



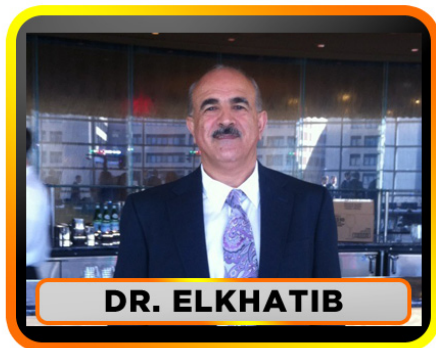
NumberSense  
that makes sense

Elkhatib

This number sense booklet is supposed to aid students in:

1. Transitioning from elementary Math to High school and College Math.
2. Doing mental Math.
3. Becoming less fearful of Math Classes.
4. Giving them a chance to compete in number sense in their schools.

The best way to benefit from this study guide is to go over the directions multiple times till you master the concept, and then practice the problems at the end of each section mentally if you can. More importantly, do not proceed to the next section unless you have mastered the previous one. One great thing about this booklet is you can go over it many times and never get bored.



I dedicate this booklet to my late mother Mahassen Abou Housah. She is my heroine. She taught me how to be passionate, diligent and caring.Mom; there is no one like you. Love you.

Your loving son

Dr.Elkhatib

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## 4 NUMBER SENSE THAT MAKES SENSE

### NUMBER SENSE

## SQUARING NUMBERS ENDING IN 5

### PROCEDURE

- Step 1** Square the 5 in the ones place. Write 25 25
- Step 2** Omit the 5 from your number and multiply the rest of the number by 1 more than the itself. Write that number.

### NOTE

An exponent is a raised symbol beside the numeral indicating how many times the number should be used as a factor. So for  $4^2$ , the 2 is the exponent.

### EXAMPLE

#### 1 Evaluate $25^2$

- Step 1** Square 5, and write 25. 25
- Step 2** Multiply the number 2 by 1 more than itself.  
 $2 \times 3 = 6$  **ANSWER:** 625

#### 2 Evaluate $95^2$

- Step 1** Square 5, and write 25. 25
- Step 2** Multiply 9 by 1 more than itself.  
 $9 \times 10 = 90$  **ANSWER:** 9025



## PRACTICE

SQUARING NUMBERS ENDING  
IN 5

PART

A

1  $5^2 =$

2  $95^2 =$

3  $75^2 =$

4  $105^2 =$

5  $65^2 =$

6  $115^2 =$

7  $55^2 =$

8  $85^2 =$

9  $35^2 =$

10  $45^2 =$

PART

B

1  $105 \times 105 =$

2  $85 \times 85 =$

3  $35 \times 35 =$

4  $115 \times 115 =$

5  $15 \times 15 =$

6  $95 \times 95 =$

7  $55 \times 55 =$

8  $75 \times 75 =$

9  $45 \times 45 =$

10  $65 \times 65 =$

## 6 NUMBER SENSE THAT MAKES SENSE

### NUMBER SENSE

## MULTIPLYING EVEN DIGITS BY 2-DIGIT NUMBERS ENDING WITH 5

### PROCEDURE

**Step 1** Double the number (Ending with 5)

**Step 2** Half the other number

**Step 3** Multiply both results

### EXAMPLE

**1** What is  $25 \times 18$  ?

Step 1	Double 25	50
Step 2	Half 18	9
Step 3	$50 \times 9 = 450$	

**2** What is  $45 \times 14$  ?

Step 1	Double 45	90
Step 2	Half 14	7
Step 3	$90 \times 7 = 630$	

## PRACTICE

**MULTIPLYING EVEN DIGITS BY  
2-DIGIT NUMBERS ENDING WITH 5**

**1**  $35 \times 12 =$

**2**  $45 \times 18 =$

**3**  $25 \times 14 =$

**4**  $25 \times 22 =$

**5**  $55 \times 14 =$

**6**  $75 \times 12 =$

**7**  $85 \times 14 =$

**8**  $25 \times 24 =$

**9**  $35 \times 26 =$

**10**  $65 \times 12 =$

## 8 NUMBER SENSE THAT MAKES SENSE

### NUMBER SENSE

## DIVIDING BY 0.01, 0.05, 0.10, 0.50

### PROCEDURE

Think of 0.01 as 1 penny

0.05 as 1 nickel

0.10 as 1 dime

0.25 as 1 quarter

0.50 as 50 cents

### EXAMPLE

#### 1 Divide 15 by 0.01

Procedure

Think of 15 as \$15 and 0.01 as 1 penny. Ask yourself: How many pennies are there in \$15? Since there are 100 pennies in \$1, therefore there are 1500 pennies in \$15.

**ANSWER:**

1500

#### 2 Divide 12 by 0.05

Procedure

Think of 12 as \$12 and 0.05 as 1 nickel. Ask yourself: How many nickels are there in \$12? Since there are 20 nickels in \$1, therefore there are 240 nickels in \$12.

**ANSWER:**

240

#### 3 Divide 24 by 0.10

Procedure

There are 10 dimes in \$1

**ANSWER:**

240

#### 4 Divide 42 by 0.25

Procedure

There are 4 quarters in \$1

**ANSWER:**

$42 \times 4 = 168$

#### 5 Divide 32 by 0.50

Procedure

There are 2 50-cents in \$1

**ANSWER:**

$32 \times 2 = 64$

## PRACTICE

DIVIDING BY 0.01, 0.05, 0.10,  
0.50

- 1  $14 \div 0.05 =$
- 2  $18 \div 0.01 =$
- 3  $24 \div 0.05 =$
- 4  $26 \div 0.50 =$
- 5  $22 \div 0.25 =$
- 6  $32 \div 0.25 =$
- 7  $82 \div 0.25 =$
- 8  $28 \div 0.25 =$
- 9  $18 \div 0.10 =$
- 10  $84 \div 0.05 =$
- 11  $124 \div 0.01 =$
- 12  $42 \div 0.05 =$
- 13  $38 \div 0.05 =$
- 14  $240 \div 0.01 =$
- 15  $180 \div 0.10 =$
- 16  $38 \div 0.50 =$
- 17  $284 \div 0.50 =$
- 18  $824 \div 0.50 =$
- 19  $428 \div 0.01 =$
- 20  $1820 \div 0.50 =$

## 10 NUMBER SENSE THAT MAKES SENSE

### NUMBER SENSE

### MULTIPLYING BY 11

#### PROCEDURE

- Step 1** Write the digit in the ones place.
- Step 2** Add the digit in the tens place to the digit in the ones place. Write digit in the ones place in the answer. Carry any tens.
- Step 3** Move over one place to the left. Add that digit to its neighbor on the right, remembering to add any digit carried.
- Step 4** Continue adding each digit to its neighbor on the right, carrying if necessary.
- Step 5** The digit on the far left, plus any digit carried, becomes the first digit of the answer.

#### EXAMPLE

##### 1 What is $11 \times 287$ ?

- |               |   |       |
|---------------|---|-------|
| <b>Step 1</b> | Write the digit in the ones column  | 7     |
| <b>Step 2</b> | Add $8 + 7 = 15$<br>Write the 5 and carry the 1.                                      | 57    |
| <b>Step 3</b> | Add $2 + 8 = 10$ Plus the one that was carried is 11.<br>Write the 1 and carry the 1. | 157   |
| <b>Step 4</b> | Add the 1 to the 2, the last digit on the left, equals 3.                             | 3,157 |

##### 2 What is $11 \times 6,657$ ?

- |               |   |        |
|---------------|---|--------|
| <b>Step 1</b> | Write the digit in the ones column  | 7      |
| <b>Step 2</b> | Add $5 + 7 = 12$<br>Write 2 and carry 1.                                    | 27     |
| <b>Step 3</b> | Add $6 + 5 = 11$ , plus the 1 carried = 12.<br>Write the 2 and carry the 1. | 227    |
| <b>Step 4</b> | Add $6 + 6 = 12$ plus the 1 carried = 13.<br>Write the 3 and carry 1        | 3,227  |
| <b>Step 5</b> | Add 1 to the 6, the last digit on the left, equals 7.                       | 73,227 |

## PRACTICE

## MULTIPLYING BY 11

## PART

## A

- 1  $11 \times 57,902 =$
- 2  $11 \times 267,179 =$
- 3  $11 \times 3,426,987 =$
- 4  $11 \times 5,852,493 =$
- 5  $11 \times 8,219,185 =$
- 6  $11 \times 6,754,911 =$
- 7  $11 \times 1,831,971 =$
- 8  $11 \times 6,465,239 =$
- 9  $11 \times 480,994,232 =$
- 10  $11 \times 938,183,214 =$

## PART

## B

- 1  $96,895 \times 11 =$
- 2  $611,265 \times 11 =$
- 3  $5,057,648 \times 11 =$
- 4  $49,174,274 \times 11 =$
- 5  $383,301,787 \times 11 =$
- 6  $729,898,702 \times 11 =$
- 7  $166,161,179 \times 11 =$
- 8  $512,888,510 \times 11 =$
- 9  $954,791,655 \times 11 =$
- 10  $394,265,183 \times 11 =$



## 12 NUMBER SENSE THAT MAKES SENSE

### NUMBER SENSE

### ADDING NUMBERS IN A SERIES

#### SKILL

- Step 1** Add the smallest number of the group to the largest number.
- Step 2** Multiply the sum by the number of addends
- Step 3** Divide the product by 2.

#### EXAMPLE

##### 1 Add $1+2+3+4+\dots+50$

**Procedure:** Add 1 to 50. You get 51. Multiply  $51 \times 50 = 2550$ .  
Divide the result by 2  
 $2550 \div 2 = 1275$

##### 2 What is the sum of $44 + 48 + 52 + 56$ ?

**Procedure:** Add  $44+56=100$   
Add  $48+52=100$   
Add the 2 results:  
 $100+100=200$

##### 3 What is the sum of $32 + 33 + 34 + 35$ ? (This method works for consecutive numbers.)

**Procedure:** Multiply 30 by 4, you get 120.  
Now add  $2+3+4+5=14$   
Add the 2 results  $120+14=134$

## PRACTICE

## ADDING NUMBERS IN A SERIES

 Solve:

**1**  $1+2+3+4+\dots+60=$

**2**  $41+45+42+43=$

**3**  $1+2+3+4+5+\dots+100=$

**4**  $23+22+21+27=$

**5**  $36+32+64+68=$

**6**  $1+2+3+4+5+6+\dots+40=$

**7**  $62+61+63+65=$

**8**  $51+52+53+55=$

**9**  $21+32+29+48=$

**14 NUMBER SENSE THAT MAKES SENSE****NUMBER SENSE****CUBES AND SQUARES TO  
MEMORIZE****SQUARES**

$9^2$	81
$10^2$	100
$11^2$	121
$12^2$	144
$13^2$	169
$14^2$	196
$15^2$	225
$16^2$	256
$17^2$	289
$18^2$	324
$19^2$	361
$20^2$	400
$21^2$	441
$22^2$	484
$23^2$	529
$24^2$	576
$25^2$	625

**CUBES**

$1^3$	1
$2^3$	8
$3^3$	27
$4^3$	64
$5^3$	125
$6^3$	216
$7^3$	343
$8^3$	512
$9^3$	729
$10^3$	1,000
$11^3$	1,331
$12^3$	1,728

## PRACTICE

CUBES AND SQUARES TO  
MEMORIZE

PART

A

- 1  $11^2 =$  \_\_\_\_\_
- 2  $6^3 =$  \_\_\_\_\_
- 3  $19^2 =$  \_\_\_\_\_
- 4  $9^3 =$  \_\_\_\_\_
- 5  $11^3 =$  \_\_\_\_\_
- 6  $23^2 =$  \_\_\_\_\_
- 7  $12^3 =$  \_\_\_\_\_
- 8  $10^3 =$  \_\_\_\_\_
- 9  $25^2 =$  \_\_\_\_\_
- 10  $24^2 =$  \_\_\_\_\_

PART

B

- 1  $25^2 =$  \_\_\_\_\_
- 2  $12^3 =$  \_\_\_\_\_
- 3  $10^3 =$  \_\_\_\_\_
- 4  $8^3 =$  \_\_\_\_\_
- 5  $23^2 =$  \_\_\_\_\_
- 6  $7^3 =$  \_\_\_\_\_
- 7  $22^2 =$  \_\_\_\_\_
- 8  $21^2 =$  \_\_\_\_\_
- 9  $18^2 =$  \_\_\_\_\_
- 10  $5^3 =$  \_\_\_\_\_

**16 NUMBER SENSE THAT MAKES SENSE****NUMBER SENSE****MULTIPLYING TWO NUMBERS  
CLOSE TO BUT LESS THAN 100****PROCEDURE** 

- Step 1** Find the difference of each of the numbers from 100.
- Step 2** Multiply these differences; write the product as the last two digits of the answer on the right.
- Step 3** Subtract the difference of one number from the other original number; write the difference as the first two digits of the answer on the left.

**EXAMPLE** **1** What is  $94 \times 97$  ?

- |               |  |      |
|---------------|--|------|
| <b>Step 1</b> | Find the difference of 94 and 97 from 100  | 6;3  |
| <b>Step 2</b> | Multiply 6 and 3; write 18 as the last two digits of the answer on the right   | 18   |
| <b>Step 3</b> | Subtract the difference of one number from the other original number; $94 - 3 = 91$ or $97 - 6 = 91$ ; write 91 as the first two digits of the answer on the left. | 9118 |

**2** What is  $92 \times 91$  ?

- |               |                                 |      |
|---------------|---------------------------------|------|
| <b>Step 1</b> | $100 - 92 = 8$ ; $100 - 91 = 9$ | 8; 9 |
| <b>Step 2</b> | $8 \times 9 = 72$               | 72   |
| <b>Step 3</b> | $92 - 9 = 83$ or $91 - 8 = 83$  | 8372 |

## PRACTICE

**MULTIPLYING TWO NUMBERS  
CLOSE TO BUT LESS THAN 100****PART****A**

**1**  $98 \times 97 =$  \_\_\_\_\_

**2**  $95 \times 99 =$  \_\_\_\_\_

**3**  $98 \times 99 =$  \_\_\_\_\_

**4**  $97 \times 92 =$  \_\_\_\_\_

**5**  $96 \times 95 =$  \_\_\_\_\_

**6**  $94 \times 97 =$  \_\_\_\_\_

**7**  $93 \times 91 =$  \_\_\_\_\_

**8**  $92 \times 97 =$  \_\_\_\_\_

**9**  $88 \times 94 =$  \_\_\_\_\_

**10**  $90 \times 99 =$  \_\_\_\_\_

**PART****B**

**1**  $89 \times 95 =$  \_\_\_\_\_

**2**  $96 \times 93 =$  \_\_\_\_\_

**3**  $99 \times 91 =$  \_\_\_\_\_

**4**  $94 \times 96 =$  \_\_\_\_\_

**5**  $88 \times 98 =$  \_\_\_\_\_

**6**  $99 \times 89 =$  \_\_\_\_\_

**7**  $87 \times 97 =$  \_\_\_\_\_

**8**  $96 \times 90 =$  \_\_\_\_\_

**9**  $89 \times 91 =$  \_\_\_\_\_

**10**  $90 \times 94 =$  \_\_\_\_\_

**18 NUMBER SENSE THAT MAKES SENSE****NUMBER SENSE****MULTIPLYING TWO NUMBERS  
CLOSE TO BUT GREATER THAN 100****PROCEDURE** 

- Step 1** Find the difference of each of the numbers from 100.
- Step 2** Multiply these differences; write the product as the last two digits of the answer on the right.
- Step 3** Add the difference of one number to the other original number; write the sum as the first three digits of the answer on the left.

**EXAMPLE** **1** What is  $104 \times 102$  ?

- |               |  |       |
|---------------|--|-------|
| <b>Step 1</b> | Find the difference of 104 and 102 from 100.   | 4; 2  |
| <b>Step 2</b> | Multiply 4 and 2; write 08 as the last two digits of the answer on the right.  | 08    |
| <b>Step 3</b> | Add the difference of one number to the other original number; $4 + 102 = 106$ or $2 + 104 = 106$ ; write the sum (106) as the first three digits of the answer on the left. | 10608 |

**2** What is  $108 \times 111$  ?

- |               |                                     |       |
|---------------|-------------------------------------|-------|
| <b>Step 1</b> | $108 - 100 = 8$ ; $111 - 100 = 11$  | 8; 11 |
| <b>Step 2</b> | $8 \times 11 = 88$                  | 88    |
| <b>Step 3</b> | $11 + 108 = 119$ or $8 + 111 = 119$ | 11988 |



## PRACTICE

**MULTIPLYING TWO NUMBERS  
CLOSE TO BUT GREATER THAN 100****PART****A**

- 1  $102 \times 109 =$  \_\_\_\_\_
- 2  $103 \times 107 =$  \_\_\_\_\_
- 3  $106 \times 102 =$  \_\_\_\_\_
- 4  $109 \times 105 =$  \_\_\_\_\_
- 5  $102 \times 108 =$  \_\_\_\_\_
- 6  $101 \times 110 =$  \_\_\_\_\_
- 7  $111 \times 106 =$  \_\_\_\_\_
- 8  $109 \times 104 =$  \_\_\_\_\_
- 9  $105 \times 106 =$  \_\_\_\_\_
- 10  $112 \times 103 =$  \_\_\_\_\_

**PART****B**

- 1  $104 \times 103 =$  \_\_\_\_\_
- 2  $108 \times 104 =$  \_\_\_\_\_
- 3  $113 \times 103 =$  \_\_\_\_\_
- 4  $105 \times 102 =$  \_\_\_\_\_
- 5  $103 \times 108 =$  \_\_\_\_\_
- 6  $110 \times 109 =$  \_\_\_\_\_
- 7  $107 \times 108 =$  \_\_\_\_\_
- 8  $104 \times 106 =$  \_\_\_\_\_
- 9  $114 \times 107 =$  \_\_\_\_\_
- 10  $101 \times 102 =$  \_\_\_\_\_

## DIFFERENCE OF TWO SQUARES

PROCEDURE 

$$a^2 - b^2 = (a + b)(a - b)$$

- Step 1** Find the sum of the numbers that are being squared.
- Step 2** Find the difference of the numbers that are being squared.
- Step 3** Find the product of the sum and difference of the numbers being squared.

EXAMPLE 

**1** What is  $13^2 - 9^2$  ?

<b>Step 1</b>	Find the sum of 13 and 9. $13 + 9 = 22$	22
<b>Step 2</b>	Find the difference of 13 and 9. $13 - 9 = 4$	4
<b>Step 3</b>	Find the product of 22 and 4. $22 \times 4 = 88$	88

**2** What is  $27^2 - 18^2 =$

<b>Step 1</b>	Find the sum of 27 and 18. $27 + 18 = 45$	45
<b>Step 2</b>	Find the difference of 27 and 18. $27 - 18 = 9$	9
<b>Step 3</b>	Find the product of 45 and 9. $45 \times 9 = 405$	405

## PRACTICE

DIFFERENCE OF TWO  
SQUARES

PART

A

- 1  $9^2 - 5^2 =$  \_\_\_\_\_
- 2  $13^2 - 4^2 =$  \_\_\_\_\_
- 3  $20^2 - 18^2 =$  \_\_\_\_\_
- 4  $24^2 - 11^2 =$  \_\_\_\_\_
- 5  $16^2 - 15^2 =$  \_\_\_\_\_
- 6  $28^2 - 19^2 =$  \_\_\_\_\_
- 7  $19^2 - 13^2 =$  \_\_\_\_\_
- 8  $8^2 - 7^2 =$  \_\_\_\_\_
- 9  $33^2 - 17^2 =$  \_\_\_\_\_
- 10  $45^2 - 37^2 =$  \_\_\_\_\_

PART

B

- 1  $14^2 - 7^2 =$  \_\_\_\_\_
- 2  $17^2 - 14^2 =$  \_\_\_\_\_
- 3  $38^2 - 34 =$  \_\_\_\_\_
- 4  $29^2 - 25^2 =$  \_\_\_\_\_
- 5  $14^2 - 12^2 =$  \_\_\_\_\_
- 6  $44^2 - 24^2 =$  \_\_\_\_\_
- 7  $82^2 - 78^2 =$  \_\_\_\_\_
- 8  $48^2 - 43^2 =$  \_\_\_\_\_
- 9  $42^2 - 36^2 =$  \_\_\_\_\_
- 10  $98^2 - 89^2 =$  \_\_\_\_\_

## 22 NUMBER SENSE THAT MAKES SENSE

### NUMBER SENSE

## SQUARING NUMBERS THAT DO NOT END WITH 5

### RULE

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

### EXAMPLE

**1** Evaluate:  $23^2$

### SOLUTION

- Step 1 Rewrite  $23^2$  as  $(20 + 3)^2$
- Step 2 Square 20. You get 400.
- Step 3 Multiply  $2 \times 20 \times 3$ , you get 120
- Step 4 Square 3, you get 9. Finally add all the results.  $400 + 120 + 9 = 523$ .
- ANSWER:** 523

**2** Evaluate:  $37^2$

### SOLUTION

- Step 1 Rewrite  $37^2$  as  $(40-3)^2$
- Step 2 Square 40. You get 1600.
- Step 3 Multiply  $2 \times 40 \times 3$ , you get 240
- Step 4 Square 3, you get 9. Finally subtract  $1600 - 240$  and add 9 to the result.  
 $1360 + 9 = 1369$
- ANSWER:** 1369

## PRACTICE

SQUARING NUMBERS THAT DO  
NOT END WITH 5

## INSTRUCTIONS

Evaluate

1  $83^2 =$

2  $62^2 =$

3  $54^2 =$

4  $91^2 =$

5  $81^2 =$

6  $21^2 =$

7  $32^2 =$

8  $51^2 =$

9  $71^2 =$

10  $88^2 =$

11  $98^2 =$

12  $39^2 =$

13  $48^2 =$

14  $69^2 =$

15  $89^2 =$

## 24 NUMBER SENSE THAT MAKES SENSE

### NUMBER SENSE

## SOLVING PROPORTIONS MENTALLY

**1** If  $\frac{a}{b} = \frac{c}{d}$ , then  $\frac{b}{a} = \frac{d}{c}$ .

**EXAMPLE:**  $\frac{1}{x} = \frac{5}{6}$ , then  $\frac{x}{1} = \frac{6}{5}$  or  $x = \frac{6}{5}$ .

**2** If  $\frac{a}{b} = \frac{c}{d}$ , then  $\frac{a}{c} = \frac{b}{d}$ .

**EXAMPLE:**  $\frac{10}{x} = 5$ , then  $\frac{10}{5} = \frac{x}{1}$  or  $x = 2$ .

**3** If  $\frac{a}{b} = \frac{c}{d}$ , you can reduce  $a$  and  $c$  or  $b$  and  $d$ .

**EXAMPLE:**  $\frac{15}{x} = \frac{5}{3}$ , divide 15 and 5 by 5, you get:  $\frac{3}{x} = \frac{1}{3}$ , cross multiply:  $x = 9$

**EXAMPLE:**  $\frac{x}{75} = \frac{1}{25}$ , divide 75 and 25 by 25, you get:  $\frac{x}{3} = \frac{1}{1}$ , cross multiply:  $x = 3$

## PRACTICE

SOLVING PROPORTIONS  
MENTALLY

**1**  $\frac{1}{x} = \frac{5}{8}, x =$

**2**  $\frac{5}{x} = \frac{10}{2}, x =$

**3**  $\frac{30}{x} = \frac{60}{5}, x =$

**4**  $\frac{x}{10} = \frac{9}{5}, x =$

**5**  $\frac{100}{x} = \frac{1000}{5}, x =$

**6**  $\frac{9}{20} = \frac{1}{x}, x =$

**7**  $\frac{36}{x} = \frac{72}{2}, x =$

**8**  $\frac{25}{x} = \frac{20}{3}, x =$

**9**  $\frac{1}{x} = \frac{1}{5}, x =$

**10**  $\frac{30}{x} = \frac{20}{3}, x =$

**11**  $\frac{x}{50} = \frac{3}{100}, x =$

**12**  $\frac{2x}{5} = \frac{1}{10}, x =$

**13**  $\frac{2x}{3} = \frac{1}{9}, x =$

**14**  $\frac{9x}{5} = \frac{18}{3}, x =$

**15**  $\frac{3x}{7} = \frac{1}{21}, x =$

**16**  $\frac{16x}{5} = \frac{32}{3}, x =$



EXAMPLE **1** Divide:

$$\frac{1}{2} \div \frac{5}{8}$$

**SOLUTION**

Rewrite the problem as:

$$\frac{\frac{1}{2}}{\frac{5}{8}}$$

Now, multiply 1 by 8 and divide by 2 times 5.

$$\frac{8}{10}$$

Finally, simplify by dividing both sides by 2.

**ANSWER:**  $\frac{4}{5}$

**2** Divide:

$$7 \div \frac{2}{3}$$

**SOLUTION**Rewrite the problem as:  $\frac{7}{1} \div \frac{2}{3}$ 

$$\frac{7}{1} \div \frac{2}{3} \text{ or } \frac{7}{\frac{2}{3}}$$

Now, multiply 7 by 3 and divide by 2 times 1,  $\frac{21}{2}$ . Since it could not be reduced, the answer stays the same.

**ANSWER:**  $\frac{21}{2}$

## CONTINUED

**3** Divide:

$$\frac{8}{9} \div 7$$

### SOLUTION

Rewrite the problem as:

$$\frac{8}{9} \div \frac{7}{1} \text{ or } \frac{\frac{8}{9}}{\frac{7}{1}}$$

Now, multiply 8 by 1 and divide by 9 times 7.

$$\frac{8}{63}$$

Since it could not be reduced, the answer stays the same.

**ANSWER:**  $\frac{8}{63}$

**4** Divide:

$$2\frac{1}{3} \div 5\frac{1}{4}$$

### SOLUTION

Convert each fraction into an improper fraction:

$$2\frac{1}{3} \text{ becomes } \frac{7}{3}$$

$$5\frac{1}{4} \text{ becomes } \frac{21}{4}$$

Now, rewrite the problem as:

$$\frac{\frac{7}{3}}{\frac{21}{4}}$$

Multiply 7 by 4 and divide by 3 times 21.

$$\frac{28}{63}$$

Divide both sides by 7.

**ANSWER:**  $\frac{4}{9}$

## PRACTICE

DIVIDING FRACTIONS  
MENTALLY

## INSTRUCTIONS

Divide

1  $\frac{7}{3} \div \frac{5}{9}$

2  $3\frac{1}{2} \div 9\frac{1}{4}$

3  $5 \div \frac{1}{10}$

4  $\frac{12}{5} \div 4$

5  $\frac{2}{9} \div \frac{1}{9}$

6  $6 \div \frac{1}{12}$

7  $\frac{7}{15} \div 5$

8  $\frac{7}{5} \div \frac{14}{3}$

9  $2\frac{1}{8} \div 1\frac{1}{4}$

10  $12\frac{1}{4} \div 3$

11  $\frac{1}{5} \div \frac{1}{10}$

12  $\frac{2}{3} \div \frac{1}{3}$

13  $\frac{7}{10} \div \frac{1}{10}$

14  $\frac{7}{8} \div \frac{1}{8}$

15  $\frac{2}{7} \div \frac{1}{7}$

**ADDING & SUBTRACTING  
FRACTIONS MENTALLY****BACKGROUND INFORMATION** 

If you were to add or subtract fractions where the denominators do not have a GCF. The butterfly method is the quickest way to perform such operations.

**EXAMPLE** **1** Add:

$$\frac{3}{5} + \frac{1}{6}$$

**SOLUTION**

- Multiply the denominators first.  $5 \times 6 = 30$
- Now cross multiply from left to right and add.  $3 \times 6 + 1 \times 5 = 18 + 5 = 23$

**ANSWER:**  $\frac{23}{30}$

**2** Subtract:

$$\frac{5}{7} - \frac{1}{3}$$

**SOLUTION**

- Multiply the denominators first.  $7 \times 3 = 21$
- Now cross multiply from left to right and subtract.  $5 \times 3 - 1 \times 7 = 8$

**ANSWER:**  $\frac{8}{21}$

## PRACTICE

## ADDING &amp; SUBTRACTING FRACTIONS MENTALLY

## INSTRUCTIONS

Add or Subtract as Indicated

1  $\frac{5}{11} + \frac{1}{3}$

2  $\frac{7}{12} - \frac{1}{7}$

3  $\frac{1}{5} + \frac{2}{3}$

4  $\frac{7}{11} + \frac{1}{2}$

5  $\frac{2}{5} - \frac{1}{3}$

6  $\frac{3}{10} + \frac{1}{3}$

7  $\frac{3}{8} - \frac{1}{5}$

8  $\frac{7}{10} - \frac{1}{3}$

9  $\frac{7}{9} + \frac{1}{2}$

10  $\frac{14}{17} - \frac{1}{3}$

# SIMPLIFYING COMPLEX FRACTIONS MENTALLY

## EXAMPLE

**1** Simplify:

$$\frac{\frac{1}{2} + \frac{1}{3}}{\frac{1}{6} + \frac{1}{2}}$$

### SOLUTION

Find the L.C.D. of all 4 denominators namely: 2, 3, 6, 2. The answer is 6. Now, multiply 6 by each fraction.

$$\frac{(6)\frac{1}{2} + (6)\frac{1}{3}}{(6)\frac{1}{6} + (6)\frac{1}{2}}$$

Simplify:

$$\frac{3 + 2}{1 + 3} = \frac{5}{4}$$

**ANSWER:**  $\frac{5}{4}$

**2** Simplify:

$$\frac{\frac{6}{7} - \frac{1}{3}}{\frac{4}{7} + \frac{1}{3}}$$

### SOLUTION

Find the L.C.D. of all 4 denominators namely: 7, 3, 7, 3. The answer is 21. Now, multiply 21 by each fraction.

$$\frac{(21)\frac{6}{7} - (21)\frac{1}{3}}{(21)\frac{4}{7} + (21)\frac{1}{3}}$$

Simplify:

$$\frac{18 - 7}{12 + 7} = \frac{11}{19}$$

**ANSWER:**  $\frac{11}{19}$

## PRACTICE

## SIMPLIFYING COMPLEX FRACTIONS MENTALLY

## INSTRUCTIONS

Simplify

1

$$\frac{\frac{1}{2} + \frac{1}{5}}{\frac{1}{10} + \frac{1}{2}}$$

2

$$\frac{\frac{3}{5} + \frac{1}{3}}{\frac{1}{15} + \frac{1}{5}}$$

3

$$\frac{\frac{1}{2} + \frac{3}{10}}{\frac{7}{10} - \frac{1}{2}}$$

4

$$\frac{\frac{1}{4} + \frac{1}{8}}{\frac{3}{8} - \frac{1}{4}}$$

5

$$\frac{\frac{2}{7} - \frac{1}{14}}{\frac{3}{14} - \frac{1}{7}}$$

6

$$\frac{\frac{1}{6} + \frac{5}{12}}{\frac{7}{12} - \frac{1}{6}}$$

7

$$\frac{\frac{1}{3} + \frac{1}{9}}{\frac{2}{3} + \frac{5}{9}}$$

8

$$\frac{\frac{6}{7} + \frac{1}{7}}{\frac{1}{14} + \frac{3}{7}}$$

9

$$\frac{\frac{3}{10} - \frac{1}{5}}{\frac{3}{5} + \frac{1}{10}}$$

10

$$\frac{\frac{1}{8} + \frac{3}{16}}{\frac{1}{4} + \frac{1}{16}}$$



**END****YOU HAVE REACHED THE END OF THIS  
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