2026 AMC 10B Solutions

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1. What is the value of

$$\frac{2^{2026}+2^{2025}-2^{2023}}{2^{2024}-2^{2023}}?$$

A 5

B 7

C 9

D 11

E 13

Small hint:

Factor out 2^{2023} from the numerator and denominator

Big hint:

$2^{2026}=8\times 2^{2023}$

Solution:

Cancel the common factor 2^{2023} to obtain

$$\frac{8+4-1}{2-1}=11.$$

Thus, the correct answer is **D**.

2. A souvenir shop sells solid metal sculptures of Achilles in two sizes. One is 6 cm tall and one is 8 cm tall. Proportions between the two sculptures are preserved. The smaller sculpture has a mass of 486 grams. What is the mass, in grams, of the larger sculpture?

A 648

B 864

C 972

D 1152

E 1458

Small hint:

Mass scales with volume

Big hint:

The length scale factor is $\frac{4}{3}$

Solution:

The volume, and hence mass, scales by the cube of the length ratio. The larger mass is

$$\begin{aligned} 486 \times \left(\frac{4}{3}\right)^3 &= 18 \times 64 \\ &= 1152. \end{aligned}$$

Thus, the correct answer is **D**.

3. Bees occupy the 8 corners of a $1 \times 2 \times 3$ rectangular box. The bees can fly inside the box, but cannot fly farther than $\frac{1}{2}$ unit from their respective corners. What is the volume, in cubic units, of the region inside the box that cannot be reached by any bee?

A $6 - \frac{\pi}{3}$

B $6 - \frac{\pi}{4}$

C $6 - \frac{\pi}{6}$

D $6 - \frac{\pi}{8}$

E $6 - \frac{\pi}{12}$

Small hint:

Each bee reaches one eighth of a sphere

Big hint:

The eight reachable regions have no overlapping volume

Solution:

The eight spherical eighths together have the volume of one sphere of radius $\frac{1}{2}$. Subtracting from the box gives

$$\begin{aligned} 1 \times 2 \times 3 - \frac{4}{3}\pi \left(\frac{1}{2}\right)^3 \\ = 6 - \frac{\pi}{6}. \end{aligned}$$

Thus, the correct answer is **C**.

4. What positive real number x satisfies the equation

$$\frac{3}{x+4} - \frac{4}{x+3} = \frac{4}{x-3} - \frac{3}{x-4}?$$

A $\sqrt{21}$

B $3+\sqrt{7}$

C 6

D $\sqrt{37}$

E $4+\sqrt{13}$

Small hint:

Group the two fractions with numerator 3 on one side

Big hint:

$\frac{1}{x+a} + \frac{1}{x-a} = \frac{2x}{x^2-a^2}$

Solution:

Rearranging and combining gives

$$\frac{6x}{x^2-16} = \frac{8x}{x^2-9}.$$

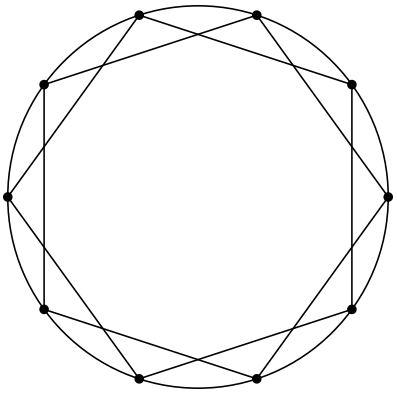
Since $x \neq 0$, cancel $2x$ and cross-multiply:

$$3(x^2-9) = 4(x^2-16).$$

Thus $x^2 = 37$. The positive root is $x = \sqrt{37}$, which is in the domain of the original equation.

Thus, the correct answer is **D**.

5. There are 2026 equally spaced points that all lie on a circle. A line segment is drawn between two points if there is exactly one point between them along the circle. Into how many regions will this divide the interior of the circle? The figure below shows an example with 10 equally spaced points, in which case there are 21 interior regions.



A 4052

B 4053

C 4054

D 6079

E 6081

Small hint:

Count the central region, the small triangles, and the regions along the circle separately

Big hint:

Match the small triangles to marked points and the outer regions to arcs between consecutive points

Solution:

There is 1 central region. Each marked point is the tip of one small triangle, giving 2026 triangular regions. Each arc between consecutive marked points borders one outer region, giving another 2026. The total is

$$1 + 2026 + 2026 = 4053.$$

Alternatively, use Euler's formula for a connected planar graph: $V - E + F = 2$, where V counts vertices, E counts edges, and F counts faces, including the region outside the circle.

Each of the 2026 segments crosses exactly two others. Each crossing is counted from both segments, so there are 2026 interior vertices. Add the marked points to get V. Each segment is cut into three edges, and the circle contributes 2026 arcs. Thus

$$V = 2026 + 2026 = 4052$$
$$E = 3 \times 2026 + 2026 = 8104$$

Euler's formula gives $F = 2 - 4052 + 8104 = 4054$. Subtract the outside face to get 4053 regions inside the circle.

Thus, the correct answer is **B**.

6. For how many integers n is

$$\frac{n^2-1}{n+2}$$

also an integer?

A 2

B 3

C 4

D 6

E infinitely many

Small hint:

Divide n^2-1 by $n+2$ with remainder

Big hint:

$n^2-1=(n+2)(n-2)+3$

Solution:

The expression equals $n-2+\frac{3}{n+2}$. It is an integer exactly when $n+2$ is one of -3, -1, 1, and 3. These give four distinct integers n, none equal to -2.

Thus, the correct answer is **C**.

7. A circle in the coordinate plane passes through $(0, 0)$, $(3, 0)$, and $(0, 4)$. The equation of the circle can be written in the form $x^2 + y^2 + ax + by + c = 0$ for some constants a, b, and c. What is $a + b + c$?

A -7

B -2

C 0

D 5

E 7

Small hint:

The origin gives $c = 0$

Big hint:

Substitute $(3, 0)$ and $(0, 4)$ to find a and b

Solution:

Substitution gives

$$\begin{aligned} c &= 0 \\ 9 + 3a &= 0 \\ 16 + 4b &= 0 \end{aligned}$$

Therefore $a = -3, b = -4$, and $a + b + c = -7$.

Thus, the correct answer is **A**.

8. Consider the infinite sequence of sets

$$\{1\}, \{2, 4\}, \{3, 5, 7\}, \{4, 6, 8, 10\}, \{5, 7, 9, 11, 13\}, \ldots.$$

Here the kth set contains one more element than the previous set, and its members are the terms of an arithmetic sequence beginning with k and having common difference 2. Let N be the number of these sets that contain the number 2026. What is the sum of the digits of N?

A 10

B 14

C 16

D 19

E 20

Small hint:

The last number in the kth set is $3k - 2$

Big hint:

The set contains 2026 exactly when k is even and $k \leq 2026 \leq 3k - 2$

Solution:

The kth set runs from k to $3k - 2$ in steps of 2. Thus it contains 2026 exactly when k is even and $k \leq 2026 \leq 3k - 2$. The eligible indices are the even integers from 676 through 2026. There are

$$N = \frac{2026 - 676}{2} + 1 = 676.$$

Its digit sum is $6 + 7 + 6 = 19$.

Thus, the correct answer is **D**.

9. A library offers 5 desks arranged in a row from left to right for quiet studying. Students arrive one at a time and sit down at a desk. If possible, each student avoids sitting next to another student. Otherwise they will, if possible, sit next to one student rather than two. How many possible seating configurations (which seats are occupied) for one to five students are there?

A 14

B 17

C 20

D 22

E 24

Small hint:

Count the reachable configurations separately for each number of students

Big hint:

The first two occupied desks cannot be adjacent

Solution:

Number the desks from left to right. There are 5 one-student configurations and 6 nonadjacent pairs. For three students, write the occupied desk numbers together. The reachable configurations are

$$124, \quad 125, \quad 134, \quad 135,$$
$$145, \quad 235, \quad 245.$$

These follow by trying each nonadjacent pair and selecting a vacant desk with the fewest occupied neighbors. From these triples, the only four-student configurations are $1235, 1245,$ and $1345.$ All five desks give one more configuration. The total is $5 + 6 + 7 + 3 + 1 = 22.$

Thus, the correct answer is **D**.

10. What is the area of the region bounded by the graphs of $|x+y| \leq 4$ and $x^2+y^2-4(x-y) \leq 2xy$?

A 4

B 8

C 10

D 12

E 16

Small hint:

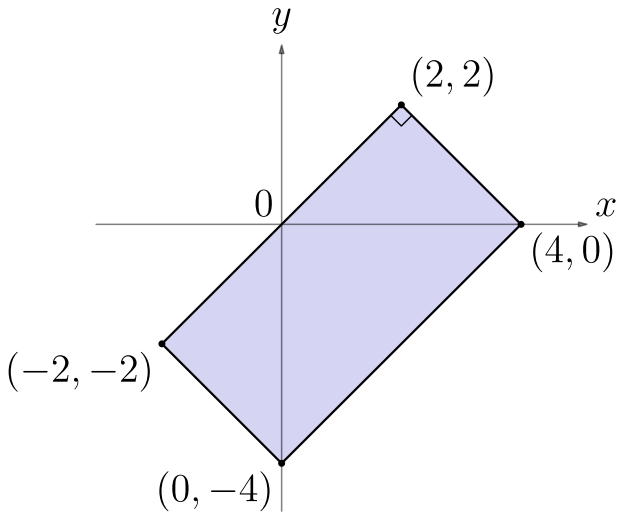
The second inequality is $(x-y)(x-y-4) \leq 0$

Big hint:

The boundary lines are $x+y=\pm 4, x-y=0$, and $x-y=4$

Solution:

The inequalities are $-4 \le x + y \le 4$ and $0 \le x - y \le 4$. Their intersection is a rectangle.



By the Pythagorean Theorem, the side lengths are $\sqrt{4^2 + 4^2} = 4\sqrt{2}$ and $\sqrt{2^2 + 2^2} = 2\sqrt{2}$. Thus the area is

$$(4\sqrt{2})(2\sqrt{2}) = 16.$$

Thus, the correct answer is **E**.

11. In $\triangle ABC$, point D is $\frac{1}{3}$ of the way from A to B, point F is $\frac{1}{4}$ of the way from B to C, and point E is $\frac{1}{5}$ of the way from C to A. What is the ratio of the area of $\triangle DFE$ to the area of $\triangle ABC$?

Express your answer as a common fraction.

A $\frac{1}{3}$

B $\frac{5}{12}$

C $\frac{7}{15}$

D $\frac{1}{2}$

E $\frac{3}{5}$

Small hint:

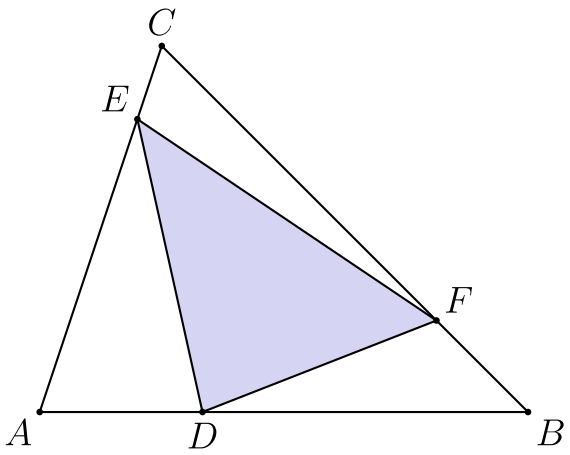
Subtract the three corner triangles from $\triangle ABC$

Big hint:

The area of $\triangle ADE$ divided by the area of $\triangle ABC$ is $\frac{AD}{AB} \cdot \frac{AE}{AC}$

Solution:

The shaded triangle is $\triangle DFE$.



The area fractions of the corner triangles at A, B, and C are respectively $\frac{1}{3} \times \frac{4}{5}$, $\frac{2}{3} \times \frac{1}{4}$, and $\frac{3}{4} \times \frac{1}{5}$. The remaining fraction is

$$1 - \frac{4}{15} - \frac{1}{6} - \frac{3}{20} = \frac{5}{12}.$$

Thus, the correct answer is **B**.

12. Sharon tosses a fair coin six times and keeps track of how many heads and tails she has gotten. Her first toss is heads. What is the probability that after every toss Sharon's count of heads differs from her count of tails?

Express your answer as a common fraction.

A $\frac{1}{8}$

B $\frac{3}{16}$

C $\frac{1}{4}$

D $\frac{5}{16}$

E $\frac{3}{8}$

Small hint:

The second toss must also be heads

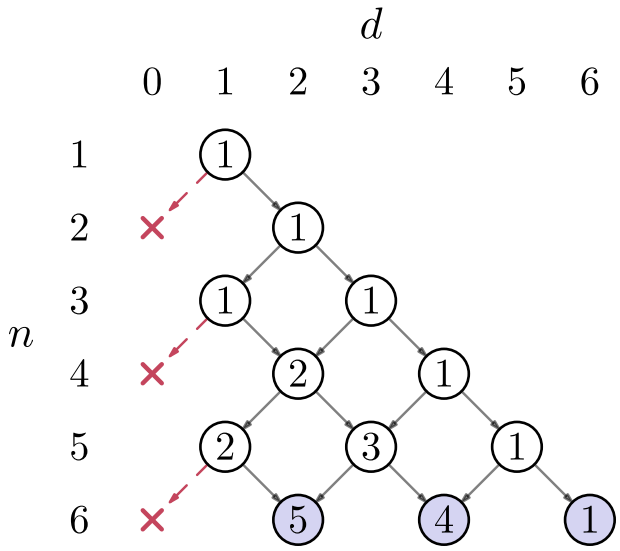
Big hint:

Count sequences that start with heads and never tie. At lead d, add the previous counts for $d-1$ and $d+1$. Divide the last row's total by 2^5.

Solution:

After the first head, heads must stay ahead of tails: a negative lead would require passing through a tie.

In the diagram, n is the number of tosses and d is heads minus tails. A circled number counts sequences that have avoided a tie. Start with 1 after the given first head. A head moves one column right and a tail one column left. Cross out every route that reaches $d = 0$.



To fill a circle, add the numbers at the starts of its incoming arrows. For example, the 3 in row 5 is $2+1$, and the 5 in row 6 is $2+3$.

The last row has $5+4+1=10$ successful sequences. The first toss is fixed, so the remaining five tosses have $2^5=32$ equally likely outcomes. Hence

$$\frac{10}{32}=\frac{5}{16}.$$

Thus, the correct answer is **D**.

13. Two points P and Q are chosen independently and uniformly at random on the circle $x^2 + y^2 = 4$ in the coordinate plane. What is the probability that no point on $\overline{PQ}$ lies less than 1 unit from the origin?

Express your answer as a common fraction.

A $\frac{1}{3}$

B $1 - \frac{\pi}{6}$

C $\frac{1}{2}$

D $\frac{\pi}{6}$

E $\frac{2}{3}$

Small hint:

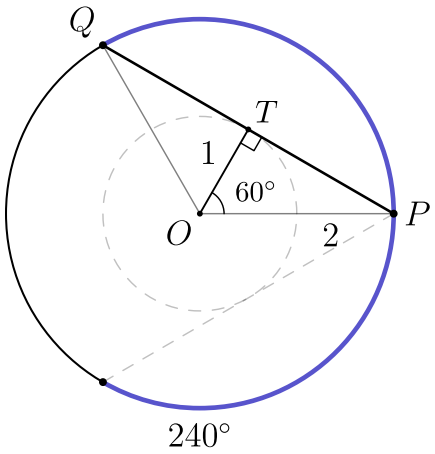
The closest point on the chord to the origin is its midpoint

Big hint:

A chord tangent to the unit circle subtends 120° at the origin

Solution:

Fix P and let O be the origin. At the limiting position, $\overline{PQ}$ is tangent to the unit circle at T, so $OT = 1, OP = 2$, and $OT \perp PQ$.



The right triangle OTP has hypotenuse 2 and adjacent leg 1, so $\angle POT = 60^\circ$. The perpendicular from the center bisects the chord and its central angle, giving $\angle POQ = 120^\circ$.

The allowable positions of Q lie within 120° of P in either direction. This is the highlighted arc of 240°, so the probability is

$$\frac{240}{360} = \frac{2}{3}.$$

Thus, the correct answer is **E**.

14. Real numbers r and s satisfy the equations $r + s = 2$ and $2^r + 2^s = 7$. What is $8^r + 8^s$?

A	199
B	209
C	221
D	237
E	259

Small hint:

Write $8^r + 8^s$ as $(2^r)^3 + (2^s)^3$

Big hint:

$a^3 + b^3 = (a + b)^3 - 3ab(a + b)$

Solution:

Let $a = 2^r$ and $b = 2^s$. Then $a + b = 7$ and $ab = 2^{r+s} = 4$. Therefore

$$\begin{aligned} 8^r + 8^s &= a^3 + b^3 \\ &= 7^3 - 3 \times 4 \times 7 \\ &= 259. \end{aligned}$$

Thus, the correct answer is **E**.

15. Real numbers u and v are chosen independently and uniformly at random, with $0 \leq u \leq 30$ and $0 \leq v \leq 10$. What is the probability that the equation $x^2 + ux + v^2 = 0$ has a real solution?

Express your answer as a common fraction.

A $\frac{1}{4}$

B $\frac{1}{3}$

C $\frac{1}{2}$

D $\frac{2}{3}$

E $\frac{3}{4}$

Small hint:

A real solution exists exactly when $u^2 - 4v^2 \geq 0$

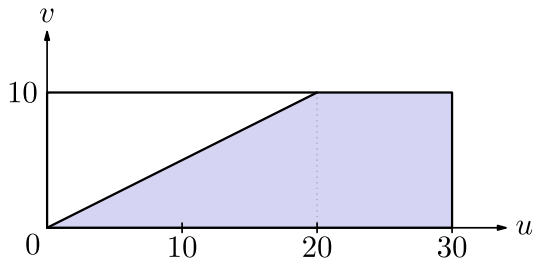
Big hint:

The possible pairs (u, v) fill a 30-by-10 rectangle. Exclude the triangle $u < 2v$.

Solution:

A real root exists exactly when the discriminant $u^2 - 4v^2$ is nonnegative. Since u and v are nonnegative, this is equivalent to $u \geq 2v$.

Put u on the horizontal axis and v on the vertical axis. The possible pairs fill a rectangle of width 30 and height 10. The shaded region satisfies $u \geq 2v$.



The unshaded triangle has legs 20 and 10. Subtract its area from the rectangle to get the probability

$$1 - \frac{\frac{1}{2} \times 20 \times 10}{30 \times 10} = \frac{2}{3}.$$

Thus, the correct answer is **D**.

16. The 4 squares in a 2×2 grid of squares are each colored either solid red, white, or blue. In how many ways can this be done so that no square colored red shares a side with a square colored blue?

A 29

B 30

C 32

D 34

E 35

Small hint:

Count by the number of white squares

Big hint:

With two white squares, distinguish adjacent and opposite positions

Solution:

With no white squares, all four squares are connected by shared sides, so they must all be red or all blue: 2 ways.

With one white square, choose its position in 4 ways. The other three squares form a connected chain, so they must share one of 2 colors, red or blue. This gives $4 \times 2 = 8$ ways.

With two adjacent white squares, the white pair can be either row or either column: 4 choices. The remaining two squares share a side, so both must be red or both blue: 2 choices. This gives $4 \times 2 = 8$ ways.

With two opposite white squares, choose one of the 2 diagonals for the white pair. The other two squares do not share a side, so each has 2 independent color choices. This gives $2 \times (2 \times 2) = 8$ ways.

With three white squares, choose the nonwhite square in 4 ways and its color in 2 ways, giving $4 \times 2 = 8$ ways. All white gives one way.

The total is $2+8+8+8+8+1=35$.

Thus, the correct answer is **E**.

17. A list contains 2026 statements, each of which is either true or false. The first statement is "The number of false statements in this list is at least 1001." The second statement is "The number of false statements in this list is at least 1002." In general, the kth statement in the list is "The number of false statements in this list is at least $k+1000$." How many statements in the list are true?

A 342

B 513

C 1013

D 1026

E 1513

Small hint:

All true statements come before all false statements

Big hint:

If F statements are false, the true ones have indices $k \leq F-1000$

Solution:

Let F be the number of false statements. If $F \leq 1000$, all statements would be false, contradicting that bound. Thus $F > 1000$, and there are exactly $F-1000$ true statements. Consequently

$$F+(F-1000)=2026,$$

so $F=1513$ and the number of true statements is $2026-1513=513$.

Thus, the correct answer is **B**.

18. What is the least positive integer n such that $2026!$ is not a multiple of 2025^n?

A 251

B 252

C 253

D 254

E 255

Small hint:

$2025 = 3^4 \times 5^2$

Big hint:

Count factors of 3 and 5 in $2026!$

Solution:

Every multiple of 5 contributes a factor of 5. Each multiple of 25 contributes another, each multiple of 125 another, and each multiple of 625 another. There are $405, 81, 16,$ and 3 such multiples, respectively.

The exponent of 5 in $2026!$ is $405 + 81 + 16 + 3 = 505$. Counting factors of 3 in the same way gives $675 + 225 + 75 + 25 + 8 + 2 = 1010$. Since $2025 = 3^4 \times 5^2$, 2025^n divides the factorial exactly when both $2n \leq 505$ and $4n \leq 1010$. The largest such n is 252, so the first failure is 253.

Thus, the correct answer is **C**.

19. A jar contains 12 green marbles and 8 red marbles. In a game, Anika and Ben take turns drawing a random marble from the jar, with replacement. If Ben ever draws a red marble, he wins, and if Anika ever draws a green marble, she wins. Otherwise, the game continues with the next player's turn. The probability that Ben eventually wins is A if Anika goes first and B if Ben goes first. What is $B - A$?

Express your answer as a common fraction.

A $\frac{2}{25}$

B $\frac{4}{25}$

C $\frac{4}{19}$

D $\frac{6}{19}$

E $\frac{9}{20}$

Small hint:

$A = \frac{2}{5}B$

Big hint:

$B = \frac{2}{5} + \frac{3}{5}A$

Solution:

Anika must first draw red for Ben to win when she starts, so $A = \frac{2}{5}B$. When Ben starts, he either wins immediately or draws green, giving

$$B = \frac{2}{5} + \frac{3}{5}A = \frac{2}{5} + \frac{6}{25}B.$$

Hence $B = \frac{10}{19}$, $A = \frac{4}{19}$, and $B - A = \frac{6}{19}$.

Thus, the correct answer is **D**.

20. Annie, Bobby, and Casey each receive an integer, not necessarily distinct, from 1 through 10. In how many ways can the numbers be given so that their sum is divisible by 7?

A 139

B 140

C 142

D 143

E 145

Small hint:

Dividing $8, 9,$ and 10 by 7 leaves remainders $1, 2,$ and 3

Big hint:

Among 1 through 7, exactly one number completes any given sum to a multiple of 7

Solution:

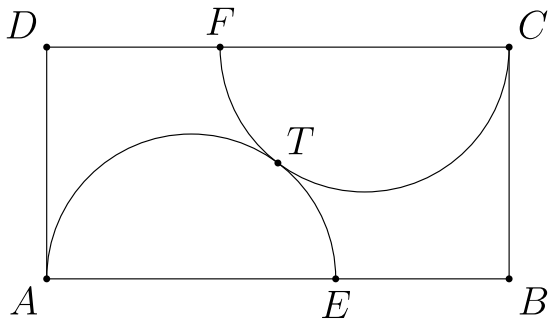
Here a residue modulo 7 means the remainder after division by 7. The numbers 1 through 7 give every remainder once, so one of them always completes any two chosen numbers to a multiple of 7.

Count by how many people receive a number in 8 through 10. If none do, the first two numbers have 7^2 choices, and the third has exactly one suitable residue: 49 ways. If exactly one does, choose that person and their number, then one of the other numbers; the last is determined: $3 \times 3 \times 7 = 63$ ways.

If exactly two do, choose the person who receives a number from 1 through 7 in 3 ways. Each of the other two people has 3 choices, with residues in $\{1, 2, 3\}$. The remaining number is determined: $3 \times 3^2 = 27$ ways. If all three do, their residue sum must be 7, giving permutations of $(1, 3, 3)$ and $(2, 2, 3)$, or 6 ways. The total is $49 + 63 + 27 + 6 = 145$.

Thus, the correct answer is **E**.

21. Rectangle $ABCD$ has $AB = 6$ and $BC = 3$. Inside the rectangle are two congruent semicircles, the first with diameter $\overline{AE}$, where E lies on $\overline{AB}$, and the second with diameter $\overline{CF}$, where F lies on $\overline{CD}$. The two semicircles are tangent at T. See the figure.



What is the radius of the semicircles?

Express your answer as a common fraction.

A $\frac{13}{8}$

B $\frac{7}{4}$

C $\frac{15}{8}$

D 2

E $\frac{17}{8}$

Small hint:

Let r be the radius and join the semicircle centers

Big hint:

The center separation has horizontal component $6 - 2r$ and vertical component 3

Solution:

Let r be the common radius. Tangency makes the distance between centers $2r$. Their horizontal separation is $6 - 2r$, and their vertical separation is 3. Thus

$$(6 - 2r)^2 + 3^2 = (2r)^2.$$

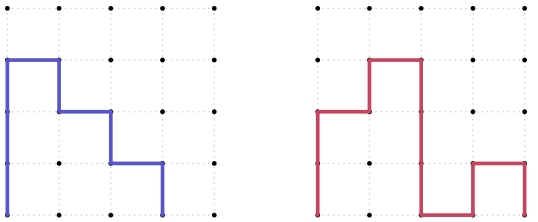
Cancelling $4r^2$ gives $45 - 24r = 0$, so $r = \frac{15}{8}$.

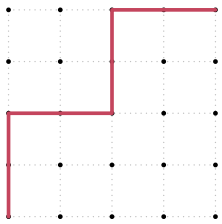
Thus, the correct answer is **C**.

22. Belinda follows a path on the plane that is entirely contained within the square region $0 \leq x \leq 4$ and $0 \leq y \leq 4$. Call her path *dignified* if and only if all of the following conditions are satisfied.

- Each step is one unit up, down, or to the right.
- The path does not revisit any vertex.
- The path starts at $(a, 0)$ and ends at $(b, 0)$, where a and b are integers with $a < b$, and touches the x-axis only at these two points.

The following figure shows some examples of dignified and not dignified paths.





How many dignified paths can Belinda follow?

A 174

B 340

C 448

D 512

E 970

Small hint:

Count by the horizontal distance $d = b - a$

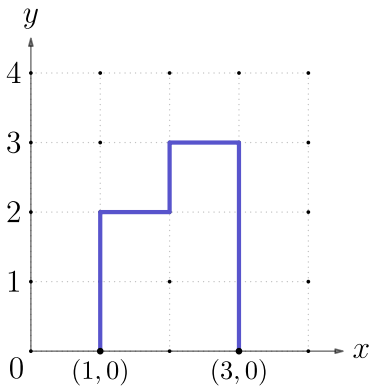
Big hint:

Choose the height of each rightward step; the vertical parts are then forced

Solution:

Fix the number of rightward steps. Each must be at height $1, 2, 3,$ or $4,$ because the path stays in the square and touches the x-axis only at its endpoints.

For example, take two rightward steps at heights 2 and $3,$ starting at $(1, 0).$ The path must go up to height $2,$ right, up to height $3,$ right, then down to the axis.



Once the start and heights are chosen, the vertical parts are forced. Between rightward steps, go straight up or down to the next height. Reversing direction would revisit a vertex. Every choice of heights gives a valid path: the heights stay positive, and after moving right the path never returns to an earlier column.

With two rightward steps, the starting x-coordinate can be $0, 1,$ or 2 : there are 3 starting positions. Each step independently has 4 height choices, so this case contributes $3 \times 4^2 = 48$ paths.

In general, let $d = b - a$ be the number of rightward steps. It can be $1, 2, 3,$ or $4.$ The starting x-coordinate can be any integer from 0 through $4 - d,$ giving $5 - d$ positions. There are 4^d choices for the heights.

The total number of paths is

$$\begin{aligned} &4 \times 4 + 3 \times 4^2 \\ &\quad + 2 \times 4^3 + 4^4 \\ &= 448. \end{aligned}$$

Thus, the correct answer is **C**.

23. The eight vertices of a cube are randomly and independently colored red, white, or blue. What is the expected number of faces of the cube that have at least two blue vertices?

Express your answer as a common fraction.

A $\frac{16}{27}$

B 2

C $\frac{58}{27}$

D $\frac{22}{9}$

E $\frac{212}{81}$

Small hint:

Find the probability for one face, then multiply by 6

Big hint:

Subtract the cases of zero and exactly one blue vertex

Solution:

For one face, the probability of at least two blue vertices is

$$1-\left(\frac{2}{3}\right)^4-4\times\frac{1}{3}\left(\frac{2}{3}\right)^3 = \frac{11}{27}.$$

The factor 4 counts the possible positions of the lone blue vertex. Adding this probability over the six faces gives the expected number $6\times\frac{11}{27}=\frac{22}{9}$.

Thus, the correct answer is **D**.

24. Starting with a list of three numbers, form a sequence in which each subsequent term is the average of the previous three terms. For example, starting with the sequence $(2, 4, 9)$, the next two terms are $\frac{2+4+9}{3} = 5$ and $\frac{4+9+5}{3} = 6$. Which of the following initial three terms will produce a sequence that has the greatest 2026th term?

A $(1, 2, 3)$

B $(2, 1, 1)$

C $(3, 4, 8)$

D $(4, 4, 7)$

E $(4, 5, 6)$

Small hint:

Compare corresponding terms by subtracting the sequences

Big hint:

Once three consecutive differences are positive, every later difference is positive

Solution:

Option C is larger term by term than A and B. Subtract D from C: the first six differences are

$$-1,\ 0,\ 1,\ 0,\ \frac{1}{3},\ \frac{4}{9}.$$

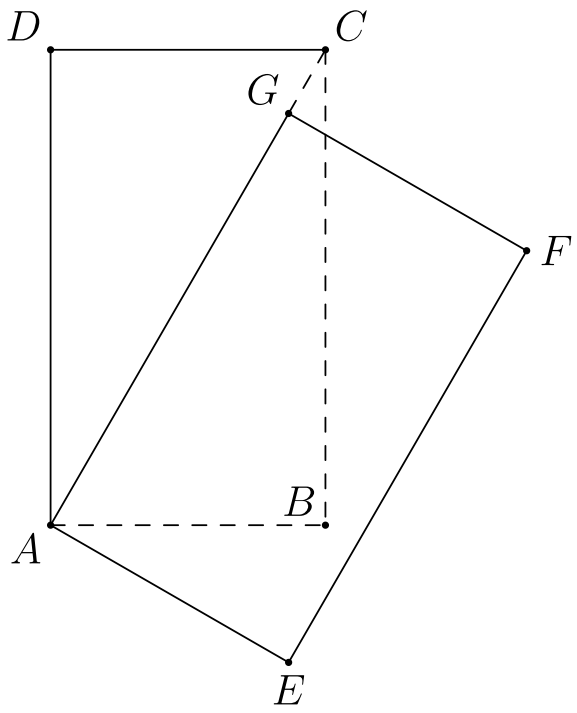
The next difference is positive, so from the fifth term onward every difference is positive. Subtract E from C: the first six differences are

$$-1,\ -1,\ 2,\ 0,\ \frac{1}{3},\ \frac{7}{9}.$$

The same argument applies. Thus C has the largest term at every index from the fifth onward, including 2026.

Thus, the correct answer is **C**.

25. Rectangular card $ABCD$ has $AB = 1$ and $AC = 2$. As shown in the figure, a second card, $AEFG$, congruent to the first, is stacked onto it so that $\overline{AG}$ lies on $\overline{AC}$ and the two cards share corner A.



Additional cards are added, following the same pattern (with shared corner A), creating a fan of cards. The process stops when a new card fits exactly atop $ABCD$. The shape then created is a nonconvex polygon with rotational symmetry. What is the area of this polygon?

A $20\sqrt{3} - 24$

B $34\sqrt{3} - 48$

C $6 + 3\sqrt{3}$

D 12

E $8\sqrt{3}$

Small hint:

Each new card is rotated 30°, so there are 12 distinct cards

Big hint:

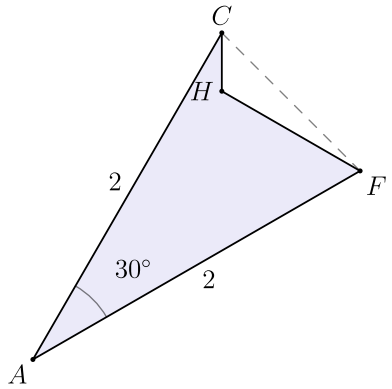
Find the boundary between two consecutive outer corners, including its inward notch

Solution:

The rectangle has sides 1 and $\sqrt{3}$, so the rotation is 30°. Place $A = (0,0)$, $B = (1,0)$, and $C = (1,\sqrt{3})$. The next card's outer corner is $F = (\sqrt{3},1)$. Its upper edge has equation $x + \sqrt{3}y = 2\sqrt{3}$. It meets $x = 1$ at $H = (1, 2 - \frac{1}{\sqrt{3}})$.

Between the rays AF and AC, the boundary is FHC. Only the two pictured cards and the card rotated 30° counterclockwise from $ABCD$ meet the interior of this sector. In that third card, each ray makes at most 30° with the short side, so it reaches at most $\frac{1}{\cos 30^\circ} = \frac{2}{\sqrt{3}}$. The card ending at F reaches at least $\sqrt{3}$ along each ray. So the third card adds nothing here.

The area of triangle AFC is $\frac{1}{2} \times 2 \times 2 \sin 30^\circ = 1$. The inward notch is triangle FHC. Its vertical base has length $HC = \sqrt{3} - (2 - \frac{1}{\sqrt{3}})$, and its horizontal height is $\sqrt{3} - 1$.



Subtract the notch from the large triangle to get the area of one sector:

$$1 - \frac{1}{2}\left(\frac{4}{\sqrt{3}} - 2\right)(\sqrt{3} - 1)$$
$$= \frac{5\sqrt{3}}{3} - 2.$$

There are 12 congruent sectors, giving $20\sqrt{3} - 24$.

Thus, the correct answer is **A**.

Problems: https://live.poshenloh.com/past-contests/amc10/2026B

