

Simplify $x + 2 + \frac{4}{x-2} + \left(\frac{x^3}{x^2-4} - x \right)$

9. Solve the equations :

1. $-17\left(x - \frac{4-x}{3}\right) = 12\left(5x - \frac{7+3x}{8}\right)$.

2. $\begin{cases} 32x + 81y = 45. \\ 28x - 39y = 369. \end{cases}$

3. $\frac{3x}{x+2} - \frac{x-1}{6} = x-9$.

10. Prove that the difference between the cube of the sum of any two numbers and the sum of their cubes is divisible by three times their product.

EUCLID.

11. To draw a straight line from a given point without the circumference, which shall touch a given circle.

Show that two such lines can be drawn, and that they are equally inclined to the line which joins the given point with the centre of the given circle.

12. If a straight line touch a circle and from the point of contact a straight line be drawn cutting the circle, the angles which this line makes with the line touching the circle shall be equal to the angles which are in the alternate segments of the circle.

Write out the converse of this proposition.

MENSURATION.

13. The area of a chess board which contains 64 equal squares and an outer rim an inch wide, is 134.56 square inches: find the side of each square. Find also the width of the outer rim of another board of the same size, in which the area of each square is 1.361 square inches.

14. The three sides of a triangle are in the ratio 4 : 5 : 7, and their sum equals 32 yards, find the area of the triangle in yards, to two places of decimals.

FEMALE CANDIDATES.

ARITHMETIC.

Three hours allowed for this paper.

Candidates are not permitted to answer more than one Question in each Section.

The solution must in every instance be given at such length as to be intelligible to the Examiner, otherwise the answer will be considered of no value.

SECTION I.—1. The first of 4 parcels of money contained two hundred and six pounds, and twopence; the second fifty sovereigns, seventeen half-sovereigns, and nine half-pence; the third twenty-seven half-guineas, and eightpence; the fourth nineteen half-sovereigns, and three half-crowns. Distribute the amount equally among 29 societies.

2. One room contains 18 sq. yds., 3 sq. ft., 19 in.; a second, 42 sq. yds., 8 ft., 11 in.; a third, 29 sq. yds., 5 ft., 100 in. What must be added or subtracted in each case to make the rooms of average size?

SECTION II.—A silversmith made a certain number of teaspoons weighing 26 lbs. 10 oz. 13 dwt., and a certain number of tablespoons weighing 38 lbs. 10 oz. 11 dwts. 18 grs.; find the cost of all the spoons at £3 17s. 11d. per oz.

State the different methods employed in subtraction, and give your reasons for preferring one of them to another.

2. A farmer rents a farm of 400 acres on the following terms:—He pays as rent 100 qrs. of wheat, 75 qrs. of barley, and 60 qrs. of oats, the price of wheat, barley, and oats being respectively 49s. 6d., 30s. 8d., and 19s. 2d. per quarter. Give his average rent per acre in $\text{£} s. d.$

SECTION III.—1. Make the following bill:—5 tons of coal at 15s. 6d. per ton, carriage of same at 2s. 6d. per ton; 2 trucks of gravel (i.e., 11½ tons) at 5s. per ton, carriage of same at 2s. 6d. per ton.

What are the two different kinds of practice called? Which kind is mostly used in bills of parcels? Give reasons for your answer.

9. Find the change out of a £10 note after paying the following bill:—12½ yds. of flannel at 1s. 6d. per yd., 37 yds. of calico at 1s. 0½d. per yd., 21 yds. of muslin at 2s. 4½d. per yd., 18 yds. of linen at 2s. 6d. per yd.

What is a *Bill of Parcels*? What else is it sometimes called? What rules of mental arithmetic can be applied in finding the amounts of the items?

SECTION IV.—1. Find by practice the rent of 311 acres 2 roods 26 perches at 5s. 8½d. per rood.

What rule does practice depend upon? And how is that rule simplified by it?

2. A bankrupt can pay only 12s. 6d. in the pound, and his debts amount to £1,537 4s. 4d.; what is his estate worth? How much will be paid on a debt of £276 11s. 6d.?

What is meant by an "*aliquot*" part?

SECTION V.—1. The planting of a rood of ground cost £28 8s. 4d.; what was paid for planting 23 acres 3 roods 24 perches and 11 sq. yds.?

Explain and define *measure*, *factor*, *multiple*, *submultiple*.

2. Bought 176 yds. 2 qrs. 2 nails, 1½ inch, at 18s. 2d. per English ell (=5 quarters); what is the gain or loss in selling at 6d. per inch?

3. Explain the terms *profit* and *loss*—*profit* and *loss* per cent.

SECTION VI.—1. If the road in front of a row of houses, three-quarters of a mile long, be repaired at a cost of £7 9s. 6d., what portion of the expense should be paid by an inhabitant, whose premises have a frontage of 18 yds. 2 ft.?

Explain the difference between "*ratio*" and "*proportion*." How many kinds of proportion are there? State and explain the names given to several parts in a proportion sum.

2. An engine of 16-horse power can pump out $\frac{2}{3}$ of the water in a reservoir in 3 days, working 7 hours a day. In how many days will an engine of 15-horse power, working 8 hours a day, empty the reservoir?

By what methods can the work be shortened in a proportion sum? Explain why these methods are correct.

SECTION VII.—1. Two-sevenths of a farm is sown with wheat, four-ninths of it is pasture, and the remainder, woodland, contains 24 acres, 2 roods, 7 perches. Find the size of the farm.

What is a fraction? Name the different kinds of vulgar fractions, and distinguish between them.

2. If the owner of $\frac{1}{4}$ of a ship sold $(\frac{1}{4}$ of $\frac{2}{3}$)ths of his share for £4990, what was the value of $(\frac{1}{4}$ of $\frac{2}{3}$)ths of the whole ship at the same rate.

Give and explain the names of the different parts of a vulgar fraction, and show their relation to each other, and to the integer.

SECTION VIII.—1. How much will remain of $\frac{1}{3}$ of £25 2, after the following articles have been paid for, viz: 1½ yds. of cloth at £0 8 per yard, and 12 2 yds. of linen at £0 125 per yard? Give the answer in decimal form.

Name the different kinds of decimals, and distinguish between them.

2. Find the value of $\frac{2}{3}$ of $\frac{1}{9}$ of £1 18s. + $\frac{2}{3}$ of 0.0375 of 15s. + $\frac{2}{3}$ of 0.429 of 8s. 3d., and express the result as the decimal of £5.

How may a vulgar fraction be converted into a decimal? What kind of vulgar fraction can produce no finite decimal? Explain why.

SECTION IX.—1. In what time will £436 10s. amount to £568 18 1s. at 7 per cent. per annum, simple interest?

Define "*principal*," "*amount*," "*interest*," (simple and compound), "*discounts*," "*stocks*," "*annuities*."

2. A farmer mixes wheat; 9½ qrs. at 38s. 6d., the same quantity at 40s. 6d., and at 42s. 9d. per quarter, and 24½ qrs. at 45s. and the same quantity at 47s. per quarter. What is the average price of the mixture?

What is a *percentage*? an *average*?

DICTATION AND PENMANSHIP.

Twenty minutes allowed for these exercises.

Candidates are not to *paint* their letters in the *Copy-setting Exercises*, but to take care that the copy is clean and without erasures.

Omissions and erasures in the *Dictation Exercise* will be counted as mistakes.

The words must not be divided between two lines, there is plenty of room for the passage to be written.

Write in large hand, as a specimen of Penmanship, the words *Major Fitzgerald*.

Write in small hand, as a specimen of Penmanship, the sentence—

There is a willow grows aslant a brook,

That hoves his hoar leaves in the glassy stream.