

Ventilation Training Day 3 - Math Work Sheet

Please review the mine specifics:

The average entry of the mine is **6 feet high, 20 feet wide**.

This is a shaft mine, the top barometer pressure is 31.25 inches Hg, and the bottom shaft barometer pressure reading is 29.70 inches Hg. The oxygen reading 20.8%

The **intake airshaft** has a diameter of 22 feet.

The **return airshaft** has a diameter of 20 feet

The **1st left Section** has a reading of 210 fpm on the anemometer; 103 fpm is the minimum for maintaining ventilation. The methanometer reading at the regulator is .3%.

The **1st Right Section** has a reading of 108 on the anemometer at 30 seconds; 137 fpm is the minimum for maintaining ventilation. The methanometer reading at the regulator is .5%.

The **2nd Right Section** has a reading 120 on the anemometer for 30 seconds. Due to fall in the return, the barrier was compromised releasing 3.9% methane at the regulator.

The **Mains Longwall Section** has a reading of 1.8 on the magnehelic with a pitot tube thru a 3-foot wide diameter overcast tube; 166 fpm is the minimum for maintaining ventilation, the methanometer reading was .4%. at the return regulator.

A sump is in the mains for water, its dimensions are: **30 feet long, 15 feet wide** across the top, **10 feet wide** across the bottom and is **5 feet deep**. The sump is full.

The **manometer** for the mine's water gauge is 2.15 on the positive, and 2.25 on the negative.

The **battery charging station** on the mains has a smoke tube reading 38 seconds over 25 feet.

Also, on the surface, there is a mast being raised that is 45 feet, and will be secured by an anchor pin that is 25 feet away.

The **CO₂ reading** is at the seals is 4500 ppm.

The mine's cover is **480 feet** with an adjoining abandoned mine **400 feet away**.

The outside temperature is **23.9⁰ Celsius**.

[Review map on the worksheet](#)

Note: Use 3.1416 for Pi in all calculations and do not round off your numbers in the middle of a calculation. Also use correction chart for all anemometer readings.

- 1. What is the area of the average entry of the mine?**
 - a. 88 sq. ft.
 - b. 90 sq. ft.
 - c. 100 sq. ft.
 - d. 120 sq. ft.

- 2. What is the area of the intake mineshaft?**
 - a. 288.91 sq. ft
 - b. 300.34 sq. ft
 - c. 380.13 sq. ft
 - d. 421.22 sq. ft

- 3. What is the area of the return mineshaft?**
 - a. 288.91 sq. ft
 - b. 300.34 sq. ft
 - c. 314.16 sq. ft
 - d. 421.22 sq. ft

- 4. What is the perimeter of the intake mineshaft?**
 - a. 62.8 ft.
 - b. 69.1 ft
 - c. 61.5 ft
 - d. 63.4 ft.

- 5. What is the perimeter of the return mineshaft?**
 - a. 62.8 ft.
 - b. 60.1 ft
 - c. 61.5 ft
 - d. 63.4 ft.

- 6. What is the quantity of air in the Mains Longwall Panel return?**
 - a. 36,400
 - b. 35,520
 - c. 34,000
 - d. 37,965

- 7. What is the quantity of air in 1st Left return?**
 - a. 26,500
 - b. 28,490
 - c. 25,200
 - d. 27,240

- 8. What is the quantity of air in 1st Right return?**
 - a. 25,920
 - b. 26,090
 - c. 27,960
 - d. 28,000

- 9. What is the quantity of air in 2nd Right?**
- a. 28,180
 - b. 29,880
 - c. 28,500
 - d. 29,402
- 10. What is the total volume of air intaking at the intake airshaft?**
- a. 123,045
 - b. 129,320
 - c. 127,883
 - d. 125,070
- 11. What is the quantity if air in the battery charging station?**
- a. 4,000
 - b. 4,667
 - c. 4,000
 - d. 4,739
- 12. How much wire rope is exactly needed to secure the outside mast to the anchor pin?**
- a. 50.3 ft.
 - b. 51.5 ft.
 - c. 55.7 ft.
 - d. 58.3 ft.
- 13. What is the water gauge reading for this mine?**
- a. 4.4
 - b. 4.1
 - c. 5.1
 - d. 4.0
- 14. What is the depth of shaft for this mine?**
- a. 1500.8
 - b. 1357.8
 - c. 1482.3
 - d. 1460.9
- 15. How many gallons of water are in the mains sump?**
- a. 14,560.4
 - b. 13,404.8
 - c. 13,950.3
 - d. 13,987.5
- 16. What is the rubbing surface of the intake airshaft?**
- a. 93,844.6
 - b. 92,500.9
 - c. 91,420.5
 - d. 97,100.3

17. What is the rubbing surface of the return airshaft?

- a. 80,285
- b. 85,313
- c. 89,420
- d. 87,100

18. What is the quantity of gas in the Mains?

- a. 160
- b. 176.9
- c. 151.9
- d. 155.6

19. What is the quantity of gas in 1st Left?

- a. 84.3
- b. 81.7
- c. 80.9
- d. 85.6

20. What is the quantity of gas in 1st Right?

- a. 130.4
- b. 129.6
- c. 160.4
- d. 139.8

21. What is the quantity of gas in 2nd Right?

- a. 1123.8
- b. 1165.3
- c. 1280.9
- d. 1255.4

22. What is the 24-hour liberation of methane for this mine?

- a. 2,196,490
- b. 2,215,728
- c. 2,103,040
- d. 2,022,445

23. What is the total volume of air exhausting at the return airshaft?

- a. 129,363
- b. 127,883
- c. 124,584
- d. 121,500

24. What is the total volume of air needed to dilute the methane from 3.9% to 2.0% in the 2nd Right section?

- a. 57,123
- b. 58,265
- c. 51,800
- d. 52,970

- 25. What size does the regulator in 2nd Right have to be to accomplish this?**
- a. 15.90
 - b. 16.9
 - c. 12.9
 - d. 11.2
- 26. What size does the regulator in 1st left have to be adjusted to?**
- a. 3.29
 - b. 4.00
 - c. 2.37
 - d. 2.91
- 27. What size does the regulator in 1st Right have to be adjusted to?**
- a. 3.14
 - b. 3.72
 - c. 4.06
 - d. 4.7
- 28. What does the regulator in the Mains have to be adjusted to?**
- a. 4.6
 - b. 3.8
 - c. 5.9
 - d. 5.1
- 29. How much horsepower is required to move the air in the return airshaft the entire column?**
- a. 3.2 per minute
 - b. 3.0 per minute
 - c. 2.7 per minute
 - d. 1.8 per minute
- 30. If one kilowatt costs \$.08, what is the electrical cost to run the main fan for a 30-day cycle?**
- a. \$7,298.99
 - b. \$4,366.63
 - c. \$8,184.46
 - d. \$8,250.17
- 31. By observing the mine's fan chart on page 8, what was the initial water gauge reading at Sunday midnight?**
- a. 3.5
 - b. 4.0
 - c. 4.4
 - d. 5.0
- 32. Due to a severe storm, the power at the mine was disrupted, at what day and time did the main fan go down?**
- a. Wednesday, 6 am
 - b. Thursday, 6 am
 - c. Thursday, 8 am
 - d. Thursday, noon

- 33. How long was the main fan down?**
- a. 12 hours
 - b. 14 hours
 - c. 16 hours
 - d. 18 hours
- 34. How long did it take for mine's water gauge to get back to normal once the fan was restarted?**
- a. 6 hours
 - b. 8 hours
 - c. 10 hours
 - d. 12 hours
- 35. What is the percentage reading of carbon dioxide at the seals?**
- a. 4.5%
 - b. .45%
 - c. .045%
 - d. 45%
- 36. What is the outside temperature at the mine in Fahrenheit?**
- a. 65
 - b. 70
 - c. 75
 - d. 80
- 37. A sling psychrometer used in the mine shows 53⁰ F on the wet bulb and 62⁰ F on the dry bulb, what is the relative humidity of the mine?**
- a. 44%
 - b. 51%
 - c. 65%
 - d. 79%
- 38. What is the barrier to be provided between the two mines?**
- a. 156 feet
 - b. 94 feet
 - c. 300 feet
 - d. 59 feet
- 39. What is the weight of the water in the sump?**
- a. 45.4 tons
 - b. 50.2 tons
 - c. 52.2 tons
 - d. 54.5 tons
- 40. How long will it take a 20-gallon per minute pump to drain the sump on the mains?**
- a. 8 hours, 48 minutes
 - b. 9 hours, 29 minutes
 - c. 10 hours, 13 minutes
 - d. 11 hours, 40 minutes

Anemometer correction Chart

Serial Number	52832		
Date	04/14/99		
Ind. Vel.	Correction	Ind. Vel.	Correction
50	+64	500	-15
75	+53	550	-19
100	+41	600	-22
125	+33	700	-27
150	+27	800	-33
175	+21	900	-40
200	+17	1000	-45
250	+9	1200	-56
300	+2	1400	-65
350	-3	1600	-84
400	-8	1800	-104
450	-12	2000	-112

When sign is: + Add - Subtract

