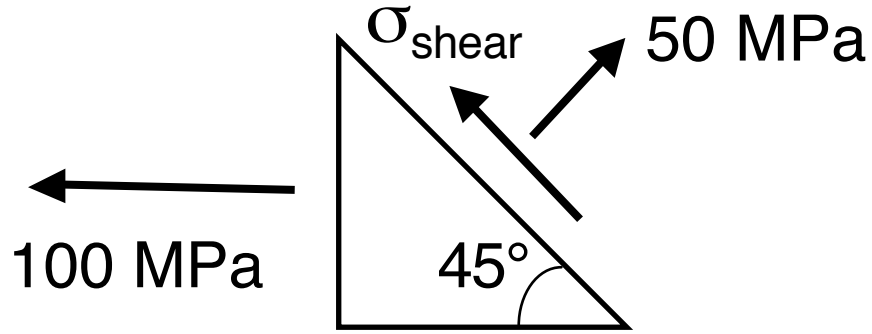
A 45° triangular block of material is 1 m thick and 1 m on each of its straight sides. It is loaded by a tensile stress of 100 MPa on one face, 50 MPa on the inclined face, and no stress on the third face.

What is the value of the shear stress on the inclined face required to achieve equilibrium of the block?



1) Application of a single component of shear stress cannot achieve equilibrium

2) $+ 50\,[1 - 2\,(2)^{1/2}]$ MPa

3) $- 50\,[1 - 2\,(2)^{1/2}]$ MPa

4) + 50 MPa

5) – 50 MPa

6) Some other answer

7) I don't know/I don't understand

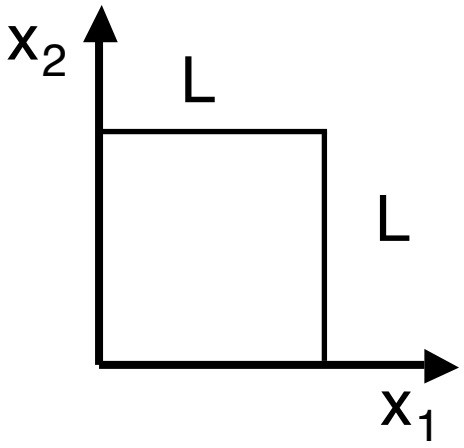
A square plate (L x L) of material has a displacement distribution given by:

$$u_1 = a\, x_1\, x_2$$

$$u_2 = b\, x_2$$

where a and b are constants.

What is the shear strain, ε_{12}, at (L, L)?



1) $\varepsilon_{12} = 1/2\,(aL)$

2) $\varepsilon_{12} = 1/2\,(aL + b)$

3) $\varepsilon_{12} = b$

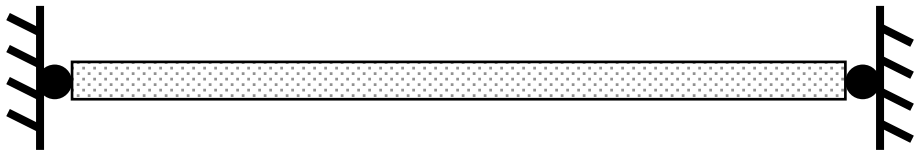
4) $\varepsilon_{12} = aL + bL$

5) $\varepsilon_{12} = 1/2\,(ax_1 + b)$

6) Some other answer

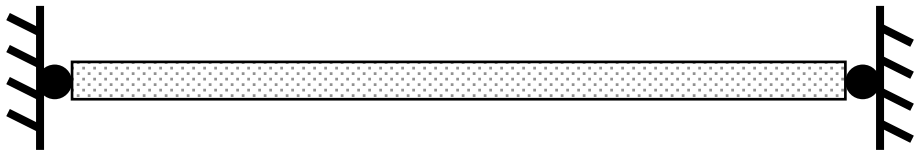
7) I don't know/I don't understand

A bar supported by rollers at each end is restrained by rigid walls and exposed to a temperature increase. In order to calculate the force in the bar, the most useful **compatibility** condition is:



1) The bar remains straight and rigid.
2) There is no applied force, so there is no bar force.
3) The deflections will be symmetric .
4) The bar will remain horizontal .
5) There will be no displacement of each end of the bar.
6) Some other answer
7) I don't know/I don't understand

A spring (represented as the bar below) is subjected to a compressive force to enable it to fit between rigid walls. In order to calculate the force in the spring, the most useful **constitutive** relation is:



1) The spring remains straight.
2) The force in the spring is equal to the reaction force of the walls.
3) The spring force, F, and spring extension, δ, are related by: $F = k\delta$.
4) The force at each end of the spring is related by: $F = k\delta$.
5) There will be no displacement of either wall.
6) Some other answer
7) I don't know/I don't understand