $x-4=12$ and $x=8$

(b) $\frac{(3+x)}{4}=3$ and $x=9$

(c) $(x+2)-3(x-4)=6$ and $x=4$

(d) $\frac{1}{3}(x+2)=-\frac{2}{5}(x-9)$ and $x=4$

1.3

APPLICATIONS

3. A disease has three treatments, depending on the percent of the body affected by the disease. Doctors have the treatment down to three stages as follows;

Stage 1: less than 15%   Stage 2: 15-25%   Stage 3: 25-50%

For anything more then 50% there is no cure. If the disease is spreading according to the formula $P = 6d + 5$ where P is the percent of the body affected and d is the number of days, fill out the following chart and explain to a patient what you observed.

Days	% of body Affected
1	
2	
3	
4	
5	
6	
7	
8	

Explanation of What You Observe:

REASONING

4. Bobby wants to go on a school trip that will cost him $250. He comes up with an equation that represents how much he needs to save each week as follows:

$25w + 30 = 250$, where w is the number of weeks spent saving.

(a) If he has 9 weeks to save will he have enough money to go on the trip? Explain.

(b) He also wants to have $100 spending cash on the trip. He decides to save an extra $10 a week. To do this he changes his original equation as follows;

$25w + 30 + 10w = 250 + 100$, where w is the number of weeks spent saving.

Will nine weeks be enough time now? Show your calculations and Explain.

Multi-Step Equations

- When solving a multi-step equation, we need to take care of addition/subtraction first. Next, get rid of division and then multiplication. (opposite of order of operations)
- If we have variables on both sides of the equation, we need to isolate the variable on one side!

Examples: Solve and Check.

1) $5a+16=51$

2) $\frac{g}{-5}+3=-13$

3) $14=\frac{x+12}{-6}$

4) $6x+1=15-x$

5) $2y+3=5y-9$

6) $\frac{2}{5}n-9=7-\frac{3}{5}n$

7) $\frac{3}{7}p+4=\frac{1}{7}p-6$

8) $9(4n-1)=2(9n+3)$

9) $3(x-8)-5=9(x+2)+1$

Special Situations:

10) $5n+4=7(n+1)-2n$

11) $7+2(x+1)=2x+9$

To the right are two methods to solve the same equation. Justify each step in the solving process. Which method do you prefer? Why?

Method 1:

$$5(x+3)-3x=55$$
$$5x+15-3x=55$$
$$2x+15=55$$
$$2x+15-15=55-15$$
$$2x=40$$
$$\frac{2x}{2}=\frac{40}{2}$$
$$x=20$$

Method 2:

$$5(x+3)-3x=55$$
$$\frac{5(x+3)}{5}-\frac{3x}{5}=\frac{55}{5}$$
$$x+3-\frac{3}{5}x=11$$
$$\frac{2}{5}x+3=11$$
$$\frac{2}{5}x+3-3=11-3$$
$$\frac{2}{5}x=8$$
$$\frac{5}{2}\left(\frac{2}{5}\right)x=\frac{5}{2}(8)$$
$$x=20$$

12) A number less than one is the same as six times the difference of one and the number.

13) One-third the sum of a number and one is one-sixth the difference of triple the number and 5.

Solve each equation.

1) $26 = 8 + v$

3) $15 + b = 23$

5) $m + 4 = -12$

7) $m - 9 = -13$

9) $v - 15 = -27$

11) $-104 = 8x$

13) $-6 = \frac{b}{18}$

2) $-6 + \frac{x}{4} = -5$

4) $0 = 4 + \frac{n}{5}$

6) $-1 = \frac{5 + x}{6}$

8) $2(n + 5) = -2$

10) $-6 = \frac{n}{2} - 10$

12) $144 = -12(x + 5)$

15) $\frac{v}{8} = 2$

17) $-15x = 0$

19) $21 = -7n$

21) $-126 = 14k$

23) $-16 + x = -15$

25) $-17 = x - 15$

27) $\frac{v}{7} = 8$

29) $-7 + m = 8$

1.8

Midpoint, Segment Addition and Angle Addition

GEOMETRY TERMS

A **midpoint**of a segment is the point that divides a segment into two equal parts.

Segment Addition states the sum of the parts of a segment equals the measure of the whole segment.

Angle Addition states the sum of the parts of an angle equals the measure of the whole angle.

Find x if M is the midpoint of $\overline{AB}$.

1. AM=6x+4, BM=7x-2
2. AM=12x-10, BM=8(x+1)

Find x if R and T are endpoints of a segment and point S is between them.

5. RS=2x, ST=5x+4 and RT=32
4. RS=4x, RT=24 and RS=ST

Find x if $\overrightarrow{AD}$ is in the interior of $\angle CAT$.

6. $m\angle CAD = 3x+1$, $m\angle DAT = 2x$ and $m\angle CAT = 21$

7. $m\angle CAD = 7x-9$, $m\angle DAT = 7x-9$ and $m\angle CAT = 9x+17$

APPLICATIONS

Find x if M is the midpoint of $\overline{AB}$.

1. AM=12x+7, BM=3x+52
2. AM=14x-31, BM=4(3x+2)

Find x if C and E are endpoints of a segment and point D is between them.

3. CD=14x, DE=6x-10 and CE=90
4. CD=7, DE=8x and CE=5x+20

5. CD=2x + 1, CE=24 and CD=DE

Find x if $\overrightarrow{AD}$ is in the interior of $\angle CAT$.

6. $m\angle CAD = 12$, $m\angle DAT = 2x$ and $m\angle CAT = 34$

7. $m\angle CAD = 4x - 1$, $m\angle DAT = 2x - 1$ and $m\angle CAT = 5x$

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Geometry: Segment Addition, Angle Addition, Midpoint

Short Answer

1. Find x if A is the midpoint of $\overline{HT}$. HA = $24x - 16$ and AT = $8(2x + 5)$

2. Find x if I is the midpoint of $\overline{LP}$. LI = $5(3x + 7)$ and AT = $5x - 15$

3. Find x if R and S are endpoints of a segment and point Q is between them.
   RQ = 32, QS = $4x$, RS = $10x + 20$

4. Find x if C and D are endpoints of a segment and point W is between them.
   CW = 28, WD = $9x$, CD = $13x + 22$

1.12

5. Find x if A and B are endpoints of a segment and point P is between them.
   AP = $6x$, AB = 60 and AP = PB

6. Find x if A and B are endpoints of a segment and point P is between them.
   AP = $17x$, AB = 102 and AP = PB

7. Find x if $\overrightarrow{OT}$ is in the interior of $\angle DOG$, $m\angle DOT = 16x - 20$, $m\angle TOG = 4x$ and $m\angle DOG = 80$.

8. Find x if $\overrightarrow{OP}$ is in the interior of $\angle HOT$, $m\angle HOP = 3x$, $m\angle POT = 2x - 15$ and $m\angle HOT = 65$.

SECTION 1.4 – MODELING WITH LINEAR EQUATIONS

Although word problems can often be some of the most challenging for students, they give us great opportunities to refine our understanding of the relationships between quantities and how to manipulate expressions to solve equations. When you solve any real world problem in mathematics you are **modeling** a physical situation with **mathematical tools**, such as **equations**, **diagrams**, **tables**, as well as many others.

As we work through these problems, try to make sure to always do the following:

MODELING AND SOLVING LINEAR WORD PROBLEMS

1. Clearly define the quantities involved with common sense variables and **let statements**.
2. Use your **let statements** to write out expressions for **quantities that you are interested in.**
3. Carefully translate the information you are told into an equation.
4. Solve the equation – remember to mentally note the justification for each step.
5. Check the reasonableness of your answer! This could be the most important, and neglected, step in the modeling/problem solving method.

Let's start off with a reasonably easy example.

***Exercise* #1:** The sum of a number and five more than the number is 17. What is the number?

(a) First experiment with some numbers. This will help you when going to the abstract with variables.

(b) Now, let's carefully set up **let statements** and an **equation** that relates the quantities of interest. Solve the equation for the number.

***Exercise* #2:** The difference between twice a number and a number that is 5 more than it is 3. Which of the following equations could be used to find the value of the number, n? Explain how you arrived at your choice.

(1) $2n-n+5=3$ (3) $n+5-2n=3$

(2) $n-(2n+5)=3$ (4) $2n-(n+5)=3$

The modeling process can become much more complicated when the information becomes more convoluted. Let's work with one particular **age** problem next.

***Exercise* #3:** Evie and her father are comparing their ages. At the current time, Evie's father is 36 years older than her. Three years from now, Evie's father will be five times her age at that point. How old is Evie now?

(a) Before we start to work with setting up variables, expressions, and equations, let's first do some **guess-and-check** work. Try a few ages for Evie now, and see if any are correct. Think carefully about the information given in the question.

(b) Set up careful let statements to define **expressions** that keep track of Evie's age and her father's age now and three years from now. Then, set up an equation that summarizes the information in the problem about their ages in five years. Then, solve the equation and check for reasonableness.

***Exercise* #4:** Kirk has 12 dollars less than Jim. If Jim spends half of his money, and Kirk spends none, then Kirk will have two dollars more than Jim. How much money did they both start with?

Name: ______________________________ Date: ________________

LINEAR WORD PROBLEMS
COMMON CORE ALGEBRA I HOMEWORK

FLUENCY

1. The sum of three times a number and 2 less than 4 times that same number is 15. Which of the following equations could be used to find the value of the number, n? Explain how you arrived at your choice.

(1) $3n+4n-2=15$ (3) $4n+3(n-2)=15$

(2) $3n+4(n-2)=15$ (4) $3n-4(n-2)=15$

2. Create a let statement for the following examples. Be sure to carefully read the question and figure out exactly what you are looking for. Then, set up an equation that summarizes the information in the problem and solve the equation and check for reasonableness.

(a) The sum of 3 less than 5 times a number and the number increased by 9 is 24. What is the number?	(b) Tom is 4 more than twice Andrews age. Sara is 8 less than 5 times Andrews age. If Tom and Sara are twins, how old is Andrew?
(c) A wireless phone plan costs Eric \$35 for a month of service during which he sent 450 text messages. If he was charged an fixed fee of \$12.50, how much did he pay per text?	(d) Daniel is currently 26 years older than his son. In six years he will be three times older than his son. How old are both of them now?

1.16

APPLICATIONS

3. There is a competition at the local movie theater for free movie tickets. You must guess all four employees' ages given a few clues. The first clue is that when added together, their ages total 106 years. Kirk is twice ten years less than the manager's age, Brian is 12 years younger than twice the manager's age, and Matt is 6 years older than half the manager's age. What are all four of their ages? It may help to set up four let statements, one for each employee (including the manager).

REASONING

In some cases the answers you will get won't make physical sense or need a bit of interpreting. Look at the next example and be careful when you interpret your final solution.

4. Tanisha and Rebecca are signing up for new cellphone plans that only charge for the number of minutes and everything else is included in a monthly fee. Their plans are as follows:

   Tanisha's plan: \$0.15 per minute used talking and a \$25 monthly fee.
   Rebecca's Plan: \$0.10 per minute used talking and a \$18.50 monthly fee.

   (a) Figure out after how many minutes the two plans will charge the same amount?

   (b) Interpret your answer. It may help to read their two plans again and think about which one you would rather pay.

SECTION 1.5 - CONSECUTIVE INTEGERS

One of the ways we can practice our ability to work with algebraic expressions and equations is to play around with problems that involve **consecutive integers**. Make sure you known what the integers are:

THE INTEGERS AND CONSECUTIVE INTEGERS

The **integers** are the subset of the **real numbers**: $\{\ldots -4, -3, -2, -1, 0, 1, 2, 3, \ldots\}$ (so positive and negative whole numbers).

Consecutive integers are any list of integers (however long) that are separated by only 1 unit. Such as:

$$1, 2, 3 \text{ or } 5, 6, 7, 8 \text{ or } -4, -3, -2 \text{ or } -10, -9, -8, -7, -6$$

Consecutive Evens

$4, 6, 8$ or $-8, -6, -4, -2$ or $14, 16$

Consecutive Odds

$7, 9, 11$ or $-5, -3, -1, 1$ or $-9, -7, -5$

***Exercise* #1:** Let's work with just two consecutive integers first. Say we have two consecutive integers whose sum is eleven less than three times the smaller integer.

(a) It is important to play around with this problem numerically. So, try a variety of combinations and see if you can find the correct pair of consecutive integers. Be sure to show your calculations.

(b) Now, carefully set up let statements that give expressions for our two consecutive integers. Using these expressions, set up an equation that allows you to find them and solve the equation.

Let's try some more problems. We always encourage you to play around with numbers before you go to the algebraic set up. The algebra should flow from what you do with numbers, not the other way around.

***Exercise* #2:** I'm thinking of three consecutive odd integers. When I add the larger two the result is nine less than three times the smallest of them. What are the three consecutive odd integers?

***Exercise* #3:** Three consecutive even integers have the property that when the difference between the first and twice the second is found, the result is eight more than the third. Find the three consecutive even integers.

***Exercise* #4:** The sum of four consecutive integers is -18. What are the four integers?

Name: ________________________________ Date: ________________

More Linear Equations and Consecutive Integer Games
Common Core Algebra I Homework

Fluency

1. Set up let statements for appropriate expressions and using these expressions set up an equation that allows you to find each number described. Be sure to find EACH integer you are looking for.

   (a) Find two consecutive integers such that ten more than twice the smaller is seven less than three times the larger.

   (b) Find two consecutive even integers such that their sum is equal to the difference of three times the larger and two times the smaller.

   (c) Find three consecutive integers such that three times the largest increased by two is equal to five times the smallest increased by three times the middle integer.

   (d) Find three consecutive odd integers such that the sum of the smaller two is three times the largest increased by seven.

1-20

APPLICATIONS

3. In an opera theater, sections of seating consisting of three rows are being laid out. It is planned so each row will be two more seats than the one before it and 90 people must be seated in each section. How many people will be in the third row?

4. In the same opera theater personal balcony sections with three rows of seating are being mapped as well. In these sections there must be an odd number of seats in each row and each row must have two more seats than the one before it. The last stipulation is that the front row must have one quarter the total seats in the back 2 rows combined. How many seats will be in each row?

REASONING

5. Instead of finding even or odd consecutive integers we could also look for integers that differ by a number other then 2. Find three numbers that each differ by 3 such that 5 times the largest integer is equal to three times the smallest increased by 5 times the middle.

6. What do you think every other even integer means? Set up a let statement that would show this.

7. Find three every other even integers such that the sum of all three is equal to three times the largest decreased by the other two numbers.

SECTION 1.6 - COST, REVENUE, AND PROFIT

Cost, Revenue, and Profit Lesson **Name:**____________________

1. ________________ is the money needed to produce a particular product.

2. _________________ is the amount of money made selling a product.

3. _________________ is the earnings after the costs are subtracted from the revenue.

- **Profit = Revenue – Cost or P = R – C**

4. The ___________________________ occurs when the revenue equals the cost.

- **Revenue = Cost**

The Future Engineers of America Club (FEA) wants to raise money for a field trip to the science museum. They will make and sell custom photo buttons and will sell them for two dollars. They have found two companies to make the buttons, but the production costs are different.

Picture Buttons will charge \$125 for set-up and \$0.15 per button. Buttons for You will charge \$75 for set-up and \$0.40 per button.

Cost of x buttons produced by Picture Buttons

$$125 + 0.15x$$

Cost of x buttons produced by Buttons for You

$$75 + 0.40x$$

To help decide which company to use, club members want to determine how many buttons they would have to sell for the production costs to be the same.

1. Write an equation that makes the production costs of the two companies equal.

2. Solve.

3. What is the meaning of the value you got for x in the equation above?

4. The FEA club estimates they will sell more than 200 buttons. Make a recommendation to the club explaining which company would be the better choice.

> **CONNECT TO BUSINESS**
>
> *Revenue* is the amount of money made selling a product. *Profit* is earnings after costs are subtracted from the revenue.
>
> Profit = Revenue − Cost
>
> The *break even point* occurs when revenue equals cost.
>
> Revenue = Cost

5. Each button will sell for $2.00. The revenue for selling x buttons at $2.00 each is $2x$. Write and solve an equation to find the break even point for the button fundraiser using the company you recommended to the FEA club.

6. How much profit will the FEA club earn on sales of 250 buttons if they use the company you recommended?

> **MATH TIP**
>
> The formula for finding profit is $P = R - C$, where P represents the profit, R represents the revenue, and C represents the cost.
>
> This formula is an example of a literal equation. You can solve the literal equation for R to get a formula for finding revenue:
>
> $P = R - C$
> $P + C = R - C + C$
> $P + C = R$
> $R = P + C$

7. The Future Engineers of America Club treasurer was going back through the fundraising records. On Monday, the club made revenue of $90 selling buttons at $2.00 each. One person sold 20 buttons, but the other person selling that day forgot to write down how many she sold. How many buttons did the other person sell?

Cost, Revenue, Profit Assignment **Name:**__________________________

Hayden's Bicycle Helmets makes bicycle helmets at a cost of ***3000 + 12x*** *dollars per month to produce* ***x*** *helmets. They sell helmets at* ***$21 apiece.***

a) What is the cost to produce 500 helmets?

b) What is the revenue for selling 500 helmets?

c) What is the breakeven point?

d) Will they earn a profit selling 500 helmets per month?

1.24

An electronics manufacturer can produce and sell x iPods per week. The total cost, C, of producing x iPods is $C = 74x + 30{,}000$ *dollars and the total revenue, R, is* $R = 95x$. *Find the profit in terms of x.*

a) What is the cost to produce 250 iPods?

b) What is the revenue for selling 250 iPods?

c) What is the breakeven point?

d) Will they earn a profit selling 250 iPods per week?

Just as we can solve linear equations by using properties of **expressions** (commutative, associative, and distributive) and equations (addition and multiplication properties), we can do the same for inequalities. But, we have to make sure we know what those properties are. Let's test them.

***Exercise* #1:** Consider the **true** inequality $4 < 8$.

(a) If we add 3 to both sides of the inequality, what is the resulting inequality? Is it true?

(b) If we subtract 4 from both sides of the inequality, what is the resulting inequality? Is it true?

(c) If we multiply both sides of the inequality by 2, what is the resulting inequality? Is it true?

(d) If we divide both sides of the inequality by 2, what is the resulting inequality? Is it true?

Hmm... Based on Exercise #1, you might conclude that the **truth values** of **inequalities** have the same properites as the **truth values** for **equalities (equations)**. But there is one huge difference between linear inequalities and linear equations.

***Exercise* #2:** Returning to our **true** inequality $4 < 8$.

(a) If we multiply both sides of the inequality by -2, what is the resulting inequality? Is it true?

(b) If we divide both sides of the inequality by -2, what is the resulting inequality? Is it true?

PROPERTIES OF INEQUALITIES

1. **THE ADDITION (AND SUBTRACTION) PROPERTY:** If $a > b$ is true then $a+c > b+c$ is true.
2. **THE MULTIPLICATION (AND DIVISION) PROPERTY:** If $a > b$ is true then $c \cdot a > c \cdot b$ will be true if c is a positive number and $c \cdot a < c \cdot b$ will be true if c is a negative number.

***Exercise* #3:** Write a true inequality and show that it becomes false when multiplying (or dividing, your choice) each side by a negative.

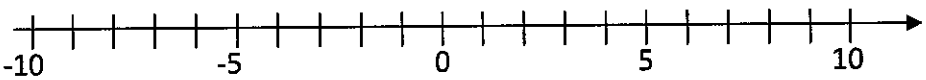
Now that we know the ways that the truth value of an inequality can remain the same or change, we can solve linear inequalities.

***Exercise* #4:** Given the linear inequality $4x-3\geq 5$ do the following:

(a) Solve the inequality by applying the properties of inequalities that we found earlier.

(b) Write 5 numbers that make the final solution true and plot them on the number line below (c).

(c) Now, graph all of the solutions on the number line below (this is called the **solution set**).



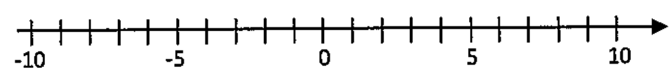
***Exercise* #5:** Given the linear inequality $8-2x>16$ do the following:

(a) Rewrite the left hand expression as an equivalent expression using addition.

(b) Solve the inequality by applying the properties on inequality.

(c) Pick a number that is true based on your solution to (b) and show that it makes the original inequality true.

(d) Graph the solution to the inequality on the number line below.



When we solve inequalities, we will also use the **commutative, associative,** and **distributive properties** of **numbers** (not equations) to write **simpler equivalent expressions** on both sides of the inequality.

***Exercise* #6:** Consider the inequality $8(x-2)-3(2x+1)\leq 7x+4-3(x+1)$.

(a) Use the distributive, commutative, and associative properties of numbers to simply the left and right hand expressions of this inequality.

(b) Solve the inequality using the properties of inequality and graph the final solution set on a number line that you draw by hand.

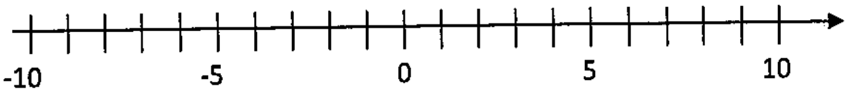
Name: ______________________________ Date: ________________

Solving Linear Inequalities
Common Core Algebra I Homework

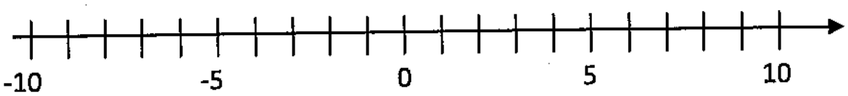
Fluency

1. Solve the inequality using the properties of inequality and graph the final solution set on the number line provided.

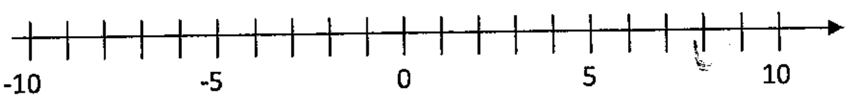
(a) $5x-6\le 24$



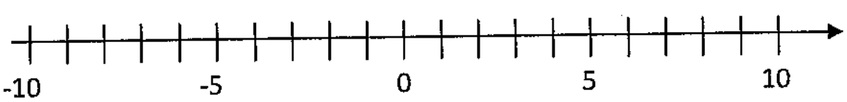
(b) $2(5-x)\le 12$



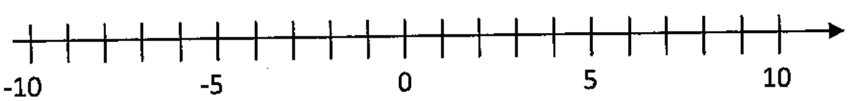
(c) $6-4x>18$



(d) $8x-6(x-2)>20-2x$



(e) $\dfrac{3(2x+2)}{6}>\dfrac{1}{3}x+2$



1.28

APPLICATIONS

2. Two siblings Edwin and Rhea are both going skiing but choose different payment plans. Edwin's plan charges \$45 for rentals and \$5.25 per lift up the mountain. Rhea's plan was a bundle where her entire day cost \$108.

   (a) Set up an inequality that models the number of trips, n, up the mountain for which Edwin will pay more than Rhea. Solve the inequality.

   (b) What is the greatest amount of trips that Edwin can take up the mountain and still pay less than Rhea? Explain how you arrived at your answer.

REASONING

3. Given a, b, c, d are all positive, solve the following inequalities for x.

   (a) $ax+b\geq cd$

   (b) $\dfrac{a(x+2)}{b}>c$

4. If $ax+b>d$ and $a<0$ then

   (1) $x>\dfrac{d-b}{a}$

   (3) $x<\dfrac{d}{a}-b$

   (2) $x<\dfrac{d-b}{a}$

   (4) $x>\dfrac{d}{a}-b$

Solve each inequality and graph its solution.

1) $-12 > x - 7$

−12 −10 −8 −6 −4 −2

2) $\frac{m}{3} - 3 \le -6$

−14 −12 −10 −8 −6 −4

3) $n - 6 \le -14$

−10 −8 −6 −4 −2

4) $-4(-4 + x) > 56$

−14 −12 −10 −8 −6 −4

5) $a - 17 > -16$

−5 −4 −3 −2 −1 0 1 2 3 4 5

6) $-4(3 + n) > -32$

1 2 3 4 5 6 7 8 9 10 11

7) $3 + v \le -9$

−14 −12 −10 −8 −6

8) $-3(r - 4) \ge 0$

−4 −3 −2 −1 0 1 2 3 4 5 6

9) $-3x > 3$

−5 −4 −3 −2 −1 0 1 2 3 4 5

10) $-3(p - 7) \ge 21$

−6 −5 −4 −3 −2 −1 0 1 2 3 4

11) $\frac{k}{4} < -4$

−24 −22 −20 −18 −16 −14

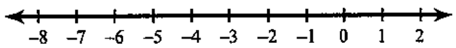
12) $\frac{-9 + a}{15} > 1$

22 23 24 25 26 27 28 29 30 31 32

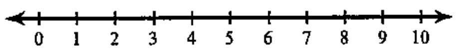
1.30

Solve each inequality and graph its solution.

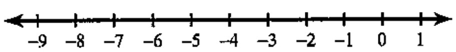
1) $3 < -5n + 2n$



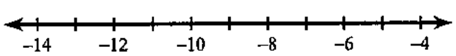
3) $-p - 4p > -10$



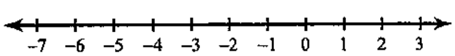
5) $9 \geq -2m + 2 - 3$



7) $6 - 4(6n + 7) \geq 122$



9) $167 < 6 + 7(2 - 7r)$



11) $-8x + 2x - 16 < -5x + 7x$