1. Simplify: $\left(5\,a^8\sqrt{6b^{11}}\right)\left(2\,\sqrt{3a^3b^{10}}\right)$

   a) $10a^8\sqrt{18a^3b^{21}}$ b) $30a^8\sqrt{2a^3b^{21}}$ c) $30a^9b^{10}\sqrt{2ab}$ d) $30a^8\sqrt{18a^3b^{21}}$

2. Using the quadratic formula solve the following quadratic: $2x^2 - 3x + 5 = 0$
   a) $\dfrac{3\pm7i}{4}$ b)$\dfrac{3\pm i\sqrt{31}}{4}$ c)$\dfrac{-3\pm\sqrt{-31}}{4}$ d) $\dfrac{5i}{2}, -i$

3. Find the vertex and the opening direction of the parabola, $y = -3x^2 - 12x - 7$.
   a) $(-2,5)$, down   b) $(2, 19)$, down   c) $(2, 5)$, up   d) $(-2,5)$, up

4. The volume of a rectangular prism is modeled with the function V(x) = $2x^3 + x^2 - 13x + 6$. The prism has a height of (x-2). Find one possible solution set for the length and width of the prism.
   a) $(2x-1)(x+3)$ b) $(2x+1)(x-3)$ c) $(x-1)(x+3)$ d) $(x-2)(x+3)$

5. Which of the following is a factor of x^3-64?
   a) $x^2+4x+16$ b) x-8   c) x+4   d) x^2-4x+16

6. Suppose $P(x) = 3x^3 - 2x^2 + x + k$ and $Q(x) = x - 2$. Find the value for k so that the remainder of $\dfrac{P(x)}{Q(x)}$ is 5.
   a) -13   b) 13   c) -18   d) 39

7. Simplify: $\dfrac{\frac{4}{x}}{\frac{1}{x}+4}$
   a) 1   b) $\dfrac{4}{4x+1}$ c) $\dfrac{4}{x+1}$ d) $\dfrac{4}{5}$

8. A calculator company produces a scientific calculator and a graphing calculator. Long-term projections indicate an expected demand of at least 100 scientific and 80 graphing calculators each day. Because of limitations on production capacity, no more than 200 scientific and 170 graphing calculators can be made daily. To satisfy a shipping contract, a total of at least 200 calculators much be shipped each day.

   If each scientific calculator sold results in a $2 loss, but each graphing calculator produces a $5 profit, write the objective function and constraints that would be used to maximize profits.

   a) $100 \le s \le 200$ b) $100 < s < 200$ c) $100 > s > 200$ d) $100 < s < 200$
      $80 \le g \le 170$ $80 < g < 170$ $80 > g > 170$ $80 \le g \le 170$
      $s + g \ge 200$ $s + g \ge 200$ $s + g = 200$ $s + g = 200$
      P(s , g)= 5g−2s   P(s , g)= 5g+2s   P(s , g)= 5g+ 2s   P(s , g)= 5g− 2s

9. What is the LCD of the following rational equation: $\dfrac{a}{a^2-36} + \dfrac{2}{a-6} = \dfrac{1}{a+6}$

   a)   a-6   b) a+6   c) (a+6)(a-6)   d) $(a+6)^2$

10. Solve: $3x = \sqrt{15 - 6x}$
    a)   x=1   b) x=1, -5/3   c) no solution   d) x=1.45, -3.45

11. What types of solutions does the following quadratic function have: $3x^2+2x=10$
    a)   2 imaginary   b) 2 real, rational   c) 2 real, irrational   d) 1 real rational, 1 real irrational

12. Solve the following system: $\begin{cases} 3x^2 + 4x - y = 7 \\ 2x - y = -1 \end{cases}$

     a) $(-2, -3)$ b) $(-2, -3)$ $(\frac{4}{3}, \frac{11}{3})$ c) $(2, 3)$ $(\frac{4}{3}, \frac{11}{3})$ d) no solution

13. The following is a graph of P(x), which models the speed of a person riding a bike over six minutes in mph. What can we say about the person's bike ride?
     a) The bike was speeding up between two and five minutes.
     b) The bike was stopped at the second minute.
     c) The bike was continually speeding up from minute four to minute six.
     d) The bike was stopped at minute five.
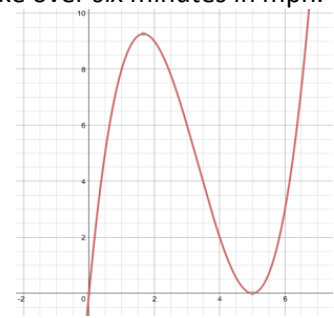
14. State the x intercepts of the function y = 2 sin3(x−20°), where 20 °≤ x≤140°.
     a) 0°, 60°, 120°   b) −20°, 40°, 100°   c) 20°, 80°, 140°   d) 0°, 180°, 360°

15. A ball is dropped from a height of 9 feet and bounces half its height after each bounce. Which of the following sequences models the height of the ball as a function of the number of bounces?
     a) $a_n = 9 - 0.5(n - 1)$ b) $a_n = 9 - 0.5n$ c) $a_n = 9(0.5)^{n-1}$ d) $a_n = 9(0.5)^n$

16. What is the 109th term of the following arithmetic sequence: $a_n = 500, 495, 490, ...$?
     a) -40   b)-35   c)-30   d)-45

17. Given the graph of f(x), what transformations are required to graph f(3x)?"
     a) Multiply all y-values by 3   b) Multiply all x-values by 3
     c) Divide all y-values by 3   d) Divide all x-values by 3

18. Which of the following domains will allow you to take the inverse of the function: $f(x) = x^2 + 4x + 6$
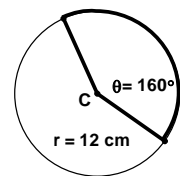   a) x ≥ -2   b) x ≤ 2   c) x ≥ -4   d) x ≤ 4

19. Which of the following would be a correct way to condense the expression: $\log x + \log(2x + 1) - 7\log y$
     a) $\log(\frac{3x+1}{7y})$ b) $\log(14x^3 + 7y^2)$ c) $\frac{\log x \log(2x+1)}{\log 7y}$ d) $\log(\frac{2x^2+x}{y^7})$

20. Find the length of the circular arc and then the area of the sector outlined in the picture.
     a) $\frac{32\pi}{3}, 64\pi$ b) $64\pi, \frac{32\pi}{3}$ c) $24\pi, 144\pi$ d) $\frac{3\pi}{64}, \frac{\pi}{128}$

θ= 160°

r = 12 cm

21. The equation h = $10\cos\left(\frac{\pi}{20}(t - 3)\right)$+ 4 models the height of a car on a ferris wheel after t seconds. How long will it take the car to make full revolution?
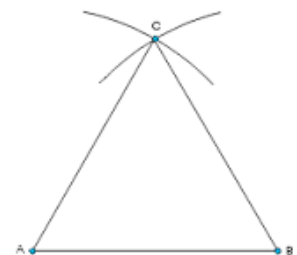   a) 1 minute   b) 40 seconds   c) 20 seconds   d) 40 minutes

22. Given cos θ = $\frac{3}{5}$ where 0 ≤ θ ≤ 90°, find sinθ and tanθ .
     a) $\frac{4}{5}, \frac{3}{4}$ b) $\frac{4}{5}, \frac{4}{3}$ c) $\frac{5}{4}, \frac{3}{4}$ d) $\frac{4}{5}, 1$
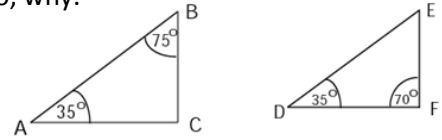
23. The following picture is a construction of a(n) _____ .

     a) Midpint of a segment   b) equilateral triangle   c) right triangle   d) angle bisector of triangle
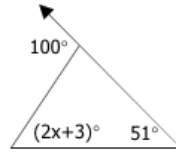
24. Determine whether or not the following triangles are similar and if so, why.
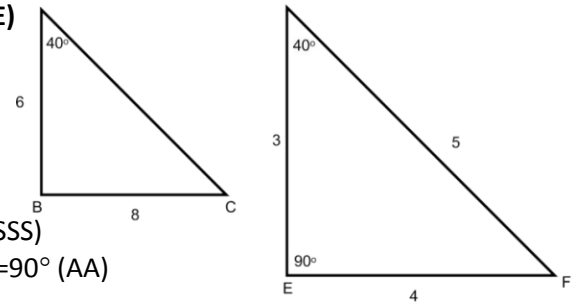
   a)   AA~   b) SAS~   c) not similar   d) SSS~

25. Find the value for x given the following diagram.

   a)   46   b) 23   c) 49   d) 80

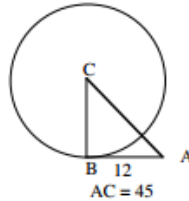**26.** Which of the following pieces of information is needed to prove the two triangles are similar?

(Note: NOT TO SCALE)

   a) Nothing, the triangles are already similar (SAS)   b) AC=15 (SSS)
   c) m< ABC=90° (ASA)   d) m< ABC=90° (AA)

27. Solve for BC in the picture to the right.

   a)   57.0   b) 33.0   c) 43.4   d) 25.3

28. You are painting a circular disk, but the can of paint for sale can only fill a sector of the circle with central angle of one radian. What is the minimum number of cans of paint you will need to buy in order to paint the entire disk?

   a)   360 cans   b) 7 cans   c) 6 cans   d) 2 cans

29. Give the coordinates of the center of the circle: $3x^2 = 9 - 3y^2 - 6y$

   a)   (0, -1)   b) (0, 1)   c) (-1, 0)   d) (1, 0)

30. If the focus of a parabola is (2, 5) and the directrix is y = 3, find the equation of the parabola.

   a) $y = \frac{1}{4}(x - 2)^2 + 4$ b) $y = \frac{1}{4}(x + 2)^2 + 4$ c) $y = -\frac{1}{4}(x - 2)^2 + 4$ d) $y = (x - 2)^2 + 4$

31. A company needs to design a box for packaging a new product that has a volume of 200 m^3. The packaging requires that the width be 10 m shorter than the length and the height be 20 m longer than the length. To the nearest tenth, find the length of the box.

   a)   -0.9 cm   b) 5.3 cm   c) 10.6 cm   d) 8.3 cm

32. The heights of students are distributed normally with a mean of 58" and standard deviation of 3". Approximately 68% of students are between what heights?

   a)   55" and 61"   b)52" and 64" c)49" and 67" d)46" and 70"

33. If you wanted to give a survey that had a 3% margin of error at a 95% confidence level, how many people would you have to survey?

   a)   900 people   b)500 people c) 30 people d)10 people

Key
1. C
2. B
3. A
4. A
5. A
6. C
7. B
8. A
9. C
10. A
11. C
12. B
13. D
14. C
15. C
16. A
17. D
18. A
19. D
20. A
21. B
22. B
23. B
24. A
25. B
26. D
27. C
28. B
29. B
30. A
31. C
32. A
33. A