Solutions for
Problem of the Week
Master Sheet

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11/17/25

11/10/25

OLYMPIAD

11/10/25 SOLUTION

STRATEGY: PROCEED ONE CONDITION AT A TIME.

THE THOUSANDS DIGIT CAN'T BE 2 OR GREATER BECAUSE THEN THE ONES DIGIT WOULD BE MORE THAN 9. THUS, THE THOUSANDS DIGIT IS 1. ALSO, THE QUESTION READS, "DR. BOLTON *WAS* BORN..."

CONDITION:

THE TENS DIGIT IS TWICE THE THOUSANDS DIGIT...... 1 _ 2 _

THE ONES DIGIT IS 3 TIMES THE TENS DIGIT ...... 1 _ 2 6

THE HUNDREDS DIGIT IS THE SUM OF THE OTHER THREE DIGITS 1 9 2 6

DR. BOLTON WAS BORN IN 1962

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 6, OLYMPIAD 3, 3A. 3 MINUTES

11/3/25

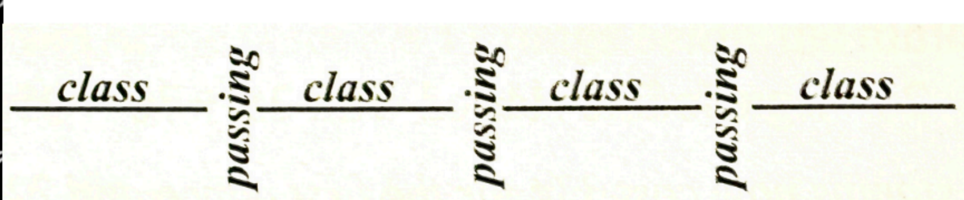
OLYMPIAD

11/3/25 SOLUTION

STRATEGY: REPRESENT THE PROBLEM VISUALLY.

THE ELAPSED TIME FROM 8:26 TO 11:26 IS 3 HOURS, WHICH IS 180 MINUTES. THERE ARE 3 (NOT 4) PASSING PERIODS BETWEEN CLASSES, FOR A TOTAL PASSING TIME OF 12 MINUTES. THIS LEAVES A TOTAL OF 168 MINUTES FOR THE FOUR CLASSES.

ONE CLASS PERIOD CONTAINS 42 MINUTES.



MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 5, OLYMPIAD 5, 5E. 5 MINUTES

10/27/25

OLYMPIAD

10/27/25 SOLUTION

STRATEGY: EXAMINE THE DIFFERENCES BETWEEN SCORES.

THE LEAST SUM IS 3 X 2 = 6 AND THE GREATEST SUM IS 3 X 8 = 24. THE 5-RING SCORES 3 POINTS MORE THAN THE 2-RING AND THE 8-CIRCLE SCORES 3 POINTS MORE THAN THE 5-RING. THUS "MOVING" A DART FROM THE 2-RING INCREASES THE SUM BY A MULTIPLE OF 3. HENCE, ALL POSSIBLE SUMS ARE MULTIPLES OF 3 AND ARE BETWEEN 6 AND 24, INCLUSIVE;

7 SUMS ARE POSSIBLE.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 11, OLYMPIAD 1, 1C. 5 MINUTES

10/21/25

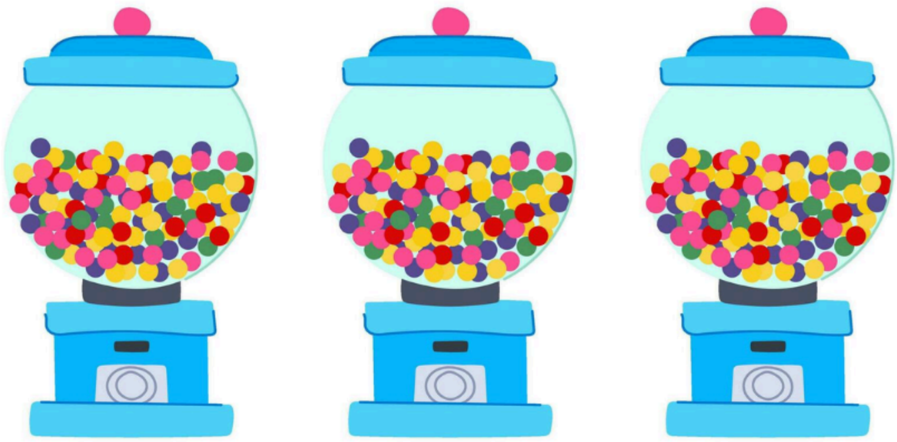
OLYMPIAD

10/21/25 SOLUTION

STRATEGY: CHOOSE THE GUMBALLS SO AS TO AVOID THREE OF A COLOR.

AFTER ANNA BUYS 8 GUMBALLS, SHE MIGHT HAVE 2 RED, 2 GREEN, 2 YELLOW, AND 2 PURPLE. THE NEXT GUMBALL SHE BUYS MUST BE ONE OF THOSE SAME FOUR COLORS, GUARANTEEING HER THREE OF THE SAME COLOR. SO, THE MINIMUM NUMBER OF GUMBALLS SHE SHOULD EXPECT TO BUY IS 9.

THE MINIMUM COST THAT GUARANTEES THREE GUMBALLS OF THE SAME COLOR IS $5 \times 9 = 45$¢.



MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 7, OLYMPIAD 4, 4C. 5 MINUTES

10/13/25

OLYMPIAD

10/13/25 SOLUTION

STRATEGY: DRAW A PICTURE.

THERE ARE TWO POSSIBILITIES:

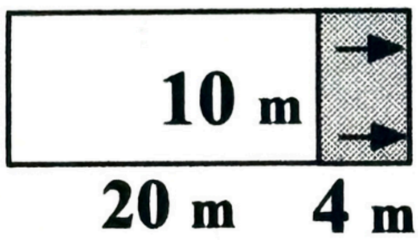
IN THE FIRST PICTURE, THE 10 M SIDE HAS MOVED RIGHT. TO ENCLOSE AN EXTRA 40 SQ M, THE TWO 20 M SIDES ARE EACH LENGTHENED BY 4 M.

THIS REQUIRES AN EXTRA 8M OF FENCING.

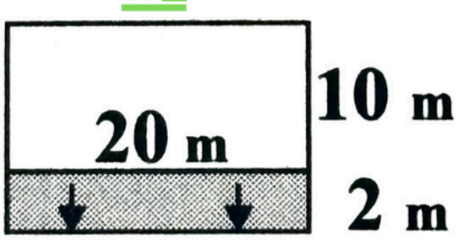
IN THE SECOND PICTURE, THE 20 M SIDE HAS MOVED DOWN. TO ENCLOSE AN EXTRA 40 SQ M, THE TWO 10M SIDES ARE EACH LENGTHENED BY 2 M. THIS REQUIRES AN EXTRA 4 M OF FENCING.

THE LEAST NUMBER OF METERS OF ADDITIONAL FENCING NEEDED IS 4 M.

#1



#2



MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 17, OLYMPIAD 2, 2D. 6 MINUTES

10/6/25

OLYMPIAD

10/6/25 SOLUTION

STRATEGY: COMBINE ONE STAMP OF EACH KIND INTO A "SUPER STAMP".

IMAGINE ONE "SUPER STAMP" CONSISTING OF ONE OF EACH OF THE STAMPS MENTIONED. THIS SUPER STAMP COSTS 50 + 20 + 10 + 5 = 85¢. THERE ARE 510 ÷ 85 = 6 OF THESE SUPER STAMPS AND

THEREFORE JESSIE HAS 6 FIFTY-CENT STAMPS.

THIS METHOD ILLUSTRATES THE DISTRIBUTIVE PROPERTY

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 10, OLYMPIAD 5, 5B. 5 MINUTES

9/29/22

OLYMPIAD

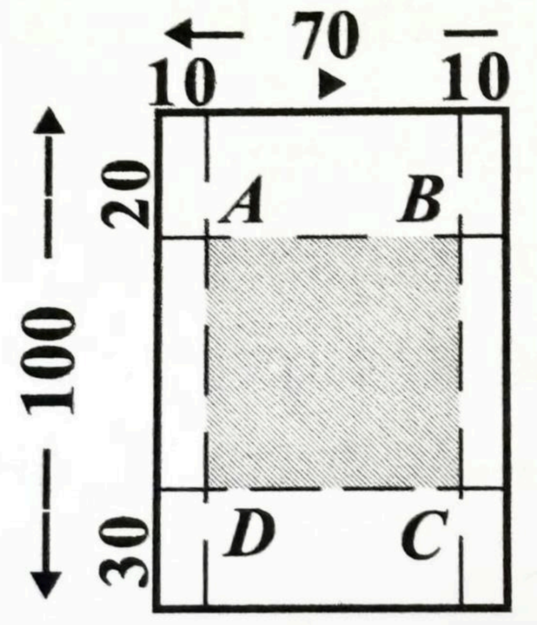
9/29/25 SOLUTION

STRATEGY: DRAW A DIAGRAM

AS SHOWN, THE FRONT OF HOUSE ABCD WOULD BE 70 - 10 - 10 = 50 FEET.

THE SIDE OF HOUSE ABCD WOULD BE 100 - 20 - 30 = 50 FEET.

THE LARGEST AREA THE HOUSE CAN HAVE IS 50 X 50 = 2500 SQ. FT.



MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 10, OLYMPIAD 2, 2C. 6 MINUTES

9/22/25

OLYMPIAD

9/22/25 SOLUTION

STRATEGY: FIND THE TOTAL NUMBER OF POINTS EARNED

IN EACH RACE 5 + 3 + 1 = 9 POINTS ARE EARNED. THE THREE RACERS EARN A TOTAL OF 3 × 9 = 27 POINTS. IF EACH RACER HAS THE SAME SCORE, EACH WOULD HAVE 9 POINTS. THUS, BETH'S TOTAL SCORE IS GREATER THAN 9. EACH RUNNER'S TOTAL IS THE SUM OF THREE ODD NUMBERS AND THEREFORE IS ODD. THE LEAST ODD NUMBER GREATER THAN 9 IS 11, WHICH IS A POSSIBLE WINNING SCORE. FOR EXAMPLE, THE SCORES COULD BE 5, 5, 1; 3, 3, 3; 1, 1, 5.

BETH'S LEAST POSSIBLE TOTAL SCORE IS 11.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 10, OLYMPIAD 2, 2C. 6 MINUTES

9/15/25

OLYMPIAD

9/15/25 SOLUTION

STRATEGY: TRACK THE DOLLAR CHANGES

Month	Before Change	Change (%)	Change ($)	After Change
October	$1,000	20%	$200	$1,200
November	$1,200	–20%	–$240	$960

THE NOVEMBER PRICE IS $960.

OR

STRATEGY: TRACK THE PERCENT CHANGES

NOTE THAT IN METHOD 1, $1200 IS 120% OF THE $1000. INCREASING AN AMOUNT BY 20% IS EQUIVALENT TO FINDING 120% OF THAT AMOUNT, SO THAT THE OCTOBER PRICE IS 120% OF THE SEPTEMBER PRICE. THEN 1.20 X $1,000 = $1,200. SIMILARLY, A DECREASE OF 20% IS EQUIVALENT TO FINDING 80% OF THE AMOUNT. THEN 80% OF $1200 = $960.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 14, OLYMPIAD 1, 1C. 5 MINUTES

9/8/25

OLYMPIAD
9/8/25 SOLUTION
STRATEGY: COMPUTE THE INCOME AND EXPENSES SEPARATELY.
THE GROCER SPENDS $15 FOR 180 ORANGES. AFTER THROWING AWAY THE 20 ROTTEN ORANGES, SHE SOLD THE REMAINING 160 ORANGE. THIS IS 20 SETS, EACH WITH 8 ORANGES. SHE GROSSED 20 X 85¢ = $17.00.
HER PROFIT IS $17 - $15 = $2.
MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 5, OLYMPIAD 4, 4B. 5 MINUTES
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9/1/25

OLYMPIAD

9/1/25 SOLUTION

STRATEGY: CALCULATE THE NUMBER OF MINUTES LOST

TO BE AGAIN CORRECT, THE CLOCK MUST LOSE A TOTAL OF 12 HOURS, WHICH EQUALS 720 MINUTES. AT 12 MINUTES LOST PER HOUR, 60 HOURS MUST ELAPSE.

BONUS QUESTIONS:

1. *WHAT IS THE CORRECT TIME WHEN THE CLOCK FIRST SHOWS 5:20?*
2. *AT THE NEXT CORRECT TIME OF 9:30, WHAT TIME DOES THE CLOCK SHOW?*

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 12, OLYMPIAD 3, 3D. 5 MINUTES

8/25/25

OLYMPIAD

8/25/25 SOLUTION

STRATEGY: USE ALGEBRA

LET X = THE NUMBER OF ADDITIONAL MINUTES TALKED.

$$25 + 3X = 40$$

SUBTRACT 25 FROM BOTH SIDES

$$3X = 15$$

DIVIDE BY 3 ON BOTH SIDES

$$X = 5$$

$$5 + 3 = 8$$

JASON'S CALL LASTS 8 MINUTES.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 16, OLYMPIAD 3, 3A. 4 MINUTES

8/18/25


OLYMPIAD
MATH OLYMPIADS
8/18/25 SOLUTION
STRATEGY: COUNTING
86 DAYS FROM TODAY IS 120 + 86 OR 206 DAYS AFTER A FRIDAY. A WEEK IS 7 DAYS. 206 ÷ 7 = 29 R3.
29 WEEKS AND 3 DAYS AFTER A FRIDAY IS THE SAME DAY OF THE WEEK AS 3 DAYS AFTER THE FIRST FRIDAY.
86 DAYS FROM TODAY IS A MONDAY.
WHY IS MONDAY SO FAR FROM FRIDAY AND FRIDAY SO NEAR TO MONDAY?
MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 15, OLYMPIAD 5, 5E. 5 MINUTES
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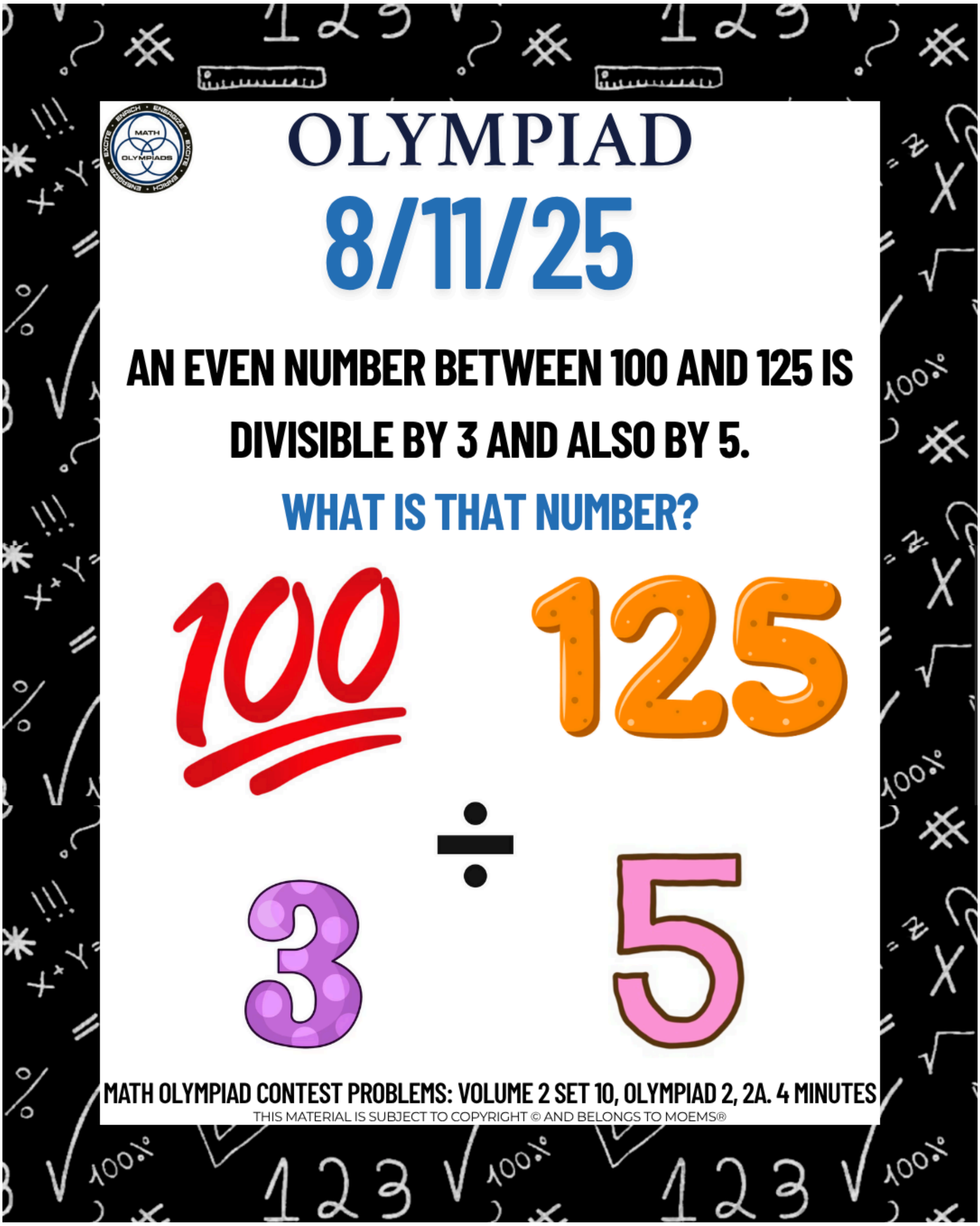
8/11/25


OLYMPIAD
8/11/25
AN EVEN NUMBER BETWEEN 100 AND 125 IS DIVISIBLE BY 3 AND ALSO BY 5.
WHAT IS THAT NUMBER?
100
125
÷
3
5
MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 10, OLYMPIAD 2, 2A. 4 MINUTES
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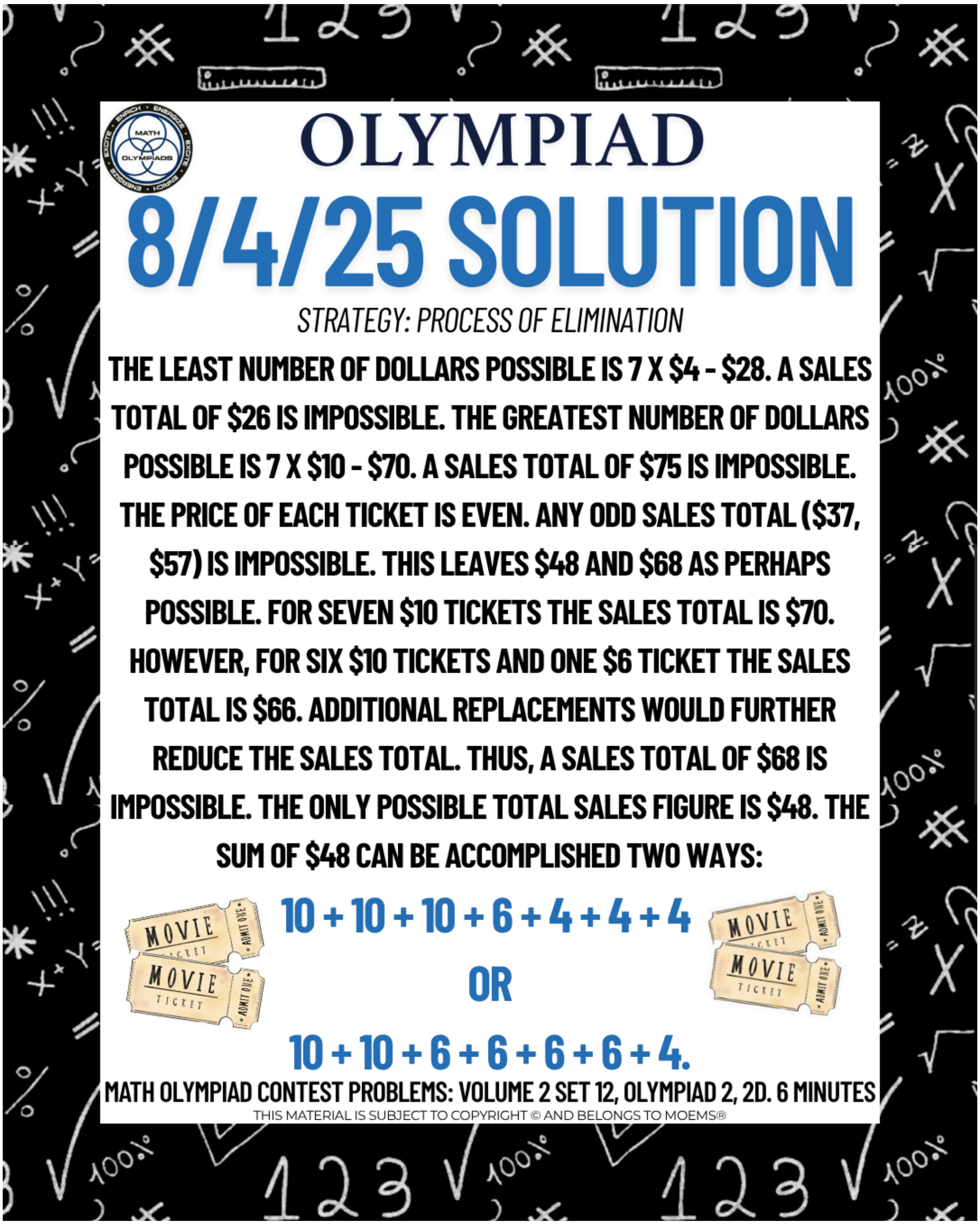
8/4/25


OLYMPIAD
8/4/25 SOLUTION
STRATEGY: PROCESS OF ELIMINATION
THE LEAST NUMBER OF DOLLARS POSSIBLE IS 7 X $4 - $28. A SALES TOTAL OF $26 IS IMPOSSIBLE. THE GREATEST NUMBER OF DOLLARS POSSIBLE IS 7 X $10 - $70. A SALES TOTAL OF $75 IS IMPOSSIBLE. THE PRICE OF EACH TICKET IS EVEN. ANY ODD SALES TOTAL ($37, $57) IS IMPOSSIBLE. THIS LEAVES $48 AND $68 AS PERHAPS POSSIBLE. FOR SEVEN $10 TICKETS THE SALES TOTAL IS $70. HOWEVER, FOR SIX $10 TICKETS AND ONE $6 TICKET THE SALES TOTAL IS $66. ADDITIONAL REPLACEMENTS WOULD FURTHER REDUCE THE SALES TOTAL. THUS, A SALES TOTAL OF $68 IS IMPOSSIBLE. THE ONLY POSSIBLE TOTAL SALES FIGURE IS $48. THE SUM OF $48 CAN BE ACCOMPLISHED TWO WAYS:
10 + 10 + 10 + 6 + 4 + 4 + 4
OR
10 + 10 + 6 + 6 + 6 + 6 + 4.
MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 12, OLYMPIAD 2, 2D. 6 MINUTES
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7/28/25

OLYMPIAD

7/28/25 SOLUTION

STRATEGY: FIND THE TIME THAT EACH CANDLE BURNS

CANDLE B BURNS AT TWICE THE RATE OF CANDLE A, SO CANDLE B NEEDS HALF THE TIME THAT CANDLE A DOES. CANDLE B BURNS FOR 72 ÷ 2 OR 36 MINUTES. SIMILARLY, CANDLE C BURNS ONE-THIRD OF THE TIME THAT CANDLE B DOES OR 12 MINUTES.

THE GREATEST NUMBER OF MINUTES OF LIGHT IS PROVIDED WHEN THE CANDLES BURN IN SUCCESSION, FOR 72 + 36 + 12 OR 120 MINUTES.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 16, OLYMPIAD 1, 1B. 5 MINUTES

7/21/2025

OLYMPIAD

7/21/25 SOLUTION

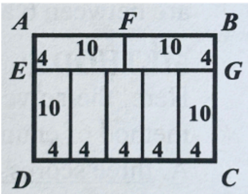
STRATEGY: USE THE FACT THAT THE OPPOSITE SIDES IF A RECTANGLE ARE EQUAL.

BECAUSE ALL SEVEN RECTANGLES ARE CONGRUENT, *AF = FB*. THUS, *BA* IS DIVIDED INTO TWO CONGRUENT PARTS AND THE LENGTH OF EACH IS 10. THEREFORE, *ED* = 10 AND *GC* = 10, ALSO.

SINCE *AB = 20, DC = 20.* SIMILARLY, DC IS DIVIDED INTO FIVE EQUAL PARTS, THE CORRESPONDING SIDES OF FIVE CONGRUENT RECTANGLES. THE LENGTH OF EACH PART IS 4. THUS, EACH OF THE CONGRUENT RECTANGLES ARE 10 BY 4. HENCE, AE = 4 AND BG = 4. COMBINING AE AND ED, AD = 14, AND THEREFORE, BC = 14.

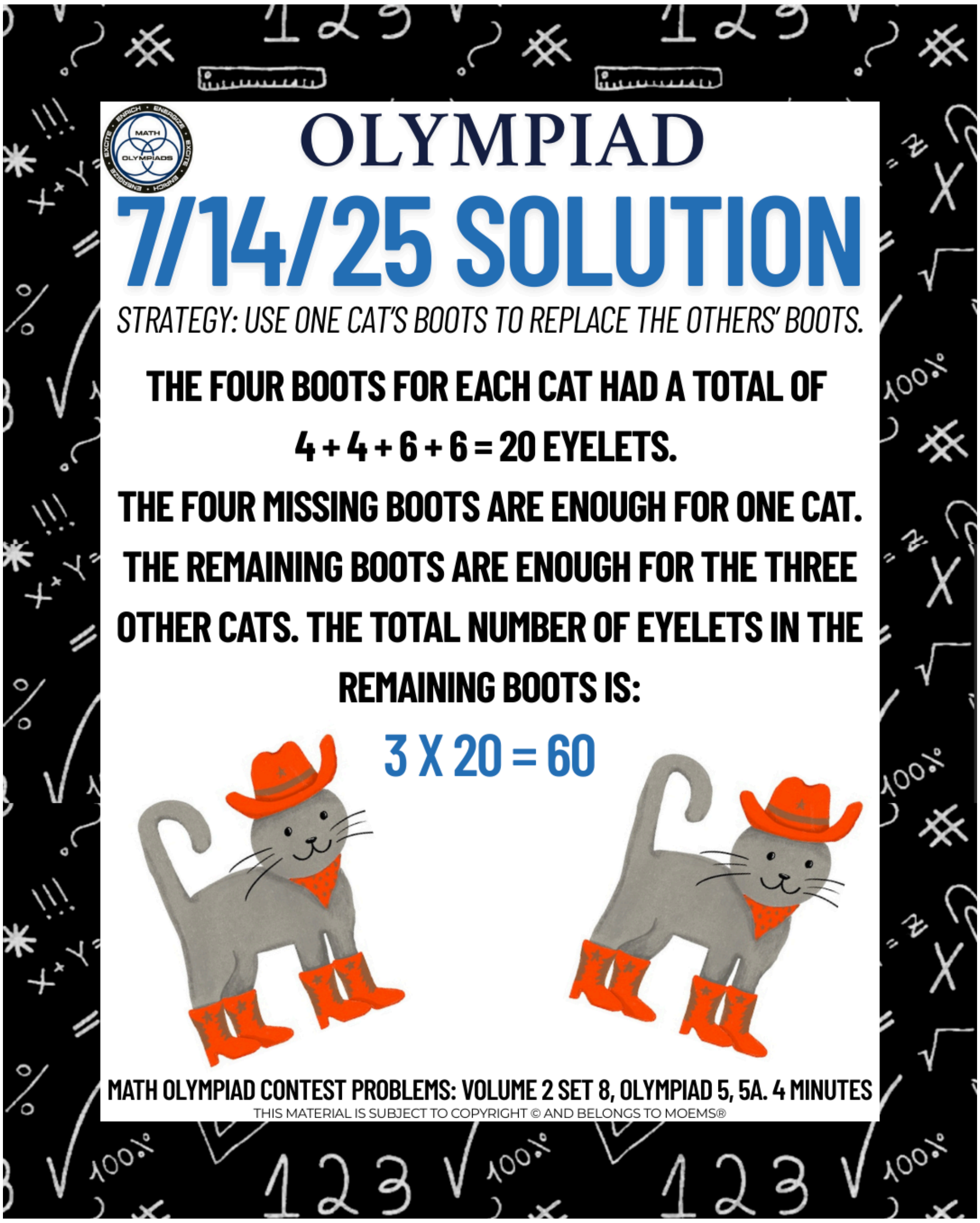
THE PERIMETER OF RECTANGLE ABCD IS:

20 + 14 + 20 +14 = 68



MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 11, OLYMPIAD 2, 2A. 4 MINUTES

July 14, 2025


OLYMPIAD
7/14/25 SOLUTION
STRATEGY: USE ONE CAT'S BOOTS TO REPLACE THE OTHERS' BOOTS.
THE FOUR BOOTS FOR EACH CAT HAD A TOTAL OF
4 + 4 + 6 + 6 = 20 EYELETS.
THE FOUR MISSING BOOTS ARE ENOUGH FOR ONE CAT.
THE REMAINING BOOTS ARE ENOUGH FOR THE THREE OTHER CATS. THE TOTAL NUMBER OF EYELETS IN THE REMAINING BOOTS IS:
3 X 20 = 60
MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 8, OLYMPIAD 5, 5A. 4 MINUTES
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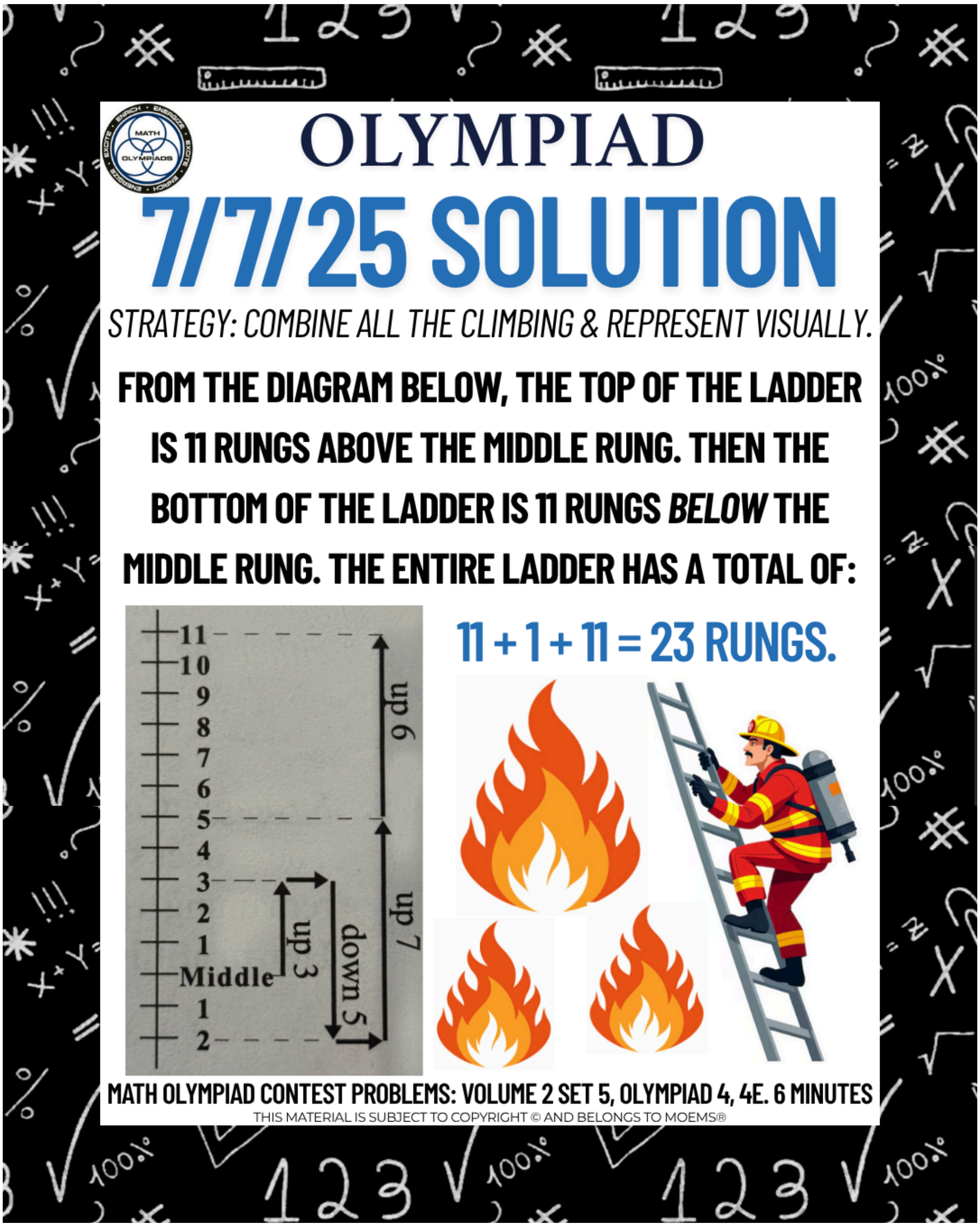
July 7, 2025


OLYMPIAD
7/7/25 SOLUTION
STRATEGY: COMBINE ALL THE CLIMBING & REPRESENT VISUALLY.
FROM THE DIAGRAM BELOW, THE TOP OF THE LADDER IS 11 RUNGS ABOVE THE MIDDLE RUNG. THEN THE BOTTOM OF THE LADDER IS 11 RUNGS *BELOW* THE MIDDLE RUNG. THE ENTIRE LADDER HAS A TOTAL OF:
11
10
9
8
7
6
5
4
3
2
1
Middle
1
2
up 3
down 5
up 7
up 9
11 + 1 + 11 = 23 RUNGS.
MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 5, OLYMPIAD 4, 4E. 6 MINUTES
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June 30, 2025

OLYMPIAD

6/30/25 SOLUTION

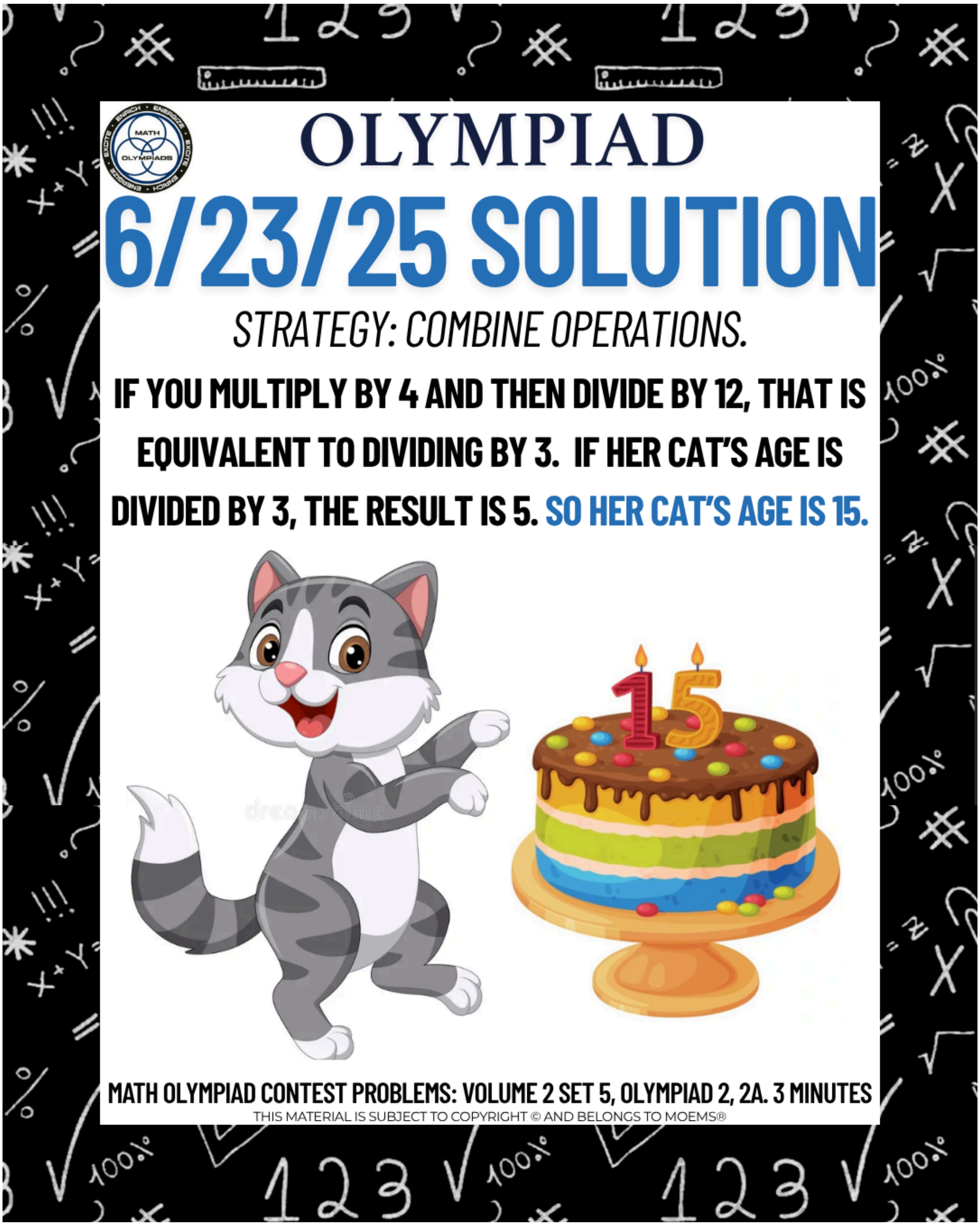
STRATEGY: USE A TABLE.

IF THE AGES OF THE 3 BROTHERS WERE 4, 12, AND 20 FOUR YEARS AGO, THE MIDDLE BROTHER TODAY, 16, WOULD BE TWICE THE AGE OF THE YOUNGEST BROTHER, 8, AND THE OLDEST ONE WOULD BE 24 YEARS OLD.

Ages 4 years ago	1, 3, 5	2, 6, 10	3, 9, 15	4, 12, 20
Current Ages	5, 7, 9	6, 10, 14	7, 13, 19	**8, 16, 24**

MATH OLYMPIAD CONTEST PROBLEMS: FEBRUARY 13, 2018, DIVISION E, CONTEST 4

June 23, 2025


OLYMPIAD
6/23/25 SOLUTION
STRATEGY: COMBINE OPERATIONS.
IF YOU MULTIPLY BY 4 AND THEN DIVIDE BY 12, THAT IS EQUIVALENT TO DIVIDING BY 3. IF HER CAT'S AGE IS DIVIDED BY 3, THE RESULT IS 5. SO HER CAT'S AGE IS 15.
15
MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 5, OLYMPIAD 2, 2A. 3 MINUTES
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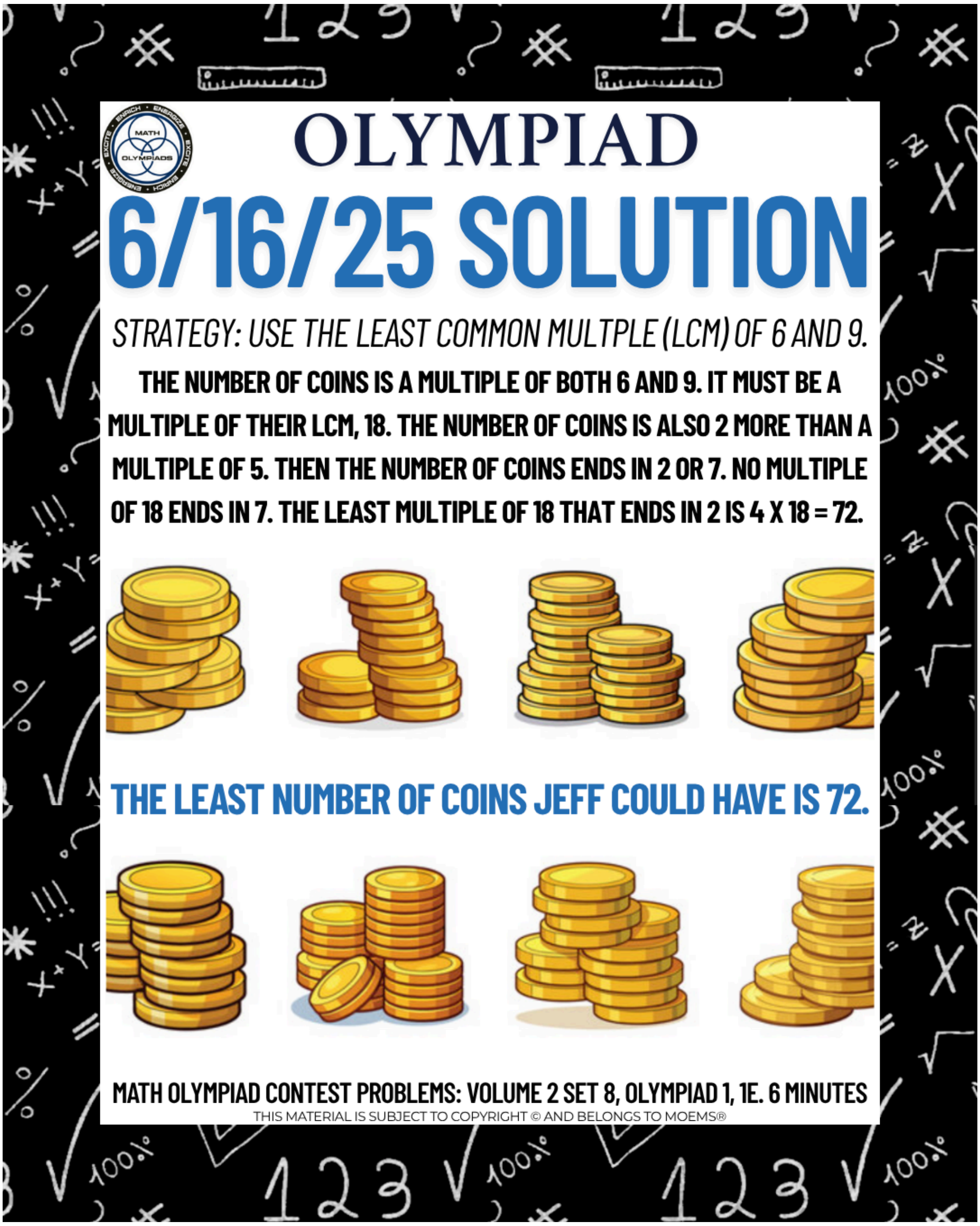
June 16, 2025


OLYMPIAD
6/16/25 SOLUTION
STRATEGY: USE THE LEAST COMMON MULTPLE (LCM) OF 6 AND 9.
THE NUMBER OF COINS IS A MULTIPLE OF BOTH 6 AND 9. IT MUST BE A MULTIPLE OF THEIR LCM, 18. THE NUMBER OF COINS IS ALSO 2 MORE THAN A MULTIPLE OF 5. THEN THE NUMBER OF COINS ENDS IN 2 OR 7. NO MULTIPLE OF 18 ENDS IN 7. THE LEAST MULTIPLE OF 18 THAT ENDS IN 2 IS 4 X 18 = 72.
THE LEAST NUMBER OF COINS JEFF COULD HAVE IS 72.
MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 8, OLYMPIAD 1, 1E. 6 MINUTES
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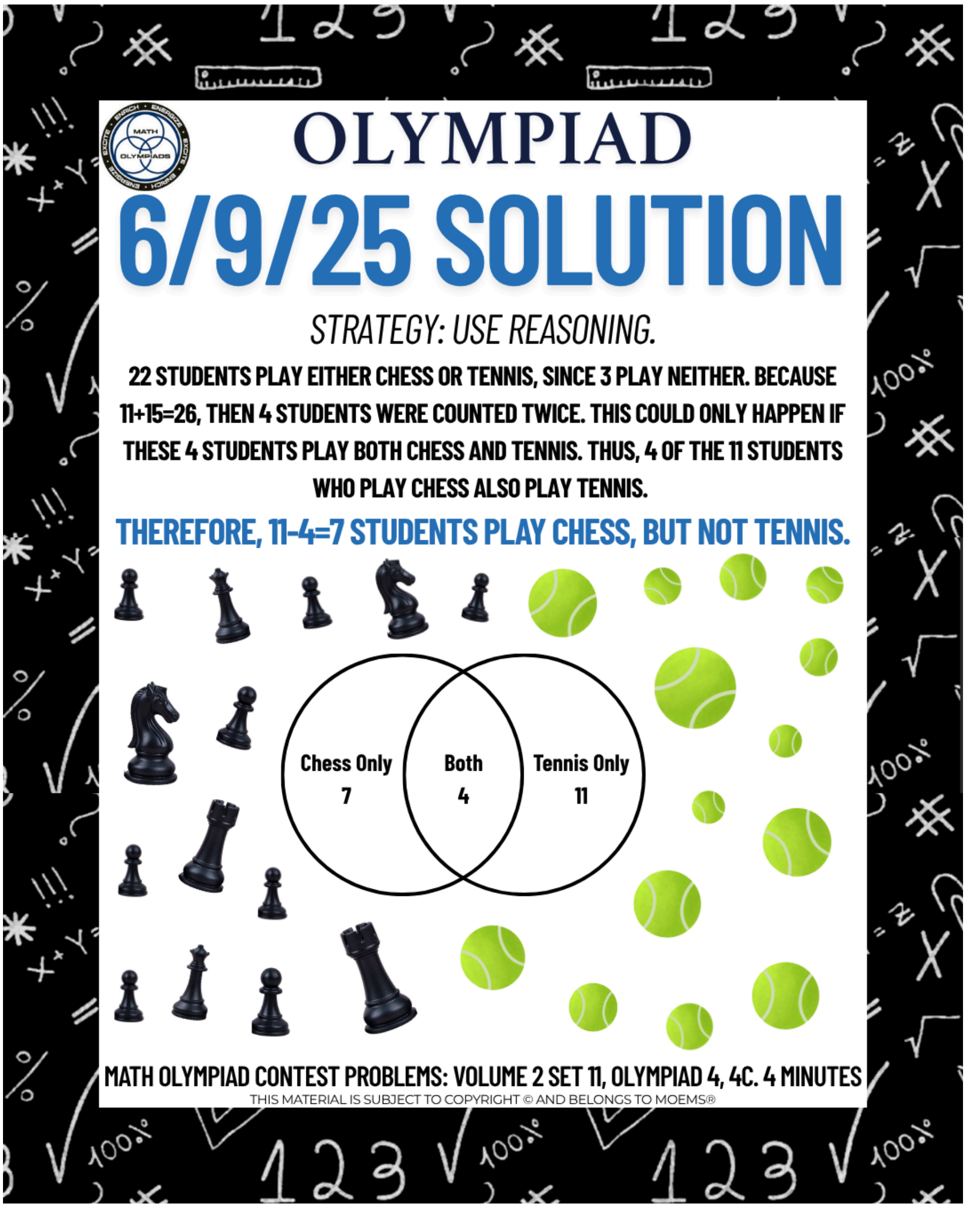
June 9, 2025


OLYMPIAD
6/9/25 SOLUTION
STRATEGY: USE REASONING.
22 STUDENTS PLAY EITHER CHESS OR TENNIS, SINCE 3 PLAY NEITHER. BECAUSE 11+15=26, THEN 4 STUDENTS WERE COUNTED TWICE. THIS COULD ONLY HAPPEN IF THESE 4 STUDENTS PLAY BOTH CHESS AND TENNIS. THUS, 4 OF THE 11 STUDENTS WHO PLAY CHESS ALSO PLAY TENNIS.
THEREFORE, 11-4=7 STUDENTS PLAY CHESS, BUT NOT TENNIS.
Chess Only 7
Both 4
Tennis Only 11
MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 11, OLYMPIAD 4, 4C. 4 MINUTES
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June 2, 2025

OLYMPIAD

6/2/25 SOLUTION

STRATEGY: WORK BACKWARDS.

AFTER THE EXCHANGE, MARIA HAS 3 MARBLES FOR EVERY 1 THAT JUAN HAS, A RATIO 3:1. THAT IS, OF THE 72 MARBLES MARIA HAS 3 OF EVERY 4 AND JUAN HAS 1 OF EVERY 4. THEREFORE, MARIA ENDS WITH 54 AND JUAN WITH 18 MARBLES.

	TOTAL	JUAN	MARIA
Step 3: Juan has ¼ of the marbles.	72	18	54
Step 2: Juan gives Maria 12 marbles.	72	30	42
Step 1: Juan gives Maria ½ his marbles.	72	60	12

BEFORE JUAN GAVE 12 OF HIS MARBLES TO MARIA, SHE HAD 54-12=42 AND JUAN HAD 18+12=30. BEFORE JUAN GAVE HALF OF HIS MARBLES TO MARIA, HE HAD 2X30=60 MARBLES AND SHE HAD 42-30=12 MARBLES. MARIA ORIGINALLY HAD 12 MARBLES.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2 SET 16, OLYMPIAD 5, 5D. 7 MINUTES

May 26, 2025

OLYMPIAD - 5/26/25

The LCM of 2,3,6 and 9 is 18. So, by adding 18 to 33,822, we can ensure that it will be divisible by all four numbers.

Therefore, the answer is 33,840.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 15, OLYMPIAD 4, 4C. 6 MINUTES

May 19, 2025

OLYMPIAD - 5/19/25

Let x = one side of the rectangle.
Let y = the other side.

$$P = x + x + y + y$$

$$x + x + y = 88$$
$$y + y + x = 80$$

From equation 1, $y = 88 - 2x$.
From equation 2, $x = 80 - 2(88-2x)$

$$x = 80 - 176 + 4x$$
$$-3x = -96$$
$$x = 32$$

Then, $32 + 32 + y = 88$

$$64 + y = 88$$
$$y = 24$$

So,
$P = 32 + 32 + 24 + 24 =$ **112**

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 15, OLYMPIAD 4, 4C. 6 MINUTES

May 12, 2025

OLYMPIAD - 5/12/25

Begin listing the perfect squares between 100 and 200:

$$11^2 = 121$$
$$12^2 = 144$$
$$13^2 = 169$$
$$14^2 = 196$$

196/7 = 28

So 196 is a perfect square and multiple of 7.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2

SET 16, OLYMPIAD 5, 5B. 4 MINUTES

May 5, 2025

OLYMPIAD - 5/05/25

The distance between -11 and -3 is
-3 - 11 = 8
¾ of this distance is ¾ is 6

Add 6 to -11 to get -5

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 15, OLYMPIAD 4, 4A. 3 MINUTES

April 28, 2025

OLYMPIAD - 4/28/25

If 120 days ago was Friday, that means that 120/7 = 17 weeks and 1 day have passed. Therefore, today is Saturday.

86/7 = 12 weeks and 2 days.

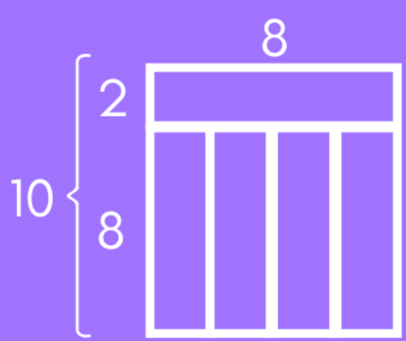
Therefore, it will be Monday.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 15, OLYMPIAD 5, 5E. 5 MINUTES

April 21, 2025

OLYMPIAD - 4/21/25

Let the small side of the rectangle be x. A long side must be 4x.
Guess and check:
If x = 2, then a long side must be 8.
2 + 2 + 8 + 8 = 20. Therefore, this measurement is correct.



A = 8 x 10 = 80cm

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 16, OLYMPIAD 1, 2E. 6 MINUTES

April 14, 2025

OLYMPIAD - 4/14/25

Simplify each and subtract,

$$\frac{2003}{25} + 25 \qquad \frac{2003 + 25}{25}$$

$$\frac{2003}{25} + \frac{625}{25} \qquad \frac{2028}{25}$$

$$\frac{2628}{25} - \frac{2028}{25} = \frac{600}{25} = 24$$

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 16, OLYMPIAD 1, 1C. 5 MINUTES

April 7, 2025

OLYMPIAD - 4/7/25

Express as a single fraction in lowest terms:

$$\frac{7}{19} \times \frac{13}{44} + \frac{7}{19} \times \frac{19}{44} + \frac{7}{19} \times \frac{25}{44} + \frac{7}{19} \times \frac{31}{44}$$

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2

SET 14, OLYMPIAD 2, 2D. 6 MINUTES

March 31, 2025

OLYMPIAD - 3/31/25

List the two digit multiples of four:

$$\underbrace{12, \underbrace{16, \underbrace{20, \ldots, 88}_{(20 + 88)/2 = 54}, 92}_{(16 + 92)/2=54}, 96}_{(12 + 96)/2 =54}$$

From outside in, each pair will cancel itself out such that the average of any pair will be equal to the average of all the numbers. Therefore, the average is 54.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 14, OLYMPIAD 2, 2A. 4 MINUTES

March 24, 2025

OLYMPIAD - 3/24/25

Using the format: ABCBA.
A can never be 0, therefore, a can be any digit 1-9.

B could be any digit 0-9. Therefore, there are 9 x 10 = 90 possible combinations of A and B.

Similarly, C can be any digit 0-9. For any possible value of AB, there are 10 possible values of C, totaling 90 x 10 = 900 combinations

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 14, OLYMPIAD 2, 2B. 5 MINUTES

March 17, 2025

OLYMPIAD - 3/17/25

Begin by multiplying each number by 100 (moving the decimal place two to the left). Then, simple division can be done to calculate whole numbers which add to 25.

$$\frac{6}{.3} + \frac{.3}{.06} = \frac{600}{30} + \frac{30}{6} = 20 + 5 = 25$$

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 13, OLYMPIAD 2, 2D. 5 MINUTES

March 10, 2025

OLYMPIAD - 3/10/25

Let x represent the number of friends and y represent the cost of the video game.

$$8x = y + 11$$
$$6x = y - 5$$

We can rewrite equation 2 as,

$$y = 6x + 5$$

Using substitution into equation 1,

$$8x = (6x + 5) + 11$$
$$8x = 6x + 16$$
$$2x = 16$$
$$x = 8 \text{ friends.}$$

Plugging back into our rewritten equation 2,

$$y = 6(8) + 5 = \$53$$

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 14, OLYMPIAD 2, 2C. 5 MINUTES

March 3, 2025

OLYMPIAD - 3/03/25

Emily won 12 matches. Since Jessica won 20% of matches, Emily must have won 80%

Therefore,
12 = .80T
where T is the total number of matches.
12/.80 = 15 matches.

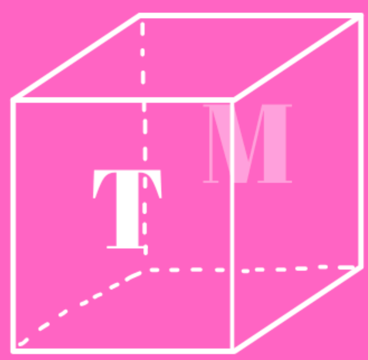
Therefore,
Jessica won 15-12 = 3 matches

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 13, OLYMPIAD 2, 2D. 5 MINUTES

February 24, 2025

OLYMPIAD - 2/24/25

When the cube is folded, the M will be opposite the T.



MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 2, OLYMPIAD 5, 5A. 3 MINUTES

January 27, 2025

OLYMPIAD - 1/27/25

$v = d/t$ so,

For the first 120 miles, the average speed is 40 mph.

$$\frac{120 \text{ mi}}{1} \times \frac{1 \text{ hr}}{40 \text{ mi}} = 3 \text{ hrs}$$

For the full trip (240 miles), the average speed is 48 mph.

$$\frac{240 \text{ mi}}{1} \times \frac{1 \text{ hr}}{48 \text{ mi}} = 5 \text{ hrs}$$

This means that the return trip (120 mi) lasted 2 hours at a speed of M.

$M = v = 120/2 = 60$ mph

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 14, OLYMPIAD 3, 3E. 6 MINUTES

January 20, 2025

OLYMPIAD - 1/20/25

Since the distance between lights 1 and 3 is 600m, the distance between each street light is 300m. Since there are 15 lights, there are only 14 gaps between them all. Therefore, 300 x 14 = 3 x 14 x 100 = 42 x 100 = 4200 m.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 14, OLYMPIAD 3, 3C. 5 MINUTES

January 13, 2025

OLYMPIAD - 1/13/25

Reverse the order of operations.

5 x 12 = 60.
60/4 = 15

Check:

15 x 4 = 60
60/12 = 5.

Answer: 15 years old

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 5, OLYMPIAD 2, 2A. 3 MINUTES

January 6, 2025

OLYMPIAD - 1/06/25

Let s = sitting ducks
l = lame ducks
n = normal ducks

$l = s + 2$
$n = l + 2 = s + 2 + 2 = \mathbf{s + 4}$

Total Ducks = $n + l + s = 33$

$(s + 4) + (s + 2) + s = 33$
$3s + 6 = 33$
$-6 \quad -6$
$3s = 27$
$s = 9$

So, there are 9 sitting ducks, which means that there are 11 lame ducks and 13 normal ducks.
9 sitting ducks x 0 legs = 0 legs
11 lame ducks x 1 leg = 11 legs
13 normal ducks x 2 legs = 26 legs

In total, there are 37 legs.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 4, OLYMPIAD 1, 1E. 6 MINUTES

December 9, 2024

OLYMPIAD - 12/09/24

If the sum is 350 and 100 is in the set, the largest another number could be (without considering the average) is 250.

For the average to be 50, we would need to have 7 numbers in our set since average = sum/amount and 350/7 = 50.

We want our set to begin with the lowest counting numbers possible. It must include 100, and we can subtract the small numbers from 250 in order to find the largest possible number.

{1, 2, 3, 4, 5, 100, 235}

Check:
1 + 2 + 3 + 4 + 5 + 100 + 235 = 350
350/7 = 50.

The answer is 235.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 5, OLYMPIAD 3, 3E. 5 MINUTES

December 2, 2024

OLYMPIAD - 12/02/24

The unit price to buy one candy cane can be found by dividing \$0.50 by 4. Each candy cane costs \$0.125, or 1/8 of a dollar. Each candy can sells for a unit price of \$0.50/3 = 1/6 of a dollar.

The profit can be found by subtracting 1/6 - 1/8 = 1/24 of a dollar per candy cane.

Create an equation where n = # of candy canes
(1/24)n = 5
n = 120

Check: If Bryan buys 120 candy canes at a price of 4 for \$0.50, he will spend \$15. Then, if he sells all 120 canes at a rate of 3 for \$0.50, he will make \$20. The profit is then \$5.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 4, OLYMPIAD 1, 1C. 5 MINUTES

November 25, 2024

OLYMPIAD - 11/25/24

The pages of a book are numbered consecutively from 1 through 177, inclusive. If a page is chosen at random, what is the probability that the page number will contain the digit '1'?

The numbers that will contain a 1 are

- 1 : 1 number
- 10-19 : 10 numbers
- 21, 31, 41 ... 91 : 8 numbers
- 100-177 : 78 numbers

Which is, in total, 97 numbers. Therefore, 97 out of 177 pages contain a 1.
Therefore, the probability is 97/177

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 5, OLYMPIAD 4, 4A. 4 MINUTES

November 18, 2024

OLYMPIAD - 11/18/24

Given the table above, we can fill in the gap between 7 and 4 by adding and then subtracting from 20.
$7 + 4 = 11$. $20 - 11 = 9$. Therefore, the gap = 9

A		7									7	9	4

Next, we can repeat this for the box directly to the left of 7 and 9: $7 + 9 = 16$. $20-16 = 4$.

A		7								4	7	9	4

Now repeat the process until the chart is filled in.

9	4	7	9	4	7	9	4	7	9	4	7	9	4

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 5, OLYMPIAD 4, 4A. 4 MINUTES

November 4, 2024

OLYMPIAD - 11/4/24

If the first number is x, then we can represent all 9 consecutive numbers as:
x, x + 1, x + 2, x + 3, x + 4, x + 5, x + 6, x + 7, and x + 8

If we add all these terms up, we have 9x + 36.
Then 9x + 36 = 378
9x = 342
x = 38.

So, the consecutive pages are:
38, 39, 40, 41**, 42,** 43, 44, 45, 46

and the middle page is 42.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 3, OLYMPIAD 5, 5B. 5 MINUTES

October 21, 2024

OLYMPIAD - 10/21/24

If we lose 3 minutes per hour, we can write this as an expression to represent the number of minutes lost, $3x$, where x represents the number of hours passed since 1:00.

Now, we need to find x. If we start with 1:00 PM, we can jump 12 hours to 1:00 AM and then add up from there.

From 1 AM to 10 AM, there are 9 hours. So in total, $12 + 9 = 21$ hours have passed.

If we go back to our original expression, $3(21) = 63$ minutes were lost. In other words, we are behind 1 hour and 3 minutes

---

So, if the correct time is 10 AM, the clock will show 8:57 AM

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2

SET 5, OLYMPIAD 3, 3C. 5 MINUTES

October 14, 2024

OLYMPIAD - 10/14/24

Newton's father is approaching 50 so within the next 9 years, it is not possible that their ages are the same in reverse since for example, next year, newton will be 15 and his father will not be 51.

In 10 years, newton will be 24 and his father will not be 42,

In **11 years**, Newton will be 25 an his father will be 52.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 5, OLYMPIAD 3, 3B. 4 MINUTES

October 7, 2024

OLYMPIAD - 10/7/24

If the area of a square is 36, the side lengths must be 6, and therefore the perimeter is 4(6) = 24

Let x be the width of the rectangle. Then, the length is 2x. So,

$$x + x + 2x + 2x = 24$$

$$6x = 24$$

$$x = 4.$$

Therefore, the side lengths are 4 and 8. So, the area is 32 square cm.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2

SET 2, OLYMPIAD 3, 3D. 6 MINUTES

September 30, 2024

OLYMPIAD - 9/30/24

EXAMPLE SOLUTION:

MAKE A TABLE OF EACH SCENARIO. IN SCENARIO 1, THE RATIO MUST BE 3:2 FOR ALL POSSIBLE PAIRS OF VOTES. HOWEVER, KIM'S NUMBER OF VOTES MUST BE GREATER THAN 8 FOR SCENARIO 2 TO BE POSSIBLE SO WE WILL START WITH THE PAIR 9:6. THEN, SUBTRACT 8 FROM KIM'S NUMBER AND ADD 8 TO AMY'S UNTIL WE GET A PAIR WITH A RATIO 1:2

SCENARIO 1 - RATIO IS 3:2

KIM	AMY
9	6
12	8
15	10
18	12

SCENARIO 2 - RATIO IS 1:2

KIM	AMY
1	14
4	16
7	18
10	20

THEREFORE, THE TOTAL NUMBER OF VOTES IS 30

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2
SET 3, OLYMPIAD 4, 4C. 5 MINUTES

September 23, 2024

OLYMPIAD - 9/23/24

WHAT IS THE VALUE OF THE WHOLE NUMBER N IF:

$$n = \frac{1}{2} \text{ OF } \frac{2}{3} \text{ OF } \frac{3}{4} \text{ OF } \frac{4}{5} \text{ OF } 100?$$

IN MATH, OF MEANS MULTIPLICATION. USING THE COMMUTATIVE PROPERTY, WE CAN START BY MULTIPLYING 100 BY 1/2.

$$n = \frac{1}{2} \times 100 \times \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} = 50 \times \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5}$$

NEXT, WE MULTIPLY 4/5 X 50. FIRST DIVIDE BY 5 AND THEN MULTIPLY BY 4.

$$n = 50 \times \frac{4}{5} \times \frac{2}{3} \times \frac{3}{4} = 40 \times \frac{2}{3} \times \frac{3}{4}$$

NOW MULTIPLY BY 3/4 AND FINISH BY MULTIPLYING BY 2/3

$$n = 40 \times \frac{3}{4} \times \frac{2}{3} = 30 \times \frac{2}{3} = 20$$

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2

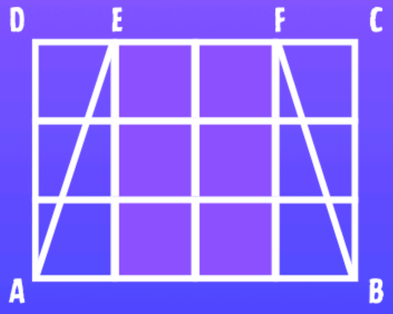
SET 1, OLYMPIAD 4, 4A. 4 MINUTES

September 16, 2024

OLYMPIAD - 9/16/24

ABCD IS A RECTANGLE WHOSE AREA IS 12 SQUARE UNITS. HOW MANY SQUARE UNITS ARE CONTAINED IN THE AREA OF TRAPEZOID EFBA?

THE INTERIOR BOXES CAN BE COUNTED: 6



THE TRIANGULAR PIECES OF THE TRAPEZOID CAN BE PUT TOGETHER TO MAKE 3 FULL BOXES

ALL TOGETHER, THE TRAPZOID IS MADE UP OF 9 SQUARE UNITS

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2

SET 1, OLYMPIAD 4, 4B. 5 MINUTES

September 9, 2024

OLYMPIAD - 9/09/24

ROBERT THROWS 5 DARTS AT THE TARGET SHOWN.
EACH DART LANDS IN A REGION OF THE TARGET,
SCORING THE POINTS SHOWN. OF THE FOLLOWING TOTAL
SCORES, LIST ALL THAT ARE *NOT* POSSIBLE.
HOW MANY CUBES DOES THE TOWER CONTAIN?

6, 14, 17, 38, 42, 58

IF 5 DARTS ARE THROWN AND EACH LANDS, THE MINIMUM SCORE IS 10. THEREFORE, 6 IS NOT A POSSIBILITY.

2 + 2 + 2 + 2 + 8 = 14. (THIS IS JUST ONE EXAMPLE TO PROVE IT TRUE.)

17 IS NOT A POSSIBILITY BECAUSE IT IS ODD.

10 + 10 + 10 + 4 + 4 = 38. (THIS IS JUST ONE EXAMPLE TO PROVE IT TRUE)

10 + 10 + 10 + 10 + 2 = 42. (THIS IS JUST ONE EXAMPLE TO PROVE IT TRUE)

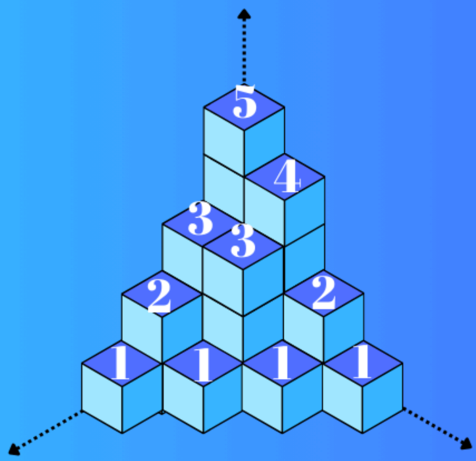
THE MAXIMUM NUMBER OF POINTS YOU CAN GET IS 50 SO 58 IS NOT POSSIBLE.

MATH OLYMPIAD CONTEST PROBLEMS: VOLUME 2

SET 4, OLYMPIAD 2, 2A. 5 MINUTES

June 24, 2024

SOLUTION - 6/24/24



$$1(4) + 2(2) + 3(2) + 4 + 5 = 23$$

Math Olympiad Contest Problems: Volume 2
Set 1, Olympiad 3, 3B. 5 Minutes

June 17, 2024

SOLUTION - 6/17/24

100/12 = 8 r 4. So, the time will show 4 hours after 10:45 which is 2:45.

Math Olympiad Contest Problems: Volume 2
Set 1, Olympiad 3, 3A. 4 Minutes

June 10, 2024

SOLUTION - 6/10/24

Let child tickets = c and let

adult tickets = a

Then, $3c + 7a = 64$ and $c = 12 - a$

Then, $3(12 - a) + 7a = 64$

So, $36 - 3a + 7a = 64$

$36 + 4a = 64$

$4a = 28$

$a = 7$

so, $c = 5$

Math Olympiad Contest Problems: Volume 2
Set 1, Olympiad 2, 2E. Minutes

June 03. 2024

SOLUTION - 6/03/24

A remainder of four means that any answer must be a divisor of 18; namely 1, 2, 3, 6. 9, or 18. It also means that the answer must be greater than 4. So the elligible divisors are 6, 9, and 18.

Math Olympiad Contest Problems: Volume 2
Set 1, Olympiad 2, 2D. 5 Minutes

May 27, 2024

SOLUTION - 5/27/24

Below, boxes represent digits and different letters represent different non-zero digits. What three digit number is the least possible product?

Strategy: Starting with B, consider every possible value for each unknown number. D = 9 and either B = 3 or 7. If B=7, at least one partial product would have three digits. Therefore B=3.

$$
\begin{array}{cccc}
 & & A & B \\
\times & & C & B \\
\hline
 & & \boxed{E} & 9 \\
 & \boxed{G} & \boxed{F} & \\
\hline
 & \boxed{} & \boxed{} & \boxed{D}
\end{array}
$$

Of the 7 combinations of A and C which produce two-digit partial products, only 1 and 2 (in either order) satisfy the condition that the product is a minimum. Then, E = 6 and F = 3. Therefore the least possible product is 299.

Math Olympiad Contest Problems: Volume 2
Set 1, Olympiad 2, 2C. 5 Minutes

May 20, 2024

SOLUTION - 5/20/24

A rectangular box is 2 cm high, 4 cm wide, and 6 cm deep. Michelle packs the box with cubes, each 2 cm by 2 cm by 2 cm, with no space left over. How manu ubes does she fit in the box?

Volume Box = lwh = (2)(4)(6) = 48 cubic cm

Volume Cube = (2)(2)(2) = 8 cubic cm

48/8 = 6 cubes

Math Olympiad Contest Problems: Volume 2

Set 1, Olympiad 2, 2A. 3 Minutes

May 13, 2024

SOLUTION - 5/13/24

Marty has 6 more pogs than Jen has. After he gives 10 pogs to Jen. How many More pogs will Jen have than Marty?

Let Jen have 100 pogs at first. Then, Marty has 106. If Marty gives 10 pogs to Jen, then Jen will have 110 and Marty will have 96. So Jen has, 110-96 = 14 pogs more than Marty.

Math Olympiad Contest Problems: Volume 2
Set 1, Olympiad 2, 2A. 3 Minutes

April 29, 2024

SOLUTION - 4/29/24

Answer: 30 x 40 x 50 x 60 x 70 = 252,000,000

There are 6 terminal zeros.

April 22, 2024

SOLUTION - 4/22/24

Unit price for Toyworld: 25/4 = $6.25
Unit price for Gameland: 30/5 = $6

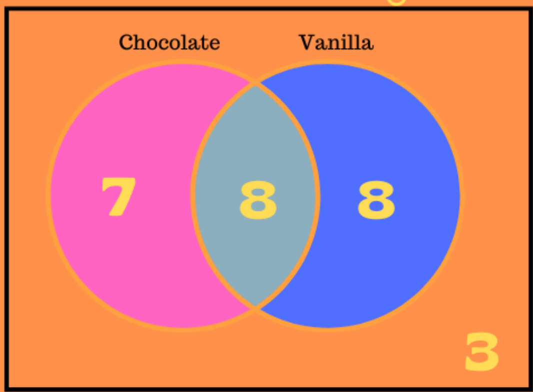
20 crayons x $6.25 = $125 at Toyworld
20 crayons x $6 = $120 Gameland

Gameland sells 20 crayons for $5 less than Toyworld.

April 15, 2024

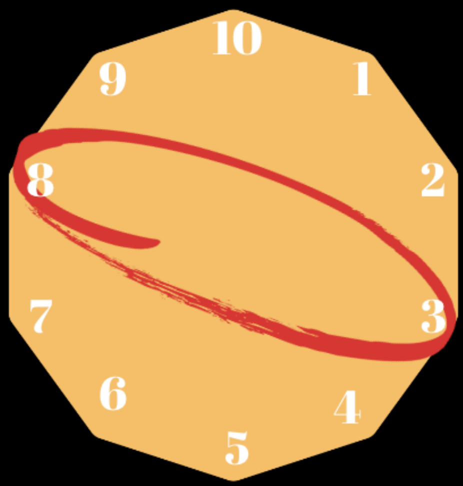
SOLUTION - 4/15/24

If there are 26 total students and 3 do not like either chocolate or vanilla, then 23 students like chocolate, vanilla, or both.
We were told that 15 people like chocolate and 16 like vanilla. If you total these numbers to 31, we realize that 8 people must have been over counted. Therefore these are the students who like both. See the vendiagram below:



April 1, 2024

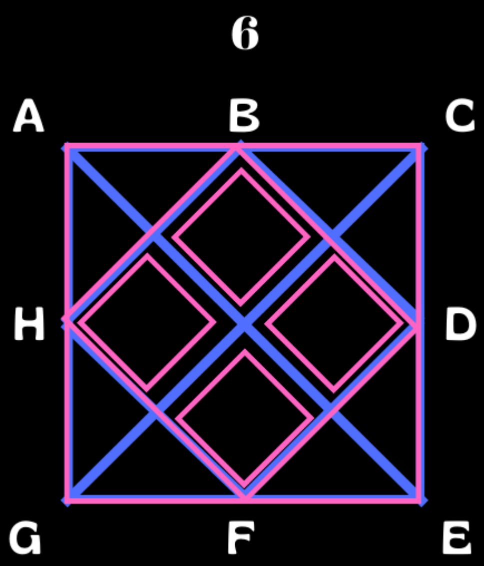
SOLUTION - 4/01/24



Answer: 8 and 3

March 18, 2024

SOLUTION - 3/18/24



March 11, 2024

SOLUTION - 3/11/24

If one side of a smaller square = s, The area of square ABCD = can be represented by $9(s)^2$

The area of the white shaded region is $7(s)^2$

If $7(s)^2 = 14$, then $s = \sqrt{2}$

So, the area of ABCD = $9(s)^2 = 9(\sqrt{2})^2 = 18$

February 26, 2024

SOLUTION - 2/26/24

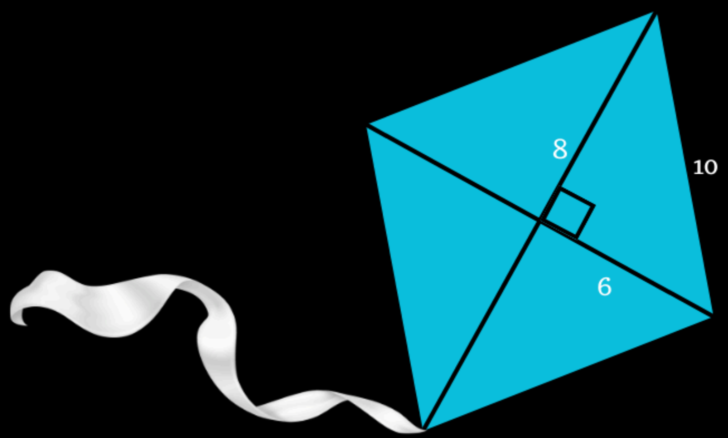
$$2 \times 2 \times 2 \times 2 = 16$$

$$\frac{(\cancel{20} \times \cancel{24} \times \cancel{28} \times \cancel{32})}{(\cancel{10} \times \cancel{12} \times \cancel{14} \times \cancel{16})}$$

February 12, 2024

SOLUTION - 2/12/24

In a rhombus, the diagonals bisect eachother at right angles. Therefore, it is broken up into 4 congruent right triangles with side lengths 8 and 6. The 6,8,10 pythagorean triple tells us that the hypotenuse of each triangle is 10in. So the perimeter is 40 inches



February 5, 2024

SOLUTION - 2/05/24

1, 3, 7, 9, 11, 13, 15,
17, 19, 21, 23, 25,
27, 29, 31, 33, 35,
37, 39, 41

It appears 9 times

January 29, 2024

SOLUTION - 1/29/24

Let J = Jimmy's age now

Let T = Tom's age now

1st piece of info:

$(J-10) = 3(T-10)$ -->

$J = 3(t-10)+10$

$(J + 5) = 10 + 2(T + 5)$-->

$J = 10 + 2(T+5) -5$

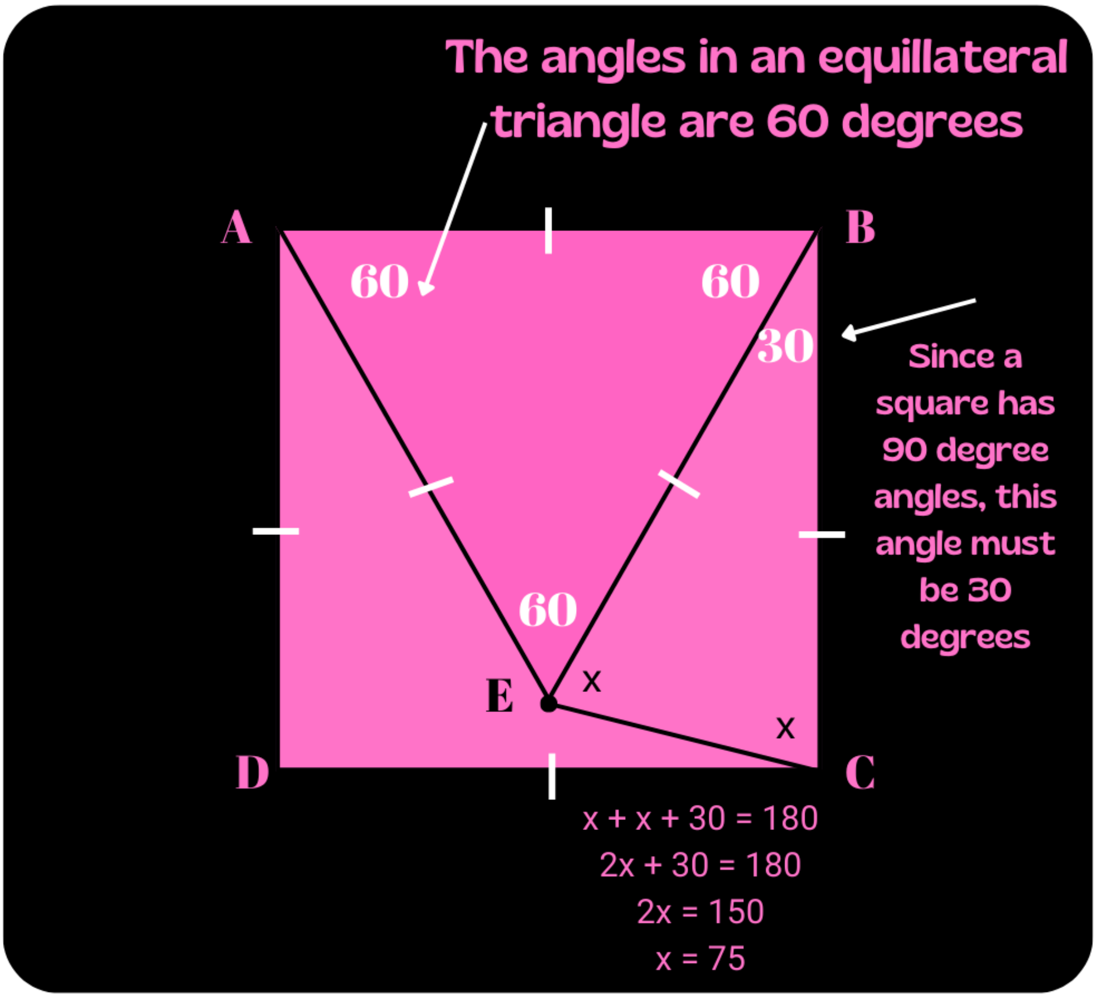
$10 + 2(T+5) -5 = 3(t-10)+10$

$15 + 2T = 3T -20$

$35 = T$

January 22, 2024

SOLUTION - 1/22/24



January 15, 2024

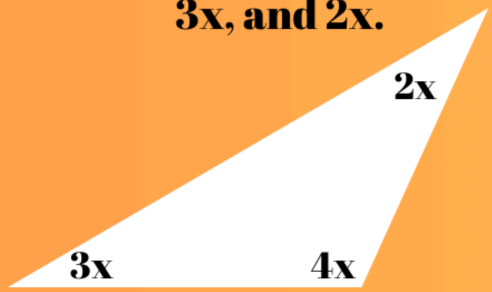
SOLUTION - 1/15/24

$$T(0) = 0$$
$$T(1) = 0$$
$$T(2) = 1$$
$$T(3) = 0 + 0 + 1 = 1$$
$$T(4) = 0 + 1 + 1 = 2$$
$$T(5) = 1 + 1 + 2 = 4$$
$$T(6) = 1 + 2 + 4 = 7$$
$$T(7) = 2 + 4 + 7 = 13$$
$$T(8) = 4 + 7 + 13 = 24$$

January 8, 2024

SOLUTION - 1/08/24

Since the angles are in a ratio of 4:3:2, we can label the degree measures as 4x, 3x, and 2x.



Since the angles in a triangle always add up to 180 degrees,

$$2x + 3x + 4x = 180$$
$$9x = 180$$
$$x = 20$$

So, the second largest angle is 3(20) = 60 degrees.

January 1, 2024

SOLUTION - 12/18/23

$$x + 24 = 3x$$

$$24 = 3x - x$$

$$24 = 2x$$

$$x = 12$$

Check:

$$12 + 24 = 12(3)$$

December 18, 2023

SOLUTION - 12/18/23

Numbers greater than 100 divided by 8 that give remainder 1: 105, 113, 121, 129, 137, 145, 153, 161, **169**

Numbers greater than 100 divided by 7 that give remainder 1: 106, 113, 120, 127, 134, 141, 148, 155, 162, **169**

Numbers greater than 100 divided by 6 that give remainder 1: 103, 109, 115, 121, 127, 133, 139, 145, 151, 157, 163, **169**

The only common number in all three lists is **169**

December 11, 2023

SOLUTION - 12/11/23

$$
\begin{array}{rrrrr}
 & & {}^{+1}4 & {}^{+4}_{+1}\underline{2} & \underline{6} \\
 & & \times & \underline{3} & 7 \\
\hline
 & \underline{2} & \underline{9} & 8 & 2 \\
1 & 2 & \underline{7} & \underline{8} & \\
\hline
\underline{1} & \underline{5} & \underline{7} & \underline{6} & \underline{2}
\end{array}
$$

December 04, 2023

Solution - 12/04/23

Let x = # of 2 person tables

Let y = # of 5 person tables

Then, $x + y = 30$

And $2x + 5y = 81$

Using the first equation, $y = 30 - x$

Plugging into the second equation:

$$2x + 5(30 - x) = 81$$

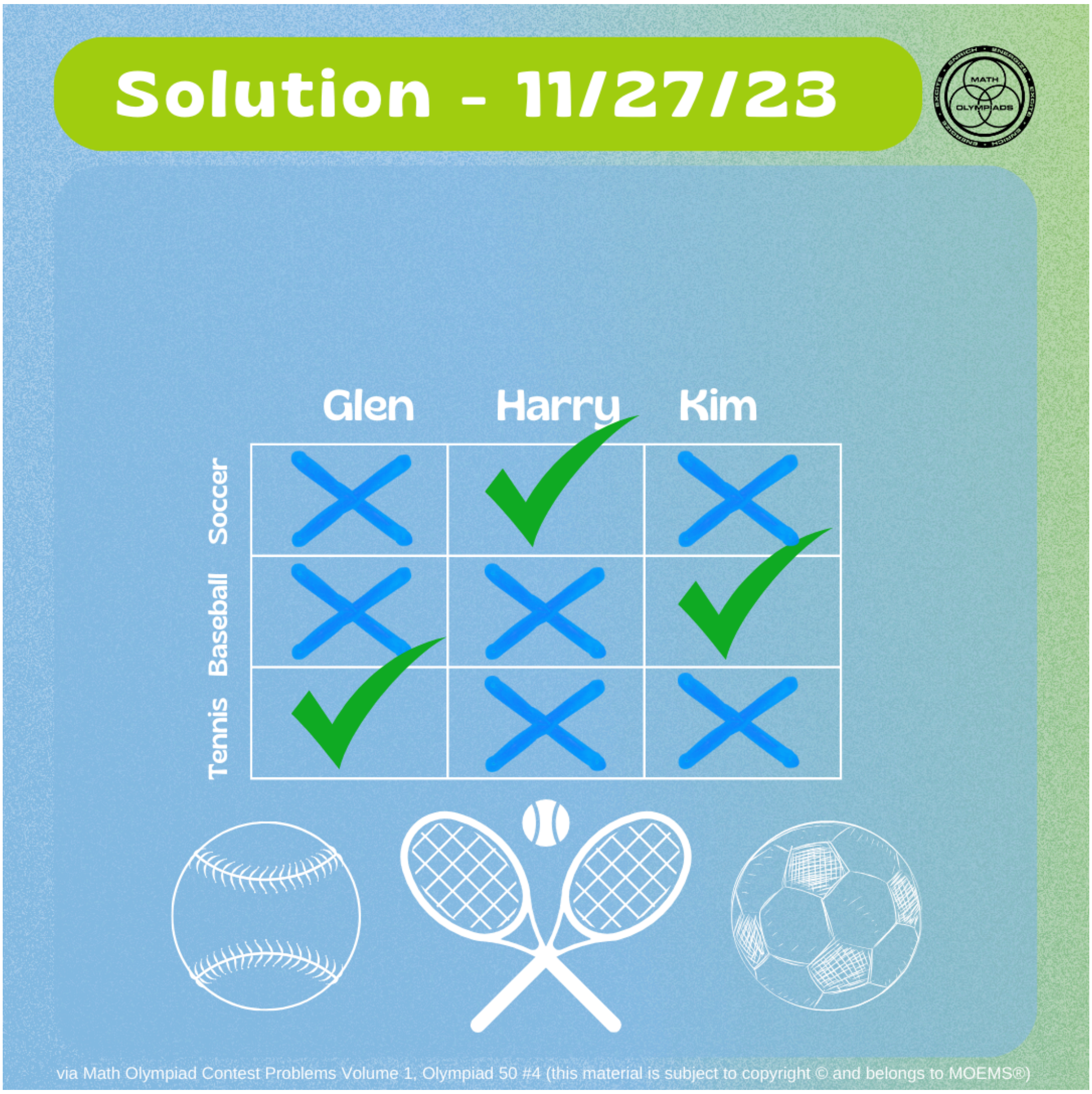
$$2x + 150 - 5x = 81$$

$$-3x + 150 = 81$$

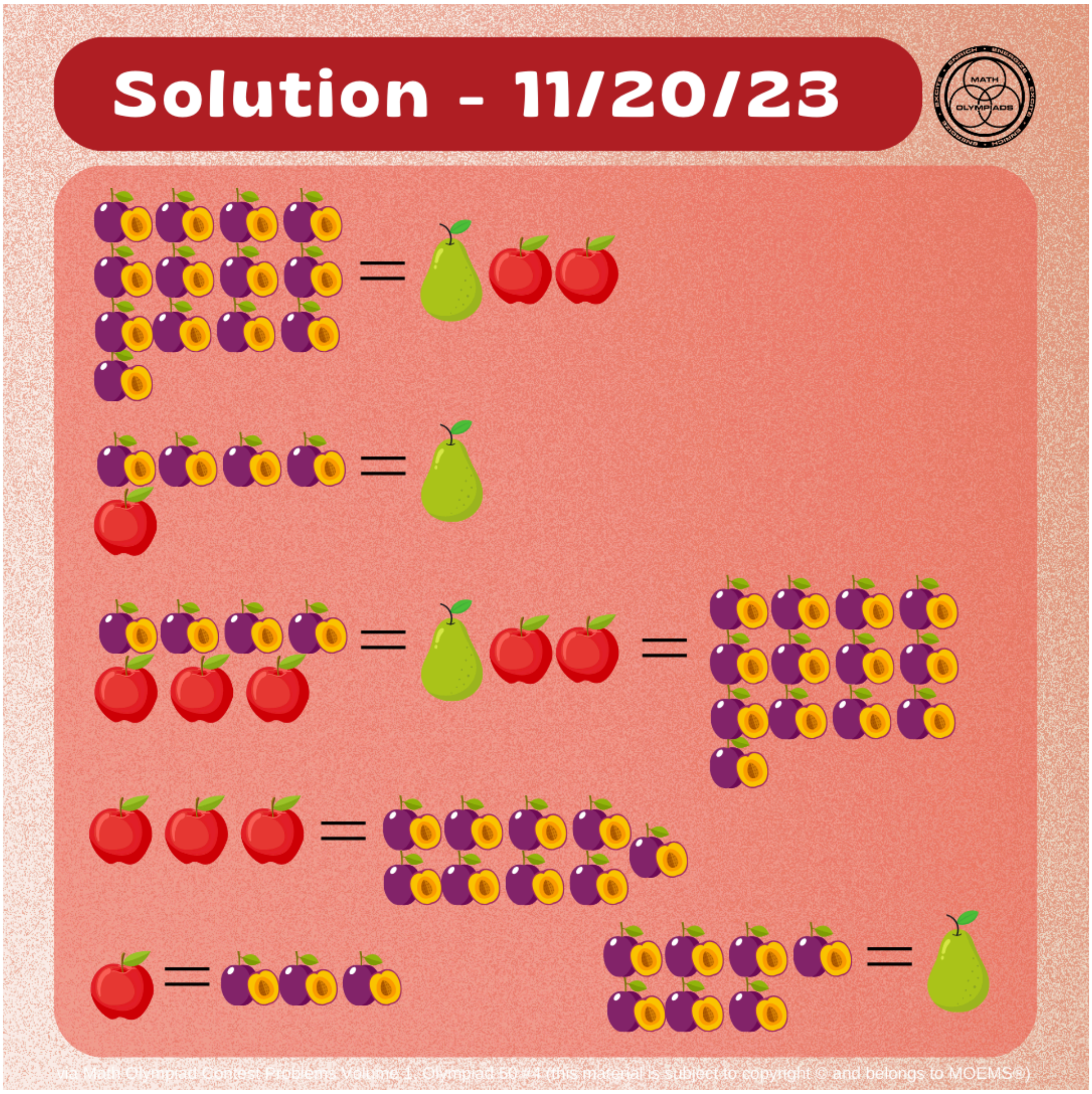
$$-3x = -69$$

$x = 23$ two person tables

November 27, 2023



November 20, 2023



November 13, 2023

SOLUTION - 11/13/23

$$\frac{1}{3} \xrightarrow{+x} \underline{\quad} \xrightarrow{+x} \underline{\quad} \xrightarrow{+x} \frac{1}{2}$$

$$\frac{1}{3} + 3x = \frac{1}{2}$$

$$-\frac{1}{3} \qquad -\frac{1}{3}$$

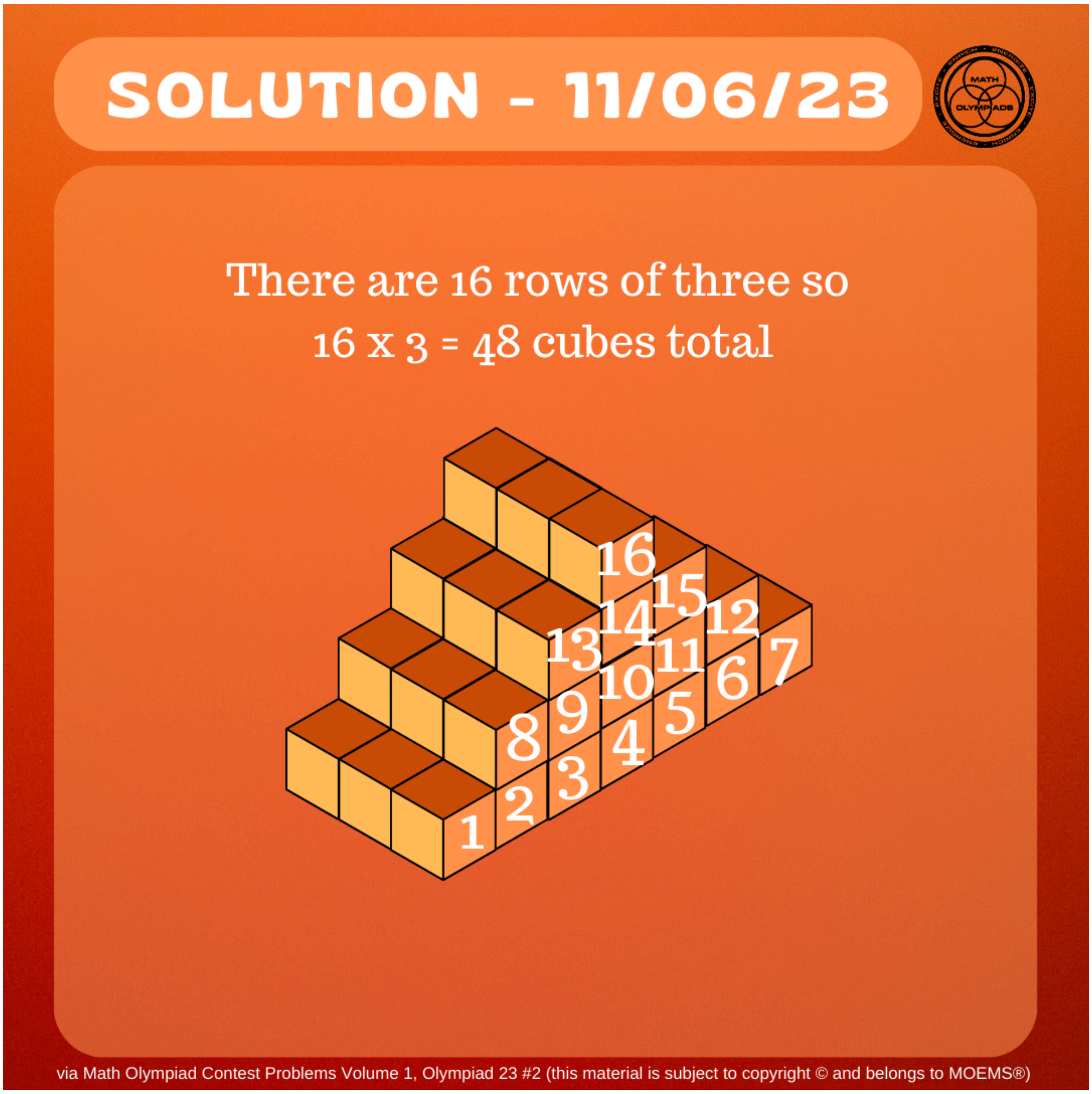
$$3x = \frac{1}{6}$$

$$/3 \qquad /3$$

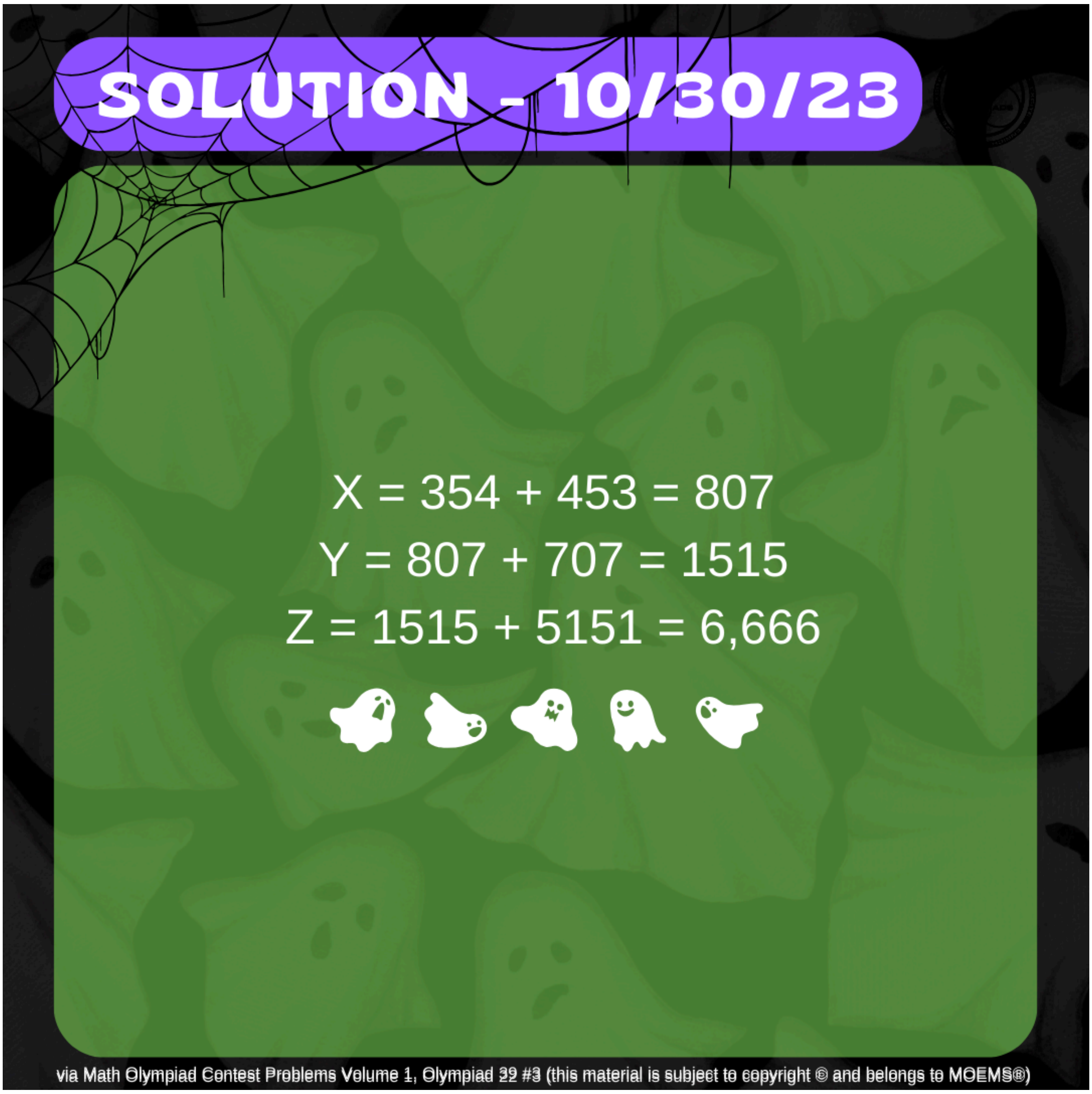
$$x = \frac{1}{18}$$

$$\frac{1}{3} \xrightarrow{+1/18} \frac{7}{18} \xrightarrow{+1/18} \frac{8}{18} \xrightarrow{+1/18} \frac{1}{2}$$

November 6, 2023



October 30, 2023



October 23, 2023

SOLUTION - 10/23/23

The average of three numbers can be found by adding them all and dividing by 3.

$$\frac{1/2 + 1/3 + x}{3} = 1$$

Cross multiply and get,

$$(1/2 + 1/3) + x = 3$$

$$(3/6 + 2/6) + x = 18/6$$

$$5/6 + x = 18/6$$

$$-5/6 \qquad -5/6$$

$$x = 13/6 = 2\ 1/6$$

October 16, 2023

SOLUTION - 10/16/23

The length of the large rectangle created by x's is 18 and the width is 8. So, without the missing x's there should be 18 x 8 = 144 x's.

The triangle taken out contains 9 x's and the missing rectangle is 5 x 3 = 15 x's.

So, 144 - 9 - 15 = 120 x's

October 02, 2023

OLYMPIAD - 10/02/23

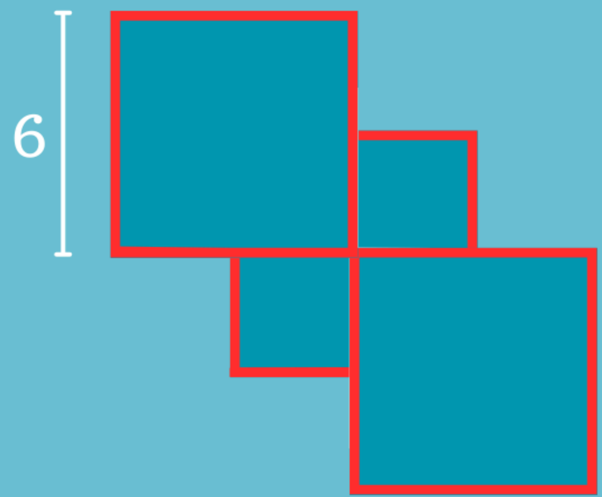
A	B	C	D	E	F	G
1		2		3		4
	7		6		5	
8		9		10		11
	14		13		12	
15		16		...		

Column A contains numbers that when divided by 7, has a remainder of 1. Column B has remainder 0, C has remainder 2, D remainder 6, E remainder 3, F remainder 5, and G remainder 4. 300/7 is 294 r6. So, it will be in column D

September 25, 2023

SOLUTION - 9/25/23

We can look at this diagram as the area of two squares with side length 6 plus two squares of side length 3:



So, 2(6x6) + 2(3 x 3) = 2(36) + 2(9)

72 + 18 = 90 units sq

September 18, 2023

SOLUTION - 9/18/23

Let the mans age = x and the womans age = y

Since their ages add up to 99,

$$x + y = 99$$

$$x = 99 - y$$

Since the man is 9 years older,

$$x = y + 9$$

Set them equal to eachother and solve

$$99 - y = y + 9$$

$$90 = 2y$$

$$y = 45$$

$$x = 54$$

September 11, 2023

SOLUTION - 9/11/23

P = Area of ABCD = 16 sq in = s^2 --> s=4

AB=AD=BC=BD=4

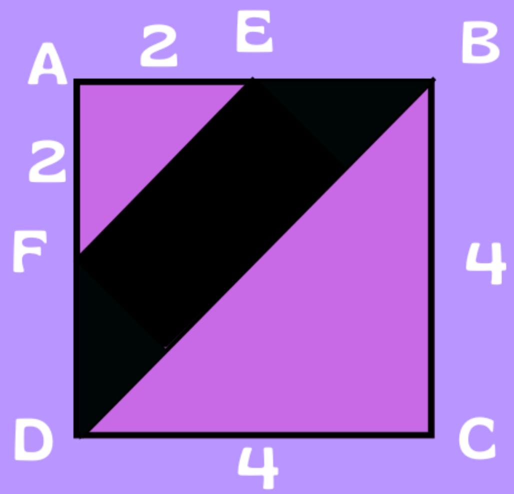
Since E and F are midpoints,

EB=EA=AF=FD=2.

Q = Area of Triangle AEF = (.5)(2)(2)=2

R = Area of Triangle BDC=(.5)(4)(4)=8

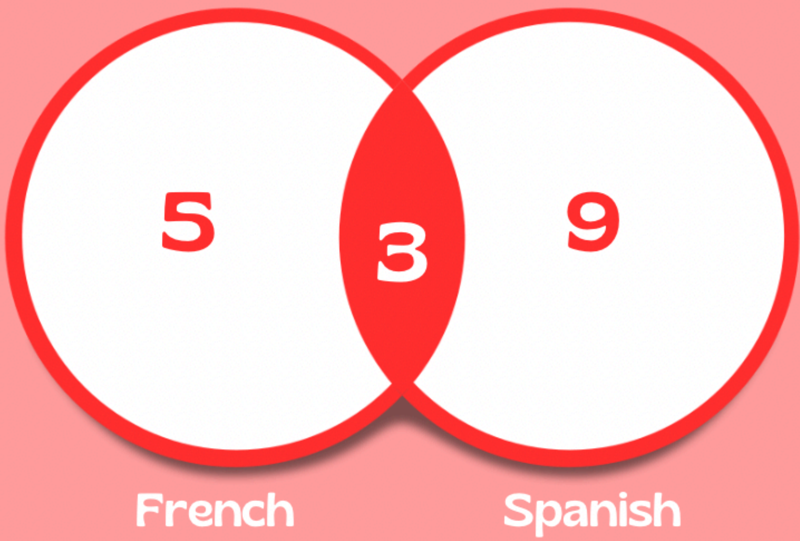
Area of EBDF = P - Q - R = 16-2-8 = **6 sq inches**



September 4, 2023

SOLUTION - 8/21/23

Create a venn diagram and start in the shared region. 3 students take both subjects. If 8 students take French, but three take both, 5 take ONLY french. Similarly, 9 take ONLY Spanich. That means that the students who take Spanish OR French OR both adds up to 17. So the remaining students who take neither would be 30-17 = 13



August 21, 2023

SOLUTION - 8/21/23

Let the players be represented by A,B,C,D,E,F.
Player A will have 3 games with players B, C, D, E, F which accounts for 15 games.
Player B will have 3 games with Players A,C,D,E,F. However, we already counted the games with player A. So we don't overcount, we will only look at the games with C, D, E, F. Which is 12 games.
Similarly, Player C will have games with A, B, D, E, F (but we already counted the games with A and B). So we only care about the three games played between player C and D, E, F = 9 games.
Following this process, Player D plays 6 games with E, and F. Player E plays 3 games with F. and all of player F's games have been accounted for.
Therefore, 15 + 12 + 9 + 6 + 3 = 45 games total

August 7,2023

SOLUTION - 8/07/23

If two days ago was Sunday, today is Tuesday.

365/7 = 52 remainder 1

So, 365 days from now will be a Wednesday

July 31, 2023

SOLUTION - 7/30/23

List the factor pairs of 10,000 until you get two factors without a 0 digit.

1, 10000
2, 5000
4, 2500
5, 2000
8. 1250
10, 1000
16, 625

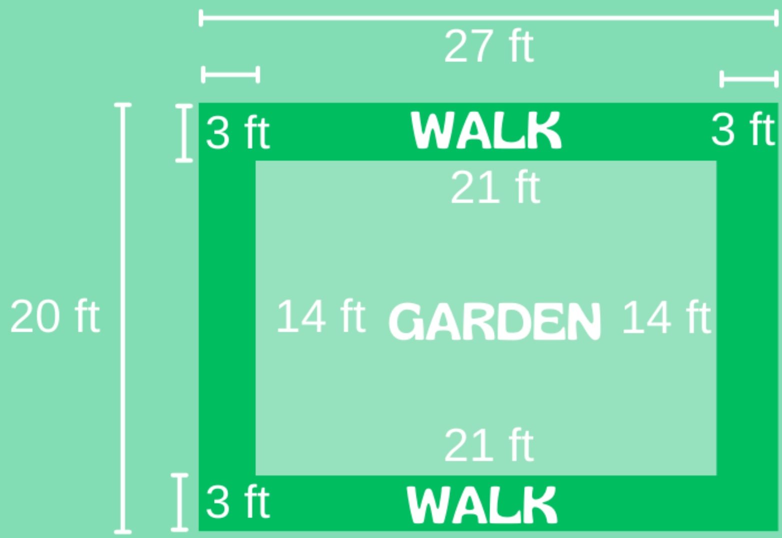
July 24, 2023

SOLUTION - 7/24/23

Since the number divided by 5 has a remainder of 1, it must end in either a 1 or a 6. Since the number must be odd, it must end in a 1. We are now looking for the smallest number greater than 10 that equals 1 more than a multiple of 7 that ends in a 0. Therefore, the smallest number is 71.

July 17, 2023

SOLUTION - 7/17/23

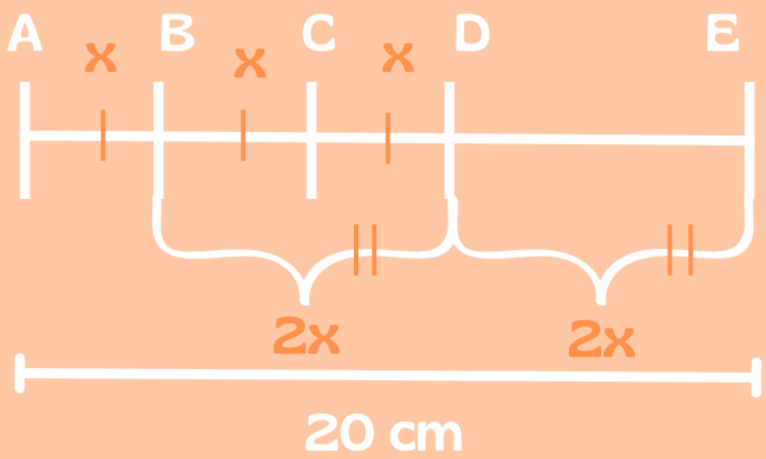


The area of the larger rectangle formed by the boarder of the walk way is A = 20 x 27 = 540.
The area of the garden itself is A = 14 x 21 = 294.
Then, the dark shaded region =
540 - 294 = 246 square feet

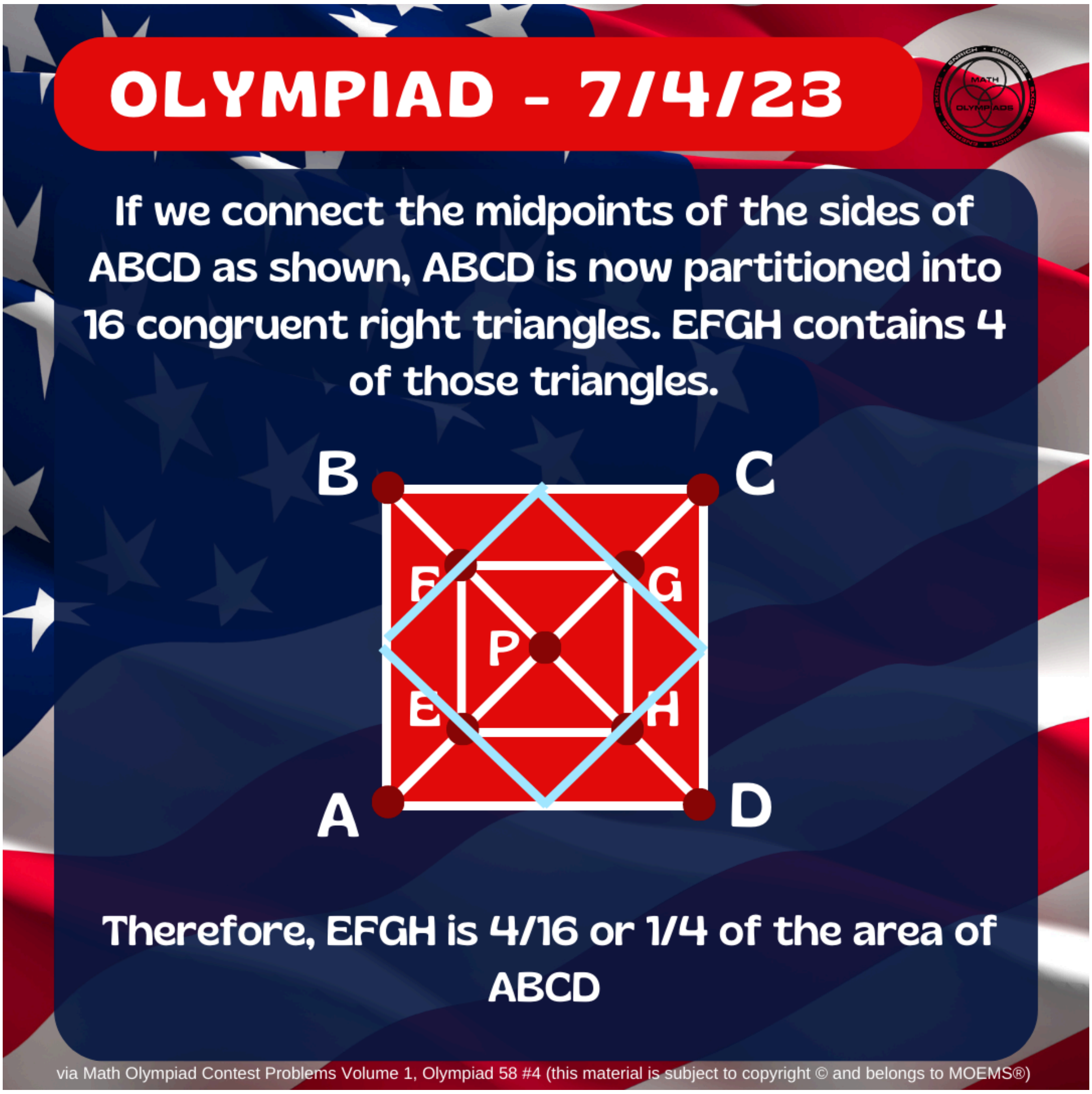
July 10, 2023

SOLUTION - 6/5/23

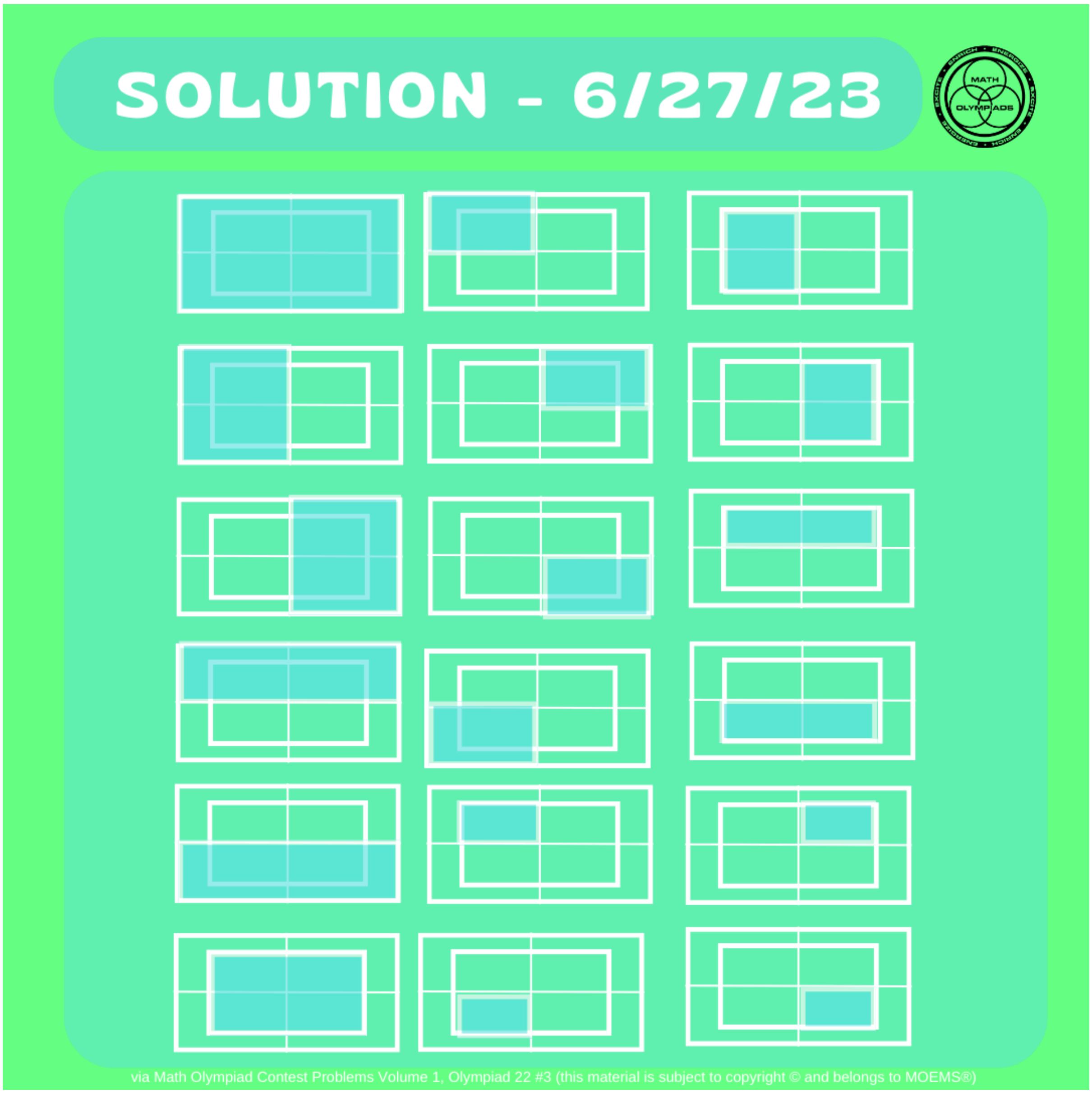
Since B is the midpoint of AC, AB = BC.
Since C is the midpoint of BD, BC = CD.
By transitivity, AB = BC = CD.
Since D is the midpoint of BE, BD = DE.
Let AB = BC = CD = x. Then, BD = DE = 2x.
So, AE = x + x + x + 2x = 5x = 20.
Then, x = 4.
So DE = 2x = 2(4) = 8.



July 4, 2023


OLYMPIAD - 7/4/23
If we connect the midpoints of the sides of ABCD as shown, ABCD is now partitioned into 16 congruent right triangles. EFGH contains 4 of those triangles.
B
C
F
G
P
E
H
A
D
Therefore, EFGH is 4/16 or 1/4 of the area of ABCD
via Math Olympiad Contest Problems Volume 1, Olympiad 58 #4 (this material is subject to copyright © and belongs to MOEMS®)

June 26, 2023


SOLUTION - 6/27/23
MATH
OLYMPIADS
via Math Olympiad Contest Problems Volume 1, Olympiad 22 #3 (this material is subject to copyright © and belongs to MOEMS®)

June 19, 2023

SOLUTION - 6/19/23

Let x = field goals and y = foul shots

$2x + 1y = 72$ and $x = y + 6$

Using substitution we have

$$2(y + 6) + y = 72$$
$$2y + 12 + y = 72$$
$$3y + 12 = 72$$
$$3y = 60$$
$$\mathbf{y = 20}$$

Then, $x = 26$

June 12, 2023

SOLUTION - 6/12/23

Write out the even numbers between 1-101

2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100

every 3 numbers will be divisible by 3. Then, there are 16 even numbers divisible by 3 between 1 and 101

June 6, 2023

SOLUTION - 6/5/23

Since the original paper is a square, we can represent the perimeter of the square as P = 4x where x is the side length of the square.

Then, since the paper was folded in half, each rectangle has a perimeter of

$$p = x + x + .5x + .5x = 3x = 18$$

So, $x = 6$.

Then, $P = 4x = 4(6) = 24$

May 29, 2023

SOLUTION - 5/29/23

Both shaded regions will combine to be the area of one square. One square has the area:

A = (10)^2 = 100 square units

Alternatively, the shaded region on the right has an area
A = .25(pi)(10)^2
and the left,
A = 100 - .25(pi)(10)^2
Adding these areas gives us 100 square units

May 22, 2023

SOLUTION - 5/22/23

The rectangular tiles are
2 in x 3 in = 6 square inches.

The square region is
2 ft x 2 ft = 24 in x 24in = 576
square inches.

Therefore, the least number of
tiles you would need is,
576/6 = 96 tiles.

May 15, 2023

SOLUTION - 5/15/23

Notice that each term in the second series is 4 times as large as the corresponding term in the first.

$$1 + 4 + 9 + 16 + \ldots + 625 = 5525$$

and

$$4 + 16 + 36 + 64 + \ldots + 2500 = N$$

So,

$$4 + 16 + 36 + 64 + \ldots + 2500$$
$$= 4(1 + 4 + 9 + 16 + \ldots + 625)$$
$$= 4(5525)$$
$$= 22{,}100$$

May 8, 2023

SOLUTION - 5/8/23

Let x = the weight of the heavier boy
Let y = the weight of the other boy

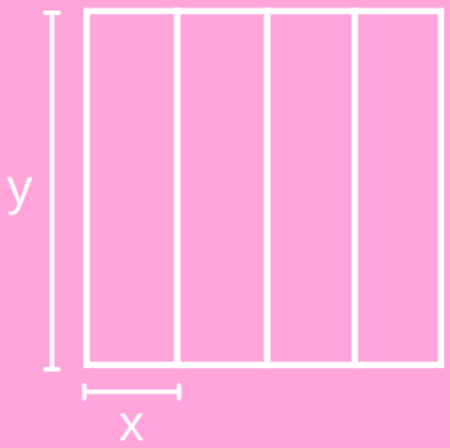
Since the heavier boy is 34 pounds heavier,
$x = y + 34$.
Since the sum of their weights is 138 pounds,
$x + y = 138$

The, $(y + 34) + y = 138$
$2y + 34 = 138$
$2y = 104$
$y = 52$

Therefore, the heavier boy weighs
$x = y + 34 = 52 + 34 = 86$ lbs

May 1, 2023

SOLUTION - 5/01/23



1. Since the perimeter of the small rectangles are 25 units,

$$2x + 2y = 25$$

2. Since the figure is a square?

$$4x = y$$

3. We can use the second equation in the first:

$$2x + 2(4x) = 25$$
$$2x + 8x = 25$$
$$10x = 25$$
$$x = 2.5$$

4. Then, each side of the square is

$$y = 4(2.5) = 10$$

Therefore, the perimeter is

$$y = 4(10) = 40$$

April 24, 2023

SOLUTION - 4/24/23

If the train travels at 30 miles per hour and it takes 2 minutes to completely clear the tunnel, we must do the following conversions:

$$\frac{30 \text{ miles}}{1 \text{ hour}} = \frac{1 \text{ hour}}{60 \text{ mins}} = \frac{.5 \text{ miles}}{1 \text{ min}}$$

Then, if the tunnel ride took 2 minutes, the tunnel is

$$\frac{.5 \text{ miles}}{1 \text{ min}} = \frac{2 \text{ mins}}{1} = \text{1 mile long}$$

If the tunnel is 9 times as long as the train, the train is 1/9 of a mile. Or 586.67 feet long.

April 17, 2023

SOLUTION - 4/17/23

There are 16 edges on the perimeter of figure A.
48/16 = 3
So, each edge = 3 inches
There are 20 edges in figure B.
So, 3 x 20 = 60.

Therefore, the perimeter of figure B is 60 inches.

April 10, 2023

SOLUTION - 4/10/23

When Person B is born, Person A is 14 years old. So, Person A is 14 years older.

So, when person B is 14, Person A is 28.

$$1962 + 14 = 1948 + 28$$
$$1976 = 1976$$

So, In 1976, person A is twice as old as person B!

April 4, 2023

SOLUTION - 4/03/23

Since each cycle has two pedals and he counted 50 pedals, we know that there are 25 cycles in total.

Let b = # of bicycles

Let t = # of tricycles

Then, $b + t = 25$ Or,

$b = 25 - t$

We also know that each bicycle has two wheels, and each tricycle has 3 wheels. Therefore there are

$2b + 3t = 64$ wheels.

Substituting (25-t) for b gives us:

$2(25-t) + 3t = 64$

$50 - 2t + 3t = 64$

$50 + t = 64$

$t = 14$

March 27, 2023

SOLUTION - 3/27/23

$$[(x) + (x+1) + (x+2) + (x+3) + (x+4) + (x+5) + (x+6) + (x+7) + (x+8) + (x+9) + (x+10) + (x + 11) + (x+12) + (x + 13) + (x + 14)] / 15 = 15$$

$$(15x + 105) / 15 = 15$$
$$15x + 105 = 15 \times 15$$
$$15x + 105 = 225$$
$$15x = 120$$
$$x = 120/15 = 8$$

So, if $x=8$, then the first five numbers are 8, 9, 10, 11, 12. The average of these numbers is

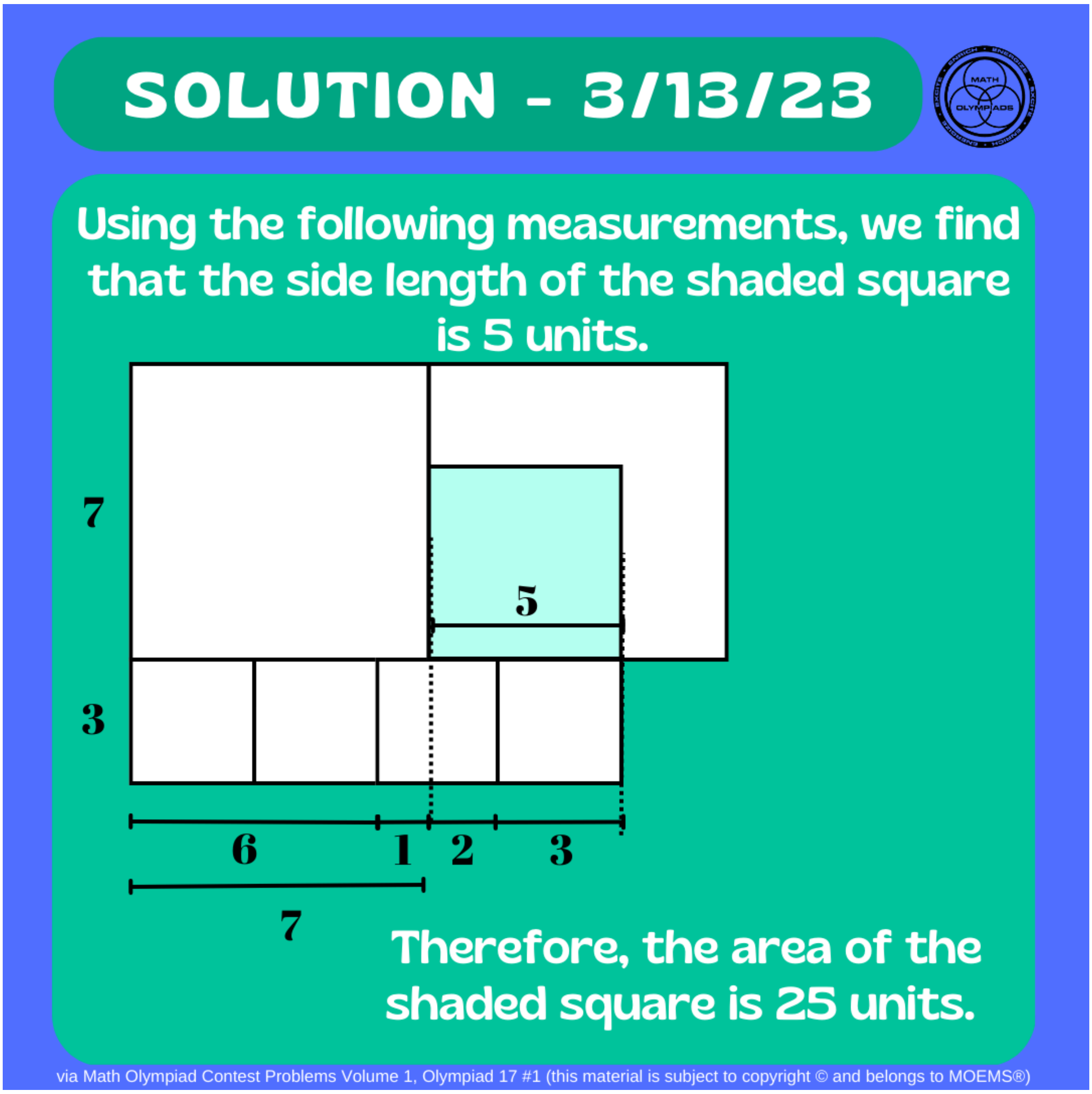
$(8 + 9 + 10 + 11 + 12)/ 5 = 50/5 =$ **10**.

March 23, 2023

SOLUTION - 3/20/23

Jan 1 = Monday
+7 = Jan 8 = Monday
+7 = Jan 15 = Monday
+7 = Jan 22 = Monday
+7= Jan 29 = Monday
Jan 30 = Tuesday
January 31 = Wednesday
Feb 1 = Thursday
+7 = Feb 8 = Thursday
+7 = Feb 15 = Thursday
+7 = Feb 22 =Thursday

March 23, 2023



March 6, 2023

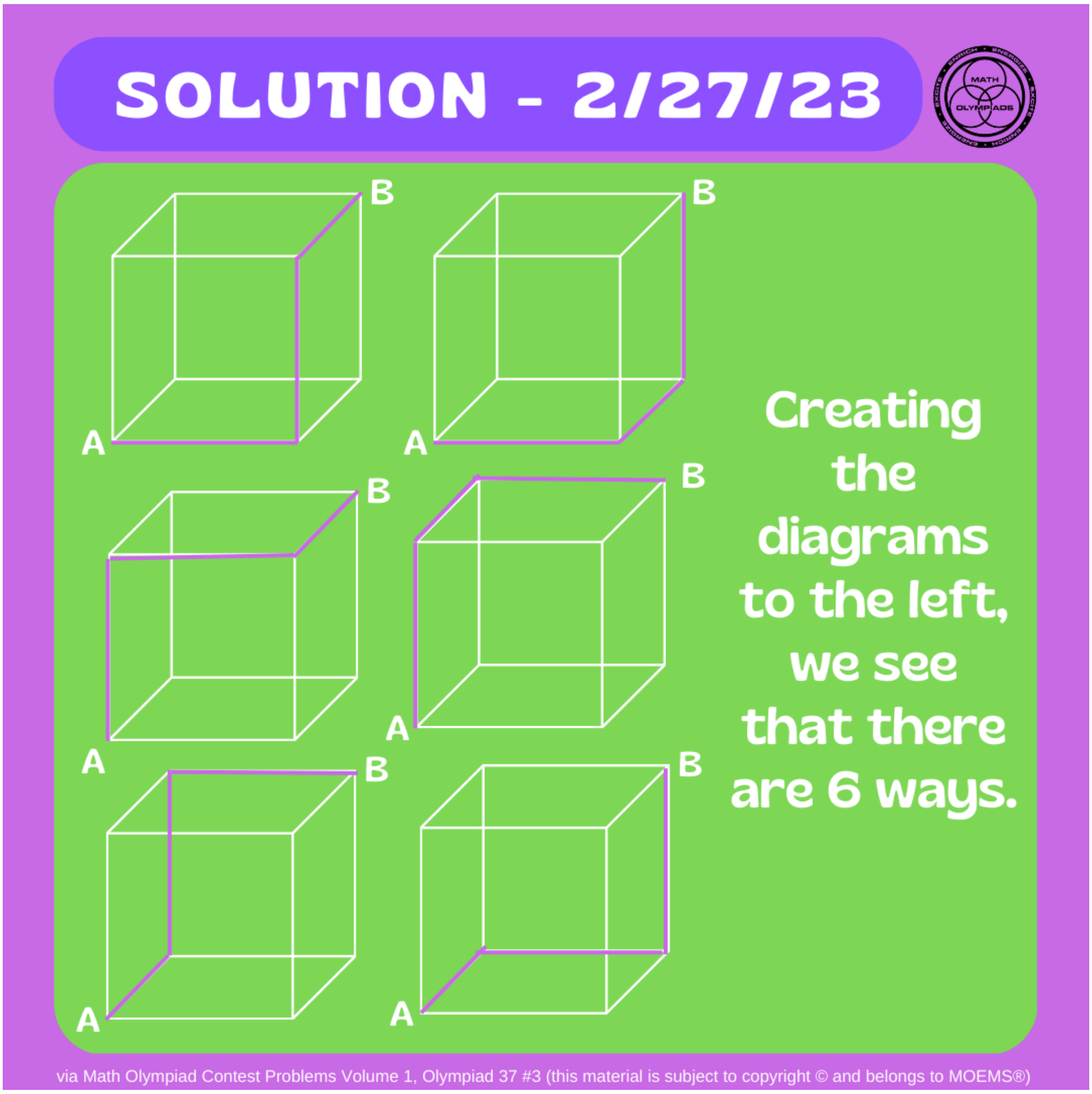
SOLUTION - 3/06/23

= $0.75

Therefore, the remaining 7 coins add up to
$1.00 - $0.75 = $0.25

So, the remaining coins are
5 pennies and 2 dimes

Feb 27, 2023


SOLUTION - 2/27/23
MATH OLYMPIADS
A
B
Creating the diagrams to the left, we see that there are 6 ways.
via Math Olympiad Contest Problems Volume 1, Olympiad 37 #3 (this material is subject to copyright © and belongs to MOEMS®)

Feb 20, 2023

SOLUTION - 2/20/23

The acute angles we can find are:

BAC
BAD
BAE
CAD
CAE
DAE

So, there are 6 acute angles.

Feb 13, 2023

SOLUTION - 2/06/23

If he drove 60 miles at 40 miles per hour, then he drove for:

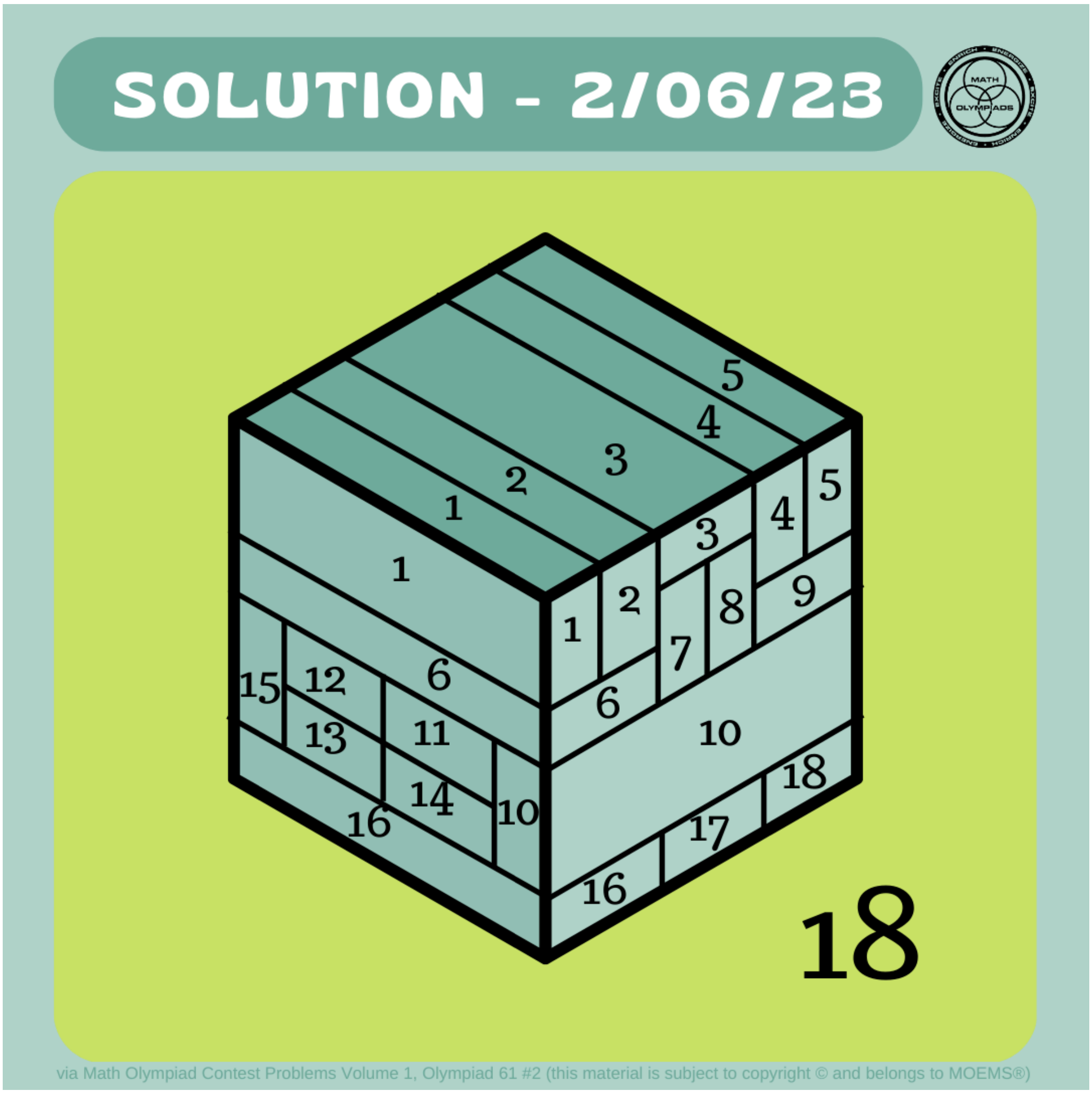
$$\left(\frac{60\text{ miles}}{1}\right)\left(\frac{1\text{ hour}}{40\text{ miles}}\right) = 1.5\text{ hours}$$

Since he arrived at 12:15, he left 1.5 hours before 12:15. So,

12:15
1 hour
11:15
.5 hour
10:45

Therefore, he left at 10:45

Feb 6, 2023


SOLUTION - 2/06/23
MATH
OLYMPIADS
1
2
3
4
5
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
18
via Math Olympiad Contest Problems Volume 1, Olympiad 61 #2 (this material is subject to copyright © and belongs to MOEMS®)

January 30, 2023

SOLUTION - 1/30/23

5		13
	x	
9	7	y

Using the two diagonals, we can set up the following equations:

$$5 + x + y = 13 + x + 9$$

By subtracting x, we get:

$$5 + y = 22.$$

By subtracting 5, we get that $y = 17$

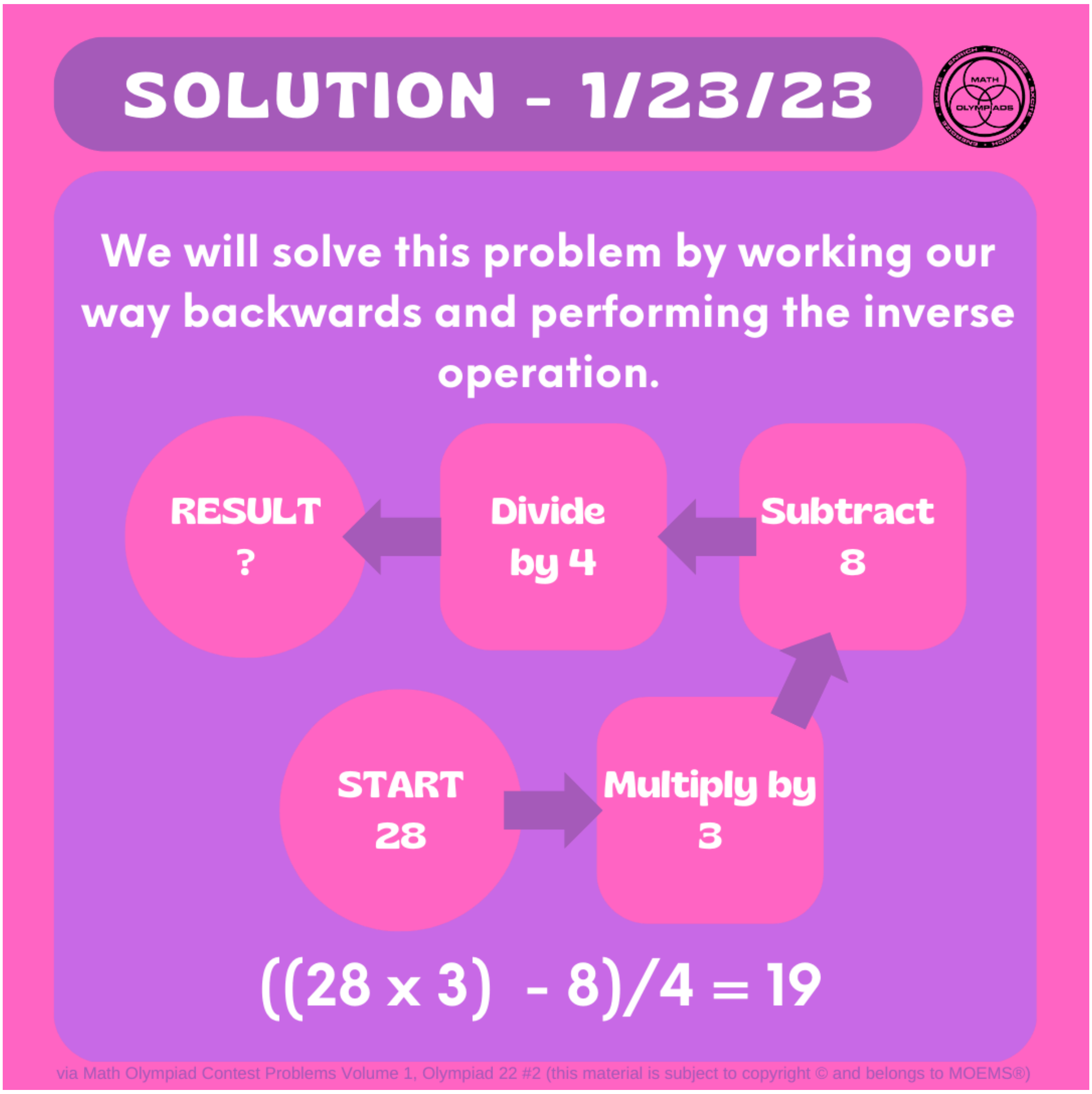
5		13
	11	
9	7	17

Now, we know that all rows, columns, and diagonals add up to $9 + 7 + 17 = 33$

So, $x = 11$. Then, the rest of the spaces can be easily calculated as follows:

5	15	13
19	11	3
9	7	17

January 23, 2023



January 16, 2023

SOLUTION - 1/16/23

We first know that S = 1 because that is the only thing that can be carried over in addition.

Then, V=9 and E=0. So, we have:

$$\begin{array}{r} 9\,C\,R \\ +\quad 9\,C\,C\,T \\ \hline 1\,0\,R\,9\,0 \end{array}$$

It must be the case that R + T = 10.

So, C + C + 1 = 9. Therefore, C = 4 and,

$$\begin{array}{r} 9\,4\,R \\ +\quad 9\,4\,4\,T \\ \hline 1\,0\,3\,9\,0 \end{array}$$

January 9, 2023

SOLUTION - 1/9/23

An OCTILLA contains 8 OCTILs.

1 OCTIL contains 8 OCTAs. So,

1 OCTILLA = 8 OCTILs = 8 x 8 OCTAs = 64 OCTAs

An OCTA contains 8 OCs so,

64 OCTAS = 64 x 8 OCs = 512 OCs

Since an OC is a bundle of 8 sticks,

512 OCs = 512 x 8 sticks = 4,096

January 2, 2023

SOLUTION - 12/26/22

If a number is divisible by 72 then it is also divisible by 8 and 9. Rewrite the number A4273B as the following sum A42000 + 73B.

A42000 is divisible by 8 so, 73B must also be divisible by 8. Therefore, B must be 6.

If a number is divisible by 9, the digit sum is also divisible by 9. Therefore,

$$A + 4 + 2 + 7 + 3 + 6 \text{ or,}$$
$$A + 22$$

is a multiple of 9. The smallest multiple of 9 which is greater than 22 is 27. So A + 22 = 27. Therefore, A = 5.

December 26

SOLUTION - 12/26/22

The average of 6 numbers, a, b, c, d, e, and f would be found by adding the numbers and dividing them by the amount of numbers:

$$\frac{a+b+c+d+e+f}{6} = 7$$

If we take two numbers away, we are left with:

$$\frac{a+b+c+d}{4} = 8$$

Multiplying the first equation by 6 on each side and the second equation by 4, we have:

$$a+b+c+d+e+f = 42$$

$$a+b+c+d = 32$$

We can substitute the second sum into the first equation: $32 + e + f = 42$. So, $e + f = 10$.

December 19

SOLUTION - 12/19/22

If we let the first of the three consecutive numbers be represented by x, the next conscutive number would be x + 1. After that would be x + 2.

If the sum of the first and third numbers is 118 then,

$$x + (x + 2) = 118$$

$$(x + x) + 2 = 118$$

$$2x + 2 = 118$$

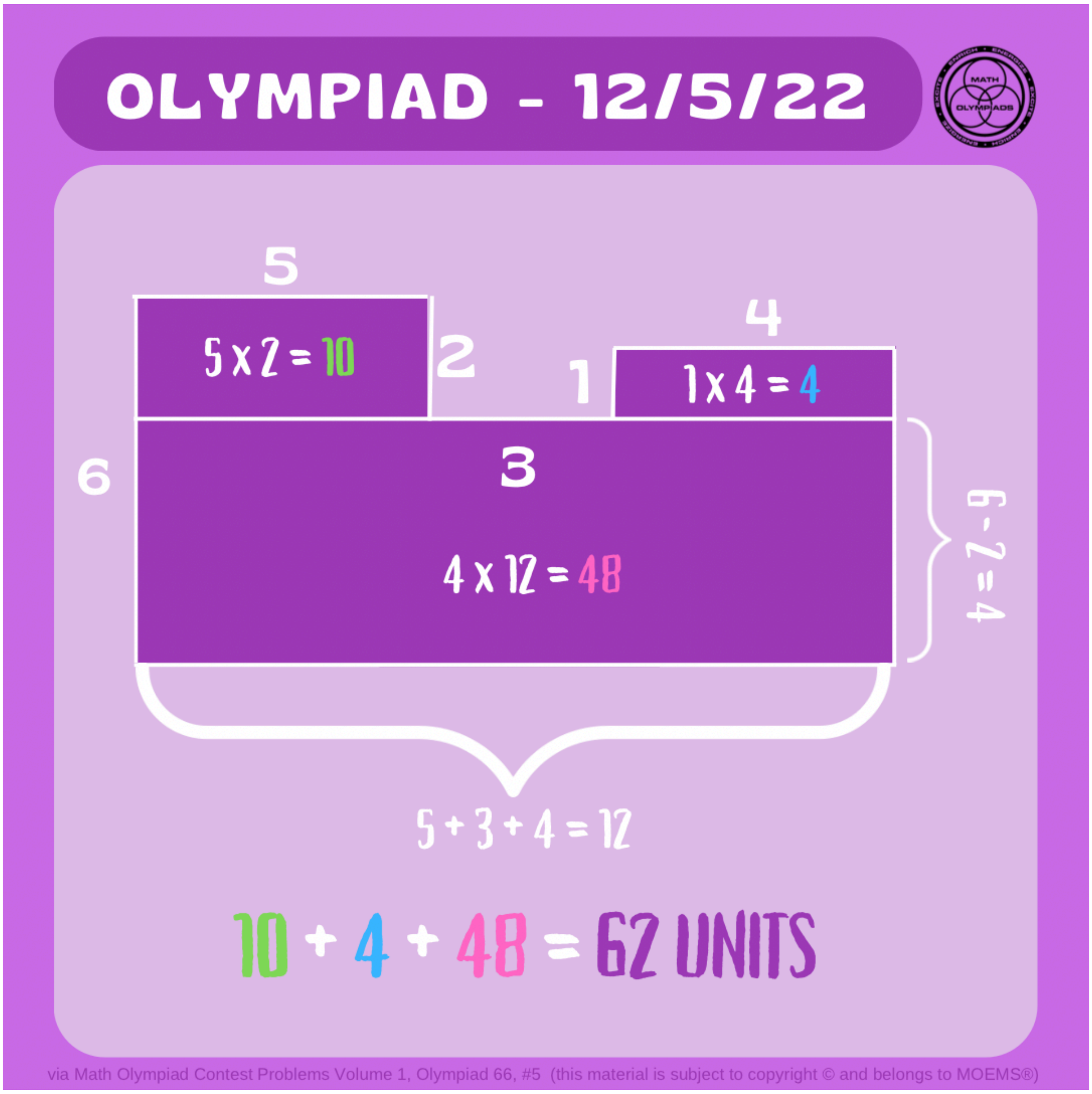
Subtracting 2 from both sides, we get
2x = 116. Dividing by two gives us:
x = 58
So, the three consecutive numbers are:
58, 59, and 60

December 12

SOLUTION - 11/12/22

The weight of the water poured out was 10-5.75 = 4.25. This was one half of the water so, the total weight of the water must be 8.5. Then the weight of the jar is 10-8.5 = 1.5 pounds.

December 5

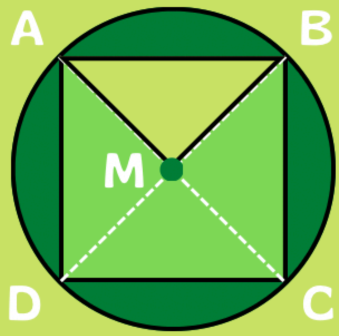


OLYMPIAD - 12/5/22
MATH OLYMPIADS
5
5 x 2 = 10
2
1
4
1 x 4 = 4
6
3
4 x 12 = 48
6 - 2 = 4
5 + 3 + 4 = 12
10 + 4 + 48 = 62 UNITS
via Math Olympiad Contest Problems Volume 1, Olympiad 66, #5 (this material is subject to copyright © and belongs to MOEMS®)

November 28

SOLUTION - 11/28/22

First we find the area of the four individual triangles created by the diagonals. Since the diagonals are diameters, the length of AC and BD are 10 units. In a square, the diagonals bisect each other so we can call the midpoint of AB and BD, M. Then, AM and BM are 5 units. So, the area of triangle AMB is:



$A = (1/2)bh = (1/2)(5)(5) = 12.5$

Since there are 4 smaller triangles that make up square ABCD:

Area of ABCD $= 4(12.5) = 50$

November 21

SOLUTION - 11/21/22

If we multiply the numerator and denominator by 2 + 1/3 we get:

$$\frac{1}{1+\frac{1}{2+\frac{1}{3}}} \cdot \frac{(2+1/3)}{(2+1/3)} = \frac{2+\frac{1}{3}}{2+\frac{1}{3}+1}$$

Next, we can multiply all terms by 3:

$$\frac{6+1}{6+1+3} = \frac{7}{10}$$

November 14

SOLUTION - 11/14/22

If you start with 4 and count by 3s, you get a sequence 4, 7, 10, ... , N.

This is an algebraic sequence (each term increases by a common difference). So, we can represent this sequence by a formula:

$S(n) = 4 + 3(n-1)$

where n is the term number.

By plugging in 15, we get

$S(n) = 4 + 3(15-1) = 46$

Alternatively, we can write out each term in the sequence by increasing by 3

4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46.

November 7

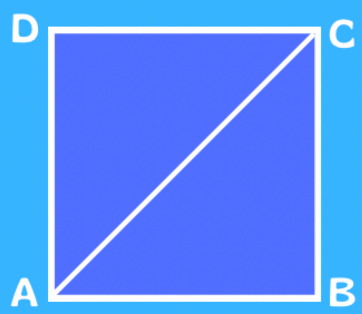
OLYMPIAD - 11/07/22

Let's look at triangle ABC:
Using the Pythagorean Theorem,

$$\overline{AB}^2 + \overline{BC}^2 = \overline{AC}^2$$

However, since ABCD is a square, AB and BC are the same length. So, we can represent their lengths by x. We also know that AC is 8 units.

$$x^2 + x^2 = 8^2$$
$$2x^2 = 64$$
$$x^2 = 32$$



The area of a square is side length squared. Since the sides are both x, then,

$$A = x^2 = 32 \text{ units}$$

October 31

SOLUTION - 10/31/22

Let F = Frankenstein, D= Dracula,
M = Mummy

STEP 1: Write equations

(1) $F + D = 12$

(2) $D + M = 18$

(3) $F + M = 10$

STEP 2: Manipulate equations

(1) $F + D = 12$ tells us that $F = 12 - D$

(2) $D + M = 18$ tells us that $M = 18 - D$

STEP 3: We can plug these into equation (3), combine like terms and solve:

$$(12 - D) + (18 - D) = 10$$
$$(12 + 18) + (-D + -D) = 10$$
$$30 - 2D = 10$$
$$-2D = -20$$
$$D = 10$$

STEP 4: Use this value to find the others

$F = 12 - (10) = 2$

$M = 18 - (10) = 8$

So, Frankenstein had the least amount of candy since he had 2 pieces!

STEP 5: EAT CANDY!

October 24

OLYMPIAD - 10/24/22

We can represent each factor as 6A and 6B. Then, (6A)(6B) = 36AB = 504.

We can divide by 36 to get AB = 504/36 =14.

If A=1, then 6(A) = 6. However, neither of the numbers is 6.

So, if A = 2, then 6A=12. 504/12 = 42 (So B=7). Or, B=2 and A=7. Regardless, 12 and 42 are divisible by 6 and multiply to 504. **42** is the larger of the two numbers.

October 17

OLYMPIAD - 10/17/22

2(length) + 2(width) = 22
(length) x (width) =area

2(1) + 2(10) = 22, **1 x 10 = 10**

2(2) + 2(9) = 22, **2 x 9 = 18**

2(3) + 2(8) = 22, **3 x 8 = 24**

2(4) + 2(7) = 22, **4 x 7 = 28**

2(5) +2(6) = 22, **5 x 6 = 30**

answer: 5 different areas

October 10

SOLUTION- 10/10/22

On the way there...

21 people - 9 on stage coach = 12 people on buggies

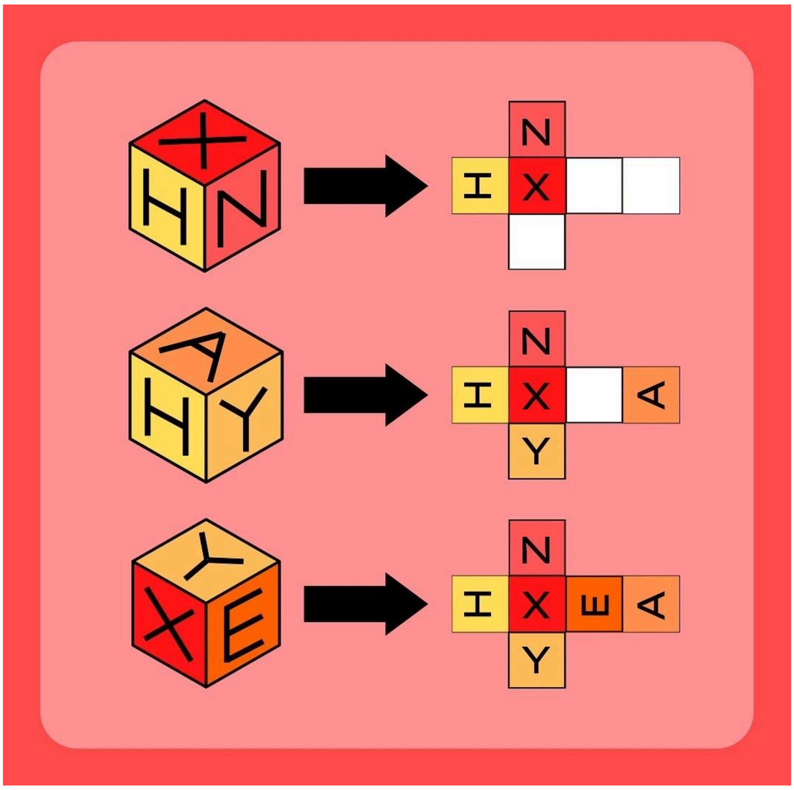
12 people/ 3 people per buggy = 4 buggies.

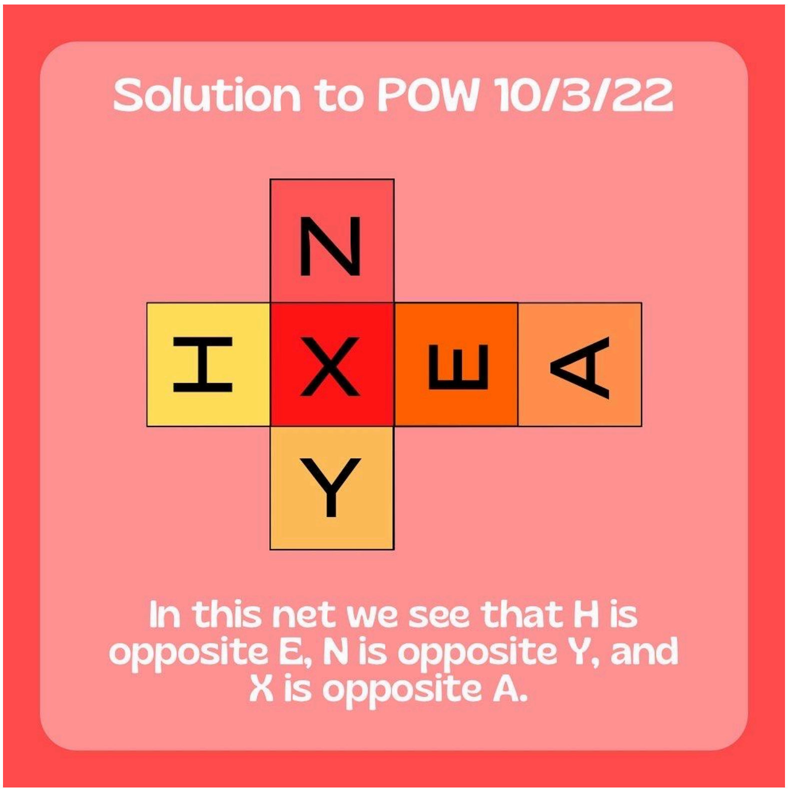
On the way back...

4 people on buggies x 4 buggies = 16 people

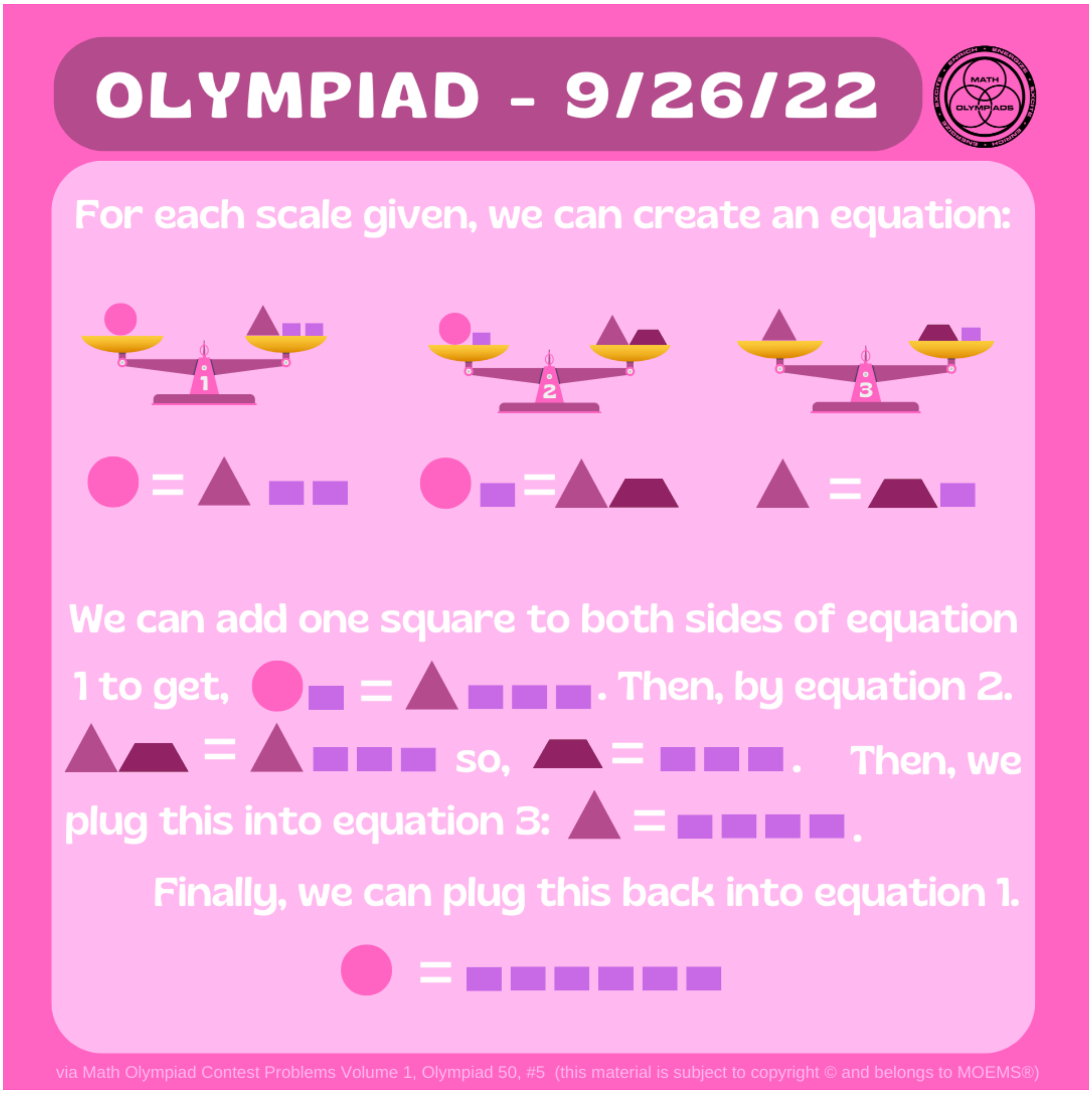
21 people total - 16 on buggies = 5 people on stage coach

October 3


X
H
N
A
Y
E


Solution to POW 10/3/22
N
H
X
E
A
Y
In this net we see that H is opposite E, N is opposite Y, and X is opposite A.

September 26



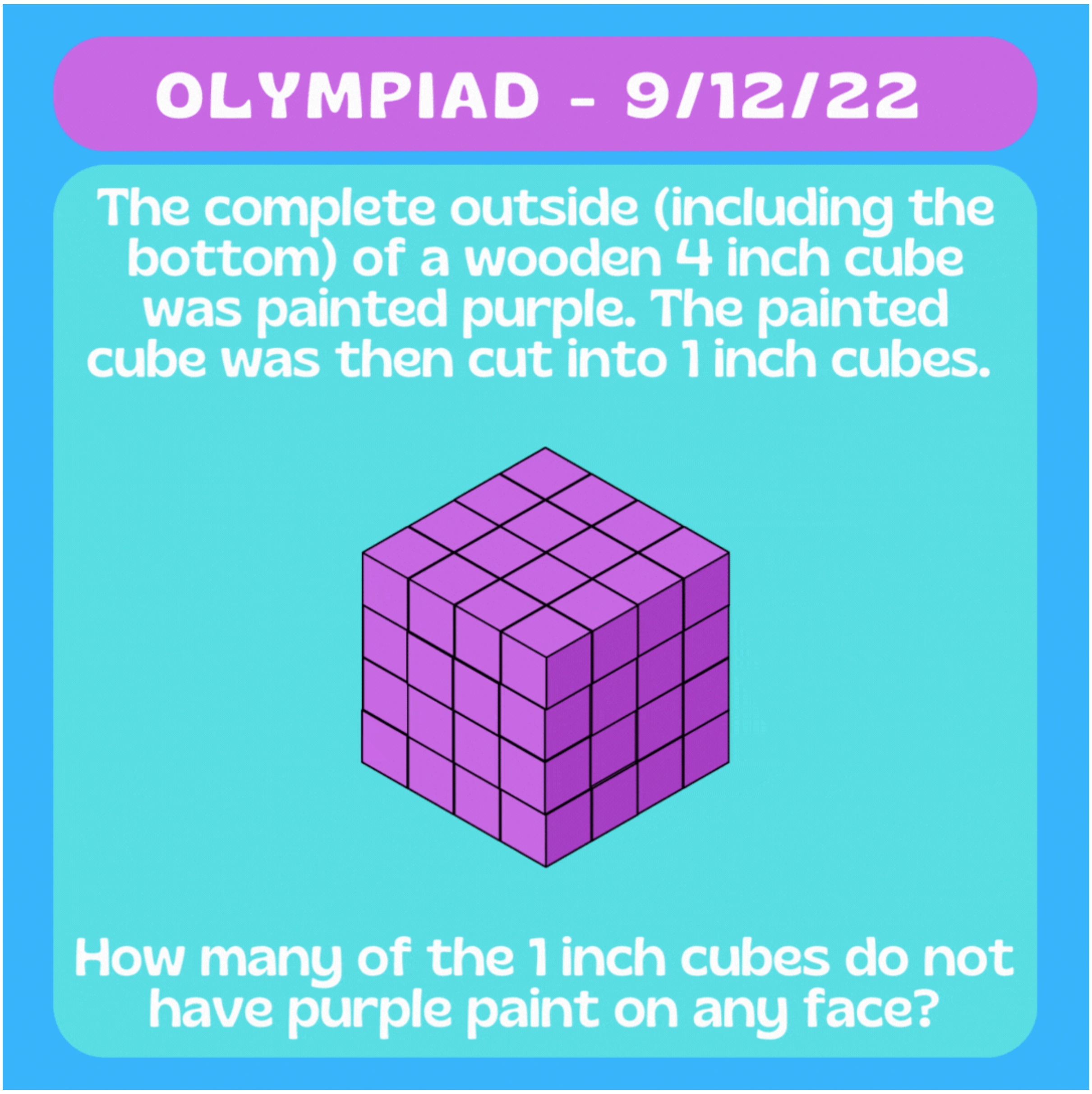
September 19

OLYMPIAD - 9/19/22

A	B	C	D	E	F	G
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	-	-

The second row of the table represents the remainder of any number when you divide it by zero. So, 1000/7 is 142 remainder 6. Therefore, 1000 will appear in column F.

September 12

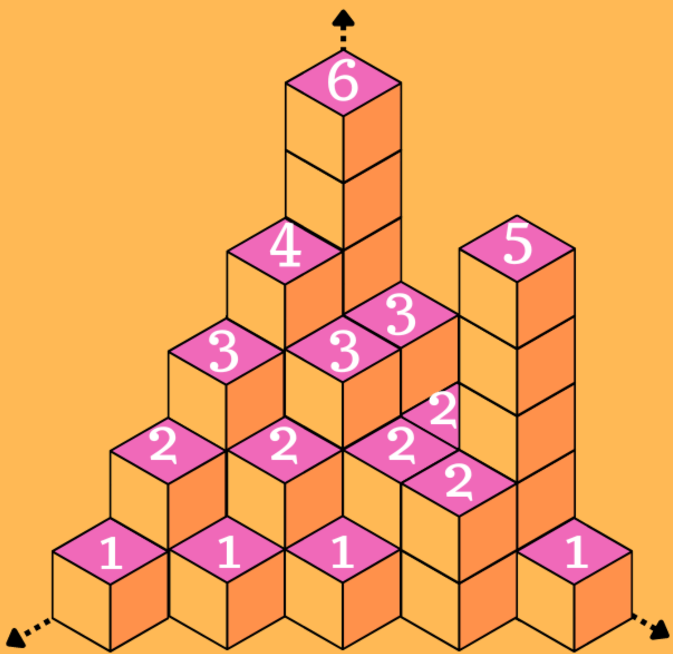


This gif demonstrates what happens as we pull back each layer of the cube with paint on it. We are left with a 2x2 cube. So there are 8, 1 inch cubes.

September 5

OLYMPIAD - 9/5/22

We can write the height of each stack on the top square and add them:



$4(1) + 2(5) + 3(3) + 4 + 5 + 6 = 38$