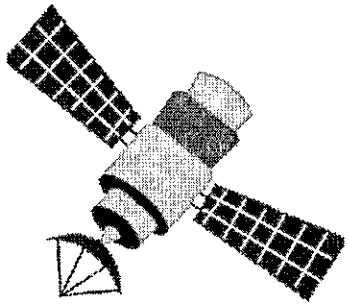
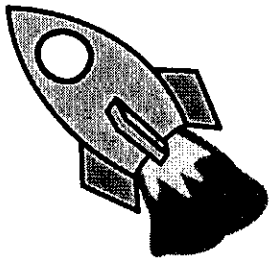
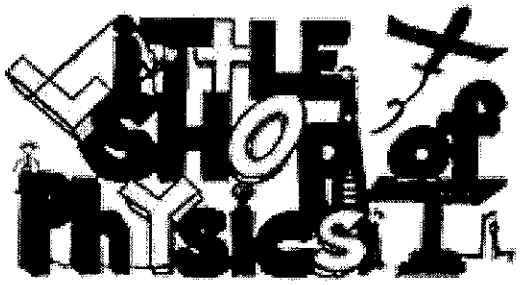


Physics



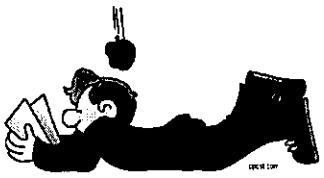
Physics 20

Skill Booklet



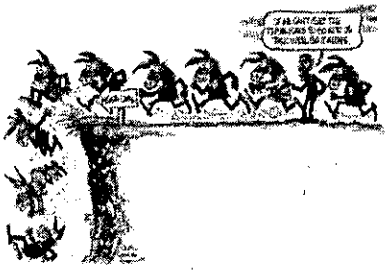
Name: Key

What is your reason for taking Physics 20?

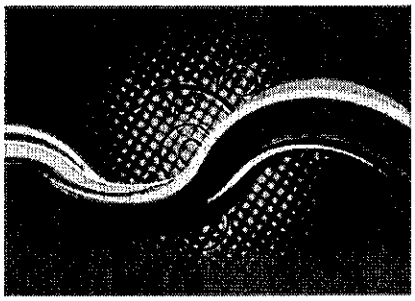


What is do you want to get from this class?

How do you plan to be successful?



If you could do anything, what would you do?



SI Units

International system of physical units (*SI Units*) based on the meter, kilogram, second, ampere, kelvin, candela, and mole, together with a set of prefixes to indicate multiplication or division by a power of ten.

Mass is measured in kg

Length is measured in m

Time is measured in s

Scientific Notation

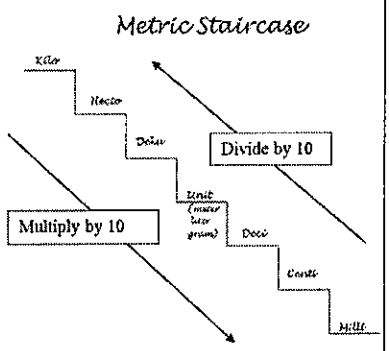
Scientific Notation is a way of writing numbers that are too big or too small to be conveniently written in decimal form. Scientific notation is commonly used in calculators and by scientists, mathematicians and engineers. Note the TI Calcualtors as **E** instead of ×10"

Decimal notation	Scientific notation
2	2×10^{0}
300	3×10^{2}
4,321.768	4.321768×10^{3}
−53,000	-5.3×10^{4}
6,720,000,000	6.72×10^{9}
0.2	2×10^{-1}
0.000 000 007 51	7.51×10^{-9}

Express the following in scientific notation

1. 4 320 000 4.32×10^{6}
2. 0.0048 4.8×10^{-3}
3. 43 200 4.32×10^{4}
4. 0.000065 6.5×10^{-5}
5. 18 500 000 000 1.85×10^{10}
6. 103 1.03×10^{2}
7. 15.3 1.53×10^{2}
8. 0.2058 2.058×10^{-1}

Conversions



Time

$$2.5 hours \times \frac{60\,\text{min}}{1 hr} \times \frac{60\,\text{sec}}{1\,\text{min}} = 9000\,\text{sec}$$

$$1 year \times \frac{365 days}{1 year} \times \frac{24 hours}{1 day} \times \frac{60\,\text{min}}{1 hr} \times \frac{60\,\text{sec}}{1\,\text{min}} = 31536000\,\text{sec}$$

Velocity

$$15 m/s \times \frac{1 km}{1000 m} \times \frac{3600 s}{1 hour} = 54 km/h$$

$$100 km/h \times \frac{1000 m}{1 km} \times \frac{1 hour}{3600 s} = 27.8 m/s$$

Convert the following

a. 35 mm = 0.035 m

b. 450 cm = 4.5 m

c. 1596 km = 1596 000 m

d. 1560 g = 1.56 kg

e. 543 mg = 0.000543 kg

f. 4 hours = 14 400 s $\quad \frac{4\,hr}{1} \times \frac{60\,min}{1\,hr} \times \frac{60\,s}{1\,min}$

g. 3 days = 259 200 s $\quad \frac{3\,days}{1} \times \frac{24\,hr}{1\,day} \times \frac{60\,min}{1\,hr} \times \frac{60\,s}{1\,min}$

h. 75 minutes = 4500 s $\quad 75\,min \times \frac{60\,s}{1\,min}$

i. 30 km/h = 8.3 m/s $\quad \frac{30\,km}{1\,hr} \times \frac{1000\,m}{1\,km} \times \frac{1\,hr}{60\,min} \times \frac{1\,min}{60\,s}$

j. 12.5 m/s = 45 km/h

$$\frac{12.5\,m}{s} \times \frac{1\,km}{1000\,m} \times \frac{60\,s}{1\,min} \times \frac{60\,min}{1\,h}$$

Significant Digits (Sig Digs)

- All non-zero digits are significant
- Zeros between non-zero digits are significant.
- Leading zeros are never significant.
- In a number with a decimal point, trailing zeros, those to the right of the first non-zero digit, are significant.
- In a number without a decimal point, trailing zeros may or may not be significant. More information through additional graphical symbols or explicit information on errors is needed to clarify the significance of trailing zeros.

Examples

Value	Sig Digs
91	2
101.1203	7
12.2300	6
0.00058	2
1300	4
5.56×10^{-4}	3
5.6×10^{8}	2

State the number of significant digits

Value	Sig Digs
563	3
9.0503	5
0.00698	3
5.00	3
9000	4
3.05×10^{4}	3
2.8×10^{-1}	2

Working with measurements

- ✓ **multiplication** and **division**, the calculated result should have as many significant figures as the *measured* number with the *least* number of significant figures. For example,

  $1.234 \times 2.0 = 2.468\ldots \approx 2.5$,

- ✓ **addition** and **subtraction**, the last significant <u>*decimal place*</u> (hundreds, tens, ones, tenths, and so forth) in the calculated result should be the same as the*leftmost* or largest *decimal place* of the last significant figure out of all the *measured* quantities in the terms of the sum. For example,

  $100.0 + 1.234 = 101.234\ldots \approx 101.2$

ALWAYS ROUND AT THE END OF EVERY CALCULATION

Complete the following and round to the correct amount of significant digits

1. $59.65\text{g} + 100.3\text{ g}$ (2) (1) $= 160.0\text{g}$
2. $432.2\text{ m} + 24.04\text{ m}$ (1) (2) $= 456.2\text{m}$
3. $12.5m \times 18m =$ (3) (2) $2.3 \times 10^2\ m^2$
4. $\dfrac{46.5 \times 12^2}{3.06} =$ (3) (3) 2.19×10^3
5. $\dfrac{(1.005 \times 10^{-4})(5.8 \times 10^{10})}{0.0020} =$ (4) (2) (2) 2.9×10^9

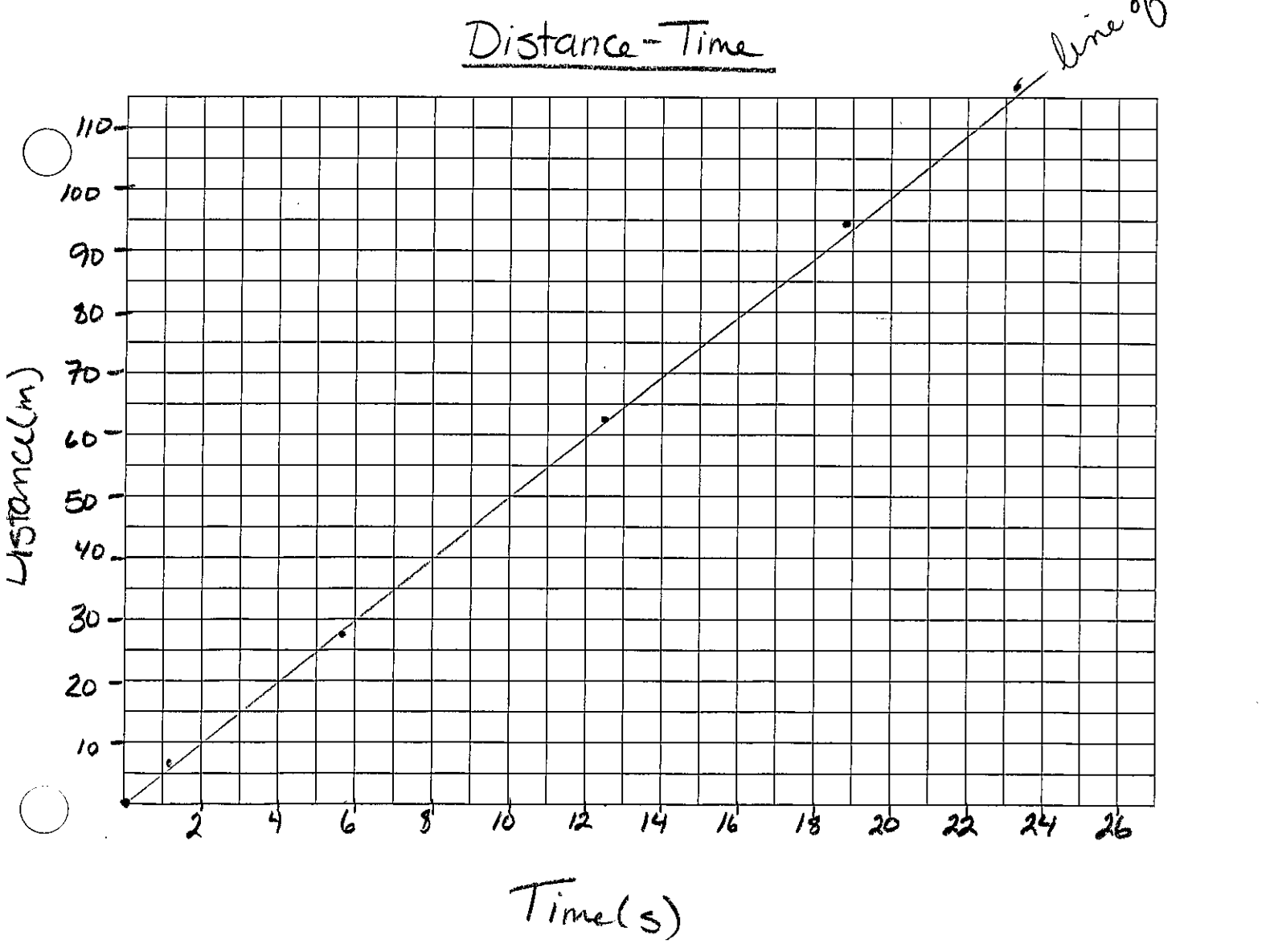
Graphing

When graphing data remember to always include the following

- a title
- label axes, include units
- uniform scale on the axes
- plot points; draw a line of best fit if needed.

Graph the following data and determine the slope of the line of best fir

Time (s)	Distance (m)
0.0	0.0
1.2	6.0
5.8	27.5
12.5	62.5
18.9	94.5
23.4	117



Solving Equations

Determine the value of x in the following equations.

1. $3x+18=3$ $3x=-15$ $\boxed{x=-5}$

2. $0.5x^2=162$ $x^2=324$ $\boxed{x=\pm 18}$

3. $\frac{13.6x}{3.8}=30.4$ $13.6x=115.52$ $\boxed{x\approx 8.5}$

Manipulating Equations

Isolating a specified variable in a formula, for example isolate the t in the distance formula

$$d=vt$$

$$\frac{d}{v}=t$$

Solve the following equations for the indicated variable.

a. $F=mg$ for m $\quad \frac{F}{g}=\frac{mg}{g}$ $\quad m=\frac{F}{g}$

b. $v=v_i+at$ for t $\quad -v_i \quad -v_i$ $\quad \frac{v-v_i}{a}=\frac{at}{a}$ $\quad t=\frac{v-v_i}{a}$

c. $v_f^2=v_i^2+2ad$ for a $\quad -v_i^2 \quad -v_i^2$ $\quad \frac{v_f^2-v_i^2}{2d}=\frac{2ad}{2d}$ $\quad a=\frac{v_f^2-v_i^2}{2d}$

d. $E_k=\left(\frac{1}{2}mv^2\right)2$ for v $\quad \frac{2E_k}{m}=\frac{mv^2}{m}$ $\quad v=\sqrt{\frac{2E_k}{m}}$