Practice THEA Mathematics Exam

1. A machine in a soft drink bottling factory caps 3 bottles per second. How many bottles can it cap in 15 hours?

A) 2.7×10^3

B) 1.6×10^4

C) 1.8×10^4

D) 1.6×10^5

2. A truck has a full 50-gallon gas tank. It uses 7¼ gallons on the first part of its journey, 13½ on the second part of its journey, and 15¼ gallons on the third part of its journey. How many gallons of gas remain in the gas tank?
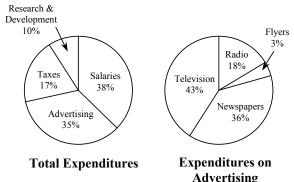
A) 14

B) 14¼

C) 15

D) 36

3. A rancher is planning to put up 220 yards of fencing. In the morning she puts up 80 yards, and in the afternoon she puts up 40% of the remaining fence. What percent of the fence did she put up that day?

A) 36%

B) 51%

C) 62%

D) 76%

4. During a bike-a-thon a local company pledges to to donate $1.25 for every $4.00 pledged by the public. If the public pledges a total of $156.00 dollars per mile, how much will the company donate per mile?

A) $2.75

B) $48.75

C) $195.00

D) $499.20

5. Use the pie charts below to answer the question that follows.

Research & Development 10%

Flyers 3%

Radio 18%

Television 43%

Taxes 17%

Salaries 38%

Advertising 35%

Newspapers 36%

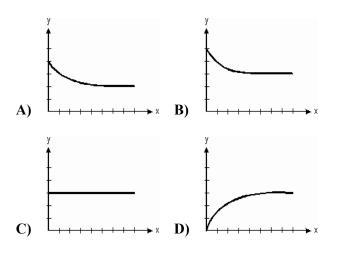**Total Expenditures**

Expenditures on Advertising

The first pie chart represents a company's expenditures, and the second pie chart shows a breakdown of the company's advertising expenditures. What percent of the the company's expenditures is spent on radio advertising?

A) 6.3%   **B)** 11.7%

C) 18.0%   **D)** 35.0%

6. Scientists have stocked Wilson's pond with a species of fish. The scientists note that the population has steadily decreased over a period of time until the population is approximately half the number of fish originally stocked. If the number of fish are plotted on the y-axis and the amount of time on the x-axis, which of the following could result?
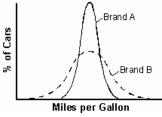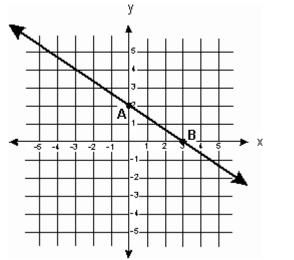
A)

B)

C)

D)

7. A student has received scores of 88, 82, and 84 on three quizzes. If tests count twice as much as quizzes, what is the lowest score the student can get on the next test to achieve an average score of at least 70?

A) 13

B) 48

C) 70

D) 96

8. Use the distribution curves below to answer the question that follows.

Brand A

Brand B
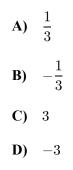
% of Cars

Miles per Gallon

The distribution curves above show data on the gas mileage for two different brands of car. Which of the following correctly analyzes the information presented in these distributions?

A) The mean gas mileage of brand A is greater than the mean gas mileage of brand B.

B) Data was collected for more cars of brand A then of brand B.

C) Brand A cars have smaller variability in gas mileage than brand B cars.

D) Brand A cars get poorer gas mileage than brand B cars.

9. Use the graph below to answer the question that follows.

Which of the following equations represents line AB?

A) $y = -\dfrac{2}{3}x + 2$

B) $y = \dfrac{3}{2}x + 3$

C) $y = -2x + 3$

D) $y = 3x + 2$

10. What is the slope of the line passing through $(0, -1)$ and $(3, -2)$?

A) $\dfrac{1}{3}$

B) $-\dfrac{1}{3}$

C) 3

D) -3

11. Which of the following is an equation of the line passing through $(-2, 4)$ and $(6, 0)$?
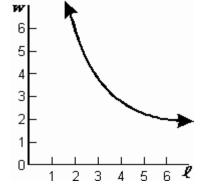
A) $y = \dfrac{1}{2}x + 3$

B) $y = -\dfrac{1}{2}x + 3$

C) $y = -2x + 3$

D) $y = -\dfrac{1}{2}x + 6$

12. Use the graph below to answer the question that follows.

The graph shows how the width (w) depends on the length (*l*) for a rectangle of constant area. What is the value of w for $l = 8$?

A) 1 **B)** $\dfrac{3}{2}$ **C)** 4 **D)** 96

13. If $-\dfrac{1}{3}x + 7 = 16$, what is the value of $2x + 1$?

A) -5

B) -27

C) -53

D) -137

14. If $5r = 9t + 7$, what is the value of t?

A) $t = \dfrac{5r - 7}{9}$

B) $t = \dfrac{5r + 7}{9}$

C) $t = \dfrac{5r}{9} - 7$

D) $t = \dfrac{5r}{9} + 7$

15. What is the solution to the system of equations $x^2 - x + 6 = y$ and $2x + 2y = 36$?

A) $(0, 6),\ (9, 9)$

B) $\left(2\sqrt{3}, 18 - 2\sqrt{3}\right),\ \left(-2\sqrt{3}, 18 + 2\sqrt{3}\right)$

C) An infinite number of solutions.

D) No solution.

16. Which of the following graphs shows the solution of
$y + 2x + 2 = 0$ and $y = x^2 - 9$?

A)

B)

C)

D)

17. C is 10 more than the square of the quotient of the sum of x and y and the product of x and y. Which expresses this relationship?

A) $C = \left(\dfrac{x+y}{xy} + 10 \right)^2$

B) $C = \left(\dfrac{x+y}{xy} \right)^2 + 10$

C) $C = \left(\dfrac{xy}{x+y} \right)^2 + 10$

D) $C = \dfrac{(x+y)^2}{xy} + 10$

18. The number P is 50 less than the square of the difference of m^2 and n. Which of the following equations expresses this relationship?

A) $P = \left(m^2 - n\right)^2 - 50$

B) $P = \left(m^2 - n\right) - 50$

C) $P = \left(m^2 - n - 50\right)^2$

D) $P = 50 - \left(m^2 - n\right)^2$

19. A ten-foot-long board is cut into three pieces. The second piece is half as long as the first. The third piece is 4½ feet longer than the second. How long is the first piece?

A) $1\dfrac{1}{10}$ feet

B) $2\dfrac{1}{5}$ feet

C) $2\dfrac{3}{4}$ feet

D) $3\dfrac{1}{3}$ feet

20. Angel has $1.80 in nickels, dimes, and quarters in his pocket. He has twice as many quarters as nickels. The number of dimes in his pocket is one more than the number of nickels and quarters put together. Which set of three equations could be used to determine how many nickels, dimes, and quarters Angel has?

A) $5N + 10D + 25Q = 180$
$Q = 2N$
$D = N + Q + 1$

B) $5N + 10D + 25Q = 180$
$N = 2Q$
$D = N + Q + 1$

C) $5N + 10D + 25Q = 1.80$
$Q = 2N$
$D + 1 = N + Q$

D) $0.05N + 0.10D + 0.75Q = 1.80$
$Q = 2N$
$D + 1 = N + Q$

21. Robin Chang collected $175 in the second week of her school charity drive. This was $35 more than she collected in the first week. How much did she collect in the two weeks?

A) $210

B) $315

C) $385

D) $420

22. One factor of $x^2 - 2x - 24$ is ____ .

A) $(x - 24)$

B) $(x - 4)$

C) $(x - 6)$

D) $(x + 6)$

23. $\dfrac{x^2 - x}{x^2 + 3x + 2} \div \dfrac{x^2 + 2x}{x^2 - 1} =$

A) $\dfrac{x^2}{x^2 + 2x + 1}$

B) 1

C) $\dfrac{x^2 - 1}{x^2 - 4}$

D) $\dfrac{x^2 - 2x + 1}{x^2 + 4x + 4}$

24. $\dfrac{9c}{24cx - 18c^2} =$

A) $\dfrac{3}{8x - 6c}$

B) $\dfrac{1}{15x - 9c}$

C) $\dfrac{8x - 6c}{3}$

D) $\dfrac{3}{6x - 8c}$

25. $\dfrac{a^{\frac{3}{2}}b^3c^5}{a^2b^{\frac{1}{3}}} \div a^2b^{\frac{5}{3}}d^{\frac{1}{2}} =$

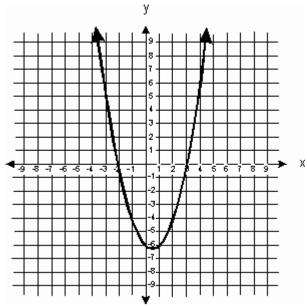**A)** $a^{\frac{3}{2}}b^{\frac{13}{3}}c^5d^{\frac{1}{2}}$

B) $\dfrac{a^6b^6c^5}{d^{\frac{1}{2}}}$

C) $\dfrac{a^{\frac{3}{8}}b^{\frac{3}{2}}c^5}{d^{\frac{1}{2}}}$

D) $\dfrac{bc^5}{a^{\frac{5}{2}}d^{\frac{1}{2}}}$

26. If $f(x) = 2x^2 + \dfrac{1}{2}x - 4$, what is $f\left(-\dfrac{1}{2}\right)$?

A) $-\dfrac{13}{4}$

B) 5

C) $-\dfrac{15}{4}$

D) 3

27. Use the graph below to answer the question that follows.
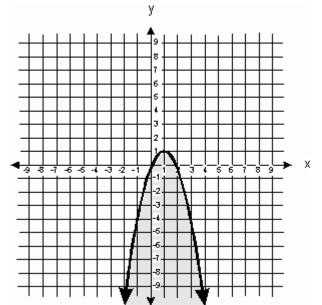

Which equation is represented by this graph?

A) $y = -x^2 + x + 6$

B) $y = x^2 - x - 6$

C) $y = -x^2 - x - 6$

D) $y = x^2 - x + 6$

28. Use the graph below to answer the question that follows.

Which of the following inequalities describes the shaded region?

A) $y \leq -x^2 - 2x$

B) $y > -x^2 + 2x$

C) $y \leq -x^2 + 2x$

D) $y \leq -x^2 + 2x + 2$

29. Which of the following expressions should be placed in each set of parentheses below in order to solve the equation by completing the square?
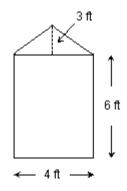
$$x^2 + 6x + (?) = 15 + (?)$$

A) $\dfrac{3}{2}$

B) 3

C) 6

D) 9

30. Which of the following expressions appear as a step in solving $3x^2 = x - 5$ using the quadratic formula?

A) $\dfrac{-1 \pm \sqrt{61}}{6}$

B) $\dfrac{1 \pm \sqrt{-59}}{6}$

C) $\dfrac{1 \pm \sqrt{61}}{6}$

D) $\dfrac{1 \pm \sqrt{59}}{6}$

31. The height of a rocket in feet is given by the equation $h = 128t - 32t^2$ where t is the time in seconds after it is fired and h is the height in feet. At what time is the rocket at a height of 128 feet?

A) 1 second

B) 2 seconds
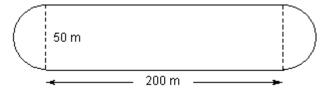
C) 3 seconds

D) 4 seconds

32. Use the diagram below to answer the question that follows.

A window is rectangular with a triangular top section. What is the total area of glass needed for the window?

A) 24 square feet

B) 30 square feet
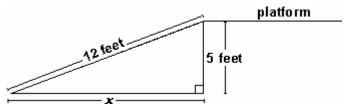
C) 36 square feet

D) 48 square feet

33. Use the diagram below to answer the question that follows.

The drawing above represents a race track. The ends are semicircular. What is the approximate distance in meters a runner runs in 8 laps around the track?

A) 560 m

B) 4000 m

C) 4460 m

D) 5710 m

34. An observatory dome is hemispherical in shape with a radius of 18 meters and is built using 12 equal sections. Which of the following formulas describes the surface area of <u>each</u> section?
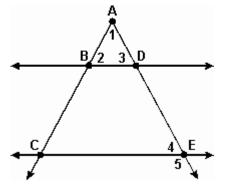
A) $\dfrac{1}{12} \cdot \dfrac{1}{2} \cdot \dfrac{4}{3}\pi(18)^3$

B) $\dfrac{1}{12} \cdot 4\pi(18)^2$

C) $\dfrac{1}{12} \cdot \dfrac{1}{2} \cdot 4\pi(36)^2$

D) $\dfrac{1}{12} \cdot \dfrac{1}{2} \cdot 4\pi(18)^2$

35. Use the diagram below to answer the question that follows.

A ramp 12 feet long is leaning against a raised platform which is 5 feet above the ground. What is the distance from the ramp's contact point with the ground and the base of the platform?

A) 7 feet

B) 8.5 feet

C) $\sqrt{119}$ feet

D) 13 feet

36. Figure ABCDE is similar to figure FGHIJ. If AE = 5, FJ = 20, and BC = 40, what is GH?

A) 10

B) 25

C) 45

D) 160

37. If pentagon ABCDE is similar to pentagon GHIDF, and DI = 20, CD = 50, and DE = 45, what is DF?

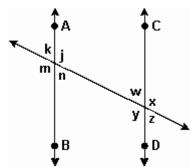A) 112.5

B) 25

C) 18

D) 15

38. Use the diagram below to answer the question that follows.

Line AB is parallel to line CD. What is the sum of the measure of angle **k** and the measure of angle **y**?

A) 90°

B) 100°

C) 180°

D) 360°

39. Use the diagram below to answer the question that follows.

If △ABD is an equilateral triangle, and line BD is parallel to line CE, what is the measure of angle 5?
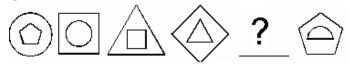
A) 60°

B) 90°

C) 120°

D) 180°

40. Use the statements below to answer the question that follows.

1. *All people wearing hats have brown hair.*
2. *Some of the people have red hair.*
3. *All people who have brown hair like pizza.*
4. *People who have red hair like hamburgers.*
5. *Carl has brown hair.*

Which of the following statements must be true?

A) Carl likes pizza.

B) Carl has red hair.

C) Carl is wearing a hat.

D) Carl likes hamburgers.

41. Use the pattern sequence below to answer the question that follows.
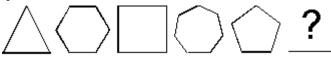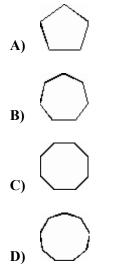
What is the missing design in the sequence?

A)

B)

C)

D)

42. Bess, Tara, Gerard, and Clifton all work for the same company. One is a writer, one a researcher, one an artist, and one an engineer. Use the statements below to answer the question that follows.
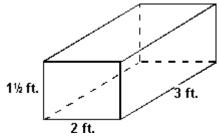
  I.   *Bess and Gerard eat lunch with the engineer.*
  II. *Clifton and Tara carpool with the researcher.*
 III. *Gerard works in the same building as the writer and researcher.*

Who is the researcher?

A) Tara

B) Bess

C) Clifton

D) Gerard

43. Use the pattern sequence below to answer the question that follows.

What is the missing figure?

A)

B)

C)

D)

44. Use the diagram below to answer the question that follows.

A rectangular box has dimensions
1½ feet × 2 feet × 3 feet. What is the length of the longest object that can be put in the box, if the object can be placed in any position?

A) 3.6 feet

B) 3.9 feet

C) 6.5 feet

D) 15.25 feet

45. Sarah is planning to rent an apartment. She makes the table below in order to compare the monthly cost of renting two different apartments.

Apartment	Rent ($)	Average Monthly Electricity Use (kWh)	Commuting Cost ($/day)
A	575	250	1.50
B	600	225	.75

If electricity costs 5¢ per kilowatt-hour (kWh), which of the following statements is true?

A) Apartment A will be cheaper.

B) Apartment B will be cheaper.

C) Apartments A and B will cost the same per month.

D) She cannot determine which apartment will be cheaper.

Use the information below to answer the three questions that follow.

A water treatment plant is built with three cylindrical tanks to contain the water for a town. Each tank has a radius of 15 feet and a depth of 25 feet.

46. If there are about 7.5 gallons in a cubic foot of water, approximately how many gallons of water can be treated at the plant at any one time?

A) 7.1×10^3

B) 1.3×10^5

C) 4.1×10^5

D) 4.1×10^6

47. Engineers know that the amount of water lost due to evaporation is directly proportional to the surface area of the holding tanks and that the local climate causes water to evaporate at the rate of about $\frac{1}{10}$ gallon of water per hour for each square foot of water exposed to the air. About how many total gallons of waste water may enter the three tanks each day to maintain full capacity?

A) 2.1×10^2

B) 1.7×10^3

C) 5.0×10^3

D) 5.0×10^4

48. The three tanks are occasionally cleaned by draining them. The following table gives the depth of water as the tanks are being drained.

Time (hours)	Depth (feet)
0	25
1	17
2	9
3	1

Which of the following equations will give the depth (D) at any time (t)?

A) $D = -8t - 25$

B) $D = -\frac{1}{8}t + 25$

C) $D = 8t + 25$

D) $D = -8t + 25$

Practice THEA Exam Answer Key

1. D	2. A	3. C	4. B	5. A
6. A	7. B	8. C	9. A	10. B
11. B	12. B	13. C	14. A	15. B
16. C	17. B	18. A	19. C	20. A
21. B	22. C	23. D	24. A	25. D
26. C	27. B	28. C	29. D	30. B
31. B	32. B	33. C	34. D	35. C
36. D	37. C	38. C	39. C	40. A
41. A	42. B	43. C	44. B	45. A
46. C	47. C	48. D		