Unit 1 Quiz 2: Algorithms and Flowcharts – SOLUTION

Binary search for the name: "**Bond**"

	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
a)	*s*				***m***					*e*

	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
b)	*s*	***m***		*e*						

	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
c)			*s*, ***m***	*e*						

	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
d)		*e*	*s*							

Binary search for the name: "**Bane**" **(7)**

	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
a)	*s*				***m***					*e*

	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
b)	*s*	***m***		*e*						

	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
c)	*s*,***m***,*e*									

	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
d)	*e*	*s*								

Binary search for the name: "**Goodman**"

	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
a)	*s*				***m***					*e*

	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
b)						*s*		***m***		*e*

	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
c)						*s*, ***m***	*e*			

	Azikewe	Bloom	Byrne	Davidson	Gateri	Hinton	Jackson	Linton	Smith	Wall
d)					*e*	*s*				

h) How many times does the algorithm need to compare two names before exiting if the list was searched for the name "Bond", "Bane", "Goodman"? ***(All answers the same)*** ***3***

One for each of a, b, c, d, e, so a total of 5 points.

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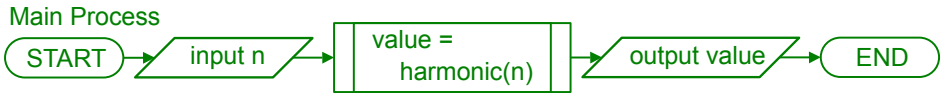
2. The ***harmonic series*** in general form is given by:

$$\sum_{x=1}^{\infty} = 1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\ldots$$

```
// Main program
RECEIVE n FROM KEYBOARD
SET value TO harmonic(n)
SEND value TO DISPLAY
```

a) Draw a flowchart for the main program given above. **(4)**

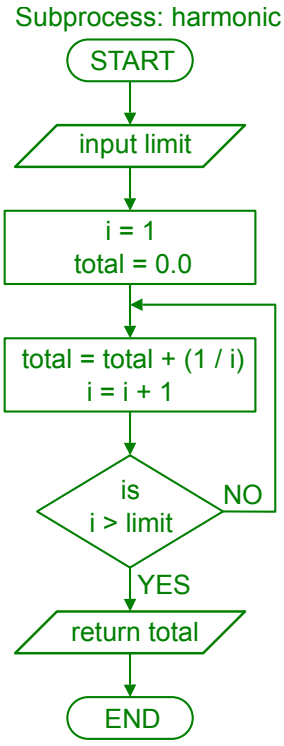


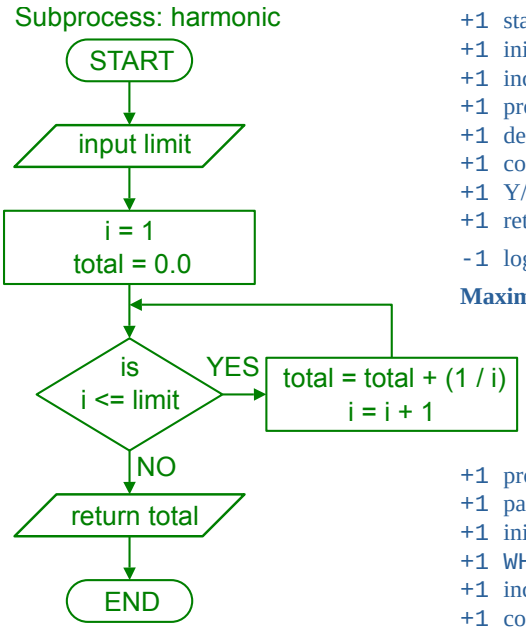
`+1` start, input `n` `+1` set value to function `-1` error other than above
`+1` subprocess block `+1` output value and end **Maximum: 4 points**

b) Develop an algorithm that calculates the *harmonic series* up to **`1/n`**.

i) Represent the algorithm as a flowchart subprocess. **(8)**

ii) Represent the algorithm as a Pearson pseudocode function. **(8)**





`+1` start, input `limit`
`+1` initialize `i`, `total`
`+1` increment `i`
`+1` proper formula for `total`
`+1` decision block → iteration
`+1` correct condition in decision block
`+1` Y/N correct
`+1` return total and end
`-1` logic error other than above
Maximum: 8 points

`+1` proper function declaration, `BEGIN`
`+1` parameter to function
`+1` initialize `i`, `total`
`+1` `WHILE` or `REPEAT`
`+1` increment counter
`+1` correct loop condition
`+1` `END WHILE`, `END FUNCTION`
`+1` return calculated value
`-1` other error not specified above
Maximum: 8 points

```
FUNCTION harmonic(limit)
BEGIN FUNCTION
    total = 0.0
    i = 1
    REPEAT
        total = total + 1 / I
        i = i + 1
    UNTIL i > limit
    RETURN total
END FUNCTION
```

```
FUNCTION harmonic(limit)
BEGIN FUNCTION
    total = 0.0
    i = 1
    WHILE i <= limit DO
        total = total + 1 / I
        i = i + 1
    END WHILE
    RETURN total
END FUNCTION
```

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3. Complete the stages of the ***bubble sort*** algorithm in order to sort the numbers in the diagram below. For each stage, show when two elements are swapped with an X, as shown between the first rows, or compared and not swapped with two vertical bars (| |).