

2025 Wolverine Math Tournament Elementary School Division: Individual Round

Westview Math Club

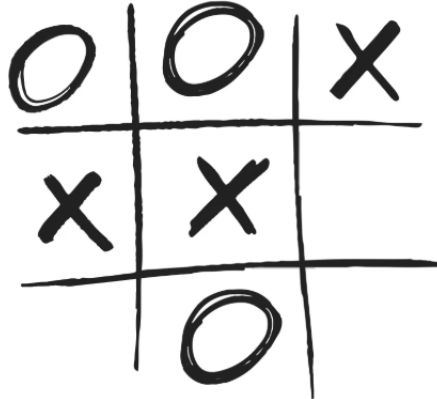
May 17th, 2025

1 ES Individual Round Questions:

The questions are in increasing order of difficulty. The last few are particularly challenging. Please write your answers on the answer sheets given. Simplify all fractions (write $\frac{1}{2}$ instead of $\frac{2}{4}$). Do not express your answer as a decimal (write $\frac{1}{2}$, not 0.5). Good luck!

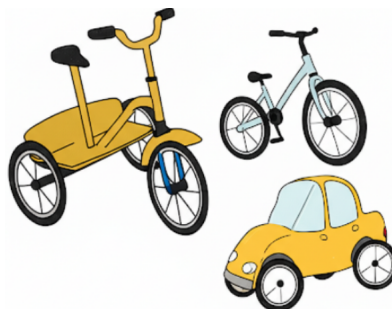
Time limit: 60 minutes

1. Jack, Aneesh, and David are having a debate on the value of $1 + 1$. Jack says the answer is 3. Aneesh says it's undefined. David says that they are both wrong. What is $1 + 1$?
2. In Tic Tac Toe, people try to make a row, column, or diagonal of 3 X's or 3 O's. In the game shown below, Aiden is playing as the X's, Vedant is playing as the O's, and it is Aiden's turn. If they both play as best as they can, who will win?

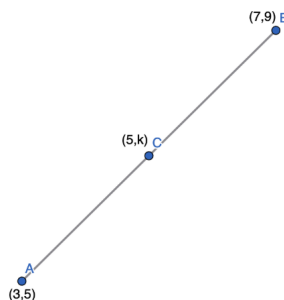


3. Jack is trying to focus on his Honors English assignments. Every time 5 people walk by him, he gets annoyed. 65 people have walked by. How many times has Jack gotten annoyed?
4. Philip gets 3 dollars every minute from the bank. He starts with 15 dollars. How much money does he have after 8 minutes?
5. To make Wolverade, you need $2\frac{1}{4}$ cups of Wolverade powder. If you only have a $\frac{1}{4}$ cup measuring scoop, how many full scoops do you need to measure out the powder?
6. Aiden is first in line, Ben is second, Carl is third, and Dylan is fourth. If Aiden swaps places with Carl, and Dylan swaps places with Aiden after, then what place is Dylan in line now?
7. Ryan the hammerhead shark and Shriya the sea otter are swimming in the sea. Ryan has 26 fish, and Shriya has 6 fish. Ryan feels bad for Shriya, so he wants to share some of his fish. How many fish does Ryan need to give to Shriya so that they both have an equal number of fish?

8. Mihir uses the digit 2 and the 4 basic operations to create this expression:
 $(2 + 2) - (2 - 2) \cdot (2 \cdot 2) \div (2 \div 2)$. What answer does Mihir get?
9. Let $a \heartsuit b = (a + b)^2 - b$. What is the value of $(1 \heartsuit 2) \heartsuit 3$?
10. Vedant turned 15 four years ago. If Vedant is 3 years older than Rishi, and Hamza is 3 times Rishi's age, how old is Hamza now?
11. If $6927A$ (where A is a digit) is a multiple of 9, what is A ?
12. There are four different light switches in Kristi's living room. Each switch can either be ON or OFF. How many different ways can the switches be set?
13. Julian the Wolverine is covering his floor with Wolverine bucks. If a Wolverine buck measures 4×3 inches, how many Wolverine bucks would it take him to cover a square floor with a side length of 5 feet, with no overlap?
14. David's phone's battery life (in hours) is inversely proportional to its screen brightness (expressed as a percentage). When the brightness is set at 80%, the battery lasts for 4.5 hours. David is planning to have a 6-hour gaming session on his phone. At what percent brightness should he use for his battery to last exactly enough for his session?
15. The length and width of a rectangle are each increased by 20%. By what percentage is the area of the rectangle increased?
16. Six wolverines can dig a secret tunnel under Westview in 4 hours. If 8 wolverines work together at the same digging speed, how many hours will it take them to finish the tunnel?
17. James loves riding vehicles. He has 2 cars, and the rest of them are tricycles and bicycles. He has a total of 12 vehicles, with a combined total of 34 wheels. How many tricycles does he have? A bicycle has 2 wheels, a tricycle has 3 wheels, and a car has 4 wheels.



18. A triangle has side lengths of 14, 25, and 25. What is the positive difference between the area and perimeter of the triangle?
19. Two best friends, Ryan and Luna, are standing on the coordinate grid. Luna is standing at point $(3, 5)$ and Ryan is standing at $(7, 9)$. Ryan and Luna want to stay connected, so they draw a line between their two points. If the point $(5, k)$ is on the line, find the integer k .



20. Philip forgot his backpack at home, so he ran from school to his house, a distance of 5 miles in 30 minutes. After picking up his backpack, he ran back to school in 45 minutes. What was Philip's average speed for the entire trip, in miles per hour (mph)?
21. In a convex pentagon, the measures of the interior angles form an arithmetic progression. If the smallest angle measures 80 degrees, what is the measure of the largest angle (in degrees)?
22. Avi is searching through his backpack in a dark cave, which contains 3 identical flashlights, 2 different hats (red and blue), and 4 granola bars. What is the minimum number of items he must pull to guarantee getting at least one granola bar and two flashlights? Assume that Avi cannot see inside the backpack and is pulling items out randomly.
23. There are three best friends, Hamza, Rishi, and Dev. Each of them receives a number from 1 to 25. They see each other's numbers but not their own. Rishi says that both of the numbers he can see are divisible by 2. Hamza says that both of the numbers he sees are prime. Dev says that both of the numbers he can see are multiples of 11. What is the sum of all of their numbers?
24. A 3-digit number has the following properties:
- The sum of its digits is 18.
 - The hundreds digit is twice the tens digit.
 - Reversing the digits (swapping the hundreds and ones digits) gives a number that is 297 more than the original number.

What is the original number?

25. Aiden has a goofy clock. Every time the hour and the minute hand align, the clock freezes for 1 full hour. Every time the hands of the clock form a right angle, the clock freezes for 15 minutes. Starting at noon, the clock becomes weird and follows the mentioned rules, causing it to freeze. Later, the clock shows 4:00 PM. What is the actual time when the clock shows 4:00 PM?

A special thanks to our sponsor Jane Street for helping make this contest possible!



Jane Street

2 ES Individual Round Answer Key

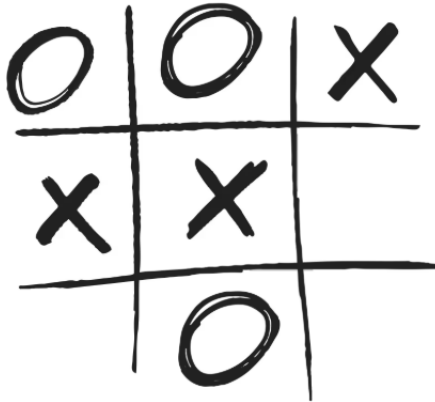
1. 2
2. Aiden
3. 13
4. 39
5. 9
6. 3 or 3rd
7. 10
8. 4
9. 97
10. 48
11. 3
12. 16
13. 300
14. 60 or 60%
15. 44 or 44%
16. 3
17. 6
18. 104
19. 7
20. 8
21. 136
22. 8
23. 35
24. 639
25. 9:45 PM

3 ES Individual Round Solutions

1. Jack, Aneesh, and David are having a debate on the value of $1 + 1$. Jack says the answer is 3. Aneesh says it's undefined. David says that they are both wrong. What is $1 + 1$?

$$1 + 1 = \boxed{2}$$

2. In Tic Tac Toe, people try to make a row, column, or diagonal of 3 X's or 3 O's. In the game shown below, Aiden is playing as the X's, Vedant is playing as the O's, and it is Aiden's turn. If they both play as best as they can, who will win?



As it is **Aiden's** turn, he can place an X in the left-center box to create his 3-in-a-row and win.

3. Jack is trying to focus on his Honors English assignments. Every time 5 people walk by him, he gets annoyed. 65 people have walked by. How many times has Jack gotten annoyed?

$$65 \text{ people} / 5 \text{ people per annoyance} = \boxed{13} \text{ times}$$

4. Philip gets 3 dollars every minute from the bank. He starts with 15 dollars. How much money does he have after 8 minutes?

$$15 \text{ starting} + 3 \text{ dollars/min} * 8 \text{ min} = 15 + 24 = \boxed{39} \text{ dollars}$$

5. To make Wolverade, you need $2\frac{1}{4}$ cups of Wolverade powder. If you only have a $\frac{1}{4}$ cup measuring scoop, how many full scoops do you need to measure out the powder?

$$\begin{aligned} 2\frac{1}{4} \text{ cups} &= \frac{9}{4} \text{ cups} \\ \frac{9}{4} \text{ cups} \div \frac{1}{4} \text{ cups per scoop} &= \boxed{9} \text{ scoops} \end{aligned}$$

6. Aiden is first in line, Ben is second, Carl is third, and Dylan is fourth. If Aiden swaps places with Carl, and Dylan swaps places with Aiden after, then what place is Dylan in line now?

At the beginning, we have $ABCD$ (letter corresponding to the first letter of the name). After the first swap, it becomes $CBAD$, then $CBDA$. Dylan ends up in third place (**3**).

7. Ryan the hammerhead shark and Shriya the sea otter are swimming in the sea. Ryan has 26 fish, and Shriya has 6 fish. Ryan feels bad for Shriya, so he wants to share some of his fish. How many fish does Ryan need to give to Shriya so that they both have an equal number of fish?

We know that the total amount of fish won't change, since the only action is moving fish from one person to another. We add the number of fish that Ryan has to the number of fish that Shriya has. This gives 32 fish in total. For them to have an equal amount of fish, both need to have 16 fish. Ryan currently has 26 fish, but needs to get to 16 fish, which is just $26 - 16 = \boxed{10}$ fish.

8. Mihir uses the digit 2 and the 4 basic operations to create this expression:
 $(2 + 2) - (2 - 2) \cdot (2 \cdot 2) \div (2 \div 2)$. What answer does Mihir get?

$(2 + 2) - (2 - 2) \cdot (2 \cdot 2) \div (2 \div 2)$ is the original equation. $(2 - 2) \cdot (2 \cdot 2)$ simplifies to 0, thus we get $(2 + 2) - 0 \div 1$, which equals $\boxed{4}$

9. Let $a \heartsuit b = (a + b)^2 - b$. What is the value of $(1 \heartsuit 2) \heartsuit 3$?

$(1 \heartsuit 2) \heartsuit 3$ is the original expression. $1 \heartsuit 2 = (1 + 2)^2 - 2 = 7$. $7 \heartsuit 3 = (7 + 3)^2 - 3 = \boxed{97}$

10. Vedant turned 15 four years ago. If Vedant is 3 years older than Rishi, and Hamza is 3 times Rishi's age, how old is Hamza now?

If Vedant turned 15 four years ago, he is 19 now. Since Rishi is 3 years younger than Vedant, he is $19 - 3 = 16$ years old. Since Hamza is 3 times Rishi's age, Hamza is $3 * 16 = \boxed{48}$ years old.

11. If $6927A$ (where A is a digit) is a multiple of 9, what is A ?

For an integer to be divisible by 9, the sum of the digits must be a multiple of 9. Thus, $6 + 9 + 2 + 7 + A = 24 + A$ is a multiple of 9. Since A is an integer from 1 to 9, the only possible multiple of 9 that can be achieved is 27, so $A = 27 - 24 = \boxed{3}$.

12. There are four different light switches in Kristi's living room. Each switch can either be ON or OFF. How many different ways can the switches be set?

There are two possibilities for each switch. Thus, there are $2 \times 2 \times 2 \times 2 = \boxed{16}$ ways for the switches to be set.

13. Julian the Wolverine is covering his floor with Wolverine bucks. If a Wolverine buck measures 4×3 inches, how many Wolverine bucks would it take him to cover a square floor with a side length of 5 feet, with no overlap?

There are 12 inches in a foot. Therefore, the number of Wolverine bucks in 1 square foot is $\frac{12}{3} * \frac{12}{4} = 4 * 3 = 12$. There are $5^2 = 25$ square feet in a square with side length 5 feet, so it would take $25 * 12 = \boxed{300}$ Wolverine bucks to cover the floor.

14. David's phone's battery life (in hours) is inversely proportional to its screen brightness (expressed as a percentage). When the brightness is set at 80%, the battery lasts for 4.5 hours. David is planning to have a 6-hour gaming session on his phone. At what percent brightness should he use for his battery to last exactly enough for his session?

Since battery life is inversely proportional to screen brightness, we find that battery life * brightness = constant. We find that this constant is equal to $4.5 * 80 = 360$. Therefore, we get that

when battery life=6, the brightness should be $\frac{360}{6} = \boxed{60}$ percent.

15. The length and width of a rectangle are each increased by 20%. By what percentage is the area of the rectangle increased?

The area of a rectangle is its length \times width. Let the original length and width be L and W , respectively. Then, the new length and width are $1.2L$ and $1.2W$, respectively. The new area is then $1.2L \times 1.2W = 1.44LW$. The original area was LW , so the new area is $\frac{1.44LW}{LW} = 1.44$ times larger than the original. The percent increase is then $100(1.44 - 1) = 100 \times 0.44 = \boxed{44\%}$.

16. Six wolverines can dig a secret tunnel under Westview in 4 hours. If 8 wolverines work together at the same digging speed, how many hours will it take them to finish the tunnel?

If six wolverines can dig the tunnel in 4 hours, then one wolverine can dig the tunnel in $4 \times 6 = 24$ hours. This means that each wolverine has a digging rate of $\frac{1}{24}$ tunnels/hour. Thus, 8 wolverines would have a digging rate of $\frac{8}{24} = \frac{1}{3}$ tunnels/hour. Thus, they would take $\frac{1}{\frac{1}{3}} = \boxed{3}$ hours to dig the tunnel.

17. James loves riding vehicles. He has 2 cars, and the rest of them are tricycles and bicycles. He has a total of 12 vehicles, with a combined total of 34 wheels. How many tricycles does he have? A bicycle has 2 wheels, a tricycle has 3 wheels, and a car has 4 wheels.



Since he has 12 vehicles and 2 cars, he has $12 - 2 = 10$ vehicles that aren't cars. His 2 cars have a total of $4 \times 2 = 8$ wheels, so his vehicles that aren't cars have a total of $34 - 8 = 26$ wheels. Let the number of tricycles be T , and the number of bicycles be B . We get the following system of equations:

$$T + B = 10$$

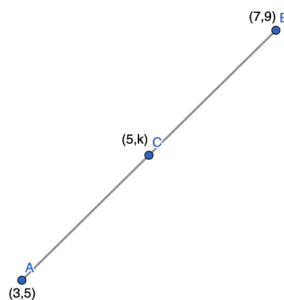
$$3T + 2B = 26$$

Multiplying the first equation by 2 and subtracting from the second equation, we get $3T + 2B - (2T + 2B) = T = 26 - 2 \times 10 = 6$. Thus, he has $\boxed{6}$ tricycles.

18. A triangle has side lengths of 14, 25, and 25. What is the positive difference between the area and perimeter of the triangle?

Notice that this triangle is isosceles. Draw the altitude of the triangle from the vertex. The altitude splits the opposite side into 2 line segments of length 7. The height is then $\sqrt{25^2 - 7^2} = 24$. Thus, the area is $\frac{24 \times 14}{2} = 168$. The perimeter of the triangle is $25 + 25 + 14 = 64$. Thus, the positive difference between the area and perimeter is $168 - 64 = \boxed{104}$.

19. Two best friends, Ryan and Luna, are standing on the coordinate grid. Luna is standing at point $(3, 5)$ and Ryan is standing at $(7, 9)$. Ryan and Luna want to stay connected, so they draw a line between their two points. If the point $(5, k)$ is on the line, find the integer k .



This line has a slope of $\frac{9-5}{7-3} = \frac{4}{4} = 1$. Since the point with x-coordinate of 5 is $5 - 3 = 2$ units to the right of Luna, and the slope is 1, it is also 2 units above Luna, so $k = 2 + 5 = \boxed{7}$.

20. Philip forgot his backpack at home, so he ran from school to his house, a distance of 5 miles in 30 minutes. After picking up his backpack, he ran back to school in 45 minutes. What was Philip's average speed for the entire trip, in miles per hour (mph)?

His average speed is (total distance)/(total time). His total distance traveled was $5 + 5 = 10$ miles, and the total time is $\frac{(30+45)}{60} = \frac{5}{4}$ hours. Thus, his average speed is $\frac{10}{\frac{5}{4}} = \boxed{8}$ mph.

21. In a convex pentagon, the measures of the interior angles form an arithmetic progression. If the smallest angle measures 80 degrees, what is the measure of the largest angle (in degrees)?

The sum of the interior angles of a pentagon is $3 * 180 = 540$. Let the common difference be r . We have that the angle measures of the pentagon are $80, 80 + r, 80 + 2r, 80 + 3r$, and $80 + 4r$. The sum of these angle measures is $400 + 10r$. Set this equal to 540 and solve for r to obtain $400 + 10r = 540 \Rightarrow 10r = 140 \Rightarrow r = 14$. Thus, the measure of the largest angle is $80 + 4r = 80 + 4 * 14 = 80 + 56 = \boxed{136}$.

22. Avi is searching through his backpack in a dark cave, which contains 3 identical flashlights, 2 different hats (red and blue), and 4 granola bars. What is the minimum number of items he must pull to guarantee getting at least one granola bar and two flashlights? Assume that Avi cannot see inside the backpack and is pulling items out randomly.

The worst possible scenario (the scenario where Avi has to take out the most items) is that pulls out both hats, all 4 granola bars, and 2 flashlights. This is a combined total of $2 + 4 + 2 = \boxed{8}$ items.

23. There are three best friends, Hamza, Rishi, and Dev. Each of them receives a number from 1 to 25. They see each other's numbers but not their own. Rishi says that both of the numbers he can see are divisible by 2. Hamza says that both of the numbers he sees are prime. Dev says that both of the numbers he can see are multiples of 11. What is the sum of all of their numbers?

If both numbers Hamza can see (Rishi's and Dev's) are prime, and Dev says that all the numbers he can see (Hamza's and Rishi's) are multiples of 11, this means Rishi's number must be 11, since it is the only prime multiple of 11. In addition, since Rishi can only see even numbers, Dev's number must be 2, since it is the only even prime. Finally, Hamza's number must be 22 since it is the only even multiple of 11 within 1 and 25. $11 + 2 + 22 = \boxed{35}$.

24. A 3-digit number has the following properties:

- The sum of its digits is 18.

- The hundreds digit is twice the tens digit.
- Reversing the digits (swapping the hundreds and ones digits) gives a number that is 297 more than the original number.

What is the original number?

Let the number be ABC , where A, B , and C each represent digits. Using the conditions, we get the following system of equations:

$$A + B + C = 18$$

$$A = 2B$$

$$100C + 10B + A = 100A + 10B + C + 297 \Rightarrow 99C - 99A = 297 \Rightarrow C - A = 3$$

Plugging in the 2nd equation into the third equation, we get $C = 2B + 3$, and plugging in this with the second equation into the first equation, we can solve for B . $2B + B + 2B + 3 = 18 \Rightarrow 5B = 15 \Rightarrow B = 3$

Thus, $A = 2 \times 3 = 6$ and $C = A + 3 = 9$, and the 3-digit number ABC is **639**.

25. Aiden has a goofy clock. Every time the hour and the minute hand align, the clock freezes for 1 full hour. Every time the hands of the clock form a right angle, the clock freezes for 15 minutes. Starting at noon, the clock becomes weird and follows the mentioned rules, causing it to freeze. Later, the clock shows 4:00 PM. What is the actual time when the clock shows 4:00 PM?

At noon, the hour and minute hands are both at 12, thus the clock stops for 60 minutes. The minute hand then starts to lead the hour hand until they make a right angle (we don't need to know when), so the total delay is now 75 minutes. The clock continues until another right angle is formed (still before 1:00). By the time the clock reads 1:00, there has been a 90-minute delay. This pattern continues, 90 minutes of delay per hour. By the time the clock reads 3:01, there is now a 270-minute delay. Afterwards, the hands meet, causing a 60-minute delay, and another right angle is formed for 15 minutes (there is no second right angle formed at 3:00 because it would have to be at 4:00 pm). In total, there is a 345-minute delay, 5 hours and 45 minutes. 5 hours and 45 minutes added to the clock time of 4:00 is **9 : 45PM**.