2012–2013
MATHCOUNTS®
School Handbook

Contains 300 creative math problems
that meet NCTM standards for grades 6-8.

For questions about your local MATHCOUNTS program,
please contact your chapter (local) coordinator. Coordinator contact
information is available through the Find My Coordinator option of the
Competition Program link on www.mathcounts.org.

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Count Me In!

A contribution to the MATHCOUNTS Foundation will help us continue to make this worthwhile program available to middle school students nationwide.

The MATHCOUNTS Foundation will use your contribution for program wide support to give thousands of students the opportunity to participate.

To become a supporter of MATHCOUNTS, send your contribution to:

MATHCOUNTS Foundation
1420 King Street
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Or give online at:

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Other ways to give:

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For more information regarding contributions, call the director of development at 703-299-9006, ext. 103 or e-mail info@mathcounts.org.

The MATHCOUNTS Foundation is a 501(c)3 organization. Your gift is fully tax deductible.

The National Association of Secondary School Principals has placed this program on the NASSP Advisory List of National Contests and Activities for 2012–2013.

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CRITICAL 2012-2013 DATES

2012

Sept. 1 - Dec. 14	Send in your school's Registration Form to receive a hard copy of the *MATHCOUNTS School Handbook*, the Club in a Box Resource Kit and/or your copy of the 2012-2013 School Competition Kit. *Items will ship shortly after receipt of your form, with the mailing of the School Competition Kit following this schedule:* Registration Forms *postmarked by* Oct. 1: Kits mailed in early November. *Kits continue mailing every two weeks through December 31, 2012.* Mail or fax the MATHCOUNTS Registration Form (*with payment if participating in the competition*) to: **MATHCOUNTS Registration, P.O. Box 441, Annapolis Junction, MD 20701** **Fax: 240-396-5602** (*Please fax or mail, but do not do both.*) Questions? Call 301-498-6141 or confirm your club or competition registration via www.mathcounts.org/clubschools or www.mathcounts.org/competitionschools, respectively.
Fall 2012	Video submission period begins for Reel Math Challenge.
Fall 2012	Clubs should begin working on Silver Level Challenges; deadline is March 1, 2013.
Nov. 16	**Deadline to register for the Competition Program *at reduced registration rates*** ($90 for a team and $25 for each individual). After Nov. 16, registration rates will be $100 for a team and $30 for each individual.
Dec. 14 **(postmark)**	**Competition Registration Deadline** *In some circumstances, late registrations might be accepted, at the discretion of MATHCOUNTS and the local coordinator.* ***Late fees may also apply. Register on time to ensure your students' participation.***

2013

Early Jan.	If you have not been contacted with details about your upcoming competition, call your local or state coordinator! *If you have not received your School Competition Kit by the end of January, contact MATHCOUNTS at 703-299-9006.*
Jan. 7	Voting opens to the general public for Reel Math Challenge.
Feb. 1-28	**Chapter Competitions**
Feb. 28	Video submission period for Reel Math Challenge ends, and general public voting ends.
March 1-31	**State Competitions**
March 1	Deadline for MATHCOUNTS Club Programs to reach Silver Level. Applications for Silver Level Status must be received by MATHCOUNTS as of this date for entry to the Silver drawing.
March 14	Top 20 video submissions for Reel Math Challenge are announced.
March 28	Top 4 video submissions for Reel Math Challenge are announced.
March 29	Deadline for MATHCOUNTS Club Programs to reach Gold Level. Applications for Gold Level Status and Ultimate Math Challenges must be received by MATHCOUNTS as of this date for entry to the Gold drawing.
May 10	**2013 Raytheon MATHCOUNTS National Competition in Washington, D.C.**

INTRODUCTION

The mission of MATHCOUNTS is to provide fun and challenging math programs for U.S. middle school students to increase their academic and professional opportunities. Currently in its 30th year, MATHCOUNTS meets its mission by providing three separate but complementary programs for middle school students: the **MATHCOUNTS Competition Program**, the **MATHCOUNTS Club Program** and the **Reel Math Challenge**. This *School Handbook* supports each of these programs in different ways.

The **MATHCOUNTS Competition Program** is designed to excite and challenge middle school students. With four levels of competition - school, chapter (local), state and national - the Competition Program provides students with the incentive to prepare throughout the school year to represent their schools at these MATHCOUNTS-hosted* events. MATHCOUNTS provides the preparation and competition materials, and with the leadership of the National Society of Professional Engineers, more than 500 Chapter Competitions, 56 State Competitions and one National Competition are hosted each year. These competitions provide students with the opportunity to go head-to-head against their peers from other schools, cities and states; to earn great prizes individually and as members of their school team; and to progress to the 2013 Raytheon MATHCOUNTS National Competition in Washington, D.C. There is a registration fee for students to participate in the Competition Program, and participation past the School Competition level is limited to the top 10 students per school.

*****Working through the School Handbook and previous competitions is the best way to prepare for competitions.***** *A more detailed explanation of the Competition Program is on pages 42 through 53.*

The **MATHCOUNTS Club Program (MCP)** is designed to increase enthusiasm for math by encouraging the formation within schools of math clubs that conduct fun meetings with a variety of math activities. The resources provided through the MCP are also a great supplement for classroom teaching. The activities provided for the MCP foster a positive social atmosphere, with a focus on students working together as a club to earn recognition and rewards in the MATHCOUNTS Club Program. Some rewards are participation-based, and others are achievement-based, but all rewards require a minimum number of club members (based on school size). Therefore, there is an emphasis on building a strong club and encouraging more than just the top math students within a school to join. There is no cost to sign up for the MATHCOUNTS Club Program, but a Registration Form must be submitted to receive the free club materials. (A school that registers for the Competition Program is automatically signed up for the MATHCOUNTS Club Program.)

*****The School Handbook is supplemental to the MCP. Resources in the Club Resource Guide may be better suited for more collaborative and activities-based club meetings.*****
A more detailed explanation of the MATHCOUNTS Club Program is on pages 54 through 58.

The **Reel Math Challenge** is an innovative program involving teams of students using cutting-edge technology to create videos about math problems and their associated concepts. This competition excites students about math while allowing them to hone their creativity and communication skills. Students form teams consisting of four students and create a video based on one of the Warm-Up or Workout problems included in this handbook. In addition, students are able to form teams with peers from around the country. As long as a student is a sixth, seventh or eighth grader, he or she can participate. Each video must teach the solution to the selected math problem as well as demonstrate the real-world application of the math concept used in the problem. All videos are posted to www.reelmath.org, where the general public votes on the best videos. The 20 videos with the highest vote totals advance to the semifinals of the competition, after which a panel of MATHCOUNTS judges reviews them and selects four finalists. Each of the four finalist teams receives an all-expense-paid trip to the 2013 Raytheon MATHCOUNTS National Competition, where the teams will present their videos to the 224 students competing in that event. The competitors then will vote for one of the four videos to be the winner of the Reel Math Challenge. Each member of the winning team will receive a $1000 college scholarship.

*****The School Handbook provides the problems from which students must choose for the Reel Math Challenge.*****
A more detailed explanation of the Reel Math Challenge is on page 59.

*While MATHCOUNTS provides the actual School Competition Booklet with the questions, answers and procedures necessary to run the School Competition, the administration of the School Competition is up to the MATHCOUNTS coach in the school. The School Competition is not required; selection of team and individual competitors for the Chapter Competition is entirely at the discretion of the school coach and need not be based solely on School Competition scores.

NEW THIS YEAR

COMPETITION PROGRAM REGISTRATION FEES

This program year, school registration fees will change depending on when a school's registration is postmarked. Registration fees will follow the schedule outlined below:

- For registrations postmarked by November 16, 2012, the cost to register a team is $90, and the cost to register each individual is $25.

- For registrations postmarked after November 16, 2012 but by December 14, 2012, the cost to register a team is $100, and the cost to register each individual is $30.

- Registrations postmarked after the December 14, 2012 registration deadline might be accepted at the discretion of MATHCOUNTS and the local coordinator. However, schools that initiate a registration or add to a previous registration after the December 14, 2012 postmark deadline will be subject to a late fee of $20. The $20 late fee is a per-incident charge rather than a per-student charge.

TITLE I REGISTRATION FEES

Schools entitled to receive Title I funds may register for half the cost of the applicable registration fee. For schools with registrations postmarked by November 16, 2012, the cost to register a team is $45, and the cost to register each individual is $12.50. For schools with registrations postmarked after November 16, 2012 but by December 14, 2012, the cost to register a team is $50, and the cost to register each individual is $15.

In order for schools to qualify for Title I rates, at least 40% of the student body must be enrolled in the Free and Reduced Lunch Program.

INTERACTIVE SCHOOL HANDBOOK

This year, we are pleased to offer both the *2011-2012* and *2012-2013 MATHCOUNTS School Handbooks* online in a new, interactive format through NextThought, a software technology company devoted to improving the quality and accessibility of online education.

When logged on to the NextThought platform, students will be able to discuss problems in real time, share notes or highlights directly in the content, receive help from coaches and collaborate with teammates and peers across the country. Online collaboration channels, such as live chats, digital whiteboards and note-sharing capabilities will enable students to build personal learning networks, build knowledge and develop a deeper understanding of math topics.

In addition to providing users with online, interactive access to the Warm-ups, Workouts, and Stretches included in the *2011-2012 and 2012-2013 MATHCOUNTS School Handbooks*, the NextThought platform will allow students and coaches to take advantage of the following features:

- Students can highlight problems, add notes, comments and questions, and show their work through digital whiteboards. All interactions are contextually stored and indexed within the *School Handbook*.
- Content is accessible from any computer with a modern web browser through the cloud-based platform.
- Interactive problems can be used to assess student or team performance.
- With the ability to receive immediate feedback, including solutions, students develop critical-thinking and problem-solving skills.
- An adaptive interface with a customized math keyboard makes working with problems easy.
- Advanced search and filter features provide efficient ways to find and access MATHCOUNTS content and user- generated annotations.
- Students can build their personal learning networks through collaborative features.

- Opportunities for synchronous and asynchronous communication allow teams and coaches flexible and convenient access to each other, building a strong sense of community.
- Students can keep annotations private or share them with coaches, their team or the global MATHCOUNTS community.
- Digital whiteboards enable students to share their work with coaches, allowing the coaches to determine where students need help.
- Live individual or group chat sessions can act as private tutoring sessions between coaches and students or can be de facto team practice if everyone is online simultaneously.
- The secure platform keeps student information safe.

To access the interactive handbooks through NextThought, please visit www.mathcounts.org/handbook.

HELPFUL RESOURCES

COACHES' RESOURCE VIDEO SERIES

MATHCOUNTS has created a video series to help you understand the free resources available to you in your Club in a Box Resource Kit. To date, there are five videos, but the library will continue to grow as we see a need.

MATHCOUNTS Online: Math Resources - This video provides an overview of the math resources available on the MATHCOUNTS website.

Introduction to the Club in a Box Resource Kit - This short video provides you with an understanding of the materials included in your Club in a Box Resource Kit and how best to utilize them.

How to Become a Silver (and Gold) Level School in the MATHCOUNTS Club Program - These videos explain the steps necessary for your school to achieve Silver Level and Gold Level Status in the Club Program. Requirements, incentives and prizes are discussed.

Introduction to the *MATHCOUNTS School Handbook* - Have you received your handbook but are unsure about how to best utilize the problems? The *School Handbook* video discusses the variety of problems that can be found in the handbook as well as how to utilize the problems for MATHCOUNTS competition preparation or classroom use.

All of these videos can be accessed at www.mathcounts.org/videos or on the MATHCOUNTS YouTube page, which can be found at www.youtube.com/mathcounts.

MATHCOUNTS AND SOCIAL MEDIA

Did you know that MATHCOUNTS is now on Facebook, Twitter and YouTube? Stay updated on important MATHCOUNTS news and math happenings through posts and Tweets. Watch highlights from the National Competition, access the Coaches' Video Series, watch a promotional video about the Club Program and view all of the newest MATHCOUNTS Minis online!

Experience MATHCOUNTS on social media at the following websites:

www.facebook.com/mathcounts
www.twitter.com/mathcounts
www.youtube.com/MATHCOUNTS

THE MATHCOUNTS OPLET

(Online Problem Library and Extraction Tool)

. . . a database of thousands of MATHCOUNTS problems AND step-by-step solutions, giving you the ability to generate worksheets, flash cards and Problems of the Day

Through www.mathcounts.org, MATHCOUNTS is offering the MATHCOUNTS OPLET - a database of 12,500 problems and over 5,000 step-by-step solutions, with the ability to create personalized worksheets, flash cards and Problems of the Day. After purchasing a 12-month subscription to this online resource, the user will have access to *MATHCOUNTS School Handbook* problems and MATHCOUNTS competition problems from the past 12 years and the ability to extract the problems and solutions in personalized formats. (Each format is presented in a pdf file to be printed.)

Once the subscription is purchased, the user can access the MATHCOUNTS OPLET each time he or she goes to www.mathcounts.org/oplet and logs in. Once on the MATHCOUNTS OPLET page, the user can tailor the output to his or her needs by answering a few questions. These are some options that can be personalized:

SAVE
$25 OFF

YOUR SUBSCRIPTION FEE IF YOU PURCHASE OPLET BEFORE
October 12, 2012.

Use code **OPLET1213** to receive your discount when registering online as a NEW subscriber.

Use code **RENEW1213** to receive your discount when renewing a current subscription.

MATHCOUNTS®
www.mathcounts.org/OPLET

- Format of the output: Worksheet, Flash Cards or Problems of the Day
- Number of questions to include
- Solutions (whether to include or not for selected problems)
- Math concept: Arithmetic, Algebra, Geometry, Counting and Probability, Number Theory, Other or a Random Sampling
- MATHCOUNTS usage: Problems without calculator usage (Sprint Round/Warm-Up), Problems with calculator usage (Target Round/Workout/Stretch), Team problems with calculator usage (Team Round), Quick problems without calculator usage (Countdown Round) or a Random Sampling
- Difficulty level: Easy, Easy/Medium, Medium, Medium/Difficult, Difficult or a Random Sampling
- Year range from which problems were originally used in MATHCOUNTS materials: Problems are grouped in five-year blocks in the system.

Once these criteria have been selected, the user either (1) can opt to have the computer select the problems at random from an appropriate pool of problems or (2) can manually select the problems from this appropriate pool of problems.

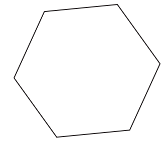
How does a person gain access to this incredible resource as soon as possible?
A 12-month subscription to the MATHCOUNTS OPLET can be purchased at www.mathcounts.org. The cost of a subscription is $275; however, schools registering students in the MATHCOUNTS Competition Program will receive a $5 discount per registered student. If you purchase OPLET before October 12, 2012, you can save a total of $75* off your subscription. Please refer to the coupon above for specific details.

If you would like to get a sneak peek at this invaluable resource before making your purchase, you can check out screen shots of the MATHCOUNTS OPLET at www.mathcounts.org/oplet. You will see the ease with which you can create countless materials for your Mathletes, club members and classroom students.

*The $75 savings is calculated using the special $25 offer plus an additional $5 discount per student registered for the MATHCOUNTS Competition Program, up to 10 students.

Warm-Up 1

1. ____________ % A cake with a regular hexagonal top is sliced along each of its 9 diagonals. What percent of the resulting 24 pieces are triangles?



2. ____________ calories Rocky's family recipe for macaroni and cheese makes 4 servings of 310 calories each. Rocky decided to make $1\frac{1}{2}$ times the amount in the recipe. How many calories are in Rocky's batch of macaroni and cheese?

3. ____________ inches

Alberto's dad is 6 feet 3 inches tall, and his mother is 5 feet 7 inches tall. One method used to predict a young child's adult height is to take the average of the mother's height and the father's height. Using this method, what is Alberto's expected adult height, in inches?

4. ____________ dots If the dot pattern shown here is continued, how many dots will there be in Figure 5?

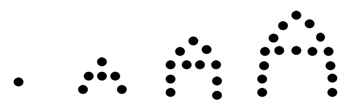


Figure 1 Figure 2 Figure 3 Figure 4

5. $ ____________ The toll for a major highway is 8 cents for every 5 miles traveled. What is the toll, in dollars, for a trip of 115 miles on this highway?

6. ____________ % A candle 25 cm tall burns at the rate of 5 cm per hour. What percent of the original candle is left after it has burned for 2 hours?

7. ____________

If a fair coin is flipped 17 times, what is the probability that the number of heads will equal the number of tails?

8. ____________ units Two squares, each with an area of 25 units^2, are placed side-by-side to form a rectangle. What is the perimeter of the rectangle?

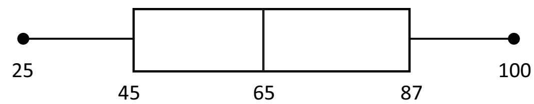
9. ____________ students The ratio of girls to boys in the seventh grade at Hypatia Middle School is 3:2. There are 134 boys in the seventh grade. What is the total number of students in the seventh grade at Hypatia Middle School?

10. $ ____________ When Johanna and Klara ate at their favorite restaurant, the subtotal was $26.40. A 7% tax and an 18% tip were added to the bill, both applied to the subtotal. What was the total cost, including tax and tip?

Warm-Up 2

11. __________ Half of a third of x equals a fourth of y plus a fifth of y. If $x = 27$, what is the value of y?

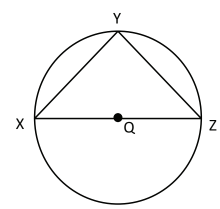
12. __________ What is the positive difference between the range and the interquartile range of the data set represented by this box-and-whisker plot?



13. __________ If x and y are positive integers such that $x^y = 8$, what is the maximum possible value of $x + y$?

14. __________ jars If 1 bucket + 5 jars = 1 tub, and 3 buckets + 2 jars = 2 tubs, how many jars are equal to 1 tub?

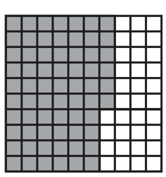
15. __________ in^2 Isosceles triangle XYZ is inscribed in circle Q, as shown. If diameter XZ is 2 inches, what is the area of ΔXYZ?



16. __________ plates A state creates license plates that each contain two letters followed by three digits. The first letter must be a vowel (*A*, *E*, *I*, *O*, *U*), and duplicate letters and digits are allowed. How many different license plates are possible?

17. __________ % What percent of the first 50 positive integers contain no odd digits?

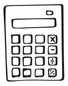
18. __________ %



What percent of the grid shown here is not shaded?

19. __________ For what positive integer n is $2n + 3n + 4n = n^n$?

20. $ __________ At Hall of Oats, yogurt-covered raisins sell for \$3.99 per pound. How much will $33\frac{1}{3}$ pounds of yogurt-covered raisins cost?



Workout 1

21. $__________ Using his \$50 gift card, Xi bought 5 apps for \$1.99 each and a new set of headphones for \$10. After these purchases, what was the remaining balance on his \$50 gift card?

22. ________ Tweets If it takes 24 seconds to write a Tweet and 8 seconds to send it, what is the greatest number of Tweets that can be written and sent in 6 minutes?

23. ________ gallons A car averages 20 miles per gallon of gas in city driving and 30 miles per gallon in highway driving. At these rates, how many gallons of gas will the car use on a 300-mile trip if $\frac{4}{5}$ of the trip distance is highway driving and the rest is city driving?

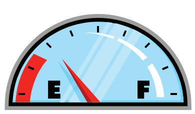
24. ________ in^3 The sum of the lengths of the edges of a cube is 24 inches. What is the volume of the cube?

25. ________ combinations If Molly can choose from 5 kinds of fruit, 3 salads and 4 beverages for her lunch, how many different combinations of a fruit, a salad and a beverage can she make?

26. ________ miles The Kola Superdeep Borehole in Russia was drilled to a depth of about 40,200 feet. Given that there are 5280 feet per mile, about how deep was the hole, in miles? Express your answer as a decimal to the nearest tenth.

27. ________ If x ☺ y is defined as $xy + (x - y)$, what is the value of 4 ☺ 2?

28. ________ gallons



The fuel tank in Alexia's car holds 13.4 gallons of gas. How many gallons of gas does she have when her tank is one-quarter full? Express your answer as a decimal to the nearest hundredth.

29. ________ % The Dr. Seuss story *The Cat in the Hat* contains 236 distinct words, 1 of which has three syllables and 14 of which have two syllables. The rest of the words have only one syllable. What percent of the words have only one syllable? Express your answer to the nearest tenth.

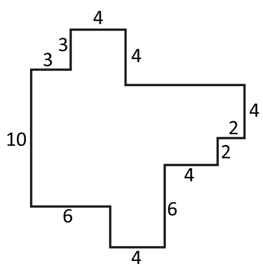
30. ________ degrees In a triangle with angles measuring a, b and c degrees, the mean of b and c is a. What is the value of a?

Warm-Up 3

31. __________ The numerator of a fraction is one-half the denominator. If the numerator is increased by 2 and the denominator is decreased by 2, the value of the fraction is $\frac{2}{3}$. What is the numerator of the original fraction?

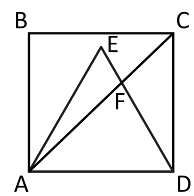
32. __________ What is the product of the digits of 7! ?

33. __________ In the *xy*-plane, lines *a* and *b* intersect at point (5, −2), and lines *b* and *c* intersect at point (−3, 3). What is the slope of line *b*? Express your answer as a common fraction.

34. ________ units² 

All of the angles in the figure shown are right angles. What is the total area of the figure?

35. ________ degrees The figure shows equilateral triangle AED inside square ABCD. Segment AC is a diagonal of the square. What is the measure of ∠EFC?



36. ________ inches The heights of the five starters of a college basketball team are 6′6″, 6′7″, 6′9″, 6′11″ and 7′. What is the mean height of these players, in inches?

37. ________ frogs There are some frogs and some lily pads at a pond. If lily pads with frogs on them have two frogs each, then there is one lily pad with no frogs on it. If each lily pad has exactly one frog on it, then there is a frog with no lily pad. How many frogs are at the pond?

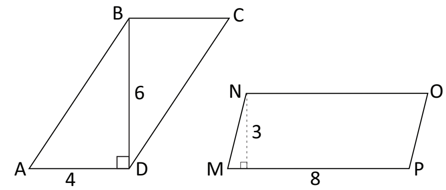
38. ________ servings  To make punch for her upcoming party, Mary uses a recipe that calls for $\frac{1}{2}$ cup of fruit juice per serving. If she has 3 gallons of fruit juice, what is the greatest number of servings of punch she can make? [Note: 1 gallon = 16 cups]

39. ________ goldfish Jim has $\frac{1}{3}$ as many goldfish as Hannah. Hannah has 5 times as many goldfish as Ping. If Ping has 18 goldfish, how many goldfish does Jim have?

40. __________ What is the product of 9 and $1.\overline{3}$?

Warm-Up 4

41. __________ What is the ratio of the area of ΔABD to the area of parallelogram MNOP, shown here? Express your answer as a common fraction.

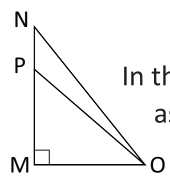


42. __________ What is the value of $2015^2 - 2013^2$?

43. __________ What is the difference between the following sums?

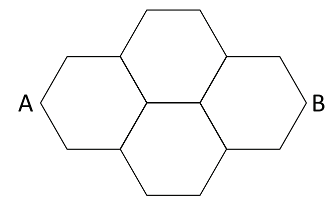
12,345	54,321
12,340	4,321
12,300	321
12,000	21
+ 10,000	+ 1

44. __________ units

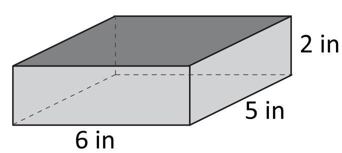


In the figure, MP is 20% less than MN. If PN = 4 units and $\overline{MO}$ is three times as long as $\overline{PN}$, what is the length of $\overline{OP}$?

45. __________ paths Four regular hexagons of side length 1 unit are placed together as shown. How many paths of length 7 units are there from point A to point B along edges of the hexagons?

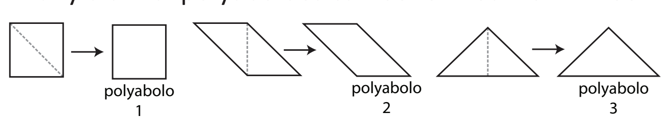


46. __________ in² The top base has been removed from a right rectangular prism as shown. The result is an open box that measures 6 inches by 5 inches by 2 inches. Each exterior face of the box is painted red, and each interior face of the box is painted blue. What is the total area of the box's painted surfaces?



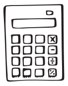
47. __________ What is the value of $\dfrac{ab^2c+5}{x^0y}$ if $a = 3$, $b = -2$, $c = 10$, $x = -7$ and $y = 5$?

48. __________ poly-aboloes A polyabolo is a polygon formed by joining congruent isosceles right triangles in such a way that each triangle shares a side with at least one other triangle. Three distinct polyaboloes can be formed from two triangles, as shown below. If rotations and reflections are not counted separately, how many distinct polyaboloes can be formed from three triangles?



49. __________ dimes McCall has \$14.00 in change, and he has only nickels, dimes and quarters. If McCall has the same number of each type of coin, how many dimes does McCall have?

50. __________ days Lorna observed that her brother wore green on 9 of the last 21 days. Assuming the same rate, on how many days would Lorna expect him to wear green in the next five weeks?



Workout 2

51. ________ What is the sum of the first 150 odd positive integers?

52. $ ________

Lani started a cleaning service. During her first month in business, Lani spent \$380 on supplies and drove 800 miles at an average cost of \$0.30 per mile. In addition, her business phone and other expenses were \$198. That month Lani completed 60 jobs, earning \$50 per job. What was Lani's profit during her first month in business?

53. ________ If $2^x = 7$, what is the value of 2^{2x}?

54. ________ permutations

How many of the permutations using one or more letters from the word TEXAS are also permutations using the letters in TENNESSEE? Two such permutations to include are ST and TS.

55. ________ ft/s If Tom travels 150 miles in 1 hour 45 minutes, what is his speed in feet per second? Express your answer as a decimal to the nearest tenth.

56. ________ baby boys In 1990, the ten most popular names for baby boys in Gladwell were given to 3375 babies, representing about 18.70% of all baby boys born in Gladwell in 1990. In 2000, the ten most popular names for baby boys in Gladwell were given to 2115 babies, representing about 14.60% of all baby boys born in Gladwell in 2000. How many more baby boys were born in Gladwell in 1990 than in 2000? Express your answer to the nearest hundred.

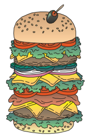
57. ________ positive integers How many positive integers each have one less digit than their squares?

58. ________ If $f(x) = 2x^2 + 8$, what is the positive value of x for which $f(x) = 136$?

59. ________ red balloons What is the number of red balloons on a float containing 25 balloons, if 56% of the balloons are not red?

60. ________ minutes At how many minutes after noon do the hour hand and minute hand of an analog clock first meet again? Express your answer to the nearest whole number.

Warm-Up 5

61. ________ ways  A burger restaurant advertises that there are 96 possible ways to order your burger, assuming you have it on a white, wheat or sourdough bun. How many ways can you order a burger on a sourdough bun?

62. ________ hours Working together, 2 groomers can brush 8 horses in 3 hours. How many hours would it take 3 groomers to brush 12 horses at this rate?

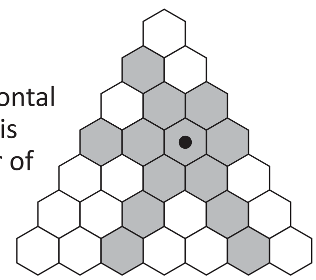
63. ________ In a regular hexagon, what is the ratio of the length of the shortest diagonal to the length of the longest diagonal? Express your answer as a common fraction in simplest radical form.

64. ________ students Liz is a student in Ms. Xu's class. Liz says to her classmates, "Of all the pairs of students Ms. Xu can choose as class leaders, I am included in one-tenth of those pairs." How many students are in Ms. Xu's class?

65. ________ If $y = -x$ and $y \neq 0$, what is the value of $\dfrac{x^{2013}}{y^{2013}}$?

66. ________ minutes During Bill's three-hour meeting, the word *global* was used, on average, once every five minutes during the first two hours. If the word *global* was used 54 times throughout the meeting, then what was the average number of minutes between uses in the third hour?

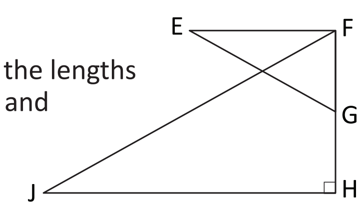
67. ________ dots When a dot is placed in the figure shown, all cells along the dot's horizontal row and two diagonals are shaded. For instance, when the sample dot is placed in the figure, 13 cells are shaded. What is the minimum number of dots that must be placed so that all cells are shaded?



68. (____ , ____) Given the points A(−2, 1) and B(3, 4), what are the coordinates of point C in the fourth quadrant such that $m\angle CAB = 90$ degrees and AB = AC? Express your answer as an ordered pair.

69. ________ degrees The measure of ∠A is 32 degrees. What is the positive difference between the degree measures of the complement and the supplement of ∠A?

70. ________ cm In the figure shown, point G is the midpoint of $\overline{FH}$, $\overline{JH} \perp \overline{FH}$ and the lengths of $\overline{JH}$ and $\overline{FG}$ are 8 cm and 3 cm, respectively. If ∠EGF ≅ ∠JFH and ∠FJH ≅ ∠FEG, what is the perimeter of ΔEFG?



Warm-Up 6

71. __________ The competition scores for eight students from Descartes Middle School are listed below. What is the positive difference between the median and the range of these scores?

12, 28, 17, 8, 25, 19, 10, 22

72. __________ What is the sum of the exponents when $\dfrac{(3a^2b^3)(ab^2)}{3ab}$ is written in simplest form?

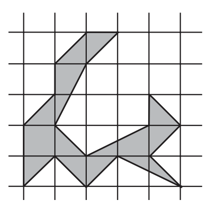
73. ________ feet What is the length of the diagonal of a rectangle with side lengths of 5 feet and 3 feet? Express your answer in simplest radical form.

74. __________ What is the slope of the line that intersects the *x*-axis at $x = 91$ and intersects the *y*-axis at $y = 7$? Express your answer as a common fraction.

75. __________ What is the units digit of 2013^{2013}?

76. __________ If Russell rolls two standard dice once, what is the probability that the sum of the two numbers rolled is not a prime number? Express your answer as a common fraction.

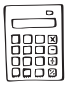
77. ________ units² What is the area of the shaded region?



78. ________ seconds Chris and Sandy ran a half-mile race. Sandy ran the race at a steady pace of $\frac{1}{6}$ mile per minute, and Chris ran at a steady pace of $\frac{1}{5}$ mile per minute. How many seconds after Chris finished the race did Sandy cross the finish line?

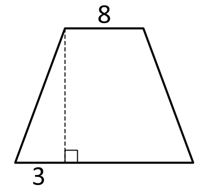
79. ________ faces A regular polyhedron has 8 vertices and 12 edges. How many faces does it have?

80. ________ in² What is the area, in square inches, of the largest triangle that can fit in a 3-inch by 4-inch rectangle?



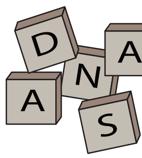
Workout 3

81. ________ inches The area of the isosceles trapezoid shown is 84 in^2. What is its perimeter? Express your answer as a decimal to the nearest tenth.



82. ________ % What single percent discount is equivalent to two successive discounts of 15% and 10%? Express your answer to the nearest tenth.

83. ________ In a certain word game the vowels *A*, *E*, *I*, *O* and *U* are worth 5 points each. There are two of each of these vowels in the game set. The remaining letters of the alphabet are worth 2 points each, and there is only one of each. If Molly chooses two letters at random and without replacement, what is the probability that the letters have a total value of 7 points? Express your answer as a common fraction.



84. ________ % The rate of inflation is given by the following formula: $\frac{b-a}{a} \times 100$, where a represents the previous year's consumer price index (CPI) and b represents the current year's CPI. If the CPI for 2011 was 224.94, and the 2010 CPI was 218.06, what was the rate of inflation from 2010 to 2011? Express your answer as a decimal to the nearest hundredth.

85. ________ minutes

Marla can cut the lawn in 2 hours, and her brother Sid can cut it in 3 hours. If they work together, each with a mower, how many minutes will it take them to cut the lawn?

86. ________ % Only 64% of the students in Ms. Kreeger's class passed both of the two most recent tests. On the most recent test, 80% of the students passed. What percent of students who passed the most recent test also passed the previous test?

87. ________ If $f(x) = 2x - 3$ and $g(x) = \frac{x-3}{2}$, what is $f(g(3))$?

88. ________ minutes

How many minutes faster will Jacob complete a 100-mile drive traveling at a rate of 65 miles per hour than if he traveled at a rate of 55 miles per hour? Express your answer to the nearest whole number.

89. ________ minutes A train traveling at 45 miles per hour enters a tunnel that is 1 mile long. The length of the train is $\frac{1}{8}$ mile. How many minutes after the front of the train enters the tunnel does the back of the train exit the tunnel? Express your answer as a decimal to the nearest tenth.

90. ________ What is the sum of the digits of 2015^2?

Warm-Up 7

91. __________ people John's four brothers each have names that begin with the letter *J*, but none of the other members of his family has a name that begins with *J*. If a person in John's family is randomly selected, there is a 25% chance that the person's name will start with *J*. How many people are in John's family?

92. __________ The sum of two integers is 7, and the sum of their squares is 25. What is the product of these two integers?

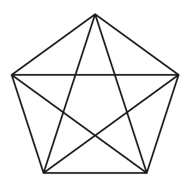
93. __________ times When Roger hits the BAKE button on his oven, the temperature display shows + + +. The first time he hits the TEMP button, the display changes to 350°. Each time Roger hits the TEMP button thereafter, the displayed temperature increases by 5°. After pressing the BAKE button, how many times does Roger need to hit the TEMP button to reach 425°?

94. __________ quarters A piggy bank contains a certain number of coins, of which 53 are dimes and 19 are nickels. The remainder of the coins in the bank are quarters. If the probability of randomly selecting a quarter from the bank is $\frac{1}{4}$, how many quarters does the bank contain?

95. __________ units² What is the area, in terms of *a* and *b*, of a rectangle with a length and width of $3a^2b$ units and $2ab^3$ units, respectively?

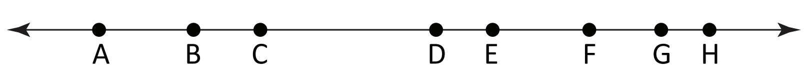
96. __________ cm The perimeter of a isosceles right triangle is 80 cm. What is the length of the hypotenuse? Express your answer in simplest radical form.

97. __________ triangles How many triangles of any size are contained in this figure?



98. __________ If *a*, *b* and *c* are positive integers such that $a + b = 9$ and $ac - 2bc = 0$, what is the value of *a*?

99. segment __________ Points A through H are distributed along a line as shown. Seven segments are created with adjacent points as endpoints. On which of the seven segments should a new point X be placed so that the sum of the distances from point X to each point A through H is as small as possible?



100. __________ In a set with *n* elements, where *n* is a positive integer, what fraction of the subsets contain an even number of elements? Express your answer as a common fraction.

Warm-Up 8

101. __________ There exist pairs of integers, x and n, for which $x^n = (2^5)(4^4)(8^{\frac{8}{3}})(16^{\frac{3}{4}})$. What is the greatest possible value of n among these pairs?

102. __________ If $\frac{1}{x} + \frac{1}{y} = \frac{1}{2}$ and $\frac{1}{x} - \frac{1}{y} = \frac{1}{4}$, what is the value of $\frac{1}{x^2} - \frac{1}{y^2}$? Express your answer as a common fraction.

103. __________ If n is a randomly chosen positive integer less than 2013, what is the probability that the sum $1^n + 2^n + 3^n$ is divisible by 3? Express your answer as a common fraction.

104. ______ degrees In $\triangle ABC$, AC = 12 units and BC = 7 units. If the area of $\triangle ABC$ is 42 units^2, what is the degree measure of $\angle C$?

105. ______ ways Each face of a cube is colored either red or blue. In how many distinct ways can the cube be colored? Two colored cubes are distinct if one cannot be rotated to look like the other.

106. __________ A five-person committee has to meet at one of five possible times. Each member has a conflict at exactly one of the five times, and the conflicts are random and independent of each other. What is the probability that there is a time when all five people can meet? Express your answer as a common fraction.

107. __________ Five distinct odd integers have a mean of 35 and a range of 22. What is the smallest possible value of the least of these five integers?

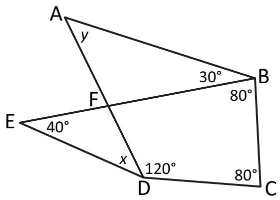
108. ______ papers After deducting his 10% commission, Jun sent $27 to the newspaper dealer for whom he delivers papers. If each newspaper sells for 20 cents, how many papers did Jun deliver?

109. __________ What is the value of r for which $(r - 5)^2 = (r + 2)^2$? Express your answer as a decimal to the nearest tenth.

110. $ __________ A popular brand of Brazilian coffee costs $20 per pound, and a particular brand of Colombian coffee costs $16 per pound. If you mix 15 pounds of Brazilian coffee with 5 pounds of Colombian coffee, how many dollars does one pound of the mixture cost?

Workout 4

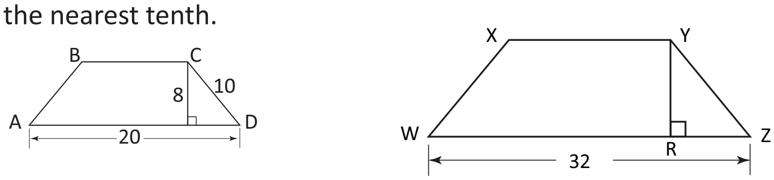
111. ______ degrees



What is the value of $x + y$ in the figure shown?

112. $ ______ Sherry bought a sport utility vehicle. She received a discount of 18% off the manufacturer's list price but then had to pay 8% state sales tax. If she paid $17,712 for the car after the discount and tax were applied, how much was the manufacturer's list price?

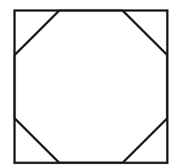
113. ______ units Trapezoid ABCD is similar to trapezoid WXYZ. What is the length of $\overline{RZ}$? Express your answer as a decimal to the nearest tenth.



114. ______ amounts

Manuel grabs at least one coin from his pocket, which contains a dime, a nickel and two pennies. How many different amounts could Manuel possibly grab?

115. ______ cm A regular octagon is inscribed in a square, as shown. If the sides of the octagon are 1 cm in length, what is the length of a side of the square? Express your answer as a decimal to the nearest tenth.



116. ______ cookies A box of fewer than 100 but more than 12 cookies can be shared equally among 4, 10 or 12 people with no cookies left over. How many cookies are in the box?

117. ______ The denominator of a positive common fraction is 3 more than its numerator. If $\frac{5}{28}$ is added to this fraction, the result is the same as the positive difference between the reciprocal of the original fraction and 1. What is this common fraction?

118. ______ What is the smallest possible value of $a^{(b^c)}$ where a, b and c are distinct integers chosen from the set {2, 3, 4}?

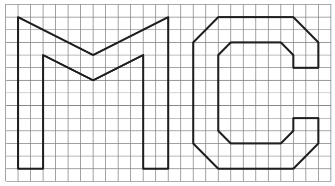
119. ______ products How many different products are possible when two one-digit positive integers are multiplied?

120. ______ cents For every two used paperback books Clarissa buys at the regular price, she gets a third book for a nickel. If Clarissa spent $4.65 for nine paperback books, what is the regular price of a used paperback book, in cents?

Warm-Up 9

121. __________ A bag contains three quarters, two dimes and a nickel. If two coins are randomly drawn without replacement, what is the probability that both coins are the same denomination? Express your answer as a common fraction.

122. ________ units^2



If the area of the C in this logo is 58 units^2, what is the area of the M?

123. ______ eighth graders There were 42 eighth graders who voted to go to Washington, D.C. for a class trip. This represents $\frac{2}{9}$ of the students in eighth grade. How many eighth graders did not vote for the class trip to Washington, D.C.?

124. __________ The mean of five different integers is 30. If the smallest integer is 7, what is the greatest possible value of any of the integers?

125. __________ If $f(x) = g(x) + 2$, and $g(x) = \frac{1}{2}f(x)$, what is the value of $f(2013)$?

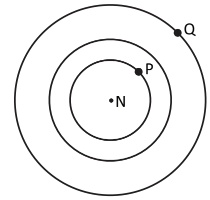
126. ________ cars

There are 20 cars in Lot A, and there are 20 more cars in Lot B than there are in Lot C. If there are a combined total of 100 cars parked in all three lots, how many cars are in Lot C?

127. __________ If $w = x + y + z$, what is the arithmetic mean of w, x, y and z in terms of w? Express your answer as a common fraction.

128. ______ degrees What is the degree measure of an angle whose supplement is three times as large as its complement?

129. ________ cm The three concentric circles shown have center N and diameters of 16 cm, 12 cm and 10 cm. Points N, P and Q are collinear. What is the distance from point P to point Q?



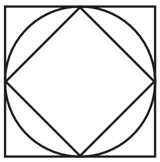
130. __________ If x and y are real numbers such that $x^2 = y^2$ and $x \neq y$, what is the value of $x^2 + 2(x + y) - y^2 + 8$?

Warm-Up 10

131. ________ degrees If the sum of the supplement and complement of an acute angle is equal to 7 times the angle, what is the degree measure of the acute angle?

132. ________ Julius found three sheets of paper torn from a book, each with page numbers on both sides. If three of these page numbers were 1, 82 and 93, what is the sum of the page numbers on the other sides of the three sheets?

133. ________ units^2

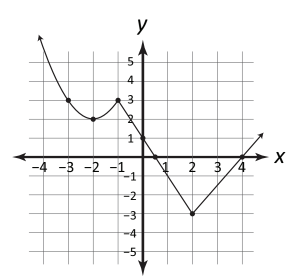


When a circle is inscribed in a square of side length 2 units, the four points of intersection between the circle and square are the vertices of a smaller square. What is the positive difference between the area of the circle and the area of the smaller square? Express your answer in terms of π.

134. ________ ways Five people are arranged in a line. In how many ways can they be arranged in a different order so that each person is standing beside at least one person he or she originally stood beside?

135. ________ candies Forty-eight candies are divided into two piles. The candies in the first pile are placed six to a bag, and the candies in the second pile are placed three to a bag. If a total of nine bags are used, how many candies are in the larger of the two piles?

136. ________ years old Maria is exactly 10 years older than Abe. Four years ago, Maria was twice as old as Abe was then. What is Maria's age now?

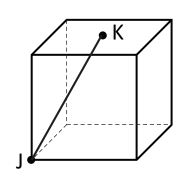


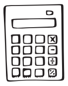
137. ________ In the graph shown, if $f(-2)=p$ and $f(p) = r$, what is the value of $r + f(-1)$?

138. ________ integers For $f(x) = 2x + 2$, the domain is {0, 1, 2, …, 9, 10}. How many integers are in both the domain and the range of f?

139. ________ The sum of three consecutive integers is 24. What is the product of the three integers?

140. ________ cm The length of each edge of a cube is 10 cm, and point K is placed at the center of a face of the cube. A line is drawn through the cube, as shown, from point K to point J, a vertex of the cube on the opposite face. What is the length of $\overline{KJ}$? Express your answer in simplest radical form.





Workout 5

141. ________ pounds A man who initially weighed 220 pounds completed a diet-and-exercise program. After the 12-week program, his body fat percentage had dropped from 30% to 20%, and his weight had dropped to 200 pounds. If every part of his body that is not fat or muscle has a constant weight of 120 pounds, how many pounds of muscle did he gain during the program?

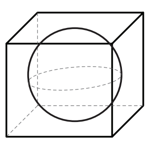
142. ________ cm A piece of paper is 0.1 mm thick. It is folded in half and then cut along the fold line. The cut pieces then are stacked one on top of the other. This folding and cutting process is completed a total of 10 times. If all of the pieces are stacked on top of each other, how many centimeters tall will the stack be? Express your answer as a decimal to the nearest hundredth.

143. ________ The number 34 is removed from a set of five numbers with a mean of 20. What is the mean of the remaining four numbers? Express your answer as a decimal to the nearest tenth.

144. ________ people The population of Big City has always doubled every 5 years. If the current population is 25,600 people, what was Big City's population 20 years ago?

145. $ ________ Kara bought 1 package of cookies and 4 popsicles for $3.59. Cam bought 5 packages of cookies and 2 popsicles for $12.55. How much will it cost to buy both a package of cookies and a popsicle?

146. ________ in^2



A sphere has a radius of 4 inches. What is the surface area of the smallest cube that could circumscribe the sphere?

147. ________ What is the positive difference between the mean and the median of the squares of the first 10 positive integers?

148. ________ % A department store advertises that it has reduced its prices by 10%, then reduced the lower prices by 20%, then by 30%, then by 40%. What single percent discount would yield the same final price? Express your answer to the nearest hundredth.

149. ________ numbers Each Dance-A-Thon contestant has a three-digit ID number that is divisible by 8. If the tens and units digits cannot be the same, what is the maximum number of contestants' numbers that can have 4 as the hundreds digit?

150. ________ A unit fraction is a fraction whose numerator is 1 and whose denominator is a natural number greater than 1. If three unit fractions with distinct single-digit denominators have a sum of $\frac{5}{8}$, what is the sum of the denominators?

Warm-Up 11

151. ________ cm The area of an equilateral triangle is $16\sqrt{3}$ cm^2. What is its perimeter?

152. ________ mm The ratio of the height of a parallelogram to its base is 3:5. If the area of the parallelogram is 135 mm^2, what is the length of its base?

153. ________ Triangle EFG has side lengths $x - 1$, $x + 1$ and $x + 3$. For what value of x is ΔEFG a right triangle?

154. ________ What is the sum of the coordinates of the x- and y-intercepts of $3x - 2y = 15$? Express your answer as a mixed number.

155. ________ A larger cube is created from 64 white unit cubes. Two opposite faces of that larger cube are painted black, and the remaining four faces are painted red. The unit cubes then are placed in a bag. If one unit cube is drawn at random, what is the probability that it has two red faces and one black face? Express your answer as a common fraction.

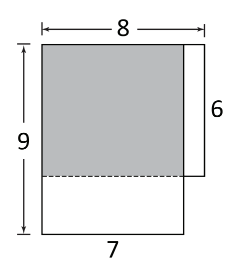
156. ________ Megan rolls two standard dice, hoping for double sixes. Melanie flips five coins, hoping that all of them land heads. What is the probability of the more likely outcome? Express your answer as a common fraction.

157. ________ cookies During the first four days of this week, Katie and her friends together ate an average of 8 cookies a day. If the cookies they ate on the fifth day are included, together they ate an average of 10 cookies a day for the five days. How many cookies did they eat on the fifth day?

158. ________ books Joseph's books on animation are grouped into books about cartoon mice, cartoon rabbits and cartoon toys, in a ratio of 5:3:2, respectively. If Joseph has 21 cartoon rabbit books, how many books on animation does he have altogether?

159. ________ If a is $\frac{4}{9}$ of b, and c is $\frac{3}{4}$ of a, what fraction of b is c? Express your answer as a common fraction.

160. ________ m^2 A 6-meter by 8-meter rectangle overlaps a 7-meter by 9-meter rectangle so that they share two sides and a vertex as shown. In square meters, what is the total area of the rectangles not shaded?

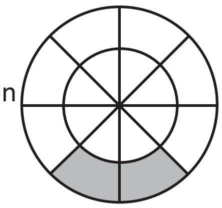


Warm-Up 12

161. ________ At Mercury Junior High 5% of the students are taking both French and Latin. If 25% of the students are taking French, what is the probability that a randomly chosen student taking French is also taking Latin? Express your answer as a common fraction.

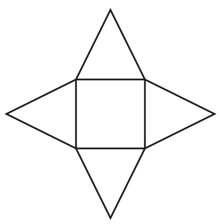
162. ________ cm A rectangular prism has a length of $3x$ cm, a width of $\frac{1}{3}y$ cm and a height of xy cm. Its volume is 144 cm^3. If the height of the prism is twice its length, what is the length of the prism?

163. ________ Two concentric circles are each divided into 8 congruent sections, as shown. The area of the larger circle is 3 times the area of the smaller circle. The shaded region represents what portion of the entire figure? Express your answer as a common fraction.



164. ________ feet A playground has a length of a yards b feet c inches. In terms of a, b and c, how many feet long is the playground?

165. ________ cm^3

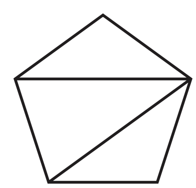


The diagram shows the net for a right square pyramid. Each side of the base is 2 cm long. The length of each side of the isosceles triangular faces is $\sqrt{3}$ cm. What is the volume of the pyramid? Express your answer as a common fraction.

166. ________ What is the value of $\dfrac{1+2+3+\cdots+2012}{1+2+3+\cdots+2013}$? Express your answer as a common fraction.

167. ________ units What is the length of the shortest side of ΔABC whose perimeter is 64 units, if the ratio AB:BC is 4:3 and AC is 20 less than the sum of the lengths of sides AB and BC?

168. ________ ways As shown, a regular pentagon can be divided into triangles only by connecting vertices with non-overlapping diagonals in one way. In how many different ways can a regular hexagon be divided into triangles by connecting vertices with non-overlapping diagonals? (Rotations and reflections are not considered different.)



169. ________ gallons To create his special blend of lemonade, Manny starts with a lemonade mix that is 20% lemon juice. Then he adds pure lemon juice to make a blend that is 25% lemon juice. How many gallons of pure lemon juice must he add to 30 gallons of the lemonade mix to make his special blend of lemonade?

170. ________ Snacklies Pink Snacklies come 3 to a pack, and green Snacklies come 5 to a pack. A basket of pink Snacklies contains 8 more packs than a basket of green Snacklies, although both baskets contain the same number of Snacklies. How many Snacklies are in each basket?

Workout 6

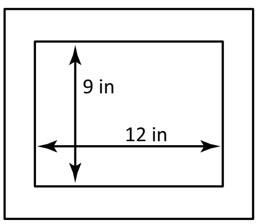
171. ________ turns Juwan played a game in which he could score either 11 or 16 points on each turn. Juwan scored exactly 175 points. How many turns did Juwan take?

172. ________ % The stock exchange index went up 3.76% on Monday, down 4.25% on Tuesday, down 1.16% on Wednesday, up 2.12% on Thursday and down 5.38% on Friday. What was the net percent that the stock exchange index was down for the week? Express your answer to the nearest hundredth.

173. ________ % A company's budget increased from \$29 million to \$133 million over a period of 10 years, growing by the same percent each year. What was the annual percent increase? Express your answer to the nearest hundredth.

174. ________ Jorge has a bag with 6 red marbles and 12 blue marbles. He randomly selects 4 marbles from the bag, one at a time without replacement. What is the probability that he selects 2 red marbles followed by 2 blue marbles? Express your answer as a common fraction.

175. ________ inches



A 9-inch × 12-inch rectangular picture is framed by a border of uniform width. The combined area of picture plus border is 180 in^2. In inches, what is the width of the border? Express your answer as a decimal to the nearest tenth.

176. ________ ounces On average, a bushel of corn contains 72,800 kernels and weighs 56 pounds. There are 16 ounces per pound, and an average ear of corn contains 650 kernels. In ounces, how much do the kernels from one average ear of corn weigh?

177. ________ A set of six consecutive positive integers is divided into three groups of two numbers each. The sum of the numbers in each group is 31. What is the least possible product of the two numbers within one of the groups?

178. ________ If $x + y = 2$ and $x^2 + y^2 = 34$, what is the value of $x^3 + y^3$?

179. \$________ A lottery ticket costs 50 cents and contains four distinct numbers from 1 to 20, inclusive. How much money would a person need to spend to buy a lottery ticket for every possible combination of four numbers?

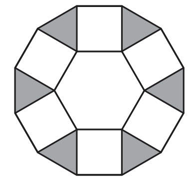
180. ________ teachers At Gauss Middle School, the current student-to-teacher ratio is 17.5:1. The school currently has 560 students. Next year, the student-to-teacher ratio must be 19:1. If the school gains 10 students, how many fewer teachers will be needed next year?

Warm-Up 13

181. __________ What is the value of the sum 1 + 4 + 7 + 10 + … + 91 + 94?

182. __________ What is the sum of the prime factors of 969?

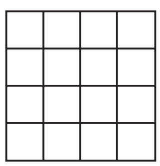
183. ________ ft^2 This drawing shows six identical squares joined at pairs of their vertices to form a regular hexagon. Each square has sides of length 4 feet. What is the total area of the shaded triangles? Express your answer in simplest radical form.



184. __________ A triangle has sides of integer lengths 20 cm, 13 cm and x cm, where the side of length x cm is not the longest side. If the area of the triangle is 66 cm^2, what is the value of x?

185. __________ A set contains all possible five-digit positive integers that can be made using each of the digits 1, 3, 5, 7 and 9 once. What is the median of that set?

186. __________



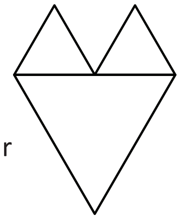
Two unit squares are chosen at random, without replacement, from the 4 × 4 grid shown. What is the probability that the squares do not share a side? Express your answer as a common fraction.

187. ______ nickels Dean pays the exact amount for a \$1.00 hot dog, using 36 coins. What is the greatest number of nickels he can use?

188. __________ If $(4x + 7)^2 = ax^2 + bx + c$, what is the value of $a + b$?

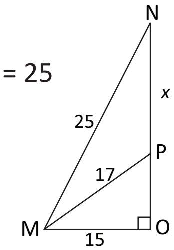
189. ______ drops A yo-yo will regain 80% of its distance with each successive drop. How many drops will it take before it rises less than half its initial distance?

190. ________ in^2 Sara outlines the head of a fox by drawing two congruent equilateral triangles along one side of a larger equilateral triangle as shown. The smaller triangles have sides of length 2 inches. What is the area of the entire figure? Express your answer in simplest radical form.



Warm-Up 14

191. ________ units In right triangle MNO shown here, MO = 15 units, MP = 17 units and MN = 25 units. What is the length of $\overline{NP}$?



192. __________ If the volume of one cube is 8 times the volume of another cube, then what is the ratio of the area of a face of the smaller cube to the area of a face of the larger cube? Express your answer as a common fraction.

193. ________ sundaes Parker's favorite ice cream shop has a sundae special on Sundays. He can create his own sundae by choosing one of 8 flavors of ice cream, one of 4 fruit toppings, one of 3 nut toppings and one of 2 kinds of whipped cream. How many additional unique sundaes could be made if Parker is allowed to skip one or more of the following: fruit topping, nut topping and whipped cream?

194. __________ In the figure, A, B and C are points on the number line with coordinates shown. If AC = 5AB, what is the value of C? Express your answer as a common fraction.

195. ________ girls The ratio of boys to girls in the math club is 4:5. If there are 3 more girls than boys in the math club, how many girls are in the math club?

196. __________ In the magic square shown, the three numbers in each of the rows, columns and diagonals have equal sums. What is the value of d in this magic square?

a	b	13
c	d	e
f	4	25

197. __________ If x is a real number and $x^{27} = 27$, what is the value of x^9 ?

198. __________ The difference between two positive two-digit integers is 9, and their sum is 99. What is the larger of the two integers?

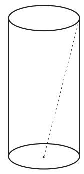
199. __________ What is the value of $\dfrac{81^2-18^2}{81-18} - \dfrac{72^2-27^2}{72-27} + \dfrac{63^2-36^2}{63-36} - \dfrac{54^2-45^2}{54-45}$?

200. __________ What four-digit palindrome has exactly one factor that is prime?

Workout 7

201. ________ sides A regular polygon has interior angles between 128 degrees and 130 degrees. How many sides does the polygon have?

202. ________ cm



A cylinder has a volume of 240π cm^3 and a height of 15 cm. What is the distance between the center of one base and the edge of the other base? Express your answer as a decimal to the nearest hundredth.

203. ________ laps Selina can run around the track 3 times in 8 minutes. Marta can run around the same track 2 times in 5 minutes. If Selina and Marta begin at the same time and the same place, what is the combined number of laps the girls both will have run when they next reach the starting point at the same time?

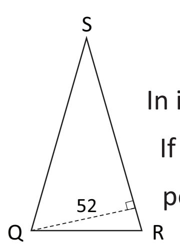
204. ________ girls This year, 200 boys and 250 girls attended Edison Middle School. If the number of boys enrolled were to increase by 10%, what is the maximum possible increase in the number of girls enrolled that would produce at most an 8% increase in the total student enrollment?

205. ________ unit cubes A cube consists of 64 white unit cubes. All exterior faces of the cube except the bottom face are painted red. How many of the unit cubes have exactly two faces painted red?

206. ________ cookies The four Mathletes® on the Descartes Middle School MATHCOUNTS team each calculated the mean number of cookies they brought for lunch on the days they brought bag lunches to school last month. Using the information in the chart, what was the mean number of cookies for all the bag lunches the four Mathletes brought last month? Express your answer as a decimal to the nearest hundredth.

Name	Mean Number of Cookies in Bag Lunch	Number of Bag Lunches Brought to School Last Month
Amy	2	16
Jerrod	4	12
Miguel	3	20
Patty	2	12

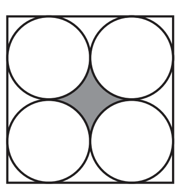
207. ________ mm



In isosceles triangle QRS, the length of base QR is $\frac{1}{5}$ the perimeter of the triangle. If the length of the altitude drawn from point Q to side SR is 52 mm, what is the perimeter of ΔQRS? Express your answer as a decimal to the nearest tenth.

208. ________ What is the least positive integer n for which $\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\cdots+\frac{1}{n}>2$?

209. ________ units^2



In the figure shown, each circle is tangent to two other circles and to two sides of the square and has a radius of 7 units. What is the area of the shaded region? Express your answer as a decimal to the nearest hundredth.

210. ________ cm^2 What is the area of the largest possible quadrilateral with a perimeter of 24 cm?

Warm-Up 15

211. ________ One-half of the children who belong to a local club are over 14 years old. One-fourth of the remaining children are under 10 years old. What fraction of the club's members who are children are age 10 to 14 years old, inclusive? Express your answer as a common fraction.

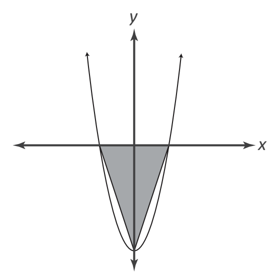
212. ________ The nth triangular number is the sum of the first n positive integers. Bill meant to add up the first ten triangular numbers but accidently missed two of them. If his total was 186, what is the positive difference between the two triangular numbers he missed?

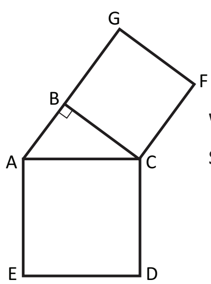
213. ________ Five positive integers have a mean of 8. What is the greatest possible value for the median of the five integers?

214. ________ combinations If a local bank has only \$2 bills and \$5 bills available, how many combinations of bills can a bank teller use to make exactly \$100?

215. ________ points Twenty-five students take a quiz. If 10 points are added to each of the lowest five scores, by how many points will the mean of the quiz scores increase?

216. ________ units^2 The equation of the graph shown is $f(x) = x^2 - 9$. What is the area of the triangle with vertices at the x-intercepts and vertex of the parabola?



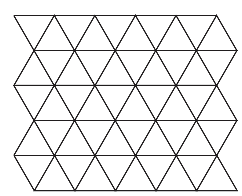


217. ________ units What is the perimeter of right triangle ABC, shown here, if the area of square AEDC is 100 units^2 and the area of square BCFG is 64 units^2?

218. ________ Each week Laura's mom randomly assigns the seven daily chores to Laura and her six siblings so that each child gets one chore. What is the probability that two different children are chosen to wash dishes on Friday and Saturday? Express your answer as a common fraction.

219. ________ units^2 A cube has a volume of $343x^3y^6$ units^3. What is the area of a base of the cube? Express your answer in terms of x and y.

220. ________ triangles In the figure shown, every interior angle has a measure of 60 degrees. How many equilateral triangles of any size are there in the figure?



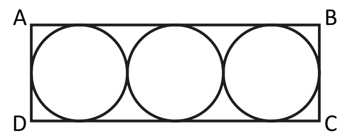
Warm-Up 16

221. ________ children For her son's birthday party, Teena prepared enough food to feed 20 adults or 32 children. If only 15 adults attend the party, how many children, in addition to those adults, can be fed with the food Teena prepared?

222. ________ pies The math team purchased 16 pies for a Pi Day celebration. Some of the pies cost \$8.50 each, and the rest cost \$7.00 each. If the total cost for the pies was \$121.00, how many of the pies cost \$8.50 each?

223. ________ If $(x + y)^2 = 100$ and $xy = 20$, what is the value of $x^2 + y^2$?

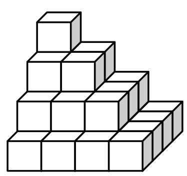
224. ________ cm^2 Three circles are enclosed in rectangle ABCD as shown. If the area of each circle is 9π cm^2, what is the area of rectangle ABCD?



225. ________ The coach asks each of the 10 math team members to solve the 5 most difficult problems from the last competition. The newest team member, Robert, can solve only 3 of the problems. There is enough time to present the solution to 3 problems. If the coach assigns each of 3 randomly selected team members a different one of the 5 problems to present, what is the probability that Robert is selected and assigned to present the solution to a problem he is unable to solve? Express your answer as a common fraction.

226. ________ $units^2$ Two noncongruent right triangles have integer side lengths, and each triangle has a perimeter of 60 units. What is the positive difference between the areas of these two triangles?

227. ________ in^3

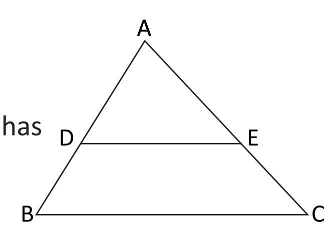


Cubes with 2-inch edges are stacked to form the figure shown. What is the total volume of the structure?

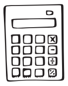
228. ________ m A museum director is hanging paintings on a rectangular wall in a museum. The paintings measure 3 m × 4 m, 2 m × 7 m and 3 m × 5 m. Once hung, the paintings leave 76 m^2 of the wall uncovered. If the dimensions of the wall are w meters by h meters, where w and h are positive integers, what is the smallest possible perimeter of the wall?

229. ________ The sum of the five numbers in the set $\{2x + 3, x + 11, \frac{1}{3}(4x + 5), 5x - 7, \frac{1}{2}x + 20\}$ is 127. What is the median of this set of numbers?

230. ________ cm^2 In ΔABC shown here, AE = 6 cm, AC = 10 cm and $\overline{DE} \parallel \overline{BC}$. If ΔABC has an area of 250 cm^2, what is the area of trapezoid DBCE?



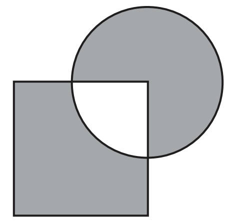
Workout 8



231. ________ Quintavius adds the numbers 1 through 6 while Grizabella adds the numbers 1 through n. If Grizabella's sum is 5 times Quintavius' sum, what is the value of n?

232. ________ °C The formula $T(h) = 100 - 0.0005h$, where h represents the number of feet above sea level, is an accurate estimate for the temperature, T, in degrees Celsius, at which water will boil. However, it provides a reasonable estimate only for $0 \le h \le 20{,}000$. What is the difference between the least and greatest values for $T(h)$ when h is within this range?

233. ________ units A circle is centered at one vertex of a square of side length 1 unit, as shown. If the areas of the two shaded regions are equal, what is the radius of the circle? Express your answer as a decimal to the nearest hundredth.



234. ________ revo-lutions Jonathan's bicycle tires each have a diameter of 26 inches. If he rides his bicycle 100 feet in a straight line, how many complete revolutions will one of his tires make?

235. ________ A bag contains 4 blue and 3 yellow marbles. The marbles are removed from the bag one at a time without replacement. What is the probability that the fifth marble removed is yellow? Express your answer as a common fraction.

236. ________ The sequence 1, 3, 4, 7,… is continued by adding the two preceding numbers to get the next term. What is the sum of the first 10 terms of this sequence?

237. $________ A certain model of car decreases in value at a rate of 10% per year. If Helen paid $25,000 for this model five years ago, how much is it worth now?

238. ________ numbers A shrinking number is a positive three-digit integer in which the hundreds digit is greater than the tens digit, and the tens digit is greater than the ones digit. In other words, for a three-digit number ABC, A > B > C. How many three-digit numbers are shrinking numbers?

239. ________ The raw scores on the physics group projects are 18, 29, 32, 35, 36, 49, 53, 64, 66. The teacher wants to rescale the scores using the linear formula $G = kR + c$, where G is the final grade and R is the raw score. She wants the highest score to scale to 100 and the median to scale to 80. What is the value of the product kc? Express your answer as a common fraction.

240. ________ Rebecca cut shapes out of construction paper to create a face. The nose and mouth were created using an equilateral triangle and a semicircle, as shown. What is the ratio of the area of the nose to the area of the mouth if the perimeters of the nose and the mouth are equal? Express your answer as a decimal to the nearest hundredth.

Warm-Up 17

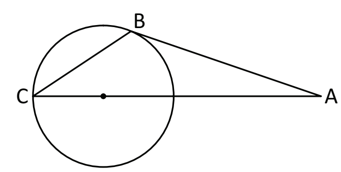
241. _________ If the diameter of circle P is $\frac{3}{5}$ the diameter of circle Q, what is the ratio of the circumference of circle Q to the circumference of circle P? Express your answer as a common fraction.

242. _________ What is the units digit of 7^{282}?

243. _________ miles The Wu family wishes to have both their car and their RV with them during their weekend camping trip. Mrs. Wu leaves home in the RV 1.5 hours before Mr. Wu departs from home in the car. Mr. Wu drives 15 miles per hour faster than Mrs. Wu and arrives at the campsite 30 minutes later than she arrives. If Mrs. Wu drives 45 mi/h, how many miles is it from their home to the campsite?

244. _________ Let $a \# b = \frac{a}{b} + \frac{b}{a}$. What is the value of $[(1 \# 2) \# 3] - [1 \# (2 \# 3)]$? Express your answer as a common fraction.

245. _________ degrees Angle A is formed by a line tangent to a circle and a line through the center of the circle, as shown. If $m\angle A = 20$ degrees, what is $m\angle BCA$?

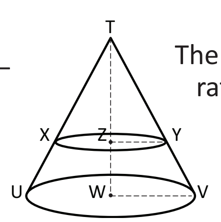


246. _________ The x-value of an ordered pair is randomly selected from the set {2, 4, 6, 8, 10}. The y-value of the same ordered pair is randomly selected from the set {5, 6, 7, 8, 9, 10}. What is the probability that the ordered pair is on the line $y = x + 1$? Express your answer as a common fraction.

247. _________ What is the mean of the first 80 positive integers? Express your answer as a decimal to the nearest tenth.

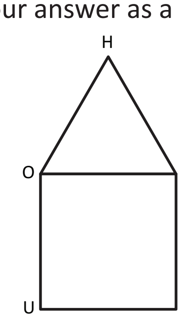
248. _________ values Michael rolls n standard six-sided dice and reports that the sum of the numbers displayed is 17. How many values of n are possible?

249. _________



The figure shows two cones with a common vertex and parallel bases. If the ratio of the base radii ZY and WV is 3 to 5, what is the ratio of the volume of the smaller cone to the volume of the larger cone? Express your answer as a common fraction.

250. _________ m Pentagon HOUSE comprises square OUSE and equilateral triangle OHE. The area of ΔOHE is $100\sqrt{3}$ m^2. What is the perimeter of pentagon HOUSE?



Warm-Up 18

251. ________ % If 15% of x is 20% of y, what percent of x is y?

252. ________ prime numbers How many two-digit prime numbers can be written as the sum of two primes?

253. ________ mi/h Dora is traveling to visit Diego at an average speed of 60 mi/h. Dora realizes that if she drives at an average speed of 75 mi/h, her travel time will be reduced by 6 minutes. How many miles per hour would Dora's travel need to average for her travel time to increase by 6 minutes?

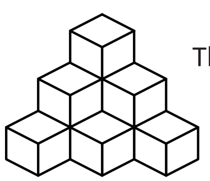
254. ________ For positive integers x and y, $(x + y)^2 = 324$ and $x^2 + y^2 = 194$. What is the positive difference between x and y?

255. ________ What is the probability that a randomly selected real number x between -10 and 10 satisfies $x^2 + x > 2$? Express your answer as a common fraction.

256. ________ students The students at Pericles Junior High participated in three events in the L. O. Kwint speech contest. Two students participated in all three events, 4 students did extemp and debate, 5 did extemp and dramatic reading, 6 did debate and dramatic reading. If 12 students from PJH participated in each event, how many students from PJH participated in the contest?

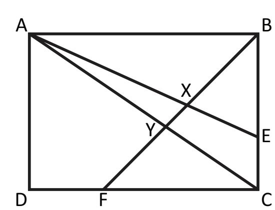
257. ________ baskets A farmer's market sells only baskets of apples and baskets of oranges, each for a fixed whole number of dollars. Abigail paid \$23 for five baskets of fruit. Benedict paid \$24 for four baskets of fruit. If Charles paid \$20, how many baskets of fruit did he buy?

258. ________ cubes



The figure shows cubes stacked to form three layers. The pattern is continued to create a solid structure with the rows in each successive layer extending out one cube past the layer above them. How many cubes are needed to create a 10-layer structure?

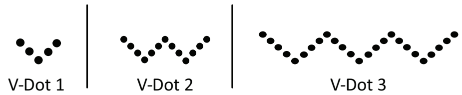
259. ________ In rectangle ABCD, point E lies on $\overline{BC}$ so that $\frac{BE}{EC} = 2$ and point F lies on $\overline{DC}$ so that $\frac{CF}{FD} = 2$. Segments AE and AC intersect $\overline{BF}$ at points X and Y, respectively. The extended ratio FY:YX:XB = a:b:c so that a, b and c are relatively prime positive integers. What is the value of $a + b + c$?



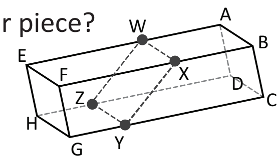
260. ________ ordered pairs How many distinct ordered pairs of positive integers x and y satisfy $x + y = 2013$?

Workout 9

261. ________ dots This V-Dot pattern progresses as shown. As the pattern continues, how many dots will it take to make V-Dot 40?



262. ________ % The base of the right square prism shown has sides of length 10 cm, and each lateral face has an area of 200 cm^2. The prism is sliced into two pieces by plane WXYZ. $\overline{WX} \parallel \overline{AB}$, $\overline{YZ} \parallel \overline{GH}$ and the ratio of GY to XB is 2:3. If $m\angle YXB$ = 135 degrees, what percent of the volume of the square prism is the volume of the smaller piece?

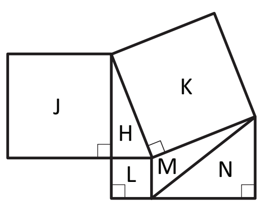


263. ________ cents/g According to the U.S. Mint specifications below, what is the difference between the value-to-weight ratios of a quarter and a dime?

Coin	Penny	Nickel	Dime	Quarter
Weight (g)	2.500	5.000	2.268	5.670

264. ________ mi/h A boat travels 2 miles upstream in the same time that it would take the same boat to travel 3 miles downstream. If the rate of the stream's current is 5 mi/h, how many miles per hour would the boat travel in still water?

265. ________ units^2

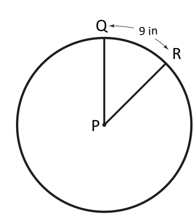


Right triangle H is formed by the sides of squares J, K and L. The side length of square L is 4.5 units, and the area of square J is 81 units^2. Triangle M is formed by the sides of squares K and L. Right triangle N shares a side of triangle M. A side of L and a side of triangle N are collinear. What is the area of the quadrilateral formed by triangles M and N? Express your answer as a decimal to the nearest hundredth.

266. ________ After Carlos accidentally spills water on his paper, he is left with the partial equation $1729^2 - 2 \times 1730^2 + 17\square\square^2 = 34\square\square$, where each $\square$ represents a smudged digit, not necessarily all the same. What is the sum of the four smudged digits?

267. ________ The four-digit integer 8XYZ consists of four distinct digits and is divisible by 7, 8 and 9. What is the value of X + Y – Z?

268. ________ in^2 A sector of circle P is enclosed by $\overline{PQ}$ and $\overline{PR}$, and $\overset{\frown}{QR}$ has length 9 inches. If the sector's perimeter is 33 inches, what is the area of this sector?



269. ________ unit squares A 15 × 20 rectangle completely covers 300 unit squares on a rectangular grid. If a diagonal of the rectangle is drawn, through how many of the unit squares' interiors would it pass?

270. ________ paths A path in the *xy*-plane consists of steps of 1 unit in the positive *x* or *y* direction. How many paths from (0, 0) to (4, 4) do not pass through the point (2, 2)?

Functions Stretch

A *function* maps a set of input values (*domain*) to a set of output values (*range*) in such a way that each input value maps to exactly one output value. The following exercises explore various types of functions through the use of equations, tables and graphs.

271. __________ What is the value of $f(-2)$ if $f(x) = x^2 + x + 5$?

272. __________ What is the value of x if $f(x) = 4$ for $f(x) = 3x - 14$?

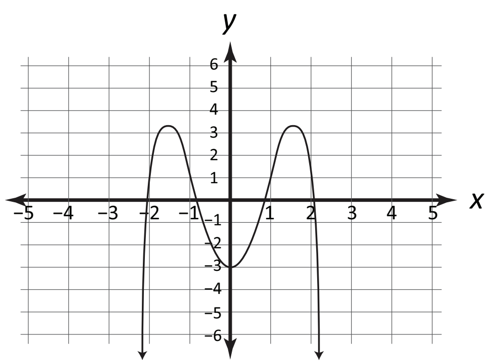
The table shown represents the function $h(x)$.

273. __________ According to the table, what is the value of $h(2)$?

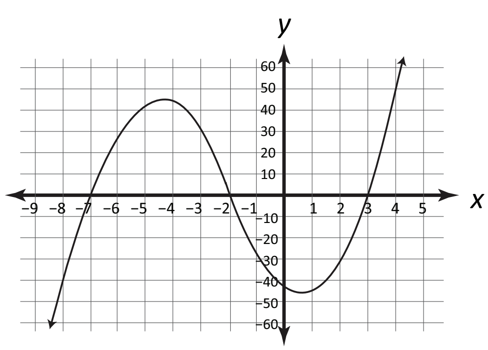
274. __________ What is the value of x if $h(x) = 58$?

x	***h(x)***
−1	3
0	10
1	7
2	6
3	19
4	58

275. __________ Based on the graph of $f(x) = -x^4 + 5x^2 - 3$, shown here, what is the value of $f(0)$?

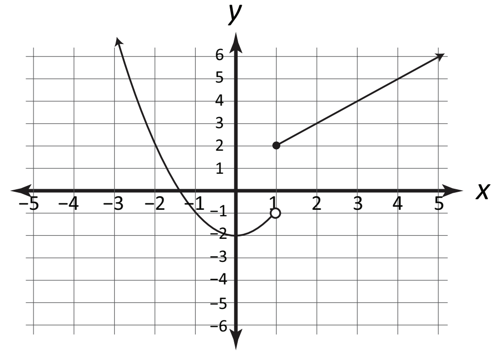


276. __________ Based on the graph of $f(x) = x^3 + 6x^2 - 13x - 42$, shown here, what is the sum of all x-values for which $f(x) = 0$?



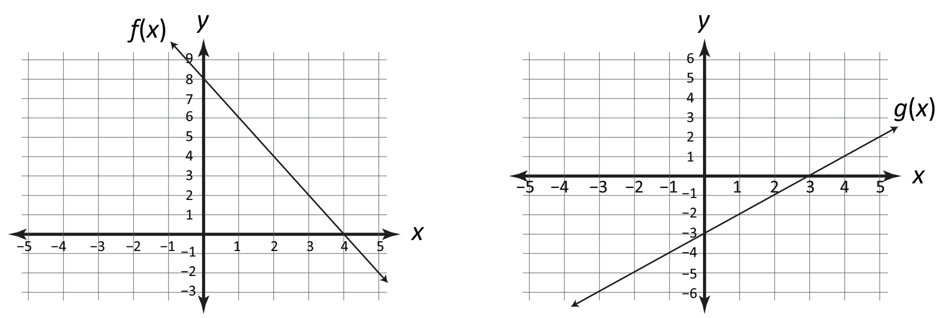
277. __________ A function that is defined by more than one equation, each with its own domain, is called a *piecewise function*. What is the value of $f(1)$ for the piecewise function defined and graphed as shown?

$$f(x)=\begin{cases} x^2-2, & x<1 \\ x+1, & x\ge 1 \end{cases}$$



278. __________ The composition of the function f with the function g is defined as $f(g(x))$. The domain of $f(g(x))$ is the set of all x-values such that x is in the domain of g, and $g(x)$ is in the domain of f. If $f(x) = 4x - 6$ and $g(x) = 2x + 1$, what is the value of $f(g(2))$?

279. __________ The functions f and g are graphed below. If $g(5) = r$ and $f(r) = s$, what is the value of s?



280. a = __________ What are the values of a and b that complete the table, representing the linear function $k(x)$?

b = __________

x	***k(x)***
−3	−5.5
0	*b*
3	9.5
a	17

Work Stretch

281. ______ minutes Working alone, Alice can paint a room in 1 hour. Bob can paint the room in 2 hours alone. How many minutes will it take them to paint the room together?

282. ______ minutes James is trying to learn a new yoga posture. Reading about it from a book, he would take 30 minutes to learn the posture. Working with an instructor doubles his rate of learning. How many total minutes will it take James to learn the posture if his instructor arrives after he has studied from the book for 10 minutes?

283. ______ minutes A hose could fill a small pool in 50 minutes if the pool did not leak. Alas, the pool leaks at a steady rate that can drain it completely in 300 minutes. How many minutes will it take the hose to fill the leaky pool?

284. ___ : ___ pm A vineyard's grapes can be harvested by 10 workers in 5 hours. If one worker starts the harvest at noon, and another worker joins the harvest each hour on the hour, at what time will the harvest be completed?

285. ___ : ___ pm Alfonso can write 100 practice problems for the math team in 20 hours, Beauregard can write the same number of problems in 30 hours, and Clyde can write that number of problems in 40 hours. Working together, at what time will the three of them finish writing 100 practice problems if Alfonso starts at noon, Beauregard joins him at 1 pm and Clyde joins them at 2 pm?

286. ______ minutes Vincent can process 50 orders in 2 hours working alone. When Leela is in the room, Vincent works at twice his normal speed. When Fry is in the room, Vincent works at half his normal speed. If Vincent works alone for 10 minutes, then with Leela for 10 minutes, then alone for 10 minutes, then with Fry for 10 minutes, then alone for 10 minutes, and this pattern continues (alone, with Leela, alone, with Fry), how many minutes will it take to process 50 orders?

287. ______ minutes Larry and Curly are trying to fill a sandbox with sand. Working alone, Larry can fill an empty sandbox in 4 hours, and Curly can do the same job in 5 hours. Moe is trying to empty the sandbox. Working alone, Moe can empty a full sandbox in 6 hours. If the sandbox is half full at the time Larry and Curly begin filling the sandbox and Moe begins emptying it, how many minutes will it take for the sandbox to be filled? Express your answer to the nearest whole number.

288. ______ hours Danielle and Jennifer can do a job in 2 hours working together. Danielle could do it in 3 hours alone. How many hours would it take Jennifer to do the job alone?

289. ______ hours One hose can fill a pool twice as quickly as another, smaller hose. If the two hoses together can fill the pool in 6 hours, how many hours would it take the smaller hose alone to fill the pool?

290. ______ housekeepers The Hilbert Lodge has a housekeeping staff of ten. Working alone, one housekeeper can clean all of the rooms in the lodge in 4 hours. A different housekeeper can clean all of the rooms in 5 hours, and still another takes 6 hours to clean all the rooms, working alone. Working alone, each of the remaining seven housekeepers can clean all the rooms in 7, 8, 9, 10, 11, 12 and 13 hours, respectively. What is the minimum number of housekeepers needed to clean all of the rooms in Hilbert Lodge in exactly 2 hours?

Coordinate Geometry Stretch

Coordinate geometry is where algebra intersects geometry. The characteristics of equations are made visual by plotting ordered pairs on a Cartesian coordinate plane. The mathematician and philosopher René Descartes is given credit for creating the idea of using a coordinate plane.

Some of the problems that follow involve using the slope, $m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$, and a point, (x_1, y_1), or points on a line to determine the equation of the line. The equation of a line can be written in the following forms:

Standard (general) form	Ax + By = C, where A, B and C are integers
Slope-intercept form	$y = mx + b$, where b is the y-intercept
Point-slope form	$y - y_1 = m(x - x_1)$
Intercept form	$\frac{x}{a} + \frac{y}{b} = 1$, where a and b are the x- and y-intercepts, respectively
Two-point form	$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$

The preceding forms may be of use when solving the following problems, but all equation answers should be in slope-intercept form. Any non-integer values should be expressed as common fractions unless otherwise indicated.

291. (,) What is the midpoint of the line segment whose endpoints are (−4, −2) and (6, −5)? Express your answer as an ordered pair.

292. __________ Two lines are parallel if they have the same slope. What is the equation of a line parallel to $y = 2x - 5$ that passes through the point (3, 5)?

293. __________ Two lines are perpendicular if the product of their slopes is −1. In other words, their slopes are opposite inverses (or negative reciprocals). What is the equation of the line perpendicular to $y = \frac{2}{3}x - \frac{1}{3}$ at the point (−4, −3)?

294. __________ What is the equation of a line with x-intercept (−3, 0) and y-intercept (0, 6)?

295. __________ A line has a slope of $\frac{1}{2}$ and a y-intercept of (0, −3). That line intersects the line $2x + 3y = -2$ at a point. What is the sum of the coordinates of the point?

296. __________ A circle can be reprsented by an equation in the form $(x - h)^2 + (y - k)^2 = r^2$, where (h, k) are the coordinates of the center of the circle, and r is the radius of the circle. The graph of $x^2 + y^2 = 25$ is a circle with center (0, 0) and a radius of 5 units ($r^2 = 25$, from the equation). The graph of the line $y = x - 7$ intersects this circle at two points. What is the sum of the x-coordinates of these two points?

297. __________ The point (−2, 10) lies on the circle $(x - 3)^2 + (y + 2)^2 = 169$. What is the equation of the line tangent to that circle at that point?

298. __________ The two circles, $x^2 + y^2 = 25$ and $(x - 7)^2 + (y - 7)^2 = 25$, have a common chord. What is the equation of the line containing that chord?

299. ________ units Based on the Pythagorean Theorem, the distance d between two points (x_1, y_1) and (x_2, y_2) in the coordinate plane is $d = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$. What is the length of the common chord in question 298? Express your answer in simplest radical form.

300. __________ Triangle ABC has vertices A(3, 2), B(−2, 1) and C(6, −5). What is the equation of the line containing the altitude from vertex A to side BC?

BUILDING A COMPETITION AND/OR CLUB PROGRAM

RECRUITING MATHLETES®

Ideally, the materials in this handbook will be incorporated into the regular classroom curriculum so that all students learn problem-solving techniques and develop critical thinking skills. When a school's MATHCOUNTS Competition Program or Club Program is limited to extracurricular sessions, all interested students should be invited to participate regardless of their academic standing. Because the greatest benefits of the MATHCOUNTS programs are realized at the school level, the more Mathletes involved, the better. Students should view their experience with MATHCOUNTS as fun, as well as challenging, so let them know from the very first meeting that the goal is to have a good time while learning.

Here are some suggestions from successful competition and club coaches on how to stimulate interest at the beginning of the school year:

- Build a display case showing MATHCOUNTS shirts and posters. Include trophies and photos from previous years' club sessions or competitions.
- Post intriguing math questions (involving specific school activities and situations) in hallways, the library and the cafeteria. Refer students to the first meeting for answers. **Use the MATHCOUNTS poster from your Club in a Box Resource Kit!**
- Make a presentation at the first pep rally or student assembly.
- Approach students through other extracurricular clubs (e.g., honor society, science club, chess club).
- Inform parents of the benefits of MATHCOUNTS participation via the school newsletter or PTA.
- Create a MATHCOUNTS display for Back-to-School Night.
- Have former Mathletes speak to students about the rewards of the program.
- Incorporate the Problem of the Week from the MATHCOUNTS website (www.mathcounts.org/potw) into the weekly class schedule.

MAINTAINING A STRONG PROGRAM

Keep the school program strong by soliciting local support and focusing attention on the rewards of MATHCOUNTS. Publicize success stories. Let the rest of the student body see how much fun Mathletes have. Remember, the more this year's students get from the experience, the easier recruiting will be next year. Here are some suggestions:

- Publicize MATHCOUNTS meetings and events in the school newspaper and local media.
- Inform parents of meetings and events through the PTA, open houses and the school newsletter.
- Schedule a special pep rally for the Mathletes.
- Recognize the achievements of club members at a school awards program.
- Have a students-versus-teachers Countdown Round, and invite the student body to watch.
- Solicit donations from local businesses to be used as prizes in practice competitions.
- Plan retreats or field trips for the Mathletes to area college campuses or hold an annual reunion.
- Take photos at club meetings, coaching sessions or competitions and keep a scrapbook.
- Distribute MATHCOUNTS shirts to participating students.
- Start a MATHCOUNTS summer-school program.
- Encourage teachers of students in lower grades to participate in mathematics enrichment programs.

MATHCOUNTS COMPETITION PROGRAM . . .
A MORE DETAILED LOOK

The MATHCOUNTS Foundation administers its math enrichment, coaching and competition program with a grassroots network of more than 17,000 volunteers who organize MATHCOUNTS competitions nationwide. Each year more than 500 local competitions and 56 "state" competitions are conducted, primarily by chapter and state societies of the National Society of Professional Engineers. All 50 states, the District of Columbia, Puerto Rico, Guam, Virgin Islands, U.S. Department of Defense schools and U.S. State Department schools worldwide participate in MATHCOUNTS. Here's everything you need to know to get involved.

PREPARATION MATERIALS

The annual *MATHCOUNTS School Handbook* provides the basis for coaches and volunteers to coach student Mathletes on problem-solving and mathematical skills. Coaches are encouraged to make maximum use of MATHCOUNTS materials by incorporating them into their classrooms or by using them with extracurricular math clubs. Coaches also are encouraged to share this material with other teachers at their schools, as well as with parents.

MATHCOUNTS has created a video series to help you understand the free resources available to you. To date, there are five videos, but the library will continue to grow as we see a need. The **Introduction to the *MATHCOUNTS School Handbook*** video discusses the variety of problems that can be found in the handbook as well as how to utilize the problems for MATHCOUNTS competition preparation or classroom use. Please take advantage of these great new resources. All of these videos can be accessed at www.mathcounts.org/videos or on the MATHCOUNTS YouTube page, which can be found at www.youtube.com/mathcounts.

The *2012–2013 MATHCOUNTS School Handbook* contains 300 problems. As always, these FREE, challenging and creative problems have been written to meet the National Council of Teachers of Mathematics' Standards for grades 6-8. The link for the *School Handbook* is being sent electronically to every U.S. school with seventh- and/or eighth-grade students and to any other school that registered for the MATHCOUNTS Competition Program last year. This handbook also is available to schools with sixth-grade students. A hard copy of the *MATHCOUNTS School Handbook* is available upon request to all schools, free of charge. Coaches who register for the MATHCOUNTS Club Program or the MATHCOUNTS Competition Program will receive the handbook in their Club in a Box Resource Kit.

In addition to the great math problems, be sure to take advantage of the following resources that are included in the *2012-2013 MATHCOUNTS School Handbook*:

> **Vocabulary and Formulas** are listed on pages 52-53.
> A **Problem Index** is provided on pages 88-89 to assist you in incorporating the *MATHCOUNTS School Handbook* problems into your curriculum. This index organizes the problems by topic, dificulty rating and mapping to the Common Core State Standard for each problem.
> **Difficulty Ratings** on a scale of 1-7, with 7 being the most difficult, are explained on page 61.
> **Common Core State Standards** are explained on page 87.

A variety of additional information and resources can be found on the MATHCOUNTS website, at www.mathcounts.org, including problems and answers from the previous year's Chapter and State Competitions, the MATHCOUNTS Coaching Kit, MATHCOUNTS Club Program resources, forums and links to state programs. When you sign up for the Club Program or Competition Program (and you have created a User Profile on the site), you will receive access to even more free resources that are not visible or available to the general public. Be sure to create a User Profile as soon as possible, and then visit the Coaches section of the site.

The MATHCOUNTS OPLET, which contains *MATHCOUNTS School Handbook* problems and competition problems from the last 12 years, is a wonderful resource. Once a 12-month subscription is purchased, the user can create customized worksheets, flash cards and Problems of the Day by using this database of problems. For more information, see page 8 of this handbook or go to www.mathcounts.org/oplet and check out some screen shots of the MATHCOUNTS OPLET. A 12-month subscription can be purchased online.

Additional coaching materials and novelty items may be ordered through Sports Awards. An order form, with information on the full range of products, is available in the MATHCOUNTS Store section at www.mathcounts.org/store or by calling Sports Awards toll-free at 800-621-5803. A limited selection of MATHCOUNTS materials also is available at www.artofproblemsolving.com.

COACHING STUDENTS

The coaching season begins at the start of the school year. The sooner you begin your coaching sessions, the more likely students still will have room in their schedules for your meetings and the more preparation they can receive before the competitions.

Be sure to take advantage of the new Coaches' Resource Videos. The **Introduction to the *MATHCOUNTS School Handbook*** video discusses the variety of problems that can be found in the handbook as well as how to utilize the problems for MATHCOUNTS competition preparation or classroom use. The videos can be accessed at www.mathcounts.org/videos or on the MATHCOUNTS YouTube page, which can be found at www.youtube.com/mathcounts.

The original problems found in the *MATHCOUNTS School Handbook* are divided into three sections: Warm-Ups, Workouts and Stretches. Each Warm-Up and Workout contains problems that generally survey the grades 6-8 mathematics curricula. Workouts assume the use of a calculator; Warm-Ups do not. The Stretches are collections of problems centered around a specific topic.

The problems are designed to provide Mathletes with a large variety of challenges and prepare them for the MATHCOUNTS competitions. (These materials also may be used as the basis for an exciting extracurricular mathematics club or may simply supplement the normal middle school mathematics curriculum.)

Answers to all problems in the handbook include codes indicating level of difficulty and Common Core State Standard. The difficulty ratings are explained on page 61, and the Common Core State Standards are explained on page 87.

WARM-UPS AND WORKOUTS

The Warm-Ups and Workouts are on pages 9-35 and are designed to increase in difficulty as students go through the handbook.

For use in the classroom, Warm-Ups and Workouts serve as excellent additional practice for the mathematics that students already are learning. In preparation for competition, the Warm-Ups can be used to prepare students for problems they will encounter in the Sprint Round. It is assumed that students will not be using calculators for Warm-Up problems. The Workouts can be used to prepare students for the Target and Team Rounds of competition. It is assumed that students will be using calculators for Workout problems.

All of the problems provide students with practice in a variety of problem-solving situations and may be used to diagnose skill levels, to practice and apply skills or to evaluate growth in skills.

STRETCHES

Pages 36-40 present the Coordinate Geometry, Functions and Work Stretches. The problems cover a variety of difficulty levels. These Stretches may be incorporated in your students' practice at any time.

ANSWERS

Answers to all problems can be found on pages 61-65.

SOLUTIONS

Complete solutions for the problems start on page 66. These are only possible solutions. You or your students may come up with more elegant solutions.

SCHEDULE

The Stretches can be used at any time. The following chart is the recommended schedule for using the Warm-Ups and Workouts if you are participating in the Competition Program.

September 2012	Warm-Ups 1-2	Workout 1
October	Warm-Ups 3-6	Workouts 2-3
November	Warm-Ups 7-10	Workouts 4-5
December	Warm-Ups 11-14	Workouts 6-7
January 2013	Warm-Ups 15-16	Workout 8
	MATHCOUNTS School Competition	
	Warm-Ups 17-18	Workout 9
February	Selection of competitors for Chapter Competition	
	MATHCOUNTS Chapter Competition	

To encourage participation by the greatest number of students, postpone selection of your school's official competitors until just before the local competition.

On average, MATHCOUNTS coaches meet with Mathletes for an hour one or two times a week at the beginning of the year and with increasing frequency as the competitions approach. Sessions may be held before school, during lunch, after school, on weekends or at other times, coordinating with your school's schedule and avoiding conflicts with other activities.

Here are some suggestions for getting the most out of the Warm-Ups and Workouts at coaching sessions:

- Encourage discussion of the problems so that students learn from one another.
- Encourage a variety of methods for solving problems.
- Have students write problems for each other.
- Use the MATHCOUNTS Problem of the Week. Currently, this set of problems is posted every Monday on the MATHCOUNTS website at www.mathcounts.org/potw.
- Practice working in groups to develop teamwork (and to prepare for the Team Round).
- Practice oral presentations to reinforce understanding.
- Take advantage of additional MATHCOUNTS coaching materials, such as previous years' competitions, to provide an extra challenge or to prepare for competition.
- Provide refreshments and vary the location of your meetings to create a relaxing, enjoyable atmosphere.
- Invite the school principal to a session to offer words of support.
- Recruit volunteers. Volunteer assistance can be used to enrich the program and expand it to more students. Fellow teachers can serve as assistant coaches. Individuals such as MATHCOUNTS alumni and high school students, parents, community professionals and retirees also can help.

OFFICIAL RULES AND PROCEDURES

The following rules and procedures govern all MATHCOUNTS competitions. The MATHCOUNTS Foundation reserves the right to alter these rules and procedures at any time. **Coaches are responsible for being familiar with the rules and procedures outlined in this handbook.** Coaches should bring any difficulty in procedures or in student conduct to the immediate attention of the appropriate chapter, state or national official. Students violating any rules may be subject to immediate disqualification.

REGISTRATION

To participate in the MATHCOUNTS Competition Program, a school representative is required to complete and return the Registration Form (available at the back of this handbook and on our website, at www.mathcounts.org) along with a check, money order, purchase order or credit card authorization. **Your registration must be postmarked no later than December 14, 2012** and mailed to MATHCOUNTS Registration, P.O. Box 441, Annapolis Junction, MD 20701. *For early bird registrations postmarked by November 16, 2012, the discounted cost to register a team is $90, and the discounted cost to register each individual is $25*. For registrations postmarked after November 16, 2012 but by December 14, 2012, the cost to register a team is $100, and the cost to register each individual is $30. Schools entitled to receive Title I funds may register for half the cost of the applicable registration fee. An additional fee of $20 will be assessed to process late registrations. (This fee is for each late registration form and not for each student being registered.) See the Registration Form on page 91 for additional details.

> **Do not hold up the mailing of your Club in a Box Resource Kit because you are waiting for a purchase order to be processed or a check to be cut by your school for the competition registration fee. Fill out your Registration Form and send in a photocopy of it without payment. We immediately will mail your Club in a Box Resource Kit (which contains a hard copy of the *MATHCOUNTS School Handbook*) and credit your account once your payment is received with the original Registration Form.**

By completing the Registration Form, the coach attests to the school administration's permission to register students for MATHCOUNTS.

Academic centers or enrichment programs that do not function as students' official school of record are not eligible to register.

Registration in the Competition Program entitles a school to send students to the local competition and earns the school Bronze Level Status in the MATHCOUNTS Club Program. Registered schools will receive two mailings:

- The first, immediate mailing will be the Club in a Box Resource Kit, which contains a copy of the *2012-2013 MATHCOUNTS School Handbook*, the *Club Resource Guide* with 10 club meeting ideas and other materials for the MATHCOUNTS Club Program.
- The second mailing will include the School Competition Kit (with instructions, School Competition & Answer Key, recognition ribbons and student participation certificates) and a catalog of additional coaching materials. The first batch of School Competition Kits will be mailed in early November, and additional mailings will occur on a rolling basis to schools sending in the Registration Forms later in the fall.

Your Registration Form must be postmarked by December 14, 2012. *In some circumstances, late registrations might be accepted, at the discretion of MATHCOUNTS and the local coordinator.* However, late fees will apply.

The sooner you register, the sooner you will receive your Club in a Box Resource Kit and School Competition Kit to help prepare your team. Once processed, confirmation of your registration will be available through the registration database in the Competition section of the MATHCOUNTS website (www.mathcounts.org). Other questions about the status of your registration should be directed to MATHCOUNTS Registration, P.O. Box 441, Annapolis Junction, MD 20701. Telephone: 301-498-6141. Your state or local coordinator will be notified of your registration, and you then will be informed of the date and location of your local competition. **If you have not been contacted by mid-January with competition details, it is your responsibility to contact your local coordinator** to confirm that your registration has been properly routed and that your school's participation is expected. Coordinator contact information is available in the Competition section of www.mathcounts.org.

ELIGIBLE PARTICIPANTS

Students enrolled in the sixth, seventh or eighth grade are eligible to participate in MATHCOUNTS competitions. Students taking middle school mathematics classes who are not full-time sixth, seventh or eighth graders are not eligible. Participation in MATHCOUNTS competitions is limited to three years for each student, though there is no limit to the number of years a student may participate in the school-based coaching phase.

School Registration: A school may register one team of four and up to six individuals for a total of 10 participants. You must designate team members versus individuals prior to the start of the Chapter (local) Competition (i.e., a student registered as an "individual" may not help his or her school team advance to the next level of competition).

Team Registration: Only one team (of up to four students) per school is eligible to compete. Members of a school team will participate in the Sprint, Target and Team Rounds. Members of a school team also will be eligible to qualify for the Countdown Round (where conducted). Team members will be eligible for team awards, individual awards and progression to the state and national levels based on their individual and/or team performance. It is recommended that your strongest four Mathletes form your school team. Teams of fewer than four will be allowed to compete; however, the team score will be computed by dividing the sum of the team members' scores by 4 (see "Scoring" on page 50 for details). Consequently, teams of fewer than four students will be at a disadvantage.

Individual Registration: Up to six students may be registered in addition to or in lieu of a school team. Students registered as individuals will participate in the Sprint and Target Rounds but not the Team Round. Individuals will be eligible to qualify for the Countdown Round (where conducted). Individuals also will be eligible for individual awards and progression to the state and national levels.

School Definitions: *Academic centers or enrichment programs that do not function as students' official school of record are not eligible to register.* If it is unclear whether an educational institution is considered a school, please contact your local Department of Education for specific criteria governing your state.

School Enrollment Status: *A student may compete only for his or her official school of record.* A student's school of record is the student's base or main school. A student taking limited course work at a second school or educational center may not register or compete for that second school or center, even if the student is not competing for his or her school of record. MATHCOUNTS registration is not determined by where a student takes his or her math course. If there is any doubt about a student's school of record, the local or state coordinator must be contacted for a decision before registering.

Small Schools: MATHCOUNTS does not distinguish between the sizes of schools for Competition Program registration and competition purposes. Every "brick-and-mortar" school will have the same registration allowance of up to one team of four students and/or up to six individuals. A school's participants may not combine with any other school's participants to form a team when registering or competing.

Homeschools: Homeschools in compliance with the homeschool laws of the state in which they are located are eligible to participate in MATHCOUNTS competitions in accordance with all other rules. Homeschool coaches must complete a Homeschool Participation Attestation Form, verifying that students from the homeschool or homeschool group are in the sixth, seventh or eighth grade and that each homeschool complies with applicable state laws. Completed attestations must be submitted to the national office before registrations will be processed. A Homeschool Participation Attestation Form can be downloaded from the right navigation bar by visiting www.mathcounts.org/competition. Please fax attestations to 703-299-5009.

Virtual Schools: Any virtual school interested in registering students must contact the MATHCOUNTS national office at 703-299-9006 before December 14, 2012 for registration details. Any student registering as a virtual school student must compete in the MATHCOUNTS Chapter Competition assigned according to the student's home address. Additionally, virtual school coaches must complete a Homeschool Participation Attestation Form verifying that the students from the virtual school are in the sixth, seventh or eighth grade and that the virtual school complies with applicable state laws. Completed attestations must be submitted to the national office before registrations will be processed. A Homeschool Participation Attestation Form can be downloaded from the right navigation bar by visiting www.mathcounts.org/competition. Please fax attestations to 703-299-5009.

Substitutions by Coaches: Coaches may not substitute team members for the State Competition unless a student voluntarily releases his or her position on the school team. Additional requirements and documentation for substitutions (such as requiring parental release or requiring the substitution request to be submitted in writing) are at the discretion of the state coordinator. Coaches may not make substitutions for students progressing to the State Competition as individuals. At all levels of competition, student substitutions are not permitted after on-site competition registration has been completed. A student being added to a team need not be a student who was registered for the Chapter Competition as an individual.

Religious Observances: A student who is unable to attend a competition due to religious observances may take the written portion of the competition up to one week in advance of the scheduled competition. In addition, all competitors from that student's school must take the exam at the same time. ***Advance testing will be done at the discretion of the local and state coordinators. If advance testing is deemed possible, it will be conducted under proctored conditions.*** If the student who is unable to attend the competition due to a religious observance is not part of the school team, then the team has the option of taking the Team Round during this advance testing or on the regularly scheduled day of the competition with the other teams. The coordinator must be made aware of the team's decision before the advance testing takes place. Students who qualify for an official Countdown Round but are unable to attend will automatically forfeit one place standing.

Special Needs: Reasonable accommodations may be made to allow students with special needs to participate. ***A request for accommodation of special needs must be directed to local or state coordinators in writing at least three weeks in advance of the local or state competition.*** This written request should thoroughly explain a student's special need as well as what the desired accommodation would entail. Many accommodations that are employed in a classroom or teaching environment cannot be implemented in the competition setting. Accommodations that are not permissible include, but are not limited to, granting a student extra time during any of the competition rounds or allowing a student to use a calculator for the Sprint or Countdown Rounds. In conjunction with the MATHCOUNTS Foundation, coordinators will review the needs of the student and determine if any accommodations will be made. In making final determinations, the feasibility of accommodating these needs at the National Competition will be taken into consideration.

LEVELS OF COMPETITION

MATHCOUNTS competitions are organized at four levels: school, chapter (local), state and national. Competition questions are written for the sixth- through eighth-grade audience. The competitions can be quite challenging, particularly for students who have not been coached using MATHCOUNTS materials. All competition materials are prepared by the national office.

The real success of MATHCOUNTS is influenced by the coaching sessions at the school level. This component of the program involves the most students (more than 500,000 annually), comprises the longest period of time and demands the greatest involvement.

SCHOOL COMPETITION: In January, after several months of coaching, schools registered for the Competition Program should administer the School Competition to all interested students. The School Competition is intended to be an aid to the coach in determining competitors for the Chapter (local) Competition. *Selection of team and individual competitors is entirely at the discretion of coaches and need not be based solely on School Competition scores.* School Competition material is sent to the coach of a school, and it may be used by the teachers and students only in association with that school's programs and activities. The current year's School Competition questions must remain confidential and may not be used in outside activities, such as tutoring sessions or enrichment programs with students from other schools. *For additional announcements or edits, please check the Coaches' Forum in the Coaches section on the MATHCOUNTS website before administering the School Competition.*

It is important that the coach look upon coaching sessions during the academic year as opportunities to develop better math skills in all students, not just in those students who will be competing. Therefore, it is suggested that the coach postpone selection of competitors until just prior to the local competitions.

CHAPTER COMPETITIONS: Held from February 1 through February 28, 2013, the Chapter Competition consists of the Sprint, Target and Team Rounds. The Countdown Round (official or just for fun) may or may not be included. The chapter and state coordinators determine the date and administration of the Chapter (local) Competition in accordance with established national procedures and rules. Winning teams and students will receive recognition. The winning team will advance to the State Competition. Additionally, the two highest-ranking competitors not on the winning team (who may be registered as individuals or as members of a team) will advance to the State Competition. This is a minimum of six advancing Mathletes (assuming the winning team has four members). Additional teams and/or Mathletes also may progress at the discretion of the state coordinator. The policy for progression must be consistent for all chapters within a state.

STATE COMPETITIONS: Held from March 1 through March 31, 2013, the State Competition consists of the Sprint, Target and Team Rounds. The Countdown Round (official or just for fun) may or may not be included. The state coordinator determines the date and administration of the State Competition in accordance with established national procedures and rules. Winning teams and students will receive recognition. The four highest-ranked Mathletes and the coach of the winning team from each State Competition will receive an all-expense-paid trip to the National Competition.

RAYTHEON MATHCOUNTS NATIONAL COMPETITION: Held Friday, May 10, 2013 in Washington, D.C., the National Competition consists of the Sprint, Target, Team and Countdown Rounds. Expenses of the state team and coach to travel to the National Competition will be paid by MATHCOUNTS. The national program does not make provisions for the attendance of additional students or coaches. All national competitors will receive a plaque and other items in recognition of their achievements. Winning teams and individuals also will receive medals, trophies and college scholarships.

COMPETITION COMPONENTS

MATHCOUNTS competitions are designed to be completed in approximately three hours:

The **SPRINT ROUND** (40 minutes) consists of 30 problems. This round tests accuracy, with the time period allowing only the most capable students to complete all of the problems. **Calculators are not permitted.**

The **TARGET ROUND** (approximately 30 minutes) consists of 8 problems presented to competitors in four pairs (6 minutes per pair). This round features multistep problems that engage Mathletes in mathematical reasoning and problem-solving processes. **Problems assume the use of calculators.**

The **TEAM ROUND** (20 minutes) consists of 10 problems that team members work together to solve. Team member interaction is permitted and encouraged. **Problems assume the use of calculators.**
<u>Note</u>: Coordinators may opt to allow those competing as individuals to create a "squad" to take the Team Round for the experience, but the round *should not be scored and is not considered official.*

The **COUNTDOWN ROUND** is a fast-paced oral competition for top-scoring individuals (based on scores in the Sprint and Target Rounds). In this round, pairs of Mathletes compete against each other and the clock to solve problems. **Calculators are not permitted.**

At Chapter and State Competitions, a Countdown Round may be conducted officially or unofficially (for fun) or it may be omitted. However, the use of an official Countdown Round must be consistent for all chapters within a state. In other words, *all* chapters within a state must use the round officially in order for *any* chapter within a state to use it officially. All students, whether registered as part of a school team or as individual competitors, are eligible to qualify for the Countdown Round.

An *official* Countdown Round is defined as one that determines an individual's final overall rank in the competition. If the Countdown Round is used officially, the official procedures as established by the MATHCOUNTS Foundation must be followed.

If a Countdown Round is conducted *unofficially*, the official procedures do not have to be followed. Chapters and states choosing not to conduct the round officially must determine individual winners on the sole basis of students' scores in the Sprint and Target Rounds of the competition.

In an official Countdown Round, the top 25% of students, up to a maximum of 10, are selected to compete. These students are chosen based on their individual scores. The two lowest-ranked students are paired, a question is projected and students are given 45 seconds to solve the problem. A student may buzz in at any time, and if he or she answers correctly, a point is scored; if a student answers incorrectly, the other student has the remainder of the 45 seconds to answer. Three questions are read to the pair of students, one question at a time, and the student who scores the higher number of points (not necessarily 2 out of 3) captures the place, progresses to the next round and challenges the next-higher-ranked student. (If students are tied after three questions (at 1-1 or 0-0), questions continue to be read until one is successfully answered.) This procedure continues until the fourth-ranked Mathlete and his or her opponent compete. For the final four rounds, the first student to correctly answer three questions advances. The Countdown Round proceeds until a first-place individual is identified. (More detailed rules regarding the Countdown Round procedure are identified in the Instructions section of the School Competition Booklet.) *Note: Rules for the Countdown Round change for the National Competition.*

ADDITIONAL RULES

All answers must be legible.

Pencils and paper will be provided for Mathletes by competition organizers. However, students may bring their own pencils, pens and erasers if they wish. They may not use their own scratch paper or graph paper.

Use of notes or other reference materials (including dictionaries and translation dictionaries) is not permitted.

Specific instructions stated in a given problem take precedence over any general rule or procedure.

Communication with coaches is prohibited during rounds but is permitted during breaks. All communication between guests and Mathletes is prohibited during competition rounds. Communication between teammates is permitted only during the Team Round.

Calculators are not permitted in the Sprint and Countdown Rounds, but they are permitted in the Target, Team and Tiebreaker (if needed) Rounds. When calculators are permitted, students may use any calculator (including programmable and graphing calculators) that does not contain a QWERTY (typewriter-like) keypad. Calculators that have the ability to enter letters of the alphabet but do not have a keypad in a standard typewriter arrangement are acceptable. Smart phones, laptops, iPads®, iPods®, personal digital assistants (PDAs), and any other "smart" devices are not considered to be calculators and may not be used during competitions. Students may not use calculators to exchange information with another person or device during the competition.

Coaches are responsible for ensuring that their students use acceptable calculators, and students are responsible for providing their own calculators. Coordinators are not responsible for providing Mathletes with calculators or batteries before or during MATHCOUNTS competitions. Coaches are strongly advised to bring backup calculators and spare batteries to the competition for their team members in case of a malfunctioning calculator or weak or dead batteries. Neither the MATHCOUNTS Foundation nor coordinators shall be responsible for the consequences of a calculator's malfunctioning.

Pagers, cell phones, iPods® and other MP3 players should not be brought into the competition room. Failure to comply could result in dismissal from the competition.

Should there be a rule violation or suspicion of irregularities, the MATHCOUNTS coordinator or competition official has the obligation and authority to exercise his or her judgment regarding the situation and take appropriate action, which might include disqualification of the suspected student(s) from the competition.

SCORING

Competition scores do not conform to traditional grading scales. **Coaches and students should view an individual written competition score of 23 (out of a possible 46) as highly commendable.**

The individual score is the sum of the number of Sprint Round questions answered correctly and twice the number of Target Round questions answered correctly. There are 30 questions in the Sprint Round and 8 questions in the Target Round, so the maximum possible individual score is 30 + 2(8) = 46.

The team score is calculated by dividing the sum of the team members' individual scores by 4 (even if the team has fewer than four members) and adding twice the number of Team Round questions answered correctly. The highest possible individual score is 46. Four students may compete on a team, and there are 10 questions in the Team Round. Therefore, the maximum possible team score is ((46 + 46 + 46 + 46) ÷ 4) + 2(10) = 66.

If used officially, the Countdown Round yields final individual standings.

Ties will be broken as necessary to determine team and individual prizes and to determine which individuals qualify for the Countdown Round. For ties between individuals, the student with the higher Sprint Round score will receive the higher rank. If a tie remains after this comparison, specific groups of questions from the Sprint and Target Rounds are compared. For ties between teams, the team with the higher Team Round score, and then the higher sum of the team members' Sprint Round scores, receives the higher rank. If a tie remains after these comparisons, specific questions from the Team Round will be compared. *Note*: These are very general guidelines. Competition officials receive more detailed procedures.

In general, questions in the Sprint, Target and Team Rounds increase in difficulty so that the most difficult questions occur near the end of each round. In a comparison of questions to break ties, generally those who correctly answer the more difficult questions receive the higher rank.

Protests concerning the correctness of an answer on the written portion of the competition must be registered with the room supervisor in writing by a coach within 30 minutes of the end of each round. Rulings on protests are final and may not be appealed. Protests will not be accepted during the Countdown Round.

RESULTS DISTRIBUTION

Coaches should expect to receive the scores of their students and a list of the top 25% of students and top 40% of teams from their coordinators. In addition, single copies of the blank competition materials and answer keys may be distributed to coaches after all competitions at that level nationwide have been completed. ***Before distributing blank competition materials and answer keys, coordinators must wait for verification from the national office that all such competitions have been completed.*** Both the problems and answers from Chapter and State Competitions will be posted on the MATHCOUNTS website following the completion of all competitions at that level nationwide (Chapter - early March; State - early April). The previous year's problems and answers will be taken off the website at that time.

Student competition papers and answers will not be viewed by or distributed to coaches, parents, students or other individuals. Students' competition papers become the confidential property of the MATHCOUNTS Foundation.

FORMS OF ANSWERS

The following rules explain acceptable forms for answers. Coaches should ensure that Mathletes are familiar with these rules prior to participating at any level of competition. Judges will score competition answers in compliance with these rules for forms of answers.

All answers must be expressed in simplest form. A "common fraction" is to be considered a fraction in the form $\pm\frac{a}{b}$, where *a* and *b* are natural numbers and GCF(*a*, *b*) = 1. In some cases the term "common fraction" is to be considered a fraction in the form $\frac{A}{B}$, where *A* and *B* are algebraic expressions and *A* and *B* do not have a common factor. A simplified "mixed number" ("mixed numeral," "mixed fraction") is to be considered a fraction in the form $\pm N\frac{a}{b}$, where *N*, *a* and *b* are natural numbers, $a < b$ and GCF(*a*, *b*) = 1. Examples:

Problem: Express 8 divided by 12 as a common fraction. *Answer:* $\frac{2}{3}$ *Unacceptable:* $\frac{4}{6}$

Problem: Express 12 divided by 8 as a common fraction. *Answer:* $\frac{3}{2}$ *Unacceptable:* $\frac{12}{8}$, $1\frac{1}{2}$

Problem: Express the sum of the lengths of the radius and the circumference of a circle with a diameter of $\frac{1}{4}$ as a common fraction in terms of π. *Answer:* $\frac{1+2\pi}{8}$

Problem: Express 20 divided by 12 as a mixed number. *Answer:* $1\frac{2}{3}$ *Unacceptable:* $1\frac{8}{12}$, $\frac{5}{3}$

Ratios should be expressed as simplified common fractions unless otherwise specified. Examples:

Simplified, Acceptable Forms: $\frac{7}{2}$, $\frac{3}{\pi}$, $\frac{4-\pi}{6}$ *Unacceptable:* $3\frac{1}{2}$, $\frac{\frac{1}{4}}{3}$, 3.5, 2:1

Radicals must be simplified. A simplified radical must satisfy: 1) no radicands have a factor which possesses the root indicated by the index; 2) no radicands contain fractions; and 3) no radicals appear in the denominator of a fraction. Numbers with fractional exponents are *not* in radical form. Examples:
Problem: Evaluate $\sqrt{15} \times \sqrt{5}$. *Answer:* $5\sqrt{3}$ *Unacceptable:* $\sqrt{75}$

Answers to problems asking for a response in the form of a dollar amount or an unspecified monetary unit (e.g., "How many dollars...," "How much will it cost...," "What is the amount of interest...") should be expressed in the form ($) *a.bc*, where *a* is an integer and *b* and *c* are digits. The *only* exceptions to this rule are when *a* is zero, in which case it may be omitted, or when *b* and *c* are both zero, in which case they may both be omitted. Examples:
Acceptable: 2.35, 0.38, .38, 5.00, 5 *Unacceptable:* 4.9, 8.0

Units of measurement are not required in answers, but they must be correct if given. When a problem asks for an answer expressed in a specific unit of measure or when a unit of measure is provided in the answer blank, equivalent answers expressed in other units are not acceptable. For example, if a problem asks for the number of ounces and 36 oz is the correct answer, 2 lb 4 oz will not be accepted. If a problem asks for the number of cents and 25 cents is the correct answer, $0.25 will not be accepted.

Do not make approximations for numbers (e.g., π, $\frac{2}{3}$, $5\sqrt{3}$) in the data given or in solutions unless the problem says to do so.

Do not do any intermediate rounding (other than the "rounding" a calculator performs) when calculating solutions. All rounding should be done at the end of the calculation process.

Scientific notation should be expressed in the form $a \times 10^n$ where *a* is a decimal, $1 \leq |a| < 10$, and *n* is an integer. Examples:
Problem: Write 6895 in scientific notation. *Answer:* 6.895×10^3
Problem: Write 40,000 in scientific notation. *Answer:* 4×10^4 *or* 4.0×10^4

An answer expressed to a greater or lesser degree of accuracy than called for in the problem will not be accepted. Whole-number answers should be expressed in their whole-number form.
Thus, 25.0 will not be accepted for 25, and 25 will not be accepted for 25.0.

The plural form of the units will always be provided in the answer blank, even if the answer appears to require the singular form of the units.

VOCABULARY AND FORMULAS

The following list is representative of terminology used in the problems but should not be viewed as all-inclusive. It is recommended that coaches review this list with their Mathletes.

absolute value
acute angle
additive inverse (opposite)
adjacent angles
algorithm
alternate exterior angles
alternate interior angles
altitude (height)
apex
area
arithmetic mean
arithmetic sequence
base 10
binary
bisect
box-and-whisker plot
center
chord
circle
circumference
circumscribe
coefficient
collinear
combination
common denominator
common divisor
common factor
common fraction
common multiple
complementary angles
composite number
compound interest
concentric
cone
congruent
convex
coordinate plane/system
coordinates of a point
coplanar
corresponding angles
counting numbers
counting principle
cube
cylinder
decagon
decimal
degree measure
denominator
diagonal of a polygon
diagonal of a polyhedron
diameter
difference
digit
digit-sum
direct variation
dividend
divisible
divisor
dodecagon
dodecahedron
domain of a function
edge
endpoint
equation
equiangular
equidistant
equilateral
evaluate
expected value
exponent
expression
exterior angle of a polygon
factor
factorial
finite
formula
frequency distribution
frustum
function
GCF
geometric mean
geometric sequence
height (altitude)
hemisphere
heptagon
hexagon
hypotenuse
image(s) of a point (points) (under a transformation)
improper fraction
inequality
infinite series
inscribe
integer
interior angle of a polygon
interquartile range
intersection
inverse variation
irrational number
isosceles
lateral edge
lateral surface area
lattice point(s)
LCM
linear equation
mean
median of a set of data
median of a triangle
midpoint
mixed number
mode(s) of a set of data
multiple
multiplicative inverse (reciprocal)
natural number
nonagon
numerator
obtuse angle
octagon
octahedron
odds (probability)
opposite of a number (additive inverse)
ordered pair
origin
palindrome
parallel
parallelogram
Pascal's triangle
pentagon
percent increase/decrease
perimeter
permutation
perpendicular
planar
polygon
polyhedron
prime factorization
prime number

principal square root
prism
probability
product
proper divisor
proper factor
proper fraction
proportion
pyramid
Pythagorean Triple
quadrant
quadrilateral
quotient
radius
random
range of a data set
range of a function
rate
ratio
rational number
ray
real number
reciprocal (multiplicative inverse)
rectangle
reflection
regular polygon
relatively prime
remainder
repeating decimal
revolution
rhombus
right angle
right circular cone
right circular cylinder
right polyhedron
right triangle
rotation
scalene triangle
scientific notation
sector
segment of a circle
segment of a line
semicircle
sequence
set
significant digits
similar figures
simple interest
slope
slope-intercept form
solution set
sphere
square
square root
stem-and-leaf plot
sum
supplementary angles
system of equations/inequalities
tangent figures
tangent line
term
terminating decimal
tetrahedron
total surface area
transformation
translation
trapezoid
triangle
triangular numbers
trisect
twin primes
union
unit fraction
variable
vertex
vertical angles
volume
whole number
x-axis
x-coordinate
x-intercept
y-axis
y-coordinate
y-intercept

The list of formulas below is representative of those needed to solve MATHCOUNTS problems but should not be viewed as the only formulas that may be used. Many other formulas that are useful in problem solving should be discovered and derived by Mathletes.

CIRCUMFERENCE

Circle $C = 2 \times \pi \times r = \pi \times d$

AREA

Square $A = s^2$

Rectangle $A = l \times w = b \times h$

Parallelogram $A = b \times h$

Trapezoid $A = \frac{1}{2}(b_1 + b_2) \times h$

Circle $A = \pi \times r^2$

Triangle $A = \frac{1}{2} \times b \times h$

Triangle $A = \sqrt{s(s-a)(s-b)(s-c)}$

Equilateral triangle $A = \dfrac{s^2\sqrt{3}}{4}$

Rhombus $A = \frac{1}{2} \times d_1 \times d_2$

SURFACE AREA AND VOLUME

Sphere $SA = 4 \times \pi \times r^2$

Sphere $V = \frac{4}{3} \times \pi \times r^3$

Rectangular prism $V = l \times w \times h$

Circular cylinder $V = \pi \times r^2 \times h$

Circular cone $V = \frac{1}{3} \times \pi \times r^2 \times h$

Pyramid $V = \frac{1}{3} \times B \times h$

Pythagorean Theorem $c^2 = a^2 + b^2$

Counting/Combinations ${}_nC_r = \dfrac{n!}{r!(n-r)!}$

MATHCOUNTS CLUB PROGRAM . . .
A MORE DETAILED LOOK

MATHCOUNTS recognizes that math clubs can play an important role in shaping students' attitudes and abilities. In an effort to support existing math clubs and their coaches, as well as encourage the formation of new math clubs, MATHCOUNTS offers the MATHCOUNTS Club Program (MCP).

Whether you are starting a new program or continuing a tradition of strong math clubs in your school, MATHCOUNTS understands the challenges involved in such a commitment. MATHCOUNTS also understands the meaningful rewards of coaching a math club and the strong impact you can have on students through organized math activities. The MATHCOUNTS Club Program is designed to provide schools with the structure and activities to hold regular meetings of a math club. Depending on the level of student and teacher involvement, a school may receive a recognition trophy or banner and be entered in a drawing for prizes.

The Club Program may be used by schools as a stand-alone program, a curriculum supplement for classroom work or part of the student preparation for the MATHCOUNTS Competition Program.

CLUB MATERIALS

When a school registers a club in the MATHCOUNTS Club Program, the school will be sent a Club in a Box Resource Kit, containing (1) the *Club Resource Guide,* which outlines structured club activities, (2) the Silver Level Status Packet, complete with five Silver Level Challenges for your students, (3) a game set to supplement an activity in the *Club Resource Guide*, (4) 12 MATHCOUNTS pencils and (5) a resource CD with five years' worth of MATHCOUNTS Club Program activities, activity sheets and solutions. Additionally, solutions to all Silver Level Challenges and an Ultimate Math Challenge will be made available online for use by math club students.

Be sure to take advantage of the Coaches' Resource Videos. The **Introduction to the Club in a Box Resource Kit** video will provide you with an overview of the materials in the Club in a Box Resource Kit. In addition, two more videos, **How to Become a Silver Level School in the MATHCOUNTS Club Program** and **How to Become a Gold Level School in the MATHCOUNTS Club Program,** explain the steps necessary for your school to achieve Silver Level and Gold Level Status in the Club Program. The videos can be accessed at www.mathcounts.org/videos or on the MATHCOUNTS YouTube page, which can be found at www.youtube.com/mathcounts.

The ***Club Resource Guide*** and the **Silver Level Challenges** are the backbone of the MCP. The *Club Resource Guide* contains 10 meeting activity ideas you can use as a basis for planning enjoyable, instructive get-togethers for your math club throughout the year. There is no particular order in which the meeting ideas must be used, and all activities are optional. In addition to the meeting ideas, five Silver Level Challenges are provided. Club sponsors should work these Challenges into their meeting plans, as completion of all five of these Challenges is required for Silver Level Status.

In addition to the materials sent in the Club in a Box Resource Kit, a special MCP Members Only page (www.mathcounts.org/mcp) will become available to any coach signing up a club in the MCP or registering students in the Competition Program. (Coaches Access is required to log in to this page. New coaches must first create a User ID and password by going to www.mathcounts.org/login and selecting New User Registration.) This web page provides solutions to all Silver Level Challenges (released one per month), over 50 meeting plans or ideas from previous years and all of the resources necessary to conduct any of the suggested meeting ideas.

GETTING STARTED

1. The MATHCOUNTS Club Program is open only to sixth-, seventh- and eighth-grade students in U.S.-based schools.

2. The club coach must complete and submit the MATHCOUNTS Registration Form to register the school's math club. Selecting Option 1 or Option 2 on this form will give your school Bronze Level Status, and it will be recognized on the MATHCOUNTS website. (The MATHCOUNTS Registration Form is available at the back of this book and online at www.mathcounts.org/club.)

3. Shortly after MATHCOUNTS receives your Registration Form, a hard copy of the *2012–2013 MATHCOUNTS School Handbook* and the Club in a Box Resource Kit will be sent to you.

4. Begin recruiting club members and spreading the word about your first club meeting. The *Club Resource Guide* included in the Club in a Box Resource Kit contains many helpful ideas for starting a club program.

5. Start using the handbook problems and materials in the Club in a Box Resource Kit with the students in your math club. Among other items, the Resource Kit includes structured club activities, the Silver Level Status Packet, pencils for your students and a game set that accompanies an activity in the *Club Resource Guide*.

6. Visit www.mathcounts.org/videos to view the new Coaches' Resource Videos. The **Introduction to the Club in a Box Resource Kit** video will provide you with an overview of the materials in the Club in a Box Resource Kit and how best to utilize them. Two more videos, **How to Become a Silver Level School in the MATHCOUNTS Club Program** and **How to Become a Gold Level School in the MATHCOUNTS Club Program**, explain the steps necessary for your school to achieve Silver Level and Gold Level Status in the Club Program. The videos can also be found on the MATHCOUNTS YouTube page at www.youtube.com/mathcounts.

ATTAINING SILVER LEVEL STATUS

1. Though it is hoped that more than 12* students will participate in your math club and tackle the Silver Level Challenges, your school must have at least 12* students who each complete all five of the Challenges. Silver Level Challenge solutions will be available each month from September through January.

2. Each of the Silver Level Challenges (and their answer keys) will be available on the MCP Members Only page in the Club Program section of www.mathcounts.org.

3. Once your school club has 12* students who have each fulfilled the Silver Level requirement of completing all five of the Silver Level Challenges, complete the Application for Silver Level Status with the names of those students and your contact information. This form is available in the Club in a Box Resource Kit, in the *Club Resource Guide* and on the MCP Members Only page of the MATHCOUNTS website.

4. Submit your Application for Silver Level Status via fax or mail using the information shown here. (Please submit your form only once.)

5. Deadline: Your Application for Silver Level Status must be received by March 1, 2013 for your school to be eligible for the prize drawing ($250 gift cards).

MATHCOUNTS Foundation
Silver Level - Club Program
1420 King Street
Alexandria, VA 22314
Fax: 703-299-5009

6. The winners of the drawing will be notified by April 26, 2013. A list of the winners will be posted online. MATHCOUNTS will send the prizes to the winners by April 26, 2013.

7. In May, MATHCOUNTS will send a trophy to all Silver Level Schools in recognition of their achievement.

**Minimum club participation based on number of students at your school. Please see Frequently Asked Questions on pages 57-58 for more information on Club Program eligibility.*

ATTAINING GOLD LEVEL STATUS

1. Your math club first must attain Silver Level Status in the Club Program.
2. Once a club has reached Silver Level Status, MATHCOUNTS will e-mail the coach the Ultimate Math Challenge. (The first e-mails will go out on February 8, 2013. Schools attaining Silver Level Status after this date will receive their Ultimate Math Challenge within one week of attaining Silver Level Status.)
3. Once your students have completed the Ultimate Math Challenge, mail students' completed Challenges (maximum of 20 per school) and the Application for Gold Level Status to the address shown here. More specific details and the Application for Gold Level Status will be provided when the Ultimate Math Challenge is e-mailed to the coach.

MATHCOUNTS Foundation
Gold Level - Club Program
1420 King Street
Alexandria, VA 22314

4. MATHCOUNTS will score the students' Ultimate Math Challenges and determine if your math club has attained Gold Level Status. Every math club member may take the Ultimate Math Challenge. However, no more than 20 completed Challenges per school may be submitted. At least 12* of the submitted Ultimate Math Challenges each must have 80% or more of the problems answered correctly for a school to attain Gold Level Status.
5. Deadline: Your Application for Gold Level Status and your students' completed Challenges must be received by March 29, 2013 for your school to be eligible for the prize drawing ($500 gift cards, trip to the National Competition).
6. The winners of the drawing will be notified by April 26, 2013. A list of the winners will be posted online. MATHCOUNTS will send the prizes to the winners by April 26, 2013.
7. In May, MATHCOUNTS will send a banner and a trophy to all Gold Level Schools in recognition of their achievement. (Gold Level Schools will not receive the Silver Level trophy, too.)

**Minimum club participation based on number of students at your school. Please see Frequently Asked Questions on pages 57-58 for more information on Club Program eligibility.*

FREQUENTLY ASKED QUESTIONS

Who is eligible to participate?
Anyone eligible for the MATHCOUNTS Competition Program is eligible to participate in the Club Program. The Club Program is open to all U.S. schools with sixth-, seventh- or eighth-grade students. Schools (brick-and-mortar, virtual and homeschools) with 12* or fewer students in each of the sixth, seventh and eighth grades are permitted to combine for the purpose of reaching Silver or Gold Level Status.

Can my enrichment and/or learning center participate?
No. The students can participate in Reel Math Challenge, but, only schools eligible for the MATHCOUNTS Competition Program can earn club prizes.

How many students can participate?
There is no limit to the number of students who may participate in the MATHCOUNTS Club Program. Encourage every interested sixth-, seventh- and eighth-grade student to get involved.

What if our school has more than one math club?
MATHCOUNTS encourages all math clubs in a school to make use of the MATHCOUNTS Club Program materials. However, each school may have only one officially registered club in the MATHCOUNTS Club Program. Therefore, it is recommended that schools combine their clubs when working toward meeting the requirements of Silver or Gold Level Status.

What does it cost to participate?
Nothing. There is no fee to participate in the Club Program. The *MATHCOUNTS School Handbook*, participation in Reel Math Challenge and the Club in a Box Resource Kit are free to all eligible schools that request them. For more information on Reel Math Challenge, visit www.reelmath.org.

Can a school participate in both the Club Program and the Competition Program?
Yes. A school may choose to participate in the Club Program, the Competition Program or both. Since these programs can complement each other, any school that registers for the MATHCOUNTS Competition Program (Option 2 on the MATHCOUNTS Registration Form) will automatically be signed up for the Club Program and will be sent the Club in a Box Resource Kit.

How is the Club Program different from the Competition Program?
The Club Program does not include a school-versus-school competition with the opportunity for top performers to advance. There are no fees to participate in the Club Program, and recognition is focused entirely on the school and the math club.

What if our school has a small student population?
The number of required participants in your club is based on the number of students at your school.

- For schools with **fewer than a *total* of 50 students** in the sixth, seventh and eighth grades, the minimum number of participants needed to satisfy the Silver and Gold Level requirements is **4**.
- For schools with **a *total* of 50-99 students** in the sixth, seventh and eighth grades, the minimum number of participants needed to satisfy the Silver and Gold Level requirements is **8**.
- For schools with **a *total* of 100 students or more** in the sixth, seventh and eighth grades, the minimum number of participants needed to satisfy the Silver and Gold Level requirements is **12**.

What are the different levels of the program?

Level	Requirements	School Receives
BRONZE	1. Choose Option 1 (Club Program) or Option 2 (Club Program and Competition Program) and fill in the required information on the MATHCOUNTS Registration Form (p. 91), in the *2012–2013 MATHCOUNTS School Handbook* or online at www.mathcounts.org. 2. Submit the form to MATHCOUNTS.	☐ Recognition on www.mathcounts.org ☐ Club in a Box Resource Kit containing hard copy of the *2012-2013 MATHCOUNTS School Handbook*
SILVER	1. Depending on the size of your school, at least 12* members of the math club each must take 5 Silver Level Challenges (available online and in the Silver Level Status Packet). 2. The Application for Silver Level Status must be received by MATHCOUNTS by March 1, 2013 (available in the Club in a Box Resource Kit, in the *Club Resource Guide* and on the MCP Members Only page in the Club Program section of www.mathcounts.org) for entry to drawings.	☐ Recognition on www.mathcounts.org ☐ Certificates for students ☐ Trophy identifying your school as a Silver Level MATHCOUNTS School ☐ Entry to a drawing** for one of ten $250 gift cards for student recognition ***Schools going on to reach Gold Level Status will be included in the Silver Level drawing but will receive only the Gold Level trophy.*
GOLD	1. Achieve Silver Level Status. 2. At least 12* members of the math club each must score 80% or higher on the Ultimate Math Challenge (available in February/e-mailed to coaches of Silver Level Schools). 3. The completed Ultimate Math Challenges and Application for Gold Level Status must be received by MATHCOUNTS by March 29, 2013. (Any number of students may take the Challenge, but a maximum of 20 completed Ultimate Challenges may be submitted per school.)	☐ Recognition on www.mathcounts.org ☐ Certificates for students ☐ Banner and trophy identifying your school as a Gold Level MATHCOUNTS School** ☐ Entry to a drawing for: 1) One of five $500 gift cards for student recognition 2) Grand Prize: $500 gift card for student recognition and a trip for four students and the coach to watch the 2013 Raytheon MATHCOUNTS National Competition in Washington, D.C. (May 10, 2013)

Minimum club participation based on number of students at your school. Please see page 57 for more information on Club Program eligibility.

REEL MATH CHALLENGE . . .
A MORE DETAILED LOOK

Reel Math Challenge is unique among MATHCOUNTS programs in that technology is a main component. Students must utilize technology to create videos on math problems and their associated concepts. Technological proficiency is a critical skill for the 21st century, and MATHCOUNTS hopes Reel Math Challenge will help students embrace the opportunity to create digital media with cutting-edge technology. This program is underwritten in part by the Department of Defense, making the program free and accessible to all participants.

Reel Math Challenge also offers students the opportunity to collaborate with students who are not in other MATHCOUNTS programs, as long as those students are in the sixth, seventh or eighth grade from eligible schools. Even if a school does not participate in other MATHCOUNTS programs, its students will be able to participate in Reel Math Challenge.

MATHCOUNTS hopes the Reel Math Challenge will not only excite students about math but also allow them to be creative and build their communications skills in a math setting. In addition, MATHCOUNTS hopes the opportunity for students to form their own teams will help them create lasting friendships with like-minded students.

DETAILS

Reel Math Challenge is a team competition. Only a team of four students may submit a video. Each video must be based on one of the Warm-Up or Workout problems included in the *2012-2013 MATHCOUNTS School Handbook* and must teach the solution to the selected math problem, as well as demonstrate the real-world application of the math concept used in the problem.

Once a video has been created, the team will need to visit www.reelmath.org to create a user name and password. A team does not need an official coach or teacher in charge of its video project; however, a parent or guardian of each of the four students must give permission for his or her child to participate in the contest. As a precondition of participation in the Reel Math Challenge, a parent or guardian will be required to execute a Release Form on behalf of each team participant.

Once the team has successfully registered, it will be able to upload a video. The submission period for videos opens in the fall and will remain open through February 28, 2013.

All videos will be posted to www.reelmath.org, where the general public will vote on the best videos. Public voting begins January 7, 2013 and will remain open through February 28, 2013. The top 20 videos with the highest vote totals will be announced in March. The top 20 videos will advance to the semifinals of the competition, after which a panel of MATHCOUNTS judges will review them and select four finalists.

Each of the four finalist teams will receive an all-expense-paid trip to the 2013 MATHCOUNTS National Competition, where they will present their videos to the 224 students competing in that event. The National Competition Mathletes then will vote for one of the four videos to be the winner of the Reel Math Challenge. Each member of the winning team will receive a $1000 college scholarship.

Once the winner has been decided and the contest has concluded, the website containing the archive of videos will remain available for public use at no charge.

Since these videos will be cross-referenced with specific MATHCOUNTS problems, and each MATHCOUNTS problem is indexed to specific math concepts and standards, this library of videos will be a powerful teaching tool for teachers and students to utilize for years.

Please visit www.reelmath.org for General Terms and Conditions.

ANSWERS

In addition to the answer, we have provided a difficulty rating for each problem. Our scale is 1-7, with 7 being the most difficult. These are only approximations, and how difficult a problem is for a particular student will vary. Below is a general guide to the ratings:

Difficulty 1/2/3 - One concept; one- to two-step solution; appropriate for students just starting the middle school curriculum.
4/5 - One or two concepts; multistep solution; knowledge of some middle school topics is necessary.
6/7 - Multiple and/or advanced concepts; multistep solution; knowledge of advanced middle school topics and/or problem-solving strategies is necessary.

Warm-Up 1

Answer	Difficulty	Answer	Difficulty
1. 75	(3)	6. 60	(2)
2. 1860	(2)	7. 0	(2)
3. 71	(2)	8. 30	(2)
4. 21	(2)	9. 335	(3)
5. 1.84	(3)	10. 33 or 33.00	(3)

Warm-Up 2

Answer	Difficulty	Answer	Difficulty
11. 10	(3)	16. 130,000	(3)
12. 33	(3)	17. 28	(2)
13. 9	(3)	18. 34	(1)
14. 13	(3)	19. 3	(3)
15. 1*	(3)	20. 133 or 133.00	(3)

Workout 1

Answer	Difficulty	Answer	Difficulty
21. 30.05	(2)	26. 7.6	(2)
22. 11	(2)	27. 10	(2)
23. 11	(3)	28. 3.35	(2)
24. 8	(3)	29. 93.6	(2)
25. 60	(2)	30. 60	(3)

Warm-Up 3

Answer	Difficulty	Answer	Difficulty
31. 10	(3)	36. 81	(2)
32. 0	(3)	37. 4	(3)
33. −5/8	(3)	38. 96	(3)
34. 153	(3)	39. 30	(2)
35. 75	(4)	40. 12	(3)

Warm-Up 4

Answer	Difficulty	Answer	Difficulty
41. 1/2	(3)	46. 148	(4)
42. 8056	(4)	47. 25	(3)
43. 0	(2)	48. 4	(3)
44. 20	(4)	49. 35	(2)
45. 6	(3)	50. 15	(2)

Workout 2

Answer	Difficulty	Answer	Difficulty
51. 22,500	(4)	56. 3600	(3)
52. 2182 or 2182.00	(2)	57. 28	(3)
53. 49	(4)	58. 8	(4)
54. 15	(4)	59. 11	(2)
55. 125.7	(4)	60. 65	(5)

** The plural form of the units is always provided in the answer blank, even if the answer appears to require the singular form of the units.*

Warm-Up 5

Answer	Difficulty		
61. 32	(2)	66. 2	(3)
62. 3	(3)	67. 3	(4)
63. $\sqrt{3}/2$	(5)	68. (1, −4)	(5)
64. 20	(5)	69. 90	(3)
65. −1	(3)	70. 12	(4)

Warm-Up 6

Answer	Difficulty		
71. 2	(2)	76. 7/12	(3)
72. 6	(3)	77. 8	(3)
73. $\sqrt{34}$	(3)	78. 30	(3)
74. −1/13	(3)	79. 6	(4)
75. 3	(4)	80. 6	(3)

Workout 3

Answer	Difficulty		
81. 38.4	(4)	86. 80	(3)
82. 23.5	(3)	87. −3	(3)
83. 14/31	(4)	88. 17	(3)
84. 3.16	(2)	89. 1.5	(4)
85. 72	(4)	90. 19	(2)

Warm-Up 7

Answer	Difficulty		
91. 20	(2)	96. $80\sqrt{2} - 80$	(5)
92. 12	(3)	97. 35	(3)
93. 16	(2)	98. 6	(4)
94. 24	(3)	99. DE	(5)
95. $6a^3b^4$	(3)	100. 1/2	(5)

Warm-Up 8

Answer	Difficulty		
101. 24	(3)	106. 601/625	(5)
102. 1/8	(4)	107. 21	(5)
103. 1/2	(5)	108. 150	(3)
104. 90	(4)	109. 1.5	(4)
105. 10	(3)	110. 19 or 19.00	(3)

Workout 4

Answer	Difficulty		
111. 90	(4)	116. 60	(3)
112. 20,000 or 20,000.00	(3)	117. 4/7	(5)
113. 9.6	(4)	118. 65,536	(4)
114. 11	(3)	119. 36	(4)
115. 2.4	(4)	120. 75	(4)

Warm-Up 9

Answer	Difficulty		
121. 4/15	(4)	126. 30	(3)
122. 62	(3)	127. $w/2$	(4)
123. 147	(3)	128. 45	(3)
124. 116	(3)	129. 3	(3)
125. 4	(5)	130. 8	(4)

Warm-Up 10

Answer	Difficulty		
131. 30	(4)	136. 24	(4)
132. 177	(2)	137. 0	(4)
133. $\pi - 2$	(4)	138. 5	(4)
134. 13	(5)	139. 504	(3)
135. 42	(5)	140. $5\sqrt{6}$	(4)

Workout 5

Answer	Difficulty		
141. 6	(5)	146. 384	(4)
142. 10.24	(3)	147. 8	(4)
143. 16.5	(4)	148. 69.76	(4)
144. 1600	(4)	149. 11	(4)
145. 2.69	(5)	150. 17	(5)

Warm-Up 11

Answer	Difficulty		
151. 24	(5)	156. 1/32	(4)
152. 15	(4)	157. 18	(4)
153. 7	(4)	158. 70	(3)
154. $-2\frac{1}{2}$	(4)	159. 1/3	(4)
155. 1/8	(4)	160. 27	(4)

Warm-Up 12

Answer	Difficulty		
161. 1/5	(4)	166. 1006/1007	(5)
162. 6	(4)	167. 18	(4)
163. 1/6	(4)	168. 3	(3)
164. $3a + b + c/12$	(3)	169. 2	(4)
165. 4/3	(5)	170. 60	(4)

Workout 6

Answer	Difficulty		
171. 15	(3)	176. 8	(3)
172. 5.12	(3)	177. 234	(3)
173. 16.45	(5)	178. 98	(5)
174. 11/204	(4)	179. 2422.50	(4)
175. 1.5	(4)	180. 2	(4)

Warm-Up 13

Answer	Difficulty		
181. 1520	(3)	186. 4/5	(4)
182. 39	(4)	187. 16	(3)
183. $24\sqrt{3}$	(4)	188. 72	(3)
184. 11	(5)	189. 4	(3)
185. 55,555	(4)	190. $6\sqrt{3}$	(4)

Warm-Up 14

Answer	Difficulty		
191. 12	(4)	196. 16	(4)
192. 1/4	(4)	197. 3	(4)
193. 288	(5)	198. 54	(4)
194. 7/6	(3)	199. 0	(5)
195. 15	(3)	200. 1331	(5)

Workout 7

Answer	Difficulty		
201. 7	(4)	206. 2.73	(4)
202. 15.52	(5)	207. 268.5	(5)
203. 31	(4)	208. 11	(4)
204. 16	(4)	209. 42.06	(5)
205. 20	(3)	210. 36	(4)

Warm-Up 15

Answer	Difficulty		
211. 3/8	(4)	216. 27	(3)
212. 22	(4)	217. 24	(4)
213. 12	(5)	218. 6/7	(4)
214. 11	(4)	219. $49x^2y^4$	(5)
215. 2	(6)	220. 110	(5)

Warm-Up 16

Answer	Difficulty		
221. 8	(3)	226. 30	(5)
222. 6	(4)	227. 240	(4)
223. 60	(4)	228. 44	(4)
224. 108	(4)	229. 23	(5)
225. 3/25	(5)	230. 160	(5)

Workout 8

Answer	Difficulty		
231. 14	(4)	236. 319	(3)
232. 10	(4)	237. 14,762.25	(4)
233. 0.56	(5)	238. 120	(4)
234. 14	(4)	239. 112/3	(5)
235. 3/7	(6)	240. 0.81	(5)

Warm-Up 17

Answer	Difficulty		
241. 5/3	(3)	246. 1/10	(4)
242. 9	(4)	247. 40.5	(3)
243. 180	(5)	248. 15	(4)
244. −116/195	(4)	249. 27/125	(5)
245. 35	(5)	250. 100	(5)

Warm-Up 18

Answer	Difficulty		
251. 75	(3)	256. 23	(4)
252. 6	(4)	257. 4	(5)
253. 50	(5)	258. 220	(5)
254. 8	(4)	259. 65	(7)
255. 17/20	(5)	260. 2012	(3)

Workout 9

Answer	Difficulty		
261. 3281	(5)	266. 16	(5)
262. 45	(5)	267. 2	(4)
263. 0	(3)	268. 54	(5)
264. 25	(4)	269. 30	(4)
265. 60.75	(5)	270. 34	(4)

Functions Stretch

Answer	Difficulty		
271. 7	(3)	276. −6	(3)
272. 6	(3)	277. 2	(3)
273. 6	(2)	278. 14	(4)
274. 4	(2)	279. 4	(4)
275. −3	(3)	280. $a = 6$, $b = 2$	(4)

Work Stretch

Answer	Difficulty		
281. 40	(3)	286. 100	(5)
282. 20	(4)	287. 106	(5)
283. 60	(4)	288. 6	(4)
284. 9:30	(5)	289. 18	(4)
285. 10:00	(5)	290. 3	(4)

Coordinate Geometry Stretch

Answer	Difficulty		
291. $(1, -\frac{7}{2})$	(3)	296. 7	(5)
292. $y = 2x - 1$	(4)	297. $y = \frac{5}{12}x + \frac{65}{6}$	(5)
293. $y = -\frac{3}{2}x - 9$	(4)	298. $y = -x + 7$	(6)
294. $y = 2x + 6$	(4)	299. $\sqrt{2}$	(6)
295. 0	(5)	300. $y = \frac{4}{3}x - 2$	(6)

MATHCOUNTS Problems Mapped to Common Core State Standards (CCSS)

Currently, 45 states have adopted the Common Core State Standards (CCSS). Because of this, MATHCOUNTS has concluded that it would be beneficial to teachers to see the connections between the CCSS and the *2012-2013 MATHCOUNTS School Handbook* problems. MATHCOUNTS not only has identified a general topic and assigned a difficulty level for each problem but also has provided a CCSS code in the Problem Index (pages 88-89). A complete list of the Common Core State Standards can be found at www.corestandards.org.

The CCSS for mathematics cover K-8 and high school courses. MATHCOUNTS problems are written to align with the NCTM Standards for Grades 6-8. As one would expect, there is great overlap between the two sets of standards. MATHCOUNTS also recognizes that in many school districts, algebra and geometry are taught in middle school, so some MATHCOUNTS problems also require skills taught in those courses.

In referring to the CCSS, the Problem Index code for each or the Standards for Mathematical Content for grades K-8 begins with the grade level. For the Standards for Mathematical Content for high school courses (such as algebra or geometry), each code begins with a letter to indicate the course name. The second part of each code indicates the domain within the grade level or course. Finally, the number of the individual standard within that domain follows. Here are two examples:

- *6.RP.3 → Standard #3 in the Ratios and Proportional Relationships domain of grade 6*
- *G-SRT.6 → Standard #6 in the Similarity, Right Triangles and Trigonometry domain of Geometry*

Some math concepts utilized in MATHCOUNTS problems are not specifically mentioned in the CCSS. Two examples are the Fundamental Counting Principle (FCP) and special right triangles. In cases like these, if a related standard could be identified, a code for that standard was used. For example, problems using the FCP were coded 7.SP.8, S-CP.8 or S-CP.9 depending on the context of the problem; SP → Statistics and Probability (the domain), S → Statistics and Probability (the course) and CP → Conditional Probability and the Rules of Probability. Problems based on special right triangles were given the code G-SRT.5 or G-SRT.6, explained above.

There are some MATHCOUNTS problems that either are based on math concepts outside the scope of the CCSS or based on concepts in the standards for grades K-5 but are obviously more difficult than a grade K-5 problem. When appropriate, these problems were given the code SMP for Standards for Mathematical Practice. The CCSS include the Standards for Mathematical Practice along with the Standards for Mathematical Content. The SMPs are (1) Make sense of problems and persevere in solving them; (2) Reason abstractly and quantitatively; (3) Construct viable arguments and critique the reasoning of others; (4) Model with mathematics; (5) Use appropriate tools strategically; (6) Attend to precision; (7) Look for and make use of structure and (8) Look for and express regularity in repeated reasoning.

PROBLEM INDEX

It is difficult to categorize many of the problems in the *MATHCOUNTS School Handbook*. It is very common for a MATHCOUNTS problem to straddle multiple categories and cover several concepts. This index is intended to be a helpful resource, but since each problem has been placed in exactly one category and mapped to exactly one Common Core State Standard (CCSS), the index is not perfect. In this index, the code **10 (3) 7.RP.3** refers to problem 10 with difficulty rating 3 mapped to CCSS 7.RP.3. For an explanation of the difficulty ratings refer to page 61. For an explanation of the CCCS codes refer to page 87.

Algebraic Expressions & Equations

14	(3)	8.EE.8
19	(3)	7.EE.4
27	(2)	6.EE.3
31	(3)	A-CED.1
42	(4)	A-SSE.2
47	(3)	6.EE.3
49	(2)	SMP
53	(4)	N-RN.1
58	(4)	8.EE.2
65	(3)	8.EE.1
72	(3)	A-SSE.3
84	(2)	7.EE.4
87	(3)	F-BF.3
92	(3)	A-SSE.2
98	(4)	8.EE.8
102	(4)	F-IF.8
109	(4)	A-SSE.2
117	(5)	A-CED.1
125	(5)	F-BF.3
126	(3)	8.EE.8
130	(4)	F-BF.3
135	(5)	6.EE.7
136	(4)	6.EE.7
137	(4)	A-REI.10
138	(4)	F-IF.2
145	(5)	SMP
159	(4)	8.EE.8
170	(4)	6.EE.7
171	(3)	SMP
175	(4)	A-SSE.3
178	(5)	A-SSE.2
188	(3)	A-APR.5
197	(4)	SMP
198	(4)	6.EE.7
216	(3)	8.G.8
222	(4)	SMP
223	(4)	A-SSE.2
232	(4)	7.EE.4
244	(4)	7.NS.3
254	(4)	A-SSE.2

*Functions Stretch

Percents & Fractions

18	(1)	6.NS.1
29	(2)	7.RP.3
56	(3)	7.RP.3
59	(2)	6.RP.3
82	(3)	7.RP.3
86	(3)	6.RP.3
91	(2)	6.RP.3
108	(3)	7.SP.3
112	(3)	7.RP.3
141	(5)	SMP
148	(4)	7.RP.3
150	(5)	7.NS.3
169	(4)	7.RP.1
172	(3)	7.RP.3
173	(5)	7.RP.3
204	(4)	6.RP.3
211	(4)	7.NS.3
221	(3)	SMP
237	(4)	7.RP.3
251	(5)	7.RP.3

Proportional Reasoning

2	(2)	4.0A.2
9	(3)	6.RP.3
20	(3)	7.NS.3
23	(3)	6.RP.3
50	(2)	7.RP.1
55	(4)	6.EE.9
62	(3)	6.RP.3
66	(3)	6.RP.3
78	(3)	6.RP.3
85	(4)	6.RP.3
88	(3)	6.RP.3
110	(3)	6.RP.3
120	(4)	6.RP.3
123	(3)	6.RP.1
144	(4)	6.RP.3
158	(3)	6.RP.3
167	(4)	6.EE.7
176	(3)	4.MD.2
180	(4)	6.RP.3
189	(3)	6.RP.3
195	(4)	6.RP.3
241	(3)	7.G.4
263	(3)	6.RP.3

*Work Stretch

Number Theory

6	(2)	6.RP.3
10	(3)	7.RP.3
11	(3)	4.OA.4
13	(3)	4.OA.4
16	(3)	S-CP.9
17	(2)	SMP
21	(2)	4.OA.3
22	(2)	4.OA.3
28	(2)	6.RP.1
32	(3)	7.NS.2
40	(3)	8.NS.1
43	(2)	7.NS.1
51	(4)	SMP
57	(3)	8.EE.1
75	(4)	3.0A.9
90	(2)	8.EE.1
99	(5)	SMP
101	(3)	N-RN.2
116	(3)	SMP
118	(4)	SMP
139	(3)	SMP
166	(5)	SMP
182	(4)	4.OA.4
185	(4)	6.SP.5
187	(3)	SMP
199	(5)	A-SSE.2
200	(5)	SMP
203	(4)	SMP
208	(4)	7.NS.2
231	(4)	SMP
238	(4)	SMP
242	(4)	SMP
252	(4)	SMP
260	(3)	SMP
267	(4)	SMP

Logic

37	(3)	SMP
67	(4)	SMP
105	(3)	SMP
132	(2)	SMP
196	(4)	SMP

Measurement

8	(2)	4.MD.3
26	(2)	6.RP.3
34	(3)	6.G.1
38	(3)	5.MD.1
69	(3)	7.G.5
73	(3)	G-SRT.6
89	(4)	6.RP.3
95	(3)	7.G.6
96	(5)	6.EE.7
113	(4)	7.G.1
122	(3)	6.G.1
142	(3)	4.OA.3
151	(5)	7.G.6
160	(4)	7.G.6
162	(4)	6.G.2
164	(3)	4.MD.2
184	(5)	7.G.6
194	(3)	SMP
207	(5)	G-CO.10
210	(4)	6.G.1
228	(4)	6.G.1
230	(5)	7.G.6
234	(4)	7.G.4
240	(5)	7.G.6
243	(5)	6.EE.9
253	(5)	6.EE.9
264	(4)	6.EE.7

Solid Geometry

24	(3)	6.G.2
46	(4)	7.G.6
79	(4)	SMP
140	(4)	8.G.7
146	(4)	7.G.6
165	(5)	6.G.4
192	(4)	8.G.9
202	(5)	7.G.6
219	(5)	7.G.6
227	(4)	7.G.6
249	(5)	8.G.9
262	(5)	8.G.9

Coordinate Geometry

33	(3)	8.EE.6
68	(5)	8.G.1
74	(3)	8.EE.6
154	(4)	8.F.5

*Coordinate Geometry Stretch

Sequences, Series & Patterns

4	(2)	4.0A.5
181	(3)	SMP
212	(4)	SMP
236	(3)	F-BF.2
258	(5)	7.G.6
261	(5)	SMP

Plane Geometry

1	(3)	4.G.2
15	(3)	6.G.1
30	(3)	4.MD.5
35	(4)	7.G.5
41	(3)	7.G.6
44	(4)	8.G.7
48	(3)	6.G.1
60	(5)	G-C.2
63	(5)	G-SRT.6
70	(4)	7.G.1
77	(3)	6.G.1
80	(3)	7.G.6
81	(4)	6.G.1
97	(3)	SMP
104	(4)	6.G.1
111	(4)	8.G.5
115	(4)	G-SRT.6
128	(3)	7.G.5
129	(3)	SMP
131	(4)	7.G.5
133	(4)	7.G.4
152	(4)	7.G.6
153	(4)	8.G.7
163	(4)	7.G.4
168	(3)	SMP
183	(4)	7.G.6
190	(4)	7.G.6
191	(4)	8.G.7
201	(4)	7.G.5
209	(5)	7.G.6
217	(4)	6.G.1
224	(4)	7.G.4
226	(5)	8.G.7
233	(5)	7.G.6
245	(5)	7.G.5
250	(5)	6.G.1
259	(7)	7.G.1
265	(5)	7.G.6
268	(5)	G-C.2
269	(4)	SMP

Problem Solving (Misc.)

5	(3)	4.0A.2
39	(2)	SMP
52	(2)	SMP
93	(2)	SMP
100	(5)	SMP
177	(3)	SMP
214	(4)	SMP
220	(5)	SMP
256	(4)	SMP
257	(3)	SMP
266	(5)	SMP

Probability, Counting & Combinatorics

7	(2)	7.SP.7
25	(2)	7.SP.8
45	(3)	SMP
54	(4)	S-CP.9
61	(2)	7.SP.8
64	(5)	S-CP.9
76	(3)	7.SP.7
83	(4)	7.SP.8
94	(3)	SMP
103	(5)	SMP
106	(5)	7.SP.5
114	(3)	SMP
119	(4)	SMP
121	(4)	7.SP.8
134	(5)	SMP
149	(4)	SMP
155	(4)	7.SP.8
156	(4)	7.SP.8
161	(4)	7.SP.8
174	(4)	7.SP.8
179	(4)	S-CP.9
186	(4)	7.SP.8
193	(5)	7.SP.8
205	(3)	SMP
218	(4)	7.SP.5
225	(5)	S-CP.9
235	(6)	7.SP.8
246	(4)	7.SP.8
248	(4)	SMP
255	(5)	A-REI.4
270	(4)	SMP

Statistics

3	(2)	4.0A.2
12	(3)	6.SP.4
36	(2)	6.SP.5
71	(2)	6.SP.5
107	(5)	6.SP.5
124	(3)	7.SP.1
127	(4)	SMP
143	(4)	6.SP.5
147	(4)	6.SP.5
157	(4)	6.RP.3
206	(4)	7.SP.1
213	(5)	6.SP.5
215	(6)	6.SP.5
229	(5)	6.SP.5
239	(5)	SMP
247	(3)	6.SP.5

MATHCOUNTS®

2012-2013 Club and Competition Program Registration

Why do you need this form?

- Register a Math Club and Receive the Club in a Box Resource Kit [*FREE*]
- Register Your School to Participate in the MATHCOUNTS Competition Program [*Competition Registration Deadline is Dec. 14, 2012*]

MATHCOUNTS CLUB PROGRAM

The **MATHCOUNTS Club Program (MCP)** may be used by schools as a stand-alone program, or it may be incorporated into preparation for the MATHCOUNTS Competition Program. The MCP provides schools with the structure and activities for regular meetings of a math club. Depending on the level of student and teacher involvement, a school may receive a recognition trophy or banner and may be entered in a drawing for prizes. Open to schools with sixth-, seventh- and eighth-grade students, the Club Program is free to all participants.

For the sixth year running, the grand prize in the Gold Level drawing is an all-expense-paid trip for the club coach and four students to watch the National Competition as our VIP guests. The 2013 Raytheon MATHCOUNTS National Competition will be held in Washington, D.C. All schools that have successfully completed the Ultimate Math Challenge by the **March 29, 2013 deadline** will attain Gold Level Status and will be entered in the grand-prize drawing.

MATHCOUNTS COMPETITION PROGRAM

MATHCOUNTS proudly presents the 30th consecutive year of the **MATHCOUNTS Competition Program,** consisting of a series of School, Local (Chapter), State and National Competitions. More than 6,000 schools from 56 U.S. states and territories will participate in this unique mathematical bee. The final 224 Mathletes® will travel to Washington, D.C. to compete for the prestigious title of National Champion at the 2013 Raytheon MATHCOUNTS National Competition, to be held May 10. Schools may register via www.mathcounts.org or on the following Registration Form.

Do not hold up the mailing of your Club in a Box Resource Kit because you are waiting for a purchase order to be processed or a check to be cut by your school for the registration fee. Process your Registration Form through your system, but send in a photocopy of it directly to MATHCOUNTS without payment. We immediately will mail your Club in a Box Resource Kit (which contains a hard copy of the *MATHCOUNTS School Handbook*) and credit your account once your payment is received with the original Registration Form.

Refer a colleague and save...

Turn to page 96 to learn how you can save on your registration fees!

MATHCOUNTS® REGISTRATION FORM: 2012-2013 School Year (HB)

Mail or fax this completed form to:
MATHCOUNTS Registration
P.O. Box 441, Annapolis Junction, MD 20701
Fax: 240-396-5602

Registration questions should be directed to the MATHCOUNTS Registration Office at 301-498-6141.

Competition Registration (Option 1) must include payment and be *postmarked* by Dec. 14, 2012 to avoid late fee.

Teacher/Coach's Name ______________________ Principal's Name ______________________

School Name ______________________ ☐ Previous MATHCOUNTS School

School Mailing Address ______________________

City, State ZIP ______________________ County/District ______________________

If your school is overseas: My school is a ☐ DoDDS OR ☐ State Department sponsored school. Country ______________

Teacher/Coach's Phone ______________________ MATHCOUNTS Chapter *(if known)* ______________________

Teacher/Coach's E-mail ______________________ Alternate E-mail ______________________

Please ship my materials to ☐ the School address above or ☐ the Alternate mailing address below.

Alternate Mailing Address ______________________

School Type ☐ Public ☐ Charter ☐ Religious ☐ Private ☐ Homeschool* ☐ Virtual*

PLEASE NOTE: Academic centers or enrichment programs that do not function as students' official school of record are not eligible to register.

**Must complete the Homeschool Participation Attestation Form to compete as individuals or a team in the MATHCOUNTS Competition Program. Forms are available at www.mathcounts.org/competition.*

How did you hear about MATHCOUNTS? ☐ Mailing ☐ Colleague ☐ Conference ☐ Internet Search ☐ Social Media ☐ Participated Previously ☐ Other ______________________

Total # of students in your math club: ______

Option 1 — Free!

☐ **REGISTER MY SCHOOL for the COMPETITION PROGRAM and the *FREE* MATHCOUNTS CLUB PROGRAM** *By checking the box, you agree to adhere to the rules of the MATHCOUNTS Competition Program and you attest to the school administration's permission to register students for MATHCOUNTS under this school''s name.*

Option 2 — Free!

☐ **REGISTER MY MATH CLUB for the *FREE* MATHCOUNTS CLUB PROGRAM** *By checking the box, you agree to adhere to the rules of the MATHCOUNTS Club Program.*

Option 1 — Free!

Competition Program Registration Fees

		Early Bird *postmarked by Nov. 16, 2012*	**Regular** *postmarked after Nov. 16, 2012*
☐ **Team Registration** *(max. of 1 team of up to 4 students)*	______ @ (0 or 1 team)	$90 = + $ ______	$100 = + $ ______
☐ **Individual Registration(s)** *(max. of 6 individuals not included on team)*	______ @ (0 - 6 ind.)	$25 = + $ ______	$30 = + $ ______
☐ **Title I Discount* (50%)** *(principal's signature required below to verify discount eligibility)*		− 50% = − $ ______ *	− 50% = − $ ______ *
☐ **Late Fee** *(only if postmarked after Dec. 14, 2012)*			$20 = + $ ______
	TOTAL DUE:	$ ________	$ ________

**Principal's signature is required for verifying that school qualifies for Title I discount:*

X ______________________

Payment: ☐ Check ☐ Money order ☐ Purchase order # __________ (p.o. must be included) ☐ Credit card

Name on card: ______________________ ☐ Visa ☐ MasterCard

Signature: ______________________ Card #: ______________________ Exp. ________

Make checks payable to the MATHCOUNTS Foundation. Payment must accompany this registration form. All registrations will be confirmed with an invoice indicating payment received or payment due. Invoices will be sent to the school address provided. If a purchase order is used, the invoice will be sent to the address on the purchase order. Payment for purchase orders must include a copy of the invoice. Registration confirmation may be obtained at www.mathcounts.org.

MATHCOUNTS Referral Program

Help us spread the word about MATHCOUNTS Programs! Refer a middle school not currently participating in the MATHCOUNTS Competition Program.

Over 90% of MATHCOUNTS coaches say they would refer MATHCOUNTS to a colleague. Why not take advantage of a referral and get a portion of your registration fees reimbursed? MATHCOUNTS is once again utilizing the referral program to encourage schools to register for the Competition Program.

If you know of a school that is not participating in the MATHCOUNTS Competition Program and should be, please enter the school information in the last section below. You may also send the coach to our registration link (www.mathcounts.org/competition). If the school you refer registers a team of four for the Competition Program, your school and the referred school each will receive a $10 refund on your teams' registration fees!* With enough successful referrals, your school could be reimbursed for its entire registration fee! *To qualify as a referred school, a school may not have participated in the MATHCOUNTS Competition Program for the previous two school years.*

Incentive for MATHCOUNTS Club Program Schools

Schools that have participated only in the MATHCOUNTS Club Program (and not in the Competition Program) may also take advantage of the incentive program. If you choose to register a team of four for the MATHCOUNTS Competition Program this school year, you will receive a refund of $10. Please check the appropriate box below indicating that (1) you were a MATHCOUNTS Club Program-only school in the past and (2) you are registering a team of four for the Competition Program this year.

Please check all that apply:

☐ **Previous** MATHCOUNTS Club Program-only school and would like to receive a $10 refund on my registration.

☐ **NEW** school that was **REFERRED** to MATHCOUNTS and would like to receive a $10 refund on my registration.

If you were referred, please provide the referring school name and teacher's name below so we may give proper credit.

School Name: ____

Teacher's Name: ____

☐ Returning school **REFERRING** another school.

Please list the school(s) you wish to refer. For each school listed below that registers a team, you will receive a $10 refund.

1
Teacher's Name ____
School Name ____
School Mailing Address *(if known)* ______________________________
City/State ____
E-mail ____

2
Teacher's Name ____
School Name ____
School Mailing Address *(if known)* ______________________________
City/State ____
E-mail ____

3
Teacher's Name ____
School Name ____
School Mailing Address *(if known)* ______________________________
City/State ____
E-mail ____

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*Refund not to exceed total amount of registration fees. Refunds will be distributed before the end of the MATHCOUNTS program year.