

## Football Statistics

**EXAMPLE 3** Calculating Quarterback Ratings

The NFL uses a complicated formula to rate a quarterback's passing efficiency. It involves the following four categories.

- a. Completion percentage:  $a = 5\left(\frac{\text{completions}}{\text{attempts}} - 0.3\right)$
- b. Average yards per attempt:  $b = 0.25\left(\frac{\text{yards}}{\text{attempts}} - 3\right)$
- c. Touchdown pass percentage:  $c = 20\left(\frac{\text{touchdowns}}{\text{attempts}}\right)$
- d. Interception percentage:  $d = 2.375 - 25\left(\frac{\text{interceptions}}{\text{attempts}}\right)$

If the result of any of these is greater than 2.375, the result is lowered to 2.375. If the result is negative, it is raised to 0. The quarterback's passer rating is

$$\text{Passer rating} = 100\left(\frac{a + b + c + d}{6}\right).$$

On November 25, 2010, Tom Brady completed a game with a perfect passer rating. He had 21 completions, 27 attempts, 341 yards, 4 touchdowns, and 0 interceptions. What was Brady's passer rating in that game?

**SOLUTION**

$$a = 5\left(\frac{\text{completions}}{\text{attempts}} - 0.3\right) = 5\left(\frac{21}{27} - 0.3\right) \approx 2.39 \quad \text{Lowered to 2.375.}$$

$$b = 0.25\left(\frac{\text{yards}}{\text{attempts}} - 3\right) = 0.25\left(\frac{341}{27} - 3\right) \approx 2.41 \quad \text{Lowered to 2.375.}$$

$$c = 20\left(\frac{\text{touchdowns}}{\text{attempts}}\right) = 20\left(\frac{4}{27}\right) \approx 2.96 \quad \text{Lowered to 2.375.}$$

$$d = 2.375 - 25\left(\frac{\text{interceptions}}{\text{attempts}}\right) = 2.375 - 25(0) = 2.375$$

$$\text{Passer rating} = 100\left(\frac{2.375 + 2.375 + 2.375 + 2.375}{6}\right) \approx 158.3$$

So, Brady's rating was 158.3. This is the highest possible rating in this rating system. That is why it is called a perfect passer rating.

**✓ Checkpoint**

Help at [Math.andYOU.com](http://Math.andYOU.com)

Which of the following had perfect passer ratings? Explain.

|                    |                    | CMP | ATT | YDS | TD | INT |
|--------------------|--------------------|-----|-----|-----|----|-----|
| Ben Roethlisberger | December 20, 2007  | 16  | 20  | 261 | 3  | 0   |
| Kurt Warner        | September 14, 2008 | 19  | 24  | 361 | 3  | 0   |
| Eli Manning        | October 11, 2009   | 8   | 10  | 173 | 2  | 0   |
| Drew Brees         | November 30, 2009  | 18  | 23  | 371 | 5  | 0   |



Tom Brady is a quarterback for the New England Patriots. As of 2011, he played in four Super Bowls, winning three of them. In 2005, he was named *Sports Illustrated's* Sportsman of the Year.