Professional Readiness Exam: Practice Test

Directions: You may use a four-function calculator and the *Definitions and Formulas Sheet* (attached) that can be found at: http://www.mttc.nesinc.com/PDFs/MI_field096_Math_SG.pdf. Both the calculator and the formula sheet will be provided to you on the day of the test.

1. Use the equation below to answer the question.
$$B = \frac{a^2(4a - 1)}{\frac{1}{4}a^3}$$

If a = 4, what is B?

    A. 15

    B. 9

    C. $\frac{15}{64}$

    D. 64

2. What is the volume, V(r), of a cone which has a radius, r, and a height, r +3?

    A. $V(r) = \frac{\pi}{3}(r^3 + 3r)$

    B. $V(r) = \frac{\pi}{3}(r^3 + 3r^2)$

    C. $V(r) = \frac{\pi}{3}(r^2 + 3r + 3)$

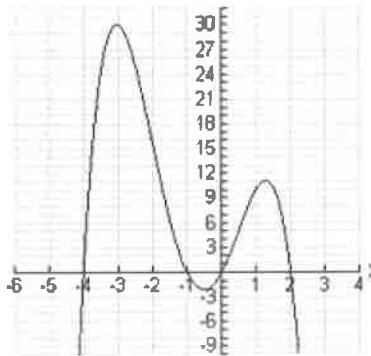   D. $V(r) = \frac{\pi}{3}(r^3 + 6r^2 + 6r)$

3. Use the table below to answer the question.

x	-3	-2	-1	1	2	3
f(x)	27	8	1	1	8	27

Which of the following families of functions best represents the data in the table above?

    A. quadratic
    B. logarithmic
    C. exponential
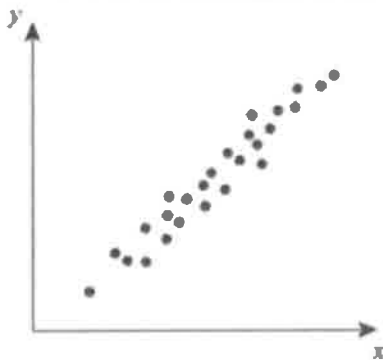   D. linear

4. Use the graph below to answer the question.

Which of the following polynomial functions could have the graph above?

A. $g(x) = -1.3x(x + 4)(x + 1)(x - 2)$

B. $g(x) = 1.3x(x + 4)(x + 1)(x - 2)$

C. $g(x) = -1.3x(x - 4)(x - 1)(x + 3)$

D. $g(x) = 1.3x(x + 4)(x + 3)(x - 1)$

5. When leaving a shopping mall, 35 shoppers were asked 9 questions about their purchasing habits. After looking at the results, it was determined that the survey's margin of error is unsatisfactorily high. Which of the following will most likely decrease the margin of error?

A. use a survey with fewer questions
B. survey more shoppers
C. survey the shoppers an hour before they start shopping
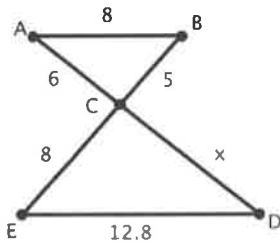D. interview the shoppers via email instead of in person

6. Use the scatterplot to answer the question.

A. There is a strong negative correlation between x and y.
B. There is a strong positive correlation between x and y.
C. There is a weak negative correlation between x and y.
D. There is a weak positive correlation between x and y.

7. Let l represent the length of a box. The width of the box is $\frac{1}{4}l$ and the height of the box is $l - 5$. Which of the following best describes the box?

   A. The length of the box is 5 units more than its height and 4 times as long as its width.
   B. The length of the box is 5 units more than its height and ¼ times as long as the width
   C. The length of the box is 5 units less than its height and 4 times as long as its width.
   D. The length of the box is 5 units less than its height and ¼ times as long as its width.

8. Use the picture below to answer the question.

   In the picture, $\triangle ABC \sim \triangle DEC$. Find the value of x if the measurements are in meters.
   A. $9\frac{3}{5}$ meters
   B. 8 meters
   C. $6\frac{2}{3}$ meters
   D. 6 meters

9. A rectangular prism has a length of 8 units and a width of 3 units. A triangular prism has a triangular base of area 24 square units. If the two prisms have equal volumes, which of the following statements must be true of the two prisms?

   A. They have the same surface area.
   B. They have the same height.
   C. They have the same number of edges.
   D. They have the same number of faces.

10. Use the data below to answer the question that follows. Find the median

    23, 10, 10, 35, 42, 26, 47, 18, 30, 10, 13

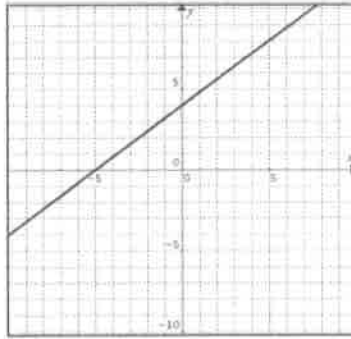   A. 10
    B. 23
    C. 6
    D. 47

11. In a scatterplot, Pearson's coefficient of correlation can be used to measure the strength of the relationship between two variables in which type of relationship:
A. exponential
B. logarithmic
C. linear
D. quadratic

12. A box contains a red(r), blue(b), and green(g) sock. If two socks are randomly chosen from the box and the first sock is NOT replaced before the second one is drawn, which of the following represents the sample space, S, for the experiment?
A. S = {rb, rg, bg}
B. S = {rr, rb, rg, bb, bg, gg}
C. S = {rb, rg, br, bg, gr, gb}
D. S = {rb, rg, rr, bg, br, bb, gr, gb, gg}

13. If a and b are positive integers, which of the following is always an integer?
A. $\frac{a}{b}$
B. $\sqrt{ab}$
C. $b\sqrt{a}$
D. $a - b$

14. If $5x - 3 = 10$, which of the following numbers should be used as the multiplicative inverse in the process of solving the equation for x?
A. 3
B. -5
C. $\frac{1}{3}$
D. $\frac{1}{5}$

15. What is the result when (2 - 4i) is subtracted from (5 + 3i)?
A. -3 - 7i
B. 3 + 7i
C. -3 + 5i
D. 3 - 5i

16. Use the argument below to answer the question that follows.
If it is sunny, then I am happy.
I am happy.
Therefore, it is sunny.

Which of the following arguments best characterizes the validity of the argument above?
A. The argument is valid, since I am happy.
B. The argument is invalid, since it is unclear when it is sunny.
C. The argument is valid, since it is true that it is sunny.
D. The argument is invalid, since there are many reasons why I could be happy.

17. What is the result when $(3n^4 - 8n^2 - n + 4)$ is subtracted from $(12n^4 - 5n^3 + 2n^2 - 7)$?
   A. $9n^4 + 3n^2 + n - 11$
   B. $9n^4 + 13n^3 + n^2 - 3$
   C. $9n^4 - 5n^3 + 10n^2 + n - 11$
   D. $9n^4 - 5n^3 - 6n^2 + n - 11$

18. Each term, a_n, in a sequence is given by $a_n = 2 + 6n$. What is the sum of the first four terms of the sequence if n = 0, 1, 2, 3?
   A. 20
   B. 44
   C. 68
   D. 92

19. To test the accuracy of a scale, a known weight of 90 grams is placed on the scale. The scale displays a weight of 98 grams. What is the percent error in the measurement?
   A. 8.2%
   B. 8.9%
   C. 91.8%
   D. 108.8%

20. A scrapbooking club has determined that a necessary condition for joining the club is to be a resident in the town where the club is based. Which of the following questions should be answered to determine if the condition is also a sufficient condition for membership?

   A. Is there a limit on the number of residents who can join the club?
   B. What are the obligations once a person becomes a member of the club?
   C. Can any resident in the town join the club?
   D. Can relatives of existing members join the club?

21. A rectangle has sides measuring x + 6 and x + 4. Which of the functions represents the area of the rectangle, A(x), in terms of x?
   A. $A(x) = 2x + 10$
   B. $A(x) = 4x + 2$
   C. $A(x) = x^2 + 24$
   D. $A(x) = x^2 + 10x + 24$

22. A laboratory that is growing bacteria for experiments finds that the number of a certain type of bacteria triples every hour. If an experiment starts with a population of 200 bacteria, which of the following equations expresses the population, P, as a function of time, t, measured in hours since the experiment begins?
   A. $P = 200 + 200(3t)$
   B. $P = 200(3t)$
   C. $P = 200(3^t)$
   D. $P = (200 \cdot 3)^t$

23. Which of the following equations represents the graph:

A. $-4x + 5y = 20$
B. $-4x - 5y = -20$
C. $5x + 4y = -20$
D. $5x - 5y = 20$

24. A spring is attached to a ceiling. When the spring is pulled down and released, the spring oscillates up and down in a regular, predictable way. Which of the following families of functions would be most appropriate for describing the height of the bottom of the spring, as a function of time?

A. rational
B. quadratic
C. trigonometric
D. logarithmic
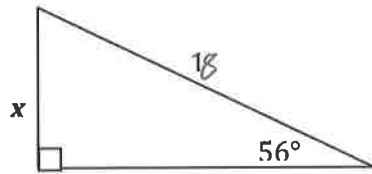
25. A segment drawn on a coordinate plane has one endpoint at (-3,1) and the other at point A. The midpoint of the segment has coordinates (0, 3). What are the coordinates of A?

A. $(7, 3)$
B. $(9, -1)$
C. $(4, 6)$
D. $(3, 5)$

26. A bicycle has wheels that measure 50 centimeters in diameter. Which of the following expressions is equal to the distance that the bicycle moves forward after completing 10 revolutions of its wheels?

A. 25π
B. 50π
C. 250π
D. 500π

27. In the picture below, which of the following could be used to calculate the length of x?
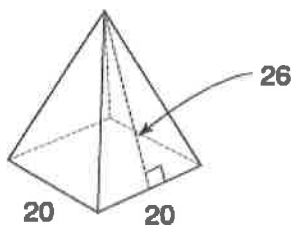
A. $x = 18sin56°$
B. $x = 18cos56°$
C. $x = 18tan56°$
D. $x = 18cot56°$

28. A sphere is inscribed in a cube. If the cube has a volume of 125 cubic inches, what is the radius of the sphere, in inches?
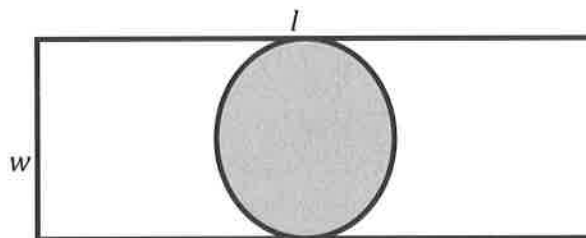A. 1.5
B. 2
C. 2.5
D. 5

29. A tent in the shape of a square pyramid has a floor that measures 20 feet on each side. The slant height of the tent is 26 feet. How much material is needed to make the tent including the floor?

A. 1440 square feet
B. 400 square feet
C. 890 square feet
D. 2480 square feet

30. A rectangular basketball court with wood flooring has length l and w. The circular section in the very center of the court is painted red. Which of the following formulas represents the area of the court that is NOT painted red?
A. $lw - \pi w^2$
B. $l^2 - 2\pi w$
C. $lw - \frac{\pi w^2}{2}$
D. $lw - \frac{\pi w^2}{4}$

31. Which of the following letters of the alphabet has exactly one line of reflective symmetry?
A. A
B. O
C. X
D. P

32. $\triangle ABC$ is graphed on a coordinate plane and has vertices A(0, 1.5), B (-1, -1), C(2, -1). Under dilation, $\triangle A' B' C'$ has vertices A' (0, 3), B'(-2, -2), C' (4, -2). What is the scale factor of this dilation?

A. 1/3
B. 1
C. 2
D. 4

33. Lines m and n are parallel. An object is reflected over line m and then over line n. The result of theses two transformations is the same as a single:

A. Rotation
B. Reflection
C. Glide reflection
D. Translation

34. Five students stand in a line facing the teacher. In how many ways can the students be arranged in the line?

A. 5
B. 5^2
C. 5!
D. 5^4

35. A college places the following question on its website: **"Should Tuition be decreased?"** There are 892 responses of "yes", 67 responses of "no", and 21 responses of "not sure". Which of the following best describes a potential problem with using these results to make a valid conclusion?

A. The sample is too small.
B. There are too many "not sure" responses.
C. There are too many "no" responses.
D. There could be multiple responses from the same participant.

36. A company makes individual sized bags of potato chips. The company guarantees that one bag of potato chips is 8.6 oz. $\pm$ 0.5 oz. Which of the following expresses the acceptable range of weight, w, in ounces, for a bag of potato chips.

A. $.81 \leq w \leq .91$
B. $8.1 \leq w \leq 9.1$
C. $3.6 \leq w \leq 13.6$
D. $.081 \leq w \leq 9.01$

37. Use the information below to answer the question that follows.

A number of years ago, it was reported that hormone replacement therapy (HRT) helped prevent heart disease in women. This conclusion was based on studies which showed a strong correlation between women who underwent HRT and women with little incidence of heart disease.

Which of the following statements best represents the validity of the news report?
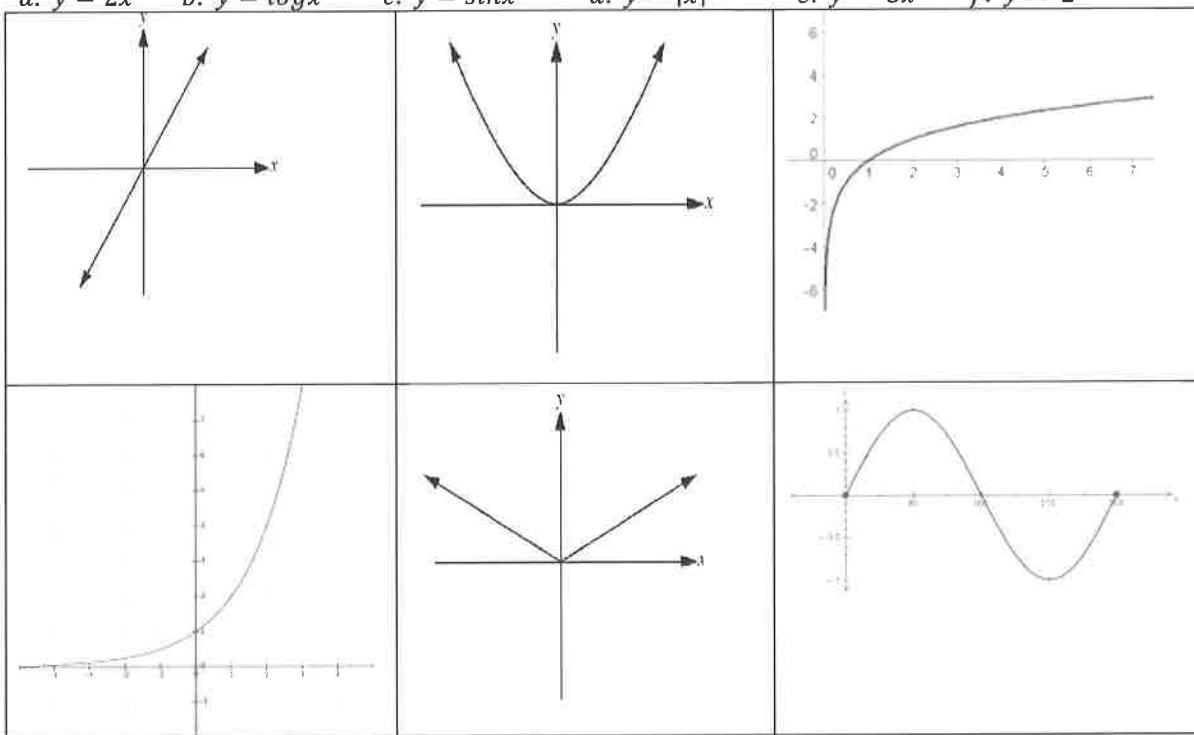A. The report is not valid because HRT was not prescribed for women who were known to have heart disease.
B. The report is not valid because the women undergoing HRT may have already had a lower risk for heart disease.
C. The report is valid because the results come from scientific studies.
D. The report is valid because a strong correlation means changes in one variable causes changes in another.

38. A collection of coins consists of nickels, dimes, and quarters. There are 2 more dimes than quarters and 3 more nickels than quarters. All of the coins together are worth $2.35. If q represents the number of quarters, which of the following represents this situation?
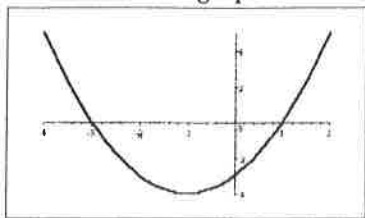A. $0.25q + .10q + .20 + .05q + .15 = 235$
B. $0.25q + .10q + 20 + .05q + .15 = 235$
C. $25q + 10q + 20 + 5q + .15 = 235$
D. $0.25q + .10 + .05q = 235$

39. Match the function with its picture

$a.\ y = 2x$ $\qquad b.\ y = \log x$ $\qquad c.\ y = \sin x$ $\qquad d.\ y = |x|$ $\qquad e.\ y = 3x^2$ $\qquad f.\ y = 2^x$

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

The graph of a function f(x) is shown above. For what values of x are the values of f(x) negative?

A. -4 < x < 0
B. x < 1
C. x > -3
D. −3 < x < 1

Professional Readiness Exam- Math Practice Test
Answer Key

Question	Answer
1	A
2	B
3	A
4	A
5	B
6	B
7	A
8	A
9	B
10	B
11	C
12	C
13	D
14	D
15	B
16	D
17	C
18	B
19	B
20	C

Question	Answer
21	D
22	C
23	A
24	C
25	D
26	D
27	A
28	C
29	A
30	D
31	A
32	C
33	D
34	C
35	D
36	B
37	B
38	C
39	a, e, b, f, d, c
40	D

SAMPLE DEFINITIONS AND FORMULAS

DEFINITIONS

$\approx$	approximately equal to	$\sim$	similar to	$\perp$	perpendicular to
$>$	greater than	$\cong$	congruent to	$\parallel$	parallel to
$<$	less than	π	≈ 3.14	$\overline{AB}$	line segment AB
		$\angle$	angle	$\overleftrightarrow{AB}$	line AB

FORMULAS

Formula	Description
Algebra	
$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	Distance formula
$\left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$	Midpoint formula
$m = \dfrac{\Delta y}{\Delta x} = \dfrac{y_2 - y_1}{x_2 - x_1}$	Slope
$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	Quadratic formula
$y = mx + b$	Slope intercept form of line
$d = r \cdot t$	Distance
$b^x = n$	Exponential
$\log_b n = x$	Logarithm
Statistics and Probability	
$\dfrac{n!}{r!(n - r)!}$	Combinations
$\dfrac{n!}{(n - r)!}$	Permutations
$z = \dfrac{x - \mu}{\sigma}$	z-score
$(n)(n - 1)(n - 2)...(3)(2)(1)$	$n!$

Trigonometry

$$\sin \theta = \frac{opp}{hyp}$$

$$\cos \theta = \frac{adj}{hyp}$$

$$\tan \theta = \frac{opp}{adj}$$

Angle (θ)	sin (θ)	cos (θ)	tan (θ)
0°	0	1	0
30°	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{3}$
45°	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1
60°	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
90°	1	0	undefined

Geometry and Measurement

$C = 2\pi r$	Circumference of a circle
$A = \frac{1}{2} bh$	Area of a triangle
$A = \pi r^2$	Area of a circle
$A = 2lh + 2lw + 2hw$	Surface Area of a rectangular box
$V = lwh$	Volume of a rectangular box
$A = $ sum of areas of polygonal faces	Surface Area of a pyramid
$V = \frac{1}{3} Bh$	Volume of a pyramid
$A = \pi rs + \pi r^2$	Surface Area of a cone
$V = \frac{1}{3} \pi r^2 h$	Volume of a cone
$A = 2\pi rh + 2\pi r^2$	Surface Area of a cylinder
$V = \pi r^2 h$	Volume of a cylinder
$A = 4\pi r^2$	Surface area of a sphere
$V = \frac{4}{3} \pi r^3$	Volume of a sphere
$a^2 + b^2 = c^2$	Pythagorean theorem

End of Definitions and Formulas