UNIVERSITY OF WATERLOO

The CENTRE for EDUCATION in MATHEMATICS and COMPUTING

2025 Beaver Computing Challenge (Grades 9 & 10)

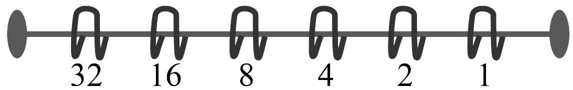
Questions, Answers, and Explanations

Part A

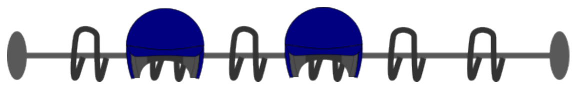
Scoreboard

Story

Two teams are playing baseball. To keep track of their score, each team uses helmets and a row of hooks. The rightmost hook represents a score of 1 and each other hook represents twice the value of the hook to its right, as shown.

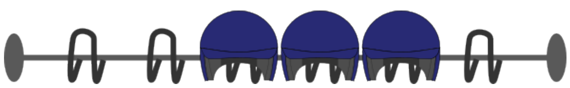


Each hook can have at most one helmet, and the total score for a team is the sum of all the scores on the hooks with helmets. For example, the following row of hooks would represent a score of $16 + 4 = 20$.



Question

The final scores for the two teams are shown.



What is the difference between the two scores?

(A) 11 (B) 9 (C) 13 (D) 7

Answer

(A) 11

Explanation of Answer

In this way of counting, each row of hooks from right to left stands for a number: 1, 2, 4, 8, 16, and 32.

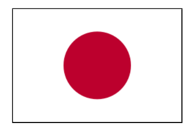
To determine the final scores, we add up the numbers where helmets are placed. One team has a score of $8 + 4 + 2 = 14$ and the other team has a score of $2 + 1 = 3$.

Therefore, the difference is $14 - 3 = 11$.

Alternatively, notice that both teams have a helmet on the second hook from the right. We can ignore these helmets as the scores will cancel each other out when we subtract. Then the difference is $(8+4)-1 = 12 - 1 = 11$, as before.

Country of Original Author

Japan



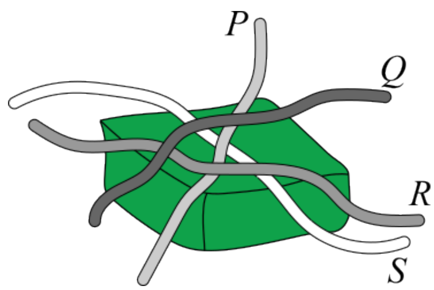
Chung Cake

Story

Banh Chung is a traditional rice cake dish eaten in Vietnam to celebrate the Lunar New Year. These rice cakes are cut using strings placed on the cake one at a time and in different directions.

Question

In what order were the four strings placed on the rice cake shown below?



(A) S, P, Q, R

(B) Q, S, P, R

(C) R, P, S, Q

(D) S, P, R, Q

Answer

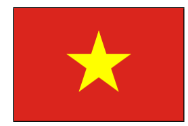
(D) S, P, R, Q

Explanation of Answer

By inspecting the image, we see that each string except string Q has at least one string cross over top of it. Therefore, string Q must be the last string placed on the cake. If we imagine that string Q has been removed, then each string except string R has at least one string cross over top of it. Therefore, string R must be the second last string placed on the cake. We can continue in this way or notice that only string S does not have any strings crossing under it so it must have been placed on the cake first. Regardless, we determine that the strings must have been placed on the cake in the order S, P, R, Q.

Country of Original Author

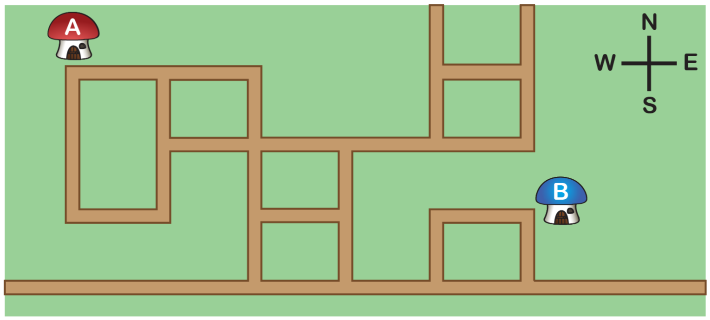
Vietnam



A Wrong Step

Story

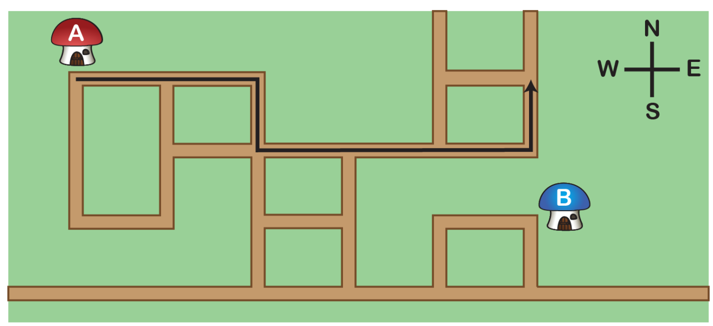
Aira is walking from her house to her friend Bo's house for the first time. A map of the streets between their houses is shown. All streets go either east/west or north/south.



Bo gave Aira the following instructions, where walking one *block* means walking straight until you reach the next street.

Step 1: Walk two blocks east (E).
Step 2: Walk three blocks south (S).
Step 3: Walk three blocks east (E).
Step 4: Walk one block north (N).

However, Aira made a mistake with one of the steps and did not arrive at Bo's house. Her route is shown.



Question

Which step did Aira **not** follow correctly?

(A) Step 1 (B) Step 2 (C) Step 3 (D) Step 4

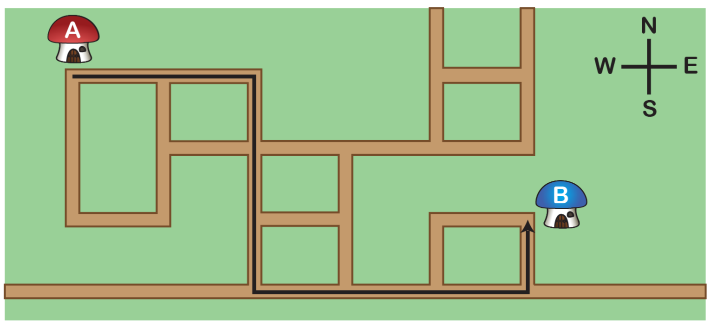
Answer

(B) Step 2

Explanation of Answer

Aira's route shows that she first walked two blocks east, which matches Step 1. She then walked one block south, but this does not match Step 2 because in Step 2 Aira was supposed to walk three blocks south. She then walked three blocks east, which matches Step 3. Finally she walked one block north, which matches Step 4. Thus, the only step that Aira did not follow correctly is Step 2.

The correct route using Bo's instructions is shown. We can verify that this route does take Aira from her house to Bo's house.



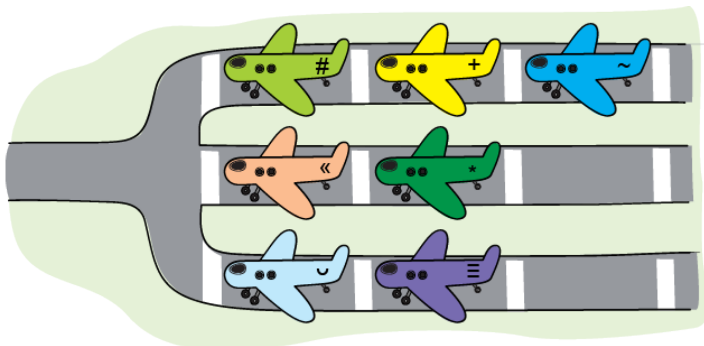
Country of Original Author

Canada

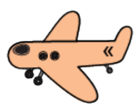
Planes

Story

Seven planes are lined up for take-off using a single shared runway. A plane cannot take off if there is a plane waiting directly in front of it.



The following table shows the take-off schedule, but some of the planes are missing from the schedule.

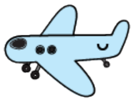
Time	**10:45**	**10:52**	**10:55**	**10:59**	**11:03**	**11:10**	**11:16**
Plane							

Question

If all the planes take off as scheduled, which plane takes off at 11:03?

(A)    (B)    (C)    (D) 

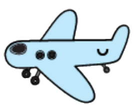
Answer

(D) 

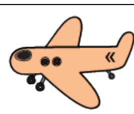
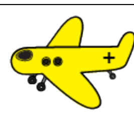
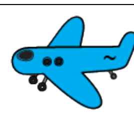
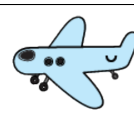
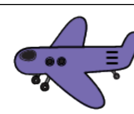
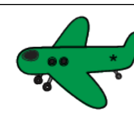
Explanation of Answer

Planes  and  need to take off before plane  can take off at 10:59.

There are three take-off spots before 10:59, but the one at 10:52 is already full. Therefore, planes  and  must take off at 10:45 and 10:55 (in that order because of how they are lined up on the top runway).

This leaves 11:03 as the only other empty slot before plane  takes off at 11:10. Since plane  must take off before plane , the plane that takes off at 11:03 must be .

A little bit of extra work allows us to determine the complete take-off schedule:

Time	**10:45**	**10:52**	**10:55**	**10:59**	**11:03**	**11:10**	**11:16**
Plane							

Country of Original Author

Lithuania

Favourite Fruit

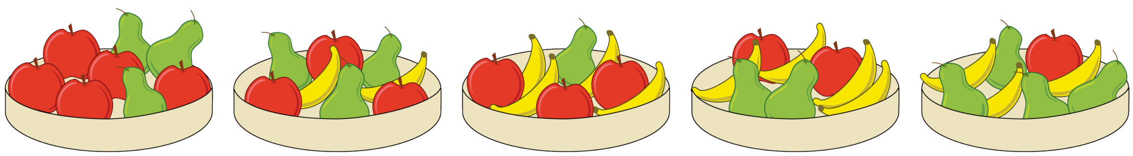
Story

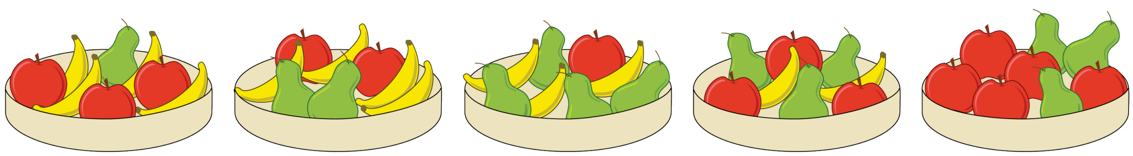
Apples , bananas  and pears  are placed in five baskets so that each basket has eight pieces of fruit.

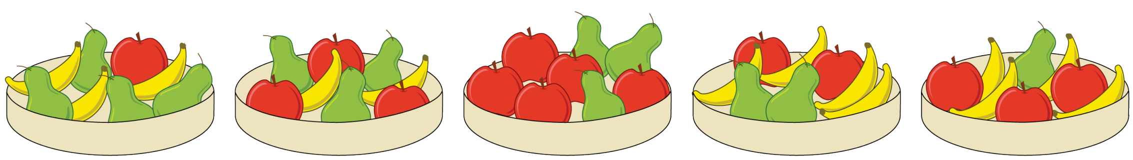
Given any two baskets, Blake always prefers the basket with more apples. If two baskets have the same number of apples, then Blake prefers the basket with more bananas.

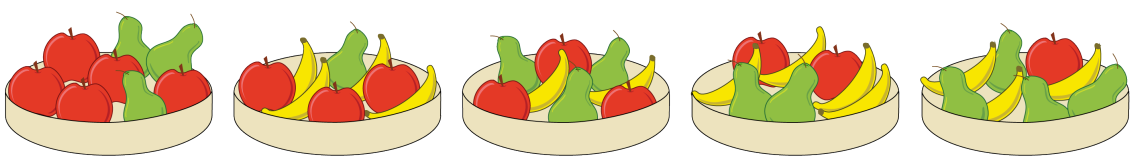
Question

Which of the following shows the five baskets ordered from Blake's most preferred to least preferred from left to right?

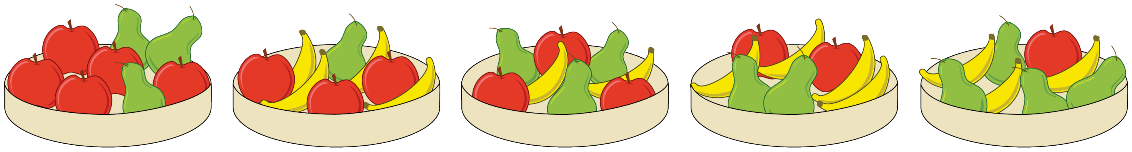
(A) 

(B) 

(C) 

(D) 

Answer

(D) 

Explanation of Answer

In Option D, the number of apples in the baskets from left to right is $5, 3, 3, 2, 1$. Of the two baskets with 3 apples, the basket with 4 bananas comes before the basket with 2 bananas. Therefore, this option shows the baskets ordered from Blake's most preferred to least preferred.

Option A is incorrect because the two baskets with 3 apples are out of order. That is, the basket with 2 bananas comes before the basket with 4 bananas.

Options B and C are incorrect because the basket with the most apples is not first.

Country of Original Author

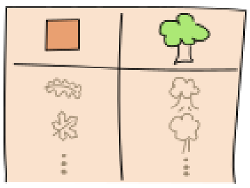
Australia

Part B

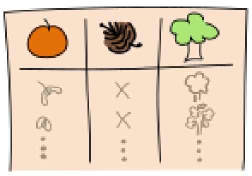
Beaver Timber

Story

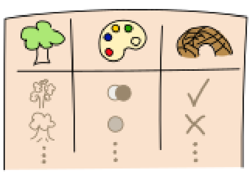
Emil's friends have each recorded different data about all the tree species in a forest. When Emil has a question while hiking in the forest, he knows he can call these friends to find the answer to his question.



Severin records the shape of the leaf for each tree species.



Quirina records the fruit as well as whether or not the tree has cones for each tree species.



Ladina records each tree species along with the colour of its bark and whether or not its wood is suitable for building a beaver lodge.

Question

Emil has found a leaf. He wants to know if it belongs to a tree species whose wood is suitable for building a beaver lodge. Which of his friends must he call?

(A) Only Ladina

(B) Only Severin and Quirina

(C) Only Severin and Ladina

(D) Severin, Quirina and Ladina

Answer

(C) Only Severin and Ladina

Explanation of Answer

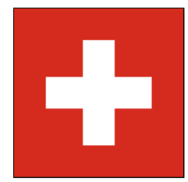
The only friend who recorded data about the shape of the leaf is Severin, so to learn anything new, Emil must call Severin to ask a question. From Severin, he can learn what tree species the leaf corresponds to.

After doing this, Emil can call Ladina to ask whether the wood of that tree species is suitable for building a beaver lodge. Ladina is the only friend who recorded information about whether or not the wood is suitable for building a beaver lodge, so Emil has to call Ladina to ask a question.

Notice that Emil did not need to call Quirina to ask any questions.

Country of Original Author

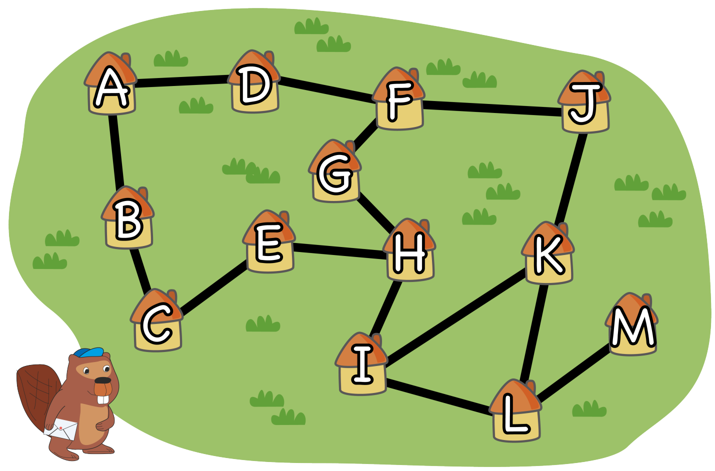
Switzerland



Beaver Island Broadcast

Story

There are 13 villages  on Beaver Island connected by roads, as shown.



Messages are delivered between villages regularly. After a message is sent from one village, it takes one day to reach its immediate neighbours.

If a village wants to broadcast a message to the entire island, they first send the message to all their immediate neighbours. Then each village who receives the message sends it on to their immediate neighbours the same day. This continues until all villages have received the message.

For example, if Village B broadcasts a message, it takes 1 day to reach Villages A and C, and 2 days to reach villages D and E.

Question

If Village H broadcasts a message, how many days will it take for the message to reach all the villages?

(A) 3 (B) 4 (C) 5 (D) 6

Answer

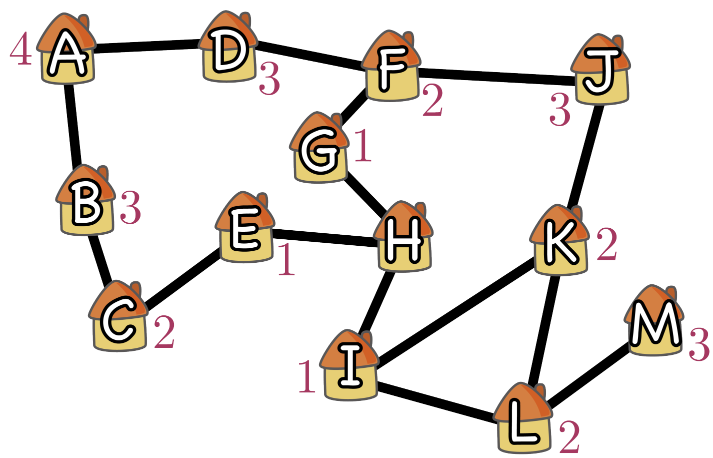
(B) 4

Explanation of Answer

Starting from Village H and looking at each village's immediate neighbours, we can track the number of days it takes for the message to reach each village as follows.

- After 1 day, Villages E, G, and I receive the message.
- After 2 days, Villages C, F, K, and L receive the message.
- After 3 days, Villages B, D, J, and M receive the message.
- After 4 days, Village A receives the message.

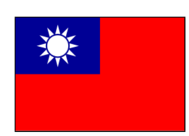
This is shown in the following diagram, where the number next to each village represents the number of days it takes for the message to reach that village.



In total, it takes 4 days for all villages to receive the message that Village H broadcasts.

Country of Original Author

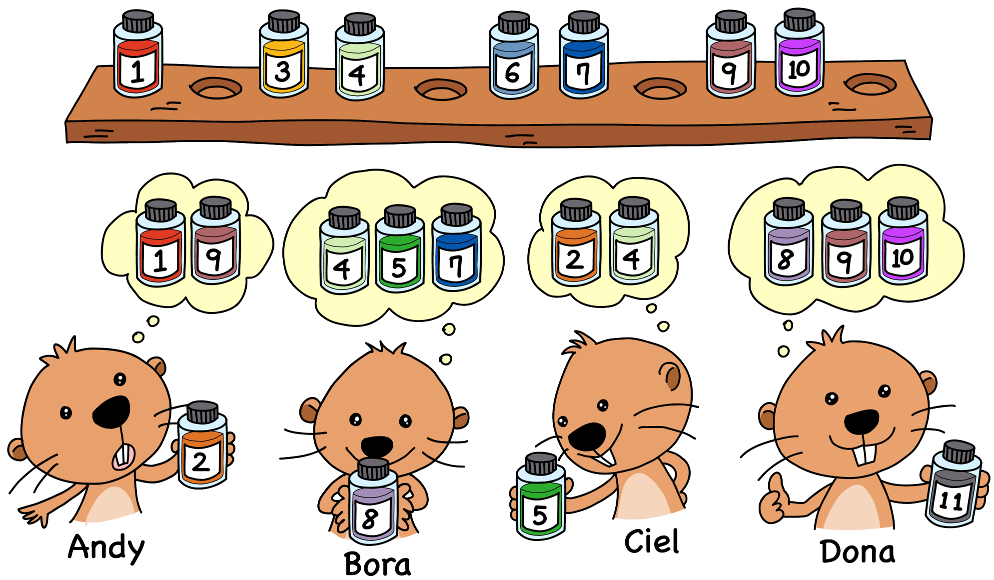
Taiwan



Sand Painting

Story

Beavers Andy, Bora, Ciel, and Dona are each making a sand painting. They share eleven numbered jars, each containing a different colour of sand. In the picture, each beaver is holding one of the jars they need for their sand painting, and the clouds above their heads show the other jars they need.



Two beavers cannot use the same jar at the same time. Also a beaver cannot start their sand painting until they have all the jars they need. Each beaver waits until all the jars they need are available, then they take them all and do their sand painting. When they are finished they return all their jars so others can use them.

Question

Which beaver does their sand painting last?

(A) Andy (B) Bora (C) Ciel (D) Dona

Answer

(D) Dona

Explanation of Answer

Andy needs jars 1 and 9, and since they are both available she can start her sand painting immediately.

Ciel needs jar 2, but Andy has jar 2 so Ciel has to wait for Andy to finish her sand painting.

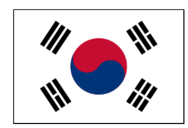
Bora needs jar 5, but Ciel has jar 5 so Bora has to wait for Ciel to finish his sand painting.

Dona needs jar 8, but Bora has jar 8 so Dona has to wait for Bora to finish his sand painting.

Therefore, Andy does her sand painting first, followed by Ciel, then Bora, and finally Dona. That is, Dona does her sand painting last.

Country of Original Author

South Korea



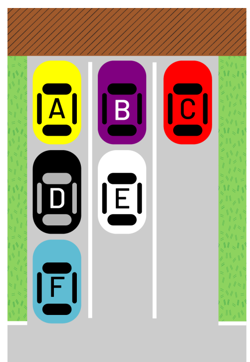
Parking at the Party

Story

Mia's friends drive to her house to attend parties. Her driveway can fit nine cars parked in three columns with three cars in each column, one behind the other.

When a friend arrives, they park at the front of a column or directly behind another car. A friend cannot leave the party until all the cars behind them in their column have left.

For example, given the six parked cars shown below, Car A must have arrived before both Cars D and F. Also, Car E must leave before Car B.



Question

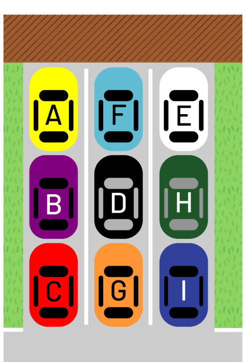
For another party, cars arrive in the order

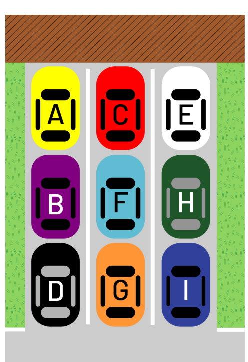
$$A, B, C, D, E, F, G, H, I$$

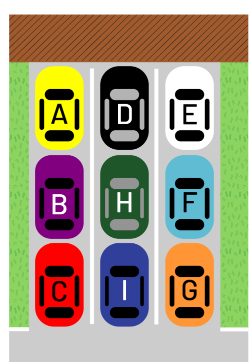
and leave in the order

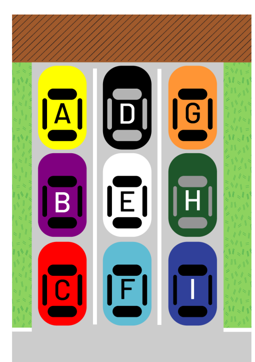
$$G, D, F, I, H, C, B, A, E.$$

Which of the following could have been how these cars parked in Mia's driveway?

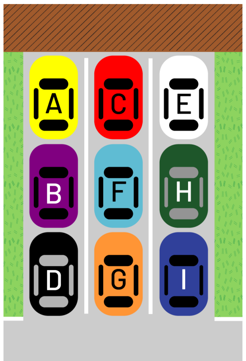
(A) 

(B) 

(C) 

(D) 

Answer

(B) 

Explanation of Answer

Since the cars arrive in "alphabetical order", the cars parked in each column must also appear in alphabetical order from top (first to arrive) to bottom (last to arrive). This matches Option B, but we also need to check if this option matches the order in which the cars leave. And it does because

- Car D leaves before Car B which leaves before Car A, matching the left column,
- Car G leaves before Car F which leaves before Car C, matching the middle column, and
- Car I leaves before Car H which leaves before Car E, matching the right column.

Therefore Option B is one way the cars could have been parked in Mia's driveway.

Option A is incorrect. One way to see this is to notice that D is parked behind F but arrives before F.

Option C is incorrect. One way to see this is to notice that H is parked behind D but leaves after D.

Option D is incorrect. One way to see this is to notice that H is parked behind G but leaves after G.

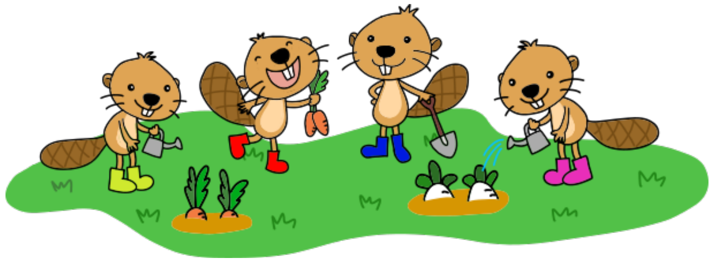
Country of Original Author

Slovenia 

Dure

Story

Villagers follow a Korean agricultural cooperative tradition called *dure*.



The villagers need to choose three dure farming days per week, according to the following rules:

1. Each dure farming day must have at least four villagers participating.
2. Each villager must participate in at least one dure farming day per week.
3. No villager can participate in all three dure farming days in a week.

In the following table, each villager has put a checkmark (✓) under the days they're available for dure.

Name	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Ain	✓		✓		✓	✓	
Boa	✓	✓	✓				
Chaewon		✓			✓		
Doyun			✓	✓		✓	
Eunwoo	✓			✓			✓
Felix		✓		✓		✓	
Gaon	✓		✓				✓
Hana		✓			✓	✓	

Question

Which days should the villagers choose for their dure farming days?

(A) Monday, Tuesday, Wednesday

(B) Monday, Tuesday, Saturday

(C) Tuesday, Wednesday, Thursday

(D) Tuesday, Wednesday, Saturday

Answer

(B) Monday, Tuesday, Saturday

Explanation of Answer

From the table, we can determine the number of villagers available each day:

- Monday: 4 people (Ain, Boa, Eunwoo, Gaon)
- Tuesday: 4 people (Boa, Chaewon, Felix, Hana)
- Wednesday: 4 people (Ain, Boa, Doyun, Gaon)
- Thursday: 3 people (Doyun, Eunwoo, Felix)
- Friday: 3 people (Ain, Chaewon, Hana)
- Saturday: 4 people (Ain, Doyun, Felix, Hana)
- Sunday: 2 people (Eunwoo, Gaon)

Since each dure farming day must have at least four villagers participating, we cannot choose Thursday, Friday, or Sunday because they each have fewer than four people available. Thus, we must choose from Monday, Tuesday, Wednesday, and Saturday.

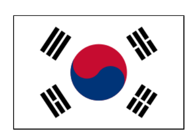
Among Monday, Tuesday, Wednesday, and Saturday, Chaewon is only available on Tuesdays and Eunwoo is only available on Mondays. Since each villager must participate in at least one dure farming day per week, it follows that the three dure farming days must include both Monday and Tuesday so that Chaewon and Eunwoo can participate.

If Monday, Tuesday, and Wednesday were chosen, then Boa would have to participate every day in order for each day to have enough villagers participating. However, from the rules we know that no villager can participate in all three dure farming days in a week. Thus, we cannot choose Monday, Tuesday, and Wednesday.

Therefore, the only remaining option is to choose Monday, Tuesday and Saturday. We can verify that this choice satisfies all three rules.

Country of Original Author

South Korea

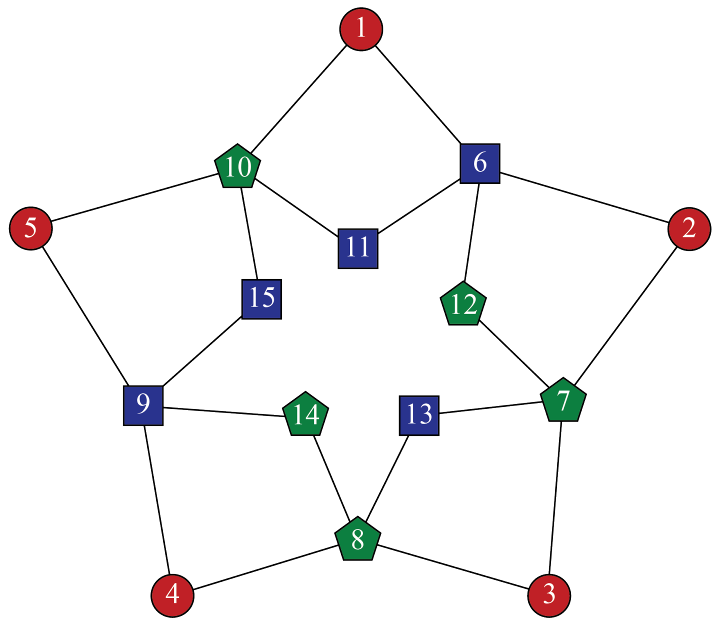


Part C

Lights

Story

Sofia has 15 programmable lights of three types (, , and). She numbers them from 1 to 15 and connects them in a star shape as shown.



Each light is controlled with a switch and Sofia programs the other lights as follows:

- Each light turns on if the two lower-numbered lights connected to it are **both** on.
- Each light turns on if **exactly one** of the two lower-numbered lights connected to it is on. In other words, one of these lower-numbered lights is on but the other is not.

Question

All the lights are off and then Sofia turns on lights 1, 2, and 4 at the same time. Which of the five lights closest to the centre (lights 11, 12, 13, 14, and 15) will turn on?

(A) Lights 11, 12, 13, 14, and 15

(B) Only lights 12, 13, and 15

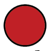
(C) Only lights 11, 12, 13, and 14

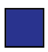
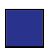
(D) Only lights 11, 13, and 14

Answer

(D) Only lights 11, 13, and 14

Explanation of Answer

Of the  lights, only lights 1, 2, and 4 are turned on. Notice that as implied by the wording of the story, each of the other lights is connected to exactly two lower-numbered lights. Therefore, we can consider the lights in increasing order to determine which ones will turn on. As we do this, we are moving towards the five lights closest to the centre.

- Since light 6 is a  light, and both lights 1 and 2 are on, it follows that light 6 turns on.
- Since light 7 is a  light, and light 2 is on but light 3 is off, it follows that light 7 turns on.
- Since light 8 is a  light, and light 4 is on but light 3 is off, it follows that light 8 turns on.
- Since light 9 is a  light, but lights 4 and 5 are not both on, it follows that light 9 remains off.
- Since light 10 is a  light, and light 1 is on but light 5 is off, it follows that light 10 turns on.
- Since light 11 is a  light, and both lights 6 and 10 are on, it follows that light 11 turns on.
- Since light 12 is a  light, but both lights 6 and 7 are on, it follows that light 12 remains off.
- Since light 13 is a  light, and both lights 7 and 8 are on, it follows that light 13 turns on.
- Since light 14 is a  light, and light 8 is on but light 9 is off, it follows that light 14 turns on.
- Since light 15 is a  light, but lights 9 and 10 are not both on, it follows that light 15 remains off.

Thus, of the five lights closest to the centre, only lights 11, 13, and 14 turn on.

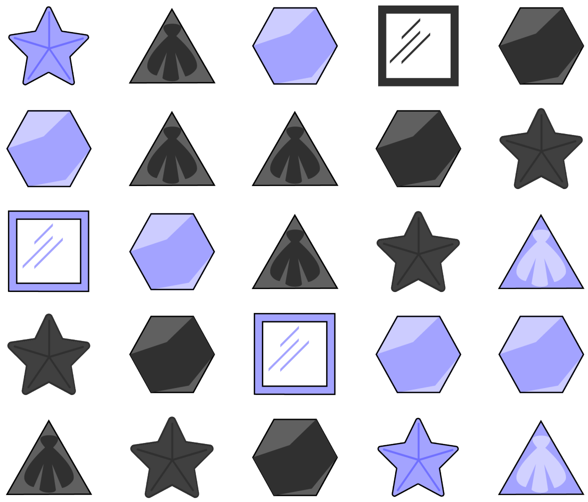
Country of Original Author

Canada

Mosaic

Story

The arrangement below uses light purple and dark grey shapes. Each shape has 3, 4, 5, or 6 outer points.

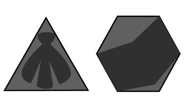


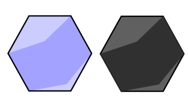
A grumpy beaver didn't like the arrangement above. So, at two locations it removed the shape and then replaced it with a different shape. After doing this, every row and every column had:

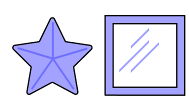
- an odd number of light purple shapes, and
- an odd number of total outer points.

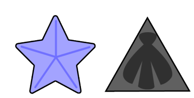
Question

Which of the following two new shapes might the beaver have used?

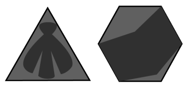
(A) 

(B) 

(C) 

(D) 

Answer

(A) 

Explanation of Answer

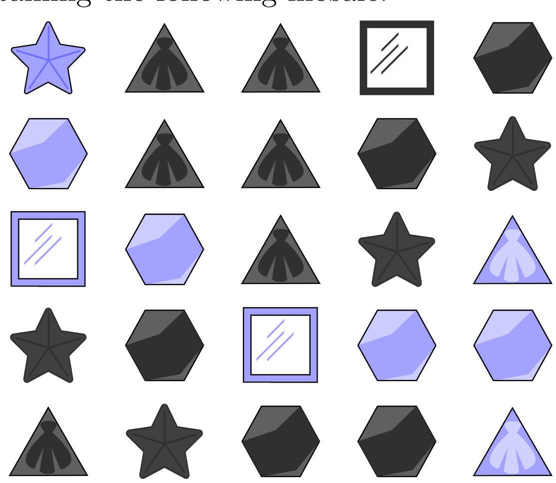
We begin by finding the rows and columns in the original arrangement that do not have an odd number of light purple shapes or that do not have an odd number of total outer points. We number our rows from top to bottom and number our columns from left to right. Looking at each row and column, we see the following counts yielding even numbers which we will call *errors*.

- Row 1 has 2 light purple shapes and 24 total outer points.
- Row 5 has 2 light purple shapes and 22 total outer points.
- Column 3 has 2 light purple shapes and 22 total outer points.
- Column 4 has 2 light purple shapes and 26 total outer points.

Thus, since exactly two shapes were replaced and there are errors in two different rows/columns, there are only four possible points of replacement. In (row, column) format, they are (1, 3), (1, 4), (5, 3), or (5, 4). Replacing two points in the same row or same column cannot fix errors in both rows/columns, so there are only two possible pairs of replacement points: (1, 3) and (5, 4), or (1, 4) and (5, 3).

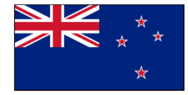
The points (1, 4) and (5, 3) originally contained dark grey shapes with an even number of points. Therefore, if they were replaced, it would have been with two light purple shapes, each with an odd number of outer points. This does not match any of the options.

The points (1, 3) and (5, 4) originally contained light purple shapes. One had an even number of outer points and the other had an odd number of outer points. Therefore, they could have been replaced with two dark grey shapes; one with an odd number of outer points and one with an even number of outer points. This matches Option A. Specifically, the beaver placed the dark grey triangle at (1, 3) and the dark grey hexagon at (5, 4) obtaining the following mosaic.



Country of Original Author

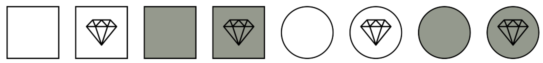
New Zealand



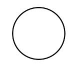
Third Game

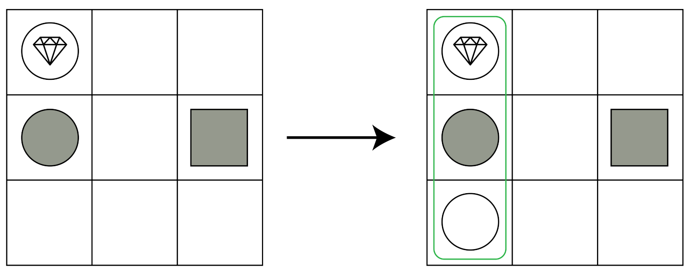
Story

Beavers Anna and Bento are playing a two-player game called Third. The game is played on a 3×3 board using a total of eight pieces. Each piece has three defining attributes: shape (square or circle), colour (grey or white), and marking (diamond or plain). The eight pieces are shown.



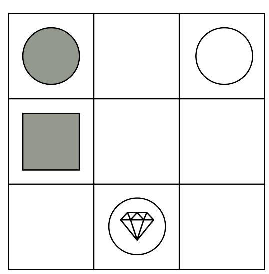
The game begins with an empty board. The two players take turns placing pieces on the board, however, each piece is selected by their opponent (from the pieces not currently on the board). The player then places this piece on any available square on the board. The winner is the first player to place the third piece in a row or a column so that all three pieces have the same colour, shape, or marking.

For example, suppose the game board is as shown, and Bento chooses the  piece for Anna. If she places this piece in the bottom-left corner, then she will win the game because she will have placed the third piece in a column with all circles.

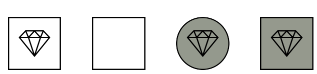


Question

Bento and Anna are playing Third and after each player has placed two pieces, the board is as shown.



It is now Bento's turn. How many of the following four pieces could Anna select for Bento if she wants to ensure that Bento **cannot** win the game on his turn?



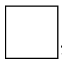
(A) 0 (B) 1 (C) 2 (D) 3

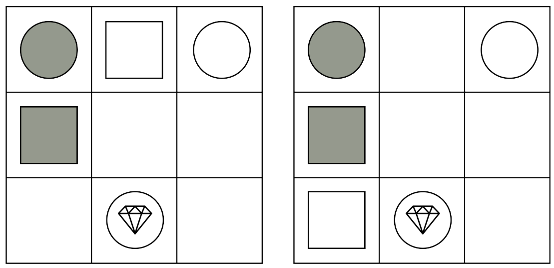
Answer

(B) 1

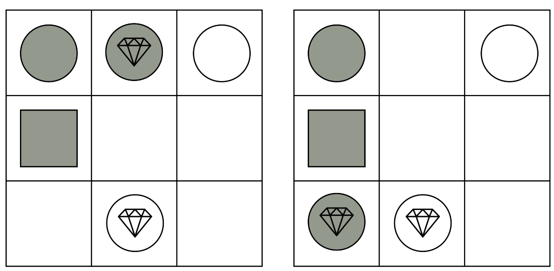
Explanation of Answer

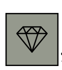
Bento can only complete the top row or the leftmost column on this turn.

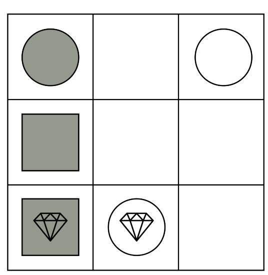
- If Anna selects the , then completing either the top row or the leftmost column will not result in a win for Bento.
- If Anna selects the , then Bento can win the game by completing either the top row or the leftmost column (three plain pieces in each case), as shown.



- If Anna selects the , then Bento can win the game by completing either the top row (three circle pieces) or the leftmost column (three grey pieces) as shown.



- If Anna selects the , then Bento can win the game by completing the leftmost column (three grey pieces) as shown.



Therefore, there is only 1 piece Anna can select to ensure Bento cannot win the game on his turn.

Country of Original Author

Brazil

Describing Sequences

Story

Sarah has a very specific procedure for describing sequences of black and white squares:

- If all the squares of a sequence are white, she writes **W** to describe the sequence.
- If all the squares of a sequence are black, she writes **B** to describe the sequence.
- Otherwise, to describe the sequence, she writes **X**, and then
  - follows her procedure for describing the left half of the sequence, and after it is complete,
  - follows her procedure for describing the right half of the sequence.

Below are four examples of sequences and what Sarah writes to describe each of them using her procedure.

W

XWB

XXBWB

XBXWXBW

Question

What does Sarah write when using her procedure to describe the following sequence?

(A) **XXXWBWXBXBW**

(B) **XXXWBXWWXXBBXBW**

(C) **XWBWXBBW**

(D) **XXXBWBXWXWB**

Answer

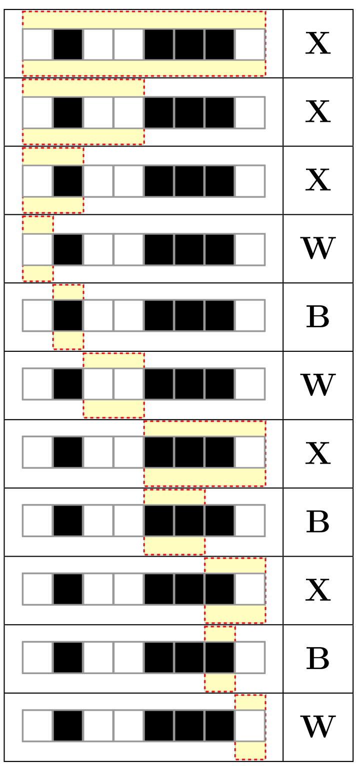
(A) **XXXWBWXBXBW**

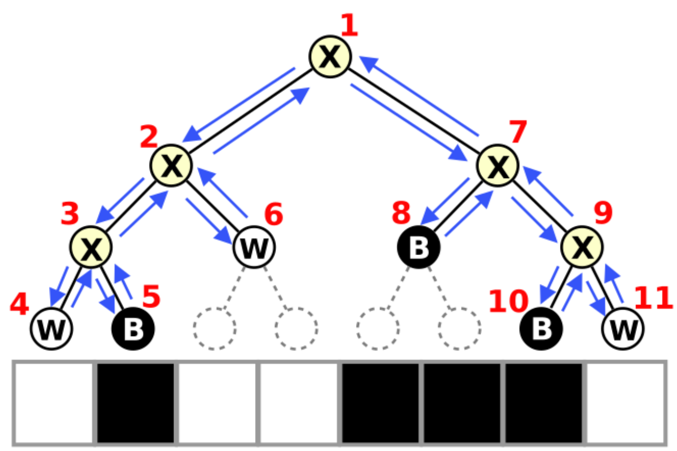
Explanation of Answer

Suppose Sarah uses her procedure to describe the given sequence. Since the sequence contains both black and white squares, Sarah first writes **X**. Then the procedure fully describes the four squares on the left of the sequence.

When describing these four leftmost squares, Sarah will first write an **X** because they also include both black and white squares. She will then follow the procedure to describe the left half of the left half of the sequence (the first two squares) followed by describing the right half of the left half of the sequence (the third and fourth squares). We can continue following the procedure ourselves to determine that she writes **XWB** and then **W** for these two pairs of squares.

It is after all this that the procedure is used to describe the right half (last four squares) of the original sequence. We will use the table and diagram below to help fill in all the details omitted above.





The table lists the portions of the sequence that are considered in the order they are considered. For each portion, the character used to describe it is shown. When read in order, we get **XXXWBWXBXBW**.

The diagram helps visualize why this is the order in which portions of the sequence are considered. The blue arrows indicate how we *"move"* and the red numbers indicate in what order the characters are written.

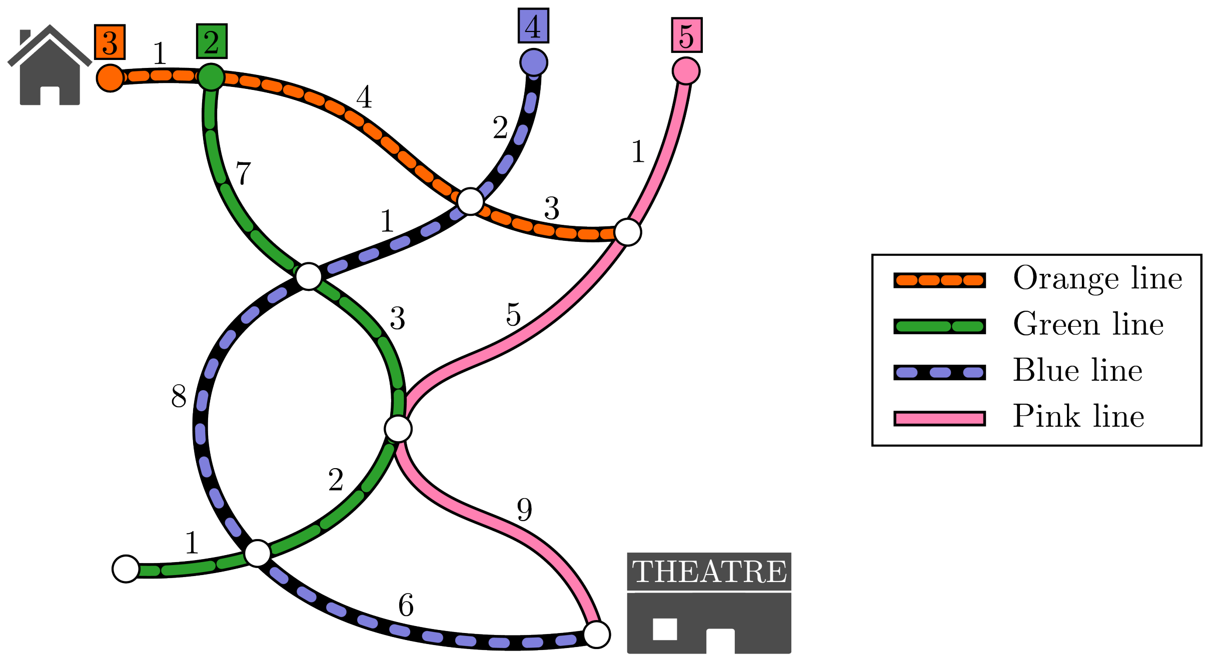
Country of Original Author

Portugal

Public Transport

Story

Marcus wants to go from his home to the theatre by bus. The following map shows Marcus's home, the theatre, and four bus lines with circles representing bus stops.



Each bus departs from the top of the map. The first bus on each of the four lines departs at the same time. After that, buses depart on each line at the time intervals shown in the squares. For example, a bus departs on the orange line leaving Marcus's home every 3 minutes.

Each line segment between two bus stops is labeled with the number of minutes it takes to travel between the two stops. For simplicity, assume that stopping at a bus stop to load and unload passengers takes no time (0 minutes).

Stops with two or more bus lines intersecting can be used to change buses. If Marcus arrives at an intersection point, he can change to a bus that arrives there at the same time or later.

Question

If Marcus departs his home on the first bus on the orange line, what is the shortest time, in minutes, needed for him to reach the theatre?

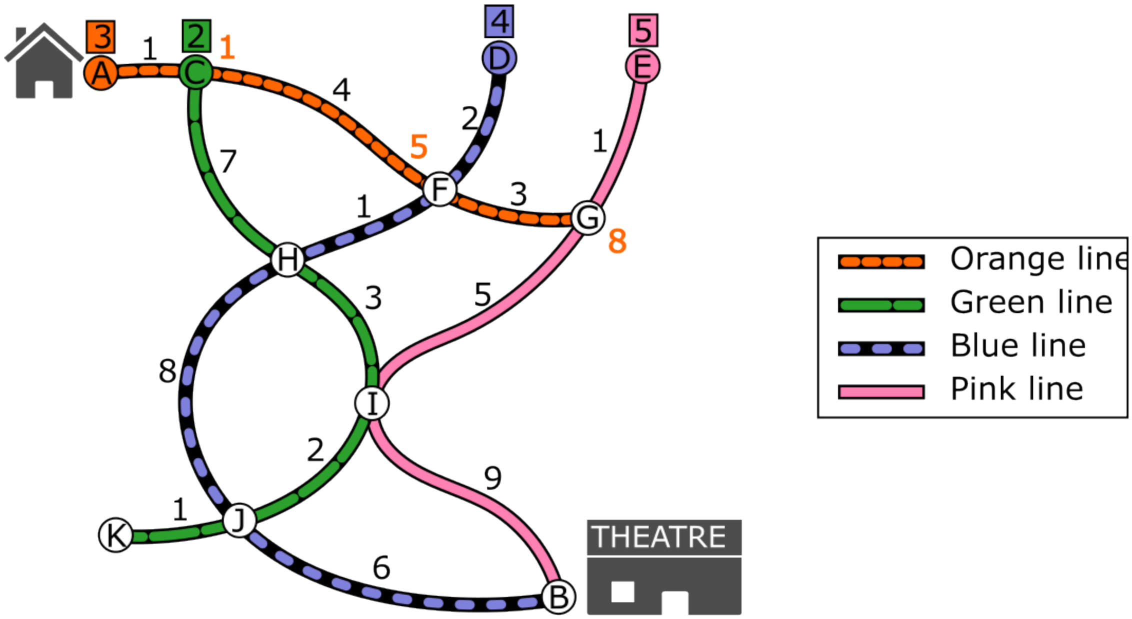
(A) 18 (B) 19 (C) 20 (D) 21

Answer

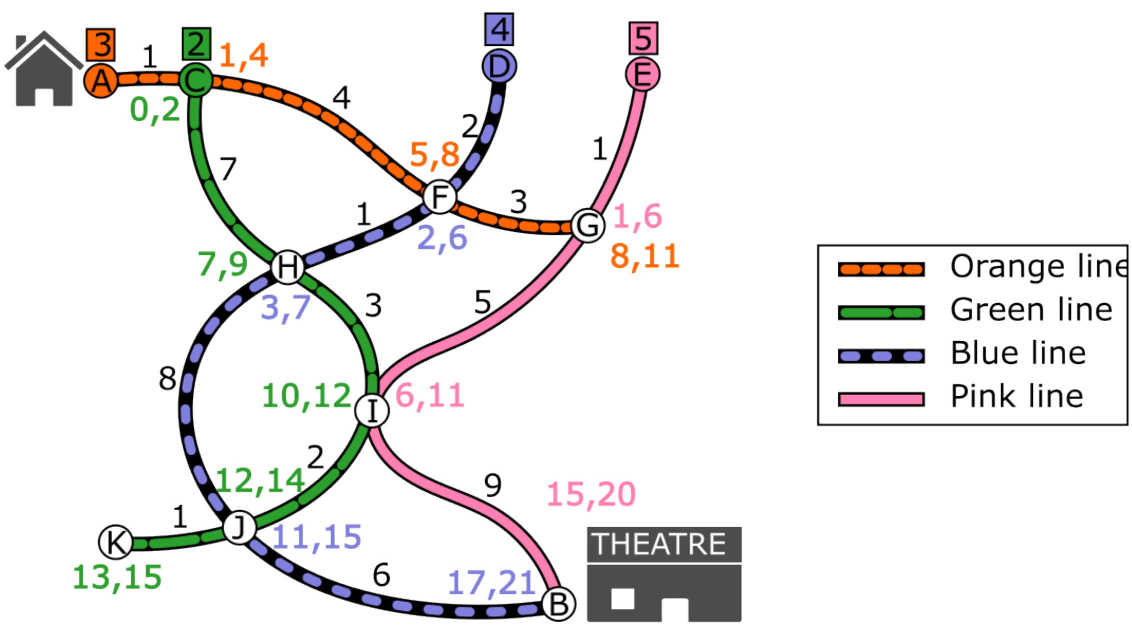
(C) 20

Explanation of Answer

Consider the first bus that departs on the orange line. It arrives at its first stop after 1 minute. It arrives at its second stop 4 minutes later after a total of 5 minutes. It arrives at its last stop 3 minutes later after a total of 8 minutes. That is, it makes its stops after 1, 5 and 8 minutes as shown below.



The second bus on the orange line departs after 3 minutes so it arrives at its stops 3 minutes later than the first bus on the orange line: after 4, 8 and 11 minutes. The diagram below shows these three times as well as all the stop times of the first two buses on the other lines.



Explanation of Answer

Notice that Marcus cannot arrive at the theatre on the first bus on the pink line. This is because it would require either arriving at stop G on the orange line within 1 minute of leaving his house, or arriving at stop I on the green line within 6 minutes of leaving his house. By looking at the times that the bus on the orange line arrives at stop G and the times that the bus on the green line stops at stop I, we see that this is not possible.

Similarly, Marcus cannot arrive at the theatre on the first bus on the blue line. This is because it would require arriving at stop F on the orange line within 2 minutes of leaving his house, or arriving at stop H on the green line within 3 minutes of leaving his house, or arriving at stop J on the green line within 11 minutes of leaving his house.

The next earliest bus to arrive at the theatre is the second bus on the pink line which arrives at the theatre after 20 minutes. Marcus can be on this bus by

- taking the first orange bus arriving at stop F after 5 minutes,
- waiting 1 minute,
- taking the second bus on the blue line arriving at stop H after a total of 7 minutes,
- taking the first bus on the green line arriving at stop I after a total of 10 minutes,
- waiting 1 minute, and
- taking the second bus on the pink line.

Therefore, the shortest time needed for Marcus to reach the theatre is 20 minutes.

Country of Original Author

Lithuania