INTERFIS
PROYECTOS EDUCATIVOS
REPOSITORIO

VIGA SIMPLEMENTE APOYADA

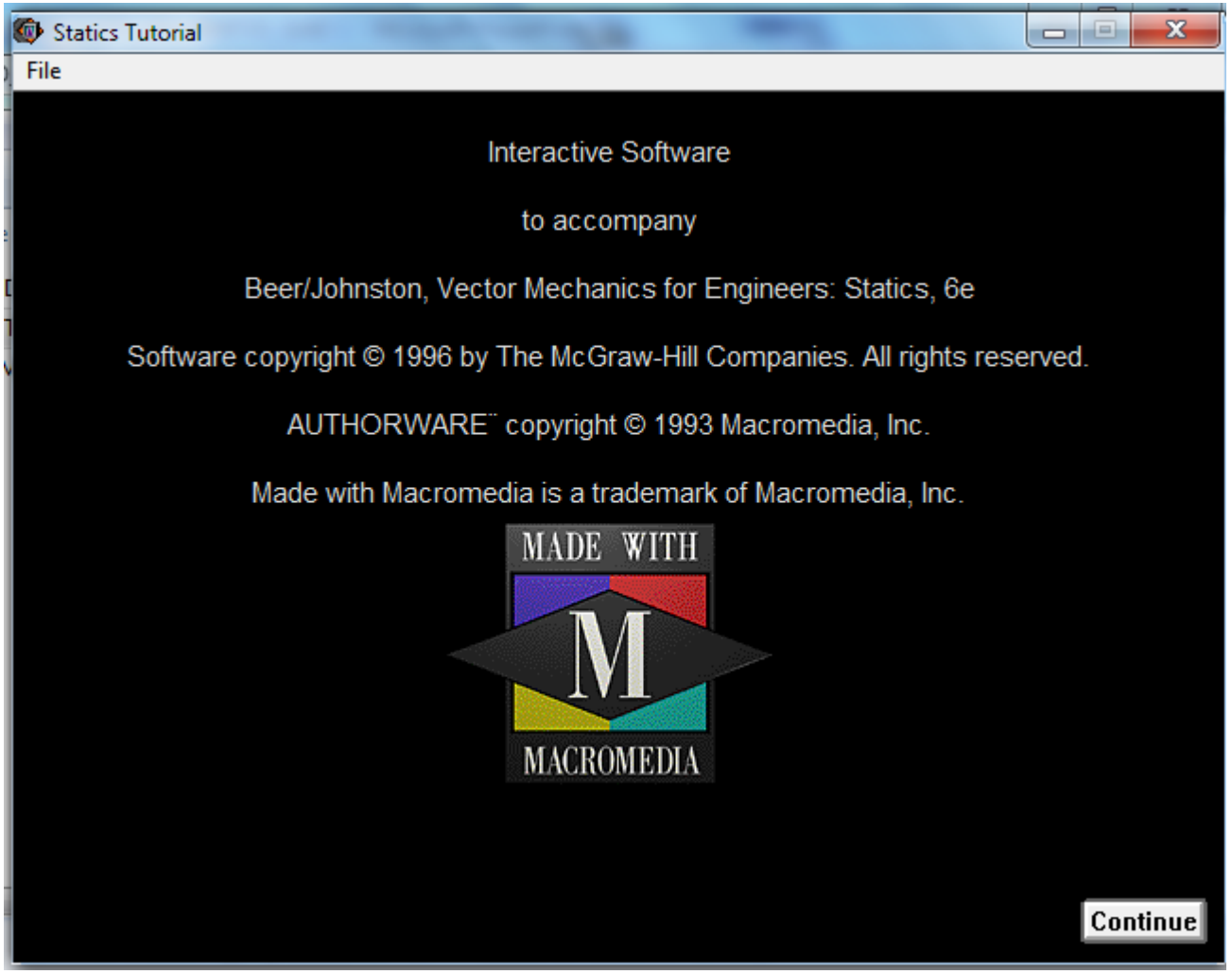
Ejercicios paso a paso a partir de Software STATICS

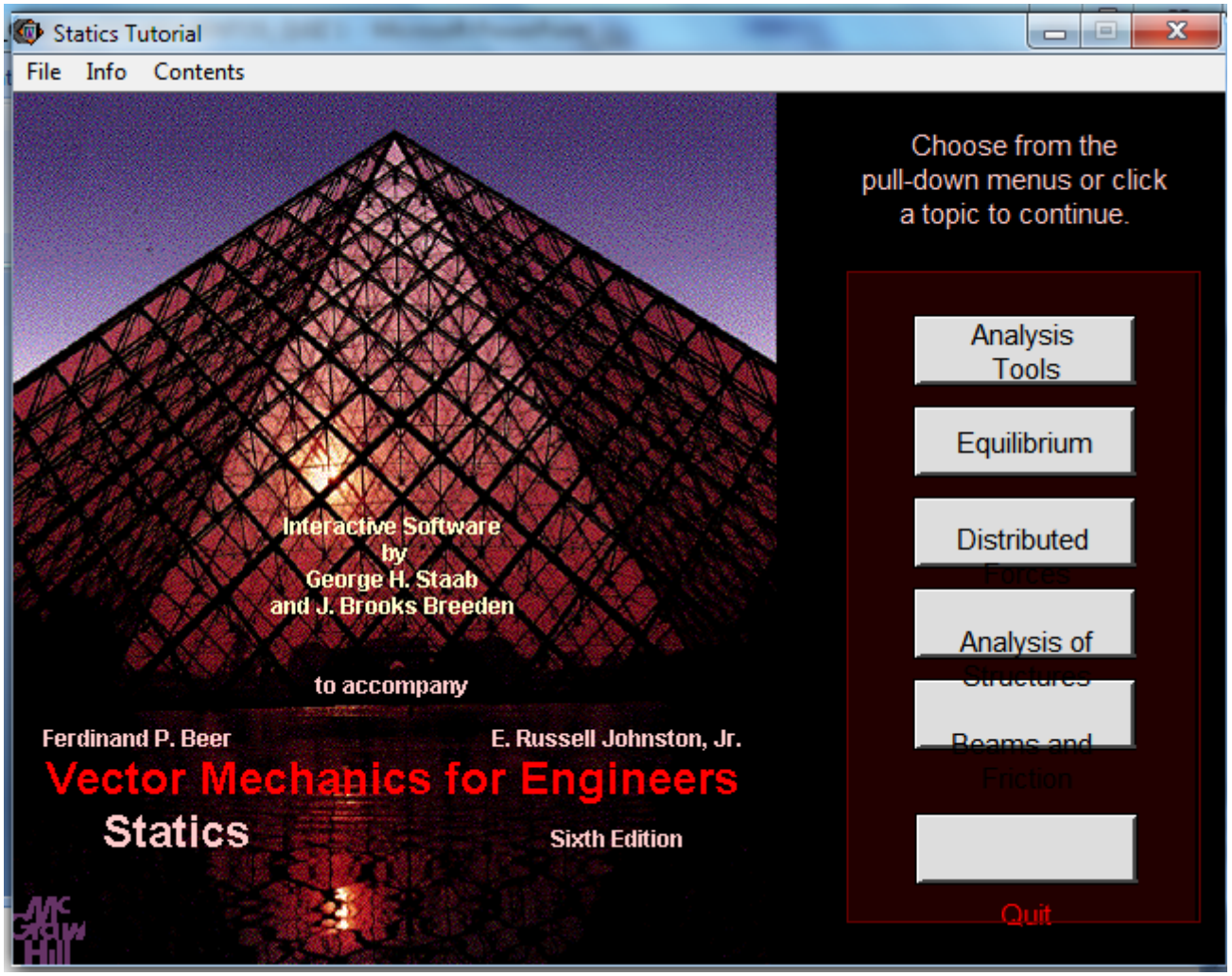
SHEAR & MOMENT DIAGRAMS.
QUIZZES
VIGA SIMPLEMENTE APOYADA
(QUIZ 3 – 4 – 6 – 7)

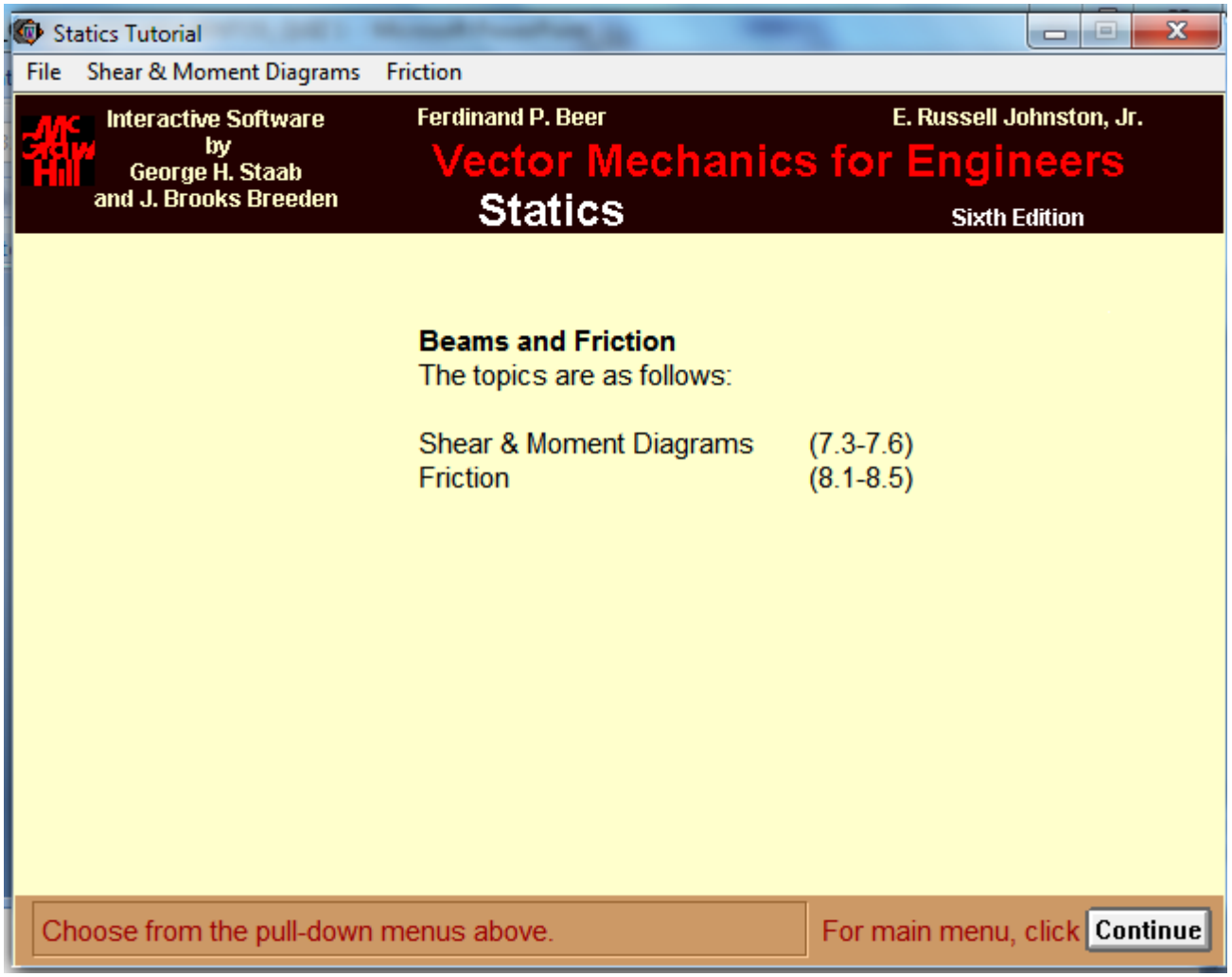
http://interfis-edu.jimdo.com/repositorio/

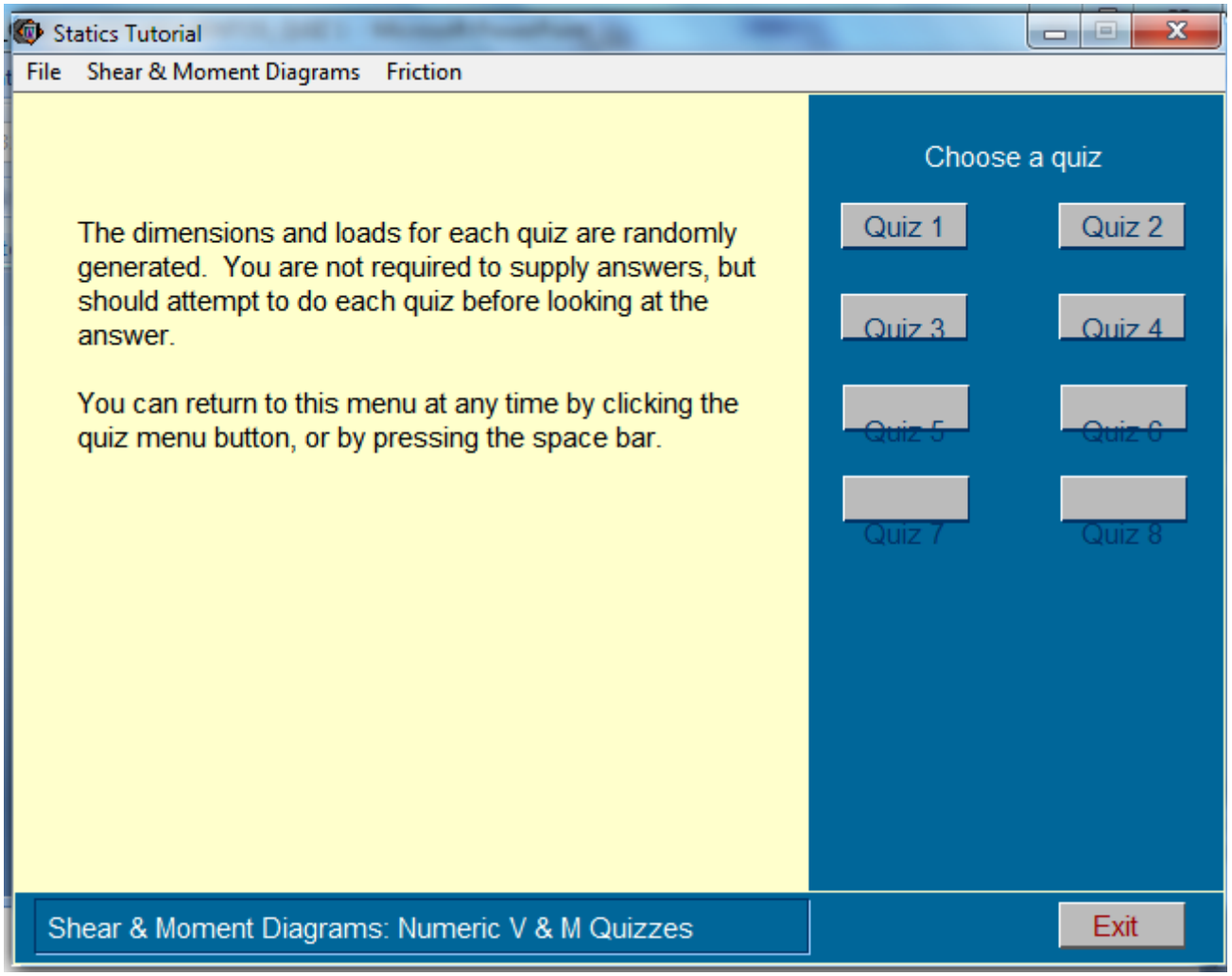
Los ejercicios siguientes se realizan con el **SOFTWARE STATICS**, incluido en “MECÁNICA VECTORIAL PARA INGENIEROS. ESTÁTICA”. Sexta edición. McGRAW-HILL. 1997 ISBN 84-481-1079-X.

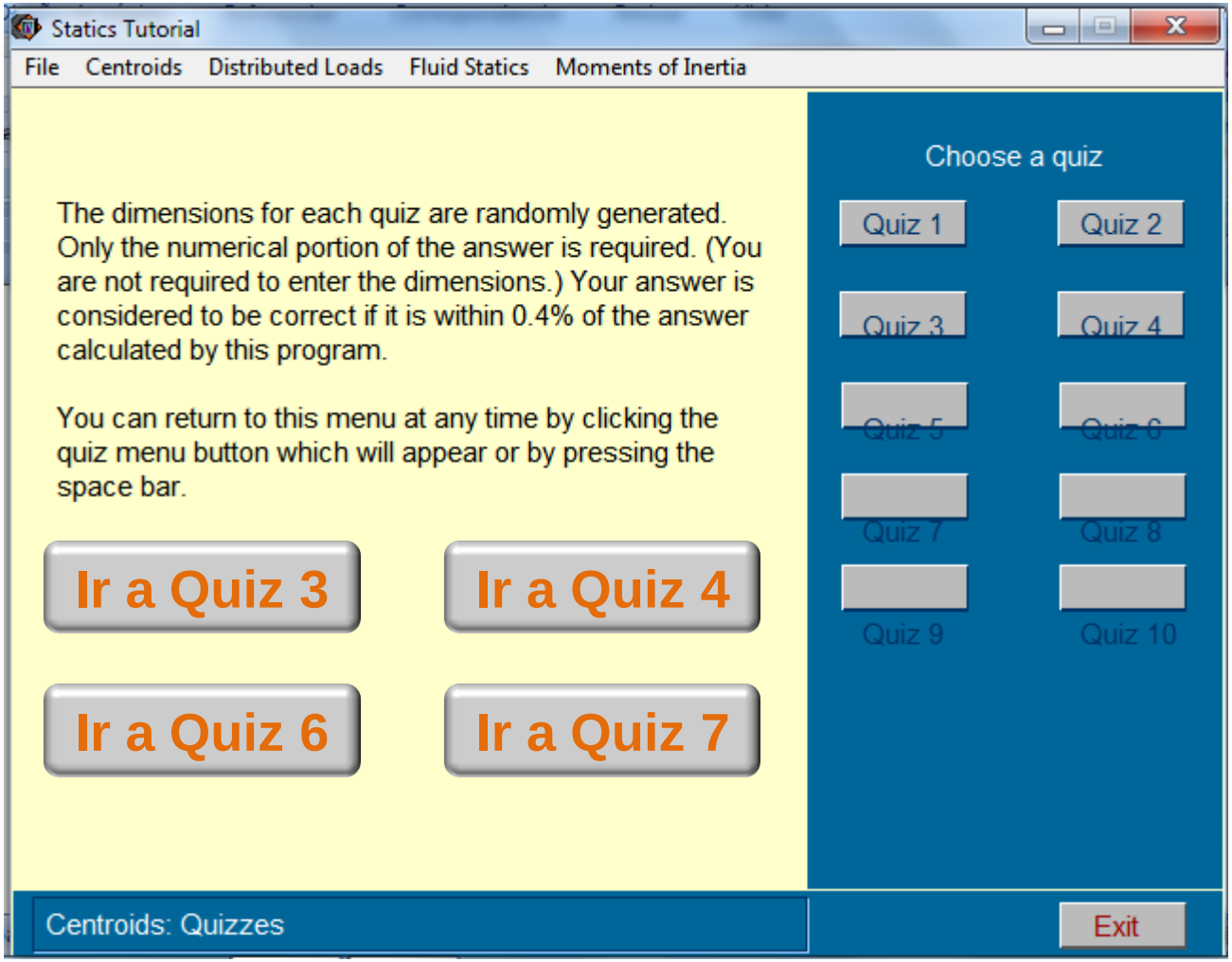
La presentación se realiza exlusivamente con fines educativos, para facilitar su discusión en clase.

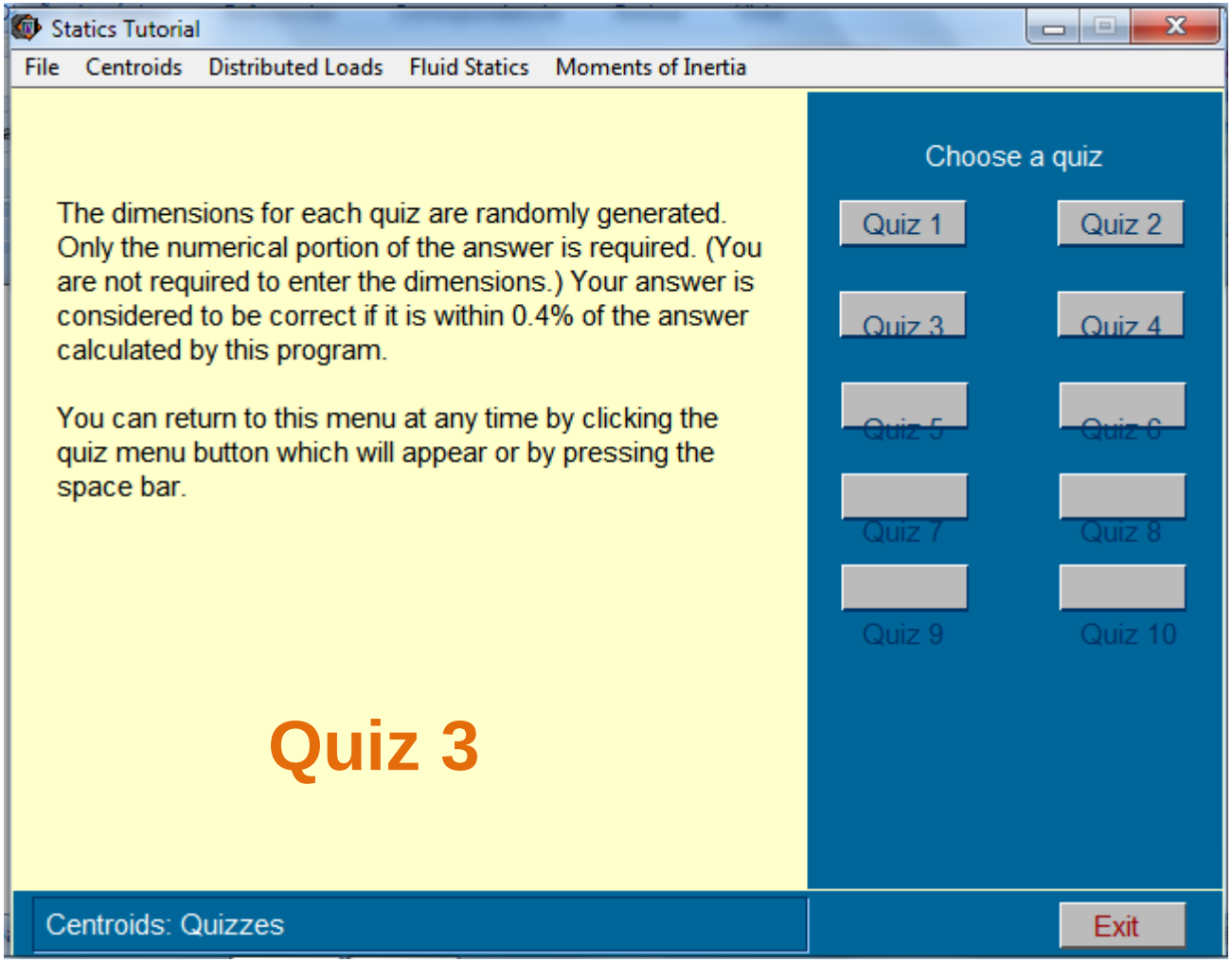

Statics Tutorial
File
Interactive Software
to accompany
Beer/Johnston, Vector Mechanics for Engineers: Statics, 6e
Software copyright © 1996 by The McGraw-Hill Companies. All rights reserved.
AUTHORWARE¨ copyright © 1993 Macromedia, Inc.
Made with Macromedia is a trademark of Macromedia, Inc.
MADE WITH
M
MACROMEDIA
Continue


Statics Tutorial
File
Info
Contents
Interactive Software
by
George H. Staab
and J. Brooks Breeden
to accompany
Ferdinand P. Beer
E. Russell Johnston, Jr.
Vector Mechanics for Engineers
Statics
Sixth Edition
Choose from the
pull-down menus or click
a topic to continue.
Analysis
Tools
Equilibrium
Distributed
Forces
Analysis of
Beams and
Friction
Quit


Statics Tutorial
File
Shear & Moment Diagrams
Friction
Interactive Software
by
George H. Staab
and J. Brooks Breeden
Ferdinand P. Beer
E. Russell Johnston, Jr.
Vector Mechanics for Engineers
Statics
Sixth Edition
Beams and Friction
The topics are as follows:
Shear & Moment Diagrams (7.3-7.6)
Friction (8.1-8.5)
Choose from the pull-down menus above.
For main menu, click
Continue

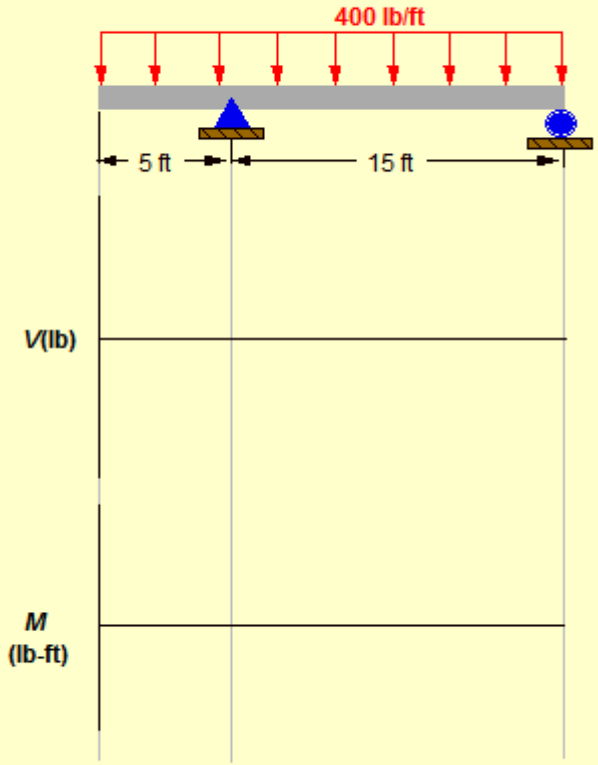

Statics Tutorial
File
Shear & Moment Diagrams
Friction
The dimensions and loads for each quiz are randomly generated. You are not required to supply answers, but should attempt to do each quiz before looking at the answer.
You can return to this menu at any time by clicking the quiz menu button, or by pressing the space bar.
Choose a quiz
Quiz 1
Quiz 2
Quiz 3
Quiz 4
Quiz 5
Quiz 6
Quiz 7
Quiz 8
Shear & Moment Diagrams: Numeric V & M Quizzes
Exit


Statics Tutorial
File
Centroids
Distributed Loads
Fluid Statics
Moments of Inertia
The dimensions for each quiz are randomly generated. Only the numerical portion of the answer is required. (You are not required to enter the dimensions.) Your answer is considered to be correct if it is within 0.4% of the answer calculated by this program.
You can return to this menu at any time by clicking the quiz menu button which will appear or by pressing the space bar.
Ir a Quiz 3
Ir a Quiz 4
Ir a Quiz 6
Ir a Quiz 7
Choose a quiz
Quiz 1
Quiz 2
Quiz 3
Quiz 4
Quiz 5
Quiz 6
Quiz 7
Quiz 8
Quiz 9
Quiz 10
Centroids: Quizzes
Exit


Statics Tutorial
File
Centroids
Distributed Loads
Fluid Statics
Moments of Inertia
The dimensions for each quiz are randomly generated. Only the numerical portion of the answer is required. (You are not required to enter the dimensions.) Your answer is considered to be correct if it is within 0.4% of the answer calculated by this program.
You can return to this menu at any time by clicking the quiz menu button which will appear or by pressing the space bar.
Quiz 3
Choose a quiz
Quiz 1
Quiz 2
Quiz 3
Quiz 4
Quiz 5
Quiz 6
Quiz 7
Quiz 8
Quiz 9
Quiz 10
Centroids: Quizzes
Exit

Statics Tutorial

File Shear & Moment Diagrams Friction



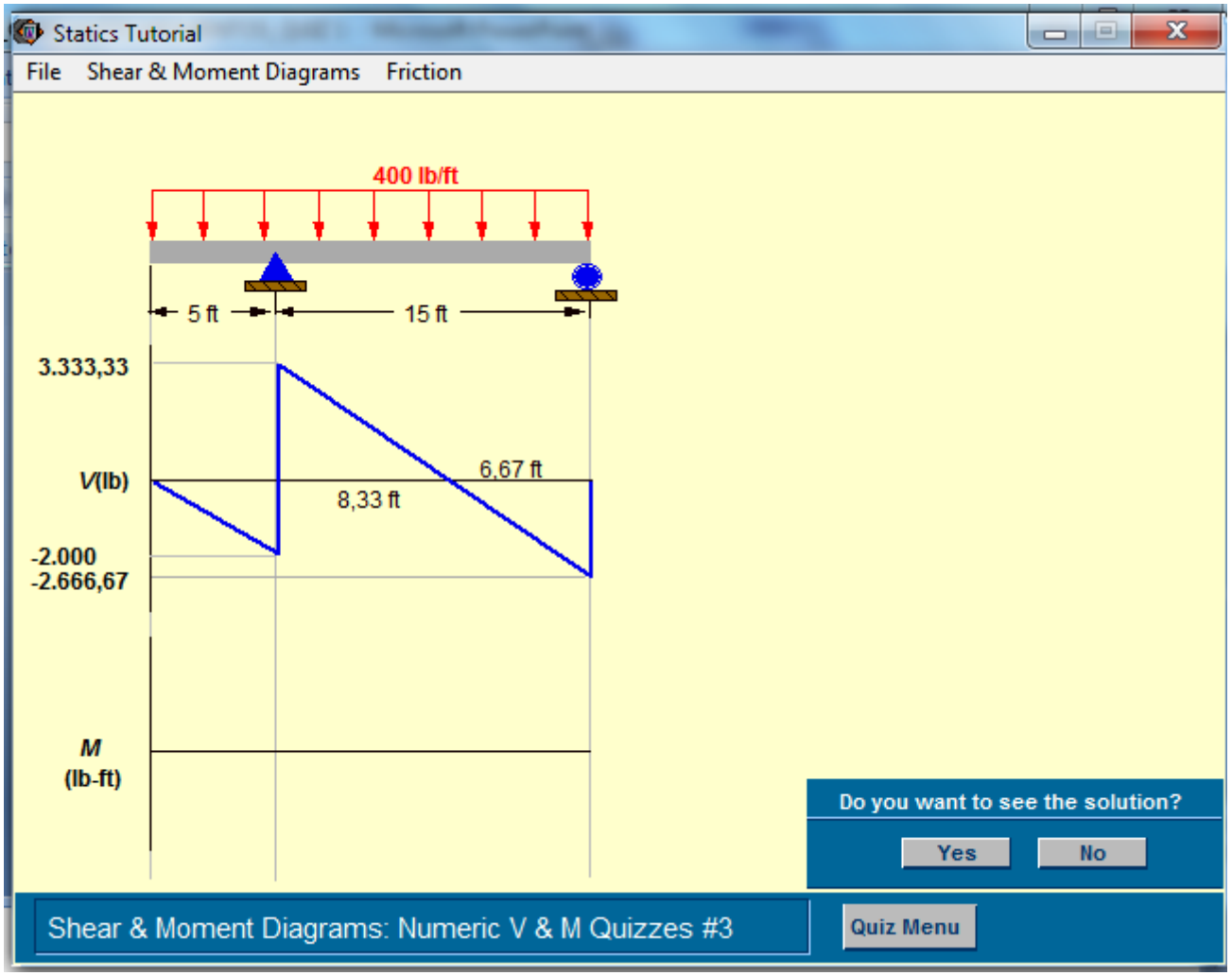
The simply supported beam shown is 20 ft long and supports a uniform load of 400 lb/ft over its span. Plot the shear and bending-moment diagrams. The horizontal reaction at ***A*** is zero.

After constructing your diagram, click the box below to see the correct shear diagram.

View Shear Force Diagram

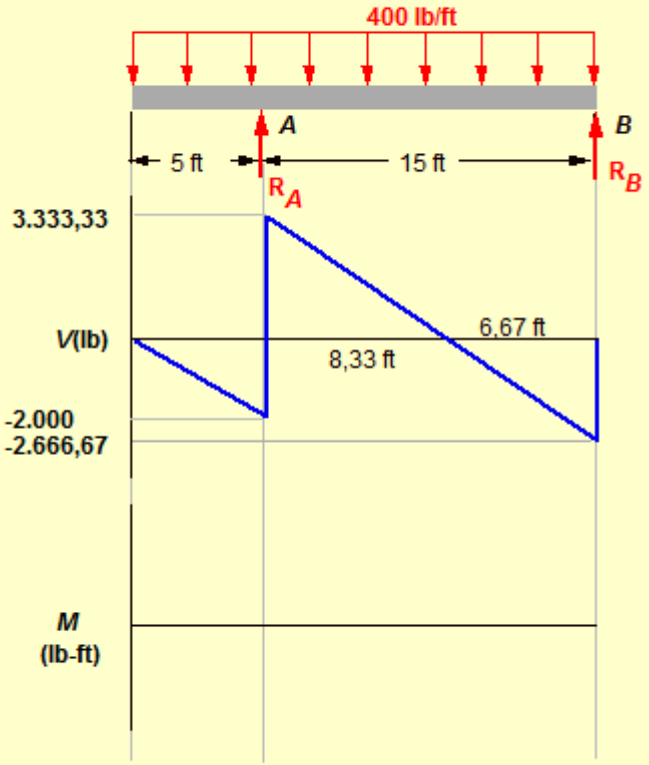
Shear & Moment Diagrams: Numeric V & M Quizzes #3

Quiz Menu


Statics Tutorial
File
Shear & Moment Diagrams
Friction
400 lb/ft
5 ft
15 ft
3.333,33
V(lb)
6,67 ft
8,33 ft
-2.000
-2.666,67
M
(lb-ft)
Do you want to see the solution?
Yes
No
Shear & Moment Diagrams: Numeric V & M Quizzes #3
Quiz Menu

Statics Tutorial

File Shear & Moment Diagrams Friction



First, establish the reactions at *A* and *B*.

The reactions are determined by first modeling the distributed load as an equivalent concentrated force, then generating the equations which satisfy the equilibrium conditions.

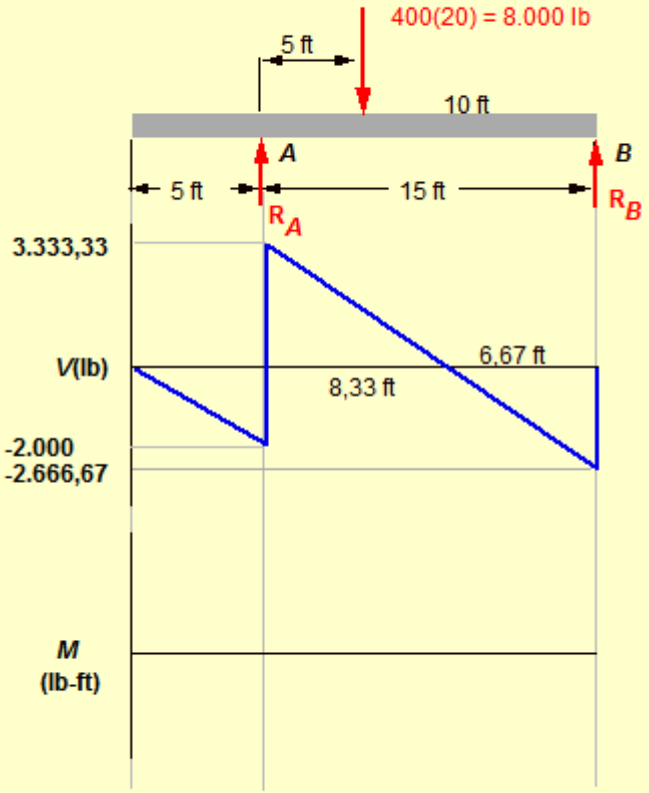
Shear & Moment Diagrams: Numeric V & M Quizzes #3

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



First, establish the reactions at *A* and *B*.

The reactions are determined by first modeling the distributed load as an equivalent concentrated force, then generating the equations which satisfy the equilibrium conditions. The equations of equilibrium are

$+\uparrow \Sigma F_y = 0$: $R_A + R_B - 8.000 = 0$

$R_A + R_B = 8.000$ (1)

$+\circlearrowleft M_A = 0$: $15(R_B) - 5(8.000) = 0$

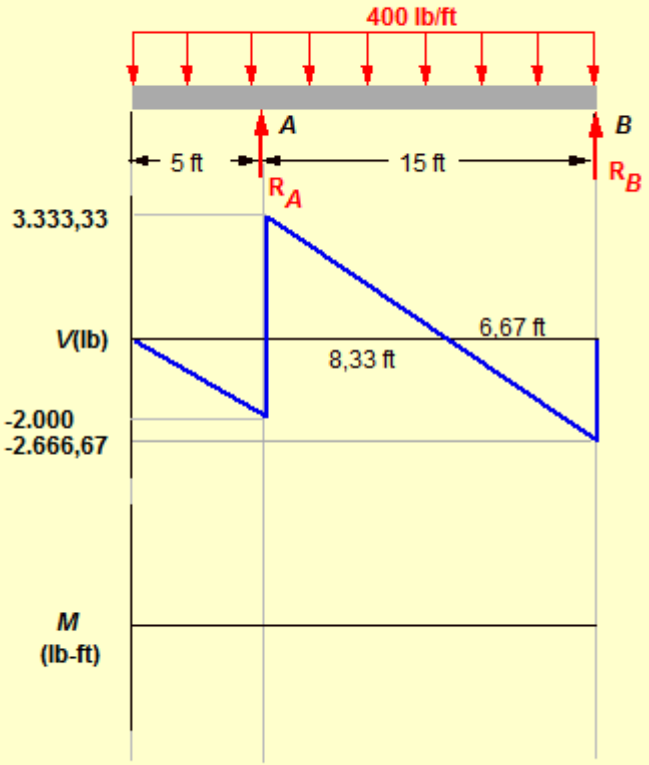
$R_B = 2.666,67$ lb

Substituting 2.666,67 into equation (1) and solving yields $R_A = 5.333,33$ lb

Shear & Moment Diagrams: Numeric V & M Quizzes #3 | Quiz Menu | Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



First, establish the reactions at *A* and *B*.

The reactions are determined by first modeling the distributed load as an equivalent concentrated force, then generating the equations which satisfy the equilibrium conditions.

The equations of equilibrium are

$+\uparrow \Sigma F_y = 0$: $R_A + R_B - 8.000 = 0$

$R_A + R_B = 8.000$ (1)

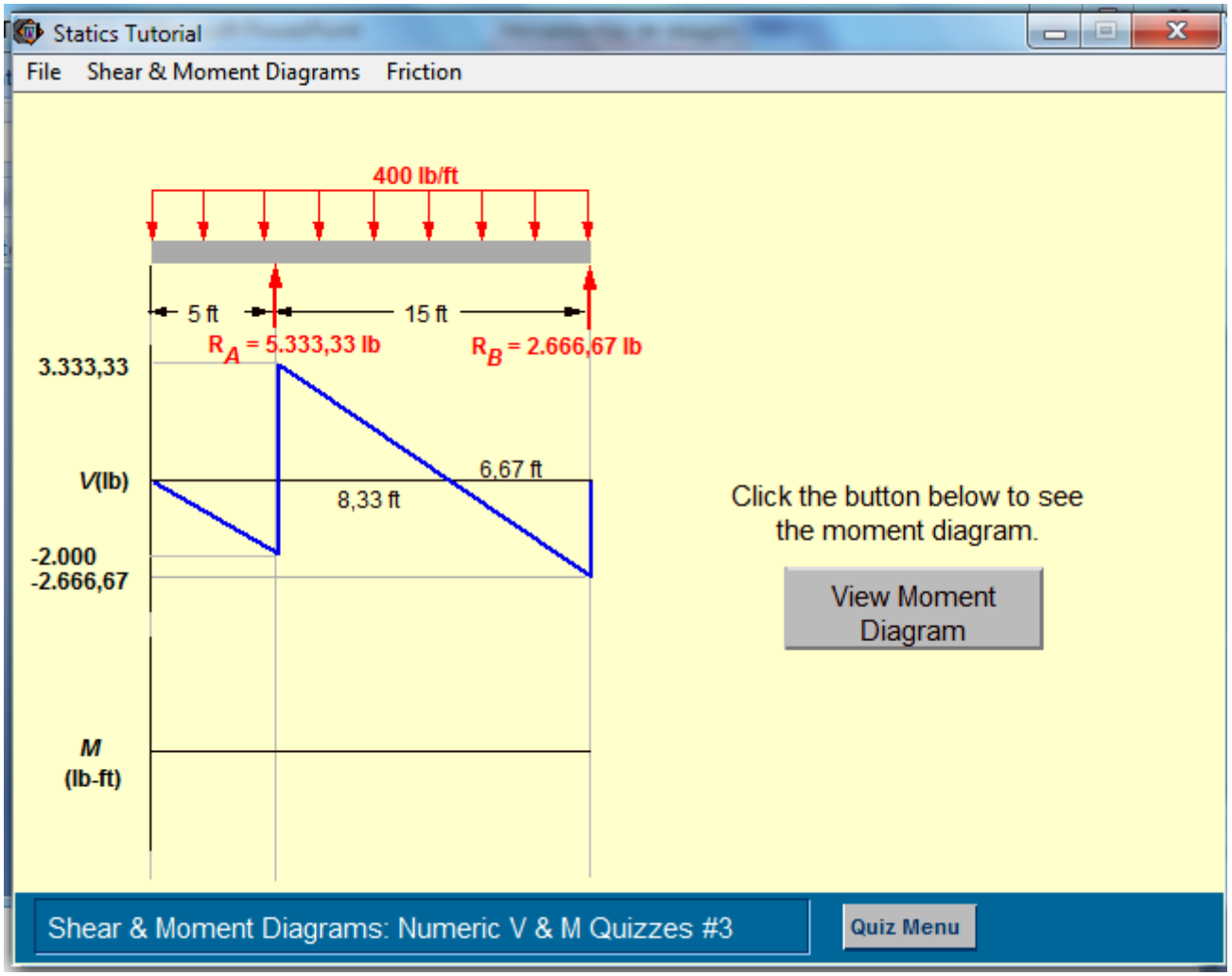
$+\circlearrowleft M_A = 0$: $15(R_B) - 5(8.000) = 0$

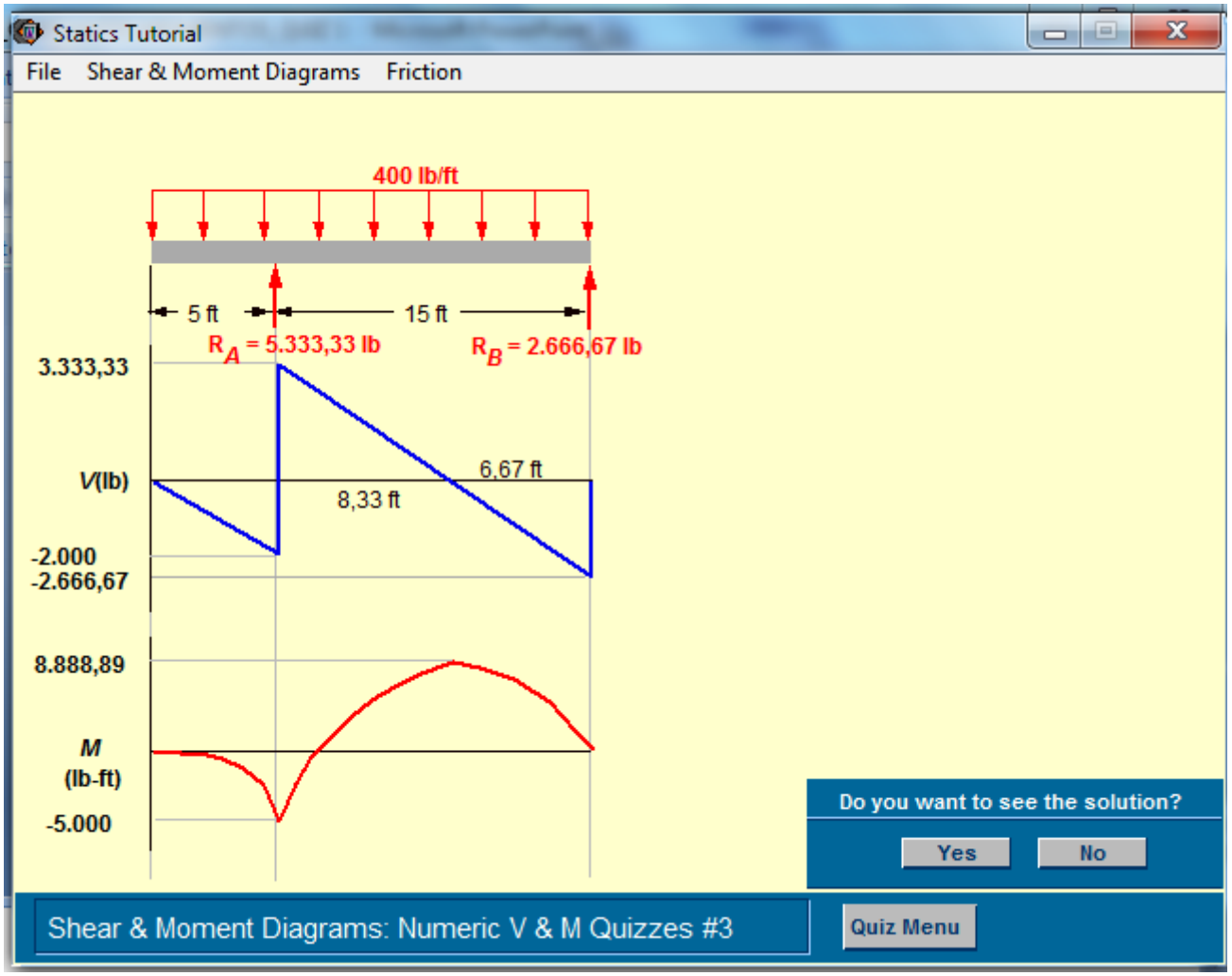
$R_B = 2.666{,}67$ lb

Substituting 2.666,67 into equation (1) and solving yields $R_A = 5.333{,}33$ lb

The shear diagram can be constructed once the reactions are known.

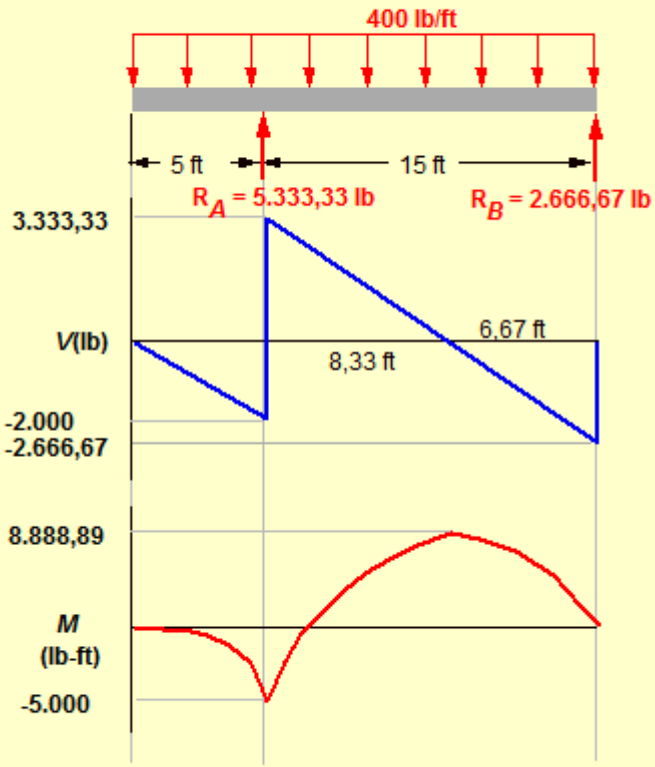
Shear & Moment Diagrams: Numeric V & M Quizzes #3 | Quiz Menu | Continue


Statics Tutorial
File
Shear & Moment Diagrams
Friction
400 lb/ft
5 ft
15 ft
R_A = 5.333,33 lb
R_B = 2.666,67 lb
3.333,33
V(lb)
6,67 ft
8,33 ft
-2.000
-2.666,67
M
(lb-ft)
Click the button below to see the moment diagram.
View Moment Diagram
Shear & Moment Diagrams: Numeric V & M Quizzes #3
Quiz Menu


Statics Tutorial
File
Shear & Moment Diagrams
Friction
400 lb/ft
5 ft
15 ft
R_A = 5.333,33 lb
R_B = 2.666,67 lb
3.333,33
V(lb)
6,67 ft
8,33 ft
-2.000
-2.666,67
8.888,89
M
(lb-ft)
-5.000
Do you want to see the solution?
Yes
No
Shear & Moment Diagrams: Numeric V & M Quizzes #3
Quiz Menu

Statics Tutorial

File Shear & Moment Diagrams Friction



The point at which the shear force passes through zero is a point where the maximum moment may occur.
In the first section of the beam the shear force varies linearly, and the moment parabolically. The moment starts at zero (there is no applied moment at the free end) and decreases (the area under the shear diagram is negative).

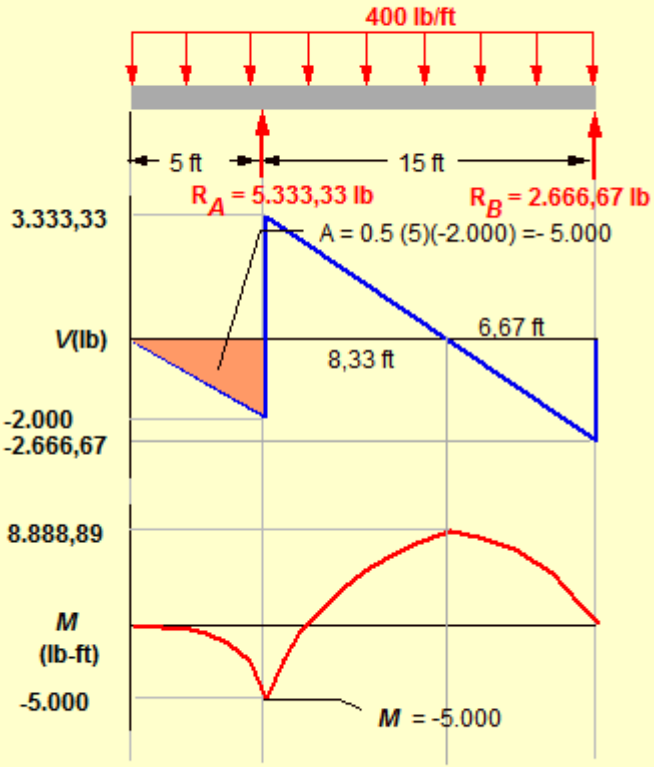
Shear & Moment Diagrams: Numeric V & M Quizzes #3

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



The point at which the shear force passes through zero is a point where the maximum moment may occur.

In the first section of the beam the shear force varies linearly, and the moment parabolically. The moment starts at zero (there is no applied moment at the free end) and decreases (the area under the shear diagram is negative).

The shear force is linear in the next section, and the moment varies parabolically. The shear diagram is positive, and the moment increases. This results in the moment diagram shape shown.

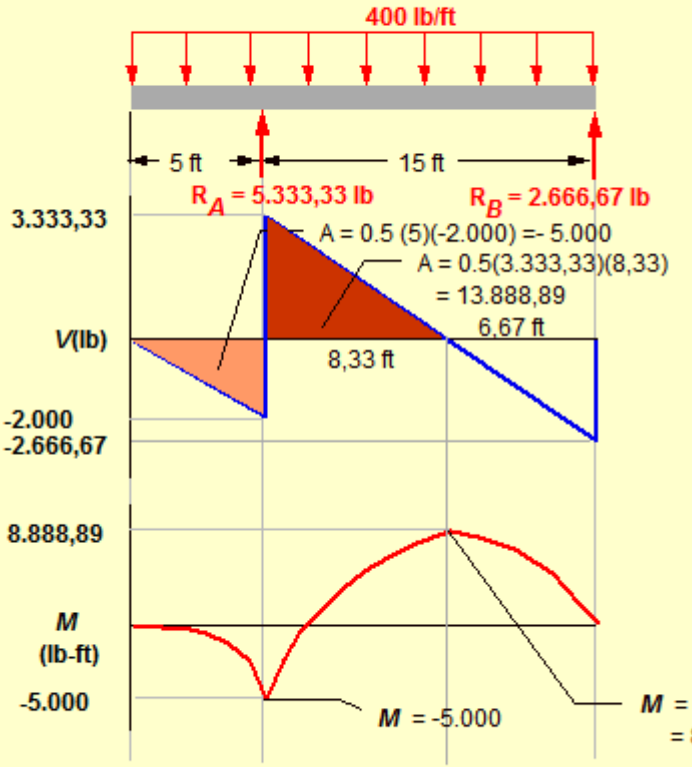
Shear & Moment Diagrams: Numeric V & M Quizzes #3

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



The point at which the shear force passes through zero is a point where the maximum moment may occur.

In the first section of the beam the shear force varies linearly, and the moment parabolically. The moment starts at zero (there is no applied moment at the free end) and decreases (the area under the shear diagram is negative).

The shear force is linear in the next section, and the moment varies parabolically. The shear diagram is positive, and the moment increases. This results in the moment diagram shape shown.

In the final section of the beam the shear force decreases linearly; therefore the moment decreases parabolically to zero.

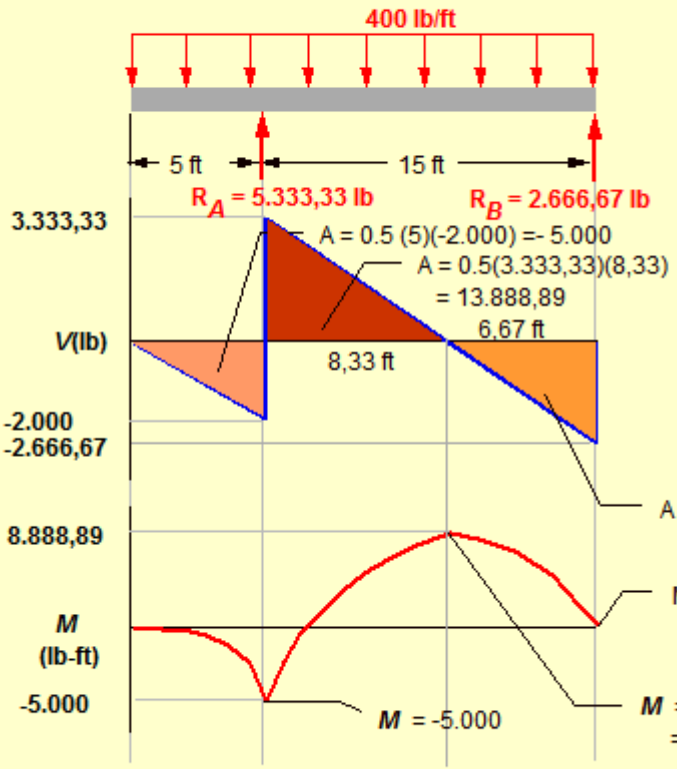
Shear & Moment Diagrams: Numeric V & M Quizzes #3

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



The point at which the shear force passes through zero is a point where the maximum moment may occur.

In the first section of the beam the shear force varies linearly, and the moment parabolically. The moment starts at zero (there is no applied moment at the free end) and decreases (the area under the shear diagram is negative).

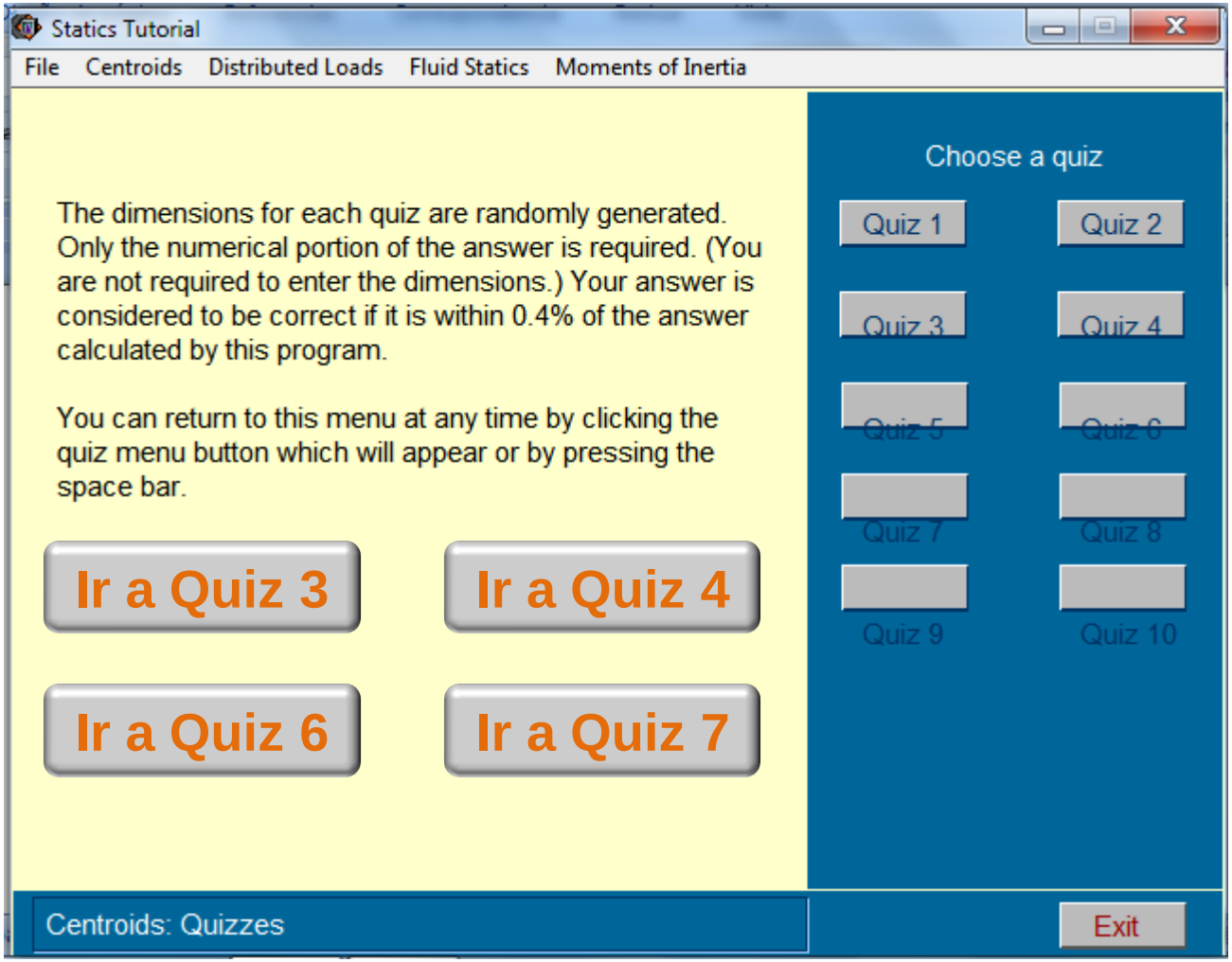
The shear force is linear in the next section, and the moment varies parabolically. The shear diagram is positive, and the moment increases. This results in the moment diagram shape shown.

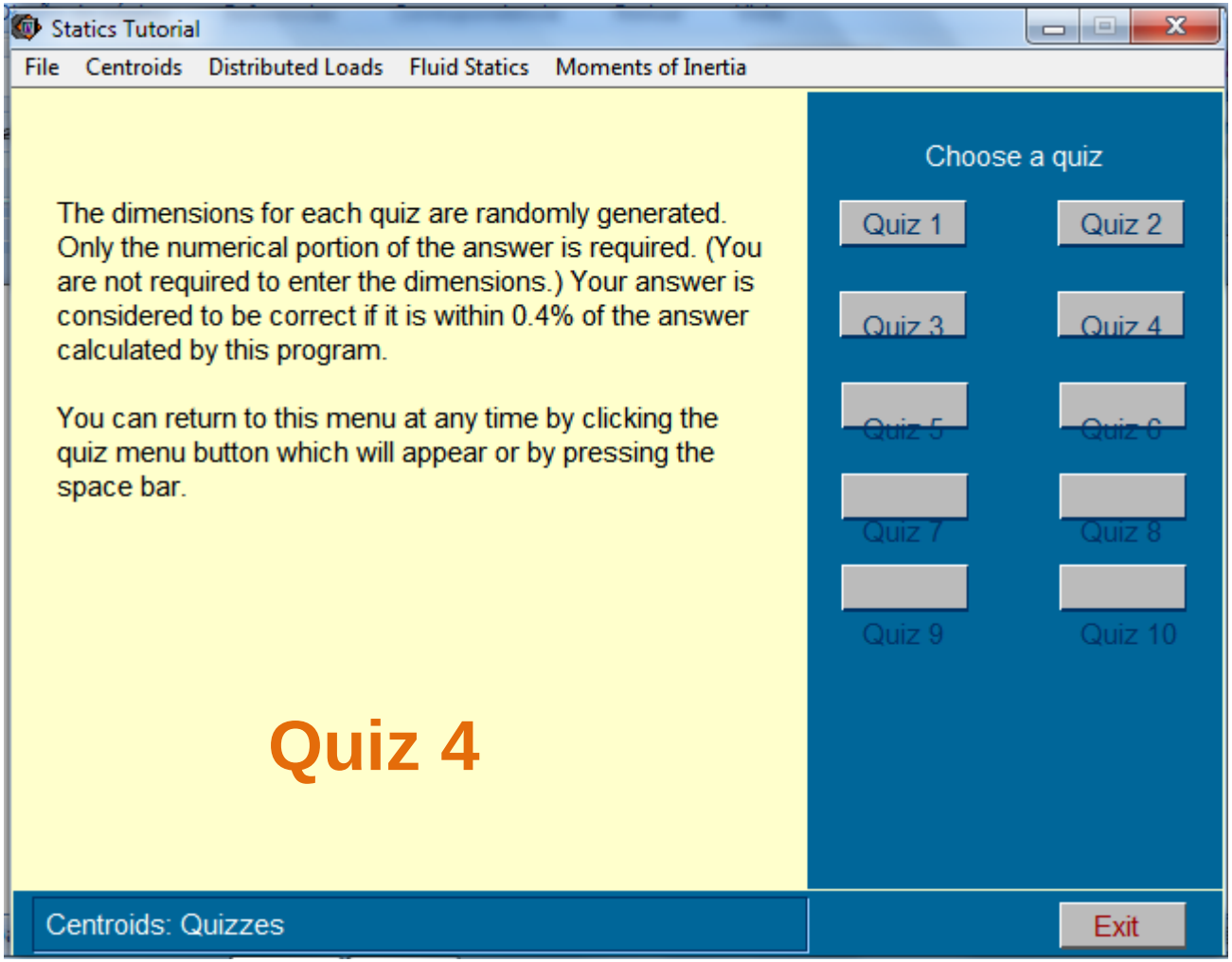
In the final section of the beam the shear force decreases linearly; therefore the moment decreases parabolically to zero.

Shear & Moment Diagrams: Numeric V & M Quizzes #3

Quiz Menu

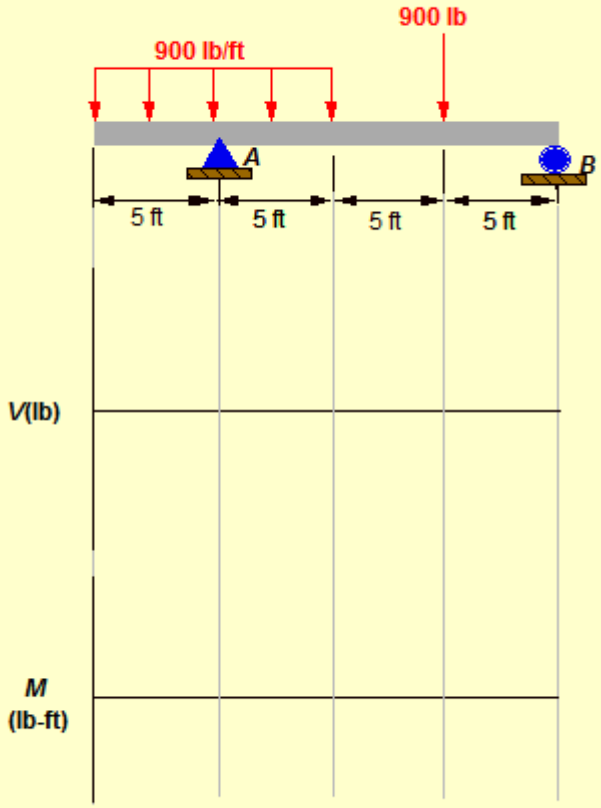
Continue


Statics Tutorial
File
Centroids
Distributed Loads
Fluid Statics
Moments of Inertia
The dimensions for each quiz are randomly generated. Only the numerical portion of the answer is required. (You are not required to enter the dimensions.) Your answer is considered to be correct if it is within 0.4% of the answer calculated by this program.
You can return to this menu at any time by clicking the quiz menu button which will appear or by pressing the space bar.
Ir a Quiz 3
Ir a Quiz 4
Ir a Quiz 6
Ir a Quiz 7
Choose a quiz
Quiz 1
Quiz 2
Quiz 3
Quiz 4
Quiz 5
Quiz 6
Quiz 7
Quiz 8
Quiz 9
Quiz 10
Centroids: Quizzes
Exit


Statics Tutorial
File
Centroids
Distributed Loads
Fluid Statics
Moments of Inertia
The dimensions for each quiz are randomly generated. Only the numerical portion of the answer is required. (You are not required to enter the dimensions.) Your answer is considered to be correct if it is within 0.4% of the answer calculated by this program.
You can return to this menu at any time by clicking the quiz menu button which will appear or by pressing the space bar.
Quiz 4
Choose a quiz
Quiz 1
Quiz 2
Quiz 3
Quiz 4
Quiz 5
Quiz 6
Quiz 7
Quiz 8
Quiz 9
Quiz 10
Centroids: Quizzes
Exit

Statics Tutorial

File Shear & Moment Diagrams Friction



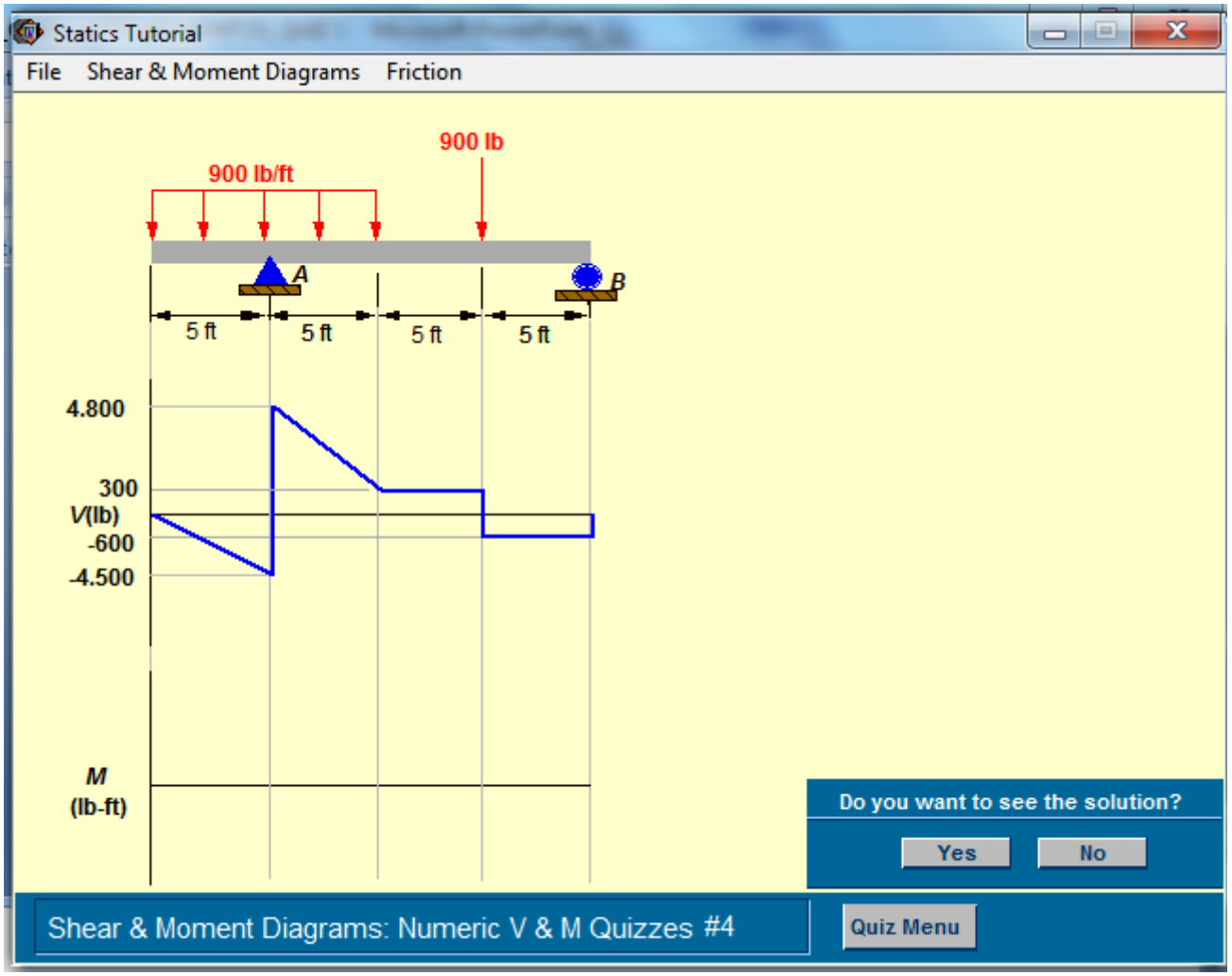
The 20-ft-long simply supported beam shown supports a uniform 900- lb/ft load over 10 ft of its span. A 900-lb concentrated load is applied 5 ft to the left of support ***B***. Plot the shear and bending-moment diagrams for this beam. The horizontal reaction at ***A*** is zero.

After constructing your diagram, click the box below to see the correct shear diagram.

View Shear Force Diagram

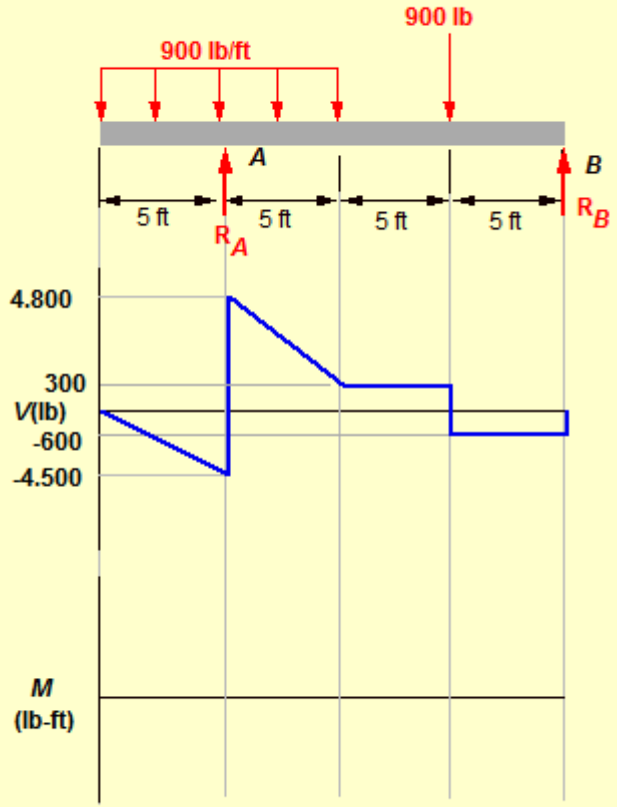
Shear & Moment Diagrams: Numeric V & M Quizzes #4

Quiz Menu


Statics Tutorial
File
Shear & Moment Diagrams
Friction
900 lb
900 lb/ft
A
B
5 ft
5 ft
5 ft
5 ft
4.800
300
V(lb)
-600
-4.500
M
(lb-ft)
Do you want to see the solution?
Yes
No
Shear & Moment Diagrams: Numeric V & M Quizzes #4
Quiz Menu

Statics Tutorial

File Shear & Moment Diagrams Friction



First, establish the reactions at *A*and *B*.

The reactions are determined by modeling the distributed load as an equivalent concentrated force, then generating the equations which satisfy the equilibrium conditions.

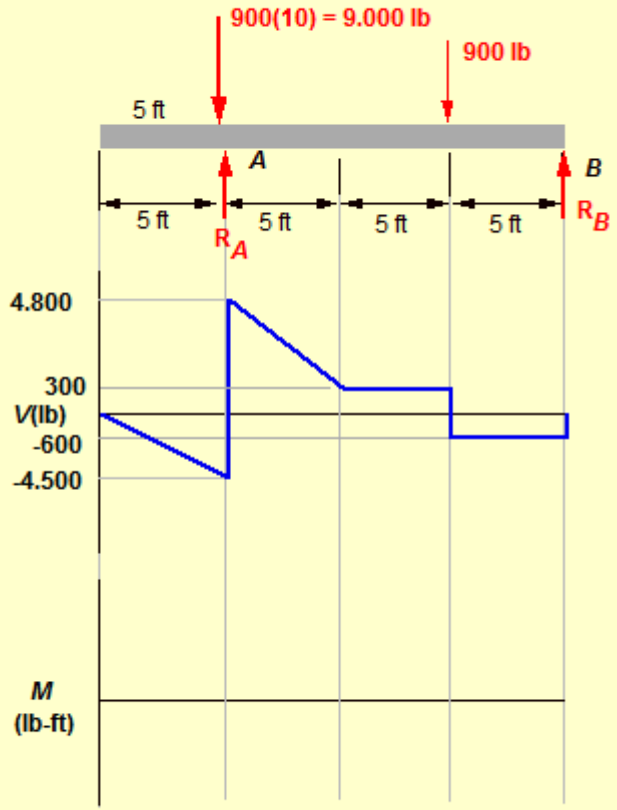
Shear & Moment Diagrams: Numeric V & M Quizzes #4

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



First, establish the reactions at *A* and *B*.

The reactions are determined by modeling the distributed load as an equivalent concentrated force, then generating the equations which satisfy the equilibrium conditions.

The equations of equilibrium are

$+\uparrow \Sigma F_y = 0$: $R_A + R_B - 9.000 - 900 = 0$

$R_A + R_B = 9.900$ (1)

$+\circlearrowleft \Sigma M_A = 0$: $15(R_B) - 10(900) = 0$

$R_B = 600$ lb

Substituting 600 lb into equation (1) and solving yields

$R_A = 9.300$ lb

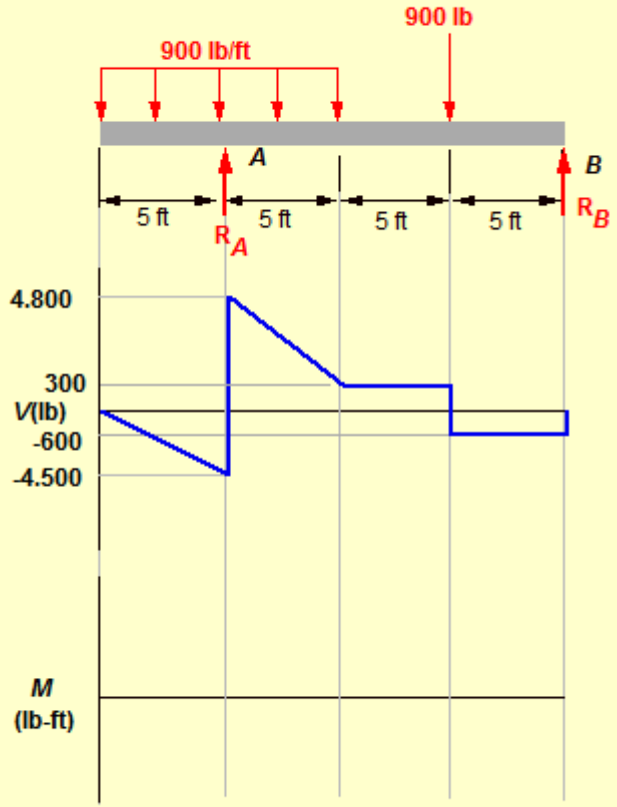
Shear & Moment Diagrams: Numeric V & M Quizzes #4

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



First, establish the reactions at *A* and *B*.

The reactions are determined by modeling the distributed load as an equivalent concentrated force, then generating the equations which satisfy the equilibrium conditions.

The equations of equilibrium are

$+\uparrow \Sigma F_y = 0$: $R_A + R_B - 9.000 - 900 = 0$

$R_A + R_B = 9.900$ (1)

$+\circlearrowleft \Sigma M_A = 0$: $15(R_B) - 10(900) = 0$

$R_B = 600$ lb

Substituting 600 lb into equation (1) and solving yields

$R_A = 9.300$ lb

The shear diagram can be constructed once the reactions are known.

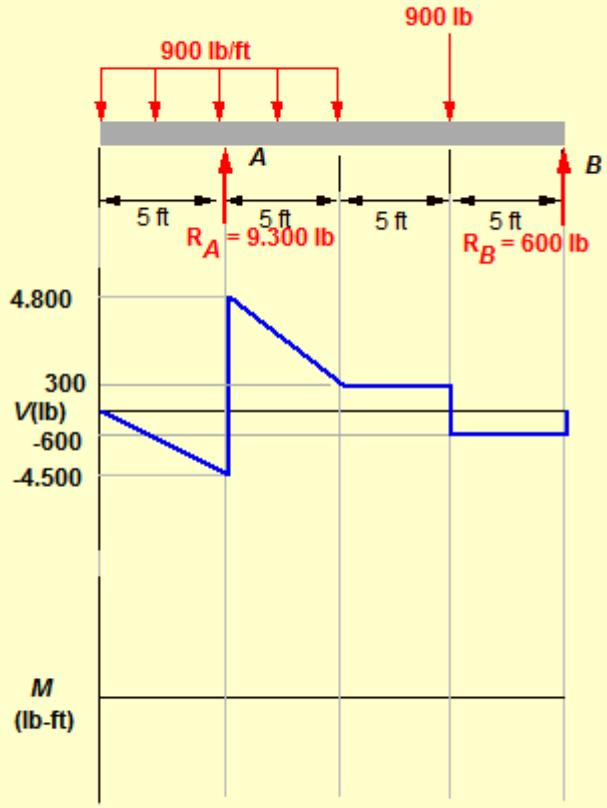
Shear & Moment Diagrams: Numeric V & M Quizzes #4

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



The shear diagram begins at zero. Since the uniform load is directed as shown, it decreases linearly. At the end of 5 ft, it has a magnitude of -4.500.

The 9.300-lb reaction at *A* causes the shear force to increase by that amount, becoming 4.800 lb.

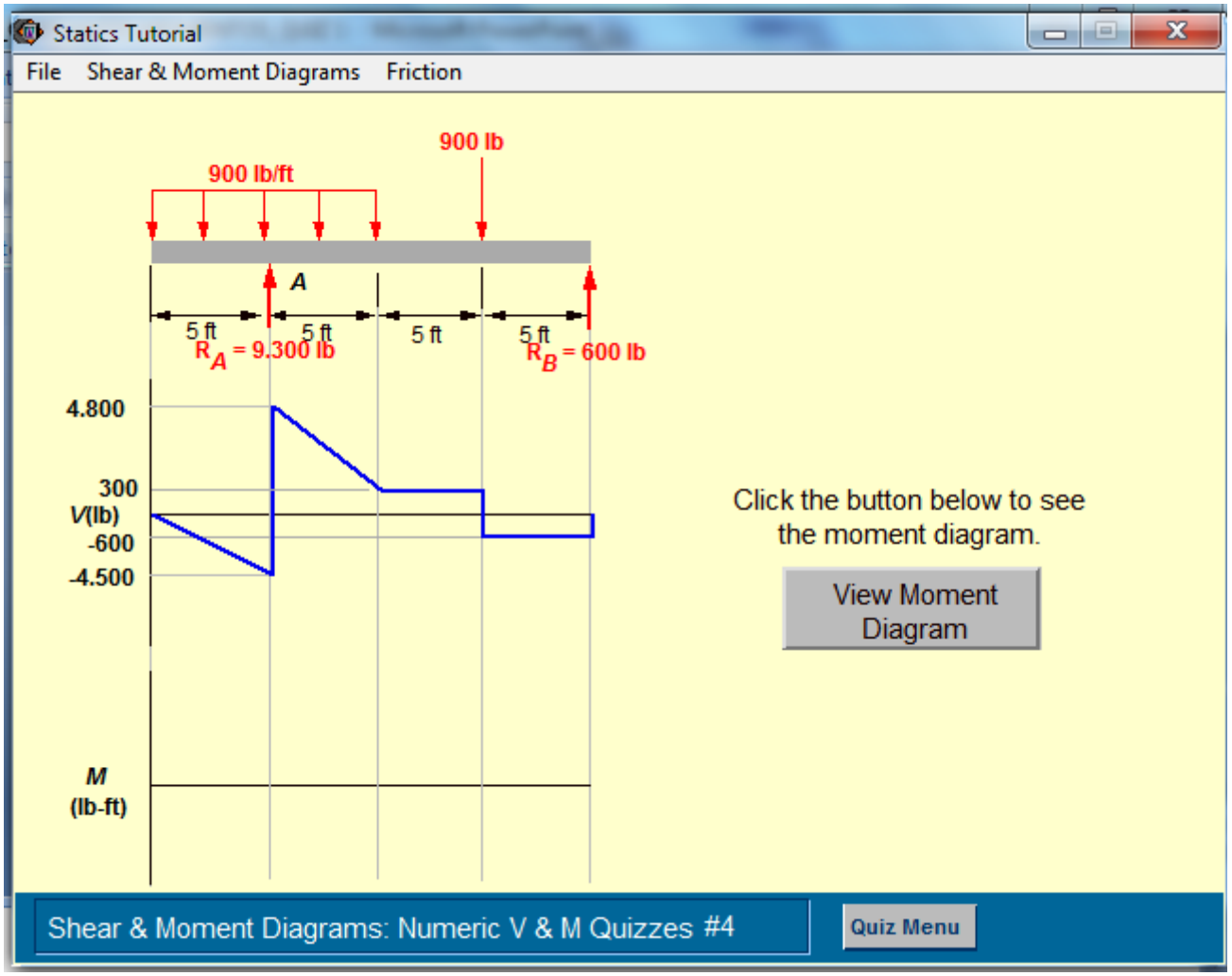
The shear force then decreases linearly at a rate of 900 lb/ft for the next 5 ft. At this point it has a magnitude of 300 lb. It remains constant for the next 5 ft.

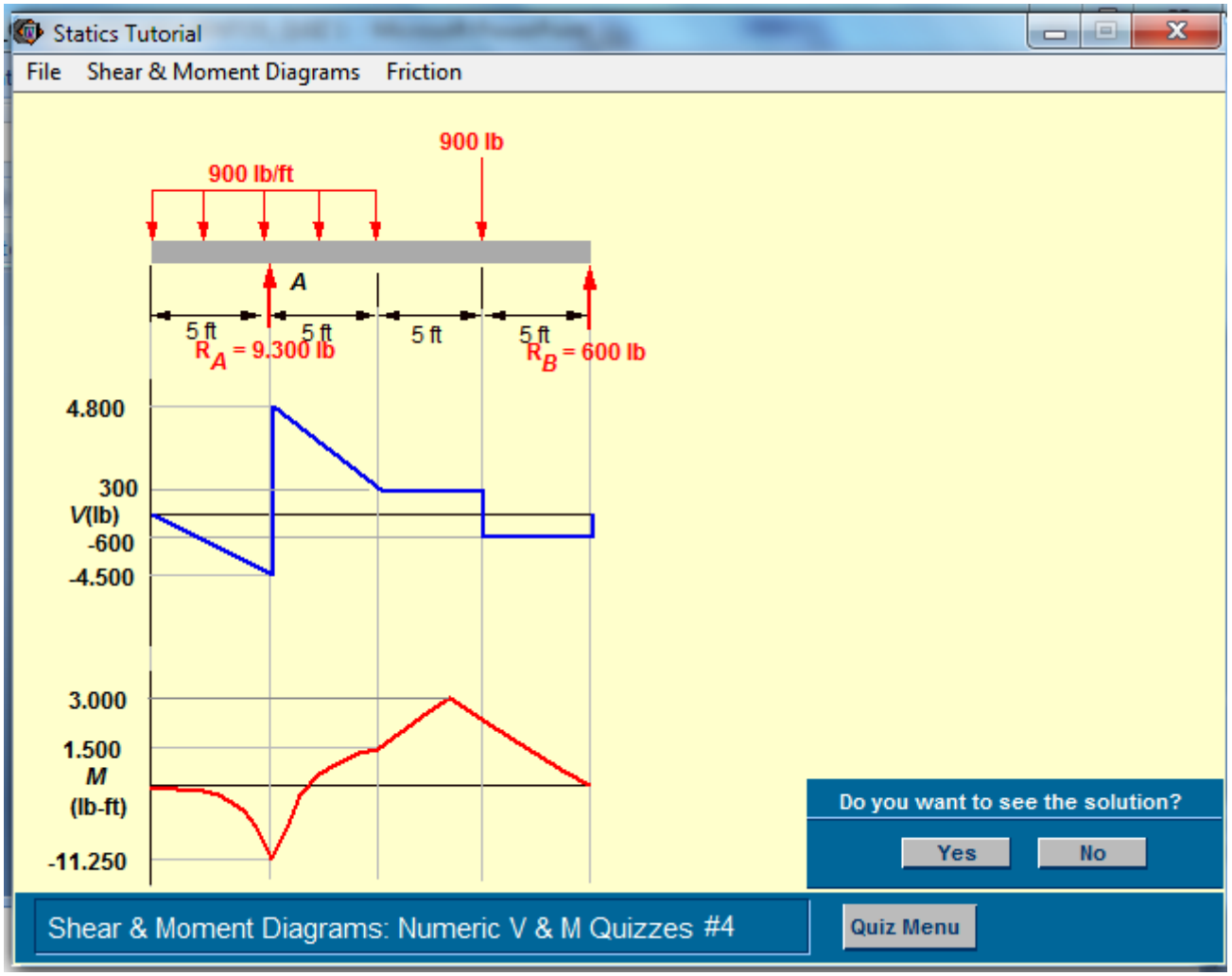
The 900-lb load causes the shear force to decrease to a value of 600 lb. The shear force remains constant until it encounters the reaction at *B*, at which point it returns to zero.

Shear & Moment Diagrams: Numeric V & M Quizzes #4

Quiz Menu

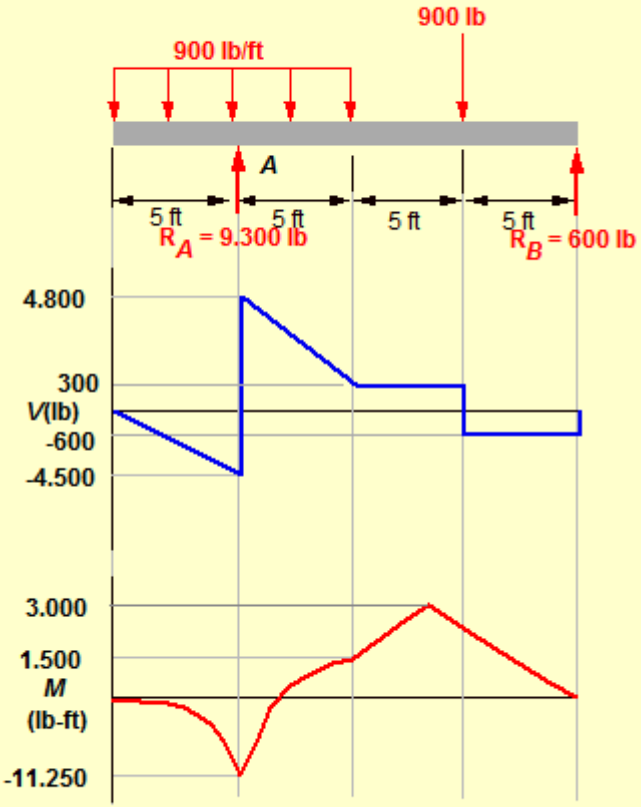
Continue


Statics Tutorial
File
Shear & Moment Diagrams
Friction
900 lb
900 lb/ft
A
5 ft
5 ft
5 ft
5 ft
R_A = 9.300 lb
R_B = 600 lb
4.800
300
V(lb)
-600
-4.500
M
(lb-ft)
Click the button below to see the moment diagram.
View Moment Diagram
Shear & Moment Diagrams: Numeric V & M Quizzes #4
Quiz Menu


Statics Tutorial
File
Shear & Moment Diagrams
Friction
900 lb
900 lb/ft
A
5 ft
5 ft
5 ft
5 ft
R_A = 9.300 lb
R_B = 600 lb
4.800
300
V(lb)
-600
-4.500
3.000
1.500
M
(lb-ft)
-11.250
Do you want to see the solution?
Yes
No
Shear & Moment Diagrams: Numeric V & M Quizzes #4
Quiz Menu

Statics Tutorial

File Shear & Moment Diagrams Friction



In the first section of the beam, the shear force varies linearly and the moment varies parabolically. The moment starts at zero (there is no applied moment at the fee end) and decreases (the area under the shear diagram is negative).

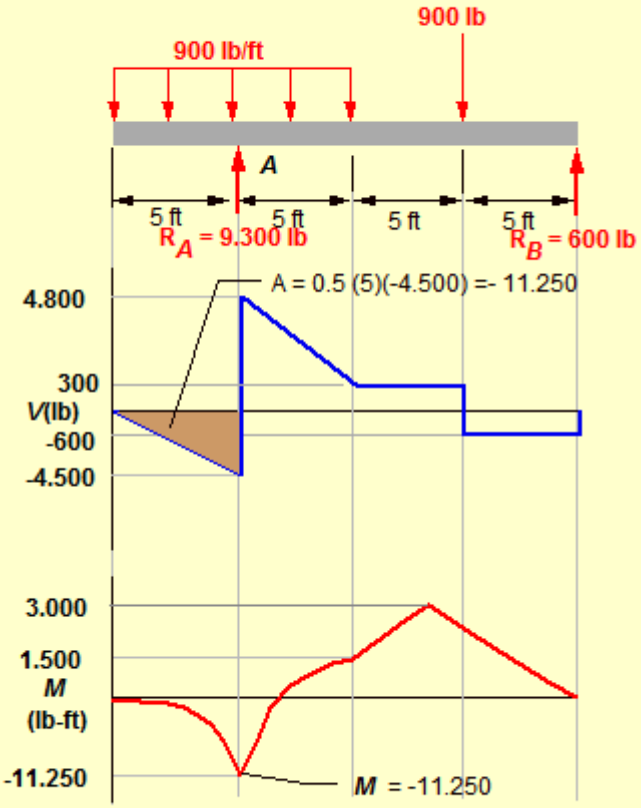
Shear & Moment Diagrams: Numeric V & M Quizzes #4

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



In the first section of the beam, the shear force varies linearly and the moment varies parabolically. The moment starts at zero (there is no applied moment at the fee end) and decreases (the area under the shear diagram is negative).

In the next section, the shear force is linear and the moment varies parabolically. The shear diagram is positive, and the moment increases. This results in the moment diagram shape shown. Finding the area under the shear diagram in this section of the beam requires computing two areas.

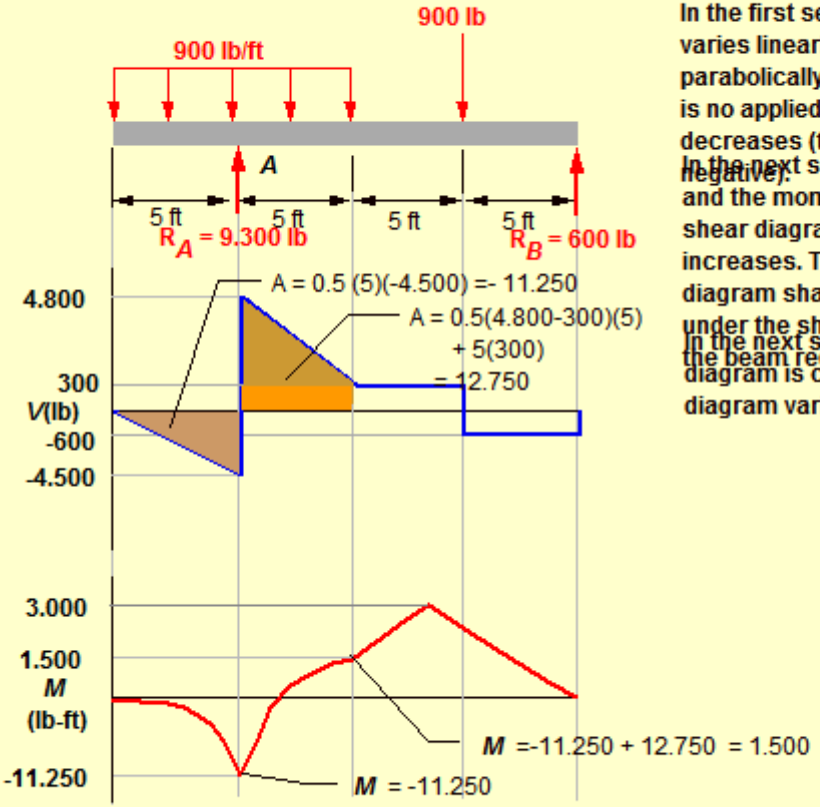
Shear & Moment Diagrams: Numeric V & M Quizzes #4

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



In the first section of the beam, the shear force varies linearly and the moment varies parabolically. The moment starts at zero (there is no applied moment at the fee end) and decreases (the area under the shear diagram is negative).

In the next section, the shear force is linear and the moment varies parabolically. The shear diagram is positive, and the moment increases. This results in the moment diagram shape shown. Finding the area under the shear diagram in this section of the beam requires computing two areas.

In the next section of the beam the shear diagram is constant; therefore the moment diagram varies linearly.

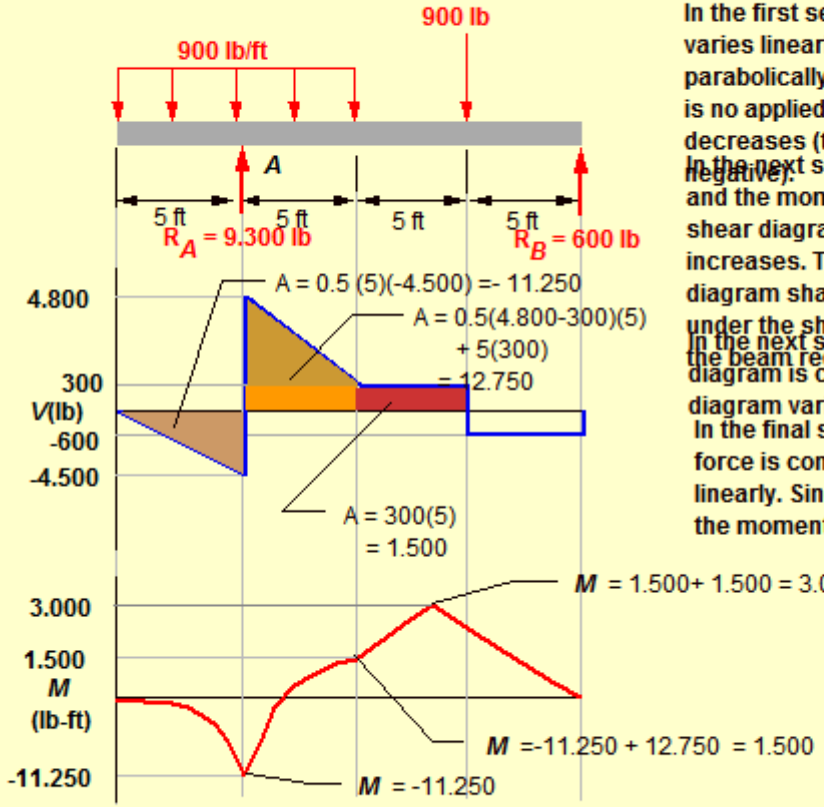
Shear & Moment Diagrams: Numeric V & M Quizzes #4

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



In the first section of the beam, the shear force varies linearly and the moment varies parabolically. The moment starts at zero (there is no applied moment at the fee end) and decreases (the area under the shear diagram is negative).

In the next section, the shear force is linear and the moment varies parabolically. The shear diagram is positive, and the moment increases. This results in the moment diagram shape shown. Finding the area under the shear diagram in this section of the beam requires computing two areas.

In the next section of the beam the shear diagram is constant; therefore the moment diagram varies linearly.

In the final section of the beam the shear force is constant, so the moment varies linearly. Since the shear force is negative, the moment decreases.

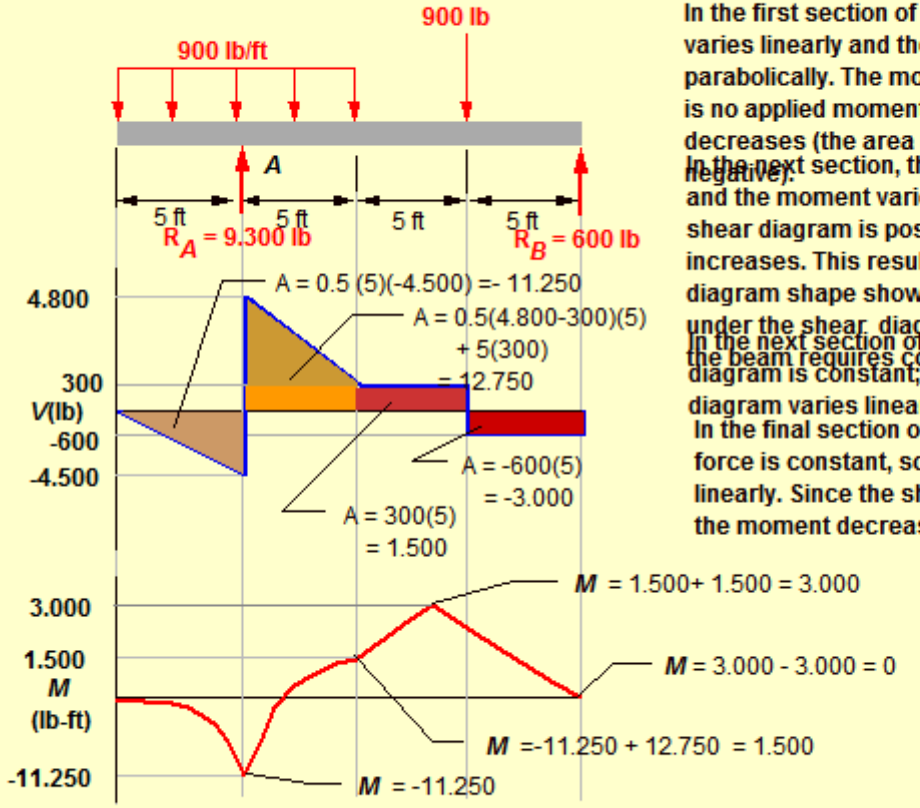
Shear & Moment Diagrams: Numeric V & M Quizzes #4

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



In the first section of the beam, the shear force varies linearly and the moment varies parabolically. The moment starts at zero (there is no applied moment at the fee end) and decreases (the area under the shear diagram is negative).

In the next section, the shear force is linear and the moment varies parabolically. The shear diagram is positive, and the moment increases. This results in the moment diagram shape shown. Finding the area under the shear diagram in this section of the beam requires computing two areas.

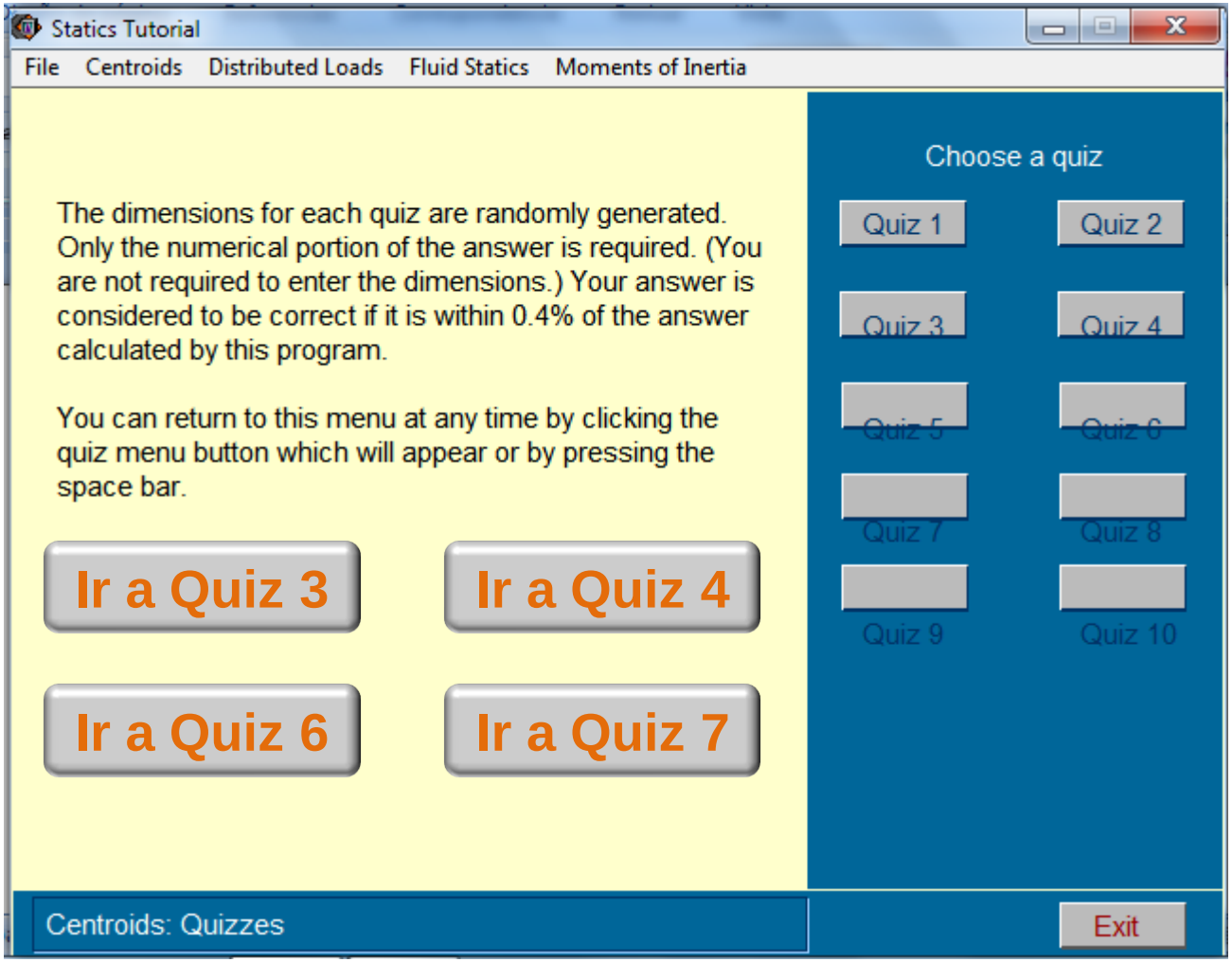
In the next section of the beam the shear diagram is constant; therefore the moment diagram varies linearly.

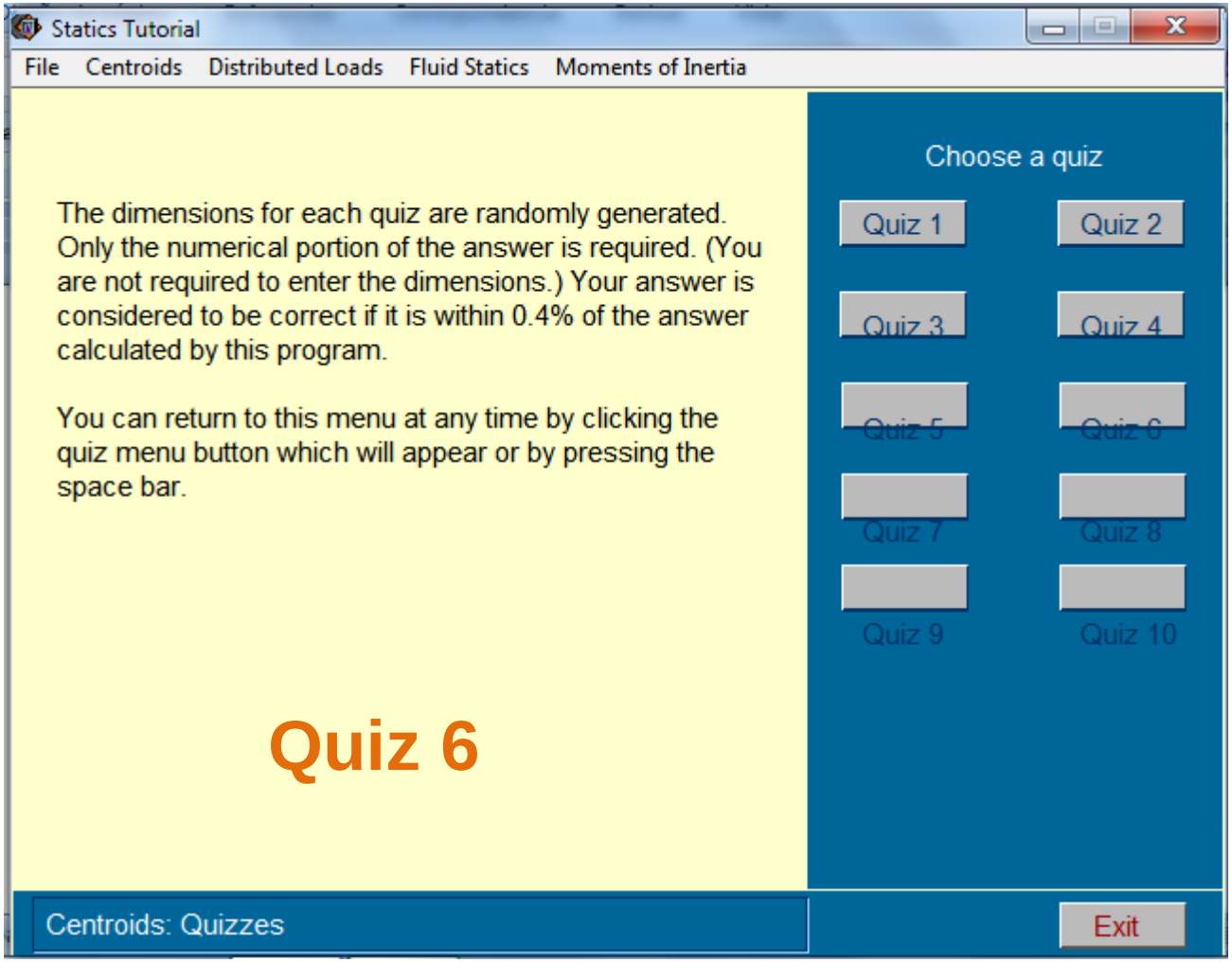
In the final section of the beam the shear force is constant, so the moment varies linearly. Since the shear force is negative, the moment decreases.

Shear & Moment Diagrams: Numeric V & M Quizzes #4

Quiz Menu

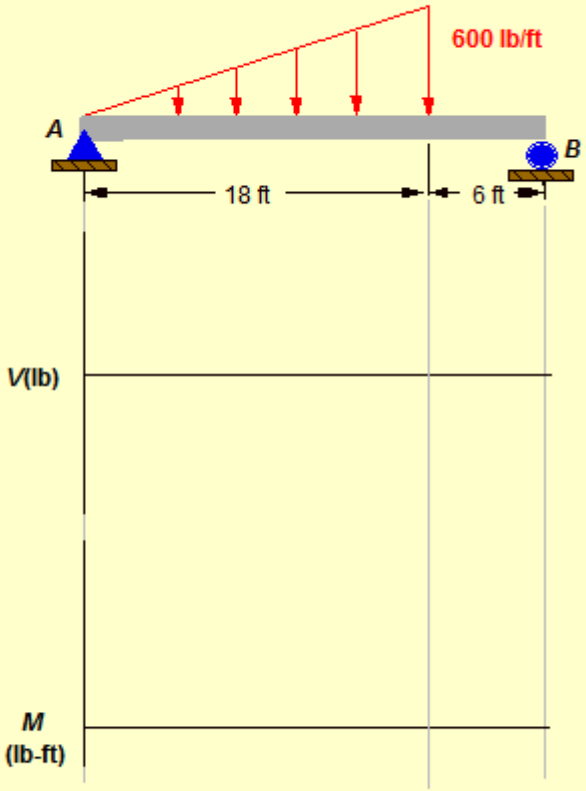
Continue


Statics Tutorial
File
Centroids
Distributed Loads
Fluid Statics
Moments of Inertia
The dimensions for each quiz are randomly generated. Only the numerical portion of the answer is required. (You are not required to enter the dimensions.) Your answer is considered to be correct if it is within 0.4% of the answer calculated by this program.
You can return to this menu at any time by clicking the quiz menu button which will appear or by pressing the space bar.
Ir a Quiz 3
Ir a Quiz 4
Ir a Quiz 6
Ir a Quiz 7
Choose a quiz
Quiz 1
Quiz 2
Quiz 3
Quiz 4
Quiz 5
Quiz 6
Quiz 7
Quiz 8
Quiz 9
Quiz 10
Centroids: Quizzes
Exit


Statics Tutorial
File
Centroids
Distributed Loads
Fluid Statics
Moments of Inertia
The dimensions for each quiz are randomly generated. Only the numerical portion of the answer is required. (You are not required to enter the dimensions.) Your answer is considered to be correct if it is within 0.4% of the answer calculated by this program.
You can return to this menu at any time by clicking the quiz menu button which will appear or by pressing the space bar.
Quiz 6
Choose a quiz
Quiz 1
Quiz 2
Quiz 3
Quiz 4
Quiz 5
Quiz 6
Quiz 7
Quiz 8
Quiz 9
Quiz 10
Centroids: Quizzes
Exit

Statics Tutorial

File Shear & Moment Diagrams Friction



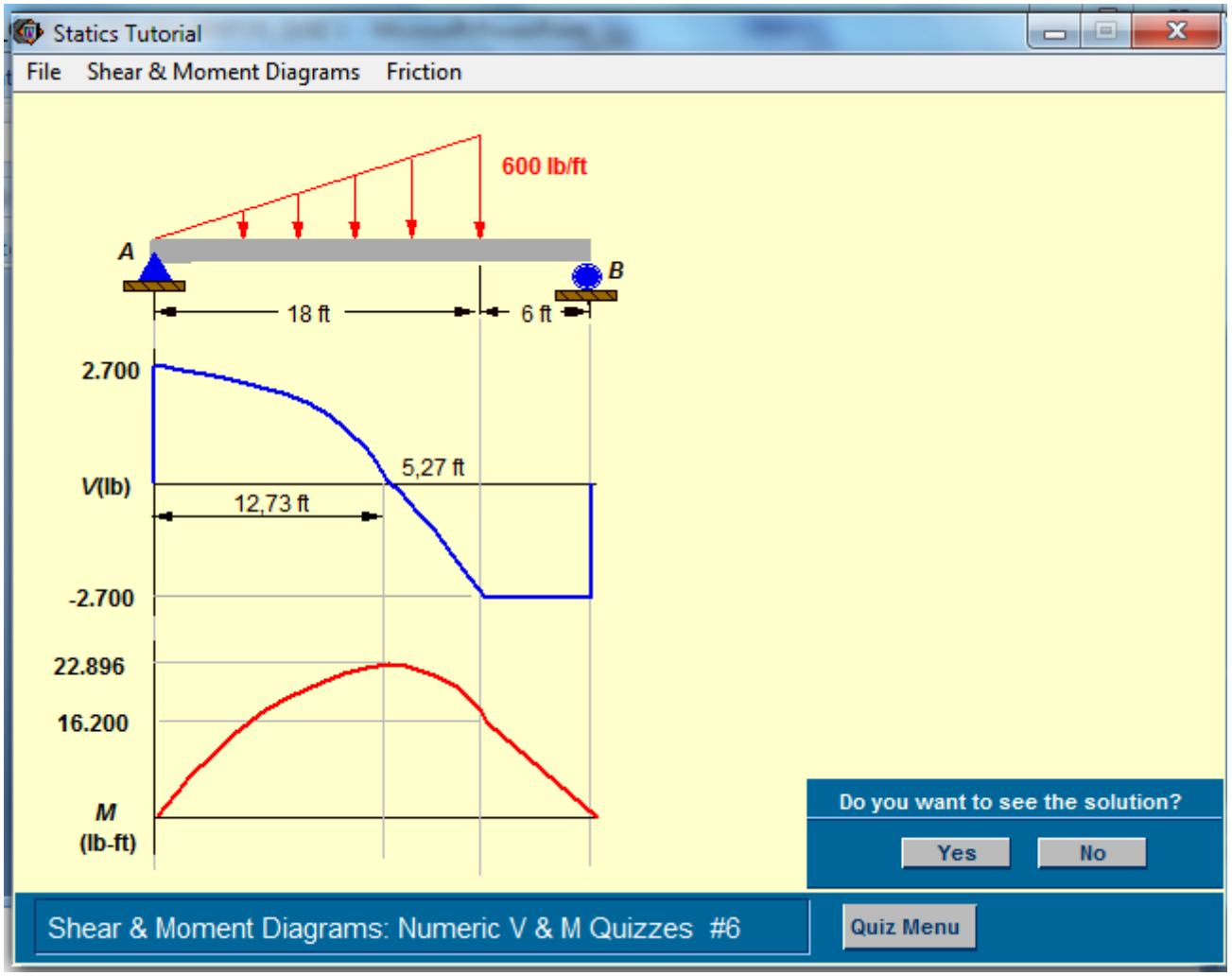
The simply supported beam shown is 24 ft long and supports a linearly varying load of 600 lb/ft over 18 ft of its span. Plot the shear and bending moment diagrams. The horizontal reaction at ***A*** is zero.

After constructing your diagram, click the box below to see the correct shear diagram.

View Diagrams

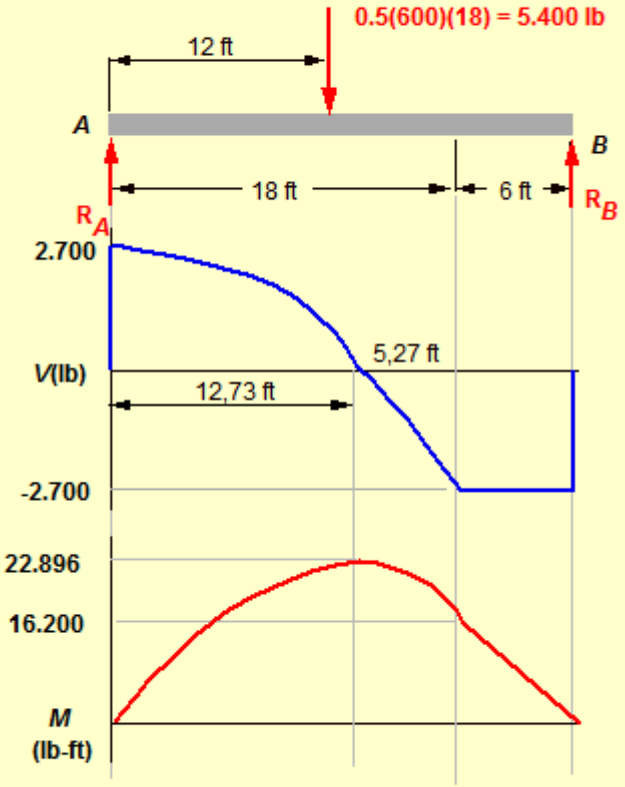
Shear & Moment Diagrams: Numeric V & M Quizzes #6

Quiz Menu


Statics Tutorial
File
Shear & Moment Diagrams
Friction
600 lb/ft
A
B
18 ft
6 ft
2.700
V(lb)
5,27 ft
12,73 ft
-2.700
22.896
16.200
M
(lb-ft)
Do you want to see the solution?
Yes
No
Shear & Moment Diagrams: Numeric V & M Quizzes #6
Quiz Menu

Statics Tutorial

File Shear & Moment Diagrams Friction



First, establish the reactions at *A* and *B*.

The reactions are determined by first modeling the distributed load as an equivalent concentrated force, then generating the equations which satisfy the equilibrium conditions. The equations of equilibrium are

$+\uparrow \Sigma F_y = 0$: $R_A + R_B - 5.400 = 0$

$R_A + R_B = 5.400$ (1)

$+\circlearrowleft \Sigma M_A = 0$: $24(R_B) - 12\,(5.400) = 0$

$R_B = 2.700$ lb

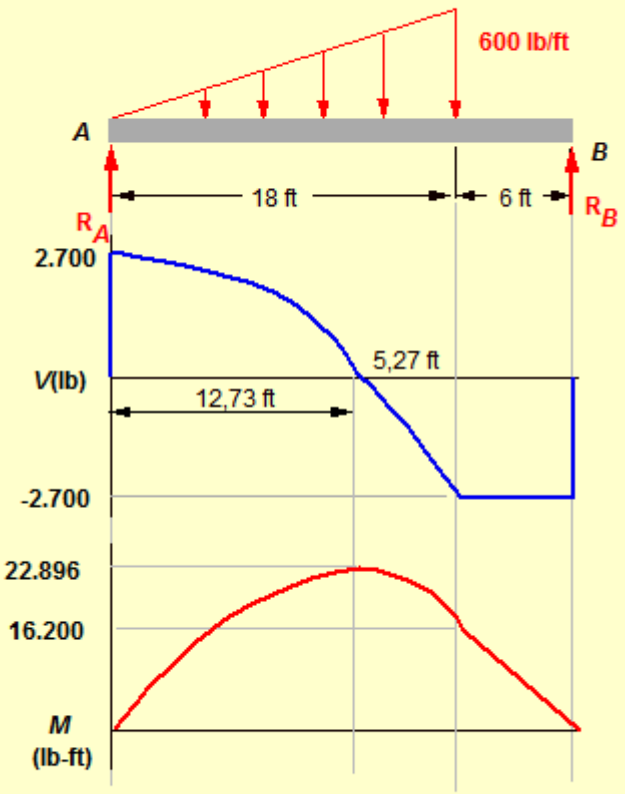
Substituting 2.700 lb into equation (1) and solving yields

$R_A = 2.700$ lb

Shear & Moment Diagrams: Numeric V & M Quizzes #6 Quiz Menu Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



First, establish the reactions at *A* and *B*.

The reactions are determined by first modeling the distributed load as an equivalent concentrated force, then generating the equations which satisfy the equilibrium conditions.

The equations of equilibrium are

$+\uparrow \Sigma F_y = 0$: $R_A + R_B - 5.400 = 0$

$R_A + R_B = 5.400$ (1)

$+\circlearrowleft \Sigma M_A = 0$: $24(R_B) - 12\,(5.400) = 0$

$R_B = 2.700$ lb

Substituting 2.700 lb into equation (1) and solving yields

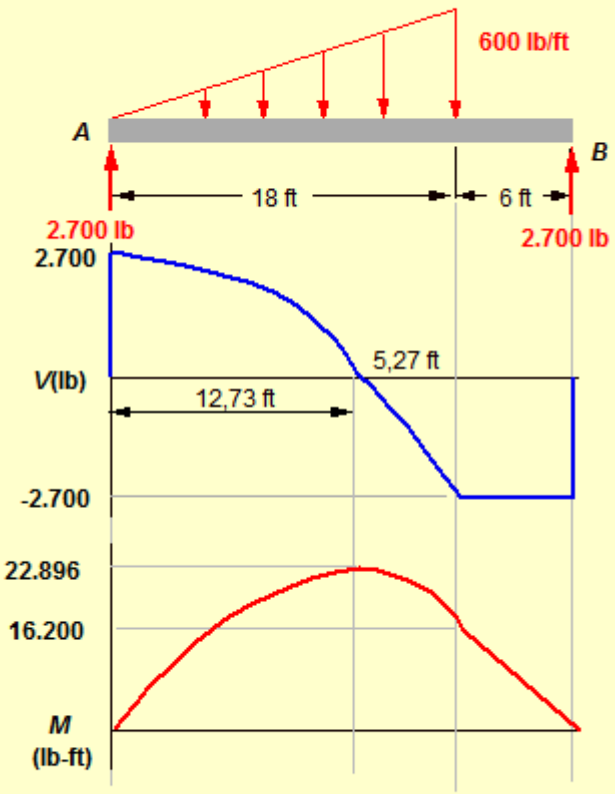
$R_A = 2.700$ lb

The shear diagram can be constructed once the reactions are known.

Shear & Moment Diagrams: Numeric V & M Quizzes #6 Quiz Menu Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



Since the load distribution is linear, it is best to construct a model and set up the equations of static equilibrium for the segment of the beam under the distributed load. Although the shear diagram can be drawn by inspection, several important features are not easily determined. For example, the point at which the shear force is zero must be determined in order to establish the maximum moment.

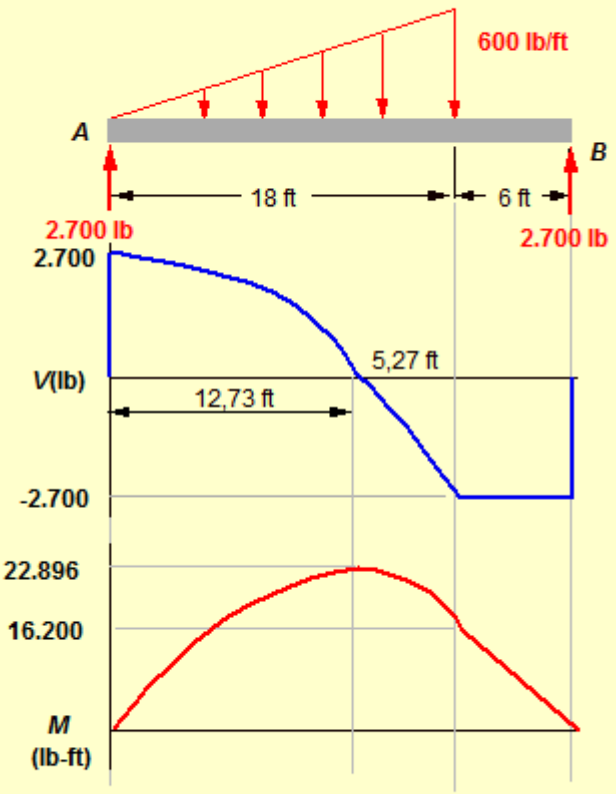
Shear & Moment Diagrams: Numeric V & M Quizzes #6

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



Since the load distribution is linear, it is best to construct a model and set up the equations of static equilibrium for the segment of the beam under the distributed load. Although the shear diagram can be drawn by inspection, several important features are not easily determined. For example, the point at which the shear force is zero must be determined in order to establish the maximum moment.

The load must be acurately represented as a function of x. The 600 lb/ft distribution is at the right end of the load. At some arbitrary location it will be different.

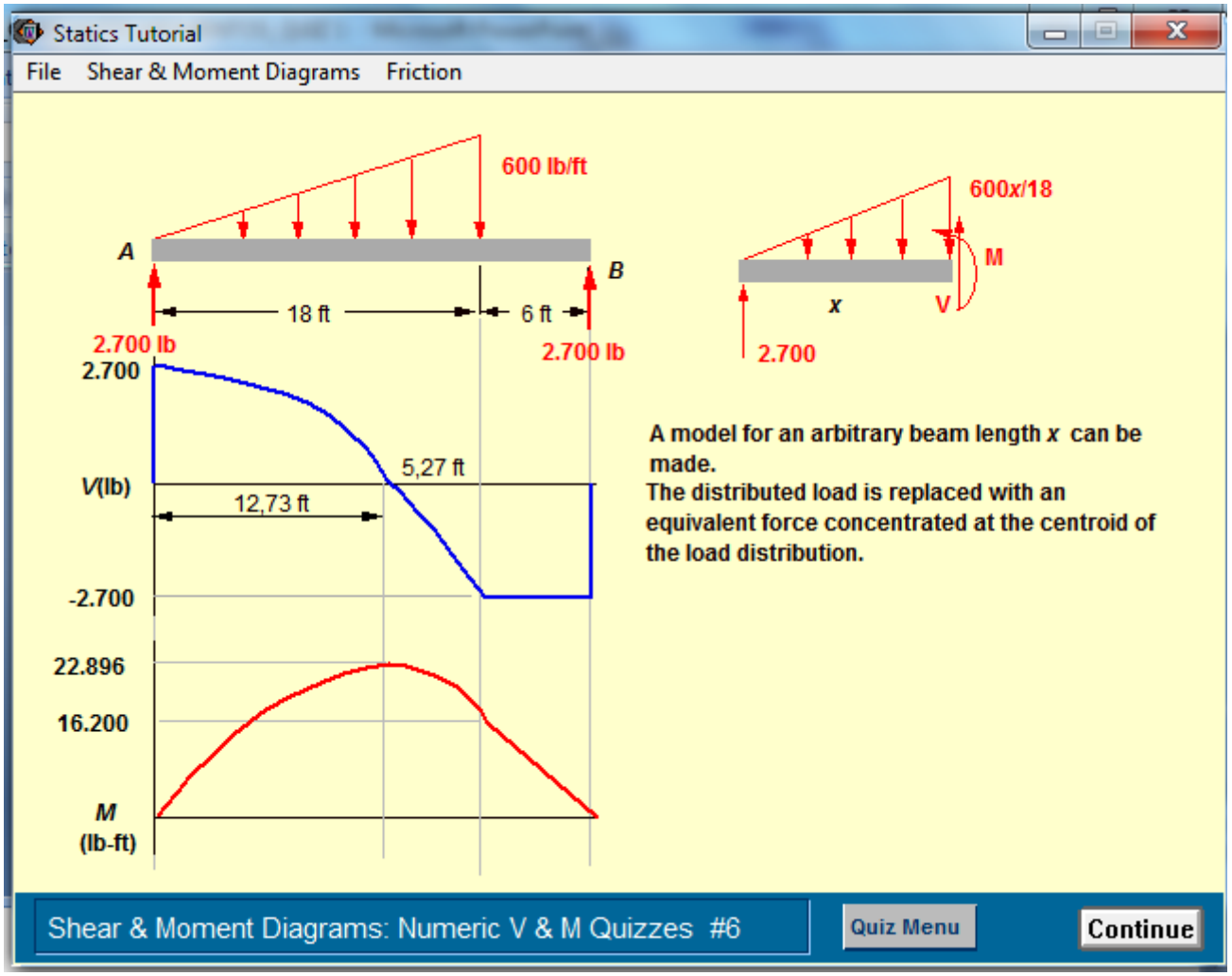
Since the distribution is linear, a simple equation for a line is used to define the distributed load.

$$w = 600x/18$$

Shear & Moment Diagrams: Numeric V & M Quizzes #6

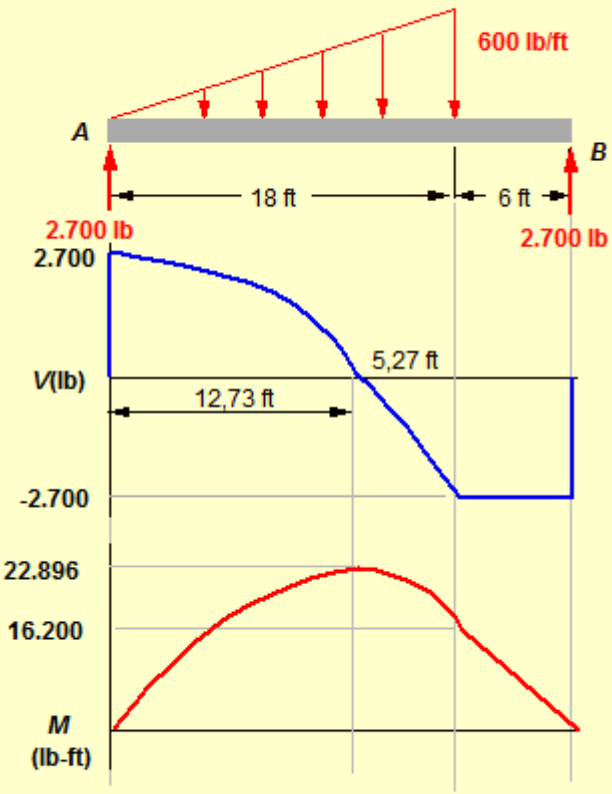
Quiz Menu

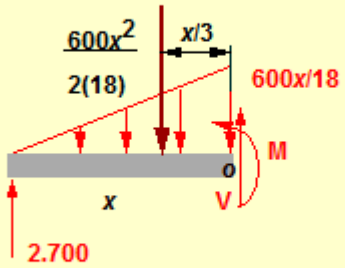
Continue


Statics Tutorial
File
Shear & Moment Diagrams
Friction
600 lb/ft
A
B
18 ft
6 ft
2.700 lb
2.700 lb
2.700
V(lb)
5,27 ft
12,73 ft
-2.700
22.896
16.200
M
(lb-ft)
600x/18
M
x
V
2.700
A model for an arbitrary beam length x can be made.
The distributed load is replaced with an equivalent force concentrated at the centroid of the load distribution.
Shear & Moment Diagrams: Numeric V & M Quizzes #6
Quiz Menu
Continue

Statics Tutorial

File Shear & Moment Diagrams Friction





A model for an arbitrary beam length *x* can be made.
The distributed load is replaced with an equivalent force concentrated at the centroid of the load distribution.

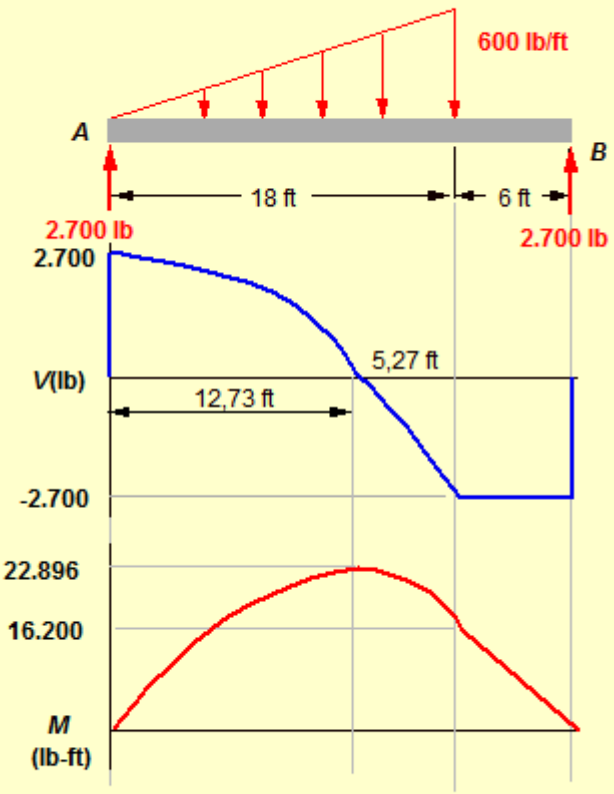
Shear & Moment Diagrams: Numeric V & M Quizzes #6

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



$V = 16{,}67x^2 - 2.700$

$M = 2.700x - 5{,}56x^3$

The point at which the shear diagram crosses the axis (point of maximum moment) is found by setting the shear equation equal to zero and solving for x:

$x = 12{,}73$ ft

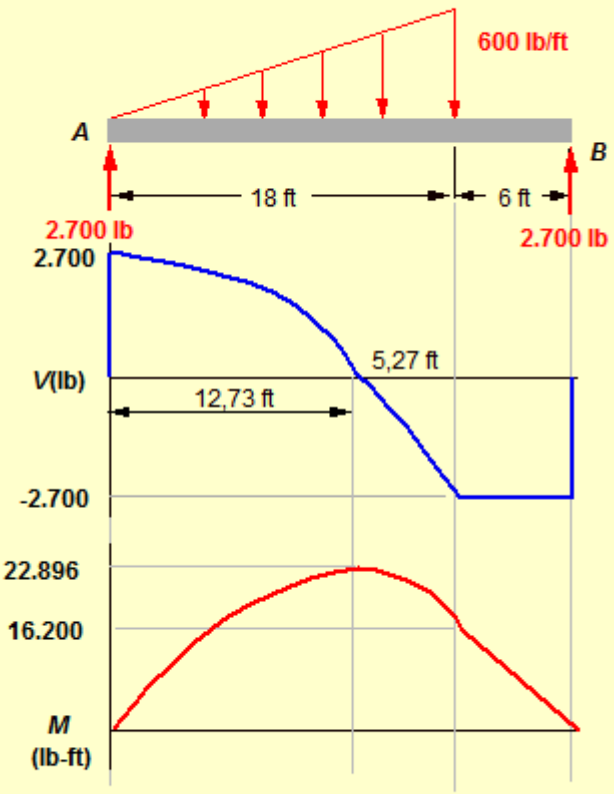
Shear & Moment Diagrams: Numeric V & M Quizzes #6

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



$V = 16{,}67x^2 - 2.700$

$M = 2.700x - 5{,}56x^3$

The point at which the shear diagram crosses the axis (point of maximum moment) is found by setting the shear equation equal to zero and solving for *x*.

$x = 12{,}73$ ft

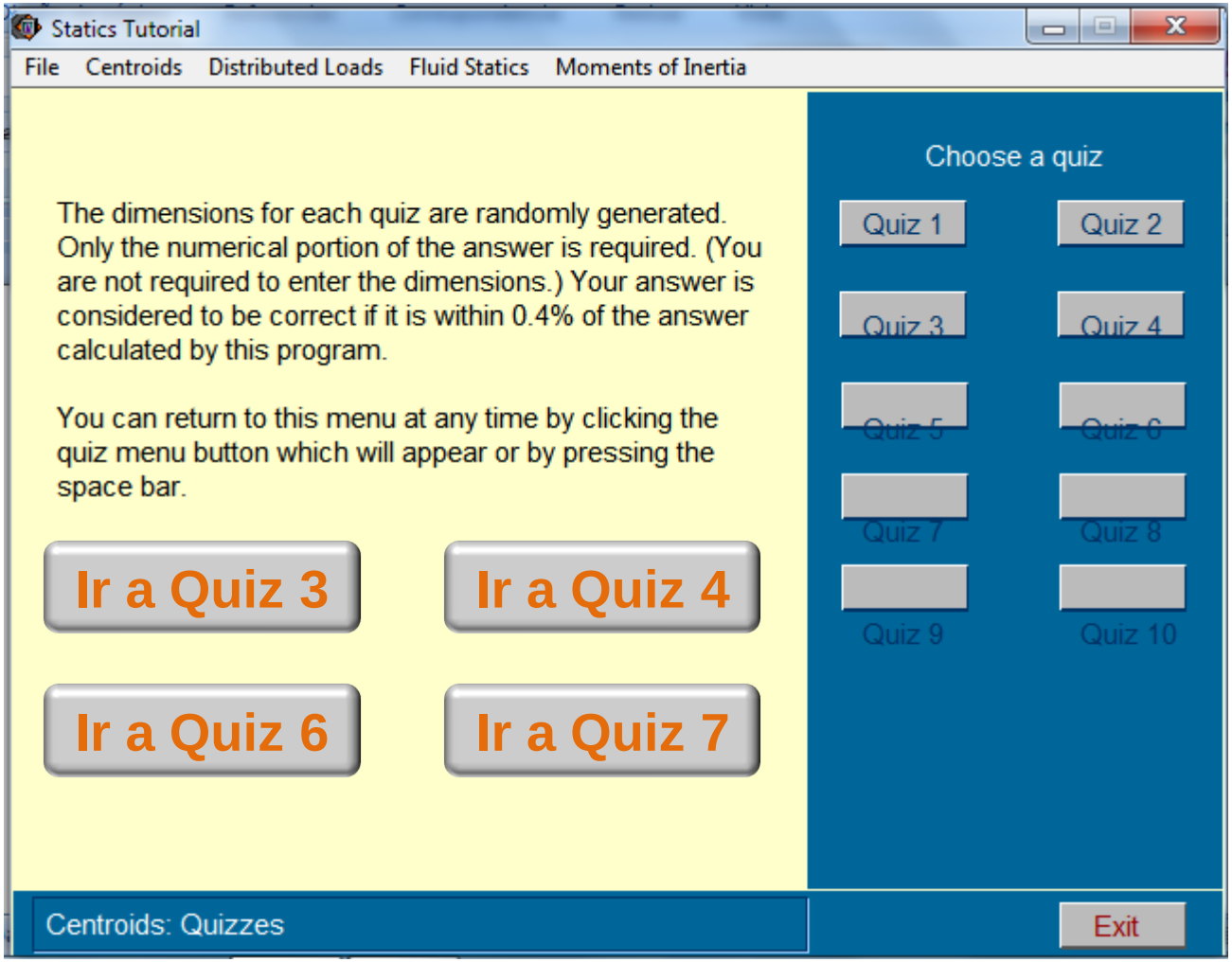
Using this value of *x*, and the moment equation, the bending moment at any spanwise location between $0 < x < 18$ can be determined, using

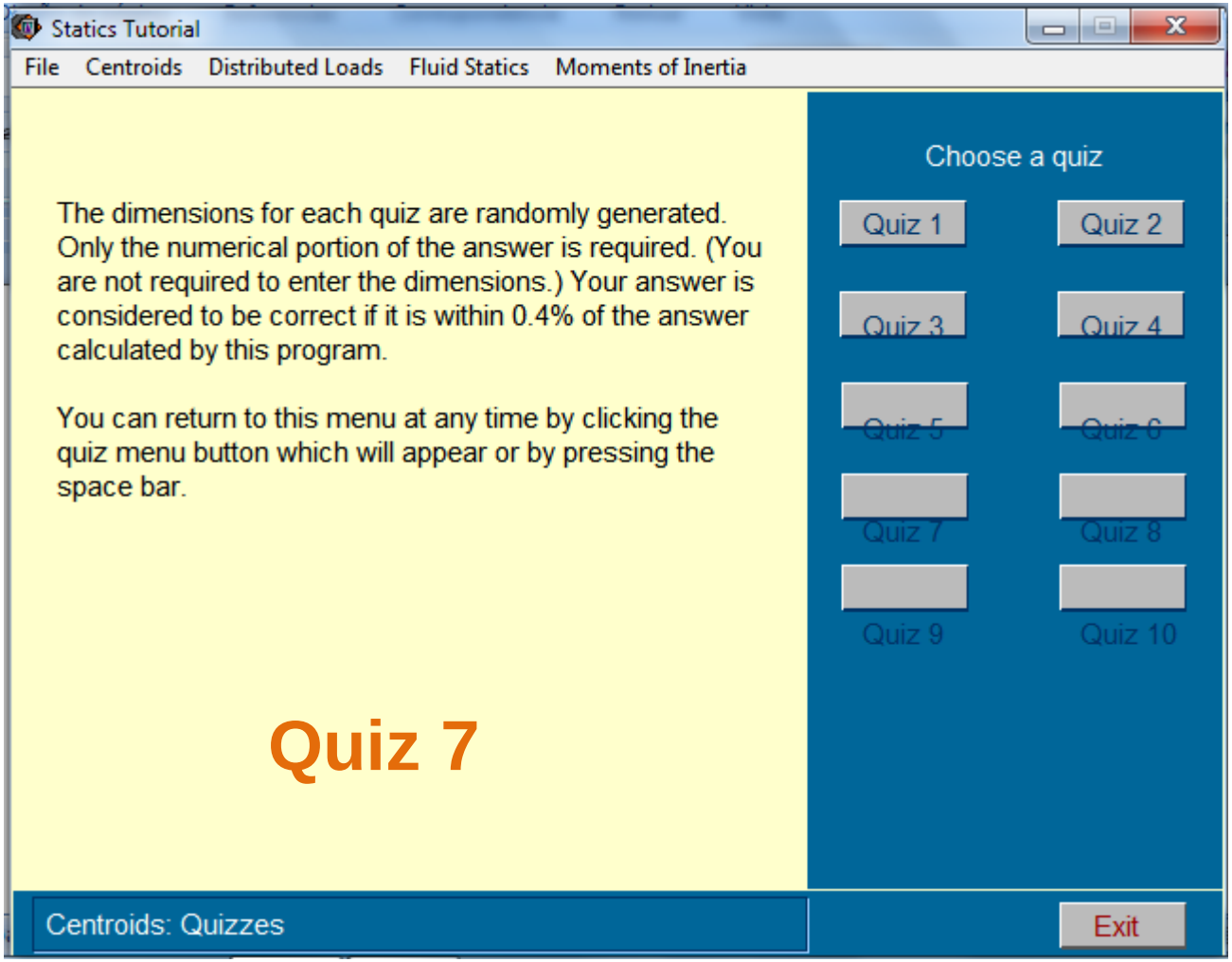
$M = 2.700x - 5{,}56x^3$

Similarly, the shear force can be determined at any point in this region using the equation for *V* above.

In any region of the beam outside the linearly distributed load, the method of inspection works well. In the final segment of the beam the shear force is constant until the reaction at *B* is reached, which brings it back to zero. The area in this segment of the shear diagram is easily computed to be A = 6(-2.700) = 16.200. When added to the moment calculated at *x* = 18, the result is as shown. Since the shear force is constant in this section, the moment varies linearly.

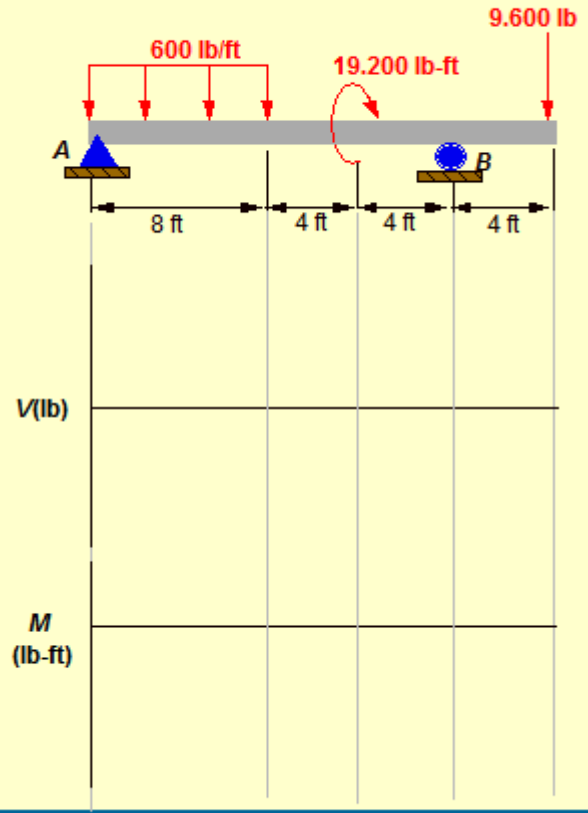
Shear & Moment Diagrams: Numeric V & M Quizzes #6 Quiz Menu Continue


Statics Tutorial
File
Centroids
Distributed Loads
Fluid Statics
Moments of Inertia
The dimensions for each quiz are randomly generated. Only the numerical portion of the answer is required. (You are not required to enter the dimensions.) Your answer is considered to be correct if it is within 0.4% of the answer calculated by this program.
You can return to this menu at any time by clicking the quiz menu button which will appear or by pressing the space bar.
Ir a Quiz 3
Ir a Quiz 4
Ir a Quiz 6
Ir a Quiz 7
Choose a quiz
Quiz 1
Quiz 2
Quiz 3
Quiz 4
Quiz 5
Quiz 6
Quiz 7
Quiz 8
Quiz 9
Quiz 10
Centroids: Quizzes
Exit


Statics Tutorial
File
Centroids
Distributed Loads
Fluid Statics
Moments of Inertia
The dimensions for each quiz are randomly generated. Only the numerical portion of the answer is required. (You are not required to enter the dimensions.) Your answer is considered to be correct if it is within 0.4% of the answer calculated by this program.
You can return to this menu at any time by clicking the quiz menu button which will appear or by pressing the space bar.
Quiz 7
Choose a quiz
Quiz 1
Quiz 2
Quiz 3
Quiz 4
Quiz 5
Quiz 6
Quiz 7
Quiz 8
Quiz 9
Quiz 10
Centroids: Quizzes
Exit

Statics Tutorial

File Shear & Moment Diagrams Friction



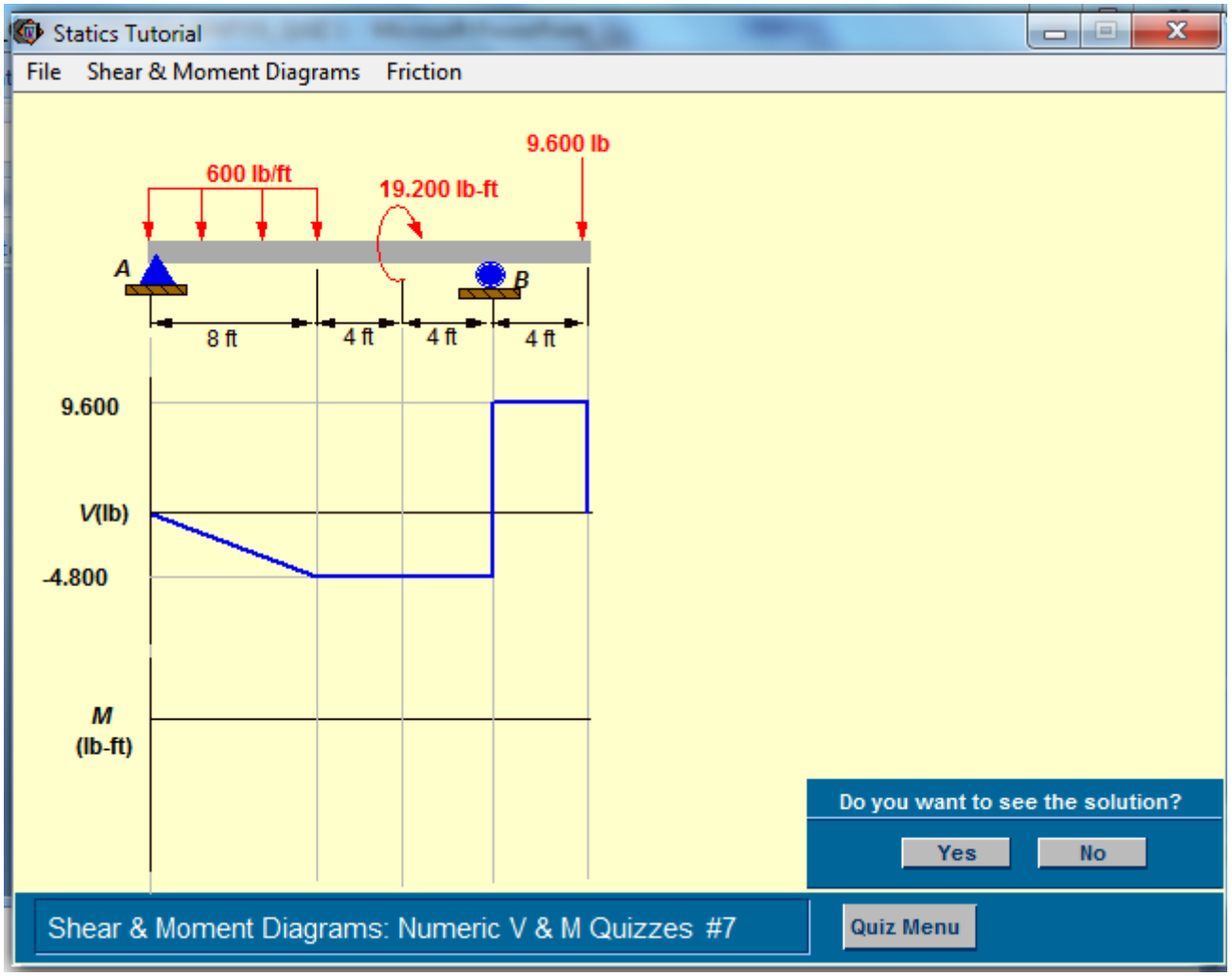
The simply supported beam shown is 20 ft long and supports a uniform load of 600 lb/ft over 8 ft of its span. A 9.600-lb concentrated load and a 19.200-ft-lb concentrated moment are applied at the locations shown. Plot the shear and bending-moment diagrams for this beam. The horizontal reaction at ***A*** is zero.

After constructing your diagram, click the box below to see the correct shear diagram.

View Shear Force Diagram

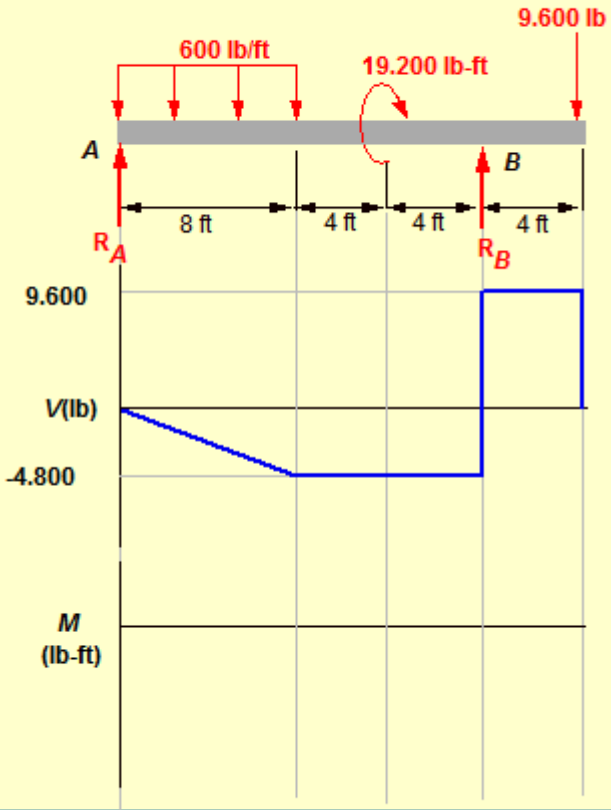
Shear & Moment Diagrams: Numeric V & M Quizzes #7

Quiz Menu


Statics Tutorial
File
Shear & Moment Diagrams
Friction
9.600 lb
600 lb/ft
19.200 lb-ft
A
B
8 ft
4 ft
4 ft
4 ft
9.600
V(lb)
-4.800
M
(lb-ft)
Do you want to see the solution?
Yes
No
Shear & Moment Diagrams: Numeric V & M Quizzes #7
Quiz Menu

Statics Tutorial

File Shear & Moment Diagrams Friction



The first step is to establish the reactions at *A* and *B*.

The reactions are determined by first modeling the distributed load as an equivalent concentrated force, then generating the equations which satisfy the equilibrium conditions.

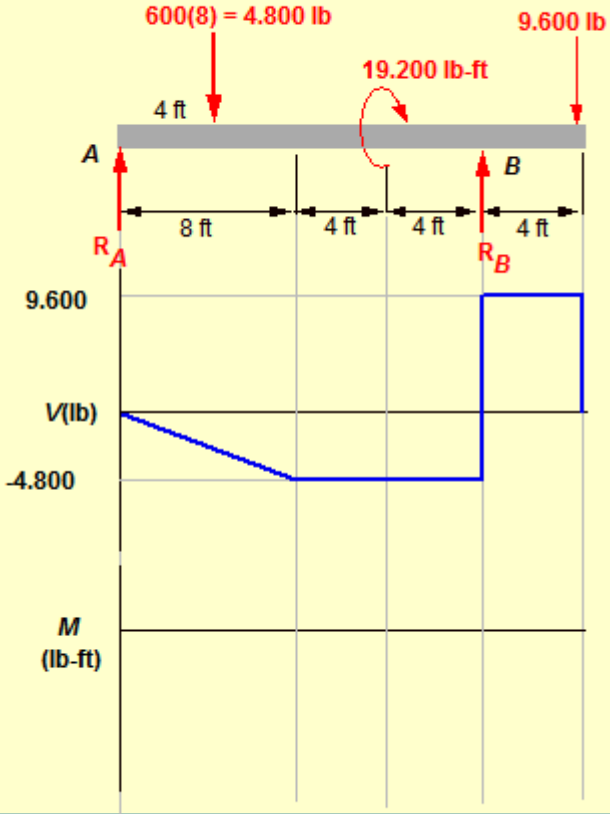
Shear & Moment Diagrams: Numeric V & M Quizzes #7

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



The first step is to establish the reactions at *A* and *B*.

The reactions are determined by first modeling the distributed load as an equivalent concentrated force, then generating the equations which satisfy the equilibrium conditions.

The equations of equilibrium are

$+\uparrow \Sigma F_y = 0$: $R_A + R_B - 4.800 - 9.600 = 0$

$R_A + R_B = 14.400$ (1)

$+\circlearrowleft \Sigma M_A = 0$: $16(R_B) - 4(4.800) - 19.200 - 20(9.600) = 0$

$R_B = 14.400$ lb

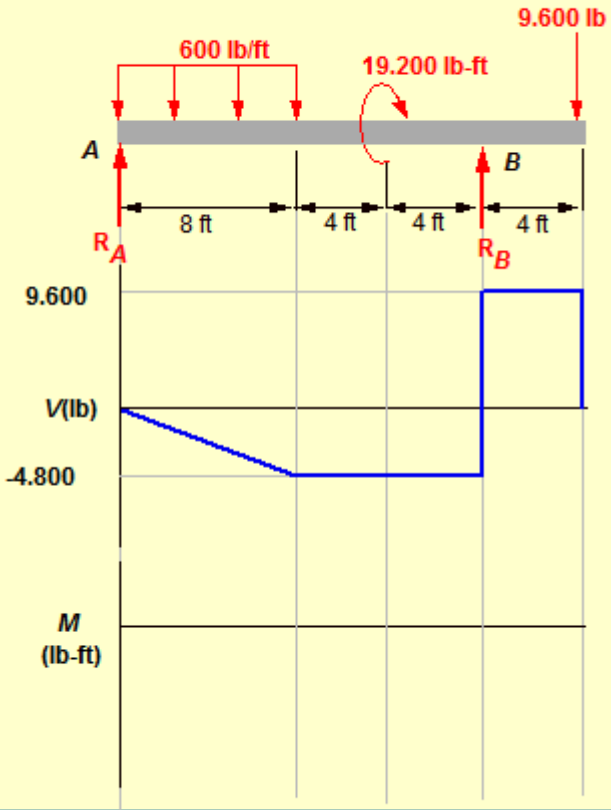
Substituting 14.400 lb into equation (1) and solving yields

$R_A = 0$ lb

Shear & Moment Diagrams: Numeric V & M Quizzes #7 | Quiz Menu | Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



The first step is to establish the reactions at *A* and *B*.

The reactions are determined by first modeling the distributed load as an equivalent concentrated force, then generating the equations which satisfy the equilibrium conditions.

The equations of equilibrium are

$+\uparrow \Sigma F_y = 0$: $R_A + R_B - 4.800 - 9.600 = 0$

$R_A + R_B = 14.400$ (1)

$+\circlearrowleft \Sigma M_A = 0$: $16(R_B) - 4(4.800) - 19.200 - 20(9.600) = 0$

$R_B = 14.400$ lb

Substituting 14.400 lb into equation (1) and solving yields

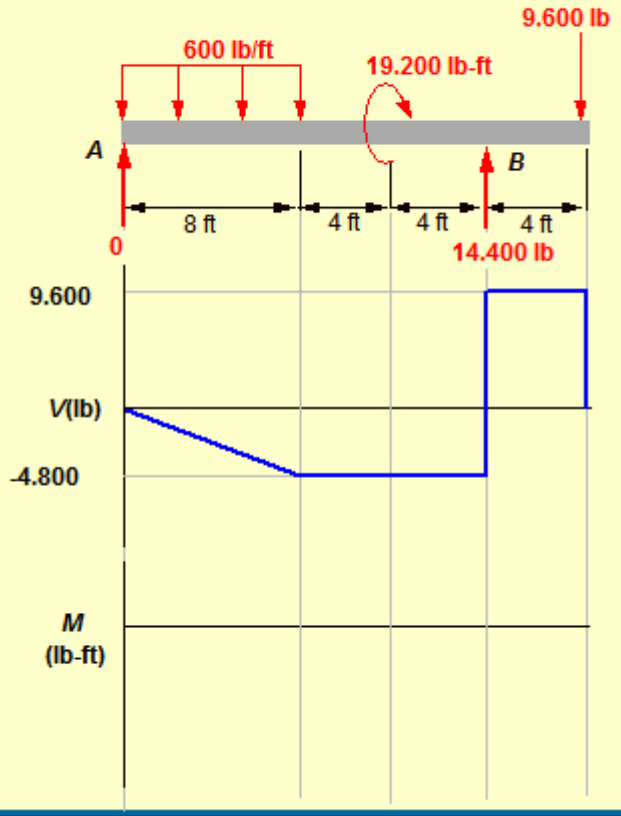
$R_A = 0$ lb

The shear diagram can be constructed once the reactions are known.

Shear & Moment Diagrams: Numeric V & M Quizzes #7 | Quiz Menu | Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



The shear diagram begins at zero. Since the uniform load is directed as shown, it decreases linearly. At the end of 8 ft it has a magnitude of -4.800.

The shear force remains constant over the next 8 ft of the beam. The 19.200 ft-lb moment 16 ft from the left support has no effect on the shear diagram.

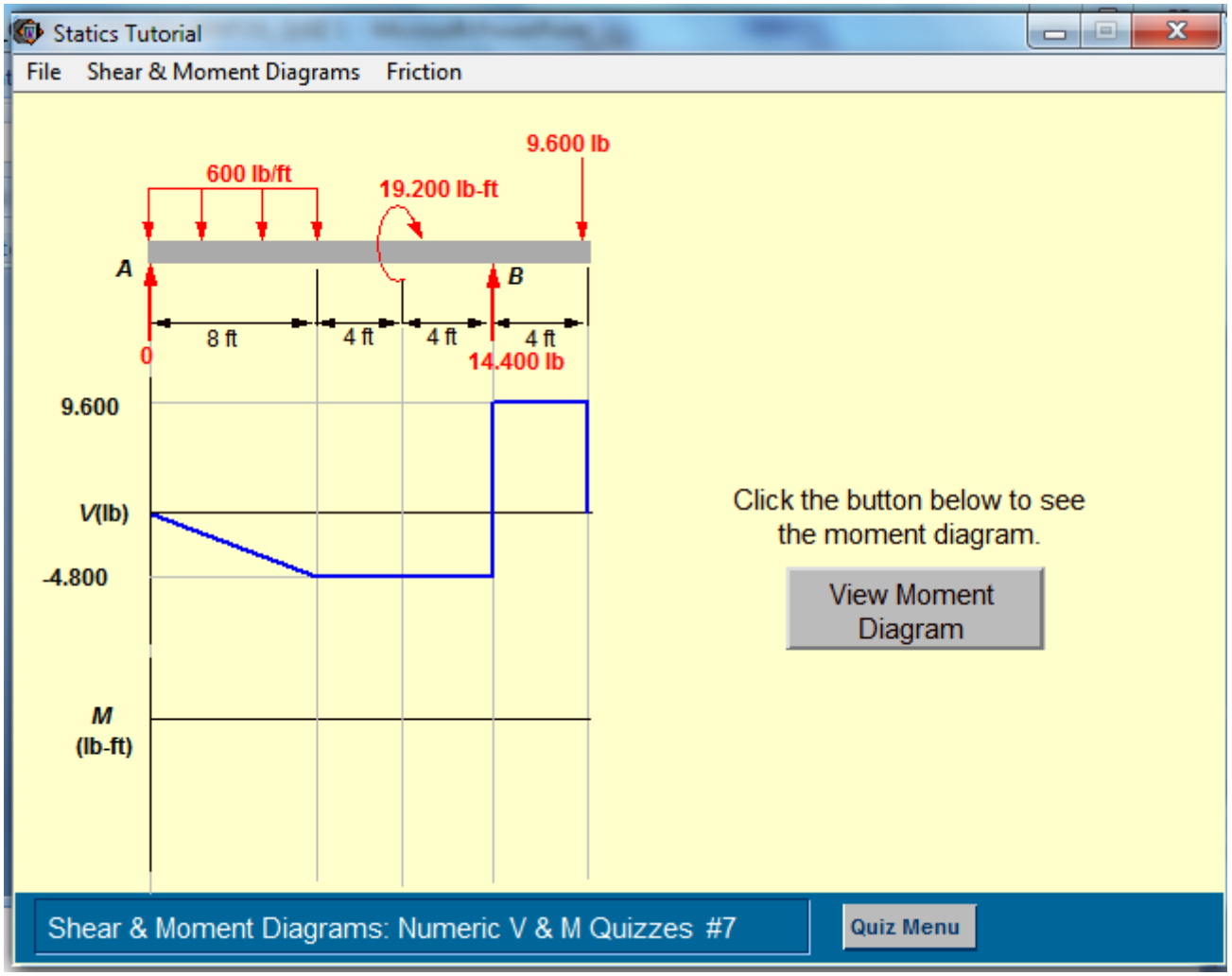
The 14.400 lb reaction at *B* brings the shear force to 9.600 lb.

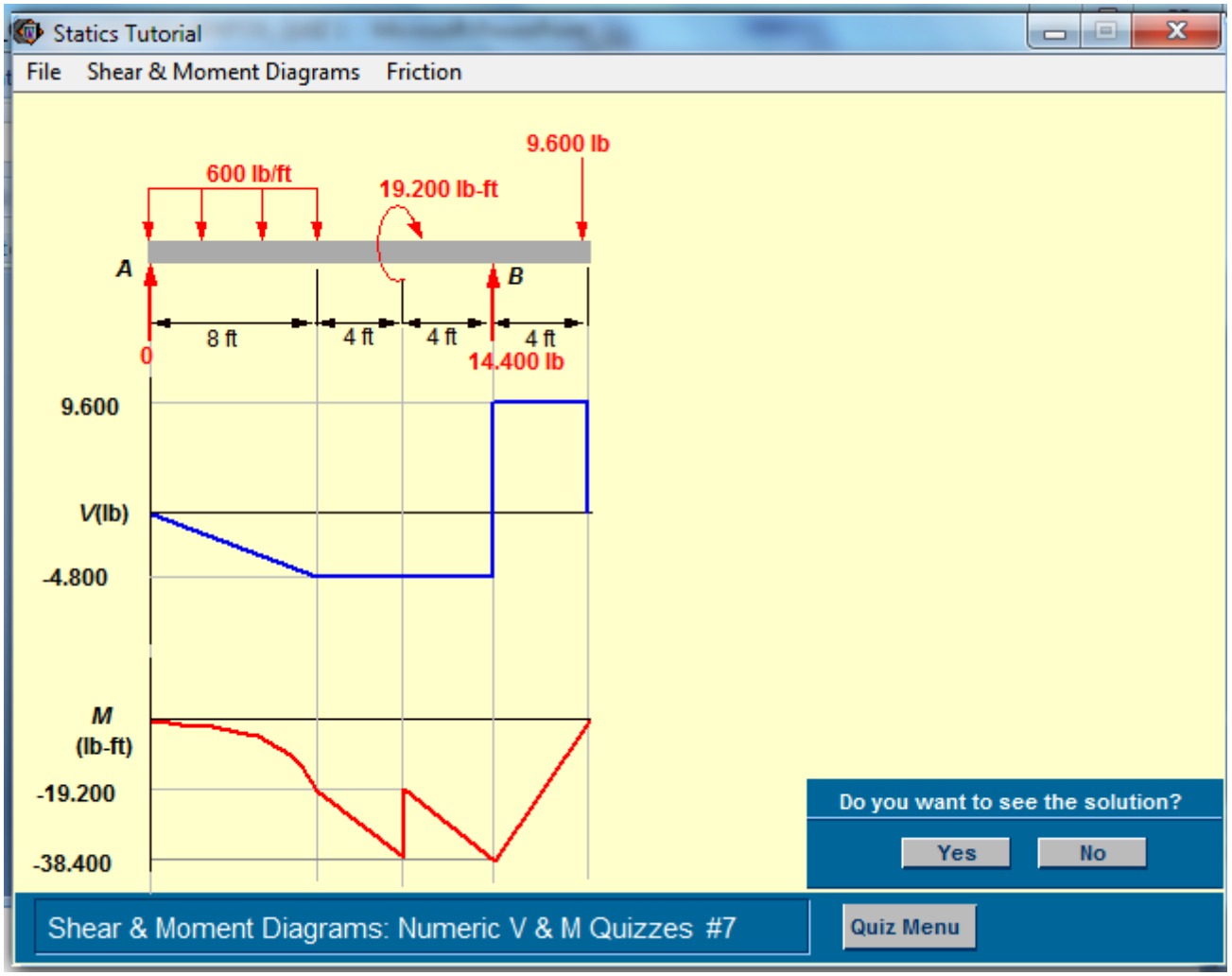
The shear diagram remains constant over the remaining 4 ft of the beam. The concentrated 9.600 lb at the end of the beam brings the shear force back to zero.

Shear & Moment Diagrams: Numeric V & M Quizzes #7

Quiz Menu

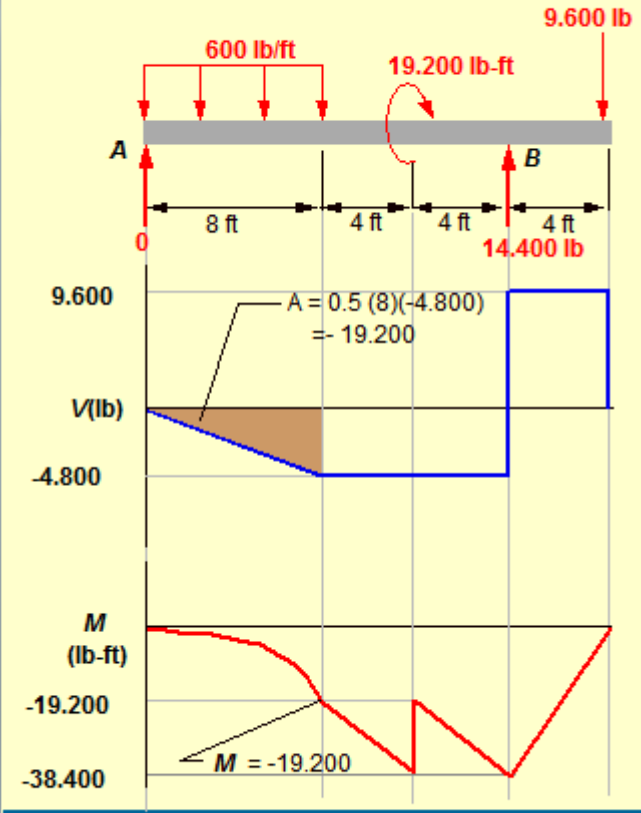
Continue


Statics Tutorial
File
Shear & Moment Diagrams
Friction
9.600 lb
600 lb/ft
19.200 lb-ft
A
B
8 ft
4 ft
4 ft
4 ft
0
14.400 lb
9.600
V(lb)
-4.800
M
(lb-ft)
Click the button below to see the moment diagram.
View Moment Diagram
Shear & Moment Diagrams: Numeric V & M Quizzes #7
Quiz Menu


Statics Tutorial
File
Shear & Moment Diagrams
Friction
9.600 lb
600 lb/ft
19.200 lb-ft
A
B
8 ft
4 ft
4 ft
4 ft
0
14.400 lb
9.600
V(lb)
-4.800
M
(lb-ft)
-19.200
-38.400
Do you want to see the solution?
Yes
No
Shear & Moment Diagrams: Numeric V & M Quizzes #7
Quiz Menu

Statics Tutorial

File Shear & Moment Diagrams Friction



In the first section of the beam, the shear force varies linearly and the moment varies parabolically. The moment starts at zero (there is no applied moment at the free end) and decreases (the shear under the shear diagram is negative), so the moment varies linearly. The shear force diagram is negative, and the moment decreases. This results in the moment diagram shape shown.

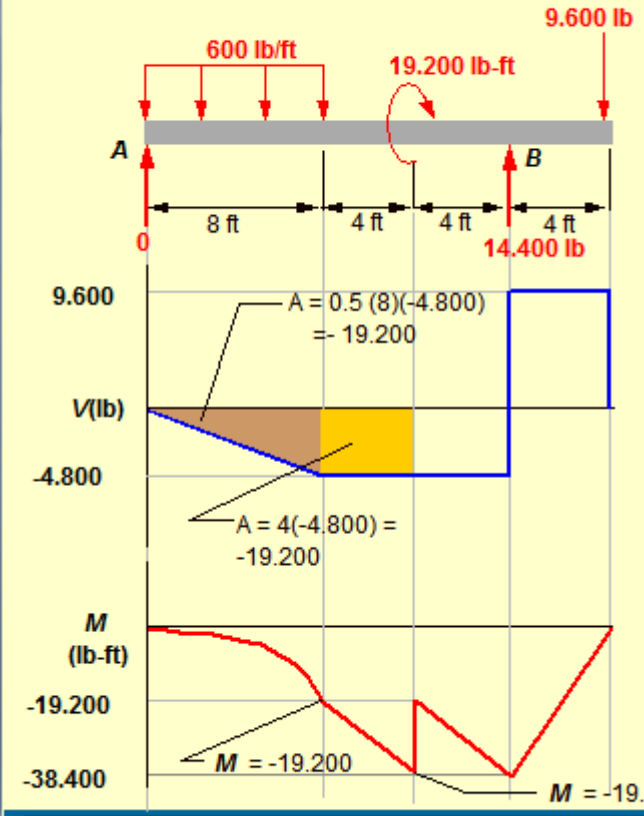
Shear & Moment Diagrams: Numeric V & M Quizzes #7

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



In the first section of the beam, the shear force varies linearly and the moment varies parabolically. The moment starts at zero (there is no applied moment at the free end) and decreases (the shear under the shear diagram is negative), so the moment varies linearly. The shear force diagram is negative, and the moment decreases. This results in the moment diagram shape shown.

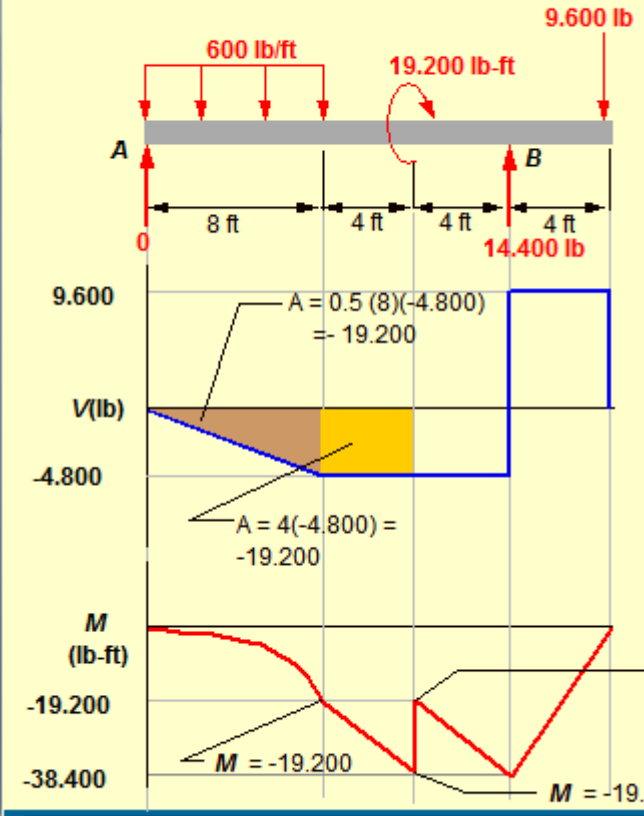
Shear & Moment Diagrams: Numeric V & M Quizzes #7

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



In the first section of the beam, the shear force varies linearly and the moment varies parabolically. The moment starts at zero (there is no applied moment at the free end) and decreases (The shear force is constant in the next section, so the moment varies linearly. The shear force diagram is negative, and the moment decreases. This results in the moment diagram shape shown.

At this location the concentrated 19.200 ft-lb moment causes a spike.

In the next section of the beam, the shear force is constant, so the moment diagram varies linearly. The area is negative, so the moment decreases.

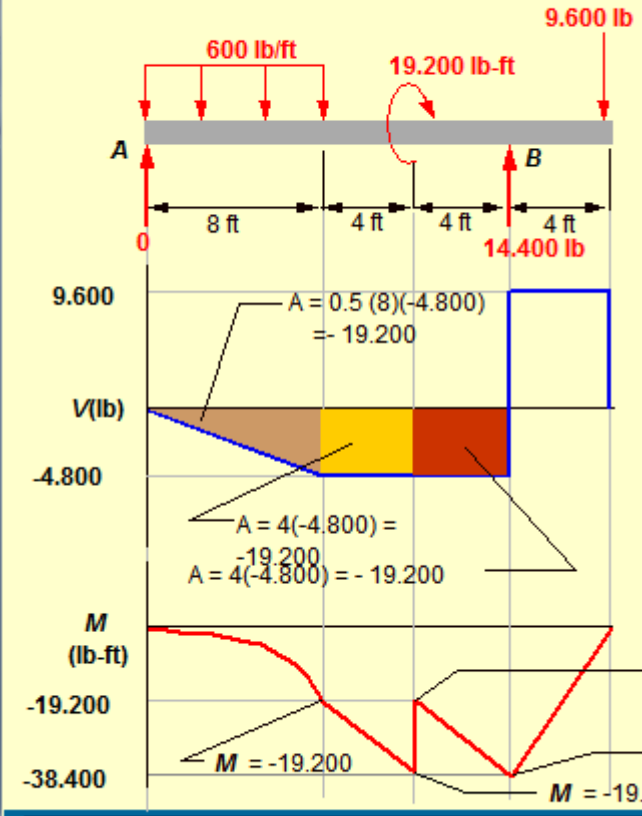
Shear & Moment Diagrams: Numeric V & M Quizzes #7

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



In the first section of the beam, the shear force varies linearly and the moment varies parabolically. The moment starts at zero (there is no applied moment at the free end) and decreases (the area under the shear diagram is negative), so the moment varies linearly. The shear force diagram is negative, and the moment decreases. This results in the moment diagram shape shown.

At this location the concentrated 19.200 ft-lb moment causes a spike.

In the next section of the beam, the shear force is constant, so the moment diagram varies linearly. The area is negative, so the moment decreases.

In the final section of the beam, the shear force is constant so the moment varies linearly. Since the shear force is positive, the moment increases.

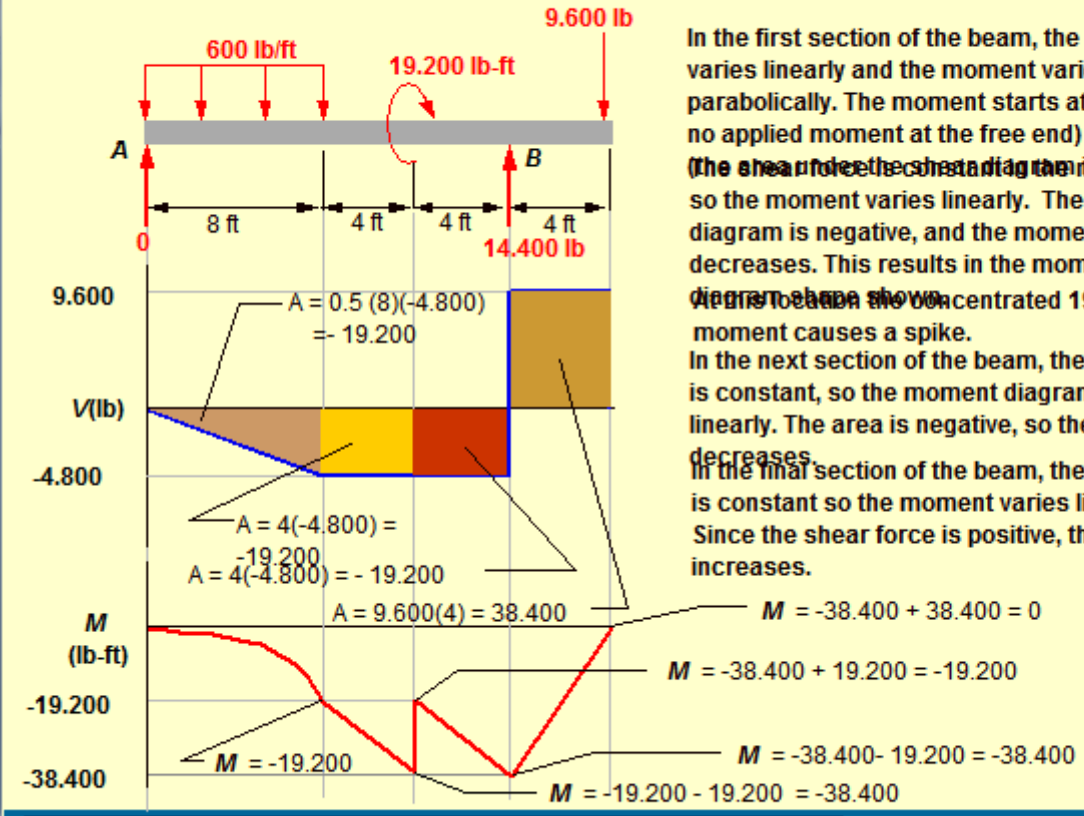
Shear & Moment Diagrams: Numeric V & M Quizzes #7

Quiz Menu

Continue

Statics Tutorial

File Shear & Moment Diagrams Friction



In the first section of the beam, the shear force varies linearly and the moment varies parabolically. The moment starts at zero (there is no applied moment at the free end) and decreases (the area under the shear diagram is negative), so the moment varies linearly. The shear force diagram is negative, and the moment decreases. This results in the moment diagram shape shown.

The shear force is constant in the next section, so the moment varies linearly. The shear force diagram is negative, and the moment decreases. This results in the moment diagram shape shown.

At this location the concentrated 19.200 ft-lb moment causes a spike.

In the next section of the beam, the shear force is constant, so the moment diagram varies linearly. The area is negative, so the moment decreases.

In the final section of the beam, the shear force is constant so the moment varies linearly. Since the shear force is positive, the moment increases.

Shear & Moment Diagrams: Numeric V & M Quizzes #7 Quiz Menu Continue

SHEAR & MOMENT DIAGRAMS.
QUIZZES
VIGA SIMPLEMENTE APOYADA
(QUIZ 3 – 4 – 6 – 7)

http://interfis-edu.jimdo.com/repositorio/

Los ejercicios siguientes se realizan con el **SOFTWARE STATICS**, incluido en “MECÁNICA VECTORIAL PARA INGENIEROS. ESTÁTICA”. Sexta edición. McGRAW-HILL. 1997 ISBN 84-481-1079-X.

La presentación se realiza exlusivamente con fines educativos, para facilitar su discusión en clase.