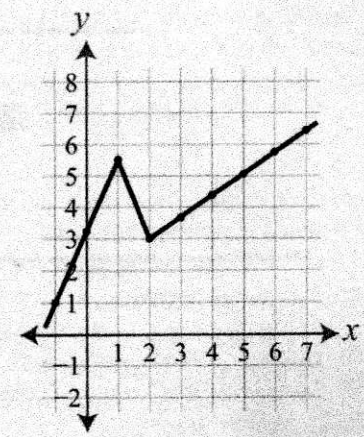
The following are the question files for this summer's mathcounts class from June 9 – June 20. Each day there are about 40-45 questions for each of you to try before class. Please spend no more than 1 hour 15 minutes attempting each question and those that you can't get be ready with questions on how to solve them-I will give you the answers each day and then entertain questions-It is important for you to take notes and look over the solutions at a later time-each day there are some questions that are chapter level questions and also state level questions-you will receive these in two different emails with the questions for the first week in one and the questions for the second week in another email.

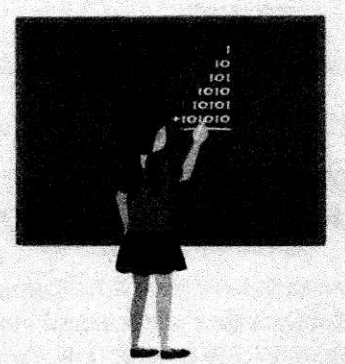
MC June 16

1. _____ The square root of n is 4. What is the value of n?

2. _____ For the function graphed here, what is the integer value of y when $x = 2$?



3. _____ Jaden writes down the following six integers: 1, 10, 101, 1010, 10101, 101010. What is the sum of the six integers Jaden has written?



4. _____ What is the value of $8^2 - 6^2$?

5. _____ people A survey of 100 people, each of whom owns a dog or a cat or both, showed that 63 own a dog and 58 own a cat. Based on these results, how many of the people surveyed own both a cat and a dog?

6. _____ apples

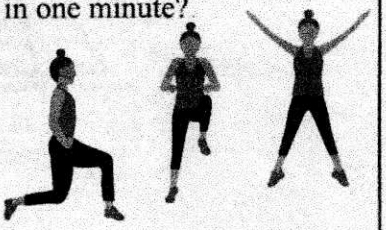
There are six apples in a bin, four bins in a bundle and two bundles in a crate. How many apples are in a crate?

7. _____ nickels

Dwight has nine coins consisting of only pennies and nickels. If the total value of the coins is 29 cents, how many nickels does Dwight have?

8. _____ heart-beats

After a brisk workout, Felicia counts 32 heartbeats in 15 seconds. Based on this count, what is Felicia's expected number of heartbeats in one minute?



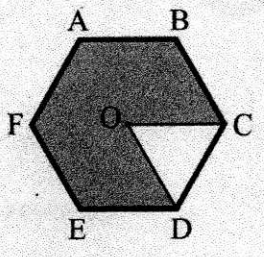
9. _____

What is the median of the first five prime numbers?

10. _____

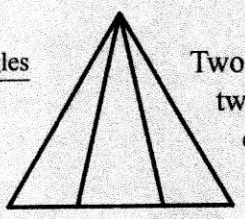
If 108 is 90% of x, what is the value of x?

11. _____ Regular hexagon ABCDEF with center O is shown. What fraction of the area of hexagon ABCDEF is shaded? Express your answer as a common fraction.



12. _____ Two times a number divided by eight equals two. What was the original number?

13. _____ triangles



Two distinct segments are drawn inside a triangle from one vertex to two points on the opposite side as shown. What is the total number of triangles of any size in the resulting figure?

14. _____ mi/h The table shows the minimum and maximum speeds of four types of baseball pitches. What is the absolute difference between the minimum speed of a fastball and the maximum speed of a knuckleball?

BASEBALL PITCH SPEEDS (mi/h)

Pitch	Min Speed	Max Speed
Fastball	80	95
Slider	70	85
Curve	65	80
Knuckleball	55	70

15. _____ zeros Kris multiplies the first six positive prime numbers together. How many zeros follow the last non-zero digit of the product?

16. _____ mi/h Carmichael's favorite race car driver completes 10 laps in 10 minutes. If one lap is 2.5 miles long, what was the average speed of the driver, in miles per hour?

17. _____ The two solutions of the equation $x^2 + ax + 14 = 0$ are $x = 2$ and $x = 7$. What is the value of a?

18. _____ Cal crosses out n randomly selected days from the seven consecutive days on her calendar, shown here. What is the minimum value of n that guarantees she crosses out three consecutive days?

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7

19. _____ Let $p \ominus q = \sqrt{p^2 - q^2}$, and let $p \oplus q = \sqrt{p^2 + q^2}$. What is the value of $(3 \oplus 4) \oplus (20 \ominus 16)$?

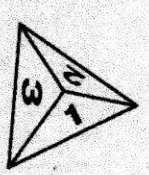
20. _____ km/h Jones is chasing a car 800 meters ahead of him. He is on a horse moving at 50 km/h. If Jones catches up to the car in 4 minutes, how fast was the car moving?

21. _____ After a hockey game, each member of the losing team shook hands with each member of the winning team. Afterwards, each member of the winning team gave a fist-bump to each of her teammates. Each team has 20 players. If n handshakes occurred and m fist-bumps occurred, what is the value of $n + m$?

22. _____ Diana has two fair spinners. The sectors of the first are numbered with the prime numbers less than 10. The sectors of the second are numbered with the positive perfect squares less than 40. On each of the spinners, all sectors have equal area. What is the probability that if both spinners are spun, the selected numbers on the two are not relatively prime? Express your answer as a common fraction.

23. _____ If A represents a digit such that the sum of the two-digit numbers 2A, 3A and 4A is the three-digit number 10A, what is the value of A?

24. _____ A fair tetrahedral die, whose faces are numbered 1, 2, 3 and 4 is rolled three times. What is the probability that the sum of the numbers rolled is 7? Express your answer as a common fraction.



25. _____ cm A line bisecting the larger acute angle in a triangle with sides of length 33, 44 and 55 cm divides the opposite side into two segments. What is the length of the shorter segment of that side? Express your answer as a common fraction.

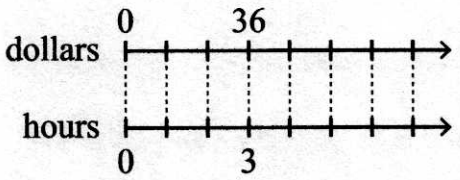
June 16

1. _____ times The height of Hyperion, the tallest redwood tree, is 380 feet. The three-year old redwood tree in Paul's backyard is 19 feet tall. The height of Hyperion is how many times the height of Paul's tree?

2. _____ If $y = 2x + 7$ and $x = 2$, what is the value of y?

3. _____ A bag has one white, two black, three red and four green marbles. If a single marble is randomly drawn from this bag, what is the probability it is black or white? Express your answer as a common fraction.

4. $ _____ If Jessica works at a fixed hourly rate of pay, as represented by the double number line shown, what is Jessica's total pay for 8 hours of work?



5. _____ points So far, Ricardo has scores of 13, 17, 19 and 21 points for the first four rounds of a dice game. What does he need the total score to be for the next two rounds combined in order to achieve an average score of 20 points per round for all six rounds?

6. _____ cm The length of a particular rectangle is $\frac{2}{5}$ its perimeter. If the length of the rectangle is 12 cm, what is its width?

7. _____ Rico showed his friends a card quickly before hiding it. Dee said the card was the 8 of spades. Todd said it was the 7 of hearts. Nia said it was the 6 of spades. Dee, Todd and Nia were each correct about either the number or the suit, but not both. What number was on the card Rico showed?

8. _____ units^2 Two vertices of a triangle are at A(1, 5) and B(5, 5) in the coordinate plane. The third vertex, C, is the translation of point B three units down and one unit left. What is the area of triangle ABC?

9. _____ All of Bethany's math quiz scores are displayed in the stem and leaf plot shown. What is the absolute difference between the median and the mode of the 10 scores?

6	9
7	0 5 6
8	3 7 7 8
9	2 4

10. _____ What value of n satisfies $(n + 1)! - n! = 4320$?

11. _____ January 1, 2018 was a Monday. What is the next year in which January 1 will fall on a Monday?

12. _____ miles On weekdays Sally rides her bike m miles each day. On each of the two weekend days she rides it 5 miles farther. If Sally rides 94 miles each week, how many miles does she ride each weekday?

13. _____ What is the greatest integer p such that 33! has 3^p as a factor?

14. _____ What is the value of $\frac{5!+6!}{4!+3!}$?

15. _____ feet A rectangle is twice as long as it is wide. When the lengths of all sides are increased by 3 feet, the area of the new rectangle is triple that of the original rectangle. What is the length of the new rectangle?

16. _____ The sum of six consecutive integers, the least of which is 30, can also be written as a sum of five consecutive integers. What is the greatest of these five integers?

17. _____ If a, b, c and d are positive integers such that $1 - \frac{1}{324} = \frac{a}{b} \cdot \frac{c}{d}$, what is the least possible value of $a + c$?

18. _____ If C is a digit such that the product of the three-digit numbers 2C8 and 3C1 is the five-digit number 90C58, what is the value of C?

19. _____ The graph of the equation $\frac{(x-3)(y-7)}{(x+1)(2y-5)} = \frac{1}{2}$ is a line missing two points. What is the slope of the line? Express your answer as a common fraction.

20. _____ What is the sum of all the integers x for which $x^2 + 4x \leq 1$?

June 17

1. _____ minutes How many minutes are in 4.5 hours?

2. _____ apples Herbert's gift basket contains three oranges for every five apples. If the basket has nine oranges, how many apples does it have?

3. _____ If $x = \frac{1}{2}$ and $y = 6$, what is the value of $12xy$?

4. _____ mi/h The table shows the minimum and maximum wind speeds for four categories of hurricanes. What is the absolute difference between the minimum wind speed of a category four hurricane and the maximum wind speed of a category one hurricane?

HURRICANE WIND SPEEDS (mi/h)

Category	Min Speed	Max Speed
Four	130	156
Three	111	129
Two	96	110
One	74	95

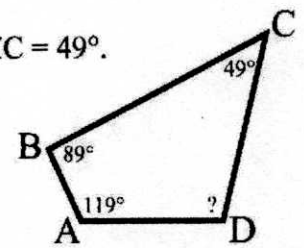
5. _____ cm What is the perimeter of a square whose area is 144 cm^2?

6. _____ furlongs

If 3 miles equal 1 league and 1 league equals 24 furlongs, how many furlongs are equal to 1 mile?

7. _____ degrees

In quadrilateral ABCD, $m\angle A = 119°$, $m\angle B = 89°$ and $m\angle C = 49°$. What is the degree measure of $\angle D$?



8. _____

If the first four terms of a geometric sequence are 2, 4, 8, 16 what is the fifth term of this sequence?

9. _____ sides

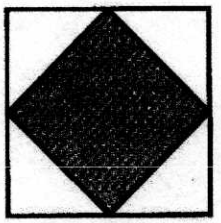
Gladys draws two polygons. Her second polygon has two fewer than twice as many sides as her first polygon. If Gladys' first polygon is a triangle, how many sides does her second polygon have?

10. $ _____

Lolli's Candy Store sells fruit-flavored candy rope, priced by length, at $4.00 per meter. At this rate, how much will it cost to buy 50 cm of candy rope?

11. _____ Misko had an average score of 70 for her first three rounds of golf. If her scores for the first two rounds were 68 and 72, what was her score for the third round?

12. _____ cm^2 In the figure shown, the shaded inner square has area 36 cm^2, and each of its vertices intersects the midpoint of a side of the outer square. What is the area of the outer square?

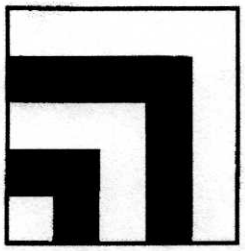


13. _____ meters Rafa and Sascha played a long 320-point tennis match. If Rafa ran an average of 12.7 meters per point and Sascha ran an average of 11.8 meters per point, how many more meters did Rafa run over the course of the match?

14. _____ $units^2$ The length and width of a rectangle add up to 16 units, and the length is three times the width. What is the area of the rectangle?

15. _____ What is the value of $\sqrt{5 \cdot 6 \cdot 10 \cdot 12}$?

16. _____ in^2



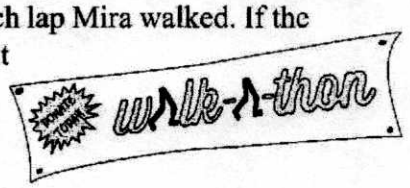
The figure shown is a square with sides of length 5 inches. The shaded stripes run parallel to the sides of the square, and they divide the bottom and left-hand sides of the square into segments of length 1 inch. What is the total area of the shaded stripes?

17. _____ numbers

How many two-digit prime numbers have 1 as their units digit?

18. _____ laps

For a charity walk-a-thon, Jen donated \$10 and pledged to donate 10¢ for each lap Mira walked. Joy pledged to donate 35¢ for each lap Mira walked. If the total amount Jen donated equals the total amount Joy donated, how many laps did Mira walk?



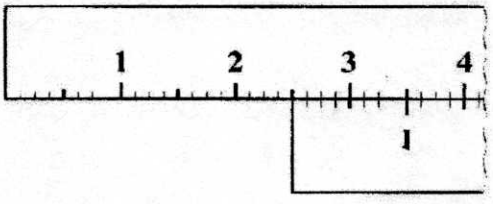
19. _____ values

$$\begin{array}{r} 4A\blacksquare \\ +\ 53\blacksquare \\ \hline 1\blacksquare\blacksquare\blacksquare \end{array}$$

Some of the digits in the following correctly-worked arithmetic problem are missing. How many possible values are there for the digit represented by A?

20. _____

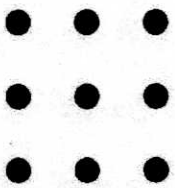
This figure shows two transparent foot-long rulers; the numerical markings on each ruler are in inches. If the marking on the top ruler for 6 inches will line up with the marking on the bottom ruler for q inches, what is the value of q? Express your answer as a mixed number.



21. _____ Noah wants to fill in the two blanks in the numeral 5__ 1__ 2 to create a five-digit positive integer that is divisible by 6. What is the greatest five-digit multiple of 6 that he can create?

22. _____ What is the integer nearest to x if $3^x = 1500$?

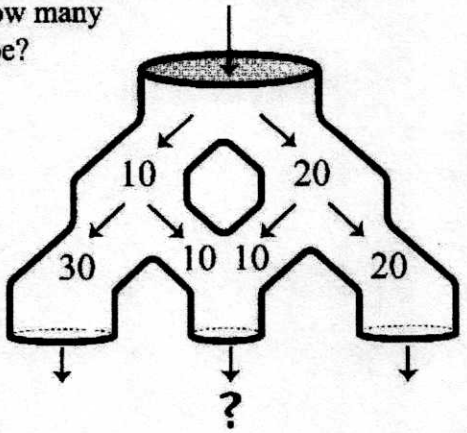
23. _____ lines



How many different lines pass through at least two of the nine points in the grid below?

24. _____ If $(2x - 3)^3 = a_3x^3 + a_2x^2 + a_1x + a_0$, what is the value of $a_3 + a_2 + a_1 + a_0$?

25. _____ marbles Ten thousand marbles are released into the top pipe as shown and roll down the pipe system. Anytime the pipe forks, the marbles split in proportion to the cross-sectional areas of the pipes. All pipes have circular cross-sections with diameters as indicated in the figure. How many marbles exit through the bottom, middle pipe?



Jun 17

1. _____ degrees

In triangle ABC, $m\angle A = 60°$, $m\angle B = 100°$ and $m\angle C = 20°$. If segment BD is constructed inside this triangle so that it bisects $\angle ABC$, what is the degree measure of $\angle BDC$?

2. _____

What is the value of the expression $\frac{1.2\times10^2}{4.8\times10^5}$? Express your answer as a common fraction.

3. _____

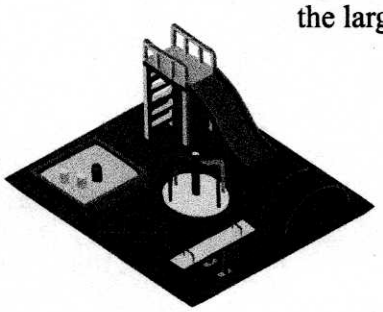
If ⚾ + ✈ = 14, and ⚾ − ✈ = 4, what is the value of ✈?

4. _____ units

Hexagon ABCDEF is drawn in the coordinate plane with vertices A(0, 0), B(4, 0), C(4, 2), D(2, 2), E(2, 4) and F(0, 4). What is the perimeter of hexagon ABCDEF?

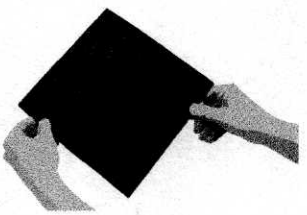
5. _____ square tiles

A school wishes to use square tiles of artificial turf to cover an outdoor play area that measures 40 feet by 72 feet. Only whole tiles that are congruent squares of the largest possible size will be used. How many such square tiles are needed?



6. _____ miles If Rose and Robyn ran 29 miles combined, and Robyn ran 4 miles less than twice as much as Rose, how many miles did Rose run?

7. _____ inches Jamie folds a piece of paper in half, and then folds it in half again. If the resulting folded piece of paper is a 4-inch by 5-inch rectangle, what is the largest possible perimeter of Jamie's original unfolded piece of paper?



8. _____ If $k! = 2^7 \cdot 3^2 \cdot 5 \cdot 7$, what is the value of k?

9. _____ The square of 207 can be computed by multiplying 200 by $200 + x$ and adding 49. What is the value of x?

10. _____ units A, B, C, D, E, F and G are points on the same line and AB = 24 units. The midpoint of segment AB is C. The midpoint of segment CB is E. The midpoint of segment AE is D. The midpoint of segment AC is F. The midpoint of segment EB is G. What is the length of segment FG?

11. _____ minutes

Starting at 9:00 p.m., Joe watches three films consecutively, with no breaks in between. The first film is the same length as the third film, and the second film is 50% longer than each of the other two films. If Joe finishes the third film at 2:15 a.m., how many minutes long is the second film?

12. _____ %

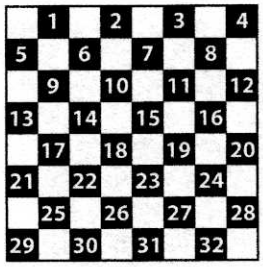
If d is 10% greater than c, c is 25% less than b, and a is 50% greater than b, by what percent is d less than a?

13. _____

If A, B, C, D, E, F and G satisfy the equations shown, what is the value of the absolute difference between $A + G$ and $A - G$?

$$\begin{aligned} A+B+C &= 5 \\ B+C+D &= 7 \\ C+D+E &= 9 \\ D+E+F &= 11 \\ E+F+G &= 13 \\ F+G &= 10 \\ A+F+G &= 11 \end{aligned}$$

14. _____ ways



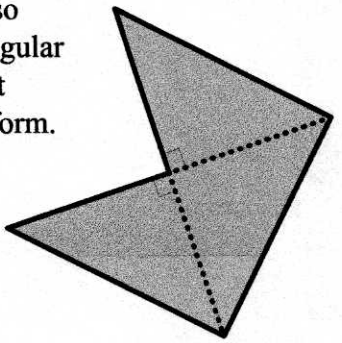
A checker starts at square 4 of the checkerboard shown here. At any time, it can move to any diagonally adjacent square below its current position. How many possible ways are there for the checker to move from square 4 to square 32?

15. _____ units^2

Sanjay cuts off a corner from a rectangular piece of paper, forming a pentagon. The side lengths of this pentagon, in order, are 10 units, 2 units, 11 units, 10 units and 5 units. What is the area of this pentagon?

16. _____ The sum of nine nonnegative numbers is 200. If M and A represent the median and arithmetic mean of the nine numbers, respectively, what is the greatest possible value of $M - A$? Express your answer as a common fraction.

17. _____ in^2 A five-sided piece of paper is divided into three congruent right triangles as shown in this figure, in which the dotted segments have length 4 inches. If the piece of paper is folded along the dotted segments so that the triangles become three faces of a right triangular pyramid, what is the area of the missing face of that pyramid? Express your answer in simplest radical form.



18. _____ If the equation shown is true for every value of x, what is the value of $b + c$?

$$(x^3 + x^2 - 3x + b)(2x^4 + cx^3 + x^2 - x + 1) = 2x^7 + 8x^6 + x^5 - 4x^4 + 39x^3 + 11x^2 - 10x + 7$$

19. _____ Suppose $a_0 = 10$ and $a_{n+1} = a_n^2$ for every non-negative integer n. What is the smallest value of n for which $a_1 \cdot a_2 \cdot a_3 \cdots a_{n-1} \cdot a_n$ has at least 100 digits?

20. _____ positive integers How many of the first 1024 positive integers are neither perfect squares nor perfect fifth-powers?

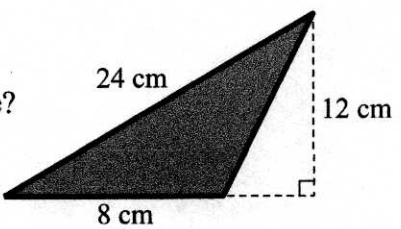
mc Jun 18

1. _____ pounds Andy's dog weighs 27 pounds, which is $\frac{3}{4}$ the weight of Seher's dog. How many pounds does Seher's dog weigh?

2. _____ mi/h It took Tamisha 15 minutes to drive 10 miles to her grandma's house. What was her average speed, in miles per hour?

3. _____ marbles Juan has 240 marbles. This is three times as many marbles as Jon and Jeremy have combined. If Jon has 50 marbles, how many marbles does Jeremy have?

4. _____ cm^2 What is the area of the shaded triangle, shown here?



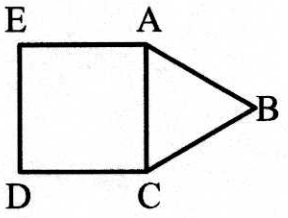
5. _____ °F On Friday in Omaha, the temperature at 6:00 a.m. was −3 °F. By noon, the temperature had risen to 3 °F. How many degrees warmer was it at noon than it was at 6:00 a.m.?

6. _____ times The average length of the human tongue is 3.9 inches. At an average length of 19 inches, a giraffe's tongue is how many times that of a human? Express your answer to the nearest integer.

7. _____ cups To make slime, mix 1 ounce of school glue with $\frac{1}{2}$ cup of water and $\frac{1}{4}$ cup of sodium tetraborate. How many cups of water would be needed to make a batch of slime using $\frac{1}{2}$ cup of sodium tetraborate?

8. _____ If $\frac{1}{6} + \frac{1}{7} + \frac{1}{n} = \frac{1}{3}$, what is the value of n?

9. _____ meters Equilateral triangle ABC and square ACDE share side AC as shown. If square ACDE has area 9 m^2, what is the perimeter of pentagon ABCDE?



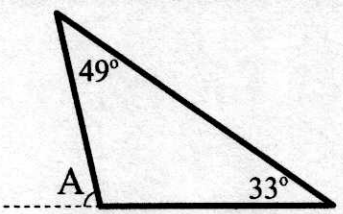
10. $ _____ Company A sells pencils in packs of 12 for \$1.50. Company B sells pencils in packs of 15 for \$2.00. What is the absolute difference of the total costs to purchase 60 pencils from each company?

11. _____ What is the smallest even integer greater than 10,000 that contains three distinct odd digits?

12. $ _____ Sean had \$72 in his bank account before he spent $\frac{1}{4}$ of it on a birthday present for his mom. He then deposited \$54.33 into his bank account. How much money does Sean have in his account now?

13. _____ primes What is the fewest number of consecutive primes, starting with 2, that when summed produce a number divisible by 7?

14. _____ degrees What is the degree measure of angle A in the figure shown here?



15. _____ What is the value of $(1.6 + 5)^2 - 1.6^2 - 5^2$?

16. _____ On a number line, what number is two-thirds of the way from $\frac{5}{8}$ to $\frac{7}{4}$? Express your answer as a common fraction.

17. _____ If the cube of a positive number is three times the square of the number, what is the number?

18. _____ gallons Jan and Jerome are mixing red paint with white paint to make pink paint, in the ratio of 4 parts red to 5 parts white. How many gallons of red paint should they mix with 1 gallon of white paint? Express your answer as a common fraction.

19. _____ % The population of Clown Town in 2020 was 24,500. In 2021, the population had risen to 26,950. What was the percent increase in population of Clown Town?

20. _____ students A class meets one day a week for four weeks. The number of students in attendance at each of the four class meetings is given in the table shown. What is the sum of the mean and median number of students in attendance per week?

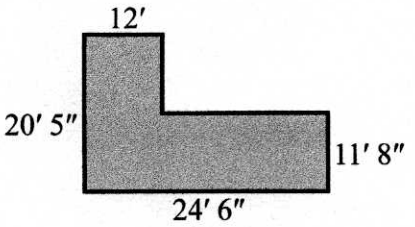
Meeting	Attendance
Week 1	32
Week 2	27
Week 3	28
Week 4	23

21. _____ What is the value of $99^2 + 101^2$?

22. $ _____ Griffin bakes a perfectly circular pizza with a diameter of 10 inches, and he sells it for \$0.20 per square inch. What is the cost for the entire pizza? Express your answer to the nearest whole dollar.

23. _____ What is the arithmetic mean of the first ten positive perfect squares? Express your answer as a decimal to the nearest tenth.

24. _____ cans This figure shows the floorplan of a room that includes a door and a window that have a combined area of 50 ft^2. Each side of the room has a wall that is 8 feet tall, and adjacent walls meet at right angles. If a can of paint covers an area of 400 ft^2, how many whole cans of paint must be purchased to paint the interior walls of this room, not including the door and the window?



25. _____ quarters Sam has exactly \$18.90 in dimes and quarters, with twice as many dimes as quarters. He spends five quarters and twice as many dimes at the convenience store, and he spends 55 cents at the donut shop. If he pays the exact amount for everything, how many quarters does Sam have left?

June 18

1. _____ candy bars

Holly is selling candy bars to raise money for her softball team. She starts with 80 candy bars and sells 32 to her neighbors and 15 to her grandparents. How many candy bars does Holly have left to sell?

2. _____ times

A recipe for chocolate chip cookies calls for $2\frac{1}{4}$ cups of chocolate chips. Jaime only has a $\frac{1}{4}$-cup measuring cup. To measure the exact amount of chocolate chips needed for the recipe, how many times does Jaime need to fill up the measuring cup?

3. _____

If 0.0036 divided by n is equal to 0.000012, what is the value of n?

4. _____

Alonzo draws a diagonal of a convex polygon with 8 sides. The diagonal divides the polygon into two smaller polygons, one with 6 sides and one with n sides. What is the value of n?

5. _____

When $x = 3$, what is the value of the expression 4^{x-5}? Express your answer as a common fraction.

6. _____ feet

Sylvia the snail crawls 23 inches in the first hour, then 59 inches in the second hour, then 49 inches in the third hour. How many feet does Sylvia crawl in these three hours? Express your answer to the nearest whole number.

7. _____ seashells

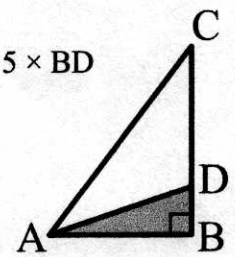
Ben, Rachel and Teri collected seashells on a beach. Ben collected five more than twice as many seashells as Teri collected. Rachel collected seven less than four times as many seashells as Teri collected. If Ben and Rachel collected the same number of seashells, how many seashells did Teri collect?

8. $ _____

At Kickin' Chicken, a chicken sandwich costs $4, plus 7% sales tax. If Quincy orders a chicken sandwich and pays with a $20 bill, how much change will he receive?

9. _____ in^2

In right triangle ABC, point D is on side BC, as shown. If $BC = 5 \times BD$ and the area of ΔABD is 8 in^2, what is the area of ΔABC?



10. _____ dolls

By selling handmade dolls, Hannah hopes to earn at least $1500 to donate to the local hospital. If she makes between $40 and $90 for each doll she sells, what is the absolute difference between the minimum and maximum number of dolls she must sell to meet her minimum fundraising goal?

11. $\_\_\_\_\_$ A fence is to be placed along the perimeter of a rectangular field with area 400 ft^2 and minimum possible perimeter. If one foot of fencing costs \$2.50, what is the total cost of the fencing needed to completely enclose the field?

12. _____ cm If each side of a square is decreased in length by 2 cm, its area is decreased by 160 cm^2. What is the original side length of the square?

13. _____ In Mr. Patterson's class, the average score among students who studied for an exam was 78. The average among students who did not study was 54. The overall class average was 70. What portion of the class did not study? Express your answer as a common fraction.

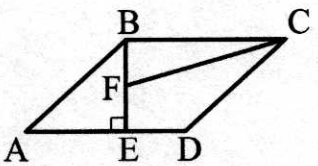
14. _____ Forty balls, numbered 1 to 40, are placed in a bag. What is the probability that the number on a randomly drawn ball is a multiple of 4 or 5? Express your answer as a common fraction.

15. _____ If $3^{(3^n)} = 27^{(27^{27})}$, what is the value of n?

16. _____ Paloma has a bag containing red, blue and white marbles. The ratio of red to blue marbles is 4:3, and the ratio of blue to white marbles is 7:2. What is the probability of Paloma randomly drawing a blue marble from this bag? Express your answer as a common fraction.

17. _____ people Riley's entire extended family goes out to eat. Each person orders either a salad for $6.50 or a cheeseburger for $7.50. They spend a total of $138.00 and buy four more salads than cheeseburgers. How many people, including Riley, are in the family?

18. _____ ABCD is a rhombus with side length 6. The measure of angle ABC is 150 degrees. Segment BE is perpendicular to base AD, and F is the midpoint of segment BE. The length of segment CF, expressed as a common fraction in simplest radical form, is $\frac{a\sqrt{b}}{c}$. What is the value of $a + b + c$?



19. _____ values When 257 is divided by m, the remainder is 5. How many possible positive integer values are there for m?

20. _____ games In Pierre's sports league, each team plays at most one game per day. Furthermore, no team is allowed to play games on three consecutive days, nor may any team play four or more games in any five consecutive days. Under these constraints, what is the maximum number of games Pierre's team could play in a 108-day interval?

June 19

1. _____ What is the value of $3^4 - 2 \times 4^2$?

2. _____ What is the value of the result when four million three hundred twenty-five thousand one hundred thirty-one is subtracted from four million three hundred twenty-six thousand fifty-two?

3. _____ What is the median of the data set {4, 16, 0, 8, 3, 11, 7}?

4. _____ pieces Parker and his three friends went trick-or-treating together. If Parker got 11 pieces of candy, and each of his friends got twice as much candy as he did, how many pieces of candy did Parker and his friends get in all?

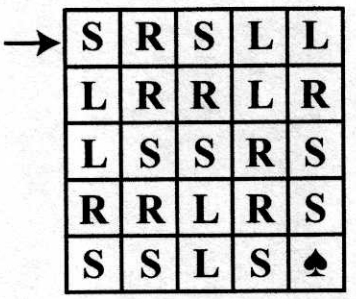
5. _____ Follow these steps:

1. Choose a two-digit positive integer.
2. Multiply it by 153.
3. Add the digits of the number obtained.
4. If the sum resulting from step 3 has more than one digit, repeat step 3. If the sum resulting from step 3 has one digit, stop.

What number is the result of following this algorithm?

6. _____ rooms

The 5 × 5 grid pictured represents 25 rooms. Annie walks into the top left room, and the direction she is facing as she enters the room is indicated by the arrow. In each room, she is instructed to either walk straight (S), make a right turn (R), or make a left turn (L). The instructions always indicate movement relative to the direction she is facing as she physically walks through the grid of rooms. She keeps going until she reaches the room with the ♠. Including the room into which she enters, and the room with the ♠, how many total rooms does Annie visit during this walk?



7. _____

The sum of the integer n and eighteen is equal to the product of four and five. What is the value of n?

8. _____ students

More than 100 students signed up to participate in the Geography Bowl competition. If teams of 2 could be made with no students left out, and teams of 3 could also be made with no students left out, what is the fewest number of students who could have signed up for the Geography Bowl?

9. _____ colors

Manuel wishes to paint each face of his rectangular prism such that no two adjacent faces of his prism are the same color. What is the minimum number of unique paint colors he needs to achieve this?

10. _____ feet

The width of a rectangle is 1 foot longer than its length, and the area of the rectangle is 72 ft^2. In feet, what is the rectangle's perimeter?

ero number of goats, each with four legs, and a nonzero number of
is, each with two legs, are living on a farm. Between all the animals,
re $\frac{3}{8}$ as many heads as there are legs. Assuming that all animals have all
limbs, what is the fewest possible number of chickens on the farm?

npic diving, there are seven judges who rate the performance of each
a scale from 0 to 10, using half-point increments, where 0 is a failed
t and 10 is excellent. After each of the seven judges has scored the dive,
highest scores and the two lowest scores are discarded. The remaining
cores are then added together and the sum is multiplied by the degree
culty of the dive. This degree of difficulty is a number between 1.2 and
famous Olympian diver completed a dive with degree of difficulty 3.5
eived the following seven performance scores from the judges: 8.0, 7.0,
, 7.5, 8.0, 7.0. What was the final number of points that the Olympian
d on this dive? Express your answer as a decimal to the nearest tenth.

el is baking cookies. His cookie recipe calls for $1\frac{3}{4}$ cups sugar and makes
kies. If he wants to scale the recipe to make exactly 18 cookies, how
ups of sugar will he need? Express your answer as a mixed number.

and his three sons, Ivan, Dmitri and Alyosha, are standing exactly on
ners of a rectangular room. Fyodor is 3 meters from Dmitri and 5 meters
van. What is the minimum possible distance that Fyodor could be from
a?

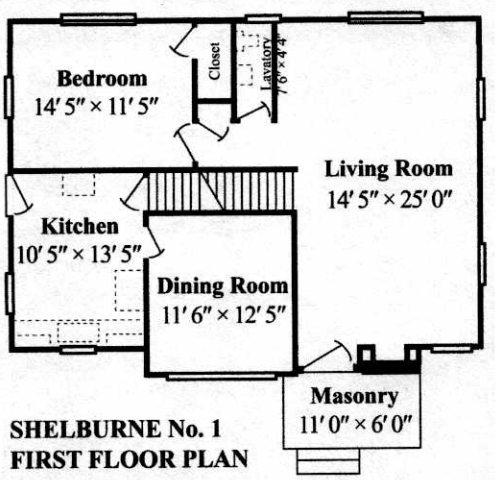
n Finger calculator company periodically checks random calculators
shipping crates out to customers. On Wednesday, 12 calculators from
f 64 crates of 144 calculators were tested. Two of the tested calculators
ound to be defective. Based on this rate of defect, how many total
ators are expected to be defective?

16. $\$$ _____

At a concert for the band Algal Rhythms, 75% of the tickets were sold at the full price of \$30. The remaining 25% of tickets were sold at a discounted price of \$10. What was the average selling price of a ticket at the Algal Rhythms concert? Express your answer in dollars, rounded to the nearest cent.

17. _____ ft^2

From 1908 to 1940, a house could be mail-ordered from the Sears catalog. Shown here is a floor plan for the Shelburne No. 1 model which was sold during the 1920s. The dimensions of each room are given in feet and inches, and adjacent walls meet at right angles. In square feet, what is the area of the dining room of the Shelburne No. 1 model? Express your answer to the nearest square foot.



SHELBURNE No. 1
FIRST FLOOR PLAN

18. _____ ft^2

A gardener uses exactly 500 feet of fencing to completely enclose a rectangular area in her backyard. If the width of her garden is 50 feet less than the length, what will be the area of her garden?

19. _____ : _____ a.m.

Joe left home traveling to Agora. At 10:32 a.m., Joe's speedometer showed that he was going 75 mi/h, and Joe knew that he had 60 miles left to travel. Assuming Joe maintains an average speed of 75 mi/h, what time will it be when he arrives in Agora? Express your answer in the form HH:MM, where HH represents the two-digit hour and MM represents the two-digit minute.

20. _____

The 5th power of a positive number is equal to the product of $\frac{2}{3}$ and the 4th power of the number. What is the ratio of this number's 10th power to its 8th power? Express your answer as a common fraction.

21. _____ sandwiches

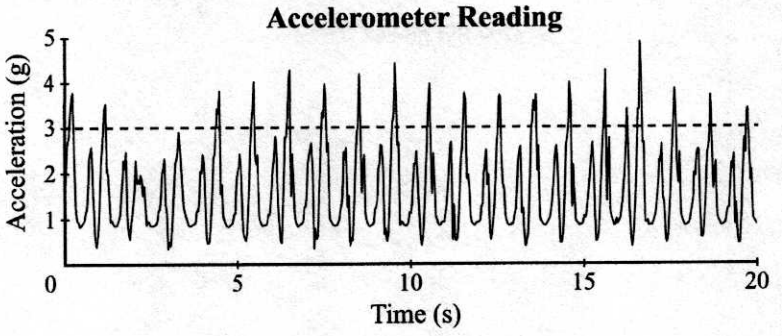
James is making a sandwich with two slices of bread chosen from rye, wheat and white, and filled with either ham or cheese, or both. If his sandwich can have one or two types of bread and the order of the ingredients doesn't matter, how many different sandwiches can James make?

22. _____ students

On Wednesday, $\frac{1}{3}$ of the students in Mr. Short's homeroom had drama practice, and $\frac{1}{4}$ of his other homeroom students had band practice. If 6 students had band practice, how many students are in Mr. Short's homeroom?

23. _____ m/s

Jen's phone uses a simple algorithm to count the number of strides she takes. The algorithm looks at the phone's accelerometer measurements, and counts a stride each time the acceleration goes from below to above 3 g. Based on the number of strides counted in the 20-second window shown here, and assuming that Jen travels 140 cm per stride, what was Jen's average walking speed, in meters per second, over the 20-second window? Express your answer as a decimal to the nearest hundredth.



24. _____

A triangle has integer side lengths 2, 5 and x. What is the median of all possible values of x?

25. _____ movies per month

Pixflix online video charges \$5.95 to view a movie. Movie Prime video service charges \$150 per year membership and \$3.95 per movie. Assuming Minda views the same number of movies each month, what is the fewest number of movies per month Minda must view to make Movie Prime the better deal?

June

1. _____ What is the slope of the line containing the points (3, 4) and (5, 12)?

2. _____ °F This chart shows the weather conditions in Madison, WI from January 11 through January 15. What was the mean high temperature for those five days in Madison? Express your answer as a decimal to the nearest tenth.

	Monday Jan. 11	Tuesday Jan. 12	Wednesday Jan. 13	Thursday Jan. 14	Friday Jan. 15
Sky					
Wind (mi/h)	5 North	4 East	11 North	0	11 South
High (°F)	10	6	−3	−4	0
Low (°F)	−2	−11	−16	0	−9

3. _____ yd^2 The screen in the movie theater measures 33 feet by 27 feet. In square yards, what is the area of the movie screen?

4. _____ A sequence is defined as shown for $n = 3, 4, 5, \ldots$. What will be the first number in this sequence that is NOT prime?

$$a_1 = 11$$
$$a_2 = 2$$
$$a_3 = a_1 + a_2$$
$$a_4 = a_3 + (a_2 + 2)$$
$$a_5 = a_4 + (a_2 + 4)$$
$$a_6 = a_5 + (a_2 + 6)$$
$$\vdots \qquad \vdots$$
$$a_{n+1} = a_n + (a_2 + 2(n-2))$$

5. _____ What is the smallest positive perfect cube divisible by 12?

6. _____ mi/h While driving, Carl notices that his odometer reads 25,952 miles, which happens to be a palindrome. He thought this was pretty rare, but 2.5 hours later, his odometer reads as the next palindrome number of miles. What was Carl's average speed during those 2.5 hours?

7. _____ Let $a \blacklozenge b = \frac{ab}{a+b}$. What is the value of $(1 \blacklozenge 2) \blacklozenge 3$? Express your answer as a common fraction.

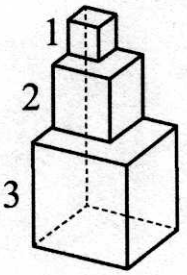
8. _____ % Grapes are 80% water by weight. When a bushel of grapes dries in the sun for two weeks, it loses 50% of its total weight. All of the weight loss is due to the loss of water. After drying for two weeks, what percentage of the grapes is water by weight? Express your answer to the nearest percent.

9. _____ The number a is 5 times as large as b. The sum of a and b is 15. What is the value of the product ab? Express your answer as a common fraction.

10. _____ ordered pairs Goldbach's conjecture states that every even number greater than two can be expressed as the sum of two prime numbers. For example, 2022 = 191 + 1831. How many ordered pairs of prime numbers have a sum of 60?

11. _____ The function $f(x)$ has the property that if P and Q are any two distinct points on the graph of $y = f(x)$, then the slope of PQ is twice the sum of the x-coordinates of P and Q. What is the value of $f(10) - f(0)$?

12. _____ cm^2 The solid shown consists of three stacked cubes of edge lengths 1 cm, 2 cm and 3 cm. What is the surface area of the figure?



13. _____ If $|2x - 1| = |x - 2|$, what is the sum of all possible values of x?

14. _____ % Brian has earned 65%, 80% and 92% on his three pre-final exams. These exams are not weighed equally: the lowest counts for only 20% of his overall grade, while the other two count for 25% each. If the final exam is the remainder of the overall grade and there are no opportunities for extra credit, what is the highest grade Brian can earn in the class? Express your answer to the nearest whole percent.

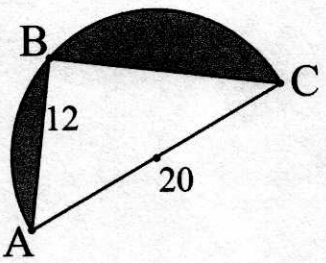
15. _____ units^2 A convex polygon has vertices at the points (2, 0), (1, 0), (1, 5) and (–2, 4). What is the area of the polygon?

16. _____ Let $x > 0$ and $y > 0$. Suppose that $xy^2 = 6$, and $x^2y^6 = 72$. What is the value of xy? Express your answer in simplest radical form.

17. _____ If $\sqrt{7-\sqrt{2+\sqrt{n}}} = 2$, what is the value of n?

18. _____ integers How many integers between 1 and 280, inclusive, are not divisible by 2, 5 or 7?

19. _____ In the figure, triangle ABC is inscribed in a semicircle with diameter AC of length 20 inches, and AB = 12 inches. When the area of the shaded region, in square inches, is expressed in the form $a\pi - b$, what is the value of $a + b$?



20. _____ If $n = 10^{2020} - 10^{2019} + 10^{2018} - 10^{2017} + \cdots + 10^2 - 10^1$, what is the sum of digits of the integer n?

June 20

1. $\$$ _____

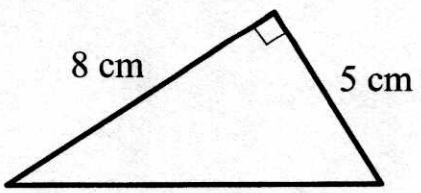
What is the total cost of 3 jars of peanut butter priced \$5 each and 5 jars of jelly priced \$3 each?

2. _____ What is the absolute difference between 2^5 and 5^2?

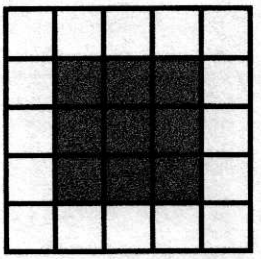
3. _____ What is the value of the expression $\frac{1}{5} + \frac{11}{15}$? Express your answer as a common fraction.

4. $\$$ _____ Bob has \$50 in his pocket when he sets off for the movie theatre. After he pays \$10 for a ticket, \$8 for popcorn and \$7 for a soda, how much money does Bob have left in his pocket?

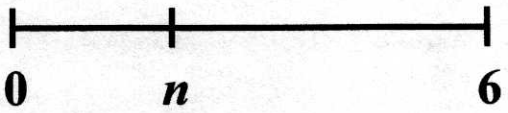
5. _____ cm^2 What is the area of the right triangle shown with legs of lengths 5 cm and 8 cm?



6. _____ % The figure shows a large square divided into 25 congruent squares. What percent of the figure is shaded?

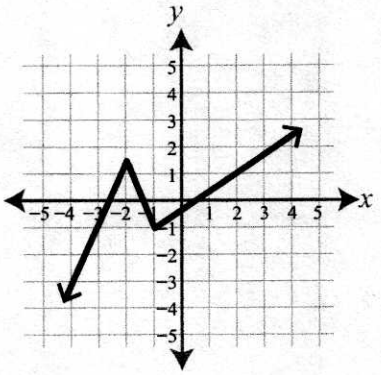


7. _____ On the number line shown, the number n is one-third of the way from 0 to 6. What is the value of n?



8. _____ What is the value of $\frac{1}{2}$ of $\frac{1}{3}$ of $\frac{1}{4}$ of 240?

9. _____ For the function graphed here, what is the greatest value of x for which $y = -1$?



10. _____ If $4n + 1 = 250$, what is the nearest integer to the value of n?

11. _____ What is the value of the expression $\sqrt{\frac{1}{4}} + \sqrt{\frac{1}{9}} + \sqrt{\frac{1}{16}}$? Express your answer as a common fraction.

12. _____ The sum of two numbers is 9 and their absolute difference is 3. What is their product?

13. _____ fish Of the fish in Ari's aquarium, $\frac{1}{2}$ are red, $\frac{1}{4}$ are blue and $\frac{1}{8}$ are black. The remaining 4 fish are yellow. Given that all of Ari's fish are a single color, how many fish are in Ari's aquarium?

14. _____ marbles A bag is filled with 100 marbles each colored red, white or blue. The table shows the results when Cia randomly draws 10 marbles. Based on this data, how many of the marbles in the bag are expected to be red?

Red	White	Blue
II	𝍸	III

15. _____ tea parties Margaret holds tea parties every Tuesday afternoon for the purpose of using her collection of 100 teacups. If she invites n people, she will use $n + 1$ teacups: one for each invited guest and one for herself. If she has already had 24 tea parties, each with two guests, how many tea parties with three guests should she host to ensure each teacup is used exactly once?

16. ____ : ____ a.m.

Evan gets stuck in an elevator. At 12:11 a.m., the elevator repair company dispatches a technician who is 75 miles away. The technician drives at an average speed of 50 mi/h, and after arriving, takes 10 minutes to enter the building, and then an additional 7 minutes to unlock the elevator. At what time is Evan released from the elevator?

17. _____

If the median of the data set $\{x + 2, x + 3, x - 4, x - 1, x + 1\}$ is 6, what is the value of x?

18. _____

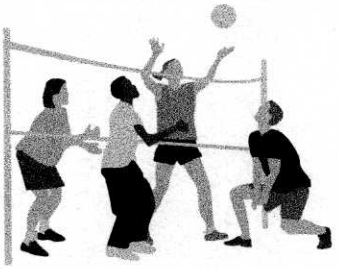
Let x, y and z be positive integers with $x < y < z$. If the mean of x, y and z is 99, what is the greatest possible value of z?

19. _____

Which digit should replace E in the units place of the number 1,234,56E so that the number is divisible by 9?

20. _____ minutes

During P.E. class, twelve students take turns playing an 8-player game. If class lasts 1 hour and each student plays the same amount of time, what is the maximum number of minutes each student can actively be playing the game?



21. _____ lengths

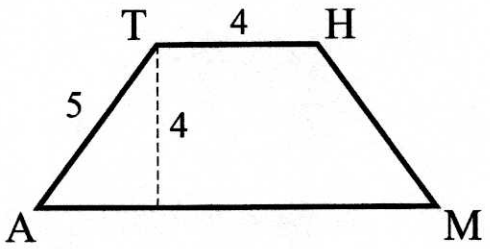
Triangle ABC has AB = 10 and BC = 6. How many different integer lengths are possible for side AC?

22. _____

Consider the geometric sequence $a_1 = 1$, $a_2 = 2$, $a_3 = 4$, $a_4 = 8$,.... What is the average of the first 10 terms of this sequence? Express your answer as a decimal to the nearest tenth.

23. _____ cm

Isosceles trapezoid MATH, shown here, has height 4 cm. If AT = HM = 5 cm and TH = 4 cm, what is the perimeter of trapezoid MATH?



24. _____

If $x + 2y = 9$ and $5x + 4y = -4$, what is the value of $8x + 10y$?

25. _____ cupcakes

Grace made over four dozen cupcakes. If she makes packages of 2 cupcakes, then there is 1 left over. Packaging in groups of 3 cupcakes leaves 2 left over, and packaging in groups of 4 cupcakes leaves 3 left over. What is the fewest number of cupcakes Grace could have made?

Jore 28

1. _____ What integer is closest to $\frac{4.7}{2}$?

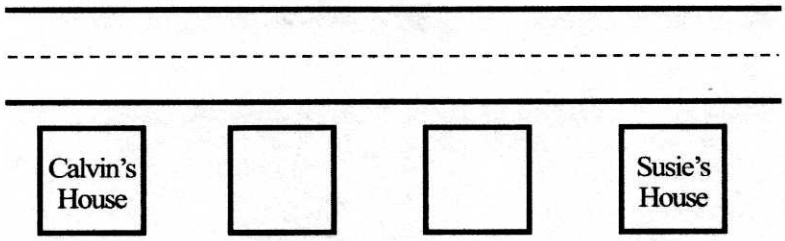
2. _____ What is the value of $\frac{10^3}{3^4 - 1}$? Express your answer as a decimal to the nearest tenth.

3. _____ What is the greatest integer value of t for which $3t < 260$?

4. _____ degrees In triangle ABC, $m\angle A = 40$ degrees and $m\angle B = 85$ degrees. What is the measure of $\angle C$?

5. _____ The arithmetic mean of 4, 8, 6, 9 and n is 6. What is the value of n?

6. _____ Calvin and Susie live on the same side of a street, as shown, where adjacent houses have address numbers that differ by six. If Calvin's address number is 2021 and is less than Susie's address number, what is Susie's address number?



7. _____ mm^2 The perimeter of a rectangle is 36 mm. What is the greatest possible area of the rectangle?

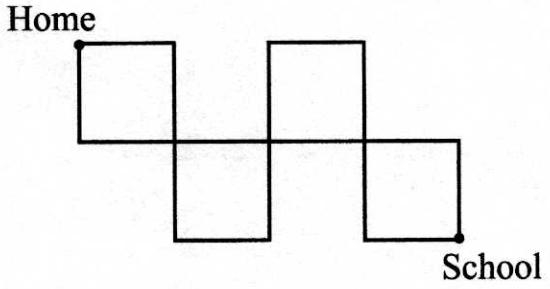
8. _____ cups It requires 5 tablespoons of flour to make 15 gulab jamun. Given that there are 16 tablespoons in a cup, how many cups of flour are required to make 200 gulab jamun? Express your answer as a mixed number.

9. _____ The absolute difference of two positive numbers is 3, and their product is 40. What is their sum?

10. _____ minutes Nautical dawn is the time in the morning when the center of the sun is 12 degrees below the horizon. Civil dawn is the time in the morning when the center of the sun is 6 degrees below the horizon. Assuming that one day corresponds to one full rotation, how many minutes pass between nautical dawn and civil dawn?

11. _____ routes

The figure shows a map of the sidewalks in Glenn's neighborhood. If all sidewalks intersect at right angles, how many different routes can Glenn take from home to school traveling only on sidewalks and in the shortest possible distance?



12. _____ baskets

Lisa is playing basketball with her friend Leslie. Lisa scores 21 points on 8 successful baskets. Each basket was worth either 2 or 3 points. How many baskets worth 3 points did Lisa make?

13. _____ hours

Jesse is making snowballs to have a snowball fight. If Jesse can make 1 snowball every 4 minutes, but 2 snowballs melt every 15 minutes, how long will it take Jesse working continuously to accumulate 21 snowballs? Express your answer to the nearest whole number of hours.

14. _____

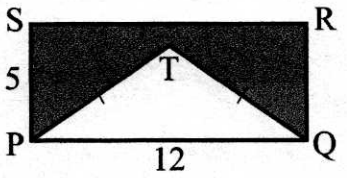
Seven consecutive odd integers sum to 217. What is the least of the seven integers?

15. _____

If $a \otimes b = a^2 + b - 3a$, what is the value of $2 \otimes (3 \otimes (-1))$?

16. _____ cm

In the figure shown, PQRS is a rectangle and PQT is an isosceles triangle. Given that the area of pentagon PTQRS is 36 cm^2, what is length PT? Express your answer in simplest radical form.

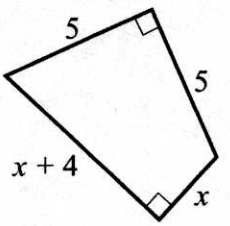


17. _____ meters

Lauren and Ally are going to race. Lauren runs 0.4 m/s faster than Ally. If Lauren is going to run 100 meters, how many meters ahead of Lauren does Ally need to start in order for both runners to reach the finish line in 20 seconds?

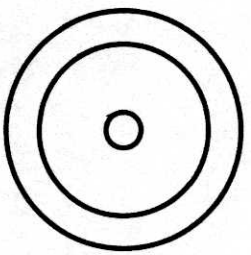
18. _____

The lengths, in units, of the sides of a quadrilateral are given in the figure shown. What is the value of x? Express your answer in simplest radical form.



19. _____

A dartboard is made up of three concentric circles, as shown, with radii 7 inches, 5 inches and 1 inch. What is the probability that a randomly thrown dart that hits this dartboard will be closer to the circle of radius 5 inches than to either of the other two circles? Express your answer as a common fraction.



20. _____

The arithmetic mean of two numbers is 7 and their geometric mean is 5. What is the sum of the squares of the two numbers?