

NINTH YEAR MATHEMATICS—JUNE 1963 (1)

Course 1—Elementary Algebra (Sample Examination)

Instructions

It is wise to divide your time so that you may complete the entire examination in *three hours*. Excess time may be used in reviewing your paper for errors.

Part I

Directions (1-30): Answer all 30 questions in this part. Write the answer to each question in the space provided at the right. No work need be shown for this part. Each correct answer will receive 2 credits. [60]

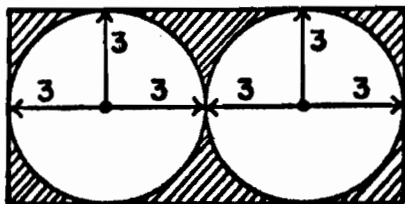
1. Perform the indicated operations and combine like terms:
$$4(d - 5) + (d + 1)(d - 2)$$
2. Factor: $m^2 + m - 42$
3. Divide $x^2y^2 - xy$ by xy .
4. Express the fraction $\frac{x^2 - 81}{2x + 18}$ in its lowest terms.
5. Solve for y : $6(y + 2) - 2y = 15$
6. Solve for a : $\frac{2a}{3} - \frac{3a}{5} = 1$
7. A tennis court is 6 feet longer than twice its width, w . Express in terms of w the number of feet in the length of the court.
8. If $\frac{a + b}{b} = \frac{7}{2}$, find the value of $\frac{a}{b}$.
9. Solve for the *positive* value of x : $3x^2 = 147$
10. Express the number of pints in m gallons.
11. Subtract $2x - 3y + 3$ from $6x - 4y - 3$.
12. If $\frac{x}{y} = -1$, what is the numerical value of $x + y$?
13. Find the value of $3a^2 - 2a + 1$ when $a = -1$.
14. Find the average of $\frac{1}{2}$ and $\frac{2}{3}$.
15. Solve for x : $\frac{2x}{3} = \frac{x + 1}{2}$
16. Solve for s : $2.9s - 20 = 1.2s - 3$

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17. Find the length of a diagonal of a square whose side is 4. [Answer may be left in radical form.]
18. Represent the sum of $\frac{1-2x}{3x}$ and $\frac{3+4x}{6x}$ as a single fraction.
19. Express in simplest form: $(\sqrt{3} + 1)(\sqrt{3} - 1)$
20. If $x = \frac{8}{\cos 60^\circ}$, find the value of x .
21. Given the formula $V = lwh$. Express l in terms of V , w and h .
22. A family spends \$58 a month for rent. This is 20% of its total monthly income. Find this income.
23. The point $(k, 6)$ lies on the graph of $x + 2y = 7$. Find the value of k .
24. If 2 is a root of the equation $3x - 1 = x + a$, what is the value of a ?

Directions (25-29): Indicate the correct completion for each of the following by writing on the line at the right the number 1, 2, 3 or 4.

25. Two circles are tangent to each other and to the sides of a rectangle as shown. The area of the shaded portion is

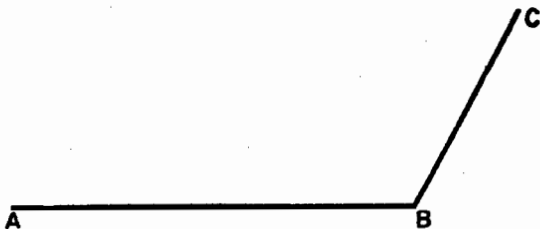


- (1) $36 - 6\pi$
 (2) $36 - 12\pi$
 (3) $72 - 6\pi$
 (4) $72 - 18\pi$

26. The expression $1 - \frac{a-1}{a+1}$ is equivalent to (1) $a+1$ (2) 2
 (3) $\frac{2}{a+1}$ (4) $\frac{a-a^2}{a+1}$
27. The product of $2x^3$ and $3x^2$ is (1) $6x^5$ (2) $6x^6$ (3) $5x^5$
 (4) $5x^6$
28. The expression $\sqrt{48} - \sqrt{27}$ is equivalent to (1) 1 (2) $\sqrt{21}$
 (3) 3 (4) $\sqrt{3}$
29. The ratio of the number of degrees in a right angle to the number of degrees in a straight angle is (1) 1:4 (2) 1:2 (3) 4:1
 (4) 2:1

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30. Construct the bisector of angle ABC .



Part II

Answer four questions from this part. Show all work unless otherwise directed.

31. Solve the following set of equations algebraically for x and y , and check your answers in both of the equations: [8, 2]

$$\frac{x+3}{2} + \frac{y-1}{3} = 5$$

$$\frac{x+4}{3} - \frac{2y-3}{5} = 2$$

32. a. On graph paper locate the points $A(-3, -5)$, $B(9, -2)$, $C(9, 3)$, $D(2, 5)$ and draw the line segments AC and BD . [2]
 b. From the graph, determine the coordinates of
 (1) point M , the intersection of AC and BD [2]
 (2) point Q , the intersection of BD and the x -axis [2]
 (3) point R , the intersection of AC and the y -axis [2]
 c. If AD and BC are extended to meet in point S , that point lies in quadrant (1) I (2) II (3) III (4) IV [2]
33. Write the equation or equations that may be used in solving problem a and problem b. In each case, state what the letter or letters represent. [Solution of equations is NOT required.]
 a. A chemist has 10 cubic centimeters of a 10% solution of acid. He wishes to add enough water to produce an 8% solution. How many cubic centimeters of water must he add? [5]
 b. The units' digit of a two-digit number exceeds the tens' digit by 2. The number is 4 times the sum of its digits. Find the number. [5]

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34. The perimeter of a triangle is 63 inches. The longest side exceeds the shortest side by 6 inches. The sum of the lengths of the longest and the shortest side is twice the length of the third side. Find the lengths of the sides of the triangle. [5, 5]
35. Answer both *a* and *b*:
- A wire 65 feet long extends from the top of a vertical pole to level ground and makes an angle of 70° with the ground. Find to the *nearest foot* the number of feet in the height of the pole. [5]
 - When a tree 45 feet high on level ground casts a shadow 81 feet long, what is the angle of elevation of the sun, to the *nearest degree*? [5]
36. There are three positive consecutive odd integers such that twice the square of the smallest diminished by 19 is equal to the product of the other two. Find the three consecutive odd integers. [4, 6]
- *37. Given: $A = \{-2, 3\}$
 $B = \{1, 2, 3\}$
 $C = \{-1, 1, 2\}$
- Find $A \cap C$. [2]
 - Find $B \cup C$. [2]
 - Find $A \times B$. [3]
 - Write an equation which has A for its solution set. [3]

* This question, based on material beyond the scope of the syllabus, may be used as a *substitute* for any one of the questions in Part II by schools that have included this topic in the course.