

5.9: Applications of Linear Equations

1. Stacey works for \$8 per hour. Make a table of values to show how much she earns for working 0 to 5 hours.

a)

Time(h)	Amount earned (\$)
0	0
1	8
2	16
3	24
4	32
5	40

→ initial (b)

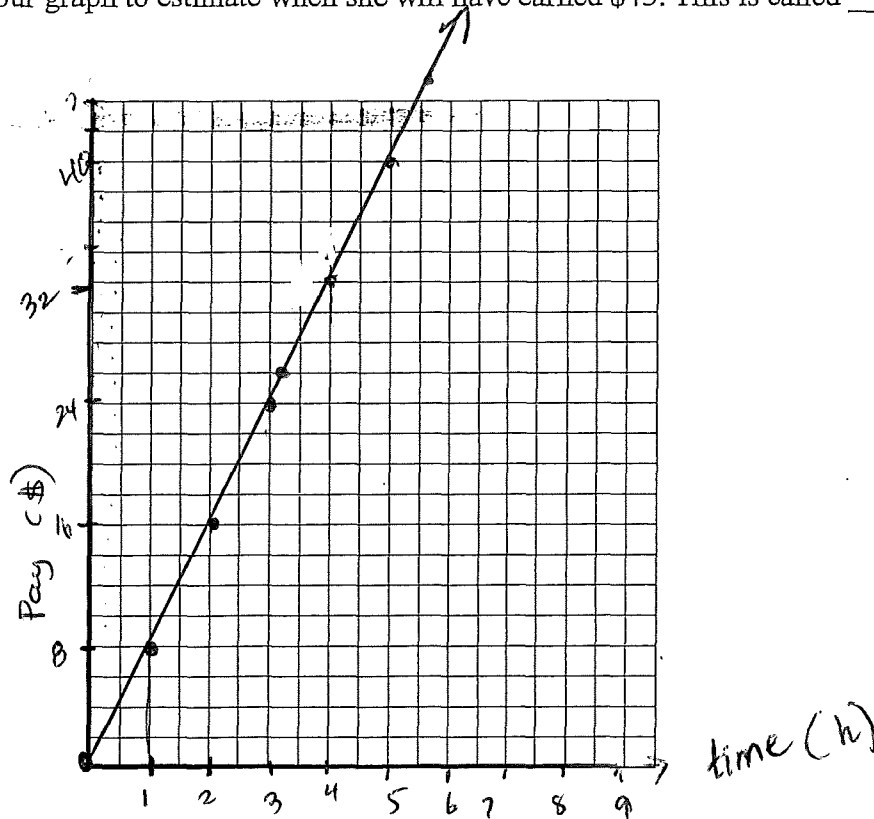
- b) Graph this relation.

- c) Use your graph to estimate when Stacey will have earned \$26. This is called interpolation

- d) Use your graph to estimate when she will have earned \$45. This is called extrapolation.

(3 hours, 12 mins)

(5 hours, 42 mins)



- e) An equation that describes Stacey's earnings is $y = 8x$.

$E = 8t$, t is time in hours
 E is earnings (\$)

2. Martin bought a new car for \$22500. The car depreciates (goes down.) by \$2500 per year. Make a table of values to show the value of the car after 8 years.

a)

Time (years)	Value of the car(\$)
0	22500
1	20000
2	17500
3	15000
4	12500
5	10000
6	7500
7	5000
8	2500

$$m = -2500$$

$$b = 22500$$

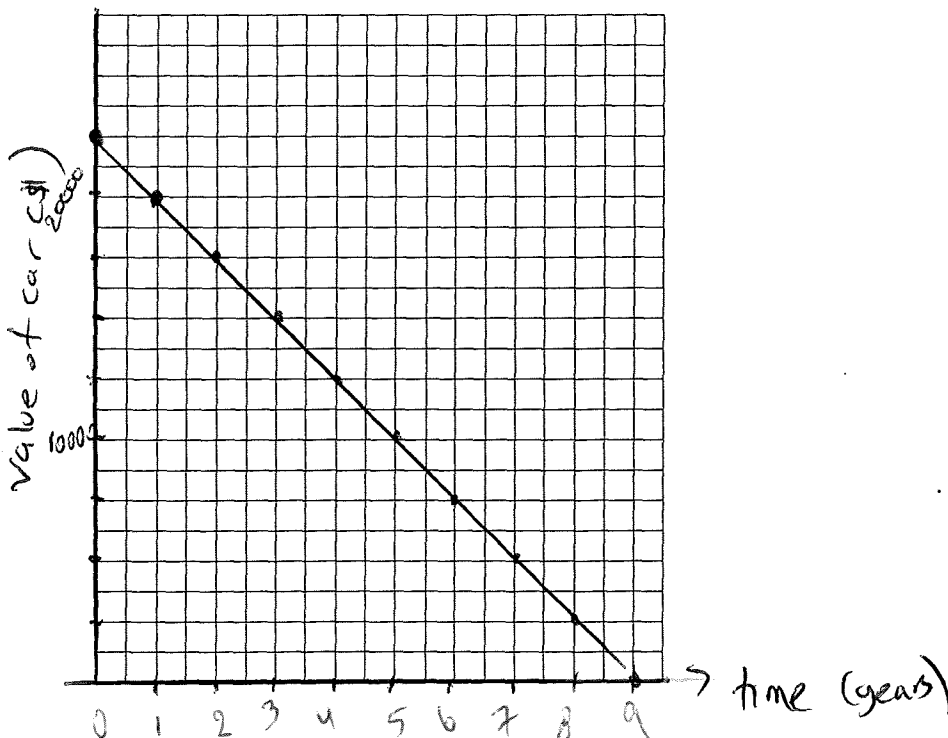
- b) Graph the relation.

- c) What is the price of a new car? 22500 Where is this on the graph? y-intercept (b)

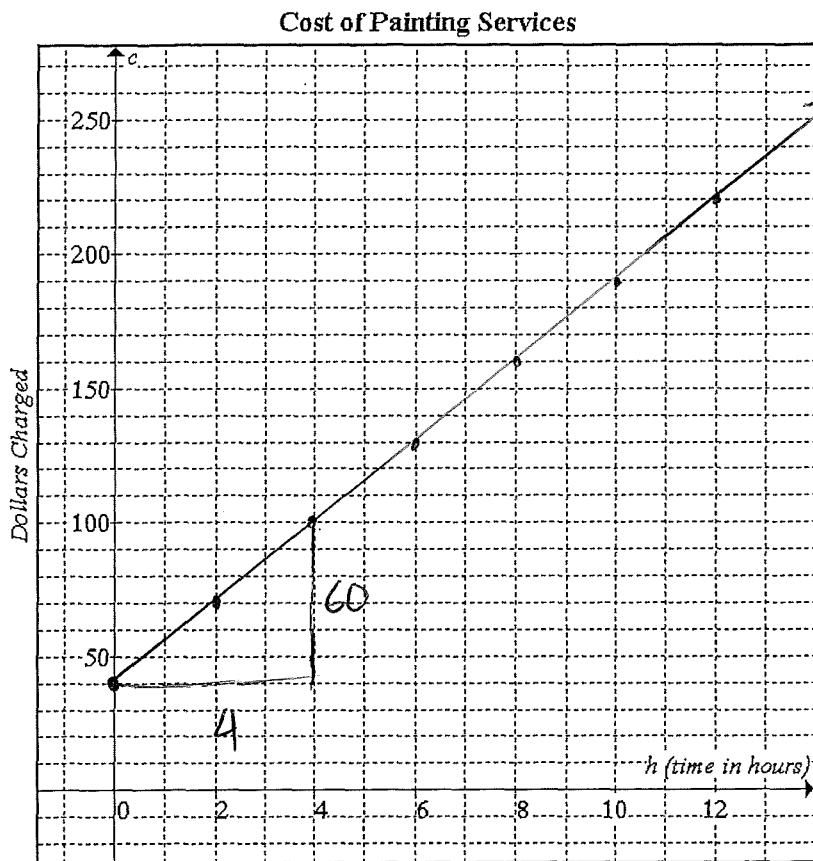
- d) What is the rate of depreciation? -2500/year. How is this depicted on the graph? m (slope)

- e) At what year will the value of the car be 0? 9 years.

- f) Give the equation that describes the linear relation. $V = -2500t + 22500$



1. a) A painter charges \$115 for 5 hours' work, \$85 for 3 hours' work and \$160 for 8 hours' work. Graph these 3 points on the grid below, *then draw a line through these points and extend it to the edge of the grid.*



Time (h)	Charge (\$)
0	40
1	55
2	70
3	85
4	100
5	115
6	130
7	145
8	160
9	175
10	190
11	205
12	220

→ initial fee

$$m = \frac{115 - 85}{5 - 3}$$

$$= \frac{30}{2}$$

$$= 15$$

b) Use the above graph to complete the table of values at right above.

c) Does the table entry for 12 h use *extrapolation* or *interpolation*?

interpolation

d) Does the table entry for 6 h use *extrapolation* or *interpolation*?

interpolation

e) Is *c* the *dependent* or *independent* variable?

dependent

f) Draw a rise/run triangle on the graph and calculate the slope:

$\frac{60}{4} = \$15/\text{hour}$

g) The slope describes the rate of change of cost per hour.

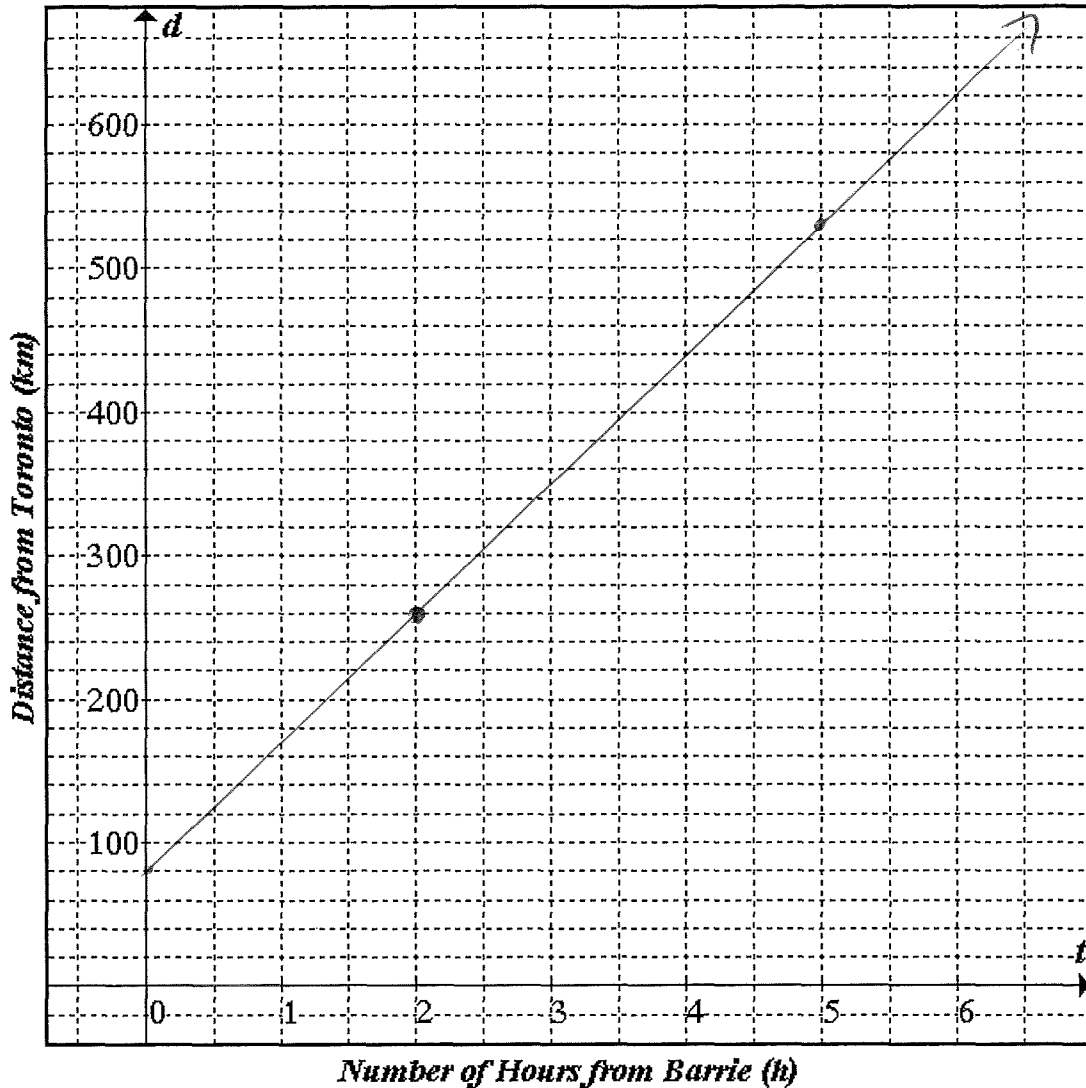
h) How does the *vertical*-intercept of the line describe the painter's fees?

initial fee.

i) State the equation of the line using *c* and *h* as the variables.

$C = 15h + 40$

2. Pixie is driving north from Toronto on Highway 400. She passes through the town of Barrie without stopping. Two hours after passing Barrie, she is 260 km from Toronto. Five hours after passing Barrie, she is 530 km from Toronto. Assuming that she is driving at a constant speed, complete the graph of her distance (d) from Toronto at time t hours after passing Barrie (assume $t = 0$ at Barrie).



t	d
0	80
1	170
2	260
5	530

$$m = \frac{530 - 260}{3} = 90$$

- a) Determine the slope of the line above.
- b) State the vertical intercept of the line.
- c) Determine the equation of the line using d and t as variables.
- d) What does the *vertical*-intercept of the graph tell you about the trip?
- e) How far from Barrie is Pixie when $t = 1$?
- f) What does the slope of the graph tell you about the trip?
- g) The slope describes the rate of change of distance per hour.

$$m = \frac{530 - 260}{3} = 90$$

$$80$$

$$y = 90x + 80$$

started 80 km away.

170 km

90 km/hour (speed)

3. The cost of a pizza is based on the number of toppings chosen. If the equation $c = 1.25n + 9.00$ gives the cost (c) for the number of toppings (n), complete the table of values below:



Number of toppings (n)	0	1	2	3	4	5	6
Cost of Pizza (c)	9	10.25	11.50	12.75	14	15.25	16.50

- a) How much more does a 3 topping pizza cost than one with 2 toppings? \$ 11.50
- b) How much more does a 6 topping pizza cost than one with 5 toppings? \$ 16.50
- c) If this equation were graphed, what would be its slope? 1.25
- d) The slope represents the rate of change of cost per topping
- e) If this equation were graphed, what would be its vertical-intercept? 9
- f) What is the meaning of the vertical-intercept in this problem? charge without any toppings.

4. The cost of riding in a taxi is given by $t = 1.3k + 2.7$ where k is the number of kilometres driven.

Number of kilometres (k)	3	5	8	9	15
Total Cost (t) in dollars	6.60	9.20	13.10	14.40	22.20



- a) How much more does it cost to ride 8 km than 3 km? \$ 13.10 - 6.60 = 6.50
- b) How much more does it cost to ride 9 km than 8 km? 14.40 - 13.10 = 1.30
- c) If this equation were graphed, what would be its slope? 1.3
- d) The slope represents the rate of change of cost per km
- e) If this equation were graphed, what would be its vertical-intercept? 2.7
- f) What is the meaning of the vertical-intercept in this problem? \$2.70 is the initial charge (to call taxi)

5. A new car gradually depreciates (loses value) after it is purchased. In other words, the older the car gets, the less its value. Jeff buys a new car and its value y years after it was purchased is given by:
 $v = -2300y + 20700$ where v is the value of the car in dollars.

a) What is the value of Jeff's car 3 years after he purchases it?

$$\underline{\$13800}$$

b) What is the value of Jeff's car 1 year after he purchases it?

$$\underline{\$18400}$$

c) What is the value of Jeff's car when it was new?

$$\underline{\$20,700}$$

d) After how many years will the car be of no value?

$$\frac{20700}{2300} = 9 \text{ years}$$

e) At what rate is the car depreciating (losing value)?

$$\underline{2300} \text{ per } \underline{\text{year}}$$

6. Write an equation that suits the following situations:

Situation	Variables	Equation
A printing job costs \$200 plus \$25 per set.	c, s	$C = 25s + 200$
Photofinishing costs \$3 plus \$4 per set of 12 pictures.	c, s	$C = 4s + 3$
The amount of fuel in a gas tank is 72 litres minus the amount used which is 0.09 litres per kilometre driven.	a, d	$a = -0.09d + 72$
The cost of hiring a disc jockey for a dance is \$50 plus \$20 per hour.	c, h	$C = 20h + 50$

7. The rental fees for a hardwood floor sanding machine is given in the table:

Hours (h)	0	3	7	9
Cost (c) in \$	37	88	156	190

a) Assuming that time in hours is the independent variable (horizontal axis), use the formula for slope to calculate the slope from 3 to 7 hours.

$$\frac{156 - 88}{7 - 3} = 17$$

b) Calculate the slope from 3 to 9 hours.

$$\frac{190 - 88}{9 - 3} = 17$$

c) Give an equation for this linear relationship.

$$C = 17h + 37$$