SHREWSBURY SCHOOL.

ARITHMETIC PRIZE
1938

1. (*a*) £114 : 7 : 6 amounts to £164 : 4 : 10 in 12 years at Compound Interest. What would it amount to in— (i) 6 years (ii) 18 years.

   (*b*) Find the interest at compound rate on £3 : 7 : 9 at 4% for 16 years to the nearest penny.

2. Evaluate $\left\{ (\cdot 01371)^{\cdot 01371} + (\cdot 145)^{\cdot 145^{\cdot 145}} \right\}^{3 \cdot 172}$

3. Factorise (i) $2x^3 - 3x^2 - 174x - 385$
   (ii) $a^3x^3 + ac^2x^2 + ad^2x - bc^2x - b^3 - bd^2$
   (iii) $x^8 - 56x^4 + 16$.

4. A man buys goods on the understanding that he will receive a discount proportional to the amount bought.

   He finds that if he had bought two different quantities of goods together instead of separately he could actually have bought $\frac{1}{20}$ more for the same money. If no discount at all had been allowed he could have bought $\frac{1}{20}$ less. Find the ratio of the two separate quantities bought.

5. In a Δ ABC, $B\hat{A}C = 90°$; ABXY, ACZW are squares outside Δ ABC; BZ, CX cut AC, AB at K and H; prove AH = AK.

6. (i) Show how to construct a triangle given the length of its medians.

   (ii) Show how to construct a right-angled triangle given the length of its hypotenuse and the sum of the lengths of the other two sides. No calculation is permitted.

7. ABCD A′B′C′D′ is a rectangular solid; AA′, BB′, CC′, DD′ are vertical; $AB = x''$, $BC = (x+1)''$, $AA' = x(x+1)''$. Calculate (i) AC′ (ii) the shortest distance from A to C by a path crossing A′B′C′D′. (iii) the volume of the tetrahedron ABCB′.

8. A road 324 ft. long and 20 ft. wide is at an inclination of 1 in 3. A man walks up the road in a zig-zag path whose inclination to the horizontal is 1 in 5. How far does he walk in reaching the top and what is the angle between his path and the line of greatest slope of the road.