

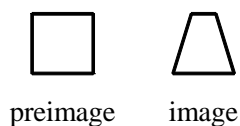
### Part I

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]

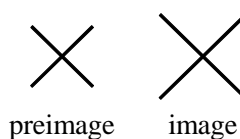
1. Evaluate.  $i^{50}$       [A] 1      [B]  $-i$       [C]  $i$       [D]  $-1$

2. Which of the following transformations represents an isometry?

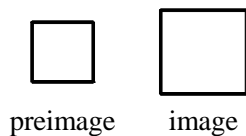
[A]



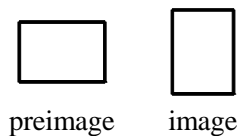
[B]



[C]



[D]



3. Find the fourth term in the expansion of  $(d - 3e)^7$ .

- [A]  $3544d^2e^5$       [B]  $3544d^4e^3$       [C]  $-945d^2e^5$       [D]  $-945d^4e^3$

4. Given  $\log_{10} 7 = S$  and  $\log_{10} 3 = T$ , find  $\log_{10} 21$ .

- [A]  $10^{ST}$       [B]  $10^{S+T}$       [C]  $ST$       [D]  $S + T$

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

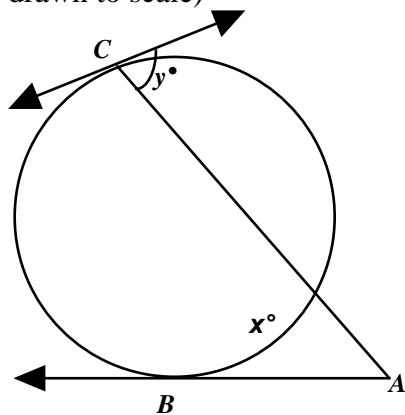
[A]  $\cos \theta = -\frac{2\sqrt{6}}{7}$ ,  $\tan \theta = -\frac{5}{2\sqrt{6}}$       [B]  $\cos \theta = \frac{2\sqrt{6}}{7}$ ,  $\tan \theta = \frac{5}{2\sqrt{6}}$

[C]  $\cos \theta = -2\sqrt{6}$ ,  $\tan \theta = -\frac{7}{2\sqrt{6}}$       [D]  $\cos \theta = -\frac{2\sqrt{6}}{7}$ ,  $\tan \theta = \frac{5}{2\sqrt{6}}$

6. A fair coin is tossed 10 times. What is the probability of obtaining exactly 1 head?

[A] 0.0439      [B] 0.1172      [C] 0.0010      [D] 0.0098

7. Find the measure of each variable if  $m\angle A = 25$  and  $m\widehat{BC} = 100$ . (not drawn to scale)



[A] 50; 210      [B] 75; 105      [C] 75; 210      [D] 50; 105

8. Simplify.  $\frac{3}{3 - \sqrt{3}}$

[A]  $\frac{3}{4}$

[B]  $\frac{3\sqrt{3}}{3\sqrt{3} - 3}$

[C]  $\frac{9 + \sqrt{3}}{6}$

[D]  $\frac{3 + \sqrt{3}}{2}$

9. Use special right triangles to find the coordinates of the point of intersection of the angle  $330^\circ$  and the unit circle. Express your answer in fractions and radicals when necessary.

[A]  $\left(\frac{2\sqrt{3}}{3}, -2\right)$

[B]  $\left(-\frac{2\sqrt{3}}{3}, 2\right)$

[C]  $\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$

[D]  $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

10. Solve the system of equations.

$$y = |x| + 1$$

$$y = -x^2 + 3$$

[A] (1, 2), (0, 0)

[B] (-3, 3), (-1, 2)

[C] (-3, 3), (0, 0)

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

11. A certain gas will escape from a storage tank according to the formula  $e = 150\sqrt{p}$ , 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 275 gallons per minute are escaping? Round your answer to the nearest tenth.

[A] 3.4 lb/in.<sup>2</sup>      [B] 20.6 lb/in.<sup>2</sup>      [C] 0.5 lb/in.<sup>2</sup>      [D] 1.8 lb/in.<sup>2</sup>

12. Divide:  $\frac{x+2}{x-2} \div \frac{x^2-4}{2-x}$

[A]  $\frac{1}{-x}$       [B]  $\frac{x+2}{x-2}$       [C]  $\frac{1}{x-2}$       [D]  $\frac{1}{2-x}$

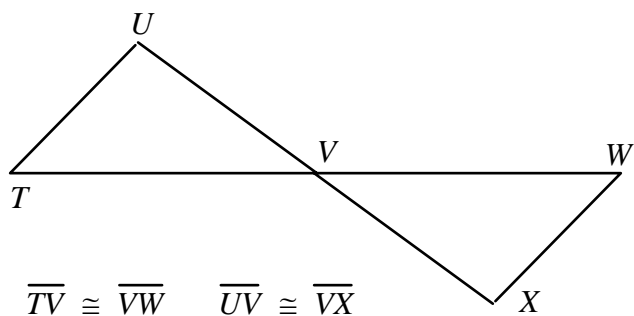
13. Solve:  $\log_3(x-7) = -2$

[A] -1      [B]  $\frac{64}{9}$       [C] 243      [D]  $-\frac{62}{9}$

14. When Spheres-R-Us ships bags of golf balls, each bag must be within 7 balls of 840. Which equation is an absolute value equation representing the high and low values, and what are those values?

[A]  $|m-840|=7$ ; 833, 847      [B]  $|840-7|=m$ ; 7, 14  
[C]  $|840-m|=7$ ; 7, 14      [D]  $|m-7|=840$ ; 833, 847

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



- [A]  $\triangle TUV \cong \triangle XWV$  by ASA.      [B]  $\triangle TUV \cong \triangle WXV$  by ASA.  
 [C]  $\triangle TUV \cong \triangle WXV$  by SAS.      [D]  $\triangle TUV \cong \triangle VWX$  by SAS.
16. Sean and Jackie made a shady area by stretching a bedspread over a clothesline. The bedspread was 2.5 m long and made an angle of  $45^\circ$  with the ground where it was anchored at each side. How wide was the shady area?

- [A] 1.3 m      [B] 2.8 m      [C] 1.8 m      [D] 0.3 m

17. Solve. Find all solutions from 0 to  $2\pi$ .  $\tan^2 \theta = \frac{\sqrt{3}}{6} \sec \theta$

- [A]  $\frac{2\pi}{3}, \frac{4\pi}{3}$       [B]  $\frac{5\pi}{6}, \frac{7\pi}{6}$       [C]  $\frac{\pi}{4}, \frac{7\pi}{4}$       [D] none of these

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

$$x^2 + 8x - 9 > 0$$

[A]  $\{x \mid -9 < x < 1\}$

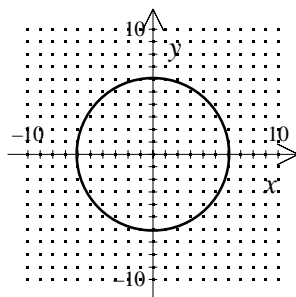
[B]  $\{x \mid x < -9 \text{ or } x > 1\}$

[C]  $\{x \mid -1 < x < 9\}$

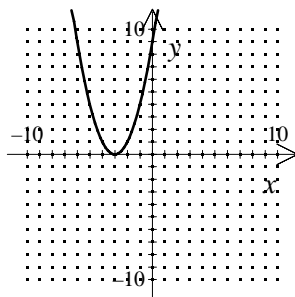
[D]  $\{x \mid x < -1 \text{ or } x > 9\}$

19. Which graph represents a function?

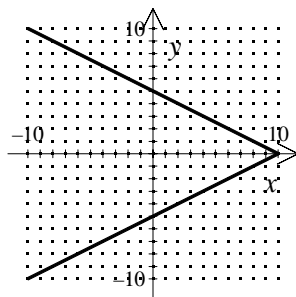
[A]



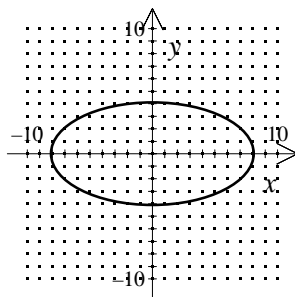
[B]



[C]



[D]



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

[A] 42

[B] 22

[C] 35

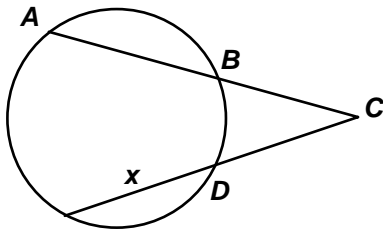
[D] 30

## 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 35 miles per hour, how long will it take to drive the same distance at 50 miles per hour?

22. Find the value of  $x$  if  $AB = 25$ ,  $BC = 8$ , and  $CD = 6$ . (not drawn to scale)



23. Simplify:  $3i^3 + 4i^2 + 3i^8 - 3$

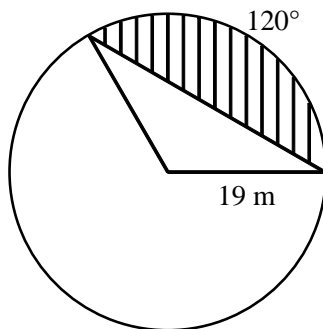
24. Solve:  $27^{9x-8} = 9$

25. Last year, the personal best high jumps of track athletes in a nearby state were normally distributed with a mean of 208 cm and a standard deviation of 16 cm. What is the probability that a randomly selected high jumper has a personal best between 224 and 256 cm?
26. If  $f(x) = 2x - 4$  and  $g(x) = x - 4$ , find  $g(f(5))$ .

### 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:  $-11x + 9 + 4x^2 = 0$

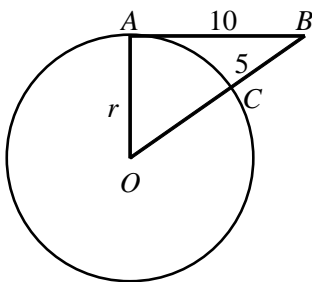


29. Write an exponential function to model the situation. Then predict the value of the function after 5 years (to the nearest whole number).  
A population of 210 animals that decreases at an annual rate of 22%.

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

$$x^2 - 4y^2 + 8x + 48y - 132 = 0$$

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)	1.2	8.6	32	81	165.2

#### 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  $a = 11$ ,  $b = 15$ , and  $c = 13$ .

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

Given: Quadrilateral  $ABCD$  with  $A(-5, 0)$ ,  $B(-1, -8)$ ,  $C(7, -4)$ ,  $D(3, 4)$ .

Prove:  $ABCD$  is a rectangle.