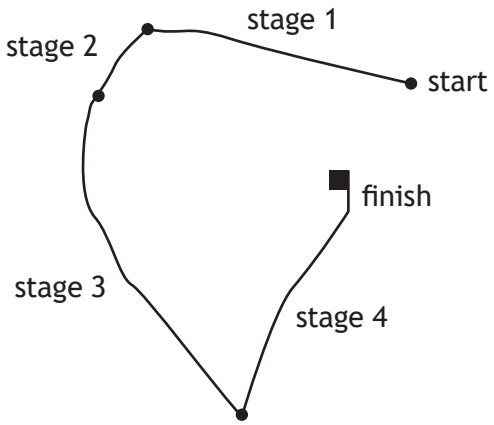
11. Edge Races are developing a program to process information on races with multiple stages.

The first race has four stages as shown below.

Race one	
Stage	**Distance (km)**
1	19.9
2	6.5
3	35.2
4	20.0



The design for part of the program is shown below.

```
6.1     Loop 4 times
6.2         Get valid distance for stage
```

(a) The distance of a stage can range from 5 to 75 km.

(i) Using a design technique of your choice, refine step 6.2 to check the user enters a valid distance. **4**

11. (a) (continued)

(ii) Test data is used to ensure the distance entered is valid.

State the type of test in the table below. **2**

Type of test	Input	Expected results
	67.6	Program continues
	3.7	Program displays an error message

(b) The following lines of code are written to input the distance for each stage of 'Race one'.

```
...
Line 6    FOR stage FROM 0 TO 3 DO
Line 7       RECEIVE distance FROM KEYBOARD
...
```

Changes should be made to the code above to ensure that any number of stages could be processed.

Describe two changes that would be required. **2**

Change 1 _____

_____

Change 2 _____

_____

11. (continued)

(c) Edge Races classify races as 'beginner', 'intermediate' or 'advanced' based on the total distance of the race. The program displays the classification after calculating the total distance.

```
...
Line 25   <calculate the total distance for the race>
Line 26   IF totalDistance < 25 THEN
Line 27        SET race TO "beginner"
Line 28   END IF
Line 29   IF totalDistance >= 25 OR totalDistance <=100 THEN
Line 30        SET race TO "intermediate"
Line 31   END IF
Line 32   IF totalDistance > 100 THEN
Line 33        SET race TO "advanced"
Line 34   END IF
Line 35   SEND race TO DISPLAY
...
```

(i) When tested the code produced an unexpected result.

Identify the type of error in the code above. **1**

(ii) The code above is inefficient.

Using a programming language of your choice, re-write lines 26 to 34 to make this more efficient. **2**

(d) During execution the code is translated.

State the type of translator that has been used. **1**

11. (continued)

(e) The average stage distance for each race is calculated and stored in the variable `avgDistance`.

(i) Using a programming language of your choice, write the code to store the average to 1 decimal place. **2**

(ii) The average stage distance should be displayed, as shown below for 'Race one'.

```
The average is 20.4 km
```

Using a programming language of your choice and the variable `avgDistance`, write the code to produce the output above. **2**