PSU Math Relays Algebra Word Problems - Team Event 2018

TEAM MEMBER #1

Select the letter of the most appropriate answer and shade in the corresponding region on the answer sheet.

Solve the problem.

1) A rectangular field is to be enclosed with 1270 ft of fencing. If the length of the field is 75 ft longer than the width, then how wide is the field?
A) 280 ft B) 355 ft C) 430 ft D) 385 ft

2) The sum of three consecutive integers is 519. Find the numbers.
A) 172, 173, 174 B) 171, 172, 173 C) 171, 173, 175 D) 173, 174, 175

3) How many gallons of a 30% alcohol solution must be mixed with 60 gallons of a 14% solution to obtain a solution that is 20% alcohol?
A) 27 gal B) 12 gal C) 36 gal D) 7 gal

4) An airplane flies 440 miles with the wind and 330 against the wind in the same length of time. If the speed of the wind is 20, what is the speed of the airplane in still air?
A) 60 mph B) 130 mph C) 145 mph D) 140 mph

5) The formula $A = P(1 + r)^2$ is used to find the amount of money, A, in an account after P dollars have been invested in the account paying an annual interest rate, r, for 2 years. Find the interest rate r if \$500 grows to \$605 in 2 years.
A) 21% B) 1% C) 210% D) 10%

6) Two cars start from the same point and travel in the same direction. If one car is traveling 57 miles per hour and the other car is traveling at 45 miles per hour, how far apart will they be after 2.7 hours?
A) 121.5 mi B) 153.9 mi C) 32.4 mi D) 275.4 mi

7) A truck rental company rents a moving truck one day by charging \$25 plus \$0.13 per mile. Write a linear equation that relates the cost C, in dollars, of renting the truck to the number x of miles driven. What is the cost of renting the truck if the truck is driven 230 miles?
A) C(x) = 25x + 0.13; \$5750.13 B) C(x) = 0.13x + 25; \$54.90
C) C(x) = 0.13x + 25; \$27.99 D) C(x) = 0.13x - 25; \$4.90

8) A ball is thrown vertically upward from the top of a building 96 feet tall with an initial velocity of 80 feet per second. The distance s (in feet) of the ball from the ground after t seconds is $s = 96 + 80t - 16t^2$. After how many seconds does the ball strike the ground?
A) 97 sec B) 6 sec C) 8 sec D) 5 sec

Find the amount that results from the investment.

9) \$1,000 invested at 12% compounded semiannually after a period of 10 years
A) \$3025.60 B) \$2207.14 C) \$3207.14 D) \$3105.85

Solve the problem.

10) Find the equation of the line which contains P(1, 3) and which is parallel to the x-axis.
A) y = 1 B) x = 3 C) x = 1 D) y = 3

TEAM MEMBER #2

Select the letter of the most appropriate answer and shade in the corresponding region on the answer sheet.

11) A high school graduating class is made up of 445 students. There are 97 more girls than boys. How many boys are in the class?
A) 97 boys B) 174 boys C) 271 boys D) 445 boys

12) A drink and a sandwich together cost $5.35. The sandwich costs $2.35 more than the drink. How much does the sandwich cost?
A) $1.50 B) $3.85 C) $6.20 D) $0.85

13) A rectangular field is to be enclosed with 1100 ft of fencing. If the length of the field is 50 ft longer than the width, then how long is the field?
A) 250 ft B) 320 ft C) 300 ft D) 350 ft

14) The manager of a coffee shop has one type of coffee that sells for $6 per pound and another type that sells for $11 per pound. The manager wishes to mix 60 pounds of the $11 coffee to get a mixture that will sell for $10 per pound. How many pounds of the $6 coffee should be used?
A) 7.5 lb B) 37.5 lb C) 75 lb D) 15 lb

15) As part of a physics experiment, Ming drops a baseball from the top of a 325-foot building. To the nearest tenth of a second, for how many seconds will the baseball fall? (Hint: Use the formula $h = 16t^2$, which gives the distance h, in feet, that a free-falling object travels in t seconds.)
A) 1.1 sec B) 4.5 sec C) 81.3 sec D) 20.3 sec

16) Kevin invested part of his $10,000 bonus in a certificate of deposit that paid 6% annual simple interest, and the remainder in a mutual fund that paid 11% annual simple interest. If his total interest for that year was $900, how much did Kevin invest in the mutual fund?
A) $6000 B) $5000 C) $4000 D) $7000

17) The length of a vegetable garden is 4 feet longer than its width. If the area of the garden is 117 square feet, find its dimensions.
A) 8 ft by 14 ft B) 10 ft by 14 ft C) 8 ft by 12 ft D) 9 ft by 13 ft

18) You have 220 feet of fencing to enclose a rectangular region. Find the dimensions of the rectangle that maximize the enclosed area.
A) 55 ft by 55 ft B) 57 ft by 53 ft C) 110 ft by 27.5 ft D) 110 ft by 110 ft

19) A projectile is thrown upward so that its distance above the ground after t seconds is $h = -14t^2 + 532t$. After how many seconds does it reach its maximum height?
A) 9 sec B) 19 sec C) 38 sec D) 28.5 sec

20) How many liters of 80% hydrochloric acid must be mixed with 40% hydrochloric acid to get 15 liters of 65% hydrochloric acid? Write your answer rounded to three decimals.
A) 8 L B) 9.375 L C) 4.688 L D) 3.125 L

TEAM MEMBER #3

Select the letter of the most appropriate answer and shade in the corresponding region on the answer sheet.

21) The sum of the angles of a triangle is 180°. Find the three angles of the triangle if one angle is four times the smallest angle and the third angle is 30° greater than the smallest angle.
A) 5°, 35°, 140° B) 17°, 68°, 95° C) 5°, 20°, 155° D) 25°, 100°, 55°

22) A rectangular sign is being designed so that the length of its base, in feet, is 12 feet less than 4 times the height, h. Express the area of the sign as a function of h.
A) $A(h) = -12h + 4h^2$ B) $A(h) = -12h^2 + 2h$ C) $A(h) = 12h - 2h^2$ D) $A(h) = -12h + h^2$

23) A package of paper and a notebook together cost $6.38. The notebook costs $0.40 more than the package of paper. How much does the notebook cost?
A) $3.79 B) $3.39 C) $2.99 D) $2.59

24) Bob wants to fence in a rectangular garden in his yard. He has 90 feet of fencing to work with and wants to use it all. If the garden is to be x feet wide, express the area of the garden as a function of x.
A) $A(x) = 47x^2 - x$ B) $A(x) = 45x - x^2$ C) $A(x) = 46x - x^2$ D) $A(x) = 44x - x^2$

25) Linda needs to have her car towed. Little Town Auto charges a flat fee of $40 plus $3 per mile towed. Write a function expressing Linda's towing cost, c, in terms of miles towed, x. Find the cost of having a car towed 12 miles.
A) $c(x) = 3x + 40$; $76 B) $c(x) = 3x + 40$; $66 C) $c(x) = 3x$; $43 D) $c(x) = 3x$; $36

26) A high school graduating class is made up of 476 students. There are 196 more girls than boys. How many boys are in the class?
A) 140 boys B) 336 boys C) 476 boys D) 196 boys

27) The owners of a candy store want to sell, for $6 per pound, a mixture of chocolate-covered raisins, which usually sells for $3 per pound, and chocolate-covered macadamia nuts, which usually sells for $8 per pound. They have a 70-pound barrel of the raisins. How many pounds of the nuts should they mix with the barrel of raisins so that they hit their target value of $6 per pound for the mixture?
A) 91 lb B) 112 lb C) 105 lb D) 98 lb

28) How much pure salt should be mixed with 3 gallons of a 50% salt solution in order to get an 80% salt solution?
A) 7.5 gal B) 4.5 gal C) 1.5 gal D) 12 gal

29) A loan officer at a bank has $99,000 to lend and is required to obtain an average return of 15% per year. If he can lend at the rate of 16% or the rate of 10%, how much can he lend at the 10% rate and still meet his required return?
A) $3807.69 B) $6187.50 C) $511,500.00 D) $16,500.00

30) A lumber yard has fixed costs of $4081.20 per day and variable costs of $0.08 per board-foot produced. Lumber sells for $1.98 per board-foot. How many board-feet must be produced and sold daily to break even?
A) 2148 board-feet B) 51,015 board-feet C) 1432 board-feet D) 1981 board-feet

TEAM MEMBER #4

Select the letter of the most appropriate answer and shade in the corresponding region on the answer sheet.

31) Brandon can paint a fence in 12 hours and Elaine can paint the same fence in 11 hours. How long will they take to paint the fence if they work together?

A) $5\frac{3}{4}$ hr B) $11\frac{1}{2}$ hr C) $5\frac{13}{24}$ hr D) $5\frac{17}{23}$ hr

Find the amount that results from the investment.

32) $14,000 invested at 11% compounded semiannually after a period of 13 years

A) $42,323.8 B) $53,387.49 C) $56,323.80 D) $54,365.92

Solve the problem.

33) After a 14% price reduction, a boat sold for $23,220. What was the boat's price before the reduction? (Round to the nearest cent, if necessary.)

A) $26,470.80 B) $27,000 C) $3250.80 D) $165,857.14

34) Elissa wants to set up a rectangular dog run in her backyard. She has 24 feet of fencing to work with and wants to use it all. If the dog run is to be x feet long, express the area of the dog run as a function of x.

A) $A(x) = 11x - x^2$ B) $A(x) = 14x^2 - x$ C) $A(x) = 12x - x^2$ D) $A(x) = 13x - x^2$

35) Jack and Jill are 25 miles apart on a calm lake paddling toward each other. Jack paddles at 3 miles per hour, while Jill paddles at 6 miles per hour. How long will it take them to meet?

A) $8\frac{1}{3}$ hr B) $2\frac{7}{9}$ hr C) 16 hr D) $2\frac{2}{3}$ hr

36) There are 14 more sophomores than juniors in an 8 AM algebra class. If there are 46 students in this class, find the number of sophomores and the number of juniors in the class.

A) 16 sophomores; 30 juniors B) 60 sophomores; 32 juniors
C) 30 sophomores; 16 juniors D) 46 sophomores; 32 juniors

37) A 35-inch-square TV is on sale at the local electronics store. If 35 inches is the measure of the diagonal of the screen, use the Pythagorean theorem to find the length of the side of the screen.

A) $\frac{\sqrt{35}}{2}$ in. B) $\frac{1225}{2}$ in. C) $\sqrt{35}$ in. D) $\frac{35\sqrt{2}}{2}$ in.

38) The number of mosquitoes M(x), in millions, in a certain area depends on the June rainfall x, in inches: $M(x) = 19x - x^2$. What rainfall produces the maximum number of mosquitoes?

A) 9.5 in. B) 361 in. C) 19 in. D) 0 in.

39) Find the dimensions of a rectangle whose perimeter is 38 meters and whose area is 78 square meters.

A) 6 m by 13 m B) 5 m by 14 m C) 5 m by 12 m D) 7 m by 12 m

40) Rob can overhaul a diesel engine in 15 hours. His apprentice takes 30 hours to do the same job. How long would it take them working together assuming no gain or loss in efficiency?

A) 10 hr B) 45 hr C) 6 hr D) 4 hr

Answer Key
Testname: ALG WORD TEAM 18

1) A
2) A
3) C
4) D
5) D
6) C
7) B
8) B
9) C
10) D
11) B
12) B
13) C
14) D
15) B
16) A
17) D
18) A
19) B
20) B
21) D
22) A
23) B
24) B
25) A
26) A
27) C
28) B
29) D
30) A
31) D
32) C
33) B
34) C
35) B
36) C
37) D
38) A
39) A
40) A