MATHEMATICS · GRADES 7-9

Direct and Partial Variation

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you tell a pure per-item cost from a cost with a starting fee. Apples priced by the kilogram cost nothing if you buy nothing, but a taxi fare starts with a flag drop before you travel a single metre. Knowing which kind you are dealing with tells you whether the total starts at zero or at a set amount. It is the difference between a bill that is all usage and a bill that has a base charge.



Rule

Direct variation passes through (0, 0): y = kx, with no added constant.

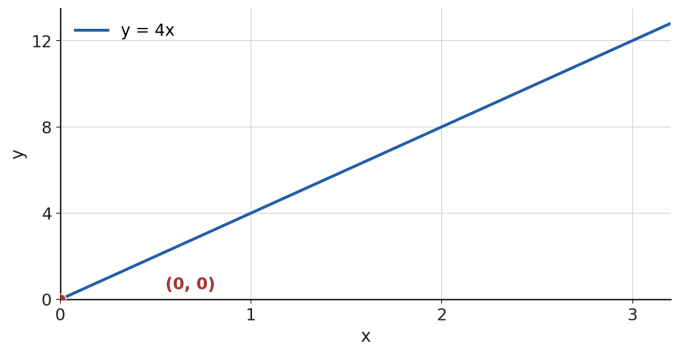
Partial variation has an added starting value: y = mx + b, so when x is 0, y is b, not 0. Check for the added constant to tell them apart. The amount the cost goes up by for each extra unit of x is called the rate of change. That starting value is also called the initial value: it is what y is when x is 0.

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Worked examples

EXAMPLE 1

Q Is y = 4x direct or partial variation?



SOLUTION

Check for a starting value: there is no added constant.

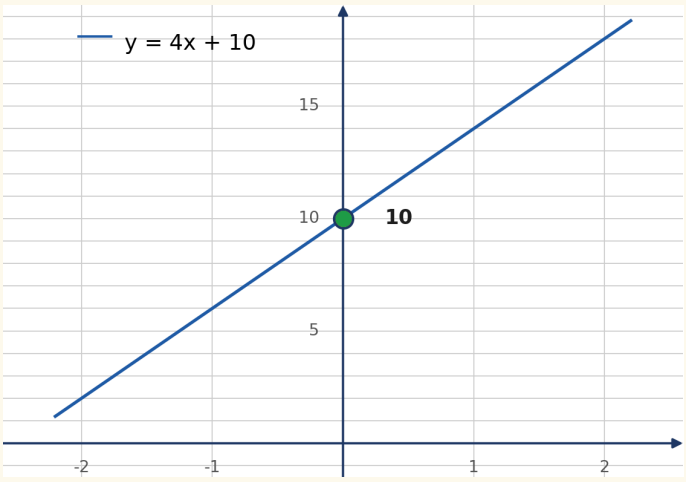
The line passes through (0, 0), since 4 × 0 = 0

It is direct variation.

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EXAMPLE 2

Q Is y = 4x + 10 direct or partial variation?



SOLUTION

Check for a starting value: there is an added 10.

When x = 0, y = 10, not 0.

It is partial variation.

Practice questions

1 Apples cost $3 per kilogram, with no starting fee. Is the cost direct or partial variation?

A Partial

B Direct

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2 A taxi charges a $10 flag drop plus $2 per kilometre. Is the fare direct or partial variation?

- **A** Partial
- **B** Direct

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3 The table shows hours worked and pay. Is the pay direct or partial variation?

Hours worked and pay

Hours worked	Pay
0	$0
1	$15
2	$30
3	$45

- **A** Partial
- **B** Direct

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4 A phone plan costs $20 a month plus $5 per gigabyte of data. What is the initial value?

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5 Is $y = 3x + 5$ direct or partial variation?

A Partial

B Direct

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6 **Is y = 7x direct or partial variation, and what is its initial value?**

- **A** Direct, initial value 7
- **B** Partial, initial value 0
- **C** Direct, initial value 0
- **D** Partial, initial value 7

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7 **A gym charges a $30 joining fee plus $25 a month. Write the cost rule and say whether it is direct or partial variation.**

- **A** Direct, y = 25x + 30
- **B** Partial, y = 30x + 25
- **C** Partial, y = 25x + 30
- **D** Direct, y = 30x + 25

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8 **The graph of a delivery cost passes through (0, 0). Is the cost direct or partial variation?**

A Direct

B Partial

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9 **A plumber charges $50 to visit plus $80 per hour of work. What is the rate of change?**

A $50 per hour

B $80 per hour

C $30 per hour

D $130 per hour

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10 A babysitter charges $12 per hour with no starting fee. What is the rate of change and the initial value?

- **A** $12 per hour, initial value $12
- **B** $0 per hour, initial value $12
- **C** $24 per hour, initial value $0
- **D** $12 per hour, initial value $0

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ANSWER KEY

1. Direct

2. Partial

3. Direct

4. $20

5. Partial

6. Direct, initial value 0

7. Partial, $y = 25x + 30$

8. Direct

9. $80 per hour

10. $12 per hour, initial value $0

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