

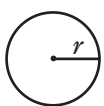
Section 2: Math Ability

Directions: For this section, solve each problem and decide which is the best of the choices given. Fill in the corresponding circle on the answer sheet. You may use any available space for scratchwork.

Notes:

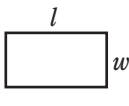
1. The use of a calculator is permitted.
2. All numbers used are real numbers.
3. Figures that accompany problems in this test are intended to provide information useful in solving the problems. They are drawn as accurately as possible EXCEPT when it is stated in a specific problem that the figure is not drawn to scale. All figures lie in a plane unless otherwise indicated.
4. Unless otherwise specified, the domain of any function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE INFORMATION

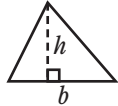


$$A = \pi r^2$$

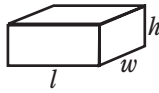
$$C = 2\pi r$$



$$A = lw$$



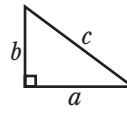
$$A = \frac{1}{2}bh$$



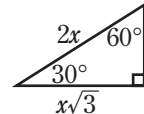
$$V = lwh$$



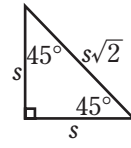
$$V = \pi r^2 h$$



$$c^2 = a^2 + b^2$$



Special Right Triangles



The number of degrees of arc in a circle is 360.

The sum of the measures in degrees of the angles of a triangle is 180.

1. If $P \times \frac{11}{14} = \frac{11}{14} \times \frac{8}{9}$, then $P =$

- (A) $\frac{8}{9}$
 (B) $\frac{9}{8}$
 (C) 8
 (D) 11
 (E) 14

2. How did you get your answer?

- (A) I multiplied $\frac{11}{14}$ by $\frac{8}{9}$, *reducing first*.
 (B) I multiplied 11×8 and then divided the product by 14×9 .
 (C) I canceled $\frac{11}{14}$ from both sides of the equals sign.
 (D) I guessed.
 (E) None of these.

3. Sarah is twice as old as John. Six years ago, Sarah was 4 times as old as John was then. How old is John now?

(A) 3
 (B) 9
 (C) 18
 (D) 20
 (E) Cannot be determined.

4. How did you get your answer?

(A) I substituted S for *Sarah*, $=$ for *is*, and J for *John* in the first sentence of the problem. Then I translated the second sentence into mathematical terms also.
 (B) I tried specific numbers for *Sarah* and/or *John*.
 (C) I racked my brain to figure out the ages but didn't write any equations down.
 (D) I guessed.
 (E) None of these.

5. 200 is what percent of 20?

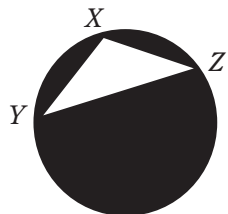
(A) $\frac{1}{10}$
 (B) 10
 (C) 100
 (D) 1,000
 (E) 10,000

6. How did you get your answer?

(A) I translated *is* to $=$, *what* to a variable, *of* to \times , etc. Then I was able to set up an equation.
 (B) I just divided the two numbers and multiplied by 100 to get the percent.
 (C) I tried to remember how to work with *is-of* problems, putting the *of* over *is* or the *is* over *of*.
 (D) I guessed.
 (E) None of these.

7. In the diagram below, $\triangle XYZ$ has been inscribed in a circle. If the circle encloses an area of 64, and the area of $\triangle XYZ$ is 15, then what is the area of the shaded region?

(A) 25
 (B) 36
 (C) 49
 (D) 79
 (E) Cannot be determined.



8. How did you get your answer?

(A) I tried to calculate the area of the circle and the area of the triangle.
 (B) I used a special triangle or tried different triangles whose area was 15.
 (C) I subtracted 15 from 64.
 (D) I guessed.
 (E) None of these.

9. $66^2 + 2(34)(66) + 34^2 =$

(A) 4,730
 (B) 5,000
 (C) 9,860
 (D) 9,950
 (E) 10,000

10. How did you get your answer?

(A) I multiplied 66×66 , $2 \times 34 \times 66$, and 34×34 and added the results.
 (B) I approximated a solution.
 (C) I noticed that $66^2 + 2(34)(66) + 34^2$ had the form of $a^2 + 2ab + b^2$ and set the form equal to $(a + b)^2$.
 (D) I guessed.
 (E) None of these.

11. The average height of three students is 68 inches. If two of the students have heights of 70 inches and 72 inches respectively, then what is the height (in inches) of the third student?

(A) 60
 (B) 62
 (C) 64
 (D) 65
 (E) 66

12. How did you get your answer?

- (A) I used the following equation:

$$(68 + 2) + (68 + 4) + x = 68 + 68 + 68$$


Then I got:

$68 + 68 + (x + 6) = 68 + 68 + 68$, and crossed off the two 68s on both sides of the equation to come up with $x + 6 = 68$.

- (B) I was able to eliminate the incorrect choices without figuring out a complete solution.

- (C) I got the equation $\frac{(70 + 72 + x)}{3} = 68$, then solved for x .

(D) I guessed.
 (E) None of these.

13. If $0 < x < 1$, then which of the following must be true?
- I. $2x < 2$
 II. $x - 1 < 0$
 III. $x^2 < x$
- (A) I only
 (B) II only
 (C) I and II only
 (D) II and III only
 (E) I, II, and III
14. How did you get your answer?
- (A) I plugged in only one number for x in I, II, and III.
 (B) I plugged in more than one number for x and tried I, II, and III using each set of numbers.
 (C) I used the fact that $0 < x$ and $x < 1$ and manipulated those inequalities in I, II, and III.
 (D) I guessed.
 (E) None of these.
15. The sum of the cubes of any two consecutive positive integers is always
- (A) an odd integer
 (B) an even integer
 (C) the cube of an integer
 (D) the square of an integer
 (E) the product of an integer and 3
16. How did you get your answer?
- (A) I translated the statement into the form $x^3 + (x + 1)^3 = \underline{\hspace{2cm}}$ and tried to see what I would get.
 (B) I tried numbers like 1 and 2 for the consecutive integers. Then I calculated the sum of the cubes of those numbers. I was able to eliminate some choices and then tried some other numbers for the consecutive integers to eliminate more choices.
 (C) I said, of two consecutive positive integers, one is even and therefore its cube is even. The other integer is odd, therefore its cube is odd. An odd + an even is an odd.
 (D) I guessed.
 (E) None of these.
17. If p is a positive integer, which *could* be an odd integer?
- (A) $2p + 2$
 (B) $p^3 - p$
 (C) $p^2 + p$
 (D) $p^2 - p$
 (E) $7p - 3$
18. How did you get your answer?
- (A) I plugged in a number or numbers for p and started testing all the choices, *starting with Choice A*.
 (B) I plugged in a number or numbers for p in each of the choices, *starting with Choice E*.
 (C) I looked at Choice E first to see if $7p - 3$ had the form of an even or odd integer.
 (D) I guessed.
 (E) None of these.
19. In this figure, two points, B and C , are placed to the right of point A such that $4AB = 3AC$. The value of $\frac{BC}{AB}$
- (A) equals $\frac{1}{3}$
 (B) equals $\frac{2}{3}$
 (C) equals $\frac{3}{2}$
 (D) equals 3
 (E) Cannot be determined.
- 
20. How did you get your answer?
- (A) I drew points B and C on the line and labeled AB as a and BC as b and then worked with a and b .
 (B) I substituted numbers for AB and AC .
 (C) I drew points B and C on the line and worked with equations involving BC and AB .
 (D) I guessed.
 (E) None of these.
21. A man rode a bicycle a straight distance at a speed of 10 miles per hour. He came back the same way, traveling the same distance at a speed of 20 miles per hour. What was the man's total number of miles for the trip back and forth if his total traveling time was one hour?
- (A) 15
 (B) $13\frac{1}{3}$
 (C) $7\frac{1}{2}$
 (D) $6\frac{2}{3}$
 (E) $6\frac{1}{3}$

22. How did you answer this question?

- (A) I used $\text{Rate} \times \text{Time} = \text{Distance}$ and plugged in my own numbers.
- (B) I averaged 10 and 20 and worked from there.
- (C) I called the times going back and forth by two different unknown variables but noted that the sum of these times was 1 hour.
- (D) I guessed.
- (E) None of these.

23. If the symbol ϕ is defined by the equation

$$a \phi b = a - b - ab$$

for all a and b , then $\left(-\frac{1}{3}\right) \phi (-3) =$

- (A) $\frac{5}{3}$
- (B) $\frac{11}{3}$
- (C) $-\frac{13}{5}$
- (D) -4
- (E) -5

24. How did you get your answer?

- (A) I played around with the numbers $-\frac{1}{3}$ and -3 to get my answer. I didn't use any substitution method.
- (B) I substituted in $a \phi b = a - b - ab$, $\left(-\frac{1}{3}\right)$ for a and -3 for b .
- (C) I worked backward.
- (D) I guessed.
- (E) None of these.

25. If $y^8 = 4$ and $y^7 = \frac{3}{x}$, what is the value of y in terms of x ?

- (A) $\frac{4x}{3}$
- (B) $\frac{3x}{4}$
- (C) $\frac{4}{x}$
- (D) $\frac{x}{4}$
- (E) $\frac{12}{x}$

26. How did you get your answer?

- (A) I solved for the value of y from $y^8 = 4$. Then I substituted that value of y in $y^7 = \frac{3}{x}$.
- (B) I took the seventh root of y in the second equation.
- (C) I divided the first equation by the second equation to get y alone in terms of x .
- (D) I guessed.
- (E) None of these.

27. If $4x + 5y = 10$ and $x + 3y = 8$, then $\frac{5x + 8y}{3} =$

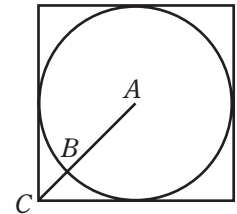
- (A) 18
- (B) 15
- (C) 12
- (D) 9
- (E) 6

28. How did you get your answer?

- (A) I solved both simultaneous equations for x and for y , then substituted the values of x and y into $\frac{(5x + 8y)}{3}$.
- (B) I tried numbers for x and for y that would satisfy the first two equations.
- (C) I added both equations to get $5x + 8y$. Then I divided my result by 3.
- (D) I guessed.
- (E) None of these.

29. The circle with center A and radius AB is inscribed in the square here. AB is extended to C . What is the ratio of AB to AC ?

- (A) $\sqrt{2}$
- (B) $\frac{\sqrt{2}}{4}$
- (C) $\frac{\sqrt{2} - 1}{2}$
- (D) $\frac{\sqrt{2}}{2}$
- (E) None of these.

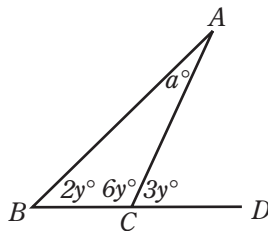


30. How did you get your answer?

- (A) I approximated the solution. I looked to see what the ratio of AB to AC might be from the diagram. Then I looked through the choices to see which choice was reasonable or to eliminate incorrect choices.
- (B) I saw a relationship between AB and AC but didn't draw any other lines.
- (C) I dropped a perpendicular from A to one of the sides of the square, then worked with the isosceles right triangle. I also labeled length AB by a single letter, and BC by another single letter.
- (D) I guessed.
- (E) None of these.

31. In the accompanying figure, BD is a straight line. What is the value of a ?

- (A) 15
- (B) 17
- (C) 20
- (D) 24
- (E) 30



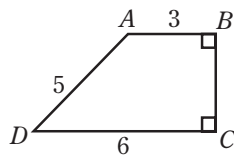
(Note: Figure is not drawn to scale.)

32. How did you get your answer?

- (A) I *first* said that $2y + 6y + a = 180$.
- (B) I *first* said that $6y + 3y = 180$, then solved for y .
- (C) I *first* said $3y = 2y + a$.
- (D) I guessed.
- (E) None of these.

33. What is the perimeter of the accompanying figure if B and C are right angles?

- (A) 14
- (B) 16
- (C) 18
- (D) 20
- (E) Cannot be determined.



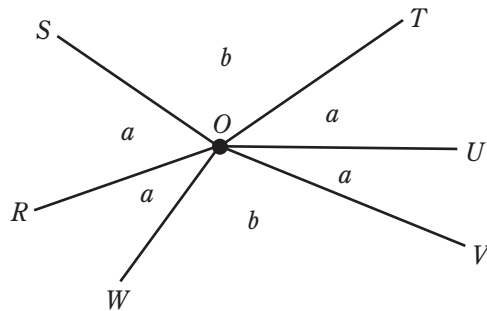
(Note: Figure is not drawn to scale.)

34. How did you get your answer?

- (A) I tried to first find angles A and D .
- (B) I drew a perpendicular from A to DC and labeled BC as an unknown (x or y , etc.).
- (C) I labeled BC as an unknown (x or y , etc.) but *did not* draw a perpendicular line from A to DC .
- (D) I guessed.
- (E) None of these.

35. Which of the angles below has a degree measure that can be determined?

- (A) $\angle WOS$
- (B) $\angle SOU$
- (C) $\angle WOT$
- (D) $\angle ROV$
- (E) $\angle WOV$



(Note: Figure is not drawn to scale.)

36. How did you get your answer?

- (A) I first said that $4a + 2b = 360$, got $2a + b = 180$, and then looked through the choices.
- (B) I looked through the choices first.
- (C) I knew that the sum of the angles added up to 360 degrees but didn't know where to go from there.
- (D) I guessed.
- (E) None of these.