

2014 Cipherring Time Trials  
Thursday, December 11th, 2014

Round 1

---

2014 Cipherring Time Trials  
Thursday, December 11th, 2014

Round 1

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

1. A regular 20-gon has vertices labeled in clockwise order from A to T. A line drawn through vertex F and the center also passes through another vertex. What letter is the label of the vertex that the line also passes through?
2. If Set  $Q$  is  $\{2, 4, 6, 8, 10, 12, 14\}$  and Set  $P$  is  $\{3, 6, 9, 12, 15, 18\}$ , what is  $P \cap \bar{Q}$ ?
3. What is the sum of the mode and median of the data set  $\{2, 89, 73, 4, 8, 79, 0, 2, 34, 6\}$ ?

---

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

1. A regular 20-gon has vertices labeled in clockwise order from A to T. A line drawn through vertex F and the center also passes through another vertex. What letter is the label of the vertex that the line also passes through?
2. If Set  $Q$  is  $\{2, 4, 6, 8, 10, 12, 14\}$  and Set  $P$  is  $\{3, 6, 9, 12, 15, 18\}$ , what is  $P \cap \bar{Q}$ ?
3. What is the sum of the mode and median of the data set  $\{2, 89, 73, 4, 8, 79, 0, 2, 34, 6\}$ ?

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 2

---

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 2

2014 Cipherring Time Trials  
Thursday, December 11th, 2014

4. Express the base 7 number  $1234_7$  as a base 10 number.
5.  $K$  kilograms of ketchup cost exactly  $N$  nickels. How many kilograms of ketchup can I buy with  $D$  dollars?
6. A hexagon has sides measuring 9 m, 16 m, 25 m, 36 m, 49 m, and 64 m, in no particular order. One of its diagonals has an integer length when measured in meters. What is the largest possible measure of that diagonal, in meters?

---

2014 Cipherring Time Trials  
Thursday, December 11th, 2014

4. Express the base 7 number  $1234_7$  as a base 10 number.
5.  $K$  kilograms of ketchup cost exactly  $N$  nickels. How many kilograms of ketchup can I buy with  $D$  dollars?
6. A hexagon has sides measuring 9 m, 16 m, 25 m, 36 m, 49 m, and 64 m, in no particular order. One of its diagonals has an integer length when measured in meters. What is the largest possible measure of that diagonal, in meters?

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 3

---

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 3

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

7. What is the perimeter, in meters, of an equilateral triangle with an area of  $\frac{4\sqrt{3}}{9}$  m<sup>2</sup>?
8. When two identically unfair coins are flipped, the non-zero probability of getting two heads is the same as the probability of getting one head. What is the probability of getting no heads?
9. If  $\cos r = \frac{1}{5}$ , what is the maximum possible value of  $\cos 2r$ ?

---

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

7. What is the perimeter, in meters, of an equilateral triangle with an area of  $\frac{4\sqrt{3}}{9}$  m<sup>2</sup>?
8. When two identically unfair coins are flipped, the non-zero probability of getting two heads is the same as the probability of getting one head. What is the probability of getting no heads?
9. If  $\cos r = \frac{1}{5}$ , what is the maximum possible value of  $\cos 2r$ ?

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 4

---

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 4

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

10. Evaluate:  $\frac{1}{2} + \frac{3}{4} \div \frac{5}{6}$

11. What is the 32nd term of an arithmetic sequence with first term 109 and common difference 87?

12. What is the solution, in the form  $(c, d)$ , of the system of equations  $4c - d = 26$  and  $2c + 3d = 17$ ?

---

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

10. Evaluate:  $\frac{1}{2} + \frac{3}{4} \div \frac{5}{6}$

11. What is the 32nd term of an arithmetic sequence with first term 109 and common difference 87?

12. What is the solution, in the form  $(c, d)$ , of the system of equations  $4c - d = 26$  and  $2c + 3d = 17$ ?



2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 5

---

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 5

2014 CIPHERING Time Trials  
Thursday, December 11th, 2014

13. What is the product of the smallest positive three-digit integer with three distinct digits and the largest two-digit integer with two distinct digits?

14. Express the solution to the system of equations  $u + t = 7$ ,  $u + r = 11$ , and  $t + r = 13$  as an ordered triple in the form  $(u, t, r)$ .

15. What is the sum of the perfect squares between 100 and 300, inclusive?

---

2014 CIPHERING Time Trials  
Thursday, December 11th, 2014

13. What is the product of the smallest positive three-digit integer with three distinct digits and the largest two-digit integer with two distinct digits?

14. Express the solution to the system of equations  $u + t = 7$ ,  $u + r = 11$ , and  $t + r = 13$  as an ordered triple in the form  $(u, t, r)$ .

15. What is the sum of the perfect squares between 100 and 300, inclusive?

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 6

---

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

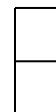
Round 6

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

16. If  $u(v) = 2^v$  and  $w(v) = v^2$ , evaluate  $u(10) - w(10)$ .

17. What is the area, in square meters, of a circle with a circumference of  $11\pi$  m?

18. In the figure to the right composed of two unit squares, how many paths of length **five** are there from the upper left corner to the lower right corner? It is okay for such a path to use the same line segment multiple times.



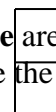
---

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

16. If  $u(v) = 2^v$  and  $w(v) = v^2$ , evaluate  $u(10) - w(10)$ .

17. What is the area, in square meters, of a circle with a circumference of  $11\pi$  m?

18. In the figure to the right composed of two unit squares, how many paths of length **five** are there from the upper left corner to the lower right corner? It is okay for such a path to use the same line segment multiple times.



2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 7

---

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 7

2014 Cipherring Time Trials  
Thursday, December 11th, 2014

19. In the system of equations  $2s - 3r = 4$  and  $Ks + 6r = 5$ , there is a value of the constant  $K$  for which there is no solution to the system. What is that value of  $K$ ?

20. A hexagon has a perimeter of 25 m and an area of  $10 \text{ m}^2$ . A larger, similar hexagon has an area of  $45 \text{ m}^2$ . What is the perimeter, in meters, of the larger hexagon?

21. The point  $(4,3)$  is reflected across the line  $y = 2$  to Point F, which is then rotated  $270^\circ$  clockwise around the point  $(-1,0)$  to Point G, which is then reflected across the line  $y = x + 1$  to Point H. What are the coordinates, in the form  $(x, y)$ , of Point H?

---

2014 Cipherring Time Trials  
Thursday, December 11th, 2014

19. In the system of equations  $2s - 3r = 4$  and  $Ks + 6r = 5$ , there is a value of the constant  $K$  for which there is no solution to the system. What is that value of  $K$ ?

20. A hexagon has a perimeter of 25 m and an area of  $10 \text{ m}^2$ . A larger, similar hexagon has an area of  $45 \text{ m}^2$ . What is the perimeter, in meters, of the larger hexagon?

21. The point  $(4,3)$  is reflected across the line  $y = 2$  to Point F, which is then rotated  $270^\circ$  clockwise around the point  $(-1,0)$  to Point G, which is then reflected across the line  $y = x + 1$  to Point H. What are the coordinates, in the form  $(x, y)$ , of Point H?

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 8

---

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

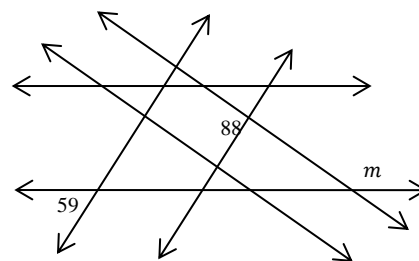
Round 8

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

22. What value(s) of  $b$  satisfy  $3 + 5b = 8b - 11$ ?

23. A triangle has two sides measuring 12 m and 16 m, with an angle of  $60^\circ$  between the two. What is the length, in meters, of the third side?

24. The figure to the right is composed of three pairs of parallel lines, and three angle measures are given in degrees. What is the value of  $m$ ?

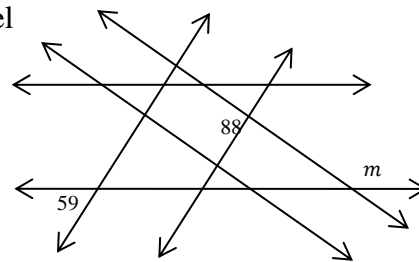


2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

22. What value(s) of  $b$  satisfy  $3 + 5b = 8b - 11$ ?

23. A triangle has two sides measuring 12 m and 16 m, with an angle of  $60^\circ$  between the two. What is the length, in meters, of the third side?

24. The figure to the right is composed of three pairs of parallel lines, and three angle measures are given in degrees. What is the value of  $m$ ?





2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 9

---

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 9

2014 Cipherring Time Trials  
Thursday, December 11th, 2014

25. Two numbers sum to 89 and differ by 57. What is the larger of the two numbers?

26. There is more than one pair of numbers that have a greatest common factor of 6 and a least common multiple of 600. What is the smallest possible sum of two such numbers?

27. Simplify:  $\sqrt{28 + \sqrt{434 + \sqrt{28 + \sqrt{434 + \dots}}}}$

2014 Cipherring Time Trials  
Thursday, December 11th, 2014

25. Two numbers sum to 89 and differ by 57. What is the larger of the two numbers?

26. There is more than one pair of numbers that have a greatest common factor of 6 and a least common multiple of 600. What is the smallest possible sum of two such numbers?

27. Simplify:  $\sqrt{28 + \sqrt{434 + \sqrt{28 + \sqrt{434 + \dots}}}}$

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 10

---

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

Round 10

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

28. Evaluate:  $(2 + 3)^{4+5-6}$

29. When I reverse the digits of my age, I get my daughter's age. In  $J$  years, where  $J$  is a counting number, this will be true again. What is the smallest possible value of  $J$ ?

30. For marching along roads, King Peter tries to arrange his army in rows of seven, but there is one person left over. If he organizes them in rows of six there are two people left over. When he organizes them in rows of eight, however, no one is left over. What is the smallest number of people greater than 10,000 that could be in his army?

---

2014 CIPHERING TIME TRIALS  
THURSDAY, DECEMBER 11TH, 2014

28. Evaluate:  $(2 + 3)^{4+5-6}$

29. When I reverse the digits of my age, I get my daughter's age. In  $J$  years, where  $J$  is a counting number, this will be true again. What is the smallest possible value of  $J$ ?

30. For marching along roads, King Peter tries to arrange his army in rows of seven, but there is one person left over. If he organizes them in rows of six there are two people left over. When he organizes them in rows of eight, however, no one is left over. What is the smallest number of people greater than 10,000 that could be in his army?