

# Training Course on Child Growth Assessment

WHO Child Growth Standards

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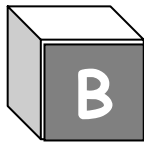
## Measuring a Child's Growth





# **Training Course on Child Growth Assessment**

## **WHO Child Growth Standards**



### **Measuring a Child's Growth**



**World Health  
Organization**

**Department of Nutrition for  
Health and Development**

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# B: Measuring a Child's Growth

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# B: Measuring a Child's Growth

## Introduction

This module describes how to determine a child's age; recognize clinical signs of certain serious problems of undernutrition; measure a child's weight and length or height; and determine a child's BMI (body mass index).

The child's age, sex, and measurements of weight and length or height will be used to calculate the following growth indicators, which will be described in the next module:

- length/height-for-age
- weight-for-age
- weight-for-length/height
- BMI (body mass index)-for-age

The measurements described in this module should be taken and recorded whenever an infant or child visits a health care provider, for example, for an immunization, a well-baby visit, or care during an illness. There is no WHO-recommended schedule of visits specifically for growth assessment, but some countries may recommend a schedule, such as 6 visits in the first 2 years of life.

## Module objectives

### Participants will learn how to:

### Refer to section:

- |  |          |
|--|----------|
| • Start a <i>Growth Record</i> for a child and select pages to use at a given visit. | 1.1, 1.3 |
| • Determine a child's age today.   | 1.2      |
| • Recognize clinical signs of marasmus and kwashiorkor.                              | 2.0      |
| • Weigh a child and record weight.   | 3.0      |
| • Measure and record length or height.   | 4.0      |
| • Determine BMI (body mass index) by referring to a table or using a calculator.     | 6.0      |

## 1.0 Use the Growth Record

A *Growth Record* is a booklet that contains all of the charts needed to record and assess the growth of a child from birth up to 5 years of age. A different *Growth Record* is needed for boys and girls because boys and girls have different weights and lengths beginning at birth. Boys and girls need to be assessed by standards that reflect normal differences in their sizes.



A *Growth Record* should be started for each child and kept by the mother. When a child visits the health facility, ask the mother if the child has a *Growth Record*. If not, start a *Growth Record* as described in section 1.1. If the child already has a *Growth Record*, obtain it from the mother and record today's visit as described in sections 1.2 and 1.3.

If a child's *Growth Record* has been left at home, record information on whatever back-up register or record is available at the health facility, and update the child's *Growth Record* at the next visit. If a child's *Growth Record* is lost or destroyed, replace it if supplies permit.

Praise the mother for having her child's growth assessed regularly.

### 1.1 Start a new Growth Record

Depending on the sex of the child, select a *Boy's Growth Record* or *Girl's Growth Record*. Show the *Growth Record* to the mother and explain the following points:

- This booklet will be your record of your child's growth and health.
- Each time you visit, your child will be weighed and measured, and the measurements will be recorded in this booklet.
- The booklet includes charts on which we will plot your child's measurements in order to assess his or her growth.
- It has a schedule of immunizations to show when your child needs and receives immunizations.
- It has recommendations about feeding your child and important points about caring for your child at different ages.
- Keep this booklet in a safe place and bring it with you whenever you bring your child to a health facility.

Complete page 1 of the *Growth Record* (Personal Data, opposite) by asking questions of the mother and reviewing any relevant documents that the mother may have, such as a health card or birth certificate.

## Personal Data

**Child's name** \_\_\_\_\_

Identification/Record number \_\_\_\_\_

Boy

*If a girl,  
must use a  
Girl's Growth  
Record*

Parents' names \_\_\_\_\_

Address \_\_\_\_\_  
\_\_\_\_\_

### Birth information:

Date of birth \_\_\_\_\_

Gestational age at birth \_\_\_\_\_ Single/multiple birth? \_\_\_\_\_

Measurements at birth:

Weight \_\_\_\_\_ Length \_\_\_\_\_ Head circumference \_\_\_\_\_

Birth rank \_\_\_\_\_

Date of birth of next younger sibling (born to mother) \_\_\_\_\_

### Feeding:

Age at introduction of any foods or fluids \_\_\_\_\_ *More details of feeding history*

Age at termination of breastfeeding \_\_\_\_\_ *may be recorded in Visit Notes*

### Adverse events (dates):

(such as death of parent, death of sibling age <5 years) \_\_\_\_\_  
\_\_\_\_\_

The date of birth (day/month/year) is especially important. If the date is not documented, ask the mother. If she does not know the date, ask her questions to determine the date as closely as possible; for example, ask when the birth occurred in relation to a local event or holiday.

The gestational age at birth (i.e. the number of weeks of pregnancy) may be recorded in the child's birth record. If not, ask the mother and record whether the baby was **term** (37–41 completed weeks of pregnancy), **pre-term** (before 37 weeks), or **post-term** (42 weeks or more).

Ask and record whether this child was a single or multiple birth. Record other data related to the child's birth if documented, for example, weight, length, and head circumference at birth.

Ask the mother about the child's birth rank (i.e. order). For example, ask: Is this your first child, second child, etc.? Include all live births in order, even if an older sibling has died. For example, if the child is the second-born, but the older sibling has died, you would still record the birth rank as 2<sup>nd</sup>.

If the mother has had other children after this child, ask when her next younger child was born.

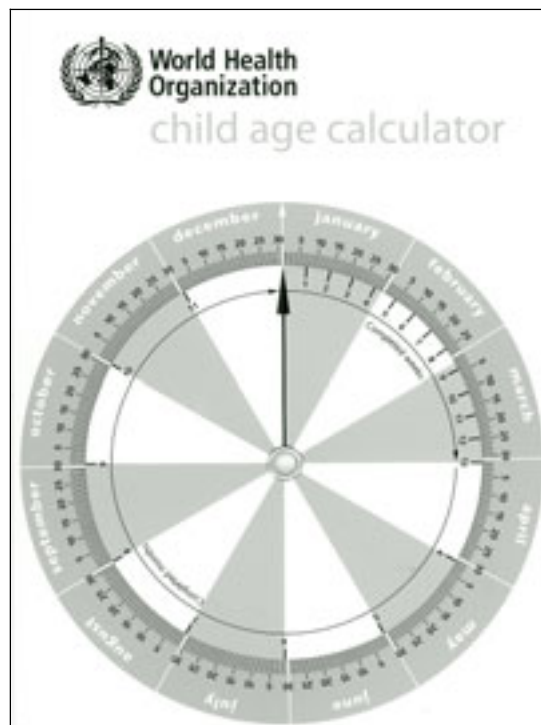
Depending on the child's age, ask appropriate questions to determine whether the child is still breastfeeding – either exclusively or with other foods and fluids. If other foods or fluids have been introduced, ask and record the age at which they were introduced. If the child is no longer breastfeeding, ask and record the age at termination of breastfeeding.

Ask about any adverse events that may affect the child’s health. For example, ask “Are there any events that have happened, such as a death of a family member or caregiver, that could affect the child’s physical or emotional health?” Also ask when these events occurred.

## 1.2 Record reason for visit and child’s age today

In the Visit Notes section on pages 6–11 of the *Growth Record*, record today’s date (day, month, and year). Ask the mother about the reason for the child’s visit and record the reason in the Visit Notes (for example, immunization, check-up, or illness). If the child is ill, take care of the immediate concerns before continuing the growth assessment process.

It is important to know the precise age of the child in order to assess certain growth indicators. Determine the age of the child today by using a computerized system (if available) or a “child age calculator,” a disk that is turned to calculate a child’s age in completed weeks or months in the first year of life. If the child is more than a year old, you will need to mentally calculate the child’s completed years and then use the disk to determine the number of additional months completed beyond the completed years. Where the exact date of birth is unknown, a local events calendar could be used to establish the child’s likely date of birth. A sample local events calendar is included in Annex I to this module.



You have been provided a WHO child age calculator with these course materials. Instructions are given on the back of the calculator as well as on the next page.

**When everyone is ready, a facilitator will demonstrate  
use of the age calculator for the group.**

### **Instructions for use of child age calculator:**

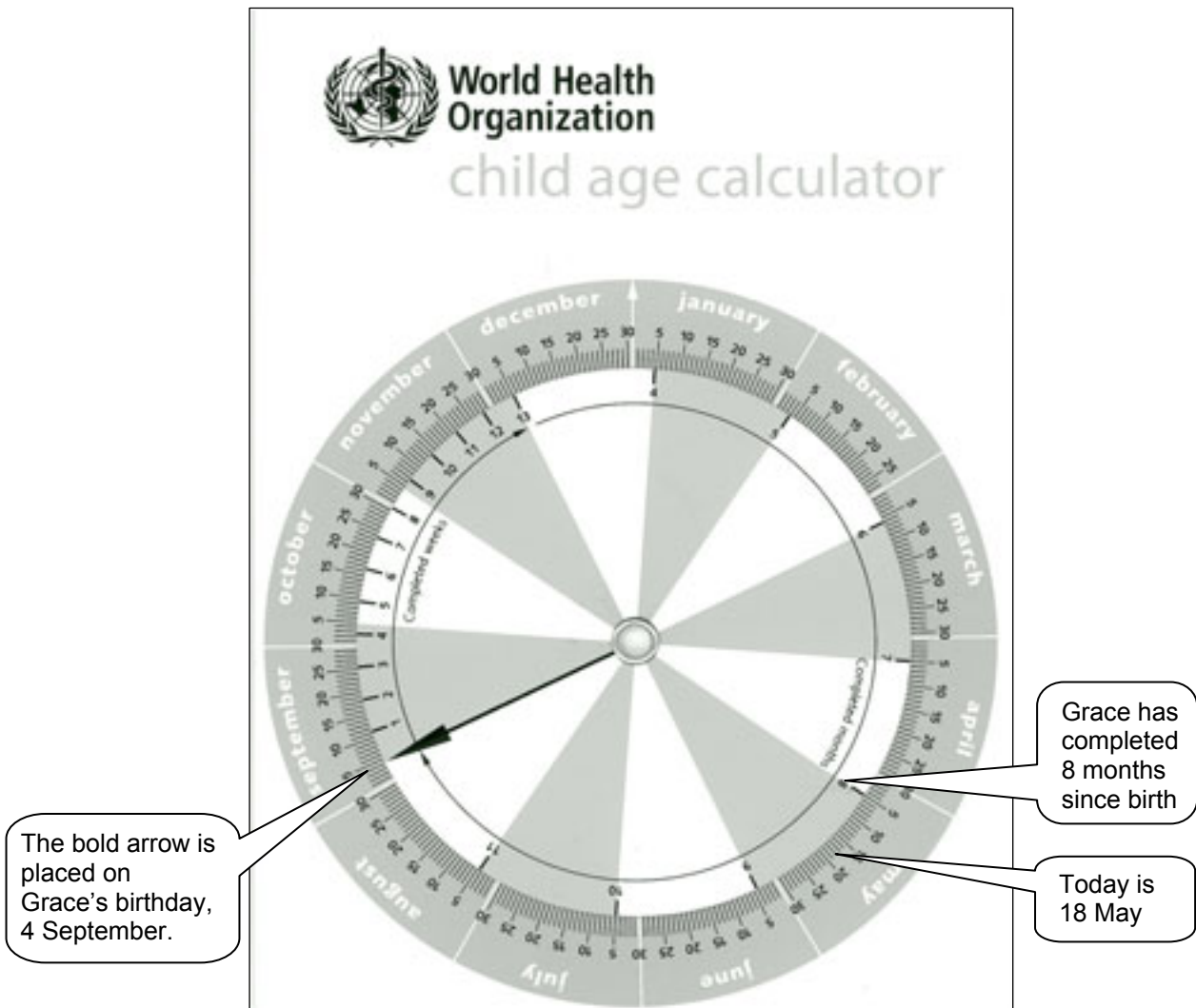
1. Determine the child's date of birth. This date should already be recorded in the *Growth Record* on page 1 (Personal Data).
2. Determine and note down the number of full years the child has completed, e.g. ask the mother how many birthdays have been celebrated if this is a local custom. (Note: Simply subtracting the year of birth from the current year will be accurate only if the child has already had a birthday this year.)
  - If the child is one or more years old, you will turn the disk to calculate the number of additional months completed.
  - If the child is less than one year old, you will use the disk to count the number of weeks (in the first 3 months) or months (from 3–11 months) completed since birth.
3. Turn the disk until the bold arrow points to the child's birthday (month and day) on the stationary circular calendar.
4. Locate today's date on the stationary calendar and count on the rotating disk how many months (or weeks if less than 3 months old) the child has completed since birth or the last birthday.
5. Record the child's age today in the Visit Notes of the *Growth Record*. Use abbreviations agreed upon for year, month, and week.
  - If the child is more than 1 year old, record completed years and months, for example, "1 yr 6 mo," "2 yr 3 mo." If no months have been completed beyond the child's birthday, record as "1 yr 0 mo," "2 yr 0 mo," etc.
  - If the child is between 3 months and 1 year old, record completed months, for example, "4 mo," "11 mo."
  - If the child is less than 3 months old, record completed weeks, for example, "9 wk."<sup>1</sup> Notice that 13 weeks = 3 months.
  - If the child was born on 29 February, place the bold arrow on 28 February.

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<sup>1</sup> If a country uses different growth charts that count months rather than weeks from birth, it will not be necessary to record weeks.

**Example**

Grace Madu is seen at a clinic on 18 May 2006. Her mother has brought her for immunization. Grace’s date of birth is already recorded on the Personal Data page of her *Girl’s Growth Record* as 4 September 2005. She has not yet completed one year since birth.



To determine Grace’s age in completed months, the health care provider turns the disk on the age calculator until the bold arrow points to her birthday, 4 September. He then locates the current date on the circular calendar. He notes that 8 months have been completed since Grace’s birthday.

In the Visit Notes section of the *Growth Record*, on page 6, the health care provider writes Grace’s age as “8 mo” and the reason for visit as “immunization.”

### 1.3 Select pages of the Growth Record to use at this visit

You will use the Visit Notes (pages 6–11 of the *Growth Record*) at every visit to record the date, child's age, measurements, reason for visit, observations, recommendations, as well as notes on feeding history, any problems, and counselling given. In addition, you may use other pages of the *Growth Record* appropriate for the child's age, including:

- Growth charts (pages 27–40) – Select the four charts to use based on the child's age at a given visit. Refer to the table of contents at the beginning of the *Growth Record* to make the selection. Growth indicators will be plotted on the selected charts.
- Feeding recommendations (pages 13–20) – Use the recommendations for the child's current or next age group.
- Care messages (pages 21–26) – As needed, use the messages that are appropriate at all times (page 21) as well as messages about emotional development, communication and movement for the child's current or next age group.
- Recommended national immunization schedule (page 4) – Refer to this page to determine whether a child is due for an immunization. This page will vary by country. Record dates that any immunizations are given and the date of the next scheduled immunization.
- Other national programme recommendations (page 5) – This page will vary according to national recommendations. Record any recommended supplements given, procedures done, etc.

#### **Example**

For Grace Madu, the 8-month-old girl described earlier, the health care provider will use the following four growth charts in the *Girl's Growth Record*:

- Length-for-age, Girls, 6 months to 2 years, page 33
- Weight-for-age, Girls, 6 months to 2 years, page 34
- Weight-for-length, Girls, Birth to 2 years, page 35
- BMI-for-age, Girls, 6 months to 2 years, page 36

The health care provider will also provide any immunizations needed, according to the schedule on page 4.

Depending on the results of Grace's growth assessment and the time available, the health care provider may discuss with the mother feeding recommendations suitable for a child who is 8 months of age. You will learn more about counselling on growth and feeding in module D.



## Exercise A

### Written Exercise – Determining a child’s age, selecting growth charts to use in the Growth Record

In this exercise you will determine the age of several children using the WHO child age calculator. Then you will determine which growth charts in the *Growth Record* should be used during the child’s growth assessment.

Answer the questions about each case described below:

1. On 30 June 2006, Mrs. Ismail brings her son Salaam to the health centre because he has ear pain. The Personal Data page in Salaam’s *Boy’s Growth Record* says that he was born on 12 September 2004.

What is Salaam’s age today, as it should be recorded in the Visit Notes (page 6) of the *Boy’s Growth Record*?

After weighing and measuring Salaam and recording his weight and length in the Visit Notes, which four growth charts from the *Growth Record* should the health care provider use for Salaam’s growth assessment?

*Title of growth chart:*

*Page number:*

2. On 19 April 2006, a girl named Ruby is seen at the health centre for a well-child visit. Ruby’s grandmother says that Ruby’s *Girl’s Growth Record* has been lost. She says that Ruby will celebrate her first birthday soon, on the first day of May. The health care provider begins a new *Girl’s Growth Record* for Ruby by completing the Personal Data page.

What is Ruby’s date of birth, as it should be recorded on the Personal Data page?

What is Ruby’s age today, as it should be recorded on the Visit Notes page?



After weighing and measuring Ruby and recording her weight and length in the Visit Notes, which four growth charts should the health care provider use?

*Title of growth chart:*

*Page number:*

3. On 20 August 2006, a baby boy named Ivan is brought to the health centre for immunization. The boy's birth record says that he was born on 26 May 2006. The health care provider begins a *Boy's Growth Record* for Ivan by completing the Personal Data page. He then turns to the Visit Notes page to record Ivan's age today.

What is Ivan's age today, as it should be recorded on the Visit Notes page?

After weighing and measuring Ivan and recording his weight and length in the Visit Notes, which four growth charts should the health care provider use?

*Title of growth chart:*

*Page number:*

**When you have finished this exercise,  
review your answers with a facilitator.**



## Exercise B

### Continuing Case Studies – Nalah and Toman

In this exercise, you will begin a *Growth Record* for a girl named Nalah and one for a boy named Toman. You will continue to follow the growth of Nalah and Toman throughout this course. You have been given a *Girl's Growth Record* and a *Boy's Growth Record* to use in this and other exercises about Nalah and Toman.

Read the information about each child below and follow the instructions given.

#### Nalah

Nalah Parab was born on 7 February 2006. She was a single, term birth (38 weeks of pregnancy). According to her birth record, her weight was 2.9 kg and length was 49 cm. Her head circumference was not measured.

Nalah's parents are Hamid and Shira Parab. Their address is at 40 Rim Road. Nalah is the first and only child born to her mother. She is breastfed, but she has also been taking some water since she was 3 weeks old. There have been no unusual adverse events in her life so far.

The date of Nalah's visit to the health centre is 25 March 2006. Her mother has brought her for immunization.

#### *Instructions:*

1. Complete the Personal Data page of the *Girl's Growth Record* for Nalah. (You may make up a record number.)
2. In the Visit Notes section of the *Girl's Growth Record*, record Nalah's date of birth. On the first row, enter the date of Nalah's visit, her age today, and the reason for her visit.
3. List below the titles and page numbers of the four growth charts that the health care provider should use during Nalah's growth assessment.

## Toman

Toman Baruni comes to the health centre with his mother, Salwa Baruni, on 15 August 2006 for a well-child visit. Mrs Baruni thinks that it must be time for Toman to have another immunization, but she has lost his *Growth Record*, so she is not sure. She says that his last visit to the health centre was at 6 months, and he had received all of his immunizations at that point.

In order to start a new *Boy's Growth Record*, the health care provider asks Mrs Baruni about Toman's birth. Mrs Baruni says that Toman was born on 10 July 2005. He was a single, term birth and weighed 3.5 kg. She does not remember his length or head circumference.

Mrs Baruni was sick at Toman's birth, and Toman was given infant formula by the nurses for 3 days in the hospital. After leaving the hospital Mrs Baruni breastfed Toman, but she stopped after 3 months.

Toman is Mrs Baruni's second child. He lives with her at 100 Centre Street, Apartment 22. Mrs Baruni's first child was born of a different husband and lives with him. Toman has no younger siblings. Mrs Baruni is separated from Shaka Baruni, but Toman spends weekends with his father. Mrs Baruni does not think that the separation has been traumatic for Toman.

### *Instructions:*

1. Complete the Personal Data page of the *Boy's Growth Record* for Toman. (You may make up a record number.)
2. Above the Visit Notes section of the *Boy's Growth Record*, record Toman's date of birth for easy reference. On the first row, enter the date of Toman's visit, his age today, and the reason for his visit.
3. List below the titles and page numbers of the four growth charts that the health care provider should use during Toman's growth assessment.

**When you have finished this exercise,  
review your answers with a facilitator.**

## 2.0 Observe the child and note clinical signs of marasmus and kwashiorkor

When a child is undressed to prepare for weighing, certain clinical signs of severe undernutrition may be apparent. It is important to recognize signs of **marasmus** and **kwashiorkor** since they require urgent specialized care that may include special feeding regimens, careful monitoring, antibiotics, etc. Regardless of their weight, children with these syndromes should be referred for urgent care.

- **Marasmus** (non-oedematous malnutrition): In this form of severe undernutrition, the child is **severely wasted** and has the appearance of “**skin and bones**” due to loss of muscle and fatty tissue. The child’s face looks like an old man’s following loss of facial subcutaneous fat, but the eyes may be alert. The ribs are easily seen. There may be folds of skin on the buttocks and thighs that make it look as if the child is wearing “baggy pants.” Weight-for-age and weight-for-length/height are likely to be very low. Look at photos 1, 2, and 3 in *E: Photo Booklet*, which show children with marasmus.



- **Kwashiorkor** (oedematous malnutrition): In this form of severe undernutrition, the child’s muscles are wasted, but the wasting may not be apparent due to **generalized oedema** (swelling from excess fluid in the tissues). The child is withdrawn, irritable, obviously ill and will not eat. The face is round (because of oedema) and the **hair is thin, sparse and sometimes discoloured**. The **skin has symmetrical discoloured patches where the skin later cracks and peels off**. A child with kwashiorkor will usually be underweight, but the oedema may mask the true weight. (See **oedema of both feet** on the next page.) Look at photos 4 and 5 in *E: Photo Booklet*, which show children with signs of kwashiorkor.

- **Marasmic kwashiorkor:** Kwashiorkor and marasmus are distinct conditions, but in communities where both occur, cases of severe undernutrition often have features of both. For example, a child may have severe wasting as seen in marasmus, along with the skin and hair changes or oedema typical in kwashiorkor. Look at photo 6 in *E: Photo Booklet*, which shows a child with marasmic kwashiorkor. The child's upper body is wasted, but the lower limbs are swollen with oedema.
- **Oedema of both feet:** Oedema of both feet is a sign that a child needs referral, even if other signs of kwashiorkor are not present. The oedema must appear in both feet. (If the swelling is in only one foot, it may just be a sore or infected foot.) To check for oedema, grasp the foot so that it rests in your hand with your thumb on top of the foot. Press your thumb gently for a few seconds. The child has oedema if a pit (dent) remains in the foot when you lift your thumb. Look at photos 4, 6, 7, and 8 in *E: Photo Booklet*, which show oedema of both feet.

A child with oedema of both feet is automatically considered severely underweight, regardless of what the scale shows. You should weigh and measure the child, but do not determine a BMI based on the weight. Note the weight, length/height, and the oedema in the Visit Notes. When plotting the child's measurements, indicate on the graphs, near the relevant points, that the child has oedema. Refer the child for specialized care.



**If a child has marasmus, kwashiorkor, or oedema of both feet, note these observations in the Visit Notes and refer the child for specialized care.**

## **Recording other observations**

Other observations about the child's appearance may also be recorded in the Visit Notes before weight and length/height are measured. The following terms may be useful in recording your observations. Keep in mind, however, that some of these terms have more technical definitions based on the child's charted weight-for-length/height and BMI-for-age.

Terms for recording observations about the child's appearance:

- Wasted\* (too thin)
- Lean (fleshed out, no noticeable fat)
- Normal (rounded contours, no noticeable excess fat)
- Heavy (sturdy, mostly muscular, not lean or thin)
- Overweight\* (noticeable fat)
- Obese\* (excess fat)

\* You will learn more technical definitions for these terms in the next module.

### 3.0 Measure weight

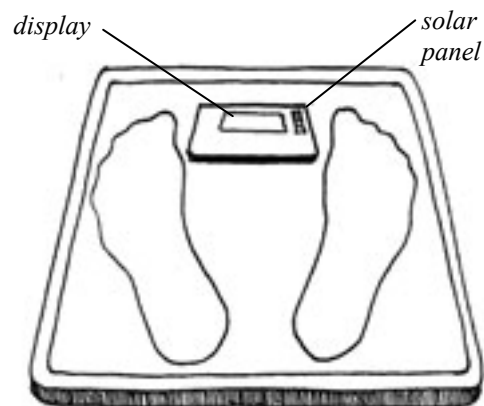
It is recommended to weigh children using a scale with the following features:

- Solidly built and durable
- Electronic (digital reading)
- Measures up to 150 kg
- Measures to a precision of 0.1 kg (100g)
- Allows tared weighing

“Tared weighing” means that the scale can be re-set to zero (“tared”) with the person just weighed still on it. Thus, a mother can stand on the scale, be weighed, and the scale tared. While remaining on the scale, if she is given her child to hold, the child’s weight alone appears on the scale. Tared weighing has two clear advantages:

- There is no need to subtract weights to determine the child’s weight alone (reducing the risk of error).
- The child is likely to remain calm when held in the mother’s arms for weighing.

There are many types of scales currently in use. The UNISCALE (made by UNICEF) has the recommended features listed above and is used in this course to demonstrate weighing techniques. It is powered by a lithium battery that is good for a million measurement sessions. The scale has a solar on-switch, so it requires adequate lighting to function. Footprints may be marked on the scale to show where a person should stand. This module will describe how to weigh a child using the UNISCALE or a similar model. Care and maintenance of the UNISCALE is described in section 5.0 of this module.



UNISCALE

A taring scale is easy to use and reliable. However, there are other types of scales that may be reliable, for example, an electronic baby scale, or a paediatric beam balance that has been calibrated. Children who can stand alone can be weighed standing on a scale. Otherwise, the mother can be weighed alone; then the mother and child can be weighed together and the mother’s weight subtracted to determine the child’s weight.

Bathroom scales are not recommended as they tend to be unreliable. Hanging scales are also not reliable when weighing agitated babies.

### 3.1 Prepare for weighing

Explain to the mother the reasons for weighing the child, for example, to see how the child is growing, how the child is recovering from a previous illness, or how the child is responding to changes that have been made in his feeding or care.

**If the child is less than 2 years old or is unable to stand**, you will do tared weighing.

Explain the tared weighing procedure to the mother as follows. Stress that the mother must stay on the scale until her child has been weighed in her arms.

- The mother will remove her shoes and step on the scale to be weighed alone first. She may need to adjust any long garments that could cover the display and solar panel of the scale.
- After the mother's weight appears on the display, tell her to remain standing on the scale. Re-set the reading to zero by covering the solar panel of the scale (thus blocking out the light).
- Then give the mother her child to hold.
- The child's weight will appear on the scale.
- Record the child's weight.

**If the child is 2 years or older**, you will weigh the child alone if the child will stand still.

Explain that the child will need to step on the scale alone and stand very still.

Undress the child. Explain that child needs to remove outer clothing in order to obtain an accurate weight. A wet diaper, or shoes and jeans, can weigh more than 0.5 kg. Babies should be weighed naked; wrap them in a blanket to keep them warm until weighing. Older children should remove all but minimal clothing, such as their underclothes.

If it is too cold to undress a child, or if the child resists being undressed and becomes agitated, you may weigh the clothed child, but note in the *Growth Record* that the child was clothed. It is important to avoid upsetting the child so that the length/height measurements can also be taken.

If it is socially unacceptable to undress the child, remove as much of the clothing as possible.

Note: If the child has braids or hair ornaments that will interfere with length/height measurements, remove them **before weighing** to avoid delay between the measurements. Especially with young children whose length will be measured, it is important to move quickly and surely from the scale to the length board to avoid upsetting the child.



### 3.2 Weigh a child using tared weighing

Be sure that the scale is placed on a flat, hard, even surface. It should not be placed on a loose carpet or rug, but a firm carpet that is glued down is acceptable. Since the scale is solar powered, there must be enough light to operate the scale.

- To turn on the scale, cover the solar panel for a second. When the number 0.0 appears, the scale is ready.
- Check to see that the mother has removed her shoes. You or someone else should hold the naked baby wrapped in a blanket.
- Ask the mother to stand in the middle of the scale, feet slightly apart (on the footprints, if marked), and remain still. The mother's clothing must not cover the display or solar panel. Remind her to stay on the scale even after her weight appears, until the baby has been weighed in her arms.
- With the mother still on the scale and her weight displayed, tare the scale by covering the solar panel for a second. The scale is tared when it displays a figure of a mother and baby and the number 0.0.
- Gently hand the naked baby to the mother and ask her to remain still.
- The baby's weight will appear on the display. Record this weight in the Visit Notes of the child's *Growth Record*. Be careful to read the numbers in the correct order (as though you were viewing while standing on the scale rather than upside-down).

Note: If a mother is very heavy (e.g. more than 100 kg) and the baby's weight is relatively low (e.g. less than 2.5 kg), the baby's weight may not register on the scale. In such cases, have a lighter person hold the baby on the scale.

#### Example

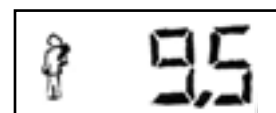


Mother's weight alone

Taring the scale



Baby's weight appears on display:



Note that the scale pictured above weighs with a precision to the nearest 0.1 kg. **Precision** describes the smallest exact unit that the scale can measure. The **accuracy** of the measurements, however, depends on whether the scale is calibrated and whether the observer reads the display correctly. Care of the measurement instruments to maximize accuracy will be described in section 5.0 of this module.

### 3.3 Weigh a child alone

If a child is 2 years old or older and will stand still, weigh the child alone. Ask the mother to help the child remove shoes and outer clothing. Talk with the child about the need to stand still. Communicate with the child in a sensitive, non-frightening way.

- To turn on the scale, cover the solar panel for a second. When the number 0.0 appears, the scale is ready.
- Ask the child to stand in the middle of the scale, feet slightly apart (on the footprints, if marked), and to remain still until the weight appears on the display.
- Record the child's weight to the nearest 0.1 kg.

If the child jumps on the scale or will not stand still, you will need to use the tared weighing procedure instead.



## 4.0 Measure length or height

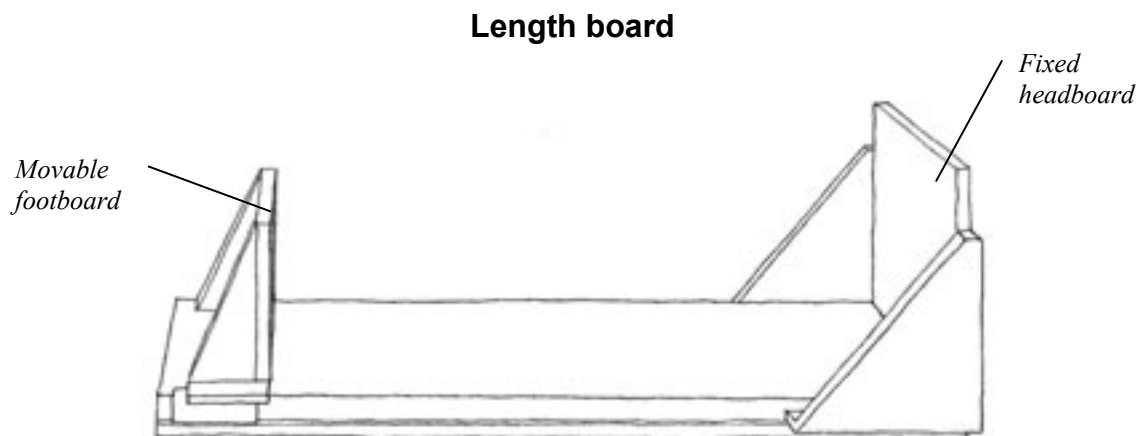
Depending on a child's age and ability to stand, measure the child's length or height. A child's length is measured lying down (recumbent). Height is measured standing upright.

- If a child is less than 2 years old, measure recumbent length.
- If the child is aged 2 years or older and able to stand, measure standing height.

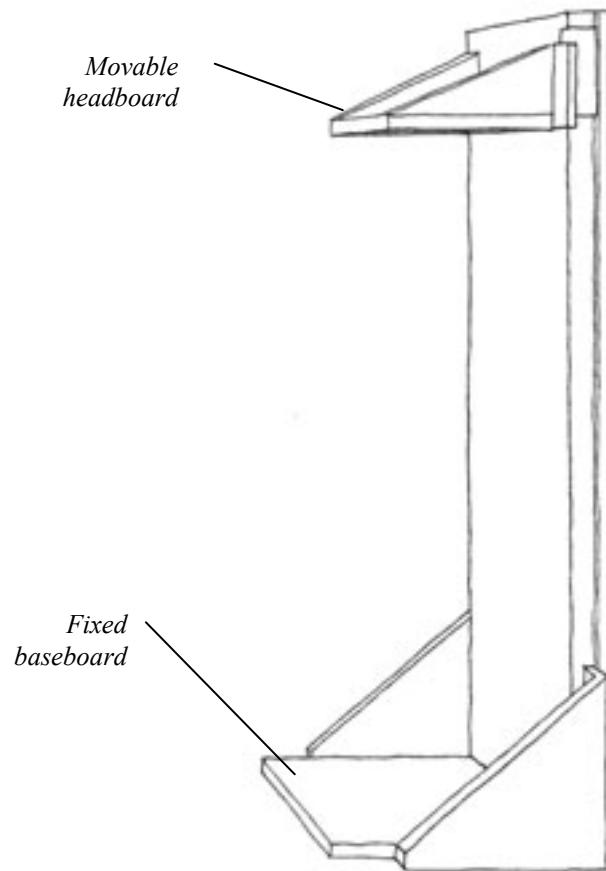
In general, standing height is about 0.7 cm less than recumbent length. This difference was taken into account in developing the WHO growth standards used to make the charts in the *Growth Record*. Therefore, it is important to adjust the measurements if length is taken instead of height, and vice versa.

- If a child less than 2 years old will not lie down for measurement of length, measure standing height and **add 0.7 cm** to convert it to length.
- If a child aged 2 years or older cannot stand, measure recumbent length and **subtract 0.7 cm** to convert it to height.

Equipment needed to measure length is a length board (sometimes called an infantometer) which should be placed on a flat, stable surface such as a table. To measure height, use a height board (sometimes called a stadiometer) mounted at a right angle between a level floor and against a straight, vertical surface such as a wall or pillar.



## Height board



A good length or height board should be made of smooth, moisture-resistant (varnished or polished) wood. The horizontal and vertical pieces should be firmly joined at right angles. A movable piece serves as the footboard when measuring length or the headboard when measuring height. Unless there is a digital counter, a measuring tape should be fixed firmly in a groove along the length of the board, so that moving parts do not scrape it and rub off the markings. Care of length and height boards is described in section 5.0.

## 4.1 Prepare to measure length or height

Be prepared to measure length/height immediately after weighing, while the child's clothes are off. Check that the child's shoes, socks, and hair ornaments have been removed. Undo braids if they will interfere with the measurement of length/height.

If a baby is weighed naked, a dry diaper can be put back on to avoid getting wet while measuring length. If the room is cool and there is any delay, keep the child warm in a blanket until length/height can be measured.

Whether measuring length or height, the mother is needed to help with measurement and to soothe and comfort the child. Explain to the mother the reasons for the measurement and the steps in the procedure. Answer any questions that she may have. Show her and tell her how she can help you. Explain that it is important to keep the child still and calm to obtain a good measurement.

## 4.2 Measure length

Cover the length board with a thin cloth or soft paper for hygiene and for the baby's comfort.

Explain to the mother that she will need to place the baby on the length board herself and then help to hold the baby's head in place while you take the measurement. Show her where to stand when placing the baby down, i.e. opposite you, on the side of the length board away from the tape. Also show her where to place the baby's head (against the fixed headboard) so that she can move quickly and surely without distressing the baby.

**When the mother understands your instructions and is ready to assist:**

- Ask her to lay the child on his back with his head against the fixed headboard, compressing the hair.
- Quickly position the head so that an imaginary vertical line from the ear canal to the lower border of the eye socket is perpendicular to the board. (The child's eyes should be looking straight up.) Ask the mother to move behind the headboard and hold the head in this position.



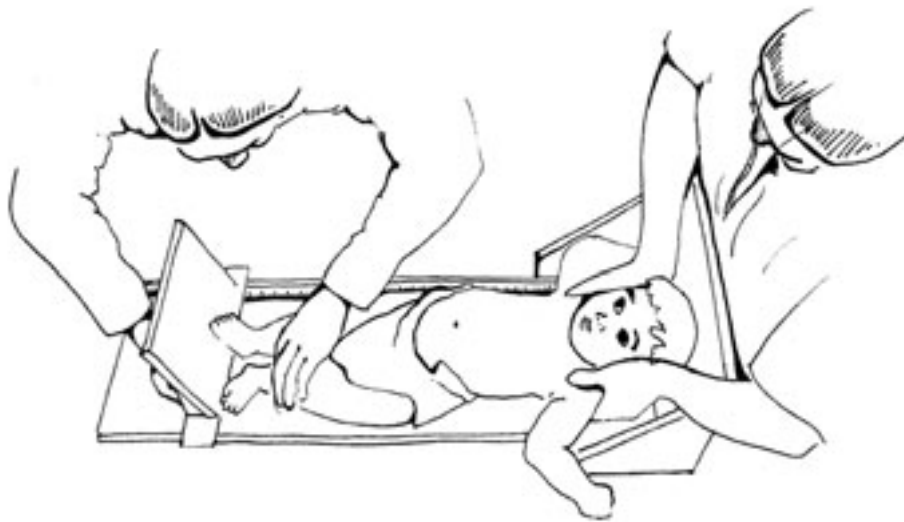
**Speed is important. Standing on the side of the length board where you can see the measuring tape and move the footboard:**

- Check that the child lies straight along the board and does not change position. Shoulders should touch the board, and the spine should not be arched. Ask the mother to inform you if the child arches the back or moves out of position.
- Hold down the child's legs with one hand and move the footboard with the other. Apply gentle pressure to the knees to straighten the legs as far as they can go without causing injury. *Note: it is not possible to straighten the knees of newborns to the same degree as older children. Their knees are fragile and could be injured easily, so apply minimum pressure.*

If a child is extremely agitated and both legs cannot be held in position, measure with one leg in position.

- While holding the knees, pull the footboard against the child's feet. The soles of the feet should be flat against the footboard, toes pointing upwards. If the child bends the toes and prevents the footboard from touching the soles, scratch the soles slightly and slide in the footboard quickly when the child straightens the toes.
- Read the measurement and record the child's length in centimetres to the last **completed** 0.1 cm in the Visit Notes of the *Growth Record*. This is the last line that you can actually see. (0.1 cm = 1 mm)

Remember: If the child whose length you measured is 2 years old or more, subtract 0.7 cm from the length and record the result as height in the Visit Notes.

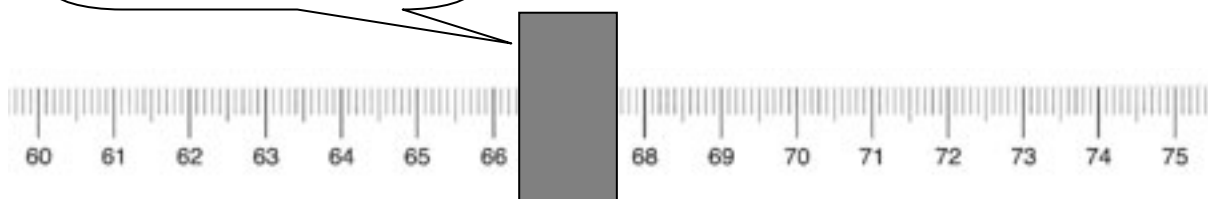


**Move quickly and surely to measure length accurately before the baby becomes agitated.**

### **Example**

Following is a picture of part of a measuring tape. The numbers and longer lines indicate centimetre markings. The shorter lines indicate millimetres. The gray box shows the position of the footboard when a length measurement is taken.

The child's feet are against this side of the movable footboard. This child's length is 66.3 cm.



### 4.3 Measure standing height

Ensure that the height board is on level ground. Check that shoes, socks and hair ornaments have been removed.

#### **Working with the mother, and kneeling in order to get down to the level of the child:**

- Help the child to stand on the baseboard with feet slightly apart. The back of the head, shoulder blades, buttocks, calves, and heels should all touch the vertical board. This alignment may be impossible for an obese child, in which case, help the child to stand on the board with one or more contact points touching the board. The trunk should be balanced over the waist, i.e., not leaning back or forward.
- Ask the mother to hold the child's knees and ankles to help keep the legs straight and feet flat, with heels and calves touching the vertical board. Ask her to focus the child's attention, soothe the child as needed, and inform you if the child moves out of position.
- Position the child's head so that a horizontal line from the ear canal to the lower border of the eye socket runs parallel to the baseboard. To keep the head in this position, hold the bridge between your thumb and forefinger over the child's chin.
- If necessary, push gently on the tummy to help the child stand to full height.
- Still keeping the head in position, use your other hand to pull down the headboard to rest firmly on top of the head and compress the hair.
- Read the measurement and record the child's height in centimetres to the last **completed** 0.1 cm in the Visit Notes of the *Growth Record*. This is the last line that you can actually see. (0.1 cm = 1 mm)

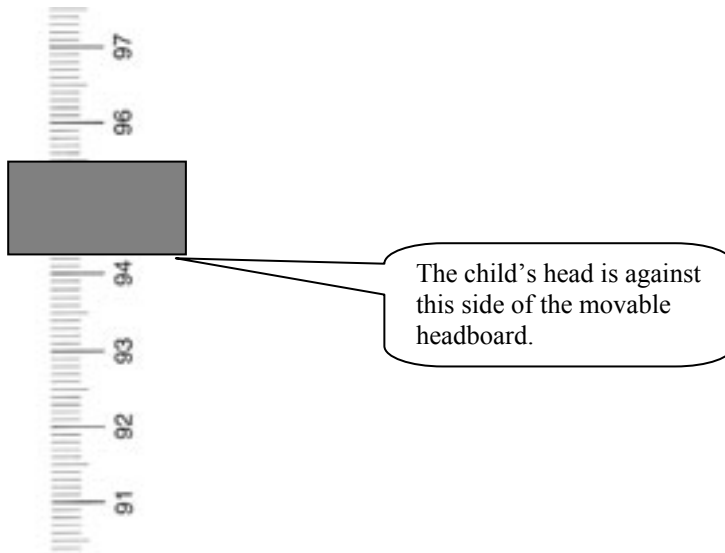
Remember: If the child whose height you measured is less than 2 years old, add 0.7 cm to the height and record the result as length in the Visit Notes.



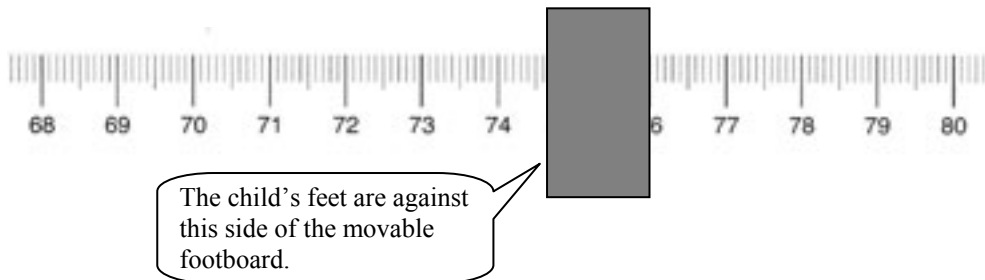
**SHORT ANSWER EXERCISE**

Read the measuring tapes below and record the measurements to the nearest 0.1 cm.

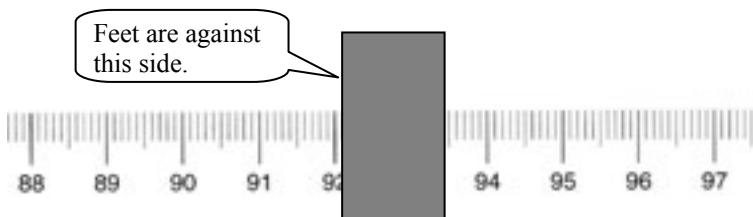
- This picture shows part of a measuring tape for a 3-year-old whose height is being measured. Record the height: \_\_\_\_\_



- This picture shows part of a measuring tape for an 11-month-old child whose length is being measured. Record the length: \_\_\_\_\_



- This picture shows part of a measuring tape for 2-year-old child who will not stand on the measuring board. His length is being measured, but his height must be recorded. What is his length? \_\_\_\_\_ What height should be recorded? \_\_\_\_\_



**When you have finished this exercise, compare your answers to those given on page 34 at the end of this module. If you have questions, talk with a facilitator.**



## 5.0 Care for measurement equipment

Proper care for the scale and length/height boards is important to ensure that measurements are as accurate as possible. Keep the equipment clean and store it at normal indoor temperature, protected from humidity and wetness.

The Uniscale will not function if it is too hot or if there is too little light. If the scale is hot, let it cool. If there is not enough light, move closer to a light source. When taring the scale, do not rub the solar panel with your foot or it will become worn; instead, simply block the light by covering it.

The accuracy of equipment should be checked at the time of purchase. Thereafter, check the scale and measuring boards at least once weekly, e.g. every Monday or Saturday.

### **To check the scale:**

- Weigh known weights of 3, 5, 10, and 20 kg.
- Check tared weighing by weighing a 20 kg weight, taring the scale, and then adding a 3 kg weight. The 3 kg weight should be displayed.
- If the weights are not accurate, calibrate the scale if possible. Otherwise, if the error is consistent (e.g. off by +0.2 kg consistently), adjust measurements accordingly (e.g. by subtracting 0.2 kg). Monitor the situation, as the amount of error may change. If measurements are off by variable amounts, notify the responsible officer that the scale needs to be replaced.

### **To check the length/height boards:**

When assembling the length/height boards, measure rods of known length to check that they are assembled correctly.

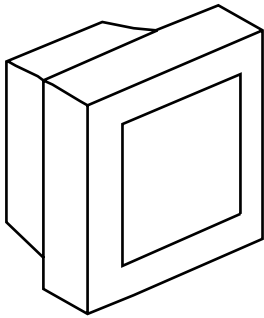
Check that the joints are tight and straight. If not, tighten or straighten them.

Check that the measuring tape can be read. If it is too worn to be read, it should be replaced.

**Live demonstration of use of equipment for measuring weight and length/height**

*This demonstration will take place with real equipment in the classroom. Facilitators will demonstrate how to use the scale and measuring boards.*

*After the demonstration, all participants will practice using the equipment.*



**Video demonstration of measuring weight and length/height**

*At this point the facilitator will show the sections of the Anthropometry Training Video related to measuring weight, length and height (about 8 minutes) and calibrating the uniscale (which applies to other scale types as well).*

## 6.0 Determine BMI (body mass index)

BMI is a number that associates a person's weight with his or her height/length. BMI can be a useful growth indicator when it is plotted on a graph against a child's age. BMI is calculated as follows:

$$\text{Weight in kg} \div \text{squared length/height in metres}$$

Another way to show the formula is  $\text{kg/m}^2$ . (If the measurements are recorded in pounds and inches, convert them to metric units before calculating BMI: 1 inch = 2.54 cm or 0.0254 m, and 1 pound = 0.4536 kg.) BMI is rounded to one decimal place.

It is very important to use a **length** measurement for a child less than 2 years old and a **height** measurement for a child age 2 years or older. If necessary, convert height to length (by adding 0.7 cm) or length to height (by subtracting 0.7 cm) before determining the child's BMI.<sup>2</sup>

If you have a calculator with an  $x^2$  button, it is relatively simple to calculate a child's BMI as follows:

- 1) Type in the weight in kg (to the nearest 0.1 kg).
- 2) Press the / or  $\div$  sign.
- 3) Type in the length or height in metres. (*This will require expressing centimetres as metres; for example, 82.3 centimetres is expressed as 0.823 metres.*)
- 4) Press the  $x^2$  button. The height squared is displayed.
- 5) Press the = button. The BMI is displayed.
- 6) Round the BMI to one decimal place and record the BMI on the Visit Notes page of the *Growth Record*.

If your calculator lacks an  $x^2$  button, follow steps 1-3, repeat steps 2 and 3, and then press the = button to display the BMI. If you have no calculator, consult a table that shows BMIs for various weights and lengths or heights. A BMI table is provided in Annex II of this module (page 36) and in the job-aid titled *Weighing and measuring a child* provided with this course. The same table may be used for all children up to age 5.

To use the BMI table:

- Find the child's length or height (in centimetres) in the far left column of the table. If the exact measurement is not shown, select the closest one. If the child's measurement is halfway between those shown, select the next higher measurement.
- Look across the row to find the child's weight. If the exact weight is not shown, select the closest one. If the weight is halfway between those shown, consider it "on the line."
- Trace your finger upward from the weight to find the child's BMI on the top row of the table. (Or you can trace downward, as the BMIs are also on the bottom row.) If the weight was "on the line," the BMI will be halfway between those shown, e.g. 15.5 if between 15 and 16.
- Record the BMI on the Visit Notes page of the *Growth Record*.

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<sup>2</sup> The BMI table and BMI-for-age charts in the *Growth Record* were constructed using length for children under 2 years and height for children aged 2 years and older.

**Example**

Following is an excerpt from the BMI table shown in Annex II of this module. This example shows how to use the BMI table for a girl named Amani, who is age 2 years and 4 months.

- Amani’s height is 88.2 cm. The closest height in the far left column of the table is 88 cm (circled below).
- Amani’s weight is 11.5 kg. The closest weight on the row for her height is 11.6 kg.
- Tracing a finger upward from Amani’s weight, you find that her BMI (on the top row of the table) is 15.

L of H (cm)	Body Mass Index (BMI)																	L of H (cm)		
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		25	26
84	5.6	6.4	7.1	7.8	8.5	9.2	9.9	10.6	11.3	12.0	12.7	13.4	14.1	14.8	15.5	16.2	16.9	17.6	18.3	84
85	5.8	6.5	7.2	7.9	8.7	9.4	10.1	10.8	11.6	12.3	13.0	13.7	14.5	15.2	15.9	16.6	17.3	18.1	18.8	85
86	5.9	6.7	7.4	8.1	8.9	9.6	10.4	11.1	11.8	12.6	13.3	14.1	14.8	15.5	16.3	17.0	17.8	18.5	19.2	86
87	6.1	6.8	7.6	8.3	9.1	9.8	10.6	11.4	12.1	12.9	13.6	14.4	15.1	15.9	16.7	17.4	18.2	18.9	19.7	87
88	6.2	7.0	7.7	8.5	9.3	10.1	10.9	11.6	12.4	13.2	13.9	14.7	15.5	16.3	17.0	17.8	18.6	19.4	20.1	88
89	6.3	7.1	7.9	8.7	9.5	10.3	11.1	11.9	12.7	13.5	14.3	15.0	15.8	16.6	17.4	18.2	19.0	19.8	20.6	89
90	6.5	7.3	8.1	8.9	9.7	10.5	11.3	12.2	13.0	13.8	14.6	15.4	16.2	17.0	17.8	18.6	19.4	20.3	21.1	90
91	6.6	7.5	8.3	9.1	9.9	10.8	11.6	12.4	13.2	14.1	14.9	15.7	16.6	17.4	18.2	19.0	19.9	20.7	21.5	91
92	6.8	7.6	8.5	9.3	10.2	11.0	11.8	12.7	13.5	14.4	15.2	16.1	16.9	17.8	18.6	19.5	20.3	21.2	22.0	92

If you wish to use the mathematical formula (kg/m<sup>2</sup>) and a calculator to determine Amani’s BMI, it is necessary to express her height in metres. Her height of 88.2 cm is expressed as 0.882 m. Her BMI is calculated as follows:

$$11.5 \text{ kg} \div 0.882 \text{ m}^2 = 14.78\dots, \text{ which would be recorded as 14.8 in the Visit Notes}$$

As you can see, the results of using the BMI table and the calculator are very close.

**Reminder:** If a child has oedema of both feet, do not determine the child’s BMI, as his weight is unrealistically high due to fluid retention. Refer the child with oedema of both feet for specialized care.



## SHORT ANSWER EXERCISE

Use the BMI table in Annex II of this module (also in the job-aid titled *Measuring and weighing children*) to find the BMI of the following children. If you have a calculator, also calculate the BMI using your calculator and compare the result.

1. A 3-year-old child is 100 cm in height and weighs 14.0 kg.
2. An 18-month-old child is 78.8 cm in length and weighs 11.2 kg.
3. A 4-year-old child is 118.5 cm in height and weighs 22.5 kg.
4. A newborn is 48.2 cm in length and weighs 3.1 kg.

**When you have finished this exercise, compare your answers to those given on page 34 at the end of this module. If you have questions, talk with a facilitator.**



## Exercise C

### Continuing Case Studies – Nalah and Toman

In Exercise B you began a *Girl's Growth Record* for Nalah and a *Boy's Growth Record* for Toman. In this exercise you will enter additional information from a series of visits by each child on the Visit Notes page, and determine age and BMI at each visit. You may use either a calculator or the BMI table to determine BMI.

#### Nalah

On the Visit Notes page of Nalah's *Girl's Growth Record*, you have already recorded some information from her visit of 25 March 2006, when she was 6 weeks old. Open her Growth Record to the Visit Notes.

1. Nalah's weight at 6 weeks was 3.5 kg and her length was 51.3 cm. Record her weight and length at 6 weeks on the Visit Notes page. Determine her BMI and record it in the Visit Notes as well.
2. Following is information from four subsequent visits by Nalah. Enter this information on the Visit Notes page. Determine Nalah's age and BMI at each visit and enter those as well.

Date of visit	Weight	Length	Reason for visit
20 April 2006	4.2 kg	54.8 cm	immunization
22 May 2006	4.3 kg	54.8 cm	diarrhoea
26 June 2006	4.8 kg	56.2 cm	immunization
15 August 2006	5.4 kg	58.1 cm	well-baby visit

## Toman

On the Visit Notes page of Toman's *Boy's Growth Record*, you have already recorded some information from his visit of 15 August 2006, when he was 1 year and 1 month old. Open his *Growth Record* to the Visit Notes.

1. Toman's weight at 1 year and 1 month old was 11.9 kg and his length was 79.0 cm. Record his weight and length at this age on the Visit Notes page. Determine his BMI and record it as well.
2. Following is information from three subsequent visits by Toman. Enter this information on the Visit Notes page. Determine Toman's age and BMI at each visit and enter those as well.

Date of visit	Weight	Length/Height	Reason for visit
15 December 2006	13.5 kg	84.5 cm	well-child visit
16 March 2007	15.0 kg	87.0 cm	ear pain
12 July 2007	16.8 kg	90.9 cm	well-child visit

**When you have finished this exercise,  
review your answers with a facilitator.**



## Exercise D

### Measuring weight, length, and height

This will be a practical exercise in a clinic setting, or in the classroom if children and measuring equipment can be brought there. The mothers should be present, if possible, to tell the children's dates of birth and to assist with measuring and reassuring them.

Your facilitator will assign you to work in pairs. Each pair should do the following steps for at least two children, one who is less than 2 years old and one who is 2–5 years old.

- Review records or ask the mother to determine the child's name, sex, and date of birth. Record this information in the inset box below on the left.
- Use the age calculator to determine the child's age today.
- Make a visual assessment of the child (e.g. does the child appear thin, fat, active, lethargic)?
- Observe the child for signs of marasmus or kwashiorkor. If there is any apparent oedema, test for oedema of both feet.
- Weigh the child.
- Measure the child's length or height. } *Each person take a turn.*
- Record results on the Visit Notes page below.
- Calculate the BMI and record it below. You may use the BMI table or a calculator to determine the BMIs.

### Visit Notes

Date	Age today (Completed years/months or weeks)	Measurements (Record below; then plot on charts)			Reason for visit, observations, recommendations
		Weight (kg)	Length/Height (cm)	BMI	
Child 1: Sex: DOB:					
Child 2: Sex: DOB:					
Child 3: Sex: DOB:					
Child 4: Sex: DOB:					



**When you have finished this exercise, compare your answers with those of another participant who measured the same children. Consult with a facilitator as needed.**



**At this point the facilitator will present a slide show titled “Measuring: It’s not so easy.”**

## Answers to short answer exercises

### Page 24

1. 94.2 cm
2. 74.6 cm (*This is the last line that can actually be seen.*)
3. Length is 92.0 cm. (*This is the last line that can actually be seen.*) Subtract 0.7 cm to convert length to height. Recorded height should be 91.3 cm

### Page 29

*The BMI found by using the BMI table is listed first. The calculated BMI is listed second.*

1. 14    *or*  $14 / 1.00^2 = 14.0$
2. 18    *or*  $11.2 / 0.788^2 = 18.03\dots$  (round to 18.0)
3. 16    *or*  $22.5 / 1.185^2 = 16.02\dots$  (round to 16.0)
4. 13.5    *or*  $3.1 / 0.482^2 = 13.34\dots$  (round to 13.3)

## Annex I: Sample Local Events Calendar (INDIA)

Month	Events/ Festivals	2002	2003	2004	2005	2006	2007
Margasira	Bhogi	13 Jan	13 Jan	14 Jan	13 Jan	13 Jan	14 Jan
	Sankranti	14 Jan	14 Jan	15 Jan	14 Jan	14 Jan	15 Jan
	Kanuma	15 Jan	15 Jan	16 Jan	15 Jan	15 Jan	16 Jan
Pushya	Republic Day	26 Jan	26 Jan	26 Jan	26 Jan	26 Jan	26 Jan
	Gandhi Vardhanti	30 Jan	30 Jan	30 Jan	30 Jan	30 Jan	30 Jan
Magha	Maha Sivaratri	12 Mar	01 Mar	18 Feb	8 Mar	26 Feb	16 Feb
	Holi	29 Mar	19 Mar	6 Mar	25 Mar	14 Mar	3 Mar
Palgun	Ugadi	13 Apr	2 Apr	21 Mar	9 Apr	30 Mar	20 Mar
	Sri Rama Navami	21 Apr	11 Apr	30 Mar	18 Apr	6 Apr	27 Mar
	Good Friday	29 Mar	18 Apr	9 Apr	25 Mar	14 Apr	6 Apr
	Ambedkar Jayanti	14 Apr	14 Apr	14 Apr	14 Apr	14 Apr	14 Apr
	May Day	1 May	1 May	1 May	1 May	1 May	1 May
Chaitra	Buddha Purnima	26 May	16 May	4 May	23 May	13 May	2 May
	Mrigasira Karthe	8 Jun	8 Jun	7 Jun	8 Jun	8 Jun	9 Jun
Jeshta	Ramzan	6 Dec	26 Nov	15 Nov	4 Nov	25 Oct	14 Oct
	Bakrid	23 Feb	12 Feb	2 Feb	21 Jan	11 Jan	1 Jan
Ashad	Raksha Bandhan	22 Aug	12 Aug	30 Aug	19 Aug	09 Aug	28 Aug
	Varalaxmi Vrathm	16 Aug	8 Aug	27 Aug	12 Aug	04 Aug	24 Aug
	Krishnastami	31 Aug	20 Aug	7 Sep	26 Aug	16 Aug	4 Sept
Sravan	Vinayaka Chavithi	10 Sep	31 Aug	18 Sep	7 Sep	27 Aug	15 Sept
	Moharam	25 Mar	14 Mar	2 Mar	20 Feb	9 Feb	30 Jan
Badra	Gandhi Jayanthi	2 Oct	2 Oct	2 Oct	2 Oct	2 Oct	2 Oct
	Durgastami	13 Oct	3 Oct	21 Oct	11 Oct	30 Sept	19 Oct
	Maharnavami	14 Oct	4 Oct	22 Oct	12 Oct	1 Oct	20 Oct
	Vijayadasami	15 Oct	4 Oct	22 Oct	12 Oct	2 Oct	21 Oct
Ashiyuja	Naraka Chaturdhi	3 Nov	24 Oct	11 Nov	30 Oct	20 Oct	8 Nov
	Deepavali	4 Nov	24 Oct	12 Nov	31 Oct	21 Oct	9 Nov
	Naga Chaviti	8 Nov	28 Oct	16 Nov	5 Nov	26 Oct	14 Nov
Kartika	Nehru Birthday	14 Nov	14 Nov	14 Nov	14 Nov	14 Nov	14 Nov
	Christmas	25 Dec	25 Dec	25 Dec	25 Dec	25 Dec	25 Dec
	Tsunami				26 Dec		

*In this sample the months are identified by their local names, feasts and celebrations with fixed dates as well as those with changing dates are updated annually while chance events, like the tsunami, typhoons, floods, etc, have to be entered as they occur.*

## Annex II: BMI Table

L or H (cm)	Body Mass Index (BMI)																		L or H (cm)	
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		26
42	1.4	1.6	1.8	1.9	2.1	2.3	2.5	2.6	2.8	3.0	3.2	3.4	3.5	3.7	3.9	4.1	4.2	4.4	4.6	42
43	1.5	1.7	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.1	3.3	3.5	3.7	3.9	4.1	4.3	4.4	4.6	4.8	43
44	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	4.1	4.3	4.5	4.6	4.8	5.0	44
45	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.1	4.3	4.5	4.7	4.9	5.1	5.3	45
46	1.7	1.9	2.1	2.3	2.5	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.7	4.9	5.1	5.3	5.5	46
47	1.8	2.0	2.2	2.4	2.7	2.9	3.1	3.3	3.5	3.8	4.0	4.2	4.4	4.6	4.9	5.1	5.3	5.5	5.7	47
48	1.8	2.1	2.3	2.5	2.8	3.0	3.2	3.5	3.7	3.9	4.1	4.4	4.6	4.8	5.1	5.3	5.5	5.8	6.0	48
49	1.9	2.2	2.4	2.6	2.9	3.1	3.4	3.6	3.8	4.1	4.3	4.6	4.8	5.0	5.3	5.5	5.8	6.0	6.2	49
50	2.0	2.3	2.5	2.8	3.0	3.3	3.5	3.8	4.0	4.3	4.5	4.8	5.0	5.3	5.5	5.8	6.0	6.3	6.5	50
51	2.1	2.3	2.6	2.9	3.1	3.4	3.6	3.9	4.2	4.4	4.7	4.9	5.2	5.5	5.7	6.0	6.2	6.5	6.8	51
52	2.2	2.4	2.7	3.0	3.2	3.5	3.8	4.1	4.3	4.6	4.9	5.1	5.4	5.7	5.9	6.2	6.5	6.8	7.0	52
53	2.2	2.5	2.8	3.1	3.4	3.7	3.9	4.2	4.5	4.8	5.1	5.3	5.6	5.9	6.2	6.5	6.7	7.0	7.3	53
54	2.3	2.6	2.9	3.2	3.5	3.8	4.1	4.4	4.7	5.0	5.2	5.5	5.8	6.1	6.4	6.7	7.0	7.3	7.6	54
55	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6.1	6.4	6.7	7.0	7.3	7.6	7.9	55
56	2.5	2.8	3.1	3.4	3.8	4.1	4.4	4.7	5.0	5.3	5.6	6.0	6.3	6.6	6.9	7.2	7.5	7.8	8.2	56
57	2.6	2.9	3.2	3.6	3.9	4.2	4.5	4.9	5.2	5.5	5.8	6.2	6.5	6.8	7.1	7.5	7.8	8.1	8.4	57
58	2.7	3.0	3.4	3.7	4.0	4.4	4.7	5.0	5.4	5.7	6.1	6.4	6.7	7.1	7.4	7.7	8.1	8.4	8.7	58
59	2.8	3.1	3.5	3.8	4.2	4.5	4.9	5.2	5.6	5.9	6.3	6.6	7.0	7.3	7.7	8.0	8.4	8.7	9.1	59
60	2.9	3.2	3.6	4.0	4.3	4.7	5.0	5.4	5.8	6.1	6.5	6.8	7.2	7.6	7.9	8.3	8.6	9.0	9.4	60
61	3.0	3.3	3.7	4.1	4.5	4.8	5.2	5.6	6.0	6.3	6.7	7.1	7.4	7.8	8.2	8.6	8.9	9.3	9.7	61
62	3.1	3.5	3.8	4.2	4.6	5.0	5.4	5.8	6.2	6.5	6.9	7.3	7.7	8.1	8.5	8.8	9.2	9.6	10.0	62
63	3.2	3.6	4.0	4.4	4.8	5.2	5.6	6.0	6.4	6.7	7.1	7.5	7.9	8.3	8.7	9.1	9.5	9.9	10.3	63
64	3.3	3.7	4.1	4.5	4.9	5.3	5.7	6.1	6.6	7.0	7.4	7.8	8.2	8.6	9.0	9.4	9.8	10.2	10.6	64
65	3.4	3.8	4.2	4.6	5.1	5.5	5.9	6.3	6.8	7.2	7.6	8.0	8.5	8.9	9.3	9.7	10.1	10.6	11.0	65
66	3.5	3.9	4.4	4.8	5.2	5.7	6.1	6.5	7.0	7.4	7.8	8.3	8.7	9.1	9.6	10.0	10.5	10.9	11.3	66
67	3.6	4.0	4.5	4.9	5.4	5.8	6.3	6.7	7.2	7.6	8.1	8.5	9.0	9.4	9.9	10.3	10.8	11.2	11.7	67
68	3.7	4.2	4.6	5.1	5.5	6.0	6.5	6.9	7.4	7.9	8.3	8.8	9.2	9.7	10.2	10.6	11.1	11.6	12.0	68
69	3.8	4.3	4.8	5.2	5.7	6.2	6.7	7.1	7.6	8.1	8.6	9.0	9.5	10.0	10.5	11.0	11.4	11.9	12.4	69
70	3.9	4.4	4.9	5.4	5.9	6.4	6.9	7.4	7.8	8.3	8.8	9.3	9.8	10.3	10.8	11.3	11.8	12.3	12.7	70
71	4.0	4.5	5.0	5.5	6.0	6.6	7.1	7.6	8.1	8.6	9.1	9.6	10.1	10.6	11.1	11.6	12.1	12.6	13.1	71
72	4.1	4.7	5.2	5.7	6.2	6.7	7.3	7.8	8.3	8.8	9.3	9.8	10.4	10.9	11.4	11.9	12.4	13.0	13.5	72
73	4.3	4.8	5.3	5.9	6.4	6.9	7.5	8.0	8.5	9.1	9.6	10.1	10.7	11.2	11.7	12.3	12.8	13.3	13.9	73
74	4.4	4.9	5.5	6.0	6.6	7.1	7.7	8.2	8.8	9.3	9.9	10.4	11.0	11.5	12.0	12.6	13.1	13.7	14.2	74
75	4.5	5.1	5.6	6.2	6.8	7.3	7.9	8.4	9.0	9.6	10.1	10.7	11.3	11.8	12.4	12.9	13.5	14.1	14.6	75
76	4.6	5.2	5.8	6.4	6.9	7.5	8.1	8.7	9.2	9.8	10.4	11.0	11.6	12.1	12.7	13.3	13.9	14.4	15.0	76
77	4.7	5.3	5.9	6.5	7.1	7.7	8.3	8.9	9.5	10.1	10.7	11.3	11.9	12.5	13.0	13.6	14.2	14.8	15.4	77
78	4.9	5.5	6.1	6.7	7.3	7.9	8.5	9.1	9.7	10.3	11.0	11.6	12.2	12.8	13.4	14.0	14.6	15.2	15.8	78
79	5.0	5.6	6.2	6.9	7.5	8.1	8.7	9.4	10.0	10.6	11.2	11.9	12.5	13.1	13.7	14.4	15.0	15.6	16.2	79
80	5.1	5.8	6.4	7.0	7.7	8.3	9.0	9.6	10.2	10.9	11.5	12.2	12.8	13.4	14.1	14.7	15.4	16.0	16.6	80
81	5.2	5.9	6.6	7.2	7.9	8.5	9.2	9.8	10.5	11.2	11.8	12.5	13.1	13.8	14.4	15.1	15.7	16.4	17.1	81
82	5.4	6.1	6.7	7.4	8.1	8.7	9.4	10.1	10.8	11.4	12.1	12.8	13.4	14.1	14.8	15.5	16.1	16.8	17.5	82
83	5.5	6.2	6.9	7.6	8.3	9.0	9.6	10.3	11.0	11.7	12.4	13.1	13.8	14.5	15.2	15.8	16.5	17.2	17.9	83
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	

L or H (cm)	Body Mass Index (BMI)																		L or H (cm)	
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		26
<b>84</b>	5.6	6.4	7.1	7.8	8.5	9.2	9.9	10.6	11.3	12.0	12.7	13.4	14.1	14.8	15.5	16.2	16.9	17.6	18.3	<b>84</b>
<b>85</b>	5.8	6.5	7.2	7.9	8.7	9.4	10.1	10.8	11.6	12.3	13.0	13.7	14.5	15.2	15.9	16.6	17.3	18.1	18.8	<b>85</b>
<b>86</b>	5.9	6.7	7.4	8.1	8.9	9.6	10.4	11.1	11.8	12.6	13.3	14.1	14.8	15.5	16.3	17.0	17.8	18.5	19.2	<b>86</b>
<b>87</b>	6.1	6.8	7.6	8.3	9.1	9.8	10.6	11.4	12.1	12.9	13.6	14.4	15.1	15.9	16.7	17.4	18.2	18.9	19.7	<b>87</b>
<b>88</b>	6.2	7.0	7.7	8.5	9.3	10.1	10.8	11.6	12.4	13.2	13.9	14.7	15.5	16.3	17.0	17.8	18.6	19.4	20.1	<b>88</b>
<b>89</b>	6.3	7.1	7.9	8.7	9.5	10.3	11.1	11.9	12.7	13.5	14.3	15.0	15.8	16.6	17.4	18.2	19.0	19.8	20.6	<b>89</b>
<b>90</b>	6.5	7.3	8.1	8.9	9.7	10.5	11.3	12.2	13.0	13.8	14.6	15.4	16.2	17.0	17.8	18.6	19.4	20.3	21.1	<b>90</b>
<b>91</b>	6.6	7.5	8.3	9.1	9.9	10.8	11.6	12.4	13.2	14.1	14.9	15.7	16.6	17.4	18.2	19.0	19.9	20.7	21.5	<b>91</b>
<b>92</b>	6.8	7.6	8.5	9.3	10.2	11.0	11.8	12.7	13.5	14.4	15.2	16.1	16.9	17.8	18.6	19.5	20.3	21.2	22.0	<b>92</b>
<b>93</b>	6.9	7.8	8.6	9.5	10.4	11.2	12.1	13.0	13.8	14.7	15.6	16.4	17.3	18.2	19.0	19.9	20.8	21.6	22.5	<b>93</b>
<b>94</b>	7.1	8.0	8.8	9.7	10.6	11.5	12.4	13.3	14.1	15.0	15.9	16.8	17.7	18.6	19.4	20.3	21.2	22.1	23.0	<b>94</b>
<b>95</b>	7.2	8.1	9.0	9.9	10.8	11.7	12.6	13.5	14.4	15.3	16.2	17.1	18.1	19.0	19.9	20.8	21.7	22.6	23.5	<b>95</b>
<b>96</b>	7.4	8.3	9.2	10.1	11.1	12.0	12.9	13.8	14.7	15.7	16.6	17.5	18.4	19.4	20.3	21.2	22.1	23.0	24.0	<b>96</b>
<b>97</b>	7.5	8.5	9.4	10.3	11.3	12.2	13.2	14.1	15.1	16.0	16.9	17.9	18.8	19.8	20.7	21.6	22.6	23.5	24.5	<b>97</b>
<b>98</b>	7.7	8.6	9.6	10.6	11.5	12.5	13.4	14.4	15.4	16.3	17.3	18.2	19.2	20.2	21.1	22.1	23.0	24.0	25.0	<b>98</b>
<b>99</b>	7.8	8.8	9.8	10.8	11.8	12.7	13.7	14.7	15.7	16.7	17.6	18.6	19.6	20.6	21.6	22.5	23.5	24.5	25.5	<b>99</b>
<b>100</b>	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	<b>100</b>
<b>101</b>	8.2	9.2	10.2	11.2	12.2	13.3	14.3	15.3	16.3	17.3	18.4	19.4	20.4	21.4	22.4	23.5	24.5	25.5	26.5	<b>101</b>
<b>102</b>	8.3	9.4	10.4	11.4	12.5	13.5	14.6	15.6	16.6	17.7	18.7	19.8	20.8	21.8	22.9	23.9	25.0	26.0	27.1	<b>102</b>
<b>103</b>	8.5	9.5	10.6	11.7	12.7	13.8	14.9	15.9	17.0	18.0	19.1	20.2	21.2	22.3	23.3	24.4	25.5	26.5	27.6	<b>103</b>
<b>104</b>	8.7	9.7	10.8	11.9	13.0	14.1	15.1	16.2	17.3	18.4	19.5	20.6	21.6	22.7	23.8	24.9	26.0	27.0	28.1	<b>104</b>
<b>105</b>	8.8	9.9	11.0	12.1	13.2	14.3	15.4	16.5	17.6	18.7	19.8	20.9	22.1	23.2	24.3	25.4	26.5	27.6	28.7	<b>105</b>
<b>106</b>	9.0	10.1	11.2	12.4	13.5	14.6	15.7	16.9	18.0	19.1	20.2	21.3	22.5	23.6	24.7	25.8	27.0	28.1	29.2	<b>106</b>
<b>107</b>	9.2	10.3	11.4	12.6	13.7	14.9	16.0	17.2	18.3	19.5	20.6	21.8	22.9	24.0	25.2	26.3	27.5	28.6	29.8	<b>107</b>
<b>108</b>	9.3	10.5	11.7	12.8	14.0	15.2	16.3	17.5	18.7	19.8	21.0	22.2	23.3	24.5	25.7	26.8	28.0	29.2	30.3	<b>108</b>
<b>109</b>	9.5	10.7	11.9	13.1	14.3	15.4	16.6	17.8	19.0	20.2	21.4	22.6	23.8	25.0	26.1	27.3	28.5	29.7	30.9	<b>109</b>
<b>110</b>	9.7	10.9	12.1	13.3	14.5	15.7	16.9	18.2	19.4	20.6	21.8	23.0	24.2	25.4	26.6	27.8	29.0	30.3	31.5	<b>110</b>
<b>111</b>	9.9	11.1	12.3	13.6	14.8	16.0	17.2	18.5	19.7	20.9	22.2	23.4	24.6	25.9	27.1	28.3	29.6	30.8	32.0	<b>111</b>
<b>112</b>	10.0	11.3	12.5	13.8	15.1	16.3	17.6	18.8	20.1	21.3	22.6	23.8	25.1	26.3	27.6	28.9	30.1	31.4	32.6	<b>112</b>
<b>113</b>	10.2	11.5	12.8	14.0	15.3	16.6	17.9	19.2	20.4	21.7	23.0	24.3	25.5	26.8	28.1	29.4	30.6	31.9	33.2	<b>113</b>
<b>114</b>	10.4	11.7	13.0	14.3	15.6	16.9	18.2	19.5	20.8	22.1	23.4	24.7	26.0	27.3	28.6	29.9	31.2	32.5	33.8	<b>114</b>
<b>115</b>	10.6	11.9	13.2	14.5	15.9	17.2	18.5	19.8	21.2	22.5	23.8	25.1	26.5	27.8	29.1	30.4	31.7	33.1	34.4	<b>115</b>
<b>116</b>	10.8	12.1	13.5	14.8	16.1	17.5	18.8	20.2	21.5	22.9	24.2	25.6	26.9	28.3	29.6	30.9	32.3	33.6	35.0	<b>116</b>
<b>117</b>	11.0	12.3	13.7	15.1	16.4	17.8	19.2	20.5	21.9	23.3	24.6	26.0	27.4	28.7	30.1	31.5	32.9	34.2	35.6	<b>117</b>
<b>118</b>	11.1	12.5	13.9	15.3	16.7	18.1	19.5	20.9	22.3	23.7	25.1	26.5	27.8	29.2	30.6	32.0	33.4	34.8	36.2	<b>118</b>
<b>119</b>	11.3	12.7	14.2	15.6	17.0	18.4	19.8	21.2	22.7	24.1	25.5	26.9	28.3	29.7	31.2	32.6	34.0	35.4	36.8	<b>119</b>
<b>120</b>	11.5	13.0	14.4	15.8	17.3	18.7	20.2	21.6	23.0	24.5	25.9	27.4	28.8	30.2	31.7	33.1	34.6	36.0	37.4	<b>120</b>
<b>121</b>	11.7	13.2	14.6	16.1	17.6	19.0	20.5	22.0	23.4	24.9	26.4	27.8	29.3	30.7	32.2	33.7	35.1	36.6	38.1	<b>121</b>
<b>122</b>	11.9	13.4	14.9	16.4	17.9	19.3	20.8	22.3	23.8	25.3	26.8	28.3	29.8	31.3	32.7	34.2	35.7	37.2	38.7	<b>122</b>
<b>123</b>	12.1	13.6	15.1	16.6	18.2	19.7	21.2	22.7	24.2	25.7	27.2	28.7	30.3	31.8	33.3	34.8	36.3	37.8	39.3	<b>123</b>
<b>124</b>	12.3	13.8	15.4	16.9	18.5	20.0	21.5	23.1	24.6	26.1	27.7	29.2	30.8	32.3	33.8	35.4	36.9	38.4	40.0	<b>124</b>
<b>125</b>	12.5	14.1	15.6	17.2	18.8	20.3	21.9	23.4	25.0	26.6	28.1	29.7	31.3	32.8	34.4	35.9	37.5	39.1	40.6	<b>125</b>
	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>	





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