"Math is Cool" Masters -- 2018-19

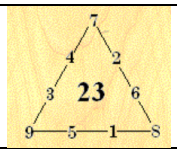
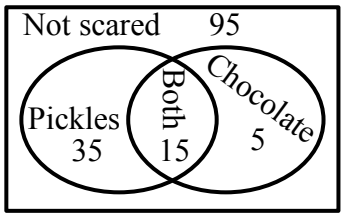
Middle School

Mental Math Solutions

8th	Answer	Solution
1	21 [miles]	7 x 3 = 21
2	12 [days]	.8 x 15 = 12
3	4 [inches]	20/5 = 4
4	3/4	{HH, HT, TH, TT} 3/4 of these have at least one H
5	14 [inches]	r = $\sqrt{194}$ = 14
6	11	(14 + 7 + 21 + 2)/4 = 11
7	135 [degrees]	6(180)/8 = 135
8	10 [sets]	${}_5C_3$ = 10

"Math is Cool" Masters -- 2018-19
Middle School
Individual Test Solutions

8th	Answer	Solution
1	4408	76 x 58 = 4408
2	885833	8735207 – 7849374 = 885833
3	2	$\sqrt{36}$ - $\sqrt{16}$ = 6 – 4 = 2
4	4.369 x 10^7	*a* x 10^b where *a* is a number between 1 and 10 and *b* is the number of places needed to move the decimal to the left to make *a* such a number
5	28 [inches]	$\sqrt{49}$ = 7 = side length, 4 x 7 = 28 = perimeter
6	1/663	Two red queens and two black jacks 2/52 x 2/51 = 1/26 x 2/51 = 1/13 x 1/51 = 1/663
7	[x =] 3	7x/3 = 7 → 7x = 21 → x = 3
8	9 [days]	If it doubles every day then it must have been half the size the day before. The day before day 10 is day 9.
9	6 [ways]	$1 x 18 $1 x 13 and $5 x 1 $1 x 8 and $5 x 2 $1 x 8 and $10 x 1 $1 x 3 and $5 x 3 $1 x 3 and $5 x 1 and $10 x 1,
10	9	(3x + 2)(3x + 2) = $9x^2$ + 12x + 4 9 is the coefficient of the x^2 term
11	105 [blips]	35 blips = 15 blaps, 15 blaps = 27 blops, so 35 blips = 27 blops, and 105 blips = 81 blops
12	2 or II	NE = Q1 and they are numbered in counterclockwise order. (-, +) is NW or Q2.

13	25	$\|3 - 4 \cdot 7\| = \|3 - 28\| = \|-25\| = 25$
14	20160 [ways]	8!/2! = 40320/2 = 20160
15	2 [zeros]	14! has a factor of 5 and a factor of 10. The factor of 10 means there will one zero at the end. The factor of 5 means there will be a 2nd zero at the end since 5 times any even number ends in a zero.
16	53 [pencils]	21 + 3 + 3 – 2 + 3 + 2 + 3 – 2 + 3 + 3 – 2 + 2 + 3 + 3 – 2 + 3 + 2 + 3 – 2 + 3 + 3 – 2 + 2 = 21 + 36 – 12 + 8 = 53
17	295[°]	The minute hand points to the 2 and the hour hand is 1/6 of the way between 4 and 5. (1/6)30 = 5. From 2 to 4 = 60 degrees. 60 + 5 = 65. 360 – 65 = 295 degrees.
18	ABDC	5683 +7462 13145, so A = 8, B = 4, C = 2, D = 3, so ABDC is greatest to least.
19	24	
20	95 [people]	 All four numbers add up to 150, the numbers in the Pickles circle add up to 50, and the numbers in the Chocolate circle add up to 20. So the answer is 95.
21	40 [minutes]	Focus on Eho. Ten minutes to go, come back and get backpack. Then thirty more to walk a mile, for a total of 40.
22	$3121.20 or 3121 dollars and 20 cents	3000(1.02) = 3060 3060(1.02) = 3121.20
23	44 [cubes]	Only cubes on the edges and the corners will have two or three faces painted. The rest have only one face or zero faces painted. There are 8 vertices and 12 edges. Subtract 2 (for the corners) from 5 to get the number of cubes on the edges. So the answer will be 12 x 3 + 8 = 44.

24	1 [hole]	3 holes with 1 putt and 2 putts on the other 15 holes makes a total of 33 putts. 47 – 33 = 14 If he has one extra putt on 14 of the 15 holes with at least 2 putts, he could conceivably have just one hole with 2 putts.
25	22/105	P(gg) = 3/15x2/14 = 6/210 P(bb) = 4/15x3/14 =12/210 P(br,br) = 3/15x2/14 = 6/210 P(bl,bl) = 5/15x4/14 = 20/210 (6+12+6+20)/210 = 22/105
26	13/16	P(at least 2 H) = 1 – P(0H or 1H) 1 – (1/32 + 5/32) = 26/32 = 13/16
27	11 [cows]	Let a = chickens, b = cows (3a + 5b = 73)(2) → 6a + 10b = 146 (2a + 3b = 45)(-3) → -6a – 9b = -135 Add the two new equations: b = 11 cows
28	$5\sqrt{5}$ [inches]	$3^2 + 6^2 = c^2 \rightarrow 9 + 36 = c^2 \rightarrow 45 = c^2 \rightarrow c = 3\sqrt{5}$ = hypotenuse of the triangle with legs 3 and 6. Then because the triangles are similar: $6/(6 + 4) = 3\sqrt{5}/x \rightarrow 6x = 30\sqrt{5} \rightarrow x = 5\sqrt{5}$
29	5	$x^2 – 5x – 50 = 0$ (x – 10)(x + 5) = 0 x = 10 and x = -5, and 10 + -5 = 5
30	$54\sqrt{3}$ [in^2]	A regular hexagon is made of 6 equilateral triangles. For and equilateral triangle, the formula is $A = s^2\sqrt{3}/4$, so for a hexagon it will be $6(6^2\sqrt{3}/4) = (216/4)\sqrt{3} = 54\sqrt{3}$
31	66 [seconds]	$r_1 = d/t$ and $r_2 = d/60$, $r_2 = 1.1r_1 = 1.1d/t \rightarrow d/60 = 1.1d/t \rightarrow 1/60 = 1.1/t \rightarrow t = 66$ seconds
32	13.5	$S = a_1/(1-r)$ or S = 9 + 3 + 1 + . . . (1/3)S = 3 + 1 + . . . Subtract equations (2/3)S = 9 → S = 9(3/2) = 13.5

33	1/26	1,3,9,347 2,6,18,334 3,9,27,321 . . . 9,27,81,243 – ratio of 1:3:9:27 . . . 26,78,234,22 27,81,243,9 If you write the list of strings of numbers where the first three are in a ratio of 1:3:9, it looks like the list above. At first, it seems like there are 27 possibilities, but it turns out that the last one in the list has the same four numbers as the one with 9,27,81,243.
34	14 [ordered pairs]	$9\pi a + 9\pi b/3 = 132\pi$ simplifies to $3a + b = 44$ Starting with a = 1, there are 14 integer solutions to this equation
35	[q =] 4800	Even multiples of 13 include 26, 52, 78, 104, etc. Even multiples of 17 include 34, 68, 102, etc. The only pair from these two lists that are close enough together to be part of a set of three consecutive even integers are 102 and 104. Then the smallest possible third of the three consecutive even integers would be 100. The prime factorization of 100 x 102 x 104 is 2 x 2 x 5 x 5 x 2 x 3 x 17 x 2 x 2 x 2 x 13. If you multiply this out without the 13 or 17 included, you get 4800.
36	702	$(x + 1/x)^2 = x^2 + 2 + 1/x^2 = 81$ So $x^2 + 1/x^2 = 79$ $(x + 1/x)(x^2 + 1/x^2) = 9 \times 79 = 711$ $x^3 + 1/x + x + 1/x^3 = 711$ $x^3 + 1/x^3 + x + 1/x = 711$ $x^3 + 1/x^3 + 9 = 711$ $x^3 + 1/x^3 = 702$ or use the pattern $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ to expand $(x + 1/x)^3 = 729$ and solve that way.
37	3/6622	44 cards total, three 6s, two 12s, one 18 (3C1 x 2C1 x 1C1)/44C3 or 1/44 x 2/43 x 3/42 x 6

38	[C =] 46	When S = 6, there are three terms, $15x^4y^2$, $16x^3y^3$, and $15x^2y^4$. 15 + 16 + 15 = 46
39	17/988	The number of sets of 3 distinct 2-digit integers is 40C3 = (40x39x38)/(3x2x1) = 9880. Sets where the median = the mean are as follows: {10,11,12}, {11,12,13}, . . . , {47,48,49} → 38 {10,12,14}, . . . , {45,47,49} → 36 {10,13,16}, . . . , {43,46,49} → 34 {10,14,18}, . . . , {41,45,49} → 32 {10,15,20}, . . . , {39,44,49} → 30 $(30+32+34+36+38)/{}_{40}C_3$ = 170/9880 = 17/988
40	[n =] 10	b must be 4, 5, 6, 7, 8, or 9 Check them all 123_4 = 27, 123_5 = 38, 123_6 = 51, 123_7 = 66, 123_8 = 83, and 123_9 = 102, so all of them meet the first condition. Then check 321_4 = 57, 321_5 = 86, 321_6 = 121, 321_7 = 162, 321_8 = 209, and 321_9 = 262. It only meets the second condition when b = 9 and $(10 + 6)^2 + 6 = 262$. So, n = 10.
41	13	-9x+9y+8z=155 and -9(-x-2y+5z=83) added together is 27y-37z=-592 2(-x-2y+5z=83) and 2x-5y+5z=74 added together is -9y+15z=240 -3(9y+15z=240) and 27y-37z=-592 added together is 8z = 128, so z = 16 9y+15(16)=240 means that y=0 -x-2(0)+5(16)=83 means that x=-3 -3 + 0 + 16 = 13
42	[d =] 117	From the first equation you can see that b x c must equal 8 and by solving the second equation you get that b + c = a. So, when b = 1 and c = 8, then a = 9. When b = 2 and c = 4, then a = 6. Swapping the values of b and c in each of these cases gives the same value of a. Since a^2 = d, there are two possible values of d, 6^2 and 9^2 and 36 + 81 = 117.

43	36/7 [ft]	Let ? = x and the right and left segments that add up to 6 be y and 6 – y Then x/12 = y/6 and x/9 = (6 - y)/6 So 6x = 12y and 6x = 54 - 9y 12y = 54 - 9y y = 18/7 x/12 = 18/42 x = 216/42 = 36/7
44	13 [cm]	Solve for the radius of the sphere $(4/3)\pi r^3 = 2304\pi$ r = 12 If x is the side length of the cube, then $x\sqrt{3} = 24$ and $x = 8\sqrt{3}$ 8 x 1.7 = 13.6 So, the largest integer less than 13.6 is 13
45	$\sqrt{3}/3$ or $\frac{1}{\sqrt{3}}$	Points chosen on the circle result in right triangle, points outside the circle result in acute triangles, points inside the circle result in obtuse triangles. The height of the triangle is 1 so half of a side is 1/rt 3, meaning the perimeter is 6/rt 3. The parts of $\overline{AO}$ and $\overline{BO}$ that are inside the semicircle are each of length 1. To get the answer simplify 2/(6/rt 3). Points O, C, and the other two intersections of the triangle and the semicircle are dimensionless, so they do not effect the probability

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Multiple Choice Solutions

8th	Answer	Solution
1	E	A(-6, 8) and A'(-6, -8) From 8 to -8 is 16 units
2	A	If a figure is dilated by a factor of 0.5, the image will have sides that are 0.5 as long as the pre-image and the area of the image will be $(0.5)^2$ times the area of the pre-image, or ¼. The ratio of ABCD to A"B"C"D" is the pre-image to image, or 4/1 = 4.
3	D	A(-6, 8) ⇒ $(-6)^2 + 8^2 = 100$, OA = 10, circumference = 20π B(-9, 6) ⇒ $(-9)^2 + 6^2 = 117$, OB = $\sqrt{117}$, circumference = $2\sqrt{117}\pi$ C(-4, 4) ⇒ $(-4)^2 + 4^2 = 32$, OC = $\sqrt{32}$, circumference = $2\sqrt{32}\pi$ D(-5, 7) ⇒ $(-5)^2 + 7^2 = 74$, OC = $\sqrt{74}$, circumference = $2\sqrt{74}\pi$ Circumference ratio of C:A is $2\sqrt{32}\pi:20\pi$, which simplifies to $2\sqrt{2}:5$.
4	C	6,929,725,043 in scientific notation is 6.929725043×10^9 and if the decimal number is rounded to the nearest hundredth, it would be 6.93×10^9
5	E	3.4 hundred million – 2.7 hundred million = 0.7 hundred million 0.7/2.7 = x/100 $x = 70/2.7 = 25.9\overline{259} \approx 25.93$

6	B	1.2% of 7.4 billion is 88800000 7,400,000,000 + 88,800,000 7,488,800,000 1.2% of 7,488,800,000 is 89,865,600 7,488,800,000 + 89,865,600 7,578,665,600 1.2% of 7,578,665,600 is 90,943,987.2 7,578,665,600 + 90,943,987.2 7,669,609,587.2 ≈ 7,669,609,587 – this is the answer
7	B	(0, 0), (1, 1), (2, 2), (3, 3), (4, 4), (5, 5), and (6, 6) are all of the doubles. There are 7 out of 28 total tiles. 7/28 = 1/4
8	C	There are a total of 8 of each number from 0 to 6, so 8(0 + 1 + 2 + 3 + 4 + 5 + 6) = 8(21) = 168
9	C	There are a total of 11 of each number from 0 to 9, so 11(0 + 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9) = 11(45) = 495
10	A	Double-nine set has 55 total tiles (1+2+3+4+5+6+7+8+9+10) Double-twelve set has 91 total tiles (1+2+3+4+5+6+7+8+9+10+11+12+13) P((6, 9), then (3, 5)) in double-nine set = 1/55 x 1/54 A = 1/(55x54) P((6, 9), then (3, 5)) in double-twelve set = 1/91 x 1/90 B = 1/(91x90) 55x54 = 5x11x2x3x3x3 91x90 = 7x13x2x3x3x5 LCM of (5x11x2x3x3x3) and (7x13x2x3x3x5) is 2x3x3x3x5x7x11x13

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Team Test Solutions

8th	Answer	Solution
1	11 [prime numbers]	23,29,31,37,41,43,47,53,59,61,67
2	17/28	(4/7 + 9/14)/2 = 17/28
3	6	All powers of 6 have 6 has the units digit
4	38 [Ruby-Throated Hummingbirds]	5/12 of 228 is 95 Ruby-Throated Hummingbirds, so there are 133 Bee Hummingbirds. 133 – 95 = 38
5	441	21^2 = sum of 1st 21 odd integers = 441, or just add them.
6	3/4	$8^2 + y^2 = 10^2$ y = 6 SOHCAHTOA tanθ = opp/adj = y/x
7	269[°]	The sum of the angles is 540° Let $m\angle A = 2°$ and $m\angle B = 3°$, then $m\angle C = 265°$. Then $m\angle D = 1°$ and $m\angle E = 269°$.
8	10 [mph]	$D = (r + x_t)t$ and $D = (r - 2x_h)t$ Using the 2nd equation, D = 270(50/60) = 225 mi 225 = (r + x)(45/60) 225 = (r – 2x)(50/60) (60/45)(225) = r + x (60/50)(225) = r – 2x Subtract the equations (4/3 – 6/5)(225) = 3x 2/15 x 225/3 = x = 10
9	48 [cm^3]	Consider triangle ADP to be the base of the tetrahedron. Its area is (12x6)/2 = 36, no matter where P is along $\overline{EH}$. The height of the tetrahedron is 4. The volume is (36x4)/3 = 48.

10	72 [paths]	ABCDE, ABEDC, ACBDE, ACBED, ACDBE, ACDEB, ADCBE, ADEBC, AEBCD, AEBDC, AEDBC, AEDCB – 12 that start with A There are also 12 that start with B CABDE, CABED, CADBE, CADEB, CAEBD, CAEDB, CBADE, CBAED, CBDAE, CBDEA, CBEAD, CBEDA, CDABE, CDAEB, CDBAE, CDBEA, CDEAB, CDEBA – 18 that start with C There are also 18 that start E DACBE, DAEBC, DBCAE, DBEAC, DCABE, DCAEB, DCBAE, DCBEA, DEABC, DEACB, DEBAC, DEBCA – 12 that start with D

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Relay Solutions

8th	Answer	Solution
1-1	12	42 = 2x3x7 2+3+7 = 12
1-2	1728	12^3 =1728
1-3	95 [multiples]	96x18 = 1728, so 95 multiples are less than 1728
1-4	19	$95 = \sqrt{475D}$ $95 \cdot 95 = 475D$ D = $\frac{95 \cdot 95}{25 \cdot 19}$ = 19
2-1	7 [perfect squares]	1,4,9,16,25,36,49
2-2	80	7x13-11=80
2-3	$20\sqrt{2}$ [inches]	Side = 80/4 = 20 Diagonal equals 20 x rt 2
2-4	$8\pi\sqrt{5}$ [inches] or $8\sqrt{5}\ \pi$ or equivalent. π should not be inside the radical.	2rt20 = 4rt5 = r D = 8rt5 C = 8πrt5

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College Bowl Round #1 Solutions

8th	Answer	Solution
1	[x=] 23	3x+16=85 3x=69 x=23
2	4/25 or "4 over 25" or "4 out of 25"	2/5x2/5=4/25
3	0	(2-2)/(2-4)=0
4	42 [cents]	9D – (3P+3N+3D) 90 – (3+15+30)=42
5	8190 [ants]	Three 4-hr periods in half a day → 21 4-hr periods in 3.5 days → 21 x 390 =8190
6	32768	$8^5 = 2^{15} = 2^{10}x2^5 = 1024x32 = 32768$
7	3	# of vertices of a nonagon is 9 and a tetrahedron has 6 edges, so 9 – 6 = 3
8	9 [days]	18 – 3 + 1 – 3 + 1 – 3 + 1 – 3 + 1 – 3 + 1 – 3 + 1 – 3 + 1 – 3 + 1 – 3 + 1 = 18 – 2(9) = 0, 9 days
9	72	0.1x6! = 0.1x720 = 72
10	360 [degrees]	Sum of exterior angles on any regular polygon is 360.

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College Bowl Round #2 Solutions

8th	Answer	Solution
1	3/10 or "3 over 10" or "3 out of 10"	P(3 blue in a bag with 10 total) = 3/10
2	East	90x7=630=360+270 Starting from north, 270 CCW = East
3	6 [candies]	Start with 21, Jean gets 9, 12 left, I eat 6, 6 left.
4	20 [diagonals]	n(n-3)/2 8(5)/2=20
5	6.4 [hours]	8Z = 8H, 2Z = 32H (or 4 times as long as 8Z), 10Z = (32/5)H (or 1/5 as long as 2Z) = 6.4H
6	[x=] 16	x + y = 50, 2x + 2= y, x + 2x + 2 = 50, 3x = 48, x = 16
7	5:20 am	60x33=1980 → 2000 min = 33 hrs, 20 min → 33 hrs, 20 min – 24 hrs = 9 hrs, 20 min → 8 PM + 9 hrs, 20 min = 5:20 am
8	4/11 or "4 over 11" or "4 to 11"	10-39 is 30 numbers 8 primes: 11, 13, 17, 19, 23, 29, 31, 37 The rest (= 22) are composite 8/22 = 4/11
9	4.3 [miles]	6 mi in 60 min → .1 mi in 1 min → 4.3 mi in 43 min
10	288π [in^3]	$V = 4/3\pi r^3$ $4/3\pi(6^3) = 4/3\pi(216) = 4\pi(72) = 288\pi$

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College Bowl Round #3 Solutions

8th	Answer	Solution
1	4.2 [times]	21/5 = 4.2
2	95	97 – 2 = 95
3	104 [degrees]	Sum of angles of a quadrilateral = 360 360 – 60 = 300 (300)/3 = 100
4	36 [cm^3]	Smallest possible values of A, B and C are A = 3, B = 2, C = 6 V = 3x2x6 = 36
5	14	ab = 147, a = 3b → $3b^2 = 147 \rightarrow b^2 = 49 \rightarrow b = 7$ and $a = 21$ 21 – 7 = 14
6	200 [skittles]	A minimum of 100 each of 4 colors = 400 The rest could be the fifth color = 200
7	19/26 or "19 out of 26" or "19 over 26"	6 red face cards, 4 aces, 4 twos = 14 winning cards and 38 losing cards 38/52 = 19/26
8	330	LCM(60, 150) = 300 GCF(60, 150) = 30 300 + 30 = 330
9	[0].45	11/5 – 7/4 = (44 – 35)/20 = 9/20 = 0.45
10	6 [ways]	4!/(2!2!) = 6

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College Bowl Round #4 Solutions

8th	Answer	Solution
1	10	6 x 99 = 594, the closest multiple of 11 less than 604 604 – 594 = 10
2	228	19(3 + 21)/2 = 228
3	38 [free throws]	(7 + x)/(12 + x) = 9/10 70 + 10x = 108 + 9x x = 38
4	115 [%]	p/100(7000)=8050 p=8050(100)/7000 = 115
5	7	Ignore the two thousand part 15^3 = 3375, so 7
6	20 [factors]	648 = 2^3 x 3^4 Total number of factors = (3 + 1)(4 + 1) = 20
7	64π [ft^2]	d = 8, r = 4, SA = $4\pi r^2$ $4\pi(4)^2 = 64\pi$
8	7 [integers]	105, 120, 135, 150, 165, 180, 195 – 7 integers
9	119	7/12 + 2/5 = (35 + 24)/60 = 59/60 59 + 60 = 119
10	20 [palindromes]	22, 33, 44, 55, 66, 77, 88, 99, 101, 111, 121 131, 141, 151, 161, 171, 181, 191, 202, 212 – 20 palindromes

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College Bowl Round #5 Solutions

8th	Answer	Solution
1	6 [years old]	¼ of 24 = 6 He'll be 30 in 24 years, which is 5 times 6.
2	11/15 [beats per second] or "11 over 15"	44 beats in 60 sec = 44/60 beats per sec = 11/15
3	[x =] 8	x + 19 = 3/5(45) x + 19 =27 x = 8
4	$38.04 or 38 dollars and 4 cents or thirty-eight-oh-four	4 x 2.99 = 11.96 50 – 11.96 = 38.04
5	28 [centimeters]	Shortest possible: A > 19 – 15 > 4 or 5 Longest possible: A < 19 + 15 < 3 or 33 33 – 5 = 28
6	11/40 or "11 out of 40" or "11 over 40"	3 x 13 = 39, so 13 multiples of 3. Multiples of 3 that are also multiples of 5 are multiples of 15. There are 2 multiples of 15 less than 40. 13 – 2 = 11 → 11/40
7	14 [prime factors]	Just count the prime numbers less than 46: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43 → 14 prime factors
8	16 [oranges]	6B = 10A and 5A = 12O → 10A = 24O → 6B = 24O → 4B = 16O
9	124	$3^2 - 4 = 5$, $5^3 - 5^2 + 7(5) - 11 = 124$
10	36 [cows]	c/s = 2/5, c/total = 2/7, 126/7 = 18, 2 x 18 = 36 cows

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College Bowl Round #6 Solutions

8th	Answer	Solution
1	[x =] 7	400x – 600 = 2200 400x = 2800 x = 7
2	16/81	(2/3)^4 = 16/81
3	6 [multiples]	27, 36, 45, 54, 63, 72 = 6 multiples
4	5.6	(2 + 3 + 5 + 7 + 11)/5 = 5.6
5	9 [cards]	If Eman only had the Edwin Diaz card, then Connor must have traded 12 cards to her for it. If Eman had more than just the Edwin Diaz card, then Conner would have traded fewer cards for it, so that Eman ended up with 12 cards. Therefore, the scenario in which Connor traded 12 cards is the one in which he has the greatest number of cards to start with. In order for Connor to have 12 cards after trading with Bella, he must have had 9 to start with (9 + 4 – 1 = 12).
6	594	A/B = C/D and B = 6A → $A/6A = 1/6 = C/D$ C is a 2-digit number. To maximize the value of D, C must be $99 \rightarrow 99/D = 1/6 \rightarrow 6(99) = D = 594$
7	784π [cm^3]	$14^2\pi(4) = 784\pi$
8	4 [minutes]	.9(150) = 135 540/135 = 4 min
9	Sunday	7 x 17 = 119 120 – 119 = 1 1 day after Saturday is Sunday
10	12 [centimeters]	A = bh/2 and b = 2h → $2h(h)/2 = 36 \rightarrow h^2 = 36 \rightarrow h = 6 \rightarrow b = 12$

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College Bowl Round (Extra) Solutions

8th	Answer	Solution
1	[x =] 24	6x – 11 = 4x + 37 2x = 48 x = 24
2	56 [centimeters]	$\sqrt{196}$ = 14 14 x 4 = 56
3	24 [ordered pairs]	(26, 24), (27, 23), . . . , (48, 2), (49, 1) 49 – 25 = 24 pairs
4	11/12	(6 – -5)/(3 - -9) = 11/12
5	39601	(200 – 1)(200 – 1) = 40000 – 2(200)(1) + 1 = 40000 – 400 + 1 = 39601
6	11/45	12 to 96 = 4(3) to 4(24), so 22 multiples of 4 out of 90, 22/90 = 11/45
7		
8		
9		
10		