

13. [Operations]

Skill 13.1 Using the commutative property for addition.

MM3.2 1 1 2 2 3 3 4 4
MM4.1 1 1 2 2 3 3 4 4

COMMUTATIVE PROPERTY for +

$$2 + 5 = 7$$

$$5 + 2 = 7$$

You can add numbers in any order
and not change the outcome.

SO $2 + 5 = 5 + 2$

Q. $6 + 3 = 3 + 6$
True or false?

A. *true*

Solve both sides of the equation and
compare the results.

$$6 + 3 = 9$$

$$3 + 6 = 9$$

The results are the same.

a) $10 - 4 = 4 - 10$
True or false?

b) $4 + 5 = 5 + 4$
True or false?

c) $7 + 9 = 9 + 7$
True or false?

$10 - 4 = 6$ but

$4 - 10 \neq 6$ false

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d) $9 - 3 = 3 - 9$
True or false?

e) $2 + 9 = 9 + 2$
True or false?

f) $8 - 1 = 1 - 8$
True or false?

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g) 8 + 2 = 2 + 8

h) $9 + 6 =$ + 9

i) $4 + 1 =$ + 4

j) + 5 = 5 + 2

k) + 7 = 7 + 5

l) $3 + 9 =$ + 3

m) + 13 = 13 + 6

n) $17 + 10 =$ + 17

o) $11 + 19 =$ + 11

p) + 22 = 22 + 14

q) + 17 = 17 + 12

r) $15 + 18 =$ + 15

s) $13 +$ = 31 + 13

t) + 16 = 16 + 28

u) $27 +$ = 7 + 27

COMMUTATIVE PROPERTY for \times

$2 \times 5 = 10$

$5 \times 2 = 10$

You can multiply numbers in any order
and not change the outcome.

SO $2 \times 5 = 5 \times 2$

Q. $\times 5 = 5 \times 9$

A. 9

Ask: "What number multiplied by 5 equals 5 multiplied by 9?"

Answer: $9 \times 5 = 5 \times 9$

a) $10 \div 2 = 2 \div 10$

True or false?

$10 \div 2 = 5$ but

$2 \div 10 \neq 5$

b) $4 \times 5 = 5 \times 4$

True or false?

c) $7 \times 9 = 9 \times 7$

True or false?

d) $9 \div 3 = 3 \div 9$

True or false?

e) $6 \times 7 = 7 \times 6$

True or false?

f) $12 \div 4 = 4 \div 12$

True or false?

g) $8 \times 2 = 2 \times 8$

h) $\times 5 = 5 \times 2$

i) $4 \times 1 =$ $\times 4$

j) $9 \times 6 =$ $\times 9$

k) $\times 4 = 4 \times 12$

l) $19 \times 10 =$ $\times 19$

m) $11 \times 3 =$ $\times 11$

n) $\times 6 = 6 \times 18$

o) $\times 13 = 13 \times 12$

p) $7 \times 18 =$ $\times 7$

q) $\times 24 = 24 \times 17$

r) $13 \times 15 =$ $\times 13$

s) $\times 5 = 5 \times 4$

t) $11 \times$ $= 10 \times 11$

u) $\times 16 = 16 \times 7$

IDENTITY ELEMENT for + is ZERO

$14 + 0 = 14$

The sum of zero and any number is that number.

Q. + 0 = 2

A. **2** Ask: "What number added to zero makes 2?"

Answer: $2 + 0 = 2$

a) $10 + 0 = 10$
True or false?

b) $6 + 0 = 0$
True or false?

c) $0 + 7 = 7$
True or false?

d) $0 + 8 = 8$
True or false?

e) $3 - 0 = 0$
True or false?

f) $9 - 0 = 9$
True or false?

g) + 0 = 8

h) + 0 = 5

i) $3 + 0 =$

j) $9 +$ $= 9$

k) $2 -$ $= 0$

l) $5 -$ $= 5$

m) Which expression equals 7?

- A) $0 + 7$
B) 0×7
C) $0 - 7$

n) Which expression equals 8?

- A) 0×8
B) $0 - 8$
C) $0 + 8$

o) Which expression equals 5?

- A) $1 + 5$
B) 1×5
C) $1 - 5$

p) Which expression equals 3?

- A) $3 + 0$
B) $0 - 3$
C) 3×0

q) Which expression equals 4?

- A) $1 + 4$
B) $1 - 4$
C) 1×4

r) Which expression equals 6?

- A) 6×0
B) $0 - 6$
C) $6 + 0$

IDENTITY ELEMENT for \times is ONE

$14 \times 1 = 14$

The product of one and any number is that number.

Q. $\times 1 = 8$

A. **8**

Ask: "What number multiplied by 1 makes 8?"

Answer: $8 \times 1 = 8$

Q. Which expression equals 13?

- A) $1 + 13$
 B) 1×13
 C) $1 \div 13$

A. **B**

Solve all expressions and then compare the results.

- A) $1 + 13 \neq 13$
 B) $1 \times 13 = 13$
 C) $1 \div 13 \neq 13$

a) $6 \times 1 = 6$
True or false?b) $1 \times 4 = 4$
True or false?c) $1 \times 1 = 2$
True or false?d) $9 \times 1 = 9$
True or false?e) $15 \div 1 = 1$
True or false?f) $3 \div 1 = 3$
True or false?

g) $\times 1 = 2$

h) $\times 1 = 7$

i) $4 \times 1 =$

j) $5 \times$ $= 5$

k) $4 \div$ $= 4$

l) $8 \div$ $= 1$

m) Which expression equals 4?

- A) 1×4
 B) $1 + 4$
 C) $1 \div 4$

n) Which expression equals 5?

- A) $1 + 5$
 B) $1 \div 5$
 C) 1×5

o) Which expression equals 12?

- A) $1 + 12$
 B) $1 \div 12$
 C) 1×12

p) Which expression equals 6?

- A) $1 \div 6$
 B) $1 - 6$
 C) 1×6

q) Which expression equals 10?

- A) $1 \div 10$
 B) 10×1
 C) $10 + 1$

r) Which expression equals 17?

- A) 17×17
 B) $17 \div 1$
 C) $1 + 17$

Only + and/or -

- Add (+) and/or subtract (-) from left to right.

Only \times and/or \div

- Multiply (\times) and/or divide (\div) from left to right.

Q. $8 - 2 - 5 + 6 =$

$$\begin{aligned} \text{A. } 8 - 2 - 5 + 6 &= \\ &= 6 - 5 + 6 \\ &= 1 + 6 \\ &= 7 \end{aligned}$$

Start with 8 and subtract 2.
The result is 6.
Then subtract 5 from 6.
The result is 1.
Finally add 6 to the 1.

a) $8 + 2 + 4 =$

$$= 10 + 4 = \boxed{14}$$

b) $6 + 5 - 3 =$

$$= \dots = \boxed{}$$

c) $14 - 7 - 6 =$

$$= \dots = \boxed{}$$

d) $7 - 5 + 9 =$

$$= \dots = \boxed{}$$

e) $19 - 8 + 1 =$

$$= \dots = \boxed{}$$

f) $16 - 2 + 5 =$

$$= \dots = \boxed{}$$

g) $4 + 6 + 3 =$

$$= \dots = \boxed{}$$

h) $13 - 7 - 4 =$

$$= \dots = \boxed{}$$

i) $5 + 8 - 9 =$

$$= \dots = \boxed{}$$

j) $6 + 5 + 1 - 2 =$

$$\begin{aligned} &= 11 + 1 - 2 \\ &= 12 - 2 = \boxed{10} \end{aligned}$$

k) $8 - 4 + 3 + 2 =$

$$= \dots = \boxed{}$$

l) $9 + 7 - 5 - 1 =$

$$= \dots = \boxed{}$$

m) $7 + 3 + 5 - 6 =$

$$= \dots = \boxed{}$$

n) $5 - 2 + 7 - 5 =$

$$= \dots = \boxed{}$$

o) $9 - 3 - 2 - 1 =$

$$= \dots = \boxed{}$$

p) $2 \times 5 \times 3 =$

$$= 10 \times 3 = \boxed{30}$$

q) $5 \times 3 \div 3 =$

$$= \dots = \boxed{}$$

r) $16 \div 4 \div 2 =$

$$= \dots = \boxed{}$$

s) $5 \times 4 \div 4 =$

$$= \dots = \boxed{}$$

t) $18 \div 6 \div 3 =$

$$= \dots = \boxed{}$$

u) $7 \times 2 \div 7 =$

$$= \dots = \boxed{}$$

v) $4 \times 2 \times 2 =$

$$= \dots = \boxed{}$$

w) $2 \times 9 \div 6 =$

$$= \dots = \boxed{}$$

x) $20 \div 5 \div 2 =$

$$= \dots = \boxed{}$$

INVERSE OPERATIONS + and -

$+ 5 - 5 = 0$

Subtraction of a number undoes addition of that same number.

Example: $17 + 5 - 5 = 17 + 0 = 17$
because adding 5 and then subtracting 5 gives 0.

INVERSE OPERATIONS × and ÷

$× 8 ÷ 8 = 1$

Division by a number undoes multiplication by that same number.

Example: $6 × 8 ÷ 8 = 6 × 1 = 6$
because multiplying by 8 and then dividing by 8 gives 1.

- Keep the number unchanged when it is followed by two inverse operations applied to the same number.

Q. $24 + 9 - 9 =$

A. $24 + 9 - 9 =$
 $= 24 + 0$
 $= 24$

Subtracting 9 undoes adding 9
OR
+ 9 and - 9 cancel each other.
24 remains unchanged.

a) $43 + 12 - 12 =$
 $= 43 + 0 = 43$

cancel each other

b) $31 - 6 + 6 =$
 $= \dots = \dots$

c) $17 + 3 - 3 =$
 $= \dots = \dots$

d) $15 + 8 - 8 =$
 $= \dots = \dots$

e) $23 - 19 + 19 =$
 $= \dots = \dots$

f) $24 - 7 + 7 =$
 $= \dots = \dots$

g) $20 + 13 - 13 =$
 $= \dots = \dots$

h) $18 - 9 + 9 =$
 $= \dots = \dots$

i) $21 - 10 + 10 =$
 $= \dots = \dots$

j) $20 ÷ 4 × 4 =$
 $= 20 ÷ 1 = \dots$

cancel each other

k) $14 × 2 ÷ 2 =$
 $= \dots = \dots$

l) $25 ÷ 5 × 5 =$
 $= \dots = \dots$

m) $16 × 4 ÷ 4 =$
 $= \dots = \dots$

n) $45 × 2 ÷ 2 =$
 $= \dots = \dots$

o) $32 ÷ 8 × 8 =$
 $= \dots = \dots$

p) $9 × 7 ÷ 7 =$
 $= \dots = \dots$

q) $18 × 3 ÷ 3 =$
 $= \dots = \dots$

r) $24 ÷ 6 × 6 =$
 $= \dots = \dots$

- Use the order of operations rules: First multiply (\times) or divide (\div).
Finally add ($+$) or subtract ($-$).

Q. $6 + 12 \div 3 =$

A. $6 + 12 \div 3 =$ *first divide*
 $= 6 + 4$ *then work from left to right*
 $= 10$

First do 12 divided by 3.
The result is 4.
Then add 6 and 4.

a) $21 \div 3 - 2 =$

$= 7 - 2 =$

b) $4 + 3 \times 3 =$

$=$ $=$

c) $6 \times 2 + 8 =$

$=$ $=$

d) $15 \div 5 - 2 =$

$=$ $=$

e) $2 \times 5 - 4 =$

$=$ $=$

f) $6 + 3 \times 5 =$

$=$ $=$

g) $6 + 9 \div 3 =$

$=$ $=$

h) $18 \div 2 + 4 =$

$=$ $=$

i) $3 \times 4 + 7 =$

$=$ $=$

j) $13 - 3 \times 3 =$

$=$ $=$

k) $4 \times 4 - 7 =$

$=$ $=$

l) $15 - 10 \div 5 =$

$=$ $=$

m) $21 \div 7 - 1 =$

$=$ $=$

n) $8 + 12 \div 4 =$

$=$ $=$

o) $15 - 5 \times 2 =$

$=$ $=$

p) $18 - 12 \div 2 =$

$=$ $=$

q) $16 \div 4 + 4 =$

$=$ $=$

r) $18 \div 6 - 3 =$

$=$ $=$

s) $8 + 28 \div 4 =$

$=$ $=$

t) $9 \times 6 - 3 =$

$=$ $=$

u) $24 - 12 \div 4 =$

$=$ $=$

- Use the order of operations rules: First evaluate inside the brackets.
Then multiply (\times) and/or divide (\div) from left to right.
Finally add ($+$) and/or subtract ($-$) from left to right.

Q. $9 + 12 \div (9 - 5) =$

A. $9 + 12 \div (9 - 5) =$
 $= 9 + 12 \div 4$ *first brackets*
 $= 9 + 3$ *then divide*
 $= 12$ *then work from left to right*

Simplify inside the brackets and subtract 5 from 9.
The result is 4.
Then divide 12 by 4.
The result is 3.
Finally add 9 and 3.

a) $7 \times (4 - 2) =$

$= 7 \times 2 = 14$

b) $9 - (4 + 3) =$

$= \dots = \dots$

c) $7 - (5 - 2) =$

$= \dots = \dots$

d) $10 - (9 - 2) =$

$= \dots = \dots$

e) $(4 + 4) \times 3 =$

$= \dots = \dots$

f) $15 \div (5 - 2) =$

$= \dots = \dots$

g) $7 \times (6 - 2) =$

$= \dots = \dots$

h) $(18 + 6) \div 3 =$

$= \dots = \dots$

i) $28 \div (1 + 6) =$

$= \dots = \dots$

j) $5 \times (11 - 8) =$

$= \dots = \dots$

k) $(13 - 7) \div 2 =$

$= \dots = \dots$

l) $42 \div (5 + 2) =$

$= \dots = \dots$

m) $(12 - 7) \times 4 =$

$= \dots = \dots$

n) $(5 + 8) \times 2 =$

$= \dots = \dots$

o) $(12 - 9) \times 5 =$

$= \dots = \dots$

p) $8 + (5 + 1) \div 2 =$

$= 8 + 6 \div 2$
 $= 8 + 3 = 11$

q) $14 - 6 - (5 + 3) =$

$= \dots = \dots$

r) $15 \div 3 - (2 + 2) =$

$= \dots = \dots$

s) $9 + (7 - 4) \times 3 =$

$= \dots = \dots$

t) $18 \div (9 - 3) + 2 =$

$= \dots = \dots$

u) $9 + 3 \times (8 - 4) =$

$= \dots = \dots$