MATHEMATICS · GRADES 10-12

Independent and dependent variables

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you tell which quantity you control and which one responds, like the hours you study and the mark you earn on a test. The hours you put in are yours to choose, and the mark is what responds, and knowing which is which is what makes a graph or an experiment make sense. You use it when you plan a science fair project, read a study in the news, or work out whether more practice really is what lifted your score.



Rule

The independent variable is the one you choose or set first.

The dependent variable is worked out from it, so it responds to the independent variable.

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Worked examples

EXAMPLE 1

Q In cost = 5 × hours, which variable is independent?

SOLUTION

Ask which variable you choose: you choose the number of hours.

Ask which variable responds: the cost depends on the hours.

So hours is independent and cost is dependent.

EXAMPLE 2

Q In $y = 2x + 1$, which variable is independent?

SOLUTION

The input x is chosen first.

The output y is worked out from x.

So x is independent and y is dependent.

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Practice questions

1 **A car drives at a steady speed. Which quantity is chosen first: time or distance?**

A time

B distance

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2 **In the formula $y = 3x$, which variable is worked out from the other: x or y?**

A x

B y

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3 **A gardener waters some plants more than others and measures how tall each plant grows. Which is the dependent variable: the amount of water or the height of the plants?**

A water

B height

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4 **For a young tree, a scientist records its age and its height as the tree grows. Which variable responds to the other: age or height?**

A age

B height

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5 For $f(x) = x^2$, if you pick x first and work out f(x) after, which one is independent?

A x

B f(x)

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6 A student earns $20 for every hour worked. Which variable depends on the other: hours worked or earnings?

A hours worked

B earnings

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7 Mia changes how long she practises piano each day and records her test score at the end of the week. Which did she choose or set: the practice time or the test score?

A practice time

B test score

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8 In the equation d = 50t, a driver picks the driving time t and the distance d follows. Which variable is independent?

A t

B d

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9 A baker chooses how many servings to make, then measures the flour needed. Which is dependent: servings or flour?

- A servings
- B flour

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10 For a square, area = side². If the side is chosen first, which variable is the dependent one?

- A side
- B area

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ANSWER KEY

1. time

2. y

3. height

4. height

5. x

6. earnings

7. practice time

8. t

9. flour

10. area

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