120. Let $2a$ be the annual rent and consider its present value for any year, say the nth, that the lease has to run.

If paid half yearly its present value to the purchaser would be

$$\frac{a}{(1.02)^{2n-1}}+\frac{a}{(1.02)^{2n}}=\frac{2a(1.01)}{(1.02)^{2n}}$$

If paid yearly its present value would be

$$\frac{2a}{(1.02)^{2n}}.$$

Hence the proposition in the question is true for each and every year the lease has to run, therefore it is true for the aggregate.

We have received a number of solutions of Prob. 9 of the First Class Arithmetic Paper set last summer. Some of our readers seem to think that the solution given on page 267 vol. III., involves some recondite theorems, or at least requires a very advanced knowledge of mathematics to understand it, and they send what they believe to be simpler and more straightforward solutions. We regret to learn this, as it shows a lack of kinematical knowledge in these of our correspondents that must very injuriously affect their progress in Natural Philosophy. True, we we did not give full explanations for we thought the solution so simple that none were required. However, we now repeat the solution with explanations, at the same time taking the opportunity to correct an error occurring in it as originally given. (We took 15*m.* instead of 15*m.* 44 *yds.*, as the distance between A and B when the train met the latter.) We also give the solution of Mr. D. McEachran, of Ashgrove, which is worked from the point of view of a person standing on the ground. As will be seen we work from the point of view of a passenger standing on the train. We also assume that a candidate for a first-class certificate who is supposed to have taught for five years, will know the table of miles per hour to yards per minute or second, almost as thoroughly as he knows the multiplication table, and we work accordingly.

A goes 6 miles an hour in 3 seconds, he goes $\frac{44}{5}$ yards, but in 3 seconds train goes over $\frac{44}{5}+\frac{44}{1}=\frac{264}{5}$ in 3 seconds $=\frac{88}{5}$ in 1 second equal rate of 36 miles per hour, in $2\frac{1}{12}$ seconds train goes $\frac{88}{5}\times\frac{25}{12}=\frac{110}{3}$ yards, therefore B travels $44-\frac{110}{3}=\frac{22}{3}$ in $2\frac{1}{12}$ seconds equals $\frac{22}{3}\times\frac{12}{25}=\frac{88}{25}$ in 1 second, therefore, A and B approach each other in ratio of $\frac{44}{15}$ to $\frac{88}{25}=220:264=5:6$, train travels for 30 min.$+2\frac{1}{12}$ sec.$=\frac{21625}{12}\times\frac{88}{5}$ equals $\frac{95150}{3}$ yards. A travels $\frac{44}{15}\times\frac{21625}{12}=\frac{47575}{9}$ yards; now distance between A and B equals $\frac{95150}{3}-\frac{47575}{9}=\frac{237875}{9}$ yards since they approach in ratio of 5 to 6. A travels $\frac{5}{11}\times\frac{237875}{9}=\frac{108125}{9}$ yards; therefore, distance from where train leaves A equals $\frac{108125}{9}+\frac{47575}{9}=\frac{155700}{9}$ yards equals 17300 yards; therefore, $\frac{17300}{1760}=9\frac{73}{88}$ miles, Answer.

Solution of page 267, *vol.* III., *with explanations and correction.* Suppose yourself a passenger standing on the side steps of the rear platform of the train. You look forward and see A just opposite the front of the engine 44, yards forward from you. In 3 seconds he is exactly opposite you and in line with a certain telegraph-pole; in 3 secs. more he is 44 yards behind you, and he continues to fall back from you at that rate, which is 30 miles an hour. You also notice that the telegraph-pole is moving away from you 6 miles an hour faster than A is. Half an hour after A was opposite you, again you look forward and now see B just opposite the front of the engine; in 2 1-12th seconds he is opposite yourself and then continues to move away from you at this rate, 44 yards in 2 1-12th seconds, or 43.2 miles per hour. Looking back you see B between you and A, B moving away from you at 43.2 miles an hour, A at only 30 miles an hour. It is evident, therefore, that B who is going away 13.2 miles an hour faster than A is, will in time be as far away from you as A, that is A and B will be together. How far from the telegraph-pole will this meeting occur When you first noticed B, he was 44 yards in front of you, and A was 15 miles behind you, hence they were 15 miles 44 yards apart. They are approaching at 13.2 miles per hour while the telegraph pole is separating from A at 6 miles an hour, hence it will separate from him 6 miles for every 13.2 miles, in 15 miles 44 yards or

(15 m. 44 yds. ÷ 13.2 m.) × 6m. = 6m. 1460 yds.

But when you first noticed B the pole was already 3 miles behind A, hence the place of meeting of A and B will be 9 miles 1460 yards, from the telegraph-pole, that is from the place where the train left A.

Gathering together the *arithmetic* of our solution, it stands thus,—

44 yds. in 3 sec. = 30 miles an hour.

44 yds. in 2 1-12 sec. = 43.2 miles an hour,

∴ A and B approach each other at the rate of 13.2 miles an hour.

On the *front* of the train meeting B, the *rear* was