

$$\begin{aligned}\therefore \sigma_1 \sigma_2 + \dots &= \frac{4\Delta^4}{a^4 b^4 c^4} (2b^2 c^2 + \dots - a^4 - \dots) \\ &= \frac{64\Delta^6}{a^4 b^4 c^4} \\ &= \sin^2 A \sin^2 B \sin^2 C.\end{aligned}$$

PROBLEMS.

145. In 1870 a Frenchman in New York proposed to invest \$5000 U. S. currency in the French 6% loan, then being sold in London at 85. Gold being at 110, London exchange 4.87, brokerage in New York $\frac{1}{2}\%$, commission for buying in London $\frac{1}{2}\%$, and London exchange on Paris being 25.43; what per cent. will the investor secure per annum, the *rentes* being payable in gold, exchange on Paris at 5.15, and gold at 115?

146. A Canadian cent is one inch in diameter, $\frac{1}{8}$ of an inch thick, and 100 of them weigh a pound. What is the weight of a mass of the metal from which these cents are made, in the form of a sphere, four inches in diameter?

147. If $x=4y$, shew that the arithmetic mean of x and y is to the geometric mean as 5 is to 4.

148. If $\frac{r}{2}a^2 + x^{\frac{1}{2}}a^2b + 2b^2$ is the perfect square of a binomial, find x in terms of r .

149. Reduce to lowest terms

$$\frac{(x^{\frac{1}{2}} + p^2)^3 - (a^2 - b^3 + c^{\frac{3}{2}})^3}{(x^{\frac{1}{2}} + p^2)(a^2 - b^3 + c^{\frac{3}{2}}) + (x^{\frac{1}{2}} - b^3 + c^{\frac{3}{2}})^2 + (x^{\frac{1}{2}} + p^2)^2}$$

150. Why is it that if any *three* consecutive numbers be multiplied together the product is divisible by 6?

151. Resolve $m^4 - 4m^3 + 5m^2 - 2m$ into elementary factors, and shew that it is divisible by 12 for all values of m above 2.

152. Solve $2x^3 - x^2 = 1$.

153. Solve

$$27x^3 - \frac{841}{3x^2} + \frac{17}{3} = \frac{232}{3x} - \frac{1}{3x^2} + 5.$$

154. Two inclined planes are placed so as to have a common vertex. Two weights,

one on each plane, are in equilibrium when connected by a cord that passes over this common vertex; shew that the weights are to one another as the lengths of the planes on which they rest.

155. Two right cones have the same base and their vertices in the same direction, but they are of different altitudes; find the distance of the centre of gravity of the solid, contained between their two surfaces, from their common base.

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156. Prove that $\sin 54^\circ - \sin 18^\circ = \frac{1}{2}$.

157. Prove that $x^7 - x$ is always divisible by 42.

158. If a, b, c are the distances from the centre of the inscribed circle of a triangle from its angular points, prove that

$$aa^2 + bb^2 + cc^2 = abc.$$

159. Having given the radii of the inscribed and circumscribing circles of a triangle and the sum of the sides, find the sides.

160. Three towers, whose heights are a, b and c , are situated at the vertices of an equilateral triangle whose sides are equal to d ; find the position of a point O within the triangle which is equidistant from the tops of the towers and the length of this distance expressed as an algebraic function of a, b, c and d .

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161. If A, B, C be the angles of a plane triangle, prove that

$$\begin{vmatrix} \sin 2A & 0 & \sin 2B & \sin 2C \\ 0 & \sin 2A & \sin 2C & \sin 2B \\ \sin 2C & \sin 2B & 0 & \sin 2A \\ \sin 2B & \sin 2C & \sin 2A & 0 \end{vmatrix}^{\frac{1}{2}} \\ = 2 \sin 2A \sin 2B \sin 2C.$$

162. If θ be the circular measure of a *small* angle, prove the following *approximate* formula:

$$\frac{\sec \theta}{\pi^2} = \frac{1^2}{\pi^2 - 4\theta^2} + \frac{3^2}{(3\pi)^2 - 4\theta^2} + \frac{5^2}{(5\pi)^2 - 4\theta^2} + \dots \text{to infinity.}$$