

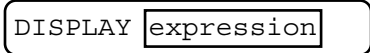
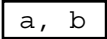
AP COMPUTER SCIENCE PRINCIPLES

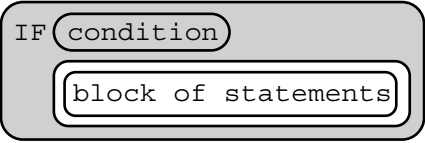
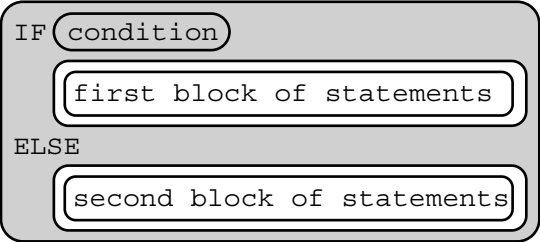
AP CSP Exam Reference Sheet

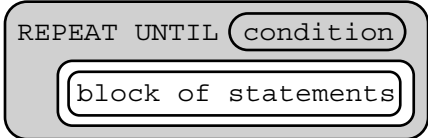
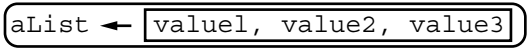
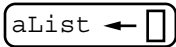
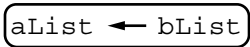
Effective
Fall 2020

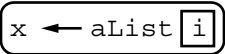
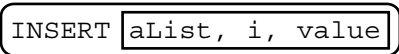
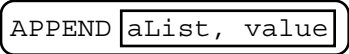
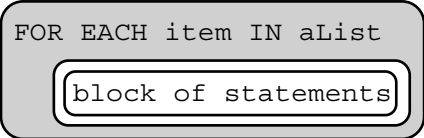
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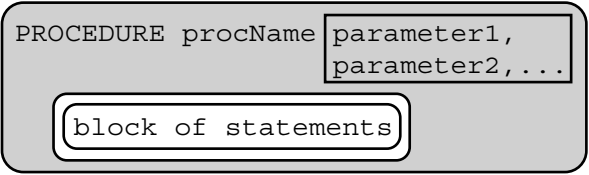
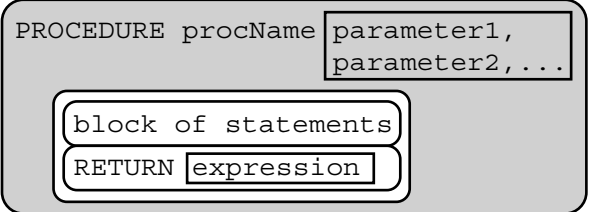
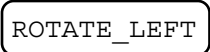
Exam Reference Sheet

Instruction	Explanation
Assignment, Display, and Input	
Text: <code>a ← expression</code> Block: 	Evaluates <code>expression</code> and then assigns a copy of the result to the variable <code>a</code> .
Text: <code>DISPLAY(expression)</code> Block: 	Displays the value of <code>expression</code> , followed by a space.
Text: <code>INPUT()</code> Block: <code>INPUT</code>	Accepts a value from the user and returns the input value.
Arithmetic Operators and Numeric Procedures	
Text and Block: <code>a + b</code> <code>a - b</code> <code>a * b</code> <code>a / b</code>	The arithmetic operators <code>+</code> , <code>-</code> , <code>*</code> , and <code>/</code> are used to perform arithmetic on <code>a</code> and <code>b</code> . For example, <code>17 / 5</code> evaluates to <code>3.4</code> . The order of operations used in mathematics applies when evaluating expressions.
Text and Block: <code>a MOD b</code>	Evaluates to the remainder when <code>a</code> is divided by <code>b</code> . Assume that <code>a</code> is an integer greater than or equal to <code>0</code> and <code>b</code> is an integer greater than <code>0</code> . For example, <code>17 MOD 5</code> evaluates to <code>2</code> . The <code>MOD</code> operator has the same precedence as the <code>*</code> and <code>/</code> operators.
Text: <code>RANDOM(a, b)</code> Block: <code>RANDOM</code> 	Generates and returns a random integer from <code>a</code> to <code>b</code> , including <code>a</code> and <code>b</code> . Each result is equally likely to occur. For example, <code>RANDOM(1, 3)</code> could return <code>1</code> , <code>2</code> , or <code>3</code> .
Relational and Boolean Operators	
Text and Block: <code>a = b</code> <code>a ≠ b</code> <code>a > b</code> <code>a < b</code> <code>a ≥ b</code> <code>a ≤ b</code>	The relational operators <code>=</code> , <code>≠</code> , <code>></code> , <code><</code> , <code>≥</code> , and <code>≤</code> are used to test the relationship between two variables, expressions, or values. A comparison using relational operators evaluates to a Boolean value. For example, <code>a = b</code> evaluates to <code>true</code> if <code>a</code> and <code>b</code> are equal; otherwise it evaluates to <code>false</code> .

Instruction	Explanation
Relational and Boolean Operators (continued)	
Text: NOT condition Block: NOT (condition)	Evaluates to true if condition is false; otherwise evaluates to false.
Text: condition1 AND condition2 Block: (condition1) AND (condition2)	Evaluates to true if both condition1 and condition2 are true; otherwise evaluates to false.
Text: condition1 OR condition2 Block: (condition1) OR (condition2)	Evaluates to true if condition1 is true or if condition2 is true or if both condition1 and condition2 are true; otherwise evaluates to false.
Selection	
Text: IF(condition) { <block of statements> } Block: 	The code in block of statements is executed if the Boolean expression condition evaluates to true; no action is taken if condition evaluates to false.
Text: IF(condition) { <first block of statements> } ELSE { <second block of statements> } Block: 	The code in first block of statements is executed if the Boolean expression condition evaluates to true; otherwise the code in second block of statements is executed.

Instruction	Explanation
Iteration	
Text: <pre>REPEAT n TIMES { <block of statements> }</pre> Block: 	The code in block of statements is executed n times.
Text: <pre>REPEAT UNTIL(condition) { <block of statements> }</pre> Block: 	The code in block of statements is repeated until the Boolean expression condition evaluates to true.
List Operations	
For all list operations, if a list index is less than 1 or greater than the length of the list, an error message is produced and the program terminates.	
Text: <pre>aList ← [value1, value2, value3, ...]</pre> Block: 	Creates a new list that contains the values value1, value2, value3, and ... at indices 1, 2, 3, and ... respectively and assigns it to aList.
Text: <pre>aList ← []</pre> Block: 	Creates an empty list and assigns it to aList.
Text: <pre>aList ← bList</pre> Block: 	Assigns a copy of the list bList to the list aList. For example, if bList contains [20, 40, 60], then aList will also contain [20, 40, 60] after the assignment.
Text: <pre>aList[i]</pre> Block: <pre>aList [i]</pre>	Accesses the element of aList at index i. The first element of aList is at index 1 and is accessed using the notation aList[1].

Instruction	Explanation
List Operations (continued)	
Text: <code>x ← aList[i]</code> Block: 	Assigns the value of <code>aList[i]</code> to the variable <code>x</code> .
Text: <code>aList[i] ← x</code> Block: 	Assigns the value of <code>x</code> to <code>aList[i]</code> .
Text: <code>aList[i] ← aList[j]</code> Block: 	Assigns the value of <code>aList[j]</code> to <code>aList[i]</code> .
Text: <code>INSERT(aList, i, value)</code> Block: 	Any values in <code>aList</code> at indices greater than or equal to <code>i</code> are shifted one position to the right. The length of the list is increased by 1, and <code>value</code> is placed at index <code>i</code> in <code>aList</code> .
Text: <code>APPEND(aList, value)</code> Block: 	The length of <code>aList</code> is increased by 1, and <code>value</code> is placed at the end of <code>aList</code> .
Text: <code>REMOVE(aList, i)</code> Block: 	Removes the item at index <code>i</code> in <code>aList</code> and shifts to the left any values at indices greater than <code>i</code> . The length of <code>aList</code> is decreased by 1.
Text: <code>LENGTH(aList)</code> Block: <code>LENGTH</code> 	Evaluates to the number of elements in <code>aList</code> .
Text: <code>FOR EACH item IN aList</code> <code>{</code> <code> <block of statements></code> <code>}</code> Block: 	The variable <code>item</code> is assigned the value of each element of <code>aList</code> sequentially, in order, from the first element to the last element. The code in <code>block of statements</code> is executed once for each assignment of <code>item</code> .

Instruction	Explanation
Procedures and Procedure Calls	
Text: <pre>PROCEDURE procName(parameter1, parameter2, ...)</pre> <pre>{ <block of statements> }</pre> Block: 	Defines procName as a procedure that takes zero or more arguments. The procedure contains block of statements. The procedure procName can be called using the following notation, where arg1 is assigned to parameter1, arg2 is assigned to parameter2, etc: <pre>procName(arg1, arg2, ...)</pre>
Text: <pre>PROCEDURE procName(parameter1, parameter2, ...)</pre> <pre>{ <block of statements> RETURN(expression) }</pre> Block: 	Defines procName as a procedure that takes zero or more arguments. The procedure contains block of statements and returns the value of expression. The RETURN statement may appear at any point inside the procedure and causes an immediate return from the procedure back to the calling statement. The value returned by the procedure procName can be assigned to the variable result using the following notation: <pre>result ← procName(arg1, arg2, ...)</pre>
Text: <pre>RETURN(expression)</pre> Block: 	Returns the flow of control to the point where the procedure was called and returns the value of expression.
Robot	
If the robot attempts to move to a square that is not open or is beyond the edge of the grid, the robot will stay in its current location and the program will terminate.	
Text: <pre>MOVE_FORWARD ()</pre> Block: 	The robot moves one square forward in the direction it is facing.
Text: <pre>ROTATE_LEFT ()</pre> Block: 	The robot rotates in place 90 degrees counterclockwise (i.e., makes an in-place left turn).

Instruction	Explanation
Robot	
Text: ROTATE_RIGHT() Block: ROTATE_RIGHT	The robot rotates in place 90 degrees clockwise (i.e., makes an in-place right turn).
Text: CAN_MOVE(direction) Block: CAN_MOVE direction	Evaluates to <code>true</code> if there is an open square one square in the direction relative to where the robot is facing; otherwise evaluates to <code>false</code> . The value of <code>direction</code> can be <code>left</code> , <code>right</code> , <code>forward</code> , or <code>backward</code> .