Name _____

Tie Breaker: Points scored on Stated and Geometry Problems

+_____ +_____+_____

5x(Last Problem Attempted)	+_____	+_____	+_____
7x(Number Incorrect)	-_____	-_____	-_____
2x(Number Incorrect SDs)	-_____	-_____	-_____
TOTAL SCORE	_____	_____	_____

UIL Calculator Applications

Test 12C

(Invitational C)

Plains High School

DO NOT OPEN THE TEST UNTIL INSTRUCTED TO BEGIN

I. Calculator Applications rules and scoring—See UIL Constitution

II. How to write the answers

A. For all problems except stated problems as noted below—write three significant digits.

1. Examples (* means correct but not recommended)

Correct: 12.3, 123, 123.*, 1.23x10*, $1.23x10^{0}$*, $1.23x10^{1}$, $1.23x10^{01}$, .0190, 0.0190, $1.90x10^{-2}$

Incorrect: 12.30, 123.0, $1.23(10)^{2}$, $1.23\cdot10^{2}$, $1.230x10^{2}$, $1.23*10^{2}$, 0.19, $1.9x10^{-2}$, $19.0x10^{-3}$, 1.90E-02

2. Plus or minus one digit error in the third significant digit is permitted.

B. For stated problems

1. Except for integer, dollar sign, and significant digit problems, as detailed below, answers to stated problems should be written with three significant digits.

2. Integer problems are indicated by (integer) in the answer blank. Integer problems answers must be exact, no plus or minus one digit, no decimal point or scientific notation.

3. Dollar sign ($) problems should be answered to the exact cent, but plus or minus one cent error is permitted. Answers must be in fixed notation. The decimal point and cents are required for exact-dollar answers.

4. Significant digit problems are indicated by underlined numbers and by (SD) in the answer blank. See the UIL Constitution and Contest Manual for details.

III. Some symbols used on the test

A. Angle measure: rad means radians; deg means degrees.

B. Inverse trigonometric functions: arcsin for inverse sine, etc.

C. Special numbers: π for 3.14159 ...; e for 2.71828 ...

D. Logarithms: Log means common (base 10); Ln means natural (base e); exp(u) means e^{u}.

12C-1. $(-21.3/98.8) + 0.2$ ---------- 1=_____

12C-2. $(-0.909 - 0.494)/(-0.833) + 1.29$ ---------- 2=_____

12C-3. $(-88.6 - 61.2 + 65.3 + 19.1)/(16)$ ---------- 3=_____

12C-4. $\dfrac{(-4.14)(-4.83 - 2.64 + 16.4)}{(-3.75)(-5.66)}$ ---------- 4=_____

12C-5. $\dfrac{(-0.00883 - 0.00423)(-0.497)}{\{(-7.33)/(\pi)\}} - (-0.0233 - 0.0131)$ ---------- 5=_____

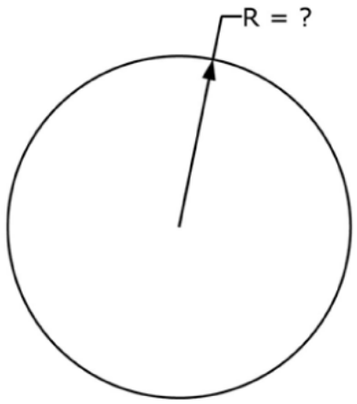
12C-6. What is the remainder of 38,305 divided by 37? ---------- 6= _____integer

12C-7. What is the sum of 3^2, 2^3 and π^π? ---------- 7= _____

12C-8. What is $5^{(4^3)}$? ---------- 8= _____

12C-9.

CIRCLE

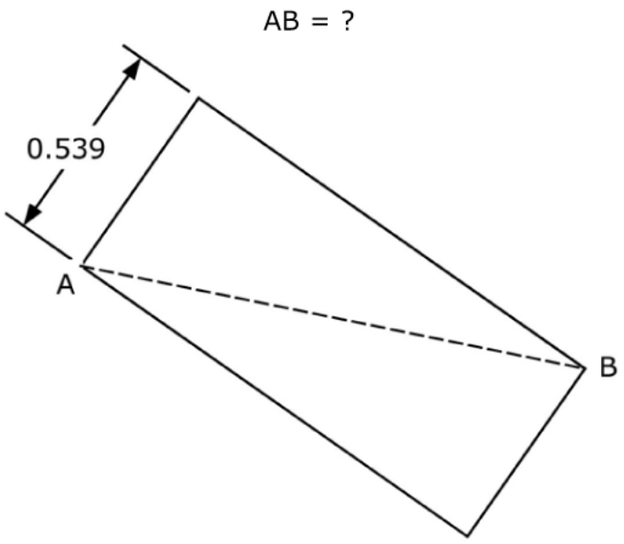


Area = 6.51

12C-9 =_____

12C-10.

RECTANGLE



Area = 0.668

12C-10 =_____

12C-11. $\dfrac{(-0.518 + 0.335)(0.702 - 0.393 + 0.403)}{(0.336)(-0.87) - 0.15}$ ---------- 11=_____

12C-12. $\dfrac{(-7.81 + 4.47 - \pi)(5.66)(-0.78)}{(3.94 - 1.79)(5.6 - 5.98)}$ ---------- 12=_____

12C-13. $\dfrac{-30900 + 7950 - 16400 + 7710 + 18900}{(36.6)(96.4 + 69.5)(-314 + 109)}$ ---------- 13=_____

12C-14. $\dfrac{(43.3 + 43)(2.85 + 10.6)(35.4 - 53.4)}{(-86.9 + 52)(76.5)\{(18.1)/(32.6)\}}$ ---------- 14=_____

12C-15. $\dfrac{2820 + 4140 - (34700 + 59200)(1.72 - 1.68)}{(-743)(-796)(-951)(375 - 646 + 822)}$ ---------- 15=_____

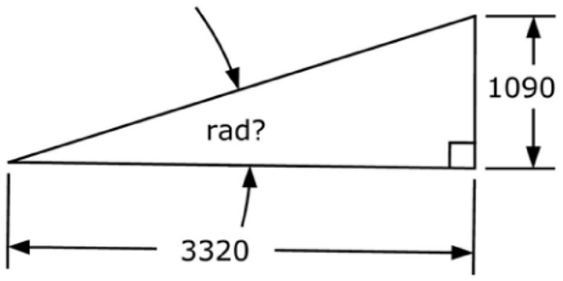
12C-16. An art dealer bought a painting for $850. He offered it for sale with a 100% mark-up, but he eventually sold it during a 20% off sale. What was the profit on the sale?---------- 16=$_____

12C-17. Dan had an average grade of 78.4 going into the last test which was worth 15% of his grade. What must he score on the last test to have an overall average of 80? ---------- 17=_____

12C-18. What number when added to the numerator and denominator of 45/93 results in 3/4?---------- 18=_____

12C-19.

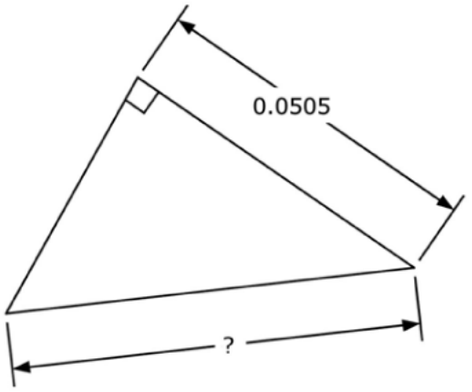
RIGHT TRIANGLE



12C-19 =_____

12C-20.

RIGHT TRIANGLE



Area = 0.00103

12C-20 =_____

12C-21. $\frac{1}{\pi + 30.5} + \frac{1}{4.93 - 6.38} + \frac{1}{(18.4)}$ ---------- 21=_____

12C-22. $\left[\frac{(0.85)(0.45)}{\pi} + 0.123\right]^2 + \sqrt{1.58\text{x}10^{-6}}$ ---------- 22=_____

12C-23. $\left[\frac{1.31 + 0.225 + \sqrt{0.365/0.718}}{0.402 + 0.0798}\right]^2$ ---------- 23=_____

12C-24. $(-1040)(-0.055) + \sqrt{(7240)/(2.75)} + [(0.851)(8.66)]^2$ ---------- 24=_____

12C-25. $(0.0473)(4.19)\sqrt{(-0.445)^2/0.466} + 1/\sqrt{23.8 + 45.4}$ ---------- 25=_____

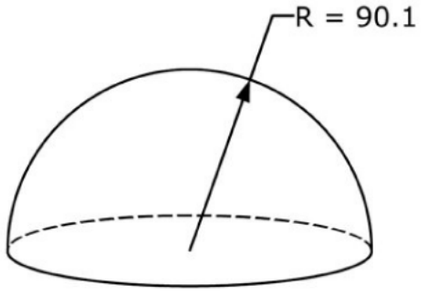
12C-26. If a barrel equals 31.5 gal, and there are 61440 minims per gal, what is the liquid volume of 3 barrels that are each 75% full? ---------- 26= _____ minims

12C-27. Freddy has 20 coins. He has twice as many quarters as pennies, two more dimes than nickels and one more penny than nickels. How much money does he have? ---------- 27= $_____

12C-28. If light travels at 186,000 mi/s, how long does it take for light to travel between two persons standing 8 ft 2 in apart?---------- 28= _____ ns(SD)

12C-29.

HEMISPHERE

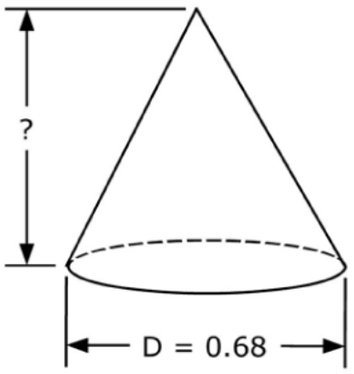


Total Surface Area = ?

12C-29 =_____

12C-30.

CONE



Volume = 0.0766

12C-30 =_____

12C-31. $\dfrac{(8.71\text{x}10^{-4} + 0.00148)^2}{\sqrt{69.1 - 67.9}} + \dfrac{1.36\text{x}10^{-7}}{\sqrt{7.09\text{x}10^{-4} + 0.0032}}$ ---------- 31=_____

12C-32. $\sqrt{\dfrac{8.81}{\sqrt{54 + 39.1}}} \times \left[\dfrac{1}{(5.79 - 5.46)^2} + \dfrac{1}{(0.543 + 0.303)^2}\right]$ ---------- 32=_____

12C-33. $\dfrac{(4.36)^2 + \sqrt{351}}{\sqrt{(77.4)(-80.6)^2}} + \dfrac{\sqrt{\sqrt{(164)(0.74)}}}{26.1 + 41.1}$ ---------- 33=_____

12C-34. $\dfrac{(4.74\text{x}10^5)^2(3.87\text{x}10^{-12} + 3.90\text{x}10^{-13})}{2.54 + (-0.961)(-2.76)} + \dfrac{1}{\dfrac{1}{0.165} + \dfrac{1}{(-0.0396)}}$ --- 34=_____

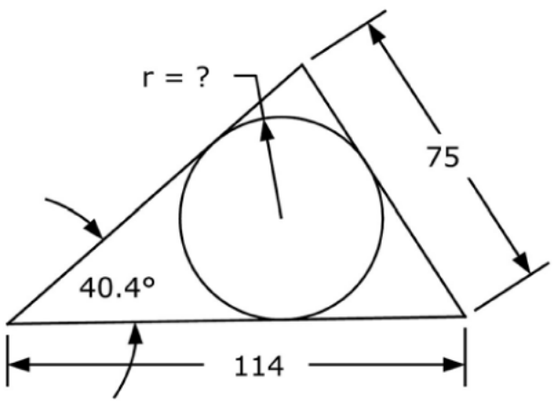
12C-35. $\dfrac{(-4970 + 13400)^2 - (14700 - 3730)^2}{\sqrt{(601)(0.877)(415 + 336 - 1350)^2}}$ ---------- 35=_____

12C-36. What is the closest approach of the line y = 5.5x+15 to the origin?----- 36=_____

12C-37. A 36-yd roll of scotch tape is spooled onto a roller. The roller is 3.5 cm in diameter, and the tape on a new roll has a 6 cm diameter. What is the tape diameter when the roll is 65% used? ---------- 37=_____cm

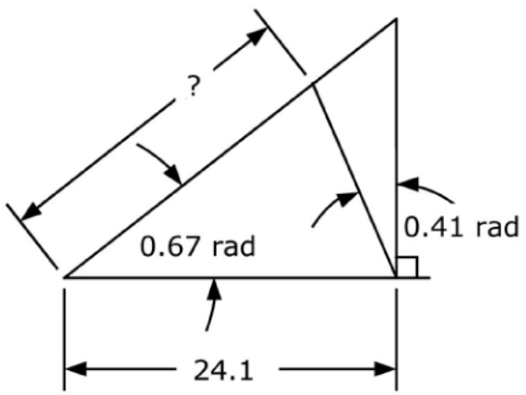
12C-38. A motorcycle dare devil rides his motorcycle up a 20° ramp at 55 mph. The ramp was built using 10 sheets of 8-ft long plywood. What is the horizontal distance from the end of the ramp to the spot on the ground where the dare devil lands? ---------- 38= _____ft

12C-39.
SCALENE TRIANGLE AND CIRCLE



12C-39 =_____

12C-40.
RIGHT AND SCALENE TRIANGLES



12C-40 =_____

12C-41. $\dfrac{10^{-(0.38\ -\ 1.22)}}{8.77\text{x}10^{-6} + 8.67\text{x}10^{-6}}$ ---------- 41=_____

12C-42. $\dfrac{(-567)}{(-163)}\left[1 - e^{-(0.759)(0.116)}\right]$ ---------- 42=_____

12C-43. $\dfrac{2.90\text{x}10^{-5} - 3.47\text{x}10^{-5}}{\text{Log}(4.46\text{x}10^{-5} + 3.16\text{x}10^{-5})}$ ---------- 43=_____

12C-44. $(246 + 1500)^{1/3} + 1/\{(81.3)^{-0.356}\}$ ---------- 44=_____

12C-45. (deg) $\{(-0.107)\sin(-112°)\} \times \{(-0.331)\cos(-71.9°)\}$ ---------- 45=_____

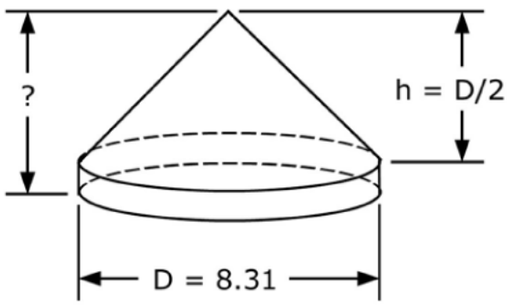
12C-46. A dozen donuts requires 14 tablespoons of glaze to cover them completely. How much glaze would be needed if the same amount of dough was used to make 2 large donuts?---------- 46= _____ tbsp

12C-47. The resistance of a 1-meter long piece of copper wire varies inversely with the square of its diameter. Measured values of wire diameter and electrical resistance (mΩ) are (11.7 mm, 0.15 mΩ), (8.2 mm, 0.34 mΩ), (5.1 mm, 0.80 mΩ) and (3.3 mm, 2.1 mΩ). What is the percent error in the estimated value of resistance for 2.31 mm diameter wire if the actual value is 4.132 mΩ?---------- 47= _____ %

12C-48. (rad) Solve for the smallest, positive non-zero value of r for which $r^{\sin(r)} = 0.5$.---------- 48=_____

12C-49.

CONE AND CYLINDER

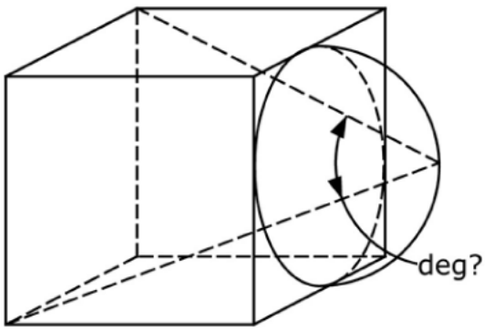


Cone Surface Area = Cylinder Surface Area

12C-49 =_____

12C-50.

HEMISPHERE AND CUBE



12C-50 =_____

12C-51. $10^{+(0.508)} + 10^{-(0.301)} + \left[10^{(0.333/0.735)} - 10^{(0.229)}\right]^{1/2}$ -- 51=_____

12C-52. $\dfrac{1 + e^{+\{0.193 + (0.291)(1.28)\}}}{(1.86\text{x}10^{5})(9.91 - e^{(-0.827)})}$ ---------- 52=_____

12C-53. $(39.6)\ \text{Ln}\left[\dfrac{56.4 + (2.54)(22.1)}{89.7 + 440}\right]$ ---------- 53=_____

12C-54. $\dfrac{(1.54)^{0.173} - (8.34)^{-0.211}}{3.8 + 0.634}$ ---------- 54=_____

12C-55. (rad) $\dfrac{\arcsin\{(0.00247)(0.00718)/(9.27\text{x}10^{-5})\}}{3.44\text{x}10^{-5} + (-0.00868)(-0.00942)}$ ---------- 55=_____

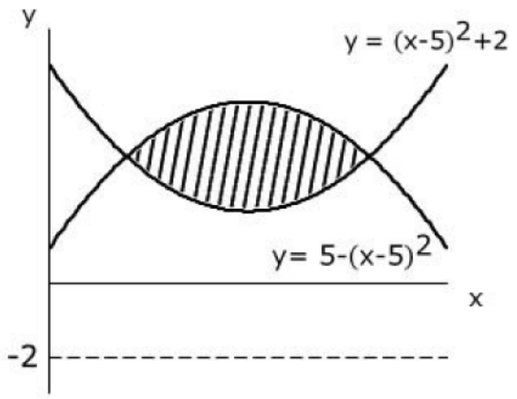
12C-56. What is the area bounded by the intersections of $f(x) = x^3 - 3x^2$ and $g(x) = 12 - 3(x-2)^2$ for $0 \le x$? ---------- 56=_____

12C-57. The drawing force F is a function of the die semicone angle α (rad) according to $F = [10 + 0.12/\alpha][0.88 + 1.32\alpha]$ kilopounds. What is the value of α that minimizes the drawing force? ---------- 57=_____ deg

12C-58. Solve for positive f if the determinant of **C** = −59 and $\mathbf{C} = \begin{vmatrix} 5 & f & 9 \\ f & 0 & 11 \\ 6 & 3 & -4 \end{vmatrix}$. 58=_____

12C-59.

SOLID OF REVOLUTION (y = −2)

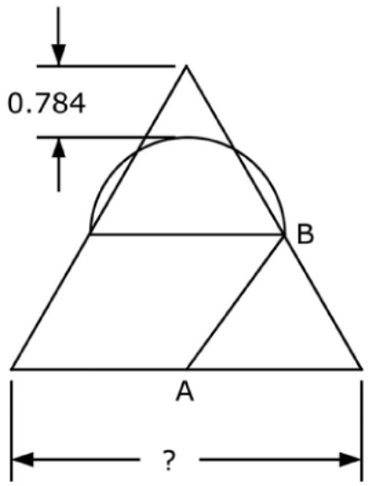


Volume = ?

12C-59 =_____

12C-60.

EQUILATERAL TRIANGLE AND SEMICIRCLE



A = midpoint
AB = 1.82

12C-60 =_____

12C-61. $(1/2)\text{Ln}\left[\dfrac{(0.454)\times(3.94)\times(3.26)^3}{(3.26)(3.87)^2}\right]^2$ ---------- 61=_____

12C-62. $(92.8-79.3)^2+(\pi+6.6)e^{\text{Ln}(10.2)}$ ---------- 62=_____

12C-63. $(\text{rad})\dfrac{1}{(774)(0.111)}\text{Ln}\left\{(5.19\text{x}10^{-4})+(-5.55\text{x}10^{-5})\sin(3.78)\right\}$ --- 63=_____

12C-64. $1+\dfrac{(0.38)^4}{2}-\dfrac{(0.38)^6}{6}+\dfrac{(0.38)^8}{24}-\dfrac{(0.38)^{10}}{120}$ ---------- 64=_____

12C-65. $(\text{rad})\dfrac{(5.27)(-0.888)-\text{Ln}\left\{(1.92)+(-5.47)e^{(-1.08)}\right\}}{\arcsin\{(0.385)/(0.959+6.15)\}}$ ---------- 65=_____

12C-66. Two planes fly at 230 mph with one 4000 ft behind the other. The lead plane initiates a horizontal loop, coming full circle and eventually 2000 ft behind the other plane. If the average velocity was constant, what was the diameter of the loop? ---------- 66=_____ ft

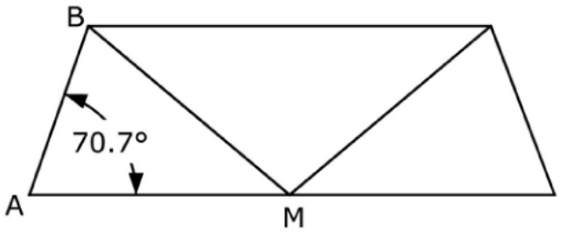
12C-67. A 50 in long piece of dental floss is pulled tight 25 in above the ground. It is then relaxed by moving one end 0.010 in towards the other end. Assuming the sagged floss forms a circular arc, how far above the ground is the midpoint of the floss? ---------- 67=_____ in

12C-68. Electric rail guns accelerate objects at incredible rates. A 25-g armature is accelerated horizontally from rest to 2 km/s over a 3-meter distance. How much energy is necessary to accomplish this? Energy is the product of the applied force and the distance traveled. ---------- 68=_____ kJ

12C-69.

ISOSCELES TRAPEZOID

Trapezoid Area = 740



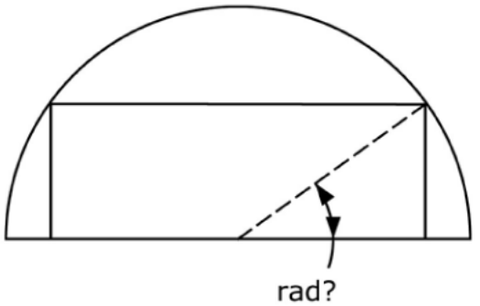
M = Midpoint

AM = BM = ?

12C-69 =_____

12C-70.

SEMICIRCLE AND RECTANGLE



Segment Area = 0.5[Rectangle Area]

12C-70 =_____

12C-1 = -0.0156
= -1.56×10^{-2}

12C-2 = 2.97
= $2.97 \times 10^{0)}$

12C-3 = -4.09
= -4.09×10^{0}

12C-4 = -1.74
= -1.74×10^{0}

12C-5 = 0.0336
= 3.36×10^{-2}

12C-6 = 10 integer

12C-7 = 53.5
= 5.35×10^{1}

12C-8 = 5.42×10^{44}

12C-9 = 1.44
= 1.44×10^{0}

12C-10 = 1.35
= 1.35×10^{0}

12C-11 = 0.295
= 2.95×10^{-1}

12C-12 = -35.0
= -3.50×10^{1}

12C-13 = 0.0102
= 1.02×10^{-2}

12C-14 = 14.1
= 1.41×10^{1}

12C-15 = -1.03×10^{-8}

12C-16 = $510.00

12C-17 = 89.1
= 8.91×10^{1}

12C-18 = 99.0
= 9.90×10^{1}

12C-19 = 0.317
= 3.17×10^{-1}

12C-20 = 0.0649
= 6.49×10^{-2}

12C-21 = -0.606
= -6.06×10^{-1}

12C-22 = 0.0612
= 6.12×10^{-2}

12C-23 = 21.8
= 2.18×10^{1}

12C-24 = 163
= 1.63×10^{2}

12C-25 = 0.249
= 2.49×10^{-1}

12C-26 = 4350000
= 4.35×10^{6}

12C-27 = $2.69

12C-28 = 8.3 (2SD)
= 8.3×10^{0}

12C-29 = 76500
= 7.65×10^{4}

12C-30 = 0.633
= 6.33×10^{-1}

12C-31 = 7.22×10^{-6}

12C-32 = 10.1
= 1.01×10^{1}

12C-33 = 0.103
= 1.03×10^{-1}

12C-34 = 0.132
= 1.32×10^{-1}

12C-35 = -3580
= -3.58×10^{3}

12C-36 = 2.68
= 2.68×10^{0}

12C-37 = 4.53
= 4.53×10^{0}

12C-38 = 183
= 1.83×10^{2}

12C-39 = 25.5
= 2.55×10^{1}

12C-40 = 22.9
= 2.29×10^{1}

12C-41 = 397000
= 3.97×10^{5}

12C-42 = 0.293
= 2.93×10^{-1}

12C-43 = 1.38×10^{-6}

12C-44 = 16.8
= 1.68×10^{1}

12C-45 = -0.0102
= -1.02×10^{-2}

12C-46 = 7.70
= 7.70×10^{0}

12C-47 = 3.55
= 3.55×10^{0}

12C-48 = 3.70
= 3.70×10^{0}

12C-49 = 5.02
= 5.02×10^{0}

12C-50 = 50.5
= 5.05×10^{1}

12C-51 = 4.79
= 4.79×10^{0}

12C-52 = 1.57×10^{-6}

12C-53 = -61.3
= -6.13×10^{1}

12C-54 = 0.0989
= 9.89×10^{-2}

12C-55 = 1660
= 1.66×10^{3}

12C-56 = 36.0
= 3.60×10^{1}

12C-57 = 5.12
= 5.12×10^{0}

12C-58 = 1.09
= 1.09×10^{0}

12C-59 = 169
= 1.69×10^{2}

12C-60 = 3.84
= 3.84×10^{0}

12C-61 = 0.238
= 2.38×10^{-1}

12C-62 = 282
= 2.82×10^{2}

12C-63 = -0.0873
= -8.73×10^{-2}

12C-64 = 1.01
= 1.01×10^{0}

12C-65 = -35.2
= -3.52×10^{1}

12C-66 = 1910
= 1.91×10^{3}

12C-67 = 24.6
= 2.46×10^{1}

12C-68 = 50.0
= 5.00×10^{1}

12C-69 = 25.8
= 2.58×10^{1}

12C-70 = 0.623
= 6.23×10^{-1}

TMSCA HIGH SCHOOL MATHEMATICS TEST # 6 ©

DECEMBER 3, 2011

Plains High School

GENERAL DIRECTIONS

1. About this test:
   A. You will be given 40 minutes to take this test.
   B. There are 60 problems on this test.
2. All answers must be written on the answer sheet/Scantron form/Chatsworth card provided. If you are using an answer sheet, be sure to use **BLOCK CAPITAL LETTERS**. Clean erasures are necessary for accurate grading.
3. If using a scantron answer form, be sure to correctly denote the number of problems not attempted.
4. You may write anywhere on the test itself. You must write only answers on the answer sheet.
5. You may use additional scratch paper provided by the contest director.
6. All problems have **ONE** and **ONLY ONE** correct [BEST] answer. There is a penalty for all incorrect answers.
7. Calculators used on this test must be conform to the UIL standards. Graphing calculators are allowed. Calculators need not be cleared.
8. All problems answered correctly are worth **SIX** points. **TWO** points will be deducted for all problems answered incorrectly. No points will be added or subtracted for problems not answered.
9. In case of ties, percent accuracy will be used as a tie breaker.

Plains High School

1. Evaluate: $1 - 3 \times 6 + 10 \div 15$

   (A) $-\frac{7}{15}$ (B) $-1\frac{7}{15}$ (C) $-16\frac{1}{3}$ (D) $-18\frac{1}{3}$ (E) $-19\frac{2}{3}$

2. Good Tred Tire Company is having a special sale on a set of 4 tires. If you buy 3 tires at the regular price of $79.99 you get the 4th one free provided you pay $5.00 per tire for mounting and balancing and $7.50 per tire for a 2-year warranty. How much would it cost for the 4 tires if the tax rate is 8.25%?

   (A) $273.30 (B) $300.36 (C) $313.89 (D) $346.37 (E) $368.02

3. The radius of a wagon wheel is 2 feet 4 inches. How many miles will it travel if it rolls 300 complete revolutions?

   (A) $\frac{5}{6}$ miles (B) $\frac{5}{12}$ miles (C) $\frac{3}{4}$ miles (D) $1\frac{2}{3}$ miles (E) $1\frac{1}{6}$ miles

4. The value of $(0.1666...) \times (0.08333...) \div (0.041666...)$ is:

   (A) 1 (B) $\frac{1}{3}$ (C) $\frac{1}{6}$ (D) $\frac{1}{9}$ (E) $\frac{1}{12}$

5. Which of the following sets is closed under both addition and multiplication?
   P = {prime numbers} R = {rational numbers} W = {whole numbers}

   (A) P, R, & W (B) R only (C) P only (D) W only (E) R & W

6. $2 + 5 + 8 + ... + 41 + 44 = ?$

   (A) 357 (B) 345 (C) 333 (D) 321 (E) 301

7. $5x - 3$ and $4 + 7x$ are factors of which of the following trinomials?

   (A) $35x^2 + x - 12$ (B) $20x^2 + 13x - 21$ (C) $35x^2 - x - 12$
   (D) $20x^2 + 23x - 15$ (E) $21x^2 - x - 20$

8. If $\frac{x+1}{x-2} + \frac{x-2}{x+1}$ is written as the mixed number $A\frac{B}{C}$, then B is?

   (A) 10 (B) 9 (C) 6 (D) 4 (E) 1

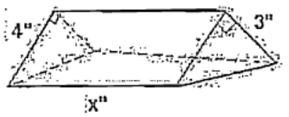
9. Ima Qwik took her roommate, Ura Snell, from their country house to town at an average speed of 75 miles per hour. Ura Snell drove from town back to the country house at an average speed of 45 miles per hour. The total travel time from the house to town and back home was 5 hours. How far is it from the house to town? (nearest mile)

   (A) 164 miles (B) 150 miles (C) 141 miles (D) 120 miles (E) 70 miles

10. The sum of the interior angles of a simple convex polygon is 900° . The polygon is a ___.

    (A) Pentagon (B) Heptagon (C) Octagon (D) Nonagon (E) Decagon

11. The lateral area of the right prism shown is 90 square inches. Find x in inches.

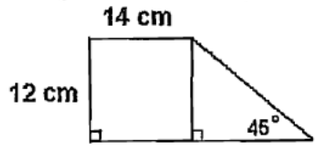


(A) 5 (B) 5.5 (C) 6.75 (D) 7 (E) 7.5

12. Point P(4, — 3) lies on the x-y plane. Point P is rotated 90° clockwise to point Q. Point Q is translated vertically 9 units up to point R. Point R is reflected across the origin to (x, y). Find $x + y$.

(A) -7 (B) -2 (C) -1 (D) 1 (E) 7

13. Find the perimeter of the trapezoid shown. (nearest cm).



(A) 64 cm (B) 69 cm (C) 72 cm (D) 74 cm (E) 81 cm

14. Using Blaise Pascal's triangle, determine what the third number in the 10^{th} row will be.

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
...

(A) 84 (B) 30 (C) 55 (D) 9 (E) 36

15. M. T. Bank saves nickels and dimes in a jar. When he counted the number of coins at the end of the week, he found that he had 45 coins. If the monetary value of his coins was \$3.45, what was the monetary value of his nickel?

(A) \$1.05 (B) \$1.20 (C) \$2.25 (D) \$2.40 (E) \$2.65

16. If $a_1 = -4$, $a_2 = 3$ and $a_n = a_{n-2} + a_{n-1}$, then a_8 equals:

(A) -1 (B) 2 (C) 5 (D) 7 (E) 8

17. If $\frac{x-1}{x+3} - \frac{x+2}{x-4} = \frac{Ax^2+Bx+C}{Px^2+Qx+R}$, then $\frac{A+B+C}{P+Q+R}$ equals:

(A) 12 (B) 5 (C) $\frac{2}{3}$ (D) 1 (E) $-\frac{6}{7}$

18. Find C if the remainder of $3x^3 - 2x^2 + 5x + C$ divided by $x - 1$ is -16.

(A) -6 (B) -22 (C) 1 (D) 3 (E) 11

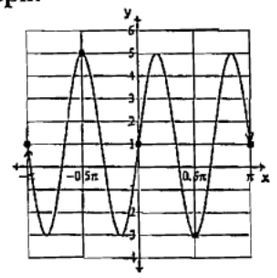
19. Which of the following is not a function:

(A) $y = -2$ (B) $|y| = x - 2$ (C) $y = 2 - 2x$ (D) $y = \sqrt{x-2}$ (E) $y = \frac{2}{x^2}$

20. Which of the following mathematicians used a special technique to find this set of numbers, {2, 3, 5, 7, 11, 13, ...}?

(A) Erastosthenes (B) Archimedes (C) Hypatia (D) Leibniz (E) Descartes

21. The equation $y =$ _____ will produce this graph.



(A) $1 - 4\sin(3x + 2\pi)$ (B) $4\sin(3x - 2\pi) + 1$ (C) $4 + \sin(3x + 2\pi)$
(D) $\sin(3x - 2\pi) + 4$ (E) $4\sin(3x + 2\pi) - 1$

22. If $\sin x \cos y = -\frac{1}{4}$ and $\sin y \cos x = \frac{1}{4}$ then $\cos(x - y)$ could equal:

(A) 0 (B) $\frac{1}{2}$ (C) $\frac{\sqrt{2}}{2}$ (D) $\frac{\sqrt{3}}{2}$ (E) 1

23. Find an identity for $\cot^2\theta + \sec^2\theta - \csc^2\theta$ for all defined values of θ.

(A) $\sin^2\theta$ (B) $\cos^2\theta$ (C) $\tan^2\theta$ (D) $\sin^2\theta + \tan^2\theta$ (E) $\cos^2\theta - \tan^2\theta$

24. Let $x^5 - x^3 + px^2 - x = q$, where p and q are positive integers. According to Descartes' Rule of Signs how many possible negative roots are there?

(A) 0 or 2 (B) 1 (C) 0, 2, or 4 (D) 1 or 3 (E) 3

25. In the expansion of $(2x + y)^3$, the sum of the coefficients of the 2nd and the 4th terms is:

(A) 13 (B) 7 (C) 4 (D) 6 (E) 15

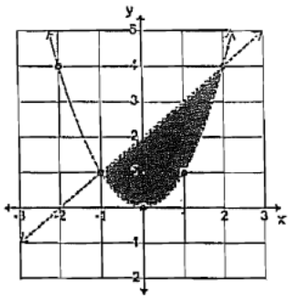
26. The inverse matrix, if it exists, of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 3 \end{bmatrix}$ is $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$. Find d.

(A) -1.5 (B) -1 (C) $-\frac{2}{3}$ (D) $-\frac{1}{3}$ (E) doesn't exist

27. Let $f(x) = x^5 - 2x^3 + 2x^2 - 3x + 12$. Find the coefficient of the linear term in $f'(x)$.

(A) -6 (B) -3 (C) 4 (D) 5 (E) 12

28. Find the area of the shaded region in square units.



(A) 3.5 (B) 3.8333... (C) 4 (D) 4.1666... (E) 4.5

29. A particle is moving in a straight line according to the function $f(t) = 2t^3 - 4t^2 + 2t - 1$. For which of the following values for t will the particle be moving to the right?

(A) 1 (B) $\frac{2}{3}$ (C) $\frac{1}{2}$ (D) $\frac{1}{3}$ (E) $\frac{1}{6}$

30. Four identical white chips are numbered 2, 3, 5, 7 and placed in a bag. Two chips are drawn, at random, without replacement from the bag. What is the probability that the sum of the values of the two chips drawn is a prime number?

(A) $16\frac{2}{3}\%$ (B) $33\frac{1}{3}\%$ (C) 50% (D) $66\frac{2}{3}\%$ (E) $83\frac{1}{3}\%$

31. Lotta Sense has 4 quarters, 10 dimes, and 5 nickels. How many ways can she form a pile of coins consisting of 2 quarters, 7 dimes, and 3 nickels?

(A) 8,400 (B) 480 (C) 50,388 (D) 42 (E) 7,200

32. A package of Mite-Lite light bulbs contains twelve bulbs. The probability that the bulbs work is 72%. What are the odds that they don't work?

(A) $\frac{11}{25}$ (B) $\frac{7}{18}$ (C) $\frac{18}{25}$ (D) $\frac{11}{18}$ (E) $\frac{7}{25}$

33. On a map legend, $\frac{1}{2}$ inch represents 100 miles. How far is it in miles, from Startheer to Endthare, if the distance on the map is $2\frac{7}{8}$ inches?

(A) 575 (B) 588.5 (C) 487.5 (D) 556 (E) 478

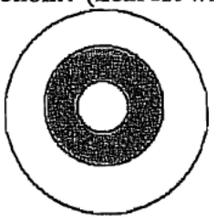
34. A coordinate is plotted on the Cartesian plane. It's abscissa is greater than zero and its ordinate is less than zero. Where is the coordinate located on the plane?

(A) Quadrant I (B) Quadrant II (C) Quadrant III (D) Quadrant IV (E) Origin

35. Ima Selsmann sold 100 tickets in five days. Each day she sold 6 more tickets than she had sold the previous day. How many tickets did she sell on the second day?

(A) 6 (B) 8 (C) 12 (D) 14 (E) 20

36. The radius of the largest circle is R. The radius of the smallest circle is $\frac{1}{3}$R. The radius of the other circle is $\frac{2}{3}$R. Robin D. Hood shoots an arrow and hits the target. What is the probability that the arrow hit the shaded section.? (nearest whole percent)



(A) 67% (B) 56% (C) 44% (D) 33% (E) 12%

37. $66_7 + 55_6 + 44_5 + 33_4 + 22_3 + 11_2 =$ _____ 10

(A) 98 (B) 100 (C) 133 (D) 210 (E) 231

38. Simplify: $(a^4b^3) \times (a^3b^2) \div (a^2b) \times (a^1b^0) \div (a^0b^{-1})$, where $a, b > 0$.

(A) a^6b^3 (B) a^6b^{-1} (C) a^4b^{-1} (D) $a^{4.5}b^6$ (E) a^6b^5

39. If $y = 2x + 5$, $3x + y = -5$ and $ax + y = 5$, then a equals:

(A) -5 (B) -2 (C) 0 (D) 1 (E) 3

40. A right circular cone has a radius of 4 inches and is 6 inches tall. What is the greatest number of fluid ounces of water that could be poured into the cone before flowing over? (nearest fl. oz.)

(A) 13 fl.oz. (B) 41 fl.oz. (C) 43 fl.oz. (D) 50 fl.oz. (E) 55 fl.oz.

41. Find the 12th term of the sequence 3, 7, 13, 21, 31, ... 241, 273, 307, ...

(A) 157 (B) 211 (C) 196 (D) 111 (E) 133

42. Simplify: $\left(\frac{1}{x} - 1\right) \div \left(\frac{1}{x^2} - 1\right)$

(A) $\frac{1}{x} + 1$ (B) x (C) $\frac{x}{1+x}$ (D) $\frac{x-1}{x}$ (E) $\frac{1-2x+x^2}{x}$

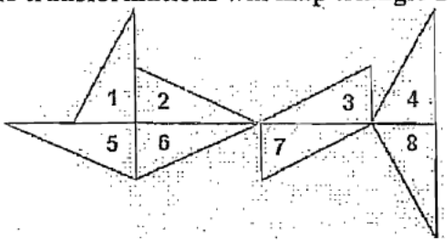
43. Four regional 1A championship math teams and one 1A wild card math team compete at the state meet. Medals are given to the first and second place teams. How many ways can first and second place be awarded to the teams competing in 1A mathematics.

(A) 6 (B) 10 (C) 12 (D) 20 (E) 60

44. If y varies inversely as x and $x = 9$ when $y = 5$, find x when $y = 45$.

(A) 25 (B) 81 (C) 1 (D) $1\frac{4}{5}$ (E) $\frac{5}{9}$

45. Which of the transformations will map triangle 1 to triangle 4?



(A) glide reflection (B) half-turn (C) reflection (D) rotation (E) translation

46. Given $\sin\theta = -\frac{5}{6}$ and $\frac{3\pi}{2} \le \theta \le 2\pi$, find $\cos 2\theta$.

(A) $-\frac{\sqrt{11}}{6}$ (B) $-\frac{7}{18}$ (C) $-\frac{7}{11}$ (D) $-\frac{6}{7}$ (E) $\frac{\sqrt{11}}{18}$

47. Dee Stroller takes a walk in the desert. She starts at the oasis and walks 300 yards on a bearing of 120°. Then she walks 400 yards on a bearing of 30°. Then she walks 300 yards on a bearing of 300°. What bearing will she need to walk in order to go directly back to the oasis?

(A) 60° (B) 120° (C) 150° (D) 210° (E) 240°

48. Point B lies on $\overline{AC}$ and points D and E exist such that $\overline{DB} \perp \overline{AC}$, $\overline{EC} \perp \overline{BC}$, AB = 2", DB = BC = CE = 1", $\overline{DB}$ does not intersect $\overline{AE}$, and all 5 points are coplanar. Find $m\angle DAE$

(A) 18.4° (B) 26.6° (C) 30° (D) 39.8° (E) 45°

49. The operation " $\oplus$ " is defined as $M \oplus N = M + \frac{N}{M}$. Compute $2 \oplus (3 \oplus 5)$.

(A) $2\frac{3}{7}$ (B) $2\frac{5}{9}$ (C) $4\frac{1}{3}$ (D) $4\frac{13}{14}$ (E) 6

50. Use the infinite geometric sequence $P, -9, 6, Q, R, \ldots$ to find $P + Q + R$.

(A) 12.1666... (B) −13.5 (C) 6.8333... (D) 20.1666... (E) −14.8333...

51. If $(2 - i) + (3 + 2i) \times (4 - 3i) = a + bi$ then $a + b = ?$

(A) 22 (B) 18 (C) 12 (D) 7 (E) 6

52. Let $f(x) = 3x^2 + 2x - 1$ and $g(x) = 2x - 1$. Find $g(f'(-1))$

(A) −13 (B) −9 (C) 8 (D) 15 (E) 20

53. Evaluate: $\int_{-a}^{a} \frac{3x^2 - 1}{2}\, dx$

(A) a^3 (B) $\frac{a(a^2 - 1)}{2}$ (C) $a^3 - a$ (D) $\frac{a - 1}{4}$ (E) $-a$

54. How many solutions are there for the equation $3x + 5y = 80$ such that both x and y are positive integers?

(A) 15 (B) 12 (C) 9 (D) 6 (E) 5

55. $\int \left(\frac{\sqrt{x}}{2}\right)\, dx =$ _____ $+ C$, where C is some arbitrary constant.

(A) $\frac{3\sqrt{x}}{2}$ (B) $\sqrt{x}$ (C) $\frac{\sqrt{x}}{3}$ (D) $\sqrt{x^3}$ (E) $\frac{\sqrt{x^3}}{3}$

56. All of the *Screech and Screem Girls Choir* have brown hair, black hair, or red hair. All but 8 of them have brown hair, all but 10 have black hair, and all but 14 have red hair. How many girls are in the choir?

(A) 32 (B) 24 (C) 20 (D) 16 (E) 12

57. Two tire changers can change 8 tires in 30 minutes. How long would it take 5 tire changers to change 50 tires if they work at the same rate as the two tire changers?

(A) 2 hrs 30 min (B) 2 hrs (C) 1 hr 15 min (D) 1 hr 5 min (E) 45 min

58. The top base of an isosceles trapezoid has a length of 12 cm. The bottom base has a length of $5x + 2$ cm. The median has a length of $4x + 1$ cm. How long is the median?

(A) 4 cm (B) 5 cm (C) 14.5 cm (D) 17 cm (E) 21 cm

59. Willie Cutitt needs to determine the height of a tree before chopping it down. He figures the angle of elevation from a spot on the ground due East of the tree to the top of the tree is 45° and the angle of elevation from a spot 50 feet further East of the tree is 30°. What is the height of the tree? (nearest inch)

(A) 28' 10" (B) 58' 8" (C) 68' 4" (D) 78' 10" (E) 118' 4"

60. A game of chance involving a square board with 9 congruent squares on it as shown below costs 25¢ to play. A player tosses the quarter onto the board landing on one of the squares. If the quarter lands on the black square the player loses the quarter. If it lands on a gray square he gets his quarter back. If it lands on the white square, the player gets his quarter back and wins a quarter. If it goes off of the board or lands on a line then the player gets to toss it again. What would be the approximate mathematical expectation for this game?

(A) $-11.1¢$ (B) $-8.3¢$ (C) 2.8¢ (D) 5.6¢ (E) 25¢

2011-12 TMSCA HS Math Test #6
Answer Key

Plains High School

1. C	21. B	41. A
2. C	22. D	42. C
3. A	23. C	43. E
4. B	24. A	44. C
5. E	25. A	45. E
6. B	26. D	46. B
7. C	27. C	47. D
8. B	28. E	48. E
9. C	29. E	49. C
10. B	30. B	50. A
11. E	31. E	51. B
12. B	32. B	52. B
13. B	33. A	53. C
14. E	34. D	54. E
15. A	35. D	55. E
16. D	36. D	56. D
17. D	37. C	57. C
18. B	38. E	58. D
19. B	39. B	59. C
20. A	40. E	60. B

Plains High School UIL Practice Meet • December 3, 2011
TMSCA • Number Sense Test #6 • 2011-12

Final _____ _____

Name:_____ **Please Print!** 2nd _____ _____

School:_____ 1st _____ _____
Score Initials

Grade Level: 9 10 11 12 A 2A 3A 4A 5A

Directions: Do not turn this page until the person conducting this test gives the signal to begin. This is a **ten-minute** test. There are 80 problems. Solve accurately and quickly as many as you can in the order in which they appear. **ALL PROBLEMS ARE TO BE SOLVED MENTALLY**. Do not make any calculations with paper and pencil. Write only in the space provided at the end of each problem. Problems marked with a (*) require approximate integral answers; any answer to a starred problem that is within five percent of the exact answer will be scored correct; all other problems require exact answers.The person conducting this test should explain these directions to the contestants.

Stop - Wait for Signal!!!

(1) $6871 + 1768 =$ _____.

(2) $42 \times 75 =$ _____.

(3) $345 \div 6 =$ _____(mixed number).

(4) $3412 - 2143 =$ _____.

(5) $\frac{19}{21} \times 19 =$ _____(mixed number).

(6) $42 \times 28 + 28 \times 28 =$ _____.

(7) $531 \times 9 - 2 =$ _____.

(8) $24 \div 2.5 =$ _____.

(9) $1\frac{3}{7} + \frac{7}{10} =$ _____(mixed number).

*(10) $34 + 344 + 3444 + 34444 =$ _____.

(11) $44^2 =$ _____.

(12) $\frac{7}{8} - \frac{5}{16} - \frac{3}{64} =$ _____.

(13) $.24\% =$ _____(proper fraction).

(14) Which is larger, $-\frac{13}{15}$ or $-\frac{9}{11}$?_____.

(15) $18 - 15 + 12 \times 6 \div 3 =$ _____.

(16) \$6.00 is 15% of \$_____.

(17) The mean of 16, 18, and 22 is _____.

(18) $1 + 3 + 5 + 7 + \ldots + 21 =$ _____.

(19) $\frac{5}{16} =$ _____%(decimal).

*(20) $162 \times 243 =$ _____.

(21) $2\frac{2}{3} \div 1\frac{1}{2} =$ _____(mixed number) .

(22) If 8 CDs cost \$3.60 then 6 CDs cost \$_____.

(23) $12 - 6 + 22 - 16 + 32 - 26 =$ _____.

(24) How many odd integers are between 13 & 51?_____.

(25) $.0999\ldots =$ _____(proper fraction).

(26) If $2x - 3 = 1$ then $4x + 6 =$ _____.

(27) $(45 \times 6 + 7) \div 8$ has a remainder of_____.

(28) $4\frac{5}{6} - 5\frac{6}{7} =$ _____(mixed number).

(29) $321_5 =$ _____$_{10}$.

*(30) $\frac{1}{16} \times 1695 \div 1.0625 =$ _____.

(31) $6\frac{2}{3} \times 6\frac{2}{3} =$ _____(mixed number).

(32) If $3^x = 27$, then $x + 3 =$ _____.

(33) $12 \div 0.08333\ldots =$ _____.

(34) Truncate $3\sqrt{3}$ to a whole number._____.

(35) The simple interest on \$400.00 at 3% for 2 months is \$_____.

(36) $5^2 + 4^3 - 3^4 =$ _____.

(37) If $x = 6$ and $y = 8$ then $x^2 - 2xy + y^2 =$ _____.

(38) Let $A = \{p,l,u,s\}$, $B=\{m,i,n,u,s\}$ and $C=\{t,i,m,e,s\}$. How many unique elements are in $A \cup B \cap C$?____.

(39) The ratio of the length to the width of a rectangle is 4 to 3. If the perimeter of the rectangle is 70 cm then the width is _____cm.

*(40) $\sqrt{214365}$ = _____.

(41) 50° Fahrenheit = _____°Celsius.

(42) $11 \times 5! - 31 \times 4! =$ _____.

(43) If $A > 1$ and $A^3 \times A^4 \div A^{-3} = A^k$ then $k =$ _____.

(44) If a triangle has side lengths of 7, 11, and x then the smallest integral value of x is _____.

(45) The slope of the line perpendicular to a line containing the points (1,1) and (2,3) is _____.

(46) If $37^2 - 33^2 = 8k$ then $k =$ _____.

(47) If $8^{(x)} = 4^{(x+1)}$, then $2^{(x-1)} =$ _____.

(48) Which of the following is a triangular number, 47, 51, or 55?_____.

(49) $413_5 + 32_5 =$ _____$_5$.

*(50) $(10\pi - 1)(10e + 3) =$ _____.

(51) $(1 + i)(2 - 3i) = a + bi$. Find $a + b$. _____.

(52) ${}_6C_3 =$ _____.

(53) $6^5 \div 4$ has a remainder of _____.

(54) $1 + 3 + 6 + 10 + 15 + \ldots + 45 =$ _____.

(55) The simplified coefficient of the xy^2 term in the expansion of $(x + 2y)^3$ is _____.

(56) The geometric series $2.25 + 1.5 + 1 + .666\ldots + \ldots$ has a sum of _____(decimal).

(57) $123 \times 105 =$ _____.

(58) The measure of a central angle of a regular hexagon is _____degrees.

(59) $\frac{1}{3} + \frac{1}{6} + \frac{1}{10} + \frac{1}{15} + \ldots + \frac{1}{45} =$ _____.

*(60) $50^2 \times 40^3 \div 30^4 =$ _____.

(61) $(123_4)(231_4) \div 3$ has a remainder of _____.

(62) $\tan(180°) - \sin(150°) + \cos(120°) =$ _____.

(63) A pack of pens has 8 red ones, 5 blue ones, and 2 black ones. The probability of randomly picking a red or a black one is _____%.

(64) Let $h(x) = 2x^3 - 3x^2 - 1$, then $h(h(1)) =$_____.

(65) $A = \begin{bmatrix} 3 & 5 \\ -4 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -4 \\ 5 & 6 \end{bmatrix}$. Find $|A - B|$._____.

(66) If $\log 2 = .1$ and $\log x = .3$ then $x =$ _____.

(67) $94 \times 98 =$ _____.

(68) The Greatest Integer Function is written as $f(x) = [x]$. Find $\left[\sqrt{2} \times \sqrt{3}\right]$._____.

(69) If polar coordinates of the rectangular coordinates $(3, -1)$ are $(r, k\pi)$, then $r^2 =$ _____.

*(70) $25 \times 35 \times 45 \times 55 =$ _____.

(71) If $f(x) = 2x^3 - 7x^2 + 4x + 4$, then $f''(-1) =$ _____.

(72) $\frac{1}{15} + \frac{1}{35} + \frac{1}{63} + \frac{1}{99} =$ _____.

(73) A line tangent to $f(x) = x^3 + 3x^2 + 3x + 1$ at $x = -2$ has a slope of _____.

(74) $\int_{-1}^{1} (x^2 - 1)dx =$ _____.

(75) Change .34, base 5, to a base 10 fraction._____.

(76) $f(x) = \frac{6x}{-3x^2+9x}$ has a positive vertical asymptote at $x =$ _____.

(77) The area of the base of a pyramid is 8 cm^2. Find the volume if its height is 4 cm._____cm^3.

(78) Find k, $1 < k < 7$, if $3k - 2 \cong 1 \pmod 9$._____.

(79) $\sin(\arccos\left(\frac{24}{25}\right)) =$ _____.

*(80) 75% of 1 acre is _____ square feet.

2011-12 TMSCA High School Number Sense Test 6 - Answer Key

Plains High School

*number) x — y means an integer between x and y inclusive

NOTE: If an answer is of the type like $\frac{2}{3}$ it cannot be written as a repeating decimal

(1) 8,639

(2) 3,150

(3) $57\frac{1}{2}$

(4) 1,269

(5) $17\frac{4}{21}$

(6) 1,960

(7) 4,777

(8) 9.6, $\frac{48}{5}$, $9\frac{3}{5}$

(9) $2\frac{9}{70}$

*(10) 36,353 — 40,179

(11) 1,936

(12) .515625, $\frac{33}{64}$

(13) $\frac{3}{1250}$

(14) $-\frac{9}{11}$

(15) 27

(16) $40.00

(17) $18\frac{2}{3}$

(18) 121

(19) 31.25

*(20) 37,398 — 41,334

(21) $1\frac{7}{9}$

(22) $2.70

(23) 18

(24) 18

(25) $\frac{1}{10}$

(26) 14

(27) 5

(28) $-1\frac{1}{42}$

(29) 86

*(30) 95 — 104

(31) $44\frac{4}{9}$

(32) 6

(33) 144

(34) 5

(35) $2.00

(36) 8

(37) 4

(38) 3

(39) 15

*(40) 440 — 486

(41) 10

(42) 576

(43) 10

(44) 5

(45) $-.5, -\frac{1}{2}$

(46) 35

(47) 2

(48) 55

(49) 1,000

*(50) 873 — 963

(51) 4

(52) 20

(53) 0

(54) 165

(55) 12

(56) 6.75

(57) 12,915

(58) 60

(59) .8, $\frac{4}{5}$

*(60) 188 — 207

(61) 0

(62) —1

(63) $\frac{200}{3}$, $66\frac{2}{3}$

(64) —29

(65) 81

(66) 8

(67) 9,212

(68) 2

(69) 10

*(70) 2,057,344 — 2,273,906

(71) —26

(72) $\frac{4}{33}$

(73) 3

(74) $-\frac{4}{3}, -1\frac{1}{3}$

(75) $\frac{19}{25}$

(76) 3

(77) $\frac{32}{3}$, $10\frac{2}{3}$

(78) 4

(79) .28, $\frac{7}{25}$

*(80) 31,037 — 34,303