

# Chapter 16: Identification Numbers

For All Practical  
Purposes



Mathematical Literacy in  
Today's World, 9th ed.

## Section 16.1 Check Digits (Airlines, Federal Express Mail, UPS packets, Avis and National Rental cars )

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## Check Digits

- Check Digit
  - A digit included in an identification number for the purpose of error detection.
    - Mathematical calculations or schemes are used on the digits of the identification number to assign the check digit.
    - Computers use the check digit to help detect typing errors during data entry to prevent and detect fraud and to find other errors.

## Scheme used on Airline tickets, Federal Express mail, UPS packets, Avis and National rental cars

Assigns the remainder upon division by 7 of the number itself as the check digit.

PASSENGER RECEIPT AND BAGGAGE CHECK  
K1018/52/627148/4359 34043400 790 39723  
ETKT ARC PASSENGER RECEIPT SITI \*\*\*\*\*  
NORTHWEST AIRLINES I A23625243 GALLIAN/JOSEPH A  
TRAVEL CONSULTANTS KALAMAKALAMAZOO R108 9JUL98 DLHMSPNW1424 KL50CT  
GALLIAN/JOSEPH A Q2CKTA/1V MULTI 6 5880/ XMSPDTMNV 742 KL50CT  
NOT VALID FOR THIS IS YOUR RECEIPT XDTWALONW3003 KL50CT  
TRANSPORTATION b4JJP BMIMSPNW3449 HL80CT  
TICKET NON REFUNDABLE/NW ONLY REF ISS AGENT ONLY CS2-33 XMSPDLHNW3504 HL80CT  
FP AX378296268101019 EXP0599/ 886547 FC 150CTDLHN \*\*\*\*\*  
WXMSPKES21BN/CV63FNWXDTWKE S21BNNAZ0129.14KES21BN-B \*\*\*\*\*  
MINWXMSPRES21NRNWDLH170.08NES21NR \$299.22 \*\*\*\*\*  
END ZPDLH2MSP2  
DTW2BM12RF02MSP2 XT 12.002P 12.00XFDLH3MSP3BM13MSP3 \*\*\*\*\*  
USD299.22 \*\*\*\*\*  
USD23.94 \*\*\*\*\*  
XT24.00 30261647754 0 012 7881879532 1 NOT VALID FOR TRAVEL  
USD347.16 0 012 7881879532 1

$$127881879532 = 18268839933 \times 7 + 1$$

**Example:**

Is the number 193234580012 a legitimate airline ticket number?

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Is the number 193234580012 a legitimate airline ticket number?

**Solution:**

Divide the number itself (without the check digit) by 7 and then use the remainder as the check digit. (19323458001 divided by 7 = 2760494000 with a remainder of 1, the check digit.) This is not a correct airline ticket number.

Try the example without reading the answer first.

Long Division (Do NOT use a calculator to compute Airline #)

If you plug this problem into a calculator, you'll get **2 760 494 000.142858**  
 Doing it using long division, you can work it out this way:

$$\begin{array}{r}
 2760494000 \text{ R } 1 \\
 7 \overline{) 19323458001} \\
 \underline{-14} \phantom{000000000} \\
 53 \phantom{000000000} \\
 \underline{-49} \phantom{000000000} \\
 42 \phantom{000000000} \\
 \underline{-42} \phantom{000000000} \\
 03 \phantom{000000000} \\
 \underline{-03} \phantom{000000000} \\
 34 \phantom{000000000} \\
 \underline{-28} \phantom{000000000} \\
 65 \phantom{000000000} \\
 \underline{-63} \phantom{000000000} \\
 28 \phantom{000000000} \\
 \underline{-28} \phantom{000000000} \\
 00 \phantom{000000000} \\
 \underline{-00} \phantom{000000000} \\
 00 \phantom{000000000} \\
 \underline{-00} \phantom{000000000} \\
 01 \phantom{000000000} \\
 \underline{-01} \phantom{000000000} \\
 1 \phantom{000000000}
 \end{array}$$

First decimal place is NOT the remainder!!!

← Remainder

<http://www.math.upenn.edu/~deturck/m170/wk1examples/calc.html>

## Remarks on remainder

Example: 418 divide by 7

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If you plug this problem into a calculator, you'll get 59.7143.

Doing it using long division, you can work it out this way:

$$\begin{array}{r} 59 \text{ R } 5 \\ 7 \overline{) 418} \\ \underline{-35} \phantom{0} \\ 68 \\ \underline{-63} \\ 5 \end{array}$$

The **R** stands for 'remainder.' That is, the number to the right of the **R** is the remainder of this division.