1.Show that if $d \neq 0$, then $d \mid(-a)$ and $-d \mid a$.

## Solution.

For example:

$$
\begin{aligned}
a & =10 ; d=5 \\
\frac{-10}{5} & =-2 ; \frac{10}{-5}=-2
\end{aligned}
$$

2.Show that it is false that $a>b$ implies $a \mid b$.

## Solution.

Let

$$
a=b+k ; k \text { - positive number }
$$

Then

$$
\frac{b}{a}=\frac{b}{b+k}<1
$$

3.Is 980637 divisible by 7 ? Show.

Solution.

$$
\begin{gathered}
980-637=343 \\
34-2 \cdot 3=28
\end{gathered}
$$

So 980637 is divisible by 7 .
4.Determine whether of the following are divisible by $3,5,7,9$, or 11 using the methods described int he text:
A. 1969

## Solution.

$$
1+9+6+9=25
$$

It is not divisible by 3 or 9 .

$$
\text { last digit } 9 \neq 0 \text { or } 5
$$

It is not divisible by 5 .

$$
1+6 \neq 9+9
$$

It is not divisible by 11 .

$$
\begin{gathered}
196-2 \cdot 9=178 \\
17-2 \cdot 8=1
\end{gathered}
$$

It is not divisible by 7.
B. 28350

## Solution.

$$
2+8+3+5=17
$$

It is not divisible by 3 or 9 .

$$
\text { last digit } 0
$$

It is divisible by 5 .

$$
2+3 \neq 8+5
$$

It is not divisible by 11 .

$$
\begin{gathered}
2835-2 \cdot 0=2835 \\
283-2 \cdot 5=273 \\
27-2 \cdot 3=21
\end{gathered}
$$

It is divisible by 7 .
C. 1421

## Solution.

$$
1+4+2+1=8
$$

It is not divisible by 3 or 9 .

$$
\text { last digit } 1 \neq 0 \text { or } 5
$$

It is not divisible by 5 .

$$
1+2 \neq 4+1
$$

It is not divisible by 11 .

$$
142-2 \cdot 1=140
$$

It is divisible by 7 .
D. 17303

## Solution.

$$
1+7+3+3=14
$$

It is not divisible by 3 or 9 .

$$
\text { last digit } 3 \neq 0 \text { or } 5
$$

It is not divisible by 5 .

$$
1+3+3=7
$$

It is divisible by 11.

$$
\begin{gathered}
1730-2 \cdot 3=1724 \\
172-2 \cdot 4=164 \\
16-2 \cdot 4=8
\end{gathered}
$$

It is not divisible by 7 .

## E. 116424

## Solution.

$$
1+1+6+4+2+4=18
$$

It is divisible by 3 and 9 .

$$
\text { last digit } 4 \neq 0 \text { or } 5
$$

It is not divisible by 5 .

$$
1+6+2=1+4+4
$$

It is divisible by 11.

$$
424-116=308 ; 30-2 \cdot 8=14
$$

It is divisible by 7.

## F. 1089

Solution.

$$
1+8+9=18
$$

It is divisible by 3 and 9 .

$$
\text { last digit } 9 \neq 0 \text { or } 5
$$

It is not divisible by 5 .

$$
1+8=9
$$

It is divisible by 11.

$$
108-2 \cdot 9=90
$$

It is not divisible by 7.
5.Classify each of the following as true or false:
A. 6 is a divisor of 24 .

## Solution.

$$
\frac{24}{6}=4 ; \text { true }
$$

B. 40 is a multiple of 8 .

## Solution.

$$
\frac{40}{8}=5 ; \text { true }
$$

C. 0 divides 10 .

## Solution.

$$
\frac{10}{0} ; \text { false }
$$

D. 13 is a factor of 33 .

## Solution.

$$
\frac{33}{13}=2+\frac{7}{13} ; \text { false }
$$

E. 12 divides 6 .

## Solution.

$$
\frac{6}{12}=\frac{1}{2} ; \text { false }
$$

6.Show that $23 n-1$ is divisible by 7 .

Solution.
$23 n-1$ is not always divisible by 7
For example

$$
23 \cdot 1-1=22 \text { is not divisible by } 7
$$

$23 \cdot 4-1=91$ is divisible by 7
7.Show that $5 n-1$ is divisible by 4

Solution.

$$
5 n-1 \text { is not always divisible by } 4
$$

## For example

$$
\begin{gathered}
5 \cdot 2-1=9 \text { is not divisible by } 4 \\
5 \cdot 1-1=4 \text { is divisible by } 4
\end{gathered}
$$

