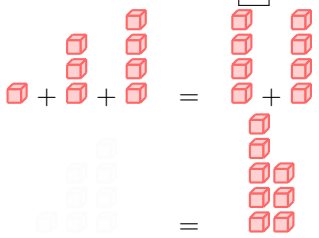
ORDER OF OPERATIONS

A WHY THE ORDER MATTERS

A.1 ADDING FROM LEFT TO RIGHT

Ex 1:

$$\begin{aligned} 1+3+4 &= \boxed{4}+\boxed{4} \\ &= \boxed{8} \end{aligned}$$

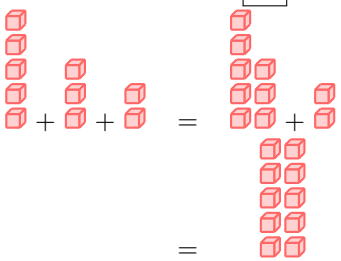


Answer:

- $1+3+4 = 4+4$ (addition on the left $1+3=4$)
- $1+3+4 = 4+4$
  $= 8$ (addition $4+4=8$)

Ex 2:

$$\begin{aligned} 5+3+2 &= \boxed{8}+\boxed{2} \\ &= \boxed{10} \end{aligned}$$

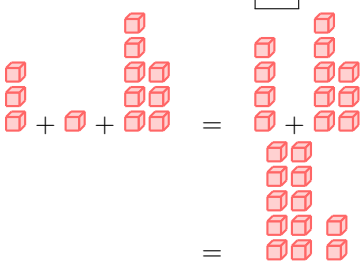


Answer:

- $5+3+2 = 8+2$ (addition on the left $5+3=8$)
- $5+3+2 = 8+2$
  $= 10$ (addition $8+2=10$)

Ex 3:

$$\begin{aligned} 3+1+8 &= \boxed{4}+\boxed{8} \\ &= \boxed{12} \end{aligned}$$

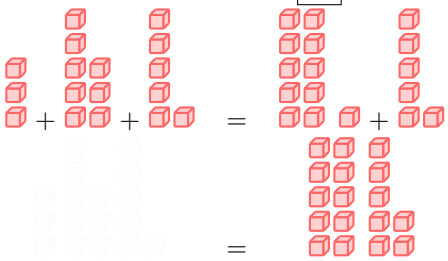


Answer:

- $3+1+8 = 4+8$ (addition on the left $3+1=4$)
- $3+1+8 = 4+8$
  $= 12$ (addition $4+8=12$)

Ex 4:

$$\begin{aligned} 3+8+6 &= \boxed{11}+\boxed{6} \\ &= \boxed{17} \end{aligned}$$



Answer:

- $3+8+6 = 11+6$ (addition on the left $3+8=11$)
- $3+8+6 = 11+6$
  $= 17$ (addition $11+6=17$)

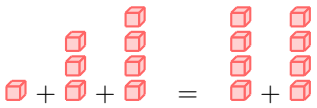
A.2 ADDING FROM LEFT TO RIGHT

Ex 5:

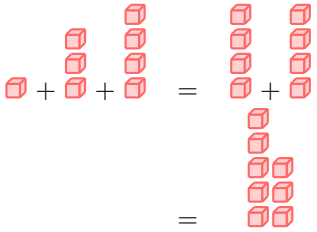
$$\begin{aligned} 1+3+4 &= \boxed{4}+\boxed{4} \\ &= \boxed{8} \end{aligned}$$

Answer:

- $1+3+4 = 4+4$ (addition on the left $1+3=4$)



- $1+3+4 = 4+4$
  $= 8$ (addition $4+4=8$)

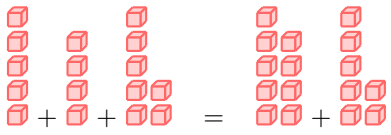


Ex 6:

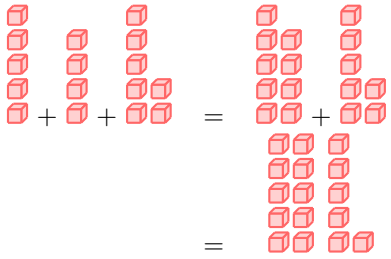
$$\begin{aligned} 5+4+7 &= \boxed{9}+\boxed{7} \\ &= \boxed{16} \end{aligned}$$

Answer:

- $5+4+7=9+7$ (addition on the left $5+4=9$)



- $5+4+7=9+7$
  $=16$ (addition $9+7=16$)

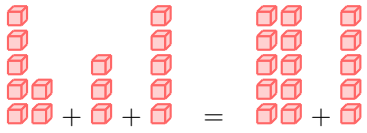


Ex 7:

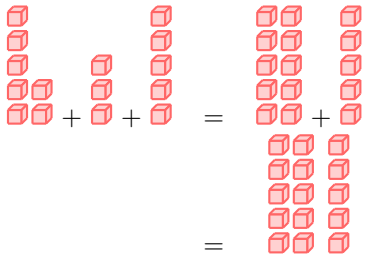
$$\begin{aligned} 7+3+5 &= \boxed{10}+\boxed{5} \\ &= \boxed{15} \end{aligned}$$

Answer:

- $7+3+5=10+5$ (addition on the left $7+3=10$)



- $7+3+5=10+5$
  $=15$ (addition $10+5=15$)

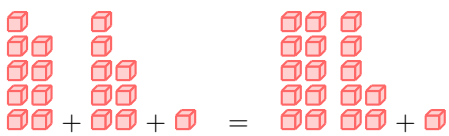


Ex 8:

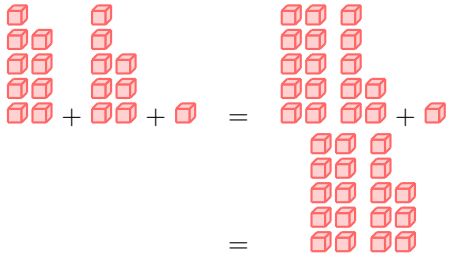
$$\begin{aligned} 9+8+1 &= \boxed{17}+\boxed{1} \\ &= \boxed{18} \end{aligned}$$

Answer:

- $9+8+1=17+1$ (addition on the left $9+8=17$)



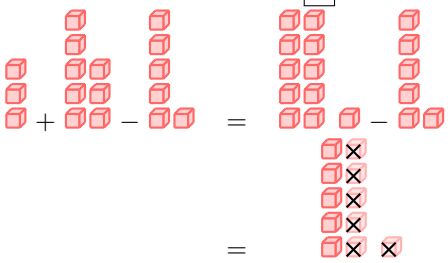
- $9+8+1=17+1$
  $=18$ (addition $17+1=18$)



A.3 ADDING AND SUBTRACTING FROM LEFT TO RIGHT

Ex 9:

$$\begin{aligned} 3+8-6 &= \boxed{11}-\boxed{6} \\ &= \boxed{5} \end{aligned}$$



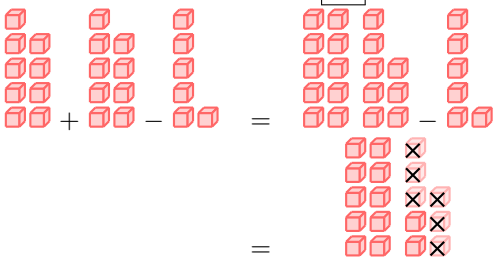
Answer:

- $3+8-6=11-6$ (addition on the left $3+8=11$)

- $3+8-6=11-6$
  $=5$ (subtraction $11-6=5$)

Ex 10:

$$\begin{aligned} 9+9-6 &= \boxed{18}-\boxed{6} \\ &= \boxed{12} \end{aligned}$$



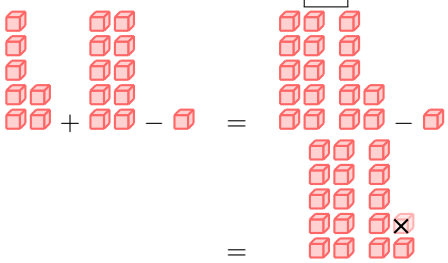
Answer:

- $9+9-6=18-6$ (addition on the left $9+9=18$)

- $9+9-6=18-6$
  $=12$ (subtraction $18-6=12$)

Ex 11:

$$\begin{aligned} 7+10-1 &= \boxed{17}-\boxed{1} \\ &= \boxed{16} \end{aligned}$$



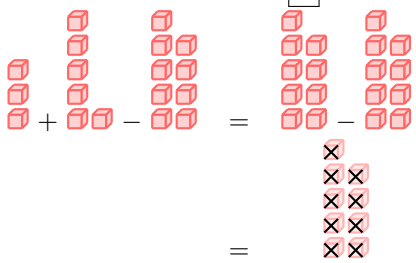
Answer:

- $7+10-1=17-1$ (addition on the left $7+10=17$)

- $7+10-1=17-1$
  $=16$ (subtraction $17-1=16$)

Ex 12:

$3+6-9 = \boxed{9}-\boxed{9}$
$= \boxed{0}$



Answer:

- $3+6-9=9-9$ (addition on the left $3+6=9$)
- $3+6-9=9-9$
  $=0$ (subtraction $9-9=0$)

A.4 MULTIPLYING AND DIVIDING FROM LEFT TO RIGHT

Ex 13:

$2\times 3\times 2 = \boxed{6}\times\boxed{2}$
$= \boxed{12}$

Answer:

- $2\times 3\times 2=6\times 2$ (multiplication on the left $2\times 3=6$)
- $2\times 3\times 2=6\times 2$
  $=12$ (multiplication $6\times 2=12$)

Ex 14:

$4\times 2\times 2 = \boxed{8}\times\boxed{2}$
$= \boxed{16}$

Answer:

- $4\times 2\times 2=8\times 2$ (multiplication on the left $4\times 2=8$)
- $4\times 2\times 2=8\times 2$
  $=16$ (multiplication $8\times 2=16$)

Ex 15:

$4\div 2\times 2 = \boxed{2}\times\boxed{2}$
$= \boxed{4}$

Answer:

- $4\div 2\times 2=2\times 2$ (division on the left $4\div 2=2$)
- $4\div 2\times 2=2\times 2$
  $=4$ (multiplication $2\times 2=4$)

Ex 16:

$2\times 4\div 2 = \boxed{8}\div\boxed{2}$
$= \boxed{4}$

Answer:

- $2\times 4\div 2=8\div 2$ (multiplication on the left $2\times 4=8$)
- $2\times 4\div 2=8\div 2$
  $=4$ (division $8\div 2=4$)

A.5 PERFORMING OPERATIONS WITHOUT PARENTHESES

Ex 17:

$4+2\times 3=\boxed{10}$

Answer:

- $4+2\times 3=4+6$ (multiplication $2\times 3=6$)
- $4+2\times 3=4+6$
  $=10$ (addition $4+6=10$)

Ex 18:

$2\times 3-1=\boxed{5}$

Answer:

- $2\times 3-1=6-1$ (multiplication $2\times 3=6$)
- $2\times 3-1=6-1$
  $=5$ (subtraction $6-1=5$)

Ex 19:

$1+3\times 3=\boxed{10}$

Answer:

- $1+3\times 3=1+9$ (multiplication $3\times 3=9$)
- $1+3\times 3=1+9$
  $=10$ (addition $1+9=10$)

Ex 20:

$10-2\times 3=\boxed{4}$

Answer:

- $10-2\times 3=10-6$ (multiplication $2\times 3=6$)
- $10-2\times 3=10-6$
  $=4$ (subtraction $10-6=4$)

Ex 21:

$10\div 2+3=\boxed{8}$

Answer:

- $10\div 2+3=5+3$ (division $10\div 2=5$)

- $10 \div 2 + 3 = 5 + 3$
  $= 8$ (addition $5 + 3 = 8$)

Ex 22:

$$10 - 4 \div 2 = \boxed{8}$$

Answer:

- $10 - 4 \div 2 = 10 - 2$ (division $4 \div 2 = 2$)
- $10 - 4 \div 2 = 10 - 2$
  $= 8$ (subtraction $10 - 2 = 8$)

A.6 PERFORMING OPERATIONS WITH PARENTHESES

Ex 23:

$$2 \times (2 + 3) = \boxed{10}$$

Answer:

- $2 \times (2 + 3) = 2 \times 5$ (parentheses: $2 + 3 = 5$)
- $2 \times (2 + 3) = 2 \times 5$
  $= 10$ (multiplication: $2 \times 5 = 10$)

Ex 24:

$$(2 + 4) \div 2 = \boxed{3}$$

Answer:

- $(2 + 4) \div 2 = 6 \div 2$ (parentheses: $2 + 4 = 6$)
- $(2 + 4) \div 2 = 6 \div 2$
  $= 3$ (division: $6 \div 2 = 3$)

Ex 25:

$$4 \times (4 \div 2) = \boxed{8}$$

Answer:

- $4 \times (4 \div 2) = 4 \times 2$ (parentheses: $4 \div 2 = 2$)
- $4 \times (4 \div 2) = 4 \times 2$
  $= 8$ (multiplication: $4 \times 2 = 8$)

Ex 26:

$$3 + (3 \times 2) = \boxed{9}$$

Answer:

- $3 + (3 \times 2) = 3 + 6$ (parentheses: $3 \times 2 = 6$)
- $3 + (3 \times 2) = 3 + 6$
  $= 9$ (addition: $3 + 6 = 9$)

Ex 27:

$$(7 - 1) \times 3 = \boxed{18}$$

Answer:

- $(7 - 1) \times 3 = 6 \times 3$ (parentheses: $7 - 1 = 6$)
- $(7 - 1) \times 3 = 6 \times 3$
  $= 18$ (multiplication: $6 \times 3 = 18$)

A.7 PERFORMING MULTI-OPERATIONS

Ex 28:

$$4 + 2 \times (2 + 3) = \boxed{14}$$

Answer:

- $4 + 2 \times (2 + 3) = 4 + 2 \times 5$ (parentheses: $2 + 3 = 5$)
- $4 + 2 \times (2 + 3) = 4 + 2 \times 5$
  $= 4 + 10$ (multiplication: $2 \times 5 = 10$)
- $4 + 2 \times (2 + 3) = 4 + 2 \times 5$
  $= 4 + 10$
  $= 14$ (addition: $4 + 10 = 14$)

Ex 29:

$$10 - 2 \times (5 - 3) = \boxed{6}$$

Answer:

- $10 - 2 \times (5 - 3) = 10 - 2 \times 2$ (parentheses: $5 - 3 = 2$)
- $10 - 2 \times (5 - 3) = 10 - 2 \times 2$
  $= 10 - 4$ (multiplication: $2 \times 2 = 4$)
- $10 - 2 \times (5 - 3) = 10 - 2 \times 2$
  $= 10 - 4$
  $= 6$ (subtraction: $10 - 4 = 6$)

Ex 30:

$$3 \times (7 - 2) + 1 = \boxed{16}$$

Answer:

- $3 \times (7 - 2) + 1 = 3 \times 5 + 1$ (parentheses: $7 - 2 = 5$)
- $3 \times (7 - 2) + 1 = 3 \times 5 + 1$
  $= 15 + 1$ (multiplication: $3 \times 5 = 15$)
- $3 \times (7 - 2) + 1 = 3 \times 5 + 1$
  $= 15 + 1$
  $= 16$ (addition: $15 + 1 = 16$)

Ex 31:

$$12 \div (6 - 2) + 3 = \boxed{6}$$

Answer:

- $12 \div (6 - 2) + 3 = 12 \div 4 + 3$ (parentheses: $6 - 2 = 4$)
- $12 \div (6 - 2) + 3 = 12 \div 4 + 3$
  $= 3 + 3$ (division: $12 \div 4 = 3$)
- $12 \div (6 - 2) + 3 = 12 \div 4 + 3$
  $= 3 + 3$
  $= 6$ (addition: $3 + 3 = 6$)

Ex 32:

$$(2+8) \div 5 - 2 = \boxed{0}$$

Answer:

- $(2+8) \div 5 - 2 = 10 \div 5 - 2$ (parentheses: $2+8=10$)
- $(2+8) \div 5 - 2 = 10 \div 5 - 2$
  $= 2 - 2$ (division: $10 \div 5 = 2$)
- $(2+8) \div 5 - 2 = 10 \div 5 - 2$
  $= 2 - 2$
  $= 0$ (subtraction: $2-2=0$)

B SOLVING PROBLEMS

B.1 BUILDING THE EXPRESSION

MCQ 33: A farmer has 3 fields, and each field contains 10 apple trees. If each tree produces 8 apples, what is the total number of apples?
Choose the correct expression

- ☐ $3 + 10 \times 8$
- ☒ $3 \times 10 \times 8$
- ☐ $(10 \times 8) \div 3$

Answer:

- **Read**: "each field contains" and "each tree produces" both imply multiplication.
- **Identify the steps**:
  1. Find the total number of trees by multiplying fields by trees per field.
  2. Multiply the total number of trees by the apples per tree.
- **Write the expression**: $3 \times 10 \times 8$ or $(3 \times 10) \times 8$

MCQ 34: A library has 50 books. 14 books are loaned out. The remaining books are then placed equally on 4 shelves. How many books are on each shelf?
Choose the correct expression

- ☐ $50 - (14 \div 4)$
- ☐ $50 + 14 \div 4$
- ☒ $(50 - 14) \div 4$

Answer:

- **Read**: "loaned out" means subtract; "placed equally" means divide.
- **Identify the steps**:
  1. Start with 50.
  2. Subtract 14 to find the remaining books.
  3. Divide the result by 4.
- **Write the expression**: $(50 - 14) \div 4$

MCQ 35: A baker makes 5 trays of cookies, with 12 cookies on each tray. He sells 40 cookies. How many cookies are left?
Choose the correct expression

- ☒ $(5 \times 12) - 40$
- ☐ $5 \times (12 - 40)$
- ☐ $5 + 12 - 40$

Answer:

- **Read**: "trays of cookies" implies multiplication; "sells" implies subtraction.
- **Identify the steps**:
  1. Calculate the total number of cookies made (5×12).
  2. Subtract the number of cookies sold.
- **Write the expression**: $(5 \times 12) - 40$

MCQ 36: Sam has 20 dollars. He buys 3 notebooks that cost 4 dollars each. He then finds 5 dollars. How much money does he have now?
Choose the correct expression

- ☐ $20 - 3 + 4 + 5$
- ☒ $20 - (3 \times 4) + 5$
- ☐ $(20 - 3) \times 4 + 5$

Answer:

- **Read**: "buys 3...that cost 4 each" means multiply then subtract; "finds" means add.
- **Identify the steps**:
  1. Start with 20.
  2. Subtract the total cost of the notebooks (3×4).
  3. Add the money he found.
- **Write the expression**: $20 - (3 \times 4) + 5$

MCQ 37: There are 30 students in a class. Today, 2 students are absent. The teacher divides the remaining students into 4 equal teams for a game. Which expression shows the number of students on each team?
Choose the correct expression

- ☐ $30 - 2 \div 4$
- ☒ $(30 - 2) \div 4$
- ☐ $30 \div 4 - 2$

Answer:

- **Read**: "absent" implies subtraction; "divides...into equal teams" implies division. The subtraction must be done first to find the total number of students present.
- **Identify the steps**:
  1. Start with 30 students.
  2. Subtract the 2 absent students.
  3. Divide the result by 4.

- **Write the expression**: $(30 - 2) \div 4$

MCQ 38: For a school bake sale, Maria bakes 4 batches of 12 cookies. At the same time, John bakes 3 batches of 10 cookies. Which expression represents the total number of cookies they baked together?
Choose the correct expression

☐ $4 + 12 \times 3 + 10$

☐ $(4 + 3) \times (12 + 10)$

☒ $(4 \times 12) + (3 \times 10)$

Answer:

- **Read**: "batches of" implies multiplication. "together" implies addition of the two totals.
- **Identify the steps**:
  1. Calculate the total cookies Maria baked (4×12).
  2. Calculate the total cookies John baked (3×10).
  3. Add the two results together.
- **Write the expression**: $(4 \times 12) + (3 \times 10)$

MCQ 39: Leo starts with 5 bags of marbles, and each bag contains 10 marbles. He loses 8 marbles during a game. Which expression shows how many marbles Leo has left?
Choose the correct expression

☐ $5 \times (10 + 8)$

☒ $(5 \times 10) - 8$

☐ $5 + 10 - 8$

Answer:

- **Read**: "bags of marbles" implies multiplication to find the total; "loses" implies subtraction.
- **Identify the steps**:
  1. Calculate the total number of marbles Leo started with (5×10).
  2. Subtract the number of marbles he lost.
- **Write the expression**: $(5 \times 10) - 8$

B.2 SOLVING REAL-WORLD PROBLEMS

Ex 40: Hugo is 5 years old. Louis is twice as old as Hugo, plus 3 years. What is the age of Louis?

Louis is $\boxed{13}$ years old.

Answer: Applying the five-step procedure:

- **1. Understand**: We must find Louis's age based on Hugo's age. "Twice as old" indicates multiplication by 2, and "plus" indicates addition.
- **2. Plan**: First, multiply Hugo's age by 2. Second, add 3 to the result.
- **3. Write Expression**: $(5 \times 2) + 3$
- **4. Calculate**: $(5 \times 2) + 3 = 10 + 3$
  $= 13$
- **5. Conclude**: Therefore, Louis is 13 years old.

Ex 41: A zoo houses 15 animals in the morning. Throughout the day, 5 new animals are admitted. In the evening, the zookeeper divides the total number of animals into 5 equal groups. How many animals are in each group?

There are $\boxed{4}$ animals in each group.

Answer: Applying the five-step procedure:

- **1. Understand**: We need to find the total number of animals first, and then divide that total into 5 equal groups.
- **2. Plan**: First, add the new animals to the initial count. Second, divide the sum by 5.
- **3. Write Expression**: $(15 + 5) \div 5$
- **4. Calculate**: $(15 + 5) \div 5 = 20 \div 5$
  $= 4$
- **5. Conclude**: Therefore, there are 4 animals in each group.

Ex 42: You have 3 apples, you purchase 5 more, and then you share the total quantity equally with a friend. How many apples are left?

You retain $\boxed{4}$ apples.

Answer: Applying the five-step procedure:

- **1. Understand**: We must first find the total number of apples. "Share equally with a friend" implies dividing the total between two people. The question asks how many you have left, which is your own share.
- **2. Plan**: First, add 3 and 5. Second, divide the sum by 2.
- **3. Write Expression**: $(3 + 5) \div 2$
- **4. Calculate**: $(3 + 5) \div 2 = 8 \div 2$
  $= 4$
- **5. Conclude**: Therefore, you retain 4 apples.

Ex 43: Hugo has 12 pencils. He gives 3 pencils to each of his 2 friends and then purchases 5 more. What is the final number of pencils Hugo possesses?

Hugo possesses $\boxed{11}$ pencils.

Answer: Applying the five-step procedure:

- **1. Understand**: We start with 12, subtract the total number of pencils given away, and then add the number of pencils purchased.
- **2. Plan**: First, calculate the total pencils given away (3×2). Second, subtract this total from the initial 12. Third, add 5 to that result.
- **3. Write Expression**: $(12 - (3 \times 2)) + 5$
- **4. Calculate**: $(12 - (3 \times 2)) + 5 = (12 - 6) + 5$
  $= 6 + 5$
  $= 11$
- **5. Conclude**: Therefore, Hugo possesses 11 pencils.