Ch 1

1.2 Order of Operations

P – ( ) [ ] ⌊ ⌋ √ ||
E – exponents
M, D) × and ÷ left to right
A, S) + and – left to right

1.3 Properties

additive identity	$a+0=0+a$ $2+0=0+2$
additive inverse (# + its opposite)	$a+(-a)=0$ $3+(-3)=0$
multiplicative identity	$a\cdot 1=a$ $3\cdot 1=3$
multiplicative prop of zero	$a\cdot 0=0$ $3\cdot 0=0$
associative (always stay same order)	$(a+b)+c=a+(b+c)$ $2+3+4=3+2+4$
commutative (changing order)	$(2+3)=(3+2)$
distributive property	$2(x-3)=2x-6$
reflexive (anything = itself)	$a=a$ $5=5$
symmetric	$8=2+6$ then $2+6=8$
transitive (if 1 quantity equals 2nd, and 2nd equals 3rd, the 3rd equals 1st)	$6+9=3+12$ and $3+12=15$, then $6+9=15$
substitution (quantity may sub for its equal)	$n=11$, then $4n=4\cdot 11$

1.1 Verbal Sentences

The quotient of 2 and x plus the quantity of 2 plus x is 18
(divide) (put in parenthesis)

$$\frac{2}{x}+(2+x)=18$$

is → equals
of → multiply
quotient divide
twice → 2x

"is less than or more than" work backwards
Ex: 3 less than x
$x-3$

Solving Equations – (use opposite operations when terms are on opposite sides of equals sign.

1. $\frac{-2x}{-2}=\frac{4}{-2}$ → $x=-2$

2. $\frac{x}{3}\cdot 3=4\cdot 3$ multiply by denominator to get rid of fraction
$x=12$

3. $\frac{x+2}{3}\cdot 3=4\cdot 3$
$x+2=12$
$-2\quad -2$
$x=10$

4. $\frac{2}{3}x+2=5$
$-2\quad -2$
$\frac{3}{2}\cdot\frac{2}{3}x=3\cdot\frac{3}{2}$
$x=\frac{9}{2}$
• work with term not connected to variable first
• multiply by reciprocal (flip)

5. $\frac{1}{4}\cdot\frac{-2}{12}x=\frac{1}{4}\cdot 12$ • Two Fractions multiply by common denominator
$\frac{-8x}{-8}=\frac{3}{-8}$
$x=-\frac{3}{8}$

1.6 relation – set of ordered pairs

$(-2,3)(2,4)(3,6)$
x y

mapping: $-2\to 3$, $2\to 4$, $3\to 6$

x	y
-2	3
2	4
3	6

table

graph

$(2,3)$
x, y
domain, range
Independent Variable, dependent variable

Interpret Graph

positive →
decreasing →
relative maximum – no nearby points have a higher y-coordinate
decreasing
← negative
relative minimum – no nearby points have a lower y-coordinate

1.7 Function: 1 range value for each domain (no repeating x's)

Ex. $(2,3)(3,4)(5,3)$
$2\to 3$, $3\to 4$, 5

Not a Function

Ex. boyfriend / girlfriend
(x repeats)
$(2,4)(3,6)(2,5)$
$2\to 3, 5$; $4\to 7$

If $f(x)=2x+1$ find value of $f(-3)$

Insert for x and solve
$f(x)=2x+1$
$f(-3)=2(-3)+1$
$f(-3)=-5$

1.5 State Number of Solutions (one, no solution, or infinate solutions)

One solution – you solve and get an answer

$6(5x-3)=8x+4$
$30x-18=8x+4$ • distribute
$-8x\quad -8x$ • find variable with smaller coefficient (#) and use opposite operation
$22x-18=4$
$+18\quad +18$ • use opposite operation
$\frac{22x}{22}=\frac{22}{22}$
$x=1$

One Solution on a graph point where lines cross.

No Solution – you get a false answer

$5x+5=5x-2$ • subtract 5x from both sides
$-5x\quad -5x$
$5\neq -2$ ← • Not true

No solution on graph is parallel lines. They never intersect. (Lines have the same slope) $y=3x+2$, $y=3x-3$

Infinate Solutions – End with true statement

$6x-3-7=6x-10$
$-6x\quad -6x$
$-10=-10$

On graph is the same line. (cross everywhere) $y=2x+1$, $y=2x$

Scatter Plots

Write equation of a line from a scatter plot.

① Draw line of best fit

② Find two points close to intersecting grid lines. (4,200) (12,300)

③ Use points to find slope $\frac{y-y}{x-x}$

$\frac{300-200}{12-4} = \frac{100}{8} = 12.5$

④ Use slope and either point above, (12,300) and insert.

$y-y = m(x-x)$

$y-300 = 12.5(x-12)$

⑤ Solve for y

$y-300 = 12.5(x-12)$

$y-300 = 12.5x-150$

$+300 \quad +300$

$\boxed{y = 12.5x+150}$

⑥ Explain slope – vertical drops increased every year by an average of 12.5 ft

⑦ Predict drop 30 yrs after 1988. (Insert into equation)

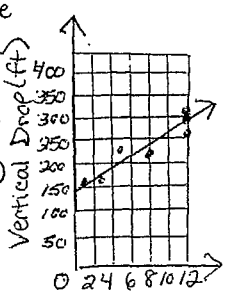
$y = 12.5x+150$

$y = 12.5(30)+150$

$y = 375+150$

$\boxed{y = 525}$

Roller Coaster Drops



OR

① Find slope $\frac{y-y}{x-x}$

② Insert in $y = mx+b$ ↓ use y-intercept

$y = mx+b$

$y = 12.5x+150$

Dependent Variable: Vertical Drop (y axis)

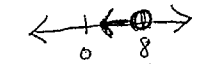
Independent Variable: Year (x axis)

Graph Inequalities

$\frac{3}{8}x < 3$ • solve, mult by reciprocal

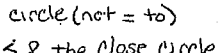
$x < \frac{24}{3}$

$x < 8$



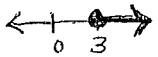
↓ open circle (not = to)

If $x \leq 8$ the close circle (is = to)



** Graph part of sign facing the variable

Ex. $3 \leq x$ (x is facing the big part, go right because numbers are larger)



OR

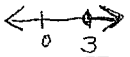
If you have trouble then flip it like a pancake and graph.

$3 \leq x$

$<$

$x \geq 3$

When you flip and x is on the left your arrow will go the same direction as the inequality sign.



** Rules:

Whenever you X or ÷ by a negative number, reverse sign.

$\frac{-3}{-3}x < \frac{6}{-3}$

$\boxed{x > -2}$

Note:

$\frac{2}{3}x < -6$

$\boxed{x < -9}$

Don't flip, you divided by positive 3

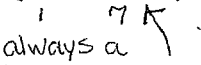
Compound Inequalities

And or < less than

$-2 \leq x-3 < 4$

$+3 \quad +3 \quad +3$

$1 \leq x < 7$



always a barbell graph

Solve by getting x alone. Do opposite operation to all 3 sections

OR or > greater or

$-2x+7 \leq 13$ or

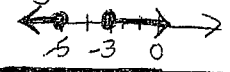
$-7 \quad -7$

$\frac{-2x}{-2} \leq \frac{6}{-2}$; $\frac{2x}{2} \leq \frac{-10}{2}$

$x \geq -3$; $x \leq -5$

↑ flipped, divided by negative

Solve both problems



Inverse Linear Functions

– set of ordered pairs obtained by reversing x and y coordinates.

Ex. $\{(4,-10),(7,-19),(-5,17)\}$

$(4,-10) \rightarrow (-10,4)$

$(7,-19) \rightarrow (-19,7)$

$(-5,17) \rightarrow (17,-5)$

Inverse of function $f(x) = 4x-8$

① replace f(x) with y $\quad y = 4x-8$

② reverse x and y $\quad x = 4y-8$

③ Solve for y $\quad +8 \quad +8$

$\frac{x+8}{4} = \frac{4y}{4}$

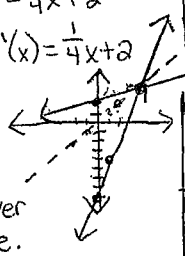
④ rewrite $\quad \frac{1}{4}x+2 = y$

$y = \frac{1}{4}x+2$

⑤ replace y with $f^{-1}(x)$ $\quad f^{-1}(x) = \frac{1}{4}x+2$

⑥ Graph both equations and graph line $y=x$

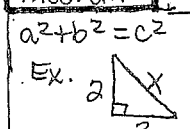
Notes: lines reflect over $y=x$ dashed line.

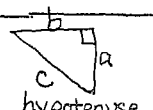


Pythagorean Theorem

$a^2+b^2=c^2$

Ex.





c hypotenuse (across from right angle)

$a^2+b^2=c^2$

$2^2+3^2=c^2$ • insert #'s

$4+9=c^2$

$\sqrt{13} = \sqrt{c^2}$ • sq root each side

$3.6 = c$

Ex. 2

$a^2+b^2=c^2$

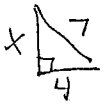
$x^2+4^2=7^2$

$x^2+16=49$

$-16 \quad -16$

$\sqrt{x^2} = \sqrt{33}$

$x = 5.7$



Graph Inequalities

$y > -2x+1$

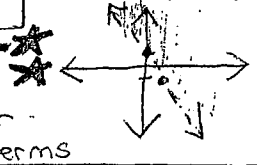
① plot y-intercept

② apply slope (make fraction if necessary)

③ Solid line if $\leq$ $\geq$
Dashed line if $<$ $>$

④ Think of y axis as thermometer
• if > shade above
• if < shade below

OR insert (0,0) into problem to see if it should be shaded.



Watch Out

* mult or div by negative reverse sign
* sign is in front of number
* if division, divide all terms

Direct Variation $y = Kx$ ← constant

Ex. If y varies directly with x, and $y=72$ when $x=8$ find x when $y=63$.

① $y = Kx$ • substitute • solve for K

$\frac{72}{8} = \frac{K8}{8}$

$9 = K$

② $y = Kx$ • substitute 9 for K and 63 for y. Solve for x

$\frac{63}{9} = \frac{9x}{9}$

Not direct variation if anything is added or subtracted

$y = Kx$ ← Ex. $y = Kx+2$ ← $y = 5x-3$