Math Virtual Learning

HS Essential Math II

April 24, 2020

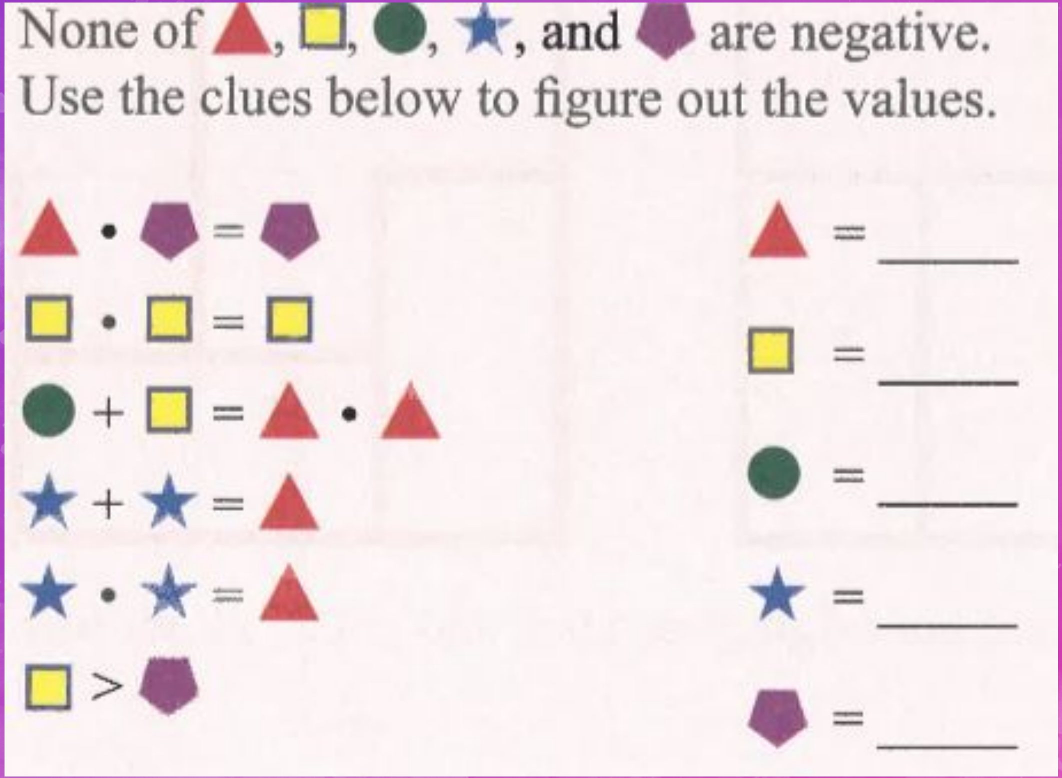
Grade/Course
Lesson: April 20, 2020

Objective/Learning Target:

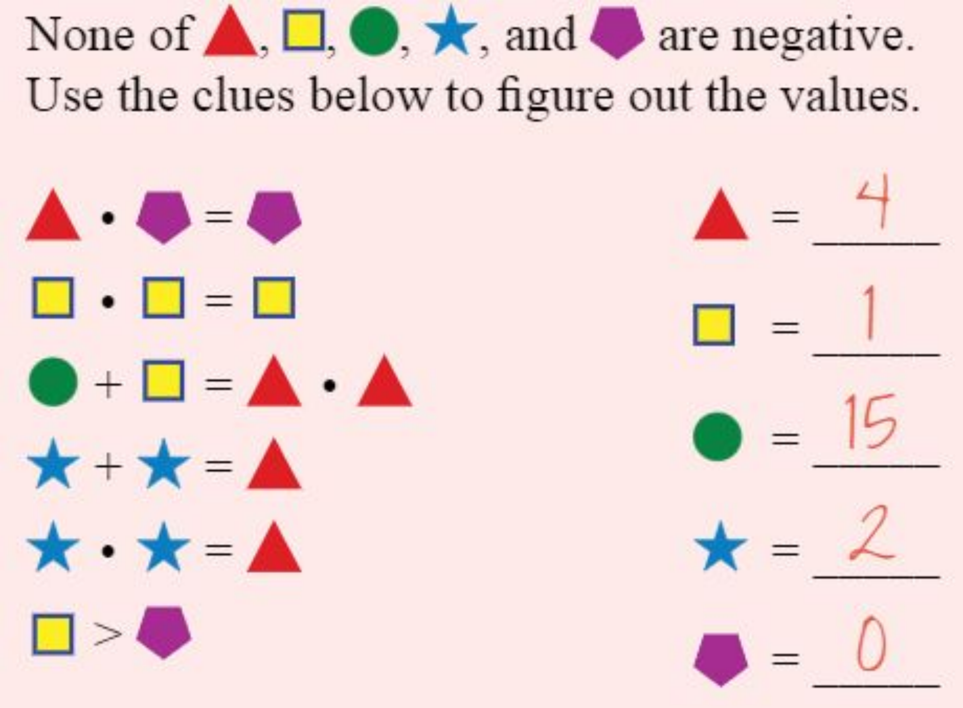
Solve equations using properties of operations and the logic of preserving equality - solving with squares.

(U5 L7 #1-6, 15-24, A-E)

Warm-Up


None of , , , , and are negative.
Use the clues below to figure out the values.

Warm-Up Answers



- Start with the squares since the only # times itself and equal to itself is 1 or 0, then the last clue let's us know that the square has to be 1 and the hexagon 0 since the square is larger than the hexagon
- Then tackle the stars, the only number plus itself AND times itself equal to the same number is 2 (2+2=4 AND (2)(2) = 4) So star =2 and triangle = 4
- Substituting the values of square and triangle into the third equation, the circle = 15

Unit 5 Lesson 7

#1-6, 15, 16, 18-24, A-E

Thinking Out Loud

Michael: I know that if $n^2 = 36$, then there are exactly two possible numbers that n can be: either 6 or -6. But what happens when something more complicated is squared?

Lena: Something more complicated? You mean like if $(p - 5)^2 = 36$? *(Lena writes the equation.)*

Michael: Yeah, like that. Something is squared still, but it's complicated. *(Michael pauses to think.)* I guess that means that $p - 5$ could be -6 or 6, right? How would we write that?

Jay: Well, I'd write what you just said using two equations.

(Jay writes the two equations: $p - 5 = 6$ or $p - 5 = -6$.)

Michael: So we get two solutions for p: either 11 or -1, but which one is it?

Lena: Both! They both make the original equation true.

> An equation can be true sometimes, always, or never. The equation $(p - 5)^2 = 36$ is true sometimes, when $p = 11$ and when $p = -1$.

Pausing to Think

Show that both 11 and -1 are solutions to $(p - 5)^2 = 36$.

Jay: So, there are two solutions! Just like there are two solutions for $n^2 = 36$. That makes sense.

Squares & Square Roots

$(p - 5)^2 = 36$

$(11 - 5)^2 = 36$

$(6)^2 = 36$

$(p - 5)^2 = 36$

$(-1 - 5)^2 = 36$

$(-6)^2 = 36$

Squaring a number multiply it by itself. Therefore, negative numbers are cancelled out.

$(4)^2 = 16$ $(-4)^2 = 16$ $-(4)^2 = -16$

$4 * 4 = 16$ $(-4)(-4) = 16$ $-(4)(4) = -16$

$\sqrt{16} = \underline{+} 4 = +4$ or -4

$\sqrt{100} = \underline{+}10 = +10$ or -10

Account for positive (+) & negative (-) roots.

Show your thinking as you solve these equations.

① $(c+3)^2 = 64$

$c + 3 =$ OR $c + 3 =$

$c =$ OR $c =$

② $(y-1)^2 = 49$

Think of $\square^2 = 49$. What could $y - 1$ be?

③ $(10-n)^2 = 81$

④ $(4x+2)^2 = 100$

Double check your work by plugging in your answer.

Show your thinking as you solve these equations.

Think of  $^2 = 49$.
What could $y - 1$ be?

① $(c+3)^2 = 64$ $\boxed{\sqrt{64} = +8 \text{ or } -8}$

$c + 3 = 8$ OR $c + 3 = -8$

$c = 5$ OR $c = -11$

$((5) + 3)^2 = (8)^2$ or $((-11) + 3)^2 = (-8)^2$

② $(y-1)^2 = 49$

$((8) - 1)^2 = (7)^2$

or

$((-6) - 1)^2 = (-7)^2$

$y - 1 = 7$ OR $y - 1 = -7$

$y = 8$ OR $y = -6$

③ $(10-n)^2 = 81$

$10 - n = 9$ OR $10 - n = -9$

$n = 1$ OR $n = 19$

$(10 - (1))^2 = (9)^2$ or $(10 - (19))^2 = (-9)^2$

$(4x+2)^2 = 100$

$(4(2) + 2)^2 =$

$(8 + 2)^2 = (10)^2$

or

$(4(-3) + 2)^2 =$

$(-12 + 2)^2 = (-10)^2$

$4x + 2 = 10$ OR $4x + 2 = -10$

$4x = 8$ OR $4x = -12$

$x = 2$ OR $x = -3$

(5) $2(h+3)^2 = 50$

$(h+3)^2 =$

$h + 3 =$ OR $h + 3 =$

$h =$ OR $h =$

(6) Jacob thought of a number, subtracted 5, squared the result, and got 16 as his final result. What two numbers could he have been thinking of?

Double check your work by plugging in your answer.

⑤ $2(h+3)^2 = 50$

$(h+3)^2 = 25$

$h + 3 = 5$ OR $h + 3 = -5$

$h = 2$ OR $h = -8$

⑥ Jacob thought of a number, subtracted 5, squared the result, and got 16 as his final result. What two numbers could he have been thinking of?

$(n-5)^2 = 16$

$n - 5 = 4$ OR $n - 5 = -4$

$n = 9$ OR $n = 1$

$2((2) + 3)^2 = 50$ equals

$2(5)^2 = 50$ equals $2(25) = 50$

Or

$2((-8) + 3)^2 = 50$ equals

$2(-5)^2 = 50$ equals $2(25) = 50$

$((9) - 5)^2 = 16$ equals

$(4)^2 = 16$ equals $4 * 4 = 16$

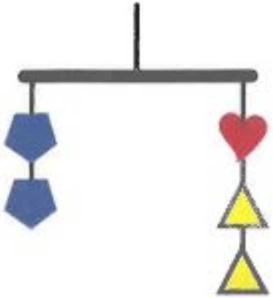
Or

$((1) - 5)^2 = 16$ equals

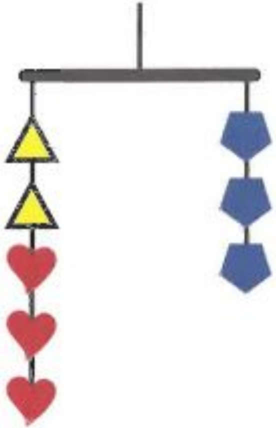
$(-4)^2 = 16$ equals $(-4) * (-4) = 16$

Stuff to Make You Think

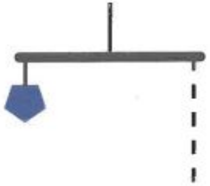
(15) This mobile balances.



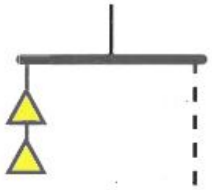
This mobile balances, too.



(a) Draw the right number of hearts to make this balance.



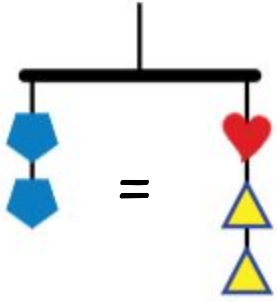
(b) Draw the right number of hearts to make this balance.



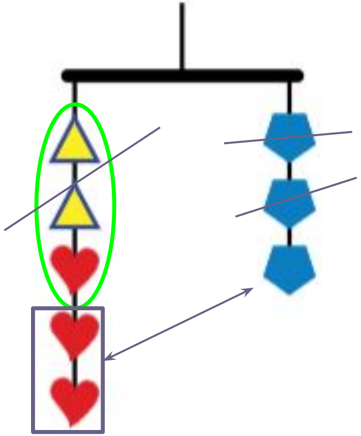
(16) If ⬟ = 8, then what are the values of ♥ and △?

⬟ = 8 ♥ = ______ △ = ______

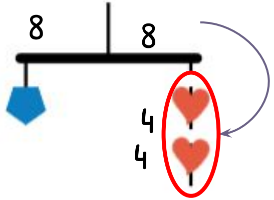
(15) This mobile balances.



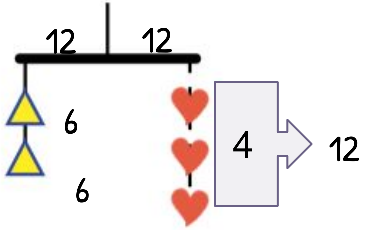
This mobile balances, too.



(a) Draw the right number of hearts to make this balance.



(b) Draw the right number of hearts to make this balance.



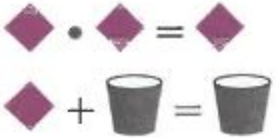
(16) If ⬟ = 8, then what are the values of ♥ and △?

⬟ = 8 ♥ = 4 △ = 6

(18) If $a + a = a$, what can you say for sure about a?

(19) If $a + b = a$, what can you say for sure about b?

(20) What could ◆ be?



◆ = ______

(21) What can you say about the value of ?

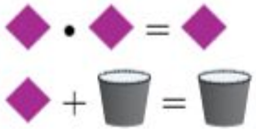
(18) If $a + a = a$, what can you say for sure about a?

a must be equal to 0.

(19) If $a + b = a$, what can you say for sure about b?

b must be equal to 0.

(20) What could ◆ be?



◆ = 0

(21) What can you say about the value of ?

 can be any number.

(22) If $x \cdot y = x$, what can you say for sure?

Think though
all possibilities.

22. If $x \cdot y = x$, what can you say for sure?

Either $x = 0$ and y is any number or $y = 1$ and x is any number.

Think though all possibilities.

23 What could ⬟, ♦, ●, △, and ★ be if all the shapes are *different* single-digit numbers (0-9)?

⬟ • △ = ♦

△ + △ = ♦

⬟ + ⬟ = △

⬟ + △ = ★

⬟ • ● = ★

⬟ = ______

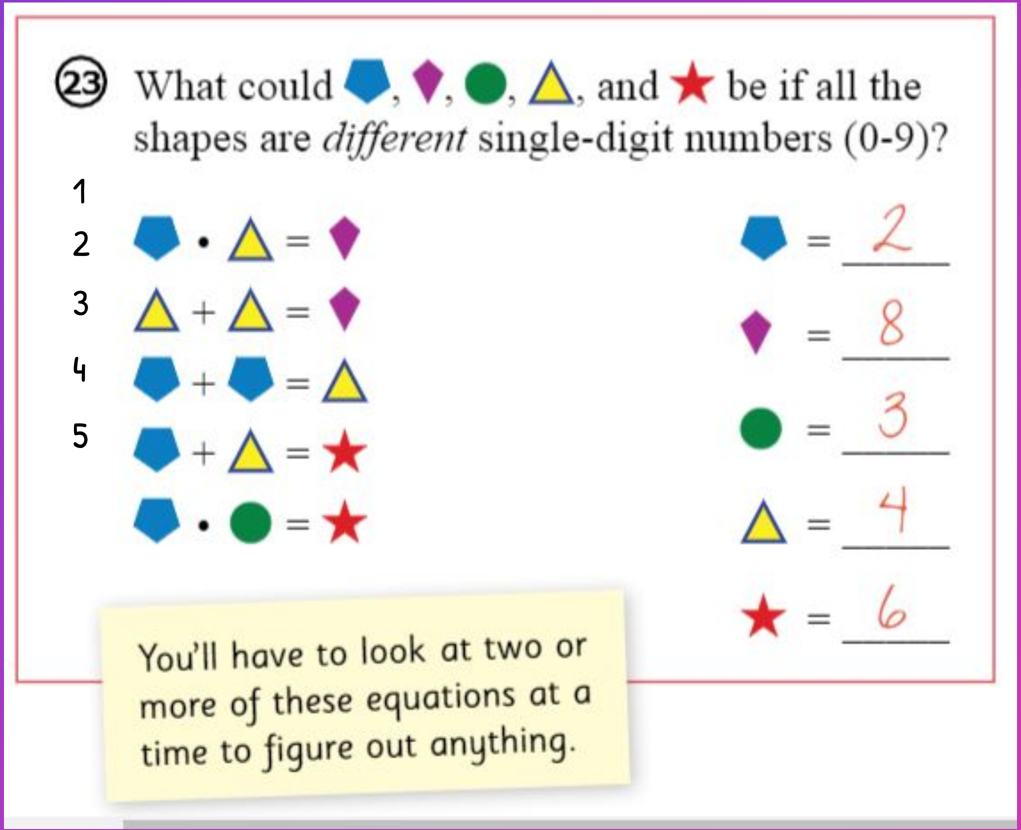
♦ = ______

● = ______

△ = ______

★ = ______

You'll have to look at two or more of these equations at a time to figure out anything.



To the right is one person's thinking about how to solve this problem.

I would start with any doubles, like the blue+blue=yellow. And yellow+yellow=purple. Also, blue has to be smaller than yellow.

So blue could not be 0 and yellow could not be 0. In addition, none of the numbers are higher than 9 so, blue and yellow have to be under 5.

So if blue is 1 , yellow is 2, and purple is 4. But when I try it with the top (blue times yellow) 1*2 isn't 4. So start over.

If blue is 2, yellow is 4, and purple is 8. Then try it with the top: 2*4=8
So far so good!

If it wasn't, I would go to blue is three—but that makes yellow 6 which is too big!

So I must be correct with blue is 2, yellow is 4, purple is 8. Now for the fourth equation, blue 2+yellow4=6 means star is 6.

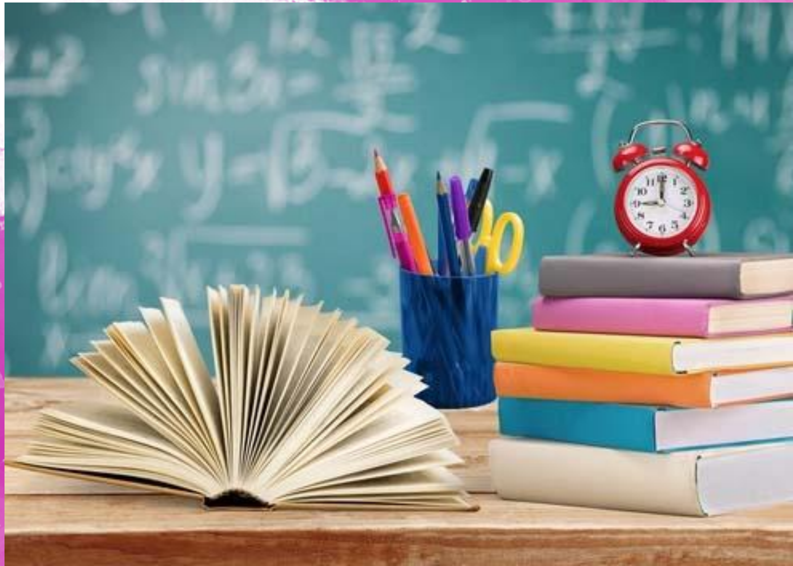
That makes the last equation blue 2 times green ? =6, makes green 3

24 If you know that $2a = 3b$ and $2a + b = 4c$, what else can you say for sure?

(24) If you know that $2a = 3b$ and $2a + b = 4c$, what else can you say for sure?

Since $2a = 3b$, we know $3b + b = 4c$.
So $4b = 4c$.
So $b = c$.

Additional Practice



Additional Practice 1

Cover all but the last instruction and the final result to undo each instruction of the trick in reverse order.

Ⓐ $(a + 10)^2 = 144$

Think of $(\quad)^2 = 144$.
What could $a + 10$ be?

$a + 10 =$ OR $a + 10 =$

$a =$ OR $a =$

Ⓑ $(w - 8)^2 = 81$

Additional Practice 1 Key

Cover all but the last instruction and the final result to undo each instruction of the trick in reverse order.

A $(a + 10)^2 = 144$

144/12 = 12

−10

Think of ( )^2 = 144.
What would a + 10 be?

−10

$a + 10 = 12$ OR $a + 10 = -12$

$a = 2$ OR $a = -22$

81/9 = 9

B $(w - 8)^2 = 81$

+8 +8

$w - 8 = 9$ OR $w - 8 = -9$

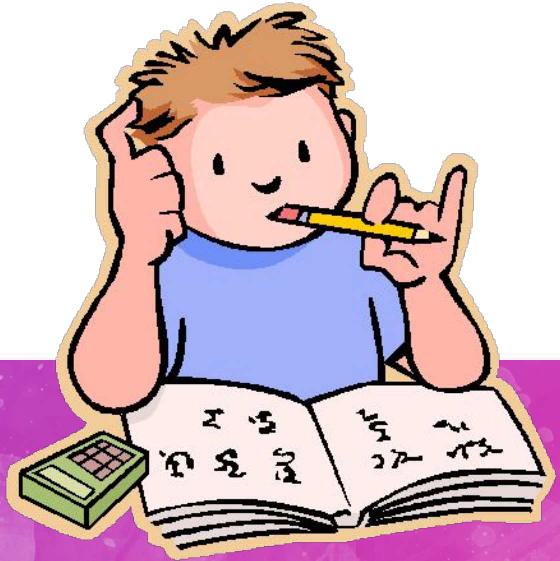
$w = 17$ OR $w = -1$

Additional Practice 2

Cover all but the last instruction and the final result to undo each instruction of the trick in reverse order.

C $(13 - b)^2 = 25$

D $(2n - 1)^2 = 81$



Practice 2 Key

Ⓒ $(13 - b)^2 = 25$ 25/5 = 5

$13 - b = 5$ OR $13 - b = -5$

-5 +5

$b = 8$ OR $b = 18$

13-5= 8 13-18= -5

Ⓓ $(2n - 1)^2 = 81$ 81/9=9

+1 +1

$2n - 1 = 9$ OR $2n - 1 = -9$

$\frac{2n = 10}{2}$ OR $\frac{2n = -8}{2}$

$n = 5$ OR $n = -4$

Additional Practice 3

Ⓔ $(h - 14)^2 + 3 = 28$

$(h - 14)^2 =$

$h - 14 =$ OR $h - 14 =$

$h =$ OR $h =$

Ⓕ $20 - (m + 1)^2 = 4$

Practice 3 Key

-3 -3

$(h-14)^2+3=28$ 28-3 = 25

$(h-14)^2 = 25$ 25/5=5

$h-14 \overset{+14}{=} 5$ OR $h-14 \overset{+14}{=} -5$

$h = 19$ OR $h = 9$

14+5=19 14-5=9

(F) $20-(m+1)^2=4$ 20-4=16

$(m+1)^2 = 16$ 16/4=4

$m+1 \overset{-1}{=} 4$ OR $m+1 \overset{-1}{=} -4$

$m = 3$ OR $m = -5$

4-1=3 -4-1= -5

Additional Resources

Solve equations using properties of operations & the logic of preserving equality.

CLICK THE LINKS for ADDITIONAL PRACTICE:

SolveMe Mobiles

Who Am I? Puzzles

Solve Me Mystery Grids

Mobiles

Mystery Grids

Who Am I ?