Math-2
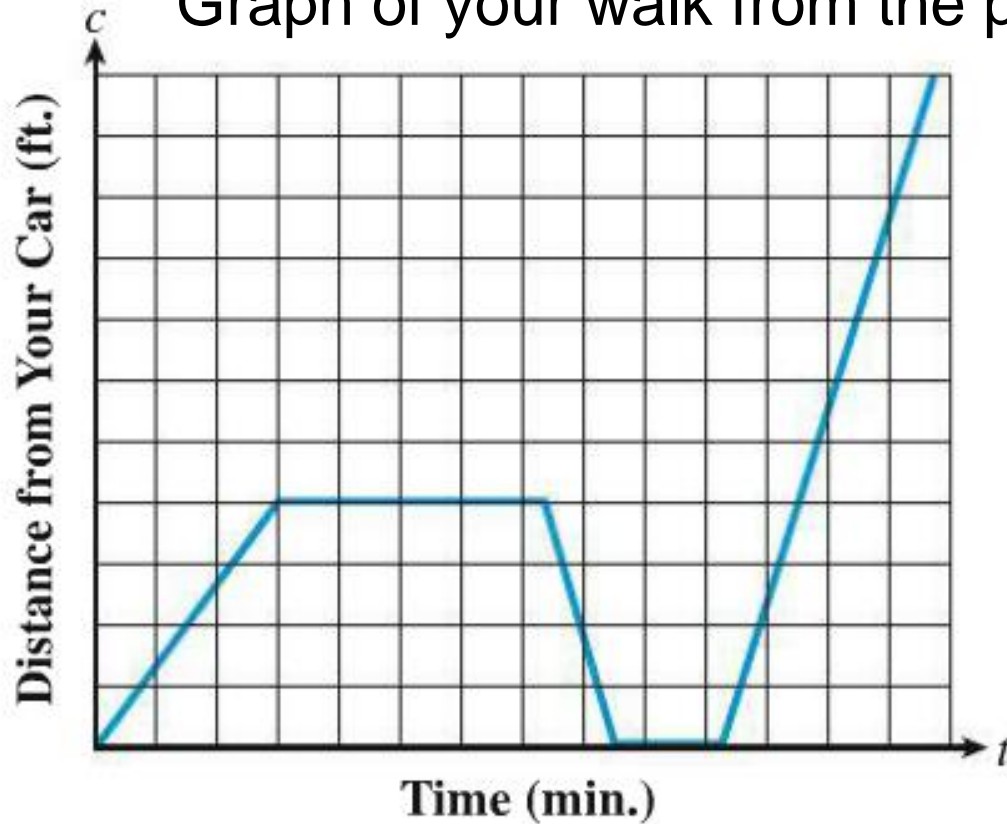# Lesson 3-4
Applications of Linear Equations

Graph of your walk from the parking lot to the library.

Distance from Your Car (ft.)

Time (min.)

List everything you can determine from the graph

$$d = f(t)$$

<u>units</u> of time are in <u>minutes</u>
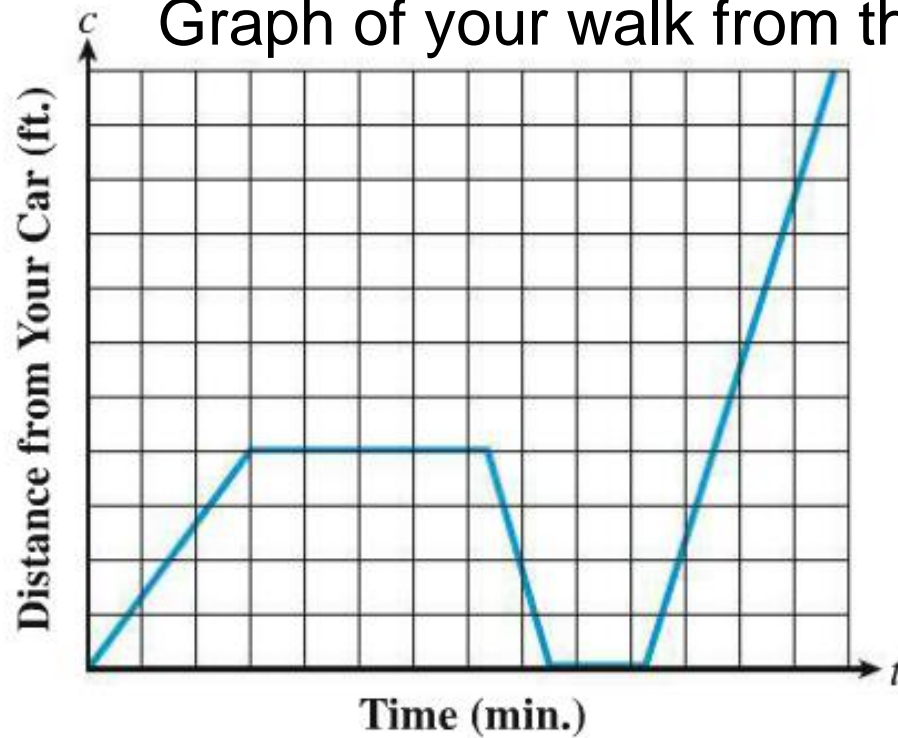
<u>units</u> of distance are in <u>feet</u>

<u>units</u> of distance are in <u>feet</u>

<u>assume</u> each time tic-mark is 1 min

<u>assume</u> each distance tic-mark is 1 ft ?!

Graph of your walk from the parking lot to the library.

Distance from Your Car (ft.)

Time (min.)

After ____min. of walking, you stopped for ~____ min.

It took you ___ min. to return to your car after you stopped.

You stayed at your car ____ min.

A Graph of a person's core body temperature
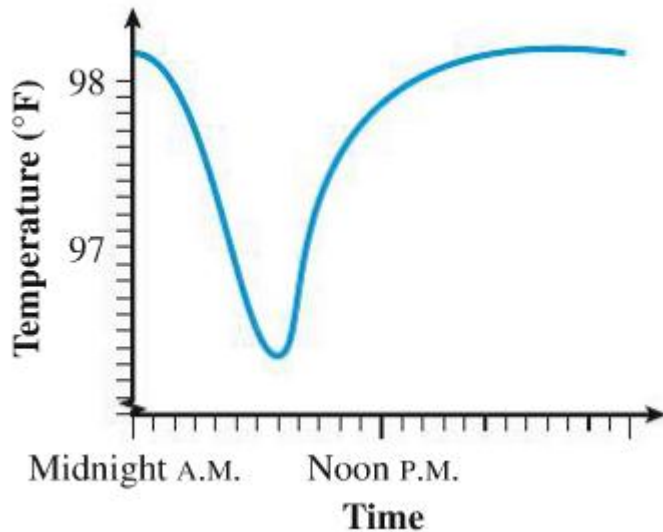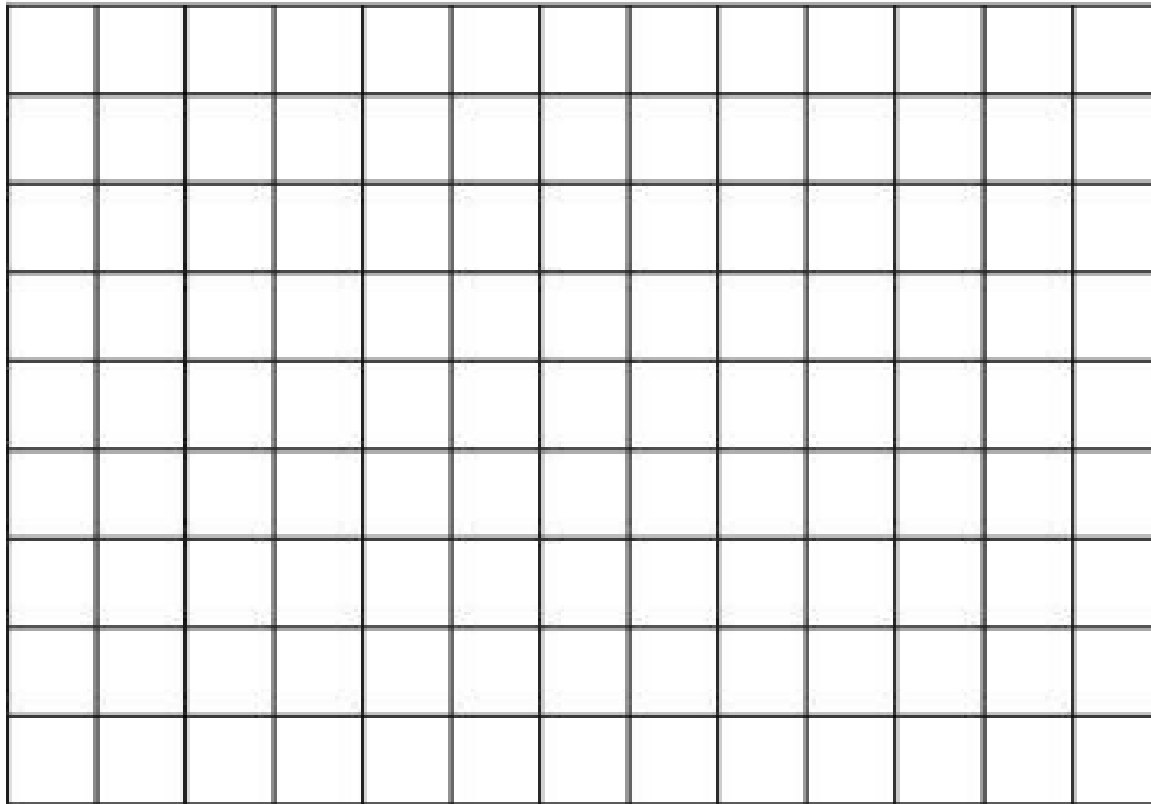

1) Describe in words what the graph is telling you.

2) ___ = f(___)

3) Independent variable: _____

4) Dependent variable: _____

You leave home on Friday afternoon for your weekend getaway. Heavy traffic slows you down for the first half of your trip but you make good time for the last half.

Graphically express your distance from home as a function of time.

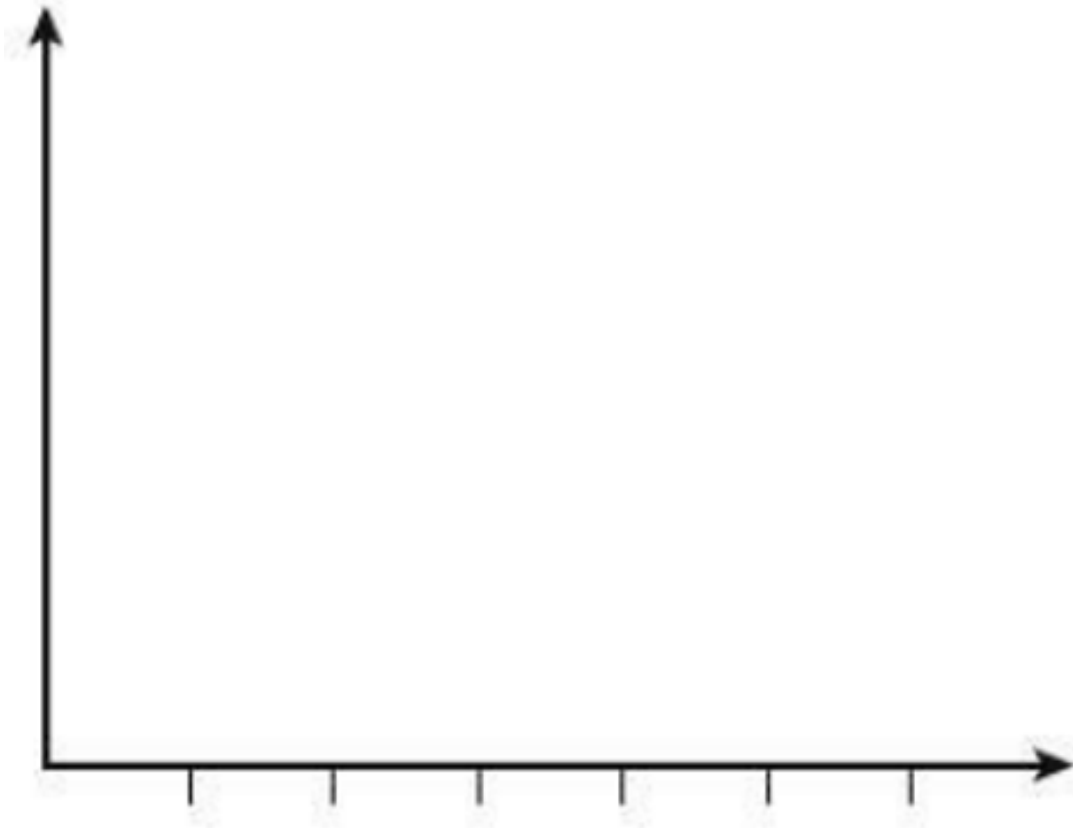Your new job pays $10 per hour. After 6 months, you receive a promotion that gives you a wage increase of $5 per hour.

1) Sketch a graph of your wage over your first year.
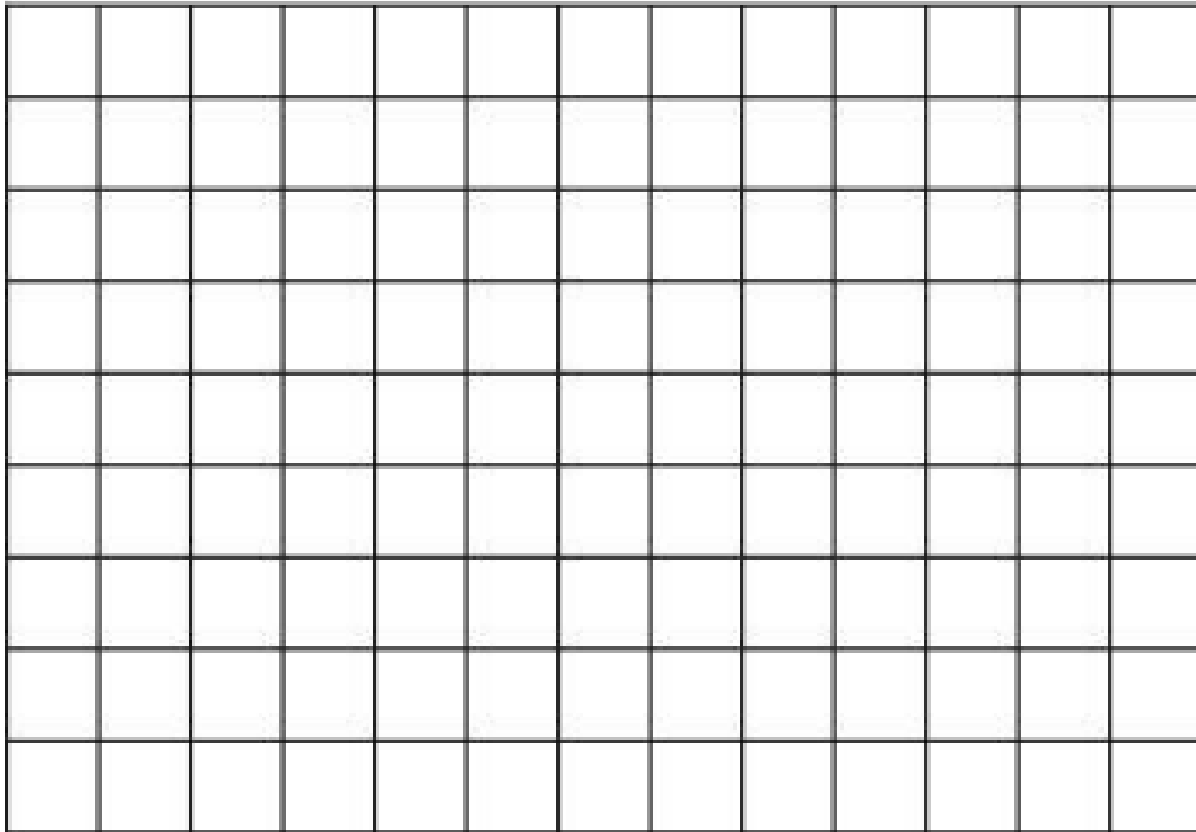
Hair grows at a steady rate. Suppose you get your hair cut every month. Measure the longest hair on your head. Graph your hair length over the course of 6 months.

Time (min)	8:03 AM	8:04 AM	8:05 AM	8:06 AM	8:07 AM
Height (ft)	36,000	32,800	29,600	26,400	23,200

Notice how this date doesn't start at zero.

To write an equation, you need a y-intercept.

It is often easier to change the time to read "time <u>since</u>" some reference point.

Time (min) (since 8:03 AM)	0	1	2	3	4
Height (ft)	36,000	32,800	29,600	26,400	23,200

Time (min)	0	1	2	3	4
Height (ft)	36,000	32,000	28,000	24,000	20,000

(The table shows the altitude of an airplane.)

write equation: y = mx + b

→ what is the slope? $m = \dfrac{rise}{run} \qquad = \dfrac{-4000\ ft}{min}$

What is the y-intercept ?   (0, b)   (0, 36000)

y = -4000x + 36000

TEST your equation.   32,000 = -4,000(1) + 36,000

Equation is "true"

Year	1990	1992	1994	1996	1998
Imports (Billions $)	52	55	58	61	64

(This table shows imports for various years.)

write equation: $y = mx + b$

→ what is the slope?

Rise = $55B - $52B = $3B

Run = 1992 – 1990 = 2 years

$$m = \frac{rise}{run} = \frac{\$3\,B}{2\,yrs}$$

$$m = \frac{\$1.5\,B}{yrs}$$

What is the y-intercept ?   → (0, b)

The year "zero" ??!!

(Change year to "years since 1990")

Yrs. Since 1990	0	2	4	6	8
Imports (Billions $)	52	55	58	61	64

(This table shows imports for various years.)

write equation: y = mx + b

→ what is the slope?

Rise = $55B - $52B = $3B

Run = 1992 – 1990 = 2 years

$$m = \frac{rise}{run} = \frac{\$3\,B}{2\,yrs}$$

$$m = \frac{\$1.5\,B}{yrs}$$

What is the y-intercept ?   → (0, b)

b = $52B

$$y = 1.5x + 52$$

What is the equation of the line that can represent this data?

Time (min)	0	1	2	3	4
Height (ft)	500	450	400	350	300

Year	1900	1910	1920	1930	1940
Population (millions)	100	125	150	175	200

What is the equation of the line that can represent this data?

Time	11 AM	11:30 AM	12 PM	12:30 PM	1 PM
distance (miles)	50	75	100	125	150

Find the equation that "models" the data.

Time (yrs)	1987	1991	1995	1999	2003
Trade deficit (Billions of $'s)	36.0	32.8	29.6	26.4	23.2
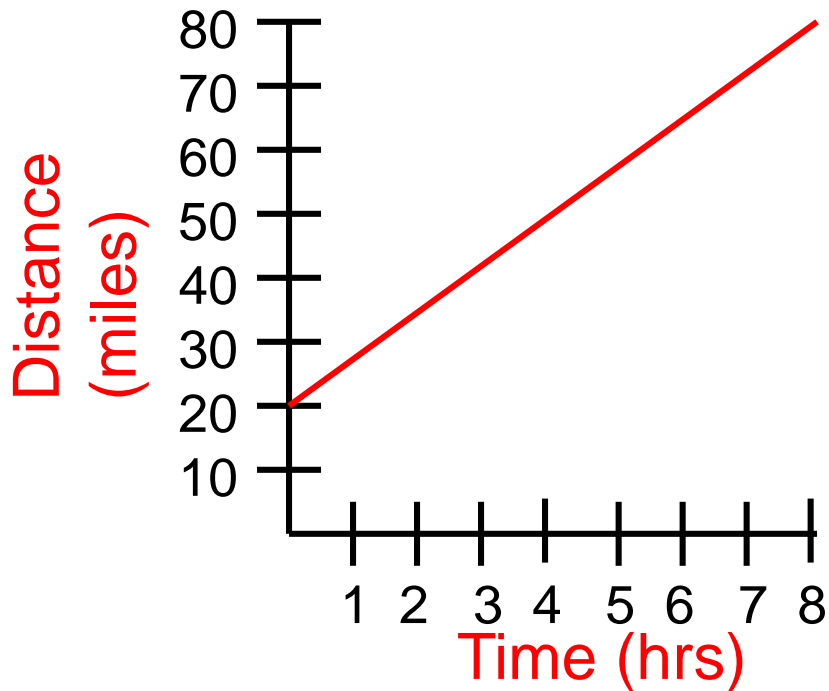
Write the equation: y = mx + b

What are the "units" of slope for this problem?

Slope: (0, 20) → (8, 80)

$$m = \frac{rise}{run} = \frac{60\,\text{miles}}{8\,\text{hrs}}$$

$$m = 7.5\ \frac{miles}{hr}$$

$$y = 7.5\,x + 20$$

Your parents are paying "big bucks" for your health club membership. You go to the health club 4 days/week. The time it takes to walk/run 3 miles at the end of each week has been graphed. Write an equation for the relation.

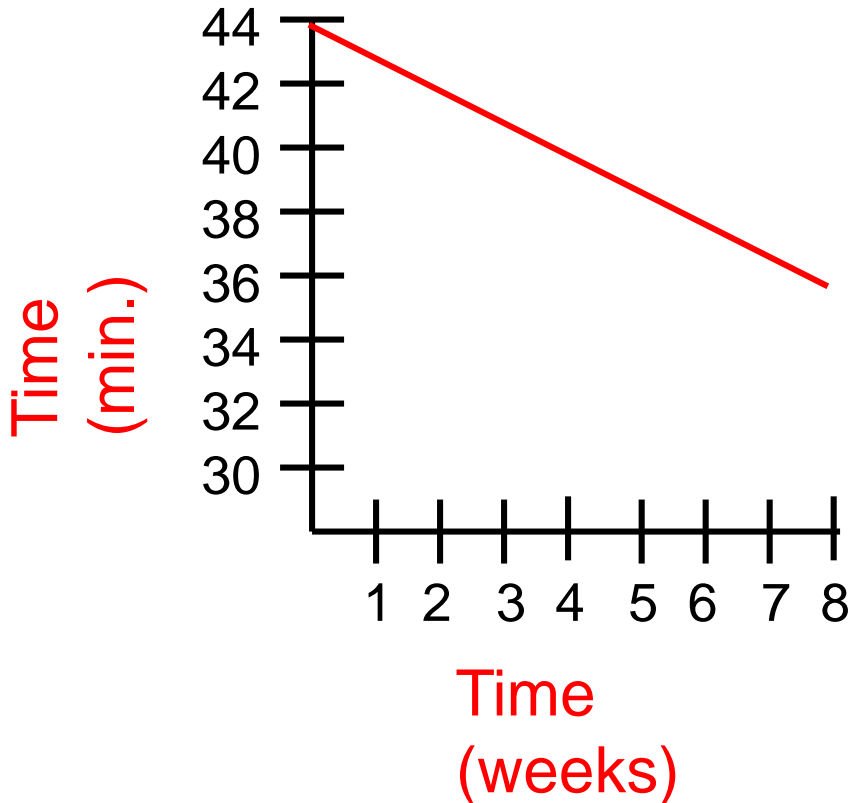$$y = mx + b$$

Slope: $(0, 44) \rightarrow (8, 36)$

$$m = \frac{rise}{run} = \frac{-8 \, \text{min}}{8 \, \text{weeks}}$$

$$m = -1 \, \frac{\text{min}}{wk}$$

$$y = -x + 44$$

Time (min.)

44
42
40
38
36
34
32
30

1 2 3 4 5 6 7 8

Time (weeks)

During the first 5 weeks of your exercise program you record your weight.

End of Week, w	0	1	2	3	4	5
weight, y (lb.)	186	183	180	177	174	171

Determine the average rate of change of your weight during the 5-week period.

Assuming your weight loss will continue at the same rate, write an equation that relates your weight to the number of weeks on the exercise program.

You decide to buy a new Honda Civic, but you are concerned about the value of the car depreciating over time. You search the Internet and obtain the following information.

Suggested Retail Price: $20,905
Depreciation per year: $1750 (assume constant)

1) What does this mean?

2) Complete the table.
"V" is the value of the car after "n" years of ownership

n (years)	0	1	2	3	5	8
V, ($)	20,905	19,155	17405	15,655	12,155	6905

3) Write the equation that predicts the value of the car based upon its age in the year.

A car rental company charges: $60 per day plus $0.75 per mile

You decide the rent the car for a day. Fill in the remainder of the table.

Write the equation that predicts the cost of renting the car based upon how many miles are driven.

$$C_A(m) = 0.75m + 60$$

"m" miles	Total Cost
0	
50	
100	
150	
200	
250	
300	

How much would your bill be if you drove the car 525 miles?

Hamburgers cost $5 and drinks cost $2.

If you can spend a total of $50, fill in the total number of hamburgers and drinks that you can buy.

Write and equation for this table.

Hamburgers	drinks
0	
2	
4	
6	
8	
10	

$$D = -\frac{5}{2}H + 25$$