

9. Write a program in a script file that finds the smallest even integer that is divisible by 13 and by 16 whose square root is greater than 120. Use a loop in the program. The loop should start from 1 and stop when the number is found. The program prints the message “The required number is:” and then prints the number.
12. Write a program in a script file that determines the real roots of a quadratic equation $ax^2 + bx + c = 0$. Name the file `quadroots`. When the file runs, it asks the user to enter the values of the constants a , b , and c . To calculate the roots of the equation the program calculates the discriminant D , given by:

$$D = b^2 - 4ac$$

If $D > 0$, the program displays message “The equation has two roots,” and the roots are displayed in the next line.

If $D = 0$, the program displays message “The equation has one root,” and the root is displayed in the next line.

If $D < 0$, the program displays message “The equation has no real roots.”

Run the script file in the Command Window three times to obtain solutions to the following three equations:

(a) $3x^2 + 6x + 3 = 0$ (b) $-3x^2 + 4x - 6 = 0$ (c) $-3x^2 + 7x + 5 = 0$

22. A list of 30 exam scores is: 31, 70, 92, 5, 47, 88, 81, 73, 51, 76, 80, 90, 55, 23, 43, 98, 36, 87, 22, 61, 19, 69, 26, 82, 89, 99, 71, 59, 49, 64

Write a computer program that determines how many grades are between 0 and 19, between 20 and 39, between 40 and 59, between 60 and 79, and between 80 and 100. The results are displayed in the following form:

Grades between 0 and 19 2 students

Grades between 20 and 39 4 students

Grades between 40 and 59 6 students

and so on. (Hint: use the command `fprintf` to display the results.)

35. The overall grade in a course is determined from the grades of 6 quizzes, 3 midterms, and a final exam, using the following scheme:

Quizzes: Quizzes are graded on a scale from 0 to 10. The grade of the lowest quiz is dropped and the average of the 5 quizzes with the higher grades constitutes 30% of the course grade.

Midterms and final exam: Midterms and final exams are graded on a scale from 0 to 100. If the average of the midterm scores is higher than the score on the final exam, the average of the midterms constitutes 50% of the course grade and the grade of the final exam constitutes 20% of the course grade. If the final grade is higher than the average of the midterms, the average of the midterms constitutes 20% of the course grade and the grade of the final exam constitutes 50% of the course grade.

Write a computer program in a script file that determines the course grade for a student. The program first asks the user to enter the six quiz grades (in a vector), the three midterm grades (in a vector), and the grade of the final. Then the program calculates a numerical course grade (a number between 0 and 100). Finally, the program assigns a letter grade according to the following key: *A* for $\text{Grade} \geq 90$, *B* for $80 \leq \text{Grade} < 90$, *C* for $70 \leq \text{Grade} < 80$, *D* for $60 \leq \text{Grade} < 70$, and *E* for a grade lower than 60. Execute the program for the following cases:

- (a) Quiz grades: 6, 10, 6, 8, 7, 8. Midterm grades: 82, 95, 89. Final exam: 81.
 (b) Quiz grades: 9, 5, 8, 8, 7, 6. Midterm grades: 78, 82, 75. Final exam: 81.

3.14 *Piecewise functions* are sometimes useful when the relationship between a dependent and an independent variable cannot be adequately represented by a single equation. For example, the velocity of a rocket might be described by

$$v(t) = \begin{cases} 10t^2 - 5t & 0 \leq t \leq 8 \\ 624 - 5t & 8 \leq t \leq 16 \\ 36t + 12(t - 16)^2 & 16 \leq t \leq 26 \\ 2136e^{-0.1(t-26)} & t > 26 \\ 0 & \text{otherwise} \end{cases}$$

Develop an M-file function to compute v as a function of t . Then, develop a script that uses this function to generate a plot of v versus t for $t = -5$ to 50.

3.15 Develop an M-file function called `rounder` to round a number x to a specified number of decimal digits, n . The first line of the function should be set up as

```
function xr = rounder(x, n)
```

Test the program by rounding each of the following to 2 decimal digits: $x = 477.9587$, -477.9587 , 0.125 , 0.135 , -0.125 , and -0.135 .

8.6 Create a function called g that satisfies the following criteria:

$$\begin{array}{ll} \text{For } x < -\pi, & g(x) = -1 \\ \text{For } x \geq -\pi \text{ and } x \leq \pi, & g(x) = \cos(x) \\ \text{For } x > \pi, & g(x) = -1 \end{array}$$

Plot your results for values of x from -2π to $+2\pi$. Choose your spacing to create a smooth curve.

8.15 In order to have a closed geometric figure composed of straight lines (Figure P8.15), the angles in the figure must add to

$$(n - 2)(180 \text{ degrees})$$

where n is the number of sides.

(a) Prove this statement to yourself by creating a vector called n from 3 to 6 and calculating the angle sum from the formula. Compare what you know about geometry with your answer.

(b) Write a program that prompts the user to enter one of the following:

triangle
square
pentagon
hexagon

Use the input to define the value of n via a `switch/case` structure; then use n to calculate the sum of the interior angles in the figure.