

5. Give a sketch of a few of the workings of a mine, showing how you would keep your survey-book, with bearings, distances, dip, width of places, and thicknesses of coal entered.
6. Describe the clinometer.

SUBJECT XVI.—*A Knowledge of Arithmetic, and the Method of keeping Accounts.*

1. What is the $\sqrt{705,600}$ and the $\sqrt[3]{594,823,321}$?
2. Divide $\frac{1}{3}$ by $\frac{7}{8}$ of $\frac{1}{4}$.
3. If you know the lengths of the three sides of a triangle, how would you find its area?
4. Explain what you know of the method of keeping accounts.
5. A heap of coal measures 200 yards by 25 yards at the base, and is 12ft. high: how many tons does it contain?
6. How many tons of coal does a pillar 42ft. by 60ft. by 9ft. contain?
7. How much does the royalty on 170,531 tons amount to at $6\frac{1}{2}$ d. per ton?
8. If $22\frac{1}{2}$ cwt. were taken instead of 20 cwt. to the ton, in the last question, what would the amount come to?

SUBJECT XVII.—*A Knowledge of the Provisions of "The Coal-mines Act, 1891."*

FOURTH DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT XIV.—*A Knowledge of the Composition and Character of the Different Classes of Coal, and also of the Character of the Rocks and Formation of the Country where Coal is likely to be found.*

1. If you came upon schist rock in prospecting for coal, would you consider it necessary to abandon operations?
2. Give the proximate analysis of a bituminous coal.
3. State the circumstances in which you would consider a pure-white sand (a) a favourable and (b) an unfavourable indication of the presence of coal.
4. Describe the characteristics of a cannel coal.
5. Are the brown or pitch coals of the East Coast of the same age as the bituminous coals of the West Coast? If so, give the reasons why the one should be bituminous and the other not.

"THE COAL-MINES ACT, 1891."

QUESTIONS USED IN EXAMINATION OF MINING MANAGERS FOR SECOND-CLASS CERTIFICATES.

FIRST DAY.—TIME: 7 A.M. TO 12 NOON.

[Candidates must attempt to answer every question. All calculations to be shown in detail.]

SUBJECT I.—*On the Sinking of Shafts and Construction of Main Roadways, Opening out a Mine, and the Division of a Mine into Districts.*

1. What considerations would guide you in fixing the position of a shaft to open up a coal-field?
2. Describe fully all your operations in sinking to the stone head. Assume conditions.
3. Give sizes of all timber used in fitting a rectangular shaft, $6' \times 14' \times 135'$, in fairly strong measures.
4. What considerations would guide you in fixing the size of the districts in a mine?

SUBJECT II.—*The various Methods adopted in Securing Shafts and Workings in a Mine, showing the relative Advantage and Efficiency of each Class of Material used.*

1. In a cap 10" deep by 8" broad, what reason is there for the extra depth? Would you adopt that form; and, if so, in what circumstances?
2. Sketch how you would support the lining at the bottom of a rectangular shaft.
3. Describe how you would support the roof near the face in working a 5ft. seam by longwall. Give dimensions.
4. What are the chief disadvantages of the circular form in shafts?
5. What kind of timber would you use for lining a wet shaft, and what for pump-rods.

FIRST DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT III.—*The various Methods of Hewing and Cutting Coal of Different Classes to Advantage, and Securing the Ground whilst so engaged.*

1. If you had an area of 30 acres in pillars, and the roof was not standing well, describe your method of working it. Thickness of coal, 10ft.
2. In working out 18ft. of coal and having coal roof, what method would you adopt to work the upper part of the 18ft., and how prevent accidents from falls of the roof thereafter?
3. State how you would work a 5ft. seam with strong shale roof and weak floor.
4. What size of pillar would you leave to protect a shaft 80 fathoms deep? Coal seam 10ft. thick, and lying at 1 in 8.

SUBJECT IV.—*The various Methods of Ventilation, and the Construction of Airways so as to produce a Good Circulation of Fresh Air in any part of a Mine.*

1. Draw to scale a good air-crossing.
2. If the volume of air be trebled, how much will the friction be increased?