- Casey's shop class is making a golf trophy. He has to paint 300 dimples on a golf ball. If it takes him 2 seconds to paint one dimple, how many minutes will he need to do his job?

(A) 4 **(B)** 6 **(C)** 8 **(D)** 10 **(E)** 12

2001 AMC 8, Problem #1—"Find the time in seconds"

- **Solution (D)** At 2 seconds per dimple, it takes $300 \times 2 = 600$ seconds to paint them. Since there are 60 seconds in a minute, he will need $600 \div 60 = 10$ minutes.

Difficulty: Easy

NCTM Standard: Measurement Standard for Grades 6–8: Understand relationships among units and convert from one unit to another within the same system.

Mathworld.com Classification:
Number Theory > Arithmetric > General Arithmetic > Arithmetic

- I'm thinking of two whole numbers. Their product is 24 and their sum is 11. What is the larger number?

(A) 3 **(B)** 4 **(C)** 6 **(D)** 8 **(E)** 12

2001 AMC 8, Problem #2—"Find the factors of 24"

- **Solution (D)** Number pairs whose product is 24 are (1,24), (2,12), (3,8) and (4,6). The sum of the third pair is 11, so the numbers are 3 and 8. The larger one is 8.

Difficulty: Easy

NCTM Standard: Number and Operations Standard for Grades 6–8: Use factors, multiples, prime factorization, and relatively prime numbers to solve problems.

Mathworld.com Classification:
Number Theory > Factoring > Factorization

- Granny Smith has \$63. Elberta has \$2 more than Anjou and Anjou has one-third as much as Granny Smith. How many dollars does Elberta have?

(A) 17 **(B)** 18 **(C)** 19 **(D)** 21 **(E)** 23

2001 AMC 8, Problem #3—"How much does Anjou have?"

- **Solution (E)** Anjou has one-third as much money as Granny Smith, so Anjou has \$21. Elberta has \$2 more than Anjou, and $\$21 + \$2 = \$23$.

Difficulty: Easy

NCTM Standard: Algebra Standard for Grades 6–8: Use symbolic algebra to represent situations and to solve problems, especially those that involve linear relationships.

Mathworld.com Classification:
Number Theory > Arithmetic > General Arithmetic > Arithmetic

- The digits 1, 2, 3, 4 and 9 are each used once to form the smallest possible **even** five-digit number. The digit in the tens place is

(A) 1 **(B)** 2 **(C)** 3 **(D)** 4 **(E)** 9

2001 AMC 8, Problem #4—"Find the units digit first"

- **Solution (E)** To make the number as small as possible, the smaller digits are placed in the higher-value positions. To make the number even, the larger even digit 4 must be the units digit. The smallest possible even number is 12394 and 9 is in the tens place.

Difficulty: Medium

NCTM Standard: Problem Solving Standard for Grades 6–8: Apply and adapt a variety of appropriate strategies to solve problems.

Mathworld.com Classification:
Number Theory > Integers > Even Number

- On a dark and stormy night Snoopy suddenly saw a flash of lightning. Ten seconds later he heard the sound of thunder. The speed of sound is 1088 feet per second and one mile is 5280 feet. Estimate, to the nearest half-mile, how far Snoopy was from the flash of lightning.

(A) 1 **(B)** $1\frac{1}{2}$ **(C)** 2 **(D)** $2\frac{1}{2}$ **(E)** 3

2001 AMC 8, Problem #5—"How many feet away was Snoopy?"

- **Solution (C)** In 10 seconds sound travels $1088 \times 10 = 10880$ ft, which is just 320 feet more than two miles. Therefore, Snoopy is just about two miles from the lightning.

Difficulty: Medium

NCTM Standard: Measurement Standard for Grades 6–8: Understand relationships among units and convert from one unit to another within the same system.

Mathworld.com Classification:
Number Theory > Arithmetic > General Arithmetic > Arithmetic

- Six trees are equally spaced along one side of a straight road. The distance from the first tree to the fourth is 60 feet. What is the distance in feet between the first and last trees?

(A) 90 **(B)** 100 **(C)** 105 **(D)** 120 **(E)** 140

2001 AMC 8, Problem #6—"Draw a diagram"

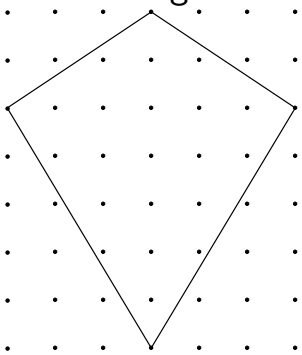
- **Solution (B)** There are three spaces between the first tree and the fourth tree, so the distance between adjacent trees is 20 feet. There are 6 trees with five of these 20-ft. spaces, so the distance between the first and last trees is 100 feet.

Difficulty: Medium-hard

NCTM Standard: Number and Operations Standard for Grades 6–8: Understand and use ratios and proportions to represent quantitative relationships.

Mathworld.com Classification:
Geometry > Geometric Similarity > Similarity

- To promote her school's annual Kite Olympics, Genevieve makes a small kite and a large kite for a bulletin board display. The kites look like the one in the diagram. For her small kite Genevieve draws the kite on a one-inch grid. For the large kite she triples both the height and width of the entire grid.



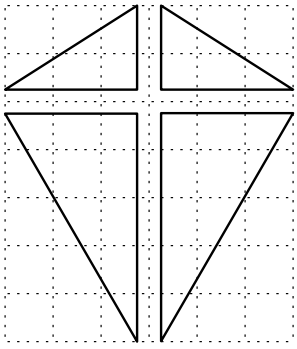
What is the number of square inches in the area of the small kite?

(A) 21 **(B)** 22 **(C)** 23 **(D)** 24 **(E)** 25

2001 AMC 8, Problem #7— "The area is made up of two pairs of congruent triangles."

- **Solution**

(A) The area is made up of two pairs of congruent triangles. The top two triangles can be arranged to form a 2×3 rectangle. The bottom two triangles can be arranged to form a 5×3 rectangle. The kite's area is $6 + 15 = 21$ square inches.



OR

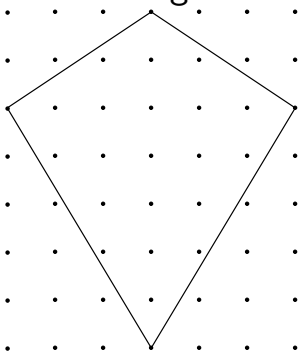
The kite can be divided into two triangles, each with base 7 and altitude 3. Each area is $(1/2)(7)(3) = 10.5$, so the total area is $2(10.5) = 21$ square inches.

Difficulty: Medium

NCTM Standard: Geometry Standard: Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships

Mathworld.com Classification: Discrete Mathematics > Point Lattices > Square Grid

- To promote her school's annual Kite Olympics, Genevieve makes a small kite and a large kite for a bulletin board display. The kites look like the one in the diagram. For her small kite Genevieve draws the kite on a one-inch grid. For the large kite she triples both the height and width of the entire grid.

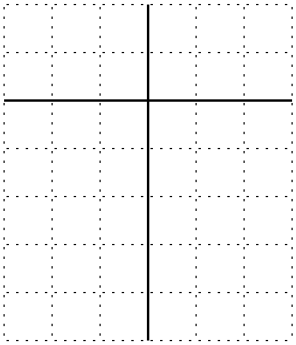


Genevieve puts bracing on her large kite in the form of a cross connecting opposite corners of the kite. How many inches of bracing material does she need?

(A) 30 **(B)** 32 **(C)** 35 **(D)** 38 **(E)** 39

2001 AMC 8, Problem #8— "The small kite is 6 inches wide and 7 inches high, what about the larger kite?"

(E) The small kite is 6 inches wide and 7 inches high, so the larger kite is 18 inches wide and 21 inches high. The amount of bracing needed is $18 + 21 = 39$ inches.

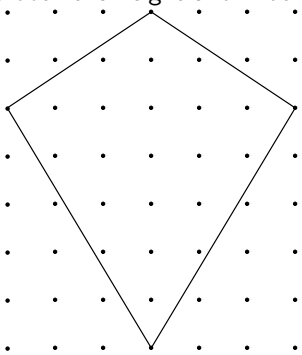


Difficulty: Medium-hard

NCTM Standard: Geometry Standard: Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships

Mathworld.com Classification: Discrete Mathematics > Point Lattices > Square Grid

- To promote her school's annual Kite Olympics, Genevieve makes a small kite and a large kite for a bulletin board display. The kites look like the one in the diagram. For her small kite Genevieve draws the kite on a one-inch grid. For the large kite she triples both the height and width of the entire grid.



The large kite is covered with gold foil. The foil is cut from a rectangular piece that just covers the entire grid. How many square inches of waste material are cut off from the four corners?

(A) 63 **(B)** 72 **(C)** 180 **(D)** 189 **(E)** 264

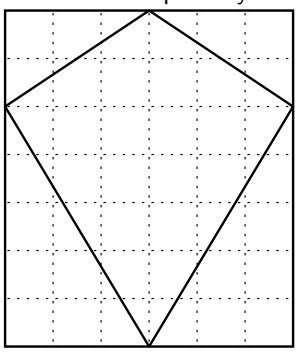
2001 AMC 8, Problem #9— "Find the area of each corner."

- **Solution**

(D) The upper corners can be arranged to form a 6×9 rectangle and the lower corners can be arranged to form a 15×9 rectangle. The total area is $54 + 135 = 189$ square inches. (Note that the kite's area is also 189 square inches.)

OR

The area cut off equals the area of the kite. If each dimension is tripled, the area is $3 \times 3 = 9$ times as large as the original area and $21 \times 9 = 189$ square inches. In general, if one dimension is multiplied by a number x and the other by a number y, the area is multiplied by $x \times y$.



Difficulty: Hard

NCTM Standard: Geometry Standard: Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships

Mathworld.com Classification: Discrete Mathematics > Point Lattices > Square Grid

- A collector offers to buy state quarters for 2000% of their face value. At that rate how much will Bryden get for his four state quarters?

(A) \$20 **(B)** \$50 **(C)** \$200 **(D)** \$500 **(E)** \$2000

2001 AMC 8, Problem #10—"Convert percentages to decimals"

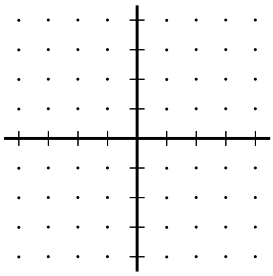
- **Solution (A)** 2000% = 20.00, so the quarters are worth 20 times their face value. That makes the total value 20(4)(\$0.25) = \$20.

Difficulty: Medium-hard

NCTM Standard: Number and Operations Standard for Grades 6–8: Develop meaning for percents greater than 100 and less than 1.

Mathworld.com Classification:
Number Theory > Arithmetic > Fractions > Percent

- Points A, B, C and D have these coordinates: $A(3, 2)$, $B(3, -2)$, $C(-3, -2)$ and $D(-3, 0)$. The area of quadrilateral $ABCD$ is



(A) 12 **(B)** 15 **(C)** 18 **(D)** 21 **(E)** 24

2001 AMC 8, Problem #11—"Divide into simpler polygons"

- **Solution (C)** The lower part is a 6×2 rectangle with area 12. The upper part is a triangle with base 6 and altitude 2 with area 6. The total area is $12 + 6 = 18$.

Difficulty: Medium

NCTM Standard: Geometry Standard for Grades 6–8: Use coordinate geometry to represent and examine the properties of geometric shapes.

Mathworld.com Classification:
Discrete Mathematics > Point Lattices > Pick's Theorem

- If $a \otimes b = \frac{a+b}{a-b}$, then $(6 \otimes 4) \otimes 3 =$

(A) 4 **(B)** 13 **(C)** 15 **(D)** 30 **(E)** 72

2001 AMC 8, Problem #12— "Substitute $\frac{a+b}{a-b}$ for $6 \otimes 4$ where $a = 6$ and $b = 4$."

- **Solution**

(A) $6 \otimes 4 = \frac{6+4}{6-4} = \frac{10}{2} = 5$, and $5 \otimes 3 = \frac{5+3}{5-3} = \frac{8}{2} = 4$.

Note: $(6 \otimes 4) \otimes 3 \neq 6 \otimes (4 \otimes 3)$. Does $(6 \otimes 4) \otimes 3 = 3 \otimes (6 \otimes 4)$?

Difficulty: Medium-hard

NCTM Standard: Algebra Standard: Represent and analyze mathematical situations and structures using algebraic symbols

Mathworld.com Classification: Foundations of Mathematics > Set Theory > Set Properties > Operation

- Of the 36 students in Richelle's class, 12 prefer chocolate pie, 8 prefer apple, 6 prefer blueberry, and as many of the remaining students prefer cherry pie as lemon. For Richelle's pie graph showing this data, how many degrees should she use for cherry pie?

(A) 10 **(B)** 20 **(C)** 30 **(D)** 50 **(E)** 72

2001 AMC 8, Problem #13— "Find the fraction of students that prefer cherry pie."

- **Solution**

(D) Since $12+8+6=26$, there are $36-26=10$ children who prefer cherry or lemon pie. These ten are divided into equal parts of 5 each.

$$\frac{5}{36}\times 360^\circ = 5\times 10^\circ = 50^\circ.$$

Difficulty: Medium-hard

NCTM Standard: Measurement Standard: Apply appropriate techniques, tools, and formulas to determine measurements

Mathworld.com Classification: Number Theory > Arithmetic > Fractions > Percent

- Tyler has entered a buffet line in which he chooses one kind of meat, two different vegetables and one dessert. If the order of food items is not important, how many different meals might he choose?

  Meat: beef, chicken, pork
  Vegetables: baked beans, corn, potatoes, tomatoes
  Dessert: brownies, chocolate cake, chocolate pudding, ice cream

(A) 4 **(B)** 24 **(C)** 72 **(D)** 80 **(E)** 144

2001 AMC 8, Problem #14—"Consider each category independently"

- **Solution (C)** There are 3 choices for the meat and 4 for dessert.

  There are 6 ways to choose the two vegetables. The first vegetable may be chosen in 4 ways and the second in 3 ways. This would seem to make 12 ways, but since the order is not important the 12 must be divided by 2. Otherwise both tomatoes/corn and corn/tomatoes would be included. The 6 choices are beans/corn, beans/potatoes, beans/tomatoes, corn/potatoes, corn/tomatoes and potatoes/tomatoes.

  The answer is 3(4)(6)=72.

Difficulty: Medium-hard

NCTM Standard: Problem Solving Standard for Grades 6–8: Apply and adapt a variety of appropriate strategies to solve problems.

Mathworld.com Classification:
Discrete Mathematics > Combinatorics > Enumeration

- Homer began peeling a pile of 44 potatoes at the rate of 3 potatoes per minute. Four minutes later Christen joined him and peeled at the rate of 5 potatoes per minute. When they finished, how many potatoes had Christen peeled?

(A) 20 **(B)** 24 **(C)** 32 **(D)** 33 **(E)** 40

2001 AMC 8, Problem #15—"How long do Homer and Christen work together?"

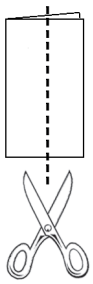
- **Solution (A)** After 4 minutes Homer had peeled 12 potatoes. When Christen joined him, the combined rate of peeling was 8 potatoes per minute, so the remaining 32 potatoes required 4 minutes to peel. In these 4 minutes Christen peeled 20 potatoes.

Difficulty: Medium

NCTM Standard: Measurement Standard for Grades 6–8: Solve simple problems involving rates and derived measurements.

Mathworld.com Classification:
Number Theory > Arithmetic > General Arithmetic > Arithmetic

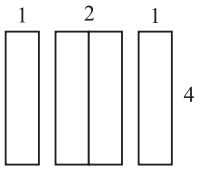
- A square piece of paper, 4 inches on a side, is folded in half vertically. Both layers are then cut in half parallel to the fold. Three new rectangles are formed, a large one and two small ones. What is the ratio of the perimeter of one of the small rectangles to the perimeter of the large rectangle?



(A) $\frac{1}{3}$ **(B)** $\frac{1}{2}$ **(C)** $\frac{3}{4}$ **(D)** $\frac{4}{5}$ **(E)** $\frac{5}{6}$

2001 AMC 8, Problem #16—"Use a diagram to compare the perimeters"

- **Solution (E)** The dimensions of the new rectangles are shown. The perimeter of a small rectangle is $4 + 1 + 4 + 1 = 10$ inches and for the large one it is $4 + 2 + 4 + 2 = 12$ inches. The ratio is $10/12 = 5/6$.



Difficulty: Hard

NCTM Standard: Geometry Standard for Grades 6–8: Describe sizes, positions, and orientations of shapes under informal transformations.

Mathworld.com Classification:
Recreational Mathematics > Folding > General Folding > Folding

- For the game show *Who Wants To Be A Millionaire?*, the dollar values of each question are shown in the following table (where K = 1000).

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Value	100	200	300	500	1K	2K	4K	8K	16K	32K	64K	125K	250K	500K	1000K

Between which two questions is the percent increase of the value the smallest?

(A) From 1 to 2 **(B)** From 2 to 3 **(C)** From 3 to 4 **(D)** From 11 to 12 **(E)** From 14 to 15

2001 AMC 8, Problem #17— "The percent increase from a to b is given by $\frac{b-a}{a}(100\%)$ "

- **Solution**

(B) The percent increase from a to b is given by $\frac{b-a}{a}(100\%)$ For example, the percent increase for the first two questions is $\frac{200-100}{100}(100\%) = 100\%$ Each time the amount doubles there is a 100% increase. The only exceptions in this game are 2 to 3 (50%), 3 to 4 ($66\frac{2}{3}\%$) and 11 to 12 (about 95%). The answer is (B).

Difficulty: Medium-hard

NCTM Standard: Algebra Standard: Analyze change in various contexts

Mathworld.com Classification: Number Theory > Arithmetic > Fractions > Percent

- Two dice are thrown. What is the probability that the product of the two numbers is a multiple of 5?

(A) $\frac{1}{36}$ **(B)** $\frac{1}{18}$ **(C)** $\frac{1}{6}$ **(D)** $\frac{11}{36}$ **(E)** $\frac{1}{3}$

2001 AMC 8, Problem #18—"How many products are not multiples of 5?"

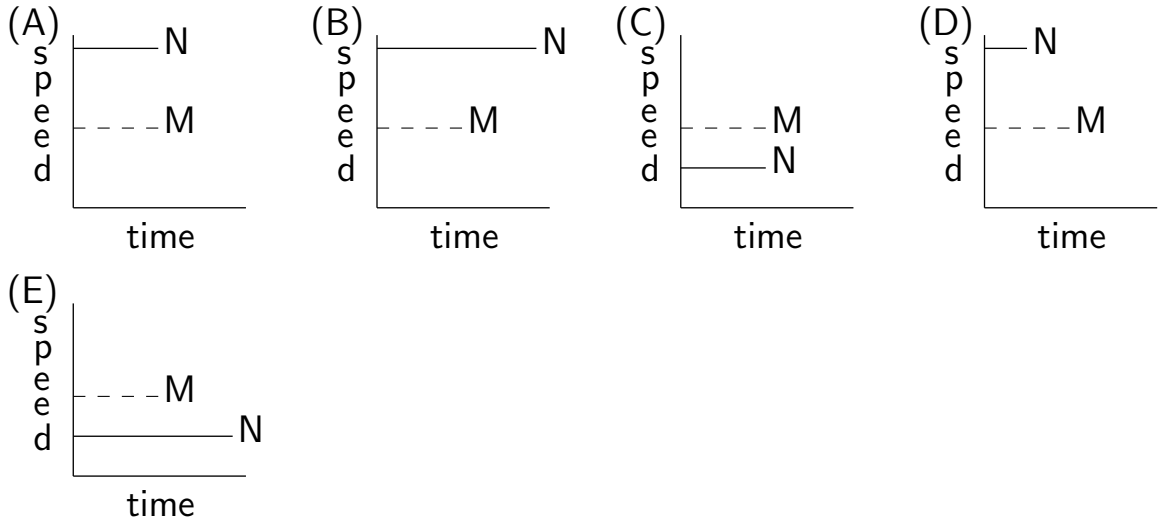
- **Solution (D)** There are $6 \times 6 = 36$ ways to roll the dice. If 5 is removed as a possibility, there are $5 \times 5 = 25$ products that are not multiples of 5. There are $36 - 25 = 11$ ways to roll the product, so the probability is $\frac{11}{36}$.

Difficulty: Hard

NCTM Standard: Number and Operations Standard for Grades 6–8: Use factors, multiples, prime factorization, and relatively prime numbers to solve problems.
Data Analysis and Probability: Use proportionality and a basic understanding of probability to make and test conjectures about the results of experiments and simulations.

Mathworld.com Classification:
Probability and Statistics > Probability > Probability

- Car M traveled at a constant speed for a given time. This is shown by the dashed line. Car N traveled at twice the speed for the same distance. If the solid line represents the collected data for Car N, which graph illustrates this?



2001 AMC 8, Problem #19— "How much time is required for the Car N compared to Car M?"

- **Solution**

(D) The second car travels the same distance at twice the speed; therefore, it needs half the time required for the first car. Graph D shows this relationship.

Difficulty: Hard

NCTM Standard: Data Analysis and Probability Standard: Develop and evaluate inferences and predictions that are based on data

Mathworld.com Classification: Geometry > Distance > Distance

- Kaleana, Quay, Marty and Shana discuss their test scores. Kaleana is the only one who shows her score to the others. Quay says, "At least two of us have the same score." Marty says, "I didn't get the lowest score." Shana adds, "I didn't get the highest score." Rank the scores from lowest to highest for Marty (M), Quay (Q) and Shana (S).

(A) S,Q,M **(B)** Q,M,S **(C)** Q,S,M **(D)** M,S,Q **(E)** S,M,Q

2001 AMC 8, Problem #20— "How does everyone's score relate to Kaleana's score?"

- **Solution**

(A) Quay indicates that she has the same score as Kaleana. Marty's statement indicates that her score is higher than Kaleana's, and Shana's statement indicates that her score is lower than Kaleana's. The sequence S,Q,M is the correct one.

Difficulty: Medium-hard

NCTM Standard: Data Analysis and Probability Standard: Develop and evaluate inferences and predictions that are based on data

Mathworld.com Classification: Foundations of Mathematics > Logic > General Logic > Logic

- The mean of a set of five different positive integers is 15. The median is 18. The maximum possible value of the largest of these five integers is

(A) 19 **(B)** 24 **(C)** 32 **(D)** 35 **(E)** 40

2001 AMC 8, Problem #21—"Make the other values small"

- **Solution (D)** The sum of all five numbers is 5(15)=75. Let the numbers be $W, X, 18, Y$ and Z in increasing order. For Z to be as large as possible, make W, X and Y as small as possible. The smallest possible values are $W = 1, X = 2$ and $Y = 19$. Then the sum of $W, X, 18$ and Y is 40, and the difference, $75 - 40 = 35$, is the largest possible value of Z.

Difficulty: Medium-hard

NCTM Standard: Data Analysis and Probability Standard for Grades 6–8: Find, use, and interpret measures of center and spread, including mean and interquartile range.

Mathworld.com Classification:
Calculus and Analysis > Special Functions > Means > Arithmetic Mean;
Probability and Statistics > Descriptive Statistics > Statistical Median

- On a twenty-question test, each correct answer is worth 5 points, each unanswered question is worth 1 point and each incorrect answer is worth 0 points. Which of the following scores is **NOT** possible?

(A) 90 **(B)** 91 **(C)** 92 **(D)** 95 **(E)** 97

2001 AMC 8, Problem #22—"How many correct answers are required to score 90 or above?"

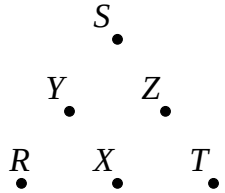
- **Solution (E)** To get a score in the 90s, a student must get 18 or 19 correct answers. If the number is 18, then the other two questions are worth 0+0, 0+1, 1+0 or 1+1, producing total scores of 90, 91 or 92. If the number correct is 19, then the total is 95+0 or 95+1. Therefore, the only possible scores in the 90s are 90, 91, 92, 95 and 96. This leaves 97 as an impossible score.

Difficulty: Medium

NCTM Standard: Problem Solving Standard for Grades 6–8: Apply and adapt a variety of appropriate strategies to solve problems.

Mathworld.com Classification:
Number Theory > Diophantine Equations > Diophantine Equation

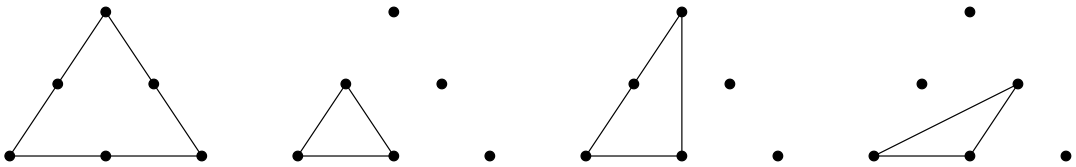
- Points R, S and T are vertices of an equilateral triangle, and points X, Y and Z are midpoints of its sides. How many noncongruent triangles can be drawn using any three of these six points as vertices?



(A) 1 **(B)** 2 **(C)** 3 **(D)** 4 **(E)** 20

2001 AMC 8, Problem #23—"Use diagrams"

- **Solution (D)** There are four noncongruent triangles.



Difficulty: Medium

NCTM Standard: Geometry Standard for Grades 6–8: Examine the congruence, similarity, and line or rotational symmetry of objects using transformations.

Mathworld.com Classification:
Geometry > Plane Geometry > Triangles > Special Triangles > Other Triangles;
Geometry > Line Geometry > Lines > Midpoint;
Discrete Mathematics > Point Lattices

- Each half of this figure is composed of 3 red triangles, 5 blue triangles and 8 white triangles. When the upper half is folded down over the centerline, 2 pairs of red triangles coincide, as do 3 pairs of blue triangles. There are 2 red-white pairs. How many white pairs coincide?

(A) 4 **(B)** 5 **(C)** 6 **(D)** 7 **(E)** 9

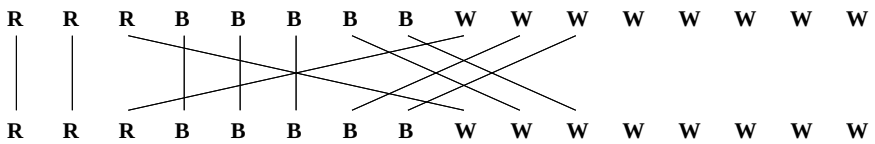
2001 AMC 8, Problem #24— "All 6 red triangles are accounted for, so the two unmatched upper blue triangles must coincide with lower white triangles."

- **Solution**

(B) All 6 red triangles are accounted for, so the two unmatched upper blue triangles must coincide with lower white triangles. Since one lower white triangle is matched with a red triangle and two are matched with blue triangles, there are five left and these must match with upper white triangles.

OR

It may be helpful to construct a diagram such as this:



Difficulty: Hard
NCTM Standard: Geometry Standard: Use visualization, spatial reasoning, and geometric modeling to solve problems
Mathworld.com Classification: Recreational Mathematics > Folding > General Folding > Folding

- There are 24 four-digit whole numbers that use each of the four digits 2, 4, 5 and 7 exactly once. Only one of these four-digit numbers is a multiple of another one. Which of the following is it?

(A) 5724 **(B)** 7245 **(C)** 7254 **(D)** 7425 **(E)** 7542

2001 AMC 8, Problem #25— "Six of the 24 numbers are in the 2000s, six in the 4000s, six in the 5000s, and six in the 7000s. Can you have four-digit multiples of all of these numbers?"

- **Solution**

(D) Six of the 24 numbers are in the 2000s, six in the 4000s, six in the 5000s, and six in the 7000s. Doubling and tripling numbers in the 2000s produce possible solutions, but any multiple of those in the other sets is largert than 8000.

Units digits of the numbers are 2,4,5, and 7, so their doubles will end in 4, 8, 0, and 4, respectively. Choice (A) 5724 ends in 4 but 5724/2=2862, not one of the 24 numbers. Likewise, choice (C) 7254 produces $7254/2 = 3627$, also not one of the numbers. When the units digits are tripled the resulting units digits are 6, 2, 5, and 1 and choices (B) 7245, (D) 7425 and (E) 7542 are possibilities. Division by 3 yields 2415, 2475, and 2514 respectively. Only the second of these numbers is one of the 24 given numbers. Choice (D) is correct.

Difficulty: Medium-hard

NCTM Standard: Number and Operations Standard: Understand numbers, ways of representing numbers, relationships among numbers, and number systems

Mathworld.com Classification: Foundations of Mathematics > Set Theory > General Set Theory > Set Theory