





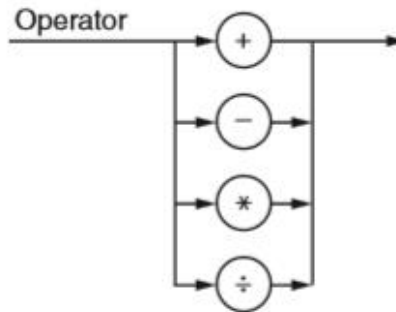
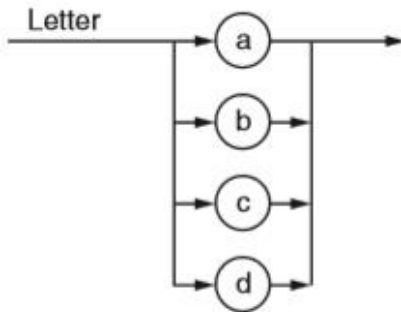
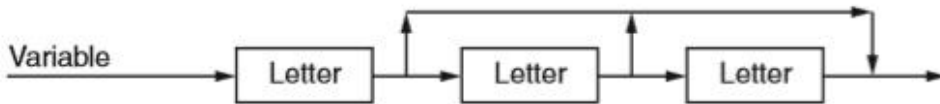
Past Papers May/June 2015 to 2018:

9608/31/M/J/15

Q.1

The following syntax diagrams, for a particular programming language, show the syntax of:

-  an assignment statement
-  a variable
-  a letter
-  an operator



(a) The following assignment statements are invalid.

Give the reason in each case.

(i) $a = b + c$ Reason

.....[1]

(ii) $a = b - 2;$ Reason

.....[1]

(iii) $a = dd * cce;$ Reason

.....[1]

(b) Write the **Backus-Naur Form (BNF)** for the syntax diagrams shown on the opposite page.

<assignmentstatement> ::=

.....

<variable> ::=

.....
<letter> ::=

.....
<operator> ::=

.....[6]

(c) Rewrite the **BNF rule** for a variable so that it can be any number of letters.







<variable> ::=

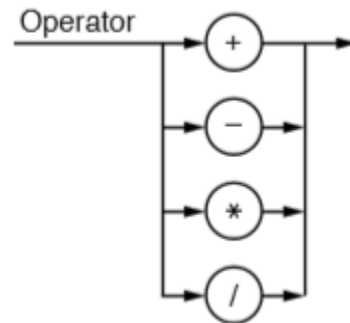
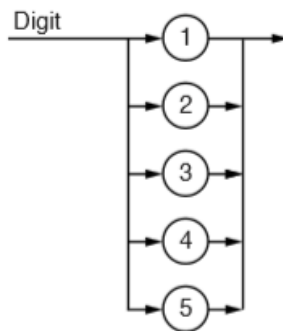
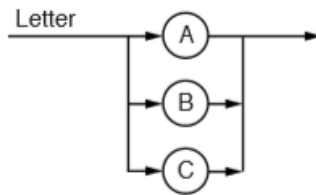
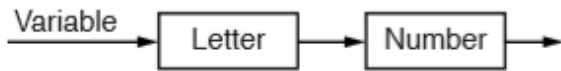
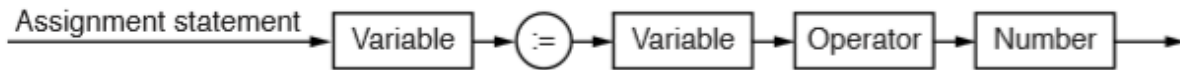
.....[2]

9608/33/M/J/15

Q.1

1 The following syntax diagrams, for a particular programming language, show the syntax of:

-  an assignment statement
-  a variable
-  a number
-  a letter
-  a digit
-  an operator



(a) The following assignment statements are invalid.

Give a reason in each case.

(i) $A2 = B3 + 123$ Reason

.....
.....[1]

(ii) $B3 := B3 - 203$ Reason

.....
.....[1]

(iii) $A2414 := A3 * B$ Reason

.....
.....[1]

(b) Complete the **Backus-Naur Form (BNF)** for the syntax diagrams shown on the opposite page.

<letter> has been done for you.

<assignmentstatement> ::=

.....

<variable> ::=

.....

<number> ::=

.....

<letter> ::= A | B | C <digit> ::=







.....

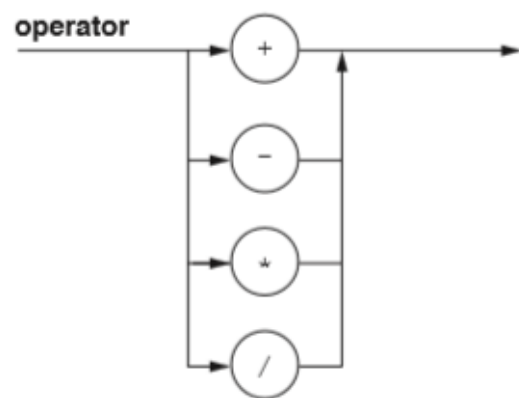
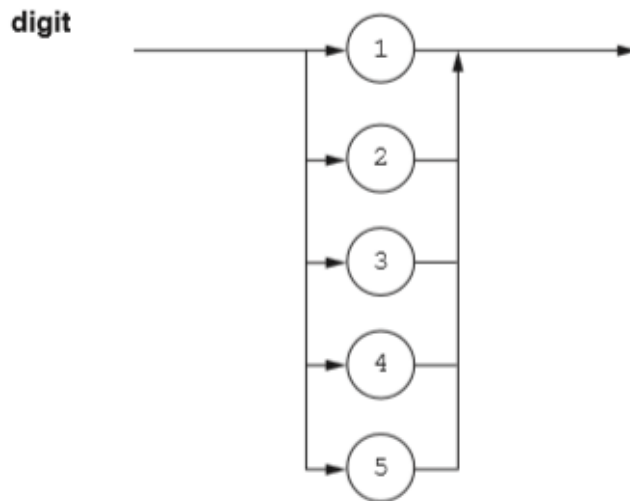
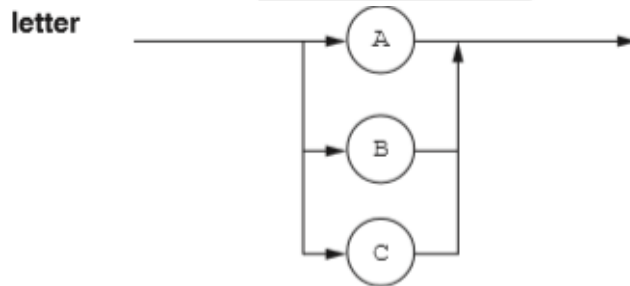
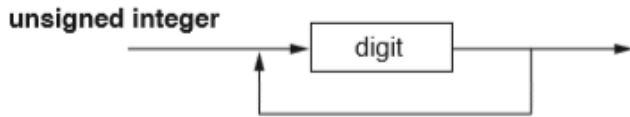
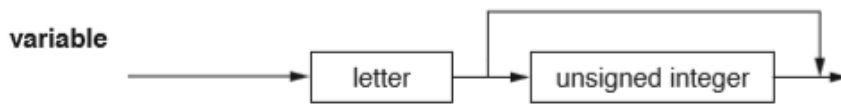
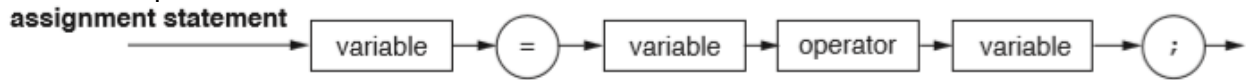
<operator> ::=

..... [6]

9608/32/M/J/18

2 The following syntax diagrams show the syntax of:

-  an assignment statement
-  a variable
-  a signed integer
-  a letter
-  a digit
-  an operator



(a) The following assignment statements are invalid. Give the reason in each case.

(i) $A = B + 5$; Reason

.....
.....[1]

(ii) $A = B - D$; Reason

.....
.....[1]

(iii) $C4 = B2 - A1 + C3$; Reason

.....
.....[1]

(b) Complete the Backus-Naur Form (BNF) for the syntax diagrams shown on the opposite page.

<assignment statement> ::=

.....
<variable> ::=







.....
<unsigned integer> ::=

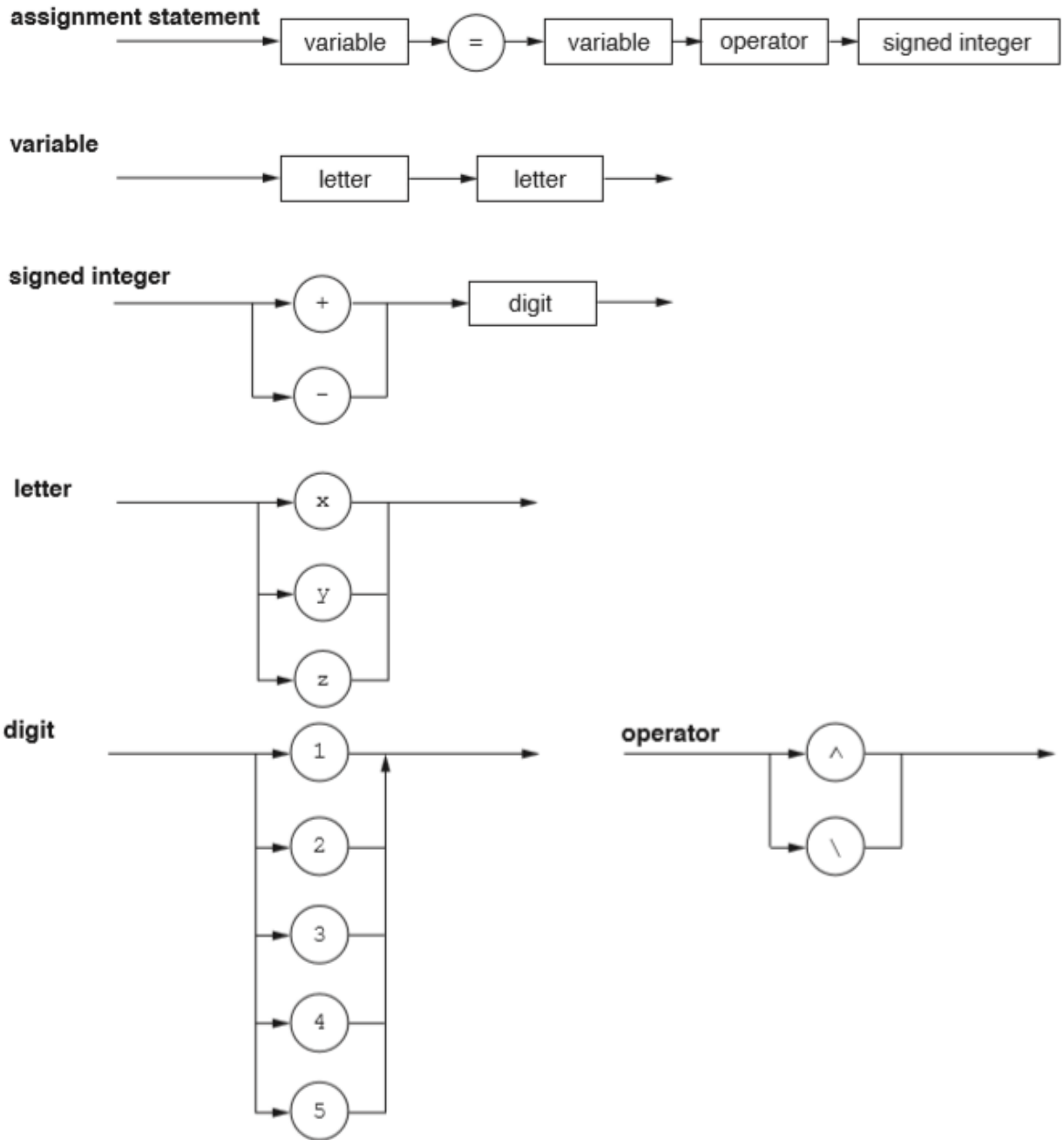
.....
<operator> ::=

..... [6]

9608/33/M/J/18

5 The following syntax diagrams show the syntax of:

-  an assignment statement
-  a variable
-  a signed integer
-  a letter
-  a digit
-  an operator



(a) The following assignment statements are invalid. Give the reason in each case.

(i) $xy = xy \wedge c4$ Reason

.....
.....[1]

(ii) $zy = zy \setminus 10$ Reason

.....
.....[1]

(iii) $yy := xz \wedge - 6$ Reason

.....
.....[1]

(b) Complete the **Backus-Naur Form (BNF)** for the syntax diagrams on the opposite page.
<assignment statement> ::=

.....
<variable> ::=

.....
<signed integer> ::=

.....
<operator> ::=

..... [4]

(c) Rewrite the **BNF** rule for a variable so that it can be any number of letters.

<variable> ::=

..... [2]

Answers
9608/31/M/J/15
Q.1

1	(a) (i)	';' missing	1
	(ii)	'2' is not a variable	1
	(iii)	'e' is not a valid letter	1
	(b)	<pre> <assignment statement> ::= <variable> = <variable><operator><variable>; <variable> ::= <letter> <letter><letter> <letter><letter><letter> <letter> ::= a b c d <operator> ::= =+ - * ÷ </pre>	<p>2</p> <p>2</p> <p>1</p> <p>1</p>
	(c)	<pre> <letter> <letter><variable> // <letter> <variable><letter> </pre>	2



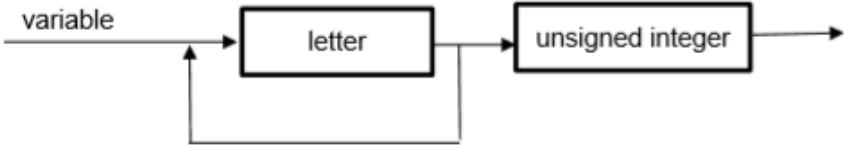
Answers
9608/33/M/J/15
Q.1

1 (a) (i)	Wrong assignment operator (should be ':=' not '=')	1
(ii)	0 is not a digit	1
(iii)	'B' is not a number	1
(b)	<pre> <assignmentstatement> ::= <variable> := <variable><operator><number> <variable> ::= <letter><number> <number> ::= <digit> <digit><number> <letter> ::= A B C <digit> ::= 1 2 3 4 5 <operator> ::= + - * / </pre>	<p>1 + 1</p> <p>1</p> <p>1 + 1</p> <p>1</p>

Answers
9608/32/M/J/18
Q.2

Question	Answer	Marks
2(a)(i)	5 is not a variable	1
2(a)(ii)	D is not a valid letter	1
2(a)(iii)	There are two operators (only one is allowed) // three variables on the right hand side but only two allowed	1
2(b)	<p>1 mark for each bullet</p> <p>assignment:</p> <ul style="list-style-type: none"> <variable> = <variable><operator><variable>; <p>variable:</p> <ul style="list-style-type: none"> <letter> <letter><unsigned integer> <p>unsigned integer:</p> <ul style="list-style-type: none"> <digit> <digit><unsigned integer> <p>operator:</p> <ul style="list-style-type: none"> + - * / <pre> <assignment statement> ::= <variable> = <variable><operator><variable>; <variable> ::= <letter> <letter><unsigned integer> <unsigned integer> ::= <digit> <digit><unsigned integer> <operator> ::= + - * / </pre>	6



2(c)	<p>1 mark per bullet</p> <ul style="list-style-type: none"> • variable with arrow • followed by repeated letter • followed by unsigned integer and arrow 	3
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Answers
9608/33/M/J/18
Q.5

Question	Answer	Marks
5(a)(i)	c4 is not a <u>signed</u> integer	1
5(a)(ii)	10 is not a valid <u>signed</u> integer // 0 is not a valid digit/signed integer // only one digit allowed	1
5(a)(iii)	wrong assignment operator // should be = not := // 6 is not a valid digit/signed integer	1
5(b)	<p>1 mark per bullet</p> <p>assignment</p> <ul style="list-style-type: none"> □ <code><variable>=<variable><operator><signed integer></code> <p>variable</p> <ul style="list-style-type: none"> □ <code><letter><letter></code> <p>signed integer</p> <ul style="list-style-type: none"> □ <code>+<digit> -<digit></code> <p>operator</p> <ul style="list-style-type: none"> □ <code>^ \</code> <pre> <assignment statement> ::= <variable> = <variable><operator><signed integer> <variable> ::= <letter><letter> <signed integer> ::= +<digit> -<digit> <operator> ::= ^ \ </pre>	4
5(c)	<p>1 mark per bullet</p> <ul style="list-style-type: none"> □ <code><letter> </code> □ <code><letter><variable></code> <p>For example:</p> <pre> <letter> <letter><variable> <letter> <variable><letter> </pre>	2