Instructions

Do not open this sheet until the signal is given.

Answer all questions in part I and five questions from part II.

Part I is to be done first and the maximum time to be allowed for this part is one and one half hours. Merely place the answer to each question in the space provided; no work need be shown.

If you finish part I before the signal to stop is given you may begin part II. However, it is advisable to look your work over carefully before proceeding to part II, since no credit will be given any answer in part I which is not correct and reduced to its simplest form.

When the signal to stop is given at the close of the one and one half hour period, work on part I must cease and this sheet of the question paper must be detached. The sheets will then be collected and you should continue with the remainder of the examination.
Fill in the following lines:

Name of school..............................................................................Name of pupil..............................................................................

Detach this sheet and hand it in at the close of the one and one half hour period.

Part I

Answer all questions in this part. Each question has 2\frac{1}{2} credits assigned to it; no partial credit should be allowed.
Each answer must be reduced to its simplest form.

1 Multiply \( x^2 - 2x + 4 \) by \( x + 2 \)

2 Divide \( x^3 + 2x^2 - 2x - 12 \) by \( x^2 + 4x + 6 \)

3 Combine into a single fraction: \( \frac{3}{x^2 - 2x} + \frac{2}{2 - x} \)

4 What are the three factors of \( 4a^3 - ab^2 \)?

5 Solve the following equation for \( m \):
   \[ 8m - 3(2m - 5) = 23 \]

6 Solve the following equation for \( x \) in terms of \( a \) and \( b \):
   \[ ax - b = bx \]

7 Two numbers are in the ratio 7:2 and their difference is 30; what is the larger number?

8 In the formula \( L = 2\pi ra \), find \( L \) if \( \pi = \frac{3}{4}, \ r = 14 \) and \( a = 3 \)

9 Solve the following equation for \( d \):
   \[ \frac{4d}{5} - \frac{2d}{3} = 4 \]

10 Solve the following set of equations for \( x \):
   \[ 4x - y = 10 \]
   \[ 2x + 3y = 12 \]

11 Express as a single term \( 5\sqrt{8} - 3\sqrt{18} \)

12 Find \( \sqrt{42} \) to the nearest tenth.

13 In the formula \( h = \frac{3V}{B} \), express \( B \) in terms of \( V \) and \( h \).

14 How many cents in the sum of \( x \) half dollars, \( 2x \) nickels and 7 cents?

15 If \( x = 12 - 2y \) and \( y \) is positive, does \( x \) increase or decrease as \( y \) increases?

16 Is the graph of \( y = 3x^2 \) a straight line, a broken line or a curved line?

17 The length of a rectangle exceeds twice its width by 5. If \( x \) represents the width, express in terms of \( x \) the perimeter of the rectangle.

18 The sine of an acute angle is .6636. Find the angle to the nearest degree.
19. In the right triangle $ABC$, what is the value of tangent $A$ expressed as a decimal?

20. On the diagram below, locate the point $x = 4$, $y = 2$ and the point $x = -5$, $y = 5$. Draw the straight line joining these points. What is the $y$-value of that point on this line for which the $x$-value is 1?

$\text{Ans.}$
Write at top of first page of answer paper to part II (a) name of school where you have studied, (b) number of weeks and recitations a week in elementary algebra. The minimum time requirement is five recitations a week for a school year.

Part II

Answer five questions from this part. Full 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.

21. A part of $25,000 was placed at interest at 4% and the remainder at 7%. The total interest received at the end of the year was $1,450. How much money was placed at interest at 4%? [8, 2]

22. The denominator of a fraction is 7 more than the numerator. If 1 is subtracted from the numerator, the value of the fraction becomes \( \frac{1}{4} \). Find the original fraction. [8, 2]

23. How many pounds of 50-cent coffee must be mixed with 100 pounds of 35-cent coffee to make a mixture worth 42 cents a pound? [8, 2]

24. Two towns, M and N, are 200 miles apart. A truck leaves M for N at the same time that an automobile leaves N for M. The truck averages 16 miles an hour, the automobile 24 miles an hour. How far from M will they meet? [8, 2]

25. Indicate whether each of the following is true or false: [Write the letters a to e in a column and then write the word true or false after each letter.]

   a. A root of the equation \( x^2 - 3x + 9 = 0 \) is \( -2 \). [2]
   b. If \( y = 3 + \frac{2}{x} \), and \( x \) is positive and increasing, then \( y \) is decreasing. [2]
   c. If \( D \) is the dividend, \( d \) the divisor, \( Q \) the quotient and \( R \) the remainder, then
      \[ D = d \times Q + R \] [2]
   d. \( \frac{ax + b}{a} = x + b \) for all values of the letters. [2]
   e. If \( 2n + b \) is an odd integer, then \( 2n + b + 4 \) is an odd integer. [2]

26. A gasoline dealer is allowed a profit of 2 cents a gallon for every gallon he sells. If he sells more than 25,000 gallons in a year he is given an additional profit of 1 cent for every gallon over that number. Assuming that he always sells more than 25,000 gallons a year, express as a formula the number of dollars \( (D) \) in his yearly income in terms of the number \( (N) \) of gallons sold. [6]

   b. The following pairs of numbers represent points on a straight line:

<table>
<thead>
<tr>
<th>( y )</th>
<th>6</th>
<th>9</th>
<th>18</th>
<th>21</th>
<th>33</th>
<th>60</th>
<th>300</th>
</tr>
</thead>
<tbody>
<tr>
<td>( x )</td>
<td>4</td>
<td>6</td>
<td>12</td>
<td>14</td>
<td>22</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>

   What numbers should take the place of the question marks? [2]

   Copy and complete the following, using information given in the table: \( x = (\ ) \ y \) [2]

27. The following table shows the average weights of boys and girls between the ages 10 and 14 years inclusive:

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys (weight in pounds)</td>
<td>63</td>
<td>68</td>
<td>74</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>Girls (weight in pounds)</td>
<td>60</td>
<td>66</td>
<td>74</td>
<td>84</td>
<td>94</td>
</tr>
</tbody>
</table>

   a. Draw a solid-line graph to represent the weights of boys and on the same axes a dotted-line graph to represent the weights of girls. Plot ages horizontally, beginning with age 10 years, and plot weights vertically, beginning with weight 50 pounds. Use a wavy base line to indicate that values from 0 to 50 on the vertical axis have been omitted. [8]

   b. From the graph made in answer to a, determine how much later the normal boy reaches the weight of 80 pounds than the normal girl. [2]

   The following question is based on one of the optional topics in the syllabus and may be substituted for any other question in part II.

28. A rectangle is 6 feet long and 4 feet wide. By adding the same amount to the length and the width, the area is increased by 39 square feet. What are the new dimensions? [10]