

No. II.

(Preliminary or Obligatory Examination.)

ARITHMETIC.

December 17th, 1878, from 2 p.m. to 4.15 p.m.

Candidates are required to observe the Regulations strictly.

Values.

- 13 (1.) Write down in words 6067008090.0005005.
- 10 (2.) What is the shortest way of finding the sum of \$18.25, \$18.25, \$18.25, \$18.25 and \$18.25 ?
- 28 (3.) Reduce that sum to ^(a) £. S. D. Halifax currency, ^(b) £. S. D. Sterling.
- 20 (4.) Reduce 26 miles 5 fur. 26 p. 2 y. to lengths each $1\frac{1}{4}$ ft.
- 16 (5.) Multiply £1 11s. 4½d. by 168, using factors each less than 10.
- 20 (6.) Divide \$2136.60 by 288, using factors each less than 10.
- 24 (7.) Divide £7 3s. 2½d. by $21\frac{3}{4}$.
- 30 (8.) Find the G. C. M. of $310\frac{1}{3}$ and $743\frac{1}{8}$.
- 12 (9.) Find the L. C. M. of 80, 18, 60, 9, 75 and 36.
- 18 (10.) Reduce to lowest terms $\frac{£13\ 12s.}{85\ \text{crowns.}}$
- 22 (11.) If $\frac{5}{8}$ of a dollar be multiplied by the last answer, what is the result ?
- 21 (12.) To the sum, difference, and product of $\frac{7}{8}$ and $\frac{7}{12}$ find a fourth proportional.
- 12 (13.) Multiply 32.5 by 100, divide 32.5 by 100, and add the results.
- 25 (14.) From 1.012 take 3
- 25 (15.) Reduce 1.33 and 2.012 to vulgar fractions, subtract, and then reduce that difference to a decimal.
- 23 (16.) Find (by practice) cost of 40 tons 6c. 3 qr. of coals @ £2 17s. per ton.
- 18 (17.) If $\frac{3}{4}$ lb of tea cost 6s. 8d., what is the price of $\frac{7}{8}$ lb ?
- 15 (18.) How many pence in .4375 of a shilling.
- 25 (19.) Multiply .863541 by .10983 to 5 and only 5 places.
- 20 (20.) What is the interest of \$60 for 10 mos. @ $4\frac{1}{2}$ per cent. per annum.

Values.

- 28 (21.) \$2750 amounts \$3135 in $1\frac{3}{4}$ years, simple interest, what is the rate per cent. ?
- 35 (22.) The population of a village which grows 10 per cent. a year, increased by 331 persons from January 1st, 1875, to January 1st, 1878. What were the numbers on each of those days ?
- 20 (23.) Having 150 shares (each \$100) of 7 per cent. stock, I sell out @ $96\frac{1}{4}$, and buy Bank of Montreal stock, (which gives 5 per cent. dividends twice a year) @ $119\frac{3}{4}$, brokerage in each case $\frac{1}{4}$ per cent. Find ^(a) How much less stock I hold ? ^(b) The increase in my income ?
- 500

No. III.

(Preliminary or Obligatory Examination.)

DRAWING.

December 17th, 1878, from 4.15 p.m. to 5 p.m.

Candidates are required to observe the Regulations strictly.

Values.

Draw the outlines of :

- 60 (1.) A garden gate.
- 60 (2.) A regular hexagon.
- 60 (3.) A maple leaf.
- 60 (4.) An axe.
- 60 (5.) A vase.
- 300

No. IV.

(Preliminary or Obligatory Examination.)

ALGEBRA AND GEOMETRY.

December 18th, 1878, from 10 a.m. to 1 p.m.

Candidates are required to observe the Regulations strictly.

ALGEBRA.

Values.

- 15 (1.) Find the sum of $\frac{1}{2}a + \frac{2}{3}b - \frac{5}{8}c$, $\frac{1}{2}b + 1\frac{1}{3}c + \frac{1}{8}a$ and $-\frac{1}{8}c + \frac{1}{3}a - \frac{7}{8}b$.
- 25 (2.) Show that $x - (y - z) = x - y + z$.
- 25 (3.) From $4a + 7b - 2c + 3d - 4\frac{1}{2}$ take $2b - 5c - 1a + \frac{5}{2}$.
- 20 (4.) Express algebraically the number of pence in the sum of £x and y shillings.

Values.

28 (5.) Give the value of $\frac{1 + (\sqrt{x-y})^2 + (y-z)^2 - (z-x)^2 + 11}{\sqrt{3x+2y+z-8}}$, if $x=2$, $y=3$, $z=4$.

24 (6.) Multiply $3x^3 - 4x^2 - x - 2$ by $1\frac{1}{2}x^2 + 2x - 4$.

45 (7.) Expand: (i). $(a^2 - ab + b^2)^2$; (ii). $(2x - y)^3$; (iii). $(b - c)^4$

25 (8.) Divide $x^8 - y^8$ by $x^2 - y^2$

50 (9.) Give the factors of: (i). $xy - xz - y^2 + z^2$; (ii). $3a^2 - 9a - 12$; (iii). $b^2 + 2bc + c^2 - b - c$.

26 (10.) What is the remainder, if $x^4 - (a + 5)x^3 + (b + 5a)x^2 - 5bx + 10$ be divided by $x - 5$?

15 (11.) Find the H. C. F. of $175 a^3 b^2$, $140 ab^5$ and $154 a^3 b^3$.

20 (12.) If $a = pd$, and $b = qd$, p and q having no common factor, find the L. C. M. of a and b .

33 (13.) Reduce to its simplest form $\frac{1\frac{1}{2}a^2 - 3ab + 1\frac{1}{2}b^2}{6a^2 - 6b^2}$

28 (14.) Simplify $\frac{a^2 - 7a + 12}{a^2 - a} \times \frac{a^3 - 1}{a^2 - 4a} \div \frac{2a^2 + 2a + 2}{a^2}$

10 25 (15.) What is the value of x , if: (i). $5x - 3 = 14x - 21$; (ii). $(2x - 7)(5 - 3x) = (3 - x)(6x - 11)$; (iii). $5x + \frac{20 - 25x}{.1} = .5 - .005x$;

30 (iv.) $\begin{cases} 2x + 2y = a + b \\ 4x - 4y = 2a - 2b \end{cases}$

26 (16.) What is the number whose half exceeds its tenth by 250?

GEOMETRY.

40 (1.) Define *straight line*, *plane surface*, *semicircle*, *trilaterals*, *isosceles triangle*, *rhombus*, *axiom* and *corollary*.

20 (2.) Give Euclid's 2nd, 3rd, and 4th *Postulates*.

40 (3.) "From the greater of two given straight lines to cut off a part equal to the less."

25 (4.) Name the first Propositions in which Euclid applies Prop. iii.

(5.) Give the constructions, explaining the steps, but without proof, of these problems:

40 (i). "To bisect a given finite straight line."

Values.

50 (ii). "At a given point in a given straight line to make an angle equal to a given rectilineal angle."

50 (iii). "To draw a straight line through a given point parallel to a given straight line."

55 (iv). "To construct a right angled triangle, having given the base and the sum of hypotenuse and perpendicular."

55 (v). To find a line whose square shall be equal to the difference of two other squares.

80 (6). "Equal triangles upon equal bases, in the same straight line, and towards the same parts are between the same parallels."

45 (7). The straight line joining the points of bisection of any two sides of a triangle is parallel to the third side. Prove.

500

N. B.—A competent knowledge of each subject is expected (Algebra and Geometry.)

No. V.

(Preliminary or Obligatory Examination.)

HISTORY AND GEOGRAPHY.

December 18th, 1878, from 2 p.m. to 4 p.m.

Candidates are required to observe the Regulations strictly.

HISTORY.

Values.

45 (1.) What is meant by the "Saxon Heptarchy?" When was it established? When did it end, and how?

40 (2.) Between what parties was the Battle of Stamford [Bridge] fought? What were the consequences of this battle?

50 (3.) In whose reign was the "Domesday Book" compiled? Explain the term "Domesday." What did the book record?

50 (4.) Explain fully the object of the "Crusades." Name the English Kings or princes who actually took part in them.

45 (5.) Explain the principle of the "Feudal System." When was it introduced into England? When and how did it receive its greatest blow?

50 (6.) "The King of England who spent six months among his people during his whole reign, and whose brightest victories brought poverty and hunger to English homes, cannot but be deemed unworthy of the name." Who was this King? What were his victories?

Values.

- 50 (7.) "This was the first outline of the modern English parliament, one part corresponding to the House of Lords, the other to the House of Commons." Give date, and explain the "one part" and the "other."
- 45 (8.) Give any facts of early English History which will show the political condition of the Jews at that time. State what you know of their present political condition.
- 50 (9.) "There were at this time two Kings captive in England." What was the time? Who were the Kings?
- 45 (10.) What is meant by the "Pragmatic Sanction?" How did it affect England?
- 40 (11.) What portions of the present British America were finally ceded to Britain by the treaty of Utrecht? What portions were still retained by France? When did Britain get the latter also?
- 500
- GEOGRAPHY.
- 70 (1.) State the changes made in the late Turkish Empire by the "Berlin Treaty."
- 40 (2.) Give accurately the relative positions of the following: Asia Minor, Afghanistan, Beloochistan, Turkestan, British India.
- 60 (3.) Draw a map of North America, mark the Dominion of Canada, United States, Mexico, River St. Lawrence, River Mississippi, Ottawa, Washington, New York, New Orleans, San Francisco.
- 50 (4.) Give accurately the present boundary of the Province of Ontario, and of the new District of Keewatin.
- 30 (5.) Classify the European powers according to forms of government, naming as far as possible the ruler of each.
- 70 (6.) Name the British possessions throughout the world. Give a full answer.
- 50 (7.) Tell all you know of Stanley's late journey through Africa.
- 30 (8.) Give a few notes on the agricultural, mining, manufacturing, lumbering and fishing resources of Canada.
- 50 (9.) Explain fully the form of Government in the United States. How is the President elected? What are the Upper and Lower Legislative bodies called? How many members in each?
- 50 (10.) Name, and classify by countries, the chief seaports of Europe.

500

No. VI.

(Preliminary or Obligatory Examination.)

FRENCH.

December 18th, 1878, from 4 p.m. to 5 p.m.

Candidates are requested to observe the Regulations strictly.

Values.

- 20 (1.) When a noun begins with a vowel or an *h* mute, how is the article distinguished? With a compound tense of a verb in a negative sentence, how are the negatives *ne* and *pas* placed?
- 20 (2.) Translate into French: (a). *I have neither the tree nor the garden.* (b). *I have neither trees nor gardens.*
- 20 (3.) How is the distinction between "this" and "that," "the former" and "the latter" expressed in French?
- 20 (4.) Translate into French: *We have not this, we have that.*
- 50 (5.) Write out in full the present indicative of *avoir*, negatively and also interrogatively.
- 20 (6.) Give the feminine of the following adjectives: *bon, beau, joli, bel, rétif.*
- 20 (7.) What adjectives are placed after the nouns they qualify? How do you distinguish "*un brave homme*" and "*un homme brave*"?
- 20 (8.) When are the pronouns *moi, toi, lui* and *eux* used instead of the nominative pronouns *je, tu, il* and *ils*? When does the régime indirect precede the direct?
- 30 (9.) Give the plural of *un gentilhomme, un chef d'œuvre, un passe-port, un passe-partout* and *un maître d'armes.*
- 280 (10.) Translate into English:

La Fontaine, à la première représentation de son opéra d'*Astrée* était dans une loge derrière des dames qui ne le connaissaient point. Il se déchaînait contre la plupart des endroits de ce poème en s'écriant: "Cela est du dernier détestable! Cela est pitoyable!" Ces dames, ennuyées de l'entendre se déchaîner ainsi, lui dirent: "Monsieur, mais cela n'est pas si mauvais, et l'auteur d'ailleurs est M. de LaFontaine." "Eh! mesdames, reprit-il, ce LaFontaine dont vous parlez est un stupide; je le connais: c'est moi-même."

No. VII.

(Preliminary or Obligatory Examination.)

LATIN.

December 19th, 1878, from 10 a.m. to 11.30 a.m.

Candidates are required to observe the Regulations strictly.

- Values.
- 50 (1.) Decline: *regnum, sanguis, quis, filius* and *duo*.
- 50 (2.) Give the genitive singular of the following words, marking the quantity of the penult of each: *bos, pes, ales, princeps, praiceps, dux, lux, vas* (m) and *vas* (n). What are the masculine terminations of the First and Second Declensions? Give the different classes of irregular adjectives.
- 52 (2.) Compare: *Superus, similis, malus, novus, senex, opimus, egregius, albus, aureus* and *pius*. What are the principal parts of a verb? Give the terminations of verbal nouns derived from the supine stem, with an example of each.
- 268 (4.) Translate into English:
- Tarquinius deinde bello aperto, regnum recuperare tentavit. Equitibus praerat Aruns Tarquinii filius; rex ipse cum legionibus sequebatur. Obviam hosti consules eunt. Brutus ad explorandum cum equitibus antecessit. Aruns, ubi Brutum agnovit, inflamatus ira; ille est vir, inquit, qui nos patria expulit; en ille nostris decoratus insignibus magnifice incedit. Tum concitat calcaribus equum, atque in ipsum consulem dirigit; Brutus avide se certamini offert. Adeo infestis animis concurrerunt, ut ambo hasta transfixi ceciderint; fugatus est tamen Tarquinius. Alter consul Romam triumphans rediit.
- 20 (5.) Give the principal parts of the verbs *Praerat, sequebatur, agnovit* and *dirigit*. Why is *ceciderint* in the subjunctive?
- 20 (6.) Mention the cases of the following words, giving the rules: *Equitibus, hosti, patria, insignibus* and *certamini*.
- 40 (7.) Write a short sketch of the life of Tarquinius Superbus and of Brutus.

500

No. VIII.

(Further or Voluntary Examination.)

LOGARITHMS, TRIGONOMETRY AND MENSURATION.

December 19th, 1878, from 11.30 a.m. to 1 pm.

Candidates are required to observe the Regulations strictly.

- Values.
- 20 (1.) $\log. 300 = 2.47712125$; what name is applied to the decimal part?
- 60 (2.) If $A = ax$ and $B = ay$, give the logarithm (to base a) of (i) $A \times B$; (ii) $A \div B$; (iii) $(A)^m$; (iv) $\sqrt[n]{A}$ stating reasons for each answer.
- 40 (3.) If $\log. {}_{10} N = n$, how do you find $\log. (N \div 10^x)$? Will your answer serve if x is negative?
- 50 (4.) Given $\log. 2000 = 3.30103$ and $\log. 7000 = 3.8450980$; find $\log. 70$, $\log. 21$, and $\log. .0035$.
- 55 (5.) If $\log. 6500 = 3.8129134$ } when { $\log. 3652 = 3.5625308$.
Find $\sqrt{\frac{1}{3}}$ to 5 decimal places } $\log. 3653 = 3.5626497$.
- 60 (6.) To what base is .06 the logarithm of 49?
- 70 (7.) Solve $mx - b - nx + d = 0$; x being the unknown.
- 65 (8.) Express the complements of $37^\circ 4' 3''$ and $-70^\circ 70'$; also the supplements of 120° and 225° , both by the French and English mode.
- 50 (9.) Prove that $\text{Sec. } 2A \cdot \text{Cosec. } 2A = \text{Sec. } 2A + \text{Cosec. } 2A$.
- 50 (10.) If $\text{Cot. } A = \frac{3}{4}$, find value of $\text{Sin. } A$, $\text{Cos. } A$, $\text{Tan. } A$, $\text{Sec. } A$, and $\text{Cosec. } A$.
- 65 (11.) If $\text{Tan. } 2A + 4 \text{Sin. } 2A = 60$, find angle A .
- 80 (12.) Given $\text{Sin. } 30^\circ = \frac{1}{2}$, find $\text{Sin. } 15^\circ$.
- 50 (13.) A man observes the elevation of a tower to be 60° and on receding from it 100 yards further it is 30° ; find height of tower.
- 75 (14.) If A, B, C , denote the angles of a triangle, and a, b, c , the sides respectively opposite to them, prove $\frac{a}{\text{Sin. } A} = \frac{b}{\text{Sin. } B} = \frac{c}{\text{Sin. } C}$, &c.
- 70 (15.) Find the area of a hexagon inscribed in a circle whose diameter is 10 inches.
- 60 (16.) The sides of a triangular field measure 45, 60, and 75 chains respectively; how many acres, &c., does it contain?
- 80 (17.) A circular pond, diameter 20 yards, is surrounded by a grass plot 20 feet wide; what did the sodding of this cost @ $\frac{1}{10}$ \$ per square yard, if the circumference of a circle is 6.2832 times the radius?
- 1000

No. IX.

(Further or Voluntary Examination).

ALGEBRA AND GEOMETRY.

December 20th, 1878, from 2 p.m. to 5 p.m.

Candidates are required to observe the Regulations strictly.

- Values
- 30 (1.) Resolve into factors $(a + b + c + d)^2 - (a - b - c + d)^2$.
- 40 (2.) Find (if possible without actual division), the remainder, when $x^4 - 10x^3 + 40x^2 - 70x + 124$ is divided by $x - 4$.
- 55 (3.) Find (if possible, by division) the value of $x^4 - 10x^3 + 40x^2 - 70x + 124$, if $x = 4$.
- 60 (4.) (a) On what principle does the process of finding the H.C.F. of two quantities depend? (b) What is the H.C.F. of $16a^2 - 4ab - 12b^2$ and $6a^3 - 6a^2b + 2ab^2 - 2b^3$.
- 65 (5) Extract the square root of: (i). $a^2c - 2a^2b + b^2$; (ii). $a - 2 + 2a^{-\frac{1}{2}} + a^{-1} - 2a^{-\frac{3}{2}} + a^{-2}$.
- 50 (6.) Simplify $\sqrt{\left(\frac{a^2}{b^3} - \frac{a}{b^2} + \frac{1}{b}\right) \div \left(\frac{b^3}{a^3} - \frac{b}{a^2} + \frac{1}{a}\right)}$
- 30 (7.) Solve: (i). $(y + 2)(y + 4)(y + 6) = y(y + 5)(y + 7)$;
50 (ii). $\frac{7}{x} + \frac{11}{y} = \frac{90}{xy}$ and $7x + 11y = 90$.
- 60 (8.) Simplify: (i). $\frac{a + b}{(b - c)(c - a)} + \frac{b + c}{(c - a)(a - b)} + \frac{c + a}{(a - b)(b - c)}$;
45 (ii). $\left(1 - \frac{x^4}{y^4}\right) \div \left(1 - \frac{x}{y}\right)$
- 60 (9.) Divide $4x^{-5} - x^{-4} + 3x^{-3} + 2x^{-2} + x^{-1} + 1$ by $1 - x^{-1} + x^{-2}$.
- 60 (10.) Give simplest form (without negative indices) of:
$$\frac{4a^{-1}c^{-3}}{b^2} \times \frac{b^{-2}}{9c^3} \times \frac{3b^2c}{b^{-5}} \times \frac{1}{8a^{-1}c^{-5}}$$
- 60 (11.) Simplify $4\sqrt{128} - 5\sqrt{-636} + 17\sqrt{-54}$.
- 60 (12.) If m and n be roots of the equation $x^2 + px + q = 0$, resolve $x^2 + px + q$ into factors.
- 55 (13.) Form the equation whose roots are 2, 1, 0, -1 and -2. Of how many dimensions is it?
- 60,85 (14.) Solve: (i). $x^4 - 45x^2 = 250$; (ii). $\frac{1}{4}x^2 + \frac{1}{2}\sqrt{x^2 + 7x + 8} = 4 - 1\frac{3}{4}x$;
75 (iii). $x^2 - 2xy = 16$ and $2xy - 4y^2 = 12$.
- 1000

GEOMETRY.

- Values.
- 70 (1.) Prove algebraically that "the difference between the squares on any two straight lines is equal to the rectangle contained by the sum and difference of the lines."
- 40 (2.) (i.) What is the relation between the square on the greatest side
110 and those on the other sides of an obtuse angled triangle; (ii). Prove your statement to be true.
- 100 (3.) (i). In a rhombus, prove the squares of the diagonals together
20 equal to squares of the four sides; (ii). Is this true of any other parallelogram?
- 60 (4.) Define *equal circles*, *angle in a segment*, *angle of a segment*, *concentric circles*.
- 130 (5.) Prove that the circumference of one circle cannot cut that of another in more points than two.
- 130 (6.) "In equal circles equal arcs are subtended by equal straight lines.
- 140,30 (7.) Describe a circle passing through three given points. When is this impossible?
- 170 (8.) If from a point without a circle two straight lines be drawn, one of which touches a circle, and the other passes through the centre, show that the square of the tangent is equal to the rectangle contained by the other line and the part of it without the circle.
- 1000

No. X.

(Further or Voluntary Examination.)

PHYSICAL GEOGRAPHY AND HISTORY.

December 20th, 1878, from 9 a.m. to 11.30 a.m.

Candidates are required to observe the Regulations strictly.

PHYSICAL GEOGRAPHY.

- Values.
- 70 (1.) What matters are comprised under the head Physical Geography?
- 100 (2.) "Physical Geography explains many interesting facts of Civil Geography." Explain.
- 100 (3.) Give some idea of the extent of land in each zone as compared with the other zones.
- 100 (4.) Distinguish between a plain and a plateau. In what continents do we find the largest plains? In what the largest plateaus?
- 100 (5.) Where is the great salt water lake region of the globe. Name some of the lakes of this district.

- Values.
- 75 (6.) Name the leading river "Falls" of the world. Where are they situated?
- 125 (7.) "Some rivers empty their waters into the sea by a single mouth; others by several mouths." Give example of each kind; and account for the latter.
- 130 (8.) Explain the nature and cause of "Tides."
- 100 (9.) "The height to which tides rise varies greatly in different places. At St. Helena it does not exceed three feet; in the Bay of Fundy it is known to reach 70 feet." Explain.
- 100 (10.) Explain the composition and properties of the atmosphere, showing the benefit from each property.
- 1000

HISTORY.

- 125 (1) "Scotland, France, Spain, and the Netherlands, were the countries with which the foreign policy of Queen Elizabeth was chiefly concerned." Give a reason for this in the case of each country.
- 125 (2.) Give a short sketch of the career of Perkin Warbeck.
- 100 (3.) Name the three leading monarchs of Europe in the time of Henry VIII. Give some idea of the power of each.
- 100 (4.) Write a short note on each of the following:—Raleigh, Bacon, Hampden, Laud, Graham of Claverhouse.
- 80 (5.) "During this reign began that contest with parliament which forms the leading feature of the period." Whose reign? What caused the contest? How did it end?
- 70 (6.) "This scheme he designated *Thorough*." Who originated this scheme? What was the object?
- 100 (7.) Give a short account of the voyage of John and Sebastian Cabot to America.
- 100 (8.) Give a short account of Roberval's expedition to Canada.
- 100 (9.) "Thus, in an unprovoked contest, the first Indian blood was unwarrantably shed in Canada, by the white man." Give particulars.
- 100 (10.) When was "The Company of One Hundred Partners" formed? With what powers was it clothed?
- 1000

No. XI.

(Further or Voluntary Examination.)

LATIN.

December 20th, 1878, from 11.30 a.m. to 1 p.m.

Candidates are required to observe the Regulations strictly.

Values.
490

VIRGIL'S ÆNEID.

- (1.) Translate :
- Vulgæ quæ vox ut venit ad aures,
Obstupere animis, gelidusque per ima cucurrit
Ossa tremor; cui fata parent, quem poscat Apollo.
Hic Ithacus vatem magno Calchanta tumultu
Protrahit in medios; quæ sint ea numina divum,
Flagitat. Et mihi jam multi crudele canebant
Artificis scelus, et taciti ventura videbant.
Bis quinos silet ille dies, tectusque recusat
Prodere voce sua quemquam, aut opponere morti.
Vix tandem, magnis Ithaci clamoribus actus,
Composito rumpit vocem, et me destinat aræ.
- 20 (2.) Scan the two last lines, marking the feet distinctly.
- 50 (3.) Parse : *Vulgi, ima, canebant, tectus, composito.*
- 40 (4.) What was the *Palladium*, and by whom was it taken from the temple of Minerva?
- 80 (5.) Sketch briefly the life and writings of Virgil, mentioning some of his contemporaries.
- 50 (6.) Derive : *Vulgus, vox, medius, bis, mors.*
- 20 (8.) *Tectusque recusat.* Give different renderings.

750

500

CÆSAR DE BELLO GALLICO

- (1.) Translate :
- Utuntur aut aere, aut taleis ferreis, ad certum pondus examinatis, pro nummo. Nascitur ibi plumbum album in mediterraneis regionibus, in maritimis ferrum; sed ejus exigua est copia; aere utuntur importato. Materia ejusque generis, ut in Gallia, est, præter fagum atque abietem. Leporem et gallinam et anserem gustare fas non putant; hæc tamen alunt animi voluptatisque causa. Loca sunt temperatiora, quam in Gallia, remisioribus frigoribus.
- 80 (2.) Distinguish between *parvus* and *exiguus*; *copia*, *abundantia* and *ubertas*; *fas* and *jus*; *animus*, *anima* and *mens*.
- 80 (3.) Mention the brass coins in use among the Romans. Give any expressions which show that the Romans originally used a certain weight of uncoined metal as money.
- 50 (4.) Names of trees are generally feminine.—Give exceptions.
- 40 (5.) *Frigoribus*.—Why in this case?

750

No. XII.

(Preliminary or Obligatory Examination.)

ENGLISH LITERATURE.

December 20th, 1878, from 2 p.m. to 3.15 p.m.

Candidates are required to observe the Regulations strictly.

Values.	
100	(1.) Into what four periods does Spalding divide the History of English Literature?
100	(2.) During the Anglo Saxon times how many languages were used for literary communication in the British Islands? State what class or classes used each.
100	(3.) What are the two branches of Celtic literature? Compare the literary remains of these two branches?
100	(4.) Name the three most eminent Latin writers of the Anglo-Saxon times. Name one important work of each.
100	(5.) Explain how literary cultivation among a people is developed.
100	(6.) Give some account of the literary labors of Caedmon.
100	(7.) Give some account of the literary labors of Ælfric.
100	(8.) Name the leading historians and chroniclers of the Norman times.
100	(9.) Name the chief poems of the series that celebrated the deeds of King Arthur and his Knights.
100	(10.) What class of poetical compositions followed the Metrical Romances? What was the aim of this class of poetry?
1000	

No. XIII.

(Further or Voluntary Examination.)

FRENCH.

December 20th, 1878, from 3.15 p.m. to 4.15 p.m.

Candidates are required to observe the Regulations strictly.

Values.	
70	Translate into French : (1.) If you had money would you buy that house?
85	(2.) The camel has five stomachs, and a fleshy lump in the middle of his back.
75	(3.) The wood-cutter is a workman who cuts down trees in the woods.
80	(4.) The swan says: I build my nest in a little island among reeds and rushes.

Values.

60	(5.) They sat down then all in a ring.
95	(6.) I had inherited from my family considerable wealth; I dissipated the greater part of it in the follies of my youth.
70	(7.) The doctor wiped his eyes and spoke to him.
105	(8.) I examined the mountain, and found that it was situated between the city and the sea, without communication by any road.
110	(9.) He immediately took off his coat, and suddenly covered the animal's head with it, addressing himself to the judge.
450	(10.) At the end of two days a ship went out of port, and came past the place where I was. I made signs with the linen of my turban, and they sent the boat to take me. I said to the sailors that I had been shipwrecked and that I had saved myself with the goods which they saw. Happily for me these people, without examining the place where I was, carried me away with my bales.
1200	

No. XIV.

(Further or Voluntary Examination.)

DRAWING.

December 20th, 1868, from 4.15 p.m. to 5 p.m.

Candidates are required to observe the Regulations strictly.)

Values.

Values.	
	Draw with shading :
100	(1.) An arm chair.
200	(2.) A horse's head.
200	(3.) A canoe.
200	(4.) An obelisk.
200	(5.) A tree.
1000	

APPENDIX No 14.

ROYAL MILITARY COLLEGE OF CANADA.

ANNUAL REPORT.

From Commandant, Royal Military College, to Lieut.-General Sir E. Selby-Smyth, K.C.M.G., President Royal Military College, and Commanding Militia, Dominion of Canada.

KINGSTON, 14th December, 1878.

SIR,—I have the honor to submit the following Report of the Royal Military College of Canada for 1878 :—

Terms and Classes, Details of.

2. The Spring Term, 1878, commenced on the 4th February, with four classes, entitled 5th, 6th, 7th and 8th, containing, respectively, 13, 11, 10 and 10 cadets; and the Autumn Term on 5th September, with five classes, 4th, 5th, 6th, 7th and 8th, containing 12, 8, 9, 14, 14 Cadets. The next term will commence on the 3rd of February, 1879, with six classes—3rd, 4th, 5th, 6th, 7th and 8th, the numbers in each of which will be determined by the result of the winter (January, 1879) semi-annual examination, and of the work and periodical examinations during the current term.

Appendices, subjects therein referred to.

3. Detailed information on various subjects is given in the Appendices.

Appendix A is a list of the Cadets who have joined the Royal Military College during the present year, and shows the establishments in which they had been previously educated.

Appendix B is a list of the Cadets to whom promotion, prizes or honorary distinctions have been awarded in 1878.

Appendices C1, C2, C3, C4, give full detail information of the (June, 1878) semi-annual examination, and of the work and preceding periodical examinations, of the Spring Term, and

Appendix D embodies the reports of the Examiners on the June 1878 examination.

Appendix E shows the Cadets arranged according to their present classes, and the relative position in those classes.

Appendix F is a complete list of the Cadets on the College Rollster at the present date, with detail information relative to each.

Appendices G 1, G 2, G 3, &c., &c., are the examination papers (German excepted) of the 4th (present highest) class for the winter half-yearly examination, 1878-79. The cadets of this class have three more terms before completing their full course of instruction.

Probable number of Cadets on College Roll, commencement of next Term.

4. The gentlemen who may be successful among the candidates who present themselves for the competitive examination for admission to the Royal Military College to be held during the present month (December, 1878), will receive orders to join at the commencement of next term, viz: 3rd February, 1879, when the total number of Cadets on the College Roll will probably be from 70 to 75.

The number of Cadets will be increased by semi-annual examinations until the full strength, viz: about 120 is attained, when there will be eight classes corresponding to the eight terms of the full course of instruction.

Instruction during Year—Theoretical Subjects.

5. The subject of theoretical instruction of the several classes, have, in accordance with Regulations, been as follows:—

8TH CLASS.

Mathematics.	French.
Geometrical Drawing.	

7TH CLASS.

Mathematics.	Fortification.
French.	Military Topography and Civil Surveying.
Geometrical Drawing.	German.

6TH CLASS.

Mathematics.	Military Topography and Civil Surveying.
French.	German.
Descriptive Geometry.	Military Administration.
Fortification.	
Artillery (Theory and Construction of)	

5TH CLASS.

Mathematics.	Artillery (Theory and Construction of.)
French.	Military Topography and Civil Surveying.
Descriptive Geometry.	German.
Fortification.	Military Administration and Law.
Tactics.	

4TH CLASS.

Mathematics.	Military Topography and Civil Surveying.
French.	German.
Descriptive Geometry.	Military Administration and Law.
Fortification.	Reconnaissance.
Strategy and Tactics.	
Artillery (Theory and Construction of.)	

Progress of Cadets—Result of Class work and Examinations.

6. The class work during the year demonstrates increased application to study and considerable improvement in the rate of progress, on the part of the cadets, and the general result of the several examinations held in the Spring term affords a distinct advance on those of previous terms.

7. The general knowledge of the Cadets who joined during 1878, as exhibited by examination after joining the College, is above the average of the Cadets of previous batches. This is gratifying, as tending to show that the educational establishments of the country are preparing their pupils for admission to the Royal Military College.

“Earl of Dufferin” Medal 1878.—Successful competitor for.

8. I have pleasure in recording the name of No. 13, Sergeant Aylesworth Bowen Perry, as the winner of the “Earl of Dufferin” medal for 1878, and also of the names of the three Cadets next in order of merit.

	Marks.
1st. Sergeant A. B. Perry.....	10,556 (medal.)
2nd. Sergeant D. McPherson	9,840
3rd. Corporal J. Spelman	9,677
4th. Sergeant A. Wartele.....	9,436

This medal is awarded to the Cadet who has obtained the greatest number of marks for theoretical and practical subjects of instruction, and for conduct, from the date of his joining the Royal Military College to the date of presentation.

The winner of the Earl of Dufferin medal for 1878, is, in the highest degree, deserving of the distinction he has attained, alike by conduct, military efficiency, and intellectual and physical qualifications.

Art models, receipt of,

9. A carefully selected and valuable collection of casts and models (some of life size) of celebrated ancient and modern examples of figures, architecture, ornament, and design, have been received, and will afford facilities for the study of high art when circumstances admit of its being commenced.

Requirements to complete the specified course of Education—Theoretical Subjects.

10. By regulation approved in Council, the whole of the classes should have received instruction in *Freehand drawing and painting* since January 1878, and the 4th class in *Civil Engineering, Chemistry, Electricity and Geology* since September 1878, but in default of instructors for these subjects, it has not been practicable to carry out the prescribed course. I beg most strongly to urge that provision may be made, by appointment of professors for these branches, for commencing those subjects next term, viz., February, 1878.

11. The want of instruction in freehand drawing especially, has already injuriously affected both the progress of the cadets and the general curriculum of study.

12. The general course of education is so arranged that proficiency attained in some one subject, may, at the proper time and point, prepare for, and assist in, the study of some other subject; indeed a certain amount of knowledge in one branch is not unfrequently *indispensable* for the prosecution of another. I may add that the cadets themselves are fully alive to this fact, and are keenly anxious to possess the facilities for learning subjects which they are conscious that they are now sufficiently advanced in education to undertake with profit, and the facilities for which they, with justice, fully expected to be accorded to them.

13. The importance, both to the country and to the individual, that the subjects alluded to in paragraph 10 should be studied as originally intended, and that they should be taught by highly qualified and thoroughly capable men, cannot be questioned.

14. The number of cadets is now such that it is not possible for one professor to pretend to give, without an assistant, adequate and personal instruction in any of the branches of instruction, still less for him to attempt to teach more than one subject.

The Professors feel and represent to me, that, in spite of their strenuous efforts, the inability to give sufficient attention to each Cadet individually, is becoming a very serious evil, and I entirely endorse their opinion. I respectfully submit that this matter may receive early consideration and remedy, as being one in which the interests of the country and cadets are equally concerned.

Instruction during year—Practical Subjects.

15. The Cadets of 1st, 2nd, 3rd, 4th and 5th terms have been practised in Infantry drills, gymnastics, swimming, &c.; and those of the 2nd, 3rd, 4th, 5th terms in Garrison and Field Artillery drills and exercises in addition.

16. The Cadets have gone through a systematic course of rifle (Martini-Henri) instruction with target practice, and also of Artillery target practice with common and shrapnel from 9-pounder M.L.R. Gun.

The average obtained by the Cadets in rifle practice was extremely good, and the Artillery practice was fully equal to the average of perfectly trained gunners.

17. A regular guard of Cadets (those in their first term excepted) has been mounted twice a week, and the duty has been performed steadily and satisfactorily.

18. The services of a sergeant instructor in gymnastics, swordmanship, fencing, &c., has proved of substantial advantage, and the Cadets now enjoy every facility for the cultivation of their physical powers and of acquiring readiness of hand and eye, under skilled supervision, and therefore without danger of accident.

19. A full Battery of four 6-pounder smooth-bore field guns has been received. These guns, on account of their comparatively light weight, are better fitted than the 9-pounder M.L.R. guns for the Cadets to practice field movements with hand drag ropes in place of horse draught.

These guns are used only for field manœuvres, but not for other drills or target practice.

Requirements to complete the specified course of Education—Practical Subjects.

20. Instruction and practice in equitation should, in accordance with Regulations of Council, have been commenced last September, but no horses have as yet been made available for this service.

An officer who cannot ride is useless on the staff, or for any mounted corps or duty; every officer is likely to be called upon to perform mounted duty, while all should aspire to staff employ.

A man seldom becomes even a moderate horseman unless he learns riding during his youth.

21. The addition of about 15 horses to the Kingston “A” Battery, School of Gunnery, would render it an effective Field Battery (which, for want of horses it is not at present) and at the same time enable it to provide the necessary facilities for the practice of equitation by the Cadets of the Military College. This addition of horses would also probably suffice to enable a limited number of Cavalry officers and non-commissioned officers to be attached to “A” Battery, for the purpose of going through a much needed course of riding.

22. At all military educational Institutions similar to the Royal Military College there is always a detachment of regular soldiers who perform certain necessary duties far more economically and satisfactorily than civilians, and by a very small increase to “A” Battery, the latter might afford similar assistance to the College,

while having the men available for recall to their Battery as gunners, for any emergency.

23. The prescribed course of military drills and exercises is designed to culminate with practical exercises in Military Engineering. It is to be regretted that the absence of the necessary facilities prevented this instruction from being commenced last September, and I beg to urge that provision be made at the earliest possible date to render the ultimate completion of the intended course feasible.

Conduct of Cadets.

24. The general conduct of the Cadets, and the performance of their duty by the non-commissioned officers has been thoroughly satisfactory.

Sanitary Condition of College.

25. The health of the cadets has been good, but the sanitary condition of the College as a whole, will not be such as it ought to be, or be free from danger until the water supply is completed for the whole establishment, staff and cadets.

Works and Buildings required to Complete.

26. It is necessary that immediate steps be taken to commence the west wing barrack block, as contemplated, as there is no permanent dormitory accommodation available for future Cadets, and without the early completion of this work, the development of the College will be entirely stopped.

27. Drill sheds and riding schools are equally obvious necessities, as there is at present no cover whatever for military exercises during winter, or inclement weather, and much valuable time must consequently be lost.

28. The provision of quarters for the Commandant and certain of the staff, is very much needed, and presses for action, not only on account of the peculiar site of the College and its distance from Kingston, but as a matter which is intimately connected with the proper discipline and welfare of the Institution.

Presentations to College.

29. The Intelligence Department of the Imperial War Office has presented to the College many valuable publications and maps, and similar information will hereafter be regularly forwarded. The Royal United Service Institution, the Institutes of the Royal Artillery and of the Royal Engineers, also now present regularly to the Royal Military College their valuable periodical publications. These presentations afford agreeable evidence of the public position which the College is rapidly attaining, and of the estimate in which it is held, and interest taken in it by the great Military Institutions of Great Britain.

Royal Military College of Canada—Conferment of Designation of.

30. The honorable distinction which has been recently granted to the College by the conferring upon it of the designation "Royal Military College of Canada," forms a step in the history of the institution

It is especially gratifying as an evidence that the military spirit, high tone, conduct and ability of the gentlemen cadets has not passed unnoticed, but has been considered to merit for the College the same title which the old Military Schools of Great Britain are justly proud to bear; and it thus draws nearer and forms another bond of comradeship between the Militia of Canada and the other military forces of Her Majesty.

Future Organization.

31. The organization recommended in paragraph 19 of my last annual report, viz.: the distribution of the Cadets into separate divisions has been partially carried out. The Cadets are now organized in separate companies, complete in every respect except officers, and the result so far, has been thoroughly satisfactory, but the principle advantage, viz.,—the more intimate relationship of staff and cadets cannot be developed until officers are attached.

I greatly regret that the addition of this keystone of the system has not yet been made, but I trust that the necessary facilities for an arrangement, which is not only the best, but also the most economical organization practicably, will not longer be postponed.

Value to country as providing scientific gentlemen, and also an effective armed force.

32. In estimating the value of the Royal Military College of Canada, in comparison with the cost of its maintenance, the double aspect of the Institution should be borne in mind.

First.—It provides a body of young men carefully and highly trained, intellectually and physically, not only with such military education and habits of order, obedience and command (due to strict discipline) as is requisite to qualify them to become thoroughly practical and scientific officers, but also, by the breadth and general scope of the curriculum of study, to fit them equally for any civil business or profession, public or private.

Secondly.—The College will, when complete, always have available and ready to turn out at a moment's notice sufficient Cadets (after excluding all under 18 years of age) to form two companies or batteries as efficient for actual field service either as Infantry or Artillery, as any troops of from over one to not less than four years enlistment, existing, whether as regards discipline, drill, or equipment, and far superior to ordinary Regiments in intelligence and general aptitude.

33. Field service for the gentlemen Cadets as a body is not the primary object of the institution of the Military College of Canada, but the capacity for it is an important fact the result of its existence and of the manner in which it has been organized, and one by no means to be ignored in a country which otherwise possesses but three hundred thoroughly trained and permanently enrolled soldiers ("A" and "B" Batteries Canadian Artillery), if only as furnishing an available disciplined armed force, ready at a moment's notice to temporarily relieve these troops in the charge of forts and stores and free them for support of the civil power, or action elsewhere.

Gentlemen Cadets—Fitness for Employment.

34. Many of the Cadets have now been at the Royal Military College for nearly three years, and I am happy to report my increased confidence that the country may unhesitatingly rely on the ability and fitness of the majority of them, when they have completed their full course, viz., June 1880, to afford her high and excellent service in whatever position she may demand it from them.

Staff—Performance of Duty by.

35. I beg to call your attention to the undiminished zeal, ability and good will with which the staff, generally, have continued to assist me in the unremitting and increasing labors which the circumstances of the College have demanded from them.

The tax upon the powers of some has been, and is greater than it should be, and it is for me equally a pleasure to acknowledge my personal indebtedness to them, and a duty to record the good and conscientious service which they have given to Canada.

Military Colleges—Influence of.

36. There are few countries whose national history has not been affected to an important degree by their Military Colleges, either as complete organizations, or by their Cadets individually, and in a country, young, but rapidly increasing in power and aspirations, such as Canada; the influence of her Military College cannot be other than especially great and beneficial.

The Royal Military College of Canada is the only Institution in which her sons are brought together under *Dominion* auspices from all her widely parted Provinces, with their more or less divergent interests and blood.

The ties of comradeship springing from daily intercourse and common pursuits during four years of the most impressionable period of life, cannot fail to create in the Cadets, a strong national instinct rising above Provincialism, while, from the associations of the Institution, the appreciation of the even greater citizenship of the British Empire is strengthened.

High standard required, and facilities necessary to realize it.

37. High excellence in anything cannot be obtained without reasonable and adequate expenditure; and half measures and *true* economy are at all times incompatible. This is peculiarly the case in Educational Institutions, which, if the means to sustain them in vigorous life, are wanting; very easily, indeed necessarily, degenerate into unrealities.

38. The increased facilities for imparting instruction referred to in this report as necessary to provide the more than ordinarily comprehensive course of education which the present circumstances of Canada imperatively demand from her Military College, are far *less* than those given to the kindred institutions of any other country, and so long as this is the case the demand cannot be excessive or extravagant.

39. In now submitting the outline requirements of the future, as in guiding the past, of the College. I have assumed that nothing less than high excellence is desired or will be tolerated.

I have the honor to be, Sir,

Your obedient servant,

E. O. HEWETT, Lieut.-Colonel, R.E.,
Commandant, Royal Military College.

APPENDIX A.—ROYAL MILITARY COLLEGE OF CANADA.

NOMINAL ROLL of Cadets who have joined the College during 1878.

Names.	Age on joining.		Date of joining.	Marks obtained at Entrance Examination.	Where Educated.	Remarks.
	Yrs.	Mos.				
			1878,			
Huntley Brodie Mackay..	19	10	February .	8,200	High School, Montreal, Que.	
Henry Hunt Hogan.....	15	4	do ...	4,643	Collegiate School, Montreal, Que.	
Robert Cartwright	17	3	do ...	4,613	F. W. Barron, Gore's Landing, Ont.	
Burton Wynn Yates.....	18	5	do ...	3,881	"The Wick," Brighton, Sussex, Eng.	
James William Sears.....	17	1	do ...	3,246	Grammar School, St. John, N B.	
Wm. John McElbinney...	15	5	do ...	3,100	High School, Brockville, Ont.	
Graeme Sym Duffus . . .	15	5	September	9,645	Murchison Castle, Edinburgh, Scotl'd.	
Edward Thornton Taylor	20	0	do ...	7,858	High School, Montreal, and McGill University.	
Ernest Fredk. Würtele....	18	7	do ...	3,192	Collegiate Institute, Galt, Ont.	
Arthur Edward Hodgins..	17	6	do ...	3,189	Upper Canada College, Toronto, Ont.	
Alex. King Kirkpatrick..	17	5	do ...	2,996	Collegiate School, Kingston, Ont.	
Fred Hamilton Powell....	15	6	do ...	2,478	Collegiate Institute, Ottawa, Ont.	
Ralph Dinkins Avery.....	18	3	do ...	2,330	Grammar School, Niagara, Ont.	
George Mowat Duff.....	15	10	do ...	2,277	Collegiate School, Kingston, Ont.	
William George Stairs ...	15	3	do ...	2,132	Murchison Castle, Edinburgh, Scotl'd.	
Herbert Clarke	17	8	do ...	2,075	Grammar School, Prescott, Ont.	
Walter Goldsbury Jones..	16	1	do ...	2,048	Murchison Castle, Edinburgh, Scotl'd.	
Fredk. Chas. Anderson...	17	3	do ...	1,977	F. W. Barron, Gore's Landing, Ont.	
Sidney Francis Gordon...	18	0	do ...	1,840	Collegiate School, Kingston, Ont.	
Henry Smith Greenwood	17	4	do ...	1,711	Edinburgh School, Kingston, Ont.	

E. O. HEWETT, Lieut.-Colonel,

Commandant, Royal Military College

December 14th, 1878.

ROYAL MILITARY COLLEGE OF CANADA.

RETURN of Cadets who have been Promoted or have received Prizes and Honorary Distinction during the Year 1878.

Rank.	Names.	Class.	Date of Award.	Subject of Award.	Nature of Distinction.	Remarks.
Cadet.....	Bridges, W. O.....	VII	1878. June.....	1st Military Topography and Civil Surveying. 1st Geometrical Drawing.....	Badge (1 star). Class prize.	"The Earl of Dufferin's Medal" is awarded to the Cadet who has obtained the greatest number of marks for intellectual and physical qualities and conduct from the date of his joining the Royal Military College to the date of award.
Cadet.....	Campbell, H. M. {	VII	June.....	1st Mathematics. 1st French. 1st German. 1st Fortification.....	Badge (3 stars). Promoted Lance-Corporal. Badge (Cross-rifles on both arms). Class prize.	
Lance-Corpl.	Cochrane, J. B. {	V	January.....	Best shot, rifle (Henri-Martini).....	Promoted Lance-Corporal.	
Cadet.....	Coryell, J. A.....	VII	January.....	1st Mathematics.....	Badge (1 star). Promoted Lance-Corporal.	
Lance-Corpl.	Davis, F.....	VI	do.....	.....	Promoted Corporal.	
Corporal.....	Davis, W. M. {	V	June.....	.....	Promoted Corporal.	
Lance-Corpl.	Denison, S. J.....	VI	January.....	1st German.....	Promoted Lance-Corporal.	
Cadet.....	Drury, E. H.....	VII	January.....	1st Military Topography and Civil Surveying. 1st Geometrical Drawing.....	Promoted Lance-Corporal. 1st prize, Military Topography. 1st Geometrical Drawing.	"The Class Prize" is awarded to the Cadet who having qualified in all subjects obtains the greatest aggregate number of marks in his class at the examination.
Sergeant.....	DesBrisay, C.....	V	October.....	Marksman, Artillery (9-pounder M.L.R.).....	Badge (Cross-gun on one arm). Promoted Sergeant.	
Corporal.....	Fairbank, C. O. {	V	January.....	.....	Promoted Corporal.	
Company Sgt.-Maj.	Freer, H. C.....	IV	June.....	Marksman, Rifle (Henri-Martini).....	Badge (Cross-rifles on one arm). Promoted Sergeant.	
Cadet.....	Graham, J. W.....	VIII	September.....	.....	Promoted Comp'y. Sergeant-Major.	"Badges" of honorable distinction are awarded as follows: and are worn till the date of the next.
Battalion Sgt.-Maj.	Irving, L. H. {	VII	January.....	Marksman, Rifle (Henri-Martini).....	Promoted Comp'y. Sergeant-Major.	
		IV	June.....	1st German. 1st Fortification and Geometrical Drawing (combined).....	1st prize, German. 1st Fortification and Geometrical Drawing (combined). Badge (1 star). Promoted Battal'n. Sergeant-Major.	
		VI	do.....	.....	
		VI	September.....	.....	

Company Sgt.-Maj.	Keefe, H. W. {	IV	September.....	.....	Promoted Company Sgt.-Major.	"Stars" to the Cadet in each class who in any term has obtained the greatest number of marks in his class, and also any Cadet in each class who is first in any two or more branches of study.
		IV	October.....	Marksman, Artillery (9-pounder M.L.R.).....	Badge (Cross-gun on one arm). Class prize.	
Cadet.....	Laurie, R. E. {	VI	June.....	1st Mathematics. 1st Artillery.....	Badge (2 stars). do (Cross-gun on one arm). Class prize.	
Cadet.....	Mackay, H. B.....	V	October.....	Marksman, Artillery (9-pounder M.L.R.).....	do (Cross-gun on one arm). Class prize.	
Sergeant.....	McPherson, D.....	IV	June.....	1st Mathematics. 1st Geometrical Drawing.....	Badge (2 stars). Promoted Sergeant.	
Cadet.....	Perley, G. E.....	VI	September.....	Best shot, Artillery (9-pounder M.L.R.).....	Badge (Cross-guns on both arms). Class prize.	
		VI	do.....	1st Mathematics. 1st German. 1st Artillery.....	1st prize, Mathematics. 1st prize, German. Badge (3 stars). Earl of Dufferin's Medal, 1878.	
Sergeant.....	Perry, A. B. {	VI	January.....	1st Military Administration and Law. For most proficient Cadet at the Royal Military College.....	Class prize. 1st prize, Strategy and Tactics, Military Administration and Law (combined). 1st prize, Fortification.	"Crossed Rifles and Crossed Guns" are awarded to Cadets who are eminent in their skill in rifle shooting and artillery practice, respectively.
		V	June.....	1st Mathematics. 1st Fortification.....	1st prize, Strategy and Tactics, Military Administration and Law (combined). Promoted Sergeant.	
Corporal.....	Rivers, V. B.....	IV	September.....	.....	Badge (Cross-guns on one arm). Promoted Corporal.	
Lance-Corpl.	Ross, A. B.....	IV	October.....	Marksman, Artillery (9-pounder M.L.R.).....	Badge (Cross-gun on one arm). Promoted Corporal.	
Cadet.....	Shanley, C. W. {	V	January.....	1st Fortification. 1st Military Topography and Civil Surveying. 1st Descriptive Geometry.....	Class prize. Badge (1 star). Badge (Cross-rifles on one arm). Promoted Lance-Corporal.	
Corporal.....	Spelman, J.....	VII	June.....	Marksman, Rifle (Henri-Martini).....	Badge (Cross-rifles on one arm). Promoted Lance-Corporal.	
		VI	January.....	Marksman, Rifle (Henri-Martini).....	1st prize, Descriptive Geometry. Badge (1 star). Promoted Corporal.	
Sergeant.....	Wartele, A. G. G. {	VI	June.....	1st Descriptive Geometry. 1st Artillery.....	1st prize, Artillery. Promoted Sergeant.	
		V	January.....	1st Military Topography and Civil Surveying.....	1st prize, Military Topography and Civil Surveying (combined). 1st prize, Descriptive Geometry. Badge (1 star).	

E. O. HEWETT, Lieut.-Colonel,
Commandant, Royal Military College.

KINGSTON, 14th December, 1878.

APPEN

ROYAL MILITARY COLLEGE of Canada.—Examination Return, Fifth

NOTE.—All marks obtained, whether

Term.	Class.	Order in Class before Examination.	NAMES IN ALPHABETICAL ORDER.	OBLIGATORY.													Totals.			
				Mathematics.	Fortification.	Artillery.	Military History, Strategy and Tactics, and Administration and Law.	Military Topography and Surveying.	French.	German.	Chemistry.	Electricity.	Geology.	Freehand Drawing and Painting.	Geometrical Drawing and Descriptive Geometry.	Drills.		Gymnastics.	Swimming.	N.-C. Officers and Cadets.	Conduct.
			Maximum marks allotted	1100	400	400	1,400	350	200	200					300	100	50	10	300	4,610
			Minimum marks allowed to count	550	200	200	700	175	66	66					100		80		100	
4th Term.	5th Class.		12 Cochrane, J.....	596	306	296	872	223	97						263	63	25	10	299	2,934
			9 Davis, W	720	256	256	1,185	202	181						178	75	25	10	300	3,388
			8 DesBrisay, C.....	625	307	273	1,024	254	101						196	63	25	10	300	3,173
			13 Dixon, F.....	{ (a) 502	{ (b) 103	239	1,221	175	77						109	63	25	10	300	393
				502	103	239	1,221	175	77						109					2,219
			10 Fairbank, C.....	673	283	347	1,053	232	87						215	100	38	10	300	3,340
			6 Freer, H	762	255	204	1,125	183	183						179	100	38	10	296	3,337
			5 Keefer, H	715	255	256	1,014	204		93					190	100	25	10	300	3,164
			2 McPherson, D.....	833	331	326	1,304	250		131					228	100	25	10	299	3,837
			1 Perry, A	983	342	326	1,286	250	127						228	100	38	10	297	3,987
			11 Rivers, V.....	566	297	331	1,066	210	120						188	100	38	10	299	3,225
			3 Spelman, J.....	927	335	369	1,141	275	83						249	88	25	10	285	3,778
			7 Wise, H.....	760	275	256	1,183	257	164						199	100	25	10	300	3,529
			4 Würtele, A.....	715	301	346	1,091	320		90					248	63	25	10	300	3,509

(a) Allowed to count (b) Not allowed to count.

KINGSTON, 20th June, 1878.

DIX—C. (I).

Class—COMBINED SUBJECTS—from 4th February to 20th June, 1878.

allowed to count or not, are entered.

Term.	Class.	Order in Class before Examination.	NAMES IN ALPHABETICAL ORDER.	VOLUNTARY.													Totals.	OBLIGATORY AND VOLUNTARY.	REMARKS.							
				Mathematics.	Geometrical Drawing and Fortification.	Artillery.	Military History, Strategy and Tactics, and Administration and Law.	Military Topography and Surveying.	French.	German.	Chemistry.	Electricity.	Geology.	Freehand Drawing and Painting.	Civil Engineering.	Geometrical Drawing and Descriptive Geometry.				N.-C. Officers only eligible.	Discipline.					
			Maximum marks allotted	600	200										200					300	50	1,350	5,960			
			Minimum marks allowed to count												66							8				
			12 Cochrane, J.....																			25	37	3,021	12	
			9 Davis, W													133					27	38	280	3,668	6	1st German.
			8 DesBrisay, C.....													101					45	442	3,620	7		
			13 Dixon, F.....																			25	423	2,244	13	Not qualified, Mathematics and Fortification.
			10 Fairbank, C.....																		36	38	130	3,470	10	
			6 Freer, H													90					24	45	273	3,610	8	1st French.
			5 Keefer, H													143					40	45	399	3,563	9	
			2 McPherson, D.....													137					201	38	889	4,726	2	1st Strategy, Tactics and Military Administration and Law, combined.
			1 Perry, A																		38	1,051	5,038	1	1st in Class; 1st Mathematics; 1st Fortification.	
			11 Rivers, V.....																		38	92	3,317	11		
			3 Spelman, J.....																		195	38	830	4,608	3	1st Artillery.
			7 Wise, H.....													98					50	38	390	3,919	5	
			4 Würtele, A.....													142					265	43	749	4,258	4	1st Military Topography and Civil Surveying; 1st Descriptive Geometry.

E. O. HEWETT, Lieut-Colonel, Commandant, Royal Military College.

APPEN

ROYAL MILITARY COLLEGE of Canada.—Examination Return, **Seventh**

NOTE.—All marks obtained, whether

Term.	Class.	Order in Class before Examination.	NAMES IN ALPHABETICAL ORDER.	OBLIGATORY.																	
				A	A	A	A	A	B	B	B	B	A	B							
				Mathematics.	Fortification.	Artillery.	Military History, Strategy and Tactics, and Administration and Law.	Military Topography and Surveying.	French.	German.	Chemistry.	Electricity.	Geology.	Freehand Drawing and Painting.	Geometrical Drawing and Descriptive Geometry.	Drills.	Gymnastics.	Swimming.	N. C. Officers and Cadets.	Conduct.	Totals.
			Maximum marks allotted.....	800	300	.....	.....	150	100	.....	.....	.....	.....	150	50 or 100.	30 or 40 or 50.	10	300	.....	1,960
			Minimum marks allowed to count....	400	150	.....	.....	75	33	.....	.....	.....	.....	50	30 or 50 or 80.	.....	.....	100	.....	.....
3	7	3	Bridges, W.....	497	209	.....	.....	128	56	.....	.....	.....	.....	113	63	20	10	206	.....	1,382
3	7	4	Campbell, H.....	657	224	.....	.....	125	70	.....	.....	.....	.....	114	88	15	10	299	.....	1,612
3	7	1	Coryell, J.....	611	200	.....	.....	96	60	.....	.....	.....	.....	111	50	20	10	288	.....	1,446
2	7	10	Daniel, A.....	{ (a) 296	{ (b) 193	.....	.....	97	43	.....	.....	.....	.....	93	100	22	5	299	.....	426
																					852
2	7	8	Ford, E.....	{ (a) 429	{ (b) 71	.....	.....	75	42	.....	.....	.....	.....	79	50	15	10	271	.....	346
																					971

(a) Allowed to count. (b) Not allowed to count.

DIX—C. (3)

Class.—COMBINED SUBJECTS.—From 4th February to 20th June, 1878.
allowed to count or not, are entered.

Term.	Class.	Order in Class before Examination.	NAMES IN ALPHABETICAL ORDER.	VOLUNTARY.												OBLIGATORY AND VOLUNTARY.	REMARKS.						
				A	A	A	A	A	B	B	B	B	A	B									
				Mathematics.	Geometrical Drawing and Fortification.	Artillery.	Military History, Strategy and Tactics, and Administration and Law.	Military Topography and Surveying.	French.	German.	Chemistry.	Electricity.	Geology.	Freehand Drawing and Painting.	Civil Engineering.	Geometrical Drawing and Descriptive Geometry.	N. C. Officers only eligible.	Discipline.	Totals.	GRAND TOTALS.	Order in Class after Examination.		
			Maximum marks allotted.....	300	.....	.....	.....	.....	100	.....	.....	.....	.....	.....	.....	100	.....	.....	500	2,460	.....	
			Minimum marks allowed to count....	.....	.....	.....	.....	.....	33	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3	7	3	Bridges, W.....	.....	.....	.....	.....	.....	56	.....	.....	.....	.....	.....	65	.....	.....	.....	121	1,503	4
																						{ 1st Military Topography and Civil Surveying. 1st Geometrical Drawing.	
3	7	4	Campbell, H.....	.....	.....	.....	.....	.....	79	.....	.....	.....	.....	.....	60	.....	.....	.....	350	1,962	1
																						{ 1st in Class. 1st Mathematics. 1st Fortification. 1st French. 1st German.	
3	7	1	Coryell, J.....	.....	.....	.....	.....	.....	54	.....	.....	.....	.....	.....	27	.....	.....	.....	228	1,674	2
2	7	10	Daniel, A.....	{ (a) 296	{ (b) 193	97	43	93	100	22	5	299	426		
2	7	8	Ford, E.....	{ (a) 429	{ (b) 71	75	42	79	50	15	10	271	346		
																							{ Not qualified, Mathematics.
																							{ Not qualified, Fortification.

APPEN

ROYAL MILITARY COLLEGE of Canada.—Examination Return, **Eighth**

NOTE.—All marks obtained, whether

Term.	Class.	Order in Class before Examination.	NAMES IN ALPHABETICAL ORDER.	OBLIGATORY.											Totals.							
				A	A	A	A	A	B	B	B	B	A	B								
				Mathematics.	Fortification.	Artillery.	Military History, Strategy and Tactics, and Administration and Law.	Military Topography and Surveying.	French.	German.	Chemistry. Electricity. Geology.	One of these Languages.	Any one of these Experimental and Physical Sciences.	Freehand Drawing and Painting.	Geometrical Drawing and Descriptive Geometry.	Drills.	Gymnastics.	Swimming.	N.-C. Officers and Cadets.	Conduct.	Drills and Exercises.	
				Maximum marks allotted.....	700				100					100		50	10	300			1,290	
				Minimum marks allowed to count....	350				33					33		40 or 45.		100				
1	8	7	Cartwright, R. { (a) (b)	416					51					54	13	10	10	284			838	
2	8	2	Drury, E.	354					36					70	63	8	10	300			841	
2	8	3	*Graham, W ... { (a) (b)	272					37					71	50	15	5	292			470	
1	8	6	Hogan, H..... { (a) (b)	433					68					61	25	10	10	299			906	
2	8	4	Hubbell, E.....	362					37					67	100	22	10	256			854	
2	8	1	*Kent, R..... { (a) (b)	292					31					66	88	15	10	270			841	
1	8	5	Mackay, H.....	676					85					88	38	10	8	300			1,205	

(a) Allowed to count. (b) Not allowed to count.

DIX—C. (4).

Class.—COMBINED SUBJECTS.—From 4th February to 20th June, 1878.

allowed to count or not, are entered.

Term.	Class.	Order in Class before Examination.	NAMES IN ALPHABETICAL ORDER.	VOLUNTARY.											Totals.	OBLIGATORY AND VOLUNTARY.	REMARKS.						
				A	A	A	A	A	B	B	B	B	A	B									
				Mathematics.	Geometrical Drawing and Fortification.	Artillery.	Military History, Strategy and Tactics, and Administration and Law.	Military Topography and Surveying.	French.	German.	Chemistry. Electricity. Geology.	One of these Languages.	Any one of these Experimental and Physical Sciences.	Freehand Drawing and Painting.	Civil Engineering.	Geometrical Drawing and Descriptive Geometry.	N.-C. Officers only eligible.	Discipline.					
				Maximum marks allotted.....	100																	200	1,490
				Minimum marks allowed to count....	33																		
1	8	7	Cartwright, R. { (a) (b)	416					51					54	13	10	10	284			37	875	7
2	8	2	Drury, E.	354					36					70	63	8	10	300					
2	8	3	*Graham, W ... { (a) (b)	272					37					71	50	15	5	292					
1	8	6	Hogan, H..... { (a) (b)	433					68					61	25	10	10	299					
2	8	4	Hubbell, E.....	362					37					67	100	22	10	256					
2	8	1	*Kent, R..... { (a) (b)	292					31					66	88	15	10	270					
1	8	5	Mackay, H.....	676					85					88	38	10	8	300					

If not qualified, Subjects to be specified.
If 1st in Class or in any Subject, the same to be specified.

841 8 † Equal.
470 10 } Not qualified, Mathematics.
906 5 * These Cadets, although not qualified respectively in Mathematics and French, are, under special circumstances, permitted to count marks in the subjects they did qualify in.
890 6
841 8 † Equal. Not qualified, French.
1st in Class.
1st Mathematics.
1st French.
1st Geometrical Drawing.

APPENDIX D.

ROYAL MILITARY COLLEGE OF CANADA

REPORT of Examiners on June, 1878, Half yearly Examination :—

Military Topography and Surveying.

The papers of each of the three classes (5th, 6th, 7th) examined are of very unequal merit, and the progress shewn is not on the whole as satisfactory as could be hoped and might be expected; some of the Cadets, however, show considerable facility for mapping ground and depicting hill slopes. Cadets Würtele in the 5th class, Bridges and Campbell in the 7th, passed particularly good examinations.

Theory of Artillery.

Each of the classes (5th and 6th) examined submitted very good papers, though some Cadets displayed a great want of common sense.

For further instruction in theory and construction in artillery, proper models and diagrams to supplement book work are much needed.

Strategy and Tactics, Military Administration and Law.

Most of the papers in these subjects are well worked, and give satisfactory proof of attention to lectures, notes and text books.

The questions in strategy were particularly well answered, especially by Cadets Wise, Perry and DesBrisay.

Modern Languages.

The progress of the Cadets in the study of modern languages (both French and German) has been on the whole, satisfactory; but the extremely limited knowledge of languages possessed by the Cadets on joining is a serious drawback throughout this course, and I think it very desirable that the standard of the entrance examination in these subjects should be raised as soon as practicable.

*Mathematics.**5th Class.*

This class proved to be a very good one; nine Cadets have taken up voluntary work in addition to obligatory.

There is only one failure in the higher branches, and the Cadet who has failed in these has sent in an extremely good paper in the lower branches.

6th Class.

The obligatory work of a few Cadets of this class is good, but sufficient pains have not been taken, even by the best, to get up their voluntary work.

Cadet Laurie has done remarkably well in obligatory subjects.

Cadet Van Straubenzee exhibits, proportionately, the most decided advance in this class, as although belonging to a junior batch, he has passed some of older standing at the College who were decidedly superior to him at the commencement of this term.

7th Class.

This class does not show any remarkable ability, and Cadets Campbell and Coryell alone can be said to have distinguished themselves.

8th Class.

The examination of the whole of the Cadets who have been only one term in this class has been very satisfactory.

The general result of the examination in the 5th and 8th classes has been very satisfactory, that of the 6th and 7th not satisfactory. The insufficient grounding of the Cadets in Euclid, before joining the Royal Military College, still holds them back, every failure being due more or less to this cause; but I also regret that for want of proper assistance I have not been able to devote that attention to each individual Cadet which I was able to give when they were fewer in numbers.

*Fortification.**5th Class.*

The progress made has been very satisfactory, there being only one failure. Corporal Perry and Corporal McPherson have sent in excellent voluntary papers.

6th Class.

This class shews insufficient preparation, and though the papers were not difficult, no Cadet deserves special mention for the answers given.

7th Class.

With the exception of Cadets Bridges and Campbell, who have done very well, the result of the examination in this class is not altogether satisfactory.

*Descriptive Geometry.**5th Class.*

The examination in this subject has been satisfactory, the papers of Sergeant Würtele and Corporal Spelman being especially deserving of notice.

6th Class.

The subject is undoubtedly difficult for beginners, and as it is taken up for the first time in this class, I consider the examination to have been satisfactory, particularly that of Cadet Ross.

Several Cadets rely entirely upon their memory, which, in this subject, must invariably lead them altogether astray, as the work altogether depends upon a thorough comprehension of the principles upon which the constructions are based.

Geometrical Drawing.—7th Class.

The answering in this class was very satisfactory. Cadet Campbell obtained full marks, and Cadet Bridges did very good work.

8th Class.

The work of this class is of an elementary nature, but has been done very well, much better than that of their predecessors; even the most backward of this class shews marked improvement.

APPENDIX E.

ROYAL MILITARY COLLEGE OF CANADA.

Class Roll—Gentlemen Cadets.

I.				II.				
Order of Class Merit.	NAMES. — ALPHABETICALLY.	Rank.	Term. No. of Marks obtained from date of joining to 20th June, 1878.	Order of Class Merit.	NAMES. — ALPHABETICALLY.	Rank.	Term. No. of Marks obtained from date of joining to 20th June, 1878.	
<p>The Cadets of Class II. who qualify at the Winter Examination of 1879 will pass into Class I. at the commencement of the following term, viz.: 4th February, 1880.</p> <p>This will complete the organization of the College with eight classes, corresponding with the eight terms required to complete the full course of study.</p>				<p>The Cadets of Class III. who qualify at the Summer Examination of 1879 will pass into Class II. at the commencement of the following term, viz.: 5th September, 1879.</p>				
III.				IV.				
<p>The Cadets of Class IV. who qualify at the Winter Examination of 1878 will pass into Class III. at the commencement of next term, viz.: 4th February, 1879.</p>				12	Cochrane, J.....	LanceCorp'l	5	6,437
				7	Davis, W.....	Corporal....	5	8,181
				9	DesBrisay, C.....	Sergeant....	5	8,027
				10	Fairbank, C.....	Corporal....	5	7,525
				8	Freer, H.....	Company Sergt-Major	5	8,065
				5	Keefer, H.....	do	5	8,627
				2	Macpherson, D.....	Sergeant....	5	9,9
				1	Perry, A.....	do	5	10,556
				11	Rivers, V.....	Corporal....	5	7,142
				3	Spelman, J.....	do	5	9,643
				6	Wise, H.....	do	5	8,594
				4	Würtele, A.....	do	4	9,436

APPENDIX E.—Continued.

ROYAL MILITARY COLLEGE OF CANADA.

Class Roll—Gentlemen Cadets.—Continued.

V.				VI.					
Order of Class Merit.	NAMES. — ALPHABETICALLY.	Rank.	Term. No. of Marks obtained from date of joining to 20th June, 1878.	Order of Class Merit.	NAMES. — ALPHABETICALLY.	Rank.	Term. No. of Marks obtained from date of joining to 20th June, 1878.		
5	Clarke, G.....	Cadet.....	4	3,953	5	Bridges, W.....	Cadet.....	4	2,512
6	Davis, F.....	LanceCorp'l	5	3,905	2	Campbell, H.....	do	3	2,915
7	Dixon, F.....	do	5	3,731	3	Coryell, J.....	do	4	2,901
8	Doucet, A.....	Cadet.....	4	3,084	7	Dunscomb, W.....	do	4	2,259
2	Gibson, G.....	do	4	4,554	4	Irving, L.....	Battalion Sergt-Major	5	2,781
4	Laurie, R.....	do	4	4,006	9	Perley, G.....	Cadet.....	5	2,027
1	Ross, A.....	LanceCorp'l	4	4,633	1	Reed, T.....	LanceCorp'l	5	2,963
3	VanStraubenzee, A..	Cadet.....	4	4,354	8	Shanly, C.....	Cadet.....	3	2,199
					6	Shaw, G.....	do	3	2,488
VII.				VIII.					
13	Cartwright, R.....	Cadet.....	2	875	12	Anderson, F.....	Cadet.....	1	1,977
5	Daniel, A.....	do	3	1,107	7	Avery, R.....	do	1	2,330
8	Drury, E.....	do	3	1,033	10	Clarke, H.....	do	1	2,075
4	Ford, E.....	do	3	1,107	8	Duff, G.....	do	1	2,277
14	Graham, W.....	do	3	654	1	Duffus, G.....	do	1	9,645
3	Greig, W.....	do	3	1,129	13	Gordon, S.....	do	1	1,840
12	Hogan, H.....	do	2	906	14	Greenwood, H.....	do	1	1,711
6	Hubbell, E.....	do	3	1,071	4	Hodgins, A.....	do	1	3,189
7	Kent, R.....	do	3	1,037	11	Jones, W.....	do	1	2,048
2	Mackay, H.....	do	2	1,293	5	Kirkpatrick, A.....	do	1	2,996
9	McElhinney, W.....	do	2	1,023	6	Powell, F.....	do	1	2,479
1	McVicar, J.....	do	4	1,298	9	Stairs, W.....	do	1	2,132
11	Sears, J.....	do	2	979	2	Taylor, E.....	do	1	7,858
10	Yates, W.....	do	2	1,022	3	Würtele, E.....	do	1	3,192

ROYAL MILITARY COLLEGE OF CANADA.
Detail Roll of Gentlemen Cadets.

Regimental Number.	Names. Alphabetically.	Date of joining.	Age on joining.	Rank and date of appointment to Rank of N.-C. Officers.	Term.	Class.	Marks counted from 20th June, 1878.	Company.	Half company.	Section.	Mess squad.	Number of room.	Number of desk.	Province from which joined.	Remarks.
55	Anderson, F. C.	Sept. 5, '78	17	Cadet	1	VIII		A	R	1	1	2	58	Ontario	
50	Avery, R. D.	do	18	do	1	VIII		B	L	1	4	50	52	do	
25	Bridges, W. O.	April 10, '77	16	do	4	VI	2,512	A	R	1	1	16	30	Quebec	
30	Campbell, H. M.	Sept. 8, '77	16	do	3	VI	2,915	B	L	1	1	44	32	New Brunswick	
41	Cartwright, R.	Feb. 1, '77	17	do	2	VII	875	A	R	1	1	3	40	Ontario	
24	Clark, G. C.	April 2, '77	16	do	4	V	3,953	A	R	1	1	20	19	do	
53	Clarke, H.	Sept. 5, '78	17	do	1	VIII		B	L	1	4	40	47	do	
14	Cochrane, J.	June 1, '76	15	Lance Corporal, Jan. 18, 1878.	5	IV	6,437	B	L	4	4	46	10	do	
28	Coryell, J. A.	April 10, '77	16	Cadet	4	VI	2,901	A	R	1	1	4	24	do	
34	Daniel, A. W.	Sept. 8, '77	16	do	3	VII	1,107	A	R	1	1	4	1	do	
8	Davis, F.	June 1, '76	16	Lance Corporal, Jan. 21, 1878.	5	V	3,905	A	R	4	1	41	37	New Brunswick	
4	Davis, W. M.	do	19	do	5	IV	8,181	B	L	4	4	42	6	do	
9	DesBrisay, O.	do	15	Sergeant, do	5	IV	8,027	B	L	4	4	48	4	do	
15	Dixon, A. E.	Feb. 2, '77	17	Cadet	5	V	3,731	A	R	4	1	6	17	New Brunswick	
21	Doucet, A. E.	Sept. 8, '77	18	do	4	V	3,084	B	L	1	4	57	21	Ontario	
37	Drury, E. H.	do	15	do	3	VIII	1,033	B	L	2	2	28	51	Quebec	
51	Duff, G. M.	do	10	do	4	V		B	L	1	4	37	49	New Brunswick	
58	Dufus, G. M.	do	15	do	1	VIII		B	L	1	1	9	48	do	
12	Duncomb, W. G. B.	April 2, '77	14	do	4	VI	2,259	A	R	2	4	37	49	Nova Scotia	
26	Duncomb, W. G. B.	June 1, '76	17	Corporal, Jan. 2, 1878.	5	IV	7,52	A	R	3	3	23	23	Quebec	
33	Ford, E.	Sept. 8, '77	15	Cadet	3	VII	1,107	A	R	2	2	14	14	Ontario	
19	Gibson, J. G.	June 1, '76	17	Co. Sgt.-Major, Sept. 1, 1878.	5	IV	8,065	B	L	2	5	51	33	do	
2	Freer, H. C.	Feb. 2, '77	17	Cadet	4	V	4,551	B	L	2	2	1	1	do	
56	Gordon, S. F.	Sept. 2, '77	17	do	1	VIII		A	R	2	5	49	20	Quebec	
38	Graham, W. J.	do	19	do	3	VII	651	A	R	2	2	15	45	Ontario	
57	Greenwood, H. S.	do	17	do	1	VIII		A	R	2	2	18	55	do	
32	Greig, W. R.	do	18	do	3	VII	1,129	A	R	2	2	19	24	do	

46	Hodgins, A. E.	do	17	do	1	VIII		A	R	3	3	23	23	do	
40	Hogan, H. H.	Feb. 1, '78	15	do	2	VII	906	B	L	2	2	22	15	Quebec	
36	Hubbell, E. W.	Sept. 1, '77	20	do	3	VI	1,071	B	L	3	5	52	57	Ontario	
7	Irvine, L. H.	June 1, '76	15	Btn. Sgt.-Major, Sept. 1, 1878.	5	VII	2,781	B	L	3	5	56	25	do	
54	Jones, W. G.	Sept. 5, '78	16	Cadet	1	VIII		B	L	3	5	55	42	Nova Scotia	
17	Keefe, H. W.	June 1, '76	15	Co. Sgt.-Major, Sept. 1, 1878.	5	IV	8,627	B	L	3	5	58	12	Ontario	
35	Kent, R. E.	Sept. 10, '77	15	Cadet	3	VII	1,037	A	R	3	2	26	39	do	
48	Kirkpatrick, A. K.	do	17	do	3	VIII		B	L	3	5	53	50	do	
20	Laurie, R. E.	Feb. 8, '77	19	do	0	V	4,006	A	R	3	2	22	15	Manitoba	
44	McElhinney, D.	do	15	do	4	VII	1,023	B	L	3	5	35	38	Ontario	
18	McPherson, J. W. J.	June 5, '76	18	Sergeant, Sept. 1, 1878.	5	IV	9,902	A	R	1	25	65	65	do	
29	McVicar, J. M.	May 3, '77	19	Cadet	2	VII	1,298	B	L	3	6	34	63	Manitoba	
29	Mackay, H. B.	Feb. 2, '78	19	do	2	VII	1,293	A	R	3	2	21	52	Quebec	
16	Perley, G. E.	June 1, '76	15	do	5	VI	2,027	B	L	4	6	45	25	New Brunswick	
13	Perry, A. B.	do	15	Sergeant, Sept. 1, 1878.	5	IV	10,556	B	L	6	4	3	9	Ontario	
49	Powell, F. H.	Sept. 5, '78	16	Cadet	1	VIII		A	R	3	2	12	53	do	
5	Reed, T. L.	June 1, '76	17	Lance Corporal, Jan. 19, 1878.	5	VI	2,963	A	R	2	2	10	43	New Brunswick	
10	Rivers, V. B.	do	16	Corporal, Jan. 21, 1878.	5	IV	7,142	B	L	2	6	47	56	Ontario	
22	Ross, A. B.	Feb. 2, '77	16	Lance Corporal, Sept. 5, 1878.	5	V	4,633	B	L	1	3	39	16	do	
43	Sears, J. W.	do	17	Cadet	4	VII		B	L	1	3	13	35	New Brunswick	
27	Shanly, C. W.	April 2, '77	17	do	2	VI	979	A	R	4	3	17	27	Ontario	
31	Shaw, G. W.	Sept. 8, '77	16	do	3	VI	2,488	A	R	4	3	7	28	Quebec	
11	Spelman, J.	June 1, '76	15	Corporal, Jan. 18, 1878.	5	IV	9,643	A	R	1	3	8	64	Ontario	
52	Stairs, W. G.	Sept. 5, '78	15	Cadet	1	VIII		A	R	4	3	27	46	Nova Scotia	
45	Taylor, E. T.	do	20	do	1	VIII		B	L	4	6	51	59	Quebec	
23	VanStraubenzee, A. H.	April 2, '77	15	do	4	V	4,354	B	L	4	6	32	18	Ontario	
3	Wise, H. E.	June 1, '76	16	Corporal, June 20, 1877.	5	IV	8,504	B	L	1	3	31	3	do	
1	Würtele, A. G. G.	do	16	Sergeant, Jan. 18, 1878.	5	IV	9,436	A	R	1	3	24	41	Quebec	
47	Würtele, E. F.	Sept. 5, '78	18	Cadet	1	VIII		B	L	4	6	30	44	do	
42	Yates, B. W.	Feb. 1, '78	18	do	2	VII	1,022	B	L	4	6	38	67	Ontario	

E. O. HEWETT, Lieut.-Colonel,
Commandant, Royal Military College.

KINGSTON, 14th December, 1878.

APPENDIX

G 1.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1879.

IV CLASS.

PERMANENT FORTIFICATION.

1st Paper.

POLYGONAL SYSTEM.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

TIME ALLOWED 3 HOURS.

TOTAL MARKS 100.

- (1) Describe fully the Casemated Mask in front of the Kaponier; say how it is traced and give a section (hand sketch) through it on the capital, marking the reliefs.
- (2) Describe, with hand sketch, the construction of the mortar battery in the salient of the Ravelin.
- (2 A) What kind of Retrenchments have been used by the Prussians in their late works, and how are they traced?
- (3) The profile of the Retrenchments used by the Prussians have been modified several times since the early part of the present century,—describe the nature of these modifications and the reasons for making them.
- (3 A) What are the chief merits of the Polygonal system as compared with the Bastioned systems?
- (4) Describe the Traverse of the Ravelin ditch and its mask, stating the object of the latter. Shew by means of a figured sketch the method of finding the relief of the mask and traverse.
- (4 A) How are the main Kaponier and the Ravelin traced? Illustrate reply by figured sketches.
- (5) Describe with the help of sketches how the ramparts of a detached fort should be organized as an artillery position.
- (6) What are the various objects fulfilled by detached forts? What considerations regulate their distance from the Enceinte?

N.B.—Questions marked A are alternative with those of the same number.

G 2.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1879.

IV CLASS.

PERMANENT FORTIFICATION.

2nd Paper.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

TIME ALLOWED 3 HOURS.

TOTAL MARKS 100.

- (1) Describe fully the construction of a front of the modern French system, giving the general dimensions and the reasons for their adoption. Illustrate your answer by a sketch.
- (2) Describe the construction of the keep of the Ravelin in the modern French system, state fully the reliefs.
- (2 A.) Describe the low faces of the Ravelin in the modern French system, giving the relief; state the objects sought to be obtained by this construction.
- (3) What objections, justly urged against Cormontaigne's system, are inapplicable to the modern French system.
- (3 A.) Describe fully the communications of the modern French system, starting from the body of the place and detailing the route to each outwork.

ATTACK OF FORTRESSES.

- (4) State how you would calculate the strength of the siege corps for the regular attack on a large fortress with detached forts, and garrisoned by 40,000 men.
 - (a). By the Woolwich method.
 - (b). By Col. Schaw's method.
- (5) What are the guns at present in the British siege train and how organized; state the probable number of guns required for the siege of a large and a small fortress respectively.
- (5 A.) What are the principal stores required for the engineer siege trains; what considerations should influence the selections of the sites for the artillery and engineer parks.
- (6) Describe the different methods of establishing the "first parallel." What will in future be the probable mode of procedure in this respect, in the attack of strong fortresses actively defended.

N.B.—Questions marked A, are alternative with those of the same numbers.

G 3.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1879.

IV CLASS.

PERMANENT FORTIFICATION.

3rd Paper.

VOLUNTARY.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

TIME ALLOWED 3 HOURS.

TOTAL MARKS 90.

- (1) Give a general description of the defences of Antwerp, the garrison required to man the works, and state the number of troops which would probably be available for the defence. Show the general form of the works by means of a sketch plan.
- (2) Describe the construction of the Kaponiers, Flanks and Orillons of the great enceinte of Antwerp, illustrating your answer by a figured sketch.
- (3) Review briefly the defensive powers of a front of the Antwerp enceinte.
- (4) What is the object of the reverse battery in the Salient of the Ravelin, and how is it constructed? How is the Ravelin ditch flanked? What objection has been raised to the method used?
- (5) What is the distance of the Antwerp detached forts from the enceinte and from each other? State generally how they are traced, giving sketch plan of majistrals only.
- (6) Show by a section on the line of fire, (hand sketch) the construction of a Haxo casemate. In what positions in the enceinte and detached forts at Antwerp are these casemates used?

G 4.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1879.

IV CLASS.

DESCRIPTIVE GEOMETRY.

1st Paper.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

TIME ALLOWED, 3 HOURS.

TOTAL MARKS	{	Obligatory.....	00
		Voluntary.....	30

- (1) Draw the projections of a cube of 2" side when two of its adjacent faces are inclined at 45° and 75° .
- (1 A.) Draw the projections of a cube of 2" side when two of its diagonals are inclined at 40° and 25° respectively.

- (2) The plan of the axis of a right cone (height 4", diameter of base 2.5") makes 45° with X Y, and one generatrix is vertical—Draw the projections of the cone.

(2 A.) Draw the projections of a square threaded screw 3" diameter and 75" pitch.

- (3) A right cylinder diameter 2" axis vertical is cut by a plane inclined at 48° . The horizontal trace of the section plane touches the base of the cylinder and makes 55° with X Y. Determine the elevation of the section and also its true form.

VOLUNTARY.

- (4) The given lines A B and C D are not parallel and do not meet—Draw a line which shall be perpendicular to both the given lines.

G 5.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1869.

IV CLASS.

DESCRIPTIVE GEOMETRY.

2nd Paper.

VOLUNTARY.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

TIME ALLOWED, 3 HOURS.

TOTAL MARKS, 90.

- (1) One of the faces of a tetrahedon of 2.5" edge is vertical and inclined 30° to the vertical plane of projection. One edge of this face is inclined at 20° . The solid is cut by a vertical plane bisecting any edge and cutting off $\frac{1}{3}$ rd off an adjacent edge. Determine the projection and the true form of the section.
- (2) Figure II. represents the crest lines and banquette of a portion of a parapet having a ramp as indicated and a passage at one end. Complete the plan of the parapet in accordance with the figured contours and the levels given. Contours to be shown to every foot. Scale $\frac{1}{2}$.
- (3) A vertical right pyramid and a horizontal right prism intersect. The former has a pentagonal base of 1.5" side, the latter a square base of 1.25" side. The height of the pyramid is 4.5". The axis of the prism make 40° with X Y and cuts the axis of the pyramid 2" above its base. Determine the projections of the intersections of the solids, when a diagonal of the base of the prism is vertical.

G 6.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1879.

IV CLASS.

I.—CONICS 50. DYNAMICS 200.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

TIME ALLOWED, 3 HOURS.

Marks.

- 10 (1) If two lines, whose equations are known, intersect; how are the co-ordinates of the point or points of intersection to be found?
- 40 (2) Define a parabola and prove that any straight line parallel to the axis bisects all chords parallel to the tangent at its extremity; that the tangents at the extremity of any such chord meet on the diameter; that the portion of the diameter thus intercepted is bisected by the curve; and shew that if x and y are measured parallel to any intersecting straight lines and if $y^2=kx$, then the locus of the point (x, y) is a parabola; also shew how to find its focus and directrix.
- 15 (3) How high will a body ascend, if it has an upward velocity v ?
- 15 (4) Given that $\text{Vis Viva} = m v^2$, what will be the increase of Vis Viva in a body m with velocity v falling through a distance s ?
- 15 (5) A body moving from rest is observed to move over 80 and 112 feet respectively in two consecutive seconds; find the acceleration and the time from rest?
- 25 (6) Prove that the path of a projectile *in vacuo* is a parabola and find the focus, directrix, time to vertex, range on both horizontal and inclined planes and the inclination after any time?
- 15 (7) Investigate the formulæ $P = m f$; $W = mg$?
- 15 (8) What is Atwood's machine? What is its use? Prove the formula for the acceleration. If the weights are 31 and $31 + 2$, at what distance should the moveable weight be removed in order to find the velocity after one second. How would this velocity be then observed and what would it be?
- 20 (9) Find the time in which a 4lb weight descending vertically, would pull a 9lb weight 49 feet along a smooth horizontal plane. Find also the tension of the string connecting them?
- 20 (10) What are the laws of impact. Prove $R = \frac{m m'}{m + m'} (u - u')$ and $v - v' = e (u' - u)$?
- 15 (11) Shew how to determine the motion after impact in the case of oblique impact?
- 15 (12) Determine the velocity and direction of rebound from a smooth plane?

Marks.

- 15 (13) A body falls from rest down a smooth curve, what is its velocity at the bottom?
- 15 (14) Define "work," "the unit of work," "horse power"?

G 7.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1879.

IV CLASS.

II.—MENSURATION.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

TIME ALLOWED, 3 HOURS.

Marks.

- 20 (1) Construct in inches $\sqrt{\frac{2}{3}}$ and $\tan 36^\circ$.
- 40 (2) A triangle has two sides 500 feet and 11 chains, 7 links respectively, the sum of the angles opposite these sides is $67^\circ 21' 46''$. Find the area in acres, roods, perches, as accurately as possible.
- 20 (3) Give a numerical expression for the area of a sector of a circle, radius 2 inches, angle $67^\circ 12'$. It need not be worked out.
- 30 (4) Draw any concave line cutting the shorter sides of a rectangle 3 inches by 2, and find the area (cut off) by Simpson's rule. Ordinates not to be further apart than an inch.
- 20 (5) Find the number of shot in an incomplete pile having 20 by 50 at the base and 7 in the shortest side of the top.
- 20 (6) What is the relation between parallelepipeds and pyramids on equal bases and between the same parallels? Thence find the volume of a pyramid or cone.
- 20 (7) Find the volume of the frustum of a pyramid or cone.
- 20 (8) Define a prismoid and state how to find its volume.
- 10 (9) Shew that the formulæ for the frustum of a pyramid and for the area of a trapezoid, may be put in the same form as that for the prismoid.

200

VOLUNTARY—ALGEBRA.

- 10 (1) Sum the series $1 \cdot 2 \cdot 3 + 2 \cdot 3 \cdot 4 + 3 \cdot 4 \cdot 5 + \&c.$, to 20 terms.
- 10 (2) Define a logarithm and its base. Prove $\log_b a = \frac{\log a}{\log b} = \frac{1}{\log_b a}$.

Marks.	
10	(3) Given the expansion of a^x , find e to one place of decimals. <i>Or</i> , given the expansion of $\log(1+x)$, obtain a suitable formula for calculating logarithm tables. <i>Or</i> , given this formula, calculate $\log_e 2$ to two places, and mention all the necessary steps for calculating $\log_{10} 2$.
10	(4) Separate $\frac{5-10x}{2-x-3x^2}$ into partial fractions, and give all the forms of partial fractions into which $\frac{N}{(x-a)(x-b)^2(x^2+bx+c)^2}$ can be separated
10	(5) Prove, for two quantities only, the principle that the arithmetic mean of any number of positive quantities is greater than the geometric mean.
50	

N.B.—The alternatives of (3) may be substituted for any question in this section.

G 8.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1879.

IV CLASS.

III.—STATICS AND APPLIED MECHANICS.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

TIME ALLOWED, 3 HOURS.

Marks.	
10	(1) Forces proportioned to 1, $\sqrt{3}$, 2 are in equilibrium. Find the angles between their directions.
10	(2) A string passes over 3 smooth pegs at the angles of an equilateral triangle, and supports a 1 lb. weight at each end. Find the pressure on each peg, 1st, if the two lower pegs are horizontal, 2nd, if two pegs are vertical.
15	(3) Find the centre of gravity of a triangle, and name that of a pyramid or cone.
10	(4) If an equilateral triangle on the side of a square be cut out from the square; find the centre of gravity of the remainder.
10	(5) n Weights 1, 2, 3, 4, &c., pounds are placed in a straight line at distances 1, 2, 3, 4, &c. feet, respectively, from one end of it. Find their centre of gravity.
15	(6) Define Virtual Velocities and Virtual Moments, and state the Principle.

Marks.	
15	(7) Find $\frac{P}{W}$ in two of the following machines: the screw, the differential screw, the differential axle, the differential pulley.
15	(8) What are the laws of friction? What are the co-efficient of friction, the angle of friction, the limiting angle of resistance, and the whole resistance of a rough surface.
30	(9) Find the force which will just support a given weight on a given rough inclined plane. Thence deduce the results when the force is—1st, vertical; 2nd, horizontal; 3rd, parallel to the plane; 4th, least in magnitude. Explain the result given by the 2nd case if the angles of the plane and of friction are each 45° .
15	(10) Investigate the conditions of equilibrium of a frame; 1st, triangular; 2nd, polygonal under the action of a force at each joint. Point out how much must be assumed in each case.
15	(11) Given a square frame in equilibrium under the action of a force at each joint; three of these forces are perpendicular to the diagonals from their points of application. Draw a diagram of all the stresses and prove that the four forces must be equal.
15	(12) Draw a diagram of a funicular polygon of five bars supporting a weight at each joint.
20	(13) Find the magnitude and direction of the thrust of a common roof, without tie-beam, upon the wall.
30	(14) Find the stresses of a King Post Truss; span 40 feet, rise 10 feet, weight on each rafter 1 ton. Find also the diameter of the tie if the tension is not to exceed 5 tons per square inch.
15	(15) Common roof with tie and collar beam; draw a diagram and draw attention to all assumptions.
15	(16) Common roof with tie. Draw a diagram of the stresses liable to be produced by wind, and explain how the requisite strength of each piece of the structure is to be arrived at.

250

ALTERNATIVE QUESTIONS.

(17) *alt. with* (1) or (2).—Perpendiculars are drawn from any point to the sides of a rectangle. Find the magnitude and direction of the resultant of the forces represented by them.

(18) *alt. with* (4) or (5).—Find the centre of gravity of a trapezoid.

(19) *alt. with* (14).—The Queen Post Truss may be substituted.

(20) *alt. with* (10) and (11) or *with* (15) and (16).—Explain the action of the wind on a King Post Truss; draw a diagram of the stresses thus produced, and give the whole resultant stress on each piece in question (14), assuming the wind to exert a normal force at each joint on one side equal to the weight sustained at that joint.

G 9.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1879.

IV CLASS.

IV.—PLANE TRIGONOMETRY.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

TIME ALLOWED, 3 HOURS.

Marks

- 10 (1) Given $\tan. \theta = \frac{3}{4}$. Find the other Trigonometrical Ratios.
- 10 (2) What are the values of $\cos. 120^\circ$, $\sin. 150^\circ$, $\tan. 210^\circ$, $\sec. 240^\circ$, $\cot. 300^\circ$, $\operatorname{cosec}. 330^\circ$, $\operatorname{vers}. 390^\circ$?
- 10 (3) Which of the following are possible or impossible: $\sin. \theta = 3$ or $\pm \frac{5}{3}$; $\sec. \theta = 3$ or $\pm \frac{1}{3}$; $\operatorname{vers}. \theta = 3$ or $\pm \frac{1}{3}$; $\left\{ \sin. ^2 \theta = \frac{1}{7} \text{ and } \cos. ^2 \theta = \frac{7}{8} \right\}$; $\left\{ \sin. \theta = \frac{1}{\sqrt{5}} \text{ and } \cos. \theta = \frac{2}{\sqrt{5}} \right\}$. Give reasons.
- 10 (4) Construct $\sin. ^{-1} .225$; $\cos. ^{-1} \frac{7}{8}$; $\tan. ^{-1} 1\frac{1}{2}$.
- 10 (5) Calculate the values of $\cos. 15^\circ$, $\sin. 18^\circ$, $\sin. 54^\circ$, $\sin. 72^\circ$.
- 10 (6) Simplify $\frac{\sin. \alpha \pm \mu \cos. \alpha}{\cos. \beta \pm \mu \sin. \beta}$ if $\mu = \tan. \theta$; (for logarithmic computation.)
- 10 (7) Find θ and P , if $P \sin. \theta = F$, and $P \cos. \theta = R$.
- 10 (8) Prove $\sin. A (1 + \tan. A) + \cos. A (1 + \cot. A) = \sec. A + \operatorname{cosec}. A$.
- 20 (9) If $C = 90^\circ$, $a = 365$, $b = 721 \cdot 18$. Find the least angle.
- 20 (10) If $C = 25^\circ 34'$, $a = 1086 \cdot 18$, $b = 366 \cdot 18$. Find the angles.
- 20 (11) If $a = 365$, $b = 721 \cdot 18$, and one of the angles opposite these is $103^\circ 14' 53''$; find the angles.
- 20 (12) Show how to calculate the height of an inaccessible object from a straight road which does not lead towards it. Choose a very simple example and solve it?
- 10 (13) Find the radius of the circle described about a given triangle.
- 10 (14) Explain circular measure, its unit, and the meaning and value of π .

Marks.

10 (15) Find the circular measure of $10^\circ 24' 12''$ and prove the formula employed.

10 (16) Prove $\frac{\sin. \theta}{\theta} = 1$, if $\theta = 0$; and employ it to find the area of a circle.

200

N. B.—The following questions are alternative with those of equal value :

VOLUNTARY—B. Five questions only to be answered.

- 10 (17) Prove $2 \sin. A = \pm \sqrt{1 + \sin. 2A} \pm \sqrt{1 - \sin. 2A}$, and explain how the proper signs are to be ascertained in each case.
- 10 (18) Given $\sin. 330^\circ$; find $\sin. 165^\circ$ by the formula in (17).
- 10 (19) Prove $\tan. 50^\circ + \cot. 50^\circ = 2 \sec. 10^\circ$; and simplify $\sin. ^{-1} \frac{a}{b} + \cos. ^{-1} \frac{a}{b}$.
- 10 (20) Given $\sin. 7A - \sin. A = \sin. 3A$. Find all acute values of A .
- 10 (21) Prove $\cot. ^{-1} \frac{3}{4} + \cot. ^{-1} \frac{3}{4} = \frac{3\pi}{4}$
- 10 (22) Adapt to logarithmic computation, for the purpose of finding l , the equation: $\sin a = \cos l \cos \delta$, $\cos a = \sin l \sin \delta$.
- (23) Adapt to logarithmic computation $\sqrt{a^2 - x^2}$; $a^2 + x^2$; $\sqrt{x - a}$; $\sqrt{2ax - x^2}$; the roots being possible.
- 50

G 10.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1879.

IV CLASS.

V—VOLUNTARY. C. CONICS AND ANALYTICAL GEOMETRY OF THREE DIMENSIONS.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

TIME ALLOWED, 3 HOURS.

Marks.

- 6 (1) Write down the principal forms of equation to a straight line and the length of perpendicular from (h, k) on each
- 6 (2) Write down those forms of the general equation of the second degree which represent a circle, a parabola, an ellipse, an hyperbola.

Marks.

- 6 (3) Write down the simplest forms of equation to the above curves, also the equations to their tangents.
- 6 (4) Mention six properties or characteristics of each of the three latter curves.
- 6 (5) Find the distance between two points in space.
- 8 (6) Find the cosine of the angle between two straight lines whose direction cosines are given.
- 8 (7) Prove $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 1$.
- 8 (8) If $d =$ distance between the points (x, y, z) and (x^1, y^1, z^1) ; shew that $d = (x - x^1) \sec \alpha = (y - y^1) \sec \beta = (z - z^1) \sec \gamma$.
- 8 (9) If $\frac{x-x^1}{a} = \frac{y-y^1}{b} = \frac{z-z^1}{c}$ are the equations to a straight line; find the direction cosines.
- 8 (10) Give two definitions of a plane, besides that given in Euclid, and shew briefly that they are consistent with it.
- 10 (11) From one of these definitions find the equation to a plane and write down the other forms namely: 1st, in terms of the inclinations of two of its traces and the intercept on the axis of Z ; 2nd, in terms of the three intercepts; 3rd, in terms of the perpendicular from the origin and its direction cosines.
- 10 (12) Find the symmetrical form of equation to a plane passing through a given point and parallel to a plane whose direction cosines are known.
- 10 (13) Find the length of the perpendicular from a given point on the given plane $Ax + By + Cz + D = 0$.

100

G 11.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1889.

IV CLASS.

VI.—VOLUNTARY—D. DIFFERENTIAL CALCULUS.

NOTE.—The Cadets in this class have three more terms before completing their full course of instruction.

TIME ALLOWED, 3 HOURS.

Marks.

- 10 (1) Define a difference, differential and differential co-efficient.
- 10 (2) Prove from definition that $d \tan \theta = \sec^2 \theta d \theta$.
- 10 (3) Differentiate vers $\frac{-1}{a} \frac{x}{a}$; $\log \frac{x + \sqrt{x^2 \pm a^2}}{a}$; $e^x (x^2 - 2x + 2)$.

Marks.

- 10 (4) Write down Taylor's Theorem and obtain Maclaurin's Theorem from it.
- 10 (5) Expand two of a^x , $\log(1+x)$, $\sin \theta$, $\tan^{-1} x$, or write down the expansions of all four.
- 10 (6) Find the value of $\frac{b^{m+1} - a^{m+1}}{m+1}$ when $m = -1$.
- 10 (7) If $u = F(x, y, z)$ what is the total differential of u when x, y, z all vary independently?
- 10 (8) What is the process for finding maxima and minima?
- 10 (9) Find the angle between the radius vector of any curve and the tangent at its extremity, or prove $\frac{2}{ds} = \frac{2}{dr} + r \frac{2}{d\theta}$.
- 10 (10) Given that the axes of an ellipse touch its evolute at each cusp, explain how many normals can be drawn to the ellipse from a given point. 1st, within; 2nd, without the evolute.

Or, explain the different orders of contact, and explain why the circle of curvature generally cuts the curve, but does not cut the ellipse at any of the four vertices.

100

I.—INTEGRAL CALCULUS.

- 20 (1) Write down the integrals of $x^n dx$, $\frac{dx}{\sqrt{2x}}$, $\frac{dx}{x}$, $a^x dx$, $\sec^2 \theta d \theta$, $\frac{dx}{\sqrt{x^2 \pm a^2}}$; $\frac{dx}{a^2 + x^2}$; $\frac{dx}{a^2 - x^2}$; $\frac{dx}{x\sqrt{x^2 - a^2}}$; $\frac{dx}{\sqrt{2ax - x^2}}$ and point out when the first is said to fail.
- 20 (2) What is a definite integral? Find the values of $\int_0^a \frac{dx}{\sqrt{a^2 - x^2}}$; $\int_0^a \sqrt{\frac{x}{a-x}} dx$; $\int_0^{\frac{\pi}{2}} \sin^2 \theta d \theta$; $\int_0^{2a} \frac{dx}{\sqrt{2ax - x^2}}$; $\int_0^{\frac{\pi}{2}} \sin^4 \theta d \theta$.
- 10 (3) Use the first form in question (1) to obtain $\int_a^b \frac{dx}{x}$.
- 10 (4) Integrate $\frac{x dx}{a + 2bx + cx^2}$.
- 20 (5) Explain integration by parts and integrate $e^x x^2 dx$ and $x \sin^{-1} x dx$.
- 20 (6) What are the usual trigonometrical substitutions? Work out one of the examples above by this process.

Marks.

- 30 (7) Integrate $\frac{x^3 dx}{x^2 + x - 2}$ and $\sin^4 \theta \cos^2 \theta d\theta$ and $\int \sqrt{a^2 - x^2} dx$
- 20 (8) Prove briefly that integration is summation.
- 20 (9) Find a formula for a plane area and for a surface of revolution.
- 20 (10) Find the area of an ellipse and parabola; also the surface of a sphere or length of arc of a cycloid.
- 200

G 12.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1879.

IV CLASS.

VII.—VOLUNTARY.—STATICS.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

TIME ALLOWED, 3 HOURS.

Marks. All equal.

- (1) Given the parallelogram of forces for direction; prove it for magnitude.
- Or*, find the rectangular components of a force represented by a given straight line in space.
- (2) Define a couple and its axis; state the propositions relating to transposition and composition of couples; and prove that a couple may be transferred to a parallel plane without altering its effect.
- (3) If the moments of two couples are 4 and 5 foot pounds respectively, and their planes are inclined at 30° . Find the resultant couple.
- (4) Find the moments of a force about the three axes of co-ordinates.
- Or*, what are the six equations of equilibrium of forces on a body? And investigate the condition that any number of forces on a body should have a single resultant.
- (5) Assuming the general expression for the distance of the centre of gravity of several bodies; find the integral formulæ for the centre of gravity of an area, arc, volume and surface of revolution.
- Or*, state and prove Guldin's theorems.
- (6) Find the centre of gravity of the segment of a circle or parabola; of a small arc of a circle; of the volume of a semi-spheroid.

Marks.

- (7) State the principle of Virtual Velocities and prove that the internal reactions of a rigid body may be neglected in the equation.
- 100 (8) Find the equation to the catenary and shew its principal properties.
- Alternative with (3); (7); (8).*
- (9) Find the centre of parallel forces acting on a system in space?
- (10) Define stable and unstable equilibrium; and prove the condition for stability of a heavy curved body on a horizontal plane?

DYNAMICS.

- 12 (1) Two balls moving in parallel but opposite directions, and having equal momenta impinge. Prove that they move after impact in parallel directions with equal momenta?
- Or*, prove that when a body moves in a circle, the normal acceleration = $\frac{v^2}{r}$?
- 12 (2) How are velocity and acceleration measured, 1st uniform, 2nd variable? Thence obtain all the elementary differential equations of motion.
- 20 (3) What is the law of force when a uniform chain moves over a smooth pulley under the action of gravity? Prove it. Find the velocity and distance moved through at any time, supposing the chain to be not in equilibrium when motion commences.
- Or*, having proved the above law of force, solve any other problem involving the same law?
- 20 (4) A body at rest at a given distance is acted upon by an attractive force varying inversely as the square of the distance. Find the velocity and distance at any time. Thence find the velocity of falling from infinity to a given distance.
- Or*, a body is projected vertically upwards in a medium, whose resistance varies as the square of the velocity; find the time of coming to rest, the maximum height reached, the velocity on returning to the point of projection, and the terminal velocity.
- 12 (5) Find the velocity of falling down a smooth curve, through a vertical height h .
- 12 (6) Prove that the cycloid is isochronous.
- Or*, prove that a pendulum oscillating through a small circular arc may be considered isochronous.
- 21 (7) Find the length of a pendulum that beats seconds; assuming $g=32.2$;
 $\pi^2 = 101$.
- Or*, given the number of revolutions, per second, of a conical pendulum; find its position and explain the working of the governor of a steam engine.
- 100

G 13.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1879.

IV CLASS.

ARTILLERY.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

TIME ALLOWED, 3 HOURS.

Marks.

- 30 (1) How are S. B., R. B. L. and R. M. L. guns respectively measured?
- 30 (2) Why is the strain on a rifled gun greater than in a S. B.?
- 60 (3) What system of rifling do you consider best, practically; state clearly your reasons, and give details of the system you choose, and its ammunition, with reference to grooves, mode of giving rotation, &c.
- 50 (4) What are the advantages of an elongated projectile?
- 50 (5) For what special reasons are breech-loading ordnance unsuited to our requirements?
- 60 (6) What percussion fuzes in our service are designed to act on graze only?
Give a list of the time fuzes for rifled ordnance. What are the advantages of powder channels? What fuzes are without them?
- 30 (7) For what guns are double shell made, and what is their use? Can the projectiles of the 64 pr. and 80 pr. converted guns be used indiscriminately? State particulars.
- 50 (8) Describe an ordinary metal friction tube. What is a *lubricator*? What are the peculiarities of the cartridges of the B. L. R. guns, 40 and 20 prs.? Describe a *tin cup* and its use; also the two natures of *primers*, in the service, clearly stating their various uses.
- 40 (9) What forces act on a projectile in the bore of a gun on the explosion of the charge? In what way can the pressures in a gun be varied by the use of different natures of powder?
- 30 (10) "Tell off" a squad for "Repository Exercises."
- 40 (11) Draw a rough diagram of gun and limber when necessary, and place the detachment by figures in place for "right gun wheel disabled," "action front," "left limber up," "gunners prepare to mount." Shew by curved line direction of limber and trail.
- 30 (12) State chief differences between the new and old drill for a standing carriage. Mention advantages.

G. 14.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1879.

IV CLASS.

VOLUNTARY.—ARTILLERY

TIME ALLOWED, 3 HOURS.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

Marks.

- 35 (1) Define *line of sight*, *line of departure*, *angle of elevation*, *quadrant angle*, *angle of departure*, *angle of descent*, *drift* or *derivation*.
- 35 (2) Give the various natures of artillery fire, with reference to the vertical and to the horizontal plane. Define accurately each nature.
- 40 (3) What natures of fire would you use for the following purposes:—
(a) penetrating decks of iron clads; (b) penetrating their armour; (c) breaching a covered revetment; (d) dismounting guns and dislodging troops protected by works.
- 10 (4) Describe the general idea and the use of hanging scales.
- 25 (5) What fuzes have lately been introduced into the service? For what purpose in each case?
Describe a 'gas check'; what is its use?
- 40 (6) Define *malleability*, *ductility*, *elastic limit* and *tenacity*. What is the property of *welding*? What forms of iron possess it, and which to the greatest extent?
- 50 (7) Give the physical properties of bronze, cast iron, wrought iron and steel. What peculiar property of wrought iron makes it particularly valuable as a metal for guns?
- 40 (8) What metal or combination of metals do you consider best for heavy ordnance. Give reasons.
- 60 (9) How is wrought iron produced from cast iron? According to modern ideas, what is the broad distinction between wrought iron and steel? How is a fibre given to either wrought iron or steel? What is the advantage of a fibre?
- 30 (10) What effect has phosphorous and sulphur on bronze and also on wrought iron?
- 45 (11) Describe shortly the original or "Armstrong" construction. What does Fraser's modification consist of? Shew how in this construction the various parts and descriptions of metals are in the most advantageous position.
- 40 (12) What are the objections to the Palliser system? What justifies the departure from general ideas?

G 15.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1879.

IV CLASS.

TACTICS.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

TIME ALLOWED, 3 HOURS.

NUMBER OF MARKS 640.

- (1) What are the duties of the supports when a Battalion is formed up for attack?
- (2) What are the duties of the Battalion main body?
- (3) In the case of a Brigade formed up for attack, what are the uses of the "second line"?
- (4) What other body is there generally besides the first and second line?
- (5) In what manner should the infantry occupying a defensive position be drawn up?
- (6) What are the general principles of defence?
(The above questions refer to the British drill.)
- (7) What is the object of keeping guns in reserve when acting on the defensive?
- (8) State what you know regarding the effects of modern weapons on tactics.
- (9) What special advantages does the attack possess?
- (10) In the battles of the Franco-German war, what was the usual mode in which the Germans conducted the attack? (This does not refer to their *drill*.)
- (11) For what purposes is the German three-rank formation now used?
- (12) What is the formation of the German company column?
- (13) In what respects does the formation of the German and French "1st line" differ from the British?
- (14) In the battle of Wörth, what were the strong and weak points of the French position?
- (15) What influence did the wood of the Niederwald have on the result of the battle?
- (16) What were the chief mistakes made by the French in this battle?

G 16.

ROYAL MILITARY COLLEGE—HALF-YEARLY EXAMINATION, JANUARY, 1879

IV CLASS.

MILITARY ADMINISTRATION.

NOTE.—The Cadets of this class have three more terms before completing their full course of instruction.

TIME ALLOWED, 3 HOURS.

NUMBER OF MARKS 450.

- (1) Give a short account of Napoleon's system of supplying an army by requisitions.
- (2) What is the method at present followed on the Continent for supplying an army in the field?
- (3) What are the best situations for forming magazines of food and forage, and of ammunition, respectively?
- (4) Write out a list of the staff of a British Division.
- (5) What duties appertain to the Adjutant-General's and Quartermaster-General's departments, respectively?
- (6) What are the functions of the Chief of the staff?
- (7) State briefly the duties of the staff after an action.
- (8) What are the different things a regiment has to do on arriving at a camping ground?
- (9) Give a sketch of a camp of a Field Battery, with the dimensions of its front and its total depth.
- (10) What are the two kinds of marches, and what general principle applies to both?
- (11) What special precautions must be taken in the case of night marches?
- (12) What are the principal uses of railways in war time?
- (13) What are the special functions of the Divisional and Corps Artillery, respectively?
- (14) Supposing a small mixed force, say of 500 infantry, 50 cavalry, and two field guns, had been collected at some town in Ontario, and had to march by road a distance of 50 miles to meet an enemy in the field; what steps do you consider it would be necessary to take to keep the force efficient for 14 days—no railways or water transport available, and tents not allowed?