

Math

60 Questions ■ Time—60 Minutes

Directions: Solve each problem; then, on your answer sheet, mark the oval corresponding to the correct answer.

Be careful not to spend too much time on any one question. Instead, solve as many problems as possible, and then use the remaining time to return to those questions you were unable to answer at first.

You may use a calculator on any problem in this test. However, some problems can best be solved without use of a calculator.

Note: Unless otherwise stated, you can assume that:

1. Diagrams that accompany problems are not necessarily drawn to scale.
2. All figures lie in the same plane.
3. The word “line” refers to a straight line (and lines that appear straight are straight).
4. The word “average” refers to arithmetic mean.

1. The number 40.5 is 1,000 times greater than which of the following numbers?

A. 0.405
B. 0.0405
C. 0.0450
D. 0.00405
E. 0.000405

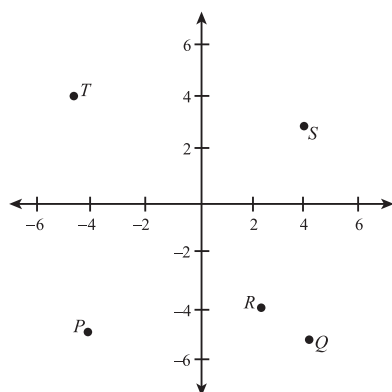
2. Lyle’s current age is 23 years, and Melanie’s current age is 15 years. How many years ago was Lyle’s age twice Melanie’s age?

F. 16
G. 9
H. 8
J. 7
K. 5

3. If x is a real number, and if $x^3 = 100$, then x lies between which two consecutive integers?

A. 1 and 2
 B. 2 and 3
 C. 3 and 4
 D. 4 and 5
 E. 5 and 6

4. In the standard (x,y) coordinate plane below, which point has the coordinates $(4, -5)$?



F. P
 G. Q
 H. R
 J. S
 K. T

5. A certain zoo charges exactly twice as much for an adult admission ticket as for a child's admission ticket. If the total admission price for the family of two adults and two children is \$12.60, what is the price of a child's ticket?

A. \$1.60
 B. \$2.10
 C. \$3.20
 D. \$3.30
 E. \$4.20

6. One marble is to be drawn randomly from a bag that contains three red marbles, two blue marbles, and one green marble. What is the probability of drawing a blue marble?

F. $\frac{1}{6}$
 G. $\frac{1}{5}$
 H. $\frac{2}{7}$
 J. $\frac{1}{3}$
 K. $\frac{2}{5}$

7. Point A bisects line segment \overline{BC} , and point D bisects line segment \overline{BA} . Which of the following congruencies holds?

A. $\overline{DC} \cong \overline{CB}$
 B. $\overline{BA} \cong \overline{CB}$
 C. $\overline{DC} \cong \overline{DA}$
 D. $\overline{AD} \cong \overline{DB}$
 E. $\overline{CA} \cong \overline{BC}$

8. If $\frac{2y}{9} = \frac{y-1}{3}$, then $y =$

F. $\frac{1}{3}$
 G. $\frac{3}{5}$
 H. $\frac{4}{9}$
 J. $\frac{9}{4}$
 K. 3

9. $4\frac{1}{2} + 3\frac{3}{4} - 2\frac{2}{5} =$

A. $\frac{57}{10}$

B. $\frac{231}{40}$

C. $\frac{117}{20}$

D. $\frac{23}{4}$

E. $\frac{29}{5}$

10. If $a = 3$, $b = -3$, and $c = \frac{1}{3}$, then $ab^2c =$

F. -27

G. -1

H. 3

J. 9

K. 27

11. M is $P\%$ of what number?

A. $\frac{100M}{P}$

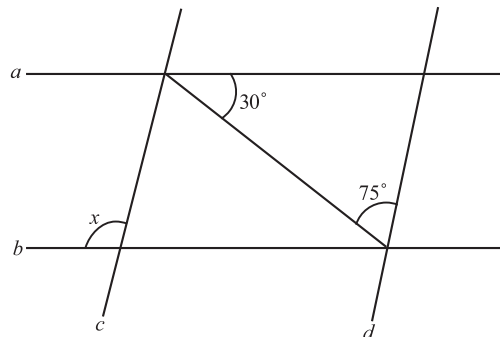
B. $\frac{100P}{M}$

C. $\frac{M}{100P}$

D. $\frac{P}{100M}$

E. $\frac{MP}{100}$

12. In the figure below, lines a and b are parallel, and lines c and d are parallel. What is the measure of $\angle x$?



F. 75°

G. 95°

H. 100°

J. 105°

K. 115°

13. A solution of 60 ounces of sugar and water is 20% sugar. If you add x ounces of water to make a solution that is 5% sugar, which of the following represents the amount of sugar in the solution after adding water?

A. $60 - 40x$

B. $0.05(60x - 20)$

C. $0.05(60 + x)$

D. $0.20(60 + x)$

E. $60(0.05 + x)$

14. In the standard (x,y) coordinate plane, lines a and b intersect at point $(5, -2)$ and lines b and c intersect at point $(-3, 3)$. What is the slope of line b ?

F. $\frac{1}{2}$

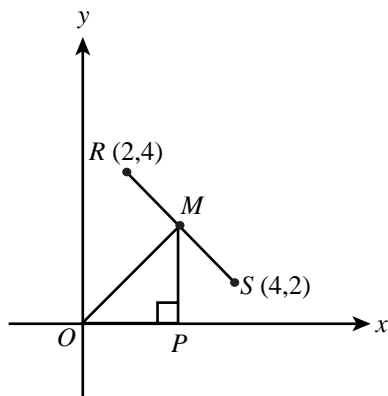
G. $-\frac{5}{2}$

H. $-\frac{2}{5}$

J. $-\frac{5}{8}$

K. It cannot be determined from the information given.

15. In the figure below, M is the midpoint of \overline{RS} . What is the area of $\triangle MOP$?



- A. 4.5
B. 4
C. 3.5
D. 3
E. $2\sqrt{2}$

16. A photographic negative measures $1\frac{7}{8}$ inches by $2\frac{1}{2}$ inches. If the longer side of the printed picture is to be 4 inches, what will be the length of the shorter side of the printed picture?

F. $3\frac{1}{8}$ inches

G. 3 inches

H. $2\frac{3}{4}$ inches

J. $2\frac{1}{2}$ inches

K. $2\frac{3}{8}$ inches

17. Which of the following is the equation of a straight line that has y -intercept 3 and is perpendicular to the line $4x - 2y = 6$?

A. $2y + 3x = -3$

B. $y + 3x = 2$

C. $2y - x = 6$

D. $y - 2x = 4$

E. $2y + x = 6$

18. Of 60 pairs of socks in a drawer, 40% are blue, while the remaining socks are all gray. If 4 blue socks are removed from the drawer, what is the ratio of gray socks to blue socks?

F. 1:2

G. 5:9

H. 3:5

J. 9:5

K. 2:1

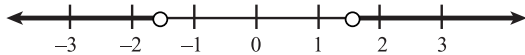
19. On the (x,y) coordinate plane, what is the distance from the point defined by $(5,4)$ and the point defined by $(1,-2)$?

A. $2\sqrt{5}$
 B. $4\sqrt{3}$
 C. $5\sqrt{2}$
 D. $2\sqrt{13}$
 E. $3\sqrt{6}$

20. Which of the following is NOT a member of the solution set for the equation $2x(3x - 1)(2x - 2)(x - 3) = 0$?

F. 3
 G. 2
 H. 1
 J. $\frac{1}{3}$
 K. 0

21. Which of the following best describes the graph on the number line below?



A. $|x| > 1.5$
 B. $|x| < -1.5$
 C. $-1.5 < |x| < 1.5$
 D. $|x| > -1.5$
 E. $|x| < 1.5$

22. $\sqrt{\frac{y^2}{2} - \frac{y^2}{18}} =$

F. 0
 G. $\frac{10y}{3}$
 H. $\frac{2y}{3}$
 J. $\frac{y\sqrt{3}}{6}$
 K. $\frac{y\sqrt{5}}{3}$

23. If $x + y = a$, and if $x - y = b$, then $x =$

A. $\frac{1}{2}(a + b)$
 B. $a + b$
 C. $a - b$
 D. $\frac{1}{2}ab$
 E. $\frac{1}{2}(a - b)$

24. If the equation $x^2 + 8x + s = 0$ has only one solution, then $s =$

F. -4
 G. 0
 H. 4
 J. 8
 K. 16

25. On the xy -coordinate plane, a point defined by the (x,y) pair $(m,2)$ lies on a circle with center $(3,-1)$ and radius 5. Which of the following is a possible value of m ?

A. 8
 B. 6
 C. -1
 D. -2
 E. -7

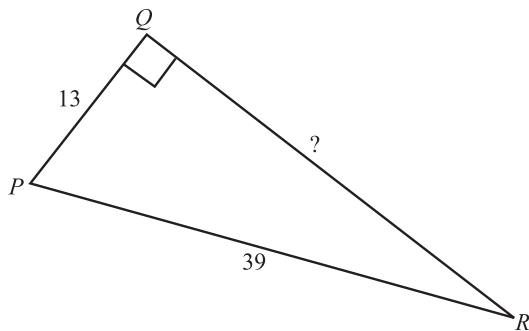
26. If the sides of a triangle are 8, 15, and 17 units long, what is the measure of the angle formed by the two shortest sides?

F. 30°
G. 45°
H. 60°
J. 75°
K. 90°

27. How many different ways can you add four positive odd integers together for a sum of 10, without considering the sequence of the integers?

A. Five
B. Four
C. Three
D. Two
E. One

28. The figure below shows right triangle PQR . What is the length of QR ?



F. $13\sqrt{3}$
G. $\frac{39\sqrt{2}}{2}$
H. 26
J. 30
K. $26\sqrt{2}$

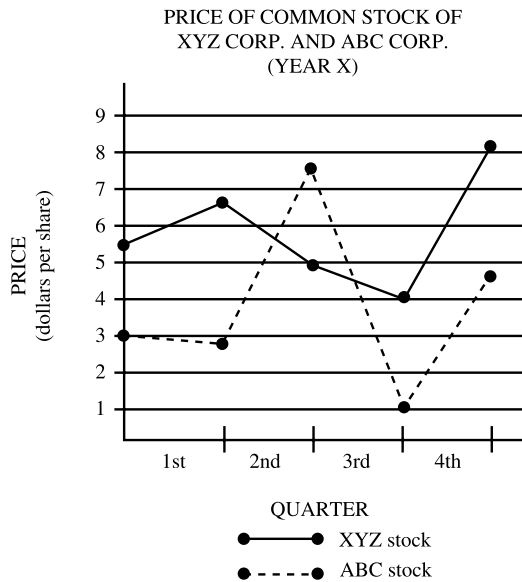
29. The average of five numbers is A . If a sixth number n is added, which of the following represents the average of all six numbers?

A. $\frac{6A - n}{5}$
B. $6A$
C. $A + \frac{n}{6}$
D. $\frac{5A + n}{6}$
E. $\frac{A \times n}{6}$

30. If two sides of a triangle are 6.5 and 8.5 inches long, which of the following cannot be the length of the third side?

F. 15 inches
G. 12 inches
H. 9.5 inches
J. 6.5 inches
K. 5.5 inches

31. Referring to the graph below, what was the greatest dollar amount by which the share price of ABC common stock exceeded the share price of XYZ common stock during Year X?



- A. \$1.80
B. \$2.60
C. \$3.00
D. \$3.60
E. It cannot be determined from the information given.
32. If x and y are negative integers, and if $x - y = 1$, what is the least possible value of xy ?
- F. 2
G. 1
H. 0
J. -1
K. -2

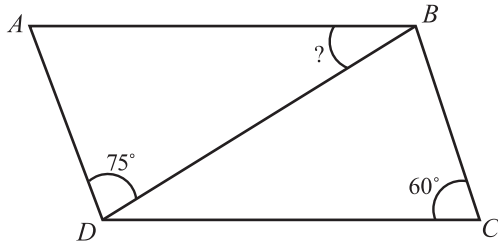
33. If $\sqrt{4x} = \sqrt{y}$, then in terms of y , $x =$

- A. $2y$
B. $\frac{\sqrt{y}}{2}$
C. \sqrt{y}
D. y^2
E. $\frac{y}{4}$

34. The distance a moving object travels can be determined as the product of the object's rate of motion (r), or speed, and the amount of time (t) traveling. If a boat travels m miles in 4 hours, then an additional 20 miles in t hours, which of the following represents the boat's average speed, in miles per hour, over the total distance?

- F. $\frac{t + 4}{m + 20}$
G. $\frac{m + 20}{t + 4}$
H. $\frac{tm}{20}$
J. $\frac{t + 20}{m + 4}$
K. $\frac{4tm}{5}$

35. In the figure below, if $\overline{AB} \parallel \overline{DC}$ and $\overline{AD} \parallel \overline{BC}$, what is the measure of $\angle ABD$?



- A. 40°
 B. 45°
 C. 50°
 D. 55°
 E. 60°
36. What is the value of m in the following system of two equations?

$$4m = 12 - 3n$$

$$\frac{3}{4}n = 3 - m$$

- F. -6
 G. -3
 H. 2
 J. 8
 K. Any real number

37. If $A = \begin{bmatrix} -3 & 5 \\ 3 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 2 \\ -1 & 1 \end{bmatrix}$, then $2A - B =$

A. $\begin{bmatrix} -3 & 12 \\ 5 & 15 \end{bmatrix}$

B. $\begin{bmatrix} -9 & 8 \\ 5 & 13 \end{bmatrix}$

C. $\begin{bmatrix} -9 & 8 \\ 7 & 13 \end{bmatrix}$

D. $\begin{bmatrix} -6 & 3 \\ 4 & 6 \end{bmatrix}$

E. $\begin{bmatrix} -3 & 8 \\ 7 & 13 \end{bmatrix}$

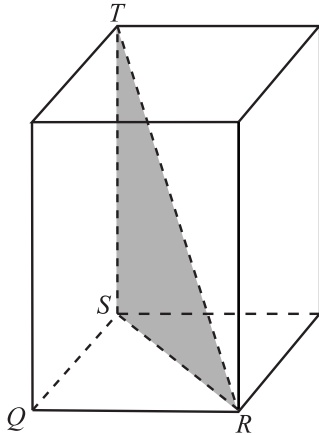
38. In an arithmetic sequence, each successive term is either greater than or less than the preceding term by the same amount. What is the tenth term of the arithmetic sequence 30, 27, 24, ...?

- F. 10
 G. 3
 H. 0
 J. -3
 K. -30

39. If $f(x) = 6^x$ and $g(x) = \log_6 x$, which of the following expressions is equal to $f(2g(M))$?

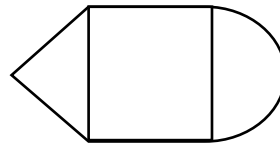
- A. $2M$
 B. 6^M
 C. M^2
 D. M^6
 E. 6^{2M}

40. The figure below shows a rectangular solid with the following unit dimensions: $\overline{QR} = 3$, $\overline{QS} = 4$, and $\overline{ST} = 5$. How many units long is \overline{RT} ?

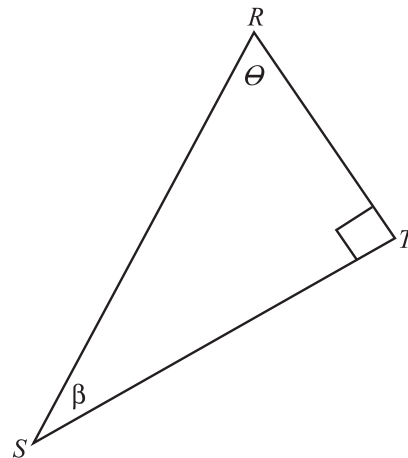


- F. $4\sqrt{2}$
 G. 6
 H. $4\sqrt{3}$
 J. 7
 K. $5\sqrt{2}$
41. Two competitors battle each other in each match of a tournament with six participants. What is the minimum number of matches that must occur for every competitor to battle every other competitor?
- A. 21
 B. 18
 C. 16
 D. 15
 E. 12

42. Three carpet pieces—in the shapes of a square, a triangle, and a semicircle—are attached to one another, as shown in the figure below, to cover the floor of a room. If the area of the square is 144 feet and the perimeter of the triangle is 28 feet, what is the perimeter of the room's floor, in feet?



- F. $32 + 12\pi$
 G. $40 + 6\pi$
 H. $34 + 12\pi$
 J. $52 + 6\pi$
 K. $52 + 12\pi$
43. $\triangle PQR$ below has angle measures 90° , θ , and β degrees as shown. Which of the following is true for all possible values of θ and β ?

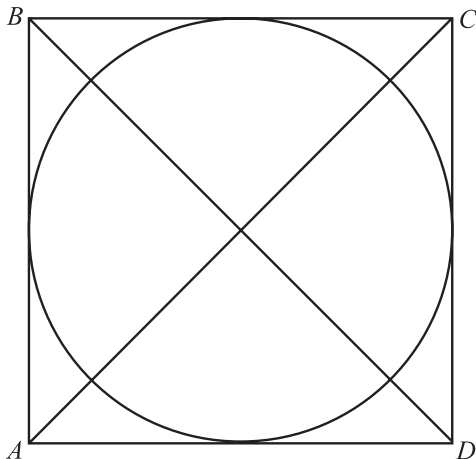


- A. $\tan\theta = \tan\beta$
 B. $\sin\theta + \cos\beta = 1$
 C. $\sin\theta \times \cos\beta = 1$
 D. $\tan\theta \times \tan\beta = 1$
 E. $\sin\theta \tan\beta = \cos\beta$

44. Two ships leave from the same port at 11:30 a.m. If one sails due east at 24 miles per hour and the other due south at 10 miles per hour, how many miles apart are the ships at 2:30 p.m.?

F. 45
G. 62
H. 68
J. 78
K. 84

45. If the circumference of the circle pictured below is 16π units, what is the unit length of \overline{AC} ?



- A. $4\sqrt{2}$
B. 16
C. $16\sqrt{2}$
D. 32
E. 16π
46. If $\sqrt{3x} = 6i$, then $x =$
- F. 12
G. 6
H. 3
J. 2
K. -12

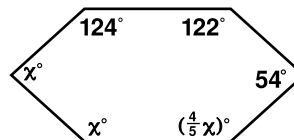
47. For all $x > 2$, $\frac{x^2 - 4}{x^2 - 2x} =$

A. $x - \frac{4}{x}$
B. $\frac{1}{2x}$
C. $1 + \frac{2}{x}$
D. $2 - x$
E. $2x - 1$

48. Events A, B, and C occur every 5 days, 3 days, and 8 days, respectively. What is the number of days after events A, B, and C all occur on the same day that they all occur again for the first time on the same day?

F. 45
G. 65
H. 80
J. 90
K. 120

49. If two of the angles of the polygon shown below are congruent, then $x =$



A. 78
B. 84
C. 120
D. 150
E. 174

50. If $x^2 + 2 = -4x$, what are the possible values of x ?

F. $-4 \pm \sqrt{2}$
G. $-2 \pm \sqrt{2}$
H. $2 \pm \sqrt{2}$
J. $4 \pm \sqrt{2}$
K. $4 \pm 2\sqrt{2}$

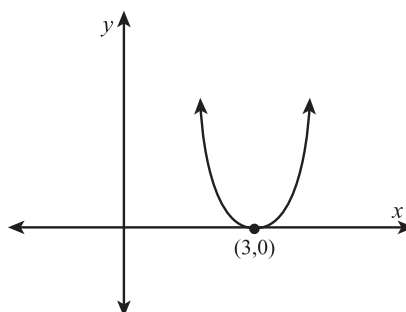
51. A certain cube contains 125 cubic inches. What is the surface area, in square inches, of each square face of the cube?

A. 5
B. 10
C. 15
D. 20
E. 25

52. A certain clock runs 48 minutes slow every 12 hours. Four hours after the clock is set correctly, the correct time is 4:00. In how many minutes, to the nearest minute, will the clock show 4:00?

F. 13
G. 14
H. 15
J. 16
K. 17

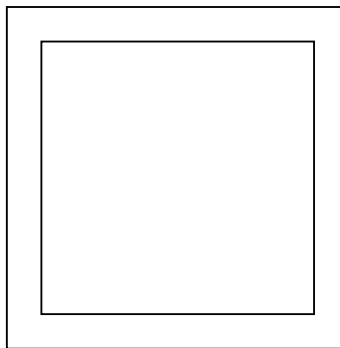
53. The figure below shows a parabola in the standard (x,y) coordinate plane.



Which of the following equations does the graph best represent?

A. $y = x^2 + 3x + 9$
B. $y = x^2 - 2x + 6$
C. $y = -x^2 + x - 3$
D. $y = x^2 - 6x + 9$
E. $y = x^2 + 2x + 3$

54. The figure below shows a flat picture mat around a square painting. The width of the mat is 1 inch, and the area of the mat is 60 square inches.



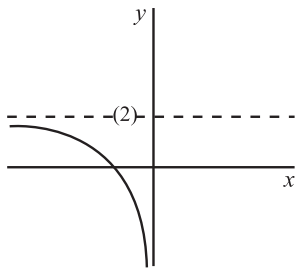
What is the length, in inches, of one side of the painting?

F. 30
G. 24
H. 18
J. 14
K. 12

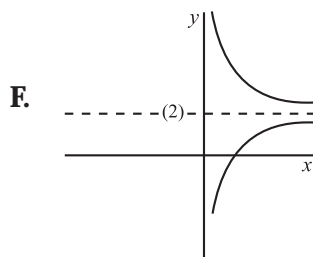
55. The altitude of a triangle is the distance from its base to the vertex opposite the base. If the length of the base (b) of a triangle and the triangle's altitude are equal in length, which of the following represents the area of the triangle?

- A. $\frac{b^2}{2}$
- B. $\frac{2b^2}{3}$
- C. b^2
- D. $4b$
- E. $2b^2$

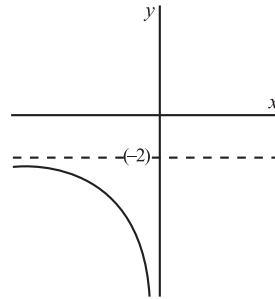
56. The graph of the equation $x = \frac{2}{y-2}$ is shown below.



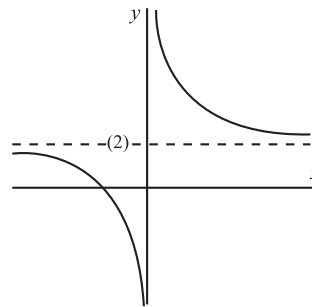
Which of the following best represents the equation $x = \left| \frac{2}{y-2} \right|$?



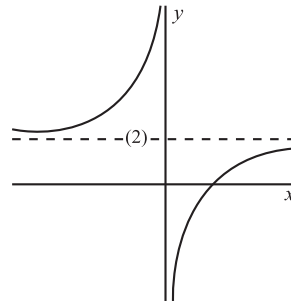
G.



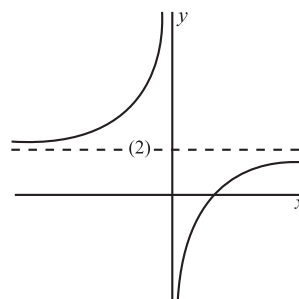
H.



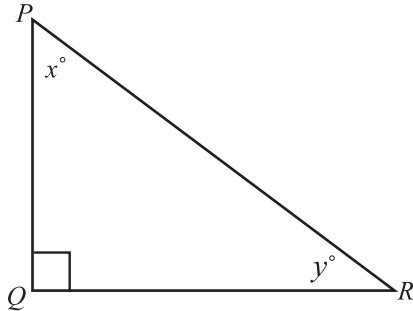
J.



K.



57. In $\triangle PQR$ below, if $\tan x > 1$, all of the following must be true EXCEPT:



- A. $x > 45$
 B. $y > 45$
 C. $\overline{PQ} \neq \overline{QR}$
 D. $x + y = 90$
 E. $x \neq y$
58. An isosceles triangle has two sides of length 3 feet each. The angle formed by the two 3-foot sides measures 32° . What is the length of the triangle's third side?
- F. $3\cos 32^\circ$
 G. $3\sin 32^\circ$
 H. $3\sin 16^\circ$
 J. $6\tan 16^\circ$
 K. $6\sin 16^\circ$

59. If $m = n$ and $p > q$, then which of the following inequalities holds true in all cases?

- A. $m - p > n - q$
 B. $p - m < q - n$
 C. $m - p < n - q$
 D. $mp > nq$
 E. $m + q > n + p$

60. In the standard (x,y) coordinate plane, the amplitude of a graph is half the distance between the graph's minimum and maximum y -values. What is the amplitude of the graph of the equation $y - 1 = 2\cos 3\theta$?

- F. 6
 G. 3
 H. 2
 J. $\frac{3}{2}$
 K. 1

STOP