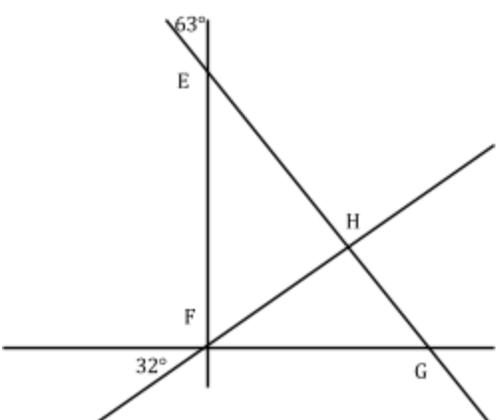# Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
Six Places to Start
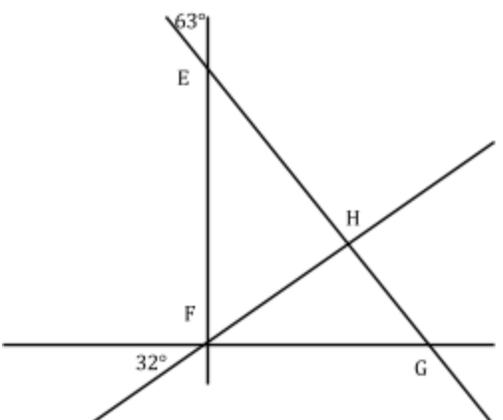## Grade 7

Letter	Problem	Answer
A	Expressions, with resulting whole number value, can be written with the following restrictions. • You can use some or all of the numbers 2, 3, and 5. • You may use the operations of addition and/or subtraction only. • You may not use a number more than once in each expression. • Example: 5 + 2 = 7. What is the one resulting whole number value from 0 through 10 that cannot be expressed?	
B	In history class, Patricia has correctly answered 78% of the 350 points the teacher has graded so far in the school year. If she earns 100% on the final 40 point assignment, by how many percentage points dos her average improve, rounded to the nearest percent?	
C	Lines EG, EF, FH, and FG intersect as shown in the figure. If segments EH and FH are of equal length, determine the measure of angle FGH.	
D	In a beach bag there are 2 identical beach balls, 1 sand bucket, and 1 bottle of suntan lotion. Your friend gives you the following riddle to solve. • The suntan lotion and the sand bucket weigh 13 ounces. • The suntan lotion, the sand bucket, and the two identical beach balls weigh 21 ounces. • The two identical beach balls and the sand bucket weigh 14 ounces. Determine the weight of the weight of the sand bucket.	
E	A small rectangular pizza has a width of 6 inches and a length of 8 inches. A medium pizza is 50% larger in area and has a width of 8 inches. What is the length of the medium pizza? Round your answer to the nearest tenth of an inch.	
F	Simplify $\dfrac{17}{1+\frac{1}{1-\frac{1}{9}}}$	
G	Use the answers corresponding to some of the problems lettered A through F to evaluate the expression below. $$B(A + E) + \frac{(C-D)}{F}$$	

Team #_____   Total Points: _____/110

Note: Questions A-F are 15 points each, G is worth 20 points

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
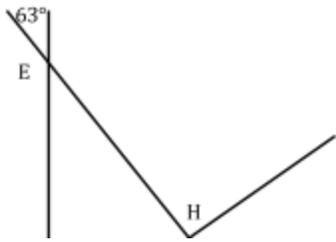## Six Places to Start
Grade 7

Letter	Problem	Answer
A	Expressions, with resulting whole number value, can be written with the following restrictions. ● You can use some or all of the numbers 2, 3, and 5. ● You may use the operations of addition and/or subtraction only. ● You may not use a number more than once in each expression. ● Example: 5 + 2 = 7. What is the one resulting whole number value from 0 through 10 that cannot be expressed?	9
B	In history class, Patricia has correctly answered 78% of the 350 points the teacher has graded so far in the school year. If she earns 100% on the final 40 point assignment, by how many percentage points dos her average improve, rounded to the nearest percent?	2 percent
C	Lines EG, EF, FH, and FG intersect as shown in the figure. If segments EH and FH are of equal length, determine the measure of angle FGH.	22 degrees
D	In a beach bag there are 2 identical beach balls, 1 sand bucket, and 1 bottle of suntan lotion. Your friend gives you the following riddle to solve. ● The suntan lotion and the sand bucket weigh 13 ounces. ● The suntan lotion, the sand bucket, and the two identical beach balls weigh 21 ounces. ● The two identical beach balls and the sand bucket weigh 14 ounces. Determine the weight of the weight of the sand bucket.	6 ounces
E	A small rectangular pizza has a width of 6 inches and a length of 8 inches. A medium pizza is 50% larger in area and has a width of 8 inches. What is the length of the medium pizza? Round your answer to the nearest tenth of an inch.	9 inches
F	Simplify $\dfrac{17}{1+\frac{1}{1-\frac{1}{9}}}$	8
G	Use the answers corresponding to some of the problems lettered A through F to evaluate the expression below. $$B(A+E) + \frac{(C-D)}{F}$$	38

Team #_____   **Total Points: _____/110**

Note: Questions A-F are 15 points each, G is worth 20 points

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
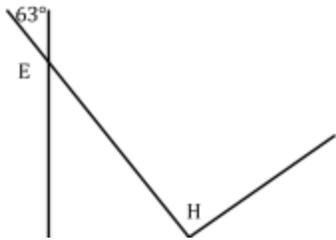## Six Places to Start
Grade 8

Letter	Problem	Answer
A	Expressions, with resulting whole number value, can be written with the following restrictions. ● You can use some or all of the numbers 2, 3, and 5. ● You may use the operations of addition and/or subtraction only. ● You may not use a number more than once in each expression. ● Example: 5 + 2 = 7. What is the one resulting whole number value from 0 through 10 that cannot be expressed?	9
B	Jennifer's 5 test scores in her science class are 87, 72, 94, 82, and 85. What is the minimum that she can score on a 6th 100-point test so that her average test score is at least 90?	120
C	Lines EG, EF, FH, and FG intersect as shown in the figure. If segments EH and FH are of equal length, determine the measure of angle FGH.	22 degrees
D	In a beach bag there are 2 identical beach balls, 1 sand bucket, and 1 bottle of suntan lotion. Your friend gives you the following riddle to solve. ● The suntan lotion and the sand bucket weigh 13 ounces. ● The suntan lotion, the sand bucket, and the two identical beach balls weigh 21 ounces. ● The two identical beach balls and the sand bucket weigh 14 ounces Determine the weight of the weight of the bottle of suntan lotion.	7 ounces
E	How many pairs of positive integers x and y are there such that x + 2y = 100?	49
F	If x # y = 2x – y^2, then 3 # (5 # 4) =	-30
G	Use the answers corresponding to some of the problems lettered A through F to evaluate the expression below. $$\frac{E}{D} + C - \frac{4-E}{B} \cdot F$$	19

Team #_____   **Total Points: _____/110**

Note: Questions A-F are 15 points each, G is worth 20 points

Greater Cleveland Council of Teachers of Mathematics

2017 Grade 7 & 8 Problem Solving Tournament
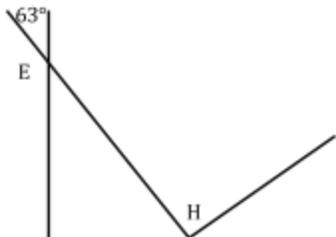## Six Places to Start
Grade 8

Letter	Problem	Answer
A	Expressions, with resulting whole number value, can be written with the following restrictions. ● You can use some or all of the numbers 2, 3, and 5. ● You may use the operations of addition and/or subtraction only. ● You may not use a number more than once in each expression. ● Example: 5 + 2 = 7. What is the one resulting whole number value from 0 through 10 that cannot be expressed?	
B	Jennifer's 5 test scores in her science class are 87, 72, 94, 82, and 85. What is the minimum that she can score on a 6th 100-point test so that her average test score is at least 90?	
C	Lines EG, EF, FH, and FG intersect as shown in the figure. If segments EH and FH are of equal length, determine the measure of angle FGH.	
D	In a beach bag there are 2 identical beach balls, 1 sand bucket, and 1 bottle of suntan lotion. Your friend gives you the following riddle to solve. ● The suntan lotion and the sand bucket weigh 13 ounces. ● The suntan lotion, the sand bucket, and the two identical beach balls weigh 21 ounces. ● The two identical beach balls and the sand bucket weigh 14 ounces Determine the weight of the weight of the bottle of suntan lotion.	
E	How many pairs of positive integers x and y are there such that x + 2y = 100?	
F	If $x \# y = 2x - y^2$, then 3 # (5 # 4) =	
G	Use the answers corresponding to some of the problems lettered A through F to evaluate the expression below. $$\frac{E}{D} + C - \frac{4-E}{B} \cdot F$$	

Team #_____   **Total Points: _____/110**

Note: Questions A-F are 15 points each, G is worth 20 points

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
Six Places to Start
Grade 8

Letter	Problem	Answer
A	Expressions, with resulting whole number value, can be written with the following restrictions. ● You can use some or all of the numbers 2, 3, and 5. ● You may use the operations of addition and/or subtraction only. ● You may not use a number more than once in each expression. ● Example: 5 + 2 = 7. What is the one resulting whole number value from 0 through 10 that cannot be expressed?	9
B	Jennifer's 5 test scores in her science class are 87, 72, 94, 82, and 85. What is the minimum that she can score on a 6th 100-point test so that her average test score is at least 90?	120
C	Lines EG, EF, FH, and FG intersect as shown in the figure. If segments EH and FH are of equal length, determine the measure of angle FGH.	22 degrees
D	In a beach bag there are 2 identical beach balls, 1 sand bucket, and 1 bottle of suntan lotion. Your friend gives you the following riddle to solve. ● The suntan lotion and the sand bucket weigh 13 ounces. ● The suntan lotion, the sand bucket, and the two identical beach balls weigh 21 ounces. ● The two identical beach balls and the sand bucket weigh 14 ounces Determine the weight of the weight of the bottle of suntan lotion.	7 ounces
E	How many pairs of positive integers x and y are there such that x + 2y = 100?	49
F	If x # y = 2x – y², then 3 # (5 # 4) =	-30
G	Use the answers corresponding to some of the problems lettered A through F to evaluate the expression below. $$\frac{E}{D} + C - \frac{4-E}{B} \cdot F$$	19

Team #_____   Total Points: _____/110

Note: Questions A-F are 15 points each, G is worth 20 points

Mental Math Hurdles, Problem 1

Find the value of the **?**

$$\frac{5 \cdot 8 + 7 \cdot 2^3}{8 \cdot 5 - 8} = \frac{10^2}{5\sqrt{25}} + ?$$

Team Number _____   ANSWER _____

Mental Math Hurdles, Problem 2

Find the value of the **?**

$$\left(\frac{2^3 \cdot \sqrt{36}}{?^2}\right)^2 = 9$$

Team Number _____   ANSWER _____

Mental Math Hurdles, Problem 3

Find the value in dollars of 2017 nickels.

Team Number _____   ANSWER $_____

Mental Math Hurdles, Problem 4

Find the value of the **?**

5 equals ⅗ of 75% times ?

Team Number _____   ANSWER _____

Mental Math Hurdles, Problem 5

Find the value of the **?**

$$\sqrt{\frac{?}{2}} = 7012 \cdot 8 - 7007 \cdot 8$$

Team Number _____   ANSWER _____

Mental Math Hurdles, Problem 6

Find the value of the **?**

$$\sqrt{\left(\frac{2}{5} + \frac{12}{?}\right)^3} = 1$$

Team Number _____   ANSWER _____

Mental Math Hurdles, Problem 7

Find the value of the **?**

$$\frac{2^3 \cdot 5 + 3^2 + 3}{-13}$$ **equals one less than ?**

Team Number _____   ANSWER _____

Mental Math Hurdles, Problem 8

Find the value of the **?**

$$\frac{(-2)^3 \cdot (12-5)}{14} + 17^0 - 1^{10} = ? + 5$$

Team Number _____   ANSWER _____

Mental Math Hurdles, Problem 9

Find the value of the **?**

$$15 \cdot \frac{\left(\frac{3}{?}\right) \cdot \left(\frac{3}{15}\right)}{\left(\frac{9}{5}\right) \cdot \left(\frac{1}{3}\right)} = 3$$

Team Number _____   ANSWER _____

Mental Math Hurdles, Problem 10

Find the value of the **?**

$$\left(\frac{3}{?}\right) \cdot \left(10 \cdot \sqrt{\frac{1}{9}}\right) - 2 = 0$$

Team Number _____   ANSWER _____

Mental Math Hurdles, Problem 11

Find the value of the **?**

$$\frac{2^3 \cdot 2}{\sqrt[6]{64}} - 12 = ?$$

Team Number _____   ANSWER _____

Mental Math Hurdles, Problem 12

Find the value of the **?**

$$\frac{3 \cdot 16 + 8}{8} + \frac{?}{5} - 17 = -2$$

Team Number _____   ANSWER _____

Mental Math Hurdles, Problem 1

Find the value of the ?

$$\frac{5 \cdot 8 + 7 \cdot 2^3}{8 \cdot 5 - 8} = \frac{10^2}{5\sqrt{25}} + \,?$$

Team Number _____   ANSWER _-1__

7th and 8th grade GCCTM Contest, 2017

Mental Math Hurdles, Problem 2

Find the value of the ?

$$\left(\frac{2^3 \cdot \sqrt{36}}{?^2}\right)^2 = 9$$

Team Number _____   ANSWER __4___

Mental Math Hurdles, Problem 3

Find the value in dollars of 2017 nickels.

Team Number _____   ANSWER <u>$100.85</u>

Mental Math Hurdles, Problem 4

Find the value of the **?**

5 equals ⅘ of 75% times **?**

Team Number _____   ANSWER <u>_10_</u>

Mental Math Hurdles, Problem 5

Find the value of the ?

$$\sqrt{\frac{?}{2}} = 7012 \cdot 8 - 7007 \cdot 8$$

Team Number _____   ANSWER __3200__

Mental Math Hurdles, Problem 6

Find the value of the ?

$$\sqrt{\left(\frac{2}{5} + \frac{12}{?}\right)^3} = 1$$

Team Number _____   ANSWER __20__

Mental Math Hurdles, Problem 7

Find the value of the **?**

$$\frac{2^3 \cdot 5 + 3^2 + 3}{-13} \quad \textbf{equals one less than ?}$$

Team Number _____   ANSWER __-3__

Mental Math Hurdles, Problem 8

Find the value of the **?**

$$\frac{(-2)^3 \cdot (12-5)}{14} + 17^0 - 1^{10} = ? + 5$$

Team Number _____   ANSWER __-9__

Mental Math Hurdles, Problem 9

Find the value of the ?

$$15 \cdot \frac{\left(\frac{3}{?}\right) \cdot \left(\frac{3}{15}\right)}{\left(\frac{9}{5}\right) \cdot \left(\frac{1}{3}\right)} = 3$$

Team Number _____   ANSWER __5__

Mental Math Hurdles, Problem 10

Find the value of the ?

$$\left(\frac{3}{?}\right) \cdot \left(10 \cdot \sqrt{\frac{1}{9}}\right) - 2 = 0$$

Team Number _____   ANSWER __5__

Mental Math Hurdles, Problem 11

Find the value of the **?**

$$\frac{2^3 \cdot 2}{\sqrt[6]{64}} - 12 = ?$$

Team Number _____   ANSWER __-4__

Mental Math Hurdles, Problem 12

Find the value of the **?**

$$\frac{3 \cdot 16 + 8}{8} + \frac{?}{5} - 17 = -2$$

Team Number _____   ANSWER __40__

Greater Cleveland Council of Teachers of Mathematics

2017 Grade 7 & 8 Problem Solving Tournament
Hurdle   #1
(This problem is worth 15 points.)

In the expression below, each triangle, like this Δ, is to be replaced by one of the four operation symbols (+, -, x, ÷). None of the operation symbols repeat. What is the greatest possible value of the simplified form of the expression?

$$[(-6)\Delta 3]\Delta(-7)$$

Team Number _____   Answer   _____

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
Hurdle   #2
(This problem is worth 15 points.)

What is the largest pair of consecutive even integers with an average that is less than -5?

Team Number _____   Answer   _____

Greater Cleveland Council of Teachers of Mathematics

2017 Grade 7 & 8 Problem Solving Tournament
Hurdle #3
(This problem is worth 15 points.)

For her birthday party, Ruby mixes punch to fill a hemispherical bowl that has a diameter of 45 centimeters. How many cylindrical glasses, 7 centimeters in diameter, can she fill to a height of 12 centimeters?

Volume of a sphere: $V = \frac{4}{3}\pi r^3$

Volume of a cylinder: $V = \pi r^2 h$

Team Number _____   Answer _____

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
Hurdle #4
(This problem is worth 10 points.)

The shaded arrow in the figure below lies inside a square with a side length of 1. The arrow was drawn by connecting two vertices of the square to the midpoint of the opposite side and to the center of the square. What is the area of the arrow?

Team Number _____   Answer _____ ___
Greater Cleveland Council of Teachers of Mathematics

2017 Grade 7 & 8 Problem Solving Tournament
Hurdle   #5
(This problem is worth 10 points.)

John recently scored a 96 on a 100-point test. This score brought his overall test average up 3 percentage points to 81%. How many tests has John's class taken in total if every test was 100 points?
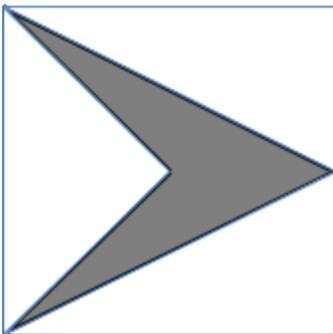
Team Number _____   Answer _____ _____

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
Hurdle   #6
(This problem is worth 10 points.)

A scientist places bacteria in the center of a dish containing a growth material. The bacteria grow and spread in a circular fashion. Each day the scientist records the diameter of the bacteria growth. Her observations for the first three days are shown in the following table. What would be the area of bacteria growth on the 7th day? Round your answer to the tenth place.

Day	Diameter of bacteria growth in inches
1	0.75
2	1.50
3	2.25

Team Number _____   Answer _____

Greater Cleveland Council of Teachers of Mathematics

(This problem is worth 10 points.)

The 5 x 5 grid shown below contains squares with dimensions of 1 x 1 to 5 x 5. How many of these squares include the black shaded square?

Team Number _____   Answer ____ _____ _____

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
Hurdle #8
(This problem is worth 5 points.)

In math class, Max is asked to spin the spinner twice. If each of the 4 regions on the spinner is equally likely, what is the probability that the sum of the two numbers he spins will be less than 6?
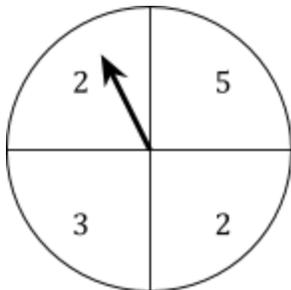

Team Number _____   Answer _____

Greater Cleveland Council of Teachers of Mathematics

2017 Grade 7 & 8 Problem Solving Tournament
Hurdle   #9
(This problem is worth 5 points.)

A family takes a trip traveling the first 2.25 hours at an average speed of 60 miles per hour. For the next three hours they average 65 miles per hour and for the last 4.5 hours they travel at an average rate of 70 miles per hour. What is their average speed for the entire trip? Round your answer to the nearest mile per hour.

Team Number _____   Answer _____

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
Hurdle   #10
(This problem is worth 5 points.)

Sally has 6 daughters and no sons. Some of her daughters have 6 daughters, and the rest have none. Sally has a total of 30 daughters and granddaughters, but she has no great-granddaughters. How many of Sally's daughters and granddaughters have no daughters?

Team Number _____   Answer _____

Greater Cleveland Council of Teachers of Mathematics

2017 Grade 7 & 8 Problem Solving Tournament
Hurdle   #1
(This problem is worth 15 points.)

In the expression below, each triangle, like this Δ, is to be replaced by one of the four operation symbols (+, -, x, ÷). None of the operation symbols repeat. What is the greatest possible value of the simplified form of the expression?

$$[(-6)\Delta 3]\Delta(-7)$$

Team Number _____   Answer _____63_____

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
Hurdle   #2
(This problem is worth 15 points.)

What is the largest pair of consecutive even integers with an average that is less than -5?

Team Number _____   Answer _____-6 and -8_____

Greater Cleveland Council of Teachers of Mathematics

2017 Grade 7 & 8 Problem Solving Tournament
Hurdle #3
(This problem is worth 15 points.)

For her birthday party, Ruby mixes punch to fill a hemispherical bowl that has a diameter of 45 centimeters. How many cylindrical glasses, 7 centimeters in diameter, can she fill to a height of 12 centimeters?

Volume of a sphere: $V = \frac{4}{3}\pi r^3$
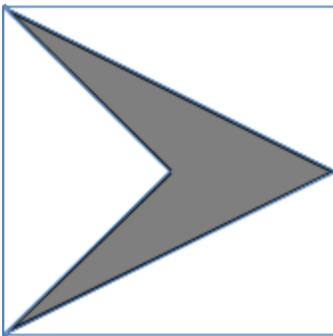
Volume of a cylinder: $V = \pi r^2 h$

Team Number _____   Answer _____51_____

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
Hurdle #4
(This problem is worth 10 points.)

The shaded arrow in the figure below lies inside a square with a side length of 1. The arrow was drawn by connecting two vertices of the square to the midpoint of the opposite side and to the center of the square. What is the area of the arrow?

Team Number _____   Answer _____1/4_____

Greater Cleveland Council of Teachers of Mathematics

2017 Grade 7 & 8 Problem Solving Tournament
Hurdle   #5
(This problem is worth 10 points.)

John recently scored a 96 on a 100-point test. This score brought his overall test average up 3 percentage points to 81%. How many tests has John's class taken in total if every test was 100 points?

Team Number _____   Answer _____6_____

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
Hurdle   #6
(This problem is worth 10 points.)

A scientist places bacteria in the center of a dish containing a growth material. The bacteria grow and spread in a circular fashion. Each day the scientist records the diameter of the bacteria growth. Her observations for the first three days are shown in the following table. What would be the area of bacteria growth on the 7th day? Round your answer to the tenth place.
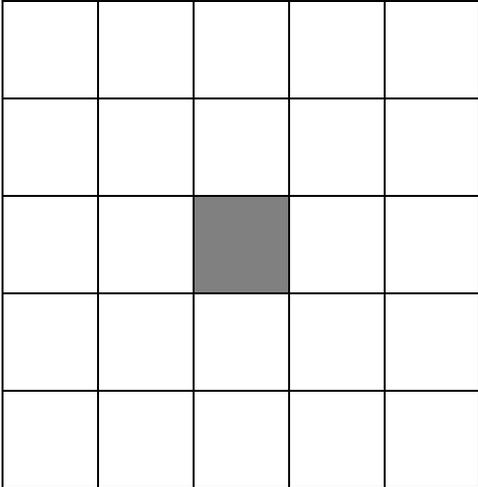
Day	Diameter of bacteria growth in inches
1	0.75
2	1.50
3	2.25

Team Number _____   Answer   21.6 square inches

Greater Cleveland Council of Teachers of Mathematics

2017 Grade 7 & 8 Problem Solving Tournament
Hurdle #7
(This problem is worth 10 points.)

The 5 x 5 grid shown below contains squares with dimensions of 1 x 1 to 5 x 5. How many of these squares include the black shaded square?
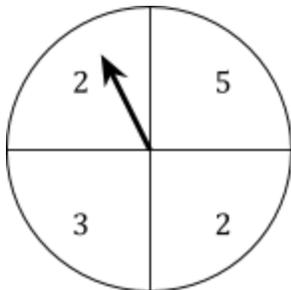
Team Number _____   Answer _____19_____

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
Hurdle #8
(This problem is worth 5 points.)

In math class, Max is asked to spin the spinner twice. If each of the 4 regions on the spinner is equally likely, what is the probability that the sum of the two numbers he spins will be less than 6?

Team Number _____   Answer _____1/2_____

Greater Cleveland Council of Teachers of Mathematics

2017 Grade 7 & 8 Problem Solving Tournament
Hurdle   #9
(This problem is worth 5 points.)

A family takes a trip traveling the first 2.25 hours at an average speed of 60 miles per hour. For the next three hours they average 65 miles per hour and for the last 4.5 hours they travel at an average rate of 70 miles per hour. What is their average speed for the entire trip? Round your answer to the nearest mile per hour.

Team Number _____   Answer ___66 miles per hour

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
Hurdle   #10
(This problem is worth 5 points.)

Sally has 6 daughters and no sons. Some of her daughters have 6 daughters, and the rest have none. Sally has a total of 30 daughters and granddaughters, but she has no great-granddaughters. How many of Sally's daughters and granddaughters have no daughters?

Team Number _____   Answer _____26_____

2017 Grade 7 & 8 Problem Solving Tournament
The Pile
Grade 7

#	Question	Answer
1.	If a prize bag contains 25 packs of gun. 10 are bubble gum, 7 are mint, and 8 are cinnamon. What is the probability of randomly choosing a pack that is not cinnamon?	
2.	A family arrived at the theme park at 1:20 p.m. If the trip to the park took 160 minutes, at what time did they leave?	
3.	Chris walked ½ mile in ¼ hour. What way Chris's speed in miles per hour?	
4.	The door into Barb's bedroom is $35\frac{1}{2}$ inches wide. She has a poster $22\frac{1}{4}$ inches wide. If she hangs the poster in the center of the door, how much room would be on each side of the poster?	
5.	In the town of Nuptuville, 2/3 of the men are married to 5/7 of the women. What is the ratio of men to women in the town?	
6.	Jenny stores her socks in two different drawers. In the first drawer she has 2 brown socks, 4 black socks, and 4 white socks. In the second drawer she has 4 brown socks, 2 black socks, and 6 white socks. If she chooses a sock randomly from each drawer, what is the probability that she will have two white socks?	
7.	A recent report stated that the five most popular ice cream flavors are Vanilla (26%), Chocolate (12.9%), Neapolitan (4.8%), Strawberry (4.3%), and Cookies 'n' Cream (4%). If 1000 people were interviewed concerning their favorite flavor of ice cream, how many would expect to not list one of these 5 flavors?	
8.	How many three-digit positive integers less than 150 have the unit digit greater than the tens digit?	
9.	$48 \cdot \left(\frac{7}{4} \cdot \frac{6}{5} \cdot \frac{5}{6} \cdot \frac{4}{7} \cdot \frac{3}{8}\right)$ equals	
10.	On this grid of equally spaced lattice points, what fraction of the large square is white?	
	TURN OVER FOR THE REMAINING PROBLEMS!	

#	Question	Answer
11.	Columbus and the following towns are located along highway 30 in the U.S. Columbus is west of Ames and east of Lexington. Rock River is between Soda Springs and Ames. Lexington is west of Columbus but east of Rock River. Ames is west of Rock Falls. Which town is farthest west?	
12.	If $(a \mid b \mid c \mid d) = ad - bc$, then what is $(3 \mid 4 \mid 1 \mid 2)$?	
13.	Each of the 39 students in the seventh grade at Jayhawk Middle School has one dog, or one cat, or both a dog and a cat. Twenty students have a dog and 26 students have a cat. How many students have both a dog and a cat?	
14.	The sum of four numbers is one-fourth. What is the average?	
15.	If the given table of values represents points on a straight line, what would the y value be when x = 22? 	x	10	20	30	40	 	y	15	30	45	60		
16.	A particular basketball team scores an average of 67 points per game for the first four games, and an average of 64 points per game for the first five games. How many points did the team score in its fifth game?	
17.	For the given group of numbers, put the mean, median, and mode in order from least to greatest. {1, 2, 2, 4, 5, 6, 9, 10}	
18.	Two circles of area 16π cm^2 each fit side by side so that they touch all four sides of a rectangle (see figure). What is the area of the rectangle?	
19.	A magazine price was reduced from its 2015 price by 20% for 2016, but increased from the 2016 price by 10% for 2017. If the price of the magazine is $22 per year for 2017, what was the price for 2015?	
20.	According to the Musgrave Pencil Company the average pencil can be sharpened 17 times (if sharpened well) and will write 45,000 words (considering all short and long words). If a particular 500-page book averages 300 words per page, how many pencils are needed if the book is hand written?	

Team #_____   **Total Points: _____/200**

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
The Pile
Grade 7

#	Question	Answer
1.	If a prize bag contains 25 packs of gun. 10 are bubble gum, 7 are mint, and 8 are cinnamon. What is the probability of randomly choosing a pack that is not cinnamon?	$\frac{17}{25}$
2.	A family arrived at the theme park at 1:20 p.m. If the trip to the park took 160 minutes, at what time did they leave?	10:40 a.m.
3.	Chris walked ½ mile in ¼ hour. What way Chris's speed in miles per hour?	2 m.p.h.
4.	The door into Barb's bedroom is $35\frac{1}{2}$ inches wide. She has a poster $22\frac{1}{4}$ inches wide. If she hangs the poster in the center of the door, how much room would be on each side of the poster?	$6\frac{5}{8}$ inches
5.	In the town of Nuptuville, 2/3 of the men are married to 5/7 of the women. What is the ratio of men to women in the town?	$\frac{15}{14}$
6.	Jenny stores her socks in two different drawers. In the first drawer she has 2 brown socks, 4 black socks, and 4 white socks. In the second drawer she has 4 brown socks, 2 black socks, and 6 white socks. If she chooses a sock randomly from each drawer, what is the probability that she will have two white socks?	$\frac{1}{5}$
7.	A recent report stated that the five most popular ice cream flavors are Vanilla (26%), Chocolate (12.9%), Neapolitan (4.8%), Strawberry (4.3%), and Cookies 'n' Cream (4%). If 1000 people were interviewed concerning their favorite flavor of ice cream, how many would expect to not list one of these 5 flavors?	480
8.	How many three-digit positive integers less than 150 have the unit digit greater than the tens digit?	35 integers
9.	$48\cdot(\frac{7}{4}\cdot\frac{6}{5}\cdot\frac{5}{6}\cdot\frac{4}{7}\cdot\frac{3}{8})$ equals	18
10.	On this grid of equally spaced lattice points, what fraction of the large square is white?	$\frac{7}{18}$
11.	Columbus and the following towns are located along highway 30 in the U.S. Columbus is west of Ames and east of Lexington. Rock River is between Soda Springs and Ames. Lexington is west of Columbus but east of Rock River. Ames is west of Rock Falls. Which town is farthest west?	Soda Springs

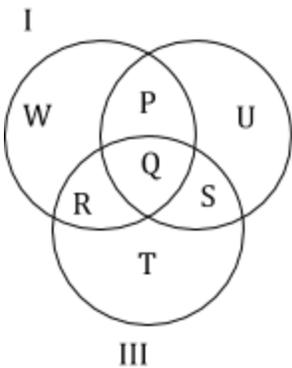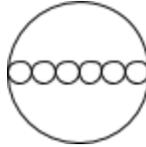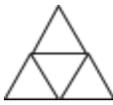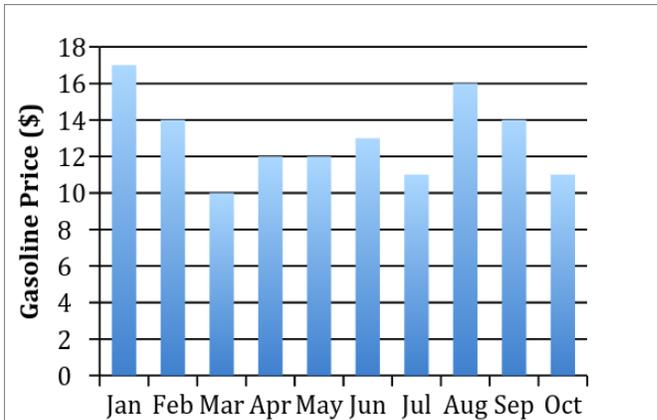| #	Question	Answer
12.	If $(a \mid b \mid c \mid d) = ad - bc$, then what is $(3 \mid 4 \mid 1 \mid 2)$?	2
13.	Each of the 39 students in the seventh grade at Jayhawk Middle School has one dog, or one cat, or both a dog and a cat. Twenty students have a dog and 26 students have a cat. How many students have both a dog and a cat?	7
14.	The sum of four numbers is one-fourth. What is the average?	$\frac{1}{16}$
15.	If the given table of values represents points on a straight line, what would the y value be when x = 22?	33
16.	A particular basketball team scores an average of 67 points per game for the first four games, and an average of 64 points per game for the first five games. How many points did the team score in its fifth game?	52
17.	For the given group of numbers, put the mean, median, and mode in order from least to greatest. {1, 2, 2, 4, 5, 6, 9, 10}	mode median mean
18.	Two circles of area 16π cm^2 each fit side by side so that they touch all four sides of a rectangle (see figure). What is the area of the rectangle?	128 cm^2
19.	A magazine price was reduced from its 2015 price by 20% for 2016, but increased from the 2016 price by 10% for 2017. If the price of the magazine is $22 per year for 2017, what was the price for 2015?	$25
20.	According to the Musgrave Pencil Company the average pencil can be sharpened 17 times (if sharpened well) and will write 45,000 words (considering all short and long words). If a particular 500-page book averages 300 words per page, how many pencils are needed if the book is hand written?	4 pencils

For question 15:

x	10	20	30	40
y	15	30	45	60

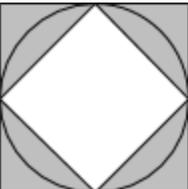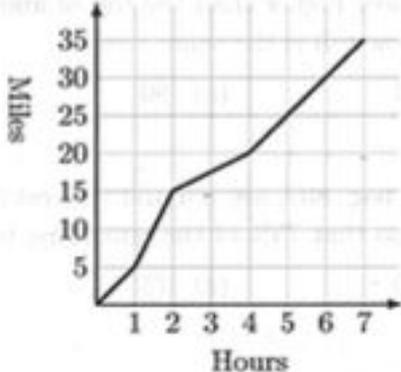Team #_____   Total Points: _____/200

Greater Cleveland Council of Teachers of Mathematics
2017 Grade 7 & 8 Problem Solving Tournament
The Pile
Grade 8

#	Question	Answer
1.	At a local market, you bought 7 candy bars and 4 packages of gun for $4.80. Your friend bought 5 candy bars and 2 packages of gum for $3.00. When you got home, your sister asked how much each candy bar cost. You told her you don't remember but you know that all candy bars cost the same amount and all packages of gum cost the same amount. Find out how much each candy bar cost.	
2.	If Bill inherited $2000 and invested the money in a five-year certificate of deposit with a 4% interest rate, compounded annually, how much money would Bill have at the end of 5 years?	
3.	A cookie recipe include the following: ½ cup butter, 2/3 cup sugar, 2.5 cups of flour, and ¼ teaspoon of cream of tartar. How many cups of flour should be used if the amount of sugar is decreased to ½ cup and the proportions remain the same?	
4.	A stack of oranges forms a pyramid with a rectangular base measuring 5 x 8 oranges. Each orange above level 1 rests in a pocket formed by 4 oranges on the level below it. A single row of oranges completes the stack. How many oranges are in the stack?	
5.	Given that $-4 \le x \le -2$ and $2 \le y \le 4$, what is the largest possible value of $\frac{x+y}{x}$?	
6.	A pound is 16 ounces. Nine pennies weigh one ounce. If Jack has 3.5 pounds of pennies and Jill has 5 pounds of pennies, how much more money (in dollars and cents) does Jill have than Jack?	
7.	Let a and b be digits of a three-digit number "6ab" that is divisible by 4. Also "6ab" is greater than 650. What is the sum of all the two-digit number "ab" for which these conditions are true?	
8.	Columbus and the following towns are located along highway 30 in the U.S. Columbus is west of Ames and east of Lexington. Rock River is between Soda Springs and Ames. Lexington is west of Columbus but east of Rock River. Ames is west of Rock Falls. Which town is farthest west?	
9.	At a party, each man danced with exactly three women and each woman danced with exactly two men. Twelve men attended the party. How many women attended the party?	
10.	A particular plant doubles its size every day. On Saturday it is _?_ times as big as it was on the preceding Sunday?	

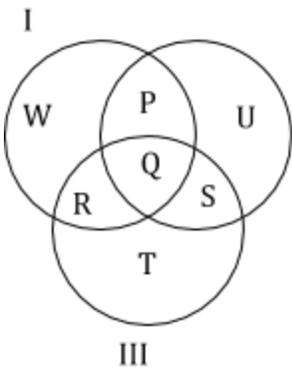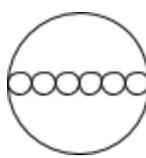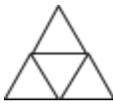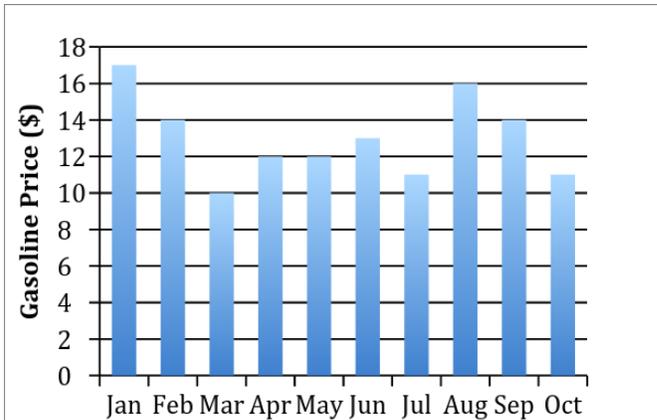| #	Question	Answer
11.	Determine the location of point X using these clues. X is not in Region R X is in circle I X is not in circle III X is not in region W	
12.	On this grid of equally spaced lattice points, what fraction of the large square is white?	
13.	Six pepperoni circles will fit exactly across the diameter of a 12-inch pizza when placed as shown. If a total of 24 pepperoni circles are placed on this pizza without overlapping each other, what fraction of the pizza do pepperoni circles cover?	
14.	A large equilateral triangle is made of tessellated smaller equilateral triangles that are 3 inches on each side (see figure of a triangle made of 4 smaller triangles). How many of the smaller triangles are necessary to build a triangle 12 inches on each side?	
13.	In rectangle ABCD, M is the midpoint of AB and N is the midpoint of BC. What is the ratio of the area of triangle BND to the area of triangle CMD?	
14.	The graph shows the price of five gallons of gasoline during the first ten months of the year. By what percent is the highest price higher than the lowest price?	

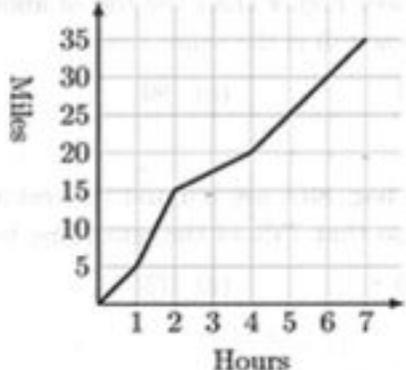| 15.	In November 2014, the European Space Agency's Rosetta mission soft-landed its Philae probe on Comet 67P. In its journey from Earth to Comet 67P, the Philae probe flew K km. Assume that Philae maintained a constant speed of S kilometers per day. Write an algebraic expression that represents the number of kilometers remaining in its journey to 67P D days after its launch from Earth.	
16.	There are exactly 24 different 3-digit whole numbers with three different digits from this set: {4, 5, 6, 7}. How many of those twenty-four 3-digit numbers are divisible by 6?	
17.	Let **WA**= number of White Americans, **AF** = number of African Americans, **HL** = number of Hispanic or Latino Americans, and **AA** = number of Asian Americans. According to the 2010 US Census, the ratio of the populations of these four racial or ethnic groups is approximately: **WA:AF:HL:AA = 16:3:4:1** If there are a total of 301.4 million Americans in these four populations in 2010, how many more million African Americans were there than Asian Americans? Round your answer to the nearest tenth of a million.	
18.	A circle with radius 1 is inscribed in a square and circumscribed about another square as shown. What is the ratio of the shaded area in the circle to the total shaded area?	
19.	Ken takes a long bike ride on a hilly highway. The graph indicates the miles traveled during the time of his ride. What is Ken's average speed for the entire ride in miles per hour?	
20.	Suppose you are blindly pulling two marbles with replacement from a bag of 14 marbles with 7 red, 4 yellow, and 3 black. What is the probability that you pick one red and one black marble?	

Team #_____   **Total Points: _____/200**

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#	Question	Answer
1.	At a local market, you bought 7 candy bars and 4 packages of gun for $4.80. Your friend bought 5 candy bars and 2 packages of gum for $3.00. When you got home, your sister asked how much each candy bar cost. You told her you don't remember but you know that all candy bars cost the same amount and all packages of gum cost the same amount. Find out how much each candy bar cost.	40 cents
2.	If Bill inherited $2000 and invested the money in a five-year certificate of deposit with a 4% interest rate, compounded annually, how much money would Bill have at the end of 5 years?	$ 2431.31
3.	A cookie recipe include the following: ½ cup butter, 2/3 cup sugar, 2.5 cups of flour, and ¼ teaspoon of cream of tarter. How many cups of flour should be used if the amount of sugar is decreased to ½ cup and the proportions remain the same?	$1\frac{7}{8}$ cups
4.	A stack of oranges forms a pyramid with a rectangular base measuring 5 x 8 oranges. Each orange above level 1 rests in a pocket formed by 4 oranges on the level below it. A single row of oranges completes the stack. How many oranges are in the stack?	100
5.	Given that $-4 \le x \le -2$ and $2 \le y \le 4$, what is the largest possible value of $\frac{x+y}{x}$?	$\frac{1}{2}$
6.	A pound is 16 ounces. Nine pennies weigh one ounce. If Jack has 3.5 pounds of pennies and Jill has 5 pounds of pennies, how much more money (in dollars and cents) does Jill have than Jack?	$2.16
7.	Let a and b be digits of a three-digit number "6ab" that is divisible by 4. Also "6ab" is greater than 650. What is the sum of all the two-digit number "ab" for which these conditions are true?	888
8.	Columbus and the following towns are located along highway 30 in the U.S. Columbus is west of Ames and east of Lexington. Rock River is between Soda Springs and Ames. Lexington is west of Columbus but east of Rock River. Ames is west of Rock Falls. Which town is farthest west?	Soda Springs
9.	At a party, each man danced with exactly three women and each woman danced with exactly two men. Twelve men attended the party. How many women attended the party?	18
10.	A particular plant doubles its size every day. On Saturday it is ? times as big as it was on the preceding Sunday?	64
	TURN OVER FOR THE REMAINING PROBLEMS!	

#	Question	Answer
11.	Determine the location of point X using these clues. X is not in Region R X is in circle I X is not in circle III X is not in region W	P
12.	On this grid of equally spaced lattice points, what fraction of the large square is white?	$\frac{7}{18}$
13.	Six pepperoni circles will fit exactly across the diameter of a 12-inch pizza when placed as shown. If a total of 24 pepperoni circles are placed on this pizza without overlapping each other, what fraction of the pizza do pepperoni circles cover?	$\frac{2}{3}$
14.	A large equilateral triangle is made of tessellated smaller equilateral triangles that are 3 inches on each side (see figure of a triangle made of 4 smaller triangles). How many of the smaller triangles are necessary to build a triangle 12 inches on each side?	16
13.	In rectangle ABCD, M is the midpoint of AB and N is the midpoint of BC. What is the ratio of the area of triangle BND to the area of triangle CMD?	½
14.	The graph shows the price of five gallons of gasoline during the first ten months of the year. By what percent is the highest price higher than the lowest price?	70 percent

15.	In November 2014, the European Space Agency's Rosetta mission soft-landed its Philae probe on Comet 67P. In its journey from Earth to Comet 67P, the Philae probe flew K km. Assume that Philae maintained a constant speed of S kilometers per day. Write an algebraic expression that represents the number of kilometers remaining in its journey to 67P D days after its launch from Earth.	K – SD km
16.	There are exactly 24 different 3-digit whole numbers with three different digits from this set: {4, 5, 6, 7}. How many of those twenty-four 3-digit numbers are divisible by 6?	6
17.	Let **WA**= number of White Americans, **AF** = number of African Americans, **HL** = number of Hispanic or Latino Americans, and **AA** = number of Asian Americans. According to the 2010 US Census, the ratio of the populations of these four racial or ethnic groups is approximately: **WA:AF:HL:AA = 16:3:4:1** If there are a total of 301.4 million Americans in these four populations in 2010, how many more million African Americans were there than Asian Americans? Round your answer to the nearest tenth of a million.	25.1 million
18.	A circle with radius 1 is inscribed in a square and circumscribed about another square as shown. What is the ratio of the shaded area in the circle to the total shaded area?	$\frac{\pi-2}{2}$
19.	en takes a long bike ride on a hilly highway. The graph dicates the miles traveled during the time of his ride. /hat is Ken's average speed for the entire ride in miles per our?	5 miles per hour
20.	Suppose you are blindly pulling two marbles with replacement from a bag of 14 marbles with 7 red, 4 yellow, and 3 black. What is the probability that you pick one red and one black marble?	$\frac{3}{28}$

Team #_____ **Total Points: _____/200**