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MAIN FUNCTION FILE
%% A function to calculate: the percentage error and new error limit (15%)

%% Defining the primary function
function [percentage_error, new_error_limit] = measurementResults(R_val, Ac_val, Pc_val, r_err,
     ac_err, pc_err, Err_lim, n)
    % Calculating percentage error
    percentage_error = calculatePercentageError(R_val, Ac_val, Pc_val, r_err, ac_err, pc_err);

    % Calculating new error limit (15%)
    new_error_limit = calculateNewErrorLimit(R_val, Ac_val, Pc_val, Err_lim, n);
end

%% Local function to calculate the percentage error
function resultsPercentageError = calculatePercentageError(R_val, Ac_val, Pc_val, r_err, ac_err,
     pc_err)
    % Defining the symbolic variables and function
    syms R_sym Ac_sym Pc_sym
    L_sym = (R_sym * Ac_sym) / Pc_sym;

    % Differentiating L with respect to each variable
    DL_DR_sym = diff(L_sym, R_sym);
    DL_DAc_sym = diff(L_sym, Ac_sym);
    DL_DPc_sym = diff(L_sym, Pc_sym);

    % Substituting the actual values into L and its derivatives
    L = double(subs(L_sym, [R_sym, Ac_sym, Pc_sym], [R_val, Ac_val, Pc_val]));

    result_R = double(subs(DL_DR_sym, [R_sym, Ac_sym, Pc_sym], [R_val, Ac_val, Pc_val]));
    result_Ac = double(subs(DL_DAc_sym, [R_sym, Ac_sym, Pc_sym], [R_val, Ac_val, Pc_val]));
    result_Pc = double(subs(DL_DPc_sym, [R_sym, Ac_sym, Pc_sym], [R_val, Ac_val, Pc_val]));

    % Calculating allowable overall error N and percentage error
    N = result_R * r_err + result_Ac * ac_err + abs(result_Pc) * pc_err;
    resultsPercentageError = (N / L) * 100;
end

%% Local function to calculate new error limits (15%)
function resultsNewErrorLimit = calculateNewErrorLimit(R_val, Ac_val, Pc_val, Err_lim, n)
    % Recalculating L for new error limit calculation
    L = (R_val * Ac_val) / Pc_val;

    % Calculating new error limits
    R_0_15 = (Err_lim * L) / (result_R * n);
    Ac_0_15 = (Err_lim * L) / (result_Ac * n);
    Pc_0_15 = (Err_lim * L) / (result_Pc * n);
    resultsNewErrorLimit = [R_0_15, Ac_0_15, Pc_0_15];
end
```

FUNCTION CALL FILE

```
% Values
R_val = 90;
Ac_val = 7.85 * 10^-7;
Pc_val = 49 * 10^-8;

% Error margins
r_err = 9;
ac_err = 7.85 * 10^(-8);
pc_err = 4.9 * 10^(-8);

% 15% error limit
Err_lim = 0.15;
n = 3;

% Calling the function
[percentage_error, new_error_limit] = results(R_val, Ac_val, Pc_val, r_err, ac_err, pc_err, Err_lim,
     n);

% Displaying  the percentage error
disp(['Percentage error: ', num2str(percentage_error), '%']);

% Labels for new error limits
new_error_limit_labels = {'R', 'Ac', 'Pc'};

% Displaying the new error limits with labels and formatted values
disp('New error limits 15%:');
for i = 1:length(new_error_limit)
    fprintf('%s: %.10f\n', new_error_limit_labels{i}, new_error_limit(i));
end
```

OUTPUT

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Percentage error: 30%
New error limits 15%:
R: 4.5000000000
Ac: 0.0000000392
Pc: -0.0000000245
```