# Testskemaer

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## 1 Vector - klassen

Der bliver i testene taget udgangspunkt i vektorerne test0, test1 og test2, samt tallene (double) amount0 og amount 1.

$$test0 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, test1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, test2 = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

$$amount0 = 1$$

$$amount1 = -1$$

Tests :

1 - Test 1 for add(vector) metoden - test0 + test1

2 - Test 2 for add(vector) metoden - test0 + test2

3 - Test 1 for mul(double) metoden - test2.mul(amount0)

4 - Test 2 for mul(double) metoden - test2.mul(amount1)

5 - Test 1 for sub(vector) metoden - test2 - test0

6 - Test 2 for sub(vector) metoden - test2 - test2

7 - Test 1 for length() metoden - test2.length

| Test nr. | Forventet resultat | Aktuelt resultat | Konklusion |
|---|---|---|---|
| 1 | Vector(2, 2, 2) | Vector(2, 2, 2) | true |
| 2 | Vector(2, 3, 4) | Vector(2, 3, 4) | true |
| 3 | Vector(1, 2, 3) | Vector(1, 2, 3) | true |
| 4 | Vector(-1, -2, -3) | Vector(-1, -2, -3) | true |
| 5 | Vector(0, 1, 2) | Vector(0, 1, 2) | true |
| 6 | Vector(0, 0, 0) | Vector(0, 0, 0) | true |
| 7 | 3.741657 | 3.741657 | true |

Udskrift fra kørsel af (Vector)Unittest :

```
Tests for the add(vector) method!
Test 1 for the add(vector) method in the vector class
test0 + test1
Expected result:
[ 2.0 ]
[ 2.0 ]
[ 2.0 ]
Actual result:
[ 2.0 ]
[ 2.0 ]
[ 2.0 ]
Conclusion : true
```

```
Test 2 for the add(vector) method in the vector class
test0 + test2
Expected result:
[ 2.0 ]
[ 3.0 ]
[ 4.0 ]
Actual result:
[ 2.0 ]
[ 3.0 ]
[ 4.0 ]
Conclusion: true
```

```
Tests for the mul(double) method!
Test 1 for the mul(double) method in the vector class
test2 * amount0
Expected result:
[ 1.0 ]
[ 2.0 ]
[ 3.0 ]
Actual amount:
[ 1.0 ]
[ 2.0 ]
[ 3.0 ]
Conclusion: true
```

```
Test 2 for the mul(double) method in the vector class
test2 * amount1
Expected result:
[ -1.0 ]
[ -2.0 ]
[ -3.0 ]
Actual amount:
[ -1.0 ]
[ -2.0 ]
[ -3.0 ]
Conclusion: true
```

```
Tests for the sub(vector) method!
Test 1 for the sub(vector) method in the vector class
test2 - test0
Expected result:
[ 0.0 ]
[ 1.0 ]
[ 2.0 ]
Actual amount:
[ 0.0 ]
[ 1.0 ]
[ 2.0 ]
Conclusion: true
```

```
Test 2 for the sub(vector) method in the vector class
test2 - test2
Expected result:
[ 0.0 ]
[ 0.0 ]
[ 0.0 ]
Actual amount:
[ 0.0 ]
[ 0.0 ]
[ 0.0 ]
Conclusion: true
```

```
Tests the length method!
Test 1 for the length method in the vector class
test2.length
Expected result:
3.7416573867739413
Actual amount:
3.7416573867739413
Conclusion: true
```

## 2 Body - klassen

Der bliver i de følgende tests taget udgangspunkt i jordens og solens start position, hastighed og acceleration. Startpositionerne er:

$$sunP = \begin{bmatrix} -1.284282111761733E-03 \\ -2.455154076901959E-03 \\ -4.207238483437137E-05 \end{bmatrix}, earthP = \begin{bmatrix} -1.813068419866209E-01 \\ 9.642197733507970E-01 \\ -6.850809238551276E-05 \end{bmatrix}$$

Da metoden der bliver brugt er enormt upræcis, ses koordinater som værene ens hvis deres værdier trukket fra hinanden er mindre end 0.01
Tests:

1 - Test 1 for update(double, Body) metoden - Earths position efter 31 timesteps på 1; altså 31 dage

2 - Test 1 for update(Body) metoden - Suns position efter 31 timesteps på 1; altså 31 dage

| Test nr. | Forventet resultat | Aktuelt resultat | Konklusion |
|---|---|---|---|
| 1 | Vector(-0.6617, 0.7286, -6.5972E-5) | Vector(0.6672, 0.732, -6.4732E-5) | true |
| 2 | Vector(-1.093E-3, -2.4915E-3, -4.6161E-5) | Vector(-1.094E-3, -2.496E-5) | true |

Udskrift fra kørsel af (Body)Unittest :

```
Tests for the Body class!
Test 1 for the update(double, Body) method in the Body class
earth.update(1, sun) * 31
Expected result:
[ -0.6617426385386131 ]
[ 0.7285798316825735 ]
[ -6.5972159938064lE-5 ]
Actual result:
[ -0.6672030861957419 ]
[ 0.7320209749017941 ]
[ -6.47320428683913E-5 ]
Conclusion: true
```

```
Test 1 for the update(double) method in the Body class
sun.update(1) * 31
Expected result:
[ -0.001093056481060748 ]
[ -0.002491459981614031 ]
[ -4.616125976796566E-5 ]
Actual result:
[ -0.001093763507920361l ]
[ -0.0024960137328469516 ]
[ -4.612185402019343E-5 ]
Conclusion: true
```

# 3 Simulator - klassen

Der gælder de samme regler for unøjagtigheden i denne test, som der var til stede i den forrige. Igen har vi startpositionerne:

$$sunP = \begin{bmatrix} -1.284282111761733E-03 \\ -2.455154076901959E-03 \\ -4.207238483437137E-05 \end{bmatrix}, earthP = \begin{bmatrix} -1.813068419866209E-01 \\ 9.642197733507970E-01 \\ -6.850809238551276E-05 \end{bmatrix}$$

Tests:

1 - Test for updatePosition() metoden - Earths og suns position efter 31 timesteps på 1; altså 31 dage

| Test nr. | Forventet resultat | Aktuelt resultat | Konklusion |
|---|---|---|---|
| Earth | Vector(-0.6617, 0.7286, -6.5972E-5) | Vector(0.6672, 0.732, -6.4732E-5) | true |
| Sun | Vector(-1.093E-3, -2.4915E-3, -4.6161E-5) | Vector(-1.094E-3, -2.496E-5) | true |

Udskrift fra kørsel af (Simulator) Unittest :

```
Test for the Simulator class!
Test 1 for the updatePosition() method
simulation.updatePosition() * 31
Expected result:
Earth:
[ -0.6617426385386131 ]
[ 0.7285798316825735 ]
[ -6.59721599380641E-5 ]
Sun:
[ -0.001093056481060748 ]
[ -0.002491459981614031 ]
[ -4.616125976796566E-5 ]

Actual result:
Earth:
[ -0.6672030861957419 ]
[ 0.7320209749017941 ]
[ -6.47320428683913E-5 ]
Sun:
[ -0.0010937635079203611 ]
[ -0.0024960137328469516 ]
[ -4.612185402019343E-5 ]
Conclusion: true
```

# 4 Computation

I denne test, bliver alle planeterne loadet ind (samt solen). Start positionerne er de samme som i de foregående tests. Der vil blive taget udgangspunkt i jorden og solen.
Tests:

1 - Test 1 for computePosition(Body, String) metoden - computePosition(earth, "Earth"), for bagefter at vurdere om koordinaterne efter 31 dage er tæt nok på

hinanden, til at de kan blive erklæret "ens".

2 - Test 1 for computePositionSun(Body, String) metoden - computePositionSun(sun, "Sun"), for bagefter at vurdere om koordinaterne efter 31 dage er tæt nok på hinanden, til at de kan blive erklæret "ens".

3 - Test 1 for trim(double) metoden - trim(0.000123456), tester om der trimmes på den rigtige måde

4 - Test 2 for trim(double) metoden - trim(0.123456), tester om der trimmes på den rigtige måde

5 - Test 3 for trim(double) metoden - trim(0), tester om der trimmes på den rigtige måde

| Test nr. | Forventet resultat | Aktuelt resultat | Konklusion |
|---|---|---|---|
| 1 | ¡ 0.02 | 0.0168 | true, pga. unøjagtighed |
| 2 | ¡ 0.01 | 0.002 | true, igen pga. unøjagtighed |
| 3 | 1.2345E-4 | 1.2345E-4 | true |
| 4 | 0.1234 | 0.1234 | true |
| 5 | 0.0 | 0.0 | true |

Udskrift fra kørsel af (Computation)Unittest :

```
Tests for the Computation class!
Test 1 for the computePosition(Body, String) method in the computation class
computePosition(Earth, "earth"), calculating the difference between the computed and given coordinates
Computation: 0.0168
Verdict: true
Because of the imprecision in the calculations, the result is : true

Test 1 for the computePositionSun(Body, String) method in the computation class
computePosition(sun, "Sun"), calculating the difference between the computed and given coordinates")
Computation: 0.002
Verdict: true
Because of the imprecision in the calculations, the result is : true

Test 1 for the trim(double) method in the computation class
trim(0.000123456)
Expected result: 1.2345E-4
Actual result: 1.2345E-4
Conclusion: true

Test 2 for the trim(double) method in the computation class
trim(0.123456)
Expected result: 0.1234
Actual result: 0.1234
Conclusion: true

Test 3 for the trim(double) method in the computation class
trim(0)
Expected result: 0.0
Actual result: 0.0
Conclusion: true
```

# 5 Body_Loader - klassen

Tests:

1 - loadPlanet(String) metoden - Tester om alle planeterne er loadet

2 - loadPlanet(String) metoden - Tester om alle datoerne er blevet loader

3 - loadSun(String) metoden - Tester om solen er blevet loadet

4 - loadSun(String) metoden - Tester om alle datoerne til solens positioner er blevet loadet

Udskrift fra køresel af (Body_Loader)Unittest

```
Tests for the Body_Loader class!
Test 1 for the loadPlanet(String) method
Tests if all nine planets have been loaded
Expected result: 9
Actual result: 9
Conclusion: true

Test 2 for the loadPlanet(String) method
Tests if all initial positions have been loaded for one of the planets
Expected result: 13
Actual result: 13
Conclusion: true

Test 1 for the loadSun(String) method
Tests if the sun have been loaded
Expected result: sun != null
Actual result: Body@6e0be858
Conclusion: true

Test 2 for the loadSun(String) method
Tests if all initial positions have been loaded for the sun
Expected result: 13
Actual result: 13
Conclusion: true
```