2.18

GIVEN: An engineer estimates the components of a force acting on a bridge abutment.

$F_x = 130$ MN $|F| = 165$ MN F_y is negative.

REQUIRED: Find F_y.

STRATEGY: Use the definition of the magnitude of a vector to solve for F_y.

$$|F| = \sqrt{F_x^2 + F_y^2}$$

SOLUTION:

$$(165\ (\text{MN}))^2 = \left(\sqrt{(130\ \text{MN})^2 + (F_y\ \text{MN})^2}\right)^2$$

$$27225\ \text{MN}^2 = (130\ \text{MN})^2 + (F_y\ \text{MN})^2$$

$$27225\ \text{MN}^2 = 16900\ \text{MN}^2 + (F_y\ \text{MN})^2$$

$$-16900\ \text{MN}^2 \qquad -16900\ \text{MN}^2$$

$$\sqrt{10325\ \text{MN}^2} = \sqrt{(F_y\ \text{MN})^2}$$

$F_y = 101.6$ MN remember, F_y is negative
report to 3 SFs.

$$\boxed{F_y = -102\ \text{MN}}$$

DISCUSSION:

Given the magnitude of F_x and $|F|$, my solution makes sense. My answer matches the solution in the back of the book.