#### 2019-2020 ALGEBRA COURSE 1 CONTEST

23. Ishmael hooked a big fish! The fish dragged his boat *x* km east, then 6x + 3 km north, then x + 8 km east, then 2x - 2 km south, then 2x + 8 km west, then  $x^2$  km south, x > 0. Then, the fish escaped. Ishmael looked around to find that he was exactly where he had started. How many km long was the route taken by the fish and Ishmael?

Answers 23.

A) 5 B) 30 C) 81 D) 102

24. Last week I mixed up 400 ml of lemonade that was 30% sugar and 24. 200 ml of lemonade that was 40% sugar, and then poured all of it into a glass. During the week 100 ml of pure water evaporated from the lemonade. What percent sugar is the remaining lemonade? A) 30% B) 33% C) 35% D) 40% 25. If  $x \neq 0$ ,  $y \neq 0$ , and  $\sqrt{xy} \times \sqrt{15} = \sqrt{3x^2} \times \sqrt{y}$ , then x =25. A) 5 B) y C) 5y D) 5 + y26. If  $x \neq 6$  and  $x \neq -3$ , then  $\frac{x^2 - 3x - 18 - x + 6}{(x - 6)(x + 3)} =$ 26.

 $\frac{x-6}{x+3}$ 

D) 6

A) 1 B) 
$$\frac{x+2}{x+3}$$
 C)

27. If 
$$3x - 4y + 5z = 13$$
 and  $4x - 5y + 6z = 18$ , then  $x - 2y + 3z =$ A) 1B) 3C) 15D) 2828. Sir Saul was the sole survivor of the siege.

There were between 1000 and 5000 knights at the start, but each day, two-thirds of the remaining knights fell or fled. Yesterday Saul lost his final 2 fellow knights. How many days ago did the siege start? B) 14

C) 7

29. If  $8^{2a} = 32b$ , then b =

A) 70

30. If *p* is the product of all integers from 1 through 1000, what is the greatest integer *q* such that  $4^q$  is a factor of *p*? A) 250 B) 312 C) 330 D) 497

The end of the contest  $\mathbb{A}^{+}$ 

D)  $\frac{-2}{-(x-6)}$ 

27.

28.

29.

30.



Steven R. Conrad, Daniel Flegler, and Adam Raichel, contest authors

#### ALGEBRA COURSE 1 CONTEST

Math League Press, P.O. Box 17, Tenafly, New Jersey 07670-0017

# 2019-2020 Annual Algebra Course 1 Contest

Spring, 2020

#### Instructions

- **Time** Do *not* open this booklet until you are told by your teacher to begin. You will have only 30 minutes working time for this contest. You might be unable to finish all 30 questions in the time allowed.
- **Scores** Please remember that *this is a contest, and not a test*—there is no "passing" or "failing" score. Few students score as high as 24 points (80% correct). Students with half that, 12 points, should be commended!
- **Format and Point Value** This is a multiple-choice contest. Each an-swer will be one of the *capital letters* A, B, C, or D. Write each answer in the Answer Column to the right of each question. We suggest (but do not require) that you use a pencil. Each question you answer correctly is worth 1 point. Unanswered questions receive no credit. You may use a calculator *unless* your school does *not* allow you to use one.

### **Please Print**

Last Name \_\_\_\_\_ First Name \_\_\_\_\_ School \_\_\_\_\_ Teacher \_\_\_\_\_ Grade Level \_\_\_\_

## **Do Not Write In The Space Below**

*To the Teacher:* 

Please enter the student's score at the right before you return this paper to the student.

Student's Score:

The school's top scorer will receive the book Math Contests-High School (Vol. 5). Other high scorers will receive Certificates of Merit. In any one school year, no student may win both a book and a certificate. The book and certificates were in the original contest package.

*If needed, duplicate book awards may be ordered as described below.* 

Twenty-one books of past contests, Grades 4, 5, & 6 (Vols. 1, 2, 3, 4, 5, 6, 7), Grades 7 & 8 (Vols. 1, 2, 3, 4, 5, 6, 7), and High School (Vols. 1, 2, 3, 4, 5, 6, 7), are available, for \$12.95 per volume, from Math League Press, P.O. Box 17, Tenafly, NJ 07670-0017.

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2019-2020 ALGEBRA COURSE 1 CONTEST					
1. If $T = 1$ , $O = 2$ , and $T + O + S + S = 7$ , then $S = 1$	1.				
A) 2 B) 3 C) 3.5 D) 4					
2. If <i>x</i> is an integer, then the least possible value of $4x^2$ is					
A) -4 B) 0 C) 4 D) 16					
3. $(c^{20})(c^2)(c^0) =$	3.				
A) 0 B) $c^0$ C) $c^{22}$ D) $c^{40}$					
4. I had <i>g</i> invited guests at my party. Each invited guest brought 2 uninvited friends. Each person who came, whether invited or not, brought two gifts. How many gifts were brought?	4.				
A) $(g+2) \times 2$ B) $(g \times 2) + 2$ C) $(g+2g) \times 2$ D) $(g+2g) \times 2g$					
5. $4y(x-y) - (3x+2y)(x-y) =$	5.				
A) $(6y + 3x)(x - y)$ C) $(2y + 3x)(x - y)$ B) $(6y - 3x)(x - y)$ D) $(2y - 3x)(x - y)$					
6. $4x^2 + 3x + 2x^3 - 2x^2 - 3x - 4x^3 =$	6.				
A) 0 B) $2x^2 - 2x^3$ C) $2x^2 + 6x - 2x^3$ D) $2x^2 + 6x + 6x^3$					
7. If $\frac{3}{5}$ of 2 <i>y</i> is equal to $\frac{4}{7}$ of <i>x</i> , then what is <i>y</i> in terms of <i>x</i> ?					
A) $\frac{10}{21}x$ B) $\frac{20}{21}x$ C) $\frac{21}{20}x$ D) $\frac{21}{10}x$					
8. How many distinct solutions does $(x + 2)(x - 2)(x^2 - 4) = 0$ have?					
A) 1 B) 2 C) 3 D) 4					
9. If $x > 5$ and $x$ is prime, the least common multiple of $20x^2$ and $30x^3$ is	9.				
A) $10x$ B) $60x^3$ C) $60x^5$ D) $600x^5$					
10. For every 30 sec. Peg and her dog Al are in the the water, Peg later walks Al for 2 min. If they spent a total of <i>h</i> hrs. combined in the water and walking, they spent <u>?</u> min. in the water.	10.				
A) 12h B) 24h C) 36h D) 48h					
11. If $x - y = 1$ and $x^2 - y^2 = 39$ , then $xy =$ A) 39 B) 78 C) 380 D) 1521	11.				
12. What is the remainder when $x^3 - x^2 + x - 1$ is divided by $x - 1$ ?	12.				
A) 0 B) 1 C) $x$ D) $2x$					

2019-2020 ALGEBRA COURSE 1 CONTEST						
13.	B. What is the equation of a line perpendicular to $y = \frac{1}{3}x + 4$ and with the same <i>x</i> -intercept?					
	A) $y = -3x + 4$	B) $y = 3x - 36$	C) $y = \frac{1}{3}x + 4$	D) $y = -3x - 36$		
14.	4. What is the sum of both solutions to $4x^2 - 4x - 35 = 0$ ?					
	A) -1	B) 0	C) 1	D) 4		
15.	5. Someone replaced Emma's <i>g</i> eggs with <i>b</i> billiard balls! Emma notices that $b + 1 = g^2$ and $b^2 + 31 = g^4$ . What is the value of <i>g</i> ? A) 4 B) 11 C) 12 D) 30					
16.	Emma flies <i>k</i> kn her missing egg A) $\frac{1000}{rk}$	h at <i>r</i> m/min. to rest. She flies for _? B) $\frac{60k}{1000r}$	etrieve hours. C) $\frac{1000k}{60r}$	D) $\frac{1000}{60rk}$	16.	
17.	$4^{2x} + 4^{2x} + 4^{2x} + 4^{2x} = $					
	A) 2 <sup>4</sup> <i>x</i>	B) 2 <sup>4<i>x</i>+2</sup>	C) $4^{8x}$	D) 16 <sup>2x</sup>		
18.	8. If $f(x) = 8x^2 - 2$ , then which of the following is equal to $f(4)$ ?					
	A) <i>f</i> (126)	B) <i>f</i> (8)	C) <i>f</i> (-2)	D) <i>f</i> (-4)		
19.	P. How many integer values of x satisfy $ 3x - 7  < 5$ ?					
	A) 1	B) 2	C) 3	D) 6		
20.	20. If $x^2 + x + 1 = 18$ , then the average of $x^3$ , $x^2$ , and x is					
	A) 6 <i>x</i>	B) 9 <i>x</i>	C) 18 <i>x</i>	D) 36 <i>x</i>		
21.	1. The Cones is an elite <i>a cappella</i> vocal group. To be accepted, a Cone has to be good at setting up chairs in the theater and have a great voice. Together, four Cones work- ing at the same rate can set up every chair in the theater in 56 min. At this same rate, it would take <u>?</u> min. for 7 Cones to set up every chair.					
	A) 24	B) 32	C) 48	D) 98		
22.	2. If $10^{a}$ is 0.01 percent of $10^{b}$ , then $a =$					
	A) <i>b</i> -4	B) <i>b</i> −2	C) <i>b</i> + 2	D) <i>b</i> +4		
	3 Go on to the next page ))					

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