

## Direct Variation & Partial Variation

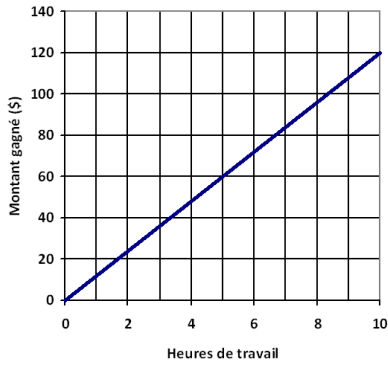
Direct Variation

- Passes through (0, 0) / origin
- Does NOT have an initial value / fixed cost

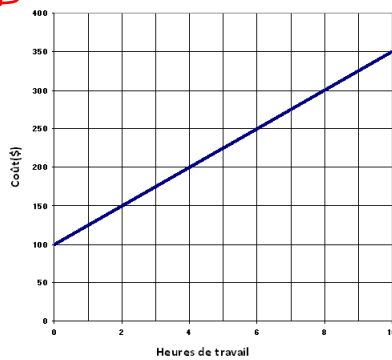
Partial Variation

- Does NOT pass through (0, 0) / origin
- Has an initial value / fixed cost

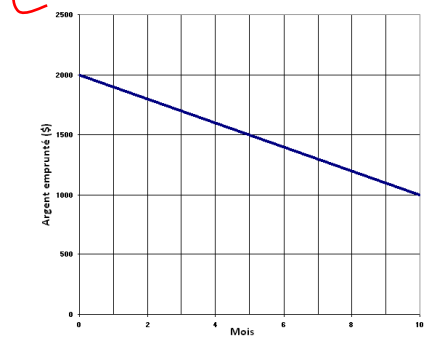
For each of the following, determine if it is an example of a direct variation or a partial variation.



Direct / Partial



Direct / Partial



Direct / Partial

*d*

A painter charges \$50 per hour.

Direct / Partial

*e*

A moving company charges a fixed cost of \$100 plus \$75 per hour.

Direct / Partial

*f*

A banquet hall charges \$700 for the rental and \$30 per person.

Direct / Partial

*g*

Hours	Cost
0	0
1	10
2	20
3	30

Direct / Partial

*h*

Hours	Cost
0	0
1	15
2	30
3	45

Direct / Partial

*i*

Hours	Cost
0	40
1	90
2	140
3	190

Direct / Partial

*j*

$$C = 6n + 100$$

Direct / Partial

*k*

$$C = 25n$$

Direct / Partial

*l*

$$C = 70 - 10n$$

Direct / Partial

2 Scarlett and Thomas both have jobs working at different stores in the mall. If they both work a 5 hour shift, they each earn \$100.

a) Predict how much you think they will each earn if they work a 10 hour shift.

b) Scarlett earns \$20 per hour at her job. Complete the following table to show her earnings.

Hours Worked	0	1	2	3	4	5	6	7	8	9	10
Money Earned											

c) Thomas earns \$40 each shift, plus \$12 per hour. Complete the following table to show his earnings.

Hours Worked	0	1	2	3	4	5	6	7	8	9	10
Money Earned											

d) Was your prediction for both Scarlett and Thomas correct? Explain.

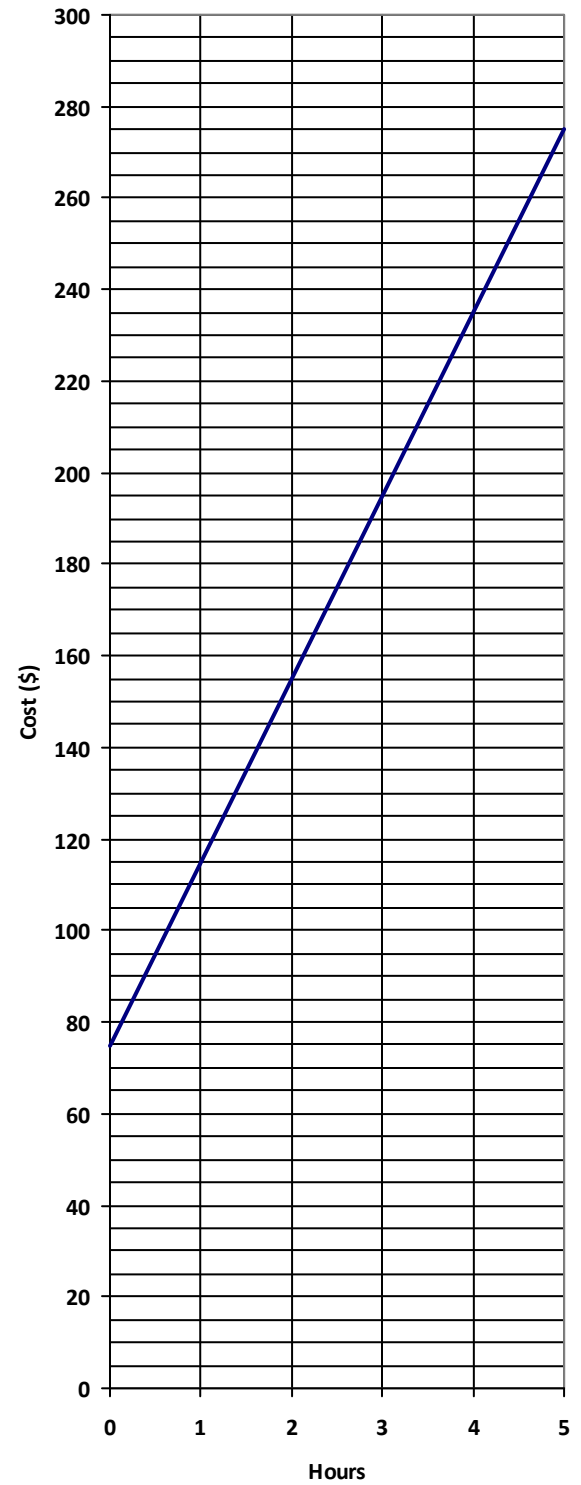
e) Determine which of the following is a direct variation and which is a partial variation. Explain.

Kelly earns \$50 when she works 5 hours, and \$80 when she works 8 hours.

A moving company charges \$270 for a 3 hour move and \$390 for a 5 hour move.

3 The following graph shows the cost to hire a mechanic, where  $C$  is the cost and  $n$  is the number of hours worked.

- a) Is this an example of direct or partial variation? Justify your answer.
  
- b) What is the fixed cost? What does it represent?
  
- c) What is the rate of change? What does it represent?
  
- d) Write an equation for the relation.
  
- e) Predict the cost of repair if the mechanic worked for 10 hours.
  
- f) How long did the repairs take if it costs \$365.00 to repair your car?



## Tricky Questions

4 Determine the initial value of each of the following and state whether it is an example of direct or partial variation.

a

Temperature (°C)	Height (cm)
-4	3
-2	8
0	13
2	18
4	23

b

Hours Worked	Money Earned
1	10
2	20
3	30
4	40
5	50

c

X	Y
-9	200
-3	170
3	140
9	110
15	80

5 Determine the missing values in the following tables. State whether it is an example of direct or partial variation.

a

# of People	Cost
0	200
10	
20	
30	
40	1000

b

Hours	Temperature
0	
2	15
	18
7	25
15	

# Types of Variation

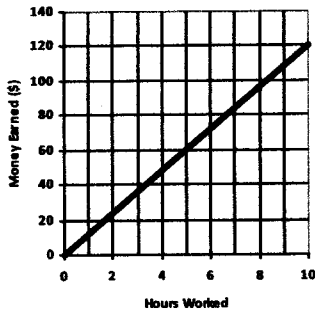
## Direct Variation

No flat fee or initial cost.

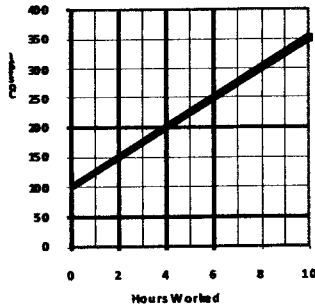
## Partial Variation

Has a flat fee or initial cost.

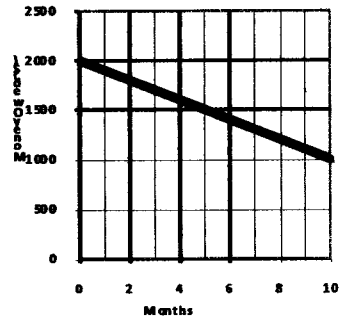
For each of the following, determine whether they are examples of direct or partial variation.



Direct / Partial



Direct / Partial



Direct / Partial

A painter charges \$50 per hour.

Direct / Partial

A moving company charges a fee of \$100 plus \$75 per hour.

Direct / Partial

A banquet hall charges a \$700 booking fee and \$30 per person.

Direct / Partial

Hours	Cost
0	0
1	10
2	20
3	30

Direct / Partial

Hours	Cost
0	0
1	15
2	30
3	45

Direct / Partial

Hours	Cost
0	40
1	90
2	140
3	190

Direct / Partial

$$C = 6n + 100$$

Direct / Partial

$$C = 25n$$

Direct / Partial

$$C = 70 - 10n$$

Direct / Partial

## Variation – Why Does It Matter?

2 Scarlett and Thomas both have jobs working in different stores at the mall. If they both work for a 5 hour shift, they each earn \$100.

a) Predict how much you think they will each earn if they work a 10 hour shift.

$$100 \times 2 = \$200$$

$\therefore$  I predict that they will earn \$200<sup>00</sup>

b) Scarlett earns \$20 per hour. Complete the following table showing her earnings.

Hours Worked	0	1	2	3	4	5	6	7	8	9	10
Money Earned	0	20	40	60	80	100	120	140	160	180	200

c) Thomas earns \$40 each shift, plus \$12 per hour. Complete the following table showing his earnings.

Hours Worked	0	1	2	3	4	5	6	7	8	9	10
Money Earned	40	52	64	76	88	100	112	124	136	148	160

d) Was your prediction correct for both Scarlett and Thomas? Explain.

No. My prediction was correct for Scarlett, but not for Thomas. Thomas is partial variation.

e) Determine which of the following are direct variation, and which are partial.

i) Kelly earns \$50 when she works 5 hours, and \$80 when she works 8 hours.

$$\frac{50}{5} = 10 \checkmark \quad \frac{80}{8} = 10 \checkmark$$

$\therefore$  Direct Variation

ii) A moving company charges \$270 for a 3 hour move and \$390 for a 5 hour move.

$$\frac{270}{3} = 90 \quad \frac{390}{5} = 78$$

$\therefore$  Partial Variation

3 The following graph shows the cost of hiring a mechanic, where C is the cost and n is the number of hours that the mechanic spends working on your car.

a) Is this an example of direct or partial variation? Justify your answer.

Partial Variation. The graph does not start at (0,0)

b) What is the initial value of the graph? What does it represent?

\$75.00

The service fee to bring the car in.

c) What is the rate of change of the graph? What does it represent?

h	C
0	75
2	155

+2 (2 | 155) + 80

$$\begin{aligned} \text{ROC} &= \frac{\Delta C}{\Delta h} \\ &= \frac{80}{2} \\ &= \$40/\text{hr.} \end{aligned}$$

This is the cost per hour for labour.

d) Write the equation of the cost.

$$C = 75 + 40h$$

e) Predict the cost if it takes 10 hours to repair your car.

$$C = 75 + 40(10)$$

$$C = 75 + 400$$

$$C = \$475$$

∴ It will cost \$475.

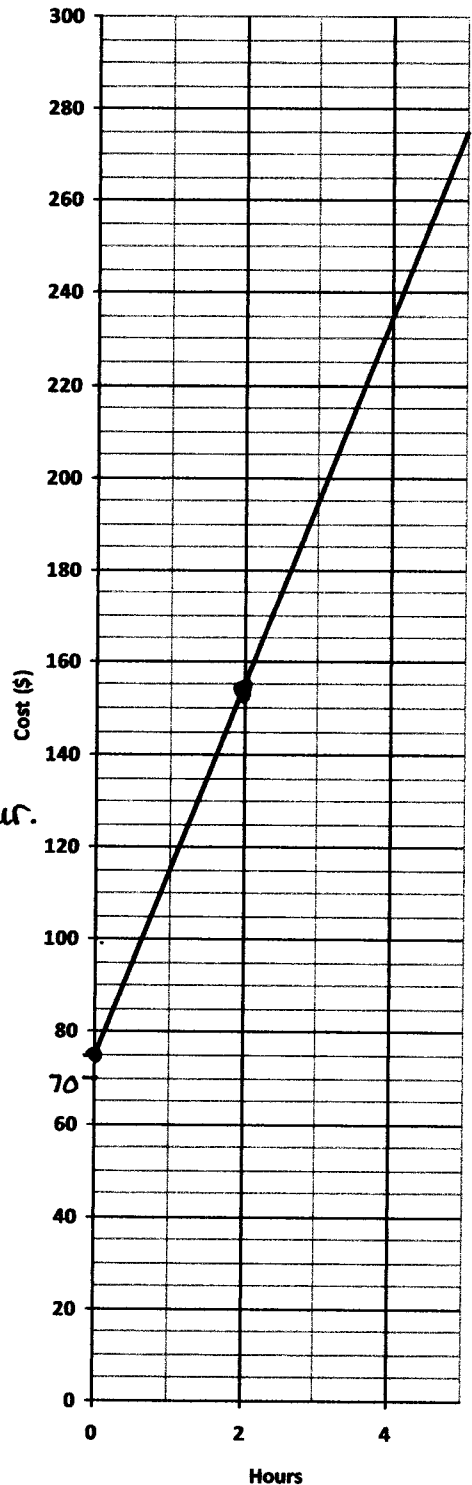
f) How long did the repairs take if it cost \$365.00 to repair your car?

$$365 = 75 + 40h$$

$$290 = 40h$$

$$7.25 = h$$

∴ It took 7.25 hours



## Tricky Questions

4

Determine the initial value of each of the following and state whether it is an example of direct or partial variation.

Temperature (°C)	Height (cm)
-4	3
-2	8
0	13
2	18
4	23

IV = 13 cm

Partial Variation

Hours Worked	Money Earned
1	10
2	20
3	30
4	40
5	50

IV = \$5

~~Partial~~ Variation  
Direct

X	Y
-9	200
-3	170
3	140
9	110
15	80

IV = 155

Partial Variation.

5

Determine the missing values in the following tables:

# of People	Cost
0	200
10	400
20	600
30	800
40	1000

$$ROC = \frac{800}{40}$$

$$= 20 \text{ \$ / person}$$

$$C = 200 + 20n$$

$20 \times 10 = 200$

Partial Variation.

Hours	Temperature
0	11
2	15
3.5	18
7	25
15	41

$$ROC = \frac{10}{5}$$

$$= 2^\circ\text{C/hr}$$

$$C = 11 + 2n$$

Partial Variation.