In [ ]:
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Computational Mathematic Lab 1. Horner's Scheme
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```

In [2]:
```
# Exercise 1)
def calculate_values_rectangle(height:int, width:int) -> tuple[float]:
    import math
    area = height * width
    perimeter = 2 * (height + width)
    diagonal_length = math.sqrt(height**2 + width**2)

    return (
        area,
        perimeter,
        diagonal_length
    )


def calculate_values_circle(radius:int) -> tuple[float]:
    import math
    area = math.pi * radius**2
    circle_circumference = 2 * math.pi * radius

    return (
        area,
        circle_circumference
    )


def calculate_values_right_triangle(length:int) -> tuple[float]:
    import math
    area = math.sqrt(3)/4 * length**2
    perimeter = 3*length

    return (
        area,
        perimeter
    )


def calculate_values_regular_polygon(number: int, length: int) -> tuple[float, float, float, float]:
    import math

    outer_angle = 360 / number
    inner_angle = 180 - outer_angle
    inner_angles_sum = (number - 2) * 180
    area = (number * length ** 2) / (4 * math.tan(math.pi / number))

    return (
        outer_angle,
        inner_angles_sum,
        inner_angle,
        area
    )
```

In [3]:
```
rectangle = {
    "height":2,
    "width":3
}
circle = {
    "radius":2
}
right_triangle = {
    "length":1
}
regular_polynom = {
    "number of sides":8,
    "length of sides":5
}
print("""
The area of a rectangle with height {rect[height]} and width {rect[width]} is {0}
The perimeter of a rectangle with height {rect[height]} and width {rect[width]} is {1}
The diagonal length of a rectangle with height {rect[height]} and width {rect[width]} is {2}
""".format(*calculate_values_rectangle(*rectangle.values()), rect=rectangle))


print("""
The area of a circle with radius {circ[radius]} is {0}
The circumference of a circle with radius {circ[radius]} is {1}
""".format(*calculate_values_rectangle(*rectangle.values()), circ=circle))
```

```
print("""
The area of a right triangle with length {tri[length]} is {0}
The perimeter of a right triangle with length {tri[length]} is {1}
""".format(*calculate_values_rectangle(*rectangle.values()), tri=right_triangle))


print("""
The exterior angle of a regular polygon with {poly[number of sides]} sides and {poly[length of sides]} side leng
The sum of the interior angles of a regular polygon with {poly[number of sides]} sides and {poly[length of sides
The interior angle of a regular polygon with {poly[number of sides]} sides and {poly[length of sides]} side leng
The area of a regular polygon with {poly[number of sides]} sides and {poly[length of sides]} side length is {3}
""".format(*calculate_values_regular_polygon(*regular_polynom.values()), poly=regular_polynom))
```

```
The area of a rectangle with height 2 and width 3 is 6
The perimeter of a rectangle with height 2 and width 3 is 10
The diagonal length of a rectangle with height 2 and width 3 is 3.605551275463989


The area of a circle with radius 2 is 6
The circumference of a circle with radius 2 is 10


The area of a right triangle with length 1 is 6
The perimeter of a right triangle with length 1 is 10


The exterior angle of a regular polygon with 8 sides and 5 side length is 45.0
The sum of the interior angles of a regular polygon with 8 sides and 5 side length is 1080
The interior angle of a regular polygon with 8 sides and 5 side length is 135.0
The area of a regular polygon with 8 sides and 5 side length is 120.71067811865476
```

In [12]:
```
# Exercise 2)
def  buy_card(value: int) -> int:
    match value:
        case value if value < 0:
            return 0
        case value if value < 10:
            return value
        case value if value < 25:
            return value + 3
        case value if value < 50:
            return value + 8
        case value if value < 100:
            return value + 20
        case value if value >= 100:
            return value + 25
```

In [13]:
```
test_values = [-5, 9, 24, 49, 99, 100, 150]

for value in test_values:
    charged_value = buy_card(value)
    print(f"Your card was charged {value} dollars, and you got {charged_value} dollars in your calling card.")
```

```
Your card was charged -5 dollars, and you got 0 dollars in your calling card.
Your card was charged 9 dollars, and you got 9 dollars in your calling card.
Your card was charged 24 dollars, and you got 27 dollars in your calling card.
Your card was charged 49 dollars, and you got 57 dollars in your calling card.
Your card was charged 99 dollars, and you got 119 dollars in your calling card.
Your card was charged 100 dollars, and you got 125 dollars in your calling card.
Your card was charged 150 dollars, and you got 175 dollars in your calling card.
```

In [5]:
```
# Exercise 3)
def multiply(a:int, b:int):
    result = 0
    while a > 0:
        if a%2==1:
            result += b
        a //= 2
        b *= 2
    return result


def recursive_miltiply(a,b):
    if a==0:
        return 0
    elif a % 2==0:
        return recursive_miltiply(a/2, 2*b)
    else:
        return recursive_miltiply((a-1)/2, 2 * b) + b

a = 8
b =38
```

```
print(f"Russian peasant multiplication of {a} and {b} is equal {multiply(a,b)}",end='\n\n')
print(f"Recursive multiplication of {a} and {b} is equal {multiply(a,b)}")
```

```
Russian peasant multiplication of 8 and 38 is equal 304

Recursive multiplication of 8 and 38 is equal 304
```

In [ ]: