

C Programming in Middle School ¹



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ABOUT THIS BOOK

This book introduces C programming for school children in middle school based on NCERT mathematics textbooks from Class 7 onwards.

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1 INTEGERS

1.1 Do the following addition through a C program

$$17 + 23$$

Solution:

```
//Code by GVV Sharma
//Adding two integers
//April 14, 2025
#include <stdio.h>

//begin main function
int main(void)
{
    //Declaring integers
    int a = 17, b = 23;
    //printing the sum
    printf("%d\n",a+b);
    return 0;
}
//end main function
```

1.2 Do the following subtraction through a C program

$$7 - 9$$

Solution:

```
//Code by GVV Sharma
//Adding negative integer
//April 14, 2025
#include <stdio.h>

//begin main function
int main(void)
{
    //Declaring integers
    int a = 7, b = 9;
    //printing the difference
    printf("%d\n",a-b);
    return 0;
}
//end main function
```

1.3 Multiply the following through a C program

$$4 \times (-8)$$

Solution:

```
//Code by GVV Sharma
//April 14, 2025
//Multiplication of numbers
#include <stdio.h>

int main(void)
{
    int a = 4, b = -8;
    printf("%d\n", a*b);
    return 0;
}
```

1.4 Perform the following division

$$(-100) \div 5$$

Solution:

```
//Code by GVV Sharma
//April 15, 2025
//division of numbers
#include <stdio.h>

int main(void)
{
    int a = -100, b = 5;
    printf("%d\n", a/b);
    return 0;
}
```

Compute the following

- | | | | |
|----------------------|-------------------------|---------------------------|-------------------------|
| 1.5 $(-75) + 18$ | 1.14 $10 \times (-1)$ | 1.23 $(-6) \times (-7)$ | 1.32 $80 \div (-5)$ |
| 1.6 $19 + (-25)$ | 1.15 $6 \times (-19)$ | 1.24 $3 \times (-1)$ | 1.33 $64 \div (-16)$ |
| 1.7 $27 + (-27)$ | 1.16 $12 \times (-32)$ | 1.25 $(-1) \times 225$ | 1.34 $(-30) \div 10$ |
| 1.8 $(-20) + 0$ | 1.17 $7 \times (-22)$ | 1.26 $(-21) \times (-30)$ | 1.35 $50 \div (-5)$ |
| 1.9 $(-35) + (-10)$ | 1.18 $15 \times (-16)$ | 1.27 $(-316) \times (-1)$ | 1.36 $(-36) \div (-9)$ |
| 1.10 $(-10) + 3$ | 1.19 $21 \times (-32)$ | 1.28 $(-81) \div 9$ | 1.37 $(-49) \div (-49)$ |
| 1.11 $17 - (-21)$ | 1.20 $(-42) \times 12$ | 1.29 $(-75) \div 5$ | |
| 1.12 $8 \times (-2)$ | 1.21 $(-55) \times 15$ | 1.30 $(-32) \div 2$ | |
| 1.13 $3 \times (-7)$ | 1.22 $(-5) \times (-6)$ | 1.31 $125 \div (-25)$ | |

1.38 $13 \div [(-2) + 1]$

1.40 $[(-36) \div 12] \div (3)$

1.39 $(-31) \div [(-30) + (-1)]$

1.41 $[(-6) + 5] \div [(-2) + 1]$

Fill in the blanks

1.42 $20 \div \underline{\hspace{2cm}} = -2$

1.43 $\underline{\hspace{2cm}} \div 4 = -3$

1.44 In a test (+5) marks are given for every correct answer and (-2) marks for every incorrect answer.

- Radhika answered all the questions and scored 30 marks though she got 10 correct answers.
- Jay also answered all the questions and scored (-12) marks though he got 4 correct answers. How many incorrect answers had they attempted?

1.45 A shopkeeper earns a profit of ₹1 by selling one pen and incurs a loss of 40 paise per pencil while selling pencils of her old stock.

- In a particular month she incurs a loss of ₹5. In this period she sold 45 pens. How many pencils did she sell in this period?
- In the next month she earns neither profit nor loss. If she sold 70 pens, how many pencils did she sell?
- The temperature at 12 noon was 10°C above zero. If it decreases at the rate of 2°C per hour until midnight, at what time would the temperature be 8°C below zero?
- In a class test (+3) marks are given for every correct answer and (-2) marks for every incorrect answer and no marks for not attempting any question.
 - Radhika scored 20 marks. If she got 12 correct answers, how many questions has she attempted incorrectly?
 - Mohini scores -5 marks in this test, though she has got 7 correct answers. How many questions has she attempted incorrectly?
- An elevator descends a mine shaft at the rate of $6\text{m}/\text{min}$. If the descent starts from 10m above the ground, how long will it take to reach -350m .

2 DECIMAL NUMBERS

Find

2.1 $\frac{2}{7} \times 3$

2.8 $7 \times 2\frac{1}{4}$

2.15 $\frac{2}{3} \times \frac{1}{5}$

2.22 $\frac{1}{3} \times \frac{15}{8}$

2.2 $\frac{9}{7} \times 6$

2.9 $4 \times 6\frac{1}{3}$

2.16 $\frac{8}{3} \times \frac{4}{7}$

2.23 $\frac{11}{2} \times \frac{3}{10}$

2.3 $\frac{1}{8} \times 3$

2.10 $6 \times 3\frac{1}{4}$

2.17 $\frac{3}{4} \times \frac{2}{3}$

2.24 $\frac{4}{5} \times \frac{12}{7}$

2.4 $\frac{13}{11} \times 6$

2.11 $8 \times 3\frac{2}{5}$

2.18 $\frac{2}{3} \times 2\frac{2}{3}$

2.25 $\frac{2}{5} \times 5\frac{1}{4}$

2.5 $\frac{2}{5} \times 2$

2.12 $\frac{1}{2} \times \frac{1}{7}$

2.19 $\frac{2}{7} \times \frac{7}{9}$

2.26 $6\frac{2}{5} \times \frac{7}{9}$

2.6 $3 \times 5\frac{1}{5}$

2.13 $\frac{1}{5} \times \frac{1}{7}$

2.20 $\frac{3}{8} \times \frac{6}{4}$

2.27 $\frac{3}{2} \times 5\frac{1}{3}$

2.7 $5 \times 6\frac{3}{4}$

2.14 $\frac{1}{3} \times \frac{4}{5}$

2.21 $\frac{9}{5} \times \frac{3}{5}$

2.28 $\frac{5}{6} \times 2\frac{3}{7}$

2.29 $3\frac{2}{5} \times \frac{4}{7}$	2.46 $5 \div 3\frac{4}{7}$	2.63 2.71×5	2.81 $0.4 \div 2$
2.30 $2\frac{3}{5} \times 3$	2.47 $\frac{7}{3} \div 2$	2.64 20.1×4	2.82 $0.35 \div 5$
2.31 $3\frac{4}{7} \times \frac{3}{5}$	2.48 $\frac{4}{9} \div 5$	2.65 0.05×7	2.83 $2.48 \div 4$
2.32 $\frac{2}{3} \times \underline{\hspace{1cm}} = \frac{10}{30}$	2.49 $\frac{6}{13} \div 7$	2.66 211.02×4	2.84 $65.4 \div 6$
2.33 $\frac{3}{5} \times \underline{\hspace{1cm}} = \frac{24}{75}$	2.50 $4\frac{1}{3} \div 3$	2.67 2×0.86	2.85 $651.2 \div 4$
2.34 $7 \div \frac{2}{5}$	2.51 $3\frac{1}{2} \div 4$	2.68 2.5×0.3	2.86 $14.49 \div 7$
2.35 $6 \div \frac{4}{7}$	2.52 $4\frac{3}{7} \div 7$	2.69 0.1×51.7	2.87 $3.96 \div 4$
2.36 $2 \div \frac{8}{9}$	2.53 $\frac{2}{5} \div \frac{1}{2}$	2.70 0.2×316.8	2.88 $0.80 \div 5$
2.37 $\frac{3}{5} \div \frac{1}{2}$	2.54 $\frac{4}{9} \div \frac{2}{3}$	2.71 1.3×3.1	2.89 $7 \div 3.5$
2.38 $\frac{1}{2} \div \frac{3}{5}$	2.55 $\frac{3}{7} \div \frac{8}{7}$	2.72 0.5×0.05	2.90 $36 \div 0.2$
2.39 $2\frac{1}{2} \div \frac{3}{5}$	2.56 $2\frac{1}{3} \div \frac{3}{5}$	2.73 11.2×0.15	2.91 $3.25 \div 0.5$
2.40 $5\frac{1}{6} \div \frac{9}{2}$	2.57 $3\frac{1}{2} \div \frac{8}{3}$	2.74 1.07×0.02	2.92 $30.94 \div 0.7$
2.41 $12 \div \frac{3}{4}$	2.58 $\frac{2}{5} \div 1\frac{1}{2}$	2.75 10.05×1.05	2.93 $0.5 \div 0.25$
2.42 $14 \div \frac{5}{6}$	2.59 $3\frac{1}{5} \div 1\frac{2}{3}$	2.76 101.01×0.01	2.94 $7.75 \div 0.25$
2.43 $8 \div \frac{7}{3}$	2.60 $2\frac{1}{5} \div 1\frac{1}{5}$	2.77 100.01×1.1	2.95 $76.5 \div 0.15$
2.44 $4 \div \frac{8}{3}$	2.61 0.2×6	2.78 7.75×0.25	2.96 $37.8 \div 1.4$
2.45 $3 \div 2\frac{1}{3}$	2.62 8×4.6	2.79 42.8×0.02	2.97 $2.73 \div 1.3$
		2.80 5.6×1.4	

Find

2.98 $\frac{1}{2}$ of	2.99 $\frac{5}{8}$ of
a) $2\frac{3}{4}$	a) $3\frac{5}{6}$
b) $4\frac{2}{9}$	b) $9\frac{2}{3}$

Find

2.100 $\frac{1}{4}$ of	2.101 $\frac{1}{7}$ of
a) $\frac{1}{4}$	a) $\frac{2}{9}$
b) $\frac{3}{5}$	b) $\frac{6}{5}$
c) $\frac{4}{3}$	c) $\frac{3}{10}$

2.102 In a class of 40 students $\frac{1}{5}$ of the total number of students like to study English, $\frac{2}{5}$ of the total number like to study Mathematics and the remaining students like to study Science.

- How many students like to study English?
- How many students like to study Mathematics?

- c) How many students like to study Science?
- 2.103 Vidya and Pratap went for a picnic. Their mother gave them a water bottle that contained 5 litres of water. Vidya consumed $\frac{2}{5}$ of the water. Pratap consumed the remaining water.
- a) How much water did Vidya drink?
- b) What fraction of the total quantity of water did Pratap drink?
- 2.104 Shaili plants 4 saplings in a row, in her garden. The distance between two adjacent saplings is $\frac{3}{4}m$. Find the distance between the first and the last sapling.
- 2.105 Lipika reads a book for $1\frac{3}{4}$ hours everyday. She reads the entire book in 6 days. How many hours in all were required by her to read the book.
- 2.106 A car runs 16km using 1 litre of petrol. How much distance will it cover using $2\frac{3}{4}$ litres of petrol.
- 2.107 The side of an equilateral triangle is 3.5cm. Find its perimeter.
- 2.108 The length of a rectangle is 7.1cm and its breadth is 2.5cm. What is its area?
- 2.109 Find the area of a rectangle whose length is 5.7cm and breadth is 3cm.
- 2.110 A two wheeler covers a distance of 55.3km in one litre of petrol. How much will it cover in 10 litres of petrol?
- 2.111 Savita was preparing a design to decorate her classroom. She needed a few coloured strips of paper of length 1.9cm each. She had a strip of coloured paper of length 9.5cm. How many pieces of the required length will she get out of this strip?
- 2.112 Each side of a regular polygon is 2.5cm in length. The perimeter of the polygon is 12.5cm. How many sides does the polygon have?
- 2.113 A car covers a distance of 89.1km in 2.2 hours. What is the average distance covered by it in 1 hour?
- 2.114 A vehicle covers a distance of 43.2km in 2.4 litres of petrol. How much will it cover in one litre of petrol?

3 PROGRAMMING

In a quiz, team A scored $a_1 = -40, a_2 = 10, a_3 = 0$ and team B scored $b_1 = 10, b_2 = 0, b_3 = -40$ in three successive rounds.

3.1 If the total scores are

$$a = a_1 + a_2 + a_3 \quad (3.0.1.1)$$

$$b = b_1 + b_2 + b_3 \quad (3.0.1.2)$$

which team scored more?

Solution:

//Code by Harini
//February 23, 2025


```

//Revised by GVV Sharma
//April 14, 2025
//add two sets of numbers and compare
#include <stdio.h>

//begin main function
int main() {
// first team scores
    int a1=-40,a2=10,a3=0;
// second team scores
    int b1=10,b2=0,b3=-40;

    //declaring scores variables
    int a,b;
    //sum of scores
    a=a1+a2+a3;
    b=b1+b2+b3;
    //comparing scores
    if (a>b){
        printf("a scored more\n");
    }
    else if (a<b){
        printf("b scored more\n");
    }
    else {
        printf("they are equal\n");
    }
//end comparison
    return 0;
}
//end main function

```

- 3.2 Write a function to compare the final scores. Check for the cases when $a = -40, b = -40$; $a = 30, b = 20$; $a = -20, b = -10$.

Solution:

```

//code by harini
//feb 23 2025
//code by GVV Sharma
//April 14 2025
//function to compare two numbers

#include <stdio.h>

//function to compare the numbers a and b
void compare(int a,int b){

```

```

        if (a>b){
            printf("a scored more\n");
        }
        else if (a<b){
            printf("b scored more\n");
        }
        else {
            printf("they are equal\n");
        }
    }
//end function to compare the numbers a and b
//begin main function
int main() {
    int a=-40,b=-40;

    //call the function to compare the numbers
    compare(a,b);

    return 0;
}
//end main function

```

3.3 Use arrays and a for loop to evaluate

$$a = \sum_{i=0}^2 a_i \quad (3.0.3.1)$$

$$b = \sum_{i=0}^2 b_i \quad (3.0.3.2)$$

Solution:

```

//code by harini
//feb 23 2025
//revise by GVV Sharma
//April 14 2025
//compares sum of 2 arrays using a for loop
#include <stdio.h>

//compare function
void compare(int a,int b){
    if (a>b){
        printf("a scored more\n");
    }
    else if (a<b){
        printf("b scored more\n");
    }
}

```

```

}
else {
    printf("they are equal\n");
}
}
//end compare function
//begin main function
int main() {
    //Declaring arrays
    int a1[]={-40,10,0};
    int b1[]={10,0,-40};
    //Initializing sums
    int a=0,b=0;
    for (int i = 0; i <= 2; i++){
        a=a+a1[i];
        b=b+b1[i];
    }
    //Call compare function
    compare(a,b);
    return 0;
}
//end main function

```

3.4 Revise the above code using only functions.

Solution:

```

//code by harini
//feb 23 2025
//revise by GVV Sharma
//April 14 2025
//using functions for arrays
#include <stdio.h>

//Declaring functions
void compare(int a,int b);
int sum(int a[]);

//begin main function
int main() {
    //Declaring arrays
    int a1[]={-40,10,0};
    int b1[]={10,0,-40};
    //Initializing sums
    int a=0,b=0;
    //finding sum for A
    a = sum(a1);

```

```

//finding sum for B
b = sum(b1);
//Call compare function
    compare(a,b);
    return 0;
}
//end main function

//compare function
void compare(int a,int b){
    if (a>b){
        printf("a scored more\n");
    }
    else if (a<b){
        printf("b scored more\n");
    }
    else {
        printf("they are equal\n");
    }
}
//end compare function
//sum function
int sum(int a1[]){
int a=0;
    for (int i = 0; i <= 2; i++){
        a=a+a1[i];
    }
    return a; //returning the sum to main
}
//end sum function

```

3.5 Use files for the input data.

Solution:

```

//Code by GVV Sharma
//April 14 2025
//using files
#include <stdio.h>

//Declaring functions
void compare(int a,int b);
int sum(int a[]);

//begin main function
int main() {
    //Declaring arrays

```

```

int a1[3], b1[3];
//declare file pointer
FILE *fp;
int i;
//Initializing sums
int a=0,b=0;
        //Read a from file a.dat
        //Open file pointer
fp = fopen("a.dat", "r");

//load data from file to array a1
for(i=0;i<=2;i++){
    fscanf(fp,"%d",&a1[i]);
}

//Close file pointer

fclose(fp);
        //Read a from file b.dat
        //Open file pointer
fp = fopen("b.dat", "r");

//load data from file to array b1
for(i=0;i<=2;i++){
    fscanf(fp,"%d",&b1[i]);
}

//Close file pointer
fclose(fp);

//finding sum for A
a = sum(a1);
//finding sum for B
b = sum(b1);
//Call compare function
    compare(a,b);
    return 0;
}
//end main function

//compare function
void compare(int a,int b){
    if (a>b){
        printf("a scored more\n");
    }
    else if (a<b){

```

```

        printf("b scored more\n");
    }
    else {
        printf("they are equal\n");
    }
}
//end compare function
//sum function
int sum(int a1[]){
int a=0;
    for (int i = 0; i <= 2; i++){
        a=a+a1[i];
    }
    return a; //returning the sum to main
}
//end sum function

```

3.6 Revise the files program using pointer arrays

Solution:

```

//Code by GVV Sharma
//April 14 2025
//using pointer arrays
#include <stdio.h>
#include <stdlib.h>

//Declaring functions
void compare(int a,int b);
int sum(int a[], int m);

//begin main function
int main() {
//declare pointer arrays
int *a1,*b1,m = 3;
//Initialzing sums
int a=0,b=0,i;
//File pointer
FILE *fp;

//Create a1
a1= (int *)malloc(m * sizeof( a1));
b1= (int *)malloc(m * sizeof( b1));

        //Read a from file a.dat
        //Open file pointer
fp = fopen("a.dat", "r");

```

```

//load data from file to array a1
for(i=0;i<=2;i++){
    fscanf(fp,"%d",&a1[i]);
}

//Close file pointer

fclose(fp);
    //Read a from file b.dat
    //Open file pointer
fp = fopen("b.dat", "r");

//load data from file to array b1
for(i=0;i<=2;i++){
    fscanf(fp,"%d",&b1[i]);
}
//Close file pointer
fclose(fp);

//finding sum for A
a = sum(a1,m);
//finding sum for B
b = sum(b1,m);
//Call compare function
compare(a,b);

//free memory
free(a1);
free(b1);
return 0;
}
//end main function

//compare function
void compare(int a,int b){
    if (a>b){
        printf("a scored more\n");
    }
    else if (a<b){
        printf("b scored more\n");
    }
    else {
        printf("they are equal\n");
    }
}

```

```

    }
//end compare function
//sum function
int sum(int *vec,int m){
int a=0;
    for (int i = 0; i < m; i++){
        a=a+vec[i];
    }
    return a; //returning the sum to main
}
//end sum function

```

3.7 Revise the files program using only functions

Solution:

```

//Code by GVV Sharma
//April 14 2025
//using functions for all
#include <stdio.h>
#include <stdlib.h>

//Declaring functions
void compare(int a,int b);
int sum(int a[], int m);
int *loadVec(char *str,int m);
int *createVec(int m);

//begin main function
int main() {
//Initialzing sums
int a=0,b=0,m = 3;
//declare pointer arrays
int *a1,*b1;
    //Read a from file a.dat
a1= loadVec("a.dat",m);
b1= loadVec("b.dat",m);
    //Read b from file b.dat

//finding sum for A
a = sum(a1,m);
//finding sum for B
b = sum(b1,m);
//Call compare function
compare(a,b);
    return 0;
}

```



```

//end main function

//compare function
void compare(int a,int b){
    if (a>b){
        printf("a scored more\n");
    }
    else if (a<b){
        printf("b scored more\n");
    }
    else {
        printf("they are equal\n");
    }
}

//end compare function
//sum of vector elements
int sum(int *vec,int m){
    int a=0;
    for (int i = 0; i < m; i++){
        a=a+vec[i];
    }
    return a; //returning the sum to main
}

//end sum function
//loading file data into vector
int *loadVec(char *str,int m){
    FILE *fp;
    int i;
    int *vec=createVec(m);
    //Open file pointer
    fp = fopen(str, "r");

    //load data from file to array a1
    for(i=0;i<m;i++){
        fscanf(fp,"%d",&vec[i]);
    }

    //Close file pointer

    fclose(fp);
    return vec;
}

//end loading file data into vector
//Defining the function for vector creation

```

```

int *createVec(int m)
{
    int *vec;

    //Allocate memory to the pointer
    vec = (int *)malloc(m * sizeof( vec));
    return vec;
}

```

Verify the following using ifelse

3.8 $25 \times (-21) = (-21) \times 25$

3.9 $(-48) \div (8) = 48 \div (-8)$

3.10 $(-23) \times 20 = 23 \times (-20)$

3.11 $90 \div (-45) = (-90) \div 45$

3.12 $(-136) \div 4 = 136 \div (-4)$

3.13 $(-15) \times [(-7) + (-1)] = (-15) \times (-7) + (-15) \times (-1)$

3.14 $10 \times [6 + (-2)] = 10 \times 6 + 10 \times (-2)$

3.15 $10 \times [6 - (-2)] = 10 \times 6 - 10 \times (-2)$

3.16 $(-15) \times [(-7) - (-1)] = (-15) \times (-7) - (-15) \times (-1)$

3.17 $18 \times [(7) + (-3)] = 18 \times (7) + 18 \times (-3)$

3.18 $(-21) \times [(-4) + (-6)] = (-21) \times (-4) + (-21) \times (-6)$

Which is greater?

3.19 $\frac{1}{2}$ of $\frac{3}{4}$ or $\frac{3}{5}$ of $\frac{5}{8}$

3.20 $\frac{1}{2}$ of $\frac{6}{7}$ or $\frac{2}{3}$ of $\frac{3}{7}$

Use arrays for the following

3.21 $(-12) \times (-11) \times (10)$

3.22 $(9) \times (-3) \times (-6)$

3.23 $(-18) \times (-5) \times (-4)$

3.24 $(-1) \times (-2) \times (-3) \times (-4)$

3.25 $(-3) \times (-6) \times (-2) \times (-1)$

3.26 Find

a) 2.7×4

b) 1.8×1.2

c) 2.3×4.35

and arrange the products in descending order.

3.27 Find the average of 4.2, 3.8 and 7.6.

4 RANDOM NUMBERS

4.0.28 Take a board marked from -104 to 104 as shown in the figure.

4.0.29 Take a bag containing two blue and two red dice. Number of dots on the blue dice indicate positive integers and number of dots on the red dice indicate negative integers.

4.0.30 Every player will place his/her counter at zero.

- 4.0.31 Each player will take out two dice at a time from the bag and throw them.
- 4.0.32 After every throw, the player has to multiply the numbers marked on the dice.
- 4.0.33 If the product is a positive integer then the player will move his counter towards 104;
if the product is a negative integer then the player will move his counter towards -104.
- 4.0.34 The player who reaches either -104 or 104 first is the winner.

104	103	102	101	100	99	98	97	96	95	94
83	84	85	86	87	88	89	90	91	92	93
82	81	80	79	78	77	76	75	74	73	72
61	62	63	64	65	66	67	68	69	70	71
60	59	58	57	56	55	54	53	52	51	50
39	40	41	42	43	44	45	46	47	48	49
38	37	36	35	34	33	32	31	30	29	28
17	18	19	20	21	22	23	24	25	26	27
16	15	14	13	12	11	10	9	8	7	6
-5	-4	-3	-2	-1	0	1	2	3	4	5
-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16
-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17
-28	-29	-30	-31	-32	-33	-34	-35	-36	-37	-38
-49	-48	-47	-46	-45	-44	-43	-42	-41	-40	-39
-50	-51	-52	-53	-54	-55	-56	-57	-58	-59	-60
-71	-70	-69	-68	-67	-66	-65	-64	-63	-62	-61
-72	-73	-74	-75	-76	-77	-78	-79	-80	-81	-82
-93	-92	-91	-90	-89	-88	-87	-86	-85	-84	-83
-94	-95	-96	-97	-98	-99	-100	-101	-102	-103	-104

Fig. 4.0.1

- 4.0.35 Write a program to simulate the game. Give the inputs manually.
- 4.0.36 Revise the program by generating the inputs using randomly as follows
- Generate the numbers on all the dice using a uniform distribution ranging from 1 to 6.
 - Simulate the blue and red dice through a Bernoulli distribution having values 1 and -1.