A body is projected vertically, 1st upwards, 2nd downwards, with an initial velocity of 60 feet per second. After how long an interval of time will it in each case be at a point 100 feet below the point of projection?

3. Enunciate—1st, the parallelogram of displacements; 2nd, the parallelogram of velocities; 3rd, the parallelogram of accelerations (forces).

A body is projected with a velocity of 160 feet at an angle of 30 degrees to the horizon. How far from the point of projection will it be after an interval of 3 seconds, and what will be its velocity then?

4. Enunciate Newton's Laws of Motion, and explain the terms rest, motion, action, and the phrase, change of motion.

Define the absolute or kinetic, and the gravitation or static units of force, and state approximately the ratio they bear to each other.

5. Briefly describe Atwood's Machine, and explain how it is used to verify the laws of motion.

Two equal masses supported by a perfectly flexible cord passing over a frictionless pulley are at rest. A mass of one ounce is added on one of them, which descends with it 3 feet. The ounce mass is then removed, and the equal masses are found to move on with a uniform velocity of 4 feet per second. Determine the measure of each of the equal masses. Find also the tension of the string —1st before, 2nd after, the removal of the ounce mass.

6. Assuming the parallelogram of forces, prove that if two forces whose lines of action meet in a point, be represented in relative direction by OA, OB, and in magnitude by $m.OA$, $n.OB$, their resultant will be represented in direction by OG, and in magnitude by $(m+n)OG$, the point G being taken in AB, so that $m.GA=n.GB$.

The quadrilateral $ABCD$ is held in equilibrium by forces which act along the sides AB, AD, CB, CD, and which are proportional to a, d, b, c times those sides respectively. Show that $ac=bd$.

7. Show that the algebraic sum of the moments about any point of two forces whose lines of action intersect, is equal to the moment of their resultant.

A straight rod, weighing 4 lbs. per foot of its length, balances about a point 3 feet from one end when weighed with 48 lbs. at that end. Find the length of the rod.

Third and Second Class Teachers.

MENTAL ARITHMETIC.

1. A hall-way is 90 inches wide, and takes 25 sq. yds. of oil-cloth to cover it. How long is it?

2. A gentleman travels from Toronto to Montreal and back. He goes at an average rate of 33 miles per hour and returns at an average of 30 miles per hour, and he finds that he occupied one hour longer in returning than in going. Find the distance from Toronto to Montreal.

3. A can do a piece of work in 7 days, and B can do it in 8 days. A works at it for $2\frac{1}{2}$ days, and B works at it for 3 days. C then finishes it in $3\frac{3}{4}$ days. In how many days could C have done the whole work alone?

4 By selling an article for $21 I would lose $12\frac{1}{2}$ per cent. At what should I sell it in order to gain $12\frac{1}{2}$ per cent.?

5. A merchant marked his goods at an advance of 60 per cent. on cost. He gave one of his customers a discount of 15 per cent. off the marked price. What was his gain on $6.80 received from that customer?

6. How much stock must I sell out of the $3\frac{1}{2}$ per cents, at 84, to enable me to buy $7,700 4 per cent. stock, the value of the stock being proportional to the dividends they pay?

Intermediate and Third Class.

NATURAL PHILOSOPHY.

1. How are forces measured? What is the unit of force commonly adopted in statics? What general relation is there between the latitude of any place and the magnitude of the statical unit of force for that place?

2. What is meant by saying that two or more given forces exactly balance each other?

If a body moving with constant velocity in