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ALGEBRA

the displacement, velocity and time can be expressed in the following formula:

$$\text{Displacement} = \text{Velocity} \times \text{Time}$$

LINEAR EQUATIONS

$$2x + 3 = 9$$

$$2x + \cancel{3} - \cancel{3} = 9 - 3$$

$$\frac{2x}{2} = \frac{6}{2}$$

$$x = 3$$

$$\frac{2x}{3} = 6$$

$$\cancel{(3)} \frac{2x}{\cancel{3}} = 6(3)$$

$$\frac{2x}{\cancel{2}} = \frac{18}{\cancel{2}}$$

$$x = 9$$

$$3w - 1 = 14$$

$$\frac{3w}{3} = \frac{15}{3}$$

$$w = 5$$

$$\cancel{(2)} \frac{4x}{\cancel{2}} = 8(2)$$

$$4x = 8 \times 2$$

$$\frac{4x}{\cancel{4}} = \frac{16}{\cancel{4}}$$

$$x = 4$$

QUADRATIC EQUATIONS



$$x^2 - 2x - 15$$

$$(x-5)(x+3)$$

$$x=5 \quad x=-3$$

$$x^2 + 5x + 6$$

$$(x+2)(x+3)$$

$$x=-2 \quad x=-3$$

$$x^2 - 2x - 8$$

$$(x-4)(x+2)$$

$$x=4, \quad x=-2$$

$$x^2 - 2x - 15$$

5+3=8
5-3=2

$$(x-5)(x+3)$$

$$x-5=0 \quad x+3=0$$

$$x=5 \quad x=-3$$

$$x^2 + 5x + 6$$

$$(x+2)(x+3)$$

$$x+2=0 \quad x+3=0$$

$$x=-2 \quad x=-3$$

SIMULTANEOUS EQUATIONS

$$\begin{array}{r} 2x + y = 4 \\ 2x - y = 0 \\ \hline \end{array}$$

$$\begin{array}{r} 4x = 4 \\ \hline 4 \quad 4 \end{array}$$

$$x = 1$$

step 2 solve for y

$$2(1) + y = 4$$

$$2 + y = 4$$

$$y = 4 - 2$$

$$y = 2$$

$$3x + 2y = 12$$

$$4x - y = 5$$

$$3x + 2y = 12$$

$$2(4x - y = 5)$$

$$3x + 2y = 12$$

$$8x - 2y = 10$$

$$\begin{array}{r} 11x = 22 \\ \hline 11 \quad 11 \end{array} \quad x = 2$$

$$\begin{array}{r} 2x + y = 4 \\ 2x - y = 4 \\ \hline \end{array}$$

$$\begin{array}{r} 2x = 4 \\ \hline 2 \quad 2 \end{array}$$

$$x = 2$$

$$2(2) - y = 4$$

$$4 - y = 4$$

$$4 - 4 = 4$$

$$0 = y$$

$$3(2) + 2y = 12$$

$$6 + 2y = 12$$

$$\begin{array}{r} 2y = 6 \\ \hline 2 \quad 2 \end{array}$$

$$y = 3$$

LOGARITHMS

$$\log_4 16 = 2$$
$$= 4^2 = 16$$

$$\log_4 16 = 2$$
$$4^2 = 16$$

$$\log_3 x = 9$$
$$= 3^9 = x$$

$$\log_3 x = 9$$
$$3^9 = x$$

$$\log_2 8 = x$$
$$2^x = 8$$

NUMBER BASES

THE BINARY NUMBER SYSTEM

Convert binary to decimal

Base = 2

$$\overline{1 \ 0 \ 1 \ 0 \ 0 \ 1 \ 0}_2 = D$$

$$1 \ 0 \ 1 \ 0_2 = D = 10_{10}$$

$\begin{array}{c} 1 \\ 2^3 \\ \parallel \\ 8 \\ \downarrow 1 \times 8 \end{array}$	$\begin{array}{c} 0 \\ 2^2 \\ \parallel \\ 4 \\ \downarrow 0 \times 4 \end{array}$	$\begin{array}{c} 1 \\ 2^1 \\ \parallel \\ 2 \\ \downarrow 1 \times 2 \end{array}$	$\begin{array}{c} 0 \\ 2^0 \\ \parallel \\ 1 \\ \downarrow 0 \times 1 \end{array}$
8	0	2	0
8 + 0 + 2 + 0			
= 10			

$\begin{array}{c} 1 \\ 2^5 \\ \parallel \\ 32 \end{array}$	$\begin{array}{c} 0 \\ 2^4 \\ \parallel \\ 16 \end{array}$	$\begin{array}{c} 1 \\ 2^3 \\ \parallel \\ 8 \end{array}$	$\begin{array}{c} 0 \\ 2^2 \\ \parallel \\ 4 \end{array}$	$\begin{array}{c} 1 \\ 2^1 \\ \parallel \\ 2 \end{array}$	$\begin{array}{c} 0 \\ 2^0 \\ \parallel \\ 1 \end{array}$
32	0	8	0	2	0
32 + 0 + 8 + 0 + 2 + 0					

$$1 \ 1 \ 0 \ 0 \ 0 \ 1_2 = D = 49_{10}$$

1	1	0	0	0	1
2^5	2^4	2^3	2^2	2^1	2^0
32	16	8	4	2	1
32 x 1	16 x 1	8 x 0	4 x 0	2 x 0	1 x 1

$$32 + 16 + 0 + 0 + 0 + 1 = 49_{10}$$

Convert octal to decimal

$$370_8 = D_{10} = 248_{10}$$

3	7	0
8^2	8^1	8^0
64	8	1
3×64	7×8	0×1
192	56	0
		192
		$+ 56$
		<u>248</u>

$$1071_8 = D_{10} = 569_{10}$$

1	0	7	1
8^3	8^2	8^1	8^0
512	64	8	1
1×512	0×64	7×8	1×1
$= 512$	$+ 0$	$+ 56$	$+ 1$
$= 569_{10}$			

Convert hexadecimal to decimal

A=10,B=11,C=12,D=13, E=14,F=15

$$23E_{16} = D_{10} = 574_{10}$$

$$\begin{array}{r}
 2 \\
 16^2 \\
 256 \\
 2 \times 256 + 16 \times 3 + 14 \times 1 = \\
 \begin{array}{r}
 2 \\
 \times 256 \\
 \hline
 512
 \end{array}
 +
 \begin{array}{r}
 3 \\
 \times 16 \\
 \hline
 48
 \end{array}
 + 14 = 574_{10}
 \end{array}$$

$$F7D_{16} = D$$

$$\begin{array}{r}
 F \\
 16^2 \\
 256 \\
 15 \times 256 + 16 \times 7 + 13 \times 1 = \\
 \begin{array}{r}
 15 \\
 \times 256 \\
 \hline
 3840
 \end{array}
 +
 \begin{array}{r}
 7 \\
 \times 16 \\
 \hline
 112
 \end{array}
 +
 \begin{array}{r}
 13 \\
 \times 1 \\
 \hline
 13
 \end{array}
 \end{array}$$

$$3840 + 112 + 13 = 3965$$

convert decimal to binary

$$26_{10} = B_2$$

$$26 = 11010$$

1	2	4	8	16	32
0	1	0	1	1	

←

$$14_{10} \text{ to } B_2 = 1110$$

1	2	4	8	16
0	1	1	1	

←

$$2 + 4 + 8 = 14$$

$$35_{10} \text{ to } B_2 = 100011$$

1	2	4	8	16	32	64
1	1	0	0	0	1	

←

Convert decimal to octal

$394_{10} \text{ to } \text{Octal}_8$

$$\begin{array}{r} 49 \\ \hline 8 \overline{) 394} \\ \underline{-32} \downarrow \\ 74 \\ \underline{-72} \\ 2 \end{array}$$

$$\begin{array}{r} 6 \\ \hline 8 \overline{) 49} \\ \underline{48} \\ 1 \end{array}$$

$$\begin{array}{r} 0 \\ \hline 8 \overline{) 0} \\ \underline{-0} \\ 6 \end{array}$$

Convert decimal to hexadecimal

$$860_{10} \text{ to Hex}_{16} = 35C$$

16 تدخل خمس مرات في 86

$$\begin{array}{r}
 16 \overline{) 860} \\
 \underline{80} \\
 60 \\
 \underline{48} \\
 12
 \end{array}$$

Arrows indicate: 860 ÷ 16 = 53 remainder 12. Then 53 ÷ 16 = 3 remainder 5.

- 16
- 32
- 48
- 64
- 80

$$\begin{array}{r}
 16 \overline{) 4813} \\
 \underline{48} \\
 13
 \end{array}$$

5

$$\begin{array}{r}
 16 \overline{) 3} \\
 \underline{0} \\
 3
 \end{array}$$

3

