Assignment description:

Complete 3 simple tasks in Pascal. These assignments will test your basic programming skills. Basic knowledge of console input/output methods, loops and if-else constructions is required.

Task 1 “Deposit”:

Write a program to manage and evaluate the deposit. Ask the user to enter the initial balance, annual rate and deposit duration (in years). The program should output card balance at the end of the deposit term.

Solution:

```
program Deposit;
var balance, rate : real;
    num_of_years, i : integer;
begin
  write('Enter the initial balance: $');
  readln(balance);
  write('Enter the annual rate (%): ');
  readln(rate);
  write('Enter the deposit duration in years: ');
  readln(num_of_years);
  for i := 1 to num_of_years do
    balance := balance * (rate / 100 + 1);
  writeln ('Your balance after ', num_of_years,' years is: $', balance:0:2 );
end.
```

Output:

Enter the initial balance: $1000

Enter the annual rate (%): 10

Enter the deposit duration in years: 2

Your balance after 2 years is: $1210.00

Enter the initial balance: $2500

Enter the annual rate (%): 12.5

Enter the deposit duration in years: 5

Your balance after 2 years is: $4505.08

Task 2 "Archimedes' principle:

Archimedes' principle states that "any object, wholly or partially immersed in a fluid, is buoyed up by a force equal to the weight of the fluid displaced by the object". That's why some objects can float in water and some objects sink. The Archimedes' principle tells us whether the body sinks or it floats (and what part of the body is actually hidden beneath the surface). For example, we know that 9/10 of iceberg is hidden as normally the density of water is $\sim 1000\ kg/m^3$ and the density of ice is $\sim 900\ kg/m^3$. Write a program that asks the density of the fluid and the density of the body and tells whether the body sinks or floats. If the body floats the program should output the exact part (in percent) of submerged part. For more details read the article on Wikipedia:

http://en.wikipedia.org/wiki/Archimedes'_principle

Solution:

```
program ArhimedesPrinciple;
var fluid_density, body_density : integer;
    submerged : real;
begin
  write('Enter the density of the fluid: ');
  readln(fluid_density);
  write('Enter the density of the body: ');
  readln(body_density);
  if fluid_density < body_density then writeln ('The body sinks!');
  else
  begin
```

```
    submerged := body_density / fluid_density * 100;
    writeln ('The body floats! Its submerged part is ', submerged:0:2,'%');
  end;
end.
```

Output:

Enter the density of the fluid: 1000

Enter the density of the body: 900

The body floats! Its submerged part is 90.00%

Enter the density of the fluid: 1000

Enter the density of the body: 2000

The body sinks!

Task 3 "Perfect numbers":

The number is called "perfect" if it is equal to the sum of its divisors (for example, 1, 2 and 3 are divisors of 6 and $1 + 2 + 3 = 6$, so 6 is a perfect number). Write a program that finds all perfect numbers from the range $[1, N]$ where N is the input parameter.

Solution:

```
program PerfectNumbers;
var sum_of_divisors, i, divisor, N : integer;
begin
  write ('Enter the upper bound of the range: ');
  read (N);
  writeln('Perfect numbers:');
  writeln('1');
  for i := 1 to N do
  begin
```

```
    sum_of_divisors := 0;
    for divisor := 1 to i - 1 do
    begin
      if (i mod divisor)=0 then sum_of_divisors := sum_of_divisors + divisor;
    end;
    if i = sum_of_divisors then writeln(i);
  end;
end.
```

Output:

Enter the upper bound of the range: 10

Perfect numbers:

1

6

Enter the upper bound of the range: 100

Perfect numbers:

1

6

28

Enter the upper bound of the range: 1000

Perfect numbers:

1

6

28

496