SOLUTIONS MANUAL

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An Introduction to Programming with C++: Fifth Edition
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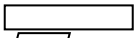
Chapter 2 Answers

CONCEPT LESSON

QUESTIONS

1. b analyze the problem
2. b output
3. a input
4. b output
5. b IPO charts
6. a input
7. b entering the input items into the computer
8. c Processing
9. c both *what* is to be calculated and *how* to calculate it
10. c entering the input items, then processing the input items, and then displaying, printing, or storing the output items
11. d pseudocode
12. a Flowcharts
13. c process
14. a input/output
15. d 
16. c 
17. b 
18. c desk-check the algorithm
19. d all of the above

EXERCISES – PENCIL AND PAPER

1.

Input	Processing	Output
original number	Processing items: none Algorithm: 1. enter original number 2. calculate the squared value by multiplying the original number by itself 3. display the squared value	squared value

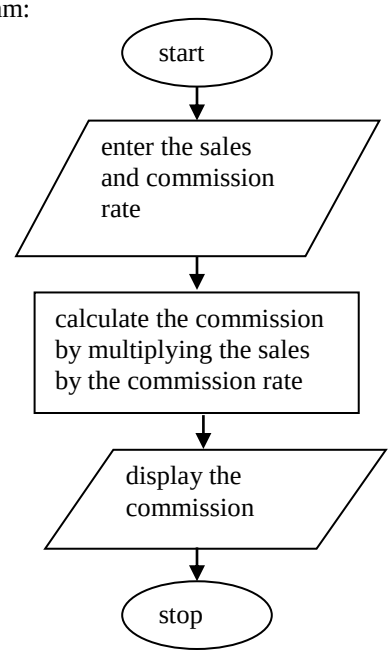
original number	squared value
~~4~~	~~16~~
6	36

2.

Input	Processing	Output
state1 sales state2 sales commission rate	Processing items: none Algorithm: 1. enter state1 sales, state2 sales, and commission rate 2. calculate the total commission by adding the state1 sales to the state2 sales, and then multiplying the result by the commission rate 3. display the total commission	total commission

state1 sales	state2 sales	commission rate	total commission
~~1000~~	~~2000~~	~~.05~~	~~150~~
3000	2500	.06	330

3.

Input	Processing	Output
sales commission rate	Processing items: none Algorithm:  	commission

sales	commission rate	commission
~~2000~~ 5000	~~.1~~ .06	~~200~~ 300

4.

Input	Processing	Output
region1 sales region2 sales region3 sales region1 increase region2 increase region3 increase	Processing items: none Algorithm: 1. enter the region1 sales, region2 sales, region3 sales, region1 increase, region2 increase, and region3 increase 2. calculate the region1 projected sales by multiplying the region1 sales by the region1 increase 3. calculate the region2 projected sales by multiplying the region2 sales by the region2 increase 4. calculate the region3 projected sales by multiplying the region3 sales by the region3 increase 5. display the region1 projected sales, region2 projected sales, and region3 projected sales	region1 projected sales region2 projected sales region3 projected sales

region1 sales	region2 sales	region3 sales	region1 increase	region2 increase	region3 increase	region1 projected sales	region2 projected sales	region3 projected sales
~~10000~~ 5000	~~3000~~ 2000	~~6000~~ 1000	~~.1~~ .02	~~.09~~ .03	~~.1~~ .02	~~11000~~ 5100	~~3270~~ 2060	~~6600~~ 1020

5.

Input	Processing	Output
original number	Processing items: none Algorithm: 1. enter original number 2. if the original number is less than or equal to zero display an error message otherwise calculate the squared value by multiplying the original number by itself display the squared value	squared value

original number	squared value
~~10~~ -3	100

6. Results of desk-checking the incorrect algorithm.

beginning inventory	amount sold	amount returned	ending inventory
50	10	2	58

Changes made to the original algorithm are shaded in the IPO chart.

Input	**Processing**	**Output**
beginning inventory amount sold amount returned	Processing items: none Algorithm: 1. enter the beginning inventory, amount sold, and amount returned 2. calculate the ending inventory by subtracting the amount sold from the beginning inventory, then adding the amount returned to the result 3. display the ending inventory	ending inventory

Results of desk-checking the correct algorithm.

beginning inventory	amount sold	amount returned	ending inventory
50	10	2	42

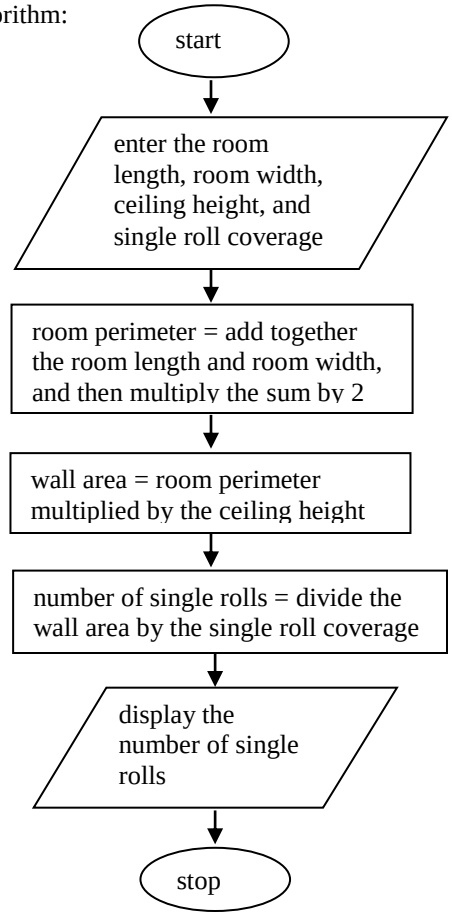
7. Changes made to the original algorithm are shaded in the IPO chart.

Input	**Processing**	**Output**
hours worked rate of pay	Processing items: none Algorithm: 1. enter the hours worked and rate of pay 2. calculate the gross pay by multiplying the hours worked by the rate of pay 3. display the gross pay	gross pay

APPLICATION LESSON

EXERCISES – COMPUTER

1.

Input	Processing	Output
room length room width ceiling height single roll coverage	Processing items: room perimeter wall area Algorithm:  	number of single rolls

2.

Input	Processing	Output
beginning balance monthly deposits monthly withdrawals	Processing items: none Algorithm: 1. enter the beginning balance, monthly deposits, and monthly withdrawals 2. calculate the ending balance by adding the monthly deposits to the beginning balance, and then subtracting the monthly withdrawals from the result 3. display the ending balance	ending balance

beginning balance	monthly deposits	monthly withdrawals	ending balance
~~2000~~ 500	~~775~~ 100	~~1200~~ 610	~~1575~~ -10

3.

Input	Processing	Output
first number second number third number	Processing items: none Algorithm: 1. enter the first number, second number, and third number 2. calculate the average by adding together the first number, second number, and third number, and then dividing the sum by 3 3. display the average	average

first number	second number	third number	average
~~25~~ 10	~~76~~ 15	~~33~~ 20	~~44.6666~~ 15

4.

Input	Processing	Output
original price discount rate	Processing items: none Algorithm: 1. enter original price and discount rate 2. calculate the sales discount by multiplying the original price by the discount rate 3. calculate the new price by subtracting the sales discount from the original price 4. display the sales discount and the new price	sales discount new price

original price	discount rate	sales discount	new price
~~100~~ 50	~~.25~~ .1	~~25~~ 5	~~75~~ 45

5.

Input	Processing	Output
number of envelopes number of pages charge per envelope charge per page	Processing items: total envelope charge total page charge Algorithm: 1. enter the number of envelopes, number of pages, charge per envelope, and charge per page 2. calculate the total envelope charge by multiplying the number of envelopes by the charge per envelope 3. calculate the total page charge by multiplying the number of pages by the charge per page 4. calculate the total due by adding the total envelope charge to the total page charge 5. display the total due	total due

number of envelopes	number of pages	charge per envelope	charge per page	total envelope charge	total page charge	total due
~~100~~ 10	~~100~~ 15	~~.10~~ .20	~~.25~~ .30	~~10~~ 2	~~25~~ 4.50	~~35~~ 6.50

6.

Input	Processing	Output
first seminar attendees second seminar attendees seminar price	Processing items: none Algorithm: 1. enter the first seminar attendees, second seminar attendees, and seminar price 2. calculate the total attendees by adding together the first seminar attendees and the second seminar attendees 3. calculate the cost by multiplying the total attendees by the seminar price 4. display the total attendees and the cost	total attendees cost

first seminar attendees	second seminar attendees	seminar price	total attendees	cost
~~10~~ 30	~~10~~ 10	~~200~~ 100	~~20~~ 40	~~4000~~ 4000

7.

Input	Processing	Output
hours worked hourly pay rate FWT rate FICA rate state rate	Processing items: total taxes Algorithm: 1. enter the hours worked, hourly pay rate, FWT rate, FICA rate, and state rate 2. calculate the gross pay by multiplying the hours worked by the hourly pay rate 3. calculate the FWT by multiplying the gross pay by the FWT rate 4. calculate the FICA by multiplying the gross pay by the FICA rate 5. calculate the state tax by multiplying the gross pay by the state rate 6. calculate the total taxes by adding together the FWT, FICA, and state tax 7. calculate the net pay by subtracting the total taxes from the gross pay 8. display the gross pay, FWT, FICA, state tax, and net pay	gross pay FWT FICA state tax net pay

hours worked	hourly pay rate	FWT rate	FICA rate	state rate	total taxes	gross pay	FWT	FICA	state tax	net pay
~~20~~ 30	~~6~~ 10	~~.2~~ .2	~~.08~~ .08	~~.02~~ .04	~~36~~ 96	~~120~~ 300	~~24~~ 60	~~9.60~~ 24	~~2.40~~ 12	~~84~~ 204

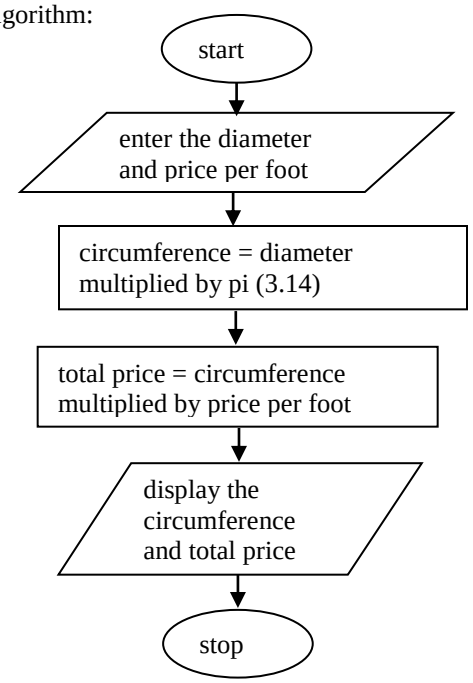
8.

Input	Processing	Output
side1 side2 side3 side4	Processing items: none Algorithm: 1. enter side1, side2, side3, and side4 2. calculate the perimeter by adding together side1, side2, side3, and side4 3. display the perimeter	perimeter

The desk-check data may vary.

side1	side2	side3	side4	perimeter
~~10~~ 20	~~6~~ 10	~~5~~ 15	~~8~~ 20	~~29~~ 65

9.

Input	**Processing**	**Output**
diameter price per foot	Processing items: none Algorithm:  	circumference total price

The desk-check data may vary.

diameter	price per foot	circumference	total price
~~35~~ 7	~~2~~ 3	~~109.90~~ 21.98	~~219.80~~ 65.94

10.

Input	Processing	Output
length in feet width in feet price per square foot of tile	Processing items: none Algorithm: 1. enter the length in feet, width in feet, and price per square foot of tile 2. calculate the area by multiplying the length in feet by the width in feet 3. calculate the total price by multiplying the area by the price per square foot of tile 4. display the area and total price	area total price

The desk-check data may vary.

length in feet	width in feet	price per square foot of tile	area	total price
~~10~~ 20	~~6~~ 10	~~5~~ 3	~~60~~ 200	~~300~~ 600

11.

Input	Processing	Output
length in feet width in feet height in feet	Processing items: none Algorithm: 1. enter the length in feet, width in feet, and height in feet 2. calculate the volume by multiplying the length in feet by the width in feet, and then multiplying the result by the height in feet 3. display the volume	volume

The desk-check data may vary.

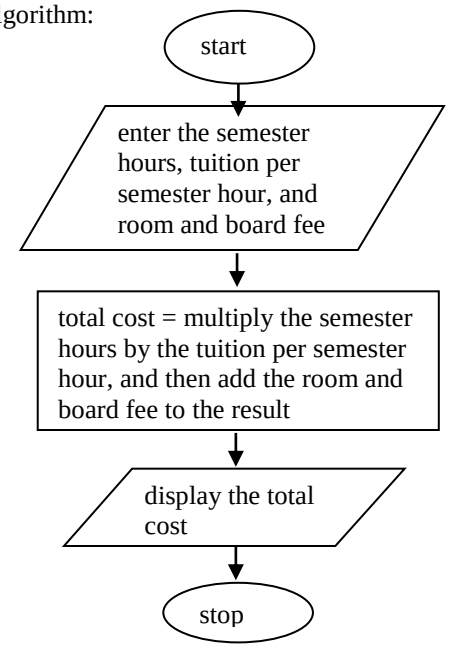
length in feet	width in feet	height in feet	volume
~~100~~ 2	~~30~~ 3	~~3~~ 4	~~9000~~ 24

12.

Input	Processing	Output
current pay1 current pay2 current pay3 raise rate	Processing items: none Algorithm: 1. enter the current pay1, current pay2, current pay3, and raise rate 2. calculate the new pay1 by multiplying the current pay1 by the raise rate, and then adding the result to the current pay1 3. calculate the new pay2 by multiplying the current pay2 by the raise rate, and then adding the result to the current pay2 4. calculate the new pay3 by multiplying the current pay3 by the raise rate, and then adding the result to the current pay3 5. display the new pay1, new pay2, and new pay3	new pay1 new pay2 new pay3

current pay1	current pay2	current pay3	raise rate	new pay1	new pay2	new pay3
~~7.55~~ 8.00	~~10.00~~ 6.50	~~10.30~~ 7.25	~~.02~~ .02	~~7.70~~ 8.16	~~10.20~~ 6.63	~~10.51~~ 7.40

13.

Input	Processing	Output
semester hours tuition per semester hour room and board fee	Processing items: none Algorithm:  	total cost

semester hours	tuition per semester hour	room and board fee	total cost
~~20~~ 14	~~100~~ 100	~~3000~~ 3000	~~5000~~ 4400

14.

Input	Processing	Output
hours worked hourly pay rate	Processing items: overtime pay Algorithm: 1. enter the hours worked and hourly pay rate 2. if the hours worked is greater than 40 calculate the overtime pay as follows: first subtract 40 from the hours worked, then multiply the result by the hourly pay rate divided by 2 calculate the gross pay by multiplying the hours worked by the hourly pay rate, and then adding the overtime pay to the result otherwise calculate the gross pay by multiplying the hours worked by the hourly pay rate 3. display the gross pay	gross pay

hours worked	hourly pay rate	overtime pay	gross pay
~~20~~ 43	~~6~~ 10	 45	~~120~~ 445

15. Changes to the original algorithm are shaded in the figure.

Input	**Processing**	**Output**
number	Processing items: none Algorithm: 1. enter the number 2. calculate the cube of the number by multiplying the number by itself three times 3. display the cube of the number	cube of the number

number	cube of the number
4	64

16.

Input	**Processing**	**Output**
original price discount rate	Processing items: none Algorithm: 1. enter the original price and the discount rate 2. calculate the discount by multiplying the original price by the discount rate 3. calculate the sale price by subtracting the discount from the original price 4. display the discount and the sale price	discount sale price

original price	discount rate	discount	sale price
100	.25	25	75