

1. Which of the following describes an exponential relationship between the pair of variables listed?
- A) Each minute m , a truck's speed C increases at a constant rate of 15 meters per minute.
 - B) The depth d of water remaining in a lake decreases by 5 inches each month m as the water is being pumped out at a constant rate.
 - C) Each week w , the value V of Joe's retirement account increases by 2%.
 - D) With every 30-square-foot decrease in size s , the cost of a home addition decreases by \$100 per square foot.
2. A polynomial can be written as $(t^2 - 4)(t + 1)^2$. What are all of the roots of the polynomial?
- A) -1 and 4
 - B) $-1, 2$, and 4
 - C) $-1, 2$, and -2
 - D) $-2, 1$, and -1
3. A polynomial can be written as $(t^2 - 9)(t + 5)^3$. What are all of the roots of the polynomial?
- A) -5 and 9
 - B) $-5, -9$, and 9
 - C) $-5, 3$, and -3
 - D) $5, 3$, and -3
4. In the xy -plane, the graph of $y = (x + 2)^2 - 8$ is the image of the graph of $y = (x - 1)^2 - 8$ after a translation of how many units to the left?
5. In the xy -plane, the graph of $y = (x + 4)^2 + 7$ is the image of the graph of $y = (x - 3)^2 + 7$ after a translation of how many units to the left?

6. If $x \neq 3$, what is the value of $(\frac{1}{x-3})(-6 + 2x)$?

7. If $x \neq -2$, what is the value of $(\frac{1}{x+2})(6 + 3x)$?

8. If $x \neq -4$, what is the value of $(\frac{1}{x+4})(8 + 2x)$?

9. For a positive real number x , where $x^6 = 3$, what is the value of x^{18} ? [NO CALC]

A) $\sqrt[3]{18}$

B) 9

C) 27

D) 54

10. For a positive real number x , where $x^8 = 5$, what is the value of x^{16} ? [NO CALC]

A) $\sqrt{5}$

B) 10

C) 25

D) 55

11. Which of the following is an equivalent form of $\sqrt[3]{g^{6a}k^2}$, where $g > 0$ and $k > 0$? [NO CALC]

A) $g^{\frac{1}{3a}}k^{-1}$

B) $g^{\frac{1}{2a}}k^{\frac{3}{2}}$

C) $g^{3a}k^{-1}$

D) $g^{2a}k^{\frac{2}{3}}$

12. Which of the following is an equivalent form of $\sqrt[3]{g^{12a}k}$, where $g > 0$ and $k > 0$? [NO CALC]

A) $g^{\frac{1}{4a}}k^{-1}$

B) $g^{\frac{1}{9a}}k^{\frac{3}{2}}$

C) $g^{4a}k^{-\frac{1}{3}}$

D) $g^{4a}k^{\frac{1}{3}}$

$$f(t) = \frac{3(8t - 10c)}{2} - 15$$

13. The number of people who go to a local mall can be modeled by the function f above, where c is a constant and t is the air temperature in degrees Fahrenheit ($^{\circ}\text{F}$) for $60 < t < 100$. If 345 people are predicted to go to the pool when the temperature is 80°F , what is the value of c ? [NO CALC]

A) 20

B) 40

C) 60

D) 80

$$h(t) = \frac{3(7t - 8c)}{2} - 25$$

14. The number of people who go to a local mall can be modeled by the function h above, where c is a constant and t is the air temperature in degrees Fahrenheit ($^{\circ}\text{F}$) for $60 < t < 100$. If 200 people are predicted to go to the pool when the temperature is 90°F , what is the value of c ? [NO CALC]

- A) 20
- B) 40
- C) 60
- D) 80

15. The function f is defined by $f(t) = (t - 3)(t + 1)^2$. If $f(h - 3) = 0$, what is one possible value of h ? [NO CALC]

16. The function f is defined by $f(t) = (t - 4)(t + 2)^2$. If $f(h - 3) = 0$, what is one possible value of h ? [NO CALC]

- 17.** An instrument shows the number of revolutions per minute made by each tire of a bicycle. In each revolution, the bicycle travels a distance equal to the circumference of one of its tires. The circumference of each tire is equal to $2\pi r$, where r is the radius of the tire.

If the radius of each tire on Joe's bicycle is .2 meter, what is the approximate speed of Joe's bicycle, to the nearest kilometer per hour, when the instrument is showing 679 revolutions per minute? (1 kilometer = 1000 meters)

- 18.** An instrument shows the number of revolutions per minute made by each tire of a bicycle. In each revolution, the bicycle travels a distance equal to the circumference of one of its tires. The circumference of each tire is equal to $2\pi r$, where r is the radius of the tire.

If the radius of each tire on Joe's bicycle is .25 meter, what is the approximate speed of Joe's bicycle, to the nearest kilometer per hour, when the instrument is showing 569 revolutions per minute? (1 kilometer = 1000 meters)

- 19.** An instrument shows the number of revolutions per minute made by each tire of a bicycle. In each revolution, the bicycle travels a distance equal to the circumference of one of its tires. The circumference of each tire is equal to $2\pi r$, where r is the radius of the tire.

If the radius of each tire on Joe's bicycle is .18 meter, what is the approximate speed of Joe's bicycle, to the nearest kilometer per hour, when the instrument is showing 542 revolutions per minute? (1 kilometer = 1000 meters)

- 20.** An instrument shows the number of revolutions per minute made by each tire of a bicycle. In each revolution, the bicycle travels a distance equal to the circumference of one of its tires. The circumference of each tire is equal to $2\pi r$, where r is the radius of the tire.

If the radius of each tire on Joe's bicycle is .15 meter, what is the approximate speed of Joe's bicycle, to the nearest kilometer per hour, when the instrument is showing 439 revolutions per minute? (1 kilometer = 1000 meters)

- 21.** An instrument shows the number of revolutions per minute made by each tire of a bicycle. In each revolution, the bicycle travels a distance equal to the circumference of one of its tires. The circumference of each tire is equal to $2\pi r$, where r is the radius of the tire.

If the radius of each tire on Joe's bicycle is .16 meter, what is the approximate speed of Joe's bicycle, to the nearest kilometer per hour, when the instrument is showing 389 revolutions per minute? (1 kilometer = 1000 meters)

- 22.** Joe gets new tires for his car. The radius of each of his old tires is .2 meters, and the radius of each of his new tires is 12% larger than the radius of one of his old tires. What is the circumference of each new tire, to the nearest tenth of a meter?
- 23.** Joe gets new tires for his car. The radius of each of his old tires is .18 meters, and the radius of each of his new tires is 13% larger than the radius of one of his old tires. What is the circumference of each new tire, to the nearest tenth of a meter?
- 24.** Joe gets new tires for his car. The radius of each of his old tires is .22 meters, and the radius of each of his new tires is 14% larger than the radius of one of his old tires. What is the circumference of each new tire, to the nearest tenth of a meter?
- 25.** Joe gets new tires for his car. The radius of each of his old tires is .25 meters, and the radius of each of his new tires is 15% larger than the radius of one of his old tires. What is the circumference of each new tire, to the nearest tenth of a meter?

26. Which of the following equations describes a circle with radius 6 that goes through the origin?

- A) $(x - 3)^2 + (y + 3)^2 = 6$
- B) $(x - 3)^2 + (y + 3)^2 = 36$
- C) $(x - 6)^2 + (y + 6)^2 = 36$
- D) $(x - 3\sqrt{2})^2 + (y + 3\sqrt{2})^2 = 36$

27. If $3\sqrt{3x} = a$, what is $3x$ in terms of a ? [NO CALC]

- A) $\frac{a^2}{9}$
- B) $\frac{a^2}{3}$
- C) a^2
- D) $3a^2$

28. If $4\sqrt{4x} = a$, what is $4x$ in terms of a ? [NO CALC]

- A) $\frac{a^2}{16}$
- B) $\frac{a^2}{8}$
- C) $\frac{a^2}{4}$
- D) $4a^2$

29. If $f(x) = x^2 - 3x + 8$ and c is a positive integer less than 5, what is one possible value of $f(c)$? [NO CALC]

30. If $f(x) = x^2 - 4x + 7$ and c is a positive integer less than 4, what is one possible value of $f(c)$? [NO CALC]
31. If $f(x) = x^2 - 5x + 12$ and c is a positive integer less than 4, what is one possible value of $f(c)$? [NO CALC]
32. An angle with a measure of $\frac{5\pi}{6}$ radians has a measure of d degrees, where $0 \leq d < 360$. What is the value of d ? [NO CALC]
33. An angle with a measure of $\frac{\pi}{6}$ radians has a measure of d degrees, where $0 \leq d < 360$. What is the value of d ? [NO CALC]
34. An angle with a measure of $\frac{3\pi}{4}$ radians has a measure of d degrees, where $0 \leq d < 360$. What is the value of d ? [NO CALC]

$$x - 8 = \sqrt{x + 4}$$

35. Which of the following values of x is a solution to the equation above? [NO CALC]

- A) -1
- B) 2
- C) 3
- D) 12

$$x - 2 = \sqrt{x + 18}$$

36. Which of the following values of x is a solution to the equation above? [NO CALC]

- A) -2
- B) 5
- C) 7
- D) 10

Answers:

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| 1. C | 13. B | 26. D |
| 2. C | 14. C | 27. A |
| 3. C | 15. 6 or 2 | 28. A |
| 4. 3 | 16. 1 or 7 | 29. 12,8,or6 |
| 5. 7 | 17. 51 | 30. 3 or 4 |
| 6. 2 | 18. 54 | 31. 6 or 8 |
| 7. 3 | 19. 37 | 32. 150 |
| 8. 2 | 20. 25 | 33. 30 |
| 9. C | 21. 24 | 34. 135 |
| 10. C | 22. 1.4 | 35. D |
| 11. D | 23. 1.3 | 36. C |
| 12. D | 24. 1.6 | |
| | 25. 1.8 | |