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## Sample Answer for Programming Assignment Unit 5

### Python Program

```
import math

def mysqrt(a):
    x = a
    while True:
        y = (x + a/x) / 2.0
        if y == x:
            break
        x = y
    return x

def test_square_root():
    a = 1
    while a < 26:
        mine = mysqrt(a)
        maths = math.sqrt(a)
        print("a =", a, "| mysqrt(a) =", mine, "| math.sqrt(a) =", maths, "| diff =", abs(mine-maths))
        a = a + 1

test_square_root()
```

### Output for Python 3

```
a = 1 | mysqrt(a) = 1 | math.sqrt(a) = 1.0 | diff = 0.0
a = 2 | mysqrt(a) = 1.414213562373095 | math.sqrt(a) = 1.4142135623730951 | diff = 2.220446049250313e-16
a = 3 | mysqrt(a) = 1.7320508075688772 | math.sqrt(a) = 1.7320508075688772 | diff = 0.0
a = 4 | mysqrt(a) = 2.0 | math.sqrt(a) = 2.0 | diff = 0.0
a = 5 | mysqrt(a) = 2.23606797749979 | math.sqrt(a) = 2.23606797749979 | diff = 0.0
a = 6 | mysqrt(a) = 2.449489742783178 | math.sqrt(a) = 2.449489742783178 | diff = 0.0
a = 7 | mysqrt(a) = 2.6457513110645907 | math.sqrt(a) = 2.6457513110645907 | diff = 0.0
a = 8 | mysqrt(a) = 2.82842712474619 | math.sqrt(a) = 2.8284271247461903 | diff = 4.440892098500626e-16
a = 9 | mysqrt(a) = 3.0 | math.sqrt(a) = 3.0 | diff = 0.0
```

```

a = 10 | mysqrt(a) = 3.162277660168379 | math.sqrt(a) =
3.1622776601683795 | diff = 4.440892098500626e-16
a = 11 | mysqrt(a) = 3.3166247903554 | math.sqrt(a) =
3.3166247903554 | diff = 0.0
a = 12 | mysqrt(a) = 3.4641016151377544 | math.sqrt(a) =
3.4641016151377544 | diff = 0.0
a = 13 | mysqrt(a) = 3.6055512754639896 | math.sqrt(a) =
3.605551275463989 | diff = 4.440892098500626e-16
a = 14 | mysqrt(a) = 3.7416573867739413 | math.sqrt(a) =
3.7416573867739413 | diff = 0.0
a = 15 | mysqrt(a) = 3.872983346207417 | math.sqrt(a) =
3.872983346207417 | diff = 0.0
a = 16 | mysqrt(a) = 4.0 | math.sqrt(a) = 4.0 | diff = 0.0
a = 17 | mysqrt(a) = 4.123105625617661 | math.sqrt(a) =
4.123105625617661 | diff = 0.0
a = 18 | mysqrt(a) = 4.242640687119286 | math.sqrt(a) =
4.242640687119285 | diff = 8.881784197001252e-16
a = 19 | mysqrt(a) = 4.358898943540673 | math.sqrt(a) =
4.358898943540674 | diff = 8.881784197001252e-16
a = 20 | mysqrt(a) = 4.47213595499958 | math.sqrt(a) =
4.47213595499958 | diff = 0.0
a = 21 | mysqrt(a) = 4.58257569495584 | math.sqrt(a) =
4.58257569495584 | diff = 0.0
a = 22 | mysqrt(a) = 4.69041575982343 | math.sqrt(a) =
4.69041575982343 | diff = 0.0
a = 23 | mysqrt(a) = 4.795831523312719 | math.sqrt(a) =
4.795831523312719 | diff = 0.0
a = 24 | mysqrt(a) = 4.898979485566356 | math.sqrt(a) =
4.898979485566356 | diff = 0.0
a = 25 | mysqrt(a) = 5.0 | math.sqrt(a) = 5.0 | diff = 0.0

```

## Output for Python 2

```

('a =', 1, '| mysqrt(a) =', 1, '| math.sqrt(a) =', 1.0, '|
diff =', 0.0)
('a =', 2, '| mysqrt(a) =', 1.414213562373095, '|
math.sqrt(a) =', 1.4142135623730951, '| diff =',
2.220446049250313e-16)
('a =', 3, '| mysqrt(a) =', 1.7320508075688772, '|
math.sqrt(a) =', 1.7320508075688772, '| diff =', 0.0)
('a =', 4, '| mysqrt(a) =', 2.0, '| math.sqrt(a) =', 2.0,
'| diff =', 0.0)
('a =', 5, '| mysqrt(a) =', 2.23606797749979, '|
math.sqrt(a) =', 2.23606797749979, '| diff =', 0.0)
('a =', 6, '| mysqrt(a) =', 2.449489742783178, '|
math.sqrt(a) =', 2.449489742783178, '| diff =', 0.0)

```

```
('a =', 7, '|' mysqrt(a) =', 2.6457513110645907, '|'
math.sqrt(a) =', 2.6457513110645907, '|' diff =', 0.0)
('a =', 8, '|' mysqrt(a) =', 2.82842712474619, '|'
math.sqrt(a) =', 2.8284271247461903, '|' diff =',
4.440892098500626e-16)
('a =', 9, '|' mysqrt(a) =', 3.0, '|' math.sqrt(a) =', 3.0,
'| diff =', 0.0)
('a =', 10, '|' mysqrt(a) =', 3.162277660168379, '|'
math.sqrt(a) =', 3.1622776601683795, '|' diff =',
4.440892098500626e-16)
('a =', 11, '|' mysqrt(a) =', 3.3166247903554, '|'
math.sqrt(a) =', 3.3166247903554, '|' diff =', 0.0)
('a =', 12, '|' mysqrt(a) =', 3.4641016151377544, '|'
math.sqrt(a) =', 3.4641016151377544, '|' diff =', 0.0)
('a =', 13, '|' mysqrt(a) =', 3.6055512754639896, '|'
math.sqrt(a) =', 3.605551275463989, '|' diff =',
4.440892098500626e-16)
('a =', 14, '|' mysqrt(a) =', 3.7416573867739413, '|'
math.sqrt(a) =', 3.7416573867739413, '|' diff =', 0.0)
('a =', 15, '|' mysqrt(a) =', 3.872983346207417, '|'
math.sqrt(a) =', 3.872983346207417, '|' diff =', 0.0)
('a =', 16, '|' mysqrt(a) =', 4.0, '|' math.sqrt(a) =', 4.0,
'| diff =', 0.0)
('a =', 17, '|' mysqrt(a) =', 4.123105625617661, '|'
math.sqrt(a) =', 4.123105625617661, '|' diff =', 0.0)
('a =', 18, '|' mysqrt(a) =', 4.242640687119286, '|'
math.sqrt(a) =', 4.242640687119285, '|' diff =',
8.881784197001252e-16)
('a =', 19, '|' mysqrt(a) =', 4.358898943540673, '|'
math.sqrt(a) =', 4.358898943540674, '|' diff =',
8.881784197001252e-16)
('a =', 20, '|' mysqrt(a) =', 4.47213595499958, '|'
math.sqrt(a) =', 4.47213595499958, '|' diff =', 0.0)
('a =', 21, '|' mysqrt(a) =', 4.58257569495584, '|'
math.sqrt(a) =', 4.58257569495584, '|' diff =', 0.0)
('a =', 22, '|' mysqrt(a) =', 4.69041575982343, '|'
math.sqrt(a) =', 4.69041575982343, '|' diff =', 0.0)
('a =', 23, '|' mysqrt(a) =', 4.795831523312719, '|'
math.sqrt(a) =', 4.795831523312719, '|' diff =', 0.0)
('a =', 24, '|' mysqrt(a) =', 4.898979485566356, '|'
math.sqrt(a) =', 4.898979485566356, '|' diff =', 0.0)
('a =', 25, '|' mysqrt(a) =', 5.0, '|' math.sqrt(a) =', 5.0,
'| diff =', 0.0)
```