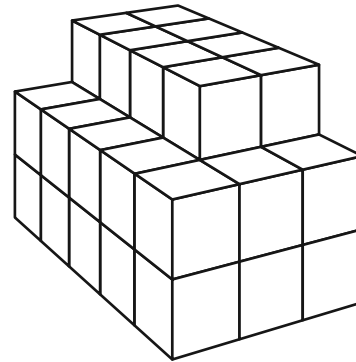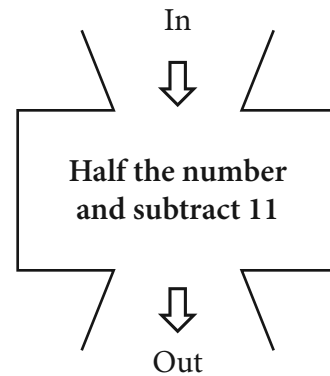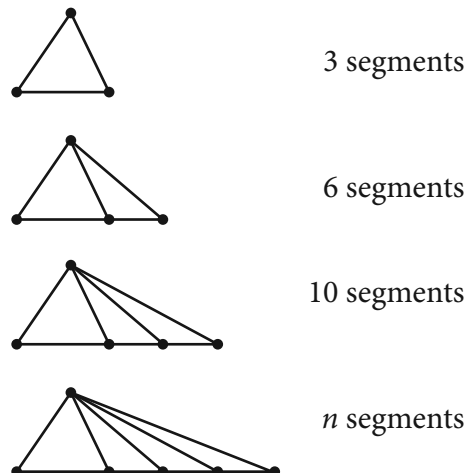# ICTM 4th Grade Mathematics Contest
(2012–2013)—Individual (#1)

1. A 12 oz. can of soda has 140 calories. How many calories does Bryan consume if he drinks 4 cans of soda?

2. What number will come out of the machine if 64 goes into the machine?

3. How many multiples of 14 are between 5 and 99 on the number line?

4. Brooke deposited $74.00 into her bank account, which had a balance of $159.00. She later withdrew $167.00 to buy some video games. What was the balance on Brooke's account after this withdrawal?

5. The shape shown is built using $1" \times 1" \times 1"$ cubes. What is the volume of the shape?

6. The Stickney Water Reclamation Plant is the largest wastewater treatment facility in the world. In 2010, it processed about 30 million gallons per hour. How many million gallons of water did the plant process in 12 minutes?

7. Autumn is making a pictograph showing the number of books read by each of her classmates last year. Each 📖 represents 6 books read. Nathan read 96 books last year. How many 📖 should Autumn's pictograph show for Nathan?

8. Determine the value of n.

In
⇩

Half the number and subtract 11

⇩
Out

3 segments

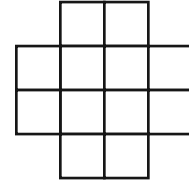6 segments

10 segments

n segments

ICTM 4th Grade Mathematics Contest
(2012–2013)—Team (#1)

1. How many 2-digit odd numbers can be written using digits 2, 3, 4, and 6 at most one time each per number?

2. Hailey's water bottle holds 24 ounces of water. It is $\frac{2}{3}$ empty. How many ounces of water are in the bottle?

3. How many squares are in the figure shown?

4. Timothy is losing his marbles. Between breakfast and lunch, he lost $\frac{2}{3}$ of his marbles. At lunch, he gave 14 marbles to Jennifer. Between lunch and dinner, he lost $\frac{3}{5}$ of the marbles he had left. At dinner, he had 8 marbles. How many marbles did he have at breakfast?

5. The club meeting started at 1:45 p.m. and lasted one and a half hours. Luis gave a 45 minute talk at the end of the meeting. At what time did Luis's talk end?

6. While playing a board game, Makayla had these letters:
G_2 R_1 I_1 T_1 L_1 A_1 N_1 E_1
She used all of her letters to play a geometry word. What was the word?

7. Write any number. Multiply the number by 6 and subtract 9. Take one-third of the result. Subtract 2 times the original number. What number is left?

8. Jeremiah is thinking of a number. When the number is quadrupled, the result is 184. What is Jeremiah's number?

9. How many paths are there from A to B if you can only travel in the direction of the arrows?
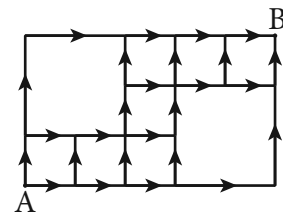
10. Arianna is twentieth in line and Kimberly is tenth in line. How many students are between them?

11. How many ones are there in one million, eight hundred eleven thousand?

12. There are 63 blue tiles and 45 white tiles in a bag. What fractional part of the tiles in the bag are not blue?

13. For the Padres-Diamondbacks baseball game shown, what is the value of $m + n$?

| Inning	1	2	3	4	5	6	7	8	9	Total
Padres	1	0	1	1	0	0	1	m	2	8
Diamondbacks	n	0	0	0	0	0	1	0	2	6

14. At the end of the Double Jeopardy round of Jeopardy!, Alexis had $7,600 and Ryan had "negative $1,500." Alexis had how much more money than Ryan?

15. Route 66 is about 2450 miles long. If you spend 7 hours per day for 7 days driving the whole length of Route 66, how many miles per hour would you average?

16. If 33 comes out, what number went in?

In

Triple and subtract 42

Out
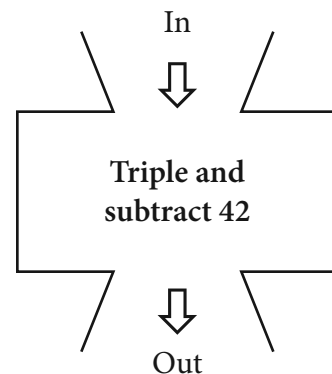
17. Michael has 7 dozen pogs. He trades $5\frac{1}{2}$ dozen pogs to Chase. How many pogs does Michael have left?

18. Look at the sequence 2, 4, 6, 8, 10, 12, 14, 16, ... until you find the tenth "2." In what number with the tenth "2" be found?

19. Sofia spins the spinner 3 times and writes down the numbers. What is the smallest possible result if she adds the first two and subtracts the third number?

12 15
18 13
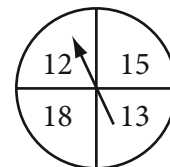
20. How many whole numbers leave a remainder of 1 when divided into 61?

ICTM 4th Grade Mathematics Contest
(2012–2013)—Individual (#2)

1. A container can hold 24 bottles. The container is $\frac{3}{4}$ empty. How many bottles are in the container?

2. Last school year, Dylan read 128 books. The graph shows the number of books Dylan read each month. The greatest number of books months Dylan read in a single month is how many times the least number of books he read in a single month?

3. Alexis scores a goal about 2 times per 13 attempts. If Alexis has 65 goal attempts, then how many goals would you predict for Alexis?
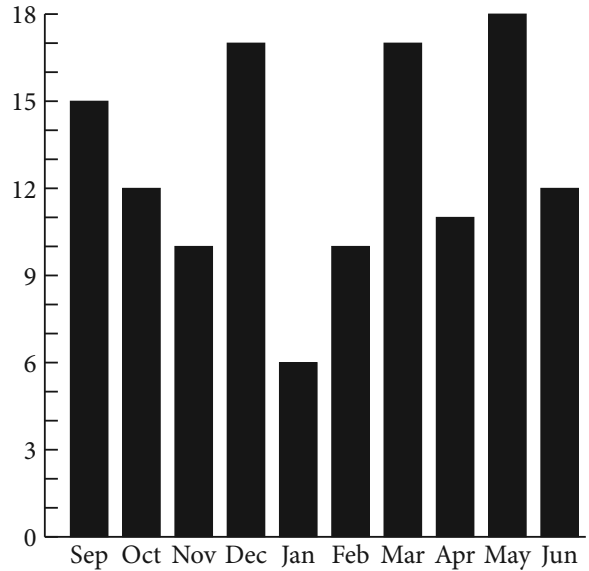
4. What digit is in the hundred thousands place for the number 987654321?

5. The entry fee for a contest is $35. For entering the contest, Diego gets free gifts worth a total of $28.75. How much more is the entry fee than the amount the gifts are worth?

6. How many rectangles are in the figure shown?

7. There are 32 students in Mary's class. 18 of the students speak more than one language. 21 of the students play a sport. 2 students only speak one language and don't play a sport. How many students both speak more than one language and play a sport?
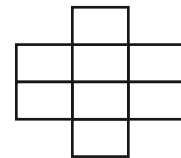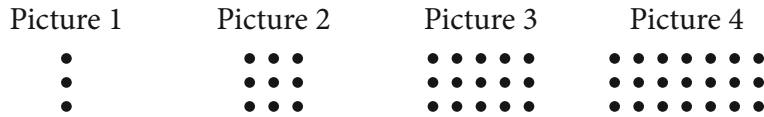
8. How many multiples of 7 are there between 30 and 92 on a number line?

30   92
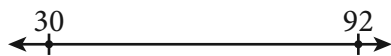
ICTM 4th Grade Mathematics Contest
(2012–2013)—Team (#2)

1. How many dots will be in Picture 9?

   Picture 1   Picture 2   Picture 3   Picture 4

2. The thermometer outside Stephanie's window said the temperature was –8°F one night. The temperature the next morning was 17 degrees warmer. What was the temperature that next morning?

3. What is the mode of the set of data below?
   10, 10, 12, 19, 24, 35, 37, 37, 37, 46, 48, 50, 50, 99

4. Nicholas raked the leaves from 18 neighbor's yards last week. He earns $7.25 per yard. How much did he earn?

5. What is the least number of hits to score exactly 72 points?
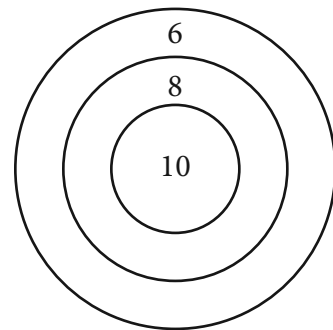
6. A group of dogs and chickens has 64 legs and 14 beaks. How many dogs are there?

7. What is the sum of all odd 3-digit numbers you can make using each of the digits 2, 3, and 4 one time per number?

8. $47 - 39 = n$. What is the value of 5 times n?

9. In the triangle shown, for each new row, a dot is black when the two dots above it are the same color. Otherwise, the dot is white. How many black dots will there be in the row with 13 dots?
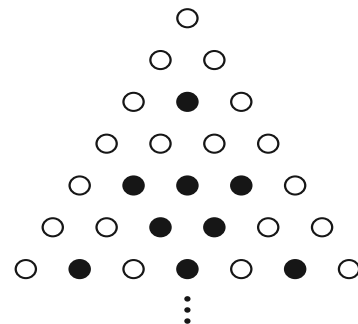
10. A touchdown is worth 6 points and a field goal is worth 3 points. Hunter scores 16 touchdowns and kicked 7 field goals during the season. How many points did Hunter score?

11. $\frac{1}{3} + \frac{1}{8} + \frac{1}{12} = \frac{\square}{24}$. What is the missing number?

12. Draw the next figure.

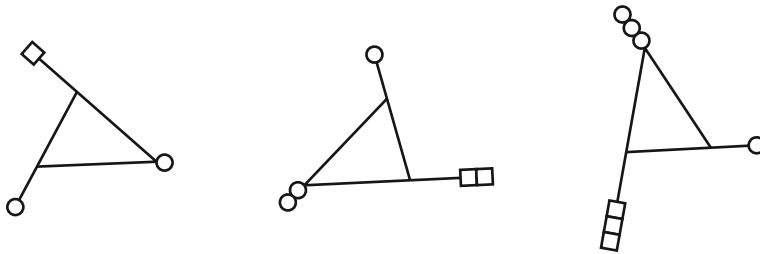13. Fourteen scouts went on a weekend camping trip along with 6 fathers. What was the cost per person for food for this trip if the total food cost was $256.80?

14. What is the value of n?

$$28 \xrightarrow{+9} \square \xrightarrow{\times 10} \square \xrightarrow{\div 5} n$$

15. How long, in centimeters, is an alligator that measures 3 m 86 cm from the tip of its nose to the end of its tail?

16. Claire is older than Jayden. The sum of their ages is 26 and the product of their ages is 168. How old is Jayden?

17. How many whole numbers divide into 78 and leave a remainder of 2?

18. What is the perimeter of the triangle when $x = 7$?
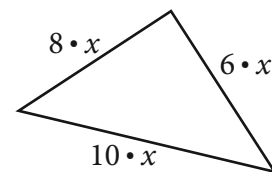
19. Natalia has 6 times as many quarters as dimes and three times as many dimes as nickels. Natalia has 40¢ in nickels. How much money does she have?

20. Jack wants to send a letter to a friend in George, Washington (a town in the state of Washington), so he needs at least 45¢ in postage. He has a lot of 13¢ stamps and 20¢ stamps, both featuring George Washington, but nothing else. What is the smallest amount he can make with these stamps that will be enough to mail his letter?

1. Autumn is making a pictograph showing the number of books read by each of her classmates last year. Each ✎ represents 6 books read. Brian read 36 books and Samantha read 54 books. How many more ✎ should Autumn's pictograph show for Samantha than for Brian?

2. Arrange the digits 1, 2, 3, and 4 in the boxes to get the largest product. What is this product?

(product)

3. A bag contained 12 chips numbered 2, 4, 6, 8, ..., 24. Kylie removes all the multiples of 4 or 6. What is the sum of the chips Kylie removed from the bag?

4. There are 14 windows, each with 6 sections. Each section takes 3 minutes to wash. If Daniel begins washing at 9:30 a.m., what time will he finish the job?

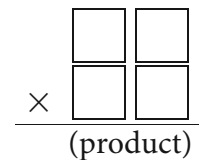
5. Sebastian scored exactly 97 points. What is the least number of darts he could have thrown?
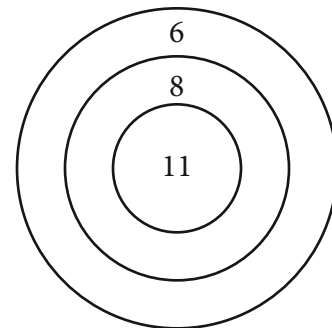
6. Let $n = 353535$ and $m = 535353$. Find the value of $m - n$. Divide this number by 6. What is the answer?

7. On RED MOON, a nittle is worth 4¢, a dittle is worth 9¢, and a quittle is worth 24¢. How much money does TULLA have if she has 8 nittles, 10 dittles, and 12 quittles?

8. How many toothpicks will be in the 7th arrangement?

8   14   20
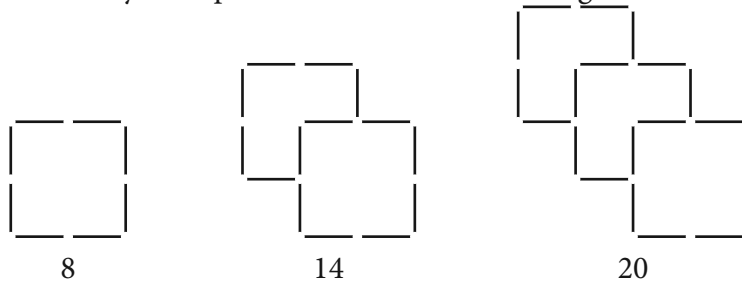
1. What is the 3-digit number closest to 555 that can be formed using 3 different digits taken from the list below?

   1, 3, 4, 6, 8, 9

2. Last school year, Dylan read 128 books. The graph shows the number of books Dylan read each month. What is the average number of books Dylan read per month from September through January?
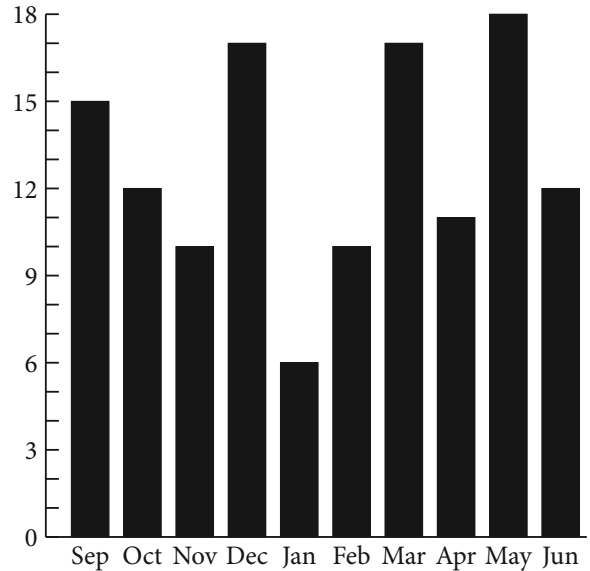
3. How many zeros are there in sixty three million forty two thousand?

4. Margaret and five of her friends go to an Indian restaurant and all have the buffet for lunch. Their total bill was $44.10. What is each person's share of the cost?

5. What is the value of b if $47 + c = 91$ and $b - c = 7$?

6. If the scale balances, what is the value of w?
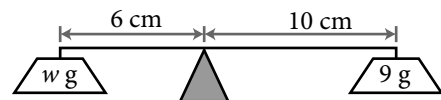
7. Which fraction is the smallest? $\frac{1}{3}, \frac{1}{6}, \frac{1}{10}, \frac{2}{11}, \frac{3}{20}$

8. The cover price for Cat Fancy magazine is $4.99. A one-year subscription costs $15 for 12 issues. How much money does the one-year subscription save compared to the cover price?

9. What is the largest sum of 3 different connected numbers?
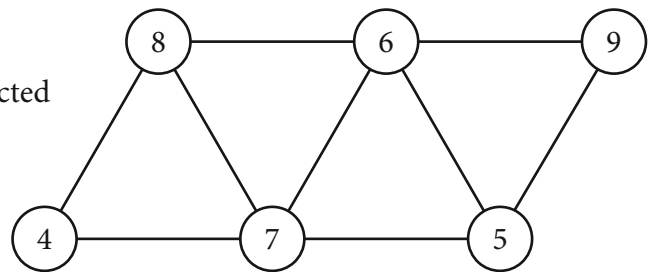
10. Blue marbles are worth 10¢ each.
    Red marbles are worth 6¢ each.
    Green marbles are worth 4¢ each.
    Taylor has 25 blue, 16 red, and 13 green marbles. How much are her marbles worth?

11. Tripling half of n gives 111. What is the value of n?

12. Angel decides to trick his friend Jenna by changing the buttons on her calculator as shown. $36 \div 9$ should give a result of 4. What is the result that is seen on the calculator with the switched buttons?

Old Arrangement   New Arrangement

13. How many minutes are in $\frac{17}{24}$ of two hours?

14. The letters from the word "equation" are put into a bag, mixed up, and a letter is drawn from the bag. What is the probability that the letter drawn comes after N in the alphabet?

15. What is the smallest odd number that uses all the digits?
5, 6, 4, 7, 8, 9

16. Caroline played the word "eighty" in a board game. Each letter is worth the number of points shown on its tile. The H was placed on a "double letter score" and the word was on a "triple word score." How many points did she score?
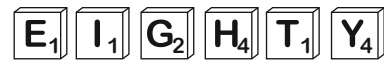
17. The average of two numbers is 29. The product of the numbers is 825. What is the sum of the numbers?

18. Jordan says, "My uncle has 36 animals on his farm. Some are pigs, the rest are geese. There are a total of 110 legs on the pigs and geese." How many geese live on the farm?

19. Determine the value of $a + b + c$ in the prime factor tree.

20. Look at the sequence 3, 6, 9, 12, ... until you determine the twelfth "3". In what number will the twelfth "3" be found?
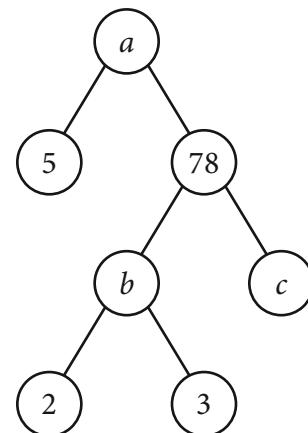
1. $4 \times 140 = \boxed{560 \text{ calories}}$.

2. $\frac{1}{2} \times 64 = 32$; $32 - 11 = \boxed{21}$.

3. The multiples of 14 between 5 and 99 on the number line are 14, 28, 42, 56, 70, 84, and 98. There are $\boxed{7}$ of them.

4. After the deposit, her balance was $159 + $74 = 233; after the withdrawal, her balance was $233 - $167 = \boxed{$66}$.

5. The bottom two layers are each 3 cubes wide by 5 cubes deep, so they each contain $3 \times 5 = 15$ small cubes. The top layer is 2 cubes wide by 4 cubes deep, so it contains $2 \times 4 = 8$ small cubes. In total, there are $15 + 15 + 8 = 38$ small cubes, each with a volume of 1 in^3, so the volume of the shape is $\boxed{38 \text{ in}^3}$.

6. 30 million gallons per hour is 30 million gallons per 60 minutes, or 1 million gallons per 2 minutes, so in $12 = 6 \times 2$ minutes, the plan processes $\boxed{6 \text{ million gallons}}$ of water.

7. $96 \div 6 = 16$, so the pictograph should show $\boxed{16}$ of the icon.

8. There are 5 segments from the top vertex. If the points along the bottom edge are labeled A, B, C, D, and E, the segments to be counted along the bottom edge are $\overline{AB}$, $\overline{AC}$, $\overline{AD}$, $\overline{AE}$, $\overline{BC}$, $\overline{BD}$, $\overline{BE}$, $\overline{CD}$, $\overline{CE}$, and $\overline{DE}$ —10 more segments. There are a total of $n = \boxed{15}$ segments.

1. For a number to be odd, the ones digit must be odd and 3 is the only odd digit available, so it must be the ones digit. Since each digit can be used at most one time per number, the 3 can't be used as the tens digit, leaving three possible tens digits: 2, 4, and 6, for a total of $1 \times 3 = \boxed{3}$ 2-digit odd numbers that can be made with the given digits (23, 43, and 63).

2. If it is $\frac{2}{3}$ empty, it is $1 - \frac{2}{3} = \frac{3}{3} - \frac{2}{3} = \frac{1}{3}$ full, so there are $24 \times \frac{1}{3} = 24 \div 3 = \boxed{8 \text{ ounces}}$ of water in the bottle.

3. There are 12 small squares. There are also 5 larger (2×2) squares. No square larger than that fits in the figure, so there are a total of $12 + 5 = \boxed{17}$ squares.

4. At dinner he had 8 marbles, having lost $\frac{3}{5}$ of the marbles he had at the end of lunch, so 8 marbles was $1 - \frac{3}{5} = \frac{2}{5}$ of the marbles he had at the end of lunch, or each $\frac{1}{5}$ of the marbles he had at the end of lunch was $8 \div 2 = 4$, so he had $4 \times 5 = 20$ marbles at the end of lunch. Adding in the 14 he gave away at lunch, he had $20 + 14 = 34$ marbles at the beginning of lunch. Since he'd lost $\frac{2}{3}$ of his marbles before lunch, those 34 marbles were $1 - \frac{2}{3} = \frac{1}{3}$ of the marbles he had at breakfast, so he had $34 \times 3 = \boxed{102 \text{ marbles}}$ at breakfast.

5. One and a half hours after 1:45 p.m. is the same as a half-hour after 2:45 p.m. or 3:15 p.m. Another 45 minutes later is $\boxed{4\!:\!00 \text{ p.m.}}$.

6. The letters can be rearranged to spell $\boxed{\text{TRIANGLE}}$.

7. Suppose we start with 0, for simplicity (in general, x). Multiplying by 6 gives 0 ($6x$). Subtracting 9 gives –9 ($6x - 9$). Taking $\frac{1}{3}$ of the result gives $-9 \div 3 = -3$ (($6x - 9) \div 3 = 2x - 3$). Subtracting 2 times the original number gives $-3 - 2 \times 0 = \boxed{-3}$ ($2x - 3 - 2x = -3$).

8. $184 \div 4 = \boxed{46}$.

9. Label A as 1. For each intersection, label it with the sum of the labels of the intersections leading to it. The label at B is the number of ways to get there, $\boxed{26}$.
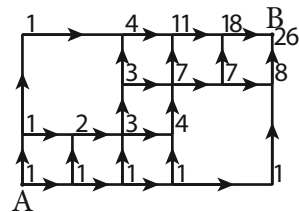
10. They are $20 - 10 = 10$ position-changes away from one another, but that over-counts the students between them by 1—there are $10 - 1 = \boxed{9}$ students between them (11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, and 19th in line).

11. One million, eight hundred eleven thousand is 1,811,000, so there are $\boxed{3}$ ones.

12. There are a total of $63 + 45 = 108$ tiles, 45 of which are not blue, so $\frac{45}{108} = \frac{5 \times 9}{12 \times 9} = \boxed{\frac{5}{12}}$ of the tiles are not blue.

13. For the Padres, $8 = 1 + 0 + 1 + 1 + 0 + 0 + 1 + m + 2 = m + 6$, so $m = 8 - 6 = 2$. For the Diamondbacks, $6 = n + 0 + 0 + 0 + 0 + 0 + 1 + 0 + 2 = n + 3$, so $n = 6 - 3 = 3$. $m + n = 2 + 3 = \boxed{5}$.

14. $\$7{,}600 - (-\$1{,}500) = \$7{,}600 + \$1{,}500 = \boxed{\$9{,}100}$.

15. 7 hours per day for 7 days is $7 \times 7 = 49$ hours. $2450 \div 49 = \boxed{50 \text{ miles per hour}}$.

16. If 33 comes out, then before 42 was subtracted, we had $33 + 42 = 75$; before tripling, the number that went in was $75 \div 3 = \boxed{25}$.

17. $7 - 5\frac{1}{2} = 1\frac{1}{2}$, so he has $1\frac{1}{2}$ dozen left, or $12 + 6 = \boxed{18}$.

18. Continuing the sequence, $\underline{2}$ (1st), 4, 6, 8, 10, 1$\underline{2}$ (2nd), 14, 16, 18, $\underline{2}$0 (3rd), $\underline{2}$2 (4th and 5th), $\underline{2}$4 (6th), $\underline{2}$6 (7th), $\underline{2}$8 (8th), 30, 3$\underline{2}$ (9th), 34, 36, 38, 40, 4$\underline{2}$ (10th), ..., so the tenth 2 occurs in $\boxed{42}$.

19. To get the smallest possible result, the first two numbers, which are added, should be as small as possible and the third number, which is subtracted, should be as large as possible. That is, $12 + 12 - 18 = \boxed{6}$.

20. The whole numbers that leave a remainder of 1 when divided into 61 are factors of $61 - 1 = 60$ that are bigger than 1, so: 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, and 60, a total of $\boxed{11}$ whole numbers.

1. If the container is $\frac{3}{4}$ empty, it is $1 - \frac{3}{4} = \frac{1}{4}$ full. $\frac{1}{4} \times 24 = 24 \div 4 = \boxed{6 \text{ bottles}}$.

2. He read the greatest number of books in May, 18, and the least in January, 6. 18 is $18 \div 6 = \boxed{3}$ times as many as 6.

3. She scores 2 times per 13 attempts and makes $65 = 5 \times 13$ attempts, so the prediction should be $5 \times 2 = \boxed{10 \text{ goals}}$.

4. $987,\boxed{6}54,321$.

5. $\$35.00 - \$28.75 = \boxed{\$6.25}$.

6. There are 14 small ($\square$) rectangles, 4 1×2 ($\square\square$) rectangles, 2 1×3 ($\square\square\square$) rectangles, 5 2×1 ($\boxminus$) rectangles, 2 2×2 ($\boxplus$) rectangles, 1 2×3 ($\boxplus\boxplus$) rectangle, 2 3×1 ($\equiv$) rectangles, and 1 4×1 ($\boxminus$) rectangle, for a total of $14 + 4 + 2 + 5 + 2 + 1 + 2 + 1 = \boxed{31 \text{ rectangles}}$.

7. $32 - 2 = 30$ of the students speak more than one language, play a sport, or both, but $18 + 21 = 39$, so $39 - 30 = \boxed{9 \text{ students}}$ both speak more than one language and play a sport.

8. The multiples of 7 between 30 and 92 are $5 \times 7 = 35$, ..., $13 \times 7 = 91$, so it's the first 13 multiples of 7 without the first 4 multiples of 7—$13 - 4 = \boxed{9}$ multiples of 7.

1. The first picture has 3 dots and each picture after that has 2 more columns of 3 dots, or 6 more dots than the previous picture. Picture 9 is $9 - 1 = 8$ pictures after the first picture, so it will have $3 + 8 \times 6 = 3 + 48 = \boxed{51 \text{ dots}}$.

2. $-8 + 17 = 17 - 8 = \boxed{9°F}$.

3. The mode is the number that appears more than any other number. There are 3 37s and no more than 2 of any other number, so the mode is $\boxed{37}$.

4. $18 \times \$7.25 = \boxed{\$130.50}$.

5. Start by trying to use as many of the highest-point-value hit (10 points) as possible: $7 \times 10 = 70$, but there's no way to get $72 - 70 = 2$ more points. $6 \times 10 = 60$, leaving $72 - 60 = 12$, which can be done with 2 hits for 6 points each, so it's possible to do with $6 + 2 = \boxed{8 \text{ hits}}$. It is also possible to do it in 8 hits with: 4 10s and 4 8s; or 5 10s, 2 8s, and 1 6. Any other combination of hits that yields 72 points requires at least 9 hits.

6. Dogs don't have beaks, so the 14 beaks means 14 chickens, which accounts for $14 \times 2 = 28$ of the legs. Thus, $64 - 28 = 36$ legs come from the dogs, meaning $36 \div 4 = \boxed{9 \text{ dogs}}$.

7. For the number to be odd, the ones digit must be odd, so 3 must be the ones digit. That leaves 2 and 4 for the other two digits, so the only possible odd 3-digit numbers are 243 and 423. Their sum is $243 + 423 = \boxed{666}$.

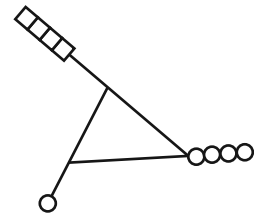8. $n = 47 - 39 = 8$, so $5 \times n = 5 \times 8 = \boxed{40}$.

9. The rows after those shown in the question are shown at the right. There are $\boxed{9 \text{ black dots}}$ in the row with 13 dots.
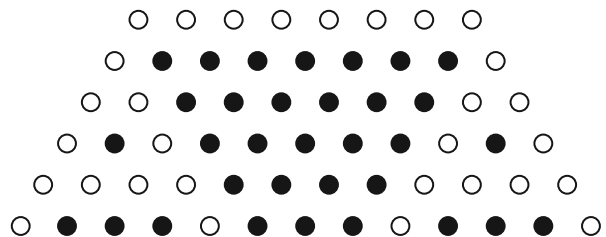
10. $16 \times 6 + 7 \times 3 = 96 + 21 = \boxed{117 \text{ points}}$.

11. $\frac{1}{3} + \frac{1}{8} + \frac{1}{12} = \frac{8}{24} + \frac{3}{24} + \frac{2}{24} = \frac{13}{24}$, so the missing number is $\boxed{13}$.

12. Rotate the last given figure clockwise, add an additional square to the group of squares, and an additional circle to the group of circles (not the single circle).

13. There were $14 + 6 = 20$ people, so the cost per person was $256.80 \div 20 = \$25.68 \div 2 = \boxed{\$12.84}$.

14. $28 + 9 = 37$; $37 \times 10 = 370$; $370 \div 5 = n = \boxed{74}$.

15. 3 m 86 cm $= 300$ cm $+ 86$ cm $= \boxed{386 \text{ cm}}$.

16. Since the product of their ages is 168, look at the factors of 168. For example, $168 = 21 \times 8$, but $21 + 8 \neq 26$. $168 = 14 \times 12$ and $14 + 12 = 26$, so their ages are 14 and 12. Since Claire is older, Jayden's age is the smaller number, $\boxed{12}$.

17. Whole numbers that divide into 78 and leave a remainder of 2 are factors of $78 - 2 = 76$ that are greater than 2: 4, 19, 38, and 76. So, there are $\boxed{4}$.

18. $10 \cdot x + 8 \cdot x + 6 \cdot x = 24 \cdot x$, so when $x = 7$, the perimeter is $24 \cdot 7 = \boxed{168}$.

19. 40¢ in nickels is 40¢ $\div$ 5¢ $= 8$ nickels, so she has 8 nickels, $3 \times 8 = 24$ dimes, and $6 \times 24 = 144$ quarters. The total value of the coins is 40¢ $+ 24 \times 10$¢ $+ 144 \times 25$¢ $= 40$¢ $+ 240$¢ $+ 3600$¢ $= 3880$¢ $= \boxed{\$38.80}$.

20. Make a table where each row starts with a number of 20¢ stamps, then find out how many 13¢ stamps are needed and the total postage. The smallest total is $\boxed{46¢}$ with 1 20¢ stamp and 2 13¢ stamps.

# of 20¢	value of 20¢	# of 13¢	value of 13¢	total value
0	0¢	4	52¢	52¢
1	20¢	2	26¢	46¢
2	40¢	1	13¢	53¢
3	60¢	0	0¢	60¢

1. Samantha read $54 - 36 = 18$ more books than Brian, so the pictograph should show $18 \div 6 = \boxed{3}$ more book icons for Samantha.

2. The largest product will come from the two numbers being as large as possible, so use the two largest digits—3 and 4—for the highest place value—the tens place. The two possible products are $31 \times 42 = 1302$ and $32 \times 41 = \boxed{1312}$.

3. $4 + 6 + 8 + 12 + 16 + 18 + 20 + 24 = \boxed{108}$.

4. It will take $14 \times 6 \times 3 = 252$ minutes or 4 hours and 12 minutes to wash the windows, so he will finish at $\boxed{1:42 \text{ p.m.}}$.

5. Since the total score is odd and 11 is the only odd point value, there must be an odd number of 11s; 9 would give 99 points, which is too many; 7 11s would leave $97 - 77 = 20$ points, which could be 1 8 and 2 6s ($97 = 7 \times 11 + 1 \times 8 + 2 \times 6$) for a total of $\boxed{10 \text{ hits}}$. Using fewer 11s will require increasing the number of 8s and 6s by more than the reduction in 11s, so 10 is the least number of hits.

6. $53 - 35 = 18$, so $m - n = 535353 - 353535 = 181818$. Dividing by 6, $18 \div 6 = 3$, so $181818 \div 6 = \boxed{30303}$.

7. $8 \times 4¢ + 10 \times 9¢ + 12 \times 24¢ = \boxed{410¢}$.

8. Each arrangement has 6 more toothpicks than the previous arrangement, so the 7th arrangement, which is 6 arrangements after the 1st arrangement, will have $8 + 6 \times 6 = 8 + 36 = \boxed{44 \text{ toothpicks}}$.

1. Start with the greatest-value place, the hundreds digit. To be as close to 555 as possible, use 4 or 6 for the hundreds digit. Using 4, the tens place should be as high as possible, so 9, followed by the highest possible ones place, 8, giving 498. Using 6, the tens place should be as low as possible, so 1, followed by the lowest possible ones place, 3, giving 613. $555 - 498 = 57$ and $613 - 555 = 58$, so $\boxed{498}$ is the closest such 3-digit number.

2. From September through January, he read $15 + 12 + 10 + 17 + 6 = 60$ books in 5 months, for an average of $60 \div 5 = \boxed{12 \text{ books per month}}$.

3. Sixty three million forty two thousand is 63,042,000, which has $\boxed{4 \text{ zeros}}$.

4. There are $1 + 5 = 6$ people, so each person's share is $\$44.10 \div 6 = \boxed{\$7.35}$.

5. $c = 91 - 47 = 44$, so $b - 44 = 7$ and $b = 7 + 44 = \boxed{51}$.

6. For the scale to balance, the products of the mass or weight and its distance from the pivot (the torque) on each side must be equal, so $6 \times w = 10 \times 9$ or $w = 90 \div 6 = \boxed{15}$.

7. With equal numerators, the fraction with the greater denominator is smaller, so $\frac{1}{10}$ is smaller than $\frac{1}{3}$ and $\frac{1}{6}$. $\frac{1}{10} = \frac{2}{20}$, so it is smaller than $\frac{3}{20}$. $\frac{1}{10} = \frac{11 \times 1}{11 \times 10} = \frac{11}{110}$ and $\frac{2}{11} = \frac{10 \times 2}{10 \times 11} = \frac{20}{110}$, so $\frac{1}{10}$ is smaller than $\frac{2}{11}$. Thus, $\boxed{\frac{1}{10}}$ is the smallest of the given fractions.

8. At the cover price, 12 issues would cost $12 \times \$4.99 = \$59.88$, so the subscription saves $\$59.88 - \$15 = \boxed{\$44.88}$.

9. To get the largest sum, try to use the largest numbers. In order, the largest few numbers are 9, 8, 7, and 6. It's not possible to use 9, 8, and 7, but $9 + 8 + 6 = \boxed{23}$ is allowed. Any other combination would require trading the 9 or the 8 (or both) for a smaller number without increasing the other numbers by more, so that's the largest sum.

10. $25 \times 10¢ + 16 \times 6¢ + 13 \times 4¢ = 250¢ + 96¢ + 52¢ = 398¢ = \boxed{\$3.98}$.

11. Undoing the tripling, half of n must be $111 \div 3 = 37$ and $n = 2 \times 37 = \boxed{74}$.

12. Entering $36 \div 9$ is really doing $96 + 3 = \boxed{99}$.

13. Two hours is $2 \times 60 = 120$ minutes; $\frac{17}{24} \times 120 = 17 \times 120 \div 24 = 17 \times 5 = \boxed{85 \text{ minutes}}$.

14. "Equation" has 8 letters, 3 of which come after N in the alphabet (Q, U, and T), so the probability is $\boxed{\frac{3}{8}}$.

15. To make the smallest number, use the smallest digits in the greatest-value places, so start with the 4, then the 5, and so on, until all the digits are used. This gives $\boxed{456789}$, which happens to be odd.

16. $(1 + 1 + 2 + 2 \times 4 + 1 + 4) \times 3 = 17 \times 3 = \boxed{51 \text{ points}}$.

17. Since the average of two numbers is half of the sum of the two numbers, the sum of the two numbers is $29 \times 2 = \boxed{58}$. (The numbers are 25 and 33.)

18. If the 36 animals were all geese, there would be $36 \times 2 = 72$ legs. There are $110 - 72 = 38$ more legs than that and each pig contributes 2 more legs than a goose, so there must be $38 \div 2 = 19$ pigs and $36 - 19 = \boxed{17}$ geese.

19. $a = 5 \times 78 = 390$; $b = 2 \times 3 = 6$; $c = 78 \div b = 78 \div 6 = 13$.
$a + b + c = 390 + 6 + 13 = \boxed{409}$.

20. The sequence is multiples of 3. Writing out terms of the sequence: $\underline{3}$ (1st), 6, ..., 27, $\underline{30}$ (2nd), $\underline{33}$ (3rd and 4th), $\underline{36}$ (5th), $\underline{39}$ (6th), 42, ..., $6\underline{3}$ (7th), ..., $9\underline{3}$ (8th), ..., 120, $12\underline{3}$ (9th), 126, 129, $1\underline{3}2$ (10th), $1\underline{3}5$ (11th), $1\underline{3}8$ (12th), ... So, the twelfth 3 occurs in $\boxed{138}$.