

EXAMINATION FOR QUALIFYING CERTIFICATES

ELEMENTARY ALGEBRA

Tuesday, January 18, 1916—1.15 to 4.15 p. m., only

Answer 10 questions, including all the questions in group I, two from group II and two from group III. Credit will not be granted unless all operations (except mental ones) necessary to find results are given; simply indicating the operations is not sufficient. Each answer should be reduced to its simplest form. Papers entitled to less than 75 credits will not be accepted.

Group I

Answer all the questions in this group.

1 a Perform the indicated operations:

(2a - 3)^2 - 3a(a - 2) - (3 - a)^2

b Divide m^2 + 6m + 9 - 25x^2 by m + 3 - 5x

2 a Factor 8a^3 + 27b^3

x^4 + 2x^2y^2 + y^4 - a^2b^2
x^3 - 7x^2 - 3x + 21

b Find the H. C. F. and the L. C. M. of 2x^2 + xy - y^2 and 6x^2 + xy - 2y^2

3 Solve (cx - d)/dx + (dx + c)/cx = 2 + (c - d)/cdx

4 a Simplify 2*sqrt(3) - 1/2*sqrt(12) + 4*sqrt(27)

b Simplify 3*sqrt(14)*sqrt(21) - (8*sqrt(12))/sqrt(2)

c Solve x - sqrt(2x^2 - 7) = -3

5 Solve { x - 2y + 3z = 6
2x + 3y - 4z = 20
3x - 2y + 5z = 26

6 By completing the square solve the equation 2x^2 - 7x + 4 = 0

and find the roots correct to two decimal places.

Group II

Answer two questions from this group.

7 A father engaged his son to work on the condition that the son was to receive \$2 for each day he worked and to forfeit \$1 for each day he was idle; at the end of 20 days the son received \$34. How many days did he work?

ELEMENTARY ALGEBRA—concluded

8 A picture 8 inches by 12 inches is placed in a frame of uniform width; if the area of the frame equals the area of the picture, find the width of the frame. [Draw a diagram.]

9 The sum of two fractions whose numerators are 3 is three times the smaller fraction; three times the smaller subtracted from twice the larger is $\frac{3}{8}$. What are the fractions?

Group III

Answer two questions from this group.

10 *a* Two trains leave a town at the same time and travel in the same direction; the faster one runs m miles per hour and the slower runs s miles per hour. In how many hours will they be k miles apart?

b The age of the older of two sisters is now 6 years less than twice the age of the younger; if x represents the number of years in the age of the younger sister now, express by means of an equation the fact that 9 years ago the age of the older was two and one half times the age of the younger.

11 *a* What must be the value of m if $x-5$ is a factor of $2x^2 - mx - 35$?

b What must be the value of k if 2 is a root of $3x^2 - 12x + k = 0$?

12 *a* If $a = \frac{2b-3}{b^2}$ and $c = \frac{a+1}{a+3}$ find c when $b = -1$

b Simplify and arrange in ascending powers of m :
 $(m-2)^4 - (m-1)^3 + 3(2-m)^2$

ELEMENTARY ALGEBRA

DIRECTIONS FOR RATING

Tuesday, January 18, 1916—1.15 to 4.15 p. m., only

The direction, "Less than 60% of the credit should be granted when an error in computation occurs," should be followed in rating all incorrect answers to questions which fall under the topics mentioned in "Suggestions on the Rating of Regents Examination Papers in Mathematics" under "Elem. Alg. 2."

Except in schools where the "committee system" is used, teachers are urged to mark papers cumulatively, that is, to add the credits earned by each answer to the total credits earned by preceding answers so that the mark given to the last answer is the per cent to which the paper is entitled, e. g. consecutive answers earning 5, 7, 4 etc. respectively should be marked 5, 12, 16 etc.

1 10 credits

a 6 credits

Allow 1 credit for squaring $(2a-3)$ correctly.

Allow 1 credit for multiplying $(a-2)$ by $3a$ correctly.

Allow 1 credit for squaring $(3-a)$ correctly.

Allow 1 credit for changing signs correctly.

Allow 2 credits for collecting terms correctly.

b 4 credits [Allow no partial credit.]

2 10 credits

a 6 credits

Allow no credit on any one part unless both factors are correct (2 credits each).

b 4 credits

Allow 2 credits for correct factors.

Allow 1 credit for correct H. C. F.

Allow 1 credit for correct L. C. M. either indicated or expanded.

3 8 credits

Allow 3 credits for clearing fractions correctly.

Allow 5 credits for solution.

Allow 6 credits if no error has been made but answer is not simplified.

4 12 credits

a 2 credits. Allow $\frac{1}{2}$ for each reduction, 1 for sum.

b 3 credits. Allow 1 for multiplication, 1 for division, 1 for difference.

c 7 credits

Allow 3 credits for removing radical correctly.

Allow 2 credits for forming quadratic equation correctly.

Allow 2 credits for correct solution of equation.

Allow 5 credits if only one answer is found correctly.

5 10 credits

Allow 6 credits for finding first correct value.

DIRECTIONS FOR RATING—concluded

Allow 2 credits for finding second correct value.
Allow 2 credits for finding third correct value.

6 10 credits

Allow 5 credits for correct solution to $x = \frac{7 \pm \sqrt{17}}{4}$

Allow 3 credits for first correct decimal value.

Allow 2 credits for second correct decimal value.

Allow 6 credits if double sign is not used but other work is correct.

Allow 8 credits if work is not given for finding square root but other work is correct.

7 10 credits

Allow 6 credits for correct equation.

Allow 4 credits for correct solution.

8 10 credits

Allow 5 credits for correct equation.

Allow 5 credits for correct solution.

Allow no credit for diagram.

9 10 credits

Allow 6 credits if both equations are formed correctly.

[No credit should be given for one equation correctly formed if the other is not given or is inaccurate.]

Allow 4 credits for solution.

Allow 2 credits for first correct value of unknown.

Allow 1 credit for second correct value of unknown.

Allow 1 credit for writing correct fractions.

10 10 credits

a 4 credits [Allow no partial credit.]

b 6 credits

Allow 2 credits for correct expression for age of older nine years ago.

Allow 2 credits for correct expression for age of younger nine years ago.

Allow 2 credits for correct equation.

11 10 credits

Assume that a and b can be solved mentally and allow full credit for correct answers (5 each) if no work is given, but allow no credit if answer is incorrect.

a If solved by division, allow 2 credits for correct division.

12 10 credits

a 5 credits

Allow 3 credits for correct substitution.

Allow 2 credits for correct simplification.

b 5 credits

Allow 3 credits for correct simplification.

Allow 2 credits for correct arrangement.