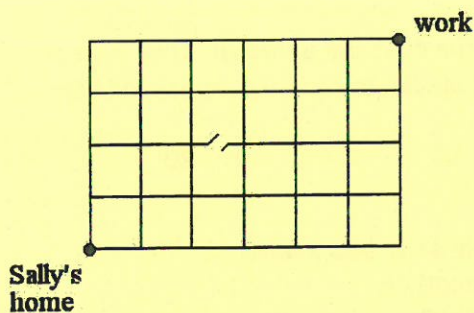


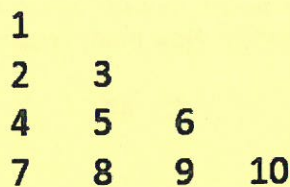


10. Jeff wrote a math book. It takes 852 digits to number the pages of Jeff's book. (For example, it takes 8 digits to number pages 99–101 of the book.) How many times does the digit 7 appear in the page numbers of Jeff's book?  
 A. 58                      B. 60                      C. 62                      D. 64                      E. 66
11. The expression  $3,333,333,334^2$  is equal to a 20-digit number. What is the sum of those 20 digits?  
 A. 45                      B. 51                      C. 55                      D. 58                      E. 61
12. Find the area of the region in the fourth quadrant bounded by the coordinate axes and the lines  $y = x - 3$  and  $x - y = 7$ .  
 A. 16                      B. 20                      C. 33                      D. 40                      E. 42
13. If  $9^x - 9^{x-1} = 24$ , find  $(6x)^x$ .  
 A.  $\frac{1}{2}$                       B. 3                      C.  $\frac{9}{2}$                       D.  $\frac{27}{2}$                       E. 27
14. Find the sum of the solutions to  $6x^2 + x - 6 = x^2 + 1$ .  
 A.  $-\frac{1}{6}$                       B.  $-\frac{1}{5}$                       C. 0                      D.  $\frac{1}{6}$                       E.  $\frac{1}{5}$

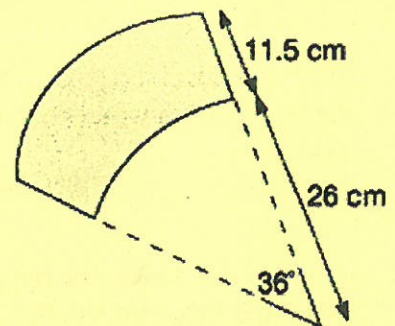
Use the three diagrams below to answer questions 15, 16 and 17.



Question 15



Question 16



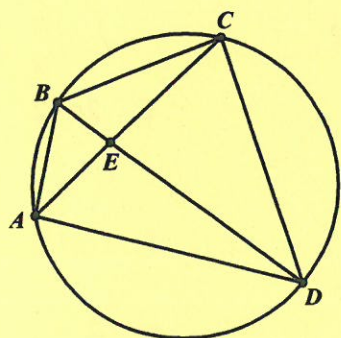
Question 17

15. Sally travels to work but must travel only north or east. Furthermore, because of construction, a section of road is unusable, as shown above left. Determine the number of ways Sally can get to work.  
 A. 30                      B. 90                      C. 150                      D. 180                      E. 210
16. Assume that the triangular array will continue in the manner shown above center. What number will be directly below 94?  
 A. 104                      B. 106                      C. 108                      D. 110                      E. 112
17. In the figure shown above right, the angle at the center of the sector is degrees. Find the area in square centimeters of the shaded region. Round your answer to the nearest square centimeter.  
 A. 72                      B. 132                      C. 181                      D. 229                      E. 299

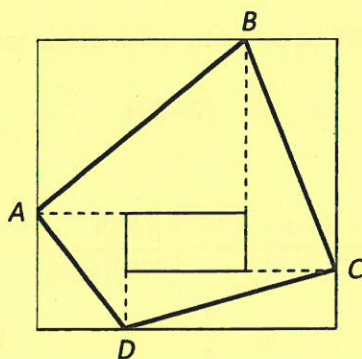
18. A square piece of paper is folded in half twice: from top to bottom, then from top to bottom again. If the perimeter of the final rectangle is 35 cm, what was the perimeter of the original square?  
 A. 54                      B. 56                      C. 70                      D. 105                      E. 140
19. The straight-line distance from Danville to Johnsonville is 35 miles. The straight-line distance from Johnsonville to Hubbardsville is 12 miles. Let  $D$  be the straight-line distance from Danville to Hubbardsville. Which of the following three statements is/are TRUE?  
 I.  $D$  could be 25 miles.  
 II.  $D$  could be 42 miles.  
 III.  $D$  could be 50 miles.  
 A. I only                      B. I and II only                      C. II and III only                      D. all of them                      E. none of them
20. A three-digit number is selected at random. What is the probability that none of the three digits is prime?  
 A.  $\frac{1}{5}$                       B.  $\frac{1}{4}$                       C.  $\frac{49}{150}$                       D.  $\frac{3}{5}$                       E.  $\frac{2}{3}$
21. If  $|x-2|=p$  and  $x < 2$ , then  $x-p$  MUST be equal to which of the following?  
 A.  $2-2p$                       B.  $-2$                       C.  $|2-2p|$                       D.  $2$                       E.  $2p-2$
22. Simplify the following fraction:  $\frac{(1+2+3+\cdots+199)(200)}{(201+202+203+\cdots+399)(400)}$   
 A.  $\frac{1}{12}$                       B.  $\frac{1}{6}$                       C.  $\frac{1}{4}$                       D.  $\frac{1}{3}$                       E.  $\frac{1}{2}$
23. Find the circumference of the circle given by the equation  $x^2 + y^2 - 14x + 8y + 1 = 0$ .  
 A.  $8\pi$                       B.  $12\pi$                       C.  $16\pi$                       D.  $25\pi$                       E.  $64\pi$
24. Suppose  $x$ ,  $y$  and  $z$  are positive integers with  $x < y < z$  and  $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$ . What is the value of  $x + y + z$ ?  
 A. 1                      B. 4                      C. 9                      D. 11                      E. no such integers exist
25. How many integers  $k$  satisfy  $6k^3 - 6k > k^4 - k^2$ ?  
 A. 3                      B. 4                      C. 5                      D. 6                      E. Infinitely many
26. The area of a circle is given by  $\frac{81}{16}\pi$ . What is the perimeter of the largest square that fits inside of this circle?  
 A.  $\frac{3}{2}$                       B. 2                      C.  $\frac{9\sqrt{2}}{4}$                       D.  $3\sqrt{2}$                       E.  $9\sqrt{2}$
27. For how many integers  $x$  does a triangle with side lengths 12, 25 and  $x$  have all its angles acute?  
 A. 5                      B. 6                      C. 7                      D. 8                      E. 9

28. Two identical cylindrical tanks were full of water. Two different models of pumps were used to empty the tanks. The pumps were started at the same time and each pumped at a constant rate. The first tank was emptied in 3 hours, and the second tank was emptied in 4 hours. How many minutes after the pumps were started was the water depth in one tank twice the depth in the other tank?
- A. 60                      B. 72                      C. 120                      D. 132                      E. 144
29. The solution of the equation  $7^{x+7} = 8^x$  can be expressed in the form  $x = \log_b 7^7$ . What is  $b$ ?
- A.  $\frac{7}{15}$                       B.  $\frac{7}{8}$                       C.  $\frac{8}{7}$                       D.  $\frac{15}{8}$                       E.  $\frac{15}{7}$
30. If  $f$  is a function such that  $f(x-1) = x^2 - 3x + 5$ , then  $f(x+1)$  is equal to which of the following?
- A.  $x^2 + x + 3$                       B.  $x^2 - x + 3$                       C.  $x^2 + x$                       D.  $x^2 - 3x + 7$                       E.  $x^2 - 2x + 6$

Use the Figures below to answer questions 31, 32, 33 and 34.



Question 31



Question 32

Age	Exceed Limit if Possible?		Total
	Always	Not Always	
Under 30	100	100	200
Over 30	40	160	200
<b>Total</b>	<b>140</b>	<b>260</b>	<b>400</b>

Questions 33 and 34

31. In the circle shown (not to scale) above left, arc  $AC$  measures  $126^\circ$ ,  $\angle BDC$  measures  $35^\circ$ , and arc  $AD$  measures  $140^\circ$ . Find the measure of  $\angle BEC$ .
- A.  $90^\circ$                       B.  $95^\circ$                       C.  $100^\circ$                       D.  $102^\circ$                       E.  $105^\circ$
32. A rectangle of area  $22 \text{ cm}^2$  is placed inside a square whose side lengths are 12 cm with the sides of the rectangle parallel to the sides of the square, as shown above center. (The diagram is not drawn to scale.) Perpendiculars are drawn from the corners of the rectangle to the sides of the square. What is the area of quadrilateral  $ABCD$  in square centimeters?
- A. 72                      B. 83                      C. 86.4                      D. 108                      E. 132

A survey asked people how often they exceeded speed limits. The data were then entered into a contingency table of counts, categorized by age group and response. **THE TABLE IS SHOWN ABOVE RIGHT AND WILL BE USED FOR QUESTIONS 33 AND 34.**

33. What percentage of people *over age 30* reported that they always exceeded the speed limit?
- A. 10                      B. 20                      C. 33                      D. 40                      E. 50
34. What are the odds that a randomly-selected respondent said that they *did not* always exceed the speed limit?
- A. 1 to 1                      B. 1 to 2                      C. 2 to 1                      D. 7 to 13                      E. 13 to 7