Programming Projects

1. Ans:

```
# include <stdio.h>
# include <math.h>

double payment(double, double, int);

int main()
{
   int num_payments;
   double interest_rate, purchase_price, down_payment, amount_borrowed, monthly_payment;
   printf("Enter the purchase price=> ");
   scanf("%lf",&purchase_price);
   printf("Enter down payment=> ");
   scanf("%lf",&down_payment);
   printf("Enter the annual interest rate=> ");
   scanf("%lf",&interest_rate);
   printf("Enter the total number of payments=> ");
   scanf("%d",&num_payments);
   amount_borrowed = purchase_price - down_payment;
   monthly_payment = payment(amount_borrowed,interest_rate,num_payments);
   printf("Amount borrowed = $%.2f \nMonthly payment = $%.2f",amount_borrowed,monthly_payment);
   return 0;
}

double payment(double P, double annual_rate, int n)
{
   double i=annual_rate/1200.0;
   double installment;
   installment = i*P/(1-pow((1+i),-n));
   return installment;
}
```

O/P

Enter the purchase price=> 4300
Enter down payment=> 500
Enter the annual interest rate=> 7
Enter the total number of payments=> 36
Amount borrowed = $3800.00
Monthly payment = $117.33

2. Ans:

```
# include <stdio.h>

void triangle(void);
void rectangle(void);

int main()
{
   triangle();
   rectangle();
   printf("\n\n");
   triangle();
```

```
   rectangle();
   return 0;
}

void triangle(void)
{
   printf("  /\\ \n");
   printf(" /  \\ \n");
   printf("/    \\ \n");
   printf("------ \n");
}

void rectangle(void)
{
   printf("-------- \n");
   printf("|        | \n");
   printf("|        | \n");
   printf("-------- \n");
}
```

O/P

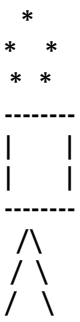
```
  /\
 /  \
/    \
------
--------
|      |
|      |
--------


  /\
 /  \
/    \
------
--------
|      |
|      |
--------
```

3. Ans:

```
# include <stdio.h>

void triangle(void);
void rectangle(void);
void draw_intersect(void);
void draw_circle(void);
void skip_5_lines(void);

int main()
{
   /*Rocket Ship*/
   triangle();
   rectangle();
   draw_intersect();
   skip_5_lines();
```

```
   draw_circle();
   rectangle();
   draw_intersect();
   skip_5_lines();
   draw_circle();
   triangle();
   draw_intersect();
   draw_circle();
   rectangle();
   draw_intersect();
   return 0;
}

void triangle(void)
{
   printf("  /\\ \n");
   printf(" /  \\ \n");
   printf("/    \\ \n");
   printf("------- \n");
}

void rectangle(void)
{
   printf("-------- \n");
   printf("|      | \n");
   printf("|      | \n");
   printf("-------- \n");
}

void draw_intersect(void)
{
   printf("  /\\ \n");
   printf(" /  \\ \n");
   printf("/    \\ \n");
}

void draw_circle(void)
{
   printf("   * \n");
   printf("*     * \n");
   printf(" *   * \n");
}

void skip_5_lines(void)
{
   printf("\n\n\n\n\n");
}
```

O/P



4. Ans:

```
# include <stdio.h>
# include <math.h>
# define PI 3.14159265
# define E 2.71828183
```

```
double factorial(int);

int main()
{
   int n;
   double result;
   printf("Enter the value of n=> ");
   scanf("%d",&n);
   result = factorial(n);
   printf("%d! equals approximately %.5f\n",n,result);
   return 0;
}

double factorial(int n)
{
   return (pow(n,n)*pow(E,-n)*sqrt((2*n + 1/3.0)*PI));
}
```

O/P

Enter the value of n=> 5
5! equals approximately 119.97003

5. Ans:

```
# include <stdio.h>
# include <math.h>

double round_num(double);
double scale(double x, int n);

int main()
{
   double num, result;
   printf("Enter the number=> ");
   scanf("%lf",&num);
   result = scale(round_num(scale(num,2)),-2);
   printf("%f is rounded to %.2f\n",num,result);
   return 0;
}

double round_num(double x)
{
   int rounded_x;
   rounded_x = (int)(x + 0.5);
   return (rounded_x);
}

double scale(double x, int n)
{
   double scale_factor;
   scale_factor = pow(10,n);
   return (x * scale_factor);
}
```

O/P

Enter the number=> 32.4851
32.485100 is rounded to 32.490000

6. Ans:

```
# include <stdio.h>

double speed_fps(int, double);
double speed_mps(int, double);

int main()
{
   int minutes;
   double seconds;
   printf("Enter the time in minutes and seconds => ");
   scanf("%d %lf",&minutes, &seconds);
   printf("After %d minutes and %.2f seconds,\nThe speed in FPS is %.2f f/s and\nThe speed in MPS is
%.2f m/s\n",minutes,seconds,speed_fps(minutes,seconds),speed_mps(minutes,seconds));
   return 0;
}

double speed_fps(int m, double s)
{
   double t, dist = 5280.0;
   t=60*m+s;
   return (dist/t);
}

double speed_mps(int m, double s)
{
   double t, dist = 5280.0*1000/3282.0;
   t=60*m+s;
   return (dist/t);
}
```

O/P

```
Enter the time in minutes and seconds => 3 52.83
After 3 minutes and 52.83 seconds,
The speed in FPS is 22.68 f/s and
The speed in MPS is 6.91 m/s

Enter the time in minutes and seconds => 3 59.83
After 3 minutes and 59.83 seconds,
The speed in FPS is 22.02 f/s and
The speed in MPS is 6.71 m/s

Enter the time in minutes and seconds => 4 0.03
After 4 minutes and 0.03 seconds,
The speed in FPS is 22.00 f/s and
The speed in MPS is 6.70 m/s

Enter the time in minutes and seconds => 4 16.22
After 4 minutes and 16.22 seconds,
The speed in FPS is 20.61 f/s and
The speed in MPS is 6.28 m/s
```

7. Ans:

```
# include <stdio.h>

double Total_cost(int, int, double);
```

```
int main()
{
   int initial_hcost, annual_fcost;
   double tax_rate;
   printf("Enter the initial house cost => ");
   scanf("%d",&initial_hcost);
   printf("Enter the annual fuel cost => ");
   scanf("%d",&annual_fcost);
   printf("Enter the tax rate => ");
   scanf("%lf",&tax_rate);
   printf("The total cost of a house after a 5 year period is
%.2f\n",Total_cost(initial_hcost,annual_fcost,tax_rate));
   return 0;
}

double Total_cost(int ihc, int afc, double r)
{
   return (ihc + 5.0*afc + 5.0*ihc*r);
}
```

O/P

Enter the initial house cost => 67000
Enter the annual fuel cost => 2300
Enter the tax rate => 0.025
The total cost of a house after a 5 year period is 86875.00

Enter the initial house cost => 62000
Enter the annual fuel cost => 2500
Enter the tax rate => 0.025
The total cost of a house after a 5 year period is 82250.00

Enter the initial house cost => 75000
Enter the annual fuel cost => 1850
Enter the tax rate => 0.020
The total cost of a house after a 5 year period is 91750.00

8. Ans:

```
# include <stdio.h>

double Acceleration(double, double, double);

int main()
{
   double initial_v, final_v, acc;
   printf("Enter the initial velocity => ");
   scanf("%lf",&initial_v);
   printf("Enter the final velocity => ");
   scanf("%lf",&final_v);
   acc = Acceleration(initial_v, final_v, 1/60.0);
   printf("The cyclist's constant rate of acceleration is %.2f mi/hr^2\n",acc);
   printf("The cyclist will take %.2f minutes to come to rest, given an initial speed of %.2f mi/hr\n",((0.0-
initial_v)/acc)*60.0,initial_v);
   return 0;
}

double Acceleration(double iv, double fv, double t)
```

```
{
   return ((fv - iv)/t);
}
```

O/P

Enter the initial velocity => 10
Enter the final velocity => 2.5
The cyclist's constant rate of acceleration is -450.00 mi/hr^2
The cyclist will take 1.33 minutes to come to rest, given an initial speed of 10.00 mi/hr

9. Ans:

```
# include <stdio.h>
# include <math.h>
# define PI 22/7.0

double Surface_area(double, double);

int main()
{
   int quantity;
   double radius, height, cost, area;
   printf("Enter the radius of the container (in cm) => ");
   scanf("%lf",&radius);
   printf("Enter the height of the container (in cm) => ");
   scanf("%lf",&height);
   printf("Enter the cost per square centimeter of the material => ");
   scanf("%lf",&cost);
   printf("Enter the number of containers to be produced => ");
   scanf("%d",&quantity);
   area = Surface_area(radius, height);
   printf("The cost of each container is %.2f\n",area*cost);
   printf("The total cost of producing all the containers is %.2f\n",area*cost*quantity);
   return 0;
}

double Surface_area(double r, double h)
{
   return (PI*pow(r,2) + 2*PI*r*h);
}
```

O/P

Enter the radius of the container (in cm) => 3
Enter the height of the container (in cm) => 7
Enter the cost per square centimeter of the material => 2
Enter the number of containers to be produced => 50
The cost of each container is 320.57
The total cost of producing all the containers is 16028.57

10. Ans:

```
# include <stdio.h>

double celsius_at_depth(double);
double fahrenheit(double);
```

```
int main()
{
   double depth, celsius, fah;
   printf("Enter the depth (in kilometers) inside the earth => ");
   scanf("%lf",&depth);
   celsius = celsius_at_depth(depth);
   fah = fahrenheit(celsius);
   printf("The temperature at %.2f km depth in degrees Celsius is %.2f\n",depth,celsius);
   printf("The temperature at %.2f km depth in degrees Fahrenheit is %.2f\n",depth,fah);
   return 0;
}

double celsius_at_depth(double d)
{
   return (10*d + 20);
}

double fahrenheit(double c)
{
   return (1.8*c + 32);
}
```

O/P

Enter the depth (in kilometers) inside the earth => 7
The temperature at 7.00 km depth in degrees Celsius is 90.00
The temperature at 7.00 km depth in degrees Fahrenheit is 194.00

11. Ans:

```
# include <stdio.h>
# include <math.h>

double speeds_ratio(int, int);

int main()
{
   int max_speed, min_speed;
   double ratio;
   printf("Enter the maximum speed in revolutions per minute => ");
   scanf("%d",&max_speed);
   printf("Enter the minimum speed in revolutions per minute => ");
   scanf("%d",&min_speed);
   ratio = speeds_ratio(max_speed,min_speed);
   printf("The ratio between successive speeds of a six-speed gearbox\nwith maximum speed %d rpm
and minimum speed %d\nrpm is %.2f\n",max_speed,min_speed,ratio);
   return 0;
}

double speeds_ratio(int M, int m)
{
   return (pow(M*1.0/m,1/5.0));
}
```

O/P

Enter the maximum speed in revolutions per minute => 52
Enter the minimum speed in revolutions per minute => 21
The ratio between successive speeds of a six-speed gearbox

with maximum speed 52 rpm and minimum speed 21
rpm is 1.20

12. Ans:

```
# include <stdio.h>
# include <math.h>

double speed_sound(double);

int main()
{
   double temperature, speed;
   printf("Enter the temperature (in Fahrenheit) => ");
   scanf("%lf",&temperature);
   speed = speed_sound(temperature);
   printf("The speed of sound in air at temperature %.2f Fahrenheit is %.2f ft/sec\n",temperature,speed);
   return 0;
}

double speed_sound(double t)
{
   return (1086.0*sqrt((5*t + 297)/247.0));
}
```

O/P

Enter the temperature (in Fahrenheit) => 97
The speed of sound in air at temperature 97.00 Fahrenheit is 1932.35 ft/sec

13. Ans:

```
# include <stdio.h>

double population(int);

int main()
{
   int year;
   double pop;
   printf("Enter a year after 1990> ");
   scanf("%d",&year);
   pop = population(year);
   printf("Predicted Gotham City population for %d (in thousands): %.3f\n",year,pop);
   return 0;
}

double population(int y)
{
   int t;
   t = y - 1990;
   return (52.966 + 2.184 * t);
}
```

O/P

Enter a year after 1990> 2015
Predicted Gotham City population for 2015 (in thousands): 107.566