

KCATM 2012
TEAM TEST
WORD PROBLEMS

1. A student in an algebra course has test scores of 64 and 78. What score on the third test will give the student an average of 80 if all tests have the same weight?
 - a) 80
 - b) 82
 - c) 95
 - d) 100
 - e) None of the above

2. A student in an algebra course has test scores of 64 and 78. What score on the third test will give the student an average of 80 if the third test counts twice as much as either of the other tests?
 - a) 88
 - b) 89
 - c) 90
 - d) 98
 - e) None of the above

3. A radiator contains 8 quarts of a mixture of water and antifreeze. If 40% of the mixture is antifreeze, how much of the mixture should be drained and replaced by pure antifreeze so that the resultant mixture will contain 60% antifreeze?
 - a) $\frac{4}{3}$ quarts
 - b) $\frac{8}{3}$ quarts
 - c) $\frac{16}{3}$ quarts
 - d) 6 quarts
 - e) None of the above

4. Two pumps are available for filling a gasoline storage tank. Pump A, used alone, can fill the tank in 3 hours, and pump B, used alone, can fill it in 4 hours. If both pumps are used simultaneously, how long will it take to fill the tank?
 - a) $\frac{1}{7}$ hours
 - b) $\frac{7}{2}$ hours
 - c) $\frac{7}{12}$ hours
 - d) $\frac{12}{7}$ hours
 - e) None of the above

5. A large grain silo is to be constructed in the shape of a circular cylinder with a hemisphere attached to the top. The diameter of the silo is to be 30 feet, but the total height is yet to be determined. Find the height of the silo that will result in a capacity of 11250π cubic feet.
- a) 30 ft
 - b) 37.5 ft
 - c) 50 ft
 - d) 55 ft
 - e) None of the above
6. After playing 100 games, a major-league baseball team has a record of 0.650; that is, the team has won 65% of its games. If the team wins only 50% of its games for the remainder of the season, after how many additional games will its record be 0.600?
- a) 50
 - b) 52
 - c) 55
 - d) 60
 - e) None of the above
7. An art student wants to make a string sun-catcher by connecting six equally spaced points on the circumference of a circular frame to its center with string. What would be the radian measure of the angle between two adjacent pieces of string?
- a) 60π
 - b) $\frac{\pi}{60}$
 - c) $\frac{\pi}{6}$
 - d) $\frac{\pi}{12}$
 - e) None of the above
8. A four-digit serial number is to be created from the digits 0 through 9. How many serial numbers can be created?
- a) 40
 - b) 1000
 - c) 9999
 - d) 1111
 - e) None of the above

9. A four-digit serial number is to be created from the digits 0 through 9. If 0 can not be the first digit, no digit may be repeated, and the last digit must be 5, how many serial numbers can be created?
- a) 448
 - b) 504
 - c) 762
 - d) 2240
 - e) None of the above
10. Jim buys a large circular pizza that is divided into eight equal slices. He measure along the outer edge of the crust from one piece and finds it to be 5.5 inches. What is the diameter of the pizza to the nearest inch?
- a) 14
 - b) 8
 - c) 7
 - d) 4
 - e) None of the above
11. A number x is selected at random from the interval $[40, 50]$. The probability density function of x is given by $f(x) = \frac{1}{10}$. What is the probability that a number selected is in the subinterval $[42, 48]$?
- a) 0.6
 - b) $0.\overline{63}$
 - c) 0.06
 - d) $6.\overline{3}$
 - e) None of the above
12. A passenger ferry makes trips from a town to an island community that is 7 miles down shore from the town and 3 miles off a straight shoreline. The ferry travels along the shoreline to some point and then proceeds directly to the island. If the ferry travels 12 mi/hr along the shoreline and 10 mi/hr as it moves out to sea and has a total travel time of 45 minutes, what is one possible distance that the ferry may travel along the shoreline before turning to the island?
- a) $1.\overline{90}$ miles
 - b) 2.4 miles
 - c) 3.17 miles
 - d) $4.\overline{11}$ miles
 - e) None of the above

13. According to a certain model, German shepherds can make vertical leaps of over 10 feet when scaling walls. If the distance s (in feet) off the ground after t seconds is given by the equation $s = -16t^2 + 24t + 1$, for how many seconds is the dog more than 9 feet off the ground?
- a) 0.12
 - b) 0.50
 - c) 0.74
 - d) 2.30
 - e) None of the above
14. A solution of ethyl alcohol that is 75% alcohol by weight is to be used as a bactericide. The solution is to be made by adding water to a 95% ethyl alcohol solution. How many grams of the 95% solution should be used to prepare 400 grams of the bactericide?
- a) 84.2
 - b) 270
 - c) 315.8
 - d) 380
 - e) None of the above
15. An object travels in such a way that distance s (in miles) from the starting point is a function of time t (in hours) is $s(t) = 10t^2$. What is the average velocity between $t = 2$ hours and $t = 5$ hours?
- a) 210 mi/hr
 - b) 105 mi/hr
 - c) 70 mi/hr
 - d) 42 mi/hr
 - e) None of the above
16. What is the instantaneous velocity of the object in Problem 15 when $t = 4$ hours?
- a) 17.5 mi/hr
 - b) 40 mi/hr
 - c) 70 mi/hr
 - d) 80 mi/hr
 - e) None of the above
17. A population grows from an initial size of 100,000 to an amount $P(t)$, given by $P(t) = 100000(1 + 0.6t + t^2)$. What is the acceleration in the size of the population?
- a) $100000(.06 + 2t)$
 - b) 6000
 - c) 106000
 - d) 200000
 - e) None of the above

18. Following the birth of a child, a parent wants to make an initial investment that will grow to \$50,000 by the child's 20th birthday. If interest is compounded continuously at 9%, what should the initial investment be?
- a) \$27777.78
 - b) \$2725.00
 - c) \$8264.94
 - d) \$5602.21
 - e) None of the above
19. A construction firm is trying to decide which of two models of a crane to purchase. Model A costs \$50,000 and requires \$4000 per year to maintain. Model B has an initial cost of \$40,000 and a maintenance cost of \$5500 per year. For how many years must model A be used before it becomes more economical than Model B?
- a) $2\frac{2}{3}$ years
 - b) $5\frac{2}{3}$ years
 - c) $6\frac{2}{3}$ years
 - d) $13\frac{2}{3}$ years
 - e) None of the above
20. I am the 16th number in the Fibonacci sequence, what am I?
- a) 377
 - b) 610
 - c) 1597
 - d) 2584
 - e) None of the above
21. A class consists of 60 girls and 40 boys. In how many ways can a president, vice-president, treasurer, and secretary be chosen if the treasurer must be a girl, the secretary must be a boy, and a student may not hold more than one office?
- a) 22,814,400
 - b) 94,1094,000
 - c) 32,813,200
 - d) 10,200,000
 - e) None of the above
22. The speed of the current in a stream is 5 mi/hr. It takes a canoeist 30 minutes longer to paddle 1.2 miles upstream than to paddle the same distance downstream. What is the canoeist's rate in still water?
- a) 2 mi/hr
 - b) 7 mi/hr
 - c) 10.4 mi/hr
 - d) 12 mi/hr
 - e) None of the above

23. In a round-robin tennis tournament, every player meets every other player exactly once. How many players can participate in a tournament of 45 matches?
- a) 5
 - b) 7
 - c) 9
 - d) 10
 - e) None of the above
24. A searchlight reflector has the shape of a paraboloid, with the light source at the focus. If the reflector is 3 feet across at the opening and 1 foot deep, how far from the center is the focus?
- a) $\frac{1}{4}$ ft
 - b) $\frac{9}{16}$ ft
 - c) $\frac{7}{16}$ ft
 - d) $\frac{2}{3}$ ft
 - e) None of the above
26. Two cities are connected by means of a highway. A car leaves city B at 1:00 pm and travels at a constant rate of 40 mi/hr toward city C. Thirty minutes later, another car leaves B and travels toward C at a constant rate of 55 mi/hr. If the lengths of the cars are disregarded, at what time will the second car reach the first car?
- a) 2:35 pm
 - b) 2:50 pm
 - c) 4:15 pm
 - d) It never will
 - e) None of the above
27. w varies jointly to x and the square of y and inversely to z . If x is cut in half, y is doubled and z is quadrupled, what will happen to w ?
- a) it is doubled
 - b) it is tripled
 - c) it is cut in half
 - d) it is cut in fourth
 - e) None of the above
28. A man wishes to save money by setting aside 1 cent the first day, 2 cents the second day, 4 cents the third day, and so on. Assuming he does not run out of money, what is the total amount saved at the end of 30 days?
- a) \$0.70
 - b) \$123.32
 - c) \$32,768
 - d) \$10737418.23
 - e) None of the above

28. A certain culture of bacteria initially contains 10,000 bacteria and increases by 20% every hour. How many bacteria are in the culture at the end of 10 hours?
- a) 10,737
 - b) 13,000
 - c) 52,341
 - d) 61,917
 - e) None of the above
29. A cheese manufacture produces 18,000 pounds of cheese from January 1 through March 24. Supposed that this rate of production continues for the remainder of the year. Predict, to the nearest pound, the number of pounds of cheese produced for the year. Assume it is not a leap year.
- a) 72000
 - b) 79157
 - c) 82511
 - d) 121000
 - e) None of the above
30. A telephone company determines that the duration, t , of a phone call is an exponentially distributed random variable with probability density function $f(t) = 2e^{-2t}$. What is the probability a phone call will last no more than 5 minutes?
- a) 0.99995
 - b) 0.9995
 - c) 0.995
 - d) 0.95
 - e) None of the above
31. A carpenter wishes to construct a ladder with nine rungs whose lengths decreased uniformly from 24 inches at the base to 18 inches at the top. What is the length of the third rung from the bottom?
- a) 23.25 in
 - b) 22.50 in
 - c) 21.75 in
 - d) 19.5 in
 - e) None of the above
32. A contest will have five cash prizes totaling \$5000, and there will be a \$100 difference between successive prizes. What would first prize be?
- a) \$1000
 - b) \$1100
 - c) \$1200
 - d) \$4600
 - e) None of the above

33. A closed cylindrical oil drum of height 4 ft is to be constructed so that the total surface area is 10π square ft. Find the diameter of the drum to the nearest foot.
- a) 1
 - b) 2
 - c) 5
 - d) 10
 - e) None of the above
34. A new car costs \$26000. In any year, it depreciates 30% of its value at the beginning of that year. What is the car worth after 5 years?
- a) \$8918
 - b) \$6242.60
 - c) \$4369.82
 - d) \$3058.87
 - e) None of the above
35. The area of a circle is increasing at a rate of 10π square centimeters per second when the radius is one centimeter. At what rate is the radius increasing?
- a) $\frac{\pi}{10}$ cm/sec
 - b) $\frac{\pi}{5}$ cm/sec
 - c) 5π cm/sec
 - d) 5 cm/sec
 - e) None of the above
36. If 13 cards are drawn from a deck, what is the probability that at least 2 of the cards are hearts?
- a) 0.0128
 - b) 0.0801
 - c) 0.9071
 - d) 0.9098
 - e) None of the above
37. If the temperature remains constant, the pressure of an enclosed gas is inversely proportional to the volume. The pressure of a certain gas within a spherical balloon of radius 9 inches is 20 pounds per square inch. If the radius of the balloon increases to 12 inches, approximate the new pressure of the gas.
- a) 8.4 lb/in²
 - b) 864 lb/in²
 - c) 6.4 lb/in²
 - d) 89.4 lb/in²
 - e) None of the above

38. A customer remembers that 2, 4, 7, and 9 are the digits of a four-digit access code from an ATM machine. Unfortunately, the customer has forgotten the order of the digits. Find the largest possible number of trials necessary to obtain the correct code.
- a) 12
 - b) 16
 - c) 24
 - d) 256
 - e) None of the above
39. A particle travels along the s-axis with a position curve of $s(t) = 0.3x^5 - 4x^4 - 7x^2$, when $t = 5$, the particle is
- a) speeding up
 - b) slowing down
 - c) traveling at a constant velocity
 - d) standing still
 - e) None of the above
40. The weight of a human's brain is directly proportional to his or her body weight. If a person who weights 200 lbs has a brain that weighs 5 lbs what is the weight of the brain of a person who weights 120 lbs?
- a) 2.7 lbs
 - b) 3.0 lbs
 - c) 4.1 lbs
 - d) 8.3 lbs
 - e) None of the above