

4. Describe a hexagon within a given circle. (20)
5. Prove that triangles are to each other in the duplicate ratio of their homologous sides. (20)
6. Find a fourth proportional to three given straight lines. (20)

Algebra.

1. Solve the following equations:

$$(1) \sqrt{x+1} + \sqrt{2x} = 7$$

$$(2) 7x - 20\sqrt{x} = 3$$

$$(3) \begin{cases} 7xy - 5x^2 = 36 \\ 4xy - 3y^2 = 105 \end{cases}$$

$$(4) (a+b)(a-x) = a(b-x). \quad (20)$$

2. Find the number consisting of two digits which is equal to three times the product of those digits and is also such that if it be divided by the sum of the digits the quotient is 4. (20)

3. A sum of money consists of shillings and crowns and is such that the square of the number of crowns is equal to twice the number of shillings; also the sum is worth as many florins as there are pieces of money: find the sum. (A crown = 5s, and a florin 2s.) (20)

4. Find the value of

$$(1) \frac{x^2 - 2x + 3}{x^2 + 1} + \frac{x-2}{x^2 - x + 1} - \frac{1}{x+1}$$

$$(2) \frac{1}{(a-b)(a-c)} + \frac{1}{(b-a)(b-c)} + \frac{1}{(c-a)(c-b)} \quad (20)$$

5. After A has received £10 from B he has as much money as B and £8 more, and between them they have £40, what money had each at first? (20)

**Natural Philosophy.*

N. B.—Answer any five of the following questions:

1. By means of a wheel and axle a power of 22 lbs. balances a weight of 870 lbs. If the radius of the wheel be 67 inches what will be the radius of the axle? (20)
2. Show that the surface of a heavy inelastic fluid at rest is horizontal. (20)
3. Describe a Hydrometer or the Hydrostatic Balance. (20)
4. What is meant by the specific gravity of a body? A substance weighs 14 lbs. in water and 2560 oz. out of water. What is its specific gravity? (20)
5. Find the Fahrenheit temperature corresponding to -40° and $+350^\circ$ centigrade. Describe a Reamur's thermometer. (20)
6. What are conductivity, convection, ebullition and radiation as terms used in connection with the study of heat? Illustrate each process. (20)
7. Explain wave-motion, and state explicitly the difference between waves of condensation and rarefaction. (20)
8. Describe an electrical machine, a Leyden jar and a Grove's Battery. (20)

*N.B.—It is optional with candidates to take either Natural Philosophy or Scientific Agriculture.