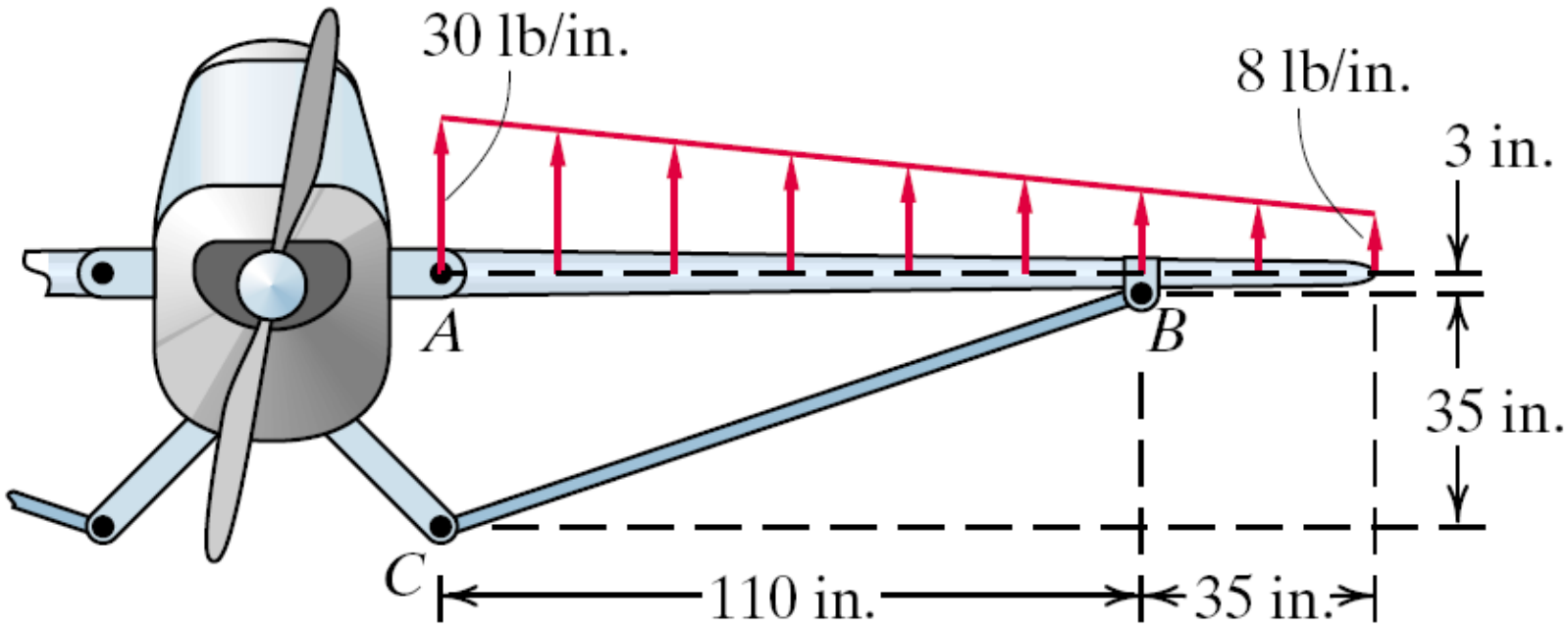
ASEN 2001 –Lab 1

Computer Analysis of Structures

Session 1

ASEN 2001

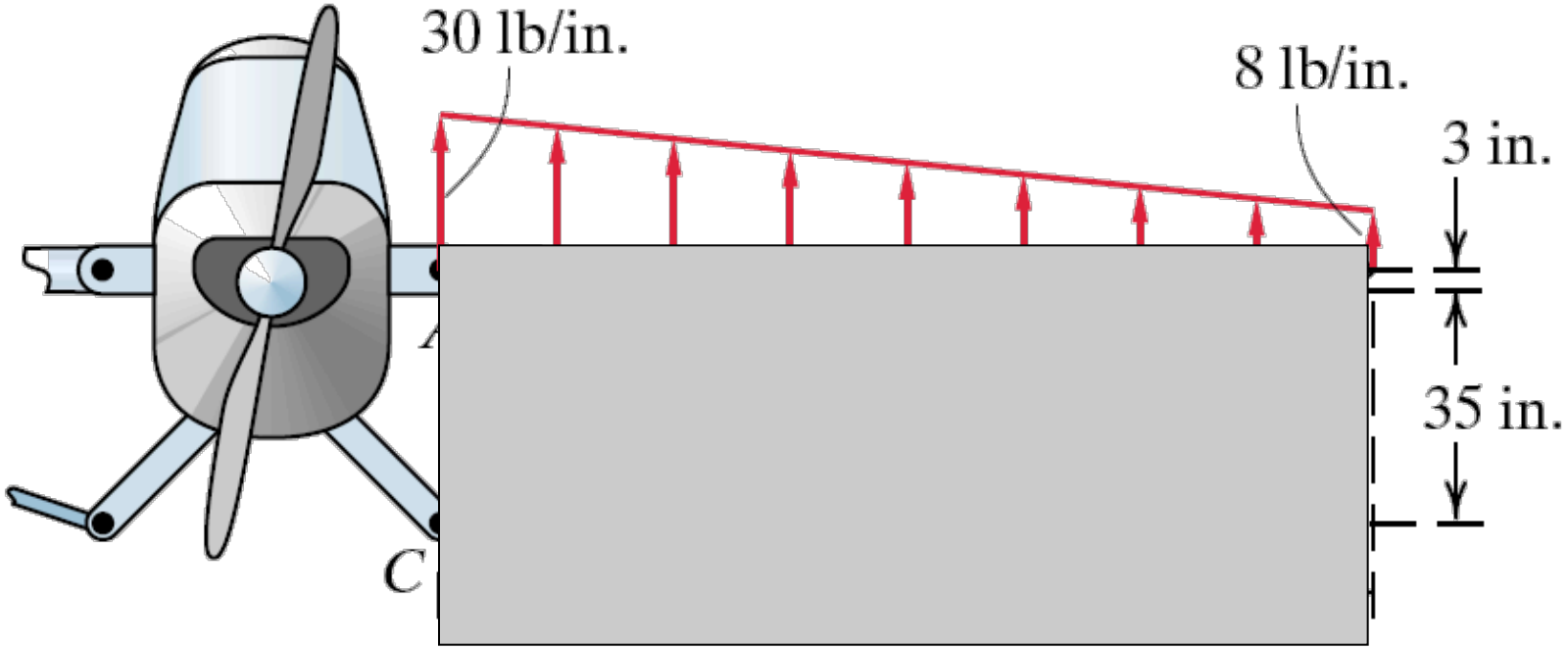
Does the wing break?



Structures: Or Why Things Don't Fall Down
by J.E. Gordon

ASEN 2001

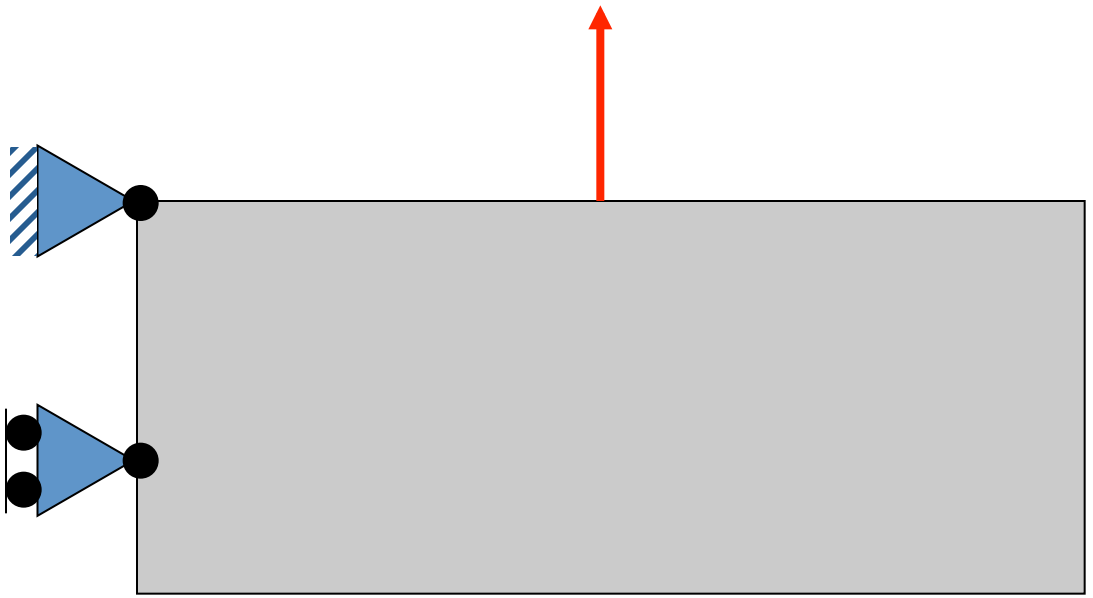
Does the wing break?



Idealization

ASEN 2001

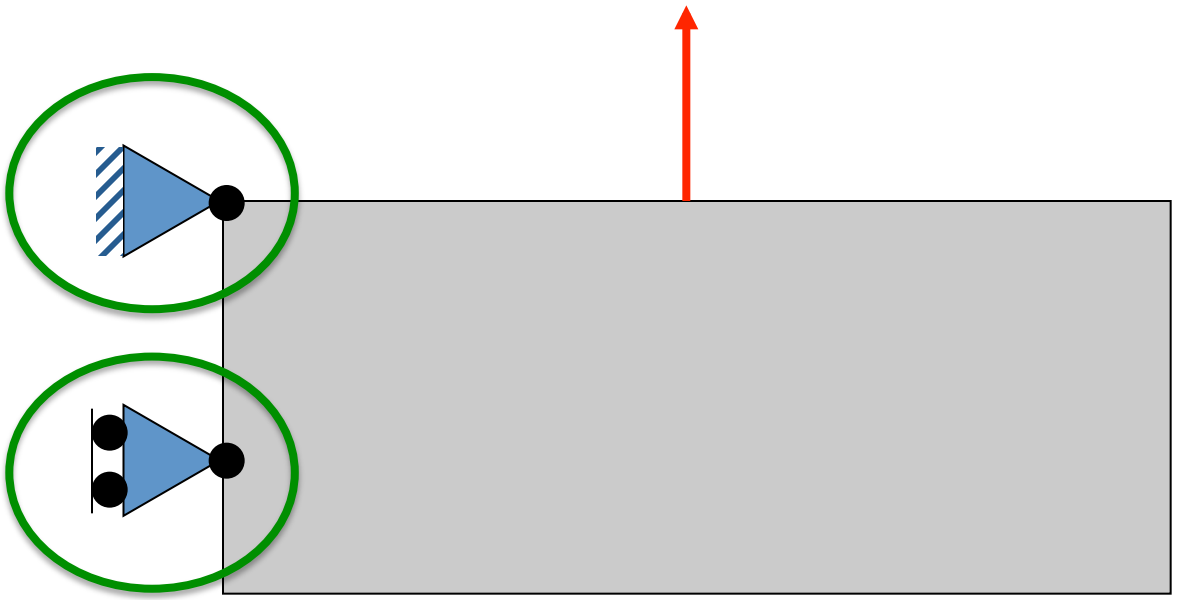
Does the wing break?



Equivalent external forces & analysis of reaction forces

ASEN 2001

Does the wing break?

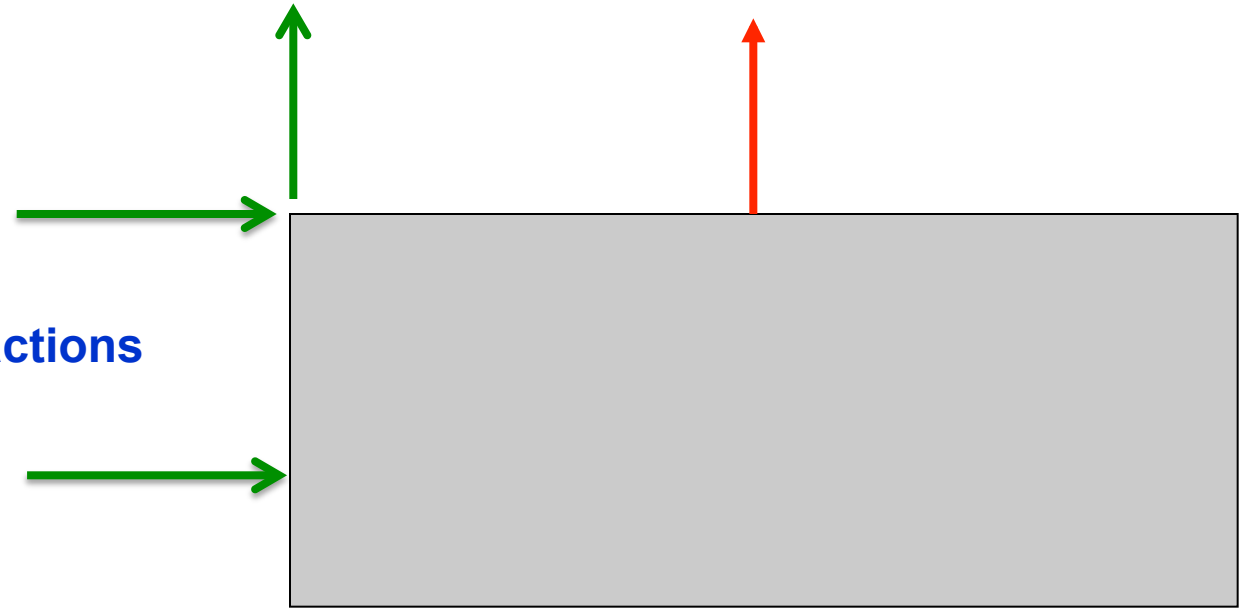


Supports

Equivalent external forces & analysis of reaction forces

ASEN 2001

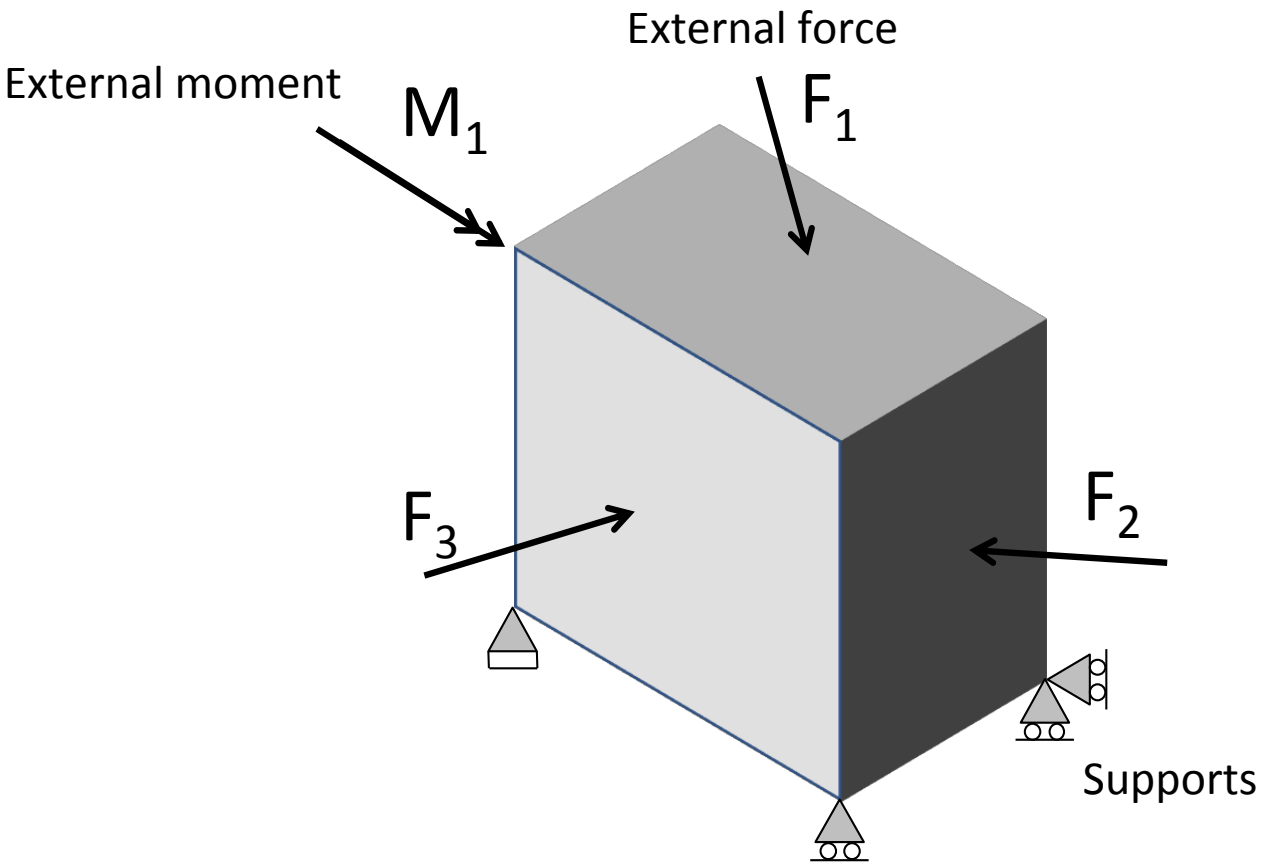
Does the wing break?

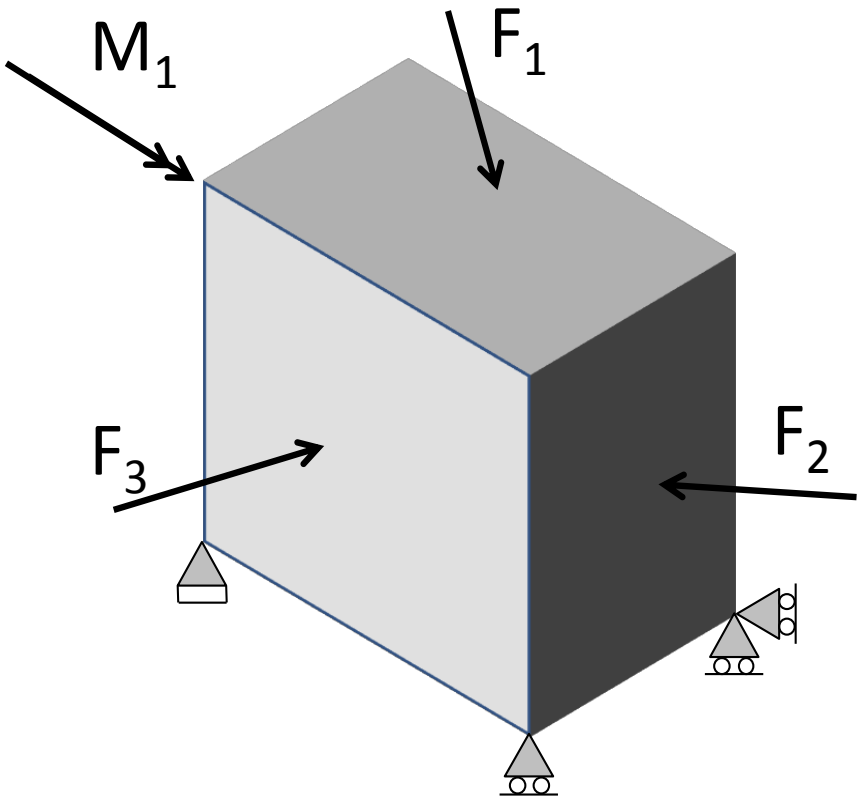


Support reactions

Equivalent external forces & analysis of reaction forces

Keeping a structure from moving: Static equilibrium



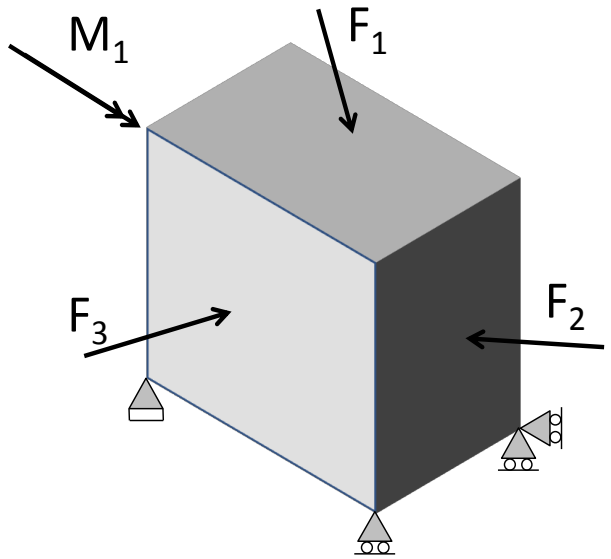


A 3-D structure is being acted upon by a number of external forces and moments. Supports are provided to prevent the structure from moving.

Compute the magnitude of the support reactions.

In teams of two, write a computer program that can taking in the information concerning the external forces and moments, along with support reaction locations and calculates the magnitudes of those support reactions.

Deliverables



- Group report
  - Theory manual
  - Developer manual
- MATLAB source code
  - Input routine
  - Compute reactions routine
  - Output routine
  - Main routine
- Input and output files for the verification examples

One zip file

Due: 26 Sep, 7:00 am

No late submissions accepted

Goal this week

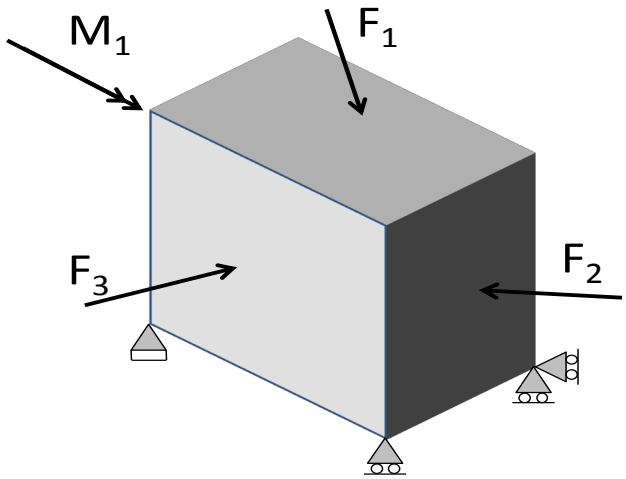
Creating the input routine

Developing the overall program structure

Input file

```
# number of external forces and moments
2   1
# coordinates of the points at which external forces are applied
# x     y     z
0.0   1.0   1.0
5.0   3.0   0.0
# magnitude and direction of external forces
# F    dx    dy     dz
11.0   3.0   2.0   -9.0
0.1   3.0   1.0    1.0
# location at which external couple moments are applied
# x     y     z
0.0   1.0   1.0
# magnitude and direction of external couple moments
# M    dx     dy    dz
10.0   4.0   -2.0   9.0
# location of supports
# x     y     z
1.0   1.0   1.0
1.0   1.0   1.0
1.0   1.0   1.0
0.0   1.0   0.0
0.0   1.0   1.0
1.0   1.0   0.0
# type (F/M) and direction of reaction
# type   dx     dy     dz
F        1.0    6.0   -7.0
F        4.0    1.0    1.1
F        1.0    8.0    1.0
F        6.0    1.0    0.0
M        0.0    9.0    1.0
M       -1.0    1.0    0.0
```

= comments to let reader know what information is to follow



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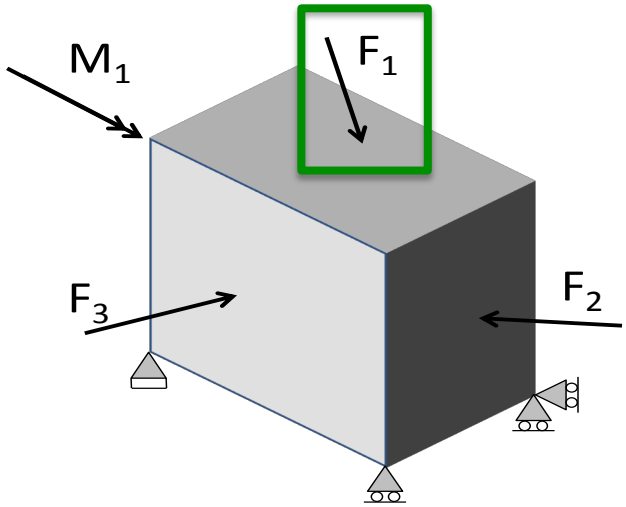
F       6.0    1.0    0.0
M       0.0    9.0    1.0
M      -1.0    1.0    0.0
```

Number of external forces



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F        6.0    1.0    0.0
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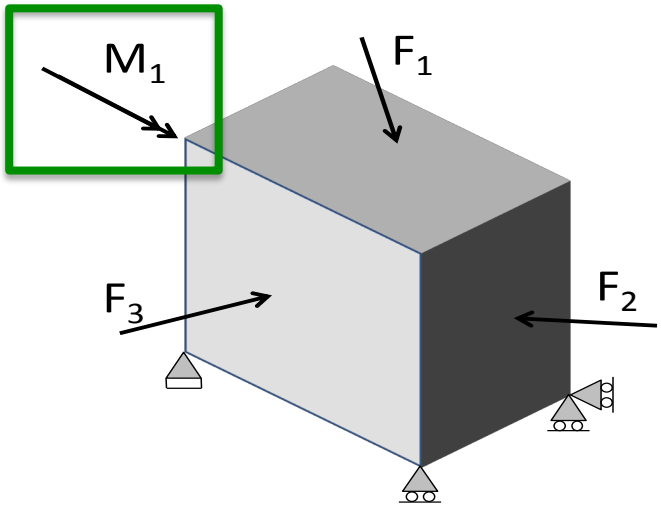
M       -1.0    1.0    0.0
```

Number of external moments



Input file

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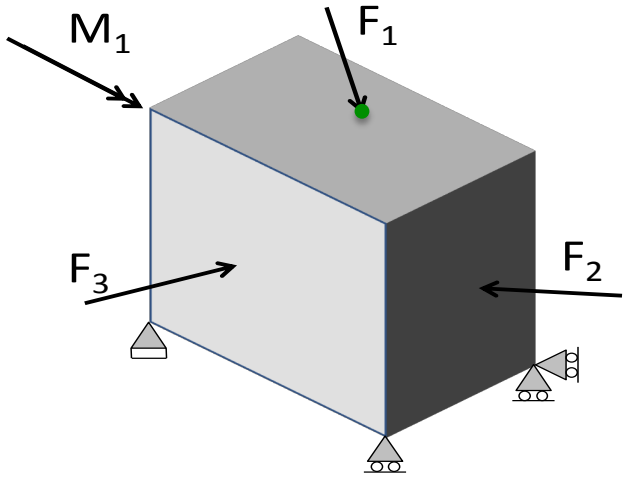
M        0.0    9.0    1.0
M       -1.0    1.0    0.0
```

x, y, and z coordinates of point where force is applied



Input file

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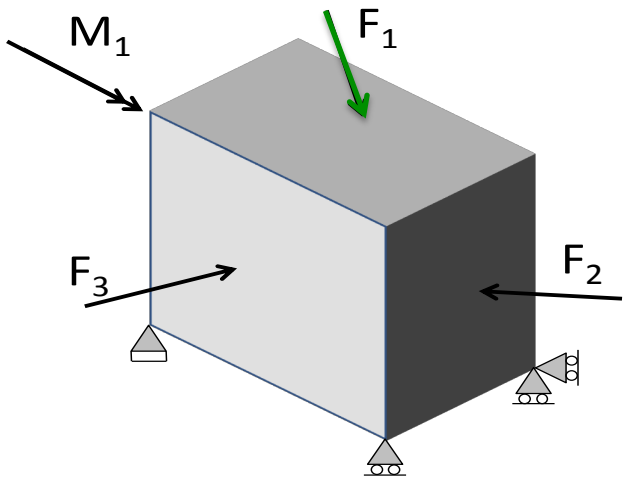
F        6.0    1.0    0.0
M        0.0    9.0    1.0
M       -1.0    1.0    0.0
```

magnitude of force



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F        6.0    1.0    0.0
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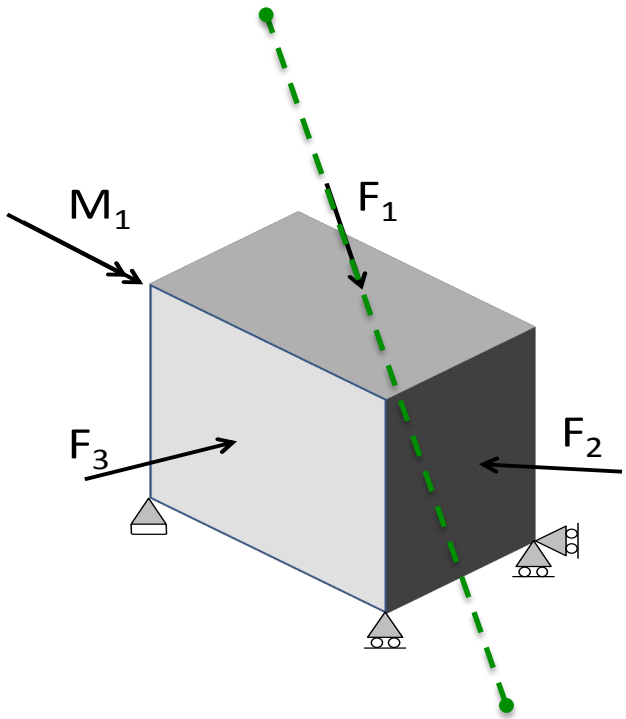
M       -1.0    1.0    0.0
```

direction of force



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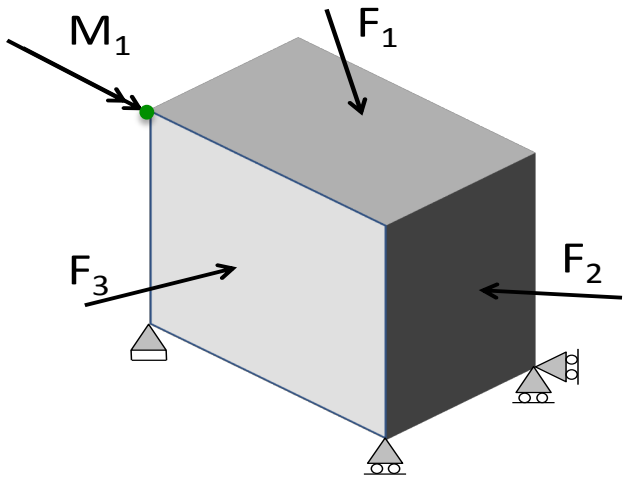
```

x, y, and z coordinates of point where moment is applied



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F       6.0    1.0    0.0
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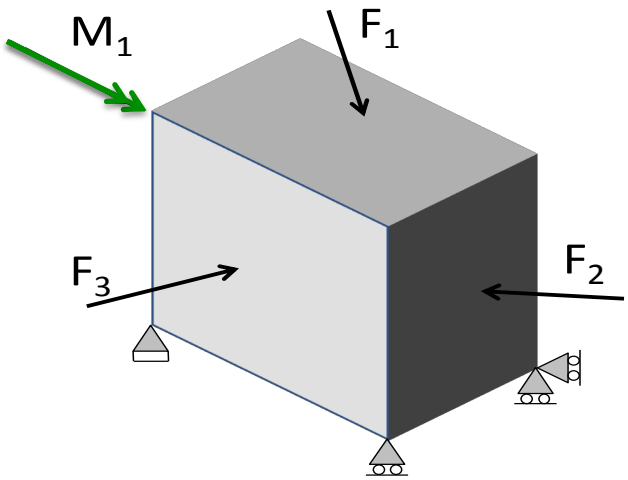
```

magnitude of moment



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F       6.0    1.0    0.0
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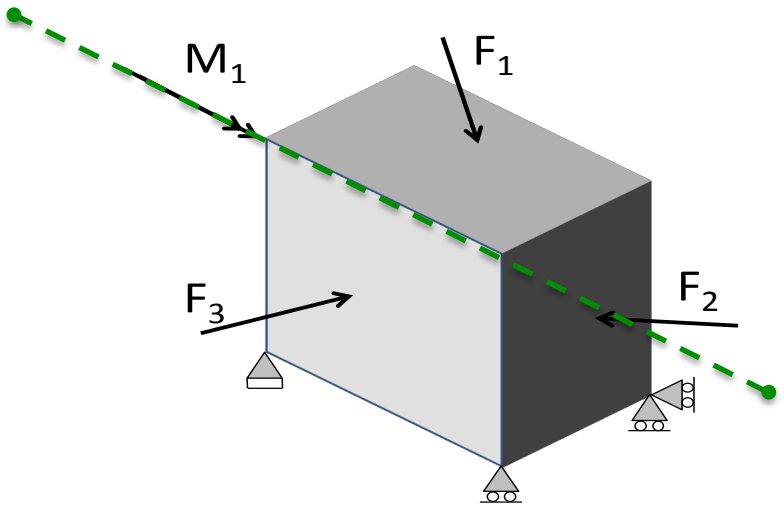
M      -1.0    1.0    0.0
```

direction of moment



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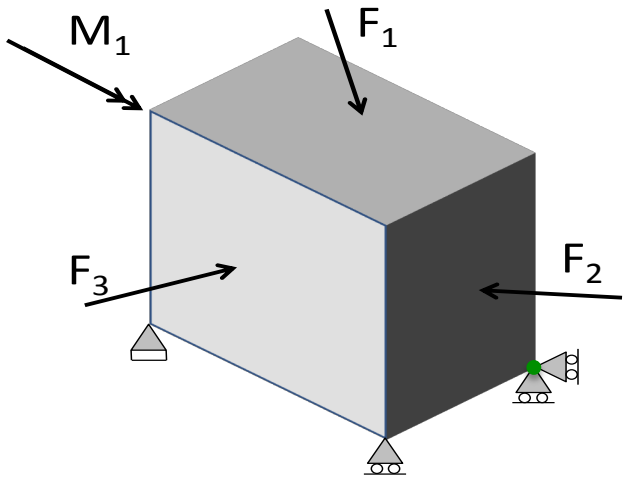
```

x, y, and z coordinates of point where support is located



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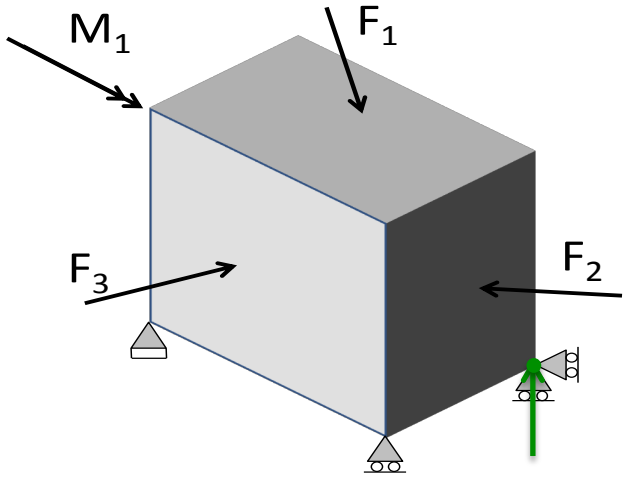
F        1.0    8.0    1.0
F        6.0    1.0    0.0
M        0.0    9.0    1.0
M       -1.0    1.0    0.0
```

type of reaction – ‘F’ force or ‘M’ moment



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F       6.0    1.0    0.0
M       0.0    9.0    1.0
M      -1.0    1.0    0.0
```

direction of reaction