Exchange Rates, Hire Purchase, Taxes & Wages

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Consumer Arithmetic is mathematics used in everyday financial decisions. Exchange rates, bills, wages, taxes, and hire purchase questions all ask you to track money carefully through a real situation.

CSEC gives Consumer Arithmetic a strong presence in both papers, so read the wording slowly. Identify what is being charged, earned, converted, deducted, or paid over time. Your explanation should follow the flow of the transaction, because one missed step can change the final amount.

Exchange rates tell you how much one currency is worth in another currency.

Understanding Exchange Rates

An exchange rate is a ratio between two currencies. Decide whether you are moving from the base currency to the foreign currency or reversing the conversion before choosing multiplication or division.

Exchange Rate: How many units of one currency equal one unit of another.

Example: If 1 USD = 115 JMD, then:

- 1 U.S. dollar = 115 Jamaican dollars
- To convert USD to JMD, MULTIPLY by 115

Formula:

$$\text{Amount in New Currency} = \text{Amount in Old Currency} \times \text{Exchange Rate}$$

📋 **Example**

Convert 500 dollars USD to JMD if 1 USD = 115 JMD

Step 1: Identify values

- Amount = 500 USD
- Exchange rate = 1 USD = 115 JMD

Step 2: Multiply

[MathBlock]
500 \text{ USD} \times 115 = 57,500 \text{ JMD}
[/MathBlock]

$500 USD = **57,500 JMD**.

Converting Back (Reverse Conversion)

Reverse conversion undoes the first conversion. If multiplying changed USD to JMD, dividing by the same rate changes JMD back to USD.

To convert from JMD back to USD, DIVIDE by the exchange rate.

Formula:

$$\text{Amount in Original Currency} = \frac{\text{Amount in New Currency}}{\text{Exchange Rate}}$$

📋 **Example**

Convert 57,500 JMD back to USD if 1 USD = 115 JMD

Step 1: Divide by exchange rate

[MathBlock]
57,500 \div 115 = 500 \text{ USD}
[/MathBlock]

57,500 JMD = **500 USD**.

Multiple Currency Conversions

For multiple conversions, treat each exchange as a separate step and label the currency after every line. This prevents mixing rates from different currencies.

Sometimes you need to convert through multiple currencies (e.g., USD ’EUR ’GBP).

📋 **Example**

Convert 100 dollars USD to GBP using intermediate conversion:

- 1 USD = 0.92 EUR
- 1 EUR = 0.86 GBP

Step 1: Convert USD to EUR

[MathBlock]
100 \text{ USD} \times 0.92 = 92 \text{ EUR}
[/MathBlock]

Step 2: Convert EUR to GBP

[MathBlock]
92 \text{ EUR} \times 0.86 = 79.12 \text{ GBP}
[/MathBlock]

$100 USD = **79.12 GBP**.

📝 **Exam Tip**

Exchange rate tip:

- When converting to a "stronger" currency (fewer units), you DIVIDE or multiply by a number less than 1
- When converting to a "weaker" currency (more units), you DIVIDE by a small number or multiply by a large number
- Always check if your answer makes sense!

Part 7: Hire Purchase and Mortgages

Hire purchase and mortgages are ways to buy expensive items by paying in installments (small payments over time).

Hire Purchase

Hire purchase spreads payment over time, but the total paid is usually more than the cash price. The exam often asks you to compare these amounts to find the extra cost.

In **hire purchase**, you:

- 1. Pay a **deposit** upfront (percentage of total price)
- 2. Pay the REMAINING amount in equal **installments** over time
- 3. Usually with **interest** added

Total amount paid = Deposit + (Installment × Number of installments)

Total interest = Total paid - Original price

> 📋 **Example**
>
> **A TV costs 800 dollars. You pay 15% deposit and the rest in 12 equal monthly installments at 8% per annum simple interest on the amount owed.**
>
> **Step 1**: Calculate deposit
>
> [MathBlock]
> \text{Deposit} = 15\% \text{ of } 800 = 0.15 \times 800 = \$120
> [/MathBlock]
>
> **Step 2**: Find amount still owed
>
> [MathBlock]
> \text{Amount Owed} = 800 - 120 = \$680
> [/MathBlock]
>
> **Step 3**: Calculate interest on amount owed (12 months = 1 year)
>
> [MathBlock]
> I = \frac{P \times R \times T}{100} = \frac{680 \times 8 \times 1}{100} = \$54.40
> [/MathBlock]
>
> **Step 4**: Total to pay over 12 months
>
> [MathBlock]
> \text{Total} = 680 + 54.40 = \$734.40
> [/MathBlock]
>
> **Step 5**: Monthly installment
>
> [MathBlock]
> \text{Monthly} = \frac{734.40}{12} = \$61.20
> [/MathBlock]
>
> You pay: 120 dollars deposit + 61.20 dollars/month for 12 months.
>
> Total paid: 120 + (61.20 × 12) = 854.40 dollars (vs. original 800 dollars, so 54.40 dollars in interest).

Mortgages

A mortgage is a long-term loan, so the numbers can be large and the time period can be long. Read carefully to see whether the question wants monthly payment, total repayment, interest paid, or the outstanding balance.

A **mortgage** is a loan for buying property (houses). You:

- 1. Borrow most of the money from a bank

- 2. Pay it back over many years (15-30 typically)
- 3. With monthly payments that include interest

The calculation is similar, but with many more periods.

> 🧠 **Remember**
> In hire purchase and mortgages:
> - Deposit is paid immediately
> - Remaining balance is paid in equal installments
> - Interest is added to the balance before calculating installments

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Part 8: Rates, Taxes, and Utilities

Utility Bills

Utility bills combine fixed charges, usage charges, and sometimes tax. Work down the bill line by line instead of trying to do everything in one calculation.

Utilities include electricity, water, gas, telephone.

Bills usually have:

- 1. **Fixed charge**: Same every month (connection fee)
- 2. **Variable charge**: Based on usage (kWh for electricity, gallons for water, etc.)
- 3. **Tax**: Government tax added on top

Total Bill = Fixed Charge + (Usage Rate × Units Used) + Tax

📋 **Example**

An electricity bill shows:

- Fixed charge: 15 dollars
- Usage: 250 kWh at 0.12 dollars per kWh
- Tax: 10% of total

Calculate the bill.

Step 1: Calculate usage charge

[MathBlock]
\text{Usage Cost} = 250 \times 0.12 = \$30
[/MathBlock]

Step 2: Calculate subtotal

[MathBlock]
\text{Subtotal} = 15 + 30 = \$45
[/MathBlock]

Step 3: Calculate tax

[MathBlock]
\text{Tax} = 10\% \text{ of } 45 = 0.10 \times 45 = \$4.50
[/MathBlock]

Step 4: Calculate total

[MathBlock]
\text{Total} = 45 + 4.50 = \$49.50
[/MathBlock]

The bill is 49.50 dollars.

Invoices and Shopping Bills

Invoices are organised records of a transaction. Quantity, unit price, discount, subtotal, and tax each have a role, so calculate in the same order the invoice presents them.

An **invoice** is a bill for goods or services purchased.

Typical components:

- List of items with prices
- Subtotal
- Discount (if any)
- Tax
- Final Total

Formula:

$$\text{Total} = (\text{Subtotal} - \text{Discount}) + \text{Tax}$$

📋 **Example**

An invoice shows:

- Item 1: 25 dollars
- Item 2: 40 dollars
- Item 3: 35 dollars
- Subtotal: 100 dollars
- Discount: 10% on subtotal
- Tax: 8% on discounted amount

Calculate the total.

Step 1: Calculate discount

[MathBlock]
\text{Discount} = 10\% \text{ of } 100 = \$10
[/MathBlock]

Step 2: Calculate discounted subtotal

[MathBlock]
\text{Discounted Subtotal} = 100 - 10 = \$90
[/MathBlock]

Step 3: Calculate tax

[MathBlock]
\text{Tax} = 8\% \text{ of } 90 = 0.08 \times 90 = \$7.20
[/MathBlock]

Step 4: Calculate total

[MathBlock]
\text{Total} = 90 + 7.20 = \$97.20
[/MathBlock]

Total due: 97.20 dollars.

Rates and Taxes

Rates and taxes are percentage or fixed charges applied to a value. Identify the taxable amount first, then apply the rate.

Property tax, **income tax**, and other taxes are usually expressed as **percentages of value**.

Tax Amount = Tax Rate × Value

📋 **Example**

A house worth 200,000 dollars is taxed at 1.5% annually. How much tax is owed?

[MathBlock]
\text{Tax} = 1.5\% \text{ of } 200,000 = 0.015 \times 200,000 = \$3,000
[/MathBlock]

Annual property tax is 3,000 dollars.

Part 9: Salaries, Wages, Insurance, and Investments

Salaries and Wages

Salary usually refers to a fixed yearly or monthly amount, while wages often depend on hours worked. Overtime, deductions, and allowances can change the final pay.

Salary: A fixed amount paid yearly or monthly (usually for office jobs).

Wage: Paid based on hours worked at an hourly rate.

Gross Pay: Total pay before deductions.

Deductions: Money taken out (tax, insurance, pension, etc.).

Net Pay: Money you actually receive after deductions.

\text{Net Pay} = \text{Gross Pay} - \text{Deductions}

📋 **Example**

A worker earns 25 dollars/hour and works 40 hours per week. In one month (4 weeks), what's the gross pay? If deductions are 22%, what's the net pay?

Step 1: Calculate total hours in month

[MathBlock]
\text{Total hours} = 40 \times 4 = 160 \text{ hours}
[/MathBlock]

Step 2: Calculate gross pay

[MathBlock]
\text{Gross Pay} = 25 \times 160 = \$4,000
[/MathBlock]

Step 3: Calculate deductions

[MathBlock]
\text{Deductions} = 22\% \text{ of } 4,000 = 0.22 \times 4,000 = \$880
[/MathBlock]

Step 4: Calculate net pay

[MathBlock]
\text{Net Pay} = 4,000 - 880 = \$3,120
[/MathBlock]

Gross pay: 4,000 dollars. Net pay: 3,120 dollars.

Insurance

Insurance questions involve paying a premium to protect against a possible loss. The key quantities are the value insured, the premium rate, and any payout or compensation.

Insurance: Paying a small amount regularly to be protected against large losses.

Premium: The amount you pay for insurance (usually monthly or yearly).

Claim: Asking the insurance company to pay for a loss.

Insurance calculations usually involve:

- Premium as a percentage of property value
- Deductible (amount you pay, insurance pays the rest)
- Coverage limits (maximum insurance will pay)

📋 **Example**

A car valued at 25,000 dollars is insured at 3.5% premium per year. What's the annual premium?

[MathBlock]
\text{Premium} = 3.5\% \text{ of } 25,000 = 0.035 \times 25,000 = \$875
[/MathBlock]

Annual insurance premium is **875 dollars**.

Investments

Investment questions ask how money grows or produces returns. Check whether the return is a fixed amount, a percentage, simple interest, or compound interest.

Investment: Money you put into something (stocks, bonds, savings accounts) hoping it grows.

Investment returns are usually expressed as:

- **Return on Investment (ROI)**: Percentage gain
- **Dividend**: Money paid from profits

We already covered compound interest for savings accounts. Stocks and bonds work similarly but with different formulas.

📋 **Example**

You invest 5,000 dollars in a fund that guarantees 7% per annum compound interest for 4 years. What's it worth at the end?

[MathBlock]
A = 5000\left(1 + \frac{7}{100}\right)^4 = 5000(1.07)^4
[/MathBlock]

[MathBlock]
(1.07)^4 = 1.3108
[/MathBlock]

[MathBlock]
A = 5000 \times 1.3108 = \$6,554
[/MathBlock]

Investment grows to **6,554 dollars** (gain of **1,554 dollars**).

Part 10: Combining Multiple Concepts

Real consumer arithmetic questions rarely use only one idea. Write a short plan first: convert currency, calculate discount, add tax, find installments, or whatever sequence the story requires.

Real exam problems often combine several concepts. Let's solve some complex problems.

📋 **Example**

A shop buys shirts for 15 dollars each and marks them up 60%. They offer a 15% discount during a sale. Sales tax is 10%. What's the final price a customer pays for one shirt?

Step 1: Find marked price (60% markup)

[MathBlock]
\text{MP} = 15 + (0.60 \times 15) = 15 + 9 = \$24
[/MathBlock]

Step 2: Find sale price (15% discount)

[MathBlock]
\text{SP} = 24 - (0.15 \times 24) = 24 - 3.60 = \$20.40
[/MathBlock]

Step 3: Find final price after tax (10%)

[MathBlock]
\text{Final} = 20.40 + (0.10 \times 20.40) = 20.40 + 2.04 = \$22.44
[/MathBlock]

Customer pays **22.44 dollars**.

Step 4: Find profit percentage for shop

[MathBlock]
\text{Profit} = 22.44 - 15 = \$7.44
[/MathBlock]

[MathBlock]
\text{Profit \%} = \frac{7.44}{15} \times 100\% = 49.6\%
[/MathBlock]

(Note: Tax goes to government, not profit. Shop keeps only the difference between their cost and sale price.)

📋 **Example**

You borrow 10,000 dollars for 3 years at 6% simple interest. After 1 year, you pay back 4,000 dollars. How much do you still owe at the end of 3 years?

Step 1: Calculate total interest for 3 years on original 10,000 dollars

[MathBlock]
I = \frac{10,000 \times 6 \times 3}{100} = \$1,800
[/MathBlock]

Step 2: Total owed after 3 years (if no payments made)

[MathBlock]
A = 10,000 + 1,800 = \$11,800
[/MathBlock]

Step 3: You pay 4,000 dollars after 1 year, which reduces what you owe

[MathBlock]
\text{Remaining} = 11,800 - 4,000 = \$7,800
[/MathBlock]

You still owe **7,800 dollars** at the end of 3 years.

(Note: In simple interest, we calculate total interest upfront, then subtract payments.)

📝 **Exam Tip**

CSEC Consumer Arithmetic Strategy:

- 1. **Read carefully** — identify what you're given and what you need to find
- 2. **State your formula** — write the equation first
- 3. **Substitute values** — plug in the numbers
- 4. **Show steps** — don't jump to the answer
- 5. **Check reasonableness** — does your answer make sense?
- 6. **Include units** — write dollar signs or percentages
- 7. **Round appropriately** — usually to 2 decimal places for money