

# 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. **120 sq. ft.**

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% **1357.8 feet**

The **intake airshaft** has a diameter of 22 feet. **380.13 sq. ft - 69.1 ft.**

The **return airshaft** has a diameter of 20 feet **314.16 sq. ft - 62.8**

The **1<sup>st</sup> 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%. **27,240 cfm**

The **1<sup>st</sup> 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%. **27,960 cfm**

The **2<sup>nd</sup> 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. **29,880 cfm**

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. **37,963 cfm**

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. **1875 cu. ft.....13,987.5 gal.**

The **manometer** for the mine's water gauge is 2.15 on the positive, and 2.25 on the negative. **4.40 inches**

The **battery charging station** on the mains has a smoke tube reading 38 seconds over 25 feet. **4,739 cfm**

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. **51.5 ft.**

The CO<sub>2</sub> reading is at the seals is 4500 ppm. **.45%**

The mine's cover is 480 feet with an adjoining abandoned mine 400 feet away. **Barrier = 94 ft**

The outside temperature is 23.9<sup>0</sup> Celsius. **75<sup>0</sup> F**

[Please review map on last page](#)

Note: Use 3.1416 for Pi in all calculations and do not round off your numbers in the middle of a calculation.

- 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. 37,963
  
- 7. What is the quantity of air in 1<sup>st</sup> Left return?**
  - a. 26,500
  - b. 28,490
  - c. 25,200
  - d. 27,240
  
- 8. What is the quantity of air in 1<sup>st</sup> Right return?**
  - a. 25,920
  - b. 26,090
  - c. 27,960
  - d. 28,000

**9. What is the quantity of air in 2<sup>nd</sup> 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. 123,043**
- 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. 151.8**
- d. 155.6

**19. What is the quantity of gas in 1<sup>st</sup> Left?**

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

**20. What is the quantity of gas in 1<sup>st</sup> Right?**

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

**21. What is the quantity of gas in 2<sup>nd</sup> 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. 2,215,584**
- 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 2<sup>nd</sup> Right section?**

- a. 57,123
- b. 56,150**
- c. 51,800
- d. 52,970

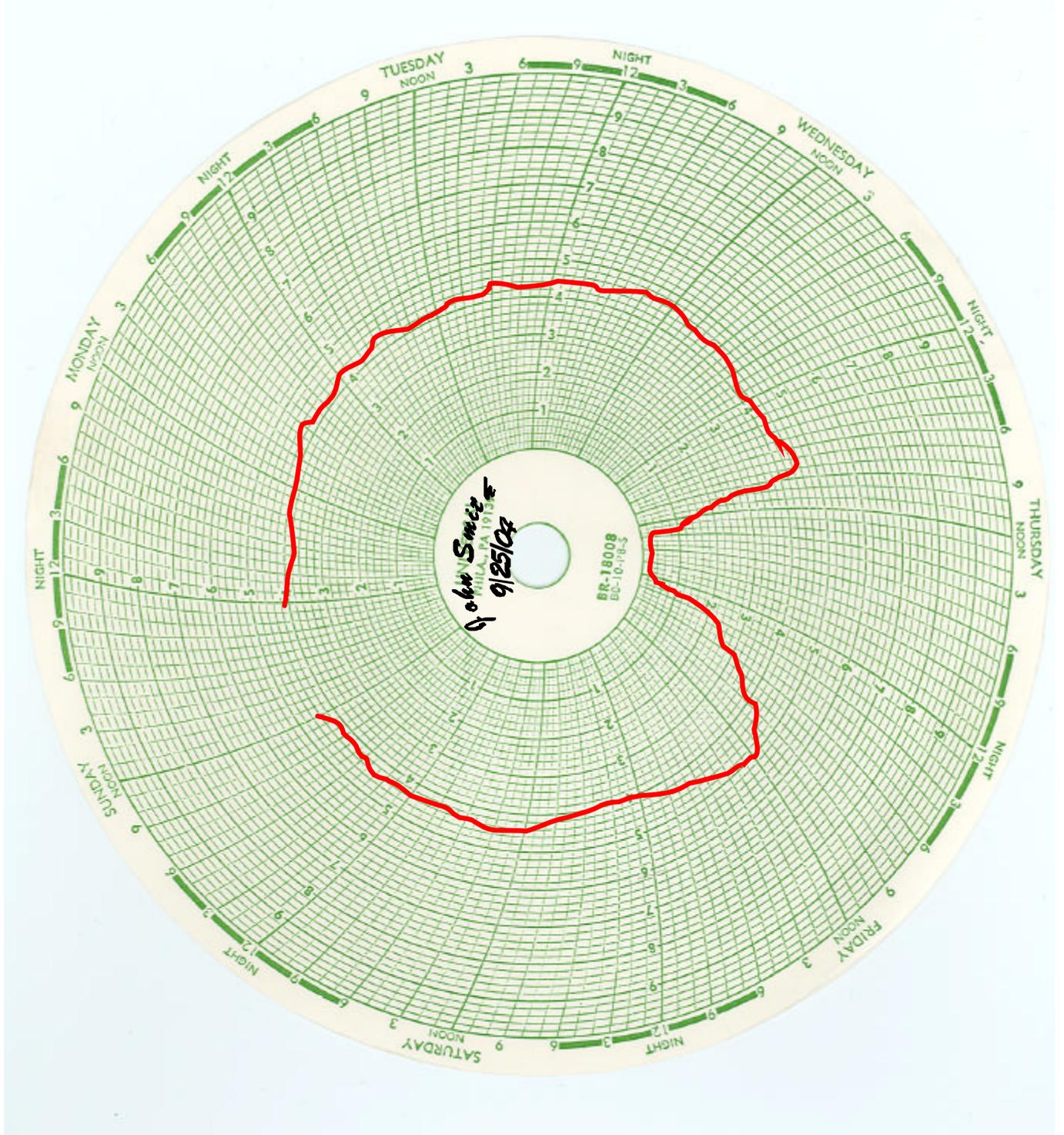
25. What size does the regulator in 2<sup>nd</sup> Right have to be to accomplish this?
- a. 15.90
  - b. 16.9
  - c. 17.9
  - d. 16.2
26. What size does the regulator in 1<sup>st</sup> left have to be adjusted to?
- a. 3.29
  - b. 4.00
  - c. 2.37
  - d. 2.91
27. What size does the regulator in 1<sup>st</sup> Right have to be adjusted to?
- a. 3.12
  - 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
  - b. \$4,366
  - c. \$8,184
  - 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 53<sup>0</sup> F on the wet bulb and 62<sup>0</sup> 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 to 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

<b>Serial Number</b>	<b>52832</b>		
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



**Answer Sheet:**

1. (d) 120 sq. ft.
2. (c) 380.13 sq. ft
3. (c) 314.16 sq. ft.
4. (b) 69.1 ft
5. (a) 62.8 ft.
6. (d) 37,963 cfm
7. (d) 27,240 cfm
8. (c) 27,960 cfm
9. (b) 29,880 cfm
10. (a) 123,043 cfm
11. (d) 4,739 cfm
12. (b) 51.5 ft.
13. (a) 4.4 inches
14. (b) 1357.8 ft.
15. (d) 13,987.5
16. (a) 93,844.6 sq. ft
17. (b) 85,313 sq. ft.
18. (c) 151.8 cfm
19. (b) 81.7 cfm
20. (d) 139.8 cfm
21. (b) 1165.3 cfm
22. (b) 2,215,584 cf-methane
23. (c) 124,582 cfm
24. (b) 56,150 cfm
25. (d) 16.2 sq .ft.
26. (c) 2.37 sq.ft.
27. (a) 3.12 sq. ft.
28. (b) 3.8 sq. ft.
29. (a) 2.2
30. (d) \$5,672
31. (b) 4.0
32. (c) Thursday, 8 am
33. (c) 16 hours
34. (d) 12 hours
35. (b) .45%
36. (c) 75
37. (a) 44%
38. (b) 94 ft.
39. (c) 52.2 tons
40. (d) 11 hours, 40 minutes