1. Write a number in the circle and square to make a true number sentence.

$\bigcirc - \square = 5$

2. In our class there are 5 boys and 4 girls. At a class party, we each had an ice cream cone with 2 scoops of ice cream. How many scoops of ice cream did we have altogether?

   Draw a picture to show how you got the answer.

3. Jimmy saw a spider on his sister's bed. If each spider has 8 legs, how many legs would 4 spiders have?

Spiders	Legs
1	8
2	16
3	
4	

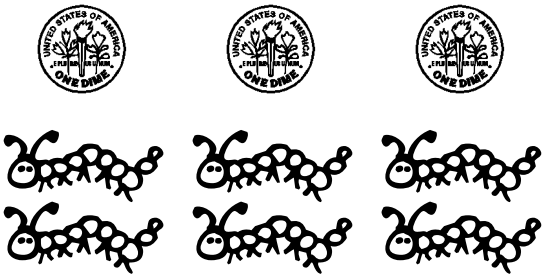
4. In a contest . . .

   - Team #1 earned 301 points
   - Team #2 earned 109 points
   - Team #3 earned 207 points

   What is the total number of points earned by the three teams?

   How many more points did Team #3 earn than Team #2?

   What is the difference between the number of points earned by Team #1 and Team #2?

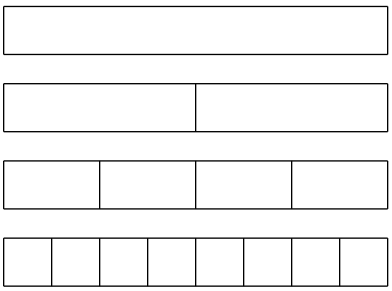
5. 

   Gordon wants to buy caterpillars to feed his box turtle. He can buy 6 caterpillars for 3 dimes.

   How many caterpillars can he buy with 1 dime?

   How many caterpillars can he buy for 5 dimes?

6. Use the fraction pieces to answer the following questions.



   One whole piece equals how many fourths?

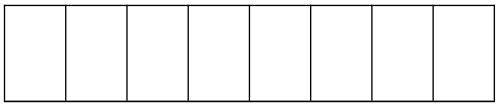
$1 = \frac{\square}{4}$

   One half equals how many eighths?

$\frac{1}{2} = \frac{\square}{8}$

7. Mrs. Cooley drew a fraction model and shaded $\frac{3}{4}$ of it.

Mrs. Cooley drew another fraction model. Shade it so that the fraction is the same as the first model.



Write a fraction for the shaded amount.

_____

8. Write the correct numbers to complete each fraction.

△ □ —— of the shapes are white

▼ ○ —— of the shapes are black

■ ▽ —— of the shapes are triangles

□ ● —— of the shapes are squares

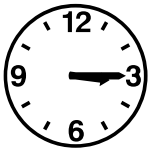
—— of the shapes are circles

9. Rewrite the addition sentence as a subtraction sentence.

8 + 22 = 30

_____

Write a story problem that could be solved with either the addition or subtraction sentence.

10. 

Tracy stopped reading at 3:15 in the afternoon. What are some other ways you can write this time?

11. The first clock shows when recess begins and the second clock shows when recess ends.

How many minutes long is recess?

The school day ends 1 hour and 20 minutes after recess. At what time does school end? Show your answer on the clock.

12. 40 students were surveyed to determine what type of transportation they used to get to school. The results are shown in the table.

Bus	8
Car	10
Walk	12
Bike	6
Other	4

Represent the data in the form of a pictograph.

13. Mr. Rivers poured water into 5 fish bowls. Then he put 3 orange fish into each bowl.

Draw the orange fish in each bowl.

_____ groups of _____ orange fish

Mr. Rivers bought 15 striped fish. He wants to divide the striped fish equally among the fish bowls.

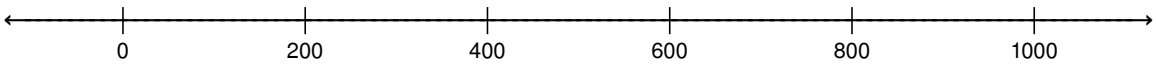
Draw the striped fish in each bowl.

_____ groups of _____ striped fish

Write two different number sentences to show how many fish in all.

14. Austin has 883 nickels in a jar.

a) Is 883 closer to 800 or 900 on the number line? Show this below.



b) Austin goes to the bank to exchange his nickels for $20 bills. How many $20 bills will he get? How many nickels will be left over?

c) Austin asks for as many $1 bills as possible for his leftover nickels. How many $1 bills will he get?

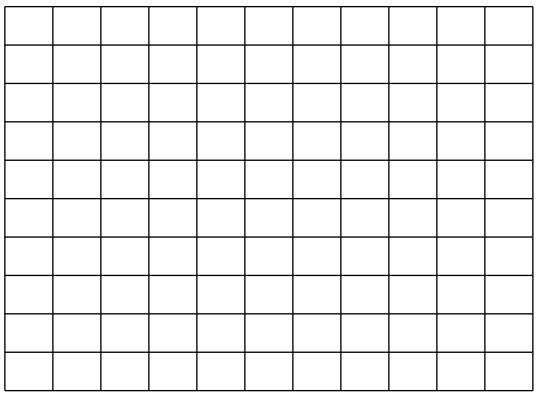
d) Austin goes home and puts his remaining nickels in the jar. How many more nickels does he need before he can exchange them all for a $5 bill?

15. Estimate the length of the line below to the nearest half-inch. Then use a ruler to measure the line to the nearest quarter-inch. How close was your estimate?

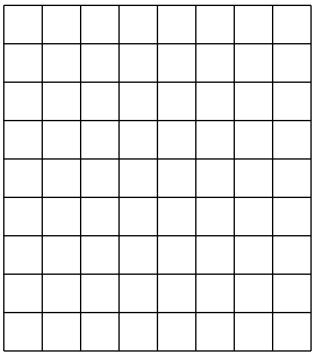
16. Use the data in the table to make a bar graph.

Favorite Ice Cream

	Number of Students
Chocolate	50
Mint Chip	10
Rocky Road	15
Strawberry	25
Vanilla	40

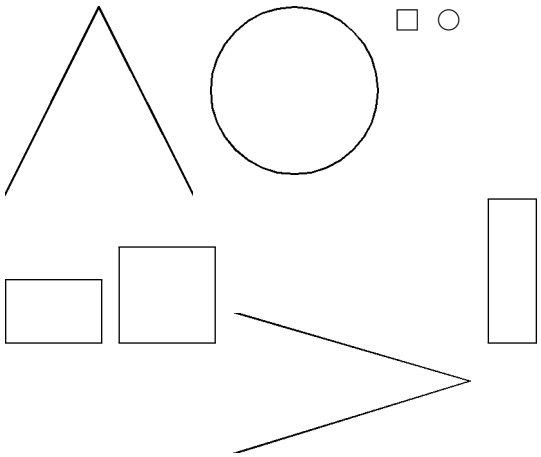


17. Michael's teacher gave him the grid paper below. He made a design inside of it that had a perimeter of 14 units. What could he have drawn? (Draw a figure that has a perimeter of 14 units.)



18. Does this hold more, less, or the same as 1 liter?

19. In what ways could you sort these shapes?



20. What Am I?

I have four sides.

I have opposite sides parallel.

I have four right angles.

Problem-Attic Sample Document
all items from CCSS Math Database

CCSS Math Samples

1.
Objective: 3.NBT.02

2.
Objective: 3.OA.08

3.
Objective: 3.OA.09

4.
Objective: 3.OA.08

5.
Objective: 3.OA.08

6.
Objective: 3.NF.03B

7.
Objective: 3.NF.03B

8.
Objective: 3.NF.01

9.
Objective: 3.NBT.02

10.
Objective: 3.MD.01

11.
Objective: 3.MD.01

12.
Objective: 3.MD.03

13.
Objective: 3.OA.01

14.
Objective: 3.NBT.01

15.
Objective: 3.MD.04

16.
Objective: 3.MD.03

17.
Objective: 3.MD.08

18.
Objective: 3.MD.02

19.
Objective: 3.G.01

20.
Objective: 3.G.01

1. Complete the pattern and give the rule.

   11, 22, ____, 44, ____

   To complete the following pattern, follow this rule:

   "double the previous number"

   5, ____, ____, ____, ____

2. This table shows how many books the Second Grade classrooms collected for a book sale.

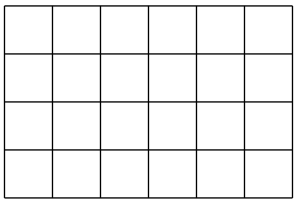
Classroom	Math	Reading	Science	History
#34	18	19	20	17
#35	15	13	9	16
#36	10	14	7	11

   Which room collected the fewest Science books?

   Which room collected the most books altogether?

3. Justin caught 51 fish in 3 days. He spent over 5 hours each day fishing with a friend. He caught the same number of fish each day. How many fish did he catch on the last day?

4. The school ordered 23 boxes of dry erase markers. Each box contains 1 dozen markers. What is the total number of markers the school ordered?

5. 

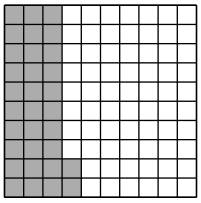
   The picture shows one way to arrange 24 small squares into a rectangular pattern.

   There are other ways to arrange 24 squares in a rectangular pattern. Draw as many of these arrangements as you can.

   Write a multiplication sentence for each arrangement that shows the total is always 24.

   Find the perimeter of each rectangle. Which has the smallest and which has the largest perimeter?

6. Write a fraction and a decimal for the shaded part of the region.



7. Lucinda has $0.25 in her pocket. On a hundredths mat, build a model for the amount of money Lucinda has. How is the number written as a fraction? Use a decimal manipulative to build a model.

8. Draw a picture to represent the mixed number.

   $1\frac{3}{4}$

9. A ribbon is cut into three pieces.

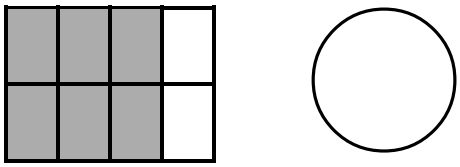
   Tao's piece is $\frac{1}{2}$ yard.

   Alissa's piece is $\frac{5}{16}$ yard.

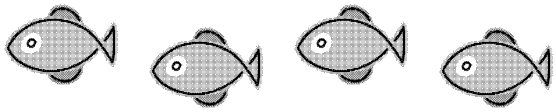
   Sean's piece is $\frac{7}{8}$ yard.

   Compare the lengths of the three pieces of ribbon. Use the symbols >, <, and =. Draw number lines, diagrams, or pictures to help you. Label your work. How do you know that your comparison is correct? Explain.

10. Look at the shaded section of the rectangle. Shade the same portion of the circle.



11. A group of fish is swimming together in a lake.



Red Yellow Yellow Yellow

   What part of this group is yellow?

   If two more red fish join the group, what fraction will be yellow?

12. The high school band members sold 1,020 rolls of wrapping paper, and they sold 1,200 gift bags. Did they sell more wrapping paper or more gift bags? Show your answer with base 10 blocks.

13. a) Choose five different digits between '0' and '9'. Using those digits, make the largest number that you can.

   ___ ___ ___ ___ ___

   b) Now round your number to the nearest:

   TEN _____

   HUNDRED _____

   THOUSAND _____

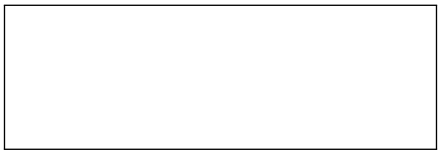
   TEN-THOUSAND _____

   c) With the same five digits as above, change their order to make the smallest number.

   ___ ___ ___ ___ ___

   d) Explain how your numbers in parts a and c are different. What pattern do you see for the largest and smallest numbers?

14. Find the perimeter of the rectangle to the nearest $\frac{1}{8}$ inch. Also label the rectangle showing the length and width.



15. Discuss with a partner the following statements. If the statement is reasonable, write "OK" next to it. If not, re-write the statement in a way that makes it reasonable. (You can change either the object or the measurement.)

   a) A complete rotation is 180°

   b) An adult male is 1500 cm tall

   c) A gallon container of orange juice is about 3.77 liters

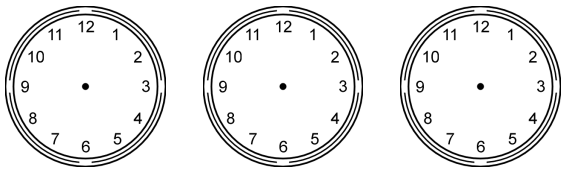
   d) An infant weighs about 20 kilograms

   e) A pencil is approximately 0.6 meters long

16. Use a ruler and draw a line 6.3 cm.

Divide the line into three equal parts. How long is each part?

17.



_____ _____ _____

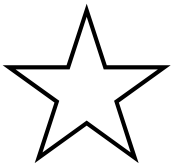
_____ _____ _____

a) On the clocks above, draw in the minute and hour hands to show a right angle, an acute angle, and an obtuse angle.

b) Below each clock, give the name of the angle you drew and tell what time each clock shows.

c) Use mathematical vocabulary to describe each of the 3 angles.

18. Draw a line of symmetry on the star. Is there more than one line of symmetry?



19. Room #1
Daily Schedule

Activity	Time
Reading	8:00
Recess	9:30
Writing	9:45
Math	10:30
Lunch	11:30
Social Science	12:15
Science	1:00
Computer	2:00
Art	2:30
School's out	3:00

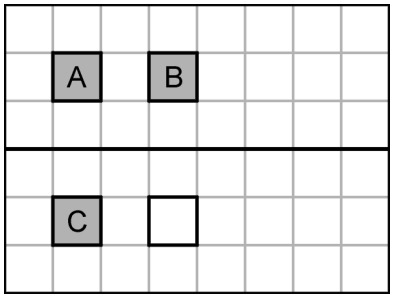
How many minutes do students in Room #1 have for lunch?

What is the total amount of time for Reading and Writing?

If a student is tutored after school until 4:30, how long is the school day altogether?

20. If this graph paper were folded on the dark line, which lettered square would go on top of the empty white square?

How would you fold the graph paper so that the "C" square goes on top of the empty white square? Show your answer with a thick dotted line.



Problem-Attic Sample Document
all items from CCSS Math Database

Grade 4

1.
Objective: 4.OA.05

2.
Objective: 4.OA.03

3.
Objective: 4.OA.03

4.
Objective: 4.OA.02

5.
Objective: 4.OA.03

6.
Objective: 4.NF.06

7.
Objective: 4.NF.06

8.
Objective: 4.NF.03B

9.
Objective: 4.NF.02

10.
Objective: 4.NF.01

11.
Objective: 4.NF.01

12.
Objective: 4.NBT.02

13.
Objective: 4.NBT.03

14.
Objective: 4.MD.03

15.
Objective: 4.MD.02

16.
Objective: 4.MD.01

17.
Objective: 4.G.01

18.
Objective: 4.G.03

19.
Objective: 4.MD.02

20.
Objective: 4.G.03

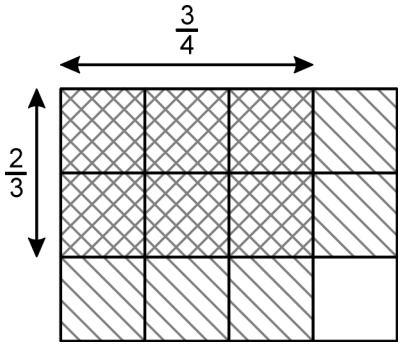
1. Find the missing numbers in the Input/Output table. Explain the rule you followed.

Input	Output
2	12
3	18
4	24
5	30
6	
8	
9	
10	

Make 2 more Input/Output tables, each following a different rule, and each with at least 4 rows. Write the rule next to each table.

2. In order to solve the problem $4(5 + 7)$, Sandy first added $5 + 7$ and then multiplied the sum by 4. Brian first multiplied 4×5 and 4×7, then added the two products together. The teacher told both students that their solution was correct. Explain why both students were correct?

3. Write the multiplication sentence modeled below.



Draw a model to illustrate the product $\frac{1}{2} \times \frac{3}{5}$. Explain your model.

4. Cash and Sawyer bought a bucket of worms for fishing. One day, the boys used $\frac{1}{5}$ of the bucket. They put the bucket in the refrigerator overnight. The next day they used $\frac{1}{6}$ of the bucket.

$$\frac{1}{5} + \frac{1}{6}$$

What fraction of the bucket of worms did they use in all? Use a common denominator and show how you came up with your answer.

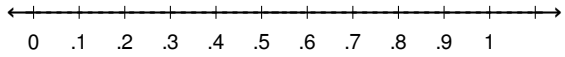
5. At the cafeteria, LaShonda bought a medium drink and a sandwich for a total of $4.35. Describe the change she might be given if she pays with a $5.00 bill.

6. Marc has 207 markers and 236 colored pencils in a large container. He wants to put an equal number of markers into 18 different boxes. How many markers will he have in each box?

7. The number 1,248 is divisible by six single digit numbers. What are they?

8. Model this addition problem on the number line.

$0.4 + 0.3 =$



9. Fill in the missing numbers in the factor tree.

600

$2 \times$ _____

$2 \times 2 \times$ _____

$2 \times 2 \times 2 \times$ _____

$2 \times 2 \times 2 \times 3 \times$ _____

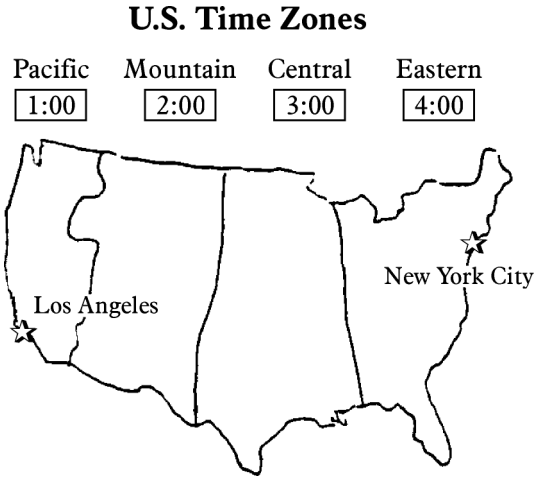
$2 \times 2 \times 2 \times 3 \times 5 \times$ _____

10. Using the digits 3, 5 and 7, write a number between 0.357 and 0.753. Use each digit only once.

0.____ ____ ____

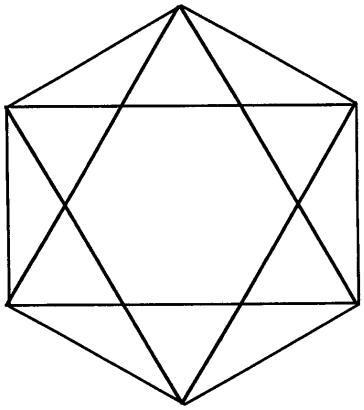
11. José cut 1-meter board into five equal pieces. How long is each piece in centimeters?

12. Based on the map, what is the time in Los Angeles when it's 10:30 am in New York City?

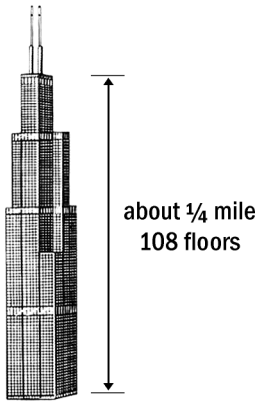


13. The dimensions of a brick are $2'' \times 3'' \times 4''$. How many bricks are needed to have a total volume of exactly 2 cubic feet?

14. Name and draw at least six different polygons that are contained in the figure below.



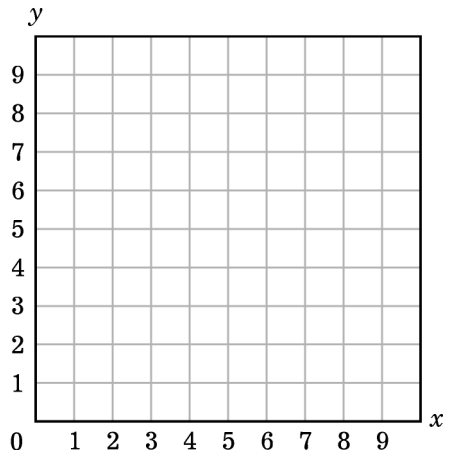
15. One of the tallest buildings in the world is the Willis Tower in Chicago. (It used to be named the Sears Tower.) There is an observation deck at the top which is approximately one-quarter mile above the ground. How many feet is that?



People argue about how many floors are in the Willis Tower. It has 108 floors when counted by a standard method. It has 110 floors when the roof and a mechanical platform are included. Using either number, calculate the average distance from one floor to the next. If you round your answer to the nearest tenth of a foot, does it matter whether you use 108 or 110 floors in your calculation? Explain.

16. Graph and label the following pairs of coordinates.

Point	x	y
A	3	4
B	6	3
C	5	8
D	8	7



If you connect points to form segments AB, BC, CD and DA, what shape do you get? Justify your answer.

Problem-Attic Sample Document
all items from CCSS Math Database

Grade 5

1.
Objective: 5.OA.03

2.
Objective: 5.OA.01

3.
Objective: 5.NF.04A

4.
Objective: 5.NF.01

5.
Objective: 5.NBT.07

6.
Objective: 5.NBT.06

7.
Objective: 5.NBT.06

8.
Objective: 5.NBT.07

9.
Objective: 5.NBT.05

10.
Objective: 5.NBT.03B

11.
Objective: 5.MD.01

12.
Objective: 5.MD.01

13.
Objective: 5.MD.01

14.
Objective: 5.G.04

15.
Objective: 5.MD.01

16.
Objective: 5.G.02

1. Here is a group of numbers:

   8.2 25.0 12.5 52 2.25
   4.0 112 200 0.05

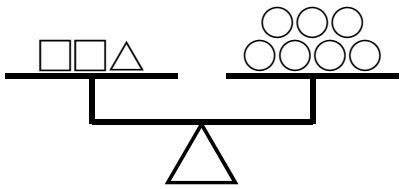
   Find two numbers in the group which, when multiplied together, would result in an *integer* between 10 and 100. Explain how you chose the numbers.

2. Insert one pair of parentheses, ( ), in order to make each statement true.

   a) $64 \div 4 \times 2 + 6 = 14$

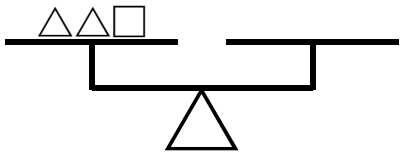
   b) $50 \times 3 \div 6 - 1 = 30$

3. The objects on the scale below make it balance exactly.



   According to the scale, if △ balances ○○○, then □ balances how many circles?

   Using the relationship you discovered above, if △△□ are on the left side, how many circles would be needed on the right side for the scale to balance?



4. Look at this equation:

$$\frac{A+B}{2} = C$$

   Find three different numbers that you could substitute for the letters, given these restrictions: $A \neq 0$, $B > 3$ and C is even.

5. Name the exponent, n, that will make each of the following true.

   a) $2 \times 3^n \times 5 = 90$

   b) $2^n \times 3 \times 5 = 120$

   c) $7^n \times 17 = 119$

   d) $2^n \times 3^n \times 5^n = 900$

6. You can convert a temperature from Fahrenheit to Celsius with this formula:

$$C = \tfrac{5}{9}(F - 32)$$

   The following temperatures are in Fahrenheit. Convert them to Celsius. Round your answers to the nearest degree.

   a) 164°

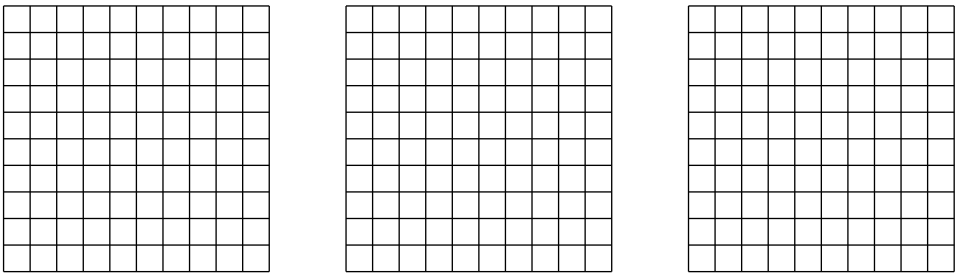
   b) 23°

   c) 101°

   d) 75°

7. Each grid below represents the number 1. Shade the grids to show these fractions:

70% $\frac{3}{4}$ 0.65

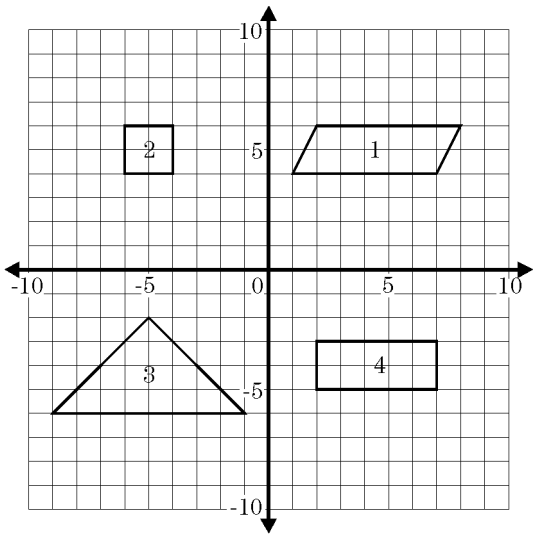


8. If n pencils cost c cents, write an expression in terms of n and c for:

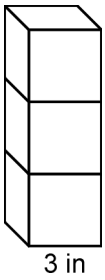
   a) the cost of 1 pencil

   b) the cost of p pencils

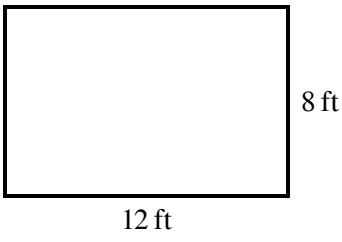
9. Which of the figures has the greatest area? Explain your answer.



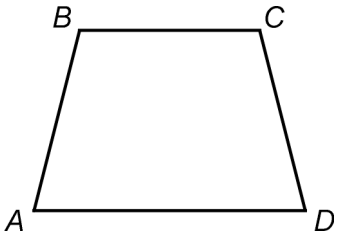
10. If you stack three cubes one on top of the other, what is the surface area of the tower of cubes? Assume each cube has 3 inch sides.



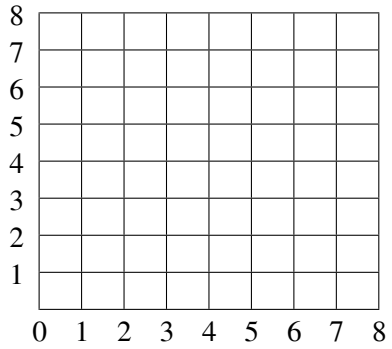
11. Anthony wants to plant a garden where the length to width ratio is 5 : 2. If he already has a plot that is 12 feet long by 8 feet wide, how much must he add to the length to get the desired ratio?



12. Look at the trapezoid.



On the grid below, draw the same trapezoid so that B has the coordinates $(2, 6)$, D has the coordinates $(7, 1)$, the length of $\overline{BC}$ is 4, and the length of $\overline{AD}$ is 6.



What are the coordinators of A and C?

What is the area of the trapezoid?

13. A jet flew 5,668 miles. If it was in the air for 13 hours, what was its average speed?

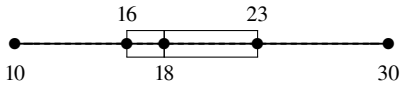
At the same speed, approximately how long would it take to go 3,500 miles?

14. Sam's heart beats 80 times a minute. Approximately how many times does his heart beat in 10 seconds?

When Sam is sleeping, his heart slows down to about 50 beats per minute. If Sam is awake for 16 hours and asleep for 8 hours, what is the total number of times his heart beats in a day?

15. According to the latest data, there are 128,000 students enrolled in the state's community college system. The average age of a student is 29, but half of all the students are under the age of 24. Give an explanation of how this is possible.

16. Write down a data set with eight numbers that corresponds to the box and whisker graph.



17. Andrea's math test scores are 93, 95, 76, 88 and 93.

    a) State the average (mean), median and mode of the test scores.

    b) Andrea wants an average score of at least 90. What is the lowest score she can get on the next test to achieve her goal?

18. A meteorologist determines the average daily low temperature for the week by adding the following temperatures:

$$\{3,\ 10,\ -5,\ -13,\ 2,\ 1,\ -4\}$$

The meteorologist comes up with an average of 5.6. Explain why that result is not reasonable. What mistake do you think the meteorologist made when calculating the average?

Problem-Attic Sample Document
all items from CCSS Math Database

Grade 6

1.
Objective: 6.NS.03

2.
Objective: 6.EE.02C

3.
Objective: 6.EE.05

4.
Objective: 6.EE.05

5.
Objective: 6.EE.01

6.
Objective: 6.EE.02C

7.
Objective: 6.RP.03C

8.
Objective: 6.EE.02A

9.
Objective: 6.G.01

10.
Objective: 6.G.04

11.
Objective: 6.RP.01

12.
Objective: 6.G.03

13.
Objective: 6.RP.03B

14.
Objective: 6.RP.03D

15.
Objective: 6.SP.03

16.
Objective: 6.SP.04

17.
Objective: 6.SP.05C

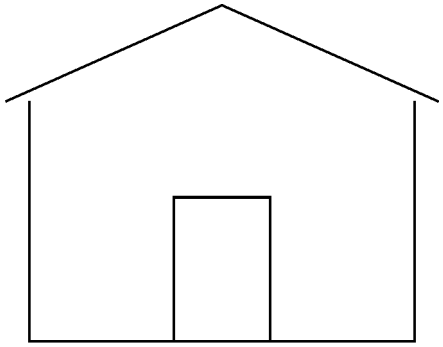
18.
Objective: 6.SP.05B

1. At gift shop, there are four kinds of scented candles:

vanilla	\$2.29
lavender	\$1.96
apple spice	\$2.15
sea breeze	\$2.30

Erica has exactly \$11.00 to spend. She wants to purchase at least one of each scented candle. If she spends all of her money, then which type of candle can she purchase more than one of?

2. Zoe is planning to build a shed. She wants it to be 10 feet wide with 3.5 feet on each side of the door. In a scale drawing of the shed, $\frac{1}{2}$ inch equals one foot. How wide will the door of her shed be in real life? How wide will it be in the scale drawing?



3. A box has dimensions of $2 \times 3 \times 4$ feet. A similar box has dimensions of $4 \times 6 \times 8$ feet. Compare the surface areas and volumes of the two boxes.

4. Given:

$A = -3 - (-9) - 2$
$B = 16 - 32$
$C = -41 - 12 - (-16)$

a) What is the value of $A + B + C$?

b) How much greater is B than C?

c) What is the value of $(A - B) - C$?

5. Use $<$, $>$, and $=$ to compare the values.

25% ◯ $\frac{3}{8}$

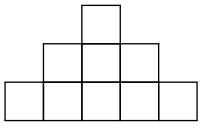
0.4 ◯ $\frac{1}{2}$

75% ◯ $\frac{9}{16}$

110% ◯ 1.2

6. If $10^{15} - 1$ is written out with all of its digits, what is the sum of all of the digits?

7. Nine 1-cm cubes are stacked in the pattern below. What is the total surface area of the resulting object?


(side view)

8. Bricklayers use the formula $N = 7LH$ to determine how many bricks they will need to build a wall. N is the total number of bricks needed, L the is length of the wall, and H is the height of the wall.

   a) How many bricks will be needed to build a wall 8 feet high and 35 feet long?

   b) A bricklayer has 1820 bricks. He needs to build a wall 30 feet long. How tall can the wall be?

   c) A brick weighs 1.75 pounds. If a wall is 5 feet high and 12 feet long, what would be the weight of all the bricks in the wall?

   d) A bricklayer needs to build a wall 4 feet high and 25 feet long. He has $1680 to buy bricks. How much can he spend on each brick?

---

9. Insert one set of parentheses in the expression below so that the result equals -1.

$$\frac{5 - 2 \times 1}{2^2 - 7 \times 1}$$

10. At a supermarket, Marcel buys 3 jars of strawberry jam for $5.91. What is the unit price?

    The jam is delivered to the supermarket in cases that contain 24 jars. If Marcel bought a whole case, what would it cost him?

    The supermarket makes a profit of 40% on strawberry jam. What is the wholesale price of a case? (Wholesale price is what the supermarket pays.)

11. Explain how the result of $x + |x|$ is different depending upon whether x is positive or negative?

12. Complete the table.

A	-96	8		-702	7.67	-40
B	-4	-56	-14			$2\frac{2}{3}$
$A \div B$			16	-39	-1.3	

13. An airplane traveling at 13,000 feet makes a climb of 5,000 feet followed by a descent of 3,000 feet. Represent the plane's final altitude as a sum of positive and negative integers.

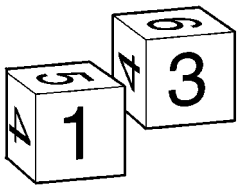
14. At 9:00 am on super-sale day at Clothing City, Amy saw the coat she wants priced at $65. Amy has only $46. Every hour the price on coats will be reduced 10% from the previous hour's price. At what time will Amy be able to buy the coat for $46 or less, provided the coat is still available?

15. Fred is conducting a survey in order to determine the type of movie young adults like to see. His survey included all ages and both males and females. What suggestion would you give Fred in order to make sure that his survey will be accurate and reliable?

16. Pablo is practicing for the annual horseshoe throwing competition. He typically makes 2 out of 5 shots. To simulate his horseshoe throwing ability, Pablo uses 2 dimes and 3 nickels. What do the three nickels represent?

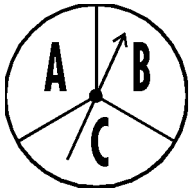
17. You and a friend are playing a game with number cubes. (The faces are numbered 1 through 6). You roll 2 cubes and you find the product of the two numbers. If the product is *even*, you win. If the product is *odd*, your friend wins.

    If you roll the cubes just once, who has the better chance of winning, you or your friend? Justify your answer.



18. An experiment consists of selecting three cards at random from a deck of 52 cards and recording the color of each. List the simple events associated with this experiment.

19. 



    A coin is tossed and the spinner is spun. List all the possible outcomes.

20. Ed and Fred were each asked independently to write down one of these three numbers: 1, 2 or 3.

    What is the probability...

    a) they each write down the same number?

    b) they each write down the number 1?

    c) the sum of their numbers is 4?

Problem-Attic Sample Document
all items from CCSS Math Database

Grade 7

1.
Objective: 7.EE.03

2.
Objective: 7.G.01

3.
Objective: 7.G.06

4.
Objective: 7.NS.03

5.
Objective: 7.NS.02D

6.
Objective: 7.NS.03

7.
Objective: 7.G.06

8.
Objective: 7.EE.03

9.
Objective: 7.NS.03

10.
Objective: 7.RP.02B

11.
Objective: 7.NS.01B

12.
Objective: 7.NS.03

13.
Objective: 7.NS.01C

14.
Objective: 7.RP.03

15.
Objective: 7.SP.01

16.
Objective: 7.SP.07B

17.
Objective: 7.SP.08A

18.
Objective: 7.SP.07B

19.
Objective: 7.SP.08B

20.
Objective: 7.SP.08B

1. Explain why the quantity x^2 is always be positive, but $\sqrt{x^2}$ can result in a positive or negative value for x.

2. Find the square roots:

   $\sqrt{400}$

   $\sqrt{0.49}$

   $\sqrt{\frac{4}{9}}$

   $\sqrt{5^{10}}$

3. x dollars is invested at $x\%$ simple interest for 1 year and earns \$81 interest. What is the value of x?

4. How many zeros are in the number $\left(\left(6.1 \times 10^7\right)^9\right)^2$, when it is written without powers and without scientific notation?

5. Write an equation of the line that passes through the point $(1, -2)$ and whose slope is $\frac{2}{3}$.

6. Consider $5x - 2y = 30$. As x decreases by k units, what is the resulting change in y?

7. Make up a word problem that the following setup could represent. Tell what kind of quantities you're working with, and solve the problem.

quantity #1	x
quantity #2	$3x - 5$
total of the two quantities	53

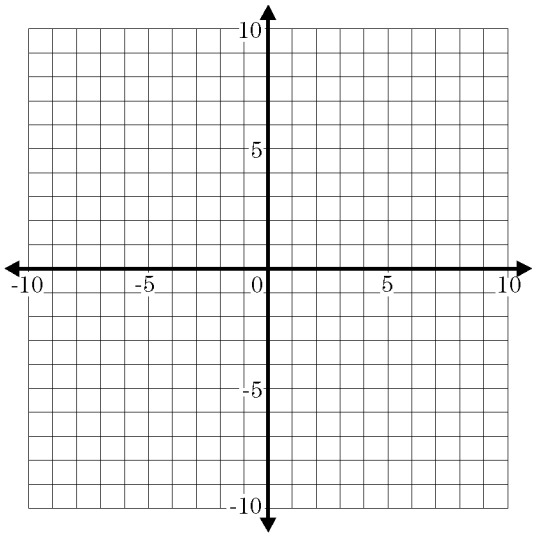
8. At what point do the following lines intersect?

$$3x - 4y = 28$$
$$-2x + 11 = 5y$$

9. The high school athletic director knows that 70% of the people who attend basketball games are students and 30% are adults. Approximately 7,500 people will attend basketball games this year. The athletic director wants to achieve an average ticket price of \$2.50 a ticket.

   Your job is to come up with an admission price for students and adults based on this information. Use a table or graph if it will help. Explain how you determined the admission price and why the procedure you used is appropriate.

10. Graph the equation $y = 5x - 3$ for the interval $x = -3$ to $x = 1$.



11. If $(2, y)$ is the solution to the equation

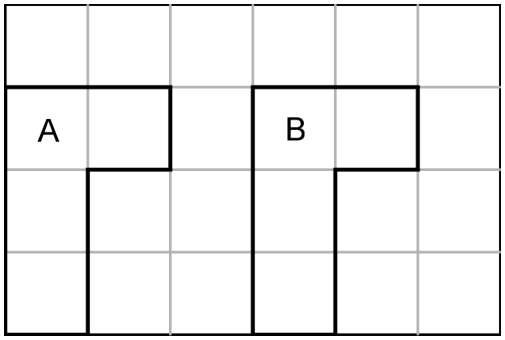
$$x + 3y = 14,$$

what is the value of y?

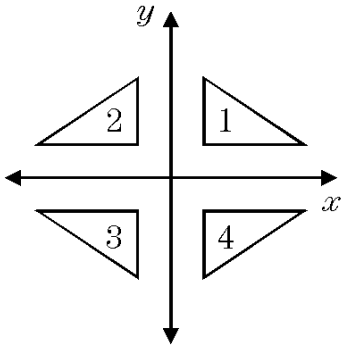
12. Express 0.3666... as a number in the form $\frac{a}{b}$ where a and b are integers.

13. A linear relationship exists such that $y = 65$ when $x = 7$, and an increase of 1 in x always produces an increase of 8 in y. What is the equation for this relationship?

14. Use the figures to determine if figure A was flipped, slid or turned to form figure B.

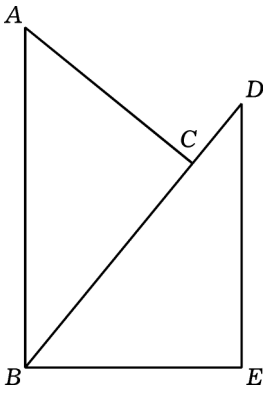


15. In the accompanying diagram, what is the image of triangle 2 after a reflection in the y-axis and a rotation of 180° about the origin?



16. In the accompanying diagram, $\overline{AB} \parallel \overline{DE}$, $\overline{AB} \perp \overline{BE}$ and $\overline{AC} \perp \overline{BD}$.

If $m\angle A = 35$, find the measure of $\angle D$.

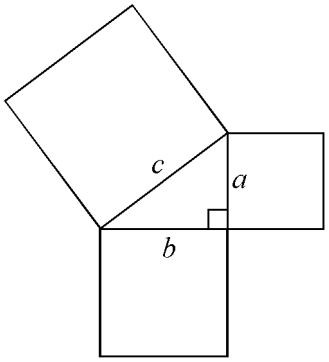


17. The following are different representations of the Pythagorean Theorem:

I. $a^2 + b^2 = c^2$

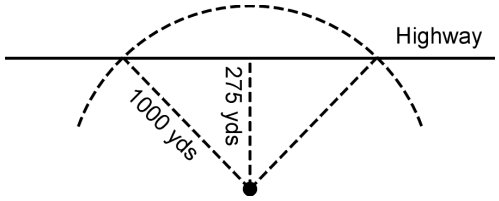
II. In any right triangle, the area of the square whose side is the hypotenuse is equal to the sum of the areas of the squares whose sides are the two legs.

III.



Imagine you had a friend who does know the Pythagorean Theorem. Explain how you would use each representation to communicate the idea and why it would be effective.

18. A low-power radio station with a range of 1000 yards is used to broadcast traffic advisory messages. The transmitter is located 275 yards off a straight stretch of the highway.



a) What length of highway is within range of the transmitter?

b) If cars usually travel between 55 mph and 60 mph along this stretch of the highway, what limit should be put on the length of the advisories to insure they can be heard entirely by someone driving on the highway? Explain or show how you arrived at your answer.

19. Find the exact distance between the points $A(3, -1)$ and $B(-4, -2)$.

What is the midpoint of $\overline{AB}$

What is the slope of $\overline{AB}$?

A line through A and B contains the point $(10, k)$. What is the value of k?

20. A cone has a height of 12 inches and a radius of 5 inches at its base.

a) Find the volume of a similar cone if each of the dimensions is one-third that of the orginal cone. Round to the nearest hundredth of an inch.

b) If the height is doubled and the radius is halved, what happens to the volume?

21. Separate the numbers below into the most specific of these groups:

integers

rational numbers

irrational numbers

real numbers

$$8 \quad 2\tfrac{1}{3} \quad -4 \quad \pi \quad 0.010010001...$$
$$|-3| \quad 0.8 \quad \sqrt{31}$$

22. Lisa has the job of buying doughnuts for a school fund raiser. A local bakery sells doughnuts at the following prices.

Number	Cost
6	\$1.35
10	\$2.15
14	\$2.95
18	\$3.75

a) Draw a graph for the information in the table.

b) What is the slope of the graph?

c) What is the real world meaning of the slope?

d) What is the y-intercept of the graph?

e) Another bakery sells doughnuts according to the data in the table below. Use the graph to determine which number of doughnuts is the best deal.

Number	Cost
4	\$1.00
8	\$1.70
12	\$2.50
24	\$5.00

Problem-Attic Sample Document
all items from CCSS Math Database

Grade 8

1.
Objective: 8.EE.02

2.
Objective: 8.EE.02

3.
Objective: 8.EE.02

4.
Objective: 8.EE.04

5.
Objective: 8.EE.06

6.
Objective: 8.EE.06

7.
Objective: 8.EE.07B

8.
Objective: 8.EE.08A

9.
Objective: 8.EE.08C

10.
Objective: 8.F.03

11.
Objective: 8.F.03

12.
Objective: 8.NS.01

13.
Objective: 8.F.04

14.
Objective: 8.G.01

15.
Objective: 8.G.03

16.
Objective: 8.G.05

17.
Objective: 8.G.06

18.
Objective: 8.G.07

19.
Objective: 8.G.08

20.
Objective: 8.G.09

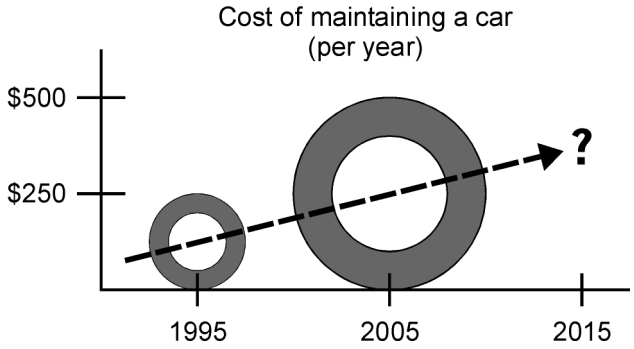
21.
Objective: 8.NS.01

22.
Objective: 8.SP.03

1. The equation $x^3 - 5x^2 + 8x - C = 0$ has one real root. If $(1 + i)$ is a root, find the value of the real root.

2. How many imaginary roots has the equation $x^5 + x^3 + 1 = 0$?

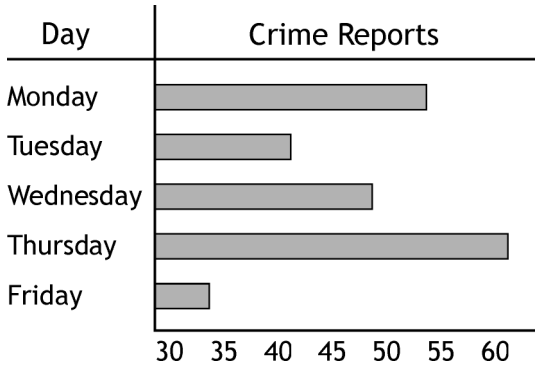
3. The graph below is misleading for several reasons. Tell why it is misleading and suggest some ways to improve it.



Assume the annual cost of maintaining a car was $250 in 1995, the cost doubled over the next 10 years, and the cost is expected to double again by 2015. Draw a bar or line graph which accurately shows this information.

Is it reasonable to assume that the annual cost of maintaining a car was $125 in the year 1985, or $62.50 in the year 1975? Explain.

4. Here is a graph published in the local paper in a section called *Police Blotter*:



a) What impression does the graph convey? Why?

b) Draw a new histogram using the range 0 to 100 as the horizontal scale.

c) What are some reasonable conclusions you can draw from the new histogram?

5. Find the sum of the pair of complex numbers:

$$4\sqrt{2} - 3i, \quad 9\sqrt{2} - i$$

6. Solve for x and y:

$$i(1 - yi) = 4 + 2xi$$

7. Express in simplest form:

a) $\sqrt{60} - 6\sqrt{\frac{5}{3}}$

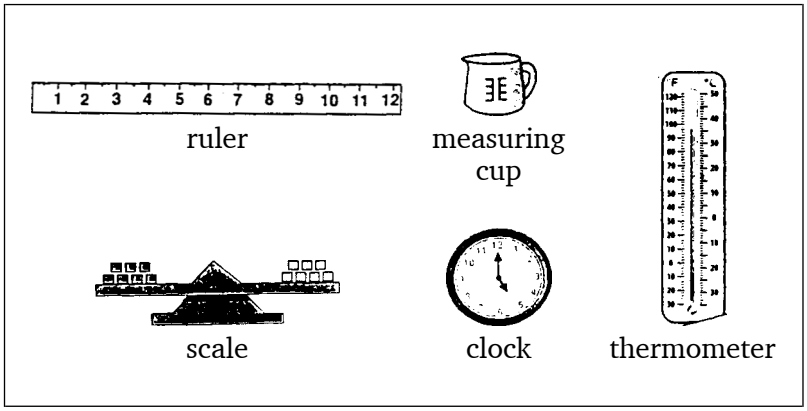
b) $\dfrac{2\sqrt{3} + 3\sqrt{2}}{\sqrt{8} - \sqrt{12}}$

c) $\sqrt{\dfrac{25x^5}{y^3}}$

8. You cut strips of cloth for a swimsuit company. Each strip must be cut to the nearest $\frac{1}{16}$th of an inch or it will not be acceptable.

If you told to cut 8-cm strips, determine to the nearest millimeter what are the shortest and longest pieces that are acceptable.

9. It has often been said that "your measurement is only as good as the tool you are using." Explain what this phrase means. Use at least two of the measuring tools below as examples.



10. Find the exact value of $128^{-\frac{2}{7}}$

11. If $10^{0.845} \approx 7$, then what is the (approximate) value of $10^{1.69}$?

12. Find the value of $(2a)^0 + a^{-\frac{1}{2}}$ when $a = 9$.

13. Explain why $1.2\overline{34} + 5.\overline{7}$ is rational.

14. Two forces of 5 pounds and 12 pounds act upon a body at an angle of 90° with each other. Find in pounds the magnitude of the resultant.

15. A woman drives 30 km north, then 5 km west, then 2 km south to her final destination. To two decimal places, how far is she from her starting point?

16. Find the multiplicative inverse of $\begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$.

17. If $\begin{vmatrix} a & 1 & 0 \\ 2 & 1 & 1 \\ 1 & 3 & 1 \end{vmatrix} = 0$, find the value of a.

18. Do all matrices have multiplicative inverses? Explain.

19. Use the two matrices to determine if the following statements are true or false.

$$A = \begin{bmatrix} 5 & 7 & 1 \\ 4 & 9 & 5 \end{bmatrix} \qquad B = \begin{bmatrix} 7 & 6 \\ 3 & 4 \\ 9 & 8 \end{bmatrix}$$

a) $A + B = B + A$ (Commutative law for matrix addition)

b) $AB = BA$ (Commutative law for matrix multiplication)

c) Comment on the results of part a) and b)

20. The following table gives the number of males and females who visited three different store locations in 2012.

	Males	Females
Location I	450	875
Location II	500	375
Location III	1025	1100

a) Create a 3×2 matrix A whose elements are the 2002 figures.

b) The company predicts that the 2013 figures will be given by $1.2A = B$. Determine the matrix (B) for the 2013 figures.

c) Determine a new matrix C = B – A and explain what this matrix represents.

Problem-Attic Sample Document
all items from CCSS Math Database

HS Number and Quantity

1.
Objective: N.CN.08

2.
Objective: N.CN.09

3.
Objective: N.Q.01

4.
Objective: N.Q.01

5.
Objective: N.CN.02

6.
Objective: N.CN.02

7.
Objective: N.RN.02

8.
Objective: N.Q.03

9.
Objective: N.Q.03

10.
Objective: N.RN.02

11.
Objective: N.RN.02

12.
Objective: N.RN.02

13.
Objective: N.RN.03

14.
Objective: N.VM.03

15.
Objective: N.VM.03

16.
Objective: N.VM.10

17.
Objective: N.VM.12

18.
Objective: N.VM.10

19.
Objective: N.VM.08

20.
Objective: N.VM.08

1. If $x - 2$ is a factor of $x^3 + hx + 10$, find the value of h.

2. A root of $x^3 + x^2 - 24 = 0$ lies between 2 and 3. Find this root to the *nearest integer*.

3. Express $\frac{3}{1-x} - \frac{2}{x}$ as a single fraction in simplest form.

4. If $\frac{x-y}{y} = 7.1$, then what is the value of $\frac{x}{y}$?

5. Write the equation or equations that would be used to solve each of the following problems. In each case state what the letter or letters represent. *Solutions of the equations is not required.*

   a) A motorboat travels 15 miles up a river and immediately returns to the starting point. The round trip takes 4 hours. If the rate of the motorboat in still water is 8 miles per hour, find the rate of the current of the river.

   b) How many ounces of a 50% acid solution should be combined with 20 ounces of pure acid to change it to an 80% acid solution?

   c) It took 12 people 5 hours to build an airstrip. If 4 more people had been hired to work at the same rate, how many hours would the job have taken?

6. A truck rental company charges a fixed \$25 plus a variable amount based on the number of miles driven. For the first 100 miles, the cost is 20¢ per mile. After that, the cost is 40¢ per mile.

   a) Sketch a graph of the total cost vs. number of miles.

   b) On your graph, show the cost of renting a truck for a 200-mile trip.

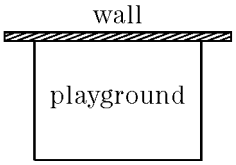
   c) What is the maximum distance you can go in the truck and spend less than \$200?

7. Given:

   - x varies directly with the square of y
   - x is 3 when y is 4

   Find x when y is 6.

8. People planning a children's playground want to save on the cost of fencing it by positioning the playground against a wall of a building so that one side will not need to be fenced. The playground has to be a rectangle $400\,\text{m}^2$ in area. What dimensions should they choose for the playground in order to use the least amount of fencing?



9. Solve for a: $\frac{3}{2a-1} + 2 = \frac{9}{2a-1}$

10. Solve: $5\sqrt{x+2} = 3\sqrt{x-3}$

11. A scientist's research involves studying how new medicines affect the production of antibodies in the bloodstream. The research involves two different case studies.

In Case Study 1, the researcher begins with 100 antibodies, adds a medicine, and finds that the number of antibodies increases by 20 each day.

In Case Study 2, the researcher begins with 100 antibodies, adds a different medicine, and finds that the number of antibodies increases by 20 percent each day.

a) A partially-completed table for each case study is shown below. Complete the tables.

Case Study 1	
number of days	*number of antibodies*
–	100
1	120
2	
3	
4	
5	
6	
7	

Case Study 2	
number of days	*number of antibodies*
–	100
1	120
2	144
3	
4	
5	
6	
7	

b) For each case study, write an equation that relates the number of antibodies (A) to the number of days (d) since adding the medicine.

Case 1: _____Case 2: _____

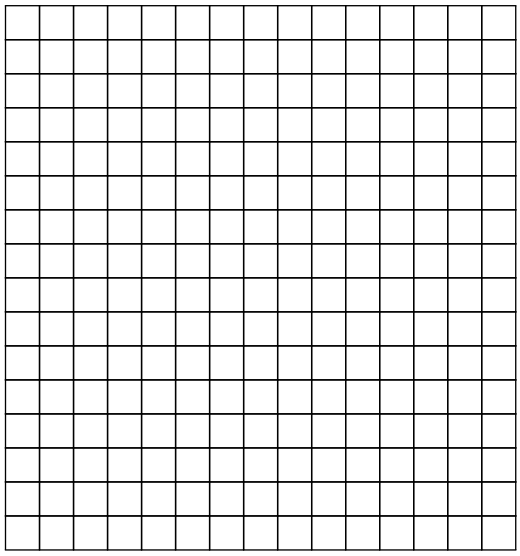
c) Assuming the growth continues at the same rate, predict the number of antibodies at the end of the 25th day for Case 1.

d) Sketch a graph of Case Study 2 for 7 days. Be sure to label the axes, identify the scales, and title the graph.

12. The Ride Right Cab Company charges \$2.15, plus \$0.50 per mile for a cab ride. The Flyer Cab Company charges \$1.25, plus \$0.65 per mile.

a) For each company, write an equation that represents the total cost of a cab ride. Let t be the total cost of the cab ride and m be the number of miles driven.

b) On the grid provided, graph the equations you wrote. Be sure to clearly label your scale and axes.



c) For what distance would the cost of a cab ride be the same for both companies? What is that cost?

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13. Consider the following set of instructions:

- Pick a number.
- Double it.
- Add 7.
- Double this result.
- Add 1.
- Add your original number.
- Divide by 5.
- Subtract 3.

Use algebra to show what must always happen no matter what number you start with.

14. Solve: $|2x + 4| \geq x$

15. Put $y = (x + 8)(x - 2)$ into the form $a(x - h)^2 + k$.

16. Solve for the variable and answer to two decimal places:

a) $(4x + 5)^2 = 84$

b) $(4x)^2 + 5 = 84$

c) $(4x)^2 + 5^2 = 84$

d) $[4(x + 5)]^2 = 84$

17. Find the value of the discriminant of and write the number and the nature of the roots of $8x^2 - 9x - \frac{1}{2} = 0$.

18. A business can manufacture 50 bicycles a week and sell them all for \$200 each. The owner is considering increasing the price of the bikes, but she knows that it will decrease sales. She uses this equation to estimate how much in dollars, y, she will make if he raises the price by x dollars.

$$y = 10000 + 50x - x^2$$

If she wants to make \$10400 what is the least amount she can raise the price of each bike?

19. Write in determinant form an equation of the line through the points $(3, 2)$ and $(-1, 0)$.

20. Consider the graphs of $\frac{x^2}{4} + \frac{y^2}{25} = 1$ and $y = x^2 - 5$. What are the points of intersection?

21. Given: $\sqrt{x} - \frac{1}{\sqrt{x}} = 4$

What is the value of $x^2 + \frac{1}{x^2}$?

22. Divide $\left(-6a^8b + 3a^4b^2 - 12a^4b^3\right)$ by $-3a^4b$. Assume $a,\ b \neq 0$.

23. Factor $xy^2 - y^3 - 4x + 4y$ completely.

24. For what values of k is $x^2 + x - k$ factorable over the set of integers?

Problem-Attic Sample Document
all items from CCSS Math Database

HS Algebra

1.
Objective: A.APR.02

2.
Objective: A.APR.03

3.
Objective: A.APR.07

4.
Objective: A.APR.07

5.
Objective: A.CED.01

6.
Objective: A.CED.02

7.
Objective: A.CED.02

8.
Objective: A.CED.03

9.
Objective: A.REI.02

10.
Objective: A.REI.02

11.
Objective: A.CED.02

12.
Objective: A.CED.03

13.
Objective: A.REI.01

14.
Objective: A.REI.03

15.
Objective: A.REI.04A

16.
Objective: A.REI.04B

17.
Objective: A.REI.04B

18.
Objective: A.REI.04B

19.
Objective: A.REI.08

20.
Objective: A.REI.11

21.
Objective: A.SSE.01B

22.
Objective: A.SSE.02

23.
Objective: A.SSE.02

24.
Objective: A.SSE.03B

1. The graph of an absolute value function contains the points $(-4, 11)$, $(0, 11)$, $(1, 14)$ and $(4, 23)$. What is the equation of the graph?

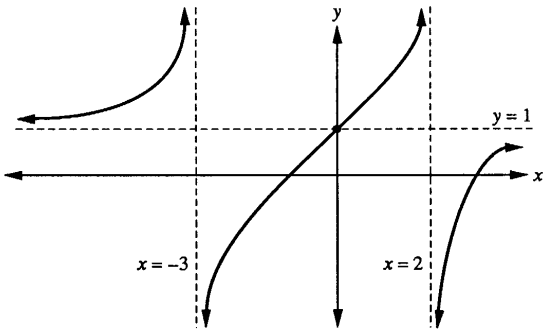
2. In still water, a barge can go one 1 mile every 15 minutes.

   a) What is the speed of the barge in miles per hour?

   b) Write an expression for the distance the boat travels upriver in h hours, against a current whose speed is r miles per hour.

   c) Write an expression for the distance the boat travels downriver in the same amount of time and with the same current as in part b.

   d) What is the *average* of the expressions in part b and part c? Explain.

3. 

   Write an equation for the rational function whose graph is shown above.

4. What transformation takes $y = f(x)$ to $y = -\frac{1}{2}f(x - 8) + 3$?

5. Solve for x: $4^{\frac{3x}{2}} = 2^{x+4}$

6. Consider the statement: The difference of the squares of any two consecutive odd integers is exactly divisible by 8.

   a) Show that the above statement is true for 7 and 9, which are consecutive odd integers.

   b) If n is any integer, then $2n + 1$ must represent an odd integer. What expression represents the next consecutive odd integer?

   c) Express in terms of n the difference of the squares of the consecutive odd integers in part b.

   d) Show that the difference of the squares in part c is exactly divisible by 8.

7. Given $f(x) = 3^x$, find the value of each of the following.

   a) $[f(x)]^2$

   b) $f(x^2)$

   c) $f[f(x)]$

   d) $f\left[f\left(\frac{1}{x}\right)\right]$

   e) $f\left[\frac{1}{f(x)}\right]$

8. Given the series $\sum_{k=1}^{4}(5-2k)$.

   a) Write the series in expanded form.

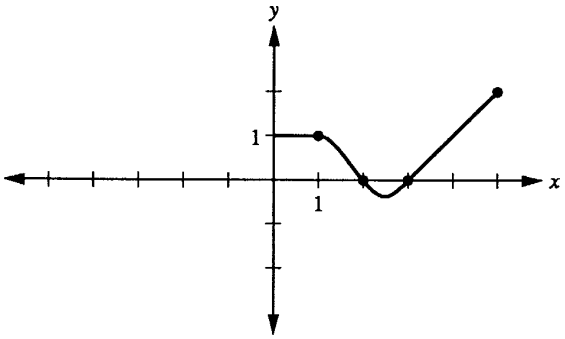
   b) Evaluate the series.

9. Graph the solution: $|3x-1|<2$

10. Graph $f(x)=\begin{cases}-3 & \text{if } x<0\\ -1 & \text{if } x=0\\ x & \text{if } x>0\end{cases}$

11. Graph: $(x-2)^2+(y+5)^2=36$

12.



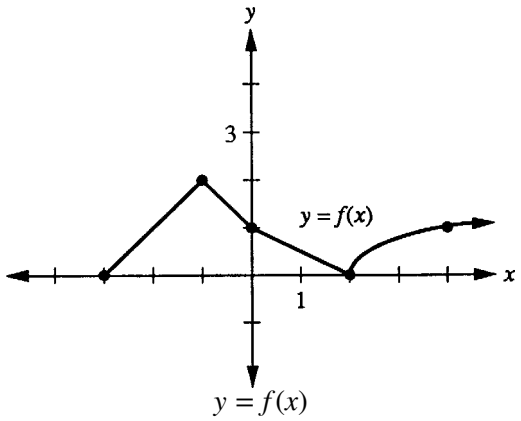
The graph of $f(x)$ is shown. Sketch, on the same axis the rest of the graph if $f(-x)=f(x)$.

13. Solve for the positive value of x: $\log 15-\log x=\log(2x-7)$

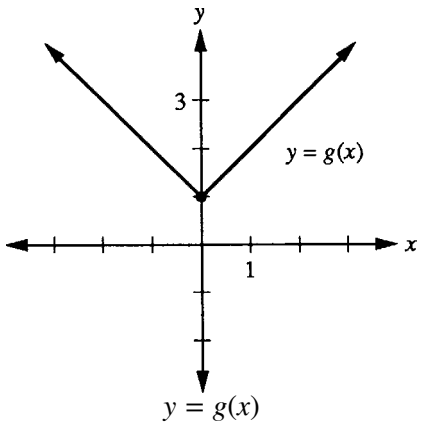
14. Express t in terms of common logarithms: $6^{3t-1}=5$

15. A certain amount of water is placed in an electric kettle, which is then plugged in. In 15 minutes the kettle comes to a boil and 10 minutes later the kettle has boiled dry. If A is the amount of water in the kettle t minutes after it was plugged in, then sketch a possible graph of $A=f(t)$ for $0\le t\le 30$.

16. Given the graph of $y=f(x)$, sketch $y=f\circ g(x)$.



$y=f(x)$



$y=g(x)$

17. The 2nd term in a geometric sequence is 3 and the 7th term is $12\sqrt{2}$. Find all the terms in between.

18. Consider the following pattern:

$$\begin{aligned} 10 - 1 &= 9 \\ 100 - 11 &= 89 \\ 1000 - 111 &= 889 \\ 10000 - 1111 &= 8889 \\ \ldots \quad \overbrace{\quad}^{n \text{ ones}} \quad \ldots & \end{aligned}$$

The expression on the left has n ones, as shown. In terms of n, what is the sum of the digits of the number on the right?

19. Over the last 6 weeks, Ryan has been trying to increase the number of times he can skateboard back-and-forth between two ramps without losing his board. The table shows how many times he's been successful, which he calls "sweetness".

week	**sweetness**
1	1
2	3
3	7
4	13
5	21
6	31
7	
8	

If Ryan continues to improve in weeks 7 and 8 following the same pattern in the table, how much sweetness will he have each week?

Write an expression that gives the sweetness for the nth week, assuming the pattern continues indefinitely.

20. Let Q be the point $(4, -3)$. A point P moves such that the slope of the segment QP is always $-\frac{3}{2}$. Determine the equation of the locus.

21. Acme Corporation manufactures and sells widgets. As you might expect, the number of widgets that customers will purchase is related to price. In particular,

$$w = -0.15x + 63.9$$

where w is the number of widgets that customers will purchase, and x is the price of each. Acme's total revenue from widgets, R, is equal to the product of w and x.

a) Write the function $R(x)$, which relates total revenue to the price of each widget.

b) What is the maximum revenue possible from sales of widgets? What selling price will provide maximum revenue?

22. The population of a colony of bacteria doubles every 40 hours. How long does it take for the population to be 3.5 times its original size? Give the answer to three significant digits.

23. Thorium-234 is a radioactive material. If 35 grams of it decay to 20.26 grams in 19 days, what is its half-life?

24. a) Draw the graph of the equation $y = 2x^2 + 6x + 1$ from $x = -4$ to $x = 1$, inclusive.

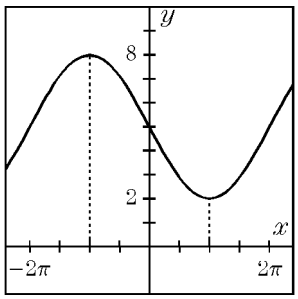
b) What are the coordinates of the turning point?

c) Draw the axis of symmetry for this graph.

d) From the graph made in answer to part a, estimate to *tenths* the roots of $2x^2 + 6x + 1 = 0$.

25. Express $\cos 295^\circ$ as a function of a positive acute angle.

26. What is the equation, in terms of sine, of the graph?



27. Find the value of $\tan(\arctan \frac{1}{2})$.

28. Find all positive values of θ less than 360° which satisfy the equation $4\cos 2\theta + 2\sin\theta - 1 = 0$. (Express the values of θ to the *nearest degree*.)

29. Prove: $\dfrac{\tan\theta - \cot\theta}{\tan\theta + \cot\theta} = 2\sin^2\theta - 1$

30. About twenty years ago, the Department of Natural Resources came up with this equation to model the fish population in a lake:

$$F = 337 - 61 \cdot \cos\left(\tfrac{\pi}{6}t\right)$$

In the equation, t is the number of months since January 2000 and F is thousands of fish.

a) Describe how the fish population changes over time. Include maximum and minimum values of the population and when they occur, the periodic nature of the population and a graph of the model.

b) In 2003, the Department of Natural Resources started collecting data on the fish population. The data is shown here:

Year	2003	2004	2005	2006	2007	2008	2009
Fish Population (in January)	276	276	271	266	261	256	251

Notice that the population started decreasing over time. What model best describes the fish population beginning with $t = 0$ for January 2004?

c) Using the new model, project the maximum and minimum populations of fish in the year 2020.

Problem-Attic Sample Document
all items from CCSS Math Database

HS Functions

1.
Objective: F.BF.01A

2.
Objective: F.BF.01A

3.
Objective: F.BF.01A

4.
Objective: F.BF.03

5.
Objective: F.IF.08B

6.
Objective: F.BF.01A

7.
Objective: F.BF.01C

8.
Objective: F.BF.02

9.
Objective: F.IF.07B

10.
Objective: F.IF.07B

11.
Objective: F.IF.07A

12.
Objective: F.BF.03

13.
Objective: F.BF.05

14.
Objective: F.BF.05

15.
Objective: F.IF.04

16.
Objective: F.BF.01C

17.
Objective: F.IF.03

18.
Objective: F.IF.03

19.
Objective: F.IF.03

20.
Objective: F.LE.02

21.
Objective: F.IF.02

22.
Objective: F.LE.04

23.
Objective: F.LE.04

24.
Objective: F.IF.08A

25.
Objective: F.TF.02

26.
Objective: F.TF.05

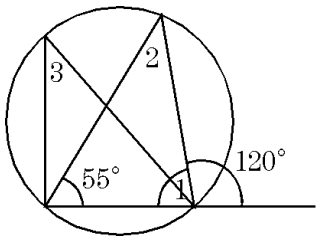
27.
Objective: F.TF.07

28.
Objective: F.TF.07

29.
Objective: F.TF.08

30.
Objective: F.TF.05

1. Given the diagram, find the measure of the following angles.



a) $m\angle 1$

b) $m\angle 2$

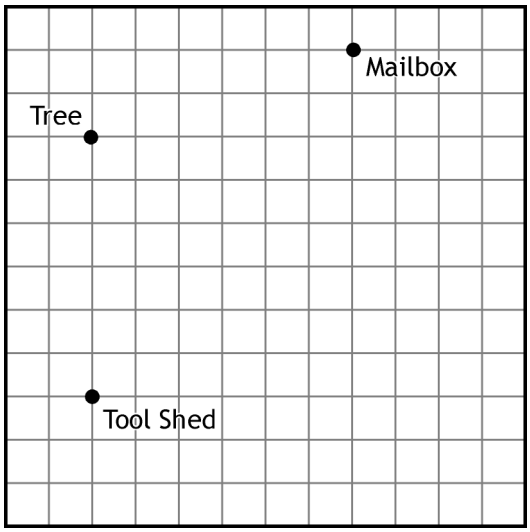
c) $m\angle 3$

2. In a circle of diameter 50 cm a chord of 16 cm is drawn. To 2 decimal places, how far is the chord from the center of the circle?

3. In a circle whose radius is 3 inches, central angle *AOB* contains one-half radian. Find the number of inches in the length of minor arc *AB*.

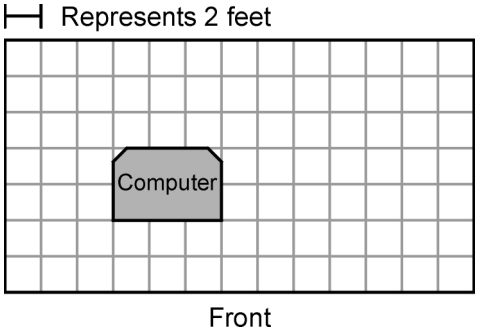
4. Stephen buried a time capsule in his yard. The distance from the capsule to the mailbox is the same as the distance from the capsule to the tool shed. The capsule is 6 feet away from the tree.

a) Use a straight edge and compass to mark the location of the time capsule on the grid. (The side of each small square is 1 foot.)



b) The time capsule is large enough that it will probably be found if someone digs within two feet of its exact location. On the grid, show the area that is two feet or closer to the time capsule.

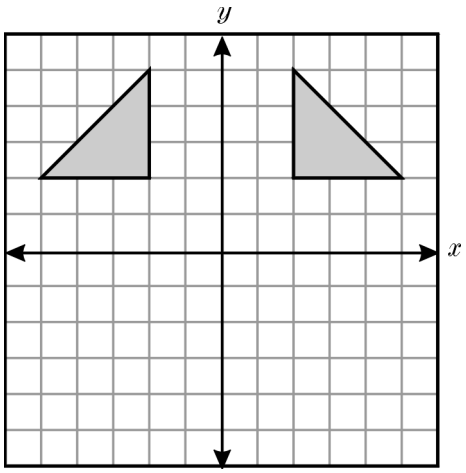
5. You are in charge of moving one of the computers in a computer lab. The diagram shows the current position of the computer.



a) Your instructions indicate that you are to first rotate the computer 90° counter-clockwise about its center. In the diagram, sketch the computer in its rotated position.

b) Then you are to translate (slide) it 6 feet to the right. Sketch the computer in its final position.

6. The graph shows a triangle that has been reflected about the *y*-axis from the first quadrant to the second quadrant.



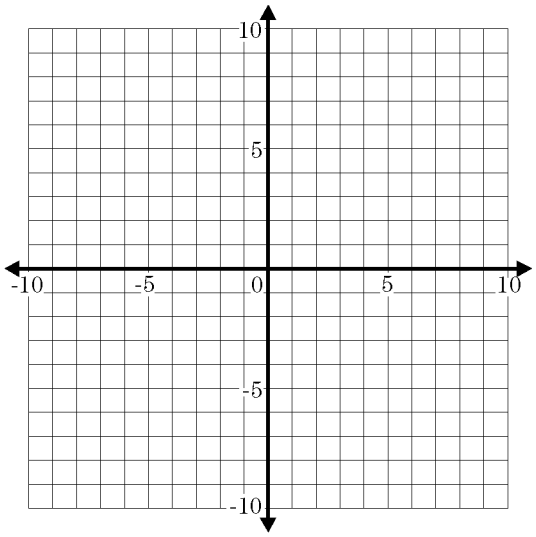
a) On the graph, draw a reflection of the triangle about the *x*-axis from the second quadrant to the third quadrant.

b) Now rotate the triangle in the first quadrant 90° clockwise around the origin. Repeat this operation with the new triangle: rotate it 90° clockwise around the origin. How many different triangles show up in the third quadrant?

c) Show or explain why the two 90° rotations have the same result as the two reflections. Since rotations and reflections do not always have the same result, what is special about this particular triangle?

7. Rectangle $ABCD$ lies on the coordinate plane with vertices $A(-4,4)$, $B(0,6)$, $C(1,4)$ and $D(-3,2)$.

a) Draw rectangle $ABCD$ on the grid and label the vertices.



b) Transform the rectangle from the points (x,y) to $(x+4, y-5)$. Label the new points as A', B', C', and D'.

c) Show that the area of the rectangle does not change as a result of the transformation.

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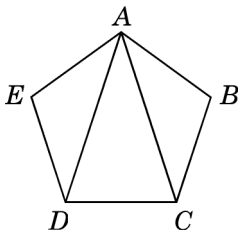
8. Rachel's backyard has 2 trees that are 60 feet apart. She wants to plant bushes so that the bushes are 40 feet apart from both trees. Draw a sketch to show where the bushes could be placed in relation to the trees. How many locations for the bushes are possible?

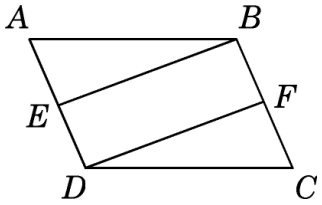
9. The point $(4,7)$ is reflected across the line $x = c$, and the image thus created is reflected across the line $y = k$, producing the final image, with coordinates $(-2,-9)$. Show why, in this case, $c = -k$.

10. Pentagon $ABCDE$ is equilateral (regular). Which congruence relationship justifies that $\triangle ADE \cong \triangle ACB$?



11. Given the triangle whose vertices are $A(-4,3)$, $B(-1,5)$, and $C(0,9)$, explain how you would find the endpoints of the segment parallel to $\overline{AB}$ that intersects $\overline{AC}$ and $\overline{BC}$ such that it makes a triangle similar to $\triangle ABC$ and one-fourth its original dimensions.

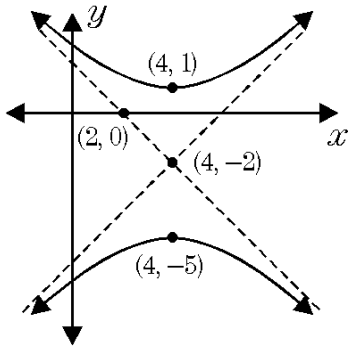
12. *ABCD* is a parallelogram. *E* is the midpoint of $\overline{AD}$ and *F* is the midpoint of $\overline{BC}$. Prove that *DEBF* is a parallelogram.



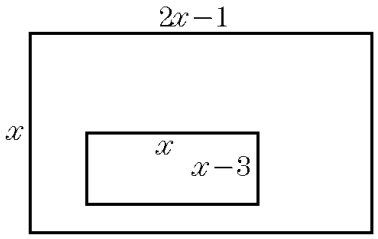
13. $\overline{AB}$ is the diameter of a circle where *A* is $(2, 0)$ and *B* is $(10, 8)$. What is the equation of the circle?

14. The equation of the axis of symmetry of a parabola is $y - 2 = 0$ and one point on the graph is $P(5, 3)$. Find another point on the graph.

15. What is the equation of the given hyperbola?



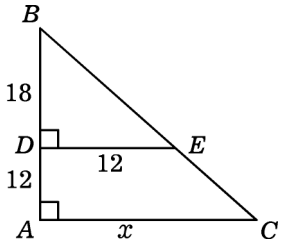
16. Using the labels on the diagram, show that the shaded area must be greater than 15 square units.



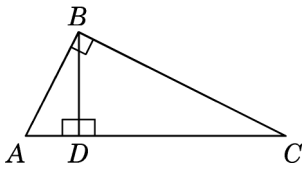
17. In the figure shown, segment *BA* is perpendicular to segment *AC* in triangle *BAC*. Segment *DE* is perpendicular to segment *BA* at point *D*. If *BD* = 18, *DA* = 12 and *DE* = 12,

    a) Find the measure of segment *AC*.

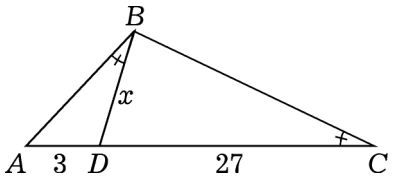
    b) Why is segment *DE* parallel to segment *AC*?



18. In $\triangle ABC$, $AC = 10$, $BC = 8$, $m\angle B = 90^\circ$ and $m\angle BDA = 90^\circ$. How long is $\overline{BD}$?



19. In $\triangle ABC$, $\angle ABD \cong \angle BCD$ and $\angle BAD \cong \angle CBD$. If $AD = 3$ and $DC = 27$, then what is the value of x?



20. If the point P has coordinates $(1, -17)$ and $\overline{OP}$ makes an angle of θ° then what are the following ratios?

    a) $\sin\theta$

    b) $\cos\theta$

    c) $\tan\theta$

21. The leg of an isosceles triangle is 6 inches in length and the vertex angle is 120°. Find the number of square inches in the area of the triangle.

22. The angle of elevation to the top of a tower is 32°. If you are 100 feet from the base of the tower, approximately how tall is the tower?

    If you walk 100 feet further away from the tower, what will be the angle of elevation to the top? (Round answer to nearest tenth of a degree.)

23. How many different triangles can be constructed, given the data $a = 7$, $b = 6$ and $A = 50^\circ$?

24. Two lighthouses (at A and B) on a relatively straight shore are 2.5 km apart. They both spot a boat at point C. If $m\angle BAC = 65^\circ$ and $m\angle CBA = 20^\circ$, then how far is the boat from the lighthouse A? Answer to 2 decimal places.

Problem-Attic Sample Document
all items from CCSS Math Database

HS Geometry

1.
Objective: G.C.02

2.
Objective: G.C.02

3.
Objective: G.C.05

4.
Objective: G.CO.12

5.
Objective: G.CO.05

6.
Objective: G.CO.05

7.
Objective: G.CO.05

8.
Objective: G.CO.01

9.
Objective: G.CO.02

10.
Objective: G.CO.07

11.
Objective: G.GPE.06

12.
Objective: G.CO.11

13.
Objective: G.GPE.01

14.
Objective: G.GPE.02

15.
Objective: G.GPE.03

16.
Objective: G.GPE.07

17.
Objective: G.SRT.04

18.
Objective: G.SRT.05

19.
Objective: G.SRT.05

20.
Objective: G.SRT.08

21.
Objective: G.SRT.08

22.
Objective: G.SRT.08

23.
Objective: G.SRT.11

24.
Objective: G.SRT.11

1. The customers at Save-More Bank are categorized by age and sex. An individual is selected at random from this group of 2000 customers.

Age	Sex	
	Male	Female
30 or less	800	600
31 or more	400	200

Is the age and sex of customers independent at Save-More Bank? Justify your answer.

2. If P(A or B) = P(A) + P(B) – P(A and B), then what is P(A or B or C) ?

3. Let A and B be independent events with $P(A) = 0.8$ and $P(B) = 0.4$.

   a) Find $P(A \cap B)$.

   b) Find $P(A \cup B)$.

4. If ${}_nC_r = 210$, what other combination must also produce an answer of 210? Explain.

5. Last month, the top five TV shows involving a live performance were (not necessarily in this order):

   Dancing with the Stars
   America's Got Talent
   So You Think You Can Dance
   The Voice
   American Idol

   When selling advertisements for TV shows, the question that really matters is whether a show ranks first or second place. These get the most advertising dollars. Given the list above, show all possibilities for first and second place.

6. How many different code words, using all of the letters at a time can be made from the letters of the word BANANA? [Any arrangement of letters is considered a code word.]

7. Customers at a local electronics store are each given a four-letter identification code. All letters are used except I and O, so there's no confusion with numbers. No letter is used more than once in a code. How many different codes are possible?

8. In a set of 7 batteries, 3 are burned out. If two batteries are selected at random, what is the probability that one burned out battery is selected?

9. A group consists of boys and girls. Their names are put into a hat, and two names are randomly drawn out without replacement. The probability of drawing two girls' names is $\frac{1}{15}$. If there are less than 11 people in the group, how many of them are girls?

10. A research study claims that a new (and more expensive) medicine will prevent acne.

    Give five questions that could be asked to detect any flaws in the study.

11. a) Identify a weakness in the following sampling method.

    To determine the percent of popular support in New Jersey for changing the school year from 10 months to 12 months, researchers telephoned every tenth person listed in the Trenton (NJ) telephone directory.

    b) How could the sampling method be improved?

12. Roger works for the Department of Fish and Game. To discover how healthy a pond is, Roger needs an estimate of the number of fish in the pond. He asked his daughter Marie for help.

    a) They caught 8 trout, 6 bass and 3 catfish. They tagged and released the fish. Later on, they caught 60 fish. Five of the fish in the second catch had tags. About how many fish are in the pond?

    b) If you go fishing in this pond, what is the probability that the first fish you catch will be a trout?

    c) Assume the ratio of trout to bass to catfish in the pond is the same as in the first catch. How many of each type of fish are there likely to be in the pond?

13. A basketball coach is trying to decide which of two players should be given a *Player of the Month* award.

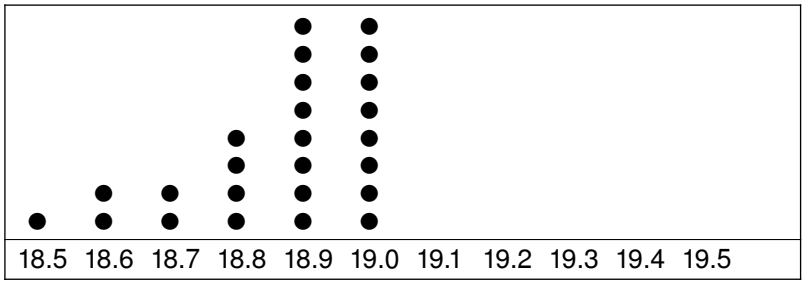
    - In the past 8 games Oscar scored 18, 12, 24, 10, 15, 8, 16 and 18 points.
    - During the same 8 games Ricardo scored 18, 15, 6, 24, 12, 20, 12 and 16 points.

    a) Compute the mean, median and mode for each player.

    b) Make and justify a decision about who best deserves to be named *Player of the Month*.

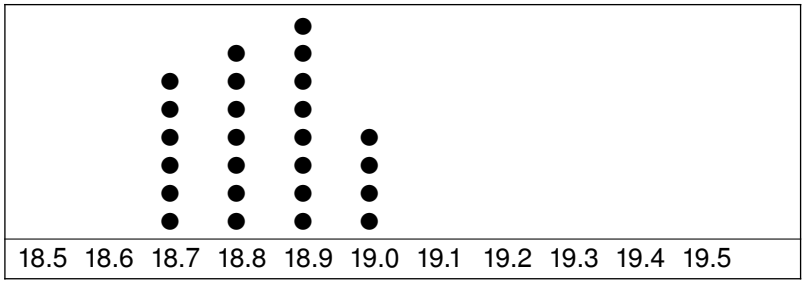
14. A company uses two machines to manufacture pencils. The length of the pencils must be 19 cm ±0.2 cm or they are rejected. Dotplots of 25 pencils produced by each machine are shown.

Length of Pencils for Machine A



Each ● represents one pencil

Length of Pencils for Machine B



Each ● represents one pencil

Why is machine A better at producing pencils than machine B?

15. Cameron filled a box with various numbers of watermelons and weighed them. He recorded the results in a table, as shown. Use a graphing calculator to estimate the weight of a melon and the weight of the empty box.

Number of Melons	Total Weight
1	10
2	14
4	18
5	19
6	22
7	27

16. A student begins an excercise program with a personal trainer. The trainer measures the number of sit-ups the student can do after each week of the program. The data is shown in the table.

Week	Sit-ups
1	44
2	45
3	49
4	54
5	55
6	57
7	61

a) Draw a scatter plot of the data.

b) Describe the correlation shown by the data.

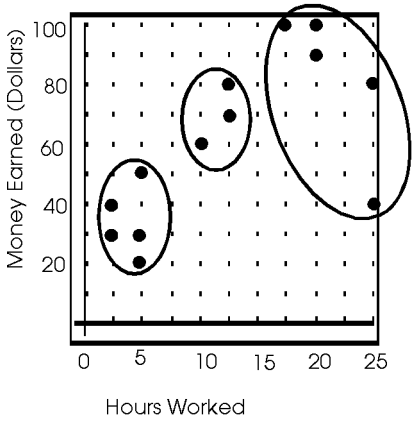
c) Predict what will happen after 35 weeks?

17. Pepsi placed a “lucky liner” in the caps of one-half of their liter bottles. Nikki bought five bottles and they all had lucky liners. How could you use computer-generated random numbers to simulate the situation and find the probability of getting five lucky liners?

18. A cereal maker has 6 different prizes you can collect. If they are equally and randomly distributed throughout their boxes of cereal, what is the expected or average number of boxes you will have to buy in order to collect all 6 prizes?

19. A standard 6-sided die is rolled until an even number comes up. What is the probability that this happens on the n^{th} toss?

20.



A number of students were interviewed to determine their number of hours worked and their total earnings last week. The results are plotted and grouped on the graph.

a) Draw the median fit line for the given plot.

b) Use the line to determine the average rate of pay (in dollars per hour) for the students in the sample.

c) Use the line to predict the pay for a student who worked 15 hours.

d) Use the line to predict how many hours a student would have to work to earn $50.

21. The time that it takes a glass of water to boil in a microwave oven is a near linear function of the amount of water in the glass. This data shows six tests of various amounts of water.

Water (ounces)	Time (seconds)
2	55
4	85
4	95
6	120
6	130
7	152

a) Use your calculator to find the linear regression line that predicts boiling time (t) from amount of water (w).

b) Create a scatterplot and show the regression line.

c) Use the equation of the regression line to predict the boiling time for 5 ounces of water.

d) What is the slope of the regression line and what does it signify?

22. The box shows instructions for a two-person game.

- Two players start with two dimes and one quarter.
- One person flips all three coins at once.
- Player A scores one point if both dimes OR the quarter shows heads.
- Player B scores a point if any of the coins shows tails.
- Play 25 rounds, taking turns flipping the three coins.
- The winner is the player with more points at the end.

Is the game fair? If so, explain why. If not, tell which player wins more often and describe a way to make the game fair.

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23. Given Z, the standard normal random variable, calculate the value of z_1 so that there is a probability of 0.65 that $Z < z_1$.

24. The level of significance for rejecting the null hypothesis has been set at 0.01. Statistical analysis returns a z-score of 2.61. Should null hypothesis be accepted or rejected?

Problem-Attic Sample Document
all items from CCSS Math Database

HS Statistics and Probability

1.
Objective: S.CP.04

2.
Objective: S.CP.07

3.
Objective: S.CP.08

4.
Objective: S.CP.09

5.
Objective: S.CP.09

6.
Objective: S.CP.09

7.
Objective: S.CP.09

8.
Objective: S.CP.09

9.
Objective: S.CP.09

10.
Objective: S.IC.03

11.
Objective: S.IC.03

12.
Objective: S.IC.04

13.
Objective: S.ID.02

14.
Objective: S.ID.03

15.
Objective: S.ID.06A

16.
Objective: S.ID.06A

17.
Objective: S.MD.01

18.
Objective: S.MD.02

19.
Objective: S.MD.03

20.
Objective: S.ID.06A

21.
Objective: S.ID.07

22.
Objective: S.MD.06

23.
Objective: S.ID.04

24.
Objective: S.MD.07