

SIGNIFICANT FIGURES CHEAT SHEET

ZEROS

- 1) Zeros between other nonzero digits are significant.
Ex. 103 and 1.03 have 3 sig. figs
- 2) Zeros in front of nonzero digits are not significant.
Ex. 0.0034 and 0.34 has 2 sig. figs
- 3) Zeros at the end of a number and to the right of the decimal are significant.
Ex. 64.00 and 640.0 has 4 sig. figs
- 4) Zeros at the end of a number with out a decimal are not significant.
Ex. 2400 and 240 have 2 sig. figs

ADDING AND SUBTRACTING – Least past rule

The answer should have the same number of digits to the right of the decimal as the number with the smallest amount of digits to the right of the decimal.

Ex. $97.3 + 5.85 = 103.15$ which rounds to 103.2 (1 decimal past)

MULTIPLYING AND DIVIDING – Least digits rule

The answer has the same number of significant figures as the number with the smallest amount of significant figures.

Ex. $123.0 * 5.35 = 658.05$ which rounds to 658 (3 sig. figs)

SIGNIFICANT FIGURES

Name _____

A measurement can only be as accurate and precise as the instrument that produced it. A scientist must be able to express the accuracy of a number, not just its numerical value. We can determine the accuracy of a number by the number of significant figures it contains.

- 1) All digits 1-9 inclusive are significant.
Example: 129 has 3 significant figures.
- 2) Zeros between significant digits are always significant.
Example: 5,007 has 4 significant figures.
- 3) Trailing zeros in a number are significant only if the number contains a decimal point.
Example: 100.0 has 4 significant figures.
100 has 1 significant figure.
- 4) Zeros in the beginning of a number whose only function is to place the decimal point are not significant.
Example: 0.0025 has 2 significant figures.
- 5) Zeros following a decimal significant figure are significant.
Example: 0.000470 has 3 significant figures.
0.47000 has 5 significant figures.

Determine the number of significant figures in the following numbers.

- | | |
|----------------|-------------------|
| 1. 0.02 _____ | 6. 5,000. _____ |
| 2. 0.020 _____ | 7. 6,051.00 _____ |
| 3. 501 _____ | 8. 0.0005 _____ |
| 4. 501.0 _____ | 9. 0.1020 _____ |
| 5. 5,000 _____ | 10. 10,001 _____ |

Determine the location of the last significant place value by placing a bar over the digit.
(Example: 1.700)

- | | |
|------------------------------|--------------------------------|
| 1. 8040 _____ | 6. 90,100 _____ |
| 2. 0.0300 _____ | 7. 4.7×10^8 _____ |
| 3. 699.5 _____ | 8. 10,800,000. _____ |
| 4. 2.000×10^2 _____ | 9. 3.01×10^{21} _____ |
| 5. 0.90100 _____ | 10. 0.000410 _____ |

Significant Figures and Errors of Measurement

I. Determine the number of significant figures in each of the following numbers:

- | | |
|---------------------------|------------------------------|
| 1. 5.432 g | 11. 2500 cm |
| 2. 40.319 g | 12. 2500.0 cm |
| 3. 146 cm ³ | 13. 1.04×10^{14} g |
| 4. 3.285 cm | 14. 3.58×10^{-9} nm |
| 5. 0.189 lb | 15. 48.57193 lb |
| 6. 429.3 g | 16. 8365.6 g |
| 7. 2873.0 cm ³ | 17. 0.002300 mg |
| 8. 99.9 mL | 18. 7.500×10^4 oz |
| 9. 0.000235 g | 19. 3.92×10^{-4} g |
| 10. 144 lb | 20. 1.000×10^3 lb |

II. Add:

- $12 \text{ cm} + 0.031 \text{ cm} + 7.969 \text{ cm} =$
- $0.085 \text{ cm} + 0.062 \text{ cm} + 0.14 \text{ cm} =$
- $3.419 \text{ g} + 3.912 \text{ g} + 7.0518 \text{ g} + 0.00013 \text{ g} =$
- $30.5 \text{ g} + 16.82 \text{ g} + 41.07 \text{ g} + 85.219 \text{ g} =$
- $143.0 \text{ cm} + 289.25 \text{ cm} + 68.45 \text{ cm} + 6.00 \text{ cm} =$
- $29.49 \text{ cm} + 83.46 \text{ cm} + 107.05 \text{ cm} + 26.618 \text{ cm} =$
- $0.0653 \text{ g} + 0.08538 \text{ g} + 0.07654 \text{ g} + 0.0432 \text{ g} =$
- $1.8 \times 10^{-5} \text{ cm} + 3.25 \times 10^{-4} \text{ cm} + 4.6 \times 10^{-5} \text{ cm} =$
- $63.489 \text{ mL} + 126.2 \text{ mL} + 68.85 \text{ mL} + 12.05 \text{ mL} =$
- $2.3 \times 10^2 \text{ g} + 4.62 \times 10^2 \text{ g} + 3.852 \times 10^2 \text{ g} =$

III. Subtract:

1. $41.025 \text{ cm} - 23.28 \text{ cm} =$

2. $289 \text{ g} - 43.7 \text{ g} =$

3. $145.63 \text{ mL} - 28.9 \text{ mL} =$

4. $62.47 \text{ g} - 39.9 \text{ g} =$

5. $40.008 \text{ mL} - 29.0941 \text{ mL} =$

IV. Multiply:

1. $2.89 \text{ cm} \times 4.01 \text{ cm} =$

2. $17.3 \text{ cm} \times 6.2 \text{ cm} =$

3. $3.08 \text{ m} \times 1.2 \text{ m} =$

4. $5.00 \text{ mm} \times 7.3216 \text{ mm} =$

5. $20.8 \text{ dm} \times 123.1 \text{ dm} =$

6. $5 \text{ cm} \times 5 \text{ cm} =$

7. $5.0 \text{ cm} \times 5 \text{ cm} =$

8. $5.0 \text{ cm} \times 5.0 \text{ cm} =$

9. $4.8 \times 10^2 \text{ m} \times 2.101 \times 10^3 \text{ m} =$

10. $9.13 \times 10^{-4} \text{ cm} \times 1.2 \times 10^{-3} \text{ cm} =$

11. $4.218 \text{ cm} \times 6.5 \text{ cm} =$

12. $150.0 \text{ m} \times 4.00 \text{ m} =$

13. $282.2 \text{ km} \times 3.0 \text{ km} =$

14. $14 \times 10^{-8} \text{ m} \times 3.25 \times 10^{-6} \text{ m} =$

15. $2.865 \times 10^6 \text{ m} \times 1.47 \times 10^3 \text{ m} =$

V. Divide:

1. $8.071 \text{ cm}^2 \div 4.216 \text{ cm} =$

2. $109.3758 \text{ m}^2 \div 5.813 \text{ m} =$

3. $24,789.4 \text{ km}^2 \div 43.5 \text{ km} =$

4. $6.058 \text{ mm}^2 \div 0.85 \text{ mm} =$

5. $4.819 \text{ cm}^2 \div 9.852 \text{ cm} =$

6. $139.482 \text{ m}^2 \div 68.75 \text{ m} =$

7. $4.23 \text{ m}^2 \div 18.941 \text{ m} =$

8. $85.621 \text{ km}^2 \div 8.05 \text{ km} =$

9. $6.023 \times 10^{14} \text{ mm}^2 \div 5.813 \times 10^{12} \text{ mm} =$

10. $1.142 \times 10^{-8} \text{ mm}^2 \div 8.5 \times 10^{-4} \text{ mm} =$

Significant figures: pp. 4-8

Group I.

- | | | | |
|------|-------|----------------|-------|
| 1. 4 | 6. 4 | 11. 2, 3, or 4 | 16. 5 |
| 2. 5 | 7. 5 | 12. 5 | 17. 4 |
| 3. 3 | 8. 3 | 13. 3 | 18. 4 |
| 4. 4 | 9. 3 | 14. 3 | 19. 3 |
| 5. 3 | 10. 3 | 15. 7 | 20. 4 |

Group II.

- | | |
|-------------|-----------------------------|
| 1. 20. cm | 6. 246.62 cm |
| 2. 0.29 cm | 7. 0.2704 g |
| 3. 14.383 g | 8. 3.89×10^{-4} cm |
| 4. 173.6 g | 9. 270.6 ml |
| 5. 506.7 cm | 10. 10.8×10^3 g |

Group III.

- | | |
|-------------|--------------|
| 1. 17.74 cm | 4. 22.6 g |
| 2. 245 g | 5. 10.914 mL |
| 3. 116.7 mL | |

Group IV.

- | | | |
|-------------------------|---|---|
| 1. 11.6 cm ² | 6. 20 cm ² | 11. 27 cm ² |
| 2. 110 cm ² | 7. 20 cm ² | 12. 600. m ² |
| 3. 3.7 m ² | 8. 25 cm ² | 13. 850 km ² |
| 4. 36.6 mm ² | 9. $10. \times 10^3$ m ² | 14. 46×10^{-14} m ² |
| 5. 2560 dm ² | 10. 11×10^{-7} cm ² | 15. 4.21×10^7 m ² |

ANSWERS

167

Group V.

- | | |
|--------------|-----------------------------|
| 1. 1.914 cm | 6. 2.029 m |
| 2. 18.82 m | 7. 0.223 m |
| 3. 570. km | 8. 10.6 km |
| 4. 7.1 mm | 9. 1.036×10^2 mm |
| 5. 0.4891 cm | 10. 1.3×10^{-1} mm |

Algebra Review

Solve for the unknown variable(s)

$$1) 3(x+5) = 7x + 2$$

$$2) 2x^2 + 9x - 12 = 14$$

$$3) \frac{1}{5} + \frac{1}{x} = \frac{1}{6}$$

$$4) \frac{15}{2x^2} = \frac{15}{5-x^2}$$

$$5) \frac{3(x+4)}{14} = \frac{84}{7(2x-4)}$$

$$6) 12(5x^2 - 32) = 3x - 7$$

$$7) \begin{aligned} -2.0y &= -6.0x^2 \\ 5.0 &= 8.0x - y \end{aligned}$$

$$8) \begin{aligned} 3x + y &= 12 \\ 10x + 2y &= 3 \end{aligned}$$

$$\begin{aligned} x - y - z &= 9 \\ 9) \quad 2.7x - z &= 1.2 \\ y + z &= -3.4 \end{aligned}$$

10) Solve for Δx in terms of θ , Δy , v_i and a . (Pretend they are numbers)

$$\Delta x = v_i (\cos \theta) \Delta t$$

$$\Delta y = \frac{1}{2} a \Delta t^2$$

This exercise's purpose is to see how well you can use your calculator. Enter in the numbers in the appropriate stops and type them into your calculator in **1 step**. Using the rules for sig figs, right down your answer.

$$V_i = 3.2 \quad a = 0.86 \quad \Delta t = 0.56$$

$$1) v_f = v_i + a\Delta t$$

$$\Delta x = 4.5 \quad \theta = 65^\circ \quad a = -9.81 \quad v_i = 13.8$$

$$6) \Delta y = \Delta x \tan \theta + \frac{1}{2} a \left(\frac{\Delta x}{v_i \cos \theta} \right)^2$$

$$V_i = 5.7 \quad \Delta t = 2.7 \quad a = 3.4$$

$$2) \Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$$

$$m = 1.2 \quad g = 9.81 \quad \theta = 19.2^\circ$$

$$7) T = \frac{mg}{\sin \theta}$$

$$V_i = 1.9 \quad a = 6.7 \quad \Delta x = 47.2$$

$$3) v_f = \sqrt{v_i^2 + 2a\Delta x}$$

$$m = 1.2 \quad g = 9.81 \quad \theta = 19.2^\circ \quad \phi = 25.7^\circ$$

$$8) T = \frac{mg}{\sin \theta + \cos \theta \tan \phi}$$

$$\Delta y = -15.3 \quad a = -9.81$$

$$4) \Delta t = \sqrt{\frac{2\Delta y}{a}}$$

$$m_1 = 230 \quad m_2 = 125 \quad \theta = 15^\circ$$

$$9) \mu = \frac{m_2 - m_1 \sin \theta}{m_1 \cos \theta}$$

$$V_i = 5.7 \quad \theta = 28^\circ \quad \Delta y = -1.2 \quad a = -9.81$$

$$5) \Delta x = v_i \sqrt{\frac{2\Delta y}{a}}$$

$$g = 9.81 \quad m_1 = 320 \quad m_2 = 195$$

$$10) a = \frac{g(m_1 - m_2)}{m_1 + m_2}$$

$g=9.81$ $m_1=320$ $m_2=195$ $\mu=0.15$ $\theta=24.6^\circ$

$$11) a = \frac{g(m_1 - m_2(\mu \cos \theta - \sin \theta))}{m_1 + m_2}$$

$k=8.99 \times 10^9$ $q_1=6.7 \times 10^{-6}$ $q_2=4.9 \times 10^{-6}$ $q_3=2.1 \times 10^{-6}$
 $r=.25$ $d=.48$

$$16) F = kq_1 \left(\frac{q_2}{r^2} + \frac{q_3}{(r+d)^2} \right)$$

$g=9.81$ $l=0.75$ $\theta=38.4^\circ$ $\mu=0.45$

$$12) v = \sqrt{2gl(\sin \theta - \mu \cos \theta)}$$

$f=15.5$ $q=23.7$

$$17) p = (f^{-1} - q^{-1})^{-1}$$

$g=9.81$ $m_1=320$ $m_2=195$ $h=1.46$

$$13) v = \frac{m_1 \sqrt{2gh}}{m_1 + m_2}$$

$G=6.67 \times 10^{-11}$ $r=3.84 \times 10^8$ $m=5.98 \times 10^{24}$

$$14) T = \frac{4\pi^2 r^3}{Gm}$$

$d=3.84 \times 10^8$ $m_1=5.98 \times 10^{24}$ $m_2=7.35 \times 10^{22}$

$$15) r = \frac{d\sqrt{m_1}}{\sqrt{m_1} + \sqrt{m_2}}$$