

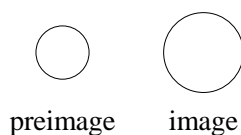
Part I

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]

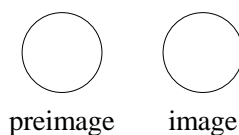
1. Evaluate. i^{21} [A] $-i$ [B] 1 [C] i [D] -1

2. Which of the following transformations represents an isometry?

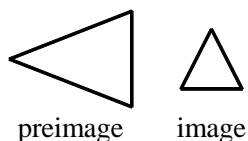
[A]



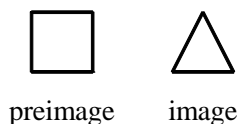
[B]



[C]



[D]



3. Find the fifth term in the expansion of $(m - 2n)^7$.

[A] $21mn^6$ [B] $21m^3n^4$ [C] $560mn^6$ [D] $560m^3n^4$

4. Given $\log_{10} 11 = F$ and $\log_{10} 5 = G$, find $\log_{10} 55$.

[A] 10^{F+G} [B] FG [C] $F + G$ [D] 10^{FG}

5. Given $\sin \theta = \frac{1}{9}$ and $\sec \theta < 0$, find $\cos \theta$ and $\tan \theta$.

[A] $\cos \theta = -\frac{4\sqrt{5}}{9}$, $\tan \theta = \frac{1}{4\sqrt{5}}$

[B] $\cos \theta = \frac{4\sqrt{5}}{9}$, $\tan \theta = \frac{1}{4\sqrt{5}}$

[C] $\cos \theta = -\frac{4\sqrt{5}}{9}$, $\tan \theta = -\frac{1}{4\sqrt{5}}$

[D] $\cos \theta = -4\sqrt{5}$, $\tan \theta = -\frac{9}{4\sqrt{5}}$

6. A fair coin is tossed 13 times. What is the probability of obtaining exactly 11 heads?

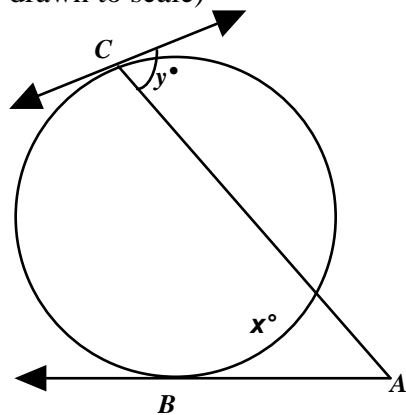
[A] 0.0095

[B] 0.0873

[C] 0.0349

[D] 0.0016

7. Find the measure of each variable if $m\angle A = 34$ and $m\widehat{BC} = 112$. (not drawn to scale)



[A] 78; 102

[B] 44; 102

[C] 44; 204

[D] 78; 204

8. Simplify. $\frac{9}{4 - \sqrt{2}}$

[A] $\frac{9}{2}$ [B] $\frac{9\sqrt{2}}{4\sqrt{2} - 2}$ [C] $\frac{36 + 9\sqrt{2}}{14}$ [D] $\frac{36 + \sqrt{2}}{14}$

9. Use special right triangles to find the coordinates of the point of intersection of the angle 315° and the unit circle. Express your answer in fractions and radicals when necessary.

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

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

10. Solve the system of equations.

$$y = |x| - 7$$

$$y = -x^2 - 1$$

[A] $(2, -5), (-2, -5)$ [B] $(2, -5), (-1, -7)$

[C] $(-4, -4), (-2, -5)$ [D] $(-4, -4), (-1, -7)$

11. A certain gas will escape from a storage tank according to the formula $e = 170\sqrt{p}$, 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 700 gallons per minute are escaping? Round your answer to the nearest tenth.

[A] 17.0 lb/in.² [B] 0.2 lb/in.²
 [C] 29.5 lb/in.² [D] 4.1 lb/in.²

12. Divide: $\frac{x+9}{x-9} \div \frac{x^2-81}{9-x}$

[A] $\frac{1}{9-x}$ [B] $\frac{1}{11-x}$ [C] $\frac{1}{x-9}$ [D] $\frac{x+9}{x-9}$

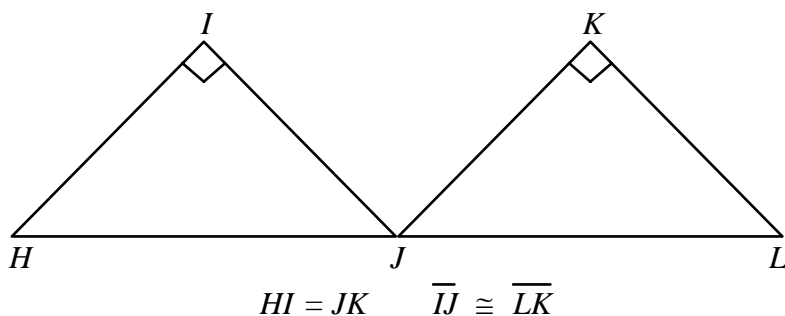
13. Solve: $\log_7 (x+1) = -2$

[A] -129 [B] $\frac{50}{49}$ [C] $\frac{1}{343}$ [D] $-\frac{48}{49}$

14. When Spheres-R-Us ships bags of golf balls, each bag must be within 4 balls of 810. Which equation is an absolute value equation representing the high and low values, and what are those values?

[A] $|m-4|=810$; 806, 814 [B] $|m-810|=4$; 806, 814
 [C] $|810-4|=m$; 4, 8 [D] $|810-m|=4$; 4, 8

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



- [A] $\triangle HIJ \cong \triangle KLJ$ by ASA. [B] $\triangle HIJ \cong \triangle JKL$ by SAS
 [C] $\triangle HIJ \cong \triangle KLJ$ by SAS. [D] $\triangle HIJ \cong \triangle LKJ$ by ASA.
16. Sean and Jackie made a shady area by stretching a bedspread over a clothesline. The bedspread was 2.6 m long and made an angle of 50° with the ground where it was anchored at each side. How wide was the shady area?
- [A] 1.2 m [B] 1.7 m [C] 2.7 m [D] 0.2 m
17. Solve. Find all solutions from 0 to 2π . $\tan^2 \theta = -\frac{3}{2} \sec \theta$
- [A] $\frac{3\pi}{4}, \frac{5\pi}{4}$ [B] $\frac{5\pi}{6}, \frac{7\pi}{6}$ [C] $\frac{2\pi}{3}, \frac{4\pi}{3}$ [D] none of these

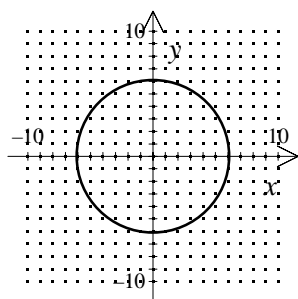
18. Solve the inequality and give the solution in set builder notation.

$$x^2 - 4x - 45 < 0$$

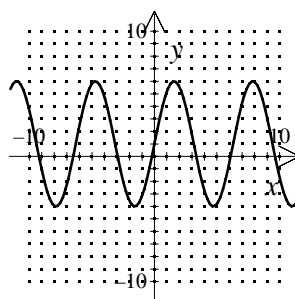
- [A] $\{x \mid -5 < x < 9\}$ [B] $\{x \mid x < -9 \text{ or } x > 5\}$
 [C] $\{x \mid x < -5 \text{ or } x > 9\}$ [D] $\{x \mid -9 < x < 5\}$

19. Which graph represents a function?

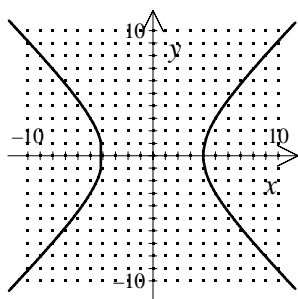
[A]



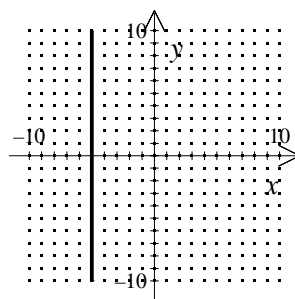
[B]



[C]



[D]



20. Evaluate the following expression to three decimal places: $\sum_{k=4}^6 \left(\frac{1}{2}\right)^k$

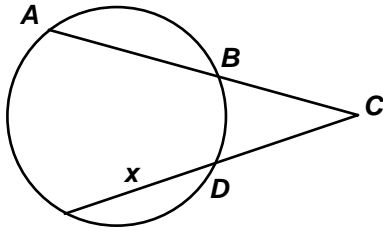
- [A] 0.055 [B] 0.109 [C] 0.094 [D] 0.984

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 8 hours to drive the distance at 30 miles per hour, how long will it take to drive the same distance at 55 miles per hour?

22. Find the value of x if $AB = 16$, $BC = 15$, and $CD = 16$. (not drawn to scale)



23. Simplify: $2i^7 + 5i^4 - 5i^5 + 2$

24. Solve: $25^{8x+5} = 125$

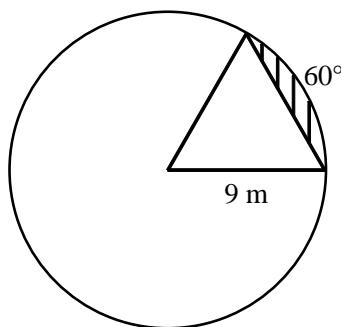
25. Last year, the personal best high jumps of track athletes in a nearby state were normally distributed with a mean of 211 cm and a standard deviation of 17 cm. What is the probability that a randomly selected high jumper has a personal best between 211 and 228 cm?

26. If $f(x) = 3x - 3$ and $g(x) = x + 4$, find $f(g(2))$.

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.

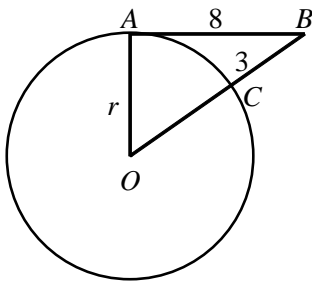


28. Solve: $-x + 5 + 7x^2 = 0$

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 220 animals that increases at an annual rate of 20%.

30. Change the equation to standard form and name the figure.
 $2x^2 + 3y^2 + 8x - 30y + 77 = 0$

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)	0.7	16.9	71.5	188.5	391.9

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 $a = 16$, $b = 18$, and $c = 12$.
34. Draw a figure in the coordinate plane and write a two-column coordinate proof.
Given: Quadrilateral $ABCD$ with $A(-5, 0)$, $B(3, -4)$, $C(7, 4)$, $D(-1, 8)$.
Prove: $ABCD$ is a rectangle.