HAL/S PROGRAMMING FUNDAMENTALS
QUIZ 3

1. Which of the following is correct:
   a) REPLACE INCR_CTR BY ‘ICTR = ICTR + 1’;
   b) REPLACE INCR_CTR BY “ICTR = ICTR + 1”;
   Ans. __________

2. Concerning the previous question, can you explain why the HAL/S compiler would be forced to use one delimiter rather than the other? Ans. __________

3. What is the value of K in the following situation?
   DECLARE INTEGER, I, J, K;
   I = 20;
   J = 7;
   K = I/J;
   Ans. __________

4. True or False. HAL/S does not allow the T (Transpose) operator to be applied to vectors (e.g., VECT**T).
   Ans. __________

5. True or False. A blank is needed in the following case to indicate the multiplication:
   B = 3 (I + J)
   Ans. __________

6. True or False. The following three expressions are completely equivalent (will generate the same object code):
   a) B**.5  b) B**(1/2)  c) SQRT(B)
   Ans. __________

7. True or False. An integer raised to a positive integer power will be evaluated as an integer. All other cases of a number raised to a power will yield a scalar result.
   Ans. __________

8. In the case of a matrix raised to a power (MATRIX**I), which of the following statements are false?:
   9. MATRIX must be a square matrix (equal numbers of rows and columns).
   10. The value of I must be known at compile time
   11. I cannot have the value 0.
   12. If I is -1 the expression is equivalent to finding the inverse of MATRIX.
   Ans. __________
9. True or False. The following code will produce the inverse of the matrix MM1:
   DECLARE MATRIX, MM1 INITIAL(3#(1,2,3)), MM2 INITIAL(0);
   DECLARE T INTEGER INITIAL(-1);
   MM2 = MM1**T;
    Ans. __________

10. True or False. Matrix transpose operations are performed by rather slow library
    subroutines and should thus be avoided when possible. Vector transpose operations are,
    however, very quick.
    Ans. __________

11. True or False. The sole CHARACTER string operator is concatenation (||).
    Ans. __________

12. True or False. Integers and Scalars are automatically converted to appropriate
    character strings whenever they are concatenated with a character string or assigned to
    a string or substring.
    Ans. __________

13. True or False. The BIT string operators are a) AND (&), b) OR (|), c) NOT (~),
    and d) concatenation (||).
    Ans. __________

14. True or False. The negation operator (-) has a higher precedence than exponentiation
    (**).
    Ans. __________

15. True or False. Sequences of operators of the same precedence are evaluated from left
    to right – except in the case of exponentiation (**) and division (/) which are
    evaluated from right to left.
    Ans. __________

16. What is the value of $2^{3^2}$?
    Ans. __________

17. True or False. The Boolean operator AND (&) is of higher precedence than OR (|).
    Ans. __________

18. Which of the following will give a different value from the other two expressions?
   a) $A/B/C$  b) $(A/B)/C$  c) $A/(B/C)$  Ans. __________

19. True or False. The following vector conversion function will result in the run-time
    formation of a single precision 3-vector: VECTOR(1)  Ans. __________

20. What keyword is used in the subscript of a vector or matrix conversion function to
    force a double precision result?  Ans. __________
21. True or False. In the MATRIX conversion function the matrix is initialized column by column.  
   Ans. __________

22. True or False. The repetition operator (#) can be used in VECTOR and MATRIX conversion functions just as it can in INITIAL or CONSTANT clauses.  
   Ans. __________

23. True or False. The expression MAT = 1; will result in a 3 by 3 single precision matrix with all 9 values set to 1. 
   DECLARE MAT MATRIX; 
   MAT = 1;  
   Ans. __________

24. True or False. In the assignment of vectors the lengths must match but precisions can be different. In the assignment of matrices, both left- and right-hand side matrices must have identical row and column sizes – precisions, however, need not match.  
   Ans. __________

25. True or False. In HAL/S, Scalars are converted to Integers by truncation.  
   Ans. __________

26. True or False. In a multiple assignment statement (L1, L2, L3 = R;) the individual assignments are performed in a left-to-right order.  
   Ans. __________

27. True or False. In an IF statement (IF exp THEN …) the “exp” may be either a BOOLEAN expression or a RELATIONAL expression. In either case the “exp” will only evaluate to the TRUE or FALSE state.  
   Ans. __________

28. True or False. An IF … THEN statement actually consists of two separate HAL/S statements even though only one semicolon is present.  
   Ans. __________

29. True or False. The following statement (with 3 statement labels) will compile. 
   KEY_IF: IF A < (I + J) THEN 
   ZERO_Q: Q = 0; 
   ELSE ZERO_R: R = 0;  
   Ans. __________

30. True or False. The ELSE clause of an IF statement can be another IF statement.  
   Ans. __________
31. True or False. The following code sequence will not compile:
   DECLARE BOOLEAN, B1 INITIAL(TRUE);
   DECLARE SCALAR INITIAL(2), S1, S2;
   IF B1 | S1 < S2 THEN
   S1 = S2;
   Ans. __________

32. Examples of ARITHMETIC operators are: **, /, *, +, …
   Examples of COMPARATIVE operators are: <, >, =, =, =, …
   Examples of LOGICAL/BIT operators are: &, |, ¬

   True or False. In a relational expression ARITHMETIC operators have higher
   precedence than COMPARATIVE operators, and the latter in turn have higher
   precedence than LOGICAL operators. 
   Ans. __________

33. True or False. There must be one and only one label on PROGRAM, COMPOOL,
   PROCEDURE, and FUNCTION header statements. 
   Ans. __________

34. True or False. Simple DO… END groups are frequently needed in demarcate the
   THEN and ELSE parts of an IF statement. The DO and END statements are
   considered executable statements, but usually very little code is generated for them
   (perhaps a branch/jump statement). 
   Ans. __________

35. Which is the BOOLEAN expression:
   a) IVAL <= I + J 
   b) MAT1 = MAT2 
   c) B1 & (B2 | ¬B3) 
   Ans. __________

36. True or False. The DO WHILE (condition) … END loop will execute at least
   once. Then, if the (condition) is false the loop will be terminated. 
   Ans. __________

37. True or False. As a rule RELATIONAL expressions produce faster, more efficient
   code than BOOLEAN expressions. 
   Ans. __________

38. True or False. The following code will compile successfully:
   BIG_LOOP: DO FOR I = 1 TO 5;
   … (omitted code) …
   BIG_LOOP: END; 
   Ans. __________

39. True or False. The only time the ‘*’ symbol is used to mean any form of
   multiplication is in the vector cross-product: V = W * Z; 
   Ans. __________