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PROBLEM: 1

a. Age of a person (in years)
Data Type: int
Justification: Age is represented as a whole number, not a decimal value

b. Speed of light
Data Type: int
Justification: This is because ~~speed of light~~ the value of speed of light lies within the range of numbers that can be represented by int

c. Gender
Data Type: char
Justification: We can use single character to represent gender of a person, 'M' for male and 'F' for female.

d. Coordinates of a point
Data Type: float
Justification: Coordinates can be a decimal value

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e. Factorial of a number

Data Type: unsigned long long int

Justification: Factorial only works on integer values that's why int is used. As value of Factorial gets to a very large values suddenly, unsigned long long is used to increase the range of number that can be stored.

f. The number of plants in a region

Data Type: unsigned long int

Justification: ~~As~~ Number of trees can only be integer that's why int is used. As region is not defined, region can be very large with very large amount of trees so unsigned long is used.

g. Mass of an electron

Data Type: float

Justification: Mass of electron is 9.1×10^{-31} kg while float can represent numbers between 10^{-38} to 10^{38} so float can be used.

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PROBLEM : 2

a. If d is a float, then the operation d=2/7 would store 0.000000 in d.
Justification: As both 2 and 7 are integers, dividing 2 by 7 would also give integer which would be 0. But as d is a float, it will store 0 as 0.000000.

b. If x is an integer, then the expression x=-7%2-8 would evaluate to -9.
Justification: x=-7%2-8
x=-1-8
x=-9

c. If c=0, then the expression 5&&c!=8||!c would evaluate to 1.
Justification: Any non-zero value is true and zero is false.
5&&0!=8||!0
&& has highest precedence in this expression
0!=8||!0
0!=8||1
0!=True||True
0!=1
1

d. The expression $a=b=c=3+4$ would evaluate to: a = 7 , b = 7 , c = 7 .

Justification: $a=b=c=3+4$

$a=b=c=7$

$c=7$

$b=c$

$b=7$

$a=b$

$a=7$

$a=7, b=7, c=7$

e. The expression $y=z=-3\%-8/2+7$ would evaluate to: y = 6 , z = 6 .

Justification: $y=z=-3\%-8/2+7$

$y=z=-3/2+7$

$y=z=-1+7$

$y=z=6$

$z=6$

$y=z$

$y=6$

$y=6, z=6$

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PROBLEM: 5

a. OUTPUT:

$w = 1 \quad x = 0 \quad y = 1 \quad z = 1$

Justification:

$W = i \,||\, j \,||\, K$

$w = 4 \,||\, -1 \,||\, 0$

Non zero value: True , Zero: False

$w = 1 \,||\, 0$

$w = 1$

$x = i \,\&\&\, j \,\&\&\, K$

$x = 4 \,\&\&\, -1 \,\&\&\, 0$

$x = 1 \,\&\&\, 0$

$x = 0$

$y = i \,||\, j \,\&\&\, K$

$y = 4 \,||\, -1 \,\&\&\, 0$ → && has higher precedence than ||

$y = 4 \,||\, 0$

$y = 1$

$z = i \,\&\&\, j \,||\, K$

$z = 4 \,\&\&\, -1 \,||\, 0$

$z = 1 \,||\, 0$

$z = 1$

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b. OUTPUT: 0 2 0.000000 2.000000

Justification:

K = i/j * j
K = 2/3 * 3
K = 0 * 3
K = 0

As K is an int, it will store 0

l = j/i * i
l = 3/2 * 2
l = 1 * 2
l = 2

As l is an int, ~~to~~ it will store 2

a = i/j * j
a = 2/3 * 3
a = 0 * 3
a = 0

As a is a float, it will store 0.000000

b = j/i * i
b = 3/2 * 2
b = 1 * 2
b = 2

As b is a float, it will store 2.000000

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c. OUTPUT: a = 1
b = 0.000000

Justification:

m = -3%2 != !3 → non-zero value: True
m = -3%2 != 0
m = -1 != 0
m = 1

n = -3*10.5/2 -3
n = -31.5/2 -3
n = -15.75 -3
n = -18.75
As n is an int, it will store -18
But since the format specifier used to print value of n is %f, %f is expecting a value of data type double or a float but the value passed is of data type int. As this behaviour is undefined, program will print n as 0.000000