



## Welcome to the ONPAR Mathematics Testlet!

This interactive elementary mathematics testlet on pre-algebra operations and reasoning contains 5 multi-part tasks.

Please ensure you have JavaScript enabled and use one of the following browsers: **Chrome 19+, IE9+, Firefox 12+, or Safari 5+.**


A printable score report will be generated when you complete the testlet.

**Next** ➡

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## Onscreen Help

You will see a **speaker** (  ) when there are words on the screen.

Click **ENGLISH** to listen to the words in English.

Click **TRANSLATE** to listen to the words in a different language.

For **TRANSLATE**, choose one of the languages below:

☐ Spanish ☐ Russian ☐ Arabic ☐ Hmong ☐ Mandarin

**Start the testlet** ➡



**ENGLISH**  
**TRANSLATE**

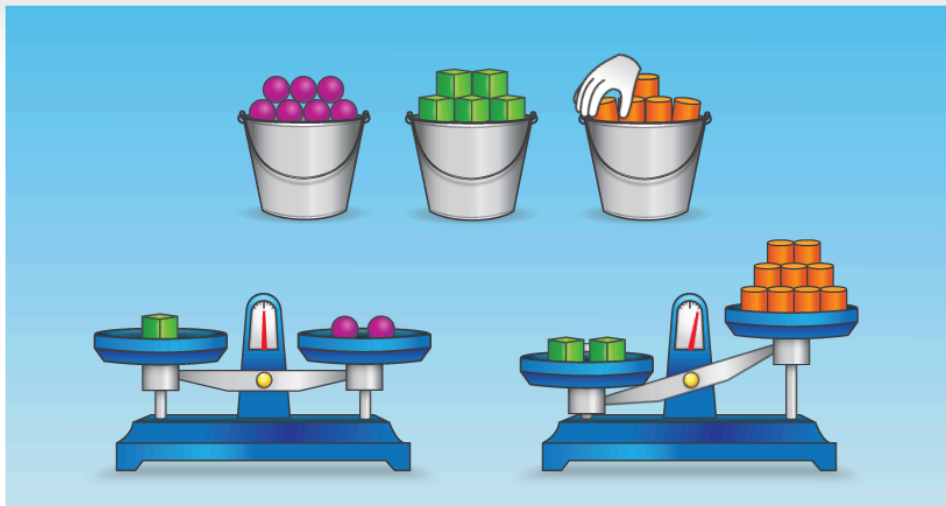
**You will see the following *Help* buttons while you take the testlet:**

**Instructions**  **Show Your Work**  



Click on the buttons during the testlet for instructions.

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Task 1



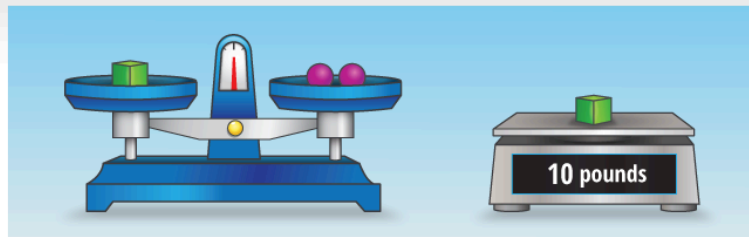
Screen 1/3



ENGLISH  
TRANSLATE

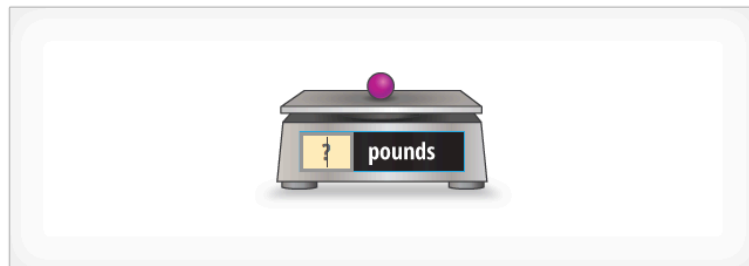
How much does 1 ball weigh?

1	2	?
3	4	?



Instructions

7	8	9
4	5	6
1	2	3
0	.	
←		



Task 1

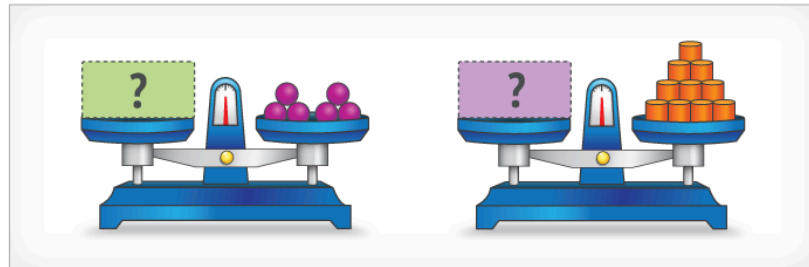
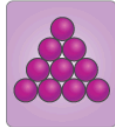
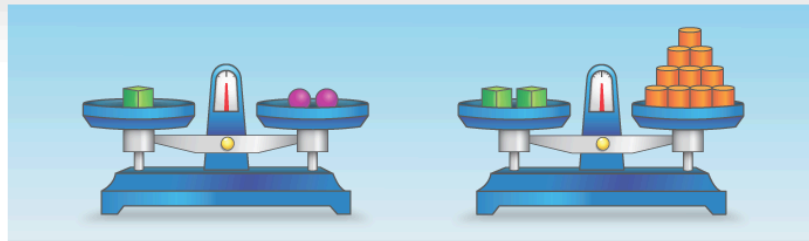
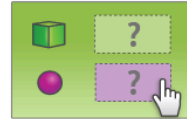


Screen 2/3



ENGLISH  
TRANSLATE

Balance the scales.



Task 1



Screen 3/3



ENGLISH  
TRANSLATE

Emma wants a game player and games.



Task 2



Screen 1/3



ENGLISH  
TRANSLATE

How much is 1 player and games?

1	2	?
3	4	?



\$10



\$5

Instructions

7	8	9
4	5	6
1	2	3
0	.	
←		

Number of games	1	2	3	4
Price of 1 player and games	\$ ?	\$ ?	\$ ?	\$ ?

Task 2



Screen 2/3



ENGLISH  
TRANSLATE

Write an expression for total price.

1	2	?
3	4	?



\$10



\$5

Instructions

$n$			
7	8	9	÷
4	5	6	×
1	2	3	-
0	.	+	
←			

Number of <u>games</u>	1	2	3	4	$n$
<u>Total price</u>	\$5	\$5	\$5	\$5	?

Task 2



Screen 3/3

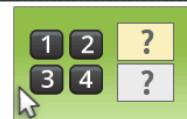
$$\square + \square = 6$$

$$\triangle + \square = 12$$

Task 3



Screen 1/4



$$\square + \square = 6$$

$$\triangle + \square = 12$$

Instructions



$$\square = \boxed{?}$$

$$\triangle = \boxed{?}$$

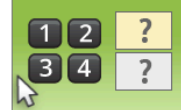
Task 3



Screen 2/4



ENGLISH **Solve.**  
TRANSLATE



$$\begin{array}{ccccccc} \star & + & \star & + & \star & = & 12 \\ & & \heartsuit & - & 2 & = & \star \end{array}$$

Instructions



$$\star + \heartsuit + \heartsuit = \boxed{?}$$

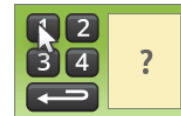
Task 3



Screen 3/4



ENGLISH **Show how you got your answer.**  
TRANSLATE



$$\begin{array}{ccccccc} \star & + & \star & + & \star & = & 12 \\ & & \heartsuit & - & 2 & = & \star \end{array}$$

Instructions



Show Your Work



$$\star + \heartsuit + \heartsuit =$$

Task 3

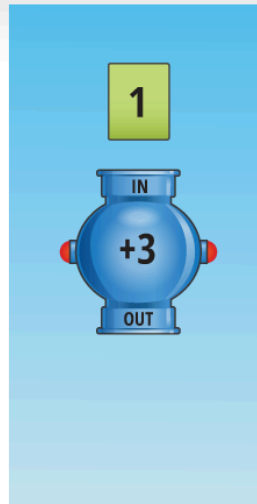


Screen 4/4



ENGLISH  
TRANSLATE

This is a **number machine**.



Task 4



Screen 1/5

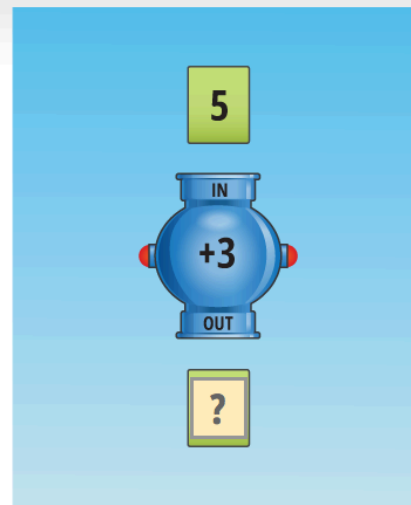
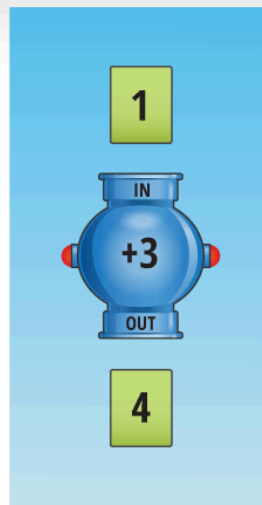


ENGLISH  
TRANSLATE

The **rule** is +3. **What number comes out?**

1	2	?
3	4	?

Instructions



Task 4



Screen 2/5

Task 4

Screen 3/5

5

IN

OUT

IN	OUT
5	

←

🗑️

▶️

✓

➡️

What is the new rule?

12?

34?

Instructions ▶️

789÷

456×

123-

0.+

←

IN

OUT

?

?

OUT

IN	OUT
5	3
6	4
8	6

←

🗑️

▶️

✓

➡️

Task 4

Screen 4/5





ENGLISH  
TRANSLATE

Complete the table and the rule.

1	2	?
3	4	?



IN	OUT
1	4
2	?
7	28
?	36

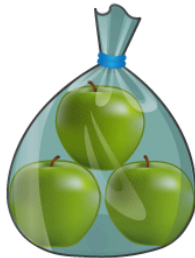
Task 4



Screen 5/5

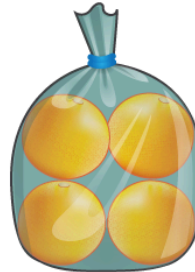
**sale**

1 bag of apples = \$3.60



**sale**

1 bag of oranges = \$5.00



Task 5



Screen 1/3



ENGLISH

TRANSLATE

How many bags of apples and bags of oranges cost \$12.20?

1	2	?
3	4	?

Instructions



sale

1 bag of apples = \$3.60



sale

1 bag of oranges = \$5.00



? bags of apples + ? bags of oranges = \$12.20



Task 5

Screen 2/3



ENGLISH

TRANSLATE

Show that the price of 1 apple is less than the price of 1 orange.

1	2	
3	4	?
←		

Instructions



Show Your Work



sale

1 bag of apples = \$3.60



sale

1 bag of oranges = \$5.00



Task 3

Screen 3/3

# ONPAR<sup>®</sup> Review Page

Flags indicate level of completion for each task. Click the image to return to that task. Click the check icon below to submit your answers.



[Download as PDF](#)

## ONPAR<sup>®</sup> Score Report

Content Area: **Algebra**

Grade:

Testlet: **Pre-Algebra Operations and Algebraic Reasoning**

Student Name: \_\_\_\_\_

Student ID: \_\_\_\_\_

Date: **11/12/2013**

### Introduction

Thank you for taking the **ONPAR Elementary Mathematics Testlet** on pre-algebra operations and algebraic reasoning. The ONPAR Elementary Mathematics Testlet measures students' understanding of these concepts by asking students to show their ability to

- infer, apply, and express implicit and explicit rules governing number and shape patterns as numerical and variable expressions;
- recognize that abstract symbols and variables represent unknown quantities;
- solve real-world problems using the four operations with whole numbers and decimals; and
- explain their reasoning using operations, numbers and symbols;

### Overall Student Performance

TASK	POSSIBLE POINTS	STUDENT SCORE
Balance	3	0
Game Stores	6	0
Stars and Hearts	5	0
Input Output	5	0
Apples and Oranges	3	0
<b>TOTAL</b>	<b>22</b>	<b>0</b>

Each of the five multi-part math tasks on this testlet includes several items worth multiple points. This score report provides the total score for the testlet, each of the five tasks, and the items within each task. A summary of what each task is measuring and a brief explanation of scores is also provided.

### Balance

**Balance** measures students' understanding of the following pre-algebra operations and algebraic reasoning concepts:

- Rule identification and application

- Rule identification and application
- variables in the form of abstract symbols stand for unknown quantities

This task measures students' ability to recognize relationships between objects presented in the real-world context of a balance, and to identify, apply, and extend the rules underlying these relationships.

Students who do well on this task can

1. Identify and reason from relationships among sets of abstract symbols
2. Use operations with whole numbers in single- and multi-step problems

#### Balance Scoring Summary

	POSSIBLE POINTS	STUDENT SCORE	Interpretive Scoring Information
Item 1	1	0	Student is unable to recognize a relationship between sets of abstract symbols (variables) to solve for a unit quantity.  Student is unable to apply a rule about a relationship between two variables (e.g., 1 green block=2 purple blocks) in a new situation with different quantities of the same variables.  Student is unable to use multi-step reasoning about the known relationships between two variables (e.g., green and purple blocks) to determine their relationship with a third variable (e.g., pink block).
Item 2	1	0	
Item 3	1	0	
TOTAL	3	0	

#### Game Stores

**Game Stores** measures the following pre-algebra operations and algebraic reasoning concepts:

- Identifying rules from sets of ordered pairs
- Graphing ordered pairs on the coordinate plane
- Translating patterns into expressions with a variable standing for the unknown quantity

This task measures students' ability to generate a linear pattern, graph ordered pairs in the first quadrant, identify a linear relationship, and produce a variable expression (rule) that fits the relationship.

Students who do well on this task can

1. Infer and apply an implicit rule
2. Perform operations to generate a pattern of ordered pairs
3. Express a pattern as a variable expression

#### Game Stores Scoring Summary

	POSSIBLE POINTS	STUDENT SCORE	Interpretive Scoring Information
Item 1	4	0	In completing a table, student does not show ability to apply a rule to generate a number pattern in the context of a real-world problem using whole numbers and the four operations  Student does not represent either the linear pattern (+10) the linear rate of change (5n).
Item 2	2	0	
TOTAL	6	0	

### Stars and Hearts

**Stars and Hearts** measures the following pre-algebra operations concepts:

- variables in the form of abstract symbols stand for unknown quantities
- quantities on both sides of an equation are equal
- operations and substitution can be performed to determine unknown quantities in an equation

Students who do well on **Items 1-3** can

1. Solve first degree equations in one and two variables
2. Substitute values for variables using operations with whole numbers
3. Explain their reasoning using operations, numbers, and symbols

Students who do well on **Item 4** can prove their solution to an equation by using operations, whole numbers, and symbols to express their reasoning.

Full credit responses to Item 4 include both of the following components

- Student expresses steps used to solve for the value of the star and the heart
- Student expresses the linear equation summing stars and hearts and has the correct answer.

### Stars and Hearts Scoring Summary

	POSSIBLE POINTS	STUDENT SCORE	Interpretive Scoring Information
Item 1	1	0	Student is unable to solve for the value of an unknown quantity in an equation.
Item 2	1	0	Student is unable to solve for the value of an unknown quantity in an equation.
Item 3	1	0	Student is unable to solve for the value of two unknown quantities in an equation using substitution and multi-step operations with whole numbers.
Item 4	2	0	Student response does not include any components of a full credit answer.
TOTAL	5	0	

### Input Output

**Input Output** measures students' understanding of the following pre-algebra operations and algebraic reasoning concepts:

- Inferring and applying patterns that underlie ordered pairs of terms
- Applying and expressing these patterns as rules for linear functions

Students who do well on this task can

1. Apply a given rule by performing operations with whole numbers
2. Identify patterns and relationships in sequences of ordered pairs
3. Express relationships between terms in complete and partially complete sequences of ordered pairs

### Input Output Scoring Summary

	POSSIBLE POINTS	STUDENT SCORE	Interpretive Scoring Information
Item 1	1	0	Student is unable to solve a problem by applying a given rule in the context of a number machine.
Item 2	1	0	Student is unable to identify the pattern in a complete sequence of ordered pairs for a linear function and express it as a rule.
Item 3	1	0	Student is unable to identify the pattern in an incomplete sequence of ordered pairs for a linear function and express it as a rule.

Item 2	1	0	Student is unable to identify the pattern in a complete sequence of ordered pairs for a linear function and express it as a rule.
Item 3	1	0	
Items 4-5	2	0	Student is unable to identify the pattern in an incomplete sequence of ordered pairs for a linear function and express it as a rule.  When given two complete and two incomplete ordered pairs, student does not generate either the missing input term or the missing output term.
TOTAL	5	0	

## Apples And Oranges

**Apples And Oranges** measures the following pre-algebra operations and algebraic reasoning concepts:

- variables in the form of abstract symbols stand for unknown quantities
- quantities on both sides of an equation are equal
- operations can be performed to determine unknown quantities in an equation

Students who do well on **Item 1** of this task can

1. Solve for two unknown quantities when given a fixed total
2. Use operations with whole numbers and decimals in single- and multi-step problems

Students who do well on **Item 2** of this task can

1. Prove a given statement about the inequality of two units
2. Use operations with whole numbers and decimals to solve for a unit quantity
3. Explain their reasoning using operations, numbers, and symbols

Full credit responses to **Item 2** include all three of the following components:

- Student completely shows all steps in problem-solving process
- Student solves for correct unit price of both apples and oranges
- Student expresses the inequality (apple<orange) in their answer

### Apples And Oranges Scoring Summary

POSSIBLE	STUDENT
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### Apples And Oranges Scoring Summary

	POSSIBLE POINTS	STUDENT SCORE	Interpretive Scoring Information
Item 1	1	0	When given a fixed total, student is unable to simultaneously solve for two unknown quantities (how many bags of apples and how many bags of oranges). Student response does not include any components of a full credit answer.
Item 2	2	0	
TOTAL	3	0	

### Timing

	Time (Seconds)
Balance	26
Screen 1	13
Screen 2 (Item 1)	2
Screen 3 (Item 2)	10
Game Stores	121
Screen 1	19
Screen 2 (Item 1)	93
Screen 3 (Item 2)	9
Stars and Hearts	69
Screen 1	26
Screen 2 (Item 1)	17
Screen 3 (Item 2)	14
Screen 4 (Item 3)	13
Input Output	100
Screen 1	36
Screen 2 (Item 1)	19



	Time (Seconds)
<b>Balance</b>	26
Screen 1	13
Screen 2 (Item 1)	2
Screen 3 (Item 2)	10
<b>Game Stores</b>	121
Screen 1	19
Screen 2 (Item 1)	93
Screen 3 (Item 2)	9
<b>Stars and Hearts</b>	69
Screen 1	26
Screen 2 (Item 1)	17
Screen 3 (Item 2)	14
Screen 4 (Item 3)	13
<b>Input Output</b>	100
Screen 1	36
Screen 2 (Item 1)	19
Screen 3	19
Screen 4 (Item 2)	16
Screen 5 (Items 3 - 4)	10
<b>Apples and Oranges</b>	25
Screen 1	23
Screen 2 (Item 1)	1
Screen 3 (Item 2)	1
<b>TOTAL</b>	<b>340</b>