

PROBLEM SET 1

Arithmetic Operations and Expressions

1. Which of the following are valid variable names? Explain why the others are invalid.

| | |
|--------------------|---------|
| NAME | maaş |
| 7DOWN | return |
| thisisaverylongone | IF |
| time&place | MAAS |
| my_name | xyz123 |
| Ankara,TURKEY | his age |

2. Indicate the data type for each of the following values.

- a) '='
- b) -18.00
- c) 0
- d) '0'
- e) 0.0
- f) 150E5

3. Write the equivalent arithmetic expression for each of the following algebraic formulas.

a) $a^3 + \left(a - \frac{2b}{a+b}\right)^2$

b) $\frac{1}{2} \sqrt{x} + y^2 \frac{x-1}{x+1}$

c) $a b + \frac{3 a^2 d}{c} - c$
 $b + \frac{\quad}{d - a}$

d) $a + b - \frac{1 - |a|}{1 + b} + (a - 2b)^5$

e) $\frac{x+1}{y - 2xy \frac{|1 - xy^{10}|}{x+2y}}$

4. Write the equivalent algebraic formulas for the following arithmetic expressions.

- a) $(a + b) / (2 * c - d) + (a * b / c)$
- b) $(5 * \text{pow}(a, 2) - 3 * b) / (c + b / 3 * (1 - \text{sqrt}(a * c)))$
- c) $(a + 3 * b) / (d - 2 * d * (a * a / (c * (1 + a * d))))$
- d) $(2 * a * a - 4 * b) / (a + b / 2 * (a + 1)) + c * a$
- e) $(a + 1) / (b - 3 * b * d * d / (2 * (1 - a * a * \text{abs}(d))))$

5. Find the results of the arithmetic expressions in question 4, using the following values for a, b, c, and d. Show each step of calculation clearly.

$$\begin{array}{ll} a = 2 & c = 0.5 \\ b = 5 & d = -1 \end{array}$$

6. Find the results of the following arithmetic expressions. Show each step of calculation clearly.

- a) $((25 / 2.0 - 0.5) * 3 + 4) / 100 * 2$
- b) $100 / 5 / 2 + 2 * 6 / 5 * 100.0$
- c) $4 / (3 + 1 / (5 - 7 / 3 - 2))$
- d) $3.0 * (3 + 5 / 3) / (5 * 3.0 / 2 + 11 / 2.0)$
- e) $5 * 0.2 / (3.0 + (5 - 3.0) / 2) - 7 / 5 + 3.0$

7. Analyze the following problems and draw a flowchart for each of them.

- a) Given the amount of dollars you have, calculate how much Turkish Liras it makes. (just google for the rates.)
- b) Given the amount of Turkish Liras you have, calculate how much Dollars or how much Euros you can buy with it.
- c) Given a length in feet, convert it into millimeters. (1 foot = 12 inches, 1 inch = 2.54 cm)
- d) Given a temperature in degrees Fahrenheit (F), convert it into degrees Centigrade (C) using the formula:

$$C = \frac{F - 32}{1.8}$$

- e) Given a temperature in degrees Centigrade (C), convert it into degrees Fahrenheit (F).
- f) Given a temperature in degrees Kelvin (K), convert it into degrees Rankine (R).
($K = 273 + C$, $R = 512 + F$)
- g) Calculate the area and the perimeter of a circle, given its diameter. ($\pi = 3.1416$)
Area of a circle = πr^2
Perimeter of a circle = $2 \pi r$

- h) Calculate the volume and the surface area of a cylinder, using the following formulas. (Note: You should decide which values must be given as input to solve this problem.)

$$\text{Volume} = \pi r^2 h$$

$$\text{Surface Area} = 2 \pi r^2 + 2 \pi r h$$

- i) Take a quantity given in TL and find the VAT (KDV) for this amount if VAT rate is 8%.
- j) Given the cost of an item in TL, display the amount of VAT you have to pay for it, and the cost of the item with VAT, if percentage of the VAT for that item is 12%.
- k) Given the marks a student got from Midterm 1, Midterm 2 and Final Exam of a course, calculate the average grade of that student.
- l) Solve the previous problem (k) again, but this time calculate the weighted average grade of that student, so that, Midterm 1 forms 25%, Midterm 2 forms 30%, and the Final Exam forms 45% of his grade.
- m) Given a distance in meters and the speed of a car in km/h, calculate how many seconds it will take for that car to travel that distance.
- n) A car traveling down a road approaches an intersection and slows down from a high speed to a lower speed in a certain time. Calculate the car's constant rate of acceleration, using the following formula. (Note: You should decide which values must be given as input to solve this problem.)

$$a = \frac{v_f - v_i}{t} \quad \text{where} \quad \begin{array}{l} v_f : \text{final velocity (speed)} \\ v_i : \text{initial velocity} \\ t : \text{time} \end{array}$$

- o) The cost to the consumer of a new car is the sum of the wholesale cost of the car, the dealer's percentage markup, and the state sales tax (applied to the markup price). Assuming a dealer's markup of 12 percent and a sales tax of 6 percent, calculate the consumer's cost given the wholesale cost of the car he buys.
- p) A Real Estate Agency pays its sales staff a salary of \$400 per month plus a commission of \$50 for each piece of real estate they sell plus 1 percent of the value of the sale. Compute and display a salesperson's salary given the number and the total value of sales he made in that month.
- q) Given a three digit integer, display each of its digits separately. For example, if the given integer is 357, the output should be 3 5 7.
- r) Given a distance in meters, display it in meters, centimeters and milimeters.
e.g. if the given distance is 34.468 m, display it as
34 meters 46 cm 8 mm
- s) Given a time duration in minutes, display this time duration in days, hours and minutes.
e.g. if the given duration is 3550 min., display it as
2 days 11 hours 10 min

8. Write a Java application/program for each of the problems in Question 7.