Cutthrough Ventilation Arrangements

Problem Booklet

Instructions

Read the problem described on the next page. Then answer the twelve questions. Do them one at a time. Don't jump ahead, but you may look back to earlier questions and your answers. Most questions direct you to select only one answer unless you are told to "Try again!" Other questions tell you to choose as many answers as you think are correct. Follow the directions for each question.

After you have selected your choice to a question, look up the number for that choice on the answer sheet. Rub the developing pen between the brackets for that choice. A hidden message will appear that tells you if the choice is correct and provides you with additional information. When you finish, you will learn how to score your performance.

Background

In mining sometimes one section cuts into another section. Examples include intentionally cutting into old works to establish a new ventilation arrangement or setting up a longwall panel.

Look at the map in Figure 1 on the next page. It shows two sections being driven 4,800 feet from the mains to develop a retreating longwall panel. The 1 Left section has four entries with a single air split. The 1 Left section crew has finished the entries and most of the longwall setup entries that will soon connect 1 Left with 2 Left. The 2 Left section has three entries with a single air split. The mine is very gassy. It liberates from 2.6 to 3.2 million cubic feet of methane a day at the fan that exhausts 690,000 cfm. The rib of the longwall panel along entry #1 in 2 Left section is especially gassy.

Problem

This exercise asks you questions about the ventilation arrangement for the sections shown in Figure 1. Study the map in Figure 1 on the next page. Then do the first question. Do each question in order. Don't jump ahead, but you may look back to earlier questions you have completed.

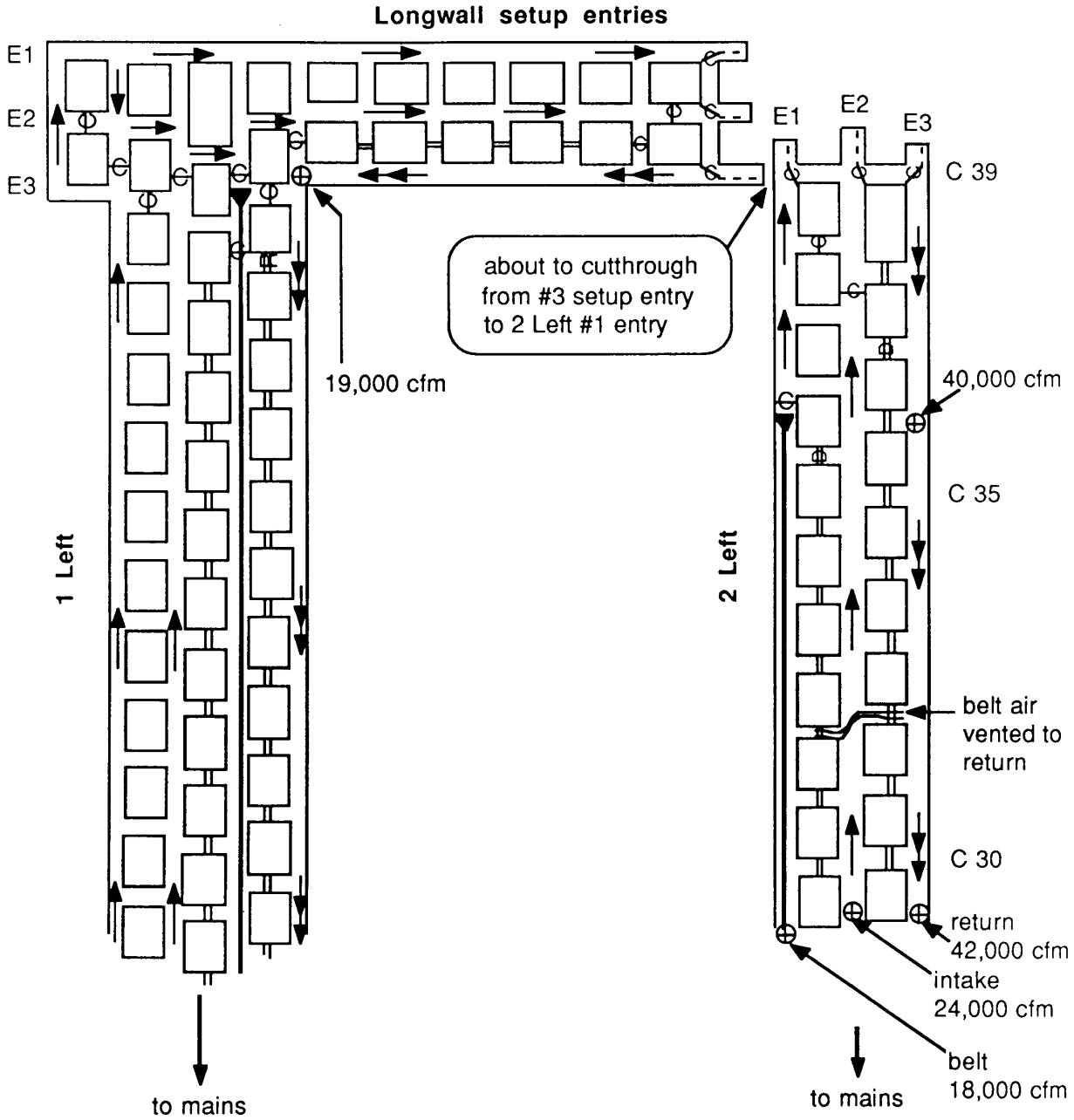

Figure 1: Mine ventilation before cutthrough from setup #3 entry to 2 Left section

Question A

Figure 2 is a schematic diagram of the map in Figure 1. Study both Figures 1 and 2. Then read the four statements on this page. Select the one true statement. (Choose only ONE unless you are told to "Try Again!")

1. The return air entry for 2 Left section is marked **D** in Figure 2.

2. The mains from which 1 Left and 2 Left sections are ventilated are marked **F** and **G** in Figure 2.

3. The longwall setup entries in Figure 2 are marked with an **A** and **B**.

4. The overcasts where the return air in 1 Left and 2 Left cross the main intakes are shown as black dots in Figure 2.

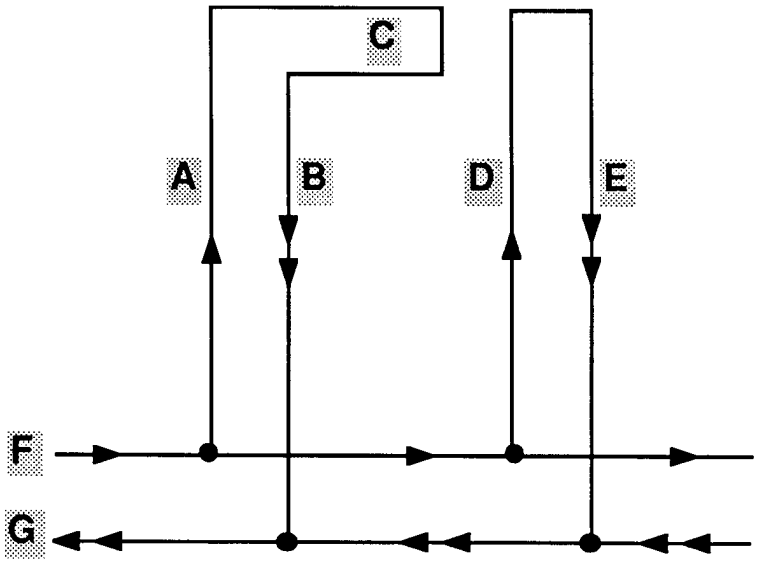

Figure 2: Simplified ventilation schematic for the map shown in Figure 1

Question B

Look at Figure 1 again. Then look at Figure 3. Approximately how many cfm of air should be present in the 1 Left intake air entry at the point indicated on Figure 3? (Choose only ONE unless you are directed to “Try Again!”)

5. 30,000

6. 19,000

7. 23,000

8. 14,000

9. 49,000

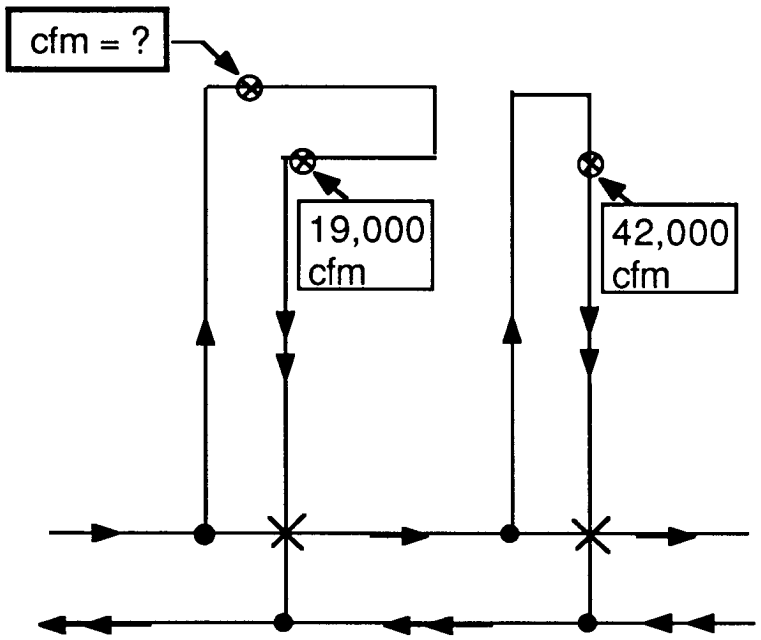

Figure 3: Estimate the airflow at the point indicated for the map shown in Figure 1

Question C

Look at Figure 1 and Figure 3. Remember that the intake air entries for both 1 Left and 2 Left sections get their air from the same intake aircourse in the mains and that both sections also exhaust their return air into the same return aircourse in the mains. Assume the length and cross sectional areas of the two sections are the same.

Using the information about airflow distribution in Figures 1 and 2, where is there most likely to be a regulator? (Choose only ONE unless you are directed to “Try Again!”)

10. In the setup entry return air entry.

11. In the 1 Left intake air entry.

12. In the 2 Left return air entry near the main return air entry.

13. In the 1 Left return air entry near the main return air entry.

14. In the intake air course in the setup entries, just before the face.

Question D

The 1 Left section crew has cut through to the 2 Left section as shown in Figure 4. The cutthrough is left open. What should you presume about which way the air will flow between 1 Left and 2 Left section? (Choose only ONE unless you are directed to "Try Again!")

15. Air will flow from point B to point A.

16. Air will flow from point A to point B.

17. The air will not flow either way, but remain still.

18. Without observing and measuring, it is impossible to be certain which way the air will flow.

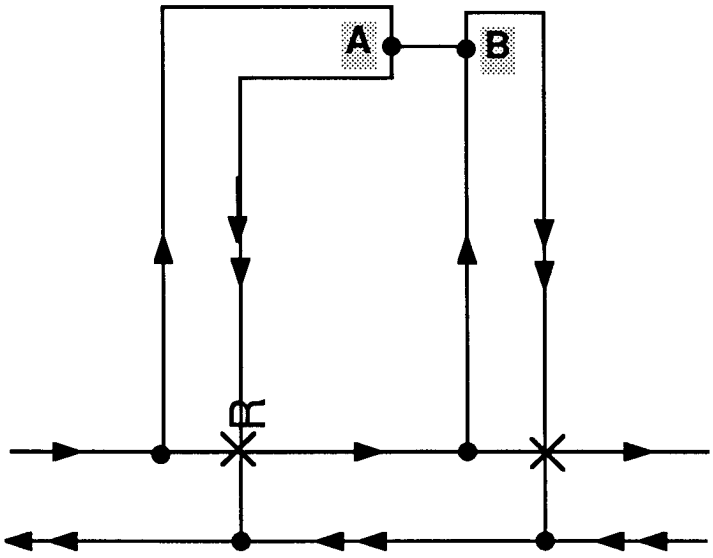

Figure 4: Cutthrough is through and open. Which way will the air flow?

Question E

Before the cutthrough between 1 Left and 2 Left sections was completed, the airflow readings shown in Figure 5A (on the next page) were taken in the returns at the points indicated. After the cutthrough was completed it was left open. The new airflow readings shown in Figure 5B were taken.

Study both Figures 5A and 5B. Then read the four statements on this page. Select all the true statements. (Select as MANY as you think are correct.)

19. The increased airflow in the 2 Left returns after the cutthrough is probably from the 1 Left section.

20. Because the airflow readings are only slightly different after the cutthrough, the ventilation elsewhere on the two sections can't have changed much either.

21. Any airflow changes in the 1 Left and 2 Left intake air entries after the cutthrough can be no more than 3,000 cfm.

22. After the cutthrough, a regulator is added to the return on 2 Left to try to stop the airflow between the sections. When this is done the airflow readings in the 1 Left return become the same as before the cutthrough (19,000 cfm). The airflow in the 2 Left return drops to 22,500 cfm. Now it is OK to leave the cutthrough open.

When you have made your selection(s) do the next question.

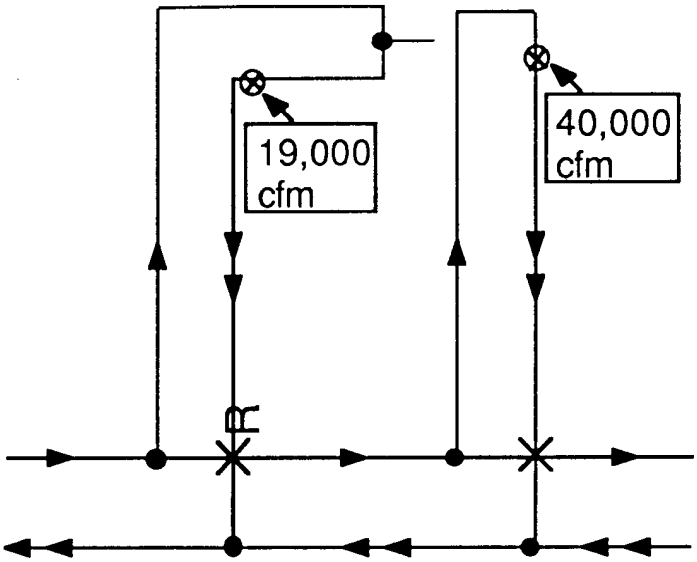

Figure 5A: Airflow readings before the cutthrough

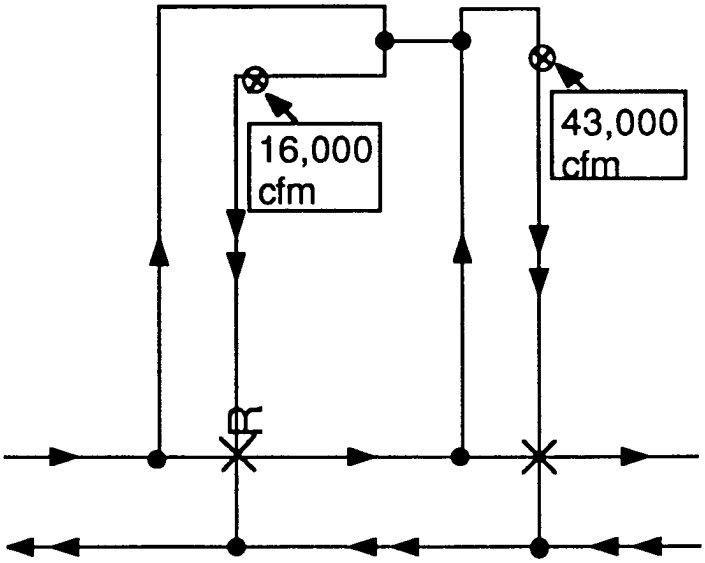

Figure 5B: Airflow readings after the cutthrough

Question F

It is a few days later. The first cutthrough is now curtained-off. Suppose you are the preshift examiner for the day shift. A maintenance crew is working in the setup entries repairing equipment. The 2 Left section foreman has just come on the section. The rest of the section crew is on the way in. When you come on the section you find a second cutthrough open between 1 Left and 2 Left. (See the map in Figure 6.) When you ask a mechanic, you learn the second cutthrough has been open for 9 hours. What would you do? (Choose only ONE answer unless you are told to "Try again!")

23. Immediately curtain-off the cutthrough.

24. Take methane and airflow readings.

25. Ask the 2 Left maintenance foreman if he wants the second cutthrough left open.

26. Leave the cutthrough wide open because it has been open long enough for the airflow between the two sections to have equalized.

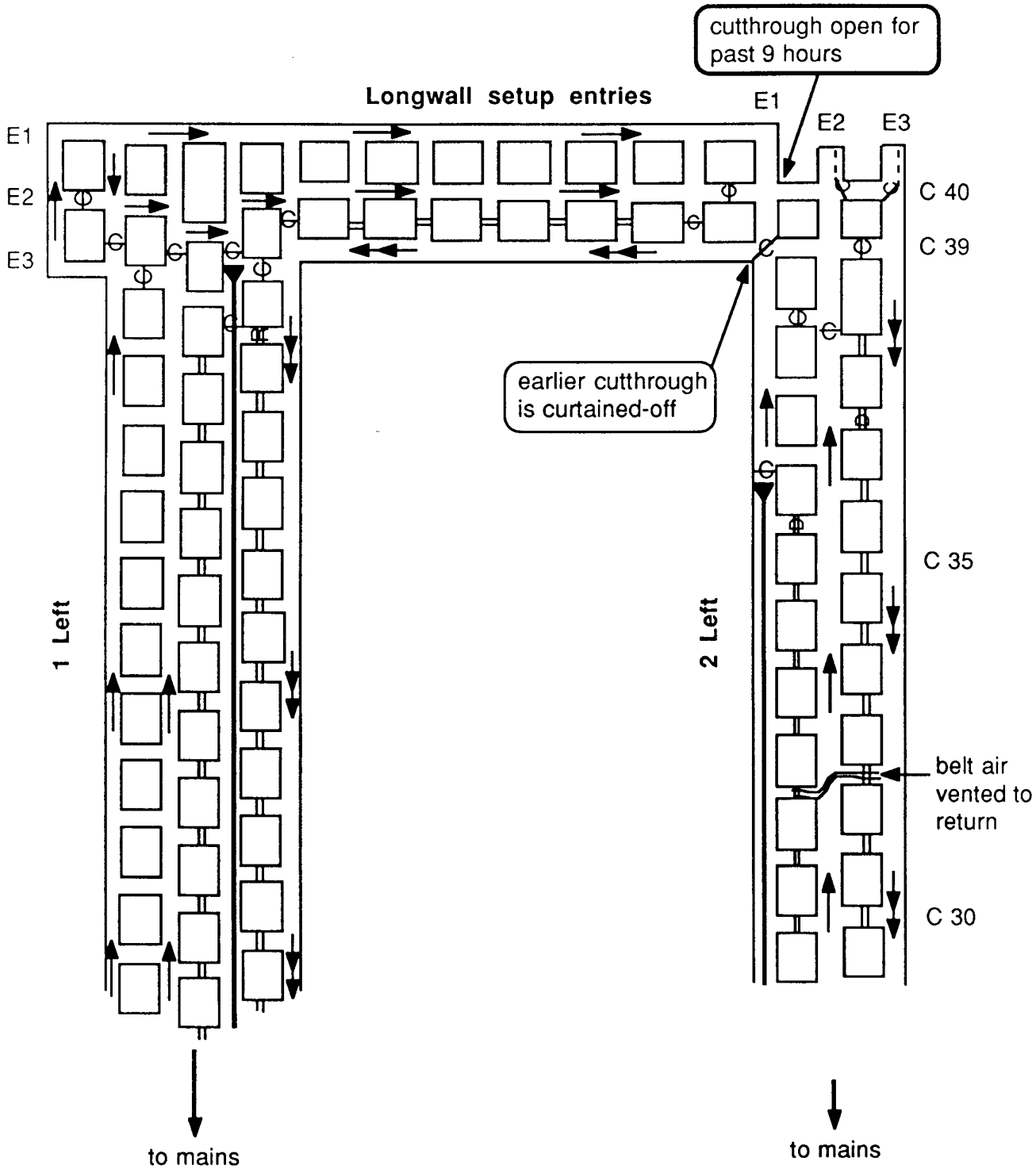

Figure 6: You discover the second cutthrough from the setup entries to the 2 Left section has been open for 9 hours.

Question G

Now you decide to take methane and airflow readings before you make any changes to the ventilation. Look at Figure 7. Select the four points at which you would take the readings. (Select as MANY as you think are necessary but **NO MORE THAN FOUR**. You need to act rapidly.)

27. Point **A**
28. Point **B**
29. Point **C**
30. Point **D**
31. Point **E**
32. Point **F**
33. Point **G**
34. Point **H**
35. Point **I**
36. Point **J**

When you have made your selection(s) do the next question.

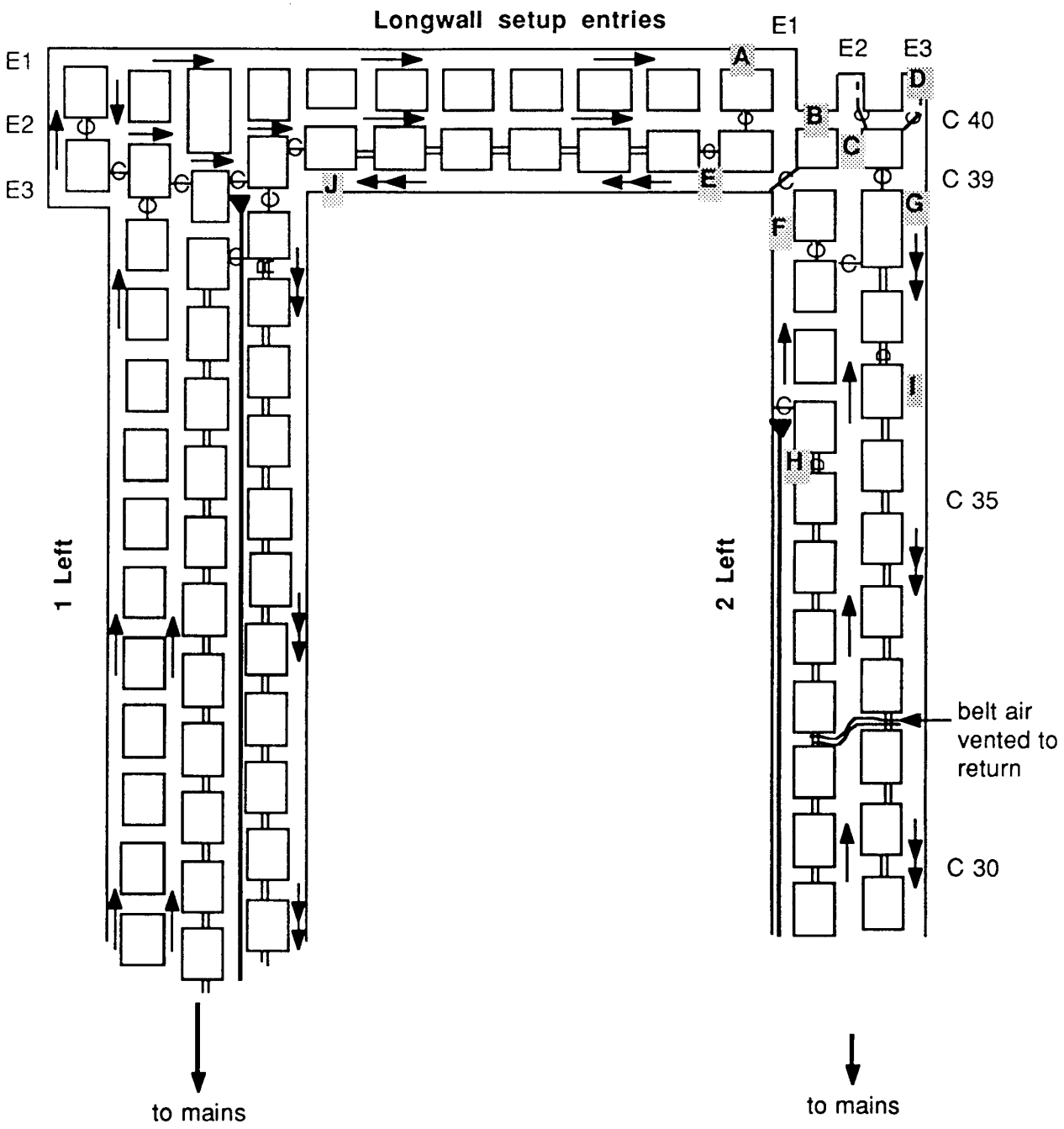

Figure 7: Points at which you would take methane and airflow measurements

Question H

Suppose you had taken methane and airflow measurements at the points shown in Table 1 below. Look at the airflow and methane readings in Table 1. Then study the map in Figure 7. If you were the examiner and you had this information, what would you do? (Select as MANY as you think are correct.)

37. Order everyone to walk out from the 2 Left section except for you and the 2 Left foreman. Tell the miners to report the conditions on the section when they get out.

38. Go to the power box. Knock the power to the entire 2 Left section. Then make sure that everyone is out of the mine.

39. Report what you have found. Call out to the surface on the mine pager which is located at the belt tailpiece just inby the belt check curtain in #1 entry in 2 Left.

40. Go to the pager at the belt tailpiece. Carefully disconnect the wires to the pager so no calls can come in.

41. After making sure the power is knocked and everyone is out of 2 Left section, go to the cutthrough, hang a curtain across it, and leave the section.

Point	% Methane	Air Flow cfm
A	0.15	36,000
B	0.15	20,000
C	2.50	20,000
E	0.15	15,700
G	1.30	43,000

Table 1: Methane and airflow readings at five points shown on the map in Figure 7

When you have made your selection(s) do the next question.

Question I

When you send the miners out from 2 Left section and when you and the foreman leave, what route should you take? (See Figure 7.) (Choose only ONE unless you are directed to “Try Again!”)

42. Both the miners and you should go out the 2 Left #2 entry because it is the intake air course and is the designated primary escape route for 2 Left section.

43. You should send the miners out the 2 Left #2 entry, but you and the foreman should leave by going out the intake air entry in the setup entries. That way you can warn the miners on the 1 Left section.

44. You should tell all the miners to leave by traveling through the #1 setup entry and going over to 1 Left section. You and the foreman should leave by the same route.

45. The best route out is through the 2 Left #3 entry because this is the shortest way to the outside and because the #3 entry is furthest from the high methane level in the #1 entry.

Question J

When a cutthrough from one section to another section is left open, as happened in this problem, why is it important to take airflow readings in the intakes as well as the returns before changing the ventilation? (Choose only ONE unless you are directed to "Try Again!")

46. It is not important. Accurate measurements in the returns for both sections are all that is needed.

47. The changes in airflow in the returns of the two sections may change very little or not change after the cutthrough. But the airflow in the intakes of the two sections may change a lot.

48. When the cutthrough takes place, the air from one section may be wetter or dryer than from the other section. This mixture of wet and dry air can produce mixtures of blackdamp and fire damp.

49. Air measurements need to be taken in the intakes of the two sections, only if there are changes in the airflow readings in the returns after the cutthrough.

Question K

Which rule is important when cutting through from one section to another? (Choose only ONE unless you are directed to “Try Again!”)

50. Never cut through without first building a permanent stopping on each side of the place where the cutthrough is to be made.

51. At the time of the cutthrough use curtains or other temporary stoppings to keep the ventilation of the two sections separate just as they were before the cut was made.

52. After the cutthrough, take airflow readings in the returns and the intakes of both sections. If there are any changes in airflow, hang a curtain in the cutthrough to keep the air from the two sections from mixing. Otherwise leave the cut open.

53. Just after the cutthrough, take air readings in the intakes and returns. Then, try to regulate the air in the returns of both sections so there is no flow of air in the cut that connects the two sections.

Question L

Think about this entire exercise. Review the maps. Remember there are two sections working and that each has two shifts. And remember that there are maintenance personnel involved as well.

On the answer sheet describe the mining and communication procedures that should have been used when cutting through from one section to the other to make sure the cutthrough proceeded safely (to prevent ventilation problems, accidents or other problems).

END OF PROBLEM

Scoring your performance

1. Count the total number of responses you colored in that were marked "correct." Write this number in the first blank on the answer sheet.

2. Count the total number of "incorrect" responses you colored in. Subtract this number from 37. Write the difference in the second blank on the answer sheet.

3. Add the numbers on the first and second blanks. This is your score.

The best possible score of 51 results from selecting all the correct answers and no wrong answers. The worst possible score of zero results from selecting all the wrong answers and no correct answers.