

1. Evaluate:  $(9^{1/2} + 4^{1/2})^2$

- (1) 5 ; (2) 13 ; **(3) 25** ; (4)  $14\frac{2}{3}$  ; (5) 20.

2. The difference between  $(\sqrt{125} + \sqrt{24})$  and  $(\sqrt{96} + \sqrt{20})$  may be written:

- (1)  $3\sqrt{5} - 2\sqrt{6}$**  ; (2)  $3\sqrt{5} - 6\sqrt{6}$  ; (3)  $7\sqrt{5} + 2\sqrt{6}$  ; (4)  $\sqrt{149} - \sqrt{116}$  ;  
(5)  $\sqrt{33}$ .

3. Which of the following is largest?

- (1)  $\frac{3}{2\frac{2}{3}}$  ; **(2)  $2\frac{2}{3}$**  ; (3)  $\frac{2}{\frac{1}{3}}$  ; (4)  $\frac{4}{2\frac{2}{3}}$  ; (5)  $(\frac{1}{2})^{\frac{3}{2}}$

4. If  $N = \frac{u^{\frac{1}{2}} v^{\frac{2}{3}}}{w^{\frac{1}{2}}}$  and  $u=8$ ,  $v=27$ , and  $w=36$ , then  $N$  equals

- (1)  $\sqrt{6}$  ; (2) 9 ; (3)  $3\sqrt{6}$  ; **(4) 3** ; (5) 1.

5. Which of the following satisfy  $\sqrt{2x-5} + (2x+5)^{\frac{1}{2}} = \sqrt{4x+20}$ ?

- (1)  $\sqrt{5}$  ; (2)  $\pm \frac{5\sqrt{5}}{2}$  ; **(3)  $\frac{5\sqrt{5}}{2}$**  ; (4)  $-\frac{5\sqrt{5}}{2}$  ; (5)  $5\sqrt{5}$ .

6. The quantity  $1+y$  can be divided without a remainder by

- (1)  $1+y^{\frac{1}{3}}$**  ; (2)  $1+\sqrt[3]{y} + \sqrt[3]{y^2}$  ; (3)  $y^{\frac{1}{3}}$  ; (4)  $1-y^{\frac{1}{3}}$  ; (5)  $1+\sqrt[3]{y} - \sqrt[3]{y^2}$ .

7. The sum of the prime factors of  $2x^3 - x^2 - 3x$  is  $x(2x^2 - x - 3)$   
 $(2x-3)(x+1)$

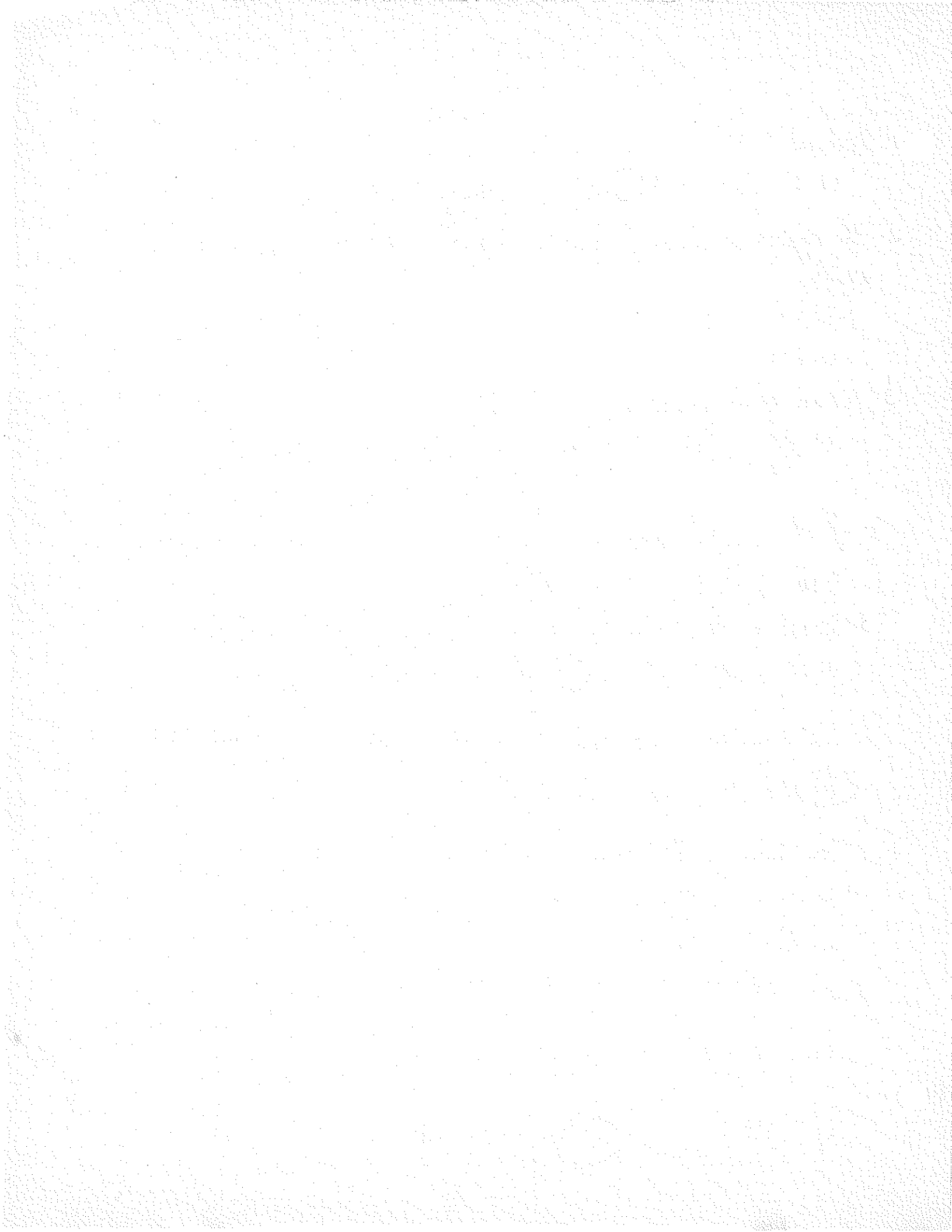
- (1)  $4x-4$  ; **(2)  $4x-2$**  ; (3)  $x(2x-3)(x+1)$  ; (4)  $2x^2 - 2x + 1$

(5) None of these.

8. An expression that is equivalent to  $\frac{r^{-1} + s^{-1}}{r^{-3} + s^{-3}}$  is

- (1)  $\frac{1}{r^2 + s^2}$  ; (2)  $\frac{(s^2 - r^3)(s - r)}{r^4 s^4}$  ; (3)  $-(r^{-4} - s^{-4})$  ;

- (4)  $\frac{r^2 s^2}{s^2 + sr + r^2}$  ; **(5)  $\frac{r^2 s^2}{s^2 - sr + r^2}$** .



9. An expression equivalent to  $\frac{2\sqrt[3]{2}}{5\sqrt[3]{5}}$  is (1)  $\frac{2\sqrt[3]{6}}{45}$

- (2)  $\frac{4}{5}$
- (3)  $6\sqrt[3]{2}$
- (4)  $\frac{\sqrt[3]{6}}{15}$
- (5)  $\frac{\sqrt[3]{18}}{15}$

10. If  $2^{\frac{n}{2}+1} = 32$ , then  $n =$  (1) 5 (2) 6 (3) 7 (4) 8 (5) none of these.

11.  $\log(b\sqrt[3]{a})$  equals (1)  $\frac{3}{2}\log(a+b)$  (2)  $\frac{1}{2}\log a + 3\log b$  (3)  $\frac{3}{2}\log(ab)$  (4)  $3\log(\sqrt{a-b})$  (5) None of these

12.  $3a^3 - 27b^3$  may be expressed as (1)  $(2a+3b)(4a^2-6ab+9b^2)$  (2)  $(2a+3b)(4a^2-9b^2)$  (3)  $(2a-3b)(4a^2+6ab+9b^2)$  (4)  $(4a^2+9b^2)(2a-3b)$  (5)  $(2a-3b)(4a^2+12ab+9b^2)$

13. The solution sets for  $2x+10 = x^2$  is (1)  $\{-1+\sqrt{11}, -1-\sqrt{11}\}$  (2)  $\{-2+2\sqrt{44}, -2-2\sqrt{44}\}$  (3)  $\{2+2\sqrt{11}, 2-2\sqrt{11}\}$  (4)  $\{1+\sqrt{11}, 1-\sqrt{11}\}$  (5)  $\{1+2\sqrt{11}, 1-2\sqrt{11}\}$

14. Simplify:  $\left(\frac{64r^{-6}t^3z^6}{343a^3b^{-7}c^0}\right)^{\frac{2}{3}}$  (1)  $\frac{16b^6t^2z^4}{49a^2r^4}$  (2)  $\frac{16r^{-4}t^2z^2}{49a^2b^{-6}}$  (3)  $\frac{16b^2t^2z^4}{49a^3r^4}$  (4)  $\frac{4r^6t^2z^4}{7a^2b^4}$  (5)  $\frac{4b^6t^2z^4}{7a^2r^4}$

15. Find the coefficient of  $x^3$  in the expansion of  $(x-\frac{1}{3})^8$ . (1)  $\frac{243}{56}$  (2)  $\frac{56}{243}$  (3)  $-\frac{14}{243}$  (4)  $-\frac{56}{243}$  (5) None of these

The experiment is performed in the following way:

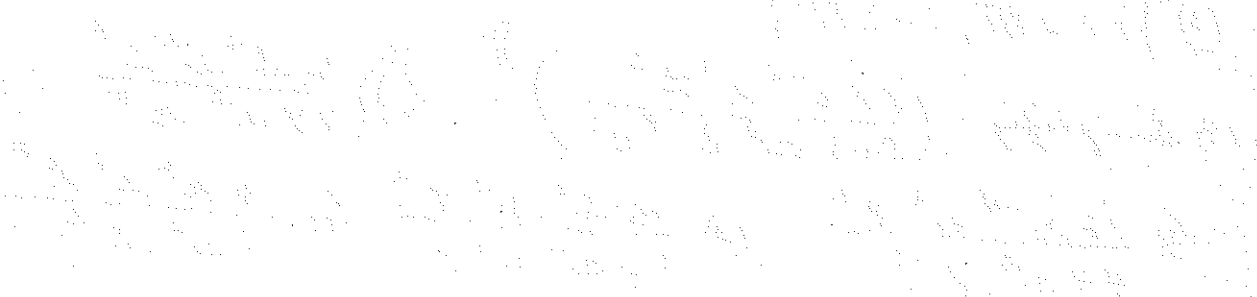


of a circle with center O. The points A, B, C, D are marked on the circumference.

Step 1: Draw a circle with center O. Step 2: Mark four points A, B, C, D on the circumference.

Step 3: Draw lines OA, OB, OC, OD. Step 4: Draw lines AB, BC, CD, DA.

Step 5: Measure the angles AOB, BOC, COD, DOA.



It is observed that the sum of the angles at the center is 360 degrees.

16. The middle term of the expansion of  $(\frac{a}{2} + \frac{2}{a})^6$  is

- (1) 1    (2) 0    (3)  $\frac{2}{a}$     (4)  $\frac{a}{2}$     (5) 20

17. If  $x^5 - 2x^4 - x^2 + 6$  is divided by  $x - 2$ ; the remainder is (1) 16    (2) -2    (3) 4    (4) none of these    (5) 21

18. The factored form of  $a^3 - 9a^2b + 27ab^2 - 27b^3$  is

- (1)  $(a+3b)(a^2+6ab+9b^2)$     (2)  $(a-3b)(a^2-3ab+9b^2)$   
 (3)  $(a+3b)^3$     (4)  $(a-3b)^3$     (5)  $a^3 - (3b)^3$

19. For the roots of the equation  $9x^2 + 4x + k = 0$  to be equal,  $k$  must be

- (1) 0    (2) 1    (3)  $\frac{1}{4}$     (4)  $-\frac{3}{4}$     (5)  $\frac{4}{9}$

20. If the domain of the function  $f(x) = 2x^2 + x + \frac{1}{8}$  is the set of all real numbers, then the range of the function is the set of all

- (1) positive real numbers    (2) negative real numbers  
 (3) non-negative real numbers    (4) real numbers  
 (5) non-positive real numbers

21. If  $m$  and  $n$  are positive integers which of the following is always a positive integer?

- (1)  $m \cdot n$     (2)  $\frac{m}{n}$     (3)  $m - n$     (4)  $n - m$     (5) all of these

22. If one solution of a quadratic equation is  $x = 2 - i$ , then the equation is (1)  $x^2 - 2ix - 7 = 0$

- (2)  $x^2 - 4x + 5 = 0$     (3)  $x^2 + 4x + 7 = 0$   
 (4)  $x^2 - 2x - 1 = 0$     (5)  $x^2 - 4x + 3 = 0$

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23. Which equation represents a real ellipse?

- (1)  $3x^2 - 4 = 2y^2$
- (2)  $3y^2 = 7 - 2x^2$
- (3)  $(x-3)(x+3y) = 9$
- (4)  $x^2 + 3x = y - 4$
- (5)  $x^2 + 2y^2 + 3 = 0$

24. The sum of the roots of the quadratic equation  $9x = 4 - 3x^2$  is

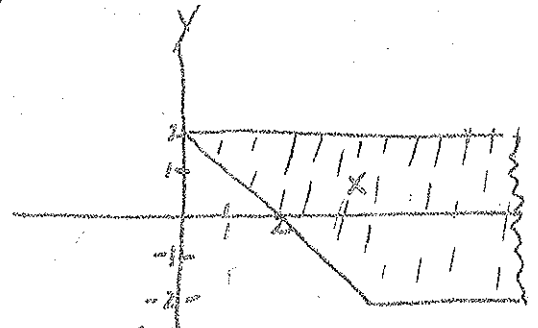
- (1) -3
- (2) 3
- (3) 9
- (4) -9
- (5)  $-\frac{4}{3}$

25. Abe noticed that during the first half of a trip that he had averaged 20 mph. What average rate must he make during the second half of the trip if he is to average 30 mph for the entire trip?

- (1) 25
- (2) 40
- (3) 50
- (4) 60
- (5) none of these

26. The graph represents

- (1)  $\{(x, y) | x + y \geq 2 \text{ and } |y| \leq 2\}$
- (2)  $\{(x, y) | x + y \geq 2 \text{ or } |y| \leq 2\}$
- (3)  $\{(x, y) | x + y \leq 2 \text{ and } |y| \geq 2\}$
- (4)  $\{(x, y) | x + y \leq 2 \text{ or } |y| \geq 2\}$
- (5) none of these



27. The solution set of the system of equations  $x^2 - 2y^2 = 1$ ;  $x^2 + 4y^2 = 25$  is

- (1)  $\{(1, 0), (3, -2)\}$
- (2)  $\{(2, \frac{5}{2}), (3, -\frac{5}{2})\}$
- (3)  $\{(0, 1), (0, 0)\}$
- (4)  $\{(3, 4), (-3, -4)\}$
- (5) none of these

28. The quadratic equation  $4x^2 - 3x + 1 = 0$  has roots that are

- (1) conjugate imaginary
- (2) equal and rational
- (3) unequal and rational
- (4) equal and irrational
- (5) unequal and irrational

The first part of the question is to find the area of the shaded region. The diagram shows a rectangle with a diagonal line from the top-left corner to the bottom-right corner. The region between the diagonal and the bottom edge is shaded. The width of the rectangle is 10 units and the height is 6 units. The diagonal is a straight line. The area of the shaded region is the area of the rectangle minus the area of the unshaded triangle.



The area of the rectangle is  $10 \times 6 = 60$  square units. The unshaded triangle has a base of 10 units and a height of 6 units. The area of this triangle is  $\frac{1}{2} \times 10 \times 6 = 30$  square units. Therefore, the area of the shaded region is  $60 - 30 = 30$  square units.



29.  $\log_4 8 =$  (1) 2 (2)  $\frac{3}{2}$  (3) 32 (4)  $\frac{1}{2}$  (5) none of these

30. The set of all  $x$  that satisfied  $3x+4 < 5x-8$  is  
(1)  $\{x | x < 6\}$  (2)  $\{x | x > 6\}$  (3)  $\{x | x < 12\}$  (4)  $\{x | -6 < x < 6\}$   
(5) none of these

31. If the sum of two numbers is 10 and their product is 20, the sum of their reciprocals is  
(1)  $\frac{1}{10}$  (2)  $\frac{1}{2}$  (3) 2 (4) 10 (5) none of these

32. The diagonal of square I is  $x+y$ . The perimeter of square II with twice the area of I is  
(1)  $(x+y)^2$  (2)  $\sqrt{2}(x+y)^2$  (3)  $2(x+y)$  (4)  $\sqrt{8}(x+y)$   
(5)  $4(x+y)$

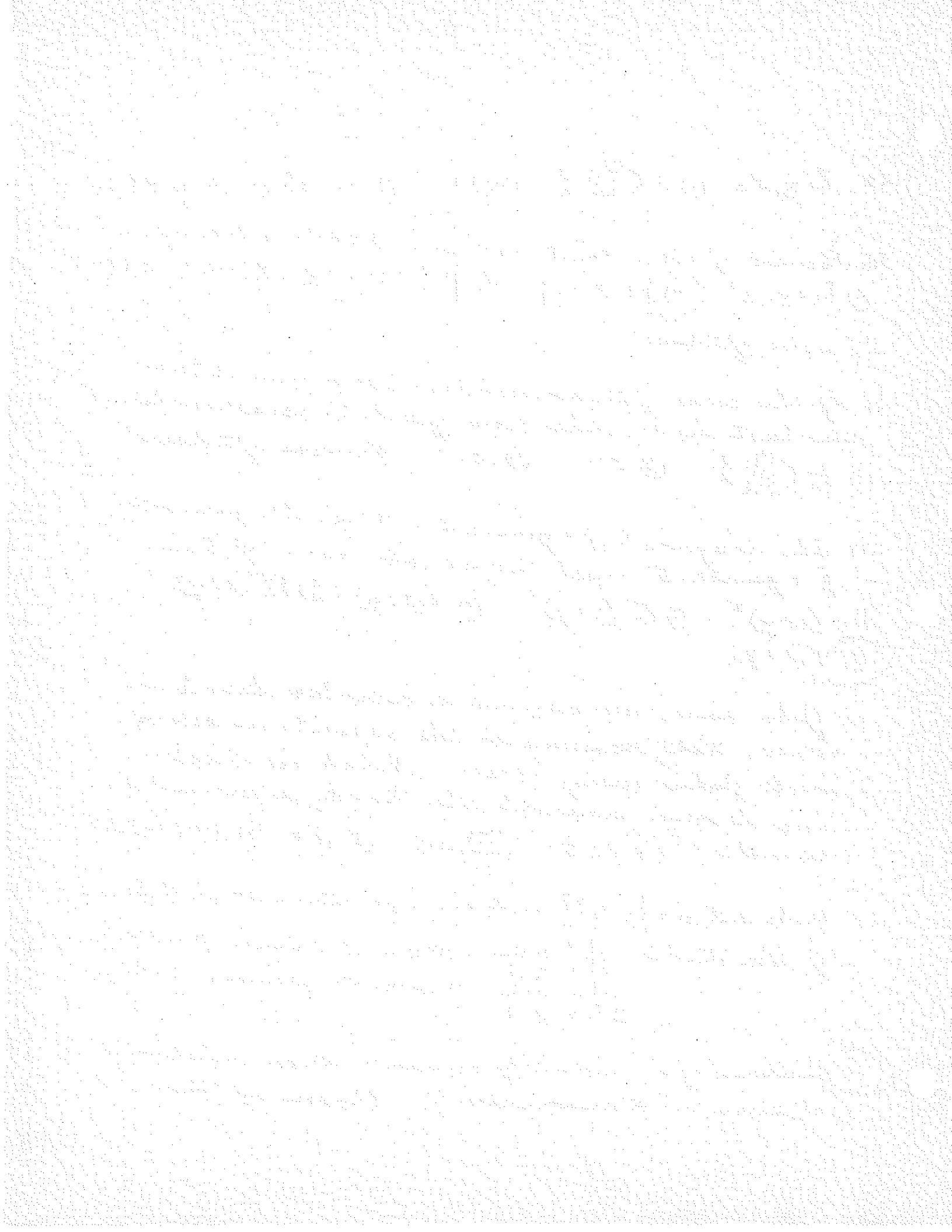
33. John can run around a circular track in 40 sec. Bill, running in the opposite direction, meets John every 15 sec. What is Bill's time to run around the track, expressed in seconds? (1)  $12\frac{1}{2}$  (2) 24 (3) 25 (4)  $27\frac{1}{2}$  (5) 55

34. If the set  $S = \{1, 2, 3\}$  and an operation  $*$  is defined by the table

	1	2	3
1	1	2	3
2	2	0	2
3	3	3	1

then a basic property under  $*$  which holds is

(1) existence of an identity element (2) commutativity  
(3) closure (4) associativity (5) none of these



(35) If  $A = \{1, 3, 4, 5, 7, 8\}$   $B = \{2, 3, 4, 5, 6, 9\}$   $C = \{1, 3, 5, 9, 10\}$   
 then  $A \cup (B \cap C)$  is (A)  $\{1, 3, 4, 5, 9\}$  (B)  $\{2, 5\}$   
 (C)  $\{1, 3, 4, 5, 7, 8, 9\}$  (D)  $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$  (E)  $\{1, 3, 4, 5\}$

(36) The 50th term of the arithmetic progression  $\frac{1}{2} + \frac{3}{2} + \frac{5}{2} + \dots$  is (A) 51 (B)  $50\frac{1}{2}$  (C) 50 (D)  $49\frac{1}{2}$   
 (E) 49

(37) The first term of a geometric progression having a sum of  $23\frac{1}{4}$ , a common ratio of 2, and having 5 terms is (A) 1 (B)  $\frac{3}{4}$  (C)  $\frac{1}{2}$  (D)  $\frac{1}{4}$  (E) none of these

(38) Two swimmers, at opposite ends of a 90-foot pool, start to swim the length of the pool, one at the rate of 3 ft. per sec., the other at 2 ft. per sec. They swim back and forth for 12 min. Assuming no loss of time at the turns, find the no. of times they pass each other.

(A) 24 (B) 2 (C) 20 (D) 16 (E) 18  
 3

(39) Five times the amount of A's money added to the amount of B's money is more than \$51.00. Three times A's money minus B's money is \$21.00. If A represents A's money and B represents B's money in dollars, then

(A)  $a > 9, B > 6$  (B)  $a > 9, B < 6$  (C)  $a > 9, B = 6$   
 (D)  $a > 9$ , but we can put no bounds on B (E)  $2a = 3B$

(40) If  $(x+1)^2 > (5x-1)$  and  $< (7x-3)$ , find the smallest possible integral value of x.  
 (A) 1 (B) 2 (C) 3 (D) 4 (E) none of these

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