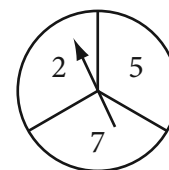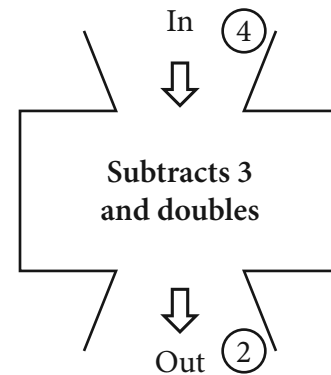# ICTM 3rd Grade Mathematics Contest
(2010–2011)—Individual (#1)

1. Makayla's birthday was 84 days ago. How many weeks ago was her birthday?

2. What number will come "out" of the machine if 19 goes "in" to the machine?

In ④

⇩

Subtracts 3 and doubles

⇩

Out ②

3. Three hundred tickets were printed for Colin's school play. The girls sold 97 tickets and the boys sold 83 tickets. How many tickets to Colin's play were not sold?

4. Amber's family eats 13 boxes of frozen waffles each month. Each box of frozen waffles has 8 individual waffles. How many individual waffles does her family eat each month?

5. How many dots will be in the next drawing?

1 dot   3 dots   7 dots
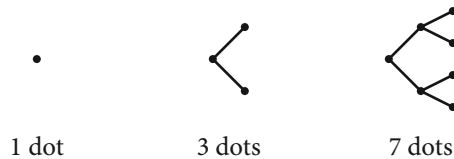
6. Nathan had 18 nickels and 11 dimes. He now has 5 nickels and 3 dimes. How much money did he spend?

7. How many 3-digit numbers can you make using the digits 3, 5, and 8 if each digit is used once per number?

8. Oscar spun the spinner two times. How many different sums are possible?

# ICTM 3rd Grade Mathematics Contest
(2010–2011)—Team (#1)

1. Jocelyn bought 21 songs for $0.99 each and paid 85¢ tax. She paid with a gift card that had $25 on it. How much is left on the gift card?

2. If today is Thursday, then what day was it eighteen days before tomorrow?

3. What digit is in the hundreds place for the number 24601?

4. How many ways can Autumn get from A to B if she must always travel in the direction of the arrows?
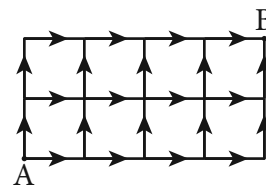
5. Determine the value of ⌓ × 4 + 7 × ⌎ if ⌓ is 9 and ⌎ is 6.

6. Tyler played the word "pentagon" in a board game. Each letter is worth the number of points shown on its tile. The E was placed on a "triple letter score" and the word was on a "double word score." How many points did Tyler score?

    P₃ E₁ N₁ T₁ A₁ G₂ O₁ N₁
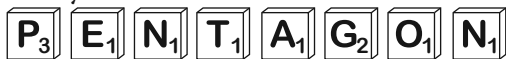
7. Write a 3-digit number that is sixty less than $264 + 576$.

8. A printing job uses 2 bottles of ink for every 5 cases of paper. How many cases of paper were used when 18 bottles of ink were used?

9. What number will go "in" to the machine if 29 comes "out" of the machine?
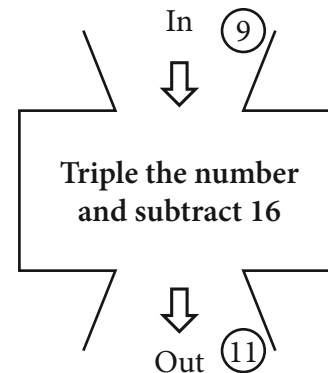
10. There are 47 cars and 29 bicycles in the parking lot outside Olivia's school. How many wheels are there in the parking lot?

11. The maximum capacity of the elevator in Eric's building is 1200 lbs. Eric and his friends weigh 84, 91, 78, 72, 81, 69, 88, 74, 93, and 85 pounds. If they all get in the elevator, how much more weight can the elevator hold?

12. Determine the smallest 3-digit number greater than 500 that can be formed using 3 different digits from those below.

$$3, 8, 4, 2, 7, 9$$

13. Determine the perimeter of the figure shown.

14. Find the missing number: $45 - \boxed{} = 37 - 18$

15. Luis has six cards numbered 3, 4, 5, 6, 8, and 10. He chooses the cards containing factors of 72. How many cards did he choose?

16. A total of 61 students are in the math club or the science club (or both). There are 37 students in the science club and 41 students in the math club. How many students are in both clubs?

17. Savannah wants to mail a three-ounce large envelope to Tuvalu, so she needs at least $2.82 in postage. She already put one 98¢ stamp on the envelope. How many 42¢ stamps does she need to put on the envelope to have enough postage?

18. Benjamin and five of his friends ordered pizza. The total cost was $41.10. What is each person's share of the cost?

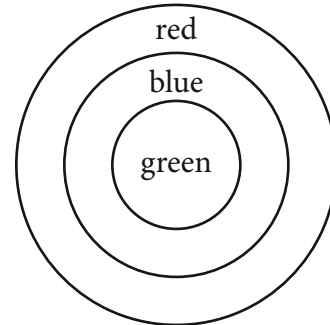19. Determine the sum of the missing numbers in the pattern:

$$1, 4, \underline{}, \underline{}, \underline{}, 36, 49, 64$$

20. The letter ⎯D⎯ has line symmetry. How many lines can be drawn to show line symmetry for the symbol ⊠?
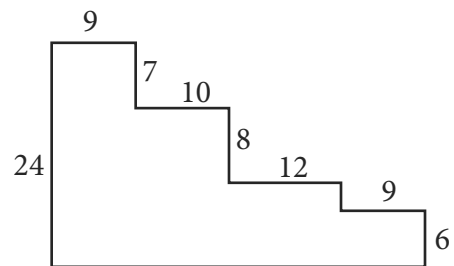
ICTM 3rd Grade Mathematics Contest
(2010–2011)—Individual (#2)

1. I am a number between 50 and 85. I am a multiple of 15. What numbers could I be?

2. green = 15 points
   blue = 11 points
   red = 8 points

   Katelyn threw 8 darts. Two landed in green, three landed in blue, and the rest landed in red. How many points did Katelyn earn?

3. What is the sum of seven hundred eighty-six and four hundred thirty-nine?

4. Ariana's brother's birthday is 38 days after her birthday. Ariana's birthday was on a Wednesday in January. What day of the week will her brother's birthday be that year?

5. Ella played the word "number" in a board game. Each letter is worth the number of points shown on its tile. How many points did Ella score?

   N_1 U_1 M_3 B_3 E_1 R_1

6. Lunch at a particular restaurant costs $6.60 per person. How much will it cost for Christopher and 19 of his friends to have lunch at the restaurant?

7. John got to school at 7:50 a.m. and stayed at school for 6 hours and 45 minutes. At what time did John leave school?

8. Each small square is 4 square units. Determine the total area of the shaded regions.
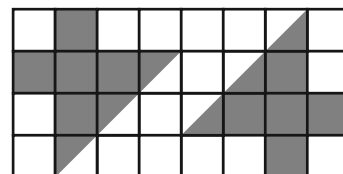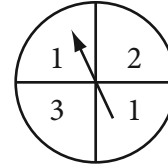
ICTM 3rd Grade Mathematics Contest
(2010–2011)—Team (#2)

1. Angel has $5.50 in coins. Eighteen of the coins are quarters. The rest are dimes. How many coins does he have?

2. Victoria spins the spinner three times. How many different products are possible?

3. A bottling plant put 77,760 ounces of cola into cans in one hour. There are 12 ounces of cola in one can and 24 cans in a case. How many full cases did the plant make in one hour?

4. How many seconds are there in $7\frac{1}{2}$ minutes?

5. Gianna is trying to read 100 books this school year. The graph shows the number of books she has read each month so far. How many more books does she need to read to get to 100?
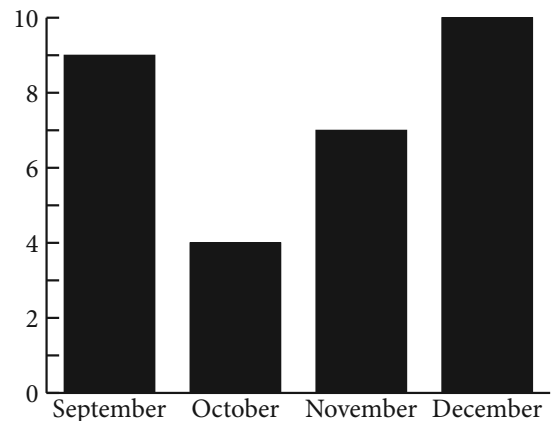
6. What is the difference between eight hundred sixty-seven and three hundred eighty-eight?

7. Mason had a bag containing 25 chips numbered 1, 2, 3, 4, ..., 23, 24, 25. He removed all of the multiples of 2, all the multiples of 3, and all the multiples of 5. What is the sum of the chips that are still in the bag?

8. How many toothpicks will be in the next picture?
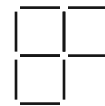
4   10   18

9. Determine the 3-digit number closest to 600 that can be formed using 3 different digits from those below.

   1, 9, 3, 8, 7, 2

10. There are about 6 servings per container for a snack food. About how many servings are in 15 packages?

11. Adrian baked cookies and put them into boxes of 8. He had 13 boxes and 5 cookies left over. How many cookies did he bake?
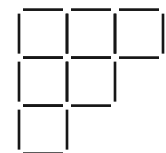
12. What is the average of the products below?

| 70	50	40	60	70
$\times\ 5$	$\times\ 6$	$\times\ 8$	$\times\ 7$	$\times\ 7$

13. What two numbers add up to 29 and multiply to 208?

14. Margaret wants to mail a one-ounce first-class letter to Truth Or Consequences (in New Mexico), so she needs at least $0.44 in postage. She has a lot of 17¢ stamps and 29¢ stamps, but nothing else. What is the smallest amount she can make with these stamps that will be enough to mail her letter?

15. How many multiples of four are there between 31 and 59 on a number line?

16. A car dealer has 60 cars. $\frac{1}{2}$ of them are black. $\frac{1}{3}$ of them are silver. $\frac{1}{20}$ of them are yellow. The rest are red. How many red cars are there?

17. How many ways can Trevor get from A to B if he must always travel in the direction of the arrows?
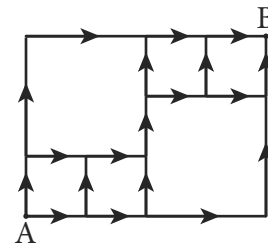
18. Daniela needs an hour and fifteen minutes to get to work. She needs to be at work by 8:10 a.m. What is the latest time she can leave for work?

19. Determine the sum of the missing numbers in the pattern:

    3, 8, ____, ____, ____, 28, 33, 38

20. Rearrange the letters to find a geometry word:

    L A C R E G E N T

1. Melanie has 510 trading cards. She puts them into stacks of 30. How many stacks will she have?

2. Maria has a strip of 44¢ comics stamps and some 64¢ butterfly stamps:

   What is the total value of Maria's stamps? Give your answer in cents.

3. How many even numbers are there between 29 and 65 on a number line?

4. Jalen bought 8 packages of blue pens and 13 packages of black pens. There are 12 pens in each package. How many more black pens than blue pens did he buy?

5. What number will go "in" to the machine if 11 comes "out" of the machine?

In ⑧
⇩

Take half the number
and add 3

⇩
Out ⑦

6. Ashley's math team sold t-shirts to raise money. There are 25 students on the team. There are 11 boys on the team. Each boy sold 9 t-shirts. Each girl sold 15 t-shirts. How many total t-shirts did the team sell?

7. David's family has 3 dozen eggs. David uses 12 eggs to bake cupcakes. His mother uses one third of the remaining eggs to make breakfast. How many eggs are left?

8. Which difference is the smallest?

$$32 \qquad 33 \qquad 37 \qquad 41$$
$$\underline{-16} \quad \underline{-18} \quad \underline{-19} \quad \underline{-24}$$
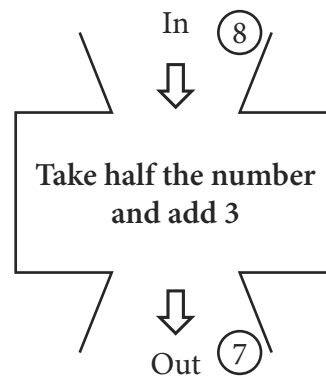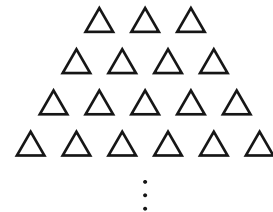
ICTM 3rd Grade Mathematics Contest
(2010–2011)—Team (#3)

1. While rearranging her bookshelves, Leslie put her books on two tables. On one table, she made 9 piles of 6 books. On the other table, she made 11 piles of 4 books. How many books does she have?

2. How many total triangles will be in the first 10 rows?

$$\triangle\ \triangle\ \triangle$$
$$\triangle\ \triangle\ \triangle\ \triangle$$
$$\triangle\ \triangle\ \triangle\ \triangle\ \triangle$$
$$\triangle\ \triangle\ \triangle\ \triangle\ \triangle\ \triangle$$
$$\vdots$$

3. From 6:00 a.m. to 6:00 p.m., how many times are all of the digits of a digital clock the same?

4. William went to sleep at 8:10 p.m. and slept for 625 minutes. At what time did he wake up?

5. Erin's back yard has a walkway around the edge. The walkway is made up of tiles. Each tile has area 9 square feet. What is the area of the lawn? (The lawn is the rectangle in the middle.)

[figure: rectangular border of tiles surrounding a region labeled "lawn"]
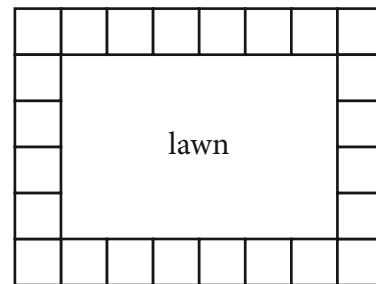
6. If today is Friday, what day will it be 23 days after the day before yesterday?

7. What prime number is the closest to 75?

8. Find each missing digit. They are all the same digit.

$$\begin{array}{r} 1\ 3\ 2 \\ -\ \square\ \square \\ \hline \square\ \square \end{array}$$

9. Justin is losing his marbles. Before school, he had 25 marbles. By lunchtime, he had lost 8 marbles. Between lunch and getting home, he lost another 9 marbles. Between getting home and going to bed, he lost half of the remaining marbles. How many marbles does he have left?

10. The perimeter of a square is 28. If all if the sides of the square are doubled, then what is the new perimeter of the square?

11. How many numbers with 6 for at least one digit are there between 25 and 95 on a number line?

12. How many squares are in the figure shown?
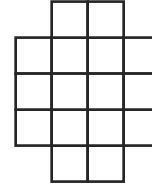
13. It costs $0.75 per hour to park on a particular street. How many minutes will a nickel buy?

14. Determine the average of the missing numbers in the pattern:

    2, 9, 16, ___, ___, ___, ___, ___, 58, 65, 72

15. In England before 1967, a tanner was worth 6 pence, a shilling was worth 12 pence, and a half-crown was worth 30 pence. How much money, in pence, does Alexander have if he has 8 tanners, 7 shillings, and 6 half-crowns?

16. What number will come "out" of the machine if 7 goes "in" to the machine?

In ⑤

⬇

Multiply the number by itself and subtract 10

⬇

Out ⑮
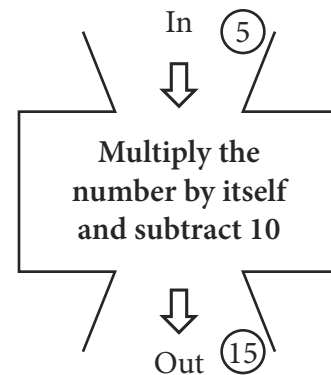
17. $78 = (7 \times n) + 8$. What is the value of n?

18. Samantha makes chain maille bracelets. Each bracelet has 84 steel rings. She has 1200 steel rings. How many bracelets can she make?

19. Nicholas wants to mail a one-ounce letter to Bora Bora, so he needs at least $0.98 in postage. He has a lot of 37¢ Seuss stamps and 25¢ Wurlitzer jukebox stamps, but nothing else. What is the smallest amount he can make with these stamps that will be enough to mail his letter?

20. Emma and her husband have one child, two cats, three dogs, and four birds in their house. Including the people, how many legs are in the house?

ICTM 3rd Grade Mathematics Contest
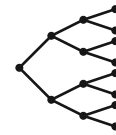**(2010–2011)—Individual Solutions (#1)**

1. 84 days $= 12 \times 7$ days $= \boxed{12 \text{ weeks}}$.

2. $19 - 3 = 16$, $16 \times 2 = \boxed{32}$.

3. $300 - 97 - 83 = \boxed{120}$.

4. $13 \times 8 = \boxed{104 \text{ waffles}}$.

5. The next drawing is shown at the right. There are the same 7 dots from the previous drawing plus 8 new dots, so $7 + 8 = \boxed{15 \text{ dots}}$.

6. He spent $18 - 5 = 13$ nickels and $11 - 3 = 8$ dimes, so he spent $13 \times 5¢ + 8 \times 10¢ = 65¢ + 80¢ = \boxed{\$1.45}$.

7. There are 3 choices for the first digit. Having used one digit, there are then 2 choices for the second digit. Having used two of the digits, there is only 1 choice for the last digit. So, there are $3 \times 2 \times 1 = \boxed{6}$ different 3-digit numbers. (They are 358, 385, 538, 583, 835, and 853.)

8. $2 + 2 = 4$, $2 + 5 = 5 + 2 = 7$, $2 + 7 = 7 + 2 = 9$, $5 + 5 = 10$, $5 + 7 = 7 + 5 = 12$, and $7 + 7 = 14$; so there are $\boxed{6}$ different possible sums.

1. $21 \times \$0.99 + \$0.85 = \$20.79 + \$0.85 = \$21.64$; $\$25 - \$21.64 = \boxed{\$3.36}$.

2. Since today is Thursday, tomorrow is Friday. Eighteen days before a Friday is the same day as $18 - 2 \times 7 = 4$ days before a Friday, which is $\boxed{\text{Monday}}$.

3. The digit in the hundreds place is $24\boxed{6}01$.

4. 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, $\boxed{15}$.
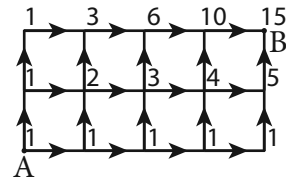
5. $\square \times 4 + 7 \times \square = 9 \times 4 + 7 \times 6 = 36 + 42 = \boxed{78}$.

6. $3 + 3 \times 1 + 1 + 1 + 1 + 2 + 1 + 1 = 13$; $2 \times 13 = \boxed{26}$.

7. $264 + 576 - 60 = 204 + 576 = 200 + 580 = \boxed{780}$.

8. 18 bottles of ink is $18 \div 2 = 9$ sets of 2 bottles, so $9 \times 5 = \boxed{45 \text{ cases}}$ of paper were used.

9. $\underline{45} - 16 = 29$; $\boxed{15} \times 3 = 45$.

10. Each car has 4 wheels and each bicycle has 2 wheels, so there are a total of $47 \times 4 + 29 \times 2 = 188 + 58 = \boxed{246 \text{ wheels}}$.

11. $84 + 91 + 78 + 72 + 81 + 69 + 88 + 74 + 93 + 85 = 815$ pounds, so the elevator can hold $1200 - 815 = \boxed{385 \text{ pounds}}$ more.

12. Since the number must be greater than 500, the hundreds digit must be at least 5 and the smallest such number will have the smallest possible hundreds digit, so the hundreds digit must be 7. To make the number as small as possible, choose the smallest tens digit—2—and then the smallest ones digit—3. The number is $\boxed{723}$.

13. Each "step" of the figure can be pushed out as shown at the right without changing the perimeter of the figure. Once all the steps are pushed out, the result is a rectangle with height 24 and width $9 + 10 + 12 + 9 = 40$, so perimeter $2 \times 24 + 2 \times 40 = \boxed{128}$.
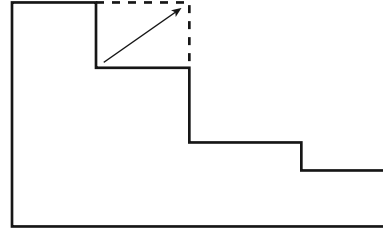
14. $37 - 18 = 19$; $45 - 19 = \boxed{26}$. (Alternately, 45 is 8 more than 37, so the missing number must be 8 more than 18.)

15. 3, 4, 6, and 8 are factors of 72, but 5 and 10 are not. He chose $\boxed{4 \text{ cards}}$.

16. The sum of the numbers of students in each club is $37 + 41 = 78$, which is more than 61, but some students were counted twice; $78 - 61 = \boxed{17 \text{ students}}$ were counted twice and are in both clubs.

17. With the 98¢ stamp on the envelope, she only needs $\$2.82 - \$0.98 = \$1.84$ more postage. $4 \times \$0.42 = \$1.68$ is not enough, but $5 \times \$0.42 = \$2.10$ is enough, so she needs $\boxed{5 \text{ stamps}}$.

18. Benjamin and five friends is 6 people. $\$41.10 \div 6 = \boxed{\$6.85}$.

19. The numbers are perfect squares, so the missing numbers are 9, 16, and 25. $9 + 16 + 25 = \boxed{50}$.

20. The symbol has 4 lines of symmetry:

1. Multiples of 15 are 15, 30, 45, 60, 75, 90, ..., so the only multiples of 15 that are between 50 and 85 are $\boxed{60, 75}$.

2. $8 - 2 - 3 = 3$ darts landed in red;
    $2 \times 15 + 3 \times 11 + 3 \times 8 = 30 + 33 + 24 = \boxed{87 \text{ points}}$.

3. $786 + 439 = \boxed{1225}$.

4. 38 days after a Wednesday is the same day as
    $38 - 5 \times 7 = 38 - 35 = 3$ days after a Wednesday, which is $\boxed{\text{Saturday}}$.

5. $1 + 1 + 3 + 3 + 1 + 1 = \boxed{10 \text{ points}}$.

6. $20 \times \$6.60 = \boxed{\$132.00}$.

7. 6 hours and 45 minutes after 7:50 a.m. is the same time as 6 hours and 35 minutes after 8:00 a.m., which is $\boxed{2\!:\!35 \text{ p.m.}}$.

8. There are 10 fully-shaded squares (each with area 4) and 6 half-shaded squares (each with shaded area 2), so the total shaded area is $10 \times 4 + 6 \times 2 = 40 + 12 = \boxed{52}$.

1. 18 quarters are worth $18 \times \$0.25 = \$4.50$, so the dimes are worth $\$5.50 - \$4.50 = \$1.00$. Each dime is worth $\$0.10$, so there are 10 dimes and a total of $18 + 10 = \boxed{28 \text{ coins}}$.

2. $1 \times 1 \times 1 = 1$, $1 \times 1 \times 2 = 2$, $1 \times 1 \times 3 = 3$, $1 \times 2 \times 2 = 4$, $1 \times 2 \times 3 = 6$, $1 \times 3 \times 3 = 9$, $2 \times 2 \times 2 = 8$, $2 \times 2 \times 3 = 12$, $2 \times 3 \times 3 = 18$, $3 \times 3 \times 3 = 27$; there are $\boxed{10}$ different products possible.

3. $77760 \div 12 = 6480$ cans, so $6480 \div 24 = \boxed{270 \text{ cases}}$.
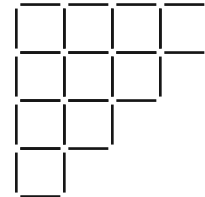
4. $7 \times 60 + 30 = \boxed{450 \text{ seconds}}$.

5. She has read $9 + 4 + 7 + 10 = 30$ books so far, so she has $100 - 30 = \boxed{70 \text{ books}}$ left to go.

6. $867 - 388 = \boxed{479}$.

7. The chips that are left are 1, 7, 11, 13, 17, 19, and 23. $1 + 7 + 11 + 13 + 17 + 19 = \boxed{68}$.

8. The next picture is as shown at the right. There are $\boxed{28 \text{ toothpicks}}$.

9. The closes to 600 and greater would start with a 7; the closest to 600 and less than it would start with a 3, so it would be farther away. Starting with a 7, choose the least tens digit, then the least ones digit, so the number is $\boxed{712}$.

10. $6 \times 15 = \boxed{90 \text{ servings}}$.

11. $13 \times 8 + 5 = \boxed{109 \text{ cookies}}$.

12. $\frac{1}{5}(70 \times 5 + 50 \times 6 + 40 \times 8 + 60 \times 7 + 70 \times 7) =$
    $\frac{1}{5} \times 70 \times 5 + \frac{1}{5} \times 50 \times 6 + \frac{1}{5} \times 40 \times 8 + \frac{1}{5} \times 60 \times 7 + \frac{1}{5} \times 70 \times 7 =$
    $14 \times 5 + 10 \times 6 + 8 \times 8 + 12 \times 7 + 14 \times 7 = 70 + 60 + 64 + 84 + 98 = \boxed{376}$.

13. $208 = 13 \times 2 \times 2 \times 2 \times 2 = 13 \times 16$ and $13 + 16 = 29$, so $\boxed{13, 16}$.

14. Make a table where each row starts with a number of 29¢ stamps, then find out how many 17¢ stamps are needed and the total postage. The smallest total is $\boxed{46¢}$ with 1 29¢ stamp and 1 17¢ stamp.

# of 29¢	value of 29¢	# of 17¢	value of 17¢	total value
0	0¢	3	51¢	51¢
1	29¢	1	17¢	46¢
2	58¢	0	0¢	58¢

15. The multiples of 4 between 31 and 59 are 32, 36, 40, 44, and 48, so there are $\boxed{5}$.

16. There are $60 \times \frac{1}{2} = 30$ black cars, $60 \times \frac{1}{3} = 20$ silver cars, and $60 \times \frac{1}{20} = 3$ yellow cars, so there are $60 - 30 - 20 - 3 = \boxed{7 \text{ red cars}}$.

17. 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, $\boxed{11}$.
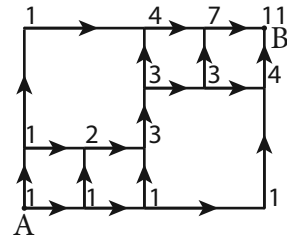
18. An hour and 15 minutes before 8:10 a.m. is the same time as an hour and 5 minutes before 8:00 a.m., which is $\boxed{6:55 \text{ a.m.}}$.

19. The missing numbers are 13, 18, and 23 (add 5 to the previous number to get the next number), so $13 + 18 + 23 = \boxed{44}$.

20. $\boxed{\text{RECTANGLE}}$.

1. $510 \div 30 = \boxed{17}$.

2. $5 \times \$0.44 + 4 \times \$0.64 = \$2.20 + \$2.56 = \boxed{\$4.76}$.

3. The even numbers between 29 and 65 are 30,
    32, 34, ..., 62, 64. From 30 to 64 is an increase of
    $64 - 30 = 34$, which is $34 \div 2 = 17$ steps of 2, so there
    are $17 + 1 = \boxed{18}$.

4. He bought $13 - 8 = 5$ more packages of black pens than
    packages of blue pens, so he bought $5 \times 12 = \boxed{60}$ more
    black pens than blue pens.

5. $\underline{8} + 3 = 11; \frac{1}{2} \times \boxed{16} = 8$.

6. There are $25 - 11 = 14$ girls, so the team sold
    $11 \times 9 + 14 \times 15 = 99 + 210 = \boxed{309 \text{ shirts}}$.

7. 3 dozen eggs is $3 \times 12 = 36$ eggs. After he uses 12,
    there are $36 - 12 = 24$ left. His mother uses $\frac{1}{3}$, leaving
    $\frac{2}{3} \times 24 = \boxed{16 \text{ eggs}}$.

8. $32 - 16 = 16$, $33 - 18 = 15$. $37 - 19 = 18$, and
    $41 - 24 = 17$, so the smallest difference is $\boxed{18}$.

1. $9 \times 6 + 11 \times 4 = 54 + 44 = \boxed{98 \text{ books}}$.

2. Each row has one more triangle than the previous row, so
   $3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11 + 12 = \boxed{75}$.

3. It happens at 11:11 a.m., 1:11 p.m., 2:22 p.m., 3:33 p.m. ,4:44 p.m., and
   5:55 p.m., so $\boxed{6 \text{ times}}$.

4. $625 = 10 \times 60 + 25$ minutes is 10 hours and 25 minutes. 10 hours and 25
   minutes after 8:10 p.m. is $\boxed{6\!:\!25 \text{ a.m.}}$.

5. The lawn is 6 tiles wide and 4 tiles tall, so it has area $6 \times 4 = 24$ tiles, which is
   $24 \times 9 = \boxed{216 \text{ square feet}}$.

6. If today is Friday, the day before yesterday was Wednesday. 23 days after
   Wednesday is the same day as $23 - 3 \times 7 = 2$ days after Wednesday, which is
   $\boxed{\text{Friday}}$.

7. Even numbers other than 2 cannot be prime, so 74 and 76 cannot be prime.
   $77 = 7 \times 11$ is not prime. $\boxed{73}$ is prime.

8. Looking at the ones digits, 2 minus a digit is that same digit, so that digit is
   either 1 or 6. If it were 1, then $132 - 11 = 11$, which is not true. If it were 6,
   then $132 - 66 = 66$, which is true, so the digit is $\boxed{6}$.

9. By the time he got home, he had $25 - 8 - 9 = 8$ marbles left. If he lost half, he
   has half left, so he has $8 \times \frac{1}{2} = \boxed{4 \text{ marbles}}$ left when he goes to bed.

10. The perimeter of a square is 4 times the length of a side, so doubling each side
    doubles the perimeter: $28 \times 2 = \boxed{56}$. (The sides of the original square were
    $28 \div 4 = 7$ and the sides of the new square are $7 \times 2 = 14$; $14 \times 4 = 56$.)

11. The numbers with 6 for at least one digit are 26, 36, 46, 56, 60, 61, 62, 63, 64,
    65, 66, 67, 68, 69, 76, and 86, so there are $\boxed{16}$.

12. There are 16 small squares, there are 8 squares made up of four small squares, and there are 2 squares made up of nine small squares. So, there are $16 + 8 + 2 = \boxed{26 \text{ squares}}$ in the figure.

13. $0.75 per hour means 3 quarters per hour, so each quarter is $\frac{1}{3}$ of an hour or 20 minutes. A nickel is $\frac{1}{5}$ of a quarter, so a nickel buys $\frac{1}{5} \times 20 = \boxed{4 \text{ minutes}}$.

14. Each number is 7 more than the previous number, so the missing numbers are 23, 30, 37, 44, and 51. Their average is $\frac{1}{5}(23 + 30 + 37 + 44 + 51) = \frac{1}{5} \times 185 = \boxed{37}$. (Note that this is the middle of the five numbers. If the pattern is adding the same number each time, the average of a set of consecutive numbers is the middle number if there are an odd number of numbers or the average of the middle two if there are an even number of numbers.)

15. $8 \times 6p + 7 \times 12p + 6 \times 30p = 48p + 84p + 180p = \boxed{312 \text{ pence}}$.

16. $7 \times 7 - 10 = 49 - 10 = \boxed{39}$.

17. If $78 = (7 \times n) + 8$, then $7 \times n = 70$, so $\boxed{n = 10}$.

18. $84 \times 14 = 1176$ and $84 \times 15 = 1260$, so she has enough steel rings to make $\boxed{14 \text{ bracelets}}$, but not 15.

19. Make a table where each row starts with a number of 37¢ stamps, then find out how many 25¢ stamps are needed and the total postage. The smallest total is $\boxed{99¢}$ with 2 37¢ stamps and 1 25¢ stamp.

# of 37¢	value of 37¢	# of 25¢	value of 25¢	total value
0	0¢	4	100¢	100¢
1	37¢	3	75¢	112¢
2	74¢	1	25¢	99¢
3	111¢	0	0¢	111¢

20. The 3 people and 4 birds each have 2 legs; the 2 cats and 3 dogs each have 4 legs. So, there are $(3 + 4) \times 2 + (2 + 3) \times 4 = 7 \times 2 + 5 \times 4 = 14 + 20 = \boxed{34 \text{ legs}}$.