(7) Find the G.C.M. and L.C.M. of $11 \times 42 \times 77 \times 550$ and 1728×605. | 12

(8) Divide $1\cdot\overset{..}{27}$ by 7, leaving the result as a recurring decimal. | 12

(9) Write down the fractions which are equal to $1\cdot\overset{..}{27}$; $\overset{.}{24}$; $8\cdot\overset{.}{571428}$. | 21

(10) Add the decimals in the last question, leaving the result as a recurring decimal. | 12

(c) Multiply $8\cdot\overset{.}{571428}$ by $1\cdot\overset{..}{27}$, giving a perfectly correct answer.

(d) Explain how to work by Double Rule of Three.

(e) State and prove the rules for working Discount and Present Worth.

(11) Extract the square root and cube root of $1\cdot1$, each to three places. | 16

(12) Factorize *five* of the following: $a^4 - b^4$; $a^5 + b^5$; $a^6 - b^6$; $8x^3 - 27y^6$; $x^2 - xy - 201y^2$; $7x^2 - 73ax + 30a^2$. | 10

(13) Find the G. C. M. of $7x^2 - 73ax + 30a^2$ and $5x^4 - 79ax^3 + 284a^2x^2 + 60a^3x$. | 10

(14) Find the L. C. M. of $42ab^2x^3y^4$; $77a^3b^4x^2y$; $550a^4b^3xy^2$. | 10

(15) Solve $ax^2 + bx + c = 0$, and give the theory of quadratic equations. | 10

(16) Solve *three* of the following equations: | 30

(i) $\dfrac{1}{a} + \dfrac{1}{x} = \dfrac{1}{b}$

(ii) $7x^2 = 73ax - 30a^2$

(iii) $3x + 4y = 15x - 2y = 11$.

(iv.) $x + y = 6$; $x + z = 8$; $y + z = 10$.

(v.) $x^2 + y^2 = a^2$; $x + y = a$.

(17) Solve *two* of the following problems: | 20

(i) A boy is one-third the age of his father, and is six times as old as his brother. Their united ages amount to 50 years. Find their ages.

(ii) A certain fraction becomes $\frac{1}{3}$ if 1 be added to its numerator, but if 1 be added to the denominator instead, it becomes $\frac{1}{4}$.

(iii) A cistern can be filled by three different pipes in $1\frac{1}{3}$ hours, $3\frac{1}{2}$ hours and 5 hours respectively; in what time will it be filled when all three are open together?

(18) Prove that if $\dfrac{a}{b} = \dfrac{c}{d} = \dfrac{e}{f}$; then $\dfrac{a+b}{a-b} = \dfrac{c+d}{c-d} = \dfrac{e+f}{e-f}$; and $\dfrac{a - 2c + e}{b - 2d + f} = \dfrac{a}{b}$ | 10

(f) State the Binomial Theorem and expand $(a - x)^{-\frac{5}{3}}$ to 5 terms.

Total............ 300

ROYAL MILITARY COLLEGE OF CANADA—HALF-YEARLY EXAMINATION, JUNE, 1879.
3RD CLASS.

II. PLANE TRIGONOMETRY AND MENSURATION.

TIME ALLOWED, 3 HOURS.

N.B.—Questions marked *a, b* and *c*, are alternative, as follows; *a* for any *two* out of 1 to 5; *b* for 6; *c* for 7, or 8, or 9, or 10; *d* for 11.

(1) Give a perfectly general definition of the trigonometrical ratios (including versed sine) of any angle; and prove that $\sin A = -\sin(A - \pi)$, and that $\sin 2A = \cos 3A$ if $A = -54°$. | 20

(2) What formulæ connect sine and secant. also tangent and cosecant. | 20

(3) Find the value of $\sin 18°$ and explain the 2nd root of the quadratic. | 20

(4) Prove two of the following identities: | 20
$$\cos A + \cos B = 2\cos\frac{A+B}{2}\cdot\cos\frac{A-B}{2}; \quad \frac{\cos A - \cos 3A}{\sin 3A - \sin A} = \tan 2A;$$
$$2\sin A = \pm\sqrt{1 + \sin 2A} \pm \sqrt{1 - \sin 2A}.$$

(5) Enumerate all the cases of oblique angled triangles, and mention in each case the formula and method of solution, also, any ambiguities that may occur. | 20

(6) Given $b = 487\cdot6521$; $c = 555\cdot9525$; $B = 57° 20' 26''$. Find " a " to seven figures. | 50

(a) Use only the logarithms involved in answering the last question to obtain the logarithm of half the area of one of the triangles; thence find the area.

(b) Given $A B = 1000$ feet $P A B = 50°$, $P A Q = 25°$, $Q A B = 27°$, $P B A = 50°$, $Q B A = 109°$. Find the distance between P and Q.

(7) Prove $\dfrac{\sin\theta}{\theta} = 1$ if $\theta = 0$. Prove that the perimeter of a circle is $2\pi r$. Find the perimeter of an equilateral triangle inscribed in a circle. | 25

(8) What is the area of a parabola between any arc and its chord? | 25

(9) What use is made of the area of a parabola to obtain a close approximation to the area of a curve? Explain with a figure and give Simpson's rule. | 25

(10) Give a single general rule applicable to find the number of round shot or shell in any complete pile, and find the number in an incomplete pile of 6 courses, with 8 in the shorter top side, 20 feet in the longer side of the base. | 25

(11) The vertical sections of a railway cutting, taken at intervals of 50 feet, are respectively 0, 400, 1080, 1170, 1280, 490, 0, square feet. Find the number of cubic yards by assuming each successive length of 100 feet to be a prismoid. | 50

(c) Answer five of the following: What are the area of an ellipse; volume of a sphere; volume of a spherical sector; volume of a spheroid; volume of a paraboloid; surface of a sphere; surface of a spherical zone or segment?

(d) A field is bounded by A B = 4·66 chains, B C = 5·24, and by three other sides outside A C = 3·89. The distances to the angles are obtained by perpendicular offsets of 75 and 63 links at distances 1·76 and 3·14 along A C. Find the area in acres.

Total. | 400

ROYAL MILITARY COLLEGE OF CANADA.—HALF-YEARLY EXAMINATION, JUNE, 1879. 3RD CLASS.

III. STATICS AND APPLIED MECHANICS.

TIME ALLOWED, 3 HOURS.

N.B.—Questions marked a, b, &c., are alternative, as follows : a for any of 1 to 6 ; b for 7 ; c for 9 or 10 ; d or e for any of 8 to 12.

Marks.

(1) What are the equations of equilibrium for any number of forces acting on a particle ? Are these sufficient for the equilibrium of a body ? If not, show the reason why. Explain all letters used. | 14

(2) Two forces—Q and R—are inclined at angles of 135° and 150° on different sides of a third force, $P = \sqrt{3} + 1$. Find their magnitudes, the system being in equilibrium. | 14

(3) What is the condition of equilibrium of a body constrained to move about a fixed axis ? What is the principle of the lever ? | 14

(4) Find the resultant of two unequal and unlike parallel forces. | 14

(5) What is meant by the *centre of parallel forces ?* | 14

(6) What is the distance, from a fixed straight line, of the centre of gravity of any number of particles. | 14

(a) Three weights of 1 lb., 2 lbs., 3 lbs. are at equal distances on the circumference of a circle, radius = 1 inch. Find the distance of the c.g. from the centre ; *or*, name some diameter which must pass through the centre of gravity.

(7) What is the Principle of Virtual Velocities ? Explain what they are. Apply the Principle to find $\frac{P}{W}$ in the case of a bucket drawn up from a well by a common windlass. | 16

(b) Find $\frac{P}{W}$ in the case of a rough inclined plane : 1st, if P acts along the plane ; 2nd, if P is horizontal ; 3rd, if P acts along the plane.

(8) What is a structure, and what are the general conditions of equilibrium ? | 20

(9) Draw any polygon of 7 sides, and draw straight lines to represent a system of forces acting at the angles, that will keep the polygonal frame in equilibrium. | 20

(10) If the forces in the above system be all reversed, will the frame be in equilibrium, and will it be stable ? Draw the least number of bars that will make it stiff. Will there be any stress on these bars ? Give reasons for the answer to this part of the question. | 20

(c) Draw a Queen Post Truss. Draw as much only of the diagram as will suffice to determine the stress on one of the uprights, the weights on each external joint being the same. Explain the construction of the diagram.

(11) Explain generally the method of determining the total stress of each part of any truss that is liable to be acted on by wind. | 20

(12) Show by a figure how the internal stresses act in a beam fixed at one end and supporting a weight at the other. | 20

(d) What is the moment of resistance of a rectangular beam ?

(e) A beam 30 feet long and 1 foot deep is supported at the ends and bears a uniform load of 400 lbs. per yard. Find the requisite width. Modulus of rupture = 10,000 ; factor of safety = 6.

Total............ | 200

ROYAL MILITARY COLLEGE OF CANADA.—HALF-YEARLY EXAMINATION, JUNE, 1879. 3rd CLASS.

IV. CONICS, DYNAMICS AND HYDROSTATICS.

TIME ALLOWED, 3 HOURS.

MARKS.

N. B.—The questions marked a, b, c are alternative as follows, viz : a, b, for any of (6) to (11), c for (12) or (13).

(1) What is meant by the " equation to a line " ? Give an example. | 20

(2) What is the equation to the parabola referred to any diameter and the tangent at its extremity ? | 20

(3) What is the property of all straight lines parallel to the axis of a parabola that entitles them to be called diameters. | 20

(4) Explain the meaning of the equation $s = ut \pm \frac{1}{2} ft.^2$; $v^2 = u^2 \pm 2 fs$; $P = mf$. | 20

(5) Find the acceleration of two particles m, m' connected by a smooth string passing over a smooth pulley. | 20

(6) The minute hand of a clock is 6 inches long, find its angular velocity, and the linear velocity of its extremity. | 20

(7) Prove that $\frac{Wv^2}{2g}$ expresses the work stored up in a moving body. | 20

Marks

(8) What is the equation connecting the Vis Viva, the work done by the powers and that done by the resistances. | 20

(9) Find the work stored up in a rotating body. Explain Moment of Inertia; also the use of a fly-wheel, and point out its principal requisites. | 20

(10) What is the work stored up in a circular hoop rolling on a plane with an onward velocity **v**? | 20

(11) If many bodies are lifted through various heights; what is the work done, expressed simply? | 20

What are the equations for working out the following problems, supposing the resistances to be 8lbs. per ton of 2240lbs., and supposing there to be no loss of velocity when the direction of motion is changed.

(a) 1st. A train with initial velocity runs down an incline. Find the velocity at the bottom, and how far it would run up a different incline before coming to rest.

(b) 2nd. What horse power will an engine require to keep up a velocity of 60 miles an hour; and how soon will it, if required, bring the train to rest, the brakes being on and the resistances being in consequence one-sixth of the weight?

(12) If the pressure of the atmosphere is equivalent to that of 30 inches of mercury (spec. grav. 13·6); find the pressure on a square inch. | 20

(13) A mixture of water and alcohol is required to have the same specific gravity as oil, viz: ·92, that of alcohol being ·8. Find the proportion between the volumes to be mixed. | 20

(14) Find the ratio between the radii of the piston and supply pipe of a hydraulic press, in order that a pressure of 1 lb. may lift a ton. | 20

(c) Define whole pressure. Find the whole pressure on the curved surface of a cone immersed in water, with axis vertical and vertex in the surface.

(15) What are the 3 conditions of equilibrium and stability of a floating body? Distinguish which are the conditions for which. Define metacentre. | 20

Total | 300

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ROYAL MILITARY COLLEGE OF CANADA.—HALF-YEARLY EXAMINATION, JUNE, 1879.

3RD CLASS.

V. VOLUNTARY MATHEMATICS.

TIME ALLOWED, 3 HOURS.

Section H.—Hydrostatics.

N. B.—Questions numbered *a, b, c,* are alternative as follows . *a* for 2; *b* for 3; *c* for 6 or 7. | MARKS.

(1) Define density and specific gravity. Explain the equations $W = s V$; $W = g \rho V$. What is the exact meaning of W in these equations? | 20

Marks

(2) If the units of weight, length and time are 1 lb. 1 yard, ½ sec., find the density of the standard used for $W = g \rho V$. What must be the unit of weight, if water be the standard, (1 yd. and ½ sec. being retained as units)? | 30

(a) The specific gravity of an alloy of gold and silver is 19, that of gold being 19·4 and silver 10·5. Find the ratio between the volumes and also between the weights of the gold and silver.

(3) What are the experimental results on which the laws governing the pressure of gases are founded. Thence prove $p = k\rho(1 + at)$? Explain the full meaning of each letter and give an approximate value for a. | 40

(b) Shew that for all fluids $dp = g\rho dz$, and prove that, (in the case of the atmosphere) $z - z' = \frac{k}{g}\log\frac{h'}{h}$ where z, z' are two altitudes, h, h' are the heights of the barometer at those altitudes, and are assumed proportional to the pressures (neglecting temperature.)

(4) Find the Moments of Inertia of the following areas:— | 30

A rectangle about one side; and about a parallel through centre.
A circular lamina about its diameter; and about a perpendicular axis through its centre.
A square about a diagonal; and about a perpendicular axis through its centre.

(5) Given the movement of Inertia of a body about an axis through its centre of gravity; what is it about any parallel axis? | 20

(6) Define whole pressure and centre of pressure. | 30

(7) Prove that whole pressure $= Sg\rho\bar{z}$. S being the surface. | 30

(c) Prove that the depth of the centre of pressure $= \dfrac{I}{\text{Area} \times \bar{z}}$.

(8) Find the centre of pressure of a trapezoid with one edge in the surface. Thence find it for a rectangle; a triangle with—1st, a side in the surface; 2nd, base horizontal, vertex in the surface. | 40

(9) Find the centre of pressure of a vertical circle wholly immersed with its centre at a given depth. | 40

(10) Define metacentre and find its height above the centre of buoyancy, *i. e.* the centre of gravity of the fluid displaced. What is the condition for stability? | 40

(11) Find the limits of the specific gravity of an isosceles right angled triangular prism, in order that it should float with the right angle immersed, and base horizontal; and prove that the metacentre is as much above the surface as the centre of buoyancy is below it. | 50

(12) Explain the double action (or Hawksbee's) air-pump, and calculate the pressure of the air in receiver after a given number of strokes. | 40

Total | 400

ROYAL MILITARY COLLEGE OF CANADA—HALF-YEARLY EXAMINATION, JUNE, 1879.

3rd CLASS.

VI. VOLUNTARY MATHEMATICS AND ARTILLERY.

SECTION G.—KINEMATICS.

	Marks.
(1) If the point A move from (1, 2) to (4, 1), and the point B from (9, 8) to (4, 11) simultaneously (using the notation of co-ordinate geometry); shew that the bar AB may be considered to have rotated about a certain centre; find that centre.	30
(2) Define a *centre of instantaneous rotation*. If a solid body be considered, what does this centre become?	20
(3) Shew how any motion of a plane figure in its own plane may be produced by the rolling of a line in the figure upon a line in the fixed plane.	30
(4) How may any motion of a solid body with one point constrained, be represented by the rolling of curves? Explain the reasons.	30
(5) Prove that a hypocycloid becomes a straight line, if the radius of the inner circle is half that of the outer one. What does a hypotrochoid become under the same circumstances?	30
(6) Two cranks are connected by a link. Find the ratio between their angular velocities at any given position. Is the ratio constant.	30
(7) A projectile has an angular velocity a about its longer axis; the resistance of the air under the point gives it an angular velocity x, about a perpendicular axis. Find the new axis and velocity of rotation.	30
Total	200

ARTILLERY MACHINES.

	Marks.
(8) What is a *wheel purchase*, determine its mechanical advantage and whether it is best to apply it to a large or a small wheel?	15
(9) A gun has to be rolled forward (on a roller and plank) a distance of 6 inches to bring it into its trunnion holes; how far back ought the roller to be placed? Give full reasons. Why not further back, nor further forward?	15
(10) Draw a sketch of Tangye's Hydraulic Jack, shewing the principles of construction; explain its action both for raising and for lowering a weight; and calculate its mechanical advantage, giving approximate dimensions to the parts.	25
(11) What does a 6-inch rope mean, and what weight ought it to bear safely when new.	10
(12) Define *sheers*, their *effective length*, the *rear guy*, and explain with a sketch the method of using them.	10

	Marks
(13) A 58 cwt. gun lies 5 yards in front of the foot of the shears. The rear guy is made fast 20 yards from the foot. The spars weigh 4 cwt. each and their effective length is 28 ft. The distance between their feet is 6 yards. Find, by construction or otherwise, the tension of the back guy, the horizontal force at each foot and the resultant pressure of each foot on the ground when the gun is raised.	25
Total	100

ROYAL MILITARY COLLEGE OF CANADA.—HALF-YEARLY EXAMINATION, JUNE, 1879.

3RD CLASS.

VII. VOLUNTARY MATHEMATICS.

TIME ALLOWED, 3 HOURS.

SECTION F.—STRESS IN BEAMS.

N.B.—Questions numbered *a*, *b*, are alternative as follows: *a* for 2; *b* for 12.

	Marks.
(1) Explain what stresses may be supposed to act upon an elementary portion of a body in a state of stress.	20
(2) Prove that shearing stress is the same in any two perpendicular directions.	20
(3) What are the directions of principal stress? Explain in a few words the method of finding them—1st, if all the stresses in two perpendicular directions are known; 2nd, if two directions of pure shearing stress are known.	30
(4) What do the algebraical signs of the direct stresses signify?	20
(a) What condition must exist with regard to the principal stresses in order that there may be some direction in which there is pure shearing stress?	
(5) Take the neutral axis of a horizontal beam in its unbent position for the axis of X; θ the inclination to the vertical section when bent. Prove $$\frac{d\theta}{dx} = \frac{1}{\rho} = \frac{d^2y}{dx^2}$$	20
(6) Prove moment of resistance $= \frac{E}{\rho} I = \frac{p}{y} I$. What is I?	30
(7) Find the moment of resistance of: 1st, a rectangular beam; 2nd, a hollow circular beam of sectional area half what it would be if solid.	30
(8) Find the curve formed by the neutral axis of a rectangular beam fixed at one end, and having a load at its extremity equal to 10 times its own weight, which must not be neglected. Prove also that the deflection at the extremity is $$\frac{83\ W\ l^3}{2\ E\ b\ d^3}.$$	30
(9) A uniformly loaded beam rests on three horizontal supports at its centre and extremities. Find the reactions of the supports and prove that the bending moment at the centre support is the greatest.	30

	Marks
(10) Shew that the shearing force at any point of a beam is the differential co-efficient of the bending moment at that point.	20
(11) Shew (with reasons) how the diagram for shearing force may be used to give the bending moment at any point.	20
(12) A beam 20 feet long and weighing 10lbs. per foot is supported at each end and carries a load of 400 lbs. at a point 2 feet from one end. Draw a diagram of shearing force and find from it where the bending moment is greatest.	30
(b) A uniformly laden train of great length is crossing a bridge. Prove when the shearing force at any given point is greatest. When is the bending moment greatest?	
Total.	300

Royal Military College of Canada—Half-yearly Examination, June, 1879.

3rd Class.

I.—ARTILLERY.

Time allowed, 3 hours.

	Marks
(1) What are the essential qualities in a cloth for a cartridge bag? What is to be used in future?	55
(2) What is the difference between reduced, full, and battering charges? Give the uses of each.	50
(3) What is ordinary fuze composition, and at what rate does it burn? In what wood time-fuzes are different compositions used and why?	55
(4) Enumerate the service wood time fuzes for rifled guns. How does the 5-second B. L. fuze differ from the M. L.?	55
(5) What is meant by a "Sensitive" percussion fuze, and for what purpose has a fuze of this nature been adopted into the service?	55
(6) What considerations regulate the length of the different projectiles fired from rifled guns?	50
(7) Describe a 40-pr. segment shell.	55
(8) Describe the gas check adopted for heavy R. M. L. guns. What advantages are gained by its use?	50
(9) What is the composition of service powder? and what function does each ingredient play in the combustion?	55
(10) How is the rapidity of combustion of powder of a given composition affected by: (i) Density; (ii) Size of Grain; (iii) Shape of Grain.	55
(11) Of what ordnance are our siege trains at present composed?	50

	Mrrks
(12) With what guns are field batteries now armed? What change is contemplated?	50
(13) How can you at once distinguish by external appearance 5-sec. from 9-sec. fuze; 20-sec. from small mortar fuze; and a 9-sec. R. B. L. from 9-sec. R. M. L. fuze?	55
(14) Suppose you were firing both segment and shrapnel shell at the same object, what instructions would you give as to fuze?	55
(15) Describe a Dwarf traversing platform, with its sliding carriage.	55
Total	800

Royal Military College of Canada.—Half-yearly Examination, June, 1879.

3rd Class.

II. VOLUNTARY ARTILLERY.

Time allowed, 3 hours.

	Marks
(1) Define malleability, toughness, elasticity, elastic limit. Compare wrought iron with steel as regards these properties.	40
(2) Define "gun-metal," and state its properties. Why is it unsuited for rifled guns?	30
(3) Describe shortly the process of toughening steel. Why is steel used in preference to wrought iron for the inner barrel of a gun?	40
(4) State the principles of Armstrong's original construction. What was the great defect in the former system of manufacture which this method was intended to remedy, and what are the defects of the method itself?	40
(5) What is meant by shrinkage? What limits it?	30
(6) What is the Frazer modification in the construction of heavy guns?	30
(7) State the object of the operation of puddling. Give an outline of the operation.	40
(8) Describe the process of forming a coil from a number of blooms.	30
(9) What is the use of a gas escape?	30
(10) How is a solid forging made?	30
(11) What are the principal woods made use of in the R. C. D.?	30
(12) What defects have to be guarded against in selecting timber.	30
Total	400

ROYAL MILITARY COLLEGE OF CANADA.—HALF-YEARLY EXAMINATION, JUNE, 1879.

3RD CLASS.

III. VOLUNTARY ARTILLERY—SECTION B.

TIME ALLOWED, 3 HOURS.

Marks.

N. B.—Questions numbered *a*, *b*, &c., are alternative as follows : *a* for 4; *b* for 7 ; *c* for 8 ; *d* for 9 ; *e* for 6 ; *f* for 11.

(1) Define *remaining velocity* and *terminal velocity*. — 20

(2) If the *twist of rifling* is one turn in "n" calibres, find the *angle of spiral*. — 40

(3) Find the equation to the parabola used for giving a twist which increases from zero to one turn in "n" calibres ; and prove that — 50

$$\tan \phi = \frac{\pi}{l}\left(1 - \frac{x}{l}\right)$$ where ϕ is the angle of spiral at any point.

(4) Show how this formula is turned to account in the examination of re-covered shell. — 50

(*a*) Given the muzzle velocity and twist, find the angular velocity. Example : n = 35, d = 11 inches, vel. = 1386 f. s.

(5) What are the principal objets to be considered in selecting an explosive material for use in guns. How far are gunpowder and gun-cotton re-spectively suitable or unsuitable ? — 60

(6) When a gun is fired, why is the energy communicated to the projectile less than that stored up potentially in the charge ? What is the *factor of effect ?* — 40

(7) Consider the effect upon the muzzle velocity by varying : 1st, the charge ; 2nd, the length of the bore. — 50

(*b*) Consider the effect of chambering a gun so as to allow *air space.*

(8) Describe one of Bashforth's chronographs briefly, and explain the arran-gement of the screens and the object he sought to arrive at. — 50

(*c*) Describe Le Boulenge's chronograph and explain the difficulties connected with remaining magnetism, and how it is sought to remove them in this instrument.

(9) Explain the letters used in the formula $f = -\,K\dfrac{d2}{w}\left(\dfrac{v}{1000}\right)^3$. Why is the factor $\dfrac{d2}{w}\ \dfrac{1}{10003}$ introduced. — 40

(*d*) Prove that if K is constant $v = \dfrac{V}{1 + cVs}$. What is the meaning of each letter ?

(10) In Bashforth's tables of remaining velocity we find against the velocity 1364, the numbers 1527·9 and 1·0047. Explain these numbers ; and show how to calculate the remaining velocity and time of flight for the 10" M. L. gun. Range 1,000 yards ; $\dfrac{d2}{w} = \cdot24$. — 50

Marks

(11) Show how to find the height of any part of a low trajectory and the greatest height. Find the greatest height of the trajectory in question (10) if the time of flight be 2·3 seconds. — 50

(*e*) Explain briefly the principal steps in finding the angle of descent.

(*f*) Give mathematical reasons for the derivation of Service R. projectiles and of flat-headed shot, pointing out the difference between them.

Total............ 500

ROYAL MILITARY COLLEGE OF CANADA—HALF-YEARLY EXAMINATION JUNE, 1879

3RD CLASS.

FREEHAND DRAWING.

NUMBER OF MARKS, 70.

TIME ALLOWED, 3 HOURS.

(1) Outlines from examples,
    a. Objects.
    b. Ornaments.
(2) Outlines from the round.
    a. Objects and models.
    b. Ornament.
(3) Drawing the human figure.
    a. In outline.
    b. Shaded.
2 and 3 alternative.

ROYAL MILITARY COLLEGE OF CANADA.—HALF-YEARLY EXAMINATION, JUNE 1879.

3RD CLASS.

FREEHAND DRAWING.

NUMBER OF MARKS, 80.

TIME ALLOWED, 3 HOURS.

(1) The scale to be $\frac{1}{4}$ inch to the foot, the height of spectator 6 feet, his distance 18 feet. Put into perspective a cubical figure 4 feet square at base, and 9 feet high, when its left side recedes from the picture plane at 40°, and its nearest angle is at 6 feet on the left of the spectator.

(2) Scale $\frac{1}{4}$ inch to the foot, height of spectator 6 feet, distance 16 feet, subject a prism, the ends of which are regular hexagons of 3 feet, lying on one of its sides so that its hexagonal end is at right angles and its long edge is parallel to the plane of the picture. Give the perpective projection.

(3) There is a case of shelves against a wall. The case is 8 feet high and 4 feet wide, it has three shelves placed so as to divide the case into four equal spaces. The case and shelves are 1-inch thick scale $\frac{1}{2}$ inch to the foot. The height of the spectator is 5 feet 6 inches and his distance 15 feet. The front of the object is to be parallel to the picture plane at 6 feet on the left of the spectator. Give perspective view.

APPENDIX G 1.

ROYAL MILITARY COLLEGE OF CANADA.

SYLLABUS OF MATHEMATICS—GENERAL SUMMARY OF SUBJECTS AND TEXT-BOOKS.

Euclid (Todhunter)—The use of Potts' Euclid will be discontinued as soon as those in store are finished.

Arithmetic (printed notes by Major Kensington, R. A.)—Together with Smith and McMurchy or any other approved text-book. Scales of notation and mercantile arithmetic are omitted.

Algebra (printed notes by Major Kensington, R. A.)—Todhunter's Elementary, and Todhunter; the latter only for the more advanced students.

Logarithms (Chambers' or other tables)—Thorough practical use of Logarithms.

Plane Trigonometry (Todhunter.)

Spherical Trigonometry (Todhunter.)

Conic Sections (Todhunter.)—This subject is taught almost entirely by lecture, geometrical proofs being given whenever practical and easy.

Differential Calculus (Williamson.)

Statics and Dynamics (Todhunter's mechanics for beginners)—The most advanced students are instructed further by lectures grounded on Todhunter's Analytical Statics, Tait's Dynamics, and other standard works, free use being made of the calculus.

Statical Problems solved by Construction (Tracts on Mechanics by Crofton and Kensington.) *Work and Energy* (Tracts on mechanics)—Special reference to artillery problems.

Rotation considered geometrically without text books up to the resultant motion of an elongated projectile.

Hydrostatics (Besants' Elementary)—Special machines used in the Royal Artillery higher course of lectures with the use of the calculus.

Mensuration—Without text-book.

Applied Mechanics (Croftons' Elementary) - Higher course of lectures grounded on Rankine, Rouleaux, Collignon, and other works.

Mechanism (Goodeve)—Steam Engine; general principles only taught by lecture.

The whole of the above course is taught by lectures and personal instruction, aided by text-books, as far as possible. Shorter and easier proofs than those in the text-books are given whenever practicable. Notes of the lectures are taken by the cadets and revised by the instructors.

The following shows the syllabus for each class in detail.

1st. Obligatory;

2nd. Voluntary.

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SYLLABUS OF MATHEMATICS—1ST CLASS.

Mechanism (Goodeve) concluded, omitting chapter III on the teeth of wheels; also particular applications. Instruction will also be given on the general principles of the steam engine. Marks, 300.

	Marks.
F. Completion of this section in the second class course......	200
G. *Dynamics.*—Completion of course laid down for third and fourth classes: D'Alembert's Theorem—the six equations of equilibrium; principal axis and ellipsoid of rotation; compound pendulum; centres of suspension, oscillation, percussion; impulse on the axis of rotation; axis of spontaneous rotation..	300
H. *Hydrostatics.*—Completion of course laid down for third class: Accurate determination of height by the barometer; flow of water through pipes; fluid friction; pressure at any point in a moving fluid; pressure on a thin surface or cylinder, tension produced; stress on boilers; pressure on a thick cylinder; and application to cast-iron guns.........	300
I. *Integral calculus;* Double and treble integration; differentiation of definite integrals; probabilities; application to the probability of hitting a target; easy differential equations..	300

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SYLLABUS OF MATHEMATICS.—2ND CLASS—1500 MARKS.

Mechanism (Goodeve)—Introductory and Chapters I and II, omitting the application of the principles to particular machines, though it is advisable to read through the whole in order to obtain a clear insight into the subject. 300.

	Marks.
A. *Algebra.*—Probalities; solution of cubic equations by Horner's and other methods; determinants; easy questions only	200
B. *Plane Trigonometry.*—Demoivre's Theorem; exponential values for sine and cosine; calculation of π; summation of easy series....................................	200
C. *Conic Sections.*—Abridged notation; anharmonic ratio; conical projection; general equation of the 2nd degree.	200
D. *Differential Calculus.*—Revision of former course with harder questions; implicit functions; use of abridged notation....................................	200
F. *Statics and applications.*—Completion of such portion of the voluntary courses of the 3rd and 4th classes as may have been omitted: Stress in beams continued; distribution of the stresses in the case of shearing stress; distribution of the stresses in the case of a flanged iron girder; continuous beams................	400

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SYLLABUS OF MATHEMATICS—3RD CLASS—(OBLIGATORY) 1300 MARKS.

Applied Mechanics (Crofton's Elementary.)—Marks 300. Repetition of the subjects studied in previous classes as follows :—

	Marks.
Euclid....................................	200
Arithmetic....................................	100
Algebra....................................	200
Plane Trigonometry, Conic sections and Mensuration	200
Statics and Dynamics, including problems by construction, work and energy....................................	200
Hydrostatics.........	100

(Voluntary) 1000 Marks.

Marks.

F. Internal stresses in a plane lamina.—Principal stresses, directions of pure shearing stress, stress in beams, moment of resistance, deflection curve of neutral axis, deflection at any point, fixed beams, beams on three supports, continuous beams, shearing force the differential coefficient of the bending moment, diagram of shearing force, application to determine the bending moment at any point, theorems on the effect of partial loading........ 300

G. *Dynamics or Kinematics.*—Any motion of a plane figure in its own plane represented by roulettes, combination of rotations, motion of a solid round a fixed point, rotations round intersecting axes, application to the rotation of the earth about an axis through the zenith at any latitude, application to the derivation of elongated projectiles.......... 200

H. *Hydrostatics.*—Sections omitted in obligatory course from Chapters I to VI of Besant, applications of the calculus, moments of inertia, whole pressure, centre of pressure below the centre of gravity, metacentre, determination of its height above the centre of flotation, position of stability, application to the flotation of simple solids, the various positions of a square log of timber according to its specific gravity, law of pressure of gases, proof of formula $P = k^\circ (1 + \alpha t)$, determination of the difference of levels corresponding to a given ratio between the pressures (neglecting temperature)......................... 400
Written notes... 100

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Syllabus of Mathematics—4th Class—(Obligatory)—1200 Marks.

N.B.—The marks given are those for the quarterly and half-yearly examinations, respectively.

Plane Trigonometry.—As for 6th Class.................................... Marks, 200.
Mensuration.—Repetition of 8th Class course. Volume of a parallelopiped and prism. Truncated prism on triangular base or on a parallelogram. Tri-section of a triangular right prism, into three equal pyramids. Volume and surface of a pyramid or cone. Centre of gravity of a pyramid or cone (both volume and surface), proof for volume omitted. Volume of a frustum. Volume of a wedge and of a prismoid. Mean section. $\dfrac{A + 4M + B}{6}$

General definition of a " mean "—Application to calculations of earth work, Surface of a sphere, zone or segment, and centre of gravity of each. Volume of a sphere and spheroid. Volume of a spherical sector proved by summing the volume between two consecutive sectors considered as a conical volume. Volume of a paraboloid of revolution—without proof. Guldin's theorems. Marks, 50 and 100.
Statical Problems solved by construction. (Tracts on Mechanics.)...... Marks, 100.
Dynamics (Todhunter).—Repetition of 5th Class course.
Chapter VII and VIII.—Acceleration also obtained directly in § 89 and 92.
Chapter IX to §107.—Result of 108 omitted. § 109.
Chapter X, omitting § 122 to end of chapter.

Chapter XI, XII, XIII to § 150, omitting proof of 147. Result of § 151 and length of seconds pendulum.

Chapter XIV.—Result of § 163 only. Normal acceleration $= \dfrac{v^2}{r}$

Chapter XVII.—Work.. Marks, 50 and 100.
Work and Energy (*Tracts on Mechanics*).—Omitting § 24, 28........ Marks, 150.
Hydrostatics (*Besant's Elementary*).
Chapter I.—Shorter proof of § 10. Omit examples 11, 12.
Chapter II.—Omit § 22, 29, 30.
Chapter III.—Omit § 34, 35. Shorter proof of example 5, § 48.
Chapter IV to Example 2, § 61.—§ 62 to end of chapter.
Chapter V.—Omit § 80, proof, 83, § 87-9, 93 to the end of the chapter.
Chapter VI.—Omit § 96, 98-101, 108 to end of chapter........ Marks, 50 and 300.
Notes and Recitations... Marks, 50.

Voluntary—800 Marks—Qualification in each Section.—One third.

A. *Algebra*—Chapters XXX, omitting 456 to 458, XXXI, XXXVIII to XXXIX, 550, omitting 549; XLVIIII to 651; L omitting 661 to 664 and 670 to end; LI to 680.. .... Marks, 50.

B. *Plane Trigonometry (Snowball)* to be replaced by Todhunter—XVII to XIX, omitting proof of 268 and 271, 273. Results in following articles may be proved by the calculus : omit 276 and 277; omit Chapter XX, and § 290 and 298 to end.

C. *Conic Sections and Analytical Geometry of three dimensions,* general repetition of 3rd Class course. Equations of a point in space. Distance between two points. Projection of a straight line proportional to the cosines of the inclinations, $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 1$. Equation to a straight line. To find the inclination from the equation. Angle between two given straight lines. Equation to a surface, to a sphere, to a cone with axis vertical, to a cylindrical surface parallel to an axis, to a plane in terms.—1st, of the inclination of its traces and intercept on axis of Z; 2nd, of the three intercepts; 3rd, of the perpendicular from the origin and its inclinations. A line in space considered as the intersection of two projecting cylindrical surfaces—particular case a straight line. Length of perpendicular from a given point on a given plane. Tangent to a curve: normal plane. Tangent plane to a surface : normal to ditto....... .... Marks 100—Notes 25.

D. *Differential Calculus*—Repetition of 5th class Course, chiefly examples.... 200.

F. *Statics*—Harder examples on the 5th Class course, resolution and composition—1st, of forces in space acting on a particle ; 2nd, of couples—1st, on a smooth of equilibrium. Equilibrium of a particle constrained to move—1st, on a smooth curve ; 2nd, on a smooth surface. Centre of parallel forces. Alteration of centre of gravity by transposition of a part of the body. Principle of virtual velocities. Proof in the cases (1) of any system of forces on a particle, whether free or restricted to a smooth curve or surface (2) of a pair of particles connected by an inextensible rod or line ; also of any number of particles similarly connected, that is a rigid body, (3) when any pair are connected by an inextensible string round a fixed point or pulley, or round a point which is one of the parts of the system. Converse of this principle. Application of the principle of virtual velocities to the mechanical powers, and to the solution of different statical problems. If any system of particles be in equilibrium under the action of gravity, their centre of gravity is (gnerally) in a highest or lowest position ; in the former case the equilibrium is unstable, in the latter stable. Condition for stability of a heavy curved body resting on a horizontal plane ; also of a flat body resting on a rough surface. Elementary methods of finding the centre of gravity of a small arc, also of any circular arc, sector and segment. General formulæ for centre of gravity of area, arc volume and surface of revolution. Guldins Theorems. Attraction of a straight bar on a particle : (1) in the direction of its length ; (2) in any given position. Attraction of a circular lamina on a particle in a perpendicular axis through the centre. Parabolic curve of the suspension bridge with vertical rods, through the centre.

The common catenary; its equation, length of arc, tension at any point, similarity to a parabola near the vertex, position of equilibrium of a heavy chain resting over two smooth pegs. Pressure on a curve produced by a string of given tension wrapped round it. Relation between the tensions at the extremities of a string passing round any arc of a rough curve; application to obtain the advantage of passing the fall three times round windlass of a gyn. Elementary proof that the ends of a chain over a smooth pulley must rest in a horizontal plane..... Marks, 100.

G. *Dynamics* (*Todhunter's Mechanics for beginners*).—Shorter proofs will be given with the aid of the calculus. The proofs relating to Kepler's planetary laws may, if necessary, be omitted. Differential equations of motion. Application to rectilinear motion under the action of a force: (1). Constant; (2). Varying as the distance; (3). Inversely as the square of the distance, Law of attraction inside and outside the earth's surface. Motion of a heavy chain (1). Hanging over a smooth pulley; (2). Placed with part resting on a smooth table. Body moving vertically in a resisting medium, the law being as the square of the velocity. Curvilinear motion. The parabola of projection. Motion of a body on a smooth curve, velocity acquired. Cycloidal pendulum; time of an oscillation; length of " second " pendulum; oscillation through small circular arc. Conical pendulum. Explanations of the equations,

$$\frac{d^2x}{dt^2} = f\frac{dx}{ds} - \frac{R}{m}\frac{dy}{ds}, \quad \frac{d^2y}{dt^2} = f\frac{dy}{ds} + \frac{R}{m}\frac{dx}{ds}$$

Application to verify the general expressions for the tangential and normal accelerations. Equal areas are described in equal times, under the influence of a central force. If the force varies inversely as the square of the distance, the orbit is an hyperbola, parabola or ellipse, according as the velocity is $> = <$ the velocity of falling from infinity. The equation of *vis viva* considered with reference to all the above cases of motion.................................. Marks, 100.

I. *Integral calculus.* Chapter I.

Compare (*e*) with §9; (*f*) with §5; also Ex. (1), (2), §13.

Integrate forms involving $(a + 2bx + cx^2)$ or $\sqrt{a + 2bx + cx^2}$, by completing the square, compare § 4, 22, 23, 24 with 58, omit § 8.

Chapter II.—Easy examples only with explanatory notes.

Chapter III.—Easy examples only with explanatory notes. Omit § 67 to end. Omit. Chapter IV, V.

Chapter VI.—More elementary proof of § 90. Omit § 92 to end.

Chapter VII to 140.—Notes on double integration applied to § 132, 137. Omit analytical proof of § 140 to 147, read 148 and integration by approximation. Read over 149.

Chapter VIII to 153 and 156.

Chapter IX to 175 and 177 to 179.

Chapter X to 204.................................. Marks, 200.
Notes, 100.

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SYLLABUS OF MATHEMATICS—5TH CLASS—(OBLIGATORY)—1,100 MARKS.

N.B.—The marks given are those for the quarterly and half-yearly examinations, respectively.

Plane Trigonometry—As for 6th Class..................Marks 200.

Conic Sections (without text books).—Definition (Todhunter's) of a Parabola Ellipse and Hyperbola. Equation to parabola. To construct any point on the parabola by drawing a tangent. Equality of inclinations of the tangent to axis and radius rector. Bi-sections of sub-tangent by the curve. Geometrical proof of equation referred to any parallel to the axis (*i. e.* diameter) and tangent at its extremity;

also that this diameter bisects all chords parallel to the tangent. Tangent at the extremities of any chord meet on the diameter bisecting it, and the portion of diameter intercepted between the chord and those tangents is bisected by the curve. The distance of any external point from the parabola, measured parallel to the axis, varies as the square of the distance along the tangent to the point of contact. Ellipse defined as the projection of a circle, as described by the trammel, with reference to focus and directrix and from $r + r' = 2a$. Equation proved from the two first. Geometrical proof from the latter that the tangent is equally inclined to the focal distances, and that the locus of the foot of the perpendicular from the focus on the tangent is the circle, radius $= a$. Mention of the lengths, ae, a, $\frac{a}{e}$ and other important properties. Hyperbola treated like Ellipse. Explanations of the asymptotes and the conjugate hyperbola. Rectangular hyperbola. Equation referred to the asymptotes without proof. Similarity of curves. Newton's definition. Similarity of all circles and of all parabolas, as they contain one constant. Dis-similarity of ellipses and hyperbolas. Similarity if $\frac{b}{a} =$ constant. Explanation of the above by the test of magnifying. Sections of a cone. Repetition as for 6th Class..20 and 100.

Mensuration—Contruction of certain ratios as $\sqrt{2}$, $\sqrt{3}$, $\sqrt{\frac{1}{12}}$ $\sqrt{\frac{2}{3}}$ and $\sin.^2\theta$, $\tan.^3\theta$, $\tan.\frac{\pi}{8}$ etc., etc., and combinations of these, Recuilineal areas and perimeters. Area of circle, sector and segment. Radii of inscribed and circumscribed circles. Area of ellipse. Area of parabola intercepted by any chord Perimeter of circle. Area of ellipse. Polygonal approximation to areas of curves. (without proof). Simpson's rule. Polygonal approximation to areas of curves. Summation of shot piles.....................Marks 20 and 100.

Statics—(Todhunter's Mechanics for beginners).

Chapter I, II. omitting § 45 to end of Chapter.

Chapter III, IV, V, omitting § 78 to end.

Explanatory notes in lieu of Chapter VI, on the equilibrium of a body and the method of working examples.

Chapter VII, § 9—Statement of 100. § 102, 106.

Chapter VIII to § 113—Short note on § 114, 115. § 116, 120.

Chapter IX to § 135—Alternative proof of 136. Result of 137 to 140. § 141-3.

Comparison of § 144-5 with § 114-5. Notation $\bar{x}$, $\bar{y}$ for co-ordinates of centre of gravity. § 146.

Chapter X, omitting § 154 to end of chapter.

Chapters XI, XII, to § 172—Result of § 173 considered geometrically. § 174 to end of chapter.

Chapter XIII—the whole. Simple view of § 187. Mechanical advantage $\frac{P}{W} =$ machines in combination $=$ product of the advantage of each machine; also $\frac{P}{W} =$ product of drivers divided by product of followers.

Chapter XIV, omitting § 202 to 206, and 2nd part of 207.

Chapters XV, XVI, XVII—Proofs by means of virtual velocities alternative with those given.

Chapter XVIII—Virtual moments. Certain forces may be excluded from the equation of virtual moments. Omit from § 235 to end of chapter.

Chapter XIX to § 254—Limiting angle of resistance of a rough plane, § 225 and 258 considered geometrically as well as analytically..........Marks, 100 and 300.

Dynamics.—(Todhunter's Mechanics for beginners.)

Short note on proof of § 37. § 72, 75, 77..................Marks, 200.

Chapters I to VI, omitting proof of § 37...............Marks, 60.

Notes and recitation.......................................

VOLUNTARY—600 MARKS—QUALIFICATION IN EACH SECTION—ONE THIRD.

A. *Algebra.*—Chapter XV to 207; XXV to 360; XXVI, XXVIII, XXXVIII to XXXIX, 550, omitting 549; XL to 560, without proof; XLI, XLIII to 596; XLVI to 628; XLVIII to 651......................Marks, 50.

B. *Plane Trigonometry* (*Snowball*).—Chapters I to V, and harder questions on obligatory course; to be replaced by Todhunter. Chapters I to XVI—Marks, 50.

C. *Conic Sections*—Repetition of 6th Class course. Chapters I to III, except 27, 148, optional, together with 147, 187 and 236. Chapters V to VII, omitting 111, 115 to 118, and omitting all but definition in 119. Chapter VIII, omitting 157. Chapter IX, with alternative proof, omitting 205, 208. Chapters XI, XII—Alternative proofs, omitting 265, 266. Chapter XIII—General acquaintance only with the method pursued, omitting 276 to end. Chapter XIV, 296, 298. Chapter XVI—Geometrical examination of the sections of a cone, showing foci and directrices in lieu of this chapter. Chapter XVII..Marks, 100.

D. *Differential Calculus* (*Williamson*).

Chapter I—Proof by binomial theorem for d(x^n) instead of § 16, 17, 18. Differentials used equally with differential coefficients.

Chapter II—Successive differentiation; omit § 39, 43 to end of chapter. Read over Leibnitz Theorem, § 48.

Chapter III—Expansion of functions. Omit § 65-68. Read over § 73, with equations 27, 28, 29, 33. Omit § 74 to end of chapter.

Chapter IV—Indeterminate forms consider also $\infty - \infty$. Read over the proof of § 91.

Chapter V—Partial differential co-efficients, § 95-96. Result only of § 97; omit § 98, 101. Note result only of Euler's Theorem, § 102. Omit § 103, 4; 107. Read over § 108-10; omit the rest.

Chapter VI—Read over only the first two pages.

Chapter VIII—Read over only § 127.

Chapter IX—Maxima and minima; omit § 136-7, 139; 141 to end of chapter.

Chapter XII—Tangents and normals; and omit § 173-7, 184 to end of chapter.

Chapter XIII—Asymptotes—only § 196 to 200 explained more briefly.

Chapter XIV—Brief explanation of multiple points.

Chapter XV—Brief explanation of envelopes and the general method of finding them.

Chapter XVI—Convexity and concavity; omit analytical investigation in § 223 to end of chapter.

Chapter XVII—Radius of curvature; omit § 228. Read over § 231. Omit § 232-3, 235-6; read over § 239; omit § 240-254.

Chapter XVIII, § 258-9. Read over § 260.

Chapter XIX—Roulettes, § 272-7; read over § 278.

Chapter XX, § 292 to equation (4).

Chapter XXI to equation (3).....................Marks, 200; Written notes, 25.

E. *Euclid*—XI...Marks, 50.

F. *Statics*—Harder questions on the obligatory course, omitting only § 154-8, and chapters XX, XXI...........................Marks, 50.

I. *Integral Calculus*—Elementary formulæ of integration as the reverse of differentiation, without Text-book...........................Marks, 50.

J. *Spherical Trigonometry* (*Todhunter*)—Chapter I to VI and § 96 to 99 with special attention to Napier's circular parts and the solution of spherical triangles. Marks, 50.

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SYLLABUS OF MATHEMATICS—6TH CLASS—(OBLIGATORY)—MARKS 600.

N.B.—The marks given are those for the quarterly and half-yearly examinations, respectively.

Euclid—7th Class course and Book VI, omitting Props. XXVII to IX. Marks 40 and 200.

Arithmetic—8th Class course ....Marks 100.

Algebra—The whole, except scales of notation and the harder examples omitted in the 8th class course and § 345 ....Marks 30 and 200.

Plane Trigonometry to Chapter XVI, omitting as for 7th Class and § 231, 2, 7, 8, 242-5, 253-4. Also study the inverse notation in § 265, without examples. Marks 40 and 200.

Conic Sections and Analytical Geometry—Lectures without text-book. Rectilinear and Polar coordinates. Distance between two points. Easy examples on areas of triangles. Equation to a line. Equation of the 1st degree. Principle of intersections. Equation to a circle. Intersections with a straight line, three cases. Definition of the sections of a right cone. General definition (Todhunter's) of a parabola, ellipse and hyperbola. Simple properties of a parabola proved geometrically.....................................Marks 50.

Notes and recitations..Mark 40.

SYLLABUS OF MATHEMATICS—6TH CLASS—(VOLUNTARY)—MARKS 400.

A. *Algebra*—Chapters XV to § 206, XVIII to § 265, XXIII to XXIV to § 497, XXV, and examples on XXXVI, XXXVIII, XXXIX, to § 548. Expansion of $\left(1 + \frac{1}{n}\right)^n$ when $n = \infty$, XL to § 562, without proofs, XLI.............Marks 50.

B. *Plane Trigonometry* to Chapter XVIII, omitting § 181 to § 210, but reading them over for comparison with the differential calculus, omitting § 254, 259...Mks. 50.

C. *Conic Sections* (*Todhunter*), I to XII, omitting Chapter IV, book work of § 83, Chapter VII, § 140, 146, 157, 159, 160, (other proofs being given) 186, 203, 205, 208, 210, 211, 235, 256, to end.

Geometrical proof alternative with analytical.

Notes on the geometrical properties, as follows :—

Parabola—To draw a tangent and thence to prove that it is equally inclined to focal distance and axis (or diameter); that the perpendicular from the focus meets it on the tangent at the vertex. Portion of tangent intercepted between the point of contact and directrix subtends a right angle at the focus; tangents at the extremities of a focal chord are perpendicular and meet upon the directrix: $p^2 = ar$, $r = \frac{a}{\sin^2 \theta}$: $r = a + x$; angle between two radii vectores, double that between the tangents. Sub-normal $= 2a$. Sub-tangent $= 2x$. Curve bisects sub-tangent. Polar equation. Latus rectum as the parameter. To draw tangents from an external point, their lengths are inversely as the sines of their inclinations to the axis. Analytical investigation into diameters and their properties. Geometrical proof of the equation of the curve, referred to diameter and tangent, together with proof that the chords parallel to the tangent are bisected; that the tangents at the extremities of any chord, meet on the diameter bisecting it, and that the curve bisects the portion of diameter intercepted between the tangents and the chord.

Distance of any external point, measured parallel to the axis, varies as the square of the distance along the tangent; hence a method of constructing a parabola by a series of points.

To draw a parabola touching two given intersecting straight lines at given points.

To draw a parabola, giving its vertex, axis, and one other point; thence to draw it, giving the axis and any two points not in the same perpendicular to the axis.

Ellipse, defined as the projection of a circle; geometric properties proved from $r + r' = 2a$; equation found from each definition; geometric properties proved from the last definition as follows: to draw a tangent, and prove its equal inclination to the focal distances.

Locus of foot of perpendicular from focus on tangent pp$'$ $= b^2 : \frac{p}{p'} = \frac{r}{r'} : p^2 = \frac{b^2 r}{r}$

Locus of intersection of tangent with the perpendicular at the focus to the radius

vector. Locus of intersection of tangent at the extremities of a focal chord. Proof of Todhunter's definition of an ellipse, the straight lines a, e, a, $\frac{a}{e}$; $r = a \pm e\,x$. Polar equation referred both to focus and centre.

Locus of intersection of two perpendicular tangents. Diameters investigated analytically as for parabola. Conjugate diameters as the projection of two perpendicular diameters of a circle; hence equation and properties of an ellipse referred to conjugate diameters. Eccentric angle. Locus of a point obtained by $a + b$, measured at inclinations θ, and then $a - b$ at $\pi - \theta$.

Hyperbola. Similar notes to those for the ellipse.

Sections of a cone. Geometrical proof, showing foci, directrices and asymptotes. Proofs of any kind will be accepted at the examinations, if sound, whether geometrical or analytical...Marks, 200.

Notes on above ....Marks, 25.

D. *Differentiation.*—Elementary differentiations without text-book. Differentials used equally with differential coefficients ....Marks, 25.

E. *Euclid XI.*—Props. I to 10...Marks, 25.

J. *Spherical Trigonometry (Todhunter).*—Chapters I to III................Marks, 25.

Syllabus of Mathematics—7th Class—(Obligatory) 800 Marks.

N.B.—The Marks given are those for quarterly and half-yearly examination respectively.

Euclid to Book IV, and definitions of Book V.—Explained algebraically, omitting Nos. 3, 7, 8, 20...Marks, 25 and 200.

Arithmetic.—Same as 8th Class course ....Marks, 25 and 150.

Algebra to harmonic progression, omitting § 345, and same as for 8th Class ....

Plane Trigonometry to Chapter XIV, § 227, omitting as for 8th Class, and § 79, 80, 96, 97, 99 to 106, 111, 112, noting process in § 113, omitting § 114, 115, 119 to 130. Chapters X to XII, § 219 to 221...............................Marks, 25 and 175.

Logarithms.—Complete use of tables both for numbers and trigonometrical ratios, with use of proportional parts. (Examined together with trigonometry.)

7th Class—(Voluntary)—200 Marks.

A. *Algebra (Todhunter)*—Chapters XIII, XV, § 206 ; XVIII to § 265, and read over § 266, 271 ; XIX, practical applications, proof of § 300, 301, 309, 310 ; XX to XXII, XXVI to XXVIII, XXX to XXXII, and XXXVIII.................Marks, 50.

B. *Plane Trigonometry* to chapter XVIII, omitting X to XII, § 254, 259, 260...Marks, 50.

C. *Conic Sections (Todhunter)* to Chapter III, omitting § 27, 37, 48. Examples up to § 21 of chapter III. Read also chapters V and VI to § 99.............Marks, 50.

E. *Euclid*—Book VI, omitting prop. 27-9..Marks, 50.

Syllabus of Mathematics—8th Class—(Obligatory)—700 Marks.

N.B.—The Marks given are those for the quarterly and half-yearly examinations, respectively.

Euclid to Book III, prop. 13 *(Todhunter).* Algebraical explanations will be given of the propositions in Book II..

Arithmetic to interest, discount stocks, proportional parts, and extraction of square and cube roots. (Printed notes and other authorized text-books) .....Marks, 25 and 200.

Algebra (Todhunter's for beginners and printed notes) to evolution. Special attention directed to factorising and solution by factors. The harder examples in chapters XXVII and XXXIX may be omitted ....Marks, 25 and 150.

Plane Trigonometry—Lectures without text book, as follows :—Definition of initial line. Terminal line. Angles of any size. The rules of signs. Trigonometrical

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ratios. The reason for their names. The primary formulæ proved from definition. The formulæ connecting each with every other. Construction of angles when the ratios are given. Change of the ratios in sign and magnitude. Circular measure. Todhunter to chapter V, omitting § 5-9. Proof of § 14, 24, 51, 53, 54, 66, 75 ....Marks, 15 and 100.

Logarithms (Chambers' or other tables)—Use of the tables without proportional parts. Instruction entirely by lecture and practice (examined together with trigonometry).

Written notes and recitations...Marks, 10.

8th Class—(Voluntary)—100 Marks.

This section comprises those elementary subjects which will be read by higher classes in their obligatory course.

Euclid—Books III and IV, and definition of Book V considered algebraically.

Algebra (Todhunter's for beginners)—The whole except scales of notation.

Plane Trigonometry (Todhunter)—VI to XVI, omitting § 79, 80, 96, 97, 99–106, 111, 112, 114, 115, 119–130. Chapters X to XII, § 219–221, 231, 232, 237-258, 242-5, 253, 254.

APPENDIX G 2.

ROYAL MILITARY COLLEGE OF CANADA.

Theoretical.

Summary of the course of theoretical instruction in fortification and military engineering.

The course is based on the Text Book 1878, for use of R. M. Academy, Woolwich.

The subject is taken up in the 2nd term and in that and the following terms (7th and 6th classes) the Cadets work through the whole of Field Fortification with the exception of Military Bridging. A short voluntary course on the occupation of positions is added as per detail below.

Obligatory.

Introductory lecture on arms in use.

Hasty Intrenchments.

Obstacles.

Occupation of natural obstacles, walls, hedges, &c.

Profile and Trace of Field works, including size and garrison required.

Detail of Field works as per detail in text book.

Works in relation to each other lines, &c.

Adaptation to irregular sites.

Defence of localities.

Defilade of Field works.

Hasty Demolitions.

Revetments and Revetting materials.

Execution of Field works.

Voluntary.

Lecture on the general conditions which influence the choice of a position and the method of occupying it with reference to the nature of the actions to be fought.

Attack and Defence of Field works.

In the Fourth, Fifth and Sixth Terms (5th, 4th, 3rd classes) the course will include a knowledge of the various bastioned systems, the Polygonal system, Detached Forts as applied to Fortresses—and the attack and defence of Fortresses as per detail below.

PERMANENT FORTIFICATION.

Obligatory.

The elements of permanent Fortification, including a brief historical sketch of the progress to the science and a description of the general principles involved, and their application to the various systems.

The Bastioned Systems, Vauban's, Comontaingnes, and the modern French, the latter especially in detail.

The Polygonal System as applied to a dry site with outworks, &c.

Detached Forts, their use and application in modern Fortification.

The attack and defence of Fortresses in detail, including execution of siege works, &c.

Military mining (Elementary).

Nature, handling and storing of Explosives used in Military Engineering.

Voluntary.

The Bastioned Systems of obligatory course more in detail.

Other Bastioned Systems : Cœhorn, Montalembert, Carnot, Chasseloop.

The Polygonal System as applied at Antwerp both to enceinte and detached Forts in detail.

Application of Mines,—including countermine systems.

Numerous plates are drawn by the Cadets, for which about half the total marks are awarded, the remainder of the marks being given for the quarterly and half-yearly examination.

Lectures are given on each subject, on which the Cadets have to take and submit to the Professor satisfactory notes. In these lectures it is sought to explain the text book and also to add thereto as much as possible, all available authors being consulted, chiefly those on current events amongst others may be noticed.

In the 7th and 8th terms the course is laid down as follows :—

Coast Defence.

Obstructions, &c.

Submarine mines.

Military Bridging, theoretical and practical.

Application of Field Fortification in the form of project for the occupation of ground, defence of given localities, &c., &c.

It is intended to have a complete outdoor course of execution for the various works, both full size and in sand—also of Telegraphy, and signalling, &c.

The course up to the end of the 6th term will, in fact, approximate closely to the full Woolwich course, while that for the 7th and 8th terms, will be based as far as possible on the course at the School of Military Engineering, Chatham.

APPENDIX G 3.

ROYAL MILITARY COLLEGE OF CANADA.

PROGRAMME OF PRACTICAL INSTRUCTION IN MILITARY ENGINEERING.

Signalling.

Earthworks, Hasty Entrenchments, Stockades, Breastworks, of various kinds, Loopholes, Rifle pits, Field casemates, Field Geometry.

4th Class.

Brushwood, Fascines, Gabions, Hurdles, Sap Rollers, Obstacles, Abattis, Wire Entanglements, Chevaux-de-frise, Palisades, and Fraises, Military Pits shallow and deep, Barricades, Fougasses, Field Redoubts, Tracing and Profiling, Splinter Proofs, Revetments, Traverses, Embrasures, etc., Field Kitchens and ovens, Water supply, Pumps.

3rd Class.

Batteries of various kinds with Platforms, Embrasures, Magazines, Parallels and approaches, deep, shallow, and blinded sap, Passages of ditches and levelling, Trench Railways.

2nd Class.

Mining, Shafts, Common Galleries, Preparing Mines, Firing Mines. Electrical testing. Making Joints, preparing Fuzes and charges, Improvised Electrical Batteries, and working with service batteries and dynamo Electric Machines.

Boring and Blasting rock, Demolition of Stockades, Gates and Buildings, Felling Timber with guncotton, Drying guncotton, Destroying railways, Hutting and Shelters.

1st Class.

Bridging, Knotting, Splicing, Blocks and Tackles, Lashing spars, Trestle and trestle bridging, Derricks, Gyns, single and double lock Bridges, Single sling, etc., in model and full size. Reconnaissance and Measuring width of Rivers, Rowing drill and use of Anchors, Barrel Piering, Timber raft Bridges, Pontooning, Bridging expedients such as crib piers, piles, etc.

The 1st Class will occasionally be assisted by the other Classes in Bridging when extra hands are required.

All Classes will be exercised in Escalading.

APPENDIX G 4.

ROYAL MILITARY COLLEGE OF CANADA.

SUMMARY OF COURSE OF INSTRUCTION IN GEOMETRICAL DRAWING, DESCRIPTIVE GEOMETRY.

Geometrical Drawing.

The course is based on Text Book—"Practical Geometry and Engineering Drawing," by G. S. Clarke.

In their 1st and 2nd terms the Cadets work out a large number of problems in plain Geometry the conditions of which are dictated to them, and the figures drawn in a series of plates which have to be carefully finished and for the drawing of which about one-half the total marks are awarded.

The following is a detail of their course :

Obligatory.	*Voluntary.*
Problems relating to—	Problems relating to—
Lines.	The Ellipse (more advanced).
Lines and circles.	The Parabola.
Plane Figures.	The Hyperbola.
The Ellipse.	Cycloidal curves.
	Various curves.

Descriptive Geometry.

In their third term the Cadets commence Descriptive Geometry, and in this and the next three terms they work through the text book named above, drawing numerous plates from manuscript notes dictated to them—about half marks are allotted for the drawing of plates, the remaining half for the quarterly and half-yearly examination in each class.

The following shows the course in detail:

Obligatory.

Orthographic Projection.
Points and lines.
Lines and Planes.
Use of indices.
*Contoured plans of Field works, &c.
Projections of Solids.
Sections of Solid by planes.
Tangent planes to surfaces.
Determination of Shadows.
Isometic projection.

Voluntary.

More difficult questions on the obligatory sections.
Interpenetration of Solids.
*Perspective projection.

* N.B.—The subjects marked by a star are not included in the text book.

The instruction is carried on by means of problems dictated, as mentioned above and by personal explanation of all difficulties to the individual Cadets.

APPENDIX G5.

ROYAL MILITARY COLLEGE OF CANADA.

SUMMARY OF OBLIGATORY COURSE OF INSTRUCTION IN MILITARY TOPOGRAPHY CIVIL SURVEYING &c.

7th Class.

Elementary principles of surveying; peculiarities of military surveying; chain surveying, with method of keeping the field book; making a chain survey on the ground, with instruction in the various cases of ground problems that may arise; the scales and conventional signs generally used; the prismatic compass, its construction, use and defects.

6th Class.

Making a survey by the prismatic compass and pacing. Making a second survey in the same way in a limited time.

Contouring and hill shading; use of the scale of shade. Hachuring in pencil and in ink.

5th Class.

Construction and uses of the pocket sextant and theodolite; drawbacks to the former; ordinary measurement of base lines.

Making a triangulation of a piece of country by means of the sextant. Filling it in by the prismatic compass.

Drawing from models of hills in pencil, ink, and brushwork.

Putting in the slopes of a survey by hachuring. Triangulation with the chain and theodolite. Traversing with the same.

Working simple cases of heights and distances by trigonometry.

Method of plotting by rectangular coordinates.

4th Class.

Use of the plane table; method of surveying without instruments; making a survey of a piece of ground in this manner.

Use of the different spirit levels and the water level.

Principles and practice of levelling, including running contours and making sections. Making sections by the theodolite.

Corrections for curvature and refraction.

Use of the barometer for making rapid sections.

The principles of reconnaissance.

Making a reconnaissance of a defensive position.
    do   do   do   road.

Principles of astronomy; motions of the heavenly bodies; various methods of reckoning time. Objects of practical astronomy.

Finding the true meridian by double altitudes of stars.

3rd Class.

Use of the large sextant. Finding the latitude by means of meridian altitudes of the sun or stars.

Mean, apparent, and sidereal time.

Finding the local time and longitude by altitudes and calculated hour angles.

Reconnaissance of woods, rivers, camping grounds, and districts.

Rapid reconnaissance of a road.
    do   do   piece of country.

2nd Class.

Rapid Military Reconnaissances in pencil made in a limited number of hours, and given in on the ground.

COURSE OF VOLUNTARY SURVEYING.

4th Class.

Principles of the correct measurements of base lines, and of the method of conducting a large triangulation; calculation of the spherical excess. The use of auxiliary stations; reduction to the sea level &c.

Hill shading in brushwork.

Finding the true meridian by observations of circumpolar stars.

Finding the variation of the compass by an azimuth and by an amplitude.

3rd Class.

Measurement of the length of an arc of the meridian between stations of given latitudes.

The figure of the earth.

Finding the azimuth of one station with respect to another.

Use of the transit instrument. Finding clock errors and latitude with it.

Finding longitude by signals and by observations of moon-culminating stars.

2nd and 1st Class.

The higher branches of surveying continued.

Finding longitude by lunars, and by eclipses of Jupiter's satellites.

Further reconnaissance.

1st Class.

N.B.—Each Cadet before obtaining a 1st or 2nd class certificate must be thoroughly competent—

1. To make a chain survey.
2. " keep a field book correctly, under various circumstances.
3. " copy plans neatly, and to know the different conventional signs.
4. " describe ground by hachuring.
5. " make a survey by compass and pacing.
6. " make an eye sketch.

7. To use the pocket sextant and make a triangulation with it.
8. " use the plane table.
9. " work the theodolite correctly, both in traversing and triangulation.
10. " make a section of ground, both with the theodolite and spirit level.
11. " contour ground with the spirit level.
12. " find the true meridian by means of the stars &c.
13. " take an altitude of a heavenly body with the sextant and artificial horizon.
14. " find the latitude by a meridian altitude.
15. " make a rapid reconnaissance of a position.
16. " do do do road.
17. " rapid military reconnaissance of country

Text books issued :

Robert's Military Surveying.
Baker's Land and Engineering Surveying.

Recommended to be read :

Any elementary work on astronomy.
Frome's Trigonometrical Surveying.

APPENDIX G6.

ROYAL MILITARY COLLEGE OF CANADA.

SUMMARY OF COURSE OF INSTRUCTION IN MILITARY ADMINISTRATION AND LAW.

6th Class.

Special Laws relating to soldiers.
General principles of organization and chain of responsibility. British Military units from companies up to Army Corps.
A short account of the British method of keeping up an Army, including recruiting, length of service, provisions for a reserve, reliefs for foreign service, etc., etc.
A short account of the different European Continental Military Systems.
   do   Military System of the United States Army.
   do   do   of the Canadian Militia.

5th Class.

A short account of the British Military Law, including Military Crimes and Punishments, the constitution and practice of Courts Martial, Rules of evidence, etc.
War Establishments of the British Army.
Organization of Continental Armies in the different recent European wars.
Principles of supply in war time, and the preparations that have to be made for a campaign.
The British method of providing ammunition reserves in the field.
A sketch of the Continental method of providing supplies of food, &c., for an Army in the field.

4th Class.

The organization and duties of the Staff and non-combatant departments. Office work, method of conducting official correspondence.
The Prussian General Staff and the English Intelligence Department, Marches, Encampments, Embarkations and Disembarkations.

The use of Railways in war time.
Arrangements for protecting the line of communication of an army in the field.

Text Books used :

Wolseley's Soldiers' Pocket Book.
Regulations for Encampments.

APPENDIX G7.

ROYAL MILITARY COLLEGE OF CANADA.

SUMMARY OF COURSE OF INSTRUCTION IN TACTICS AND STRATEGY.

INTRODUCTION.

5th Class.

A short account of the changes that have taken place in tactics at various periods.
Tactics of the three arms, separately and combined.
Latest British Infantry tactics, and a comparison with those of the principal Continental Nations.
Tactics of the present day, as modified by the experience of recent wars, illustrated from various writers.
The principles of attack and defence.

4th Class.

Principles of Tactics illustrated by studies of battles at different periods.
Elementary principles of Strategy illustrated by the study of a campaign.

3rd Class.

Information and security, outposts, reconnoitring, advance and rear Guards, Rivers, Defiles, Woods, Villages Convoys.
The subject of Strategy and the study of campaigns continued.

2nd and 1st Class.

Essays on military subjects.
The Text Books used are Clery's Minor Tactics, and Hamley's Operations of War.
Also a pamphlet on past changes in Tactics.

Recommended to be read :

Home's Precis of Tactics.
Boguslauski's Campaigns of 1870-71.
Journal of the United Service Institution.

APPENDIX G8.

ROYAL MILITARY COLLEGE OF CANADA.

SYLLABUS OF COURSE OF THEORETICAL INSTRUCTION IN THEORY AND CONSTRUCTION OF ARTILLERY.

The instruction in Artillery is carried on chiefly by means of printed and written notes, extracted from the voluminous text books of the various departments in the Royal Arsenal, Woolwich.

These notes are kept up to date from "Changes in War Stores" published monthly.

Sladen's "Principles of Gunnery" is used in the more theoretical instruction of advanced Cadets.

A few drawings as far as time permits are done in the various classes, to assist in elucidating the more important material, &c.

The course occupies two years, two hours being given in each week to each class.

During the last year Voluntary Artillery is studied consisting, as much as can be taught, of the actual structure and manufacture of ordnance, ammunition and stores, without having access to an Arsenal.

Also of the more theoretical portions of the science, with applications of the calculus and of dynamics to the calculation of velocities and trajectories.

The course is divided as follows: a series of lectures being given on each section. The total marks at present are divided into—

Obligatory, 2,000.
Voluntary, 2,000.

It is however proposed to divide them as follows:

Obligatory, 3,000.
Voluntary, 1,000.

The obligatory portions of Artillery being the most important.

6th Class. Obligatory Course.

Explosives in common use in the service, comprising gunpowder, guncotton and fulminate of mercury. Their composition and outlines of their manufacture, their physical and chemical properties, their uses, classification and storage, also the precautions to be taken for their safety.

Cartridges. The necessary qualities in the material for the bag. The differences between those for S. B., R. B. L. and R. M. L. ordnance.

The lubrication, paper cylinder, tin cup &c., used in connection with R. B. L. cartridges.

The various natures and uses of battering, full and reduced charges.

The mode of filling and storing filled cartridges, also the precautions to be taken in handling powder. S. B. projectiles and their uses, including solid, and grape shot, common and diaphragm shrapnel shell, carcasses, smoke and light balls, also mortar shell. The names and uses of the various fuzes in use with the above, including Pettman's L. S. and G. S. percussion fuzes, also the common diaphragm. Large and small mortar time fuzes. Instructions for boring and fixing fuzes, means of firing ordnance, tubes, portfires, slow and quick match.

Rockets, their principles of construction and uses.

S. B. Ordnance. Short description of the various natures still in the service and their uses, their division into guns, shell guns, howitzers, carronades and mortars, also mountain, field, siege and garrison pieces.

5th Class. Obligatory Course.

Defects of S. B. ordnance and how they are counteracted by rifling; other advantages of rifled ordnance, especially with reference to elongated projectiles.

Rifled ordnance of the service. General construction and classification as mountain, field, siege and garrison pieces. Also as B. L., M. L. and converted M. L. guns.

The question of B. L. versus M. L. guns.

Projectiles for rifled ordnance, Palliser shot and shell, double and common shell, segment Boxer shrapnel, case shot, star shell and carcasses. The various uses and comparative uses of above, also short description of the various fuzes used and under what circumstances, including the plain percussion, also R. L.

Marks I and II Pettman's G. S. The delay action and sensitive percussion fuzes, also the 5" 9" 15" 20" and 30" time fuzes.

Advantages of rifled over S. B. projectiles, means of having rotation imparted, soft coating, studs and expanding gas check.

The ordinary and the driving gas check, their history, description and uses. The wedge wad. Lacquering shell, serge bag and other means of preventing premature explosions and blind shell, pointing out the usual causes of above defects. Method of storing filled shell, precautions to be taken.

Re-read 6th Class work.

4th Class. Obligatory Course.

Principles of Rifling. Objects of rifling, angle of spiral, twist of rifling, advantages of increasing over uniform twist, velocity of rotation how measured and upon what it depends.

Derivation or drift, how counteracted. Advantages of increasing velocity.

Systems of rifling in common use, their advantages and defects. The various forms of grooves.

The disadvantages of grooves in general and of studs and ribs.

Re-read 5th class work.

4th Class. Voluntary Course.

Construction of time and percussion fuzes.

The various metals used in the construction of ordnance, how obtained, their physical properties, with reference to their use in the construction of ordnance and other stores.

3rd Class. Obligatory.

Military carriages: mountain, field, siege and garrison.

Principles of construction.

The various strains on a field carriage, how reduced to a minimum.

Construction of old and new pattern field wheel. Advantages of latter. Meaning and necessity for dish, hollow, lead, set, &c.

Wooden travelling carriages, their advantages.

Description of Mark II carriage for 9 pr.

Points of difference in larger natures.

The overbank carriage.

Howitzer beds, modes of checking recoil.

Garrison wooden carriages, standing and sliding carriages.

Wooden platforms and compressors.

Iron, single and double plate sliding carriages, also the wrought iron standing carriage.

Wrought iron platforms, Elswick compressor.

Hydraulic buffer.

Moncrieff carriage.

Re-read all previous work.

3rd Class Voluntary.

Section I. History and construction of ordnance, including cast iron, bronze and Woolwich guns. Manufacture of projectiles and various small stores including tubes, rockets and fuzes.

Manufacture of carriages.

Principles of gunnery (Sladen).

Chapter I.—Definition of terms used in gunnery.

Chapter II.—Relation between "angle of spiral" and "twist of rifling." Velocity of rotation determined from that of translation. Energy due both to translation and rotation, omitting note to pages 15, 16. Velocity of recoil, omitting the formula in page 18. Energy of recoil, omitting Kemmis' table in page 20.

Chapter III.—Pressure in the bore of a gun.

Chapter IV.—Work done by powder, omitting the calculations of Velocity, pages 31 to 33. Circumstances affecting muzzle velocity.

Chapter V.—Resistance of the air. History previous to Bashforth's experiments and conclusions, calculations leading to the tables of remaining Velocity after any time of flight or range. Practical use of these tables.

Chapter VI.—Calculation of trajectories, vertical height and angle of descent. Omit page 69 to end of chapter.

Chapter VII—Drift of the service projectiles. See also Canadian Manual of Artillery.

Chapter VIII.—Accuracy and probability of fire.

Chapter IX.—Penetration. Energy absorbed. Penetration of Armour Plates.

Appendices.—General acquaintance with the principles of Le Boulenge's Chronograph, Bashforth's Clock and Gravity Chronograph, Watkins' Chronograph, Noble's Crusher guage and chronoscope.

Application of mathematics to artillery machines.

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TEXT BOOKS.

Printed notes on Artillery, by *Captain Fairtlough, R.A.*
Principles of Gunnery, by *Major Sladen, R.A.*
Tracts on Mechanics containing Problems on Artillery Machines, *by Crofton and Kensington.*
Manuals of Drill for Canadian Artillery, by Col. Strange.
Tables of Ordnance and Ammunition published annually by the R.A. Institution.

Books of reference.

Owens' Modern Artillery (superseded as Text-book).
Treatise on Construction of Ordnance R.G.F. Woolwich.
Treatise on Ammunition, R. Laboratory, Woolwich.
Treatise on Military Carriages, R. C. Dept., Woolwich.
Current numbers of R.A. Institution proceedings.

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APPENDIX G 9.

ROYAL MILITARY COLLEGE OF CANADA.

COURSE OF PRACTICAL INSTRUCTION IN ARTILLERY.

2nd term—Field gun drill.
3rd term—Field gun drill manœuvres of a Field Battery.
4th term—Drill with M. L. Ordnance or standing carriage, mortar drill.
  Elementary shifts of ordnance:
    Knotting and splicing.
5th term—Drill with 7" B. L. on traversing platform.
  Parbuckling, and gun drill.
    Knotting and splicing.
6th term—Continuation of 5th term course, with such other shifts of ordnance as are practicable with available appliances.

APPENDIX G 10.

ROYAL MILITARY COLLEGE OF CANADA.

SUMMARY OF COURSE OF CIVIL ENGINEERING.

I. Principles of Engineering applied to Railways, Canals, &c.
  Engineering Exploration.
  Projected Locations.
  Actual Locations.
  Office work. Profile sections. Cross sections.
  Construction work. Masonry and grading, &c.
  Foundations, &c.
  Designing and execution of structures.
  Estimating quantities Excavations, Masonry, &c., &c.
  Measurements.
  Bridges and culverts, &c.
  Permanent way.
  Canals.
  Rivers.
  Harbors.

SECTIONS ON ENGINEERING AND PUBLIC WORKS.

II. Nature, production and use of materials of construction.
  Strength of materials—stone, wood, iron, steel, &c.
  Limes, cements, concretes, mortars, &c.
  Masonry, brickwork, earthwork.
  Construction routine—as per course on sheet, (1) viz :—Principles of engineering applied to Railways, Canals, &c.
III. Principles of engineering as applied to water supply.
  Collection and storage of water.
  Flow of water through sluices, pipes and channels.
  Measuring weirs and weir gauging.
  Flow of water through open channels.
  Reservoir embankments and chambers.
  Open channels and waste weirs.
  Partition, and retaining walls.
  Theory of water pressure on vertical, and inclined surfaces.
  Mains and distribution—static pressures on pipes.
  Pumping of water, pumps, prime movers, &c., &c.
  Professional Problems, &c.
  Calculations of stresses on bridges and roofs, arch braces and straining beams—arch girders, arches.
  Wood trusses—Long's, Howe's, Burr's.
  Iron trusses—Whipple's, Bollman's, Fink's, Phœnixville truss, Warren girder.

PRACTICAL WORK IN SURVEYING AND CONSTRUCTION OF RAILWAY.

1. Location of Line—curves—circular—compound and parabolic.
2. Laying out work—cuts—fills—slope—foundations of masonry.
3. Earth and Rock Excavation—prismoidal formula tables—Borrow Pits—Monthly Estimates.
4. Tracklaying—Centres—Ballast pits, &c.
5. Preparation of working Plans and Profiles—schedules—prices—specifications—contracts.
6. Designing and drafting bridges and culverts—Cattle guards—Stations, &c.

STEAM ENGINE.

1. Mechanical principles—boilers, cylinders, condensers, cranks, shafts, &c.
2. Heat combustion—steam.
6. Marine engines—Land engines.
4. Expansion—valves—power—duty—guages—proportions of boilers and engines.
5. Examples of land engines portable engines, agricultural engines.
6. Marine engines—examples—setting up engines.

APPEEDIX G 11.

ROYAL MILITARY COLLEGE OF CANADA.

Heads of course on Architecture.

1. The orders of Architecture, Tuscan, Doric, Ionic, Corinthian.
2. Structures of Greece, Rome and Mediæval Europe.
3. Structures, Modern.
4. Principles of Practical Construction,
    Arches, right and oblique,
    Domes,
    Vaults.
5. Terms used in masonry.
6. Processes used in masonry.
7. Terms used in carpentery.
8. Processes used in carpentry.

APPENDIX G 12.

ROYAL MILITARY COLLEGE OF CANADA.

Summary of instruction in Chemistry.

General Principles—Constitution of matter.
Matter—Simple and Compound.
Elements and their classification.
Solid, liquid and gaseous condition of matter.
Relation of volume of a gas to Temperature and Pressure.
Chemical affinity—Chemical combinations, and mechanical mixture—Solution.
Laws of combination by weight and volume.
Equivalent and atomic numbers—Atomic Theory.
Chemical notation and nomenclature.
Use of Formulæ and Equations.
The metalloids—Occurrence in naturel. Modes of preparation.
Oxygen—Oxone.
Hydrogen—Water.
Nitrogen—Atmosphere. Diffusion of gases.
Oxides of nitrogen, nitric acid, ammonia.
Chlorine, Bromine and Iodine—Theory of Bleaching.
Fluorine and Hydrofluoric acid.
Sulphur—Sulphurous acid—Manufacture of sulphuric acid—sulphuretted Hydrogen &c.
Phosphorus—compounds with Oxygen and Hydrogen, Theory of acids, monobasic, dibasic and tribasic.
Carbon—Carbon Monoxide and Dioxide.

Principal Hydrogen compounds of Carbon.
Manufacture of coal gas. Nature of combustion. Structure of Flame.
Oxidizing, reducing and illuminating effects of flame.
Metals—General characters—occurrences in nature.
Principal metallurgical Process.
Alloys—Classification of metals.
General properties of oxides, hydrates, sulphides, chlorides, carbonates, sulphates, nitrates, silicates.
Potassium—Nitre. Gunpowder—Theory of explosives. Guncotton—Nitroglycerine &c.
Sodium—Manufacture of Carbonate of Soda.
Barium, Strontium and Calcium.—Mortars, Cements.—Gypsum.
Magnesium, Aluminium, Clay, Porcelain, Glass.
Iron. Cast Iron, Wrought Iron, Steel.
Manganese, Cobalt, Nickel, Chromium.
Zinc, Cadmium, Lead, Manufacture of Whitelead.
Copper, Mercury, Amalgams, Tin, Arsenic, Antimony.
Silver, Gold, Platinum.
Principal compounds of metals with non-metallic elements.
Metallic Salts—Theory of Salts.
Theory of Spectrum Analysis.
Principles of organic chemistry—Classification of organic compounds based upon the atomicity of carbon.
Text Book.
    Bloxam's "Chemistry, Inorganic and Organic."

APPENDIX G 13.

ROYAL MILITARY COLLEGE OF CANADA.

Summary of Instruction in Experimental Physics.

General Properties and Physical conditions of Matter. Theory of the constitution of Matter. Gravitation. Molecular and Atomic Forces.
Capillarity, Endosmose, Diffusion.
Properties of Gases, Atmosphere, Barometers, Elastic force of Gases and its measurement, Apparatus founded on the properties of Air.
Sound.—Production, Propagation and Reflection of Sound, Measurement of Vibrations. Vibrations of stretched strings columns of air, rods, plates and membranes. Physical Theory of Music.
Heat.—Expansion of solids, liquids and gases. Thermometers. Changes of physical condition and attendant phenomena. Conduction and Radiation of Heat. Calorimetry. The Steam Engine. Theory of Heat. Mechanical Equivalent of Heat.
Light.—Transmission, Velocity and Intensity of Light, Reflection and Refraction of Light, Mirrors and Lenses, Optical Instruments, the Eye.
Dispersion, Achromatism, Interference, Polarisation, Phosphorescence.
Magnetism.—The Magnet and its properties. Terrestrial Magnetism. The Compass. Declination and Inclination. Law of magnetic attractions and repulsions. Magnetisation.
Electricity.—Fundamental Notions. Development of Electricity. Quantitative Laws of Electrical Action. Potential and Capacity. Induced Electricity. Electrical Machines.

Voltaic Pile.—Deduction and Measurement of voltaic currents. Effects of the current. Electrodynamics. Mutual action of currents. Magnetisation by currents. The Telegraph. Voltaic Induction. The Electric Light. Thermo-electricity. Electric Constants. Animal Electricity.

Outlines of Meteorology and Climatology.

Text Book—Ganot's Elementary Physics (Ninth Edition).

APPENDIX G14.

ROYAL MILITARY COLLEGE OF CANADA.

SUMMARY OF INSTRUCTION IN GEOLOGY.

General characteristics of the earth's features. Distribution of land and water. System of atmospheric and oceanic movements.

Rock material of the globe. Constituent minerals of Rocks. Structure and arrangement of Rock-masses.

Rocks, in order of their formation and contemporaneous events in Geological History. Floras. Faunas. Geographical progress. Progress of life.

Effects of Life on the earth's crust, of the Atmosphere, of Water, of Heat, Glaciers, Earthquakes, etc.

Practical Geology. Methods of investigation. Measurements. Use of Clinometer and Polariscope.

Text Book :—Dana's Manual of Geology (Third Edition).

APPENDIX G15.

ROYAL MILITARY COLLEGE OF CANADA.

SUMMARY OF COURSE OF INSTRUCTION IN MINERALOGY.

General characteristics of Minerals.

Crystallisation. Systems of Crystallisation in detail. Cleavage. Dimorphism. Measurement of Angles. Crystalline Aggregates.

Physical and chemical properties of Minerals. Action of acids, blowpipe, etc.

Classification of Minerals. Description of Minerals in detail. Ores. Chemical composition of Minerals.

Methods of determination of Minerals.

Text Book :—Dana's Manual of Mineralogy and Lithology (Third Edition).

APPENDIX G16.

ROYAL MILITARY COLLEGE OF CANADA.

SYLLABUS OF FREEHAND DRAWING.

Obligatory and Voluntary.

Grade 1.

(With preliminary courses in practical perspective, and Architectural details.)

a. Freehand outlines from examples and copies of ornament, objects and models.
b. Time sketching and sketching from memory of objects and ornaments.
c. Drawing the human figure and animal forms from copies. (Outline.)

d. Anatomical studies of the human figure and animal forms. (Outline.)
e. Drawing flowers, foliage and landscapes, details from nature in outline and shaded.

Grade 2.

a. Studies of historic styles of ornament and applied design.
b. Drawing in a given time the bones and muscles within the outline of the antique figure.
c. Drawing the human figure and animal forms from the round.
d. Painting from flat examples and from the cast in monochrome and colour.
e. Painting direct from nature in water color or oil, flowers or still life, landscapes and views of building.

This grade to embrace a general knowledge of the principles and practice of Art, *i. e.*, light and shade compositions, science of colour and principles of harmonious colouring.

Grade 3.

Painting the human figure or animals in water colour or oils.
a. From the flat or copies.
b. From nature.
c. Time sketching and compositions.
General principles and execution of the several historic schools.

Text Books used:

Bonomi's Proportions of the human figure.
Burchett's Perspective.
Manual of the Science of Colour.
Warren's Artistic Anatomy of the human figure.
     do   do   horse.
Merrifield's Manual of Light and Shade with reference to Model drawing.

APPENDIX No. 13.

REPORT OF DIRECTOR OF STORES.

DEPARTMENT OF MILITIA AND DEFENCE,
STORE BRANCH, OTTAWA, 1st January, 1880.

SIR,—I have the honor to submit the following report of the operations of this branch of the Department, under my charge, for the past year:—

CLOTHING.

The clothing this year, as in the year previous, was supplied from England, and was found satisfactory on inspection. The issues of clothing for the year are shown in the statement underneath.

ISSUES.

Tunics, Cloth.					Tunics, Serge.				Trousers, Cloth, Pairs.			Trousers, Serge, Pairs.			Forage Caps.				Great Coats.		
Cavalry.	Artillery.	Engineers.	Infantry.	Rifles.	Cavalry.	Artillery.	Infantry.	Rifles.	Cavalry.	Artillery.	Infantry.	Artillery.	Infantry.	Rifles.	Cavalry.	Artillery.	Infantry.	Rifles.	Cavalry.	Artillery.	Infantry. and Rifles.
166	1350	137	5093	1936	6	399	276	320	286	783	905	5527	1969	332	1754	3214	744	455	1188	1933	

A contract has been made with a Sherbrooke firm for the supply of 5,000 great coats of Canadian grey cloth. These are now in course of manufacture, and a first delivery of one-third is to be made on the 1st February next.

AMMUNITION.

370,190 rounds of Snider ball, and 369,340 rounds of blank cartridge have been issued during the year for the practice of the different corps. (See Appendix A.)

728,820 rounds have been sold during the year for rifle shooting to the various corps and rifle associations, for which $11,835.14 has been received by deposit receipt. In this amount is included the sums received for the sale of gunpowder and friction tubes issued to the Post Office Department for the noon gun at Ottawa. (See Appendix B.)

24,841 lbs. of gunpowder and 9,342 friction tubes were also issued to the different field and garrison batteries of artillery for practice and salutes, with the authorized proportion of shot, shell, fuzes, &c. (See Appendix C.)

DEPOSIT RECEIPTS.

The gross amount received by the sale of ammunition and other stores, and for rents, is shown in the statement underneath.

Ammunition.		Clothing.		Arms and Accoutrements.	Deficiencies.	Rents.	Miscellaneous.	Total Amount.
Rounds.	Amount.	Officers'.	Mens'.					
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
728,820	11,835 14	283 66	1,024 17	182 81	131 43	4,865 41	1,032 83	19,352 45

BOARDS OF SURVEY.

Boards of Survey were held at the usual time and place in all the Districts, and the reports therefrom were satisfactory. The obsolete and unserviceable stores condemned at these surveys were afterwards sold by public auction. The amount realized by these sales was $825.90. There has been no serious loss by fire or otherwise to report.

ORDNANCE STORES.

Only a small quantity has been received from England during the past year, consisting entirely of material for the seven and eight inch guns at Quebec.

One million rounds of small-arm ammunition was also received by the same ship, the "South Tyne," and was stored at Kingston.

20,000 pounds of gunpowder has been ordered from the Hamilton Powder Company, but no delivery of any of this quantity has yet been made. The two hundred powder barrels required for packing this gunpowder were supplied from the Quebec stores, after being re-coopered from the empties returned into store from time to time, thus effecting a saving to the Department of $400, which would otherwise have been the cost of the packages. This gunpowder is to be delivered at Quebec, subject to inspection and report by the Inspector of Warlike Stores.

LOSSES AND DEFICIENCIES

When reported, are charged against the parties concerned, but I regret to say a very small percentage is ever recovered. A detailed statement respecting these is shown in Appendix D. In District No. 7, it will be noticed that more has been recovered than appears to have been charged. This discrepancy can be accounted for in this wise: An excellent system seems to prevail in that district. When losses are verified at brigade inspections, the parties liable for such losses are charged directly for them. The amount is at once collected and transmitted to headquarters, and the deficiencies are made good by a new issue. It is seldom found necessary to furnish accounts from headquarters to this district, and the amount now shown in the column of losses is against one corps only, and has not yet been collected. The amount collected in District No. 9 is also all from one corps within a few dollars.

With respect to the camp damages, great difficulty prevails. The loss and damage is usually assessed by the storekeeper when the camp equipment is returned into store. His assessment is almost always disputed, the delinquents pleading that the loss must occur in transit, as they invariably ship complete and in good order. Paragraph 620 of the Regulations and Orders, 1879, provides for the proper assessment of camp damages on the spot, and the amount thereof to be deducted from the pay of the men. It seems hardly fair that an onerous and disagreeable duty of this nature should devolve on the Store Branch. If it were otherwise, and according to regulation, much dissatisfaction and loss would be avoided.

TENANTS AND RENTAL

Are shown in the statement underneath. The arrears go on accumulating, and those at Lévis, which are the worst on the list, have nearly doubled since last year. The rental collected during the year has been $4,865.41. The arrears now stand, at $2,407.

Number of Tenants.	Locality.	Rents per Annum.	Arrears.
		$ cts.	$ cts.
1	Manitoba	1 00	
2	Chatham	6 00	
3	Niagara	70 00	281 00
2	Ottawa	2 00	
24	Kingston	580 00	60 50
4	Toronto	320 00	90 00
4	Montreal	250 75	
1	Laprairie	1 00	
2	Isle aux Noix	104 00	
33	Quebec	3,145 53	675 00
38	Lévis	1,157 25	1,250 50
9	New Brunswick	78 00	
2	Nova Scotia	150 00	50 00
1	P. E. Island	1 00	
126		5,866 53	2,407 00

THOS. WILY, Lieut.-Colonel,
Director of Stores and Keeper of Militia Property.

To the Honorable
The Minister of Militia and Defence,
Ottawa.

(A.)

S. A. AMMUNITION issued for practice during the year 1879.

Date.		Corps and Station.	Rounds.	
			Ball.	Blank.
		Military District No. 1, London.		
June	17	Wellington Field Battery, Guelph	1,480	
do	18	Ontario do do	1,480	840
Aug.	19	No. 6 Company, 25th Battalion, St. Thomas	840	
do	19	Nos 2 and 7 Companies, 26th Battalion, Strathroy	1,680	1,680
do	19	No. 2 Company, 30th Battalion, Guelph	840	840
Sept.	12	Nos. 1 and 6 Companies, 22nd Battalion, Woodstock	1,680	1,680
do	12	7th Battalion, London	5,880	5,880
do	12	27th do Petrolia		5,040
do	12	No. 5 Company, 22nd Battalion, Norwich	840	840
do	13	No 3 do do Princeton	840	840
do	15	No. 7 do do Tilsonburg	840	840
do	19	No. 8 do do Thamesford	840	840
do	19	No. 2 do do Embro	840	840
do	20	Nos. 3 and 4 Companies, 28th Battalion, St. Mary's	1,400	
do	20	Infantry Company, Windsor	840	840
do	20	25th Battalion, St. Thomas		5,040
Oct.	1	No. 4 Company, 22nd Battalion, Ingersoll	840	840
do	7	32nd Battalion, Walkerton	6,720	6,720
do	8	1st and 2nd Troops, 1st Regiment of Cavalry	1,320	1,320
do	13	No. 1 Company, 25th Battalion, St. Thomas	840	
do	13	No. 5 do 27th do Wallaceburg	840	
do	13	No. 2 do do do Forrest	840	
do	22	24th Battalion, Chatham	4,800	4,800
Nov.	10	No. 4 Company, 30th Battalion, Elora	840	840
do	19	No. 5 do 25th do Port Stanley	840	
		Total	38,200	39,720
		Military District No. 2, Toronto.		
May	22	2nd Battalion, "Queen's Own," Toronto		15,000
June	17	Engineer Company, Toronto	1,400	1,400
Aug.	26	31st Battalion, Owen Sound	2,520	5,580
do	27	4th, 5th and 6th Troops, 2nd Regiment of Cavalry	2,100	2,100
Sept.	1	38th Battalion, Brantford	1,680	1,680
do	8	37th do York		5,880
do	20	1st and 8th Troops, 2nd Regiment of Cavalry	1,400	1,400
do	25	2nd Battalion, "Queen's Own," Toronto	8,400	
Oct.	4	Governor General's Body Guard, Toronto	1,620	1,620
do	9	10th Battalion, "Royals," Toronto	8,400	
do	20	20th Battalion, Milton	5,880	5,880
Nov.	7	Battery of Garrison Artillery, Toronto	840	
		Total	34,240	40,540
		Military District No. 3, Kingston.		
May	21	Royal Military College, Kingston		3,000
June	14	14th Battalion, Kingston	5,040	5,040
do	27	"A" Battery do	5,480	
Sept.	3	3rd Regiment of Cavalry, Cobourg	840	1,320
do	29	No. 3 Company, 40th Battalion, Campbellford	840	840
Oct.	17	57th Battalion, Peterborough	4,200	5,040
do	23	16th do Picton	3,360	3,360
		Carried forward	19,740	18,600

(A).—S. A. Ammunition issued for practice during the year 1879—Con.

Date.		Corps and Station.	Rounds.	
			Ball.	Blank.
		Brought forward	19,740	18,600
		Military District No. 3, Kingston—Continued.		
Oct.	24.....	No. 7 Company, 16th Battalion, Ameliasburg	840	840
do	24.....	No 8 do do Rednersville	840	840
do	25.....	No. 7 do 40th Battalion, Colborne	840	
do	25.....	49th Battalion, Belleville	1,680	1,680
Nov.	4.....	47th do Kingston	4,200	5,040
		Total	28,140	27,000
		Military District No. 4, Ottawa.		
May	16.....	Governor General's Foot Guards, Ottawa		7,200
June	18.....	Royal Military College, Kingston	4,200	M. H.
do	24.....	Nos. 1 and 6 Companies, 18th Battalion, Hawkesbury Mills		1,680
do	24.....	No. 5 Company, 18th Battalion, Plantagenet		840
do	24.....	No. 1 do 41st do Brockville	660	
do	24.....	No. 4 do do do Merrickville		840
do	24.....	No. 1 do 42nd do Almonte		840
do	24.....	No. 2 do do do Brockville	680	240
do	21.....	No. 3 do do do Perth	840	
do	24.....	No. 7 do do do Pembroke		840
do	24.....	No. 1 Company, 56th Battalion, Prescott		840
do	24.....	No. 5 do do Ottawa	840	840
do	24.....	No. 6 do do North Augusta		840
do	24.....	No. 7 do do Spencerville		840
do	24.....	59th Battalion, Cornwall		540
do	24.....	Infantry Company, Goulbourn		2,000
July	31.....	Governor General's Foot Guards, Ottawa		840
Oct.	20.....	Princess Louise Dragoon Guards do	5,040	
			700	700
		Total	12,960	19,920
		Military Districts Nos. 5 and 6, Montreal.		
Feb.	28.....	Brigade Garrison Artillery, Montreal	5,000	5,000
May	17.....	1st Prince of Wales Regiment do		7,500
do	20.....	Brigade Garrison Artillery do		9,000
do	20.....	Engineer Company do		2,500
do	20.....	5th Battalion do		7,500
do	20.....	6th do do		7,500
do	21.....	65th do do		7,500
do	21.....	3rd Victoria Rifles do		7,500
do	21.....	St. Jean Baptiste Infantry Company		7,500
June	25.....	60th Battalion, Dunham		1,500
do	28.....	83rd do Joliette	2,000	2,000
do	28.....	64th do Beauharnois	2,100	2,100
do	28.....	76th do Ste. Martine	5,040	5,040
July	5.....	11th do St. Andrews	5,040	5,040
do	8.....	5th do Montreal	2,400	2,400
do	11.....	3rd Victoria Rifles, Montreal	4,960	5,000
do	16.....	6th Battalion do	3,510	5,000
do	17.....	83rd do Joliette	4,720	5,000
do	25.....	1st do Prince of Wales, Montreal	2,100	2,100
do	25.....	65th do do do	3,010	5,000
Aug.	1.....	Troop of Cavalry, Montreal	5,040	5,040
do	7.....	Engineer Company do	640	640
			1,000	1,000
		Carried forward		

(A).—S.A. Ammunition issued for practice during the Year 1879.—Con.

Date.		Corps and Station.	Rounds.	
			Ball.	Blank.
		Brought forward		
		Military Districts Nos. 5 and 6, Montreal—Continued.		
Aug.	11.....	53rd Battalion, Sherbrooke	4,000	4,000
do	15.....	Field Battery, Shefford	900	900
do	30.....	St. Jean Baptiste Infantry Company	840	840
Sept.	6.....	52nd Battalion, Knowlton	2,500	2,500
do	6.....	No. 5 Company, 52nd Battalion, Mansonville	500	500
do	16.....	5th Regiment of Cavalry, Compton	2,400	2,400
do	26.....	Infantry Company, Laprairie	840	840
do	29.....	Troop of Cavalry, Brome	700	700
do	30.....	58th Battalion, Cookshire	3,500	3,500
do	30.....	54th do Richmond	1,500	1,500
do	30.....	79th do Waterloo	3,360	3,360
do	30.....	Troop of Cavalry, Huntingdon	700	700
Oct.	7.....	Brigade Garrison Artillery, Montreal	3,500	3,500
do	7.....	80th Battalion, Gentilly	3,360	3,360
do	14.....	Infantry Company, Wakefield	800	800
do	14.....	do Aylwin	800	800
Nov.	5.....	54th Battalion, Richmond	2,000	2,000
		Total	78,790	133,060
		Military District No. 7, Quebec.		
Feb.	25.....	8th Battalion, Quebec	4,200	
April	30.....	do do		4,200
May	23.....	do do		2,600
June	16.....	Field Battery do	460	
do	26.....	55th Battalion, Inverness	5,040	5,040
do	27.....	81st do Pointe aux Trembles	5,040	5,040
July	4.....	Quebec Provisional Battalion, St. Ambroise	2,880	2,880
do	12.....	Kamouraska Provisional Battalion, Kamouraska	2,880	2,880
do	15.....	Temiscouata do Rivière du Loup en bas	2,880	2,880
do	18.....	61st Battalion, Montmagny	3,600	3,600
Aug.	6.....	No. 1 Battery, Garrison Artillery, Quebec	840	840
do	6.....	"B" Battery, Quebec	5,760	5,760
do	15.....	8th Battalion do	3,500	
do	15.....	9th do do	2,000	
do	15.....	Cavalry do	1,000	
do	15.....	Field Battery do	340	
do	15.....	No. 1 do Garrison Artillery, Quebec	500	
		Total	40,920	35,720
		Military District No. 8, St. John.		
June	24.....	67th Battalion, Woodstock	4,200	4,200
do	28.....	74th do Sussex	3,360	3,360
do	28.....	71st do Fredericton	3,360	3,360
do	30.....	62nd do St. John	4,980	5,040
July	2.....	8th Regiment of Cavalry, Apohaqui	3,360	3,360
do	8.....	73rd Battalion, Chatham	2,520	2,520
July	21.....	New Brunswick Engineers, St. John	840	840
Oct.	21.....	do Brigade of Garrison Artillery, St. John	3,360	3,360
		Total	25,980	26,040

(A.)—S. A. Ammunition issued for practice during the year 1879.—*Con.*

Date.	Corps and Station.	Rounds.	
		Ball.	Blank.
	Military District No. 9, Halifax.		
July 2.....	1st Brigade of Garrison Artillery, Halifax..........................	5,040	5,040
do 2.....	63rd Battalion, Halifax.........................	5,040	5,040
do 2....	2nd Brigade of Garrison Artillery, Halifax	3,200	3,200
do 2....	66th Battalion, Halifax.................................	6,720	6,720
do 2 ...	Field Battery, Halifax.........................	1,500	....
do 2....	Battery of Garrison Artillery, Pictou	800	....
do 3.....	Victoria Provincial Battery, Baddeck	2,400	2,400
do 24.....	78th Battalion, Truro.....................	1,640	1,640
Aug. 3.....	No. 8 Company, 78th Battalion, New Laing.................	800	800
do 12.....	Cumberland Provisional Battalion, Amherst...............	1,600	1,600
do 27.....	No. 1 Company, 69th Battalion, Bear River..............	800	800
Sept. 8....	No. 7 do 78th do Mountain.................	840	840
do 11.....	68th Battalion, Kentville.....................	3,200	3,200
do 11.....	No. 2 Company, Cumberland Provisional Battalion, River Philip	800	800
do 13.....	69th Battalion, Paradise.................	2,400	2,400
do 13.....	72nd do Wilmot..................	1,600	1,600
Oct. 20....	No. 6 Company, 72nd Battalion, Nicteaux.............	800	800
do 20.....	75th Battalion, Lunenburg..................	1,600	1,600
	Total....................	40,780	38,480
	Military District No. 10, Winnipeg.		
May 8.....	Detachment, Cross Lake....................		
July 8....	Infantry Company, Kildonan.................	3,900	....
Sept. 2.....	North-West Companies to Deputy-Adjutant General.............	840	840
do 26.....	Troops of Cavalry, Winnipeg.	52,000	....
		....	460
	Total....................	56,740	1,300
	Military District No. 11, Victoria.		
March 17.....	No. 1 Rifle Company, Nanaimo..................	4,200	....
April 9.....	Battery of Garrison Artillery, Victoria.............	1,000	1,000
June 4.....	No. 1 Rifle Company, Victoria	840	....
Sept. 16.....	Battery of Garrison Artillery, Seymour.................	600	600
do 26.....	No. 1 Rifle Company, New Westminster..............	800	800
	Total..................	6,640	1,600
	Military District No. 12, Charlottetown.		
June 24.....	82nd Battalion, Charlottetown..................		
do 30.....	Engineer Company, Charlottetown..................	1,680	1,680
July 4.....	No. 4 do 82nd Battalion, Charlottetown Royalty...	840	840
do 7....	Battery of Garrison Artillery, Summerside.............	840	840
do 7.....	No. 1 Company, Prince Company Battalion, Summerside.......	840	840
Aug. 28.....	No. 2 Battery of Garrison Artillery, Charlottetown...........	880	880
do 4.....	No. 1 do do do	880	40
		840	840
	Total........................	6,800	5,960

(A.)—S. A. Ammunition issued for practice during the year 1879—*Con.*

RECAPITULATION.

	Rounds.	
	Ball.	Blank.
Military District No. 1, London	38,200	39,720
do 2, Toronto	34,240	40,540
do 3, Kingston	28,140	27,000
do 4, Ottawa...........................	12,960	19,920
do 5, and 6, Montreal....................	78,790	133,060
do 7, Quebec	40,920	35,720
do 8, St. John, N.B..................	25,980	26,040
do 9, Halifax, N.S.	40,780	38,480
do 10, Winnipeg	56,740	1,300
do 11, Victoria, B.C.	6,640	1,600
do 12, Charlottetown, P.E.I	6,800	5,960
Total.....................	370,190	369,340

THOS. WILY, Lieut.-Colonel,
Director of Stores, &c.

STORE BRANCH,
OTTAWA, 31st December, 1879.

8—27½

[B.]

S. A. Ammunition sold during the Year 1879.

Military District No. 1, London.

Date.		Purchaser.	Corps.	Rounds.	Amount.	Total Rounds.	Total Amount.
1879.					$ cts.		$ cts.
Jan.	9	Capt. Reed	24th Battalion	500	8 00		
do	14	Lieut.-Col. F. B. Leys	District Paymaster	1,000	16 00		
do	13	Major Wilkinson	Leamington Infty. Co	840	13 44		
Feb.	5	Capt. McDowell	30th Battalion	1,250	20 00		
April	2	J. W. Motherwell	Perth R. A	500	8 00		
do	2	George Hayes	London Rifle Club	1,000	16 00		
do	3	Lieut. Col. Atwood	26th Battalion	1,000	16 00		
do	29	F. W. Macqueen	Woodstock R. A	4,000	64 00		
May	2	Capt. McDonald	30th Battalion	1,000	16 00		
do	20	Major Austin	24th do	450	7 20		
do	29	F. W. Macqueen	Woodstock R. A	2,000	32 00		
June	4	G. W. Railton	Huron R. A	1,000	16 00		
do	5	Lieut.-Col. James Moffat	Brigade Major	3,000	48 00		
May	27	Lieut.-Col. Atwood	26th Battalion	2,500	40 00		
June	10	E. Hay	do	1,000	16 00		
do	7	George Hay	do	500	8 00		
do	14	Major Wilson	33rd Battalion	2,000	32 00		
do	16	do	do	2,000	32 00		
do	19	Capt. Moffatt	Western R. A	1,000	16 00		
July	4	G. W. Railton	Huron R. A	1,000	16 00		
do	12	Lieut.-Col. Moffatt	Brigade Major	500	8 00		
do	12	Capt. Stevenson	26th Battalion	2,000	32 00		
do	16	F. W. Macqueen	Woodstock R. A	2,000	32 00		
do	17	Lieut.-Col. Atwood	26th Battalion	1,000	16 00		
do	17	John D. Petrie	London	500	8 00		
do	28	Lieut.-Col. Leys	District Paymaster	1,000	16 00		
Aug.	11	F. W. Macqueen	Woodstock R. A	2,000	32 00		
do	11	George Hayes	do	2,000	32 00		
do	12	do	London R. Club	1,000	16 00		
do	20	Lieut.-Col. Atwood	26th Battalion	1,000	16 00		
do	23	do	do	500	8 00		
do	25	do	do	2,000	32 00		
do	29	do	do	750	12 00		
do	29	W. B. Wilson	Perth R. A	500	8 00		
Sept.	3	Major Wilkinson	Leamington Infty. Co	500	8 00		
do	6	Capt. McDowell	30th Battalion	2,000	32 00		
do	4	Lieut. Cheynee	Windsor Infantry Co.	500	8 00		
do	11	W. B. Wilson	Perth R. A	500	8 00		
do	17	Capt. Williamson	22nd Battalion	1,000	16 00		
do	17	D. McGregor	Perth R. A	1,000	16 00		
do	26	Major Wilson	33rd Battalion	2,000	32 00		
Oct.	2	G. W. Railton	Huron R. A	1,500	24 00		
do	3	Lieut.-Col. Peck	29th Battalion	1,370	21 92		
do	20	Lieut.-Col. Atwood	26th do	1,000	16 00		
do	27	Lieut.-Col. Peck	29th do	1,000	16 00		
do	30	Lieut.-Col. Atwood	26th do	2,000	32 00		
Nov.	12	Lieut. Cheynee	Windsor Infantry Co.	1,000	16 00		
Dec.	6	Capt. McDowell	30th Battalion	2,000	32 00		
do	6	Capt. Williamson	22nd do	500	8 00		
do	23	Lieut.-Col. Atwood	26th do	1,000	16 00		
do	23	Capt. Grattes	27th do	500	8 00		
do	29	Lieut.-Col. Atwood	26th do	500	8 00		
						64,160	1,026 56

S. A. Ammunition sold during the year 1879.—Continued.

Military District No. 2, Toronto.

Date.		Purchaser.	Corps.	Rounds.	Amount.	Total Rounds.	Total Amount.
1879.					$ cts.		$ cts.
Dec.	31	Sergt. Marston	2nd Battalion	1,500	24 00		
Jan.	21	Liet.-Col. W. D. Otter	2nd do	1,000	16 00		
Feb.	8	do do	2nd do	1,000	16 00		
May	16	Lieut.-Col. Alger	Ontario R. A	10,000	160 00		
June	5	J. L. Rawbone	Gov. Genl's. By. Gd.	500	8 00		
do	6	Lieut. C. S. Jones	38th Battalion	1,000	16 00		
do	12	Lieut.-Col. Alger	Ontario R. A	10,000	160 00		
do	24	do	do	10,000	160 00		
July	3	Lieut. C. S. Jones	38th Battalion	1,000	16 00		
do	3	Capt. Fothergill	34th Battalion	1,000	16 00		
do	11	Lieut.-Col. Alger	Ontario R. A	10,000	160 00		
do	14	Capt. Fothergill	34th Battalion	1,000	16 00		
do	16	Lieut.-Col. Alger	Ontario R. A	10,000	160 00		
do	26	J. L. Rawbone	Gov. Genl's. By. Gd.	500	8 00		
do	29	Lieut.-Col. Alger	Ontario R. A	10,000	160 00		
Aug.	5	Lieut. C. S. Jones	38th Battalion	1,500	24 00		
do	8	do do	do	1,000	16 00		
do	8	Lieut.-Col. Alger	Ontario R. A	10,000	160 00		
do	11	do do	do	10,000	160 00		
do	21	Lieut. C. S. Jones	38th Battalion	1,000	16 00		
do	22	Lieut.-Col. Alger	Ontario R. A	20,000	320 00		
do	26	Capt. Fothergill	34th Battalion	500	8 00		
Sept.	11	J. S. Rawbone	Gov. Genl's. By. Gd.	500	8 00		
do	18	do	do do	500	8 00		
Oct.	4	do	do do	4,500	72 00		
do	4	Capt. Fathergill	34th Battalion	1,000	16 00		
do	21	do	do	1,000	16 00		
do	27	Lieut.-Col. Alger	Ontario R. A	30,000	480 00		
Dec.	9	Lieut. Jones	38th Battalion	1,000	16 00		
do	23	Capt. Wilson	33rd do	1,000	16 00	152,000	2,432 00

Military District No. 3, Kingston.

Date.		Purchaser.	Corps.	Rounds.	Amount.	Total Rounds.	Total Amount.
Jan.	15	Capt. Baillie	Kingston R.A.	8,500	136 00		
do	14	Major Dingwall	46th Battalion	1,000	16 00		
July	28	Major Hooper	Napanee G.A.	1,000	16 00		
Aug.	5	Capt. Harrison	49th Battalion	2,000	32 00		
do	13	Major Hooper	Napanee G.A.	1,000	16 00		
do	29	do	do	1,000	16 00		
Oct.	2	Major Dingwall	46th Battalion	2,000	32 00		
do	12	Lieut.-Col. Rogers	Peterborough R.A.	1,000	16 00		
Nov.	4	Lieut. Johnson	Hastings R A	500	8 00		
Dec.	11	Capt. Murray	48th Battalion	2,500	40 00		
do	29	Capt. Gordon	14th do	4,500	72 00		
do	29	Capt. Baillie	47th do	500	8 00		
do	29	Lieut. Strachan	47th do			26,500	424 00

(B).—S. A. Ammunition sold during the year 1879—*Continued.*

Military District No. 4, Ottawa.

Date.	Purchaser.	Corps.	Rounds.	Amount.	Total Rounds.	Total Amount.
1879.				$ cts.		$ cts.
March 7	Capt. McKenzie	Gananoque F.B.	500	7 75		
April 7	Lieut. Cole	42nd Battalion	500	8 00		
do 25	Sergt. Cawdron	G. G. Foot Guards	500	8 00		
May 5	do	do	500	8 00		
do 7	E. Waldo	do	500	8 00		
do 9	Sergt. Cawdron	do	1,500	24 00		
do 10	do	do	1,000	16 00		
do 19	do	do	500	8 00		
do 27	Mr. O'Grady	do	500	8 00		
do 28	W. P. Anderson	do	500	8 00		
June 2	Sergt. Cawdron	do	500	8 00		
do 7	D. Morrison	do	500	8 00		
do 11	Sergt. Cawdron	do	500	8 00		
do 12	Major Bennett	56th Battalion	500	8 00		
do 18	Sergt. Cawdron	G. G. Foot Guards	500	8 00		
do 19	Capt. Sparham	42nd Battalion	1,000	16 00		
do 24	Capt. Macdonell	do	1,000	16 00		
July 2	Sergt. Cawdron	G. G. Foot Guards	500	8 00		
do 11	Major Cates	Wakefield Infty Co.	500	8 00		
do 16	Sergt. Cawdron	G. G. Foot Guards	500	8 00		
do 23	W. P. Anderson	do	500	8 00		
do 24	Sergt. Cawdron	do	500	8 00		
do 29	do	do	500	8 00		
do 29	Major Cates	Wakefield Infty Co.	500	8 00		
Aug. 1	Sergt. Cawdron	G. G. Foot Guards	500	8 00		
do 4	G. D. Booth	do	500	8 00		
do 4	Sergt. Cawdron	do	500	8 00		
do 7	H. T. Fitzsimmons	Brockville R.A.	2,000	32 00		
do 7	Sergt. Cawdron	G. G. Foot Guards	1,500	24 00		
do 7	J. W. de O'Grady	do	500	12 00	500 M. H.	
do 7	Capt. Macdonald	42nd Battalion	500	8 00		
do 6	J. W. Motherwell	Perth R.A.	2,000	32 00		
do 6	Major Bennett	56th Battalion	500	8 00		
do 11	E. Sutherland	G. G. Foot Guards	500	8 00		
do 12	Sergt. Cawdron	do	500	8 00		
do 15	do	do	500	8 00		
do 16	Capt. Macdonald	42nd Battalion	1,000	16 00		
do 20	Sergt. Deslauriers	G. G. Foot Guards	500	8 00		
do 20	Major Cates	Wakefield Infty Co.	500	8 00		
do 20	F. W. Smith	Metropolitan R.A.	3,000	48 00		
do 20	Sergt. Cawdron	G. G. Foot Guards	500	8 00		
do 25	Major Cates	Wakefield Infty Co.	500	8 00		
do 28	Lieut. Finlay	Metcalf do	500	8 00		
Sept. 2	Major Cates	Wakefield do	1,000	16 00		
do 1	J. W. Motherwell	Perth R.A.	4,000	70 00		
do 6	Sergt. Cawdron	G. G. Foot Guards	500	8 00		
do 9	Mr. Morrison	G. G. Foot Guards	1,000	16 00		
do 10	Major Cates	Wakefield Infty Co.	1,500	24 00		
do 10	W. P. Anderson	G. G. Foot Guards	500	8 00		
do 22	H. T. Fitzsimmons	Brockville R.A.	4,000	64 00		
do 24	J. W. Motherwell	Perth R.A.	500	8 00		
do 29	Sergt. Cawdron	G. G. Foot Guards	500	8 00		
Oct. 1	Capt. Carmichael	56th Battalion	500	8 00		
do 4	Sergt. Cawdron	G. G. Foot Guards	500	8 00		
do 4	Capt. Wiman	18th Battalion	2,985	47 75		
do 6	Thos. Coulter	Almonte R.A.	1,000	16 00		
do 8	Capt. Wiman	18th Battalion	500	8 00		
do 14	Sergt. Cawdron	G. G. Foot Guards	500	8 00		

(B).—S. A. Ammunition sold during the year 1879.—*Continued.*

Military District No. 4, Ottawa—Concluded.

Date.	Purchaser.	Corps.	Rounds.	Amount.	Total Rounds.	Total Amount.
1879.				$ cts.		$ cts.
Oct. 14	Thos. Coulter	Almonte R.A.	500	8 00		
do 15	Sergt. Cawdron	G. G. Foot Guards	500	8 00		
do 15	Thos. Coulter	Almonte R.A.	560	9 00		
do 15	H. Walters	Wakefield Infty Co.	500	8 00		
do 15	H. B. White		1,000	16 00		
do 22	Lieut. Finlay	Metcalf Infty Co.	1,000	16 00		
do 23	Sergt. Cawdron	G. G. Foot Guards	500	8 00		
do 27	do	do	1,000	16 00		
Nov. 14	do	do	500	8 00		
do 24	Lieut.-Col. Macpherson	Dominion R.A.	29,790	476 64		
Dec. 15	Lieut. Finlay	Metcalf Infty Co.	500	8 00		
do 31	Lieut.-Col. Macpherson	Dominion R.A.	420	10 08	420 M. H.	
			600 lbs.			
do 31	P. O. Department	Time Gun, Ottawa	Powder.	159 28		
					87,225	1,556 50

Military Districts Nos. 5 and 6 Montreal.

Date.	Purchaser.	Corps.	Rounds.	Amount.	Total Rounds.	Total Amount.
Dec. 31	Major Morehouse	53rd Battalion	560	8 96		
Jan. 7	E. S. Baker	Cookshire R.A.	560	8 96		
April 14	R. J. Spearing	Sherbrooke R.A.	560	8 96		
May 2	J. Marks	Caretaker, R. Range.	2,240	35 84		
do 5	Capt. Hawley	60th Battalion	560	8 96		
do 10	Lieut. Cushing	6th Battalion R.A.	1,680	26 88		
June 3	Major Morehouse	53rd Battalion	1,120	17 92		
do 4	J. Marks	Caretaker, R. Range	2,240	35 84		
do 4	E. S. Baker	Cookshire R.A.	560	8 96		
do 10	Lieut. Duffy	Engineer Company	560	8 96		
do 13	J. Marks	Caretaker, R. Range.	3,360	53 76		
do 20	Major Morehouse	53rd Battalion	1,120	17 92		
do 20	J. Marks	Caretaker, R. Range.	3,360	53 76		
do 23	Capt. Marves	54th Battalion	560	8 96		
do 23	Lieut. Cushing	6th Battalion R.A.	1,630	26 88		
do 30	J. Marks	Caretaker, R. Range.	3,360	53 76		
July 3	do	do do	4,480	71 68		
do 8	Major Morehouse	53rd Battalion	1,120	17 92		
do 8	Lieut. Duffy	Engineer Company	560	8 96		
do 11	J. Marks	Caretaker, R. Range.	8,960	143 36		
do 18	do	do do	4,480	71 76		
do 18	Lieut. Cushing	6th Battalion	2,800	44 80		
do 25	do	do	2,240	35 84		
do 25	Capt. Gardner	50th Battalion	560	8 96		
do 25	Major Morehouse	53rd do	1,120	17 92		
do 25	J. Marks	Caretaker, R. Range.	4,480	71 68		
do 28	E. S. Baker	Cookshire R.A.	560	8 96		
do 28	Capt. Hall	52nd Battalion	560	8 96		
do 29	J. Marks	Caretaker, R. Range.	4,480	71 68		
Aug. 4	do	do do	4,480	71 68		
do 4	Major Morehouse	53rd Battalion	1,120	17 92		
do 4	Major Kennedy	Engineer Company	560	8 96		
do 8	Lieut.-Col. d'Orsonnens	5th Brig. Dist. R.A.	560	8 96		
do 15	Sergt. Ross	50th Battalion	560	8 96		
do 15	do do	6th do	1,120	17 92		
do 15	Lieut. Cushing	6th	4,480	71 68		
do 18	J. Marks	Caretaker, R. Range.	560	8 96		
do 21	E. S. Baker	Cookshire R.C.	560	8 96		
do 23	Lieut. Cushing	6th Battalion	2,240	35 84		
do 26	H. Cook	Wellington R.A.	560	8 96		
do 26	Lieut. Edwards	58th Battalion				

(B).—S. A. Ammunition sold during the year 1879.—*Continued*.

Military Districts Nos. 5 and 6, Montreal—Concluded.

Date.		Purchase.	Corps.	Rounds.	Amount.	Total Rounds.	Total Amount.
					$ cts.		$ cts.
Aug.	28	J. Marks	Caretaker, R. Range.	4,480	71 68		
do	30	J. C. Shanks	50th Battalion	560	8 96		
Sept.	4	J. Marks	Caretaker, R. Range.	4,480	71 68		
do	4	Lieut. Cushing	6th Battalion	1,120	17 92		
do	12	Lieut.-Col. Sheppard	83rd do	560	8 96		
do	12	J. Marks	Caretaker, R. Range.	4,480	71 68		
do	12	Lieut. Cushing	6th Battalion	560	8 96		
do	25	J. Marks	Caretaker, R. Range.	3,360	53 76		
Oct	6	Major Lambert	83rd Battalion	560	8 96		
do	13	Mr. Spearing	Sherbrooke R.A	560	8 96		
do	15	Lieut.-Col. Macdonald	11th Battalion	560	8 96		
do	17	Capt. Chamberlin	Aylwin Infantry Co.	500	8 00		
do	21	Capt. Hoy	11th Battalion	560	8 96		
do	23	Mr. Reynar	Three Rivers	2,000	20 00	M.L.E.	
do	24	Lieut.-Col. Macdonald	11th Battalion	1,680	26 88		
do	30	Capt. Regan	52nd do	560	8 96		
do	31	C. W. Sleeper	Coaticook	560	8 96		
Nov.	3	J Marks	Caretaker, R. Range.	1,680	26 88		
Dec.	8	Lieut. Edwards	58th Battalion	1,120	17 92		
						107,220	1,703 52

Military District No. 7, Quebec.

Date.			Corps.	Rounds.	Amount.		
Jan.	20	Major Demers	17th Battalion	560	8 96		
Mar.	26	Capt. Miller	8th Battalion	560	8 96		
April	4	Capt. Scott	do	2,240	35 84		
do	5	Capt. Ray	do	2,240	35 84		
do	5	Capt. A'Hearn	do	560	8 96		
do	8	Capt. Miller	do	1,120	17 92		
do	16	do	do	560	8 96		
do	15	Capt. LeSueur	do	560	8 96		
do	23	Capt. Miller	do	560	8 96		
do	25	Capt. Scott	do	1,680	26 88		
do	26	Lieut.-Col. Turnbull	Quebec Squadron	560	8 96		
do	28	Capt. Miller	8th Battalion	560	8 96		
May	16	Capt. Scott	8th do	1,120	17 92		
do	26	Major Demers	17th do	560	8 96		
do	30	Major Hamel	Garrison Artillery	560	8 96		
do	31	Major Demers	17th Battalion	560	8 96		
June	11	Capt. Scott	8th do	1,120	17 92		
do	13	Major Demers	17th do	560	8 96		
do	23	do	17th do	560	8 96		
do	23	Capt. Scott	8th do	1,120	17 92		
do	30	Capt. Bourget	17th do	560	8 96		
July	4	Capt. Scott	8th do	560	8 96		
do	5	Lieut. Wurtele	8th do	560	8 96		
do	12	Capt. Scott	8th do	560	8 96		
do	22	do	8th do	560	8 96		
do	25	Lieut. Wurtele	8th do	560	8 96		
do	28	Capt. LeSueur	8th do	2,800	44 80		
do	29	Major Stewart	Megantic R. A.	3,360	53 76		
do	29	Lieut.-Col. Montizambert	"B" Battery	2,240	35 84		
Aug.	6	Lieut.-Col. Bacon	Quebec R. A	12,400	208 00	1,200 M. H.	
do	26	Lieut.-Col. Hudon	Temiscouata R. A	2,000	32 00		
Sept.	2	Capt. Scott	8th Battalion	560	8 96		
do	2	do	8th do	560	8 96		
do	4	C. A. Dubé	Rimouski R. A,	1,500	24 00		
do	4	Lieut.-Col. Hudon	Temiscouata R. A	2,000	32 00		

(B)—S. A. Ammunition sold during the year 1879—*Continued*.

Military District No. 7, Quebec—Concluded.

Date.		Purchaser.	Corps.	Rounds.	Amount.	Total Rounds.	Total Amount.
					$ cts.		$ cts.
Sept.	11	C. A. Dubé	Rimouski R. A	1,000	16 00		
do	11	Capt. Scott	8th Battalion	560	8 96		
do	17	Lieut.-Col. Hudon	Temiscouata R. A	1,000	16 00		
do	20	C. A. Dubé	Rimouska R. A	560	8 96		
do	26	Capt. Scott	7th Battalion	560	8 96		
do	6	Lieut.-Col. Hudon	Temiscouata R. A	1,000	16 00		
do	14	Lieut.-Col. Montizambert	"B" Battery	2,240	35 84		
do	17	Capt. Scott	8th Battalion	560	8 96	56,180	908 48

Military District No. 8, St. John.

Date.		Purchaser.	Corps.	Rounds.	Amount.		
Mar.	21	Sergt.-Major Carmichael	N. B. Engineers	560	8 96		
April	2	Lieut. Hunter	do	560	8 96		
do	5	Sergt.-Major Carmichael	do	560	8 96		
do	23	Lieut. Hunter	do	560	8 96		
do	30	Sergt. Carmichael	do	1,120	17 92		
May	6	Sapper Stewert	do	560	8 96		
do	12	Sapper Philps	do	560	8 96		
do	12	Major Stickney	Charlotte Co. R.A	1,120	17 92		
do	16	Capt. Perley	N. B. Engineers	1,245	19 92		
do	20	Capt. Langstroth	N. B. Cavalry	560	8 96		
do	26	Lieut. Hart	N. B. Engineers	560	8 96		
do	26	Sapper Stewart	do	560	8 96		
do	28	Lieut. Shives	St. John Rifle Club	560	8 96		
June	4	Sergt. Carmichael	N. B. Engineers	560	8 96		
do	4	Lieut. Hart	do	560	8 96		
do	9	Capt. Hart	62nd Battalion	560	8 96		
do	25	Sergt.-Major Carmichael	N. B. Engineers	2,800	44 80		
do	26	Major Likily	62nd Battalion	560	8 96		
do	27	Lieut. Hart	N. B. Engineers	560	8 96		
July	16	Lieut. Shives	62nd Battalion	560	8 96		
do	19	Sapper Philps	N. B. Engineers	560	8 96		
do	21	Capt. Hart	62nd Battalion	560	8 96		
do	22	Capt. Langstroth	N. B. Cavalry	1,120	17 92		
do	25	Sergt.-Major Carmichael	N. B. Engineers	560	8 96		
do	27	G. F. Thompson	do	560	8 96		
Aug.	4	Lieut. Loggie	York Co. R.A	1,680	26 88		
do	8	Capt. Ewing	Gar. Art., St. John	1,120	17 92		
do	9	Major Stickney	Charlotte Co., R.A	560	8 96		
do	11	Lieut. Hart	N. B. Engineers	1,680	26 88		
do	16	Sergt.-Major Carmichael	do	560	8 96		
do	16	Sapper Philps	do	560	8 96		
do	21	Sapper Stewart	do	560	8 96		
do	23	Capt. Langstroth	N. B. Cavalry	560	8 96		
do	23	Capt. Hart	62nd Battalion	560	8 96		
do	25	Lieut. Hunter	N. B. Engineers	560	8 96		
do	25	Capt. Perley	N. B. Prov. R.A	11,200	179 20		
do	27	W. B. Howard	Northumberland Co. R.A	1,680	26 88		
do	28	Sergt.-Major Carmichael	N. B. Engineers	560	8 96		
Sept.	8	do	do	560	8 96		
do	9	Sapper Philps	do	560	8 96		
do	10	Capt. Hart	62nd Battalion	1,680	26 88		
do	13	Major Stickney	Charlotte Co. R.A	1,120	17 92		
do	15	Lieut. Loggie	York Co. R.A	560	8 96		
do	26	do	do	560	8 96		

(B)—S A. AMMUNITION sold during the year 1879—*Continued.*

Military District No. 8, St. John—Concluded.

Date.	Purchaser.	Corps.	Rounds.	Amount.	Total Rounds.	Total Amount.
1879.				$ cts.		$ cts.
Sept. 27	Lieut. Hart	St. John Co. R. A	1,680	26 88		
do 30	Sapper Philps	N. B. Engineers	560	8 96		
Oct. 1	Capt. Langstroth	N. B. Cavalry	560	8 96		
do 2	Capt. Hart	62nd Battalion	560	8 96		
do 6	Lieut. Loggie	York Co. R. A	560	8 96		
do 8	Sergt.-Major Carmichael	N. B. Engineers	560	8 96		
do 14	Sergt. McLaughlin	62nd Battalion	560	8 96		
do 28	Sergt.-Major Carmichael	N. B. Engineers	560	8 96		
					51,085	817 33

Military District No. 9, Halifax.

Date.	Purchaser.	Corps.	Rounds.	Amount.	Total Rounds.	Total Amount.
Dec. 27	Lieut.-Col. Pallister	63rd Battalion	1,000	16 00		
Feb. 8	do	63rd do	500	8 00		
do 20	Lieut.-Col. Mitchell	1st Brigade G. A	500	12 00	500 M. H.	
April 1	Lieut.-Col. Pallister	63rd Battalion	1,000	16 00	500 M. H.	
do 24	Capt Bland	Provincial R. A	500	12 00	500 M. H.	
May 1	do	do	500	8 00		
do 10	Capt. Burgess	78th Battalion	500	8 00		
do 26	Capt. Bland	Provincial R. A	1,000	16 00		
do 26	do	do	2,000	32 00		
do 26	Capt. Gordon	Pictou G. A	500	8 00		
June 2	Col. Laurie	Provincial R. A	1,000	16 00		
do 7	Lieut.-Col. Mitchell	1st Brigade G. A	500	8 00		
do 11	Col. Laurie	Provincial R. A	1,000	16 00		
do 12	Capt. Ryan	Kings Co. Troop Cav.	1,500	24 00		
do 12	Lieut.-Col. Mitchell	1st Brigade G. A	1,000	16 00		
do 16	Col. Laurie	Provincial R. A	1,000	16 00		
do 18	Major Graham	Halifax F. B.	500	8 00		
do 24	Col. Laurie	Provincial R. A	1,000	16 00		
do 28	do	do	1,000	16 00		
do 28	do	do	1,500	24 00		
do 28	Lieut.-Col. Mitchell	1st Brigade G. A	500	8 00		
do 28	Lieut. Egan	63rd Battalion	1,000	16 00		
July 3	Col. Laurie	Provincial R. A	500	12 00	500 M. H.	
do 5	do	do	1,500	24 00		
do 8	Lieut.-Col. Mitchell	1st Brigade G. A	3,500	56 00		
do 11	Lieut.-Col. McIntosh	63rd Battalion	1,000	16 00		
do 12	Col. Laurie	Provincial R. A	1,000	16 00		
do 16	do	do	1,000	16 00		
do 16	Capt. Lawrence	78th Battalion	1,000	16 00		
do 19	Capt. Gordon	Pictou G. A	500	8 00		
do 19	Col. Laurie	Provincial R. A	1,500	24 00		
do 20	Capt. Purcell	2nd Brigade G. A	500	8 00		
do 23	Lieut.-Col. Mitchell	1st Brigade G. A	1,500	24 00		
do 26	Col. Laurie	Provincial R. A	1,000	16 00		
do 28	Lieut.-Col. Blair	78th Battalion	500	8 00		
do 30	Lieut.-Col. Mitchell	1st Brigade G. A	500	8 00		
do 30	Col. Laurie	Provincial R. A	1,000	16 00		
Aug. 1	Capt. Lawrence	78th Battalion	1,000	16 00		
do 4	Capt. Burgess	78th do	500	8 00		
do 4	Capt. Oxley	Cumberland Prov. B.	500	8 00		
do 4	Lieut.-Col. McIntosh	63rd Battalion	1,000	16 00		
do 8	Col. Laurie	Provincial R. A	1,000	16 00		
do 8	Capt. Stairs	2nd Brigade G. A	500	8 00		
do 9	Lieut.-Col. Mitchell	1st do	500	8 00		
do 13	do	1st do	2,000	32 00		
do 14	Col. Laurie	Provincial R. A	2,000	32 00		

(B.)—S. A. AMMUNITION sold during the year 1879—*Continued.*

Military District No. 9, Halifax.—Continued.

Date.	Purchaser.	Corps.	Rounds.	Amount.	Total Rounds.	Total Amount.
				$ cts.		$ cts.
Aug. 22	Capt. Gordon	Pictou G. A	500	8 00		
do 27	do	do	500	8 00	500 M. H.	
do 27	Col. Laurie	Provincial R. A	21,500	348 00	500 M. H.	
do 31	Capt. Gordon	Pictou G. A	500	8 00		
do 31	Lieut.-Col. McIntosh	63rd Battalion	1,000	16 00		
Sept. 5	Capt. Bland	Halifax Co. R. A	3,000	48 00		
do 5	Capt. Lawrence	Colchester Co. R. A.	1,500	24 00		
do 5	C. W. Knowles	Hants Co. R. A	1,000	16 00		
do 8	Capt. Gordon	Pictou G. A	500	8 00		
do 8	Capt. Black	Cumberland Co. R.A.	2,000	32 00		
do 11	Capt. Bland	Halifax Co. R. A	1,500	24 00		
do 11	Lieut.-Col. Hudson	Pictou Co. R. A	1,500	24 00		
do 16	Col. Laurie	Provincial R. A	500	8 00		
do 17	Lieut.-Col. McIntosh	63rd Battalion	1,000	16 00		
do 20	Capt. Bland	Halifax Co. R. A	500	8 00		
do 30	Lieut.-Col. Hudson	Pictou Co. R. A	500	8 00		
do 30	Major Harrison	Cumberland Prov. B.	500	8 00		
do 30	Col. Laurie	Provincial R. A	500	8 00		
Oct. 13	T. H. Miller	Digby Co. R. A	1,500	24 00		
do 13	Capt. Burgess	78th Battalion	1,120	17 92		
do 17	Lieut.-Col. Bremner	66th do	2,000	32 00		
do 17	Col. Laurie	Provincial R. A	500	8 00		
do 17	Lieut.-Col. McIntosh	63rd Battalion	1,000	16 00		
do 17	Capt. Burgess	78th Battalion	500	8 00		
Nov. 4	Lieut.-Col. McIntosh	63rd Battalion	500	8 00		
Dec. 16	Capt. Bland	Halifax Co. R. A	500	8 00	91,120	1,473 92

Military District No. 10, Winnipeg, M.

Date.	Purchaser.	Corps.	Rounds.	Amount.	Total Rounds.	Total Amount.
May 16	M. J. Hunter	Manitoba R. A	2,000	32 00		
June 18	do	do	2,000	32 00		
July 9	do	do	4,000	64 00		
Aug. 8	do	do	4,000	64 00		
do 18	do	do	4,000	64 00		
do 23	do	do	6,000	96 00		
Sept. 9	do	do	1,000	16 00		
Nov. 5	Martin McDonald	Pembina	500	8 00	23,500	376 00

Military District No. 11, Victoria, B.C.

Date.	Purchaser.	Corps.	Rounds.	Amount.	Total Rounds.	Total Amount.
Mar. 13	Capt. Fletcher	British Columbia R.A	2,940	47 04		
do 17	Lieut. Harvey	Nananimo Rifle Co.	4,200	67 20		
May 29	Capt. McDonnell	No. 1 Co., Vic. Rifles	840	13 44		
Sept. 27	Capt. Fletcher	do do	1,260	20 16		
do 27	Capt. Dupont	New Westminst'r R.A	7,980	127 68	17,220	275 52

(B.)—S. A. Ammunition sold during the year 1879—*Continued.*

Military District No. 12, Charlottetown, P.E.I.

Date.	Purchaser.	Corps.	Rounds.	Amount.	Total Rounds.	Total Amount.
1879.				$ cts.		$ cts.
Mar. 29	Capt. McRae	82nd Battalion	1,000	16 00		
April 1	Major Dogherty	Engineer Co.	1,000	16 00		
do 7	Capt. Mabon	82nd Battalion	500	8 00		
do 8	Major Dogherty	Engineer Co.	1,780	28 48		
May 5	Capt. Owen	Georgetown G. A.	500	8 00		
do 23	Major Dogherty	Engineer Co.	2,000	32 00		
June 4	Major Morris	Garrison Artillery	500	8 00		
do 7	Major Dogherty	Engineer Co.	3,000	48 00		
do 11	do	do	2,000	32 00		
do 16	Capt. McRae	82nd Battalion	2,000	32 00		
do 30	Major Dogherty	Engineer Co.	5,000	80 00		
July 25	Capt. Mabon	82nd Battalion	500	8 00		
do 30	Major Dogherty	Engineer Co.	2,000	32 00		
Aug. 1	Capt. Longworth	82nd Battalion	1,000	16 00		
do 4	Major Dogherty	Engineer Co.	2,000	32 00		
do 18	Capt. Irving	Provincial R. A.	6,000	96 00		
Sept. 10	Capt. McRae	82nd Battalion	1,000	16 00		
do 11	Capt. Owen	Georgetown G. A.	1,000	16 00		
do 18	apt. McLeod	Kings Co. Batt	1,500	24 00		
do 19	Major Dogherty	Engineer Co.	2,000	32 00		
do 29	E. Macdougall	Queens Co. R. A.	3,000	48 00		
Oct. 4	Major Dogherty	Engineer Co.	2,000	32 00		
do 6	Capt. Bearisto	82nd Battalion	500	8 00		
do 21	do	do	500	8 00		
Nov. 14	Capt. Longworth	do	500	8 00		
do 14	Capt. Bearisto	do	500	8 00		
do 25	Major Pollard	Charlottetown G. A.	500	8 00		
do 28	Capt. Longworth	82nd Battalion	1,000	16 00		
Dec. 2	Major Dogherty	Engineer Co.	1,120	17 92		
do 5	Capt. Mabon	82nd Battalion	560	8 96		
do 8	Capt. McLeod	Kings Co. Batt	1,000	16 00		
do 8	Capt. McRae	82nd Battalion	1,000	16 00		
do 16	Major Pollard	Charlottetown G. A.	500	8 00		
do 18	Major Dogherty	Engineer Co.	1,120	17 92		
do 19	Capt. Mabon	82nd Battalion	500	8 00		
do 20	Major Dogherty	Engineer Co.	2,000	32 00	52,580	841 28

(B).—S. A. Ammunition sold during the year 1879—*Concluded.*

RECAPITULATION.

Military District.	Rounds.	Amount.
		$ cts.
Military District No. 1, London	64,160	1,026 56
do No. 2, Toronto	152,000	2,432 00
do No. 3, Kingston	26,500	424 00
do No. 4, Ottawa	87,255	1,556 50
do Nos. 5 and 6, Montreal	107,220	1,703 52
do No. 7, Quebec	56,180	908 48
do No. 8, St. John	51,085	817 36
do No. 9, Halifax	91,120	1,473 92
do No. 10, Winnipeg	23,500	376 00
do No. 11, Victoria	17,220	275 52
do No. 12, Charlottetown	52,580	841 28
Total	728,820	11,835 14

Store Branch,
    Ottawa, 31st December, 1879.

THOS. WILY, Lieut.-Colonel,
    Director of Stores, &c.

(C.)

RETURN of Gunpowder and Friction Tubes issued for practice and salutes during the year 1879.

Stations.	Corps.	Gun-powder.	Friction Tubes.
		Lbs.	
Toronto	Field and Garrison Batteries	2,561	1,025
Kingston	do do	6,366	800
do	"A" Battery	488	1,050
do	Royal Military College	822	500
Ottawa	Post Office noon gun	600	415
do	Salutes	625	265
do	Ottawa Field Battery		200
Montreal	Detachment "B" Battery	6	138
do	Field and Garrison Batteries	3,062	1,965
Quebec	do do	1,662	250
do	"B" Battery	4,853	1,422
St. John, N.B.	Field and Garrison Batteries	2,698	944
Manitoba	Winnipeg Field Battery	250	200
P. E. Island	Garrison Batteries	848	168
	Total	24,841	9,342

STORE BRANCH,
OTTAWA, 31st December, 1879.

THOS. WILY, Lieut.-Colonel,
Director of Stores, &c.

(D.)

RETURN of Charges for Deficiences, and the amount recovered, from 1st January to 31st December, 1879.

District.	Station.	Arms and Accoutrements.		Camp Equipment.	
		Losses.	Recovered.	Losses.	Recovered.
		$ cts.	$ cts.	$ cts.	$ cts.
No. 1	London, Ont.	312 80	2 32	106 03	5 28
No. 2	Toronto do	21 28		61 75	
No. 3	Kingston do	485 60		47 98	
No. 4	Ottawa do	44 16	2 50	6 95	
Nos. 5 and 6.	Montreal, Q	1,433 04	5 60	42 67	3 74
No. 7	Quebec	62 46	119 62	16 85	6 65
No. 8	St. John, N.B.	54 26		32 68	1 96
No. 9	Halifax, N.S.	1,002 68	115 60		
No. 10	Manitoba				
No. 11	British Columbia.				
No. 12	Prince Edward Island				
	Total	3,416 28	245 64	314 91	17 63

STORE BRANCH,
OTTAWA, 31st December, 1879.

THOS. WILY, Lieut.-Colonel,
Director of Stores, &c.