Vending Machine Change Worked Example

Declaring and Initializing Variables • Basic Console Output • Formatted Console Output • Console Input • Scanner Methods • Math Expressions • Assignment Statements • Integer Division • Problem Solving Process

Problem Statement

- Make change for a simple vending machine
  - Customer inserts a bill into the vending machine
    - and selects an item for purchase
  - Vending machine gives change
    - And dispenses the item
  - All item prices are multiples of 25 cents
  - Machine gives all change in only
    - dollar coins and quarters
  - You must compute
    - how many coins of each type to return

Understand the Problem

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- What are the outputs?

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Work a Few Examples by Hand

- Customer inserts a $5 bill
- Customer selects a $2.25 item

- Machine returns 2 dollar coins
- Machine returns 3 quarters

Work a Few Examples by Hand

- Customer inserts a $1 bill
- Customer selects a $0.75 item

- Machine returns 0 dollar coins
- Machine returns 1 quarters

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      - changeDue = 100 * billDenomination – itemPrice
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      - dollarCoins = changeDue / 100
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      - `changeDue = changeDue % 100`
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    - Compute total change due
      - changeDue = 100 * billDenomination – itemPrice
    - Compute the number of dollar coins to return
      - dollarCoins = changeDue / 100
    - Compute remainder of change to give
      - `changeDue = changeDue % 100`
    - Compute the number of quarters to return
      - quarters = changeDue / 25
- What are the outputs?
  - Number of dollar coins to return
  - Number of quarters to return

Pseudocode (Rough Outline)

- Get the inputs
- Compute the desired outputs
- Output the results

Pseudocode - Refinement

- Get the denomination of the bill
- Get the price of the item in pennies
- Compute the desired outputs
- Output the results

Pseudocode - Refinement

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- Get the price of the item in pennies
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- Output the dollars coins
- Output the quarters

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- Get the price of the item in pennies
- Compute total change due
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- Compute the number of quarters to return
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- Output the quarters

Convert Pseudocode to Java Code

- Get the denomination of the bill
- Get the price of the item in pennies
- Compute total change due
- Compute the number of dollar coins to return
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- Compute the number of quarters to return
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- Output the quarters

Convert Pseudocode to Java Code

- Get the denomination of the bill

```
System.out.print("Enter denomination of bill -->");
billDenomination = in.nextInt();
```

- Get the price of the item in pennies
- Compute total change due
- Compute the number of dollar coins to return
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- Get the price of the item in pennies

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```

- Compute total change due

```
changeDue = 100 * billDenomination - itemPrice;
```

- Compute the number of dollar coins to return
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- Compute the number of quarters to return
- Output the dollars coins
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itemPrice = in.nextInt();
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- Compute total change due

```
changeDue = 100 * billDenomination - itemPrice;
```

- Compute the number of dollar coins to return

```
dollarCoins = changeDue / 100;
```

- Compute remainder of change to give
- Compute the number of quarters to return
- Output the dollars coins
- Output the quarters

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```
dollarCoins = changeDue / 100;
```

- Compute remainder of change to give

```
changeDue = changeDue % 100;
```

- Compute the number of quarters to return

```
quarters = changeDue / 25;
```

- Output the dollars coins

- Output the quarters

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- Compute remainder of change to give

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changeDue = changeDue % 100;
```

- Compute the number of quarters to return

```
quarters = changeDue / 25;
```

- Output the dollars coins

```
System.out.printf("Returning %d dollar coins", dollarCoins);
```

- Output the quarters

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- Compute remainder of change to give

```
changeDue = changeDue % 100;
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- Compute the number of quarters to return

```
quarters = changeDue / 25;
```

- Output the dollars coins

```
System.out.printf("Returning %d dollar coins", dollarCoins);
```

- Output the quarters

```
System.out.printf(" and %d quarters.%n", quarters);
```

Convert Pseudocode to Java Code

```java
import java.util.Scanner;

class Main {
  public static void main(String[] args) {
    Scanner in = new Scanner(System.in);
    // declare variables
    int billDenomination = 0;
    int itemPrice = 0;
    int changeDue = 0;
    int dollarCoins = 0;
    int quarters = 0;

    // get inputs
    System.out.print("Enter denomination of bill -->");
    billDenomination = in.nextInt();
    System.out.print("Enter item price in pennies-->");
    itemPrice = in.nextInt();

    // Calculate the change due
    changeDue = 100 * billDenomination - itemPrice;
    // Calculate the number of dollar coins to return
    dollarCoins = changeDue / 100;
    changeDue = changeDue % 100;
    // Calculate the number of quarters to return
    quarters = changeDue / 25;

    // output results
    System.out.printf("Returning %d dollar coins", dollarCoins);
    System.out.printf(" and %d quarters.%n", quarters);
  }
}
```