

**CIE 2016 Math Comp Math Fun
Answer Key**

Name: _____ **ID:** _____ **Grade: 6**
Room: _____ **Start Time:** _____ **Finish Time:** _____

No.	Answer
1	D
2	C
3	B
4	A
5	B
6	C
7	E
8	C
9	D
10	C
11	E
12	D
13	C
14	D
15	D
16	E
17	E
18	B
19	C
20	D
21	A
22	D
23	B
24	D
25	B

No.	Answer
26	B
27	B
28	E
29	D
30	B
31	C
32	C
33	E
34	D
35	A
36	D
37	B
38	D
39	B
40	D
41	D
42	D
43	
44	
45	
46	
47	
48	
49	
50	

CIE - USA/DFW
Math Competition 2016

Grade
6

40 Questions
60 Minutes

Notes

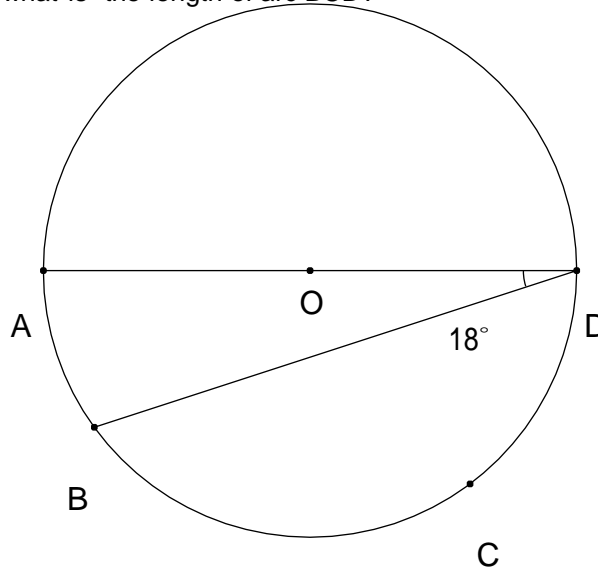
1. Make sure to write all your answers on the answer sheet. Only the answer sheet will be graded.
2. Each question carries the same weight. If you get stuck on one question, move on and work on the easier problems first.
3. Bonus questions will be counted only when there is a tie using common questions.

Name (Please Print) _____

Room (Please Print) _____

Problems

1. If 20% of a number is 30, then what is 200% of that number?
(A) 3 (B) 15 (C) 60 (D) 300 (E) 3,000
2. There are 10 tents for 24 campers. If each tent holds either 2 or 3 campers, how many of the tents will hold 2 campers?
(A) 4 (B) 5 (C) 6 (D) 7 (E) 8
3. Cal writes down the pattern 1, 5, 17, 53, ... What is the eighth number in his pattern?
(A) 4371 (B) 4373 (C) 1457 (D) 485 (E) 161
4. In the figure below, AD is a diameter of the circle with center O and $AO = 5$. If B is on the circle and angle $ADB = 18^\circ$, what is the length of arc BCD ?



- (A) 4π (B) 3.5π (C) 3π (D) 2.5π (E) 2π
5. How many diagonals does a convex polygon with 100 sides have?
(A) 100 (B) 4850 (C) 4900 (D) 9700 (E) 9800
 6. The mean of the integers 7, x , $2x - 3$, and 9 is 7. Which is the smallest out of these four integers?
(A) 3 (B) 4 (C) 5 (D) 6 (E) 7
 7. Suppose x and y are positive odd integers. Which of the following must also be an odd integer?
(A) $x + 3y$ (B) $3x - y$ (C) $3x + 3y$ (D) $(xy + 3)^2$ (E) $3xy$

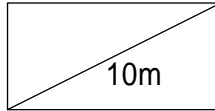
8. Which of the following numbers is twice a multiple of 7?

- (A) 21 (B) 35 (C) 42 (D) 49 (E) 77

9. Dylan wants to make a rectangle of perimeter $40m$. What is the maximum possible area of such a rectangle?

- (A) $20m^2$ (B) $40m^2$ (C) $80m^2$ (D) $100m^2$ (E) $160m^2$

10. The length of a rectangle is twice its width. If the diagonal of this rectangle is $10m$, then what is its area?



- (A) $20m^2$ (B) $30m^2$ (C) $40m^2$ (D) $60m^2$ (E) cannot be determined

11. If $\frac{a}{b} = \frac{1}{2}$, $\frac{b}{c} = \frac{2}{3}$, $\frac{c}{d} = \frac{3}{4}$, and $\frac{d}{e} = \frac{4}{5}$, then what is $\frac{e}{a}$?

- (A) $\frac{1}{5}$ (B) $\frac{5}{6}$ (C) 1 (D) $\frac{6}{5}$ (E) 5

12. Divide 229.862 by 5.26.

- (A) 43.62 (B) 43.6 (C) 47 (D) 43.7 (E) 43

13. A number is increased by $x\%$ and then decreased by $x\%$. The resulting number is a number that is 99% of the original number. Find x .

- (A) 0 (B) 1 (C) 10 (D) 99 (E) 100

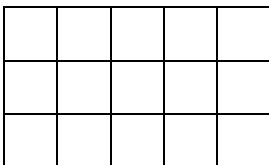
14. Cal is trying to solve 5 math problems. If he has a $\frac{1}{2}$ chance of solving each problem, what is the probability that he solves at least 1 problem?

- (A) 0 (B) $\frac{1}{32}$ (C) $\frac{1}{2}$ (D) $\frac{31}{32}$ (E) 1

15. Given that at least one of two children is a boy, what is the probability that both children are boys?

- (A) 0 (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) $\frac{1}{3}$ (E) 1

16. In the figure below, how many rectangles are there of any size?



- (A) 15 (B) 26 (C) 27 (D) 60 (E) 90

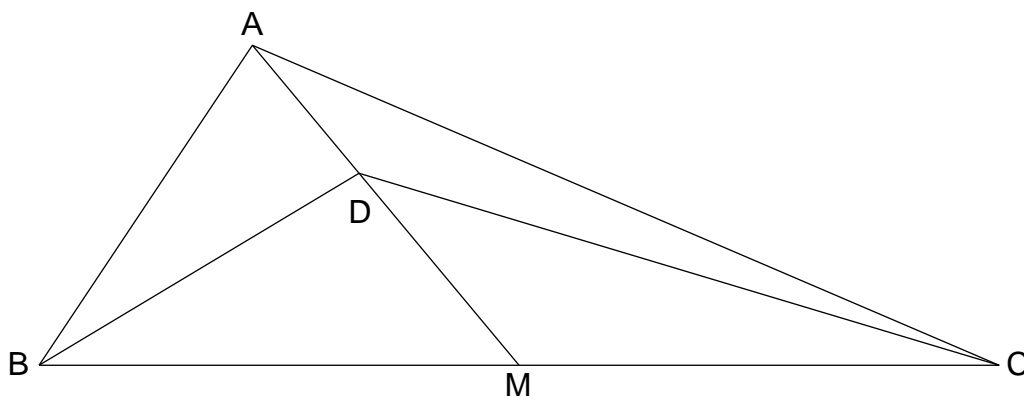
17. Jesse is walking to school. $\frac{2}{3}$ of the way there, Jesse realizes he has two options. He can continue walking to school or walk back home and ride his bike to school. If both of these options take the same amount of time, then what is the ratio of Jesse's biking speed to his walking speed? Assume both speeds are constant.

- (A) 3 : 2 (B) 2 : 1 (C) 5 : 2 (D) 4 : 1 (E) 5 : 1

18. What is the angle between the hands of an analog clock at the time 3:30?

- (A) 60° (B) 75° (C) 80° (D) 90° (E) 105°

19. In the figure below, M is the midpoint of side BC . Segment AM is drawn, and a point D is chosen on AM such that $\frac{AD}{DM} = \frac{13}{15}$. What is the ratio of the area of $\triangle ADB$ to the area of $\triangle ADC$?



- (A) 1 : 2 (B) 13 : 15 (C) 1 : 1 (D) 15 : 13 (E) 2 : 1

20. How many factors of 2016 are perfect squares?

- (A) 0 (B) 1 (C) 2 (D) 6 (E) 36

21. A fair coin is flipped 13 times. What is the probability that the same number of heads and tails are tossed?

- (A) 0 (B) $\frac{1}{13}$ (C) $\frac{1}{3}$ (D) $\frac{1}{2}$ (E) 1

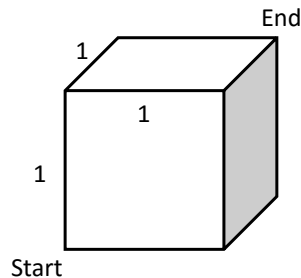
22. If x and y are the solutions to the system:

$$\begin{aligned} x^2 - 4y &= 1 \\ y^2 - 6x &= -14 \end{aligned}$$

Then what is $x + y$?

- (A) 0 (B) 2 (C) 4 (D) 5 (E) no solution exists

23. How many of the numbers of the set $\{1, 2, 3, \dots, 20\}$ divide evenly into $20! + 1$?
- (A) 0 (B) 1 (C) 5 (D) 10 (E) 20
24. At how many times during a 24-hour period do the hour hand and the minute hand of an analog clock overlap?
- (A) 2 (B) 10 (C) 12 (D) 22 (E) 24
25. A cube of length 5 is painted completely in its exterior and then cut into 125 smaller cubes with side length 1. If x of these smaller cubes have no paint on them, and y of these smaller cubes have 3 of their faces painted, then find the value $x - y$.
- (A) 17 (B) 19 (C) 26 (D) 27 (E) 56
26. Find the value of the sum: $\frac{2}{1 \times 3} + \frac{2}{3 \times 5} + \frac{2}{5 \times 7} + \frac{2}{7 \times 9} + \frac{2}{9 \times 11} + \frac{2}{11 \times 13} + \frac{2}{13 \times 15}$.
- (A) 2^{15} (B) $\frac{14}{15}$ (C) 1 (D) 2 (E) $\frac{28}{15}$
27. We are given two square pyramids that are similar. Pyramid A has surface area 234 and pyramid B has surface area 104. If the volume of pyramid A is 432, what is the volume of pyramid B?
- (A) 108 (B) 128 (C) 192 (D) 216 (E) cannot be determined
28. Bob the builder can build a house in 3 hours working alone. Wanda the worker can build the same house in 4 hours working alone. Seth the sculptor can build the same house in x hours working alone. If all three of them work together, they can build a house in just 1.5 hours. What is x ?
- (A) 2 (B) 4 (C) 6 (D) 8 (E) 12
29. A bug is at on corner of a cube with side length 1. If the bug can crawl anywhere along the outside surface of the cube, what is the length of the shortest path he can take to get to the opposite corner of the cube?



- (A) 3 (B) $\frac{\sqrt{5} + 3}{2}$ (C) $\sqrt{2} + 1$ (D) $\sqrt{5}$ (E) 2
30. Let a be a real number such that $\frac{a}{a^2 + a + 1} = \frac{1}{5}$. Determine the value of $\frac{a^2}{a^4 + a^2 + 1}$.
- (A) $\frac{1}{25}$ (B) $\frac{1}{15}$ (C) $\frac{1}{5}$ (D) $\frac{1}{2}$ (E) 1

31. On trip A , Bob drives at 20 mph for 1 hour and then drives at 30 mph for 1 more hour. On trip B , Bob drives at 20 mph for 42 miles and then drives at 30 mph for another 42 miles. If his average speed on trip A is x mph and his average speed on trip B is y mph, what is $x - y$?
- (A) 0 (B) $\frac{1}{2}$ (C) 1 (D) $\frac{3}{2}$ (E) 2
32. Alice, Bob, Charles, Dylan, and Eric are watching a movie. There are five seats in a row, but Charles and Dylan have to sit next to each other. How many ways can these five people sit with this restriction?
- (A) 120 (B) 60 (C) 48 (D) 36 (E) 24
33. How many positive integers between 1 and 100 inclusive have an odd number of divisors?
- (A) 1 (B) 2 (C) 5 (D) 8 (E) 10
34. What is the positive difference between the sum of the first 50 odd integers and the sum of the first 50 even integers?
- (A) 0 (B) 1 (C) 25 (D) 50 (E) 100
35. There exists a function f such that $f(x) + 2f\left(\frac{1}{x}\right) = x^2$ for all real x . What is the value of $f(2)$?
- (A) $-\frac{7}{6}$ (B) 0 (C) 0 (D) 2 (E) $\frac{31}{12}$
36. A pyramid has 1 block in the first row, 2 blocks in the second row, 3 blocks in the third row, and n blocks in the n^{th} row. If there are a total of 2016 blocks in a pyramid with n rows, find n .
- (A) 44 (B) 45 (C) 62 (D) 63 (E) 64
37. A square and an equilateral triangle have the same perimeter. What is the ratio of the area of the equilateral triangle to the area of the square?
- (A) $\sqrt{3}:4$ (B) $4\sqrt{3}:9$ (C) 3:4 (D) 1:1 (E) 4:3
38. What is the maximum number of regions 6 lines in a given plane can divide that plane into?
- (A) 7 (B) 16 (C) 17 (D) 22 (E) 25
39. How many solutions in real numbers does $\sqrt{6-x} = x$ have?
- (A) 0 (B) 1 (C) 2 (D) 4 (E) infinitely many
40. Find the number of ways to arrange the symbols 1, 2, 3, a , b , c if the only restrictions are that the numbers 1, 2, 3 must appear in that order and the letters a , b , c must also appear in that order. For example, 1, a , b , 2, 3, c is valid, but 1, a , c , b , 2, 3 and 2, a , b , c , 3, 1 are not.
- (A) 720 (B) 120 (C) 60 (D) 20 (E) 6

Bonus Problems

41. What is the value of $\sqrt{6 + \sqrt{6 + \sqrt{6 + \dots}}}$?

- (A) 2 (B) $\sqrt{6}$ (C) 7 (D) 3 (E) 4

42. A palindrome is defined to be a number that reads the same forwards and backwards, such as 12421 and 1331. How many 4-digit palindromes whose leftmost digit is not 0 are divisible by 13?

- (A) 0 (B) 1 (C) 2 (D) 9 (E) 1