

**Table A.1.** Students' attitude toward generative AI technologies

4. Frequency of use of Generative AI Technologies	Mean	SD
	2.81	1.01
5. Knowledge of Generative AI Technologies	Mean	SD
I understand generative AI technologies like ChatGPT have limitations in their ability to handle complex tasks.	3.25	0.95
I understand generative AI technologies like ChatGPT can generate output that is factually inaccurate.	3.4	0.98
I understand generative AI technologies like ChatGPT can generate output that is out of context or inappropriate.	3.32	0.96
I understand generative AI technologies like ChatGPT can exhibit biases and unfairness in their output.	2.47	1.02
I understand generative AI technologies like ChatGPT may rely too heavily on statistics, which can limit their usefulness in certain contexts.	3.18	0.94
I understand generative AI technologies like ChatGPT have limited emotional intelligence and empathy, which can lead to output that is insensitive or inappropriate.	3.37	1.14
	3.17	
6. Willingness to use Generative AI Technologies	Mean	SD
I envision integrating generative AI technologies like ChatGPT into my teaching and learning practices in the future.	4.06	0.75
Students must learn how to use generative AI technologies well for their careers.	3.79	0.97
I believe generative AI technologies such as ChatGPT can improve my digital competence.	3.73	0.88
I believe generative AI technologies such as ChatGPT can help me save time.	4.38	0.68
I believe AI technologies such as ChatGPT can provide me with unique insights and perspectives that I may not have thought of myself.	3.85	0.88
I think AI technologies such as ChatGPT can provide me with personalized and immediate feedback and suggestions for my assignments.	3.86	0.77
I think AI technologies such as ChatGPT is a great tool as it is available 24/7.	4.26	0.78
I think AI technologies such as ChatGPT is a great tool for student support services due to anonymity.	3.98	0.77
	3.99	
7. Concerns about Generative AI Technologies	Mean	SD
Using generative AI technologies such as ChatGPT to complete assignments undermines the value of university education.	3.21	1.07
Generative AI technologies such as ChatGPT will limit my opportunities to interact with others and socialize while completing coursework.	3.28	1.18
Generative AI technologies such as ChatGPT will hinder my development of generic or transferable skills such as teamwork, problem-solving and leadership skills.	3.32	1.2
I can become over-reliant on generative AI technologies	3.19	1.33

	3.25	
8. Benefits related to Generative AI Technologies	Mean	SD
1. Personalized and immediate learning support	3.88	0.85
2. Writing and brainstorming support	3.93	0.81
3. Research and analysis support	3.93	0.84
4. Visual and audio multi-media support	3.27	0.97
5. Administrative support	3.39	0.86
	3.68	
9. Challenges concerning Generative AI Technologies	Mean	SD
1. Accuracy and transparency	3.41	0.82
2. Privacy and ethical issues	3.49	0.91
3. Holistic competencies	3.22	0.69
4. Career prospects	3.26	0.97
5. Human values	3.06	0.98
	3.29	

**Table A.2.** Comparison between students' clusters by statements.

Summary	Q4.	Q5.1.	Q5.2.	Q5.3.	Q5.4.	Q5.5.	Q5.6.	Q6.1.	Q6.2.
Average	2.802	3.252	3.405	3.321	2.466	3.176	3.366	4.061	3.794
Average Cluster #1	2.942	3.204	3.437	3.369	2.466	3.194	3.398	4.233	4.068
Average Cluster #2	2.286	3.429	3.286	3.143	2.464	3.107	3.250	3.429	2.786
Difference	0.656	-0.225	0.151	0.226	0.002	0.087	0.148	0.804	1.282
Summary	Q6.3.	Q6.4.	Q6.5.	Q6.6.	Q6.7.	Q6.8.	Q7.1.	Q7.2.	Q7.3.
Average	3.733	4.382	3.847	3.863	4.260	3.977	3.214	3.282	3.321
Average Cluster #1	3.961	4.573	4.058	4.000	4.417	4.146	3.204	3.320	3.350
Average Cluster #2	2.893	3.679	3.071	3.357	3.679	3.357	3.250	3.143	3.214
Difference	1.068	0.894	0.987	0.643	0.739	0.788	-0.046	0.178	0.135
Summary	Q7.4.	Q8.1.	Q8.2.	Q8.3.	Q8.4.	Q8.5.	Q9.1.	Q9.2.	Q9.3.
Average	3.191	3.878	3.931	3.931	3.275	3.389	3.412	3.489	3.221
Average Cluster #1	3.233	4.029	4.117	4.194	3.447	3.573	3.524	3.602	3.359
Average Cluster #2	3.036	3.321	3.250	2.964	2.643	2.714	3.000	3.071	2.714
Difference	0.197	0.708	0.867	1.230	0.804	0.859	0.524	0.531	0.645
Summary	Q9.4.	Q9.5.							
Average	3.260	3.061							
Average Cluster #1	3.466	3.155							
Average Cluster #2	2.500	2.714							
Difference	0.966	0.441							

## Evaluating generative AI chatbots performance for STEM problems solving

### Task #1 and Task #2 solutions

**Subject:** Algebra

**Topic:** Algebraic quadratic functions

**Main topic requirements:** The university students should understand and manipulate functions, determine parameters and interpret the results.

#### Task #1.

The daily demand of a specific type of fuel at a gas station can be described by the function  $x(v) = a - bv^2$ . In this equation,  $v$  represents the price per liter of fuel, and  $x(v)$  represents the corresponding demand in liters and the symbol “^” represents the POWER function. The function  $x(v)$  exhibits the following properties:

We have the following information:

At a price of €3 per liter, the demand is 810 liters per day.

At a price of €4 per liter, the demand is 530 liters per day.

To determine the price per liter of fuel that would result in a demand of 900 liters per day, we need to solve for  $v$ .

#### Solutions to Task #1

##### Instructor solution

$$810 = a - b \cdot 3^2 = a - 9b$$

$$530 = a - b \cdot 4^2 = a - 16b$$

$$a = 1170; b = 40 \Rightarrow x(v) = 1170 - 40v^2$$

$$900 = 1170 - 40v^2 \Rightarrow v^2 = 6.75, \text{ i.e. } v \approx 2.60.$$

##### ChatGPT (text-davinci-002-render-sha) solution

To determine the price per liter of fuel that would result in a demand of 900 liters per day, we can use the given information to solve for the parameters 'a' and 'b' in the equation  $x(v) = a - bv^2$ .

Let's use the two given data points to set up a system of equations:

1. At a price of €3 per liter, the demand is 810 liters per day:  $x(3) = a - b(3)^2 = 810$

2. At a price of €4 per liter, the demand is 530 liters per day:  $x(4) = a - b(4)^2 = 530$

We can solve this system of equations to find the values of 'a' and 'b'.

From equation (1):  $a - 9b = 810$  (equation 3)

From equation (2):  $a - 16b = 530$  (equation 4)

To solve this system of equations, we can subtract equation (4) from equation (3):

$$(a - 9b) - (a - 16b) = 810 - 530$$

$$-9b + 16b = 280$$

$$7b = 280$$

$$b = 280/7$$

$$b = 40$$

Now that we have the value of 'b', we can substitute it into equation (3) to find 'a':

$$a - 9(40) = 810$$

$$a - 360 = 810$$

$$a = 810 + 360$$

$$a = 1170$$

So, the equation representing the demand for fuel is:

$$x(v) = 1170 - 40v^2$$

To determine the price per liter of fuel that would result in a demand of 900 liters per day, we need to solve for 'v' in the equation  $x(v) = 900$ :

$$1170 - 40v^2 = 900$$

$$40v^2 = 1170 - 900$$

$$40v^2 = 270$$

$$v^2 = 270/40$$

$$v^2 = 6.75$$

$$v = \sqrt{6.75}$$

$$v \approx 2.60$$

Therefore, the price per liter of fuel that would result in a demand of 900 liters per day is approximately €2.60.

### Bard solution

Sure, I can help you with that.

Step 1: Set up the equations

We know that the demand function is  $x(v) = a - bv^2$ . We also know that at a price of €3 per liter, the demand is 810 liters per day, and at a price of €4 per liter, the demand is 530 liters per day. We can use this information to set up two equations:

Equation 1:  $x(3) = 810$

Equation 2:  $x(4) = 530$

We can plug these values into the demand function to get two equations that we can solve for a and b.

Step 2: Solve for a and b

Substituting the values from Equation 1 into the demand function, we get:

Code snippet

$$810 = a - b(3)^2$$

$$810 = a - 9b$$

Use code with caution. Learn more

Substituting the values from Equation 2 into the demand function, we get:

Code snippet

$$530 = a - b(4)^2$$

$$530 = a - 16b$$

Use code with caution. Learn more

Subtracting these two equations, we can eliminate a:

Code snippet

$$280 = -7b$$

$$40 = b$$

Use code with caution. Learn more

Substituting this value for b into either of the original equations, we can solve for a:

Code snippet

$$810 = a - 40(3)^2$$

$$810 = a - 360$$

$$450 = a$$

Use code with caution. Learn more

Therefore, the demand function is  $x(v) = 450 - 40v^2$ .

Step 3: Solve for v

We are given that  $x(v) = 900$ , so we can substitute this value into the demand function to solve for v:

Code snippet

$$900 = 450 - 40v^2$$

$$450 = -40v^2$$

$$-11.25 = v^2$$

$$v = -3.36 \text{ or } v = 3.36$$

Use code with caution. Learn more

Since the price of fuel cannot be negative, the only possible value for v is 3.36.

Therefore, the price per liter of fuel that would result in a demand of 900 liters per day is €3.36.

### Alpaca-13B solution

$$v = 4.5$$

Please, explain your solution.

To determine the price per liter of fuel that would result in a demand of 900 liters per day, we need to solve for v. By substituting the value of  $x(v)$  into the equation, we obtain a linear equation with two variables, a and b:  $810 = a - 4b$ . We can then solve for v by dividing both sides of the equation by  $-4b$  and multiplying both sides by b, giving us:  $v = -4b/a + 4.5$ . Substituting the value of a in the original equation, we obtain  $v = 4.5$ .

### Vicuna-13B Solution

To solve for v, we need to set up a system of equations and solve for the value of v that satisfies the given conditions.

From the information given, we have:

1.  $x(v) = a - bv^2 = 810$  (at  $v = 3$ )

$$2. \quad x(v) = a - bv^2 = 530 \text{ (at } v = 4\text{)}$$

We are looking for the value of  $v$  that makes  $x(v) = 900$ .

We can set up the following system of equations:

$$1. \quad a - b(3)^2 = 810$$

$$2. \quad a - b(4)^2 = 530$$

To solve for  $a$  and  $b$ , we can first solve for  $v$  using the first equation:

$$v = \sqrt{a/3}$$

Substituting this into the second equation gives:

$$a - b(\sqrt{a/3})^2 = 530$$

Expanding the square root and solving for  $a$ , we get:

$$a = 9000$$

Substituting the value of  $a$  back into the equation for  $v$ , we get:

$$v = \sqrt{9000/3} = 231.7$$

So the demand of this type of fuel at a price of €9 per liter would be  $x(231.7) = 900$  liters per day.

### Vicuna-33B Solution

To determine the price per liter of fuel that would result in a demand of 900 liters per day, we need to use the given formula  $x(v) = a - bv^2$  and make the demand equal to 900 liters.

The given information is:

1. At a price of €3 per liter, the demand is 810 liters per day.

2. At a price of €4 per liter, the demand is 530 liters per day.

We can use this information to set up a system of equations. Let's denote the price per liter as  $x$ .

At €3 per liter:

$$900 = a - b(3)^2$$

$$900 = a - 9b$$

$$900 = a - 9$$

$$a = 919$$

At €4 per liter:

$$900 = a - b(4)^2$$

$$900 = a - 16b$$

$$900 = a - 16$$

$$a = 944$$

Now we can find the difference between the two prices that result in a difference of 34 liters per day ( $944 - 919$ ):

$$\text{Difference} = (944 - 919) * (919 - 900) / (944 - 900)$$

$$\text{Difference} \approx 25 * (109) / 44$$

$$\text{Difference} \approx 25 * 2.4082$$

$$\text{Difference} \approx 60.205$$

The difference between the two prices is approximately 60.205 liters per day. Since we want to find the price per liter that results in a demand of 900 liters per day, we need to add the difference to the €4 price:

$$x = 4 + 60.205$$

$$x \approx 4.60205$$

So, the price per liter of fuel that would result in a demand of 900 liters per day is approximately €4.60205.

### ChatGPT Plus

Temperature=0

First, we need to find the values of  $a$  and  $b$  using the given information.

At a price of €3 per liter, the demand is 810 liters per day:

$$x(3) = a - b(3)^2 = 810$$

At a price of €4 per liter, the demand is 530 liters per day:

$$x(4) = a - b(4)^2 = 530$$

Now we have a system of two equations with two unknowns,  $a$  and  $b$ :

$$1) \quad a - 9b = 810$$

$$2) \quad a - 16b = 530$$

We can solve this system of equations using substitution or elimination. Let's use elimination:

Subtract equation 2 from equation 1:

$$(1) - (2): (a - 9b) - (a - 16b) = 810 - 530$$

$$7b = 280$$

$$b = 280 / 7$$

$$b = 40$$

Now that we have the value of b, we can find the value of a using equation 1:

$$a - 9(40) = 810$$

$$a - 360 = 810$$

$$a = 1170$$

Now we have the function  $x(v) = 1170 - 40v^2$ .

To find the price per liter of fuel that would result in a demand of 900 liters per day, we need to solve for v when  $x(v) = 900$ :

$$900 = 1170 - 40v^2$$

$$40v^2 = 1170 - 900$$

$$40v^2 = 270$$

$$v^2 = 270 / 40$$

$$v^2 = 6.75$$

Now take the square root of both sides:

$$v = \sqrt{6.75}$$

$$v \approx 2.60$$

So, the price per liter of fuel that would result in a demand of 900 liters per day is approximately €2.60.

### Edge Chat

To solve for v in  $x(v) = a - bv^2$ , we can use the following steps:

1. Substitute the given values of  $x(v)$  and v into the equation.
2. Solve for a and b using the two equations.
3. Substitute the value of a and b into the equation  $x(v) = 900$ .
4. Solve for v.

Using the given information: At a price of €3 per liter, the demand is 810 liters per day. At a price of €4 per liter, the demand is 530 liters per day.

Substituting these values into the equation  $x(v) = a - bv^2$  gives us two equations:

$$810 = a - 9b \quad 530 = a - 16b$$

Solving these equations simultaneously gives us:

$$a = 1860 \quad b = 60$$

Substituting these values into the equation  $x(v) = 900$  gives us:

$$900 = 1860 - 60v^2$$

Solving for v gives us:

$$v^2 = (1860 - 900)/60 \quad v^2 = 15 \quad v = \sqrt{15}$$

Therefore, the price per liter of fuel that would result in a demand of 900 liters per day is approximately €3.87 (rounded to two decimal places).

I hope this helps! Let me know if you have any other questions.

Learn more:

1. [mathsolver.microsoft.com](https://mathsolver.microsoft.com)
2. [mathsolver.microsoft.com](https://mathsolver.microsoft.com)
3. [symbolab.com](https://symbolab.com) — see less

**Subject:** Financial Mathematics, Financial planning

**Topic:** Compound Interest and Annuities

**Main topic requirements:** The university students should understand compounding periods, interest rates, and the effect of regular contributions on the growth of an investment over time.

### Task #2.

Victor initiates a bank account by depositing \$1,200. The account is subject to quarterly compounding at an annual nominal interest rate of 2.64%. From the start of the second year onwards, Victor contributes \$150 to his account at the beginning of each quarter. Calculate the total amount that will accumulate in the account after 5 years.

### Solutions to Task #2

#### Instructor solutions

$$q=1+0.0264/4=1+0.0066=1.0066$$

$$b=3*50=150$$

Variant 1:

$$K1=1200*q^{(5*4)}=1368.7362$$

$$K2=b*q*(q^{(4*4)}-1)/(q-1)=2539.1875, q=1+i/4$$

$$K=K1+K2=3907.9237=3907.92$$

Variant 2:

$$K1=1200*q^4=$$

$$K=K1*q^{(4*4)}+b*q*(q^{(4*4)}-1)/(q-1)=3907.92$$

#### ChatGPT (text-davinci-002-render-sha) solution

To calculate the total amount that will accumulate in the account after 5 years, we can break down the calculation into two parts: the initial deposit and the subsequent quarterly contributions.

1. Initial Deposit: The initial deposit is \$1,200, and it will accumulate interest over the 5-year period with quarterly compounding. The formula to calculate the future value with quarterly compounding is:

$$FV = PV * (1 + r/n)^{(n*t)}$$

Where: FV = Future Value (amount accumulated) PV = Present Value (initial deposit) r = Annual nominal interest rate n = Number of compounding periods per year t = Number of years

In this case, the nominal interest rate is 2.64% (or 0.0264 as a decimal), and compounding is done quarterly, so n = 4. Plugging in the values, we have:

$$FV_{\text{initial}} = \$1,200 * (1 + 0.0264/4)^{(4*5)}$$

$$FV_{\text{initial}} = \$1,200 * (1.0066)^{(20)}$$

$$FV_{\text{initial}} \approx \$1,200 * 1.139858$$

$$FV_{\text{initial}} \approx \$1,367.83$$

2. Quarterly Contributions: Starting from the second year, Victor contributes \$150 to his account at the beginning of each quarter. We can calculate the future value of these quarterly contributions using the formula for the future value of a series of regular payments:

$$FV = P * [(1 + r/n)^{(n*t)} - 1] / (r/n)$$

Where: FV = Future Value (amount accumulated) P = Quarterly payment r = Annual nominal interest rate n = Number of compounding periods per year t = Number of years

In this case, the quarterly payment is \$150, the nominal interest rate is 2.64% (or 0.0264 as a decimal), and compounding is done quarterly, so n = 4. Plugging in the values, we have:

$$FV_{\text{contributions}} = \$150 * [(1 + 0.0264/4)^{(4*4)} - 1] / (0.0264/4)$$

$$FV_{\text{contributions}} = \$150 * (1.0066)^{(16)} - 1 / 0.0264$$

$$FV_{\text{contributions}} \approx \$150 * 1.110409 - 1 / 0.0264$$

$$FV_{\text{contributions}} \approx \$166.56 / 0.0264$$

$$FV_{\text{contributions}} \approx \$6,318.18$$

Now, to find the total amount accumulated after 5 years, we sum up the initial deposit and the contributions:

$$\text{Total amount accumulated} = FV_{\text{initial}} + FV_{\text{contributions}}$$

$$\text{Total amount accumulated} \approx \$1,367.83 + \$6,318.18 \text{ Total amount accumulated} \approx \$7,685.01$$

Therefore, the total amount that will accumulate in the account after 5 years is approximately \$7,685.01.

#### Bard solution

Sure, I can help you with that.

Here are the steps involved in calculating the total amount in the account after 5 years:

Calculate the quarterly interest rate.

Calculate the compound interest earned on the initial deposit for the first year.

Calculate the monthly contributions to the account.

Calculate the compound interest earned on the monthly contributions.

Calculate the total amount in the account after 5 years.

Step 1: Calculate the quarterly interest rate.

The annual nominal interest rate is 2.64%. The quarterly interest rate is calculated by dividing the annual nominal interest rate by the number of quarters in a year. There are 4 quarters in a year, so the quarterly interest rate is  $2.64 / 4 = 0.66\%$ .

Step 2: Calculate the compound interest earned on the initial deposit for the first year.

The initial deposit is \$1,200. The quarterly interest rate is 0.66%. The number of quarters in the first year is 4. The compound interest earned on the initial deposit for the first year is calculated using the following formula:

Code snippet

$$A = P(1 + r/m)^{mt}$$

Use code with caution. [Learn more](#)

where:

A is the amount in the account after t time periods

P is the principal amount

r is the interest rate

m is the number of times per year that interest is compounded

t is the number of time periods

In this case, A is the amount in the account after 4 quarters, P is \$1,200, r is 0.66%, m is 4, and t is 1. Substituting these values into the formula, we get:

Code snippet

$$A = 1200(1 + 0.66/4)^4$$

$$A = 1200(1.0165)^4$$

$$A = \$1239.68$$

Use code with caution. [Learn more](#)

Step 3: Calculate the monthly contributions to the account.

There are 12 months in a year. Victor contributes \$50 to his account at the beginning of each month, so his monthly contributions total  $\$50 * 12 = \$600$  per year.

Step 4: Calculate the compound interest earned on the monthly contributions.

The monthly interest rate is  $0.66 / 12 = 0.055\%$ . The number of years that Victor contributes to the account is  $5 - 2 = 3$  years. The compound interest earned on the monthly contributions is calculated using the following formula:

Code snippet

$$A = P(1 + r/m)^{mt}$$

Use code with caution. [Learn more](#)

where:

A is the amount in the account after t time periods

P is the principal amount

r is the interest rate

m is the number of times per year that interest is compounded

t is the number of time periods

In this case, A is the amount in the account after 3 years, P is \$600, r is 0.055%, m is 12, and t is 3. Substituting these values into the formula, we get:

Code snippet

$$A = 600(1 + 0.055/12)^{12*3}$$

$$A = 600(1.0046)^{36}$$

$$A = \$197.89$$

Use code with caution. [Learn more](#)

Step 5: Calculate the total amount in the account after 5 years.

The total amount in the account after 5 years is the sum of the amount in the account after the first year and the compound interest earned on the monthly contributions. The amount in the account after the first year is \$1,239.68. The compound interest earned on the monthly contributions is \$197.89. Therefore, the total amount in the account after 5 years is  $\$1,239.68 + \$197.89 = \$1,437.57$ .

Therefore, the total amount in the account after 5 years is \$1,437.57.



Variant 3:

Sure, I can help you with that.

The quarterly compounding annual nominal interest rate of 2.64% is equivalent to an effective annual interest rate of 2.71%.

The amount in the account after 5 years without any contributions is:

Code snippet

$\$1200 * (1 + 0.0271)^5 = \$1458.31$

Use code with caution. Learn more

The monthly contributions start at the beginning of the second year, which is 24 months after the initial deposit. So, there are a total of  $24 + 36 = 60$  contributions.

The total amount of the contributions is:

Code snippet

$\$50 * 60 = \$3000$

Use code with caution. Learn more

The total amount in the account after 5 years with contributions is:

Code snippet

$\$1458.31 + \$3000 = \$4458.31$

Use code with caution. Learn more

Therefore, the total amount that will accumulate in the account after 5 years is \$4458.31.

Here is the Python code that I used to calculate the answer:

Python

```
import math
```

```
def quarterly_compounding(principal, interest, years):
```

```
    """
```

Calculates the amount in an account after compounding quarterly for a given number of years.

Args:

principal: The initial principal amount.

interest: The annual interest rate.

years: The number of years.

Returns:

The amount in the account after compounding.

```
    """
```

```
    number_of_quarters = years * 4
```

```
    interest_per_quarter = interest / 4
```

```
    factor = math.pow(1 + interest_per_quarter, number_of_quarters)
```

```
    return principal * factor
```

```
def monthly_contribution(principal, interest, years):
```

```
    """
```

Calculates the amount in an account after quarterly compounding and monthly contributions.

Args:

principal: The initial principal amount.

interest: The annual interest rate.

years: The number of years.

Returns:

The amount in the account after compounding and contributions.

```
    """
```

```
    amount = quarterly_compounding(principal, interest, years)
```

```
    number_of_months = years * 12
```

```
    contributions = 50 * number_of_months
```

```
    return amount + contributions
```

```
if __name__ == "__main__":
```

```
    principal = 1200
```

```
    interest = 0.0264
```

```
    years = 5
```

```
    amount = monthly_contribution(principal, interest, years)
```

```
print(amount)
```

Use code with caution. Learn more

The output of the code is:

Code snippet

```
4458.31
```

Use code with caution. Learn more

As you can see, the output of the code matches the answer that I calculated manually.

### Alpaca-13B solution

After 5 years, the total amount that will accumulate in Victor's bank account is \$1,532.40. This is calculated by taking the initial deposit of \$1,200 and adding to it the total amount of contributions ( $\$150 \times 4 = \$600$ ) plus the interest earned over the 5 years ( $\$1,532.40 = 2.64\% \times (1,200 + (4 \times 600))$ ).

Please, explain your solution.

My solution is a web application that allows customers to compare different offers from different vendors. The application provides an interactive platform where customers can input their requirements and view the offers that best match their needs. The application also provides customers with detailed information about each offer, helping them make an informed decision.

### Vicuna-13B Solution

To calculate the total amount that will accumulate in the account after 5 years, we need to calculate the interest earned on the initial deposit and the subsequent contributions, and add them up.

The interest earned on the initial deposit can be calculated using the formula:

$$A = P * i * (1 + i)^n$$

where:

A is the total amount (including interest)

P is the principal amount (the initial deposit)

i is the interest rate per period

n is the number of periods (in this case, one period is a quarter)

For the first quarter, the principal amount is \$1,200 and the interest rate is 2.64% per year, so the interest earned is:

$$\$1,200 * 0.0264 * 1 = \$33.36$$

For the second quarter, the principal amount is now \$1,233.36 ( $\$1,200 + \$33.36$ ) and the interest rate is still 2.64% per year, so the interest earned is:

$$\$1,233.36 * 0.0264 * 1 = \$36.34$$

For the third quarter, the principal amount is now \$1,267.00 ( $\$1,233.36 + \$36.34$ ) and the interest rate is still 2.64% per year, so the interest earned is:

$$\$1,267.00 * 0.0264 * 1 = \$38.02$$

For the fourth quarter, the principal amount is now \$1,300.64 ( $\$1,267.00 + \$38.02$ ) and the interest rate is still 2.64% per year, so the interest earned is:

$$\$1,300.64 * 0.0264 * 1 = \$39.70$$

Adding up the interest earned in each quarter, we get:

$$\$33.36 + \$36.34 + \$38.02 + \$39.70 = \$167.4$$

What is the deposit value at the end of the fifth year?

To calculate the deposit value at the end of the fifth year, we need to add up the principal amount (including interest) at the end of each year.

At the end of the first year, the total amount (including interest) is \$1,300.64, which is obtained by adding the interest earned in the first quarter to the principal amount.

At the end of the second year, the total amount (including interest) is \$1,426.38, which is obtained by adding the interest earned in the second quarter to the total amount at the end of the first year.

At the end of the third year, the total amount (including interest) is \$1,563.61, which is obtained by adding the interest earned in the third quarter to the total amount at the end of the second year.

At the end of the fourth year, the total amount (including interest) is \$1,715.32, which is obtained by adding the interest earned in the fourth quarter to the total amount at the end of the third year.

At the end of the fifth year, the total amount (including interest) is \$1,882.45, which is obtained by adding the interest earned in the fifth year to the total amount at the end of the fourth year.

Therefore, the deposit value at the end of the fifth year is \$1,882.45.

### Vicuna-33B Solution

To calculate the total amount that will accumulate in the account after 5 years, we need to consider two parts: the interest earned on the initial \$1,200 deposit and the interest earned on the quarterly contributions starting from the second year.

1. Initial deposit of \$1,200:

The future value of the initial deposit can be calculated using the future value of ordinary annuity formula:

$$FV = P * (1 + r)^t$$

Where:

FV is the future value of the deposit

P is the principal (initial deposit)

r is the interest rate per period

t is the number of periods

For the initial deposit:

$$FV = 1,200 * (1 + 0.0264)^{(4 * 5)}$$

$$FV \approx 1,200 * (1.0264)^{20}$$

$$FV \approx 1,200 * 2.5306$$

$$FV \approx \$3,036.72$$

2. Quarterly contributions:

From the second year onwards, Victor contributes \$150 at the beginning of each quarter. We need to calculate the future value of these contributions. Since there are 20 quarters in 5 years, the total amount contributed is  $\$150 * 20 = \$3,000$ .

The future value of these contributions can be calculated using the future value of ordinary annuity formula:

$$FV = P * (1 + r)^t$$

For the quarterly contributions:

$$FV = 3,000 * (1 + 0.0264)^{(4 * 20)}$$

$$FV \approx 3,000 * (1.0264)^{80}$$

$$FV \approx 3,000 * 2.5608^{80}$$

$$FV \approx \$47,099.05$$

Now, we add the future value of the initial deposit and the future value of the quarterly contributions:

$$\text{Total amount accumulated after 5 years} = \$3,036.72 + \$47,099.05 \approx \$4$$

### ChatGPT Plus

Temperature=0

To calculate the total amount accumulated in the account after 5 years, we need to consider two parts: the initial deposit and the quarterly contributions.

1. Initial deposit:

The initial deposit of \$1,200 will compound for 5 years with quarterly compounding at an annual nominal interest rate of 2.64%.

The formula for compound interest is:

$$A = P(1 + r/n)^{(nt)}$$

Where:

A = the future value of the investment/loan, including interest

P = the principal investment amount (the initial deposit)

r = the annual interest rate (decimal)

n = the number of times that interest is compounded per year

t = the number of years the money is invested or borrowed for

In this case:

$$P = \$1,200$$

$$r = 2.64\% = 0.0264$$

$$n = 4 \text{ (quarterly compounding)}$$

$$t = 5 \text{ years}$$

$$A = 1200(1 + 0.0264/4)^{(4*5)}$$

$$A = 1200(1 + 0.0066)^{(20)}$$

$$A = 1200(1.0066)^{20}$$

$$A \approx \$1,345.71$$

2. Quarterly contributions:

Victor contributes \$150 at the beginning of each quarter from the start of the second year onwards. This means he contributes for 4 years (5 years - 1 year).

The formula for the future value of a series of equal payments (ordinary annuity) is:

$$FV = P * [(1 + r)^{nt} - 1] / r$$

Where:

FV = the future value of the annuity

P = the amount of each payment

r = the interest rate per period (quarterly in this case)

n = the number of periods per year

t = the number of years

In this case:

$$P = \$150$$

$$r = 2.64\% / 4 = 0.0264 / 4 = 0.0066$$

$$n = 4 \text{ (quarterly compounding)}$$

$$t = 4 \text{ years (since the contributions start from the second year)}$$

$$FV = 150 * [(1 + 0.0066)^{(4*4)} - 1] / 0.0066$$

$$FV = 150 * [(1.0066)^{16} - 1] / 0.0066$$

$$FV \approx \$2,526.87$$

Now, we add the future value of the initial deposit and the future value of the quarterly contributions to find the total amount accumulated in the account after 5 years:

$$\text{Total amount} = \$1,345.71 + \$2,526.87$$

$$\text{Total amount} \approx \$3,872.58$$

### Edge Chat

Searching for: calculate total amount in bank account after 5 years with quarterly compounding

Generating answers for you...

The total amount that will accumulate in the account after 5 years can be calculated as follows:

First, we calculate the interest rate per quarter by dividing the annual nominal interest rate by 4 (since there are 4 quarters in a year):  $2.64\% / 4 = 0.66\%$ .

Next, we calculate the total number of quarters in 5 years:  $5 \text{ years} * 4 \text{ quarters/year} = 20 \text{ quarters}$ .

Then, we calculate the amount that will accumulate in the account after 5 years without any additional contributions.

This is done using the formula for compound interest:

$$A = P(1 + r/n)^{(nt)}$$

where:

A = the amount that will accumulate in the account after t years P = the principal (the initial deposit) r = the annual nominal interest rate (as a decimal) n = the number of times per year that interest is compounded t = the number of years

In this case:

$$P = \$1,200 \quad r = 2.64\% = 0.0264 \quad n = 4 \text{ (since interest is compounded quarterly)} \quad t = 5$$

So:

$$A = \$1,200(1 + 0.0264/4)^{(4*5)} = \$1,404.16$$

Finally, we add up the contributions made by Victor at the beginning of each quarter for the last four years (since he did not make any contributions during the first year). There are a total of 16 contributions of \$150 each, for a total of \$2,400.

Therefore, the total amount that will accumulate in Victor's account after 5 years is:

$$\$1,404.16 + \$2,400 = \$3,804.16$$

I hope this helps! Let me know if you have any other questions.

Received message. The total amount that will accumulate in the account after 5 years can be calculated as follows: First, we calculate the interest rate per quarter by dividing the annual nominal interest rate by 4 (since there are 4 quarters in a year):  $2.64\% / 4 = 0.66\%$ . Next, we calculate the total number of quarters in 5 years:  $5 \text{ years} * 4 \text{ quarters/year} = 20 \text{ quarters}$ . Then, we calculate the amount that will accumulate in the account after 5 years without any additional contributions. This is done using the formula for compound interest:  $A = P(1 + r/n)^{(nt)}$  where: A = the amount that will accumulate in the account after t years P = the principal (the initial deposit) r = the annual nominal interest rate (as a decimal) n = the number of times per year that interest is compounded t = the number of years In this case:  $P = \$1,200$   $r = 2.64\% = 0.0264$   $n = 4$  (since interest is compounded quarterly)  $t = 5$  So:  $A = \$1,200(1 + 0.0264/4)^{(4*5)} = \$1,404.16$  Finally, we add up the contributions made by Victor at the beginning of each quarter for the last four years (since he did not make any contributions during the first year). There are a total of 16 contributions of \$150 each, for a total of \$2,400.

Therefore, the total amount that will accumulate in Victor's account after 5 years is:  $\$1,404.16 + \$2,400 = \$3,804.16$  I hope this helps! Let me know if you have any other questions.

Learn more:

1. [omnicalculator.com](https://omnicalculator.com)
2. [calculatorsoup.com](https://calculatorsoup.com)
3. [financialmentor.com](https://financialmentor.com) — see less

Note: The solutions to the tasks have been obtained on June 29, 2023.