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
G E A R - U P ©
D E C E M B E R 5, 2 0 2 1

Academic Excellence
in Mathematics and
Science through
Competition

π

GENERAL DIRECTIONS

I. About this test:
  A. You will be given 30 minutes to take this test. There are 80 problems on this test.
  B. ALL calculators must be cleared. HP Prime and Casio Prizm calculators are NOT permitted.
II. 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*, 1.23x10^0*, 1.23x10^1, 1.23x10^{01}, .0190, 1.90x10^{-2}
     Incorrect: 12.30, 123.0, 1.23(10)^2, 1.23$^.$10^2, 1.230x10^2, 1.23*10^2, 0.19, 1.9x10^{-2}, 19.0x10^{-3}, 1.90E-02
   2. Plus or minus one digit error in the third significant digit is permitted.
  B. For stated problems:
    1. Except for integer, dollar sign, and significant digit problems, as detailed below, answers to stated
       problems should be written with three significant digits.
    2. Integer problems are indicated by (integer) in the answer blank. Integer problems answers must be
       exact, no plus or minus one digit, no decimal point or scientific notation.
    3. Dollar sign ($) problems should be answered to the exact cent, but plus or minus one cent error is
       permitted. The decimal point and cents are required for exact dollar answers.
 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).
IV. 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.
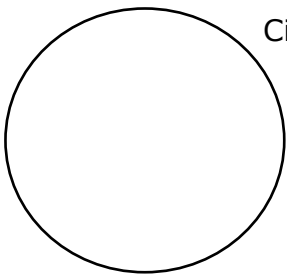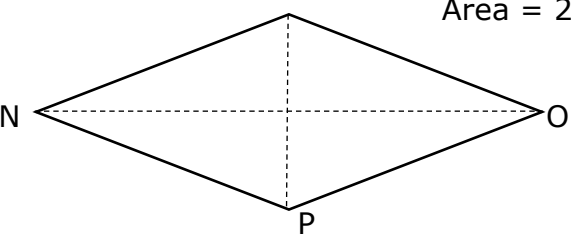
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2021 – 2022 Middle School Calculator Gear-Up On-Line Meet

1. −1510 − 2060 --- 1=_____

2. 11 + 9 + 51 -- 2=_____

3. 3000 − 2130 − 5470 --- 3=_____

4. 10 + 11 − π − 4 -- 4=_____

5. 152 − 151 + 98 − 142 --------------------------------------- 5=_____

6. 324 − 37.1 − 344 − 345 + 276 ------------------------------- 6=_____

7. 0.641 + 1.7 + 0.573 + 1.67 + 1.64 --------------------- 7=_____

8. −0.294 − 1.87 + 0.873 − 1.3 − 1.33 --------------------- 8=_____

9. 56.6 x 102 x 331 --- 9=_____

10. 207 x 42.8 x 54.4 x 166 ---------------------------------- 10=_____

11. Thirty-two percent of twenty-two percent of two thousand five hundred thirty-six is what number? ------------------------------- 11=_____

12. Calculate the number of pi's in one million. ---------------------- 12=_____

13. Rudy has kept his change in his piggy bank all year long. He has now emptied it and counted all the different coins. He has 49 dimes, 120 pennies, 87 nickels, 55 quarters, and 23 half-dollars. Calculate the total value of the coins. ------------------------------------- 13=$_____

14.   (70)[96 x 27 x 35] --- 14=_____

15.   (144/141)[34 – 119] --------------------------------------- 15=_____

16. $\{133/164\}\left[\dfrac{168}{25 + 139}\right]$ -- 16=_____

17. $\left[\dfrac{-103}{95}\right][(236/103) + 0.571]$ ------------------------------- 17=_____

18. $\dfrac{[0.961/(1.92)]/0.0611}{(0.00327 \text{ x } 0.0304)(113)}$ --------------------------------- 18=_____

19. $\left[\dfrac{(3930/4240) - (2390/1730)}{9.82\text{x}10^{-4}/(0.0014)}\right]$ -------------------------- 19=_____

20.   (0.812)[211/282 x 393/331] – 0.142 -------------------- 20=_____

21. $\dfrac{113}{(105 - 275)} - \dfrac{(257 - 107)}{34}$ -------------------------------- 21=_____

22. $\dfrac{(3530 \text{ x } 5060)/8000}{(3220 \text{ x } 1.96) + 4560}$ --------------------------------- 22=_____

23. $\left[\dfrac{138 + 1060}{629 - 722}\right]\left[\dfrac{1010}{644}\right]$ --------------------------------- 23=_____

24. Convert 11 pi over 6 radians to degrees. ------------------------ 24=_____⁰

25. Renee traveled to Japan and needed to convert her US dollars to Japanese Yen. The current conversion is 1 USD = 110.263 JPY. If she has $500, calculate the number of yen this is. ------------ 25=_____¥

26. Calculate the measure of one interior angle of a regular octagon in degrees. --- 26=_____⁰

27. $(0.145)[(782/745)(10.9 + 5.34)]$ ------------------------ 27=_____

28. $(54.7)\left[[0.00118/(0.00101)][2.15 \times 10^{-4}/(0.00157)]\right]$ ---- 28=_____

29. $[3010 - (2170 + 846)] + [(-0.0177)(3300 - 2960)]$ ---- 29=_____

30. $\dfrac{1}{-217} + \dfrac{1}{(120 - 363)}$ ----------------------------------- 30=_____

31. $(0.116)\left[\dfrac{3.76}{(1.68 \times 10^{10})}\right]$ ----------------------------- 31=_____

32. $\dfrac{1}{13.8} + \dfrac{1}{(\pi)(164 - 156)}$ ------------------------------ 32=_____

33. $\dfrac{1}{184} - \dfrac{1}{(98.3 + 139)}$ ----------------------------------- 33=_____

34. $\left[\dfrac{1/609}{1/107}\right] + [0.528]$ -------------------------------------- 34=_____

35. The sum of four consecutive even integers is 388. Calculate the
     product of the four integers. ------------------------------------- 35=_____

36. A certain gas occupies 4.5 liters at 900 mm of pressure. Calculate
     the pressure if the volume of the gas is decreased to 3.5 liters. - 36=_____mm

CIRCLE

Circumference = 42006

Area = ?

37= _____

RHOMBUS

M   MP = 125
           Area = 23437.5

N   O

P

NO = ?

38= _____

39. $\sqrt[4]{\dfrac{1.27 + 3.27}{13.2 - 12.1}}$ -- 39=_____

40. $\left[\dfrac{4500 + (1/(2.56\text{x}10^{-4}))}{(5270/4520) - 0.137}\right]^2$ ------------------------------- 40=_____

41. $\dfrac{(38400 + 6080)^3}{(0.0665 - 0.352)^2}$ --- 41=_____

42. $\sqrt{259 - 252 + 198} - \sqrt{107}$ ------------------------------- 42=_____

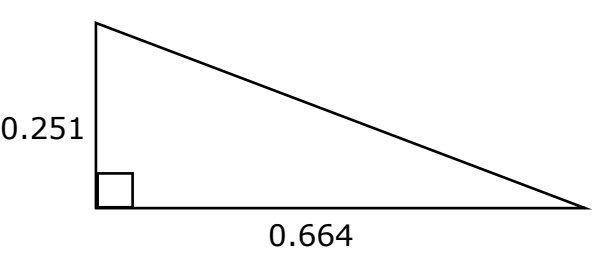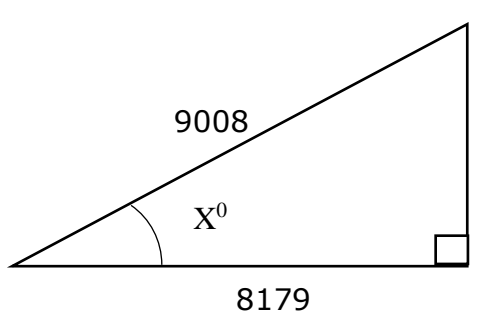43. $(1/\pi)\sqrt[3]{\dfrac{2.05 + 2.19}{0.144 - 0.0388}}$ ------------------------------- 43=_____

44. $\sqrt{387} + \sqrt{776 + 1230} - (\pi)\sqrt{1170}$ ---------------------- 44=_____

45. $\sqrt[4]{0.766 - 441/623} + 1/\sqrt{75600 + 31700}$ ---------------- 45=_____

46. $\dfrac{1}{\sqrt{1240 + 933 + 624}} + \left(\dfrac{1}{\sqrt{8.62}}\right)^3$ ---------------------- 46=_____

47. Calculate 667^{-2541}. -- 47=_____

48. Calculate e to the power of pi added to ten to the power of pi. -- 48=_____

49.

RIGHT TRIANGLE

0.251

0.664

Hypotenuse = ?

49= _____

50.

RIGHT TRIANGLE

9008

X^0

8179

X^0 = ?

50= _____

51. $$\left[\frac{2350 + 1280 + \sqrt{9.23 \times 10^6 + 8.07 \times 10^6}}{20700/34000}\right]^2$$ -------------- 51=_____

52. $$\left[\frac{\sqrt{\sqrt{10.4 - 5.37}}}{-(0.0482 - 0.0519)}\right]^2 [1.18 + 2.94]$$ ----------------- 52=_____

53. $$\frac{(366 + 262 - 512)^3}{\sqrt{7.89 + 2.66 + 2.81}}$$ --------------------------------------- 53=_____

54. $$\sqrt{\frac{1/(6.91 - 2.5)}{(59.2)(25.4 + 40.5)^4}}$$ ------------------------------------ 54=_____

55. $(0.191)(1.25 \times 10^9)^{1/3} - [(27600)(82100)]^{1/4}$ ----------- 55=_____
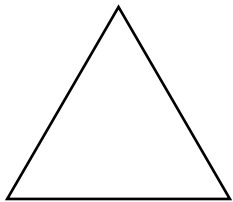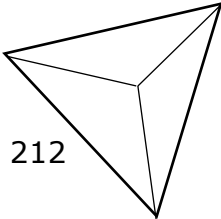
56. $0.462 + \sqrt{(745)/(412)} - (0.604 + 0.97)^2$ ---------------- 56=_____

57. $$\sqrt{\frac{(187)(808)}{(123) + (213)}} + 1/(1.84)^{-5}$$ --------------------------- 57=_____

58. $$\sqrt{\frac{(85.7)(54.9)}{(404) + (694)}} - 2.23$$ ------------------------------------ 58=_____

59. A bag contains colored marbles. There are 8 red, 12 blue, 4 black, and 3 yellow. Calculate the probability of drawing a black and then a blue if a marble is not replaced after drawing them out. -------- 59=_____

60. Convert 549 miles per hour to meters per second. --------------- 60=_____m/s

EQUILATERAL TRIANGLE	TETRAHEDRON
Area = 7295	
	212
Height = ?	Volume = ?
61= _____	62= _____

63. $\dfrac{19!}{8!} + 15!$ --- 63=_____

64. $(57100 - 1.03\text{x}10^5)^9(1.48\text{x}10^6)$ -------------------------- 64=_____

65.   (deg) $(211 - 132)\sin(247°)$ ------------------------------ 65=_____

66.   (deg) $\tan(451° - 62.7°) + 0.523$ ------------------------ 66=_____

67.   (rad) $\dfrac{\cos(6.54)}{595/115}$ -- 67=_____

68.   (deg) $\dfrac{\cos(19.8°)}{125 + 186}$ ------------------------------------- 68=_____

69.   (rad) $\cos[(4.15 - 7.32)(0.872)]$ ------------------------- 69=_____

70. $(71.1 - 23.3)e^{\pi - 0.845}$ ---------------------------------- 70=_____

71. Calculate the probability of not rolling a double on a pair of dice.   71=_____

72. The volume of a rectangular prism is 5,000 cubic inches. The base
of the rectangular prism is a square with an area of 700 square
inches. Calculate the length of the inner diagonal of the
rectangular prism. --- 72=_____in.

CONGRUENT ELLIPSES	REGULAR HEPTAGON AND CIRCLE

CONGRUENT ELLIPSES
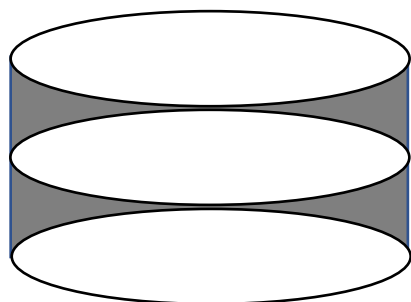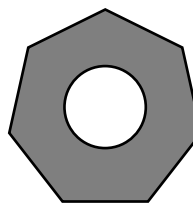
Major Axis = 2.11
Minor Axis = 0.512

Shaded area = ?

73= _____

REGULAR HEPTAGON AND CIRCLE

Edge of heptagon and Diameter of circle = 7923

Shaded Area = ?

74= _____

75. $$\dfrac{(2.88)^{0.936}(1.86)^{0.936}}{(0.849 - 0.454)^{-4}}$$ ----------------------------------- 75=_____

76. $$\dfrac{0.0639 + \sqrt{(0.0588)(0.063)} + (0.203)(0.503)}{\sqrt{\sqrt{0.167 + 0.123}}}$$ ------------ 76=_____

77. $$2\text{Log}\sqrt{\dfrac{(34.2)(\pi)}{0.853 + 2.51}}$$ ------------------------------------- 77=_____

78. $(2.67)^{\pi}(0.328)^{3}(0.238 - 0.19)^{3}$ ------------------------- 78=_____

79. $1 + 3 + 5 + ... + 651$ ------------------------------------- 79=_____

80. $$1 + 0.109 + (0.109)^{2} + \dfrac{(0.109)^{4}}{8} - \dfrac{(0.109)^{5}}{15}$$ ------------ 80=_____

2021 – 2022 TMSCA Middle School Calculator Gear-Up On-Line Answer Key

Page 1	Page 2	Page 3	Page 4
1 = -3570 = -3.57×10^3	14 = 6.35×10^6	27 = 2.47 = 2.47×10^0	39 = 1.43 = 1.43×10^0
2 = 71.0 = 7.10×10^1	15 = -86.8 = -8.68×10^1	28 = 8.75 = 8.75×10^0	40 = 6.67×10^7
3 = -4600 = -4.60×10^3	16 = 0.831 = 8.31×10^{-1}	29 = -12.0 = -1.20×10^1	41 = 1.08×10^{15}
4 = 13.9 = 1.39×10^1	17 = -3.10 = -3.10×10^0	30 = -0.00872 = -8.72×10^{-3}	42 = 3.97 = 3.97×10^0
5 = -43.0 = -4.30×10^1	18 = 729 = 7.29×10^2	31 = 2.60×10^{-11}	43 = 1.09 = 1.09×10^0
6 = -126 = -1.26×10^2	19 = -0.648 = -6.48×10^{-1}	32 = 0.112 = 1.12×10^{-1}	44 = -43.0 = -4.30×10^1
7 = 6.22 = 6.22×10^0	20 = 0.579 = 5.79×10^{-1}	33 = 0.00122 = 1.22×10^{-3}	45 = 0.494 = 4.94×10^{-1}
8 = -3.92 = -3.92×10^0	21 = -5.08 = -5.08×10^0	34 = 0.704 = 7.04×10^{-1}	46 = 0.0584 = 5.84×10^{-2}
9 = 1.91×10^6	22 = 0.205 = 2.05×10^{-1}		
10 = 8.00×10^7	23 = -20.2 = -2.02×10^1	35 = 8.84×10^7	47 = 7.88×10^{-7177}
11 = 179 = 1.79×10^2	24 = 330 = 3.30×10^2	36 = 1160 = 1.16×10^3	48 = 1410 = 1.41×10^3
12 = 318000 = 3.18×10^5	25 = 55100 = 5.51×10^4	37 = 1.40×10^8	49 = 0.710 = 7.10×10^{-1}
13 = $35.70	26 = 135 = 1.35×10^2	38 = 375 = 3.75×10^2	50 = 24.8 = 2.48×10^1

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

$51 = 1.64 \times 10^8$

$52 = 675000$
$\quad = 6.75 \times 10^5$

$53 = 427000$
$\quad = 4.27 \times 10^5$

$54 = 1.43 \times 10^{-5}$

$55 = -12.4$
$\quad = -1.24 \times 10^1$

$56 = -0.671$
$\quad = -6.71 \times 10^{-1}$

$57 = 42.3$
$\quad = 4.23 \times 10^1$

$58 = -0.160$
$\quad = -1.60 \times 10^{-1}$

$59 = 0.0684$
$\quad = 6.84 \times 10^{-2}$

$60 = 245$
$\quad = 2.45 \times 10^2$

$61 = 112$
$\quad = 1.12 \times 10^2$

$62 = 1.12 \times 10^6$

$63 = 4.32 \times 10^{12}$

$64 = -1.34 \times 10^{48}$

$65 = -72.7$
$\quad = -7.27 \times 10^1$

$66 = 1.06$
$\quad = 1.06 \times 10^0$

$67 = 0.187$
$\quad = 1.87 \times 10^{-1}$

$68 = 0.00303$
$\quad = 3.03 \times 10^{-3}$

$69 = -0.930$
$\quad = -9.30 \times 10^{-1}$

$70 = 475$
$\quad = 4.75 \times 10^2$

$71 = 0.833$
$\quad = 8.33 \times 10^{-1}$

$72 = 38.1$
$\quad = 3.81 \times 10^1$

$73 = 0.464$
$\quad = 4.64 \times 10^{-1}$

$74 = 1.79 \times 10^8$

$75 = 0.117$
$\quad = 1.17 \times 10^{-1}$

$76 = 0.309$
$\quad = 3.09 \times 10^{-1}$

$77 = 1.50$
$\quad = 1.50 \times 10^0$

$78 = 8.54 \times 10^{-5}$

$79 = 106000$
$\quad = 1.06 \times 10^5$

$80 = 1.12$
$\quad = 1.12 \times 10^0$

11. $.32(.22)(2536)$

12. $\dfrac{1,000,000}{\pi}$

13.
$49(.1) + 1.20 + 87(.05)$
$+55(.25) + 23(.5)$

24. If your calculator has a conversion key, use it. Otherwise, $\dfrac{11\pi}{6} \cdot \dfrac{180}{\pi}$ because 180 degrees = π radians

25. $\$500 \cdot \dfrac{110.263}{1\ USD}$

26. $180 - \dfrac{360}{8}$ Or

$\dfrac{180\ (n-2)}{n} = \dfrac{180(6)}{8}$

35. The 4 numbers are represented by
$n, n+2, n+4, n+6$
$\quad\quad 4n + 12 = 388$
$\quad\quad\quad n = 94$
$\quad\quad 94(96)(98)(100)$

36. $4.5(900) = 3.5x$

$x = \dfrac{4.5(900)}{3.5}$

37. $C = 2\pi r = 42006$
$r = \dfrac{42006}{2\pi}$
$A = \pi r^2 = \pi\left(\dfrac{42006}{2\pi}\right)^2$

38. $\dfrac{125x}{2} = 23437.5$

$x = \dfrac{23437.5(2)}{125}$

47. -2541 $\boxed{\textit{ENTER}}$ 667

$\boxed{\text{X}}$ $\boxed{\text{SHOW}}$ $\boxed{\text{log}}$ *(Look at the digits to the left of the decimal. This gives -7176 for the exponent. Write down 10^{-7176}.) Then punch*

-7176 $\boxed{-}$ $\boxed{10^x}$

(This gives 7.88 E-1 so negative one must be added to -7176. The answer is **7.88 x10^{-7177}***). This is done on the HP RPN*

48. $e^\pi + 10^\pi$

49. $\sqrt{.251^2 + .664^2}$

50. $\dfrac{\cos x}{1} = \dfrac{8179}{9008}$

$x = a\cos\dfrac{8179}{9008}$

59. $\dfrac{4}{27} \cdot \dfrac{12}{26}$

60.

$\dfrac{549\ mi}{1hr} \cdot \dfrac{1.609km}{1\ mi} \cdot$
$\dfrac{1000m}{1\ km} \cdot \dfrac{1\ hr}{3600sec}$

61. $\dfrac{h^2\sqrt{3}}{3} = A = 7295$

$h = \sqrt{\dfrac{7295(3)}{\sqrt{3}}}$

62. $V = \dfrac{edge^3\sqrt{2}}{12} = \dfrac{(212)^3\sqrt{2}}{12}$

71. 6 pairs of doubles, 30 that are not doubles. $\dfrac{30}{36}$

72. $(\sqrt{700})(\sqrt{700})h = 5000$
$700h = 5000; h = \dfrac{5000}{700}$
Inner diagonal = $\sqrt{a^2 + b^2 + c^2}$

$\sqrt{\left(\sqrt{700}\right)^2 + \left(\sqrt{700}\right)^2 + \left(\dfrac{5000}{700}\right)^2}$

73. This is a rectangle minus 2 ellipses. Rectangle = $2.11[.512(2)]$

Area of 2 ellipses: $2\left(\dfrac{2.11}{2}\right)\left(\dfrac{.512}{2}\right)\pi$

Find the difference between the rectangle and the ellipses.

74. Area of heptagon minus area of circle:

$\dfrac{[7923(7)]^2}{\left(\tan\dfrac{180}{7}\right)28} - \left(\dfrac{7923}{2}\right)^2\pi$

79. $\left(\dfrac{651+1}{2}\right)^2$

This works when the sum is odd integers beginning with 1.