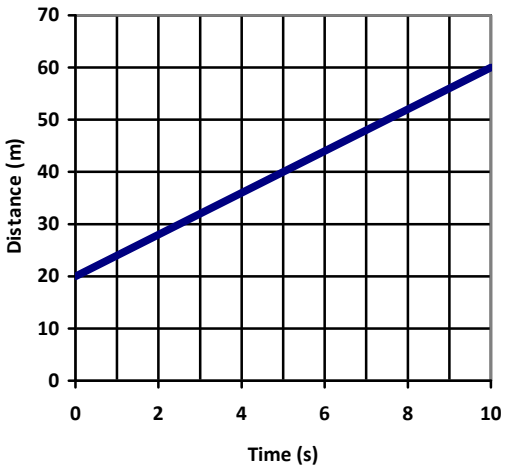
Rate of Change

Rate of Change = _____ = _____

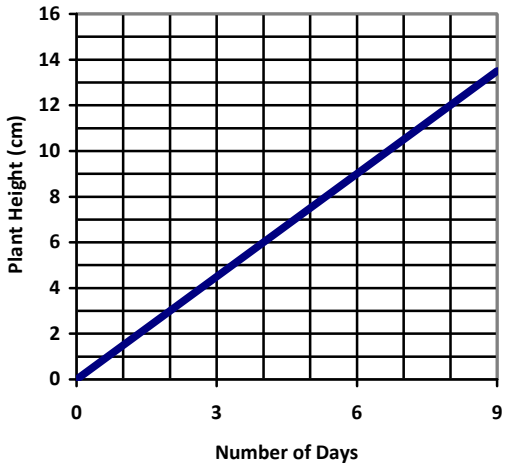
1 From a Graph

Determine the rate of change of each of the following:

a



b



2 From a Table of Values

Determine the rate of change of each of the following:

a

Time (h)	Distance (km)
0	12
1	15
2	18
3	21
4	24

b

# of Days	Money Earned
0	15.00
2	35.00
4	55.00
6	75.00
8	95.00

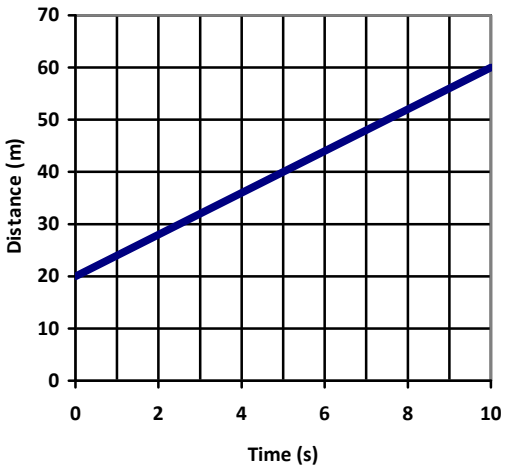
Initial Value

Initial Value is the _____ or the value where _____

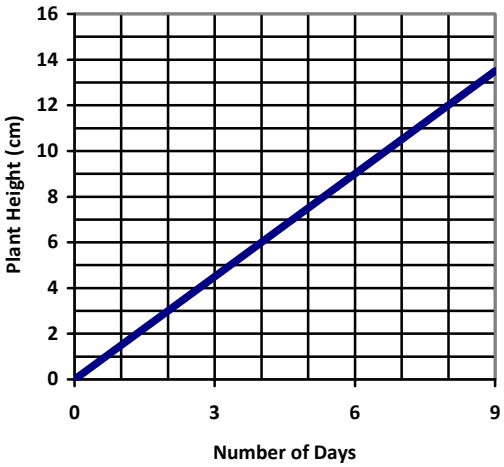
3 From a Graph

Determine the initial value of each of the following:

a



b



4 From a Table of Values

Determine the initial value of each of the following:

a

Time (h)	Distance (km)
0	12
1	15
2	18
3	21
4	24

b

# of Days	Money Earned
0	15.00
2	35.00
4	55.00
6	75.00
8	95.00

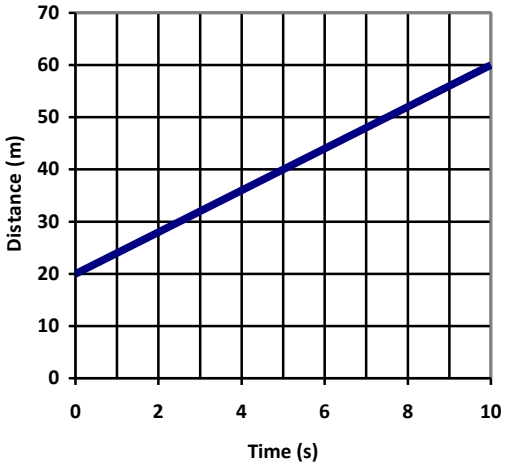
Equation of a Graph

The equation of a graph is _____

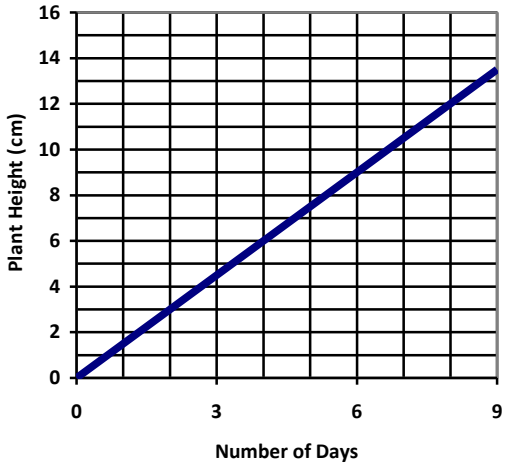
From a Graph

Determine the equation of each of the following:

a



b



From a Table of Values

Determine the equation of each of the following:

a

Time (h)	Distance (km)
0	12
1	15
2	18
3	21
4	24

b

# of Days	Money Earned
0	15.00
2	35.00
4	55.00
6	75.00
8	95.00

From a Description

Determine the equation of each of the following:

a Los the lawyer charges a $500 consultation fee and $250 per hour.

b Terrence the truck driver charges $50 for a trip plus $0.10 per kilometre.

Putting It All Together

The cost of hiring Philip the plumber is calculated using the equation **C = 50n + 100**, where n is then number of hours that he works.

a) Complete the following **table of values** for the equation:

Hours Worked	Cost
0	
1	
2	
3	

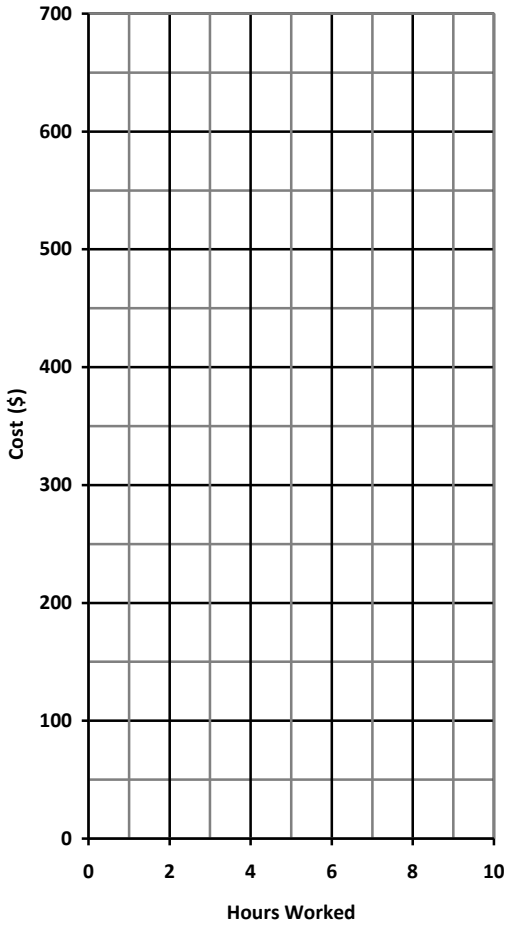
b) Make a **scatter plot** and draw a **line of best fit**.

c) Determine the **initial value** of the graph.

d) **Circle** in the table where the initial value is given.

e) **Circle** the part of the equation that matches the initial value.

f) Determine the **rate of change** of the graph.



g) **Underline** the part of the equation that matches the rate of change.

h) How can you identify in an equation which part is the initial value and which part is the rate of change?

9 The cost of hiring a birthday party service is shown below.

a) What is the initial value of the graph?

b) What does the initial value represent?

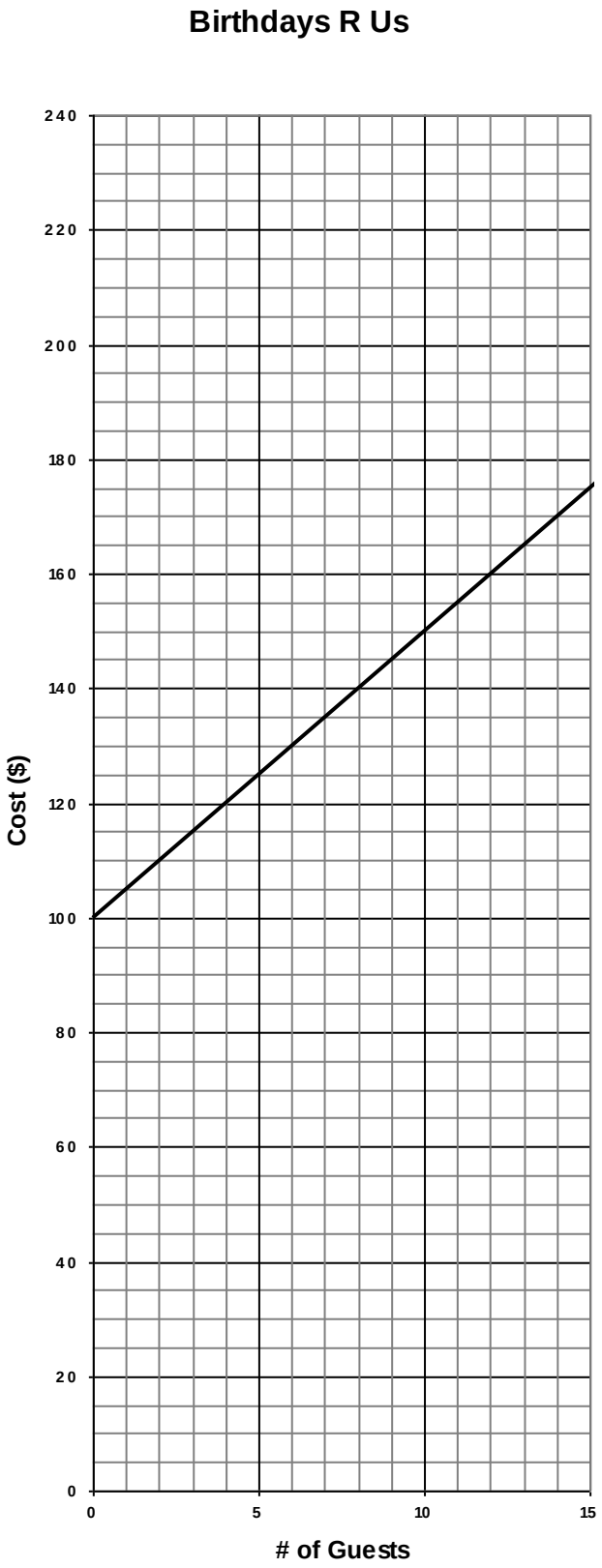
c) Calculate the rate of change?

d) What does the rate of change represent?

e) Write the equation for this graph.

f) How much would it cost if you invited 100 guests?

g) How many guests did you invite if it costs $1000?



10

Miranda babysits and charges a $10 transportation fee and $8 per hour.

a) Complete the following **table of values**.

b) Create a **scatter plot** and draw a **line of best fit**.

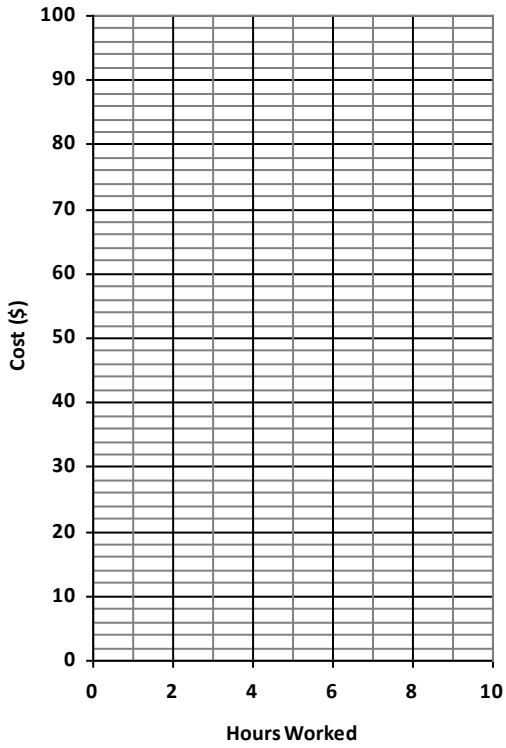
c) Determine the **initial value** of the graph:

Hours Worked	Cost
0	
1	
2	
3	

d) **Circle** in the <u>table</u> where the initial value is given.

e) **Circle** the <u>part of the question</u> that matches the initial value.

f) Calculate the **rate of change** of the graph:



g) **Underline** the <u>part of the question</u> that matches the rate of change.

11

Summary

	Graph	Table	Equation	Description
Initial Value				
Rate of Change				

Rate of Change

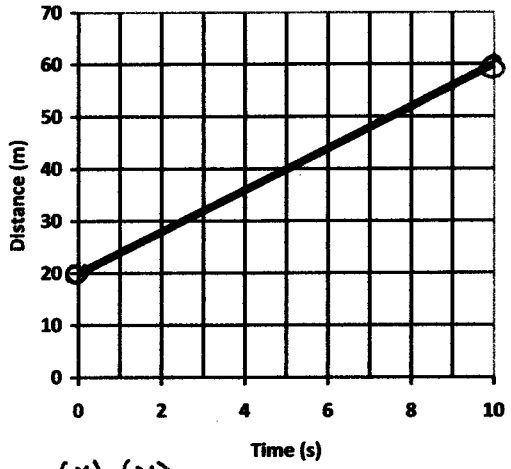
change in y

Rate of Change = $\frac{\Delta y}{\Delta x} = \frac{\text{rise}}{\text{run}}$

change in x

1 From a Graph

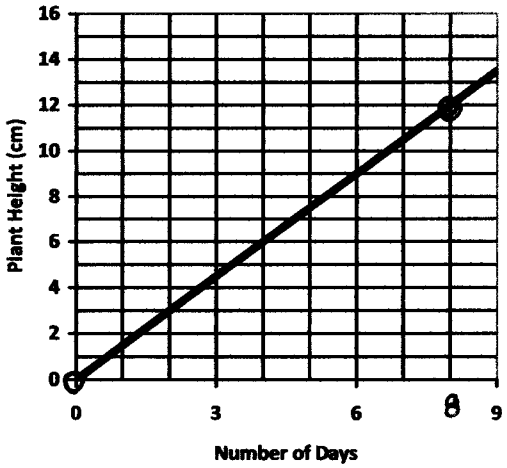
Determine the rate of change of each of the following:



(x) T	(y) D
0	20
10	60

+10, +40

$ROC = \frac{\Delta y}{\Delta x} = \frac{40}{10} = 4 \text{ m/s}$



d	H
0	0
8	12

+8, +12

$ROC = \frac{\Delta H}{\Delta d} = \frac{12}{8} = 1.5 \text{ cm/day}$

2 From a Table of Values

Determine the rate of change of each of the following:

Time (h)	Distance (km)
0	12
1	15
2	18
3	21
4	24

+1, +3; +1, +3; +1, +3

$ROC = \frac{\Delta D}{\Delta t} = \frac{3}{1} = 3 \text{ km/h}$

# of Days	Money Earned
0	15.00
2	35.00
4	55.00
6	75.00
8	95.00

+2, +20

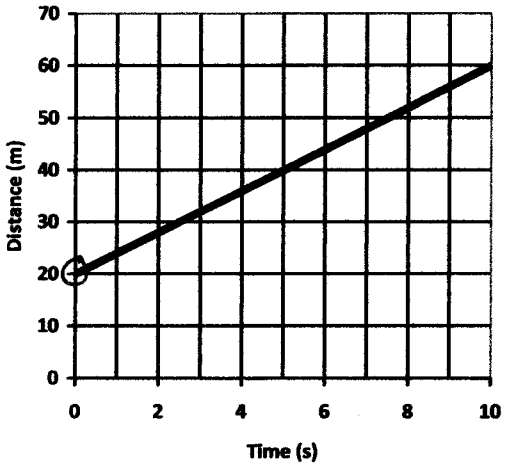
$ROC = \frac{\Delta M}{\Delta d} = \frac{20}{2} = 10 \text{ \$/hr}$

Initial Value

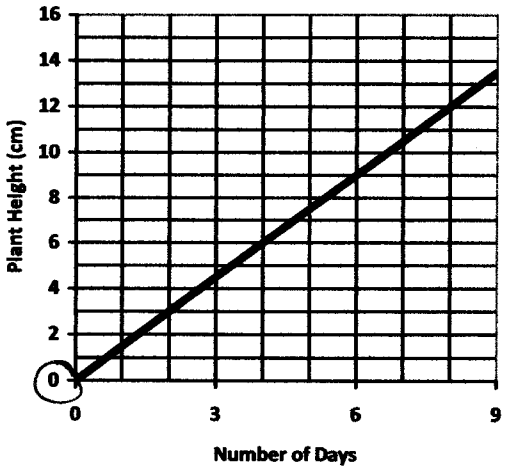
Initial Value is the starting amount or where the graph starts on y-axis (value where X=0)

3 From a Graph

Determine the initial value of each of the following:



IV = 20



IV = 0

4 From a Table of Values

Determine the initial value of each of the following:

Time (h)	Distance (km)
0	12
1	15
2	18
3	21
4	24

Look for X=0

IV = 12

# of Days	Money Earned
0	15.00
2	35.00
4	55.00
6	75.00
8	95.00

Look for X=0

IV = 15

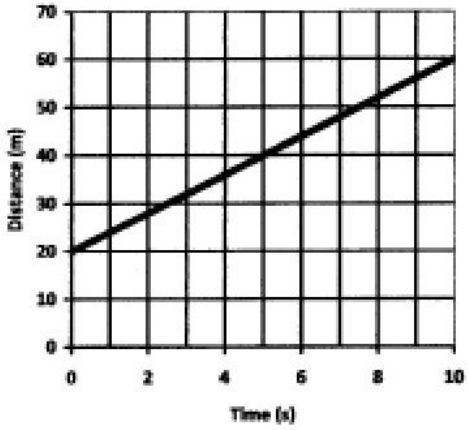
Equation of a Graph

The equation of a cost graph is $C = IV + ROC(n)$

$y = IV + ROC(x)$

5 From a Graph

Determine the equation of each of the following:



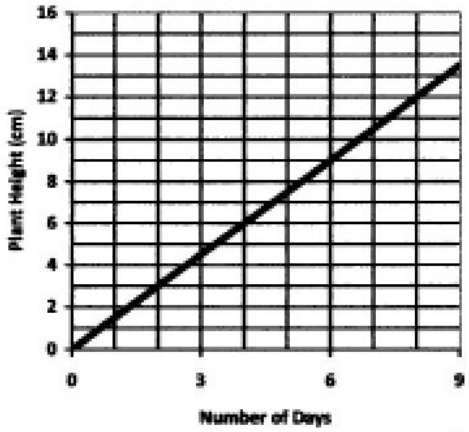
IV = 20

ROC = 4

$D = 20 + 4T$

or

$D = 4T + 20$



IV = 0 ROC = 1.5

$H = 0 + 1.5d$

or

$H = 1.5d + 0$

6 From a Table of Values

Determine the equation of each of the following:

Time (h)	Distance (km)
0	12
1	15
2	18
3	21
4	24

IV = 12

ROC = 3

$D = 12 + 3t$

# of Days	Money Earned
0	15.00
2	35.00
4	55.00
6	75.00
8	95.00

IV = 15

ROC = 10

$M = 15 + 10d$

7 From a Description

Determine the equation of each of the following:

a) Los the lawyer charges a $500 consultation fee and $250 per hour.

(IV: $500 consultation fee; ROC: $250 per hour)

let y be total fee
let x be # of hours
$\therefore y = 250x + 500$

b) Terrence the truck driver charges $50 for a trip plus $0.10 per kilometre.

(IV: $50 for a trip; ROC: $0.10 per kilometre)

let y be total charge
let x be # of kilometers
$\therefore y = 0.10x + 50$

9

Putting It All Together

The cost of hiring Philip the plumber is calculated using the equation $C = 50n + 100$, where n is then number of hours that he works.

a) Complete the following **table of values** for the equation:

Hours Worked	Cost	
0	100	50(0)+100 = 0+100
1	150	50(1)+100 = 50+100
2	200	50(2)+100 = 100+100
3	250	50(3)+100 = 150+100

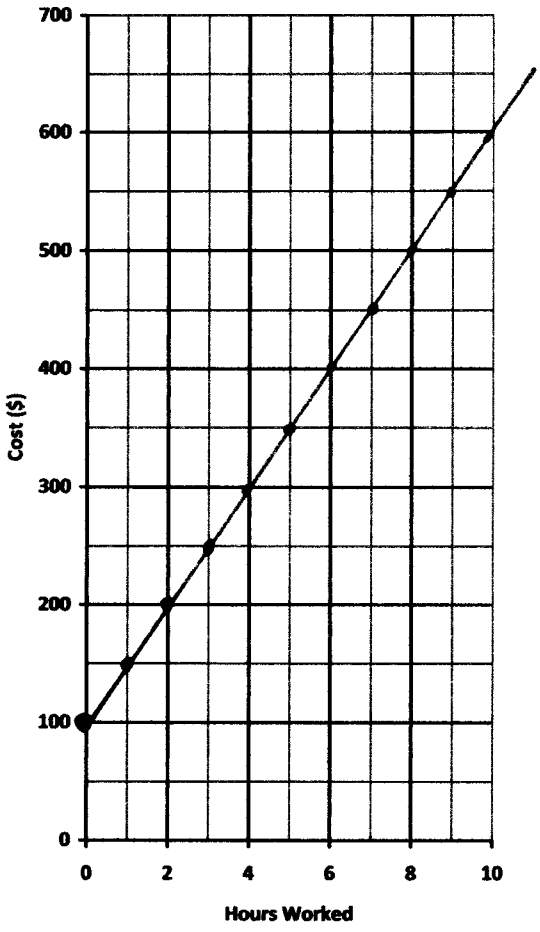
b) Make a **scatter plot** and draw a **line of best fit**.

c) Is this graph an example of **direct** or **partial** variation?

This is partial variation, since the initial value is $100

d) Determine the **initial value** of the graph.

$100



e) **Circle** in the table where the initial value is given.

f) **Circle** the part of the equation that matches the initial value.

g) Determine the **rate of change** of the graph.

h	C
0	100
2	200

+2 (0, 100), (2, 200) +100

$ROC = \frac{\Delta C}{\Delta h}$

$= \frac{100}{2}$

$= 50$ $/hour

h) **Underline** the part of the equation that matches the rate of change.

i) How can you identify in an equation which part is the initial value and which part is the rate of change?

The rate of change is infront of the n, while the initial value does not have a variable.

9 The cost of hiring a birthday party service is shown below.

a) What is the initial value of the graph?

$\$100^{00}$

b) What does the initial value represent?

The cost of booking the service

c) Calculate the rate of change?

#	C
0	100
5	125

+5 +25

$ROC = \frac{\Delta C}{\Delta n}$

$= \frac{25}{5}$

$= \$5/\text{guest}$

d) What does the rate of change represent?

The cost per guest

e) Write the equation for this graph.

$C = 100 + 5n$

f) How much would it cost if you invited 100 guests?

$C = 100 + 5(100)$

$C = 100 + 500$

$C = \$600$

$\therefore$ It will cost $\$600^{00}$

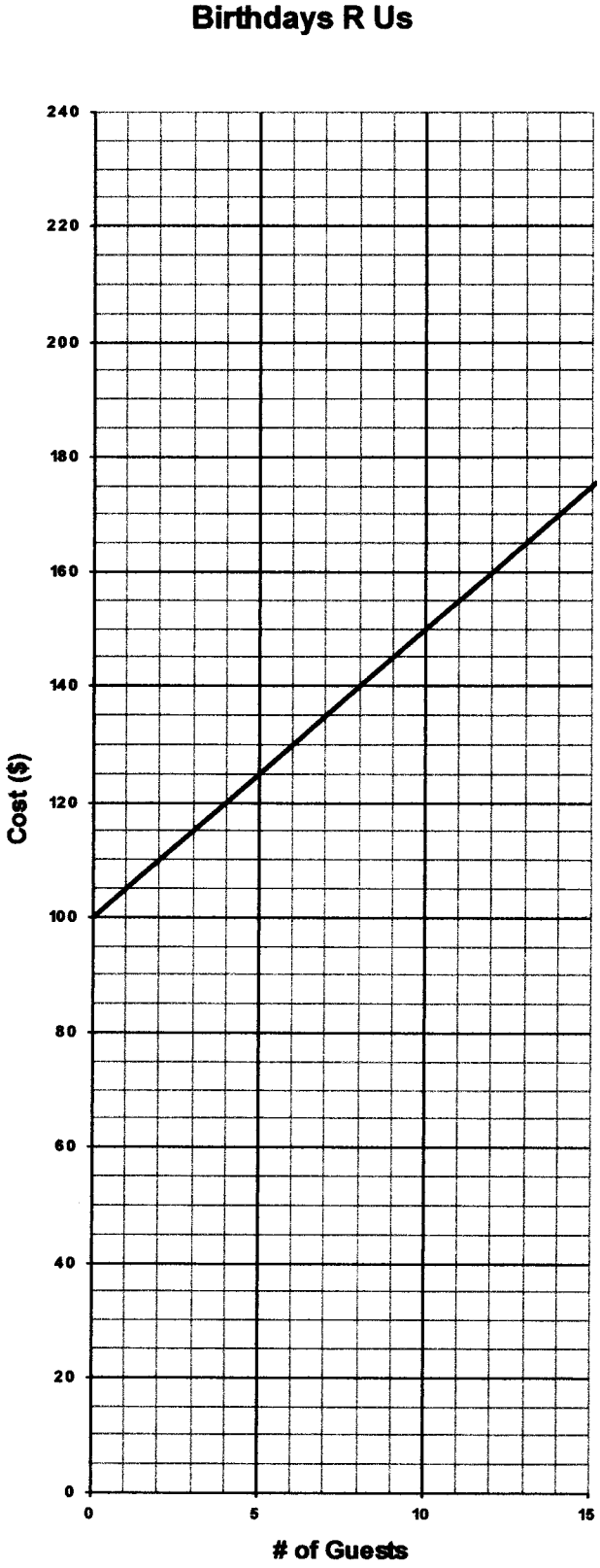
g) How many ~~hours did you hire them for~~ guests did you invite if it costs $1000?

$1000 = 100 + 5n$ (−100 −100)

$900 = 5n$

$180 = n$

$\therefore$ you invited 180 guests



10

Question

Miranda babysits and charges a $10 transportation fee and $8 per hour.

a) Complete the following **table of values**.

b) Create a **scatter plot** and draw a **line of best fit**.

c) Determine the **initial value** of the graph:

$10

d) **Circle** in the table where the initial value is given.

e) **Circle** the part of the question that matches the initial value.

f) Calculate the **rate of change** of the graph:

$ROC = \frac{\Delta y}{\Delta x}$

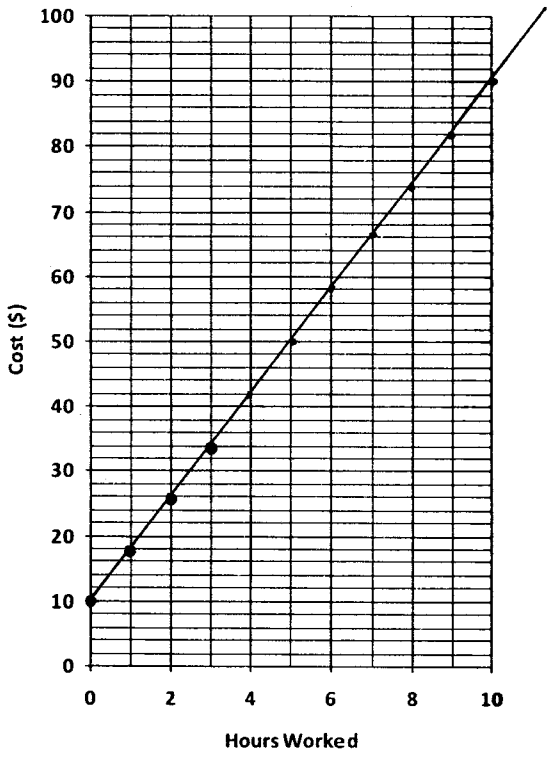
$= \frac{8}{1}$

$= \$8/\text{hour}$

g) **Underline** the part of the question that matches the rate of change.

Hours Worked	Cost
0	10
1	18
2	26
3	34

+1 (1 → 2) +8



11

Summary

	Graph	Table	Equation	Description
Initial Value	Where the graph starts on the y-axis (where x=0)	Find entry where x=0	Part of the equation with no variable	• Doesn't have the word "per" • Gets charged only once.
Rate of Change	• Choose 2 Points • Calculate the differences • Calculate $\frac{\Delta y}{\Delta x}$	⟸ Same	Part of the equation with a variable	• Look for the word "per" • Gets charged multiple times