SHREWSBURY SCHOOL.

ARITHMETIC PRIZE.
1931.

(N.B.—All Working must be shewn.)

1. The volume of a body, calculated as the average of nine different experiments, is 49.353 cubic centimetres. The average of the first four is 49.273, the fifth is greater than the sixth by 0.064, while the average of the last three experiments is 0.092 greater than the average of the first four. Find the volume of the body as obtained by the fifth experiment.

2. A mile relay race is run in this way. A does the first 220 yds., B the next 440 yds., C the next 880 yds., and D the final 220 yds. The rates of running (assumed uniform) of A, B, C and D are proportional respectively to the numbers 1001, 924, 858, 1092. The total time for the mile is $3\frac{1}{2}$ mins. Find, to the nearest second, how long it would take A to run a quarter of a mile.

3. If 11 cows are put out to graze on a certain field, the grass would be consumed in 5 days, whereas, if 8 cows had been put in the field, the grass would have lasted for 8 days. How many cows should have been put into the field if it was intended that the grass should last for 10 days? You are to assume that the grass grows at a uniform rate.

4. A railway company receives 11.5% of its booking office receipts from first class passengers, 24.5% from the second class, and 64% from the third class. The average costs of a first, second, and third class ticket are in the ratio of $2\frac{1}{4} : 1\frac{3}{4} : 1$. Owing to a reduction in the system of charges, the number of first class passengers increases by 18%, of second class by 11%, and of third class by 6%. Find, correct to three decimal places, what percentage of passengers now travel first class.

5. A plate of steel, of thickness 2 inches, is in the shape of a rectangle whose length is 3 times its breadth. Its weight is 8,377 pounds. Taking 1 cubic foot of steel to weigh 492 pounds, find the length and breadth of the plate, correct to a hundredth of an inch. (N.B.—Do not use logarithms.)

6. It was noticed that a clock which requires winding once a year only was 13 minutes slow at 8 a.m. on March 17th, but that it was 8 minutes fast at 11 p.m. on April 9th. On what day, and at what time, did it show correct time?

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7. If 10 men and 15 boys can do in 4 days as much as 12 men and 6 boys can do in 5 days, how many boys must help 6 men to finish the same work in 6 days ?

8. Of 4 pipes, A, B, C and D, A fills a 3-gallon jug in 5 minutes, B takes 8 minutes to emit a cubic foot of water, 14 minutes are required to collect a hundredweight of water from C, and the 4 pipes together would fill a cistern holding $648\frac{1}{2}$ lbs. of water in 24 minutes. Find how many cubic feet of water D would deliver in one hour. (1 cubic foot of water weighs 1,000 ozs., and 1 gallon of water weighs 10 lbs.)

9. The numbers expressing in feet the lengths of a fast and a slow train are eight times the numbers expressing in miles per hour the speeds of the slow and the fast train respectively ; the latter numbers consisting of the same two digits, but in the reverse order. If the trains are travelling in the same direction, the fast train takes 10 seconds in completely passing the slow. Find the lengths of the trains, and the time taken by the slow train to pass a man walking in the opposite direction at the rate of 2 miles an hour.

10. A certain sum of money is loaned out at $6\frac{1}{2}\%$ compound interest. The interest that accumulates during the third year is £224 19s. $7\frac{1}{2}$d. in excess of the interest during the second year. Find the original sum of money.

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