

Name: Key Date: \_\_\_\_\_

## Math III Practice Test

Directions: Do not use a calculator on the problems that specify calculator usage is not allowed.

### N.RN.3: \*No Calculators

1. Given:

- $j$  and  $l$  are nonzero rational numbers.
- $k$  and  $m$  are irrational numbers.

Which statement is always true?

- fraction*
- can't be a fraction  $\sqrt{5}, \pi$*
- ☒ A. The result of  $j + l$  is an irrational number because the sum of any two rational numbers is irrational.
- ☐ B. The result of  $k + m$  is a rational number because the sum of any two irrational numbers is rational.
- ☒ C. The result of  $j + l$  is a rational number because the sum of any two rational numbers is rational.
- ☐ D. The result of  $k + m$  is an irrational number because the sum of any two irrational numbers is irrational.

### N.CN.2: \*No Calculators

2. Which expression is equivalent to  $3(1 + 4i)(1 + 2i)$ ?

- ☐ A.  $3 + 18i + 24i^2$
- ☒ B.  $-21 + 18i$

$(3 + 12i)(1 + 2i)$

- ☐ C.  $3 + 42i$
- ☐ D.  $9 + 42i$

$$\begin{array}{r|l} 3 & 12i \\ \hline 1 & 3 \\ 2i & 6i \end{array} \begin{array}{l} 12i \\ 24i^2 \end{array}$$

$3 + 18i - 24$

### A.SSE.4:

3. The Sanchez family wants to go on a vacation in August, and they begin saving in December. The Sanchez family expects the vacation to cost \$1,700. Each month they will deposit 5% more than the previous month. In December, they deposit \$100. How much will the Sanchez family have saved for their vacation after 9 months?

- ☐ A. \$147.75
- ☒ B. \$1,102.66

- ☐ C. \$2,864.73
- ☐ D. \$6,000.00

$D - 100$   $M - 127.63$

$J - 105$   $J - 134$

$F - 110.25$   $J - 140.71$

$M - 115.76$   $A - 147.75$

$A - 121.55$

### A.APR.2: \*No Calculators

4. The equation of the volume of a rectangular prism, in cubic inches, is shown below. The height of the prism is  $x + 1$  inches. Which expression, in inches, could represent the length of this prism?

- ☐ A.  $x - 2$  because  $V(2) = 0$
- ☐ B.  $x - 3$  because  $V(-3) = 0$

- ☐ C.  $x - 6$  because  $V(0) = -6$
- ☐ D.  $x + 1$  because  $V(1) = -8$

5. Given that  $p(-3) = 0$ ,  $p(-1) = 0$ , and  $p(5) = 0$ , which expression could be  $p(x)$ ?

- ☒ A.  $x^3 - x^2 - 17x - 15$
- ☐ B.  $x^3 - x^2 - 17x + 15$

- ☐ C.  $x^3 - 3x^2 - x + 5$
- ☐ D.  $x^3 - 9x^2 + 23x - 15$

$(x+3)(x+1)(x-5)$

$(x^2+4x+3)(x-5)$   $x^3 - x^2 - 17x - 15$

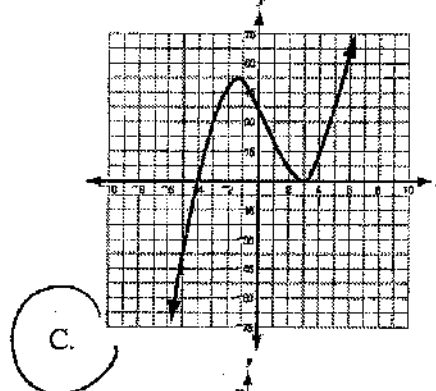
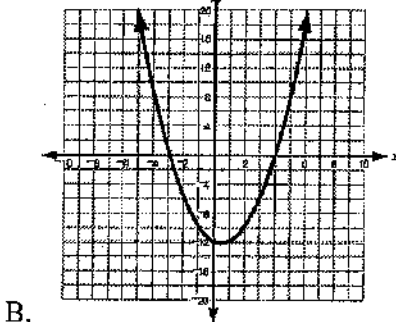
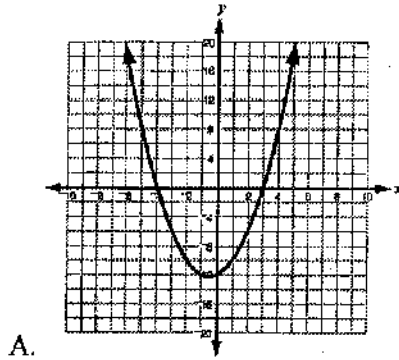
|      |         |          |        |
|------|---------|----------|--------|
| $x$  | $x^3$   | $4x^2$   | $3x$   |
| $-5$ | $-5x^3$ | $-20x^2$ | $-15x$ |

\* Something missing?  
 $V = lwh$   
 $(x+1)$

A.APR.3: \*No Calculators

6. Which graph best represents the function  $f(x) = (x - 3)^2(x + 4)$

3 touch line 4



D.

( )<sup>3</sup> = wiggle

A.APR.6: \*No Calculators

7. Which expression is equal to  $\frac{4x^2 + 8x + 12}{2x}$

A.  $2x + 4 + \frac{6}{2x}$   
 B.  $2x + 4 + \frac{12}{2x}$   
 C.  $2x + \frac{12}{2x+4}$   
 D.  $12 + \frac{x+2}{x}$

$2x + 4 + \frac{6}{x}$

A.CED.3:

8. A painter has exactly 64 pints of yellow paint and 80 pints of green paint. He plans to mix them to make color A and color B to paint the walls of a living room. He uses 3 pints of yellow paint and 5 pints of green paint to make one gallon of color A and 4 pints of yellow paint and 4 pints of green paint to make one gallon of color B.

Find the maximum number of gallons he can mix.

- A. Zero of Color A and 16 of Color B  
 B. 16 of Color A and Zero of Color B  
 C. 10 of Color A and 8 of Color B  
 D. 8 of Color A and 10 of Color B

$64 = y$   $80 = g$

$3y + 5g = 1A$

$4y + 4g = 1B$

**A.REI.2: \*No Calculators**

9. In the equation  $\sqrt{6x-2} - 7 = -3$ , which of the following is true about the  $x$  value?

A.  $x = \frac{5}{3}$

B.  $x = -3$

C.  $x = 3$

D.  $x$  is not a real number

$$\begin{aligned} & \sqrt{6x-2} - 7 = -3 \\ & \sqrt{6x-2} = 4 \\ & 6x-2 = 16 \end{aligned}$$

$$\begin{aligned} 6x &= 18 \\ x &= 3 \end{aligned}$$

$$\begin{aligned} & \sqrt{6(3)-2} \\ & \sqrt{16} \\ & 4 - 7 = -3 \end{aligned}$$

**A.REI.4.A:**

10. What number should be added to both sides of the equation below in order to complete the square?

$$x^2 + 10x = 3$$

A. 5

B. 9

$$\frac{10}{2} = (5)^2$$

C. 25

D. 100

**A.REI.4.B:**

11. What values of  $a$  result in the equation  $ax^2 - 12x - 3 = 6$  having complex solutions?

A.  $a < -12$

B.  $a < -4$

$\frac{-b}{-a}$

C.  $a > 4$

D.  $a > 16$

*i - neg. discriminant*

$$b^2 - 4ac$$

$$(-12)^2 - 4(-3)(a)$$

$$-15 \checkmark = -396$$

$$-5 \checkmark = -36$$

$$144 + 36a < 0$$

**A.REI.11:**

12. Two functions are shown below.

$$f(x) = 2x - 7$$

$$g(x) = \left(\frac{1}{2}\right)^x$$

$$2x - 7 = \left(\frac{1}{2}\right)^x$$



What is the approximate value of  $x$  when  $f(x) = g(x)$ ?

A. 2.98

B. 4.12

C. 5.38

D. 3.54

**F.IF.B.4:**

13. Which of the following functions is symmetric with respect to the  $y$ -axis?

A.  $f(x) = 4 - x^2$

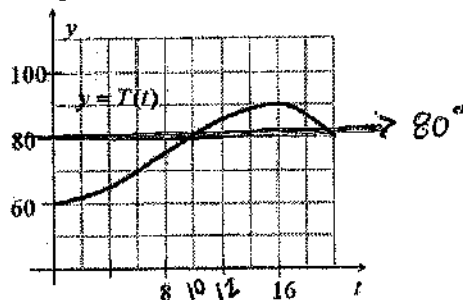
B.  $f(x) = x^3 + 5x$



C.  $f(x) = x - 1$

D.  $f(x) = -\ln x$

14. The figure shows the graph of  $T$ , the temperature (in degrees Fahrenheit) over one particular 20-hour period in Santa Elena as a function of time  $t$ .



If Anya wants to go for a two-hour hike and return before the temperature goes over 80 degrees, when should she leave?

A. Before 8 am

B. Between 8 am and 10 am

C. Between 10 am and 12 pm

D. Between 10 am and 8 pm

**F.BF.3: \*No calculators**

15. The function  $f(x) = x^3$  is changed to  $f(x) = -2x^3 - 7$ . What effect will this have on the graph of the function?

- reflect over x-axis*  
*down*
- A. The graph will be reflected in the y-axis, shifted up 2 units and vertically stretched by a factor of 7.
  - B. The graph will be reflected in the x-axis, shifted up 7 units and vertically stretched by a factor of 2.
  - ☒ C. The graph will be reflected in the x-axis, shifted down 7 units and vertically stretched by a factor of 2.
  - D. The graph will be reflected in the y-axis, shifted down 2 units and vertically stretched by a factor of 7.

16. Which statement is true for the function  $f(x) = -x^3 + 4x^2 - 3x$ ?

- A.  $f(x)$  is an even function and has end behavior such that as  $x \rightarrow \infty, f(x) \rightarrow \infty$  and as  $x \rightarrow -\infty, f(x) \rightarrow \infty$ .
- ☒ B.  $f(x)$  is an odd function and has end behavior such that as  $x \rightarrow \infty, f(x) \rightarrow -\infty$  and as  $x \rightarrow -\infty, f(x) \rightarrow \infty$ .
- C.  $f(x)$  is an odd function and has end behavior such that as  $x \rightarrow \infty, f(x) \rightarrow \infty$  and as  $x \rightarrow -\infty, f(x) \rightarrow \infty$ .
- D.  $f(x)$  is an even function and has end behavior such that as  $x \rightarrow \infty, f(x) \rightarrow -\infty$  and as  $x \rightarrow -\infty, f(x) \rightarrow -\infty$ .

**F.BF.4.A:**

17. Which expression represents the inverse of  $f(x) = 8^x + 13$ ?

- A.  $\frac{x}{8} - 13$
- B.  $\frac{1}{8^x + 13}$

- C.  $\log 8^x + 13$
- ☒ D.  $\log_8(x - 13)$

$$\begin{aligned} x &= 8^y + 13 \\ x - 13 &= 8^y \\ \log_8 x - 13 &= y \end{aligned}$$

18. Which statement represents the inverse of  $f(x) = x^3 - 7$ ?

- A.  $f^{-1}(x) = 7 - x^3$
- B.  $f^{-1}(x) = \frac{1}{x^3 - 7}$
- C.  $f^{-1}(x) = \sqrt[3]{x} + 7$

- ☒ D.  $f^{-1}(x) = \sqrt[3]{x + 7}$

$$\begin{aligned} x &= y^3 - 7 \\ x + 7 &= y^3 \\ \sqrt[3]{x + 7} &= y \end{aligned}$$

**F.LE.3: \*No calculators**

19. George is comparing the graphs of two functions  $f(x) = 3^x$  and  $g(x) = 25x^2 + 49x + 100$  for different values of  $x$ . Which statement best compares the values of the functions as the value of  $x$  increases?

- ☒ A.  $f(x)$  will eventually exceed  $g(x)$  for all real numbers greater than a certain  $x$ -value.
- B.  $g(x)$  will eventually exceed  $f(x)$  for all real numbers greater than a certain  $x$ -value.
- C.  $f(x)$  is greater than  $g(x)$  for all values of  $x$ .
- D.  $g(x)$  is greater than  $f(x)$  for all values of  $x$ .

*Graph & look at table.*

**F.TF.1:**

20. A circular clock has a minute hand that rotates from the center of the clock. This distance from the point on the minute hand from where it rotates to its end is 12 centimeters (cm). How far does the end of the minute hand move in 10 minutes?

A.  $4\pi$  cm  
B.  $8\pi$  cm

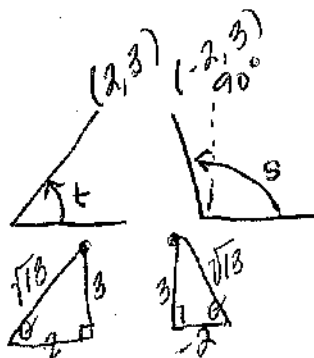
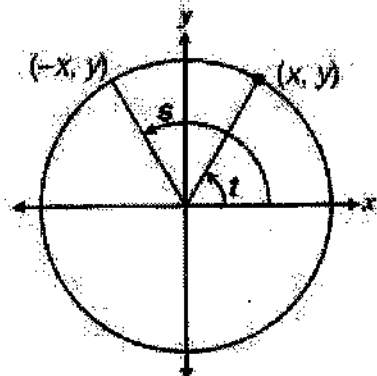
C.  $24\pi$  cm  
D.  $48\pi$  cm

$$10 \cdot 6^\circ = 60^\circ$$

$$\text{Arc length} = \frac{60}{360} \cdot 2\pi(12)$$

**F.TF.2:**

21. The figure below represents a unit circle.



$$\sin \theta = \frac{3}{\sqrt{13}} \quad \sqrt{\sin \theta} = \frac{3}{\sqrt{13}}$$

$$\cos \theta = \frac{2}{\sqrt{13}} \quad \cos \theta = -\frac{2}{\sqrt{13}}$$

Which statement best represents the relationship between Angles s and t?

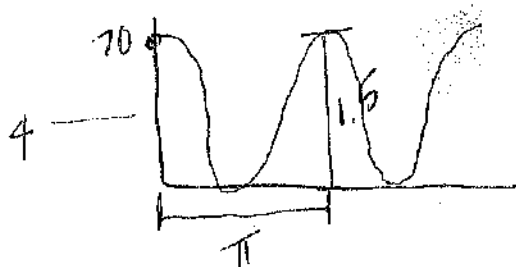
- A. The angles are equal.  
B. The angles have equal sines.  
C. The angles have equal cosines.  
D. The angles are opposite of each other.

**F.TF.5:**

22. A transmitter sends a radio wave from the top of a 70-foot building. The amplitude of the wave is 1.5, the midline of the wave is 4, and the frequency of the wave is  $\pi$ . Which equation best represents this radio wave?

A.  $y = 1.5 \sin(2x)$   
B.  $y = 1.5 \sin(2x) + 4$

C.  $y = 2 \sin(1.5x) + 4$   
D.  $y = 2 \sin(4x) + 1.5$



$$a \sin(bx) + d$$

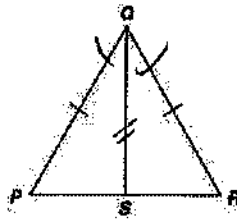
↑  
amp.  
1.5

↑  
freq.  
 $|b|$

↑  
midline  
4

**G.CO.10:**

23. Manuel is trying to prove the following theorem. If two sides of a triangle are congruent, then the angles opposite these sides are congruent. First Manuel draws isosceles  $\triangle PQR$  and then he adds an auxiliary line that bisects  $\angle PQR$ .



An incomplete version of Manuel's proof is shown below.

**Proof**

| Statements                     | Reasons                                 |
|--------------------------------|---|
| 1. $PQ = RQ$                   | 1. Given                                |
| 2. $m\angle PQS = m\angle RQS$ | 2. $\overline{QS}$ bisects $\angle PQR$ |
| 3. $QS = QS$                   | 3. Reflexive Property                   |
| 4. ?                           | 4.                                      |
| 5. $m\angle QPS = m\angle QRS$ | 5.                                      |

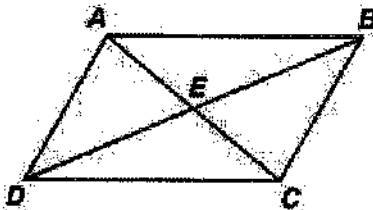
What should be the statement for Step 4 of Manuel's proof?

- A.  $\angle PQR$  is a right angle  
 B.  $\triangle PQS \cong \triangle RQS$

- C.  $\angle PSQ \cong \angle RSQ$   
 D.  $\overline{PS} \cong \overline{SR}$

**G.CO.11:**

24. Clarissa is writing a proof to show that the diagonals of a parallelogram bisect each other. She is using the figure below.



Which of the following statements should be used in Clarissa's proof?

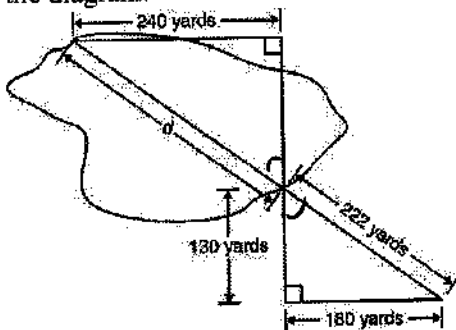
- A.  $\angle DEC \cong \angle BEA$   
 B.  $\overline{AB} \parallel \overline{CD}$

- C.  $AE = EC$

- D.  $AE + ED = BE + EC$

**G.SRT.5:**

25. To measure  $d$ , the distance across a lake, Jeremy constructed similar, right triangles as shown in the diagram.



$$\frac{240}{180} = \frac{d}{120}$$

$$180d = 53280$$

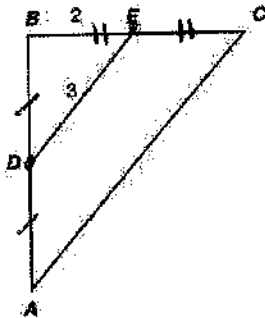
$$d = 296$$

Which value is closest to the distance, in yards, across the lake?

- A. 410  
B. 167

- C. 296  
D. 120

26. Point  $D$  is the midpoint of  $\overline{AB}$ , and Point  $E$  is the midpoint of  $\overline{BC}$ .



$$3 \cdot 2 = 6$$

*Midsegment*

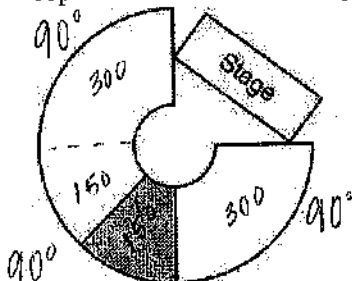
What is the length of  $\overline{AC}$ ?

- A. 4  
B. 5

- C. 6  
D. 9

**G.C.5:**

27. Hilda wants to know the number of people attending a play. The diagram below shows all the seating sections at the play. Hilda determines that there are about 150 people sitting in one section represented as the shaded portion in the diagram.

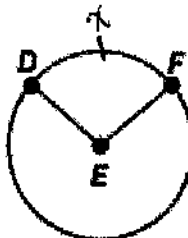
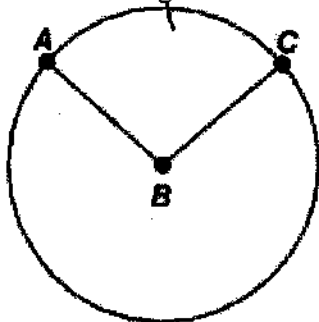


If all the seating area is full, which is closest to the total number of people attending the play?

- A. 450 people  
B. 600 people

- C. 750 people  
D. 900 people

28. The drawing below shows circle B and circle E. The  $m\widehat{AC} = m\widehat{DF}$ , and the length of  $\widehat{AC}$  is 3 times the length of  $\widehat{DF}$ .



Example (picked #s):

$$\begin{aligned} 15 &= \frac{90}{360} \cdot 2\pi r \\ 45 &= \frac{90}{360} \cdot 2\pi r \end{aligned} \quad \text{same } 2\pi r$$

Which equation best describes the relationship between  $\overline{BC}$  and  $\overline{EF}$ ?

A.  $\overline{BC} = \overline{EF}$

B.  $\overline{BC} = 3(\overline{EF})$

C.  $\overline{BC} = 6(\overline{EF})$

D.  $\overline{BC} = 9(\overline{EF})$

**G.GPE.1:**

29. What is the equation in standard form of the circle represented by  $x^2 + y^2 - 10x - 6y = 23$ ?

A.  $(x + 5)^2 + (y + 3)^2 = 23$

B.  $(x - 10)^2 + (y - 6)^2 = 23$

C.  $(x - 5)^2 + (y - 3)^2 = 23$

D.  $(x - 5)^2 + (y - 3)^2 = 57$

30. The equation shown below represents a circle. Which statement describes the key features of the circle that can be determined from the equation?

$$x^2 + 10x + y^2 - 2y + 22 = 0 \quad -2x + 5 + 1$$

A. The circle has a center at  $(-5, 1)$  and a radius of 2 units.

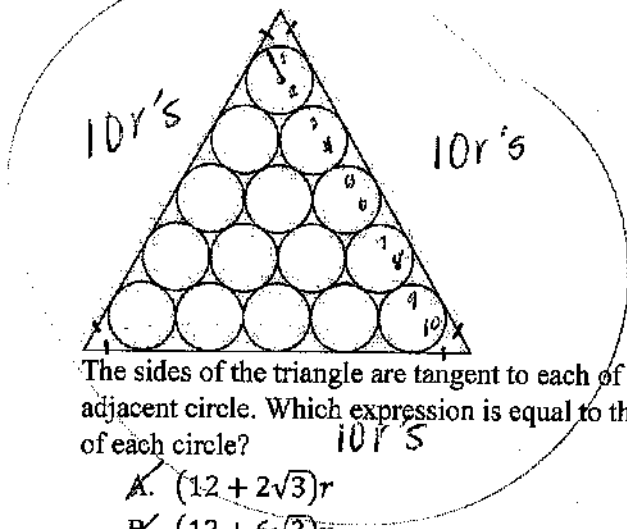
B. The circle has a center at  $(5, -1)$  and a radius of 2 units.

C. The circle has a center at  $(-5, 1)$  and a radius of 4 units.

D. The circle has a center at  $(5, -1)$  and a radius of 4 units.

**G.MG.3:**

31. Amy drew a design consisting of 15 congruent circles surrounded by an equilateral triangle as shown below.



$P = \text{at least } 30r's$

The sides of the triangle are tangent to each of the 12 outer circles. Each circle is tangent to every adjacent circle. Which expression is equal to the perimeter of the triangle in terms of  $r$ , the radius of each circle?

A.  $(12 + 2\sqrt{3})r$

B.  $(12 + 6\sqrt{3})r$

C.  $(24 + 2\sqrt{3})r \sim 27r$

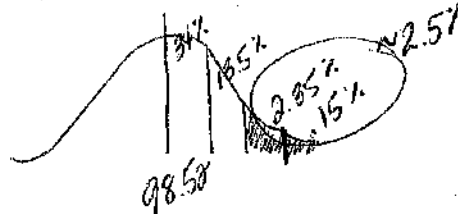
D.  $(24 + 6\sqrt{3})r \sim 34r$



S.ID.4:

32. A large random sample was taken of body temperatures of women at a university. The data from the sample were normally distributed with a mean body temperature of  $98.52^{\circ}\text{F}$  and a standard deviation of  $0.727^{\circ}\text{F}$ . Based on this sample, which percentage is the best estimate of the proportion of all women at this university who have a body temperature more than 2 standard deviations above the mean?

- A. 0.30%  
 B. 2.28%  
 C. 72.70%  
 D. 97.72%



S.IC.4:

33. A survey was conducted where 150 high school students were asked the average amount of time they spent doing household chores in one week. The data collected resulted in a mean time of 180.5 minutes with a standard deviation of 5.5 minutes. Which of these represents a 95% confidence interval for the mean weekly hours spent doing household chores of all high school students?

- A. 171.5–189.5  
 B. 175–186  
 C. 178.25–182.75  
 D. 179.62–181.38



$n=150$  (good estimate)

$$\frac{\sigma}{\sqrt{n}} = \frac{5.5}{\sqrt{150}} = .45$$

