Find the missing items in each of the following In-Out machines and find a rule. Express the rule in a complete sentence, describing how to find the out **in terms of the in**.

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**Rule:**

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**Rule:**
PATTERNS DAY 9

Perform the following operations.

1. \(4 - 3 + 1\)

2. \(24 \div 2 \cdot 3\)

3. \(4 - 3 - 1\)

4. \(14 - 8 + 3 - 1\)

5. \((5 - 2) \cdot 3^2\)

6. \(9 - (4 - 2)^2\)

7. \(14 - 2 \cdot 5 - 3\)

8. \(24 \cdot 4 \div 2\)

9. \(18 - 3^2\)

10. \(28 - 2 \cdot 3^2 + 3^2\)

11. \((21 - (16 - (5 - 3))))\)

12. \(15 - 9 + 5 - 3 + 1\)

13. \(72 \div 9 \div 4 \div 2\)

14. \(4 \cdot 9 - 5 - 3 + 1\)

15. \((12 - 3^2)^2 - 4^2 \div 2\)
Order of Operations Quiz
PATTERNS AFTER DAY 9

Simplify each expression:

1. \( 13 - 5 + 4 = \)
2. \( 8 - 2^4 ÷ 2 = \)
3. \( 25 - [2(3 + 7) - 4 ÷ 4] = \)
4. \( \frac{2 \cdot 3 - 1}{3^2} = \)
5. \( 36 - (4 + 5 \cdot 4) = \)
PATTERNS AFTER DAY 9

QUIZ  ORDER OF OPERATIONS

Perform the following operations.

1. $7 - 2 + 3 - 1$  
   1. _________

2. $18 \div 3 \cdot 2$  
   2. _________

3. $(8 - 3) \cdot 2^2$  
   3. _________

4. $13 - (5 - 2)^2$  
   4. _________

5. $53 - 3 \cdot 2^2 + 4^2$  
   5. _________

6. $15 - 9 + 5 - 3 + 1$  
   6. _________

7. $48 \div 6 \div 2 \div 2$  
   7. _________

8. $4 \cdot 9 - 6 \cdot 3 + 1$  
   8. _________
Sigma Notation – Classwork

PATTERNS DAY 11

Write out each of these summations problems as a string of numbers added together and find the given sum.

1. \[ \sum_{i=1}^{5} (2i) = \]

2. \[ \sum_{i=0}^{3} (3i + 1) = \]

3. \[ \sum_{k=1}^{4} 9k = \]

4. \[ \sum_{n=2}^{6} (5n)^2 = \]

5. \[ \sum_{k=1}^{5} 6k = \]

6. \[ \sum_{i=0}^{4} i^2 = \]

7. \[ \sum_{k=0}^{2} \frac{1}{k^2 + 1} = \]

8. \[ \sum_{k=2}^{5} (k - 1)(k + 3) = \]

Use the summation notation to write the given sums.

9. \[ \frac{5}{1+1} + \frac{5}{1+2} + \frac{5}{1+3} + ... + \frac{5}{1+15} = \]

10. \[ 4(1) + 4(2) + 4(3) + ... + 4(9) = \]

11. \[ 1 + 3 + 5 + 7 + 9 = \]

12. \[ 2 + 2 + 2 + 2 = \]
Sigma Notation – Quiz

PATTERNS DAY 11

1. \( \sum_{n=12}^{15} (2n + 2) \) represents the expression \( (2 \cdot 12 + 2) + (2 \cdot 13 + 2) + (2 \cdot 14 + 2) + (2 \cdot 15 + 2) \)

The number 12 is called the ___________________________, the number 15 is called the ___________________________ and the expression \( 2n + 2 \) is called the ___________________________.

2. Write out each of these summation problems as a string of numbers added together.
   a) \( \sum_{i=0}^{4} 3i^2 = \)
   b) \( \sum_{k=3}^{8} \frac{1}{k} = \)
   c) \( \sum_{n=1}^{3} 10k = \)

3. Use the summation notation to write the given sums.
   a) \( \frac{1}{2} + \frac{2}{3} + \frac{3}{4} + \frac{4}{5} + \frac{5}{6} = \)
   b) \( 10 + 17 + 26 + 37 = \)
SIGNUMBERS PRE-TEST: NO CALCULATORS ALLOWED.

1. \(-8 + 2 = \) _____  
2. \(-4 + 9 = \) _____  
3. \(-3 + -4 = \) _____  
4. \(10 + (-6) = \) _____  
5. \(5 - (-3) = \) _____  
6. \(4 - 10 = \) _____  
7. \(0 - 5 = \) _____  
8. \(-2 - (-6) = \) _____  
9. \(3(-4) = \) _____  
10. \(-5(2) = \) _____  
11. \(-6(-3) = \) _____  
12. \((-2)(4)(0) = \) _____  
13. \(-15 \div 5 = \) _____  
14. \(-3 \div 12 = \) _____  
15. \(-24 \div (-3) = \) _____  
16. \(20 \div (-2) = \) _____  

SIGNUMBERS POST-TEST: NO CALCULATORS ALLOWED.

1. \(5 + (-8) = \) _____  
2. \(-4 + (-2) = \) _____  
3. \(9 + (-5) = \) _____  
4. \(7 - (-3) = \) _____  
5. \(-10 - (-2) = \) _____  
6. \(4 - 10 = \) _____  
7. \(0 - (-9) = \) _____  
8. \(-8(-2) = \) _____  
9. \(5(-3) = \) _____  
10. \(16 \div (-2) = \) _____  

Give the answer, then explain using hot and cold cubes.

11. \(-5 + (-4) = \) _____  
12. \(-3 - (-7) = \) _____  
13. \(-4(5) = \) _____  

Write as an expression and give the resulting temperature change.

14. Three cold cubes are removed and seven hot cubes are added. ________  
15. Two bunches of five cold cubes are added. ________
SIGNED NUMBERS AFTER DAY 14

Express each expression in terms of hot and cold cubes and then evaluate.

1. \(2 + (-10) = \) 

2. \(-4 + (-8) = \) 

3. \(-3 - (-12) = \) 

4. \(-2(-10) = \) 

Write a numerical expression and give the resultant temperature change.

5. Six cold cubes are added and then ten hot cubes are added. 

6. Two hot cubes are added and then eight hot cubes removed. 

7. Five bunches of four cold cubes are added. 

8. Three bunches of ten cold cubes are removed. 

9. Nine cold cubes added and then twelve hot cubes removed. 

Evaluate the expressions.

10. \(-3 + (-7) = \) 

11. \(15 + (-5) = \) 

12. \(4 - 9 = \) 

13. \(-8 - (-10) = \) 

14. \(0 - 5 = \) 

15. \((-2)(-6) = \) 

16. \(4(-4) = \) 

17. \(-7(3) = \) 

18. \(-15 \div (-3) = \) 

19. \(-4 \div 20 = \) 

20. \(24 \div (-2) = \) 

21. \(12 - (-6) = \) 

22. \(-9 + 15 = \) 

23. \(-10 - (-3) = \) 

24. \(-5(-4)(0)(-3) = \) 

25. \(0 - (-8) = \) 

26. \(-24 \div (-3) \div (-2) = \)
Find the measure of each of the following angles.

Measures:

$\angle 1$ _____  $\angle 4$ _____  $\angle 7$ _____

$\angle 2$ _____  $\angle 5$ _____

$\angle 3$ _____  $\angle 6$ _____
Degree Discovery

PATTERNS DAY 18

Use your protractor to **Measure** each angle of these triangles and **Write** those measures in their appropriate angles.
Angle Measurement & Geometric Vocabulary

PATTERNS DAY 19

Match the following:

a. Obtuse Angle 1.____ A geometric figure formed by two rays with a common vertex.
b. Counterclockwise 2.____ A polygon whose sides all have equal length and whose angles all have equal measure.
c. Acute Angle 3.____ Where two lines, segments or rays intersect.
d. Degree 4.____ A portion of a line having a given endpoint and continuing to infinity in only one direction.
e. Angle of a Polygon 5.____ An angle that measures more than 90° and less than 180°.
f. Vertex 6.____ An angle that measures 90°.
g. Rays 7.____ An angle that measures more than 0° and less than 90°.
h. Protractor 8.____ The measurement unit for an angle defined by having a complete turn equal to 360°.
j. Regular Polygon 9.____ The direction in which you must turn to “open” an angle.
k. Right Angle 10.____ The instrument calibrated to measure an angle.

Use your protractor to find the measure of each angle.

∠1 = ____
∠2 = ____
∠3 = ____
Regular Polygons-Each Angle & Angle Sum Quiz
PATTERNS DAY 22

Find the value of $y^\circ$ in each of the following:

$y = ___$

Below is a REGULAR POLYGON

$y = ____$

For a REGULAR Pentagon find:

a) The SUM of all the angles.  ___________

b) The measure of any SINGLE angle.  ___________
4. Evaluate the expression: $25 - 3 \cdot 2^2 + 5$

5. A six-sided polygon has angles measuring $89^\circ$, $123^\circ$, $141^\circ$, $96^\circ$, and $138^\circ$. What is the measure of the sixth angle? Show how you get your answer.

6. Write as a string of numbers added together and find the sum.

$$\sum_{i=0}^{5} (2i + 1)^2$$

7. A REGULAR polygon has 15 sides.
   a. What is the sum of the interior angle measures? Explain how you got your answer.

   b. What is the measure of each interior angle?