8

1st Score: _____	2nd Score: _____	3rd Score: _____	
S & G _____	S & G _____	S & G _____	_____ . _____
Grader: _____	Grader: _____	Grader: _____	**Final Score**

PLACE LABEL BELOW

Name: _____ School: _____

SS/ID Number: _____ City: _____

Grade: 4   5   6   7   8   Classification: 1A   2A   3A   4A   5A   6A

Academic Excellence in Mathematics and Science through Competition
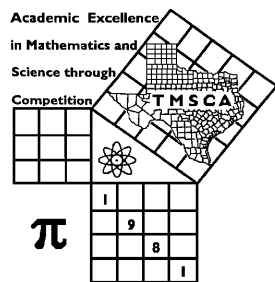
T M S C A   M I D D L E   S C H O O L

C A L C U L A T O R

T E S T   # 1 0 ©

F E B R U A R Y   4 ,   2 0 2 3

GENERAL DIRECTIONS

I. About this test:

  A. You will be given 30 minutes to take this test. There are 80 problems on this test.

II. **Calculators limited to the types specified by UIL. Calculators are no longer required to be cleared.**

III. How to write the answers:

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

   1. Examples (* means correct, but not recommended)
      Correct: 12.3, 123, 123.*, 1.23x10*, 1.23×10^{0}*, 1.23×10^{1}, 1.23×10^{01}, .0190, 1.90×10^{-2}
      Incorrect: 12.30, 123.0, $1.23(10)^{2}$, $1.23^{.}10^{2}$, 1.230×10^{2}, $1.23*10^{2}$, 0.19, 1.9×10^{-2}, 19.0×10^{-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. The decimal point and cents are required for exact dollar answers.

 IV. 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).

 V. Scoring:

  A. All problems answered correctly are worth FIVE points. FOUR points will be deducted for all problems answered incorrectly or skipped before the last problem attempted.

2022 – 2023 TNSCA Middle School Calculator Test 10

1. −1380 − 597 --- 1=_____

2. 1.6 + 3.3 + 2.8 -- 2=_____

3. 98 − 46 + 91 -- 3=_____

4. 23 − 47 + π − 12 --------------------------------------- 4=_____

5. −681 + 266 + 574 + 541 ----------------------------------- 5=_____

6. −319 + 103 − 206 − 301 − 362 -------------------------- 6=_____

7. (0.341 − 0.742) + (1.85 − 0.312 − 1.59) ----------------- 7=_____

8. −1.64 + 1.26 − 1.79 + 2.59 + 0.505 --------------------- 8=_____

9. 48.9 x 690 x 267 --- 9=_____

10. 601 x 3150 x 239 x 2080 ---------------------------------- 10=_____

11. Convert one million inches to meters. ---------------------------- 11=_____m

12. Franco is a mechanic at an independent shop. He calculated his car
    count for the year. He fixed 144 cars in 6 of the months, 132 in 5
    of the months and 150 cars in 1 of the months. Calculate the number
    of cars he fixed for the year. -------------------------------------- 12=_____INT.

13. The ratio of triangles to circles to quadrilaterals was 7:9:11. If there
    are 182 triangles among the shapes, calculate the number of shapes
    total. -- 13=_____INT.

14.   (102)[44 x 44/97] -- 14=_____

15.   111/[78 x 73 x 48] --------------------------------------- 15=_____

16. $\left[\dfrac{66}{69}\right]$[(23/64) − 0.124] -- 16=_____

17. $\left[\dfrac{63}{107}\right]$ [(45/57) + 0.139] ---------------------------------- 17=_____

18. $\left[\dfrac{272/90}{319/103}\right]$ {112 + 163 − 196} ---------------------------- 18=_____

19. $\dfrac{(85/214) + (36/184)}{(\pi - 1.72)}$ -- 19=_____

20. $\dfrac{1420 + 1420 + 6540}{(0.261)(967)(7.81\text{x}10^5)}$ ------------------------------------ 20=_____

21. $\dfrac{(939)(4.84\text{x}10^{-5})}{0.0181}$ (7320 − 3640) ------------------------ 21=_____

22. $\left[\dfrac{708 + 615}{341 - 260}\right]\left[\dfrac{997}{636}\right]$ -- 22=_____

23. $\dfrac{[-(2260 + 3000)(4300 - 1390)]}{(3.20\text{x}10^{-4}/(0.377))}$ ------------------------ 23=_____

24. Phil and Maria are putting a pool in their backyard. Excavation is
    being done and the hole will measure 46 ft. X 30 ft. X 8 ft. The
    truck hauling off the dirt carries 18.89 cubic feet. Calculate the
    number of truckloads to haul off all the dirt. --------------------- 24=_____INT.

25. The Smooth family purchased a house in 2004 for $105,000. In
    2022 the home was valued at $312,000. Calculate the percent
    increase in the value of their home. ------------------------------- 25=_____%

26. In a 30-60-90 triangle the shortest side measures 77.98 cm.
    Calculate the length of the hypotenuse in cm. -------------------- 26=_____cm

27. $(0.0532)[(89.3/63.2)(0.0735 + 0.1)]$ ------------------- 27=_____

28. $\dfrac{(0.254 - 0.24)(0.00397 + 0.0122)}{(2.69 \times 10^{11})}$ ---------------------- 28=_____

29. $\dfrac{(17.5 + 15.9)(0.0327 + 0.0655)}{(5.06 \times 10^{11})}$ ---------------------- 29=_____

30. $\dfrac{(161 + 217)}{(5.82 \times 10^{11})}$ --- 30=_____

31. $[111]\left[\dfrac{1/0.014}{1/0.0111}\right]$ --------------------------------------- 31=_____

32. $(8.92)\left[(6.85 \times 10^{-11}) - (8.62 \times 10^{-11})\right]$ ----------------- 32=_____

33. $1/(0.0287 - 0.0308) - 1/(-9.17 \times 10^{-4})$ ------------------- 33=_____

34. $\dfrac{1}{99.8} - \dfrac{1}{104} + \dfrac{1}{31}$ ------------------------------------- 34=_____

35. There are a total of 40 pigs and chickens in the farmyard. BillyBob
    counted 100 legs in all. Calculate the number of chickens in the
    farmyard. -- 35=_____INT.

36. Jerry weighs 200 kg and has been losing 2.5% of his weight each
    month doing exercise and eating right. At this rate, calculate his
    weight after 1 year. -- 36=_____kg

37.	38.
RECTANGLE	RHOMBUS

37.
RECTANGLE

3.22×10^4

X

Area = 1.97×10^{10}

X = ?

37= _____

38.
RHOMBUS

A

B   C

D

AD = 2.82×10^5
BC = 5.91×10^5
Perimeter = ?

38= _____

39. $\sqrt[4]{\dfrac{102 + 215}{3.24 - 2.16}}$ -- 39=_____

40. $(121 + 115)^2(0.406 + 1.24)^2$ ---------------------------- 40=_____

41. $(1270 + 1180 + 1080)^2(6.12 + 12.3)^2$ ------------------ 41=_____

42. $\sqrt{303} + \sqrt{524 + 886} - (\pi)\sqrt{811}$ -------------------------- 42=_____

43. $(12900)\sqrt{53500 + 6860 + 51100}$ ------------------------ 43=_____

44. $\sqrt{(21.7/21.4) + 0.655 - 0.512}$ -------------------------- 44=_____

45. $(78.5)\sqrt{1960 + 2870 - 368}$ ------------------------------ 45=_____

46. $\dfrac{1}{\sqrt{1500 + 2370 + 2460}} + \left(\dfrac{1}{\sqrt{22.5}}\right)^2$ ---------------------- 46=_____

47. Calculate the value of 4235 Base 6 in Base 10.   ------------------- 47=_____INT.

48. Elanor can wash her car in 1 hour. Her mother Sarah can do the
    same job in 45 minutes. Calculate the time it would take if they
    work together. --- 48=_____min.

49.
RIGHT TRIANGLE

Area = ?

49= _____

50.
RIGHT TRIANGLE

X = ?

50= _____
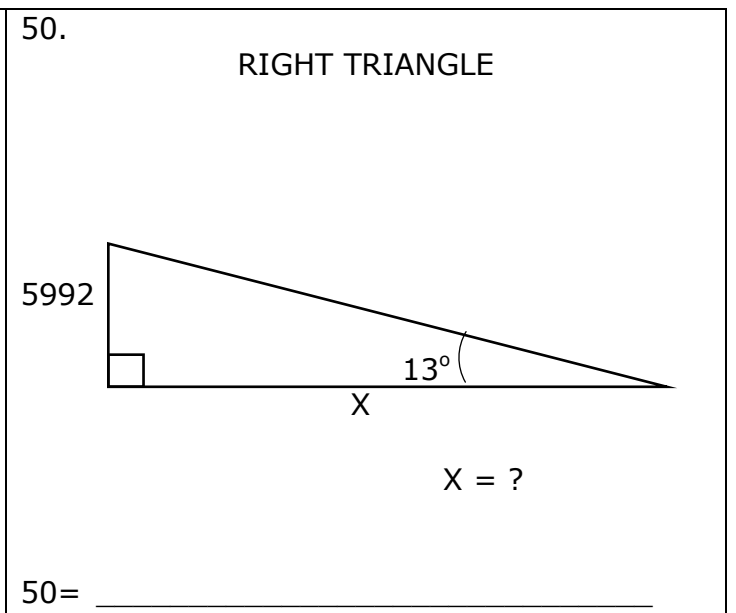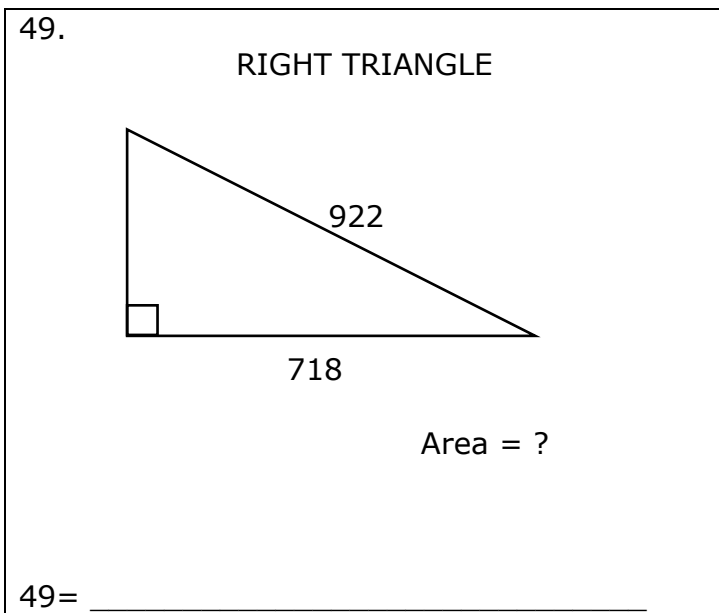
51. $\sqrt{\dfrac{4.12 \times 10^{-7}}{(0.0399)(0.0183)}} + \dfrac{(1.46 - 0.691)}{(20.4 + 7.32)}$ ------------------   51=_____

52. $\left[\dfrac{\sqrt{\sqrt{7210 - 4260}}}{-(1.10 \times 10^{5} - 63900)}\right]^{3} [3910 + 1260]$ ------------------   52=_____

53. $\dfrac{\sqrt{13.7 + \pi + 26.9}}{(1.08 \times 10^{5} - 58800 + 40000)^{3}}$ ---------------------------   53=_____

54. $2.13 + \sqrt{(274)/(32.3)} - (0.853 + 1.31)^{2}$ -----------------   54=_____

55. $(109)^{2} \sqrt{(300)/(4.25)} - (88500 + 45200)$ ----------------   55=_____

56. $17200 + \sqrt{(24800)(31600)} - (15900 + 34600)$ -----------   56=_____

57. $\sqrt{\dfrac{(1080)(7940)}{(3490) + (2060)}} + 1/(2.5)^{-4}$ -------------------------   57=_____

58. $\sqrt{\dfrac{(301)(33.7)}{(143) + (45.4)}} - 7.52$ -----------------------------------   58=_____

59. A plane flies 450 mph. This plane can travel 1000 miles with the wind
    in the same amount of time as it travels 850 miles against the wind.
    Calculate the speed of the wind. ------------------------------------ 59=_____mph

60. It was forecasted a 75% chance of rain tomorrow. Calculate the
    odds it will rain tomorrow. --- 60=_____
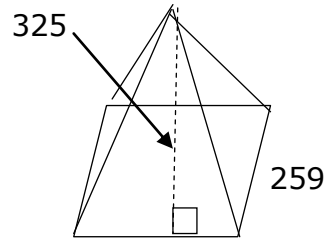
61.

CYLINDER

572
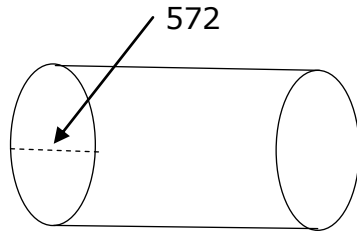
1315

Lateral Surface Area = ?

61= _____

62.

SQUARE BASED PYRAMID

325

259

Total Surface Area = ?

62= _____

63. $\dfrac{15! - 8!}{22!}$ --   63=_____

64. $(3.92\text{x}10^6 - 9.24\text{x}10^5)^{-7}(1.31\text{x}10^9)$ --------------------   64=_____

65.   (deg) $\dfrac{\tan(0.978°)}{39.6}$ ---   65=_____

66.   (rad) $\dfrac{\tan(21.7)}{25.2/1540}$ ---   66=_____

67.   (rad) $\sin\left[\dfrac{(54)(\pi)}{(246)(8.74)}\right]$ -------------------------------------   67=_____

68.   (rad) $(475)\cos(20.3)$ ---   68=_____

69.   (deg) $\dfrac{\sin(22.4°)}{\tan(22.4°)}[86.9]$ -------------------------------------   69=_____

70. $(35.1 + 19.4 + 12.4)^{2/5}$ ----------------------------------   70=_____

71. 7 ml of a 42% acid solution is mixed with 10 ml of another acid solution to make a 50% acid solution. Calculate the percent concentration of the second solution. -----------------------------   71=_____%

72. Calculate all the ways that the letters in TMSCA can be arranged.   72=_____INT.
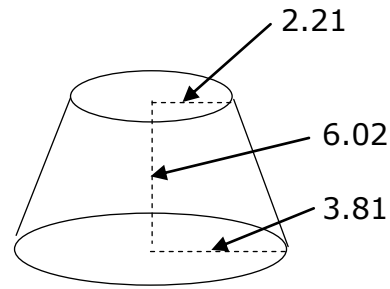
73.

SECTOR OF A CIRCLE AND A RIGHT TRIANGLE

7.66
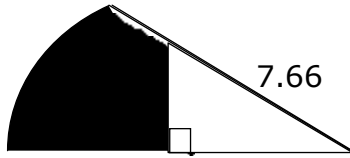
Radius = 10
Sector = 30°
Shaded Area = ?

73= _____

74.

FRUSTUM OF A CONE

2.21

6.02

3.81

Volume = ?

74= _____

75. $\dfrac{Log(1.58 \times 10^6 + 2.16 \times 10^6)}{4.49}$ ---------------------------------- 75=_____

76. $\dfrac{32.8 + \sqrt{(58.5)(31.9)} + (3.53)(17.1)}{\sqrt{\sqrt{0.0151 + 0.0101}}}$ --------------------- 76=_____

77. $Log(77.3 + 26.7 + 53.2)$ ----------------------------------- 77=_____

78. $(9.55)^{\pi}(0.455)^5(20.2 - 19.6)^3$ --------------------------- 78=_____

79. $1 + 3 + 5 + \ldots + 613$ -------------------------------------- 79=_____

80. $1 + 0.389 + (0.389)^2 + \dfrac{(0.389)^4}{8} - \dfrac{(0.389)^5}{15}$ ------------ 80=_____

2022 – 2023 TNSCA Middle School Calculator Test 10 Answer Key

Page 1	**Page 2**	**Page 3**	**Page 4** .
			$39 = 4.14$ $= 4.14 \times 10^0$
$1 = -1980$ $= -1.98 \times 10^3$	$14 = 2040$ $= 2.04 \times 10^3$	$27 = 0.0130$ $= 1.30 \times 10^{-2}$	
$2 = 7.69$ $= 7.69 \times 10^0$	$15 = 0.000406$ $= 4.06 \times 10^{-4}$	$28 = 8.42 \times 10^{-16}$	$40 = 151000$ $= 1.51 \times 10^5$
$3 = 143$ $= 1.43 \times 10^2$	$16 = 0.225$ $= 2.25 \times 10^{-1}$	$29 = 6.48 \times 10^{-12}$	$41 = 4.23 \times 10^9$
		$30 = 6.49 \times 10^{-10}$	$42 = -34.5$ $= -3.45 \times 10^1$
$4 = -32.9$ $= -3.29 \times 10^1$	$17 = 0.547$ $= 5.47 \times 10^{-1}$	$31 = 88.0$ $= 8.80 \times 10^1$	$43 = 4.31 \times 10^6$
$5 = 700$ $= 7.00 \times 10^2$	$18 = 77.1$ $= 7.71 \times 10^1$	$32 = -1.58 \times 10^{-10}$	$44 = 1.08$ $= 1.08 \times 10^0$
$6 = -1080$ $= -1.08 \times 10^3$	$19 = 0.417$ $= 4.17 \times 10^{-1}$	$33 = 614$ $= 6.14 \times 10^2$	$45 = 5240$ $= 5.24 \times 10^3$
$7 = -0.452$ $= -4.52 \times 10^{-1}$	$20 = 4.76 \times 10^{-5}$	$34 = 0.0327$ $= 3.27 \times 10^{-2}$	$46 = 0.0570$ $= 5.70 \times 10^{-2}$
$8 = 0.924$ $= 9.24 \times 10^{-1}$	$21 = 9240$ $= 9.24 \times 10^3$		
$9 = 9.01 \times 10^6$	$22 = 25.6$ $= 2.56 \times 10^1$		
$10 = 9.41 \times 10^{11}$	$23 = -1.80 \times 10^{10}$	$35 = 30$ INT.	$47 = 959$ INT.
$11 = 25400$ $= 2.54 \times 10^4$	$24 = 585$ INT.	$36 = 148$ $= 1.48 \times 10^2$	$48 = 25.7$ $= 2.57 \times 10^1$
$12 = 1674$ INT.	$25 = 197$ $= 1.97 \times 10^2$	$37 = 612000$ $= 6.12 \times 10^5$	$49 = 208000$ $= 2.08 \times 10^5$
$13 = 702$ INT.	$26 = 156$ $= 1.56 \times 10^2$	$38 = 1.31 \times 10^6$	$50 = 26000$ $= 2.60 \times 10^4$

Page 5	**Page 6**	**Page 7** .

Page 5

51 = 0.0515
  $= 5.15 \times 10^{-2}$

52 = -2.11×10^{-8}

53 = 9.32×10^{-15}

54 = 0.364
  $= 3.64 \times 10^{-1}$

55 = -33900
  $= -3.39 \times 10^{4}$

56 = -5310
  $= -5.31 \times 10^{3}$

57 = 78.4
  $= 7.84 \times 10^{1}$

58 = -0.182
  $= -1.82 \times 10^{-1}$

59 = 36.5
  $= 3.65 \times 10^{1}$

60 = 3.00
  $= 3.00 \times 10^{0}$

Page 6

61 = 2.36×10^{6}

62 = 235000
  $= 2.35 \times 10^{5}$

63 = 1.16×10^{-9}

64 = 6.05×10^{-37}

65 = 0.000431
  $= 4.31 \times 10^{-4}$

66 = -18.3
  $= -1.83 \times 10^{1}$

67 = 0.0788
  $= 7.88 \times 10^{-2}$

68 = 57.0
  $= 5.70 \times 10^{1}$

69 = 80.3
  $= 8.03 \times 10^{1}$

70 = 5.37
  $= 5.37 \times 10^{0}$

71 = 55.6
  $= 5.56 \times 10^{1}$

72 = 120 INT.

Page 7

73 = 13.5
  $= 1.35 \times 10^{1}$

74 = 175
  $= 1.75 \times 10^{2}$

75 = 1.46
  $= 1.46 \times 10^{0}$

76 = 342
  $= 3.42 \times 10^{2}$

77 = 2.20
  $= 2.20 \times 10^{0}$

78 = 5.05
  $= 5.05 \times 10^{0}$

79 = 94200
  $= 9.42 \times 10^{4}$

80 = 1.54
  $= 1.54 \times 10^{0}$

11. If you have a conversion key, change inches to cm. Otherwise, (1,000,000)(2.54) Change to meters by dividing by 100 since 100 cm = 1 meter.

$$\frac{1,000,000(2.54)}{100}$$

12. $144(6) + 132(5) + 150$

13. $7x + 9x + 11x = 27x$ total shapes. $7x$ represents the number of triangles.

$$7x = 182; x = 26$$

Total number of shapes

$$27(26)$$

24. $\frac{46(30)(8)}{18.89} \sim 584.43$

You must round up for the number of truckloads.

25. Some calculators have a % change key. If so,
Enter 105000, then 312000, then % change.
Otherwise: $\frac{312000-105000}{105000} \cdot 100$

26. The hypotenuse is twice the short leg on a 30-60-90 triangle. 77.98(2)

35. $\begin{cases} x + y = 40 \ (heads) \\ 4x + 2y = 100 \ (legs) \end{cases}$
$\begin{cases} -4x - 4y = -160 \\ 4x + 2y = 100 \end{cases}$

Add these two equations together $-2y = -60$

$$y = 30$$

36. If Jerry is losing 2.5% each month, he retains 97.5% (or .975)of his weight.

$$200(.975)^{12}$$

37. $L = \frac{A}{w} = \frac{1.97 \ x \ 10^{10}}{3.22 \ x \ 10^4}$

38. The diagonals of a rhombus form 4 equal right triangles. One side of the rhombus:

$$\sqrt{\left(\frac{2.82 \ x \ 10^5}{2}\right)^2 + \left(\frac{5.91x \ 10^5}{2}\right)^2}$$

Multiply by 4 for perimeter.

47.
$$4(6^3) + 2(6^2) + 3(6) + 5$$

48. $\frac{60(45)}{60+45}$ This formula only works for two people working together.

49. Short leg: $\sqrt{922^2 - 718^2}$

Area = $\frac{(\sqrt{922^2-718^2})(718)}{2}$

50. $tan \ 13 = \frac{5992}{x}$

$$x = \frac{5992}{\tan 13}$$

59.
Rate times time = distance
So $t = distance \div rate$

	rate	time	dist
With wind	450+w		1000
Against wind	450-w		850

59. contd.
Time with wind: $\frac{1000}{450+w}$
Time against wind: $\frac{850}{450-w}$

$$\frac{1000}{450 + w} = \frac{850}{450 - w}$$

$$1000(450 - w) = 850(450 + w)$$

Solve for w. $w = \frac{67500}{1850}$

60. 75% of the time it will rain. 25% of the time it won't rain. $\frac{75}{25}$

61. LSA $= 2\pi r h$
$$2\pi \left(\frac{572}{2}\right)(1315)$$

62. $259^2 + 4\left(\frac{325 \ x \ 259}{2}\right)$

71. ml of solution times % acid = pure acid.

ml	% as a decimal	Pure acid
7	.42	.42(7)
10	x	10x
17	.5	17(.5)

$$.42(7) + 10x = 17(.5)$$
$$x = \frac{17(.5) - .42(7)}{10}$$

Multiply by 100 to change answer to a %.

72. 5!

73. Area of sector minus area of triangle. The sector is

$\frac{30}{360} = \frac{1}{12}$ of the circle.

$\pi(10)^2 \left(\frac{1}{12}\right)$ =sector area

Legs of triangle:

$7.66(\cos 30)$ & $7.66(sin30)$

Area of triangle:

$$\frac{[7.66(\cos 30)][7.66(sin30)]}{2}$$

Subtract the triangle from the sector.

74. Volume of Frustum:

$$\frac{1}{3}\pi h(R^2 + rR + r^2)$$

$$\frac{1}{3}\pi(6.02)[3.81^2 + 2.21(3.81) + 2.21^2]$$