

Homework/Misc tips

- ① I will often send you emails from gmail - But you can just send notes to me @tcu.edu.
- ② Always show work (i.e. don't just write down answer.)
- ③ Whenever the rounding method is not specified, use standard rounding.

Operations with binary numbers.

• Addition $1_2 + 111_2 = 1000_2$

$$1 + 7 = 8$$

Decimals

$$\begin{array}{r} 973 \\ + 29 \\ \hline 1002 \end{array}$$

example: $1101 + 101111$

$$\begin{array}{r} 101111 \\ + 1101 \\ \hline 111100 \leftarrow \text{sum} \end{array}$$

(Think
 $1+1=10$
 $1+1=11$)

• Subtraction

$$\begin{array}{r} 1026 \\ - 834 \\ \hline 292 \\ \text{decimal} \end{array}$$

Binary $101001_2 - 11010_2 = ?$

$$\begin{array}{r} 0110101 \\ - 11010 \\ \hline 01111 \end{array}$$

$= 111_2$

Check:

$$\begin{array}{r} 11010 \\ + 111 \\ \hline 101001 \end{array}$$

Multiplication

decimal

$$\begin{array}{r} 125 \\ \times 37 \\ \hline 7 \rightarrow 875 \\ 30 \rightarrow 3750 \\ + \\ \hline 4625 \end{array}$$

binary

$$\begin{array}{r} 10111 \\ \times 110 \\ \hline 101110 \\ + 1011100 \\ \hline 10001010 \end{array}$$

$2 + 8 + 128 = 138$

division: Needed for $2.9 = \frac{29}{10}$

Eg. decimal.

$$\frac{41}{6} = ?$$

$$= 6 \frac{5}{6} = 6.8\overline{3}$$

$$\begin{array}{r} 6 \overline{) 41.0000} \\ \underline{48} \\ 20 \\ \underline{18} \\ 20 \end{array}$$

$\frac{2}{7} = ?$

Binary $\frac{41}{6} = 6 \frac{5}{6}$

$6 = 110_2$ $5 = 101_2$
 $6 = 110_2$

$\frac{5}{6} = ?$

$$\begin{array}{r} 110 \overline{) 1101.0000} \\ \underline{110} \\ 000 \\ \underline{110} \\ 100 \\ \underline{110} \\ 1000 \\ \underline{1100} \\ 100 \end{array}$$

$\frac{41}{6} = 110.1\overline{10}_2$

Significant Figures

4 significant figures means
4 digits in scientific notation

eg To round 2.4765×10^{-25} to 2 significant figures

$$\rightarrow 2.5 \times 10^{-25}$$

2 significant figures:

$$0.00265940 \rightarrow 0.0027$$

$$-48710 \rightarrow -49000$$

3 significant figures:

$$8792 \rightarrow 8790$$

$$0.0008792 \rightarrow 0.000879$$

$$-24,876.28311 \rightarrow -24900$$

binary

$$-1011.001_2$$

$$\rightarrow -1100_2$$

$$-1011.001_2$$

$$\rightarrow -1100_2$$

$$.0101_2$$

$$\rightarrow .0101_2$$

Similar to 2.999

$$= 3.00 \text{ to 3}$$

sig
digits

$$= 3.0 \text{ to 2 sig}$$

digits.

5 Rounding methods (According to IEEE 754 standard)

① Standard Rounding
"round to nearest, ties away from 0"

② Round to Nearest, ties to even
tie (.5 for decimals, .1 for binary) goes to the closest even number.

Examples

rounding to 3 digits

binary

17.25 → 17.2

17.35 → 17.4

17.3499 → 17.3

17.3501 → 17.4

17.25 is closest to both 17.2 and 17.3. 17.2 is even.

10.11 → 11.0

10.01 → 10.0

10.110001 → 11.0

10.101111 → 10.1

(10.1 + .1) / 11.0

③ Round toward 0 (truncation)

④ Ceiling ("round toward +∞")

⑤ Floor ("round toward -∞")

rounds to 1's place
⌈x⌉
⌊x⌋

eg Ceiling

-4.76213 to 4 places

→ -4.762

Floor -4.76213 to 4 places

→ -4.763

Floor -110.11₂ to 4 places

→ -111.0
