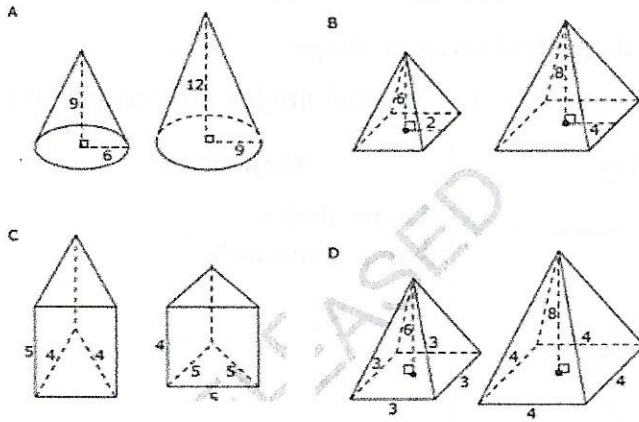


61. The length of a rectangular prism is $4\sqrt{3}$ units. The height is $3\sqrt{6}$ units. If the volume is irrational, which could be the measure of the width of the rectangular prism?
- A $2\sqrt{50}$
 B $4\sqrt{12}$
 C $5\sqrt{8}$
 D $7\sqrt{18}$
62. What is the **approximate** length of the arc subtended by an angle of $\frac{4\pi}{3}$ radians on a circle with a radius of 6.00 meters?
- A 12.57 meters
 B 14.14 meters
 C 25.13 meters
 D 28.27 meters
63. Which expression is equivalent to $\frac{x+7}{x^2+4x-21} + \frac{x+5}{x^2+8x+15}$ when x is restricted so that the expressions are defined?
- A $\frac{x+3}{x-3}$
 B $\frac{x-3}{x+3}$
 C 1
 D -1
64. Which expression is equivalent to $\frac{\frac{\sin(\theta)}{\cos(\theta)} + \frac{\cos(\theta)}{\sin(\theta)}}{\frac{1}{\sin(\theta)}}$?
- A $\frac{1}{\cos(\theta)}$
 B $\sin(\theta)$
 C $\cos(\theta)$
 D $\frac{1}{\sin(\theta)}$
65. What is the **approximate** value of the sum:
- $$8 - \frac{8}{7} + \frac{8}{49} - \dots + 8 \cdot \left(-\frac{1}{7}\right)^{2,500}?$$
- (Note: The sum of a series can be calculated using the formula $S_n = \frac{a_1(1-r^n)}{1-r}$, where $r \neq 1$.)
- A 1
 B 7
 C 8
 D 9
66. Which expression is equivalent to $(4 - 3i)^2 \div (6 + i)^2$?
- A 30
 B $42 - 12i$
 C 50
 D $62 - 12i$
67. The volume of a rectangular prism is represented by the expression $(x^3 - 2x^2 - 20x - 24)$. If the length is $(x - 6)$ and the height and width are equal, what is the width of the prism?
- A $x + 2$
 B $x - 2$
 C $x + 4$
 D $x - 4$
68. What value of h is needed to complete the square for the equation $x^2 + 10x - 8 = (x - h)^2 - 33$?
- A -25
 B -5
 C 5
 D 25
69. The table below shows the number of families living in the city of Sunnyvale from 1965 to 2000.
- | Year (after 1900) | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
|--------------------------------|------|------|------|------|------|------|------|------|
| Number of Families (thousands) | 31.1 | 30.5 | 30.1 | 28.7 | 27.1 | 25.7 | 23.2 | 20.3 |
- According to the best-fit quadratic model, **approximately** how many families will live in Sunnyvale in 2010?
- A 14,000
 B 15,000
 C 18,000
 D 19,000
70. A shipping company is designing boxes to meet specific requirements.
- Each box must be a completely closed rectangular prism with no overlapping material.
 - The boxes must hold 24 cans in two layers of 12 cans each.
 - The cans are 3 inches in diameter and 5 inches in height.
- What is the smallest amount of cardboard needed to meet the specifications?
- A 1,080 in.²
 B 840 in.²
 C 636 in.²
 D 540 in.²
71. William put the tip of his pencil on the outer edge of a graph of the unit circle at the point $(0, 1)$. He moved his pencil tip through an angle of $\frac{4\pi}{3}$ radians in the counterclockwise direction along the edge of the circle. At what angle of the unit circle did William's pencil tip stop?
- A $\frac{\pi}{3}$
 B $\frac{5\pi}{6}$
 C $\frac{7\pi}{6}$
 D $\frac{5\pi}{3}$
72. Which choice shows the solutions to the equation $8x^2 + 3x = -7$?
- A $\frac{-3 \pm i\sqrt{215}}{16}$
 B $\frac{3 \pm i\sqrt{215}}{16}$
 C $\frac{-3 \pm \sqrt{233}}{16}$
 D $\frac{3 \pm \sqrt{233}}{16}$

73. Which choice shows a pair of similar figures?



75. A student wants to determine the most liked professor at her college. Which type of study would be the **most** practical to obtain this information?

- A a simulation
- B an experiment
- C a survey
- D an observation

77. A system of equations is shown below.

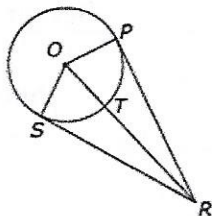
$$y = |x - 3|$$

$$y = \frac{1}{2}x$$

What is the distance between the points of intersection of the system?

- A $\sqrt{6}$
- B $\sqrt{20}$
- C $\sqrt{48}$
- D $\sqrt{80}$

79. In the figure below, \overline{PR} and \overline{SR} are tangent to circle O .



If $OT = 11$ cm and $PR = 60$ cm, what is the length of \overline{OR} ?

- A 61 cm
- B 59 cm
- C 50 cm
- D 48 cm

81. Which is an equation of a parabola that has a directrix of $y = -5$ and a focus at $(2, -1)$?

- A $y = \frac{1}{2}(x + 2)^2 + 2$
- B $y = \frac{1}{8}(x + 2)^2 + 3$
- C $y = \frac{1}{8}(x - 2)^2 - 3$
- D $y = \frac{1}{2}(x - 2)^2 - 2$

74.

Samantha invested \$10,000 in each of two different financial plans in 2013. The predicted value of each plan is modeled below.

- Plan M: a rate of 7.5%, compounded continuously.
- Plan N: The value is determined by the function $y = 5x^3 - 50x^2 + 4x + 10,000$, where x is the number of years after 2013.

Plan N has a greater predicted value than Plan M during which years?

- A from 2014 to 2041
- B from 2028 to 2055
- C from 2042 to 2073
- D Plan N never has a greater value than Plan M.

76. The graph of the function $f(x) = x^3$ will be shifted down 2 units and to the right 3 units. Which is the function that corresponds to the resulting graph?

- A $g(x) = (x + 3)^3 + 2$
- B $g(x) = (x + 3)^3 - 2$
- C $g(x) = (x - 3)^3 + 2$
- D $g(x) = (x - 3)^3 - 2$

78.

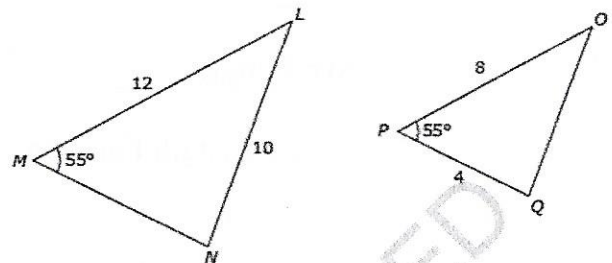
A town has 685 households. The number of people per household is normally distributed with a mean, μ , of 3.67 and a standard deviation, σ , of 0.34.

Approximately how many households have between 2.99 and 4.01 people?

- A 493 households
- B 520 households
- C 558 households
- D 575 households

Triangles LMN and OPQ are shown below.

80.



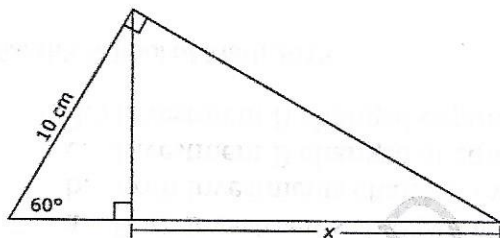
What additional information is sufficient to show that $\triangle LMN$ can be transformed and mapped onto $\triangle OPQ$?

- A $OQ = 6$
- B $MN = 9$
- C $\angle LMN \cong \angle QOP$
- D $\angle NLM \cong \angle QOP$

82. What is the **approximate** solution to the equation $3^{x-1} = 4^{2x+5}$?

- A 3.875
- B 1.262
- C -2.354
- D -4.797

83. What is the value of x in the triangle below?



- A $\frac{5\sqrt{3}}{2}$ cm
B $5\sqrt{3}$ cm
C 10 cm
D 15 cm

84. A function is shown below.

$$f(x) = \begin{cases} -x^2 + 2x & \text{for } x \leq -3 \\ 2\left(\frac{1}{3}\right)^{2x} & \text{for } -3 < x < 4 \\ \frac{2x-5}{x-7} & \text{for } x \geq 4 \end{cases}$$

What is the value of the expression $f(-3) + 2f(-1) - f(4)$?

- A $\frac{101}{36}$
B $\frac{32}{9}$
C 4
D 22

85. A farmer wants to buy between 90 and 100 acres of land.

- He is interested in a rectangular piece of land that is 1,500 yards long and 300 yards wide.
- The piece of land is being sold as one complete unit for \$87,000.

If the farmer does not want to spend more than \$900 an acre, does the land meet all of his requirements? (1 acre \approx 43,560 ft²)

- A Yes, the amount of land satisfies his needs, and the price is low enough.
B No, the price is low enough, but there is too much land.
C No, the price is low enough, but there is not enough land.
D No, the amount of land satisfies what he needs, but the price is too high.

86. A principal wants to survey 150 students to determine which electives to offer during the next school year. There are 1,800 students in the school. Which procedure could the principal use to select a sample using a systematic random sample?

- A Obtain a list of all students. Start with the eighth student, and select every twelfth student until 150 students have been selected.
B Select the first 150 students who enter the school.
C Choose the fifth student to come into the cafeteria, and then select every third student who comes into the cafeteria until 150 students have been selected.
D Place students' names on slips of paper and select 150 slips.

87. Which expression is equivalent to $\frac{\sin^4(\theta) - \cos^4(\theta)}{\sin^2(\theta) - \cos^2(\theta)}$, where $\sin^2(\theta) \neq \cos^2(\theta)$?

- A $\sin^2(\theta) - \cos^2(\theta)$
B $\cos^2(\theta) - \sin^2(\theta)$
C 2
D 1

88. To completely cover a spherical ball, a ball company uses a total area of 36 square inches of material. What is the maximum volume the ball can have?

(Note: Surface area of a sphere = $4\pi r^2$. Volume of a sphere = $\frac{4}{3}\pi r^3$.)

- A 27π cubic inches
B $36\sqrt{\pi}$ cubic inches
C $\frac{36}{\sqrt{\pi}}$ cubic inches
D $\frac{27}{\pi}$ cubic inches

89. Which function goes to positive ∞ most quickly as x increases?

- A $y = \log(x) + 100$
B $y = e^{x-9} - 3$
C $y = x^2 + 5x + 6$
D $y = 3x^5 + 4x^3 - 11x - 6$

90. Which expression is equivalent to $(x + 3)^3 - 9x(x + 3)$?

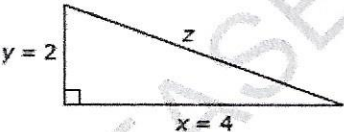
- A $x^3 + 27$
B $x^3 - 27$
C $x^3 - 9x^2 - 27x + 27$
D $x^3 - 9x^2 + 27x + 27$

91. Suppose $p(x) = x^3 - 2x^2 + 13x + k$. The remainder of the division of $p(x)$ by $(x + 1)$ is -8 . What is the remainder of the division of $p(x)$ by $(x - 1)$?

- A -8
B 8
C 16
D 20

92. A reporter wants to know the percentage of voters in the state who support building a new highway. What is the reporter's population?

- A the number of people who live in the state
B the people who were interviewed in the state
C all voters over 25 years old in the state
D all eligible voters in the state

93. A box with an open top will be constructed from a rectangular piece of cardboard.
- The piece of cardboard is 8 inches wide and 12 inches long.
 - The box will be constructed by cutting out equal squares of side x at each corner and then folding up the sides.
- What is the entire domain for the function $V(x)$ that gives the volume of the box as a function of x ?
- A $0 < x < 4$
 B $0 < x < 6$
 C $0 < x < 8$
 D $0 < x < 12$
94. The equation $2x^2 - 5x = -12$ is rewritten in the form of $2(x - p)^2 + q = 0$. What is the value of q ?
- A $\frac{167}{16}$
 B $\frac{71}{8}$
 C $\frac{25}{8}$
 D $\frac{25}{16}$
95. The diameter of a circle is 8 centimeters. A central angle of the circle intercepts an arc of 12 centimeters. What is the radian measure of the angle?
- A $\frac{3}{2}$
 B 3
 C 4
 D 8π
96. In a set of test scores that are normally distributed, a test score of 76 is 3 standard deviations below the mean. A score of 88 is 1 standard deviation above the mean. What is the mean of the data?
- A 79
 B 82
 C 84
 D 85
97. Let $f(x) = 14x^3 + 28x^2 - 46x$ and $g(x) = 2x + 7$. Which is the solution set to the equation $\frac{1}{12}f(x) = g(x)$?
- A $\{-3, 0, 1\}$
 B $\{-3, -1, 2\}$
 C $\{-2, 1, 3\}$
 D $\{1, 5, 11\}$
98. What is the solution to the equation $\frac{2x - 3}{x - 1} = \frac{8x + 1}{4x + 5}$?
- A $-\frac{14}{5}$
 B $-\frac{14}{9}$
 C $\frac{14}{9}$
 D $\frac{14}{5}$
99. A right triangle is shown below.
- 
- Which expression would result in an irrational number?
- A $x^2 + y^2$
 B $\frac{1}{2}xy$
 C $x \div y + z$
 D $x^2 - z^2$
100. Fred drives an average of 15,000 miles per year, and his car gets 20 miles per gallon of gasoline.
- The average cost of gasoline is \$3.25 per gallon.
 - He buys a new car.
 - In his new car, Fred continues to average 15,000 miles per year, and the average cost of gasoline remains the same.
- Approximately** how many more miles per gallon does the new car get if Fred has a savings of \$650 per year on gasoline?
- A 5.8 mpg
 B 7.3 mpg
 C 8.8 mpg
 D 10.3 mpg
101. Over a 10-year period, two colleges raised their per-course tuitions (T_1 and T_2) each year. The tuitions can be modeled by the following equations:
- College 1: $T_1 = 500(1.048)^x$
 College 2: $T_2 = 446(1.068)^x$
- In these equations, the tuitions are in dollars, and x represents elapsed time in years ($x = 0$ is the beginning of the 10-year period). Based on the model, at **approximately** what time during the 10-year period were the two tuitions equal?
- A $x = 5$ years
 B $x = 6$ years
 C $x = 7$ years
 D $x = 8$ years
102. Which equation describes a parabola that has vertex $(-3, 1)$ and passes through point $(0, 4)$?
- A $y = \frac{1}{3}(x + 3)^2 + 1$
 B $y = 3(x + 3)^2 + 1$
 C $y = \frac{1}{3}(x - 3)^2 + 1$
 D $y = 3(x - 3)^2 + 1$

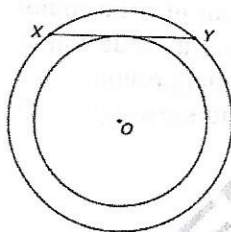
103. The table below shows the average weights for men 20–24 years of age.

Height (in inches)	Weight (in pounds)
62	130
64	138
66	148
68	156
70	167
72	176
74	186
76	197

If x represents height, and y represents weight, which linear equation **best** models these data?

- A $y = 5.01x - 181$
 B $y = 4.79x - 168$
 C $y = 0.21x + 35.2$
 D $y = 0.17x + 40.2$

105. The figure below shows concentric circles, both centered at O .



- Chord XY is tangent to the smaller circle.
- The radius of the larger circle is 15 cm.
- The radius of the smaller circle is 12 cm.

What is the length of chord XY ?

- A 27 cm
 B 24 cm
 C 18 cm
 D 10 cm

107. A city built an archway that can be modeled by the parabola $y = -x^2 + 8x + 20$. What are the coordinates of its vertex?

- A $(-4, 36)$
 B $(-2, 10)$
 C $(4, 36)$
 D $(2, 10)$

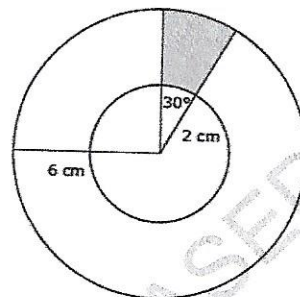
109. The graph of $y = ax^2$ is shifted up 3 units and right 5 units. Which equation represents the resulting graph?

- A $y = a(x - 5)^2 + 3$
 B $y = a(x + 5)^2 + 3$
 C $y = a(x - 3)^2 + 5$
 D $y = a(x + 3)^2 + 5$

111. What are the horizontal and vertical asymptotes of $f(x) = \frac{x^2 + 2x + 1}{x^2 + 3x - 4}$?

- A $x = 1$ and $y = -1$
 B $x = -4$, $y = -1$, and $y = 1$
 C $x = \pm 1$ and $y = 0$
 D $x = -4$, $x = 1$, and $y = 1$

104. In the figure below, the larger circle has a radius of 6 cm, and the smaller circle has a radius of 2 cm.



What is the **approximate** area of the shaded region?

- A 2.1 cm^2
 B 3.4 cm^2
 C 4.2 cm^2
 D 8.4 cm^2

- 106.

The table below represents the size, in acres, of the average farm.

Year	1950	1960	1970	1980	1997	1998
Size of Farm (acres)	213	297	374	426	436	435

- Choose which mathematical model below **best** fits the data.
- Using the model, predict the **approximate** size of the average farm in the year 2010.

- A linear; 650 acres
 B linear; 510 acres
 C quadratic; 400 acres
 D quadratic; 360 acres

- 108.

Zach purchased a stock. The value of the stock has been falling and rising as described by the polynomial function $V(x) = 2x^3 - 90x + 350$, where x is the number of weeks since the stock was purchased. What does the y -intercept of this function represent?

- A the number of weeks since the stock was purchased
 B the value of the stock at its maximum
 C the value of the stock when it was initially purchased
 D the week at which the value was at its maximum

- 110.

Approximately what is the smallest real zero of $f(x) = x^3 - 5x^2 + 2x + 6$?

- A -4.18
 B -1.68
 C -0.86
 D -0.46

- 112.

Where does the minimum value of the function $y = |x - 5| - 4$ occur?

- A at $y = -5$
 B at $y = 4$
 C at $x = 0$
 D at $x = 5$