Q: What does the multiplication rule say?

$(+) \cdot (+) = ?$ $(+) \cdot (-) = ?$

$(-) \cdot (-) = ?$ $(-) \cdot (+) = ?$

A: The multiplication rule says this:

When you multiply two numbers with the same sign, the answer is positive. When you multiply two numbers with different signs, the answer is negative.

Multiplication rule

$(+) \cdot (+) = +$

ex.: $(+8) \cdot (+3) = +(8 \cdot 3)$
$= +24$

$(+) \cdot (-) = -$

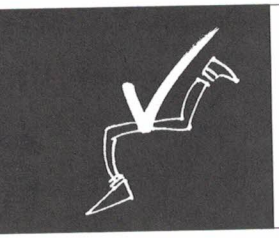
ex.: $(+8) \cdot (-3) = -(8 \cdot 3)$
$= -24$

$(-) \cdot (-) = +$

ex.: $(-8) \cdot (-3) = +(8 \cdot 3)$
$= +24$

$(-) \cdot (+) = -$

ex.: $(-8) \cdot (+3) = -(8 \cdot 3)$
$= -24$

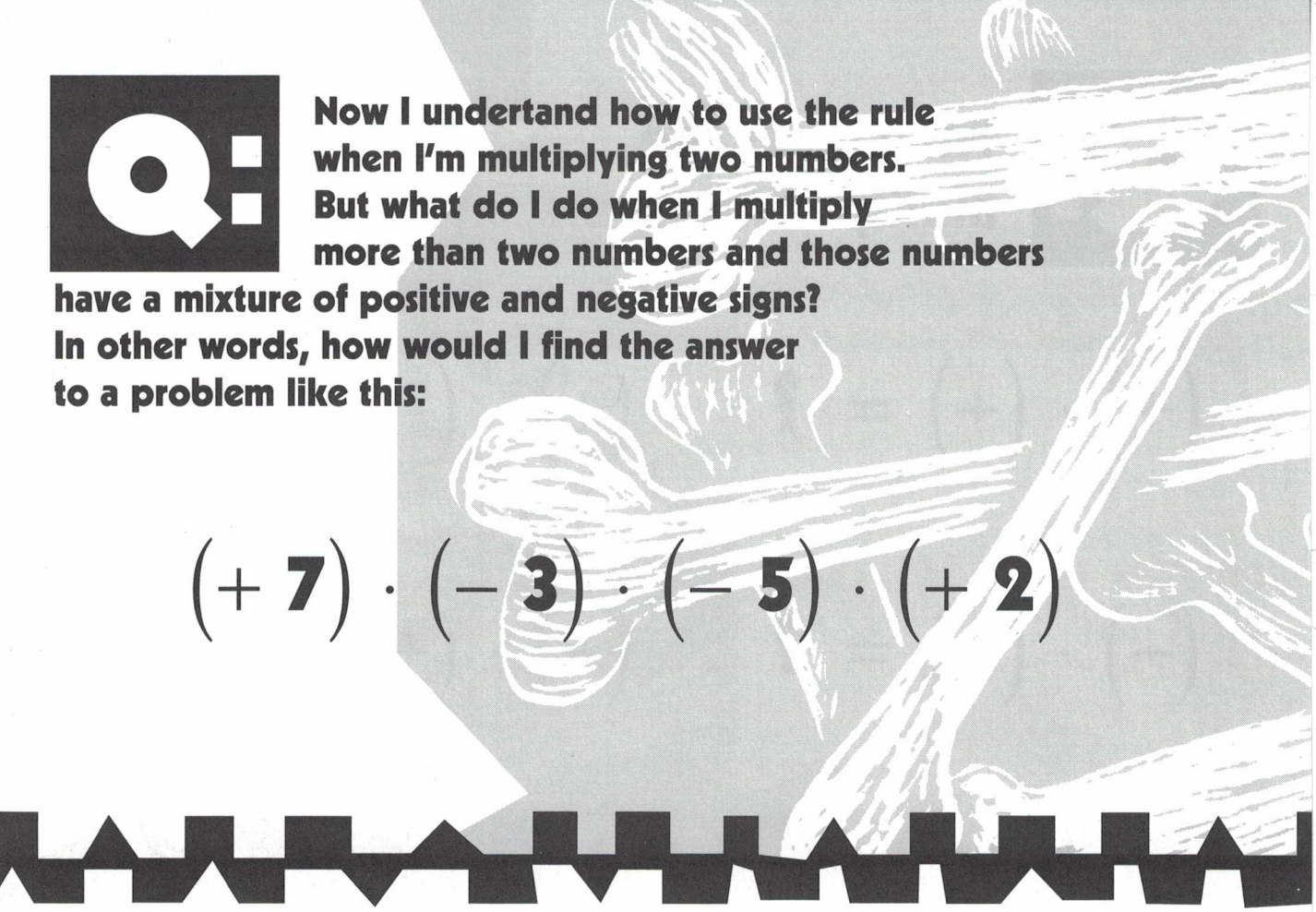


Solve using the multiplication rule:

a) $(+4) \cdot (-3)$
b) $(-7) \cdot (-9)$
c) $(+16) \cdot (+11)$
d) $(-8) \cdot (+13)$
e) $(-17) \cdot (-5)$

Answers:

a) -12 d) -104
b) $+63$ e) $+85$
c) $+176$



Q: **Now I undertand how to use the rule when I'm multiplying two numbers. But what do I do when I multiply more than two numbers and those numbers have a mixture of positive and negative signs? In other words, how would I find the answer to a problem like this:**

$$(+7) \cdot (-3) \cdot (-5) \cdot (+2)$$

A: Now you know that two negatives, multiplied, give you a positive (**p. 49**). That means that each pair of negative numbers, multiplied together, creates a positive number. This idea leads to a shortcut:

- **If the number of negative signs is even (a multiple of 2), the answer will be positive.**
- **But if the number of negative signs is odd, the answer will be negative.**

Examples of the rule for multiplying a string of numbers

$(-3) \cdot (+2) \cdot (+5) = -30$

Here there's **one** negative number. That's an **odd** number of negatives, so the answer is **negative**.

$(-3) \cdot (-2) \cdot (+5) = +30$

Here there are **two** negative numbers. That's an **even** number of negatives, so the answer is **positive**.

$(-3) \cdot (-2) \cdot (-5) = -30$

Here there are **three** negative numbers. That's an **odd** number of negatives, so the answer is **negative**.

Solve:

a) $(-5) \cdot (+2) \cdot (-4)$

b) $(-1) \cdot (-1) \cdot (-1) \cdot (-1)$

c) $(-1) \cdot (+2) \cdot (+3) \cdot (+4)$

d) $(-3) \cdot (-2) \cdot (+4)$

e) $(+8) \cdot (-2) \cdot (+3)$

Answers:

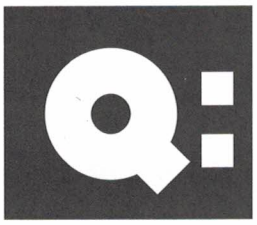
a) +40

b) +1

c) −24

d) +24

e) −48



What does the division rule say?

$+/+ = ?$ $+/- = ?$

$-/- = ?$ $-/+ = ?$

The division rule mimics the multiplication rule. It says this: **When you divide two numbers with the same sign, the answer is positive. When you divide two numbers with different signs, the answer is negative.**

Division rule

$+/+ = +$

ex.: $+24/+3 = +24/3 = +8$

$+/- = -$

ex.: $+24/-3 = -24/3 = -8$

$-/- = +$

ex.: $-24/-3 = +24/3 = +8$

$-/+ = -$

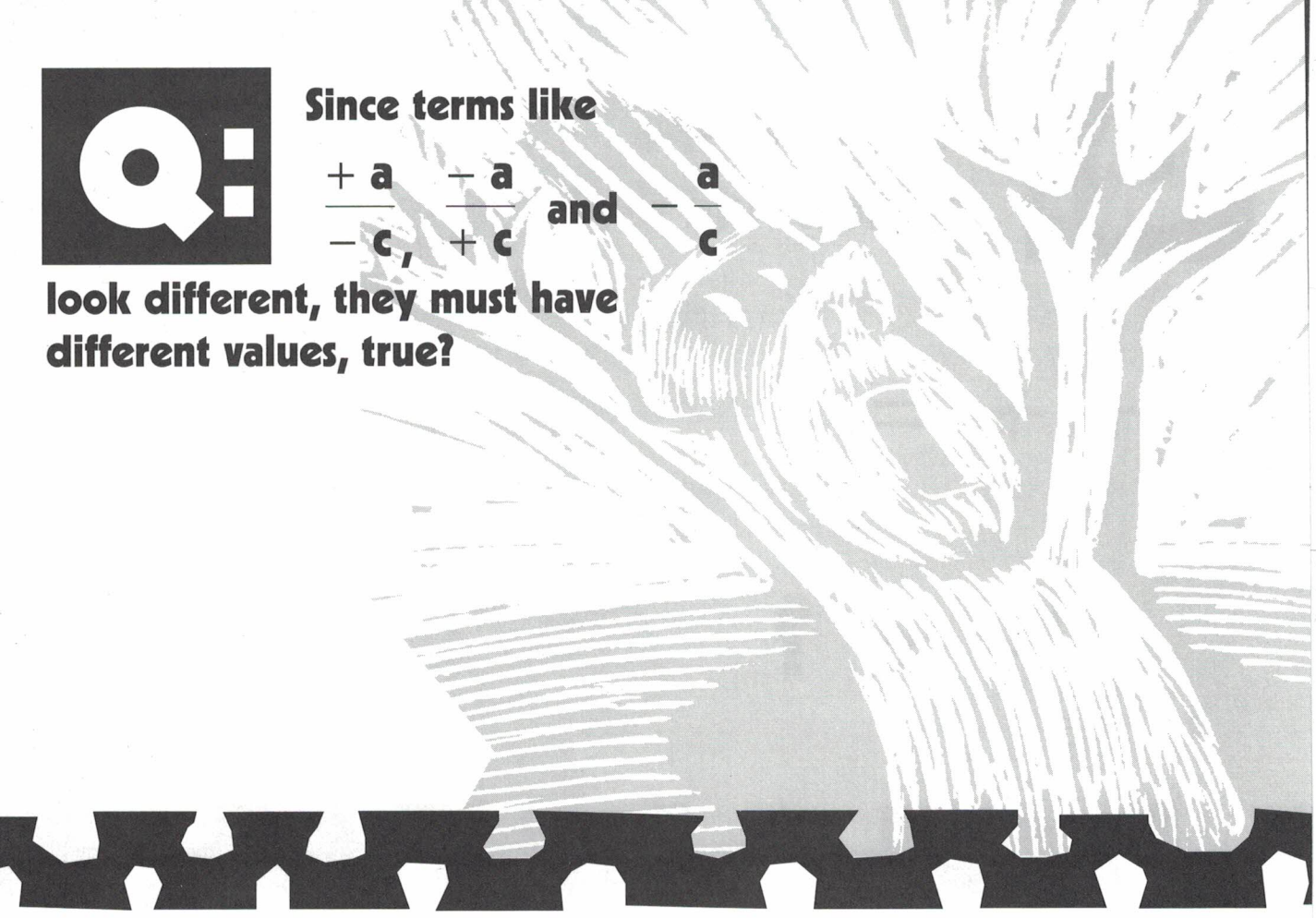
ex.: $-24/+3 = -24/3 = -8$

Simplify:

a) $+15/-3$
b) $-8/-20$
c) $+63/+7$
d) $-36/9$
e) $7/-28$

Answers:

a) -5 **d)** -4
b) $+2/5$ **e)** $-1/4$
c) $+9$



Q: Since terms like

$$\frac{+a}{-c}, \quad \frac{-a}{+c} \quad \textbf{and} \quad -\frac{a}{c}$$

look different, they must have different values, true?

A: No, false. They are all equal.

Since the division rule says that both a negative divided by a positive and a positive divided by a negative will come out negative,

$$\frac{+a}{-c}, \quad \frac{-a}{+c} \quad \textbf{and} \quad -\frac{a}{c}$$

are just three ways of writing the same quantity.

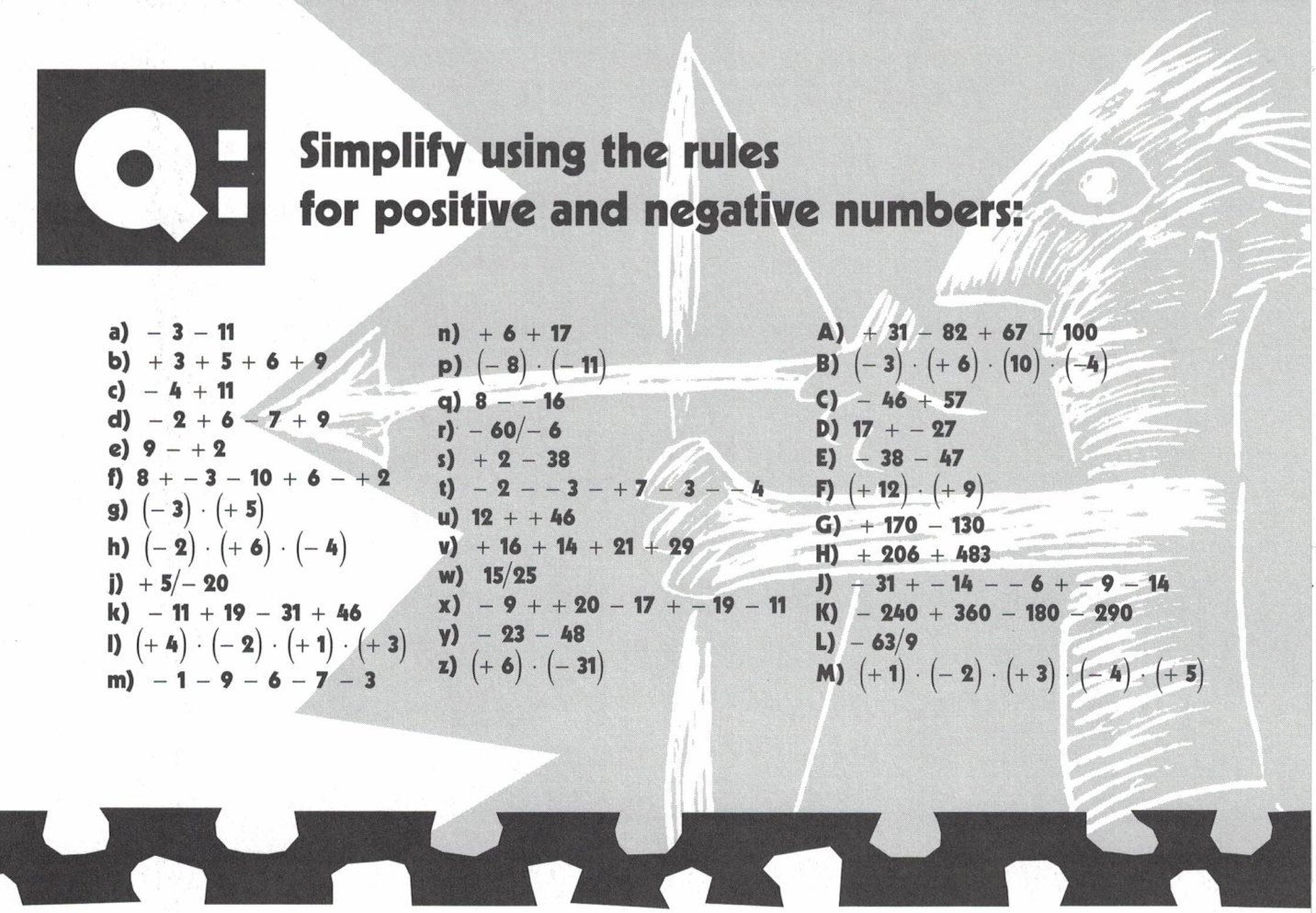
In terms of actual numbers, this means that fractions like

$$\frac{+3}{-5}, \quad \frac{-3}{+5} \quad \textbf{and} \quad -\frac{3}{5}$$

are all equal.

Note: the simplest form, which teachers usually will ask you to use to write such fractions, is with the negative sign out front, like this:

$$-\frac{a}{c} \quad \textbf{or} \quad -\frac{3}{5}$$



Simplify using the rules for positive and negative numbers:

a) $-3-11$
b) $+3+5+6+9$
c) $-4+11$
d) $-2+6-7+9$
e) $9-+2$
f) $8+-3-10+6-+2$
g) $(-3)\cdot(+5)$
h) $(-2)\cdot(+6)\cdot(-4)$
j) $+5/-20$
k) $-11+19-31+46$
l) $(+4)\cdot(-2)\cdot(+1)\cdot(+3)$
m) $-1-9-6-7-3$
n) $+6+17$
p) $(-8)\cdot(-11)$
q) $8--16$
r) $-60/-6$
s) $+2-38$
t) $-2--3-+7-3--4$
u) $12++46$
v) $+16+14+21+29$
w) $15/25$
x) $-9++20-17+-19-11$
y) $-23-48$
z) $(+6)\cdot(-31)$
A) $+31-82+67-100$
B) $(-3)\cdot(+6)\cdot(10)\cdot(-4)$
C) $-46+57$
D) $17+-27$
E) $-38-47$
F) $(+12)\cdot(+9)$
G) $+170-130$
H) $+206+483$
J) $-31+-14--6+-9-14$
K) $-240+360-180-290$
L) $-63/9$
M) $(+1)\cdot(-2)\cdot(+3)\cdot(-4)\cdot(+5)$

a) -14
b) $+23$
c) $+7$
d) $+6$
e) $+7$
f) -1
g) -15
h) $+48$
j) $-1/4$
k) $+23$
l) -24
m) -26
n) $+23$
p) $+88$
q) $+24$
r) $+10$
s) -36
t) -5
u) $+58$
v) $+80$
w) $+3/5$
x) -36
y) -71
z) -186
A) -84
B) $+720$
C) $+11$
D) -10
E) -85
F) $+108$
G) $+40$
H) $+689$
J) -62
K) -350
L) -7
M) $+120$