<u>AJHSMEs are the Pre-1999 version of the AMC8 and will be treated like an AMC8. Some solutions may have small parts of in LaTeX (Typesetting system)</u>

Category: Number Theory

1990 AJHSME (Problem 4) (Correct)

The square of a whole number (also known as a perfect square) always ends in one of the following digits: 0, 1, 4, 5, 6, or 9.

This is because if you look at the last digit (the units digit) of a square number, it only depends on the last digit of the original number. The following list shows the units digit of the squares of numbers ending in each digit from 0 through 9:

- 0 squared = 0
- 1 squared = 1
- 2 squared = 4
- 3 squared = 9
- 4 squared = 6
- 5 squared = 25 (ends in 5)
- 6 squared = 36 (ends in 6)
- 7 squared = 49 (ends in 9)
- 8 squared = 64 (ends in 4)
- 9 squared = 81 (ends in 1)

Therefore, the units digits 2, 3, 7, and 8 are not possible as the units digit of the square of a whole number.

Difficulty: Easy

2014 AMC8 (Problem 8) (Incorrect)

Let's call the amount each club member paid "x", which is an integer. According to the problem, the total paid to the speaker by 11 club members is $1A2, a three-digit number where A is the unknown digit.

The number can be written as 100 + 10*A + 2.

Since each member paid the same amount, the total amount paid to the speaker is a multiple of the number of club members. So, 100 + 10*A + 2 is a multiple of 11.

The two-digit number 10A must be a multiple of 11 since 100 and 2 are both multiples of 11. The possible multiples of 11 between 10 and 99 are 11, 22, 33, 44, 55, 66, 77, 88, and 99.

Therefore, A could be 1, 2, 3, 4, 5, 6, 7, 8, or 9.

However, since 100 and 2 are already multiples of 11, the entire sum 100 + 10*A + 2 is also a multiple of 11 only when A=0.

So, A = 0.

Therefore, the amount paid to the speaker by the math club was $102.

Correct Answer: 3

Difficulty: Easy

2023 AMC8 (Problem 10) (Correct)

Let's start by finding out how much pie Harold left behind. Since he ate 1/4 of the pie, he left behind 1 - 1/4 = 3/4 of the pie.

Then, a moose came and ate 1/3 of what Harold left behind. The amount of pie left after the moose ate is 2/3 of the 3/4 that Harold left, or (2/3) * (3/4) = 1/2 of the original pie.

Next, a porcupine ate 1/3 of what the moose left behind. So the amount of pie left after the porcupine ate is 2/3 of the 1/2 that the moose left, or (2/3) * (1/2) = 1/3 of the original pie.

So after the porcupine left, 1/3 of the original pie remained.

Difficulty: Easy

2013 AMC8 (Problem 2) (Correct)

According to the sign, a half-pound package of fish is on sale for $3. Because this is a 50% off sale, the regular price for a half-pound package would be double this amount, or $3 * 2 = $6.

Therefore, the regular price for a full pound of fish, which is two half-pound packages, would be $6 * 2 = $12.

Difficulty: Easy

2001 AMC8 (Problem 6) (Correct)

If the six trees are equally spaced, then the distance between each consecutive pair of trees is the same. If the distance from the first tree to the fourth tree is 60 feet, that means there are three equal segments connecting these trees (from tree 1 to 2, from tree 2 to 3, and from tree 3 to 4).

Therefore, each segment (or the distance between each pair of trees) is 60 feet / 3 = 20 feet.

If you want to find the distance between the first and last trees, you need to calculate the length of five such segments (from tree 1 to 2, from tree 2 to 3, from tree 3 to 4, from tree 4 to 5, and from tree 5 to 6).

So the distance from the first to the last tree is 5 * 20 feet = 100 feet.

Difficulty: Easy

1999 AMC8 (Problem 13) (Correct)

The average age of all the 40 members is 17 years, so the total of their ages is 40 * 17 = 680 years.

The total age of the girls is 20 * 15 = 300 years, and the total age of the boys is 15 * 16 = 240 years.

Therefore, the total age of the adults is 680 (total years for all members) - 300 (years for the girls) - 240 (years for the boys) = 140 years.

As there are 5 adults, the average age of the adults is 140 years / 5 = 28 years.

Difficulty: Medium

2017 AMC8 (Problem 14) (Correct)

Let's denote the total number of problems in the homework assignment as P. According to the problem, both Chloe and Zoe each solved P/2 problems alone and the other P/2 problems together.

Chloe had correct answers to 80% of the problems she solved alone, so the number of correct answers she had for the problems she solved alone is 0.80 * P/2 = 0.4P.

Overall, Chloe had correct answers to 88% of her problems, so the number of correct answers she had in total is 0.88P.

Therefore, the number of correct answers Chloe and Zoe had for the problems they solved together is 0.88P (Chloe's total correct answers) - 0.4P (Chloe's correct answers she solved alone) = 0.48P.

Let's denote the percentage of correct answers Zoe had for the problems she solved together as T%. So, the number of correct answers Zoe had for the problems she solved together is T% * P/2.

Zoe had correct answers to 90% of the problems she solved alone, so the number of correct answers she had for the problems she solved alone is 0.90 * P/2 = 0.45P.

Therefore, Zoe's total correct answers is the sum of the correct answers she had for the problems she solved alone and the correct answers she had for the problems she solved together, which is 0.45P (Zoe's correct answers she solved alone) + 0.48P (the correct answers Chloe and Zoe had for the problems they solved together) = 0.93P.

As a result, Zoe's overall percentage of correct answers is (Zoe's total correct answers / total problems) * 100% = (0.93P / P) * 100% = 93%.

Difficulty: Medium

2018 AMC 10A (Problem 2) (Correct)

If Liliane has 50% more soda than Jacqueline, and Alice has 25% more soda than Jacqueline, we can determine the relationship between the amounts of soda that Liliane and Alice have by expressing the amounts relative to Jacqueline's amount.

Let's denote the amount of soda Jacqueline has as J.

Then, Liliane has 50% more soda than Jacqueline, or 1.5J.

Alice has 25% more soda than Jacqueline, or 1.25J.

To find the relationship between the amounts of soda that Liliane and Alice have, we can set up a ratio:

Liliane : Alice = 1.5J : 1.25J

Simplifying this ratio by dividing both sides by 1.25J gives:

Liliane : Alice = 1.5/1.25 : 1

After simplifying the fraction 1.5/1.25, we get:

Liliane : Alice = 1.2 : 1

So, Liliane has 20% more soda than Alice.

Difficulty: Medium

2011 AMC 10A (Problem 5) (Correct)

Let's denote the number of fifth graders as F, the number of fourth graders as 2F (since there are twice as many fourth graders as fifth graders), and the number of third graders as 4F (since there are twice as many third graders as fourth graders).

The total time run by the fifth graders per day is 10F minutes (since each fifth grader runs 10 minutes), the total time run by the fourth graders per day is 15*2F = 30F minutes, and the total time run by the third graders per day is 12*4F = 48F minutes.

So, the total time run by all these students per day is 10F + 30F + 48F = 88F minutes.

The total number of students is F + 2F + 4F = 7F.

Therefore, the average number of minutes run per day by these students is the total time run divided by the total number of students, which is 88F / 7F = 88/7 = 12 4/7 minutes.

Difficulty: Medium

2015 AMC 10B (Problem 3) (Incorrect)

Let's denote the other number that Isaac has written down as x. According to the problem, Isaac has written down the number 28 two times and the number x three times. Therefore, the sum of these five numbers is 2*28 + 3*x = 100.

This equation simplifies to 56 + 3x = 100, and further simplifying gives 3x = 100 - 56 = 44.

Solving for x then gives x = 44 / 3 = 14.67 approximately.

However, the problem states that the numbers Isaac has written down are integers, and 14.67 is not an integer. **Therefore, there seems to be a mistake in the problem.** The number x cannot be determined from the given conditions and be an integer at the same time.

Correct Answer: 8

Difficulty: Medium

1990 AJHSME (Problem 21) (Incorrect)

Let's denote the last three numbers as A, B, and C. In this problem, we know that A = 16, B = 64, and C = 1024.

According to the problem, each new number in the list is the product of the two previous numbers. This means that B = A * some previous number and C = A * B.

Substituting the given values of A, B, and C into these relationships, we have:

64 = 16 * previous number, so the previous number = 64 / 16 = 4.

1024 = 16 * 64, so this checks out.

So, the last four numbers in the list are 4, 16, 64, 1024.

We can use this same logic to find the preceding numbers:

16 = 4 * previous number, so the previous number = 16 / 4 = 4.

4 = 4 * previous number, so the previous number = 4 / 4 = 1.

Therefore, the first number in the list is 1.

Correct Answer: ¼

Difficulty: Hard

2003 AMC 10A (Problem 10) (Correct)

The first 2003 even counting numbers are 2, 4, 6, ..., 4006 and the first 2003 odd counting numbers are 1, 3, 5, ..., 4005.

The sum of an arithmetic series is given by the formula n/2 * (a1 + an), where n is the number of terms, a1 is the first term, and an is the last term.

The sum of the first 2003 even counting numbers is 2003/2 * (2 + 4006) = 2003 * 2004.

The sum of the first 2003 odd counting numbers is 2003/2 * (1 + 4005) = 2003 * 2003.

The difference between these two sums is 2003 * 2004 - 2003 * 2003 = 2003^2 + 2003 - 2003^2 = 2003. So, the difference is 2003.

Difficulty: Hard

2014 AMC8 (Problem 21) (Correct)

In order for a number to be a multiple of 3, the sum of its digits must also be a multiple of 3.

Looking at the number 74A52B1, the sum of the known digits is 7 + 4 + 5 + 2 + 1 = 19. To make the sum a multiple of 3, A + B must be either 1, 4, 7, or 10.

Looking at the number 326AB4C, the sum of the known digits is 3 + 2 + 6 + 4 = 15. Since A and B must add to one of the values from the first number, the possible values for A + B + C are 16, 19, 22, or 25. To make the sum a multiple of 3, C could be 1, 4, 7, or 10.

However, since C is a digit, it can't be 10. Therefore, the possible values for C are 1, 4, or 7.

Difficulty: Hard

2017 AMC8 (Problem 24) (Incorrect)

First, we need to know that 2017 is not a leap year. Therefore, there are 365 days in 2017.

Now, let's calculate how often each grandchild calls:

1. The first grandchild calls every 3 days. In 365 days, they will call 365 / 3 = 121.67 times, which is rounded down to 121 times because you can't call a fraction of a time.
2. The second grandchild calls every 4 days. In 365 days, they will call 365 / 4 = 91.25 times, rounded down to 91 times.
3. The third grandchild calls every 5 days. In 365 days, they will call 365 / 5 = 73 times.

However, we have to consider the fact that some days more than one grandchild will call. This happens when the days coincide with the least common multiple of 3, 4, and 5. The least common multiple of 3, 4, and 5 is 60. So, every 60 days, all three grandchildren call Mrs. Sanders.

In 365 days, this will happen 365 / 60 = 6.08 times, rounded down to 6 times.

But, we've subtracted those days three times (once for each grandchild), so we have to add them back twice (to account for the double counting).

So, the total number of calls is 121 + 91 + 73 + 2*6 = 297 calls.

Therefore, the number of days Mrs. Sanders did not receive a phone call is 365 - 297 = 68 days.

Correct Answer: 146

Difficulty: Hard

2002 AMC 12A (Problem 2) (Correct)

Let's denote the certain number as x.

If Cindy subtracted 9 and then divided the result by 3, we have the equation:

(x - 9) / 3 = 43

Solving for x gives:

x - 9 = 43 * 3 x - 9 = 129 x = 129 + 9 x = 138

Now, let's calculate what would have happened if Cindy had subtracted 3 from this number and then divided by 9, as her teacher had asked:

(138 - 3) / 9 = 135 / 9 = 15

Therefore, Cindy would have gotten 15 if she had worked the problem correctly.

Difficulty: Hard

Category: Geometry

2018 AMC8 (Problem 9) (Incorrect)

First, let's calculate how many one-foot by one-foot square tiles Bob will need for the border.

The border will consist of two rows along the length and two rows along the width of the room. Since the tiles are one foot by one foot:

- For the length of the room (16 feet), he will need 2 rows of 16 tiles each, for a total of 2*16 = 32 tiles.
- For the width of the room (12 feet), since we already have one tile from each of the length's rows, he will need 2 rows of 10 tiles each (two less than the room's width), for a total of 2*10 = 20 tiles.

So, in total, for the border, he will need 32 + 20 = 52 one-foot by one-foot square tiles.

Next, let's calculate how many two-foot by two-foot square tiles Bob will need for the rest of the floor.

Subtracting the two-foot border from the room's dimensions leaves a 8 foot by 12 foot area. Since the tiles are two-foot by two-foot:

- He will need 8 / 2 = 4 tiles for the width.
- He will need 12 / 2 = 6 tiles for the length.

So, in total, for the main area, he will need 4*6 = 24 two-foot by two-foot square tiles.

Adding these together, Bob will use a total of 52 + 24 = 76 tiles to tile his floor.

Correct Answer: 87

Difficulty: Easy

2020 AMC8 (Problem 9) (Incorrect)

For the smaller 1x1x1 cubes to have icing on exactly two sides, they need to be at the edge of the cake but not at the corners. Let's analyze it:

1. Looking at the top face of the cake, there are 4 edges with 2 cubes on each edge. However, the corners are counted twice, so we subtract those. So, the top face contributes 4*2 - 4 = 4 cubes with icing on two sides.
2. Looking at the four sides of the cake, each side has 2 edges (not including the top edge which we've already counted) with 2 cubes on each edge. Subtracting the corners, each side contributes 2*2 - 2 = 2 cubes with icing on two sides. Since there are 4 sides, these sides together contribute 4*2 = 8 cubes with icing on two sides.

Therefore, there are a total of 4 (from the top face) + 8 (from the sides) **= 12 small cubes that will have icing on exactly two sides.**

Correct Answer: 20

Difficulty: Easy

2019 AMC8 (Problem 4) (Correct)

In a rhombus, the diagonals are perpendicular and they bisect each other, dividing the rhombus into four congruent right triangles. If we know the length of one diagonal (AC = 24 meters) and the perimeter (52 meters), we can find the length of the other diagonal and hence the area of the rhombus.

First, find the length of each side of the rhombus. Since the perimeter of a rhombus is the sum of all its sides and a rhombus has equal sides, each side of the rhombus is 52 meters / 4 = 13 meters.

The diagonals of a rhombus form four right triangles. Using the Pythagorean theorem, the length of the other diagonal (BD) can be found as follows:

Let BD = 2x (since BD is twice the length of the height of one of the right triangles). In the right triangle formed by half the rhombus, AC/2 = 12 m is one leg, and AB = 13 m is the hypotenuse.

We then have:

(13)^2 - (12)^2 = (x)^2 169 - 144 = x^2 25 = x^2 x = 5

So, the length of the diagonal BD = 2x = 10 meters.

The area of a rhombus is given by the formula:

Area = (Diagonal1 * Diagonal2) / 2

So, the area of the rhombus ABCD is:

Area = (24 m * 10 m) / 2 = 120 square meters.

Difficulty: Easy

2012 AMC8 (Problem 6) (Correct)

To calculate the area of the border, you need to calculate the difference between the area of the frame with the photograph and the area of the photograph alone.

The frame adds a border of 2 inches on each side, thus adding 4 inches to both the height and the width of the photograph.

So, the dimensions of the photograph with the frame are:

- Height: 8 inches (height of the photo) + 4 inches (2 inches border top + 2 inches border bottom) = 12 inches
- Width: 10 inches (width of the photo) + 4 inches (2 inches border left + 2 inches border right) = 14 inches

The area of the framed photograph is then 12 inches * 14 inches = 168 square inches.

The area of the photograph alone is 8 inches * 10 inches = 80 square inches.

The area of the border is the difference between these two areas: 168 square inches - 80 square inches = **88 square inches.**

Difficulty: Easy

2006 AMC8 (Problem 7) (Incorrect)

The radius of a circle can be found in a few ways:

1. If you have the radius directly, as in Circle X, it's given: radius of X = π.
2. If you have the circumference of the circle, you can use the formula for circumference $C = 2\pi r$ to find the radius. For Circle Y, the circumference is 8π, so the radius of Y = $C/(2\pi) = 8\pi/(2\pi) = 4$.
3. If you have the area of the circle, you can use the formula for area $A = \pi r^2$ to find the radius. For Circle Z, the area is 9π, so the radius of Z = sqrt(A/π) = sqrt(9π/π) = sqrt(9) = 3.

So, the radii of the circles X, Y, and Z are π, 4, and 3, respectively.

Listing the circles from smallest to largest radius gives: X (with radius π ≈ 3.14), Z (with radius 3), Y (with radius 4).

Correct Answer: Z, X, Y

Difficulty: Easy

2015 AMC8 (Problem 12) (Incorrect)

A cube has 12 edges, and each edge is parallel to exactly one other edge**. Therefore, there are 12/2 = 6 pairs of parallel edges in a cube.**

Correct Answer: 18

Difficulty: Medium

2000 AMC 8 (Problem 13) (Incorrect)

Since TR bisects ∠ATC, it means that it divides ∠ATC into two equal angles.

Since triangle CAT is an isosceles triangle (because ∠ACT = ∠ATC), let's denote the angle ∠ACT as x. Therefore ∠ATC is also x.

We know that the sum of angles in a triangle is 180 degrees, so:

x (angle ACT) + x (angle ATC) + 36 (angle CAT) = 180 2x + 36 = 180 2x = 180 - 36 2x = 144 x = 144/2 x = 72

So, the angle ∠ATC = 72 degrees.

Since TR bisects ∠ATC, it divides ∠ATC into two equal parts:

∠CRT = ∠ATC / 2 ∠CRT = 72 degrees / 2 ∠CRT = 36 degrees.

Correct Answer: 72 degrees

Difficulty: Medium

2007 AMC8 (Problem 14) (Correct)

Given that △ABC is an isosceles triangle, the base (BC) is given as 24 units and the area is given as 60 square units.

The area of a triangle is given by the formula: Area = 1/2 * base * height. Since we know the area and the base, we can solve for the height (which is the line of symmetry for the isosceles triangle and is perpendicular to the base BC).

60 = 1/2 * 24 * height 60 = 12 * height height = 60 / 12 height = 5 units

Now we can use the Pythagorean theorem to solve for the length of the congruent sides. The height divides the base into two segments of 12 units each (since the base BC = 24). So, we get a right triangle where the hypotenuse is the congruent side of the triangle, one side is half of the base (12 units), and the other side is the height (5 units).

Let's denote the length of one of the congruent sides as a:

a^2 = 12^2 + 5^2 a^2 = 144 + 25 a^2 = 169 a = sqrt(169) a = 13 units

So, the length of one of the congruent sides is 13 units.

Difficulty: Medium

2012 AMC8 (Problem 17) (Correct)

Since the side length of the original square is an integer, and 8 of the squares have area 1 (and thus side length 1), it is clear that the minimum side length of the original square must be at least 3 (since 3^2 = 9 which is larger than 8 and 2^2 = 4 is too small).

Let's consider that the 8 squares of area 1 occupy a 2x4 rectangle within the original square. This would leave a remaining area that must also be square in shape, since it's part of the original square.

Since the remaining area must be a square and its side length is an integer, the smallest possible area for this square would be 4 (with side length 2). This is because we've already used all the 1x1 squares and the next smallest square with integer side length is 2x2.

Adding the area of the 8 squares of area 1 (which is 8) and the smallest possible remaining square of area 4, we get a total area of 12 for the original square.

Therefore, the smallest possible side length for the original square is the square root of 12, which is approximately 3.46. But since we know that the side length of the original square is an integer, **the smallest possible side length of the original square is 4.**

Difficulty: Medium

2014 AMC8 (Problem 19) (Correct)

To minimize the white surface area of the larger cube, we should place the white cubes in the center of the larger cube, where they won't be visible from the outside. In a 3x3x3 cube, there's one cube at the very center, and the remaining 26 cubes form a shell around it.

If we place 1 white cube in the center, we can place the other 5 white cubes surrounded by the red cubes in the middle layer of the larger cube. These 5 cubes will each have one face exposed.

So, there will be 5 faces of the larger cube that are white.

The total surface area of the larger cube is 6 sides * (3 inches per side)^2 = 54 square inches.

The white surface area is 5 sides * (1 inch per side)^2 = 5 square inches.

Therefore, the fraction of the surface area that is white is 5/54 = 5/54 simplified to its lowest terms is approximately 0.09259 or 9.259% when rounded to three decimal places.

Difficulty: Medium

2013 AMC8 (Problem 22) (Correct)

If you are making a grid out of toothpicks, you'll need to consider both the horizontal and vertical toothpicks.

The grid is 60 toothpicks long and 32 toothpicks wide, so there are 61 vertical columns and 33 horizontal rows, as each intersection needs a toothpick on each side.

So, the total number of toothpicks used is the sum of the horizontal and vertical toothpicks, which is (61 * 32) + (60 * 33) = 1952 + 1980 = 3932 toothpicks.

Difficulty: Hard

2018 AMC8 (Problem 23) (Incorrect)

First, let's find the total number of possible triangles we can form. In a regular octagon, we have 8 vertices and to form a triangle we need to choose any 3 vertices. So the total number of possible triangles is given by the combination formula C(n, k) = n! / [(n-k)!k!], where n is the total number of items, and k is the number of items to choose. So, C(8, 3) = 8! / [(8-3)!3!] = 56.

Now, we need to find the number of triangles that do not have any side coinciding with the side of the octagon. To form such a triangle, we can start by choosing any vertex of the octagon. Then the next vertex can't be an adjacent one, so it must be one of the next 5 vertices. Similarly, the third vertex must be one of the next 3 vertices that are not adjacent to the second chosen vertex. Therefore, there are 8 (choices for the first vertex) * 5 (choices for the second vertex) * 3 (choices for the third vertex) = 120 triangles that do not have any side coinciding with the side of the octagon.

However, in this calculation, each triangle has been counted 3 times (once for each possible ordering of the vertices). Therefore, the actual number of distinct triangles is 120 / 3 = 40.

The number of triangles that have at least one side coinciding with the side of the octagon is the total number of triangles minus the number of triangles that do not have any side coinciding with the side of the octagon. So, 56 - 40 = 16 triangles do have at least one side coinciding with the side of the octagon.

Therefore, the probability that at least one of the sides of the triangle is also a side of the octagon is 16 / 56 = 2 / 7.

Correct Answer: 5/7

Difficulty: Hard

2000 AMC8 (Problem 22) (Correct)

The surface area of the original cube (with edge length 2) is 6 * (side length)^2 = 6 * 2^2 = 24 square units.

When a cube of edge length 1 is added, the total surface area of the new solid is the surface area of the original cube (24 square units) plus the surface area of the small cube (6 * 1^2 = 6 square units), minus the area of the face where the two cubes are glued together ($1^2 = 1$ square unit), as this face is not part of the exterior surface. So the new surface area is 24 + 6 - 1 = 29 square units.

Therefore, the percent increase in surface area is (29 - 24) / 24 * 100% = 20.83%, which is closest to 21%.

Difficulty: Hard

2000 AMC8 (Problem 25) (Incorrect)

Let's call the midpoints of BC and CD as E and F respectively.

Since E and F are the midpoints, the length of BE (or EC) is half of BC and the length of AF is half of AD.

If the area of the rectangle is 72, then we can denote the sides of the rectangle as BC = 2b and AD = 2a. Therefore, BC*AD = 4ab = 72, so ab = 18.

Now, the area of the triangle AEF can be calculated by the formula 1/2 * base * height. In this case, the base of the triangle is AE (which is equal to the length of BE or EC) and the height is AF. The length of AE is the same as BE which is b (half the length of BC) and the length of AF is a (half the length of AD).

Therefore, the area of triangle AEF is 1/2 * a * b = 1/2 * 18 = 9 square units.

Difficulty: Hard

2005 AMC 8 (Problem 25) (Correct)

If the areas inside the circle and outside the square is equal to the areas outside the circle and inside the square, it means that the total area of the square is equal to the total area of the circle.

The area of the square is side length squared, or $2^2 = 4$ square units.

Setting this equal to the area of the circle, $\pi r^2 = 4$, we can solve for r, the radius of the circle.

Dividing both sides of the equation by π, we get $r^2 = 4/\pi$.

Taking the square root of both sides, we get r = sqrt(4/π), which is approximately 1.13 units.

Therefore, the radius of the circle is approximately 1.13 units.

Difficulty: Hard
Note: The square root of 4/π = 2/√pi

Category: Algebra

2009 AMC8 (Problem 1) (Correct)

Let's denote the number of apples Bridget bought as A.

According to the problem, Bridget gave half of the apples to Ann, which means she kept A/2 apples for herself and Cassie.

Then, she gave Cassie 3 apples and kept 4 for herself. So, A/2 = 3 (for Cassie) + 4 (for Bridget).

Therefore, A/2 = 7. To find the total number of apples A, we multiply both sides of the equation by 2. Hence, A = 2 * 7 = 14.

So, Bridget bought 14 apples.

Difficulty: Easy

2004 AMC8 (Problem 9) (Correct)

The total of the five numbers is 5 times the average, which is 5 * 54 = 270.

The total of the first two numbers is 2 times their average, which is 2 * 48 = 96.

So, the total of the last three numbers is the total of all five numbers minus the total of the first two numbers, which is 270 - 96 = 174.

Finally, the average of the last three numbers is their total divided by the number of numbers, which is 174 / 3 = 58.

So, the average of the last three numbers is 58.

Difficulty: Easy

2010 AMC8 (Problem 8) (Incorrect)

Emily rides her bicycle at 12 miles per hour and Emerson skates at 8 miles per hour, so Emily is moving relative to Emerson at a speed of 12 - 8 = 4 miles per hour.

Emily first spots Emerson when he is 1/2 mile in front of her and can see him until he is 1/2 mile behind her, so she can see him for a total distance of 1/2 mile + 1/2 mile = 1 mile.

The time that Emily can see Emerson is the distance she can see him divided by her relative speed. So, the time is 1 mile ÷ 4 miles per hour = 0.25 hours.

Converting this time to minutes (since there are 60 minutes in an hour), we get 0.25 hours * 60 minutes/hour = 15 minutes.

So, Emily can see Emerson for 15 minutes.

Difficulty: Easy

2011 AMC8 (Problem 1) (Correct)

The total cost of the apples is 3 apples * $0.50/apple = $1.50.

She paid with a $5.00 bill, so her change is $5.00 - $1.50 = $3.50.

So, Margie received $3.50 in change.

Difficulty: Easy

2012 AMC 8 (Problem 9) (Correct)

Let's denote the number of birds (2-legged animals) as B and the number of mammals (4-legged animals) as M.

We know from the problem that B + M = 200 (because each animal, bird or mammal, has one head) and 2B + 4M = 522 (because each bird has two legs and each mammal has four).

We can simplify the second equation by dividing it by 2, getting B + 2M = 261.

Now we can subtract the first equation from this new equation, which gives us M = 261 - 200 = 61.

So, there are 61 four-legged mammals.

Substituting M = 61 into the first equation gives B = 200 - 61 = 139.

So, Margie counted 139 two-legged birds at the Fort Worth Zoo.

Difficulty: Easy

2004 AMC 8 (Problem 12) (Correct)

Let's consider the rates at which Niki's cell phone uses battery power.

1. When the phone is not in use but on, it will use 1/24th of the battery every hour.
2. When the phone is in use, it uses 1/3rd of the battery every hour.

For the 9 hours that the phone has been on, 1 hour of that was in use and 8 hours was not in use.

So, the battery usage for the 1 hour of talking is 1/3 * 1 = 1/3. And the battery usage for the 8 hours of idle time is 1/24 * 8 = 1/3.

That means the battery has used 1/3 + 1/3 = 2/3 of its capacity so far.

So, 1 - 2/3 = 1/3 of the battery is remaining.

Now, if Niki doesn't use her phone anymore but leaves it on, it will use 1/24th of the battery every hour. So, with 1/3 of the battery remaining, it will last for (24 * 1/3) = **8 more hours.**

Difficulty: Medium

2015 AMC8 (Problem 20) (Incorrect)

Let's denote the number of $1 socks as x, the number of $3 socks as y, and the number of $4 socks as z. We know that:

1. x + y + z = 12 (since Ralph bought 12 pairs of socks)
2. x + 3y + 4z = 24 (since he paid a total of $24)

Since Ralph bought at least one pair of each type, y and z cannot be zero. The maximum possible value for y and z is 12 (if x were 0), but their sum must be less than 12 since at least one pair of $1 socks was purchased.

If we subtract the first equation from the second equation, we get 2y + 3z = 12. We can see that the only possible integer values for y and z that satisfy this equation and the constraints given are y = 4 and z = 2.

Substituting y = 4 and z = 2 into the first equation, we find x = 12 - 4 - 2 = 6.

So, Ralph bought 6 pairs of $1 socks.

Difficulty: Medium

2007 AMC 8 (Problem 19) (Correct)

With Answer Choices

For any two consecutive positive integers n and $n+1$, the difference of their squares $(n+1)^2 - n^2$ simplifies to:

$[(n^2 + 2n + 1) - n^2] = 2n + 1$

This result is always odd (because it's the sum of an even number $2n$ and an odd number 1).

Therefore, the only odd number in the options, (C) 79, could be the difference of the squares of two consecutive positive integers.

Without Answer Choices

If you pick two consecutive positive integers and square them, the difference between the squares will always be odd, and it will be twice the smaller integer plus 1. This is a property that comes from the difference of squares identity, $(a+b)(a-b) = a^2 - b^2$.

If we pick the two consecutive positive integers as n and $n+1$, the difference between their squares will be:

$(n+1)^2 - n^2 = n^2 + 2n + 1 - n^2 = 2n + 1$

Since the sum of the integers is less than 100, the largest integer n we can pick is 49. This makes the maximum difference $2*49 + 1 = 99$. **So the difference of the squares of any two consecutive positive integers whose sum is less than 100 is an odd number less than or equal to 99.**

Difficulty: Medium

2009 AMC 8 (Problem 15) (Incorrect)

To find out the maximum number of servings Jordan can make, we need to find out which ingredient limits the number of servings he can make. We then divide the amount of each ingredient Jordan has by the amount of that ingredient required per serving. The smallest number we get is the number of servings Jordan can make.

The recipe requires:

- 2 squares of chocolate for 5 servings, so it's 2/5 = 0.4 squares of chocolate per serving. Jordan has 5 squares, so he can make 5/0.4 = 12.5 servings with his chocolate.
- 1/4 cup of sugar for 5 servings, so it's (1/4)/5 = 0.05 cup of sugar per serving. Jordan has 2 cups of sugar, so he can make 2/0.05 = 40 servings with his sugar.
- 1 cup of water for 5 servings, so it's 1/5 = 0.2 cups of water per serving. Jordan has lots of water, so this ingredient does not limit the number of servings he can make.
- 4 cups of milk for 5 servings, so it's 4/5 = 0.8 cups of milk per serving. Jordan has 7 cups of milk, so he can make 7/0.8 = 8.75 servings with his milk.

The smallest of these numbers is 8.75, but since he cannot make a fraction of a serving, we need to round down to the nearest whole number. **Therefore, the greatest number of servings of hot chocolate Jordan can make is 8.**

Difficulty: Medium

AMC 8, 2010, Problem 15

Let's start by figuring out the total number of gumdrops. We know that 30% are blue, 20% are brown, 15% are red, 10% are yellow, and the remaining gumdrops are green.

The problem statement says that there are 30 green gumdrops, which we can equate to the remaining percentage of gumdrops, 100% - 30% - 20% - 15% - 10% = 15%.

Therefore, if 15% of the gumdrops is equal to 30 green gumdrops, we can find out the total number of gumdrops as follows:

30 gumdrops / 15% = 30 / 0.15 = 200 total gumdrops.

Now, we know that:

- 30% of 200 gumdrops are blue, so there are 0.30 * 200 = 60 blue gumdrops.
- 20% of 200 gumdrops are brown, so there are 0.20 * 200 = 40 brown gumdrops.

Then, half of the blue gumdrops are replaced with brown gumdrops. This means there are 60/2 = 30 blue gumdrops that are replaced with brown ones.

Finally, the total number of brown gumdrops will now be the original number of brown gumdrops plus the replaced blue gumdrops, so there will be 40 brown gumdrops + 30 replaced gumdrops = **70 brown gumdrops.**

Difficulty: Medium

2017 AMC8 (Problem 23) (Incorrect)

Let's denote the number of minutes it takes Linda to travel one mile on the first day as "x" minutes.

On the second day, her speed decreases so that the number of minutes to travel one mile increases by 5 minutes. Therefore, on the second day, it takes her (x + 5) minutes to travel one mile.

Similarly, on the third day, it takes her (x + 10) minutes to travel one mile, and on the fourth day, it takes her (x + 15) minutes to travel one mile.

We know that each day, her distance traveled was an integer number of miles. Since her speed remained constant within each day, the number of minutes it took to travel one mile must also be a divisor of 60.

To find the possible values of "x", let's consider the divisors of 60. The divisors of 60 are 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, and 60.

Out of these divisors, let's find the values of "x" that satisfy the conditions for all four days.

If "x" is 1, it would result in (1 + 5 + 10 + 15) = 31 minutes for the total time, which is not possible since each day has 60 minutes.

If "x" is 2, it would result in (2 + 7 + 12 + 17) = 38 minutes for the total time, which is also not possible since each day has 60 minutes.

If "x" is 3, it would result in (3 + 8 + 13 + 18) = 42 minutes for the total time, which is still less than 60 minutes.

Continuing this pattern, we find that "x" cannot be 4, 5, 6, or 10 since the total time would still be less than 60 minutes.

If "x" is 12, it would result in (12 + 17 + 22 + 27) = 78 minutes for the total time, which is more than 60 minutes.

Therefore, the only possible value for "x" is 15. With "x" equal to 15, the total time for the four trips is (15 + 20 + 25 + 30) = 90 minutes, which is equal to 60 minutes (1 hour) multiplied by the number of trips (4).

Since Linda traveled for one hour each day, the total number of miles for the four trips is 1 mile per hour * 4 hours = 4 miles.

Therefore, the total number of miles for the four trips is 4 miles.

Difficulty: Hard

2014 AMC8 (Problem 24) (Incorrect)

The median is the middle number in a sorted list of numbers. If there's an even number of numbers, the median is the average of the two middle numbers.

Here, we have 100 customers, an even number, so the median will be the average of the 50th and 51st customers when sorted in non-decreasing order.

To maximize the median, we want as many customers as possible to have bought fewer cans than the median. Since every customer bought at least one can, we will give 1 can to the first 49 customers. This will ensure that the 50th and 51st customers (which determine the median) can have as many cans as possible.

The total number of cans given to the first 49 customers is $49 * 1 = 49$ cans.

Subtracting these from the total, we get $252 - 49 = 203$ cans remaining for the other 51 customers.

Since we're trying to maximize the median, we want the 50th and 51st customers to have as many cans as possible. Therefore, we should give the remaining cans to these customers and the others that come after.

But we can't give them all to the 50th and 51st customers, because that would mean the remaining customers (52nd to 100th) get none, violating the condition that every customer bought at least one can.

So we will give 1 can each to the 52nd to 100th customers, which is 49 cans in total. Now we have $203 - 49 = 154$ cans left.

Now, we can distribute these remaining cans equally to the 50th and 51st customers. Each gets $154/2 = 77$ cans.

So, the maximum possible median number of cans of soda bought per customer on that day is 77.

Difficulty: Hard

2010 AMC8 (Problem 24) (Correct)

To compare these numbers, it's helpful to express them with the same base.

Let's rewrite these numbers using base 2 because all of these numbers can be expressed as powers of 2.

- $10^8 = (2^{10} * 5^2)^4 = 2^{40} * 5^8$
- $5^{12} = (2^2 * 5)^{12} = 2^{24} * 5^{12}$
- 2^{24}

Now it's clear to see the order of these three numbers based on the power of 2 and the power of 5 in each expression.

The smallest number is 2^{24} because it does not have a term involving 5, and 5^n is always greater than 1 for any positive integer n.

Next, between $2^{40} * 5^8$ (10^8) and $2^{24} * 5^{12}$ (5^{12}), although 2^{40} is larger than 2^{24}, the presence of the larger power of 5 in 5^{12} makes 5^{12} larger than 10^8.

So, the correct ordering of the numbers 10^8, 5^{12}, and 2^{24} is:

$2^{24} < 10^8 < 5^{12}$

Difficulty: Hard

2009 AMC8 (Problem 23) (Correct)

Let's denote the number of boys as "b" and the number of girls as "g". According to the problem, we know that:

1. Each boy received "b" jelly beans, so the total number of jelly beans the boys received is b^2.
2. Each girl received "g" jelly beans, so the total number of jelly beans the girls received is g^2.
3. The total number of jelly beans that Mrs. Awesome brought to class was 400, and she had six left, meaning she gave out 400 - 6 = 394 jelly beans.
4. The number of boys was two more than the number of girls, so b = g + 2.

We can use this information to set up the following equation, which represents the total number of jelly beans given out:

$b^2 + g^2 = 394$

Substitute b = g + 2 into the equation:

$(g + 2)^2 + g^2 = 394$ $g^2 + 4g + 4 + g^2 = 394$ $2g^2 + 4g - 390 = 0$

Divide the equation by 2 to simplify:

$g^2 + 2g - 195 = 0$

This quadratic equation can be factored to:

$(g - 13)(g + 15) = 0$

The roots of the equation are g = 13 and g = -15. Since the number of girls can't be negative, g = 13 is the solution.

Substitute g = 13 into the equation b = g + 2 to find:

b = 13 + 2 = 15

So, there were 15 boys and 13 girls in the class, which means there were 15 + 13 = **28 students in Mrs. Awesome's class.**

Difficulty: Hard

2009 AMC8 (Problem 21) (Correct)

Given that Andy adds the numbers in each row and Bethany adds the numbers in each column, it's clear that they are both adding the same total set of numbers. The total sum of the array of numbers is the same whether you add them row by row or column by column.

Andy's average sum is calculated by dividing the total sum by the number of rows (40), while Bethany's average sum is calculated by dividing the total sum by the number of columns (75).

Therefore, the ratio A/B is equivalent to the ratio of the number of columns to the number of rows, because the total sum cancels out in the ratio. That is:

A/B = (Number of columns) / (Number of rows)

A/B = 75 / 40

A/B = 15/8

So, the value of A/B is 15/8.

Note: In the initial question, no answer choices were provided. If there were multiple choice answers, the correct choice would be **15/8 or 1.875** if the answers were in decimal form.

Difficulty: Hard

Category: Combinatorics

2006 AMC8 (Problem 4) (Correct)

First, let's understand how much one revolution of a spinner covers. One full revolution of a spinner means going around once completely, which includes North, South, East, and West, and then coming back to the starting point.

To simplify the problem, we'll use a positive number to represent a clockwise turn and a negative number to represent a counter-clockwise turn. So, Chenille's first move is a clockwise turn of 21/4 revolutions, and the second move is a counter-clockwise turn of -3 3/4 (-15/4 when converted to improper fraction) revolutions.

Adding these two moves together:

21/4 - 15/4 = 6/4 = 1.5 revolutions

This means that the spinner has moved 1.5 revolutions clockwise from its initial position.

We can disregard the full revolution (1 revolution) because it will bring us back to the starting point (which is West). So, we need to just focus on the 0.5 revolution.

A clockwise movement of 0.5 revolution from West will lead us to the East.

So, after the two moves, the spinner points to the East.

Difficulty: Easy

2007 AMC8 (Problem 5) (Correct)

Let's first figure out how much birthday money Chandler received in total. Adding up the amounts from his grandparents, his aunt, and his cousin gives us:

50 (from grandparents) + 35 (from aunt) + 15 (from cousin) = 100

So, Chandler received 100 in birthday money.

Next, we need to figure out how much more money Chandler needs to buy the mountain bike. If the bike costs 500 and he already has 100, he still needs:

500 (cost of bike) - 100 (birthday money) = 400

Chandler earns 16 per week from his paper route. To figure out how many weeks it will take for him to earn the remaining 400, we need to divide the amount he needs by the amount he earns each week:

400 (amount needed) / 16 (amount earned per week) = 25 weeks

So, it will take Chandler **25 weeks** to earn enough money from his paper route to buy the mountain bike, assuming he saves all his earnings.

Difficulty: Easy

2010 AMC8 (Problem 8) (Correct)

Since we are asked to find the possible sums of a chip drawn from each bag, we can list out the possible sums:

From Bag A and Bag B, we can have the following sums:

- 1 (from Bag A) + 2 (from Bag B) = 3
- 1 + 4 = 5
- 1 + 6 = 7
- 3 + 2 = 5
- 3 + 4 = 7
- 3 + 6 = 9
- 5 + 2 = 7
- 5 + 4 = 9
- 5 + 6 = 11

So, the possible sums are 3, 5, 7, 9, and 11. Therefore, there are **5 different possible values** for the sum of the two numbers on the chips drawn from each bag.

Difficulty: Easy

2017 AMC8 (Problem 10) (Correct)

When three cards are selected randomly without replacement from a box containing five cards numbered 1, 2, 3, 4, and 5, there are a total of C(5, 3) = 10 possible combinations.

For the number 4 to be the largest value selected, the other two cards must be chosen from the remaining three cards (1, 2, and 3). There are C(3, 2) = 3 ways to do this (selecting {1, 2}, {1, 3}, or {2, 3} along with the number 4).

Therefore, the probability that 4 is the largest value selected is the number of favorable outcomes divided by the total number of outcomes, which is **3/10 = 0.3.**

Difficulty: Easy

2012 AMC 8 (Problem 10) (Incorrect)

The four-digit numbers that can be formed using the digits 2, 0, 1, 2 are numbers that either begin with the digit 1 or the digit 2.

1. If the number starts with the digit 1, the next three spots can be filled by the remaining three digits (2, 0, 2) in 3! / 2! ways. The division by 2! is because we have a repetition of the digit 2. Therefore, 3! / 2! = 3 ways.
2. If the number starts with the digit 2, the second digit can't be 0 because the number must be greater than 1000. So, the second digit must either be 1 or 2. If it's 1, the last two spots can be filled in 2! ways (with 0 and 2), and if it's 2, the last two spots can also be filled in 2! ways (with 0 and 1). Therefore, there are 2 * 2! = 4 ways in this case.

Adding up the cases gives us a total of 3 + 4 = 7 four-digit numbers that can be formed from the digits 2, 0, 1, 2 that are greater than 1000.

Difficulty: Easy

2008 AMC8 (Problem 17) (Correct)

The formula for the perimeter of a rectangle is P = 2l + 2w, where l is the length and w is the width. If the perimeter is 50 units, then we have 2l + 2w = 50, which simplifies to l + w = 25. So the sum of the length and the width must be 25 units.

The area of a rectangle is given by A = lw. To maximize the area, the length and width should be as close to each other as possible (for a given perimeter, a square has the maximum area). So for maximum area, we should choose l = w = 12.5. But the problem specifies integer side lengths, so we choose the closest integer values, which are 12 and 13. This gives a maximum area of 12 * 13 = 156.

To minimize the area, one of the dimensions should be as small as possible, and the other as large as possible. The smallest integer length or width we can have is 1 (since they have to be positive), which makes the other dimension 24. This gives a minimum area of 1 * 24 = 24.

Therefore, the difference between the largest and smallest possible areas of the rectangles is 156 - 24 = 132.

Difficulty: Medium

2004 AMC8 (Problem 14) (Incorrect)

Given that exactly one of the statements is true, let's examine each statement and the implications.

1. **1.** If Statement I (Bill is the oldest) were true, then Statement II (Amy is not the oldest) would also be true because Bill can't be the oldest and Amy be the oldest at the same time. This would mean there are two true statements, which contradicts the given condition that exactly one statement is true. Hence, Statement I is false, which means Bill is not the oldest.
2. **2.** If Statement II (Amy is not the oldest) were true, it would be the only true statement because we already know from our analysis of Statement I that Bill can't be the oldest. So, if Amy is not the oldest, then Celine must be the oldest. Hence, Statement II could be true.
3. **3.** If Statement III (Celine is not the youngest) were true, then Statement II (Amy is not the oldest) would also be true, because if Celine isn't the youngest, she could be the oldest or middle-aged, but in both cases, Amy is not the oldest. So if Statement III were true, we would have two true statements, which contradicts the given condition that exactly one statement is true. Hence, Statement III is false, which means Celine is the youngest.

From our analysis, the only statement that can be true without contradicting the given condition is Statement II, so Amy is not the oldest, and from our conclusions above, Bill isn't the oldest and Celine is the youngest. Therefore, Celine must be the youngest, Amy must be in the middle, and Bill, by process of elimination, must be the oldest.

So, from oldest to youngest: Bill, Amy, Celine.

Difficulty: Medium

2003 AMC 8 (Problem 16) (Incorrect)

First, we need to decide who is driving. Since only Bonnie and Carlo can drive, there are 2 choices for the driver's seat.

Once the driver has been chosen, there are 3 people left to sit in the remaining 3 seats. The number of ways to arrange these 3 people in 3 seats is given by 3!, which is 3 * 2 * 1 = 6.

Therefore, the total number of possible seating arrangements is 2 (choices for driver) * 6 (arrangements of the other passengers) = 12.

Difficulty: Medium

2009 AMC 8 (Problem 13) (Correct)

An integer is divisible by 5 if and only if its last digit is 0 or 5. Since we only have the digits 1, 3, and 5, the last digit must be 5 for the number to be divisible by 5.

There are 3! = 3 * 2 * 1 = 6 total ways to arrange the digits 1, 3, and 5 into a three-digit number. However, if we fix the last digit as 5, there are 2! = 2 * 1 = 2 ways to arrange the remaining digits (1 and 3) in the first two places.

Therefore, the probability that a three-digit number formed with the digits 1, 3, and 5 is divisible by 5 is 2 (favorable outcomes) divided by 6 (total outcomes), or **2/6 = 1/3.**

Difficulty: Medium

2002 AMC 8 (Problem 18) (Correct)

First, calculate the total time Gage skated over the first 8 days.

He skated for 1 hour 15 minutes (which is 75 minutes) each day for 5 days, so that's a total of 75 * 5 = 375 minutes.

Then he skated for 1 hour 30 minutes (which is 90 minutes) each day for 3 days, so that's a total of 90 * 3 = 270 minutes.

Therefore, over the first 8 days, Gage skated for a total of 375 + 270 = 645 minutes.

He wants to average 85 minutes of skating each day over 9 days. The total time he would need to skate over those 9 days to meet this average is 85 * 9 = 765 minutes.

So on the ninth day, he would need to skate for 765 - 645 = **120 minutes in order to average 85 minutes of skating each day. This is equivalent to 2 hours.**

Difficulty: Medium

2001 AMC 8 (Problem 22) (Incorrect)

Given the scoring rules, we can derive the following:

- If a student answers all questions correctly, they get 20 * 5 = 100 points.
- If a student leaves all questions unanswered, they get 20 * 1 = 20 points.
- If a student answers all questions incorrectly, they get 20 * 0 = 0 points.

So any score between 0 and 100 should be possible if it is a multiple of 5 (for answered questions) or can be reached by adding multiples of 5 (for correct answers) to multiples of 1 (for unanswered questions).

Without specific score options provided, I can't say which scores are not possible, but the rule above should help you identify any impossible scores. **If a score isn't a multiple of 5 and also can't be reached by adding a multiple of 5 to a number from 0 to 20, then that score isn't possible on this test.**

Difficulty: Hard

2019 AMC8 (Problem 25) (Incorrect)

Since each person needs to have at least 2 apples, we should first give 2 apples to each person, which uses up 2*3 = 6 apples. That leaves 24 - 6 = 18 apples to be distributed freely among the 3 people.

The number of ways to distribute n identical items among r distinct groups (in this case, people) is given by the formula for combinations with repetitions, which is (n + r - 1) choose (r - 1). In this case, n is 18 (the number of apples left to distribute) and r is 3 (the number of people), so we need to calculate (18 + 3 - 1) choose (3 - 1), which is 20 choose 2.

20 choose 2 = 20! / [(20 - 2)! * 2!] = 20 * 19 / 2 = 190.

Therefore, there are 190 ways for Alice to share the 24 apples with Becky and Chris such that each person gets at least 2 apples.

Difficulty: Hard

2016 AMC8 (Problem 21) (Incorrect)

Let's consider all the ways in which we could draw the chips until all three reds are drawn or both green chips are drawn.

There are two scenarios that would cause us to stop drawing chips:

1. We draw all three red chips (RRR, RRRG, RRRGG, RRG, RG, GRR, GRRR, GGRR, GR).
2. We draw both green chips (GG, GGR, GGRR, GRRG, GRRGR, GRG, RGGR, RGGRR, RGRG, RRGG, RRGGR, RGR).

Out of these 15 sequences, 9 of them result in drawing all three red chips, and 6 result in drawing both green chips.

So the probability that we draw all three reds is 9/15 = 3/5 = 0.6.

Difficulty: Hard

2015 AMC8 (Problem 23) (Incorrect)

In order to place the slips into the cups such that the sums are consecutive integers, we need to work out a strategy that balances the distribution of the slips.

Note that the total sum of all slips is 34. Given that there are 5 cups, and the sums need to be consecutive, we could say the sums are (n), (n+1), (n+2), (n+3), (n+4), where n is an integer.

Given that the sum of these five consecutive integers is 34, we can say: 5n + 10 = 34, so 5n = 24, and therefore n = 24/5 = 4.8. But since n needs to be an integer, this is not possible.

The only way it's possible is if the sums are (n), (n+1), (n+2), (n+3), (n+4) and (n+5). The sum of these six consecutive integers is 6n + 15 = 34, so 6n = 19, which still doesn't yield an integer value for n.

Therefore, the problem statement contains a mistake or a misunderstanding, as the conditions can't be satisfied with the provided data as of my knowledge cutoff in September 2021.

Difficulty: Hard

2012 AMC8 (Problem 22) (Incorrect)

In a set with an odd number of terms, the median is the middle number when the numbers are listed in numerical order. For the set R, with nine distinct integers, the median will be the fifth number when listed in order.

The six given elements are 2, 3, 4, 6, 9, and 14. The three missing elements could either be less than, between, or greater than these numbers.

1. If the missing numbers are all less than 2 (the smallest of the given numbers), then 2 will be the median.
2. If two missing numbers are less than 2 and one number is between 2 and 3, then 3 will be the median.
3. If one missing number is less than 2 and two numbers are between 2 and 3, then there will be two possible values for the median, 2 and 3.
4. If all missing numbers are between 2 and 3, then 2 will be the median.

5. If all missing numbers are greater than 14 (the largest of the given numbers), then 6 will be the median.
6. If two missing numbers are greater than 14 and one number is between 4 and 6, then 4 will be the median.
7. If one missing number is greater than 14 and two numbers are between 4 and 6, then there will be two possible values for the median, 4 and 6.
8. If all missing numbers are between 4 and 6, then 4 will be the median.

So, in total, there are 6 distinct possible medians for the set R: 2, 3, 4, and 6.

Difficulty: Hard

Category: Computation

2006 AMC8 (Problem 1) (Correct)

First, let's find the sum of the three amounts:

1.98 + 5.04 + 9.89 = 16.91

Rounding 16.91 to the nearest dollar gives us $17.

Therefore, Mindy's total, to the nearest dollar, was $17.

Difficulty: Easy

1990 AJHSME (Problem 2) (Correct)

The number .12345 can be broken down into:

- 0.1
- 0.02
- 0.003
- 0.0004
- 0.00005

Each subsequent digit contributes less to the overall value of the number because it's further to the right in the decimal, and therefore represents a smaller fraction.

So, if we change any digit to 9, we'll get the largest increase by changing the leftmost digit. In this case, changing the 1 in the tenths place (0.1) to a 9 would give the largest number. **The result would be 0.92345.**

Difficulty: Easy

2022 AMC8 (Problem 7) (Correct)

First, we need to convert the size of the song from megabytes to kilobits. Given that 1 megabyte equals 8000 kilobits:

4.2 megabytes * 8000 kilobits/megabyte = 33600 kilobits

Now, we can calculate the time it takes to download this song at a speed of 56 kilobits per second:

33600 kilobits / 56 kilobits/second = 600 seconds

Finally, we convert seconds to minutes (since there are 60 seconds in a minute):

600 seconds / 60 seconds/minute = 10 minutes

So, it would have taken approximately 10 minutes to download a 4.2-megabyte song at a speed of 56 kilobits per second.

Difficulty: Easy

2023 AMC8 (Problem 1) (Correct)

First, we need to remember the order of operations, which can be remembered by the acronym PEMDAS: Parentheses, Exponents, Multiplication and Division (from left to right), Addition and Subtraction (from left to right).

Applying this rule to the given expression:

(8 x 4 + 2) - (8 + 4 x 2) becomes

(32 + 2) - (8 + 8) which becomes

34 - 16 = 18

So, the value of the given expression is 18.

Difficulty: Easy

1985 AJHSME (Problem 1) (Correct)

Let's simplify this expression step by step:

(3 x 5)/(9 x 11) * (7 x 9 x 11)/(3 x 5 x 7)

First, we can cancel out the terms that appear both in the numerator and the denominator:

= (1)/(1) * (1)/(1)

This simplifies to:

= 1

So, the value of the given expression is 1.

Difficulty: Easy

2008 AMC8 (Problem 12) (Incorrect)

The height the ball reaches after each bounce forms a geometric sequence where each term is 2/3 of the previous term. The general form of a geometric sequence is a * r^(n-1), where a is the first term, r is the common ratio, and n is the term number.

We need to find the first term n for which the height is less than 0.5 meters.

So we set up the inequality: a * r^(n-1) < 0.5, where a = 2 (the height after the first bounce), and r = 2/3.

2 * (2/3)^(n-1) < 0.5

Taking the natural logarithm of both sides (since it's easier to solve for exponents this way) and using properties of logarithms to simplify:

(n-1) * ln(2/3) < ln(0.25)

n-1 < ln(0.25) / ln(2/3)

n < ln(0.25) / ln(2/3) + 1

Using a calculator, ln(0.25) / ln(2/3) equals about 2.71.

n < 2.71 + 1

n < 3.71

Since n must be an integer (you can't have a fraction of a bounce), we round up to the nearest whole number. So n = 4.

Therefore, on the fourth bounce, the ball will not rise to a height of 0.5 meters.

Difficulty: Medium

2012 AMC 10B (Problem 5) (Incorrect)

Let's denote the cost of the meal before tax or tip as M. According to the problem:

1. The tax is 10% of the meal price, which equals 0.1M.
2. The tip is 15% of the meal price, which equals 0.15M.

The total cost of dinner is the sum of the meal price, the tax, and the tip. Therefore, we can set up the following equation:

M (meal price) + 0.1M (tax) + 0.15M (tip) = 27.50

Combine like terms to simplify:

1.25M = 27.50

Solve for M (meal price) by dividing both sides by 1.25:

M = 27.50 / 1.25 = 22 dollars

Therefore, the cost of her dinner without tax or tip was $22.

Difficulty: Medium

2011 AMC 10B (Problem 19) (Correct)

First, let's simplify the expressions in the parentheses:

(2+4+6) = 12

(1+3+5) = 9

So the given expression becomes:

12/9 - 9/12

Before subtracting the fractions, we need to simplify them:

12/9 simplifies to 4/3 and 9/12 simplifies to 3/4.

So the expression now is:

4/3 - 3/4

In order to subtract these fractions, we need to find a common denominator. The least common multiple of 3 and 4 is 12, so we convert each fraction to have a denominator of 12:

16/12 - 9/12

Finally, subtract the fractions:

(16-9)/12 = 7/12

So, the value of the given expression is 7/12.

Difficulty: Medium

2004 AMC 10A (Problem 1) (Correct)

If you and your five friends are to raise $1500 equally, you would divide the total amount by the number of people.

So, $1500 ÷ 6 people = $250 per person

Therefore, each of you will need to raise $250.

Difficulty: Medium

2013 AMC 10A (Problem 2) (Incorrect)

To determine how many times Alice must fill her 1/4 cup measuring cup to get 2 1/2 cups of sugar, we can set up a proportion:

(1/4) / (x) = (2 1/2) / (1)

First, we convert the mixed number 2 1/2 to an improper fraction:

2 1/2 = (2 * 2 + 1) / 2 = 5/2

Now, we can rewrite the proportion:

(1/4) / (x) = (5/2) / (1)

To solve for x, we can cross multiply:

1 * (1/4) = x * (5/2)

Multiplying both sides:

1/4 = (5x) / 2

To isolate x, we can multiply both sides by 2:

(2 * 1/4) = 5x

1/2 = 5x

Now, we can solve for x by dividing both sides by 5:

(1/2) / 5 = x

1/10 = x

Therefore, Alice must fill her 1/4 cup measuring cup 1/10 or 0.1 times to get the correct amount of sugar, which is equivalent to filling it once.

Difficulty: Medium

2022 AMC 12A (Problem 1) (Correct)

To evaluate the expression, we should start from the innermost parentheses:

1/(3 + 1/(3 + 1/3))

First, compute the value of 1/3, which is 0.3333 (repeating).

Then we add that to 3:

3 + 0.3333 = 3.3333

Next, we take the reciprocal of that number (which means we divide 1 by that number):

1/3.3333 = 0.3

Add that to 3:

3 + 0.3 = 3.3

Again, we take the reciprocal of that sum:

1/3.3 = 0.30303 (repeating)

Finally, we add 3 to that number:

0.30303 + 3 = 3.30303

So the value of the expression 1/(3 + 1/(3 + 1/3)) + 3 is approximately 3.30303.

Note: 3.30303 = 109/33

Difficulty: Hard

2022 AMC 12A (Problem 8) (Correct)

To find the value of the given infinite product, let's denote it as PP:
P=103 · 1033 · 10333…P=310 · 3310 · 33310

…

We can observe a pattern in the exponents of the radicals. The index of each radical is increasing by a factor of 3 as we go further. So, we can rewrite PP as follows:
P=103 · 10133 · 10193…P=310

· 31031 · 31091

…

Now, let's consider the exponent of 10 in each term of the product: 1331, 132321, 133331, 134341, and so on.

We can notice that the exponents form a geometric progression with a common ratio of 1331. To determine the sum of this infinite geometric progression, we'll use the formula for the sum of an infinite geometric series: S=a1−r,S=1−ra, where aa is the first term and rr is the common ratio.

In our case, a=13a=31 and r=13r=31, so the sum of the exponents is:
S=131−13=1323=12.S=1−3131=3231=21.

Therefore, the infinite product PP converges to the real number 10 raised to the power of 1221:
P=1012=10.P=1021=10

.

Hence, the value of the given infinite product is sqrt10

Difficulty: Hard

2022 AMC 12B (Problem 1)

First, recall that the symbol "|x - y|" represents the absolute difference between x and y.

Let's start by calculating each expression individually.

In the first expression, we have:

2 | | 3 = |2 - 3| = |-1| = 1

Then, we plug this into the first expression:

1 | | 1 = |1 - 1| = 0

Now let's do the same thing for the second expression:

1 | | 2 = |1 - 2| = |-1| = 1

Then:

1 | | 3 = |1 - 3| = |-2| = 2

Finally, subtract the results:

(1 | | (2 | | 3)) - ((1 | | 2) | | 3) = 0 - 2 = -2

So, the value of the given expression is -2.

Difficulty: Hard

2021 Fall AMC 12A (Problem 10)

In base nine, the number $27{,}006{,}000{,}052_{\text{nine}}$ can be represented as:

$2 \cdot 9^{10} + 7 \cdot 9^9 + 6 \cdot 9^6 + 5 \cdot 9 + 2$

To find the remainder of N when divided by 5, we can evaluate each term mod 5:

$2 \cdot 9^{10} \equiv 2 \cdot (-1)^{10} \equiv 2 \cdot 1 \equiv 2 \mod 5$ $7 \cdot 9^9 \equiv 7 \cdot (-1)^9 \equiv -7 \equiv 3 \mod 5$ $6 \cdot 9^6 \equiv 6 \cdot (-1)^6 \equiv 6 \cdot 1 \equiv 1 \mod 5$ $5 \cdot 9 \equiv 5 \cdot (-1) \equiv -5 \equiv 0 \mod 5$ $2 \equiv 2 \mod 5$

Adding these terms up:

$2 + 3 + 1 + 0 + 2 \equiv 8 \mod 5$

Therefore, the remainder when N is divided by 5 is 3 (since $8 \equiv 3 \mod 5$).

Difficulty: Hard

2021 Spring AMC 12A (Problem 9)

The given expression is a product of sums of powers of 2 and 3. Notice that each term in the product can be rewritten as a difference of squares:

$(2 + 3)(2^2 + 3^2)(2^4 + 3^4)(2^8 + 3^8)(2^{16} + 3^{16})(2^{32} + 3^{32})(2^{64} + 3^{64})$

$= (3^2 - 2^2)(3^4 - 2^4)(3^8 - 2^8)(3^{16} - 2^{16})(3^{32} - 2^{32})(3^{64} - 2^{64})(3^{128} - 2^{128})$

Then we can use the difference of squares formula, $a^2 - b^2 = (a - b)(a + b)$, to rewrite each term:

$= (3 - 2)(3 + 2)(3^2 - 2^2)(3^2 + 2^2)...(3^{64} - 2^{64})(3^{64} + 2^{64})$

Continue this pattern until the final term:

$= (3 - 2)(3 + 2)(3^2 - 2^2)(3^2 + 2^2)...(3^{64} - 2^{64})(3^{64} + 2^{64})(3^{128} - 2^{128})(3^{128} + 2^{128})$

Then replace 3 - 2 with 1 and simplify:

$= (3 + 2)(3^2 + 2^2)...(3^{64} + 2^{64})(3^{128} + 2^{128})$

Now you'll see that each term in the product is the sum of two different powers of 3 and 2, so the entire expression is simply:

$= 3^{128} + 2^{128}$

So, the given expression is equivalent to $3^{128} + 2^{128}$.

Difficulty: Hard