

Now, if $A^2 + B^2 + C^2 - 3ABC = 0$,

$A + B + C$ must $= 0$, or $A^2 - AB + B^2 - BC + C^2 - AC = 0$.

On the former hypothesis,

$$(x + y + z)(a + b + c) = 0,$$

i.e., either $x + y + z = 0$, or $a + b + c = 0$.

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106. Shew, *without expansion*, that

$$\frac{(a+b)^2(b-a)(b+a+2c) + (b+c)^2(c-b)(c+a+2b) + (c+a)^2(a-c)(a+b+2c)}{(a+b)^2(b-a) + (b+c)^2(c-b) + (c+a)^2(a-c)} \\ = \frac{(b-a)^3(b+a+2c)^3 + (c-b)^3(c+b+2a)^3 + (a-c)^3(a+c+2b)^3}{(b-a)^3 + (c-b)^3 + (a-c)^3}$$

93. A grocer buys tea at 50 cents per lb. Before reaching him it meets with an accident, by which one-eighth of the stock is totally lost; one-seventh of the remainder is sold at 40 per cent. loss, and one-sixth of the remainder is sold at 20 per cent. loss. At what price must the undamaged remainder be sold so as to cover the losses and realize the original profit of 30 per cent. on the whole stock?

94. Some poor vinegar worth 30 cents per gallon is mixed with pure acetic acid at \$1 per gallon, and some good vinegar at 60 cents per gallon. The mixture is diluted with water and sold at 50 cents per gallon. What quantity of each ingredient is there in 1000 gallons of the mixture?

95. If $(0.142857 + \frac{1}{4} \times 3\frac{1}{2} - \frac{4\frac{1}{2}}{2\frac{1}{2}} \times \frac{\frac{1}{2} \text{ of } 1\frac{1}{2}}{2\frac{1}{2}})$ of $1\frac{1}{2}$ of $\frac{1}{4}$ of £1 be worth $\frac{1}{20}$ guilder; if one guilder be worth $\frac{1}{12}$ six dollar, and one six dollar 52 cents, how much more Canadian money (dollars and cents) will be required to pay a debt of £6000 due in England by direct exchange at 109 $\frac{1}{2}$ per cent, than by the circuitous route through Paris, Antwerp and Copenhagen?

96. Some spirit is sold so as to gain 20 per cent. Having been, after some has been sold, diluted with water so as to realize 75 per cent. profit, it is required to know how much water has been added to each gallon of spirit?

97. A mixed train runs for half an hour at one-third the rate of an express train. After

remaining ten minutes at a station it runs at the same rate for a distance which is eleven-thirteenths of the first distance, and remaining eight minutes proceeds at the same rate for nine-thirteenths of the first distance to another station; whence, after remaining ten minutes, it proceeds at the same rate for a distance two-thirds of the *last named* distance, and after waiting ten minutes, is passed by the express train, which has made the entire journey at the rate of 39 miles per hour, in half an hour, without any stoppage. Find the distance between the stations, and the whole time consumed by the mixed train.

98. A man buys a town lot for \$2000, and immediately mortgages it for its full value to pay for the erection and furnishing of a house thereon. He intends to pay the amount and ten per cent. compound interest in five equal annual payments. At what rate must he fix his rent so as to pay his instalment, the taxes, which are $\frac{1}{20}$ of the value of the house and lot, and to clear eight per cent.?

99. The estimated value of the crops on a certain farm is 35 per cent. of the value of both farm and buildings. By reason of unfavourable seasons, however, the value of the crops is reduced from 35 per cent. to 10 per cent. of the value of the farm and buildings, or to 16 per cent. of the value of the farm alone. If the value of the buildings be \$2,100, and if the farm consist of 100 acres, find the price per acre and the value of the crops.