## The Mosteller Formula (body surface area)

Body surface area (BSA) is the measured or calculated surface area of a human body. It is used in some medical tasks to determine treatment dosage.

It's hard to measure it directly. A lot of work has been done trying to find a way to calculate it from measurements that are easy to take such as weight and height.


Various BSA formulae have been developed over the years.

## THE MOSTELLER FORMULA

$$
B S A=\sqrt{\frac{W \times H}{3600}}
$$

In the Mosteller formula, BSA is in $\mathbf{m}^{\mathbf{2}}, \mathbf{W}$ is weight in $\mathbf{k g}$, and $\mathbf{H}$ is height in $\mathbf{c m}$.

Notice you use cm in the formula for height but the answer is in square metres.

Read the units used again - the BSA you are calculating will be in square metres even though the height measurement you are using is in centimetres.

In most formulae they try not to mix units like this - either centimetres or metres would be used, not both.

$$
B S A=\sqrt{\frac{W \times H}{3600}}
$$

Where BSA is in $\mathbf{m}^{\mathbf{2}}, \mathbf{W}$ is weight in $\mathbf{k g}$, and $\mathbf{H}$ is height in $\mathbf{c m}$.

Example: A patient weighs 63.5 kg ( 10 stone) and is 167.6 cm tall ( $5^{\prime} 6^{\prime \prime}$ ).

$$
\begin{aligned}
B S A=\sqrt{\frac{W \times H}{3600}} & =\sqrt{\frac{63.5 \times 167.6}{3600}} \\
& =\sqrt{\frac{10642.6}{3600}} \\
& =\sqrt{10642.6 \div 3600} \\
& =\sqrt{2.956277778} \\
& =1.719382964 \mathrm{~m}^{2}
\end{aligned}
$$

Round this to 3 decimal places and you get

$$
=1.719 m^{2}
$$

## Questions

Use the Mosteller formula to calculate the BSA in square metres for the following people:

$$
B S A=\sqrt{\frac{W \times H}{3600}} \quad \mathrm{~W} \text { is weight }(\mathrm{kg}), \mathrm{H} \text { is height }(\mathrm{cm})
$$

Round your answers to 3 decimal places.

## ONLINE TEST

## There is an online test here.

It will give you an onscreen mark immediately

It has the same questions as these:

Q1. weight 57.2 kg ( 9 stone) height 165.1 cm tall ( $5^{\prime} 5^{\prime \prime}$ )

Q2. weight 76.2 kg (12 stone) height 175.3 cm tall ( $5^{\prime} 9^{\prime \prime}$ )

Q3. weight 88.9 kg ( 14 stone) height 177.8 cm tall ( $5^{\prime} 10$ ")

# MORE INFORMATION (OPTIONAL) 

## For

## Access to Nursing Class

Body surface area: BSA. The total surface area of the human body. The body surface area is used in many measurements in medicine, including the calculation of drug dosages and the amount of fluids to be administered IV.

A number of different formulae have been developed over the years to calculate the body surface area and they give slightly different results.

The Mosteller formula was published in 1987 in The New England Journal of Medicine. It calculate BSA in square metres using an individual's weight (kg) and height (cm). It is the most common one in current use.

The "normal" body surface area is generally taken to be 1.7 square metres.

The reality is that body surface area depends on more than just height and weight. Other influential factors include the age and gender of the individual.

For example:

- Average body surface area for adult men: 1.9 square metres
- Average body surface area for adult women: 1.6 square metres
- Average body surface area for children (9 years): 1.07 square metres
- Average body surface area for children (10 years): 1.14 square metres
- Average body surface area for children (12-13 years): 1.33 square metres


## When is the BSA calculation used?

It is used in medical calculations:

## Renal function (kidneys)

Renal function is measured by the glomerular filtration rate (GFR) which is calculated using the body surface area.

## Cardiac Index (heart)

The cardiac index is a measure of cardiac output divided by the body surface area. It gives a better approximation of an individual's required cardiac output.

## Chemotherapy (Cancer treatment) and Pharmacotherapies

Chemotherapy and pharmacotherapies are often dosed according to the patient's body surface area. Glucocorticoid dosing uses the body surface area to calculate maintenance doses and also to compare high dose use with maintenance requirement.

Reference: Mosteller RD. Simplified calculation of body-surface area. $N$ Engl $J$ Med 1987;317:1098

