 Substitution

Part 1: Substitution into an expression

Questions:

Match the question to its answer

| Question | Answer |
| --- | --- |
| Substitute into the expression |  |
| Substitute into the expression |  |
| Substitute into the expression |  |
| Substitute into the expression |  |
| Substitute andinto the expression |  |
| Substitute andinto the expression |  |
| Substitute and into the expression |  |
| Substitute andinto the expression |  |
| Substitute andinto the expression |  |
| Substitute andinto the expression |  |

Solutions:

| Question | Answer |
| --- | --- |
| Substitute into the expression |  |
| Substitute into the expression |  |
| Substitute into the expression |  |
| Substitute into the expression |  |
| Substitute andinto the expression |  |
| Substitute andinto the expression |  |
| Substitute and into the expression |  |
| Substitute andinto the expression |  |
| Substitute andinto the expression |  |
| Substitute andinto the expression |  |

Part 2: Evaluating the subject of a formula

Questions:

Evaluate each formula for the given substitution. Round answers to 2 decimal places where appropriate.

* + Evaluate for if
  + Convert 100 degrees Fahrenheit () to degrees Celsius ().
  + If , find
  + Find the volume () of a size 5 soccer ball if its radius () is .
  + Evaluate for if and
  + Find your average speed () if you travel a distance () of in a time () of hours.
  + If , and , find .
  + Find the accumulated value of an investment () if you invest () for years () at 3% p.a. interest () compounded annually.
  + Evaluate for if , and
  + Find the salvage value () of a car if it depreciates () by per annum for years () and its initial value () was .
  + If , and , find .
  + If , and , find .
  + If , , find .
  + If , and , find .

Solutions:

Evaluate each formula for the given substitution. Round answers to 2 decimal places where appropriate.

* + Evaluate for if
  + Convert 100 degrees Fahrenheit () to degrees Celsius ().
  + If , find
  + Find the volume () of a size 5 soccer ball if its radius () is .
  + Evaluate for if and
  + Find your average speed () if you travel a distance () of in a time () of hours.
  + If , and , find .
  + Find the accumulated value of an investment () if you invest () for years () at 3% p.a. interest () compounded annually.
  + Evaluate for if , and
  + Find the salvage value () of a car if it depreciates () by per annum for years () and its initial value () was .
  + If , and , find .
  + If , and , find .
  + If , , find .
  + If , and , find .

Part 3: Solving problems involving formula

Questions:

* Made the subject of the formula.
* Make the subject of the formula.
* Use the formulas to complete the table:

| Speed | Distance | Time |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Read the Queensland Government’s [stopping distance article](https://www.qld.gov.au/transport/safety/road-safety/driving-safely/stopping-distances).

* Why are you advised to keep a larger gap between vehicles in wet weather?
* Choose 3 speeds from the article’s table, How long it takes to stop? For each
  + Confirm the reaction-time distance if the reaction time is seconds.

Note: Reaction time is the time period from when a driver decides to brake to when the driver first commences braking.

* + Confirm the braking distance if the car deaccelerates at .

Formula: Note: Initial speed needs to be in m/s.

* + Calculate the total stopping distance for each speed.
  + For each speed, calculate the increase in stopping distance if you were travelling faster.
  + How does this relate the effect of travelling faster than the signed speed limit?
* A car on the Autobahn in Germany was once travelling at (the road was closed to general traffic).
  + What is its stopping distance in metres?
  + Do you think this is an accurate stopping distance? What might reduce the stopping distance of the vehicle?
* Optional: Choose a speed from the article’s table, How long it takes to stop? . Calculate the rate of de-acceleration for wet conditions.

Solutions:

* Made the subject of the formula.
* Make the subject of the formula.
* Use the formulas to complete the table:

| Speed | Distance | Time |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Read the Queensland Government’s [stopping distance article](https://www.qld.gov.au/transport/safety/road-safety/driving-safely/stopping-distances).

* Why are you advised to keep a larger gap between vehicles in wet weather?

Due to the increased stopping distance.

* Choose 3 speeds from the article’s table, How long it takes to stop? For each

Note: Sample solution is only for a stopping distance of

* + Confirm the reaction-time distance if the reaction time is seconds.

Note: Reaction time is the time period from when a driver decides to brake to when the driver first commences braking.

* + Confirm the braking distance if the car deaccelerates at .

Formula: Note: Initial speed needs to be in m/s.

* + Confirm the total stopping distance for each speed.
  + For each speed, calculate the increase in stopping distance if you were travelling faster.

If we were travelling

* How does this relate the effect of travelling faster than the signed speed limit?

When you are travelling faster than the speed limit you will take longer to stop which could increase the likelihood of accidents.

* A car on the Autobahn in Germany was once travelling at (the road was closed to general traffic).
  + What is its stopping distance in metres?

If we were travelling

* + Do you think this is an accurate stopping distance? What might reduce the stopping distance of the vehicle?

No. You would expect the car to have better brakes that would stop it at a faster rate reducing the braking distance.

* Optional: Choose a speed from the article’s table, How long it takes to stop? Calculate the rate of de-acceleration for wet conditions.

in the wet has a braking distance of , and the initial speed is

This formula can be rearranged to: