

10. A communications company uses a program to calculate a customer's average data usage over a 12-month period.

An example of a customer's monthly data usage in gigabytes (GB) is shown below.

...	Feb	March	April	May	June	July	Aug	...
	50	41	30.8	35.7	32.7	23	19	

- (a) The data usage for the customer in May is 35.7 GB. This value would be stored in a computer system using floating-point representation as shown below.

$$0.357 \times 10^2$$

Identify the mantissa and exponent in the above floating-point representation. 2

Mantissa _____

Exponent _____

- (b) The design below shows how a customer's average monthly data usage is calculated and displayed.

Algorithm

1. Store each month's data usage
2. Calculate the average monthly data usage
3. Display the average monthly data usage

The data structure `month` is used to store the data usage.

The variable `aveData` is used to store a customer's average monthly data usage.

Using a design technique of your choice, refine step 2. 4



* X 8 1 6 7 5 0 1 1 3 *

10. (continued)

- (c) A customer's average monthly data usage is displayed using the following code.

```
SEND aveData TO DISPLAY
```

The above code displays the following value to a customer.

23.3123

Using a programming language of your choice, re-write this code so the customer's average monthly data usage will display as the following.

2

23.3

- (d) The following code checks if the customer receives both their mobile data and broadband from the company before offering them a discount.

```
...
Line 44 SET custDiscount TO 0.0
Line 45 < Repeat for each customer >
Line 46   IF mobileData = TRUE AND broadband = TRUE THEN
Line 47     SEND "You are due a 20% discount." TO DISPLAY
Line 48     SET cust Discount TO bill * 0.2
Line 49   END IF
Line 50 < End repeat>
...
```

- (i) Identify the logical operator in the above code.

1

- (ii) During translation the program stops and produces an error at line 48.

State the type of error that the programmer has made and how the error can be corrected.

2

Type of error _____

Correction _____