

1. If the number abc2282 is divisible by 429, find the last three figures in the quotient.
2. If $x^2 = x + 5$, prove that $x^5 = 41x + 55$.
3. AE is a diameter of a circle; D is the mid-point of a chord BC. The perpendicular from E to BC is cut by AD (produced if necessary) at K. Prove that BE is perpendicular to CK.
4. The probability that A can solve a problem is two-thirds; the probability that B can solve it is two-fifths. What is the probability that it will be solved if they both try it?
5. A train left London punctually by the driver's watch. After travelling 8 miles at an average speed of 33 m.p.h., he noticed that the minute-hand of his watch was directly over the hour-hand. At what time did the train leave London?
6. Given a circle and a point P outside it, show how to construct a line through P to cut the circle in Q and R so that PQ = QR.
How is the point P related to the circle if the construction is not possible?
7. Four ladies and their daughters bought cloth of different qualities, each of the eight buying as many feet (in length) of cloth as she paid farthings per foot. Each mother spent 2s. 9½d. more than her daughter. Mrs. White's piece was twice as long as Mrs. Green's; Fanny bought 17 yards more than Mrs. Brown; and Dora spent 2s. 4d. more than Emily. How much change did Mrs. Black get out of a £5 note, and what was the name of Mary's mother?
8. A sphere is inscribed in a cube, and a plane passing through the other extremities of the three edges which meet in any one corner of the cube cuts the sphere in a circle, about which a square is described. Prove that the area of the square is two-thirds the area of a face of the cube.