

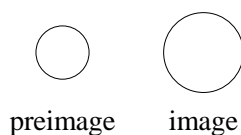
Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each question, write on the separate answer sheet the letter preceding the word or expression that best completes the statement or answers the question. [40]

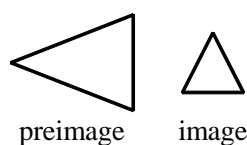
1. Evaluate. i^{95} [A] i [B] 1 [C] -1 [D] $-i$

2. Which of the following transformations represents an isometry?

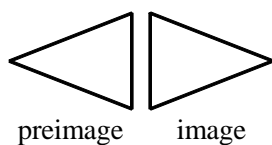
[A]



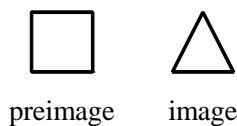
[B]



[C]



[D]



3. Find the third term in the expansion of $(t + 2u)^7$.

[A] $35t^3u^4$ [B] $84t^3u^4$ [C] $35t^5u^2$ [D] $84t^5u^2$

4. Given $\log_{10}3 = T$ and $\log_{10}5 = U$, find $\log_{10}15$.

[A] 10^{T+U} [B] TU [C] $T + U$ [D] 10^{TU}

5. Given $\sin \theta = \frac{7}{12}$ and $\sec \theta < 0$, find $\cos \theta$ and $\tan \theta$.

[A] $\cos \theta = -\frac{\sqrt{95}}{12}$, $\tan \theta = \frac{7}{\sqrt{95}}$

[B] $\cos \theta = \frac{\sqrt{95}}{12}$, $\tan \theta = \frac{7}{\sqrt{95}}$

[C] $\cos \theta = -\sqrt{95}$, $\tan \theta = -\frac{12}{\sqrt{95}}$

[D] $\cos \theta = -\frac{\sqrt{95}}{12}$, $\tan \theta = -\frac{7}{\sqrt{95}}$

6. A fair coin is tossed 8 times. What is the probability of obtaining exactly 6 heads?

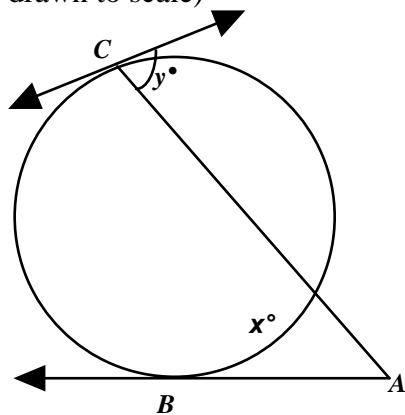
[A] 0.2734

[B] 0.0313

[C] 0.1094

[D] 0.2188

7. Find the measure of each variable if $m\angle A = 22$ and $m\widehat{BC} = 118$. (not drawn to scale)



[A] 96; 168

[B] 74; 168

[C] 96; 84

[D] 74; 84

8. Simplify. $\frac{4}{5 - \sqrt{7}}$

[A] $\frac{20 + \sqrt{7}}{18}$

[B] $\frac{10 + 2\sqrt{7}}{9}$

[C] $\frac{4\sqrt{7}}{5\sqrt{7} - 7}$

[D] $\frac{1}{2}$

9. Use special right triangles to find the coordinates of the point of intersection of the angle 135° and the unit circle. Express your answer in fractions and radicals when necessary.

[A] $\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

[B] $(\sqrt{2}, -\sqrt{2})$

[C] $\left(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$

[D] $(-\sqrt{2}, \sqrt{2})$

10. Solve the system of equations.

$$y = |x| - 4$$

$$y = -x^2 + 2$$

[A] $(-4, -1), (-1, -4)$

[B] $(2, -2), (-2, -2)$

[C] $(2, -2), (-1, -4)$

[D] $(-4, -1), (-2, -2)$

11. A certain gas will escape from a storage tank according to the formula $e = 180\sqrt{p}$, where e represents the amount escaping per minute in gallons, and p represents the pressure in pounds per square inch. What is the pressure on the gas when about 625 gallons per minute are escaping? Round your answer to the nearest tenth.

[A] 0.3 lb/in.² [B] 28.4 lb/in.²
 [C] 12.1 lb/in.² [D] 3.5 lb/in.²

12. Divide: $\frac{x+8}{x-8} \div \frac{x^2-64}{8-x}$

[A] $\frac{1}{10-x}$ [B] $\frac{x+8}{x-8}$ [C] $\frac{1}{8-x}$ [D] $\frac{1}{x-8}$

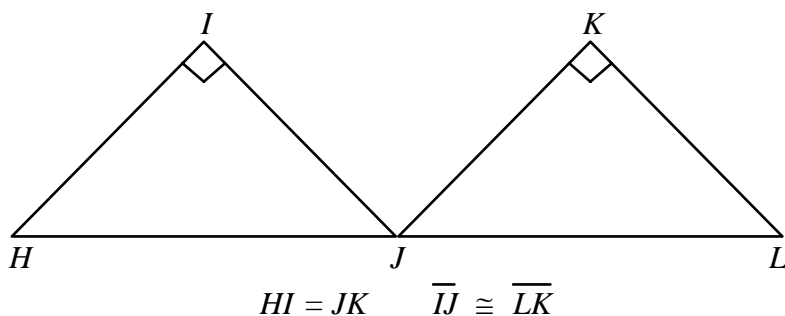
13. Solve: $\log_5 (x-2) = -2$

[A] -30 [B] $-\frac{49}{25}$ [C] 1 [D] $\frac{51}{25}$

14. When Spheres-R-Us ships bags of golf balls, each bag must be within 6 balls of 420. Which equation is an absolute value equation representing the high and low values, and what are those values?

[A] $|m-6|=420$; 414, 426 [B] $|420-m|=6$; 6, 12
 [C] $|420-6|=m$; 6, 12 [D] $|m-420|=6$; 414, 426

15. Refer to the figure shown. Which of the following statements is true?



- [A] $\triangle HIJ \cong \triangle K LJ$ by ASA. [B] $\triangle HIJ \cong \triangle JKL$ by SAS
 [C] $\triangle HIJ \cong \triangle LKJ$ by ASA. [D] $\triangle HIJ \cong \triangle K LJ$ by SAS.
16. Sean and Jackie made a shady area by stretching a bedspread over a clothesline. The bedspread was 3.2 m long and made an angle of 52° with the ground where it was anchored at each side. How wide was the shady area?
- [A] 2 m [B] 1.2 m [C] 0.2 m [D] 3 m
17. Solve. Find all solutions from 0 to 2π . $\tan^2 \theta = \frac{3}{2} \sec \theta$
- [A] $\frac{2\pi}{3}, \frac{4\pi}{3}$ [B] $\frac{\pi}{3}, \frac{5\pi}{3}$ [C] $\frac{\pi}{6}, \frac{11\pi}{6}$ [D] none of these

18. Solve the inequality and give the solution in set builder notation.

$$x^2 - x - 12 < 0$$

[A] $\{x \mid -3 < x < 4\}$

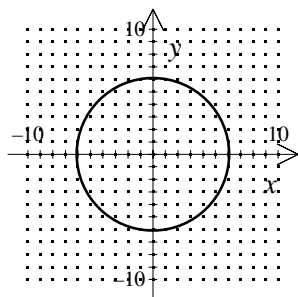
[B] $\{x \mid -4 < x < 3\}$

[C] $\{x \mid x < -4 \text{ or } x > 3\}$

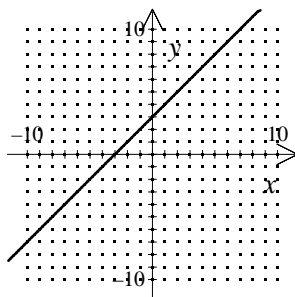
[D] $\{x \mid x < -3 \text{ or } x > 4\}$

19. Which graph represents a function?

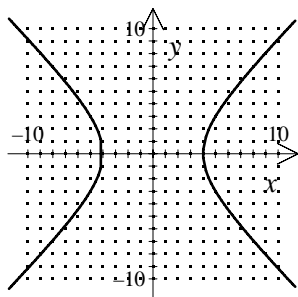
[A]



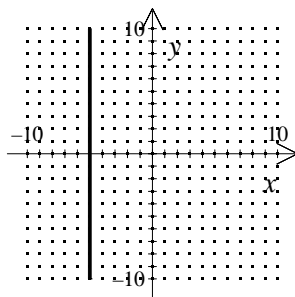
[B]



[C]



[D]



20. Evaluate the following expression: $\sum_{k=2}^7 (k^2 + k + 3)$

[A] 184

[B] 125

[C] 189

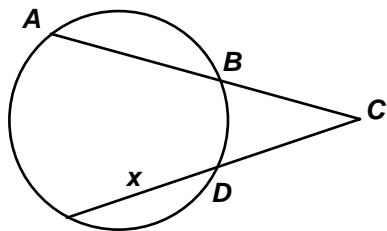
[D] 202.667

Part II

Answer all questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [12]

21. The time t required to drive a certain distance varies inversely as the speed r . If it takes 6 hours to drive the distance at 40 miles per hour, how long will it take to drive the same distance at 20 miles per hour?

22. Find the value of x if $AB = 19$, $BC = 11$, and $CD = 9$. (not drawn to scale)



23. Simplify: $5i^5 - 4i^4 - 5i^8 + 3$

24. Solve: $9^{5x-1} = 27$

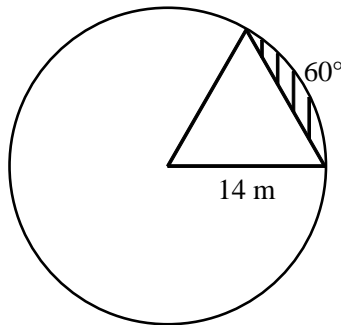
25. Last year, the personal best high jumps of track athletes in a nearby state were normally distributed with a mean of 230 cm and a standard deviation of 14 cm. What is the probability that a randomly selected high jumper has a personal best between 202 and 230 cm?

26. If $f(x) = 5x - 5$ and $g(x) = x - 1$, find $f(g(3))$.

Part III

Answer all questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [24]

27. Find the area of the shaded segment. Round your answer to the nearest hundredth.



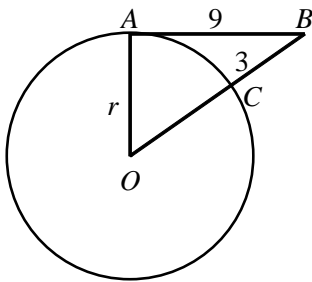
28. Solve: $-7x + 7 + 4x^2 = 0$

29. Write an exponential function to model the situation. Then predict the value of the function after 5 years (to the nearest whole number).
A population of 290 animals that decreases at an annual rate of 13%.

30. Change the equation to standard form and name the figure.

$$4x^2 + y^2 - 24x - 6y + 41 = 0$$

31. \overline{AB} is tangent to $\odot O$ at A (not drawn to scale). Find the length of the radius r , to the nearest tenth.



32. The table shows the number of llamas born on llama ranches worldwide since 1988. Find a cubic function to model the data and use it to estimate the number of births in 1999.

Years since 1988	1	3	5	7	9
Llamas born (in thousands)	1.4	15.8	62.2	159.8	327.8

Part IV

Answer all questions in this part. Each correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [12]

33. Solve triangle ABC given that $a = 14$, $b = 11$, and $c = 16$.

34. Draw a figure in the coordinate plane and write a two-column coordinate proof.

Given: Quadrilateral $ABCD$ with $A(-5, 0)$, $B(-1, -6)$, $C(5, -2)$, $D(1, 4)$.

Prove: $ABCD$ is a rectangle.