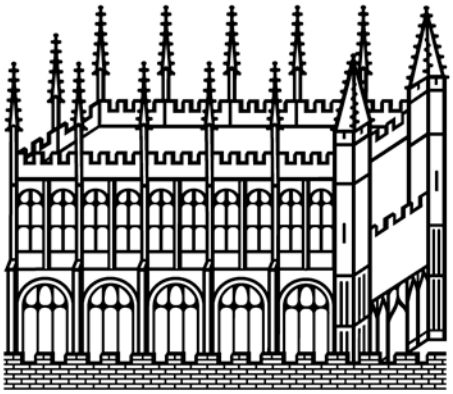
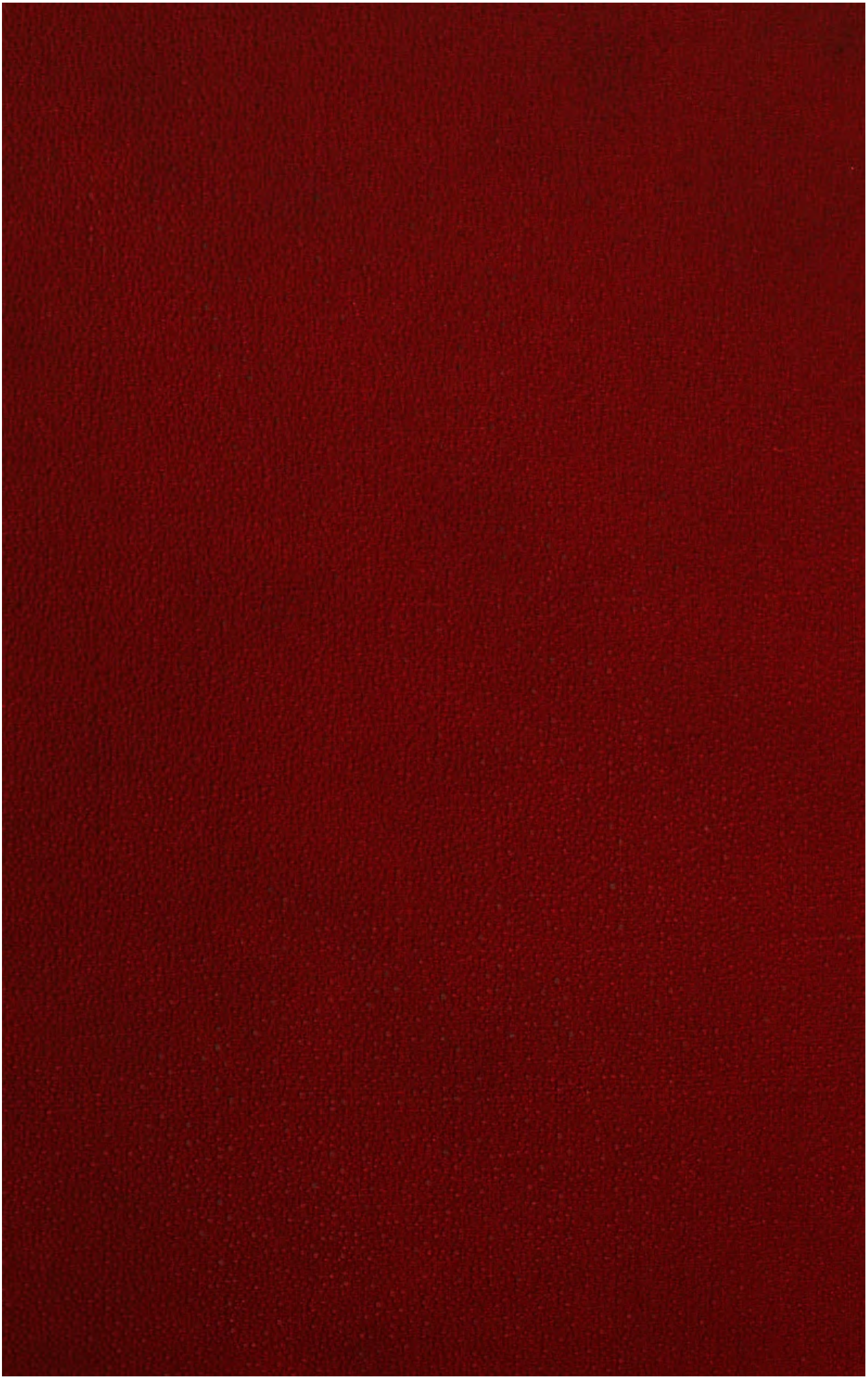




No. 1.]

GUIDE TO
PRELIMINARY
ARMY EXAMINATION.

FOR SEPTEMBER, 1881.

CONTENTS:

BY

JOHN GIBSON, M.A.,

First Class Camb., 1874; *Author of* '*Preliminary Army Examination Made Easy*,' '*French Grammar Made Easy*,' '*Specimen Essays*,' &c.

LONDON:
EDWARD STANFORD, 55, CHARING CROSS, S.W.
1881.

Price One Shilling.

Woolwich and Sandhurst Examinations.

THE Editor prepares Pupils for these Examinations, privately, in class, and by means of correspondence through the post.

POSTAL PREPARATION.

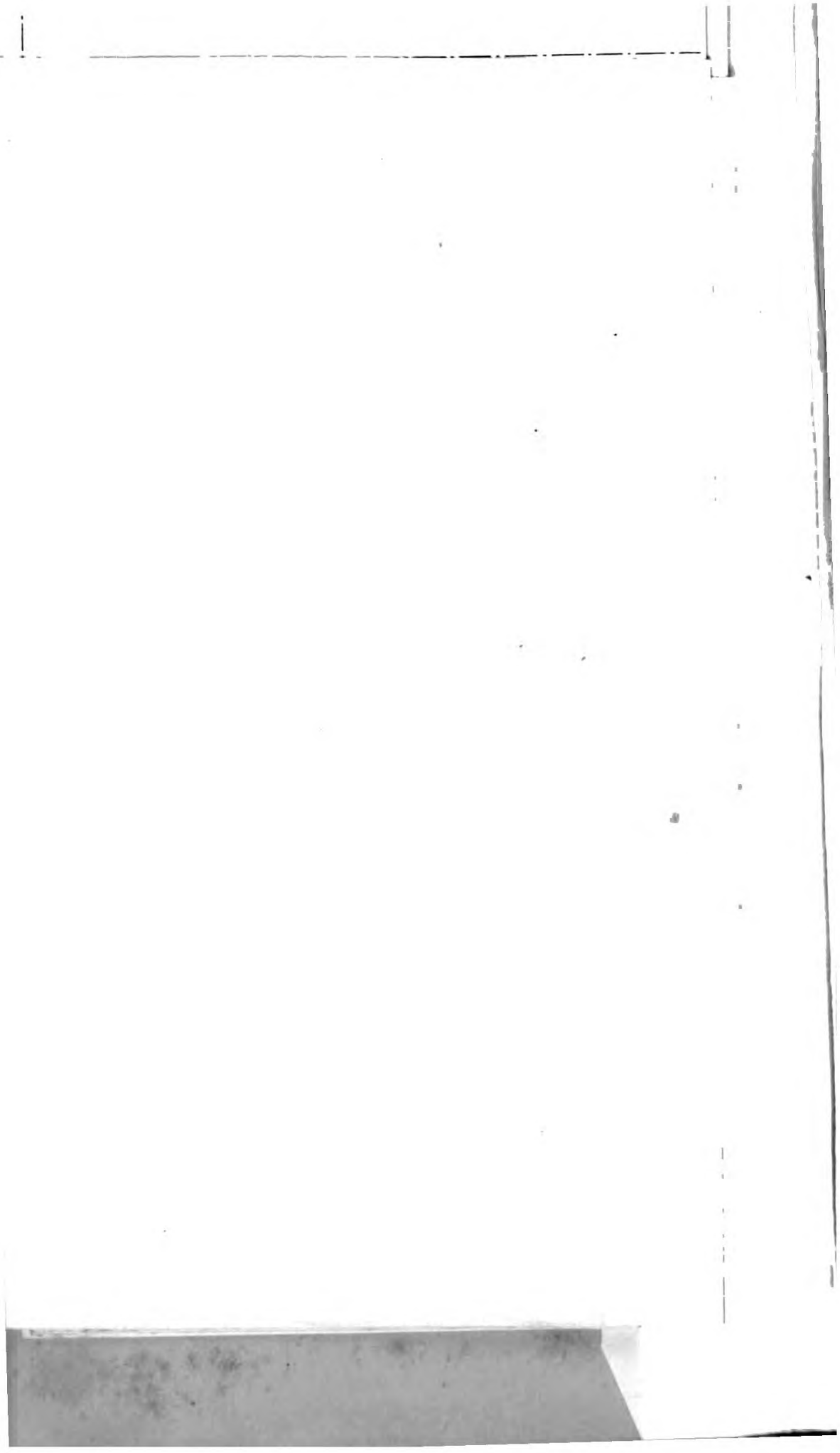
Candidates are prepared for all Army Examinations by means of Correspondence. To prove the advantage of this system it is only necessary to refer to the fact that only one of the Editor's postal pupils, out of a considerable number, has ever been postponed.

LAST MONTH'S AND FORTNIGHT'S CLASSES.

Special Classes, mainly formed for the benefit of Postal Pupils, but which others can also join, commence, one a month and the other a fortnight before each examination. During this time all the most important points are gone into, and by working out test papers students get into the proper way of answering—a point in which so many, even those who are fairly well up in their subjects, fail.

RESIDENTIAL PUPILS.

The Editor receives *eight* Pupils, to prepare for these Examinations, into his house at Bromley, Kent.



PRELIMINARY ARMY GUIDE.

SEPTEMBER EXAMINATION, 1881.

PART I.

INTRODUCTORY.

THIS is the first attempt, we believe, ever made to bring out the Answers to the Questions set in this Examination, and we must therefore crave the indulgence of our readers for any omissions or mistakes that may occur. If our present venture succeeds, we intend issuing this Guide three times a year, after the February, April, and September Examinations. The September number will contain the Questions and Answers set in the two Examinations immediately preceding its issue, and the price for this double number will be 1*s.* 6*d.*, instead of 1*s.* It will be our object, besides furnishing the questions and answers in full, to give such information, hints, &c., about these Examinations as shall appear to us advisable from time to time. We shall also give Test Papers in each number, framed on the lines of recent Examinations, for candidates to work out for themselves; and we shall devote a certain space to the purpose of answering queries, &c.

At the end of each number we shall make remarks on the nature of the several papers set in the most recent Examination; and we shall always make a point of publishing the number of pupils sent in by us for each Preliminary, and state how many of them were successful at the last Examination. We shall also give a list of the subjects set for the Further Examinations for entrance into Woolwich and Sandhurst.

We now proceed to make a few remarks on our system of

POSTAL TUITION.

This is a system carried out by us to a very great extent, and though many people are inclined to ridicule it, yet results prove that it is by no means to be despised; for, out of a very large number of Postal Pupils, we have only had *one* who ever failed to pass his examination, and he was a most irregular correspondent.

The system is as follows:—

Every week a batch of questions on a certain portion of the work taken in hand is sent to the Candidate, who answers the questions given, and returns them in the course of the week to be corrected and have hints and explanations filled in. The papers when thus revised are returned to the Postal Pupil, with a fresh batch of questions, to be treated in a similar manner to the first.

These questions and answers should be kept by the Pupil, and after revision they should be entered by him into his note-book, so that he may

have them ready to read over just before the Examination. This system of correspondence has been proved by experience to be most effective, if the course given by the Tutor is faithfully followed out by the Pupil, and the work done and returned regularly every week.

It has the following advantages:—

(i.) It keeps a Pupil to his work.

(ii.) It draws his attention to particular points, and prevents him from wasting time over matters that for Examination purposes might be absolutely useless.

(iii.) It gets him into a way of answering Test Questions on paper, a most important point, especially as these Test Papers cover nearly all the Questions likely to be asked in the Examination.

The conditions of success are threefold:—

1. The correspondence must be of sufficiently long duration. We recommend a course of not less than three months.

2. The correspondence must be regular; the questions answered and papers returned punctually every week.

3. The work must be *bonâ fide*. By this we mean that the Correspondent must get up the particular subject or subjects set for the week before sitting down to do a paper; and whenever he has need to refer to the text-book to answer a question, he must make a note to this effect in the margin.

These conditions being observed, we have no hesitation in saying that any one who tries this system will make excellent progress, and find the plan most helpful and satisfactory.

PART II.

TEST PAPER ON GEOGRAPHY.

Europe (generally).

1. Draw an outline map of Europe, insert the chief rivers and mountains, and twelve of the principal towns.

2. State the directions and approximate distances of the following places from London:—Stockholm, Dublin, Madrid, Milan, Aberdeen, Iceland, St. Albans, Constantinople.

3. Trace the course of the following rivers, mentioning their source, length, the countries through which they flow, and the seas into which they fall:—Danube, Rhone, Rhine, Elbe, Volga.

4. State the situation of the following, and mention anything of importance connected with them:—Lille, Leipsic, Saragossa, Toulon, Carlsbad, Dresden, Palermo, Ajaccio, Astrakhan.

5. Mention the capitals of the following countries and districts, and the river (if any) on which they stand:—Sweden, Hanover, Portugal, Bavaria, Saxony, Normandy, Denmark.

6. What points would be touched at, and what river mouths and capes would be passed in a coasting voyage from Havre to Barcelona?

[*To be continued in subsequent numbers.*]

TEST PAPER ON ARITHMETIC.

Vulgar and Decimal Fractions.

1. Add together $1\frac{1}{2}$, $2\frac{1}{3}$, $3\frac{1}{4}$, and $\frac{4}{5}$.
2. Subtract $9\frac{1}{10}$ from $11\frac{1}{33}$.
3. Multiply $4\frac{5}{16}$ by $1\frac{8}{9}$.
4. Divide $6\frac{7}{10}$ by $7\frac{11}{20}$.
5. Add together 1·314, 271·5, ·6741, and 15·521.
6. Subtract 16·742 from 19·8145.
7. Divide ·00625 by 25.
8. Reduce ·57123 of a mile to feet and the decimal of a foot.
9. Subtract ·179 of a day from 23·2854 hours, and give the answer in minutes and the decimal of a minute.
10. What decimal of £10 is ·561 of 10*s.*?
11. Multiply together $25\frac{6}{11}$, $\frac{22}{281}$, $\frac{15}{16}$, and $2\frac{2}{3}$.
12. Divide $10\frac{33}{52}$ by $6\frac{1}{13}$.

[*Next Test Paper will be on Practice and Proportion.*]

In working out these Test Papers, Candidates are advised to follow the system recommended in our 'Preliminary Army Examination Made Easy,' p. 10.

PART III.

CORRESPONDENCE, NOTICES, &c.

[All Correspondents are requested to send in their Communications, Queries, &c., for the next issue of this Guide (No. 2) by the end of January, 1882.]

Further Examination Subjects for Sandhurst and Woolwich in 1882.

The following Notices have been issued by the Civil Service Commissioners:—

"At the competitions for the Royal Military College, Sandhurst, and the Royal Military Academy, Woolwich, to be held in July, 1882, and at the examination to be held in April, 1882, of Lieutenants of Militia who are candidates for commissions in the Regular Army, the examination in English Literature will be limited to the following authors:—

Chaucer	.. ..	Prologue to the Canterbury Tales.
Shakespeare	.. ..	Richard II.
		Coriolanus.
Milton	.. .. ..	Lycidas, and Samson Agonistes.
Bacon	.. .. ..	Essays.
And either		
(1) Burke	.. ..	Speech on American Taxation.
With Macaulay	..	Essays on Boswell's Johnson, and Lord Chatham.
Or (2) Napier	..	History of the Peninsular War—Books VII. and VIII.

"The examination in English History will be limited, at the candidate's choice, either to the period A.D. 1760–1790 (inclusive), or to the period A.D. 1790 to 1820 (inclusive). The candidate's reading on the period selected should include the study of that part of Bright's History which treats of it."

"At the competitions for the Royal Military College, Sandhurst, and the Royal Military Academy, Woolwich, to be held in December, 1882, and at the examination to be held in October, 1882, of Lieutenants of Militia who are candidates for commissions in the Regular Army, the examination in English Literature will be limited to the following authors:—

Chaucer	Knight's Tale.
Shakespeare	Richard II.
	Julius Cæsar.
Goldsmith	Poems.
Johnson	Life of Milton.
	Life of Pope.
And either	
(1) Burke	Thoughts on Present Discontents.
With Macaulay ..	Essays on Boswell's Johnson, and Lord Chatham.
Or (2) Napier ..	History of the Peninsular War—Books IX. and X.

"The examination in English History will be limited, at the candidate's choice, either to the period A.D. 1760–1790 (inclusive), or to the period A.D. 1790 to 1820 (inclusive). The candidate's reading on the period selected should include the study of that part of Bright's History which treats of it."

Part IV.

ANSWERS IN FULL TO THE PRELIMINARY QUESTIONS, AUGUST AND SEPTEMBER, 1881.

French.

Wednesday, August 31st, 1881. 10 A.M.–12.30 P.M.

[*With Grammar and Dictation.*]

Translate into English:—

I.

"J'étais voué," dit Moreau, à l'étude des lois au commencement de cette revolution qui devait fonder la liberté du peuple français; elle changea la destination de ma vie; je la vouai aux armes. Je n'allai pas me placer parmi les soldats de la liberté par ambition; j'embrassai l'état militaire par respect pour les droits de la nation. Je devins guerrier parce que j'étais citoyen. Je portai ce caractère sous les drapeaux, je l'y ai toujours conservé. Plus j'aimais la liberté, plus je fus soumis à la discipline. Parvenu au commandement en chef, lorsque la victoire nous faisait avancer au milieu des nations ennemies, je ne m'appliquai pas moins à leur faire respecter le caractère du peuple français, qu'à leur faire redouter ses armes. La guerre

sous mes ordres ne fut un fléau que sur le champ de bataille; plus d'une fois les nations ennemies m'ont rendu ce témoignage, et cette conduite je la croyais aussi propre que nos victoires à faire des conquêtes à la France.

II.

Le roi et la famille royale arrivèrent à Châlons vers les quatre ou cinq heures de l'après-midi du 21. Là un homme de la ville, qui se trouva par hasard à la poste, lorsque la voiture changeait de chevaux, crut reconnaître le roi; tourmenté de cette idée, il va trouver le maire, lui communique sa découverte, et lui propose de faire arrêter la voiture. Le maire mit tant d'adresse à l'effrayer sur les conséquences, pour l'un et l'autre, d'une pareille démarche, que le pauvre homme finit par convenir que le plus sage était de garder le silence. Échappé à ce danger, le roi avait passé Châlons, lorsque la voiture étant arrêtée un moment sur la grande route, un inconnu, vêtu comme un bourgeois, s'en approche, met la tête à une des portières auprès de laquelle était Madame de I . . . . . , et dit assez haut: "Vos mesures sont mal prises, vous serez arrêtés." Il s'éloigna tout de suite sans qu'on eût le temps de savoir ni son nom ni ce qu'il était.

I.

"I had devoted myself," says Moreau, "to the study of the law at the commencement of this revolution, which was to found the freedom of the French people; it changed the destiny of my life; I devoted it to the pursuit of war. I did not go and rank myself among the troops of freedom through ambition, I embraced the military profession through respect for the nation's rights. I became a warrior because I was a citizen. I bore this character under the banners; I always preserved it there. The more I loved freedom, the more I submitted to discipline. When I reached the position of commander-in-chief, when victory made us promoted in the midst of the nations opposed to us, I did not a whit less bend my energies towards making them respect the character of the French people than to making them fear their arms. War under my régime was not a scourge save on the battle-field; more than once the enemy bore witness to me in this, and I thought this manner of proceeding as likely as our victories to obtain for us conquests in France.

II.

The king and the royal family arrived at Châlons towards 4 or 5 p.m. on the 21st. There a man of the town, who chanced to be at the posting inn, when the carriage was changing horses, thought he recognised the king; tortured by this thought he went to find the mayor, told him of his discovery and proposed to him to have the carriage stopped. The mayor showed such skill in frightening him about the consequences to both of them, of such a step, that the poor man ended by agreeing that the wisest plan was to keep silence. Having escaped from this danger the king had passed Châlons, when, on the carriage stopping for a moment on the high road, a stranger, dressed like a citizen, drew near, put his head in at one of the doors, by the side of which was Madame de I . . . . , and said in a pretty loud voice: "Your plans are ill conceived; you will be arrested." He got away immediately without there being time to know either his name or who he was.

Geometrical Drawing.

[*For figures to solutions, see end of the pamphlet.*]

Thursday, September 1st, 1881. 10 A.M.–12.30 P.M.

1. On a given map, 32 miles are represented by 9 inches.

(1) Construct a plain scale of miles for the map, so as to show 20 miles.

(2) Construct a comparative scale of yards for the same map, and divide it to show distances of 1000 yards. Figure your scales properly, show your calculations, and give the representative fraction.

Thirty-two miles represented by 9 inches :—

Then

$$32 \times 1760 \times 36 = 2027520 \text{ inches } \therefore \frac{2027520}{9} = \frac{1}{225280} =$$

the representative fraction of the scale.

$$32 : 20 : 9 : x;\ 20 \times 9 = \frac{180}{32} = 5\tfrac{5}{8}'' = \text{length to represent 20 miles.}$$

For the comparative scales

yds. yds. in.

56320 : 10000 :: 9 : x

9

56320) 90000 (1·598 = x = the length of line to represent
56320 10,000 yards.

336800
281600

·552000
506880

451200
450560

···640

2. The sides of a quadrilateral figure A B C D are as follows :— A B = 3 inches, B C = $2\frac{1}{2}$ inches, C D = $2\frac{3}{4}$ inches, A D = 2 inches, and the diagonal A C = 4 inches.

Draw the figure, and within it draw a second, within the second a third, and within the third a fourth similar figure, having their sides parallel to those of the first, and at a distance of $\frac{1}{4}$ inch, $\frac{1}{2}$ inch, and $\frac{3}{4}$ inch respectively from the first. Reduce the outer largest figure to a triangle of equal area.

The first measurement to be taken is that of the line A B = 3 inches, then from A with A C = 4 inches an arc is described, then from B with a radius of 2·5 inches we cut the arc having its centre at A, and determine the exact position of C, and so on. To obtain the concentric figures, bisect

each side of the given figure and also its angles; on each bisecting line passing through the side mark off the required distances. The bisecting lines of the angles of the figure enable the student to determine the intersection of the sides of the concentric figures with exactness.

For the reduction of the quadrilateral figure to a triangle of equal area, it is necessary to join D B and a line from C drawn parallel to D B to meet the base produced in E. Then D C B and D E B being triangles upon a common base D B and between the parallel lines C E and D B are equal to each other, and the portion of the figure (2) cut off by D E is compensated for by the part (1) added to it, and the triangle A D E is equal to the quadrilateral figure A B C D.

3. On a base A B, 4 inches long, describe a triangle having the side A C = $3\frac{1}{4}$ and B C = $2\frac{1}{2}$ inches. Bisect A C in D, and from C and D draw two straight lines meeting at a point in the base A B, and making equal angles with it.

Having drawn the figure, drop a perpendicular from C to cut the base in F, make F E equal to C F, then draw a line from E to D, then draw a line from C to G the point of intersection of the line E D with A B. Then the angles A G D and B G C will be equal.

4. Describe a circle of $1\frac{1}{2}$ inches radius, and show how to draw a straight line by construction from a given point 3 inches from its centre, cutting the circumference in two points, A and B, so that A B, the part of the line within the circle, may be equal to 2 inches.

Draw any chord line D E 2 inches long, and then draw the dotted circle as shown tangental to it, then a tangent drawn from P, cutting the circle in the points A and B will be the required line, and A B will be the required chord line 2 inches long.

5. Describe an equilateral triangle of $2\frac{1}{2}$ inches sides, and on one of its sides describe an isosceles triangle of 3 inches side, in the quadrilateral figure thus obtained describe a square.

A B C is the given equilateral triangle, and C D B the isosceles triangle; B E is equal to B C and the sides of the square are drawn parallel to the diagonals of the figure; the point of intersection F of the line A E with B D determines the initial corner of the square.

6. Describe a circle of $\frac{3}{4}$ inch radius, and take any point P in the circumference. Take a point Q 1 inch from P and $1\frac{1}{2}$ inches from the centre of the circle, and determine the centre of a circle that shall touch the first in P, and pass through the point Q.

C is the given circle and P Q the given points; the line R S bisecting P Q and meeting C P produced in the point R determines the centre of the required circle R.

7. With a radius of $1\frac{3}{4}$ inches, describe a circle, and in it inscribe three equal circles, touching each other and the original circle.

The given circle is divided into six equal parts; from the extremity of any one of the radii (P in this case) a tangent is drawn to meet the radius Q produced at the point S; the bisection of the angle P S Q and the production of the bisecting line to meet the radius C P in the point R determines the radius of the circle C R; the intersections of the circumference of C R with the radii of the larger circle give the centres for the inscribed circles as shown.

GEOMETRY.

(Euclid, Book I.)

Thursday, Sept. 1st. 1.30 P.M.–3.15 P.M.

[*You need not answer more than* FOUR *of the questions.*]

I. If two triangles have two sides of the one equal to two sides of the other, each to each, and likewise their bases equal ; the angle contained by the two sides of the one shall be equal to the angle contained by the two sides, equal to them, of the other.

This is the eighth proposition of the First Book of Euclid.

II. Construct a triangle, of which the three sides shall be equal to three given straight lines.

This is the twenty-second proposition of the First Book.

III. If a straight line falling on two other straight lines, makes the alternate angles equal, these two straight lines shall be parallel.

This is the twenty-seventh proposition.

IV. Describe a parallelogram which shall be equal to a given triangle and have one of its angles equal to a given rectilineal angle.

This is the forty-second proposition.

V. A B C is an isosceles triangle, having the sides A C and B C equal. If C B be produced to any point D and D A be joined, prove that the angle A D B is equal to the difference of the angles B A C, B A D.

See diagram.

Let A B C be an isosceles triangle having the sides A C and B C equal. Produce C B to any point D, and join A D ; then the angle A D B shall be equal to the difference of the angles B A C, B A D. Because the exterior angle A B C is equal to the two interior angles B A D and B D A, but the angle A B C is equal to the angle B A C ; therefore the angle B A C is equal to the angles B A D and B D A, and therefore the angle A D B = B A C – B A D. Q. E. D.

[At the last moment we have been unable to obtain the rest of the Questions set. We must apologise to our readers for the incompleteness of this first issue, which we hope to make up for in the February number. We have given Test Papers on Geography and Arithmetic, to compensate in part for the omission of these papers.—ED.]

LONDON: PRINTED BY EDWARD STANFORD, 55, CHARING CROSS, S.W.

WOOLWICH AND SANDHURST EXAMINATIONS.

SPECIAL PREPARATION

BY

JOHN GIBSON, M.A.,

First Class, Classical Tripos, Cambridge, 1874; late Senior Exhibitioner of Uppingham School; Open Exhibitioner, Foundation Scholar, and Prizeman of Trinity College; and for five years Assistant Master at Westminster School; author of various books for Students, and Public School Examiner.

Mr. GIBSON prepares Pupils for the above Privately, in Class, and by Post. The system of preparation is one combining rapidity with accuracy. Great attention is paid to backward pupils, and to those whose education has been neglected from any cause.

The Classes meet three times a week until the month immediately preceding the Examination, when Class Pupils attend every day except Saturday.

During this month a series of Test Papers is worked out, covering all the ground likely to be traversed by the Examiners. The pupils are timed over their papers and marked.

GEOMETRICAL DRAWING.

A Tutor of great experience has been specially engaged for this subject, which is a most important one, and in which the Examination will be made considerably harder in a very short space of time.

FRENCH AND GERMAN.

Great attention is paid to these languages, so as to ensure the mastery of them by the Pupils, both grammatically and colloquially.

In consequence of the extra importance lately attached to French by the Civil Service Commissioners, Special Correspondence Classes are held twice a week under the superintendence of a French Professor and Mr. Gibson, who speaks both French and German.

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Per week	2 „

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Per term	6 guineas.
Per month	2½ „

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JOHN GIBSON,
Quernmore,
Bromley, Kent.

No. 6.]

GUIDE TO
PRELIMINARY
ARMY EXAMINATION.

FOR FEBRUARY, 1883.

CONTENTS:

BY

JOHN GIBSON, M.A.,

First Class Classics Camb. 1874; *Author of 'Preliminary Army Examination Made Easy,' 'Public Examination French Grammar,' 'London Matriculation Guide,' 'Specimen Essays,' &c.*

LONDON:
EDWARD STANFORD, 55, CHARING CROSS, S.W.
1883.

Price One Shilling.

ARMY EXAMINATIONS.

THE Editor continues to prepare Pupils for these Examinations privately, in class, and by post.

POSTAL PUPILS.

The system of Correspondence is an excellent one for those who cannot make it convenient to read orally. It is conducted by means of Notes and Test Papers; and any Pupil who follows out the system faithfully cannot fail to make good progress.

During 1882, of twenty-one Postal Pupils sent up for the Public Examinations nineteen were successful.

'GEOGRAPHY MADE EASY.'

This little Manual of Geography is published by Reeves and Turner, 100, Chancery Lane. We recommend it to candidates for the Preliminary, in view of the increasing difficulty of the Geography Papers given. It covers all the questions hitherto asked at the Preliminary, in a very short space, and several of the questions given in the Further Examination.

'PUBLIC EXAMINATION FRENCH AND LATIN GRAMMARS.'

Under these titles we have brought out a second edition of our 'French and Latin Grammars Made Easy.' The new edition is thoroughly revised and slightly enlarged.

RESULTS OF RECENT EXAMINATIONS.

In July, 1882, we passed two out of four candidates sent up for the Further Examination, whilst a third candidate gained over 4100 marks at his first trial. In November, 1882, we sent up four candidates. One of these took the fourteenth place in the list, and another scored over 4300 marks at his first attempt.

All the above were First Trial Candidates, and two of the successful ones had only read with us for two months, the other for four months.

In the Preliminary Examinations of 1882 we passed five out of seven sent up.

In the Preliminary Examinations held in February and March, 1883, we passed three out of four.

SANDHURST FURTHER EXAMINATION,

NOVEMBER AND DECEMBER, 1883.

WE intend, if a sufficient number of subscribers offer themselves, to bring out a Guide to the Sandhurst Further Examinations, early in December and July each year, containing the Questions set in the June and November Examinations in the following subjects:—Latin, Greek, English, French, German, and Mathematics, followed by the Answers.

The cost of each Guide will be 2*s.* 6*d.* (nett). Annual Subscribers, on payment of 4*s.* 6*d.*, will be entitled to a copy of both the June and November Guides.

The first number will be published early in December, 1883.

Intending Subscribers will kindly communicate with J. GIBSON, M.A., Bromley, Kent.

The next Preliminary Army Guide (No. 9) will be published early in September.

*** *The next Preliminary Army Guide will be published early in September.*

PRELIMINARY ARMY GUIDE.

JULY EXAMINATION, 1883.

PART I.

REVIEW OF RECENT EXAMINATIONS.

IT seems now-a-days to be a generally conceived idea that no candidate can pass the ordeal of the Preliminary at his first attempt. And, doubtless, in a great many cases this is an actual fact. There is, however, no reason whatever why such should be the case; with proper preparation and plenty of practice in working out Test Papers of questions set on the particular lines of the Examination, any candidate, of average ability, with three months' special training, ought to be certain of success.

French, Geography, and Arithmetic seem the most fatal pitfalls; but regular "coaching" in these subjects should bring pupils up to the requisite standard of proficiency.

There is no doubt that many candidates fail simply through mismanagement of their time in the Examination. In reference to this point, we would draw the attention of our readers to the Examination Hints given in Chapter V. of our 'Preliminary Army Examination Made Easy.'

THE JULY "FURTHER" EXAMINATION, 1883.

Every "Further" Examination points to the advisability of Classics being taken up in preference to any other subject. Any candidate who has a fair knowledge of Latin to start with, can, with a few months' special tuition, make sure of securing a goodly number of marks. In Greek also the papers are very fairly straightforward.

In mathematics, on the other hand, one of the papers set almost always proves fatal to the majority of candidates. This time the Algebra was a very tough nut to crack; and none but those who had a really good knowledge of the higher branches of that subject could have solved the problems satisfactorily.

We consider the best subjects to be taken up are Latin, English, French, and Greek (or German).

We would draw the attention of our readers to the Series of Test Papers which we give in these Guides on the Special English Literature subjects that are set from time to time. We have hitherto managed to anticipate several of the questions, some of them in almost the very wording of the examiners.

Part II.

TEST PAPERS ON BURKE'S SPEECH ON AMERICAN TAXATION; SPENSER'S FAERIE QUEENE, BOOK I.; AND BYRON'S CHILDE HAROLD.

Test Paper on Burke's Speech on American Taxation.

1. Explain the significance and effect of the Navigation Act.
2. On what grounds does Burke object to the taxation of America?
3. Estimate from the speech the character of Mr. Grenville: what effect had he upon American affairs?
4. Explain—

(i.) The General Epistle to the Americans.
(ii.) The very citadel of smuggling.
(iii.) Pigging together, heads and points, in the same truckle bed.
(iv.) The preamble of 1767.

5. What attitude did Burke assume towards Lord Chatham? Explain the reasons for it.
6. Give context and explain the connection of:—

(i.) I know the map of England as well as the noble lord.
(ii.) Would twenty shillings have ruined Hampden's fortune?
(iii.) Mr. Yorke, then Attorney-General.
(iv.) His earnest labours in this vineyard will raise him to a bishopric.

7. Give the history of the Repeal of the Stamp Act.

Test Paper on Spenser's Faerie Queene, Book I.

1. Explain the causes of the contemporary popularity of the 'Faerie Queene.'
2. Give instances of Shakespeare's acquaintance with and obligations to classical writers.
3. What vice is symbolised in "Duessa"? Trace the course of the allegory.
4. Explain, and give context of:—

(α) The dear remembrance of his dying Lord.

(β) Now when Aldeboran was mounted hye
Above the shiny Cassiopeias chaire.

(γ) ——that long wandering Greek,
That for his love refused deity.

(ϵ) Both Silo this and Jordan did excel.

(ζ) In their trinall triplicities on hye.

5. Give some account of Spenser's life.

Test Paper on Byron's Childe Harold.

1. Under what circumstances was 'Childe Harold' written? Quote particular lines in which the poet seems more especially to refer to himself.

2. It has been objected to this poem that the 'Childe' is very unknightly. Discuss the condition of the times in which chivalry flourished; and from such discussion draw a conclusion as to how far the poet has been true or otherwise in the portraiture of his hero.

3. Describe the following, as nearly as you can in Byron's own words:—

(*a*) The position and beauties of Cintra.
(*b*) The prelude to the battle of Waterloo.
(*c*) The character of Rousseau.
(*d*) The dying gladiator.

4. Explain the following lines, and mention the context in which each occurs:—

(i.) Her mind is nobler sure, her charms perchance as great.
(ii.) And partly that I did his sire some wrong.
(iii.) The nympholepsy of some fond despair.
(iv.) The Niobe of nations, there she stands.
(v.) Surely that stream was unprofaned by slaughters.
(vi.) Of joy the sojourn, and of wealth the mart.
(vii.) A thousand battles have assailed thy banks.
(viii.) For sceptred cynics earth were far too wide a den.
(ix.) Each Palikar his sabre from him cast.

[*For Test Papers on the rest of the English subjects for November, see back Guides.*]

Part III.

ANSWERS TO CORRESPONDENTS, QUERIES, &c.

A. W. B.—There is every probability of the French becoming harder.

Eustace.—Yes; the course would be a very good one.

Labor improbus.—You cannot present yourself at two successive Preliminary Examinations.

Part IV.

QUESTIONS SET IN THE PRELIMINARY ARMY EXAMINATION OF JULY 11th AND 12th, 1883, FOLLOWED BY THE ANSWERS.

French.

Translate into English:

I.

L'armée, sur qui pesait plus particulièrement le fardeau de la guerre, n'était cependant pas aussi avide de la paix que le reste de la nation. Ses principaux chefs, il est vrai, qui avaient déjà vu tant de régions lointaines, et de batailles sanglantes, que Napoléon allait bientôt combler de richesses,

désiraient comme la nation elle-même jouir de ce qu'ils avaient acquis. Bon nombre de vieux soldats, qui avaient leur part assurée dans la munificence de Napoléon, n'étaient pas d'un autre avis. Mais les jeunes soldats, et c'était une grande partie de l'armée, ne demandaient pas mieux que de voir naître de nouvelles occasions de gloire et de fortune. Toutefois, après une rude campagne, un intervalle de repos ne laissait pas de leur plaire, et on peut dire que la paix était saluée par les unanimes acclamations de la nation et de l'armée, des vainqueurs et des vaincus. Excepté l'Angleterre, qui trouvait le continent encore une fois uni contre elle, excepté l'Autriche, qui avait espéré un moment la ruine de son dominateur, il n'y avait personne qui n'applaudît à cette paix, succédant tout à coup à la plus grande agitation guerrière des temps modernes.

II.

Le jour suivant, lorsque j'eus déjeûné et bien payé la bonne chère qu'on m'avait faite, je me rendis tout d'une traite à Tours. Je n'y fus pas sitôt, que j'eus le bonheur de trouver une boutique, où l'on me reçut pour ma nourriture et mon entretien ; mais je n'y demeurai que six mois ; un garçon barbier, avec qui j'avais fait connaissance et qui voulait aller à Paris, m'invita de l'accompagner, et je partis pour cette ville avec lui. Je me plaçai là sur le même pied qu'à Tours. J'entrai dans une boutique des plus estimées. Il est vrai qu'elle était auprès d'une église, et que la proximité d'un théâtre y attirait bien de la pratique. Mon maître, deux grands garçons et moi, nous ne pouvions presque suffire à servir les hommes qui venaient s'y faire raser. J'en voyais de toutes sortes de conditions, mais, entre autres, des comédiens et des auteurs.

Grammatical Questions.

1. Give singular and gender of:—lis, bijoux, hôpitaux, jeux, trous, bals.

Give masculine gender of:—neuve, vieille, bienfaitrice, rousse, vengeresse, brève.

2. Give first person singular and plural of preterite definite of following verbs:—aller, acquérir, courir, mouvoir, valoir, boire, craindre, vivre, vaincre.

3. Write in the first column the present participle; in the second column the first person singular of present subjunctive; in the third column the third person plural of the imperfect subjunctive of the following verbs:—Avancer, jouer, employer, mourir.

4. Put into French:—A week ago. July 15th. Shut the door and the window. What are you thinking of? Of whom are you thinking, of him or of her? We shall stay here. How do you sell these grapes? How do you like this book?

GEOMETRY.

(Euclid, Book I.)

[N.B.—*Where letters are given in the question, they must be used in your answer to it, or no marks will be awarded.*

1. If two straight lines E F, G H cut one another, the vertical, or opposite, angles shall be equal.

2. If two triangles have two sides of the one equal to two sides of the other, each to each, but the angle contained by the two sides of one of them greater than the angle contained by the two sides equal to them, of the other, the base of that which has the greater angle shall be greater than the base of the other.

3. If a straight line A B falling on two other straight lines C D, F G, make the alternate angles equal to one another, the two straight lines shall be parallel to one another.

4. The straight lines which join the extremities of two equal and parallel straight lines K L, M N towards the same parts, are also themselves equal and parallel.

5. Describe a parallelogram equal to a given rectilineal figure, and having an angle equal to a given rectilineal angle.

GEOGRAPHY.

1. Draw a map of South America, showing the positions of Trinidad, Tierra del Fuego, Falkland Isles, Capes Horn, Frio, St. Roque, the Andes, and showing the courses of its chief rivers. Show the towns Rio Janeiro, Lima, George Town, Valparaiso, Cayenne, Bogotá, Caracas, Buenos Ayres.

2. Describe the position, climate, natural features, population, and industries of Iceland. To whom does it belong?

3. What are the straits between (*a*) Denmark and Sweden, (*b*) Corsica and Sardinia, (*c*) Caithness and the Orkneys, (*d*) Madagascar and Africa, (*e*) Sumatra and Java, (*f*) Asia and America, (*g*) Papua and Australia, (*h*) Skye and the Hebrides, (*i*) Hants and the Isle of Wight.

4. What river in (*a*) Europe, (*b*) Asia, (*c*) Africa, (*d*) America, is supposed to discharge the greatest bulk of water into the sea?

5. Where are the rivers Syr Daria (or Jaxartes), Amoor, Mackenzie, Irrawaddy, Ebro, Shannon, Po, Trent, and where do they flow into?

Describe briefly the courses of any two.

6. Where are the following: Ehrenbreitstein, Hammerfest, Pompeii, Sydney, Marathon, Saratoga, Sevastopol, Navarino, Singapore, Simla, and for what are they remarkable?

7. Give the counties of Connaught. What English counties border Wales? What are the Scotch counties on the West Coast?

8. Enumerate four ranges in the Russian Empire, describing their position, direction, extent, and, as far as you are able, their height.

9. What is the length of a geographical mile, and how is it determined? What is the width in degrees of the Torrid Zone, and what parts of the British Empire lie within it?

Arithmetic,

including Vulgar and Decimal Fractions, Proportion, and Simple Interest.

N.B.—*You are particularly recommended to answer the questions in the order in which they are set; not omitting any one unless you are unable to do it.*

Do not lose time by copying out the questions, but refer to each question by its number.

1. Add together $2\frac{2}{3}$, $\frac{9}{14}$, $3\frac{10}{21}$, and $\frac{3}{8}$.
2. Subtract $2\frac{4}{27}$ from $5\frac{5}{54}$.
3. Multiply together $2\frac{7}{16}$, $\frac{14}{65}$, $4\frac{4}{7}$, and $\frac{15}{64}$.
4. Divide $7\frac{13}{14}$ by $\frac{107}{132}$.
5. Add together 362·134, ·031427, 3·076, and 4·987.
6. Subtract 203·830642 from 204·536.
7. Multiply 321·4379 by 3·063.
8. Divide 1·047034 by ·0302.
9. Reduce 2·0172 of 2 lbs. 10 ozs. 17 dwts. to grains and the decimal of a grain.
10. What should be the price of 17 dozen articles if 391 such articles cost £21 3*s.* 7*d.*?
11. Reduce 4 acres 2 roods 17 perches $3\frac{1}{4}$ yards to square inches.
12. Find the simple interest of £3562 10*s.* for $3\frac{1}{2}$ years at $4\frac{1}{4}$ per cent. per annum.
13. Add together $1\frac{3}{5}$, $2\frac{5}{33}$, $3\frac{7}{15}$, and $4\frac{9}{11}$.
14. Subtract $\frac{111}{112}$ from $1\frac{83}{84}$.
15. Multiply together $1\frac{7}{26}$, $1\frac{32}{33}$, $1\frac{11}{57}$, and $1\frac{65}{68}$.
16. Divide $2\frac{58}{63}$ by $3\frac{1}{84}$.
17. Add together the circulating decimals $\cdot\dot{1}42857\dot{}$, $\cdot 16\dot{}$, $\cdot 011\dot{3}6\dot{}$.
18. Subtract ·432 of 3 days 5 hours from $\frac{7}{15}$ of $4\frac{2}{7}$ weeks, and express the answer in minutes and the decimal of a minute.
19. Multiply 4·37642 by ·00172.
20. Divide 1·6308 by 362·4, and multiply the result by 1·942.
21. Divide $\cdot 9\dot{3}$ by $\cdot 10\dot{6}$, and express the answer as a decimal.
22. Multiply $1\cdot 4\dot{3}7\dot{}$ by ·792, and express the answer as a decimal.
23. A bankrupt owes three creditors £240, £360, and £400 respectively: if £325 is divided among them in proportion to their claims, how much will each receive, and how much will be paid in the £?
24. A manufacturer employs 30 women and 20 children, who work respectively 10 and 8 hours per day on five days of the week and half-time on Saturday; each woman receives $2\frac{1}{2}$*d.* and each child $1\frac{1}{2}$*d.* per hour. What should be paid for their combined labour for a year? (52 weeks = 1 year.)
25. For what amount should goods worth £1900 be insured at 5 per cent., so that, in case of total loss, the premium and the value of the goods may be recovered?
26. What sum will amount to £4022 6*s.* 3*d.* in $3\frac{1}{2}$ years at $4\frac{1}{2}$ per cent. per annum simple interest?

Elements of Geometrical Drawing,

including the Construction of Scales, and the Use of simple Mathematical Instruments.

N.B.—*The figures should be neatly drawn in clear fine pencil lines, and, if time allows, they may be inked in with Indian ink.*

The solutions must be strictly geometrical, and particular care should be taken to show all the necessary lines of construction.

1. Construct a diagonal scale of $\frac{1}{792}$ to show single yards. Let your scale represent 150 yards, figure it properly, and show by two small marks on the scale the points you would choose in order to take off a length of 67 yards.

2. Find, by construction, a third proportional to two straight lines $1\frac{1}{3}$ and $1\frac{3}{4}$ inches long; and a fourth proportional to three straight lines $1\frac{1}{4}$, $2\frac{1}{3}$, and $1\frac{5}{8}$ inches long. Write down the length of each line so found.

3. The sides of a quadrilateral figure A B C D are as follows: A B = 45 yards, B C = 38 yards, C D = 33 yards, and A D = 39 yards, and the diagonal A C = 66 yards. Make a scale of 15 yards to an inch, and draw the figure to that scale and bisect it by a straight line drawn from the point B. Determine the area of the whole figure in square yards.

4. Construct an isosceles triangle equal to the sum of four squares whose sides are respectively $\frac{1}{2}$, $\frac{5}{8}$, $\frac{7}{8}$, and $1\frac{1}{4}$ inch.

5. On an Austrian map a distance of $2\frac{1}{2}$ Austrian miles is represented by 1·15 inches. Draw a scale of English miles for the map. Show 30 English miles. Figure your scale properly, write above it its representative fraction, and show all the necessary calculations.

1 Austrian mile = 3·3312 English miles.

1 English mile = 1760 yards.

6. With a radius of $2\frac{1}{4}$ inches describe a semicircle, and in it inscribe a square *having two of its corners in the arc of the semicircle, and the side non-adjacent to these upon the bounding diameter.*

7. On one side of a straight line $2\frac{1}{2}$ inches long as base describe an isosceles triangle having its angle at the vertex 55°, and on the other side of the line as base describe an isosceles triangle having its angle at the vertex 35°. In the quadrilateral figure so obtained inscribe a circle.

ANSWERS.

French.

I.

The army, on whom the burden of the war most especially fell, was not, however, so greedy for peace as the rest of the nation. True, its principal leaders, who had already seen so many distant lands and bloody battles—whom Napoleon was soon going to overwhelm with wealth—wished, as did the nation itself, to enjoy what it had acquired. A large number of old soldiers who had their certain share in Napoleon's munificence, were of the same opinion. But the young soldiers, and these were a large proportion of the army, asked no better than to see new opportunities for glory or fortune arise. At the same time, after a hard campaign, an interval of

repose did not fail to please them; and we may say that the peace was hailed by the unanimous acclamations of the nation and of the army, both on the side of conquerors and conquered. With the exception of England, which again found the Continent united against her, and with the exception of Austria, which for a moment had hoped for the ruin of her master, there was no one who did not applaud the peace, succeeding as it did immediately the greatest warlike movement of modern times.

II.

On the following day, when I had breakfasted and paid well for the good cheer that had been done me, I betook myself in one journey to Tours. I was no sooner there than I had the good fortune to find a shop, where I was received for board and lodging; but I only remained there six months; a young barber, whose acquaintance I had made, and who wanted to go to Paris, asked me to go with him, and I set out with him for that town. I placed myself there on the same footing as at Tours. I entered one of the most respectable shops. It is true it was close by a church and that the proximity of a theatre attracted much business. My master, two tall apprentices, and myself, could scarcely suffice to serve the men who came there to be shaved. I saw men of all kinds, but among others, comedians and authors.

French Grammar.

1.

Lis,	masc.	Jeu,	masc.
Bijou,	masc.	Trou,	masc.
Hôpital,	masc.	Bal,	masc.

neuf.	vieux.	bienfaiteur.
roux.	vengeur.	bref.

(See 'Public Examination French Grammar,' under Nouns and Adjectives.)

2.

J'allai.	nous allâmes.
J'acquis.	„ acquîmes.
Je courus.	„ courûmes.
Je mus.	„ mûmes.
Je valus.	„ valûmes.
Je bus.	„ bûmes.
Je craignis.	„ craignîmes.
Je vécus.	„ vecûmes.
Je vainquis.	„ vainquîmes.

(See 'Public Examination French Grammar,' under Irregular Verbs.)

Pres. Part.	*1st Person Pres. Subj.*	*3rd Person Imp. Subj.*
avançant	que j'avance	qu'ils avançassent
jouant	que je joue	qu'ils jouassent
employant	que j'emploie	qu'ils employassent
mourant	que je meure	qu'ils mourussent
dormant	que je dorme	qu'ils dormissent
tenant	que je tienne	qu'ils tinssent
sachant	que je sache	qu'ils sussent
absolvant	que j'absolve.	(wanting)

(See 'Public Examination French Grammar,' under Irregular Verbs.)

4. Il y a une semaine.
Le quinze Juillet.
Fermez la porte et la fenêtre.
A quoi pensez-vous?
A qui pensez-vous? à lui ou à elle?
Nous resterons ici.
Pour combien vendez-vous ces raisins?
Comment trouvez-vous ce livre?

(See 'Public Examination French Grammar,' *ad fin.*)

Geography.

1. See Atlas, and 'Geography Made Easy,' pp. 158–164.

2. Iceland is situated between the North Atlantic and Arctic Oceans, 130 miles S.E. of Greenland and 850 miles W. of Norway. Its climate is very severe. It is a mountainous volcanic island, the interior of which is uninhabitable, consisting of naked rocks, glaciers, lava, and volcanoes. The highest mountain is Sna-fell; its chief volcano, Hecla. Geysers, springs of boiling water, sometimes gush out to the height of 200 feet. The island contains about 50,000 inhabitants, of Norwegian origin. The most important industries are cattle-rearing and fishing. There are a few rude home manufactures; little or no agriculture. Iceland belongs to Denmark.

(See 'Geography Made Easy,' pp. 18, 67; 'Cornwell's Geography,' pp. 290, 291.)

3. (*a*) The Kattegat, (*b*) Bonifacio Strait, (*c*) Pentland Firth, (*d*) Mozambique Channel, (*e*) Sunda Strait, (*f*) Behring Strait, (*g*) Torres Strait, (*h*) Little Minch, (*i*) Southampton Water.

(See 'Geography Made Easy,' *passim.*)

4. (*a*) The Volga, (*b*) the Yenisei, (*c*) the Nile, (*d*) the Amazon.

(See 'Geography Made Easy,' pp. 15, 99, 132, 160.)

	River.	Country.	Mouth.
5.	Syr Daria.	Turkestan.	Sea of Aral.
	Amoor.	Siberia.	Gulf of Tartary.
	Mackenzie.	N. America.	Arctic Ocean.
	Irrawaddy.	Further India.	Gulf of Martaban.
	Ebro.	Spain.	Mediterranean Sea.
	Shannon.	Ireland.	Atlantic Ocean.
	Po.	Italy.	Adriatic Sea.
	Trent.	England.	Humber.

The Shannon rises in County Cavan, and flows S.W. into the Atlantic through Loughs Allen, Ree, and Derg, passing Carrick, Athlone, and Limerick.

The Trent rises in Staffordshire, and flows N.E. into the Humber, passing Burton, Nottingham, Stoke, and Newark.

(See 'Geography Made Easy,' *passim.*)

6. Ehrenbreitstein, in Germany, on the Rhine. Strong fortress.
Hammerfest, N. of Norway. Most northern town in Europe.
Pompeii, S. of Italy. Destroyed by an eruption of Vesuvius in 69 A.D.

Sydney, capital of New South Wales. Port Jackson is supposed to be the finest harbour in the world.

Marathon, near Athens, in Greece. Defeat of Persians by Greeks in 490 B.C.

Saratoga, in the United States. N.W. of Massachusetts.

Sevastopol, fort in Russia, on Black Sea. Taken and destroyed by English and French in 1855 A.D.

Navarino, W. coast of Greece. Turkish fleet destroyed by English, French, and Russian armament in 1827 A.D.

Singapore, port of Further India. Called "The Paradise of India, the Home of Plenty, and the Abode of Wealth."

(See 'Geography Made Easy,' *passim*.)

7. Counties of Connaught:—
Roscommon, Leitrim, Sligo, Mayo, Galway.

Counties of England bordering Wales:—
Cheshire, Shropshire, Herefordshire, Monmouthshire.

Scotch counties on the W. Coast:—
Sutherland, Ross, Inverness, Argyle, Dumbarton, Renfrew, Ayr, Wigtown.

(See 'Geography Made Easy,' pp. 35, 36, 41.)

8. (i.) Ural Mountains, forming the boundary between Europe and Asia, running N. to S. Height 5400 feet.
(ii.) Caucasus, S. of Russia, running W. to E. Highest point, Elburz, 18,750 feet.
(iii.) Valdai Hills, W. of Russia in Europe, running N. to S. Height 1200 feet.
(iv.) Altai Mountains, S. of Siberia or Asiatic Russia, running S.W. to N.E. Height 7000 feet.

(See 'Geography Made Easy,' pp. 14, 73, 97.)

9. A geographical mile is about 2000 yards.
The length of a degree of longitude at the equator is found to be $69\frac{1}{10}$ English or Statute miles; and as it embraces 60 geographical miles, the relation of an English to a geographical mile is as 6 to 7 (nearly).
The Tropics contain $23\frac{1}{2}$ degrees on each side of the equator = 47 degrees in all.
British Possessions in the Tropics:—Part of India, Ceylon, Malacca, Singapore, Hong Kong, Aden, Mauritius, Sierra Leone, Gambia, Gold Coast, St. Helena, several islands in the West Indies, British Guiana, parts of Australia, the Fiji Islands.

(See 'Geography Made Easy,' pp. 3, 5, 30, 173.)

EUCLID.

1. This is Proposition 15.
2. This is Proposition 24.
3. This is Proposition 27.
4. This is Proposition 33.
5. This is Proposition 45.

Arithmetic.

1. $5\,\frac{112+108}{168}\,\frac{+80+63}{} = 5\,\frac{363}{168} = 7\,\frac{27}{168} = 7\,\frac{9}{56}$. *Ans.*

2. $3\,\frac{5-8}{54} = 2\,\frac{51}{54} = 2\,\frac{17}{18}$. *Ans.*

3. $\frac{\overset{3}{\cancel{39}}}{16} \times \frac{\overset{2}{\cancel{14}}}{\underset{13}{\cancel{65}}} \times \frac{\cancel{32}}{\cancel{7}} \times \frac{\overset{3}{\cancel{15}}}{\underset{2}{\cancel{64}}} = \frac{9}{16}$. *Ans.*

4. $\frac{111}{\underset{7}{\cancel{14}}} \times \frac{\overset{66}{\cancel{132}}}{107} = \frac{7326}{749} = 9\,\frac{585}{749}$. *Ans.*

5. *Ans.* 370·228427.

6. *Ans.* ·705358.

7. *Ans.* 984·5642877.

8. *Ans.* 34·67.

9. lbs. ozs. dwts.
   2 10 17 = 33456 grs.

   grs. grs.
   $33456 \times 2{\cdot}0172 = 33743{\cdot}7216$. *Ans.*

10. 17 dozen = 204.

    £ s. d.
    391 : 204 :: 21 3 7 : *Ans.*
    20
    ——
    423
    12
    ——
    5083

    $Ans. = \frac{\overset{221}{\cancel{5083}} \times \overset{12}{\cancel{204}}}{\underset{23}{\cancel{391}}} = 2652\text{ d.} = 11\text{ £}\ 1\text{ s.}$ *Ans.*

11.

ac.	roods.	perches.	yds.
4	2	17	$3\frac{1}{4}$
4			
18			
40			
737			
11			
8107			
11			
4)89177			
$22294\frac{1}{4}$			
$3\frac{1}{4}$			
$22297\frac{1}{2}$			
9			
$200677\frac{1}{2}$			
12			
2408130			
12			
28897560 sq. in.			

Ans.

12. $3562\frac{1}{2} \times 3\frac{1}{2} \times 4\frac{1}{4} \div 100$

$$= \frac{\overset{285}{\cancel{7125}}}{2} \times \frac{7}{2} \times \frac{17}{4} \times \frac{1}{\underset{4}{\cancel{100}}} = \frac{33915}{64} \text{ £} = 529 \text{ £ } 18 \text{ s. } 5\tfrac{1}{4} \text{ d.} \quad \textit{Ans.}$$

13. $10\frac{99+25+77+135}{165} = 10\frac{336}{165} = 12\frac{6}{165} = 12\frac{2}{55}$. *Ans.*

14. $1\frac{332-333}{336} = \frac{668-333}{336} = \frac{335}{336}$. *Ans.*

15. $\frac{\cancel{33}}{26} \times \frac{65}{\cancel{33}} \times \frac{\cancel{68}}{\underset{3}{\cancel{57}}} \times \frac{\overset{7}{\cancel{133}}}{\cancel{68}} = \frac{455}{78} = 5\frac{65}{78} = 5\frac{5}{6}$. *Ans.*

16. $\frac{184}{\cancel{63}} \times \frac{\overset{12}{\cancel{84}}}{253} = \frac{736}{759} = \frac{32}{33}$. *Ans.*

17. $\cdot\dot{1}42857\dot{} + \cdot 1\dot{6} + \cdot 011\dot{3}\dot{6} = \frac{142857}{999999} + \frac{15}{90} + \frac{1125}{99000}$

$$= \frac{142857000 + 166666500 + 11363625}{999999000} = \frac{320887125}{999999000} = \cdot 320\dot{8}87445\dot{}. \quad \textit{Ans.}$$

18. ·432 of 3 days 5 hrs. = ·432 × 77 hrs. = 33·264 hours.

$\frac{\cancel{7}}{\cancel{15}} \times \frac{\cancel{30}\ 2}{\cancel{7}}$ weeks = 2 weeks = 336 hours.

336 hours − 33·264 hours = 302·736 hours.

60

18164·160 min.

18164·16 min. *Ans.*

19. *Ans.* ·0075274424.

20.
$$\begin{array}{r} 3624\cdot)\ 16\cdot308\ (\cdot0045 \\ 14\ 496 \\ \hline \cdot18120 \\ 18120 \\ \hline \cdots\cdots \end{array}$$

·0045 × 1·942 = ·008739. *Ans.*

21. $\cdot9\dot{3} \div \cdot1\dot{0}\dot{6} = \frac{84}{90} \div \frac{105}{990} = \frac{\overset{4}{\cancel{12}}}{\cancel{84}} \times \frac{11}{\cancel{990}\ \cancel{105}\ \cancel{15}\ 5} = \frac{44}{5} = 8\cdot8$. *Ans.*

22. $1\cdot4\dot{3}\dot{7} \times \cdot792 = 1\frac{433}{990} \times \frac{792}{1000}$

$= \frac{1423}{\cancel{990}\ 10} \times \frac{\overset{8}{\cancel{792}}}{1000} = \frac{11384}{10000} = 1\cdot1384$. *Ans.*

23. £240 + £360 + £400 = £1000.

A receives $\frac{\overset{6}{\cancel{240}}}{\cancel{1000}\ 25} \times \overset{£}{\cancel{325}}^{13} = £78$

B „ $\frac{\overset{9}{\cancel{360}}}{\cancel{1000}\ 25} \times \overset{13}{\cancel{325}} = £117$ } 1*st Ans.*

C „ $\frac{\overset{2}{\cancel{400}}}{\cancel{1000}\ 2} \times \overset{65}{\cancel{325}} = £130$

And the dividend in the £ is $\frac{\overset{£}{325}}{1000} = \frac{\overset{£}{13}}{40} = 6\ 6$. *s. d.* 2*nd Ans.*

24. $30 \times 10 \times 5\frac{1}{2} \times 2\frac{1}{2}d.$

$$= \overset{15}{\cancel{30}} \times \overset{5}{\cancel{10}} \times \frac{11}{\cancel{2}} \times \frac{5}{\cancel{2}} = 4125d. \quad \text{Womens' earnings per week.}$$

$$20 \times \overset{2}{\cancel{8}} \times \frac{11}{\cancel{2}} \times \frac{3}{\cancel{2}}\,d. = 1320d. \quad \text{Childrens' earnings per week.}$$

$$4125d. + 1320d. = 5445d. \quad \text{Total earnings per week.}$$

$$5445d. \times 52 = 283140d. = £1179\ 15s. \quad \textit{Ans.}$$

25. If he insures for £100 at 5 per cent., he covers a loss of £95 plus the £5 premium.

$\therefore$ as £95 : £100 :: £1900 to answer.

$$£\frac{1900 \times 100}{95} = £2000. \quad \textit{Ans.}$$

26. Suppose £100.

Amount on £100 for $3\frac{1}{2}$ years at $4\frac{1}{2}$ per cent.

$$= \overset{£}{100} + \overset{£}{\frac{7}{2}} \times \overset{£}{\frac{9}{2}} = \overset{£}{100} + \overset{£}{\frac{63}{4}} = \overset{£}{115\tfrac{3}{4}}.$$

Now make a proportion sum

$$\overset{£}{115\tfrac{3}{4}} : \overset{£}{4022\tfrac{5}{16}} :: \overset{£}{100} : \textit{Ans.}$$

$$\textit{Ans.} = \overset{25}{\cancel{100}} \times \frac{\overset{139}{\cancel{64357}}}{\underset{4}{\cancel{16}}} \times \frac{\overset{4}{\cancel{4}}}{\cancel{463}} = £3475. \quad \textit{Ans.}$$

Geometrical Drawing.

1. 792 inches = 22 yards.

$$\text{As } \overset{\text{yds.}}{22} : \overset{\text{yds.}}{150} :: \overset{\text{in.}}{1} : x$$

$$x = \frac{150}{22} = 6{\cdot}81.$$

Draw the scale 6·81 inches long; divide into three equal parts, showing 50 miles; subdivide into five to show tens of miles. Draw ten additional parallel lines and complete the diagonal scale, as indicated in diagram. The two small circles in the scale mark a distance of 67 yards.

2. (*a*) Draw X Y and Y Z containing the angle X Y Z. On X Y measure Y $a = 1\frac{1}{3}''$, and on Y Z measure off Y $b = 1\frac{3}{4}''$. Describe an arc $b\,c$ from centre Y, radius Y b meeting Y X in c. Through c draw $c\,d$ parallel to $a\,b$. Y d is the required third proportional.

(*b*) Construct as before an angle X Y Z. From X Y cut off Y $a = 1\frac{1}{4}''$; from Y Z cut off Y $b = 2\frac{1}{3}''$. From Y X cut off Y $c = 1\frac{5}{8}''$; join $a\,b$, and through c draw $c\,d$ parallel to $a\,b$. Y d is the required fourth proportional.

3. Construct a scale of 15 yards to an inch; show 70 yards; subdivide to show single yards.

Construct the triangle A B C, measuring the given distances on the scale —A B = 45 yards, B C = 38 yards, and A C = 66 yards. On A C construct the triangle A C D: A D = 39 yards and C D = 33 yards.

This quadrilateral may be bisected as required by reducing it to the triangle A C G, as indicated in the diagram. Bisect base A G in F and join F B; or thus: draw the two diagonals D B, A C. Bisect A C in E; through E draw E F parallel to D B; join B F; B F bisects A B C D.

To determine its area geometrically, find K G a mean proportional between A G and half the altitude of the equivalent triangle A B G. K G represents the side of a square equal in area to A B C D; it measures on the scale a little over 36 yards; giving an area of about 1298 sq. yards; half the base of the triangle multiplied by the altitude (37 × 35) gives nearly the same result.

4. Draw O M and O N at right angles and of indefinite length. Set off $O a = \frac{1}{2}''$; $O b = \frac{5}{8}''$; $O c = \frac{7}{8}''$; $O d = a b$; $O e = 1\frac{1}{4}''$; $O f = c d$; join $e f$. The square on $e f$ = the sum of the squares on the four given straight lines. Describe the square $e f g k$; bisect $g k$ in l; through l draw $l h$ parallel to $f g$ or $e k$; produce $h l$ to m, making $l m = l h$; join $m f$, $m e$. $f m e$ is the triangle required.

5. 1 Austrian mile = 3·3312 Eng. miles.
$2\frac{1}{2}$ „ „ = 8·328 „

E. miles.		E. miles.		in.		in.
As 8·328	:	30	::	1·15	:	x

$$x = \frac{30 \times 1{\cdot}15}{8{\cdot}328} = 4{\cdot}14, \text{ \&c.}$$

Draw the proposed scale 4·14″ long. Divide into three equal parts to show tens of miles. Subdivide into ten parts to indicate single miles.

$$\text{R. F.} = \frac{1{\cdot}15}{8{\cdot}328 \times 1760 \times 36} = \frac{1{\cdot}15}{527662{\cdot}08} = \frac{1}{458836} \text{ nearly.}$$

6. Describe a semicircle A F E B of given radius; bisect A B in H. Draw B C perpendicular to A B and equal to H B; bisect H B in D; join C D; draw H E parallel to C D; and E P parallel to C B; take H G = H P; draw G F perpendicular to A B; join F E; F G P E is the required square.

7. Draw the line A B, $2\frac{1}{2}''$ long, as common base to the two proposed triangles.

Produce B A to C and at A construct the angle C A D = 55°; bisect the angle B A D by the line A E; at point B construct the angle A B F = E A D; produce A E, B F till they meet in G. G A B will be an isosceles triangle with a vertical angle of 55°.

Similarly construct the angle C A d = 35°; bisect d A B by line A e; make the angle A B f = B A e; produce A e and B f till they meet in g; A $g b$ is the second isosceles triangle with a vertical angle of 35°.

To inscribe a circle, join G g; bisect g A G by A H meeting G g in H; H will be the centre; the radius being a perpendicular let fall from H to any one of the four sides of the trapezium.

Draw the scale 5·54 inches long. Divide into three parts, and subdivide into ten. Each of these ten parts will represent 100 yards.

$$\text{R. F.} = \frac{7 \cdot 8}{4224 \times 36} = \frac{13}{253440} \text{ or } \frac{1}{19495} \text{ nearly.}$$

6. Construct the triangle A B C of the prescribed dimensions, bisect the base in the point D and draw E C perpendicular to A B. Find a mean proportional A G′ between A E and A D half the base. Measure the distance A G = A G′ from A along the base to G. At G raise the perpendicular G F. G F bisects the triangle as required.

To determine the area of the triangle A B C, find the mean proportional B L between the base A B and B K half the altitude of C E. The triangle A B C is equal in area to a square described on this line, which by measurement is about 1·83 inches long.

7. Describe the circle; draw two diameters at right angles to each other; to inscribe a circle in each quadrant, bisect each quadrant by lines meeting the circumference. At D the extremity of a diameter draw both ways the tangent B C; produce A E and A F to meet B C; bisect the angle A C D by C G. G is the centre of the circle which it is required to inscribe in the quadrant E A F. A circle described from centre A with radius A G will at once determine the centres of the other three circles.

No. 9.]

GUIDE TO PRELIMINARY ARMY EXAMINATION.

FOR AUGUST, 1883.

CONTENTS:

BY

JOHN GIBSON, M.A.,

First Class Classics Camb. 1874; *Author of "Preliminary Army Examination Made Easy," "Public Examination French and Latin Grammars," "London Matriculation Guide," "Specimen Essays," &c.*

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1883.

Price One Shilling.

ARMY EXAMINATIONS.

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*** *The next Preliminary Army Guide will be published five days after the February*, 1884, *Examination.*

PRELIMINARY ARMY GUIDE.

AUGUST EXAMINATION, 1883.

Part I.

REVIEW OF RECENT EXAMINATIONS.

The Geography Paper set in the Examination held on the 28th and 29th August was uncommonly stiff, and contained not only Political Geography questions, but some searching ones in Physical Geography as well. We once more advise Candidates to pay particular attention to this subject. There is little else to note in reference to this Examination; but we cannot impress too strongly the importance of working out plenty of Test Papers, carefully timed, on the particular lines of the Examination. Indeed, in view of the high standard now required, this is the only plan that will ensure success.

Part II.

THE "FURTHER" EXAMINATION.

As we mentioned in our last Number, we intend bringing out the Papers set in the "Further" Examination to be held in November and December of this year, in the following subjects:—English, French, German, Latin, Greek and Mathematics.

The Papers will be followed by solutions (in full), and we hope to get the Guide out about a week after the end of the Examination.

The price will be 2*s.* 6*d.* (nett).

Subscribers may have copies of the two Guides (July and December) that will be published every year, for an Annual Subscription of 4*s.* 6*d.*

We note that in the last "Further" Examination (June and July, 1883), the standard of marking was unusually low; at least 25 per cent. below the average.

Classics still seem to be the favourite subjects with the Examiners; and we, therefore, recommend the taking up of Latin (especially) and Greek, wherever feasible.

We refer our readers to Guides Nos. 7 and 8 for Test Papers on the English subjects set for the next "Further" Examination.

In the December "Further" February Preliminary Guide we shall give Test Papers on the English subjects for July, 1884.

PART III.

CORRESPONDENCE, NOTICES, &c.

R.S.—Our Preliminary Guides are now published by Messrs. Reeves & Turner, 100, Chancery Lane, and Dorrell & Son, 15, Charing Cross.

TU QUOQUE.—You will find the Papers required in back Numbers.

SATIS SUPERQUE.—We cannot tell you the exact standard; but it is becoming gradually raised in all subjects.

PART IV.

QUESTIONS SET IN THE EXAMINATION HELD ON AUGUST 29TH AND 30TH, 1883, FOLLOWED BY THE ANSWERS.

EUCLID. (Book I.)

N.B.—Where letters are given in the question, they must be used in your answer to it, or no marks will be awarded.

1. If two triangles, CDE, FGH, have two sides of the one equal to two sides of the other, each to each, and have also the angles contained by those sides equal to one another, they shall also have their bases, or third sides, equal; and the two triangles shall be equal, and their other angles shall be equal, each to each, namely, those to which the equal sides are opposite.

2. The greater angle EFD of the triangle DEF is subtended by the greater side, or has the greater side opposite to it.

3. All the interior angles of any rectilineal figure, together with four right angles, are equal to twice as many right angles as the figure has sides.

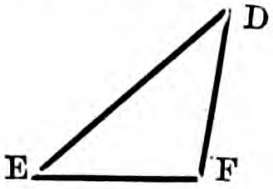
4. Describe a parallelogram that shall be equal to a given triangle BCD, and have one of its angles equal to a given rectilineal angle A.

5. If the square described on one of the sides of a triangle be equal to the squares described on the other two sides of it, the angle contained by these two sides is a right angle.

ANSWERS TO EUCLID PAPER.

1. See Euclid, I. 4, but use for the triangles the letters CDE, FGH, instead of ABC, DEF.

2. See Euclid, I. 19, and instead of figure there use the following:



3. See Euclid, I. 32. Corollary I.

4. See Euclid, I. 42.

5. See Euclid, I. 48.

(See Preliminary Army Examination Made Easy, pp. 37—40.)

FRENCH.

(Including Grammatical Questions.)

Translate into English:

1. A huit heures du matin il se mit en route, toujours précédé de son avant-garde. La plus grande partie de la route se fit à pied. Le froid était rigoureux, et Napoléon fut souvent obligé de descendre de cheval pour se réchauffer en marchant. Il s'arrêta pour se reposer un moment dans une espèce de chalet occupé par une vieille femme et quelques vaches. Il s'adressa à cette paysanne, et lui demanda si on avait des nouvelles de Paris. Elle parut fort étonnée d'une question à laquelle elle était peu occoutumée, et elle répondit qu'elle n'en savait rien. Vous ne savez donc pas ce que fait le Roi? reprit Napoléon. Le Roi! repartit la vieille femme, le Roi! vous voulez dire l'Empereur, il est toujours *là-bas*. Cette habitante des Alpes ignorait donc que Napoléon avait été précipité du trône, et remplacé par Louis XVIII.! Napoléon, qui était bien surpris en présence d'une aussi étrange ignorance, regarda Drouot, et lui dit: Eh bien, Drouot, à quoi sert de troubler le monde pour le remplir de notre nom? Il sortit tout pensif, et songeant à la vanité de la gloire.

2. Quand le roi Jean, fait prisonnier du Prince de Galles dans la fameuse bataille de Poitiers, parut devant le vainqueur, on eût dit qu'il l'était lui-même. Le prince anglais donna un magnifique souper, dans sa tente, au roi et à tous les prisonniers de distinction; il le servit pendant tout le repas, et ne voulut jamais se mettre à table, quelque prière que le roi lui en pût faire. Je ne suis pas, disait-il, assez suffisant pour m'asseoir à table de si grand prince et de si vaillant homme que le roi. Il tâchait de le consoler, en lui disant que, quoique vaincu, il avait, par ses actions héroïques, acquis plus de gloire que le vainqueur. On lui rendit tous les honneurs du triomphe quand il entra dans Londres; il était monté sur un cheval blanc richement enharnaché, ayant à son côte le prince de Galles, vêtu fort modestement, et monté sur une petite haquenée. Le roi, la reine et toute la cour d'Angleterre le reçurent avec beaucoup d'amitié et de respect. Quand ils virent que la mauvaise fortune ne l'avait point abattue, ils augmentèrent leur estime pour lui, et adoucirent sa servitude par toutes sortes de déférences et d'honnêtetés.

FRENCH GRAMMAR.

1. Give the masc. sing. of following pronouns:—Elle, cette, laquelle, celle, la tienne, sa.

Give the French for the following numbers:—13, 21, 74, 95, 80, 1000.

2. Give the 3rd pers. sing. and plur. of future indic. of vendre, dormir, ouvrir, tenir, pouvoir, vouloir, voir, croire, faire.

3. Give the infin. and pres. part. of reçois, perdit, pleut, bous, fuit, peut, saurai, conduit, pris.

4. Translate the following expressions:—

How do you do? She is just gone out. We have received no letter. Where are you going to-morrow? I like to read. Give me this and keep that. The town in which we live. He often speaks of you.

ANSWERS TO FRENCH TRANSLATION AND GRAMMAR PAPER.

1. At eight o'clock in the morning he started, still preceded by his advance guard. The greater part of the march was performed on foot. The cold was intense, and Napoleon was often obliged to get off his horse to warm himself by walking. He stopped to rest for one minute in a kind of Swiss cottage, occupied by an old woman and a few cows. He addressed this peasant, and asked her if there was any news from Paris. She seemed very much surprised at a question to which she was so seldom accustomed, and she replied that she knew nothing about it. You do not know then what the King is doing? rejoined Napoleon. The King! replied the old woman, the King! You mean the Emperor. He is still down there. This inhabitant of the Alps did not know then that Napoleon had been deposed from the throne and replaced by Louis XVIII.! Napoleon, who was much surprised at the display of such strange ignorance, looked at Drouot and said to him, Well, Drouot, what is the use of troubling the world to fill it with our name? He went out very thoughtful, meditating on the vanity of glory.

2. When King John, made prisoner by the Prince of Wales in the famous battle of Poitiers, appeared before the conqueror, one would have said that he was the conqueror himself. The English prince gave a magnificent supper in his tent to the king and all prisoners of note. He waited on them through the whole meal, and would not sit at table, however much entreated by the king to do so. I am not, said he, conceited enough to sit at the table of so great a prince and such a valiant man as the king. He sought to console him by saying that, although conquered, he had by his brave actions gained more glory than the conqueror. Full triumphal honours were given him on his entry into London; he was mounted on a white charger, richly caparisoned, with the Prince of Wales at his side in very modest attire, and mounted on a little nag. The king, the queen, and all the English court, received him with much friendship and respect. When they saw that ill-fortune had in no way lowered him, they increased their respect for him, and alleviated his thraldom by all kinds of deference and politeness.

GRAMMAR.

1. Il, ce, cet, lequel, celui, le tien, son.

(See "Public Examination French Grammar," under "Pronouns.")

Treize, vingt-et-un, soixante-quatorze, quatre-vingt-quinze, quatre-vingts, mille.

(See "Public Examination French Grammar," under "Numerals.")

2. Vendra, vendront; dormira, dormiront; ouvrira, ouvriront; tiendra, tiendront; pourra, pourront; voudra, voudront; verra, verront; croira, croiront; fera, feront.

(See "Public Examination French Grammar," under "Irregular Verbs.")

3. Recevoir, recevant; perdre, perdant; pleuvoir, pleuvant; bouillir, bouillant; fuire, fuyant; pouvoir, pouvant; savoir, sachant; conduire, conduisant; prendre, prenant.

(See "Public Examination French Grammar," under "Verbs.")

4. Comment vous portez-vous? Elle vient de sortir. Nous n'avons reçu point de lettre. Où irez-vous demain? J'aime à lire. Donnez moi ceci, et tenez cela. La ville où nous demeurons. Il parle souvent de vous.

(See "Public Examination French Grammar," *ad fin.*)

For the whole paper, see "Preliminary Army Examination Made Easy," pp. 40—42.

GEOGRAPHY.

1. On what grounds are we convinced (a) that the earth is round, (b) that it spins on its axis, (c) that its axis is not perpendicular to the plane of its motion?

2. Describe as nearly as you can the system of winds which prevails over S. and E. Asia, both during winter and during summer. Distinguish between the climate of India, China Proper, Siberia and Asia Minor.

3. Draw an outline map of Africa, including the adjacent islands of Madagascar, Madeira, Malta, Mauritius and Cape Verde. Mark Congo and Atlas Mountains; trace the course of the Senegal, Niger, Orange, Zambesi and Nile with tributaries, and mark position of the following places:—Zanzibar, Morocco, Timbuctu, Port Natal, Khartoum, Tunis, Graham's Town, Port Said.

4. Describe the position and importance of ten of the chief harbours which lie between Riga and Brest.

5. Where are the following places, and what do you know about them: 1. Ravenna; 2. Belgrade; 3. Dresden; 4. Denver; 5. Teheran; 6. Hong-Kong; 7. Orenburg; 8. Funchal; 9. Limerick; 10. Port Louis.

6. State with regard to the following counties—1. Norfolk; 2. Devonshire; 3. Glamorgan; 4. Cumberland; 5. Forfar; 6. Waterford—what are their principal rivers, towns and industries.

7. State which of the United States have a seaboard in the Atlantic, excluding the Gulf of Mexico. Indicate the position by order, and mention an important town in each.

8. Name six of the most famous geographical explorers, and give an account of each.

ANSWERS TO THE GEOGRAPHY PAPER.

1. (a) If we watch a vessel as it leaves the shore we notice that the hull is the first part to disappear from sight. Now, unless the earth were round, the hull, being the largest part of the vessel, would remain visible longer than any other part; whereas the fact is that the topmast is the last part to disappear. Hence something intervenes between the eye and the lower part of the vessel, and that something is the roundness of the earth.

Again, when a man goes over a mountain his feet are first lost to view and his head last.

Other proofs of the earth's globular form are the circumnavigation of the globe, and the circular shadow which it casts on the moon when the latter is eclipsed.

(b) The rotation of the earth upon its axis produces the alternation of

day and night. With the half turned towards the sun it is day; with the half turned away from the sun it is night.

Unless the earth rotated on its axis the alternation of day and night could only be produced by the sun and the whole of the universe moving round the earth in the space of twenty-four hours! an inconceivable and long-exploded theory.

(c) Were the axis perpendicular to the plane of its motion, the length of the day would be always and everywhere the same, and the alternation of the seasons would be wholly unknown.

(See Mackay's Physiography and "Geography Made Easy," pp. 4, 5.)

2. The monsoons, or variations and modifications of the trade winds, blow towards the Asiatic continent in summer, and in the opposite direction in winter. They regulate the alternations of the wet and dry seasons through South-Eastern Asia—the rainy season of the W. coast of India corresponding with the prevalence of the S.W. monsoon, and that of the E. coast with the S.E. monsoon. In the W. part of the Indian Ocean, south of the Equator, the N.E. monsoon blows from October to April, constituting the rainy season; while from April to October the S.E. monsoon holds sway and forms the dry season.

The climate of India is generally tropical, except in the hilly districts; and there are two seasons in the year—a dry and a rainy. In China Proper the climate is very varied, as the country extends through more than 20 degrees of latitude, and hence we may distinguish three main zones—a northern, central and southern. In the northern zone there is a continental climate, with hot summers and excessively cold winters. The central zone has a milder and more equable temperature, and enjoys two rainy and two dry seasons in the year. In the southernmost belt the climate is almost tropical.

The climate of Siberia is the most severe of any on the globe; whilst in Asia Minor the north plateau has a continental climate; in the eastern part of the plateau region the mountains are covered with snow for two-thirds of the year; in the west the winters are not so severe, but there is great variation of temperature.

(See Johnston's Physical Geography and "Geography Made Easy," pp. 101, 109, 112, 123.)

3. See "Geography Made Easy," pp. 128—143, and Atlas.

4. *Königsburg*, on the Pregel, capital of Prussia proper; here there is an university; there is a great trade in corn and timber; large vessels are unloaded and load at its port Pillau, owing to the shallowness of the Frisches Haff.

Hamburg.—At mouth of Elbe. First port of Germany, and, perhaps, of the Continent.

Amsterdam, on the Y, at mouth of Amstel. Capital of Holland; fortified on land side; a great amount of ship-building goes on here; diamond-cutting gives work to more than 1,000 men; it is the greatest commercial town in Holland. An exhibition is being held there at the present time.

Rotterdam, on Maas, second port; frequent steam communication for goods and passengers; tomb of Admiral de Witt; statue of Erasmus, who was born here.

Antwerp, on the Scheldt in Belgium; a naval and military fortress; a

cathedral with the highest tower in Europe, the view from which extends fifty miles in every direction; here Teniers and Vandyck were born; besieged in 1832 by French; it is important as being in the direct line of communication between England and the Continent.

Ostend, also in Belgium; a great watering-place; it exports a great number of rabbits. It is important as having a passage to and fro and trade with England.

Calais, in France, the nearest port to England, and the last town held by the English in France.

Boulogne.—Famous as a watering-place, much favoured by British residents.

Dieppe.—A steamer station for the Continent viâ Newhaven.

St. Malo.—A fortress and garrison town.

(See "Geography Made Easy," pp. 43—55.)

5. *Ravenna.*—N.E. of Italy, on left bank of River Montone. Capital of the Western Empire under Honorius.

Belgrade.—Capital of Servia, on right bank of River Danube. Being the key of Hungary, it has proved a constant source of contention between the Austrians and Turks.

Dresden.—In Saxony, on the River Elbe. Famous for china and works of art.

Denver.—Capital of Colorado, in the U. S.

Teheran.—Capital of Persia. Famous for cannauts, or covered waterways.

Hong Kong.—Small island off S.E. coast of China. Ceded to Great Britain by the Treaty of Canton in 1841.

Orenburg.—In the extreme east of European Russia. Great mining centre.

Funchal.—Capital of Madeira. Much resorted to by invalids from Britain.

Limerick.—At mouth of Shannon on W. coast of Ireland. Famous for glove trade. Besieged in 1691.

Port Louis.—Capital of Mauritius, on N.W. coast. Beautifully situated in a cove formed by a series of basaltic hills.

(See "Geography Made Easy," *passim.*)

6.

	Town.	*River.*	*Industries.*
Norfolk	Norwich	Wensum	Agriculture, Herring Fisheries.
Devonshire	Exeter, Honiton	Exe, Dart	Agriculture, Lace.
Glamorgan	Cardiff	Taff	Mining, Cotton, Linen, &c.
Cumberland	Carlisle	Eden	Woollen Manufactures.
Forfar	Forfar		Coarse goods, as Sheeting and Sail Cloths.
Waterford	Waterford	Suir	Agriculture, and Mining.

(See "Geography Made Easy," pp. 20—43.)

7.

States.	*Capitals.*	*States.*	*Capitals.*
Washington	Olympia	S. Carolina	Columbia
Oregon	Salem	Virginia	Richmond
California	Sacramento	Delaware	Dover
Florida	Tallahassee	New Jersey	Trenton
Georgia	Milledgeville	Massachusetts	Boston
N. Carolina	Raleigh	Maine	Augusta

(See "Geography Made Easy," pp. 151, 152.)

8. *Sebastian Cabot,* a Venetian, in 1498 discovered the mainland of N. America and Newfoundland.

Christopher Columbus, in the same century, discovered S. America.

In 1487 the Cape of Good Hope was discovered by *Bartholemew Diaz,* a Portuguese navigator; and in 1497 this Cape was doubled by *Vasco de Gama.*

Mungo Park discovered the Niger, the great river of W. Africa; and several important discoveries, *e. g.* the Congo River, Lake Nyassa, &c., have been made by the great modern explorers *Livingstone* and *Stanley.*

ARITHMETIC,

(Including Vulgar and Decimal Fractions, Proportion and Simple Interest) (including Dictation).

N.B.—You are particularly recommended to answer the questions in the order in which they are set; not omitting any one unless you are unable to do it.
Do not lose time by copying out the questions, but refer to each question by its number.

1. Add together $8\frac{5}{12}$, $\frac{21}{22}$, $\frac{7}{33}$, and $2\frac{5}{44}$.

2. Subtract $11\frac{23}{68}$ from $13\frac{13}{51}$.

3. Multiply together $2\frac{21}{32}$, $\frac{14}{51}$, and $1\frac{13}{55}$.

4. Divide $1\frac{25}{32}$ by $1\frac{9}{16}$.

5. Add together ·0487, 151·65, 9·00074, and 64·4683.

6. Subtract 1·30695 from 400·0756.

7. Multiply 709·285 by 4·0507.

8. Divide 2·5 by 32.

9. Reduce 2·105 of 4 days 11 hrs. 43 min. to minutes and the decimal of a minute.

10. If I travel by rail 42 miles for 5*s.* 3*d.*, what ought I to pay for travelling 35 miles at a price per mile 20 per cent. higher?

11. How many square inches are there in 4 acres 2 roods 35 perches 4 sq. feet 34 sq. inches?

12. Find the simple interest on £2,368 : 10*s.* for $4\frac{1}{2}$ years at $2\frac{1}{2}$ per cent. per annum.

13. Add together $1\frac{10}{21}$, $\frac{5}{26}$, $2\frac{7}{39}$, and $1\frac{8}{91}$.

14. Subtract $3\frac{17}{19}$ from $6\frac{11}{76}$.

15. Multiply together $1\frac{8}{17}$, $2\frac{47}{70}$, $\frac{34}{55}$, and $\frac{8}{21}$.

16. Divide $3\frac{78}{109}$ by $2\frac{45}{81}$.

17. Add together ·7415 of $1\frac{1}{2}$ cwt. and 11·041 lbs., and give the answer in ozs. and the decimal of an ounce.

18. Subtract ·0184 of $1\frac{3}{7}$ weeks from 13·114872 hours, and give the answer in minutes and the decimal of a minute.

19. Multiply 8561·02 by ·075608.

20. Find the continued product of 45·61, 4·0045, and ·0001 7.

21. Divide 7927·5 by ·875.

22. Divide $2{\cdot}2\dot{3}$ by $\cdot 8\dot{1}\dot{2}$, and give the answer as a decimal.

23. A man gives a boy 20 yards start in 100 yards, and loses the race by 10 yards. What would have been a fair start to give?

24. A garrison of 1,500 men has provisions for 12 weeks, at the rate of 20 ounces for each man per day; how many men would the same provisions maintain for 20 weeks, each man being allowed 18 ounces per day?

25. At what rate per cent. per annum simple interest will £862 : 10*s.* amount to £1,037 : 3*s.* 1½*d.* in 4½ years?

26. A father leaves £14,000 to be so divided among his three children that the eldest may have £1,000 more than the second, and twice as much as the third. What is the share of each?

ANSWERS TO THE ARITHMETIC PAPER.

1. $10\frac{55+126+28+15}{132} = 10\frac{224}{132} = 11\frac{92}{132} = 11\frac{23}{33}$—*Ans.*

2. $2\frac{52-69}{204} = 1\frac{256-69}{204} = 1\frac{187}{204} = 1\frac{11}{12}$—*Ans.*

3. $\frac{\cancel{17}}{\cancel{85}}{}^{\cancel{2}}_{\cancel{32}} \times \frac{\cancel{2}}{\cancel{14}}{}^{3}_{\cancel{51}} \times \frac{\cancel{3}}{\cancel{48}}{}^{\cancel{5}}_{\cancel{35}} = 1$—*Ans.*

4. $\frac{57}{32} \div \frac{19}{10} = \frac{\cancel{57}}{\cancel{32}}{}^{3}_{16} \times \frac{5}{\cancel{10}}{}^{}_{\cancel{19}} = \frac{15}{16}$—*Ans.*

5. *Ans.*—225·16774.

6. *Ans.*—398·76865.

7. *Ans.*—2873·1007495.

8. *Ans.*—·078125.

9. 4 days 11 hrs. 43 min. = 6,463 min.

$$6{,}463 \overset{min.}{\times} 2{\cdot}105 = 13604{\cdot}615 \text{ min.}—\textit{Ans.}$$

10. 5*s.* 3*d.* for 42 miles = 1½*d.* per mile.

20 per cent. higher per mile = 1½*d.* + ⅕ of 1½*d.* = $2\frac{1}{10}d.$ per mile.

$$2\tfrac{1}{10}d. \times 35 = \frac{21}{\cancel{10}}{}^{}_{2} \times \overset{7}{\cancel{35}} = \frac{147d.}{2} = 73\tfrac{1}{2}d. = 6s.\ 1\tfrac{1}{2}d.—\textit{Ans.}$$

11. 4 acres 2 roods 35 perches 4 feet 34 inches.

$$
\begin{array}{r}
4 \\
\hline
18 \\
40 \\
\hline
755 \\
30\tfrac{1}{4} \\
\hline
22650 \\
188\tfrac{3}{4} \\
\hline
22838\tfrac{3}{4} \\
9 \\
\hline
205548\tfrac{3}{4} \\
4 \\
\hline
205552\tfrac{3}{4} \\
12 \\
\hline
2466633 \\
12 \\
\hline
29599596 \\
34 \\
\hline
29599630
\end{array}
$$

Ans.—29599630 sq. inches.

12. $2368\frac{1}{2} \times 4\frac{1}{2} \times 2\frac{1}{2} \div 100$

$$= \frac{4737}{2} \times \frac{9}{2} \times \frac{5}{2} \times \frac{1}{100} = \frac{\pounds 213165}{800}$$

$$= 266\tfrac{365}{800} = \pounds 266\ \ s.\ 9\ \ d.\ 1\tfrac{1}{2} — \textit{Ans.}$$

13. $4\ \dfrac{260 + 105 + 98 + 48}{546} = 4\tfrac{511}{546} = 4\tfrac{73}{78} — \textit{Ans.}$

14. $3\ \dfrac{11 - 68}{76} = 2\ \dfrac{87 - 68}{76} = 2\tfrac{19}{76} = 2\tfrac{1}{4} — \textit{Ans.}$

15. $\dfrac{\cancel{5}}{\cancel{25}\ \cancel{17}} \times \dfrac{\cancel{14}}{\cancel{187}\ \cancel{70}\ \cancel{4}\ 7} \times \dfrac{17}{34\ 55\ 5} \times \dfrac{8}{21} = \dfrac{136}{147}$ —*Ans.*

16. $3\ \dfrac{78}{109\ 9} \div \dfrac{45}{218\ 2}$

$$= \frac{\cancel{405}}{\cancel{109}} \times \frac{\cancel{218}}{45} = 18 — \textit{Ans.}$$

17. $1\frac{1}{2}$ cwt. = 168 lbs.

$$\text{lbs.} \quad \text{lbs.}$$
$$168 \times \cdot 7415 = 124 \cdot 572$$
$$\text{lbs.} \quad \text{lbs.} \quad \text{lbs.}$$
$$124 \cdot 572 + 11 \cdot 041 = 135 \cdot 613$$
$$16$$
$$813678$$
$$135613$$
$$2169 \cdot 808 = 2169 \cdot 808 \text{ozs}—Ans.$$

18. ·0184 of $1\frac{2}{7}$ weeks.

$$= \frac{92}{\cancel{184}\ \cancel{10000}\ \cancel{1250}\ 625} \times \frac{9}{7} \times 7 \times \cancel{24}\ 3 = \frac{\text{hrs.}\ 2484}{625}$$

$$= 3\tfrac{609}{625} = 3 \cdot 9744 \text{ hrs.}$$
$$13 \cdot 114872 - 3 \cdot 9744$$
$$3 \cdot 9744$$
$$= 9 \cdot 140472 \text{ hrs.}$$
$$60$$
$$548 \cdot 42832\cancel{0} \text{ min.}—Ans.$$

19. *Ans.*—647·28160016.

20. *Ans.*—·03104969165.

21. *Ans.*—9060.

22. $2 \cdot \dot{2}\dot{3} \div \cdot 8\dot{1}\dot{2}$

$$= 2\frac{23-2}{90} \div \frac{812-8}{990}$$
$$= 2\tfrac{21}{90} \div \tfrac{804}{990}$$
$$11$$
$$= \frac{\cancel{201}}{\cancel{90}} \times \frac{\cancel{990}}{\cancel{804}\ 4} = \frac{11}{4} = 2\tfrac{3}{4} = 2 \cdot 75—Ans.$$

23. The man gained (20 — 10) 10 yards on the boy in the 100 yards. Hence a fair start would have been 10 yards.—*Ans.*

24. $\underset{\text{Weeks.}}{20} : \underset{\text{Weeks.}}{12} :: \underset{\text{Men.}}{1{,}500}—Ans.$

$$\text{Ozs.} \quad \text{Ozs.}$$
$$18 : 20$$
$$5 \qquad\qquad 2$$
$$\frac{\cancel{1500} \times \cancel{20} \times \cancel{12}}{\cancel{20} \times \cancel{18}\ 3} = \underset{\text{Men.}}{1{,}000}—Ans.$$

25.

£	*s.*	*d.*
1037	3	$1\frac{1}{2}$
862	10	0
£174	13	$1\frac{1}{2}$—Interest required.

Suppose a rate of 1 per cent.

Interest on £862 : 10*s.* at 1 per cent. for $4\frac{1}{2}$ years

$$= 862\tfrac{1}{2} \times 4\tfrac{1}{2} \div 100$$

$$= \frac{1725}{2} \times \frac{9}{2} \times \frac{1}{100} = \frac{621}{16} = 38\tfrac{13}{16}.$$
$$4$$

Dividing the interest required by this sum we get $174\frac{1}{32}$ £ $\div$ $38\frac{13}{16}$ £.

$$= \frac{5580}{32} \times \frac{16}{621} = \frac{9}{2} = 4\tfrac{1}{2} \text{ per cent.}—\textit{Ans.}$$
$$2$$

26. Let x = the share of the first.
Then $x - £1{,}000$ = the share of the second.
$\frac{1}{2}\,x$ = the share of the third.

$$x + x - £1{,}000 + \tfrac{1}{2}\,x = £14{,}000.$$
$$\therefore 2\tfrac{1}{2}\,x = 15{,}000.$$
$$\therefore 5\,x = 30{,}000.$$
$$\therefore x = 6{,}000, \text{ the share of the first.}$$
$$x - 1{,}000 = 5{,}000, \text{ the share of the second.}$$
$$\tfrac{1}{2}\,x = 3{,}000, \text{ the share of the third.}$$
} *Ans.*

(For the whole paper, see "Preliminary Army Examination Made Easy," pp. 35—37.)

DICTATION (1).

The career of Charles the Bold naturally divides itself into a French and a German portion. He was at once a French prince and a prince of the German Empire; and it is remarkable that his two spheres of action can be thus mapped out with almost as much chronological as geographical precision. We cannot understand his peculiar position without a very strong effort to free ourselves of modern notions of royalty. He held the rank of one of the first princes in Europe without being a king, and without possessing an inch of ground for which he did not owe a vassal's service to some superior lord. The phrase "Great Powers" had not been invented in the 15th century; but there can be

no doubt that if it had been, the Duke of Burgundy would have been ranked among the greatest of the Powers. He was in actual strength the equal of his royal neighbour on the West, and far more than the equal of his imperial neighbour on the East. Yet some of his territories were held of the Empire, and some of the French crown. As Duke of Burgundy and Count of Flanders he was a vassal of France; as Count of Holland, he was a vassal of the German Emperor. His dominions, large as they were, were valuable out of all proportion to their extent. No other sovereign in Europe was the direct lord of so many rich and flourishing cities, rendered still more prosperous by the long and comparatively peaceful administration of his predecessor. But, on the other hand, his dominions were far from forming a compact whole; they had different languages, customs and laws; and they had as little geographical as they had political connection. They lay, in two large separate masses, the two Burgundies forming one and the Low Countries forming the other; and their master could not go from one of his capitals to another without passing through a foreign territory.

DICTATION (2).

The old Emperor was holding his court at Rome, when letters were received from York announcing that the army had been driven back upon the fortresses and that the barbarians were ravaging the land. Severus seems to have been weary of the splendour and corruption by which his despotism was maintained. "I have been all things," he said, "and nothing avails me." He determined to lead the campaign himself, and in the summer the court was transferred to York, and an army massed upon the frontier. The restoration of the province was followed by a further advance which ended in a costly failure. The plan of advance was unsuited to the nature of the country. The estuaries were bridged and roads were driven through the fens, but still as the troops pushed their way the enemy retreated to more distant places of refuge: and before a precarious peace could be arranged it was estimated that fifty thousand men had perished in the never-ending ambuscades and skirmishes or had died of cold and disease. Before two years had passed, the war broke out again, and Severus vainly threatened to extirpate every tribe in the hills. His death is said to have been hastened by the omens of approaching ruin, and the trifling story is useful as illustrating his temperament and the manners of his time. When he went into the street of York to make an offering to some healing deity he was lead to the Temple of Mars by the mistake of a rustic soothsayer: black victims stood in readiness for a gloomy sacrifice to the god of war, and were permitted by ill fortune to follow the Emperor to the palace. A negro soldier had met him at a posting-house near Hadrian's Wall and spoken words relating to death and enthronement in heaven. "Thou hast been all things," he had cried, as he presented a funereal wreath; "Thou hast conquered all things: now, therefore, be the God of Victory!"

ELEMENTS OF GEOMETRICAL DRAWING.

(Including the Construction of Scales, the use of Simple Mathematical Instruments, and Dictation.)

N.B.—The figures should be neatly drawn in clear fine pencil lines, and, if time allows, they may be inked in with Indian ink.
The solutions must be strictly geometrical, and particular care should be taken to show all the necessary lines of construction.

1. Construct a diagonal scale of $4\frac{1}{4}$ inches to a mile to measure distances of 5 yards. Show by two small marks on the scale the points you would choose in order to take off a length of 735 yards. Figure your scale properly, and write above it its representative fraction. (1 mile = 1760 yards.)

2. Take two points, A and B, 4 inches apart, and a third point C, $2\frac{3}{4}$ inches from A and $2\frac{1}{2}$ inches from B. With A, B, and C as centres, describe three circles touching each other.

3. Draw a straight line AB, and from a point O in it *construct* on the same side of AB the following angles:—AOC = 45°, AOD = 75° AOE = $112\frac{1}{2}$°, AOF = $147\frac{1}{2}$°, and make OA = 33 feet, OC = 42 feet, OD = 25 feet, OE = 57 feet, OF = 84 feet, and OB = 60 feet. Join AC, CD, DE, EF, and FB. Scale and write down the lengths in yards of these five lines.

Scale, which should be drawn, 15 feet = 1 inch.

4. Determine the side of a square of 7 inches area; draw the square, and trisect it by lines drawn from one of its angles.

5. Two places on a French map are known to be 17 French leagues apart, and this distance is represented on the map by 2·45 English inches. Draw a scale of English miles for the map, showing 100 miles. Show all your calculations, figure the scale properly, and write above it its representative fraction.

(1 French league = 4262·84 English yards.)

6. The sides of a triangle are $3\frac{1}{2}$ inches, $2\frac{3}{4}$ inches, and 4 inches respectively. Draw the triangle, and determine an equilateral triangle of equal area.

7. Describe a regular pentagon of $2\frac{1}{2}$ inches side, and in it inscribe a square.

ANSWERS TO GEOMETRICAL DRAWING.

1. As 1760 : 1000 : : 425 : x

$$x = \frac{1000 \times 4{\cdot}25}{1760} = 2{\cdot}41.$$

Length of scale to show 1000 yards will be 2·41 inches; for drawing and figuring of scale see diagram; the two small circles mark 735 yards.

$$\text{R. F.} = \frac{4{\cdot}25}{1760 \times 36} = \frac{4{\cdot}25}{63360} \text{ or } \frac{1}{1490} \text{ nearly.}$$

2. Construct the triangle ABC; AB 4″, AC $2\frac{3}{4}$″, BC $2\frac{1}{2}$″. Bisect the angles CAB, ABC by lines meeting in point D; from D let fall perpendiculars meeting AB, BC, AC in points G, F and E. These points determine the lengths of the radii of the required circles. Complete figure as in diagram.

3. Draw any line AB—mark in it any point O. To determine the required angles:

AOC = 45° = $\frac{1}{2}$ a right angle.

AOD = 75 = $\frac{1}{2}$ a right angle + $\frac{1}{2}$ the angle of an equilateral triangle.

AOE = $112\frac{1}{2}$ = 90 + $\frac{1}{2}$ an angle of 45°.

AOF = $147\frac{1}{2}$ = 90 + $\frac{1}{2}$ an angle of 75° + 20° which is $\frac{1}{3}$ the angle of an equilateral triangle:

Draw scale long enough to measure the given distances; complete figure,—marking the lengths of the five lines in *yards*—see diagram.

4. Determine a mean proportional AB to two lines of 7″ and 1″ respectively; this gives the side of a square of 7″ area. To trisect by lines from A one of its angles, draw the diagonal AC; trisect DC, CB in points E, F, G and H—join EA, FA, GA, HA. The square is now divided into six equal triangles, and the lines AF, AG trisect the square as required.

5. 17 French leagues = 17 × $\overset{\text{Eng. yds.}}{4262{\cdot}84}$ = $\overset{\text{Eng. yds.}}{72468{\cdot}28}$ = $\overset{\text{Eng. miles.}}{41{\cdot}175}$.

$$\text{As } \overset{\text{Eng. miles.}}{41{\cdot}175} : 100 :: \overset{\text{inches.}}{2{\cdot}45} : \overset{\text{inches.}}{x}.$$

$$x = \frac{100 \times 2{\cdot}45}{41{\cdot}175} = \overset{\text{inches.}}{5{\cdot}94}.$$

Draw scale 5·94 inches long; divide into ten equal parts; sub-divide into ten to show single miles.

$$\text{R. F.} \frac{2{\cdot}45}{17 \times 4262{\cdot}84 \times 36} = \frac{2{\cdot}45}{2608858{\cdot}08}$$

$$= \frac{1}{1064840} \text{ nearly.}$$

6. Draw the triangle ABC of given dimensions; produce BC to D; through A draw AE parallel to BD; at point C place between the parallels the equilateral triangle CDF. Determine a mean proportional CG between BC and CD; mark off HD = CG; through H draw HK parallel to CF, meeting DF produced. HKD will be the equilateral triangle required.

7. Construct a pentagon on line AB, $2\frac{3}{4}$″. To inscribe a square—join EC; at E raise the perpendicular EF; make EF = EC. Draw FD meeting EA in G—G will be the position of one angle of the required square. Complete square as in diagram.

The next Guide (*No.* 10) *will be published five days after the February*, 1884, *Examination.*

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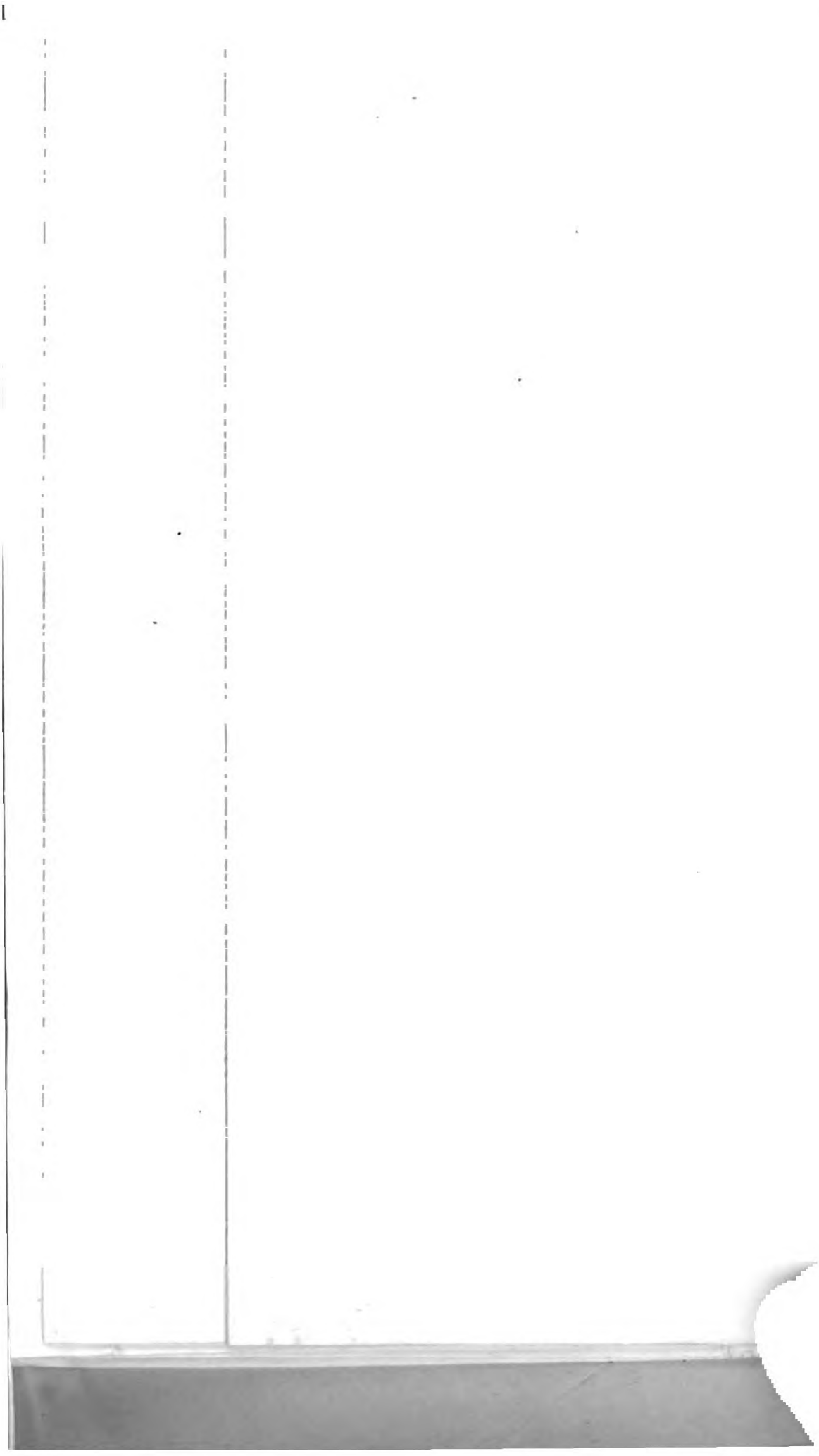

No. 10.]

GUIDE TO
PRELIMINARY
ARMY EXAMINATION.

FOR FEBRUARY, 1884.

CONTENTS:

BY

JOHN GIBSON, M.A.,

First Class Classics Camb. 1874; *Author of "Preliminary Army Examination Made Easy," "Public Examination French and Latin Grammars," "London Matriculation Guide," "Specimen Essays," &c.*

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(SANDHURST, WOOLWICH AND MILITIA LITERARY).

SPECIAL PREPARATION BY JOHN GIBSON, M.A.

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(Formerly French Master at Southampton College; and for Two Years French Master at Hoddesdon Grammar School.)

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During the last year and a half Pupils from Quernmore have taken the following places 1st (Cav.), 3rd, 6th (Univ.), 14th, 28th, 31st and 63rd.

Four of the successful candidates passed at their first attempt, with a few months' special tuition.

In the Preliminary, 11 have passed out of 17.

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(For Boys up to the age of Sixteen).

Owing to the increasing difficulty of the Army Examinations, and the importance that in consequence attaches to proper early training, we have started a Junior Department at Bromley, entirely distinct and in separate premises from the Senior Department, and under school discipline. Special Features in this Department, are:—

(i.) Dictation and English Composition are taught carefully and thoroughly from the outset.

(ii.) Great attention is paid to grounding in Latin and Mathematics.

(iii.) The utmost facilities are given for French and German (both grammatical and colloquial.)

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Prospectus containing full particulars, will be sent on application to

JOHN GIBSON, M.A.,

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*** *The next Preliminary Army Guide will be published five days after the July Examination.*

PRELIMINARY ARMY GUIDE.

MARCH EXAMINATION, 1884.

Part I.

REMARKS ON THE FEBRUARY, 1884, EXAMINATION.

The standard required for a Pass in February was a most cruel one. We believe that only about one Candidate in every ten succeeded; and the number of "blue pills" received was something unprecedented. Most of the failures appear to have been in French Grammar and Geography. We would, therefore, once more direct the special attention of Candidates to these important subjects. As we understand that 85 per cent. of the maximum marks is required for a pass, it will be seen that it is necessary to have every subject "at the fingers' ends."

Part II.

(i) OUR SANDHURST "FURTHER" GUIDE; (ii) OUR LONDON CLASS.

(i) Our Sandhurst "Further" Guide.

Our First Number, containing the Questions given in the November and December, 1883, Examination, followed by the Solutions, Test Papers in the English Literature subjects set for July next, and other information, appeared four days after the close of the Examination.

We have received several criticisms on this Guide, mostly of a friendly and favourable nature; and we trust that its issue will prove of service to both Tutors and Candidates, as showing the kind of answers that the Examiners expect, and the mould in which they should be cast.

We shall continue to publish these Guides directly after each "Further" Examination in July and December.

(ii) Our London Class.

We are making arrangements to hold a Special London Class for Army Candidates who are living in town, and unable to join us at Bromley.

We shall be happy to forward Prospectus of full particulars on applica-

tion; and we would ask those who intend to become members of this Class to give us as early notice as possible, that we may make our arrangements accordingly.

The Class will be held every morning, except Saturday, from 10 to 1 o'clock, at 24, Chancery Lane.

Part III.

CORRESPONDENCE, NOTICES, &c.

Yorks.—We cannot say with any certainty; nor do we think it likely that you will be able to obtain the information that you require.

Aliquis.—Yes, decidedly; you have every chance of success.

*** Back Numbers of our "Army Guides," containing the Questions given at previous Examinations, followed by the Answers, may be obtained of Messrs. Reeves & Turner, 100, Chancery Lane, E.C., and of Messrs. Dorrell & Son, 15, Charing Cross, S.W.

Part IV.

QUESTIONS SET IN THE EXAMINATION HELD ON MARCH 12th and 13th, 1884, FOLLOWED BY THE ANSWERS.

EUCLID (Book I.).

N.B.—Where letters are given in the question, they must be used in your answer to it, or no marks will be awarded.

1. If two angles of a triangle DEF be equal to one another, the sides also which subtend, or are opposite to, the equal angles, shall be equal to one another.

2. The angles which one straight line makes with another straight line on one side of it, either are two right angles, or are together equal to two right angles.

3. If two triangles have two angles of the one equal to two angles of the other, each to each; and one side equal to one side, *viz.*, *sides which are opposite to equal angles in each;* then shall the other sides be equal, each to each, and also the third angle of the one equal to the third angle of the other.

4. Straight lines FG, HK, which are parallel to the same straight line AB, are parallel to each other.

5. To a given straight line PQ apply a parallelogram which shall be equal to a given triangle ABC, and have one of its angles equal to a given rectilineal angle DEF.

GEOGRAPHY.

1. Where are the following capes:—Lizard, Matapan, Finisterre, Farewell, Bon, Wrath, Horn, St. Vincent, Sable, York?

2. Trace the course of the Indus, St. Lawrence, Nile, Thames, Trent, Shannon.

3. Mention the seas and straits (a) between the River Don and Southampton; (b) between Venice and Bombay.

4. What are the principal sea-ports in Brazil, the United States, Russia, Asiatic Turkey, Spain and Italy?

5. Give an account of New Zealand.

6. Give six examples of peninsulas, two from British Isles, three from Europe and Asia, and one from America.

7. Mark on the map given (Hindostan):—Calcutta, Madras, Bombay, cities on Ganges and tributaries, Darjeeling, Ootacamund, Kurrachee, Trincomalee, and the towns still held by France and Portugal.

ARITHMETIC.

(Including Vulgar and Decimal Fractions, Proportion and Simple Interest.)

N.B.—You are particularly recommended to answer the questions in the order in which they are set; not omitting any one unless you are unable to do it.
Do not lose time by copying out the questions, but refer to each question by its number.

1. Add together $2\frac{5}{6}$, $\frac{1}{2}\frac{6}{1}$, $4\frac{1}{2}\frac{5}{8}$, and $\frac{1}{6}\frac{2}{3}$.

2. Subtract $23\frac{2}{3}\frac{2}{0}$ from $32\frac{3}{5}\frac{3}{5}$.

3. Multiply together $7\frac{6}{7}$, $1\frac{1}{2}\frac{6}{3}$, $2\frac{1}{2}\frac{2}{2}$, and $3\frac{1}{1}\frac{1}{3}$.

4. Divide $9\frac{2}{2}\frac{0}{1}$ by $\frac{1}{3}\frac{1}{5}$.

5. Add together 32·98764, 5·0946, ·087259 and ·56273.

6. Subtract 23·872592 from 35·07316.

7. Multiply 28·3075 by ·00894.

8. Divide 155·73 by 3580.

9. Express ·925 of £1 : 3*s.* 4*d.* as the decimal of £5.

10. If 3 tons 7 cwt. 3 qrs. 5 lbs. cost £31 : 12*s.* 9*d.*, what is the price per ton?

11. Reduce 3 acres 1 rood 2 perches 4 yards to square inches.

12. Find the simple interest on £658 : 10*s.* at $4\frac{1}{4}$ per cent. per annum for ten years.

13. Add together $1\frac{1}{2}\frac{7}{0}$, $2\frac{1}{2}\frac{2}{4}$, $\frac{2}{3}\frac{3}{6}$ and $1\frac{5}{1}\frac{5}{6}$.

14. Subtract $25\frac{2}{3}\frac{2}{3}$ from $36\frac{1}{3}\frac{5}{7}\frac{5}{4}$.

15. Multiply together $2\frac{0}{2}\frac{0}{0}$, $4\frac{1}{1}\frac{1}{1}$, $\frac{5}{1}\frac{5}{8}$ and $1\frac{3}{4}\frac{2}{9}$.

16. Divide $2\frac{3}{1}\frac{3}{6}$ by $10\frac{5}{2}\frac{5}{4}$.

17. Add $\frac{4}{1}\frac{4}{3}$ of ·273 of 1 cwt. 2 qrs. to $\frac{5}{1}\frac{5}{2}$ of ·676 of 3 qrs. 12 lbs., and give the answer in ounces and the decimal of an ounce.

18. Subtract ·033 of $\frac{7}{4}\frac{7}{0}$ of 1 lb. troy from ·53 of 12 dwts. 3 grs., and give the answer in grains and the decimal of a grain.

19. Multiply 31·29805 by 56·84.

20. Find the continued product of 6·325, 40·83 and ·00253.

21. Divide 17·228 by ·584.

22. Divide $3\cdot7\dot{3}$ by $4\cdot9\dot{1}\dot{2}$ and give the answer as a decimal correct to five places.

23. At what rate per cent. simple interest will £910 amount to £1109 : 1*s.* 3*d.* in $6\frac{1}{4}$ years?

24. A. pays £16 : 17*s.* per annum for life insurance. B. being of the same age insures at the same rate of insurance for £660, paying £5 : 3*s.* annual premium more than A. For what sum did A. insure?

25. Of a regiment of soldiers $\frac{1}{30}$th are killed or disabled in the first battle, $\frac{7}{29}$ths of the remainder in the second battle, and $\frac{3}{11}$ths of the remainder in the third, and 512 men are left. How many were there at first?

26. If 40 men can dig a trench in four days of 9 hours each, how many men must be employed to dig a trench twice as long as the former, half as wide again, and three-quarters of the depth, in 5 days of 8 hours?

FRENCH TRANSLATION.

Piece I.

Le héros de la reddition de Calais, Eustace de St. Pierre, fut revenu à Calais avant le départ du roi d'Angleterre. Edouard par des lettres du 8 Octobre lui accorda une pension considérable en attendant qu'il pourvût plus amplement à sa fortune. D'autres lettres du même jour donnent à Eustace de St. Pierre pour lui et ses héritiers ses biens et maisons dans la ville de Calais pour les services qu'il rendra en maintenant le bon ordre et veillant à sa garde. Un exemple remarquable de l'amour pour sa ville natale qu'un homme qui avait voulu donner sa vie pour la sauver ne pouvait supporter de vivre hors de ses murs. Mais du reste ce fut à Eustace de St. Pierre seul que profitèrent les bienfaits du roi Edouard. Car lorsqu'il mourut ses héritiers qui étaient restés fidèles au roi de France étaient privés de ses biens.

(Piece II. we have not been able to obtain.—Ed.)

FRENCH GRAMMAR.

1. Give the French for:—In, near, besides, across, through, out of, until, under, before, between, beyond, upon, over, behind, among.

2. Write down the first sing. and plur. of pres. indic. of—Boire, croire, envoyes, mourir, prendre, savoir, rire, haïr, voir.

3. Give the part. pres. first sing. fut., first sing. pres. subj. of—Aller, courir, écrire, faire, fuir, pouvoir, valoir, plaire.

4. What is the French for:—

(1) He is just come.
(2) We want courage.
(3) What weather shall we have to-morrow?
(4) Is he at home?
(5) A fortnight ago.
(6) It is very windy.
(7) Do you remember it.
(8) How many have you sold?

ELEMENTS OF GEOMETRICAL DRAWING.

(Including the Construction of Scales, and the use of Simple Mathematical Instruments.)

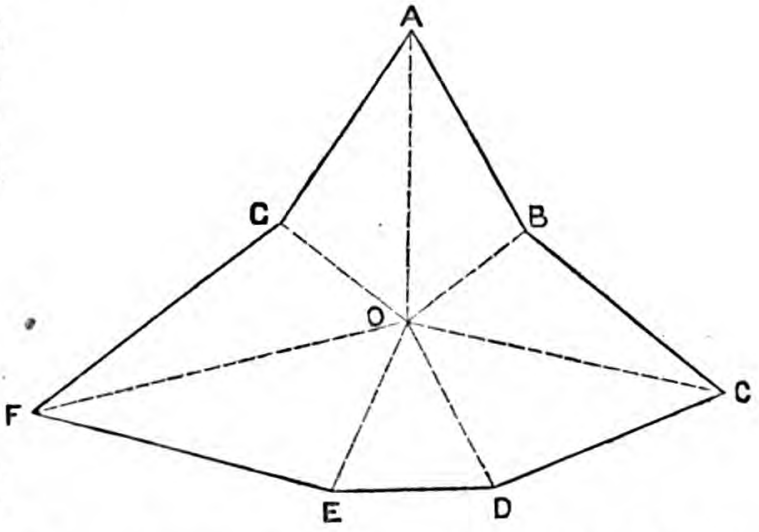
N.B.—The figures should be neatly drawn in clear fine pencil lines, and, if time allows, they may be inked in with Indian ink.
The solutions must be strictly geometrical, and particular care should be taken to show all the necessary lines of construction.

1. A distance of 3,750 paces is represented on a map by 9·2 inches. Draw a scale of yards for the map showing 2,000 yards, and divided to show distances of 50 yards. Show all your calculations, figure your scale properly, and write above it its representative fraction. (A pace = 32 inches.)

2. Draw a tangent to a circular arc of large radius without finding the centre of the circle, showing your construction.

3. Make a scale of 9 feet to an inch, and draw the figure shown in the margin to that scale. The angles AOB, BOC, &c. are all equal.

OA = 25 feet.
OB = 10 feet.
OC = 24 feet.
OD = 12 feet.
OE = 12 feet.
OF = 30 feet.
OG = 12 feet.



Write down the length of the sides of the figure AB, BC, &c. Reduce the figure to a triangle of equal area, having its apex at A and its base in ED produced.

4. Describe a triangle having its sides 3 inches, 2½ inches, and 2 inches long respectively, and in it inscribe a rectangle having one of its sides 2½ inches long. Explain your construction.

5. Construct a diagonal scale (by which single feet may be measured) for a map on which 157 feet are represented by 2·65 inches. Show 400 feet. Show your calculations, figure your scale properly, and write above it the representative fraction. Show by two small marks on the scale a length that would represent 243 feet on the map.

6. On a base of 2½ inches describe a triangle having its vertical angle 40° and its altitude 1¾ inches.

7. On a base of 2½ inches describe an isosceles triangle having a vertical angle of 40°, and on the opposite side of the base describe an equilateral triangle. In the quadrilateral figure thus obtained inscribe a circle.

ANSWERS TO THE EUCLID PAPER.

1. Proposition 6.
2. Proposition 13.
3. Proposition 26.
4. Proposition 30.
5. Proposition 44.

ANSWERS TO THE GEOGRAPHY PAPER.

1. Lizard Point, S.W. of Cornwall.
Matapan, S. of Greece.
Finisterre, N.W. of Spain.
Farewell, N.W. of South Island of New Zealand.
Bon, N. of Africa.
Wrath, N. of Scotland.
Horn, S. of South America.
St. Vincent, S.W. of Portugal.
Sable, S. of Florida, in U.S.
York, N. of Queensland, in Australia.
(See Geography Made Easy, *passim.*)

2.

River.	*Source.*	*Basin.*	*Mouth.*
Indus	Hindoo Koosh	W. India	Arabian Sea.
St. Lawrence	W. of Lake Superior, in N. America.	British America and U.S.	Gulf of St. Lawrence.
Nile	Victoria Nyanza	Centre of Africa, Nubia, Egypt	Mediterranean.
Thames	Cotswold Hills	S. of England	North Sea.
Trent	Staffordshire	Centre of England	Humber.
Shannon	County Cavan, in Ireland.	N.E. of Ireland	Atlantic Ocean.

(See Geography Made Easy, pp. 99, 132, 148, 161.)

3. (a) Humber, Wash, Mouth of Blackwater and Thames, Straits of Dover, Pevensey Bay, Southampton Water.
(b) Gulf of Patras, Red Sea, Straits of Bab-el-Mandeb, Sea of Oman, Gulf of Kutch, Gulf of Cambay.

4. *Brazil.*—Buenos Ayres, Rio Janerio, S. Salvador, Pernambuco.
The United States.—Boston, New York, Philadelphia, Baltimore, New Orleans, Charleston, San Francisco.
Russia.—Archangel, Astrakhan, Odessa, Cronstadt.
Asiatic Turkey.—Trebizond, Sinope, Scutari, Smyrna, Tripoli, Beyrout, Acre, Jaffa.
Spain.—Barcelona, Cadiz, Seville, Santander, Valencia, Malaga, Corunna, Bilboa.
Italy.—Genoa, Naples, Leghorn, Venice, Ancona, Brindisi.
(See Geography Made Easy, pp. 75, 86, 90, 113, 153, 161.)

5. The New Zealand group is the most southern group of the Polynesian Islands. The chief islands in the group are (1) North Island and

(2) South Island, separated by Cook Strait. These islands contain evidence of volcanic action, and comprise Mount Egmont, in the North Island, reaching a height of 8,000 feet, and Mount Cook, in the South Island, attaining to an altitude of 10,000 feet. They are well watered, and enjoy a delightful climate. The chief towns are: On the North Island:—Wellington, Auckland and New Plymouth; On the South Island:—Dunedin, Christchurch and Nelson.

(See Geography Made Easy, p. 170.)

6. *British Isles:* England, Scotland.
Europe: Italy, Spain, Greece.
Asia: Hindostan, Arabia, the Malay Peninsula.
N. America: Mexico.
S. America: Patagonia.

7. Vide map and Geography Made Easy, pp. 103—106.

Possessions belonging to France:—

Pondicherry, S. of Madras; Chandernagore, N. of Calcutta; Mahé, on the Malabar Coast; Karikal, in the Cauvery delta; Yavan, in the Godavery delta.

Possessions belonging to the Portuguese:—

Goa, on W. Coast; Daman, N. of Bombay; Diu, an island near Gulf of Cambay.

(See Geography Made Easy, pp. 103, 104.)

ANSWERS TO THE ARITHMETIC PAPER.

1. $6\frac{70 + 192 + 135 + 76}{252} = 6\frac{473}{252} = 7\frac{221}{252}$—*Ans.*

2. $9\frac{198 - 319}{330} = 8\frac{528 - 319}{330} = 8\frac{209}{330} = 8\frac{19}{30}$—*Ans.*

3. $\frac{\overset{5}{\cancel{55}}}{\underset{7}{\cancel{7}}} \times \frac{\overset{3}{\cancel{39}}}{23} \times \frac{\overset{9}{\cancel{63}}}{\underset{2}{\cancel{22}}} \times \frac{\overset{20}{\cancel{40}}}{\underset{13}{\cancel{13}}} = \frac{2700}{23} = 117\frac{9}{23}$—*Ans.*

4. $\frac{\overset{19}{\cancel{209}}}{\underset{3}{\cancel{21}}} \times \frac{\overset{5}{\cancel{35}}}{\underset{1}{\cancel{11}}} = \frac{95}{3} = 31\frac{2}{3}$—*Ans.*

5. *Ans.* 38·732229.

6. *Ans.* 11·200568.

7. *Ans.* ·25306905.

8. *Ans.* ·0435.

9.
£ s. d. d.
1 3 4 = 280
·925 × 280 = 259*d.*
5*l.* = 1200*d.*
259 ÷ 1200 = ·21583̇—*Ans.*

10.

tons.	*cwts.*	*qrs.*	*lbs.*		*ton.*		£	*s.*	*d.*		
3	7	3	5	:	1	: :	31	12	9	:	*Ans.*

20	20	20
67	20	632
4	4	12
271	80	7593
28	28	
2173	640	
542	160	
7593	2240	

$$Ans. = \frac{\cancel{7593} \times 2240}{\cancel{7593}} = 2240 \text{ d.}$$

$$= 9 \text{ £} \; 6 \text{ s.} \; 8 \text{ d.}—Ans.$$

11.

Acres.	*Rood.*	*Per.*	*Yds.*
3	1	2	4.

4

13

40

522

$30\frac{1}{4}$

15660

$130\frac{1}{2}$

$15790\frac{1}{2}$

9

$142114\frac{1}{2}$

12

1705374

12

20464488 sq. in.—*Ans.*

12. $658\frac{1}{2}$ £ $\times 4\frac{1}{4} \times 10 \div 100.$

$$= \frac{1317}{2} \times \frac{17}{4} \times \cancel{10} \times \frac{1}{\cancel{100}\ 10} = \frac{22389}{80} = 279 \text{ £} \; 17 \text{ s.} \; 3 \text{ d.}—Ans.$$

13. $4\ \frac{612+570+460+225}{720} = 4\ \frac{1867}{720} = 6\ \frac{427}{720}$—*Ans.*

14. $11\ \frac{45-680}{1122} = 10\ \frac{1167-680}{1122} = 10\ \frac{487}{1122}$—*Ans.*

15. $\frac{\cancel{49}}{\cancel{20}\ \cancel{4}} \times \frac{\overset{5}{\cancel{45}}}{\cancel{11}} \times \frac{\overset{5}{\cancel{5}}}{\cancel{18}\ \cancel{9}} \times \frac{\overset{2}{\cancel{8}}\ \overset{8}{\cancel{88}}}{\cancel{49}} = 5$—*Ans.*

16. $\frac{\cancel{35}}{\cancel{16}\ 2} \times \frac{\overset{3}{\cancel{24}}}{\cancel{245}\ 7} = \frac{3}{14}$—*Ans.*

17. $\frac{4}{\cancel{13}} \times \frac{\overset{21}{\cancel{273}}}{1000} \times 168\ \textit{lbs.} = \frac{14112}{1000}\ \textit{lbs.} = 14{\cdot}112$

$\frac{5}{\cancel{12}} \times \frac{676}{1000} \times \overset{8}{\cancel{96}}\ \textit{lbs.} = \frac{27040}{1000}\ \textit{lbs.} = 27{\cdot}04$

These added together = 41·152 lbs.

$\frac{8}{329{\cdot}216}$

$\frac{2}{658{\cdot}432}$ ozs.—*Ans.*

18. $\frac{33}{1000} \times \frac{17}{4\cancel{0}} \times \overset{144}{\cancel{576}\cancel{0}}\ \textit{grs.} = \frac{80784}{1000}\ \textit{grs.} = 80{\cdot}784\ \textit{grs.}$

$\frac{53}{100} \times 291\ \textit{grs.} = 154{\cdot}23\ \textit{grs.}$

By subtraction we get $\frac{80{\cdot}784}{73{\cdot}446}$ *grs.*—*Ans.*

19. *Ans.* 17553·198362.

20. *Ans.* ·6533718675.

21. *Ans.* 29·5.

22. $3\frac{73-7}{90} \div 4\frac{912-9}{990}$

$= 3\frac{66}{90} \div 4\frac{903}{990}$

$= 3\frac{11}{15} \div 4\frac{301}{330}$

$= \frac{56}{\cancel{15}} \times \frac{\cancel{330}^{22}}{1621} = \frac{1232}{1621} = \cdot 76002$.—*Ans.*

23.

£	*s.*	*d.*
1109	1	3
910		

£199 1 3 interest required.

Suppose 1 per cent.

Interest on £910 for $6\frac{1}{4}$ yrs. at 1 p. c.

$$= \overset{£}{\cancel{910}^{455}} \times \frac{\cancel{25}}{4} \times \frac{1}{\cancel{100}_{\cancel{4}\,2}} = \frac{\overset{£}{455}}{8}$$

$$199\tfrac{1}{16} \div \frac{\overset{£}{455}}{8} = \frac{\overset{£}{\cancel{3185}^{£7}}}{\cancel{16}_{2}} \times \frac{8}{\cancel{455}} = 3\tfrac{1}{2}$$

Ans.—$3\frac{1}{2}$ per cent.

24. A. pays £16 : 17*s.* premium.
B. pays £22 : 0*s.* ,,

The question is:—

If £22 effects an insurance of £660, on what sum does £16 : 17*s.* effect an insurance at the same rate?

$$\overset{£}{22} : \overset{£}{16\tfrac{17}{20}} :: \overset{£}{660} : \textit{Ans.}$$

$$\textit{Ans.} = \frac{337}{\cancel{20}} \times \frac{\cancel{660}^{33}}{\cancel{3}} \times \frac{1}{\cancel{22}_{2}} = \frac{\overset{£}{1011}}{2} = \overset{£}{505} : \overset{s.}{10}.\text{—}\textit{Ans.}$$

25. When $\frac{1}{30}$th are killed, $\frac{29}{30}$ths remain.

$$\frac{7}{\cancel{29}} \times \frac{\cancel{29}}{30} = \frac{7}{30}.$$

After this, $\frac{23}{30}$ths remain.

$$\frac{3}{\cancel{11}} \times \frac{\cancel{22}^{2}}{30} = \frac{6}{30}.$$

Now $\frac{16}{30}$ths remain.

$\frac{16}{30} = 512$ ∴ $\frac{1}{30} = 32$ ∴ the whole number $= 960$—*Ans.*

	Hrs.		*Hrs.*		*Men.*		
26.	40	:	36	: :	40	:	*Ans.*
	1	:	2				
	1	:	$\frac{3}{2}$				
	1	:	$\frac{3}{4}$				

$$Ans. = \overset{1}{\cancel{40}} \times \overset{9}{\cancel{36}} \times \overset{1}{\cancel{2}} \times \frac{3}{\cancel{2}} \times \frac{3}{\cancel{4}} \times \frac{1}{\cancel{40}} = 81.\text{—}Ans.$$

ANSWERS TO THE FRENCH TRANSLATION PAPER.

The hero of the surrender of Calais, Eustace de St. Pierre, had returned to that town before the departure of the English king. Edward in a letter under date of October 8th, granted him a considerable pension until he should make a more ample provision for his fortune. Other letters of the same date give to Eustace de St. Pierre, for himself and heirs, his property and houses in the town of Calais for the services that he shall render in maintaining good order and watching at his post. A wonderful instance of love for one's native town—that a man who had been willing to give his life to serve it could not endure to live outside its walls. But, for the rest, it was only Eustace de St. Pierre that king Edward's kindness benefited; for, when he died, his heirs, who had remained faithful to the king of France, were deprived of his property.

ANSWERS TO THE FRENCH GRAMMAR PAPER.

1. In = en; near = près de; besides = outre; across = au travers de; through = à travers; out of = hors de; until = jusqu'à ce que; under = sous; before = devant (place) or avant (time); between = entre; beyond = au-delà de; upon = sur; over = au-dessus de; behind = derrière; among = parmi.

(See "Public Examination French Grammar," under *Prepositions.*)

Pres. Indic.

	1st Pres. Sing.	*1st. Pres. Plur.*
2.	Je bois.	Nous buvons.
	Je crois.	Nous croyons.
	J'envoie.	Nous envoyons.
	Je meurs.	Nons mourons.
	Je prends.	Nous prenons.
	Je sais.	Nous savons.
	Je ris.	Nous rions.
	Je hais.	Nous haïssons.
	Je vois.	Nous voyons.

(See "Public Examination French Grammar," under *Irregular Verbs.*)

	Pres. Part.	*1st Pres. Sing. Fut. Indic.*	*1st. Pres. Sing. Pres. Subj.*
3.	Allant	J'irai	Que j'aille.
	Courant	Je courrai	Que je coure.
	Écrivant	J'écrirai	Que j'écrive.
	Faisant	Je ferai	Que je fasse.
	Fuyant	Je fuierai	Que je fuie.
	Pouvant	Je pourrai	Que je puisse.
	Valant	Je vaudrai	Que je vaille.
	Plaisant	Je plairai	Que je plaise.

(See "Public Examination French Grammar," under *Irregular Verbs.*)

4.	He is just come.	Il vient d'arriver.
	We want courage.	Il nous faut du courage.
	What weather shall we have to-morrow?	Quel temps fera-t-il demain?
	Is he at home?	Est-il chez lui?
	A fortnight ago.	Il y a quinze jours.
	It is very windy.	Il fait beaucoup de vent.
	Do you remember it?	Est-ce que vous vous en souvenez?
	How many have you sold?	Combien en avez-vous vendu?

(See "Public Examination French Grammar," *ad fin.*)

ANSWERS TO GEOMETRICAL DRAWING PAPER.

1. 3.750 paces = 120,000 inches = 10,000 feet = $\frac{10000}{3}$ yards.

$$\text{As } \frac{10000}{3}\ \text{yards} : 2{,}000\ \text{yards} :: 9.2\ \text{in.} : x\ \text{in.}$$

$$x = \frac{18400 \times 3}{10000} = \frac{55200}{10000} = 5.52 \text{ inches.}$$

Draw the scale 5.52 inches long. Divide into four equal parts to shew length of 500 yards. Subdivide into ten to shew fifties.

2. First, let the point be at one extremity of the arc, *e.g.*, at A. Join A and B: bisect AB in C by a perpendicular cutting the arc in D; join D and A: make the angle EAD = to the angle DAC. EA is the tangent required.

Secondly, if from a point within the arc, as Z; then from Z with any radius mark Y and X. Join YX, and through Z draw a line parallel to YX.

3. Draw a scale of 9 feet to an inch, long enough to shew 30 feet. Commence by a circle (not shewn in diagram); divide its circumference, by trial or otherwise, into seven equal parts. Call the centre O; draw the lines AO, OB, OC, OD, OE, OF, OG as radii from O to the circumference; mark off on these the prescribed lengths measured on scale. Complete figure as in diagram.

To reduce to a triangle:—Join A and C. Through B draw a line BH parallel to dotted line AC. Join AH. Join AD. Through H draw a

line parallel to AD, viz. HK. Join AK. AK is one side of the proposed triangle.

Repeat process on the other side, thus determining point L. AKL is the required equivalent triangle.

4. Draw a base BC of 3 in.: measure AB $2\frac{1}{2}$ in. and AC 2 inches. Determine by intersecting curves the point A. This gives the required triangle. To inscribe the rectangle mark off CD = $2\frac{1}{2}$ inches; through D draw DE parallel to AC: draw EG parallel to BC; from E and G let fall the perpendiculars EF, GH. This completes the rectangle.

5. As $157 : 400 :: 2.65 : x$

$$x = \frac{400 \times 2.65}{157} = 6.75$$

$$\text{RF} = \frac{2.65}{1884} \text{ or } \frac{1}{710} \text{ nearly.}$$

Draw scale 6.75 inches long. Divide into four equal parts; subdivide into ten. Complete diagonal scale as in diagram. The two small circles show 1243 feet.

6. On AB the base of $2\frac{1}{2}$ inches, as a chord, describe a segment of a circle to contain an angle of 40°. At $1\frac{3}{4}$ inches from AB draw a line parallel to AB, cutting the segment in F and G. Join F or G to A and B. FAB or GAB will be the required triangles.

7. On base AB $2\frac{1}{2}$ inches construct the isosceles triangle ABC—making each of the angles at the base 70°; on the opposite side describe the equilateral triangle ABD. To inscribe a circle in AC, BD, join CD and bisect the angle CBD by the line BE meeting CD in F. F is the required centre; a perpendicular let fall from F to any of the four sides of the figure will be the radius.

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