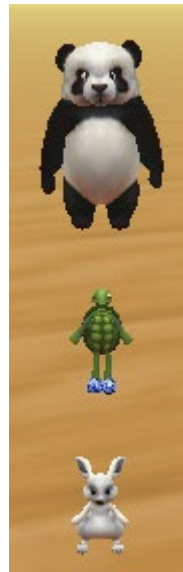


CompSci 94

Review: Sample Exam Questions

November 11, 2021



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Today is all about practicing writing code

- Write the code on paper, like you will do on the exam

Problem 1a Procedure (Rewritten Spring 18 Quest 11)

declare procedure **mystery**

with parameters: WholeNumber \Rightarrow num1 , WholeNumber \Rightarrow num2 , WholeNumber \Rightarrow num3

do in order

if $\{ \text{num1} \leq \text{num2} \}$ is true then

$\{ \text{this} \}$ say "number is 5" add detail

else

if $\{ \text{EITHER } \{ \text{num1} > \text{num3} \} \text{ OR } \{ \text{num1} > \text{num2} \} \}$ is true then

$\{ \text{this} \}$ say "number is 6" add detail

else

$\{ \text{this} \}$ say "number is 8" add detail

What happens when this code runs?

$\{ \text{this.panda} \}$ **mystery** num1: \Rightarrow 3 , num2: \Rightarrow 2 , num3: \Rightarrow 1

Problem 1a Procedure (Rewritten Spring 18 Quest 11)

```
declare procedure mystery  
with parameters: WholeNumber  $\Rightarrow$  num1 , WholeNumber  $\Rightarrow$  num2 , WholeNumber  $\Rightarrow$  num3  
do in order  
  if  $\{ \text{num1} \leq \text{num2} \}$  is true then  
    this say "number is 5" add detail  
  else  
    if  $\{ \text{EITHER } \{ \text{num1} > \text{num3} \} \text{ OR } \{ \text{num1} > \text{num2} \} \}$  is true then  
      this say "number is 6" add detail  
    else  
      this say "number is 8" add detail
```

What happens when this code runs?

```
this.panda mystery num1: 3 , num2: 2 , num3: 1
```

Panda says number is 6

Problem 1b Procedure (Rewritten Spring 18 Quest 11)

```
declare procedure mystery  
with parameters: WholeNumber  $\Rightarrow$  num1 , WholeNumber  $\Rightarrow$  num2 , WholeNumber  $\Rightarrow$  num3  
do in order  
  if  $\{ \text{num1} \leq 2 \}$  is true then  
    this say "number is 5" add detail  
  else  
    if  $\{ \text{EITHER } \{ \text{num1} > \text{num3} \} \text{ OR } \{ \text{num1} > \text{num2} \} \}$  is true then  
      this say "number is 6" add detail  
    else  
      this say "number is 8" add detail
```

What happens when this code runs?

```
this.panda mystery num1: 6 , num2: 6 , num3: 8
```

Problem 1b Procedure (Rewritten Spring 18 Quest 11)

declare procedure **mystery**

with parameters: WholeNumber \Rightarrow num1 , WholeNumber \Rightarrow num2 , WholeNumber \Rightarrow num3

do in order

if $\{ \text{num1} \leq \text{num2} \}$ is true then

this say "number is 5" add detail

else

if $\{ \text{EITHER } \{ \text{num1} > \text{num3} \} \text{ OR } \{ \text{num1} > \text{num2} \} \}$ is true then

this say "number is 6" add detail

else

this say "number is 8" add detail

What happens when this code runs?

this.panda **mystery** num1: \Rightarrow 6 , num2: \Rightarrow 6 , num3: \Rightarrow 8

Panda says number is 8

Problem 1c Procedure (Rewritten Spring 18 Quest 11)

declare procedure **mystery**

with parameters: WholeNumber \Rightarrow num1 , WholeNumber \Rightarrow num2 , WholeNumber \Rightarrow num3

do in order

if $\{ \text{num1} \leq \text{num2} \}$ is true then

this say "number is 5" add detail

else

if $\{ \text{EITHER } \{ \text{num1} > \text{num3} \} \text{ OR } \{ \text{num1} > \text{num2} \} \}$ is true then

this say "number is 6" add detail

else

this say "number is 8" add detail

What happens when this code runs?

this.panda mystery num1: \Rightarrow 0 , num2: \Rightarrow 1 , num3: \Rightarrow 3

Problem 1c Procedure (Rewritten Spring 18 Quest 11)

```
declare procedure mystery  
with parameters: WholeNumber  $\Rightarrow$  num1 , WholeNumber  $\Rightarrow$  num2 , WholeNumber  $\Rightarrow$  num3  
do in order  
  if  $\{ \text{num1} \leq \text{num2} \}$  is true then  
    this say "number is 5" add detail  
  else  
    if  $\{ \text{EITHER } \{ \text{num1} > \text{num3} \} \text{ OR } \{ \text{num1} > \text{num2} \} \}$  is true then  
      this say "number is 6" add detail  
    else  
      this say "number is 8" add detail
```

What happens when this code runs?

```
this.panda mystery num1: 0 , num2: 1 , num3: 3
```

Panda says number is 5

Problem 1d Procedure (Rewritten Spring 18 Quest 11)

```
declare procedure mystery  
with parameters: WholeNumber  $\Rightarrow$  num1 , WholeNumber  $\Rightarrow$  num2 , WholeNumber  $\Rightarrow$  num3  
do in order  
  if  $\{ \text{num1} \leq \text{num2} \}$  is true then  
    this say "number is 5" add detail  
  else  
    if  $\{ \text{EITHER } \{ \text{num1} > \text{num3} \} \text{ OR } \{ \text{num1} > \text{num2} \} \}$  is true then  
      this say "number is 6" add detail  
    else  
      this say "number is 8" add detail
```

What happens when this code runs?

```
this.panda mystery num1:  $\Rightarrow$ 7 , num2:  $\Rightarrow$ 9 , num3:  $\Rightarrow$ 3
```

Problem 1d Procedure (Rewritten Spring 18 Quest 11)

declare procedure **mystery**

with parameters: WholeNumber \Rightarrow num1 , WholeNumber \Rightarrow num2 , WholeNumber \Rightarrow num3

do in order

if $\{ \text{num1} \leq \text{num2} \}$ is true then

this say "number is 5" add detail

else

if $\{ \text{EITHER } \{ \text{num1} > \text{num3} \} \text{ OR } \{ \text{num1} > \text{num2} \} \}$ is true then

this say "number is 6" add detail

else

this say "number is 8" add detail

What happens when this code runs?

this.panda **mystery** num1: \Rightarrow 7 , num2: \Rightarrow 9 , num3: \Rightarrow 3

Panda says number is 6

Problem 2a (rewrite Fall 2018 Question 12)

declare procedure **mystery2**

with parameters:

DecimalNumber

value

DecimalNumber

amount

Add Parameter...

do in order

if EITHER value \geq 3.0 OR amount $<$ 1.0 is true then

if value $>$ amount is true then

this say "1" add detail

else

this say "2" add detail

else

if BOTH value $>$ 2.0 AND value $>$ amount is true then

this say "3" add detail

else

this say "4" add detail

What happens?

Panda says:

this.panda

mystery2

value: 1.5

, amount: 2.5

Problem 2a (rewrite Fall 2018 Question 12)

declare procedure **mystery2**

with parameters:

DecimalNumber

value

DecimalNumber

amount

Add Parameter...

do in order

if EITHER value \geq 3.0 OR amount $<$ 1.0 is true then

if value $>$ amount is true then

this say "1" add detail

else

this say "2" add detail

else

if BOTH value $>$ 2.0 AND value $>$ amount is true then

this say "3" add detail

else

this say "4" add detail

What happens?

Panda says: 4

this.panda

mystery2

value: 1.5

amount: 2.5

Problem 2b (rewrite Fall 2018 Question 12)

declare procedure **mystery2**

with parameters:

DecimalNumber

value

DecimalNumber

amount

Add Parameter...

do in order

if EITHER $\text{value} \geq 3.0$ OR $\text{amount} < 1.0$ is true then

if $\text{value} > \text{amount}$ is true then

this say "1" add detail

else

this say "2" add detail

else

if BOTH $\text{value} > 2.0$ AND $\text{value} > \text{amount}$ is true then

this say "3" add detail

else

this say "4" add detail

What happens?

Panda says:

this.panda

mystery2

value: 2.5

, amount: 2.0

Problem 2b (rewrite Fall 2018 Question 12)

declare procedure **mystery2**

with parameters:

DecimalNumber

value

DecimalNumber

amount

Add Parameter...

do in order

if EITHER value \geq 3.0 OR amount $<$ 1.0 is true then

if value $>$ amount is true then

this say "1" add detail

else

this say "2" add detail

else

if BOTH value $>$ 2.0 AND value $>$ amount is true then

this say "3" add detail

else

this say "4" add detail

What happens?

Panda says: 3

this.panda mystery2 value: 2.5 , amount: 2.0

Problem 2c (rewrite Fall 2018 Question 12)

declare procedure **mystery2**

with parameters:

DecimalNumber

value

DecimalNumber

amount

Add Parameter...

do in order

if EITHER value \geq 3.0 OR amount $<$ 1.0 is true then

if value $>$ amount is true then

this say "1" add detail

else

this say "2" add detail

else

if BOTH value $>$ 2.0 AND value $>$ amount is true then

this say "3" add detail

else

this say "4" add detail

What happens?

Panda says:

this.panda mystery2 value: 2.0 , amount: 0.5

Problem 2c (rewrite Fall 2018 Question 12)

declare procedure **mystery2**

with parameters:

DecimalNumber

value

DecimalNumber

amount

Add Parameter...

do in order

if EITHER value \geq 3.0 OR amount $<$ 1.0 is true then

if value $>$ amount is true then

this say "1" add detail

else

this say "2" add detail

else

if BOTH value $>$ 2.0 AND value $>$ amount is true then

this say "3" add detail

else

this say "4" add detail

What happens?

Panda says: 1

this.panda mystery2 value: 2.0 , amount: 0.5

Problem 3a:

Write **Tortoise Procedure paintFriend**

- This procedure has **two parameters**
 - One parameter of type **Biped** named **friend**
 - One parameter of type **Paint** named **somePaint**

The tortoise and friend turn to face each other. Then the tortoise moves stopping about 0.5 units in front of the friend. Then if the tortoise is taller than the friend, the friend is painted red. Otherwise the friend is painted the color of somePaint.

Write the procedure paintFriend



The screenshot shows a programming IDE interface. At the top, there is a dark purple header bar with a yellow hexagon icon on the left. Below the header, there are two tabs: "Scene" and "Tortoise". The "Tortoise" tab is active and contains the text "paintFriend ✕". Below the tabs, there is a light blue area containing the text "declare procedure paintFriend with parameters:". To the right of this text are four yellow hexagonal buttons: "Biped", "friend", "Paint", and "somePaint". To the right of these buttons is a button labeled "Add Paramete".

A solution

The image shows a Scratch code editor window with the following structure:

- Project Name: Scene
- Object: Tortoise
- Procedure Name: paintFriend
- Parameters: Biped (friend), Paint (somePaint)
- Code Blocks:
 - do in order
 - do together
 - this turnToFace friend add detail
 - friend turnToFace this add detail
 - this move FORWARD, this getDistanceInFrontOf friend add detail - 0.5
 - if this getHeight > friend getHeight is true then
 - friend setPaint RED add detail
 - else
 - friend setPaint somePaint add detail

Another Solution

Move forward is different.

The if statement is different.

```
declare procedure paintFriend with parameters: Biped friend, Paint somePaint Add Parameter...  
do in order  
  do in order  
    do together  
      this turnToFace friend add detail  
      friend turnToFace this add detail  
    this move FORWARD, (this getDistanceTo friend) - (friend getDepth / 2.0) - (this getDepth / 2.0) - 0.5  
  if (friend getHeight > this getHeight) is true then  
    friend setPaint somePaint add detail  
  else  
    friend setPaint RED add detail
```

3B) Calling tortoise paintFriend procedure

- Give the call for when the tortoise and pig are to turn and face each other, the tortoise moves over to about half a unit in front of the pig, and then if the tortoise is taller than the pig, then the pig is painted red, otherwise the pig is painted purple.

3B) Calling tortoise paintFriend procedure

- Give the call for when the tortoise and pig are to turn and face each other, the tortoise moves over to about unit in front of the pig, and then if the tortoise is taller than the pig, then the pig is painted red, otherwise the pig is painted purple.

```
this.tortoise paintFriend friend: this.pig , somePaint: PURPLE
```

3C) Calling tortoise paintFriend procedure

- Give the call for when the tortoise and bunny are to turn and face each other, the tortoise moves over to about a half a unit in front of the bunny, and then if the tortoise is taller than the bunny, then the bunny is painted red, otherwise the bunny is painted blue.

3C) Calling tortoise paintFriend procedure

- Give the call for when the tortoise and bunny are to turn and face each other, the tortoise moves over to about unit in front of the bunny, and then if the tortoise is taller than the bunny, then the bunny is painted red, otherwise the bunny is painted blue.

```
this.tortoise paintFriend friend: this.bunny , somePaint: BLUE
```

Problem 4 (Spring 2018 Exam 1 Question 14)

- Assume there are three objects in an Alice world, a panda, a bunny and a tortoise, and they are floating in the air, one on top of another. Complete the following panda function called `creatureAbove` that has two STurnable parameters, one named `friend1`, and one named `friend2`. This function returns the STurnable object that is highest in the air (panda or friend1 or friend2).

- Here are two possible scenarios. On the left the panda is above tortoise, who is above bunny. On the right the tortoise is above bunny who is above panda. There are other possibilities for the order of the three of them.



Write the function creatureAbove

```
declare SJointedModel function creatureAbove  
with parameters: SJointedModel friend1 , SJointedModel friend2
```

Write the function creatureAbove

The image shows a Scratch code editor window with the following content:

```
declare SJointedModel function creatureAbove  
with parameters: SJointedModel friend1 , SJointedModel friend2 Add Parameter...  
do in order  
  if BOTH friend1 isAbove this add detail AND friend2 isAbove this  
    if friend1 isAbove friend2 add detail is true then  
      return friend1  
    else  
      return friend2  
  else  
    if friend2 isAbove this add detail is true then  
      return friend2  
    else  
      if friend1 isAbove this add detail is true then  
        return friend1  
      else  
        drop statement here  
  return this
```

The code is written in a block-based style using Scratch's visual programming language. It defines a function named `creatureAbove` that takes two parameters, `friend1` and `friend2`, both of type `SJointedModel`. The function's logic is as follows:

- It starts with a `do in order` block.
- The first block is an `if` statement with a `BOTH` condition. The condition is `friend1 isAbove this add detail AND friend2 isAbove this`.
 - If this condition is true, it enters an inner `if` block with the condition `friend1 isAbove friend2 add detail is true`.
 - If true, it returns `friend1`.
 - Otherwise, it returns `friend2`.
 - Otherwise, it enters another inner `if` block with the condition `friend2 isAbove this add detail is true`.
 - If true, it returns `friend2`.
 - Otherwise, it enters a third inner `if` block with the condition `friend1 isAbove this add detail is true`.
 - If true, it returns `friend1`.
 - Otherwise, it has a dashed box labeled "drop statement here".- Finally, it returns `this`.

Problem 8 (Exam 2 Spring 2018)

- Consider an Alice world with one eagle and an array of penguins named penguins. The penguins in the array have three different heights. The penguins are either small (around 0.40 in height), medium (around .65 in height) or large (around 1.10 in height).



- Write the Scene function `NumberInHeightRange` that has two parameters. The first one is a `DecimalNumber` named `minRange`, and the second one is a `DecimalNumber` named `maxRange`. This function should return the number of penguins whose height is in the range from `minRange` to `maxRange` inclusive.

Write function

```
declare WholeNumber function NumberInRange  
with parameters: DecimalNumber minRange , DecimalNumber maxRange
```

Write function

```
declare WholeNumber function NumberInHeightRange  
with parameters: DecimalNumber minRange , DecimalNumber maxRange
```

```
WholeNumber count = 0  
for each Flyer someOne in penguins  
  if someOne getHeight >= minRange  
    if someOne getHeight <= maxRange is true  
      count = count + 1  
loop  
return count
```