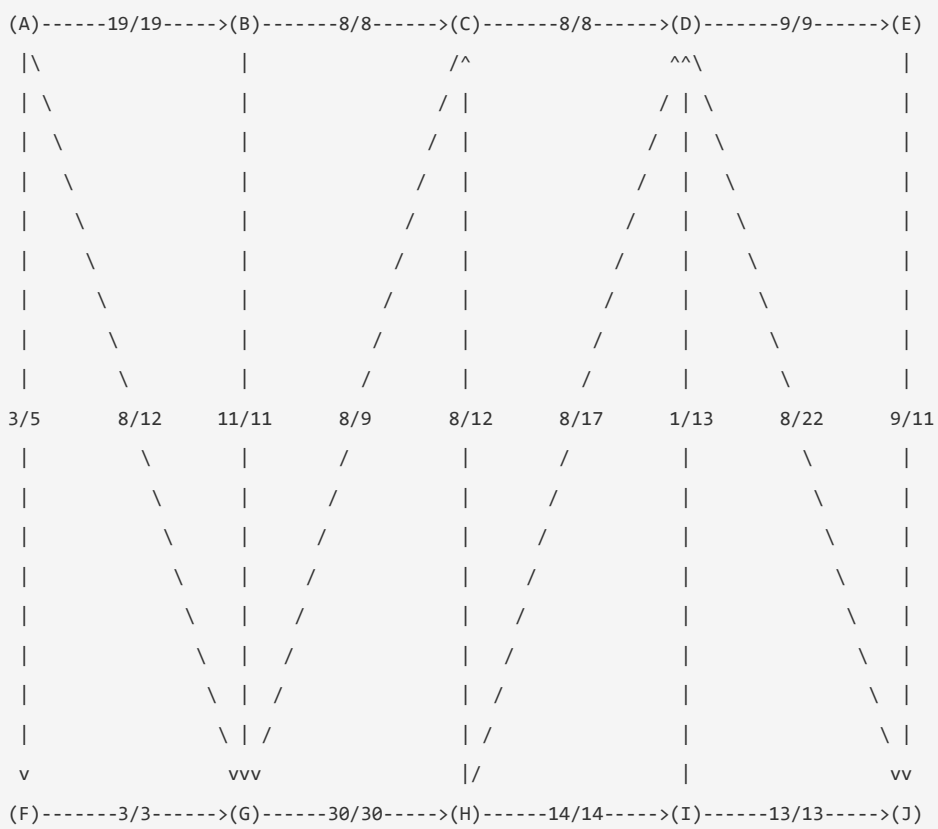
Maxflow and Mincut

Question 1

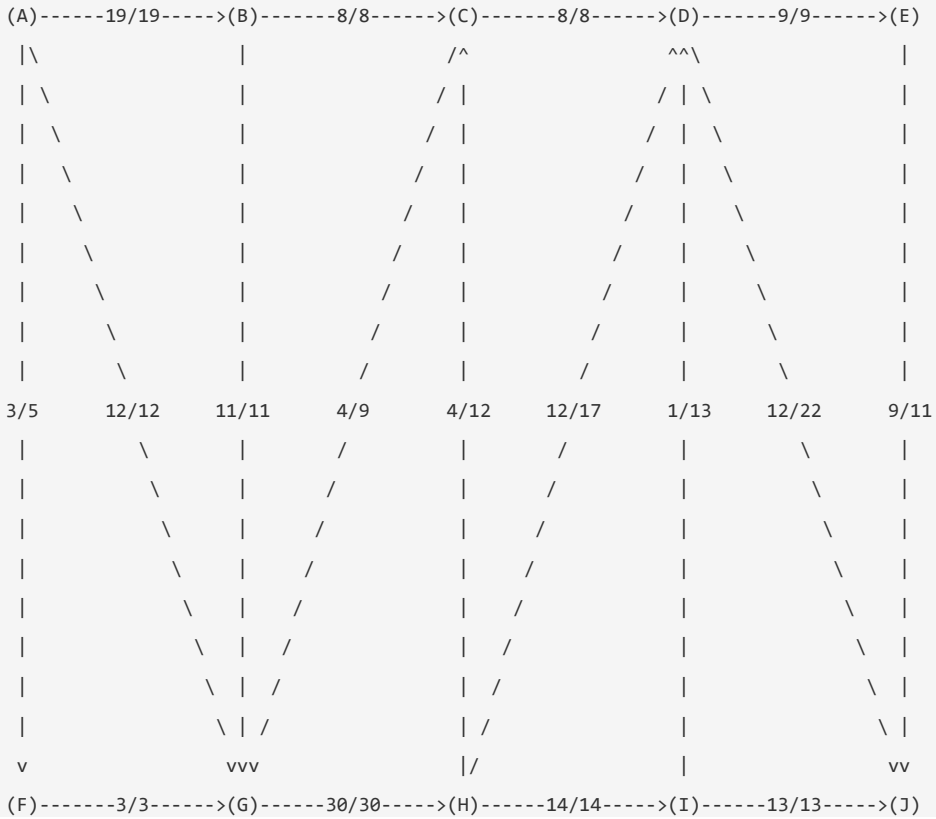


Starting from the given flow (of value 30), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

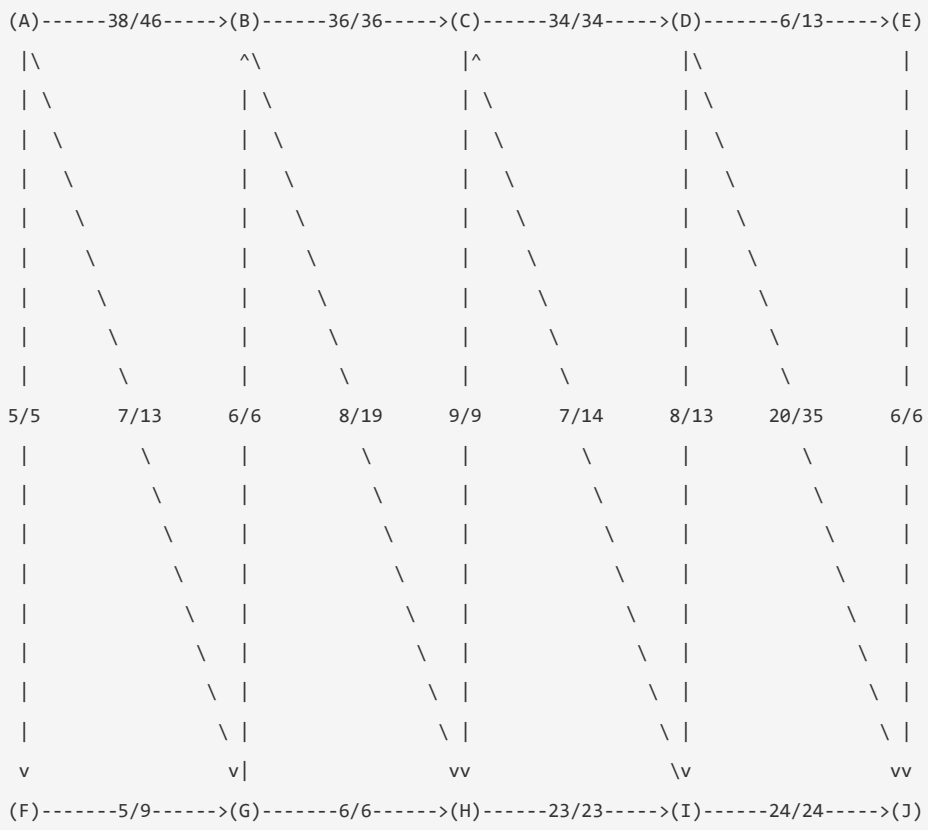
Question Explanation

```
The correct answer is: A G C H D J



augmenting path:     A->G->C->H->D->J
bottleneck capacity: 4
value of flow:       34

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B     19  /  19
    A->F      3  /   5
    A->G     12  /  12
    B->C      8  /   8
    B->G     11  /  11
    C->D      8  /   8
    C->G      4  /   9
    D->E      9  /   9
    D->J     12  /  22
    E->J      9  /  11
    F->G      3  /   3
    G->H     30  /  30
    H->C      4  /  12
    H->D     12  /  17
    H->I     14  /  14
    I->D      1  /  13
    I->J     13  /  13
```

Here is a graphical representation of the final flow network:



Question 2

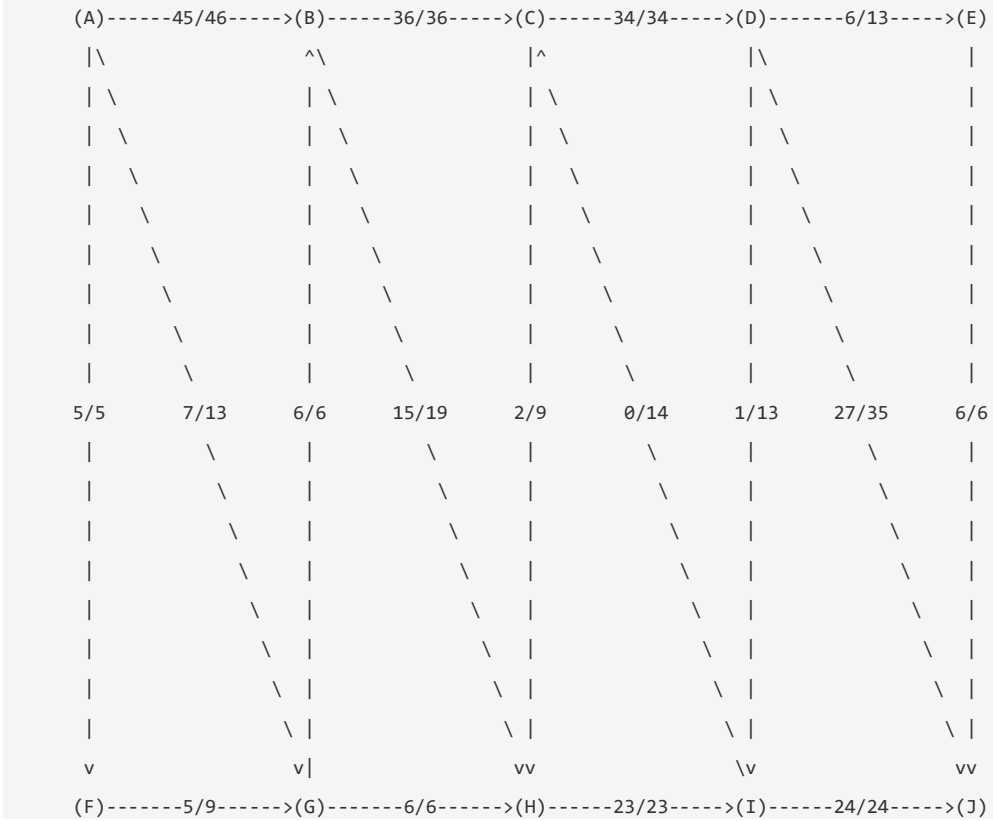


Starting from the given flow (of value 50), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

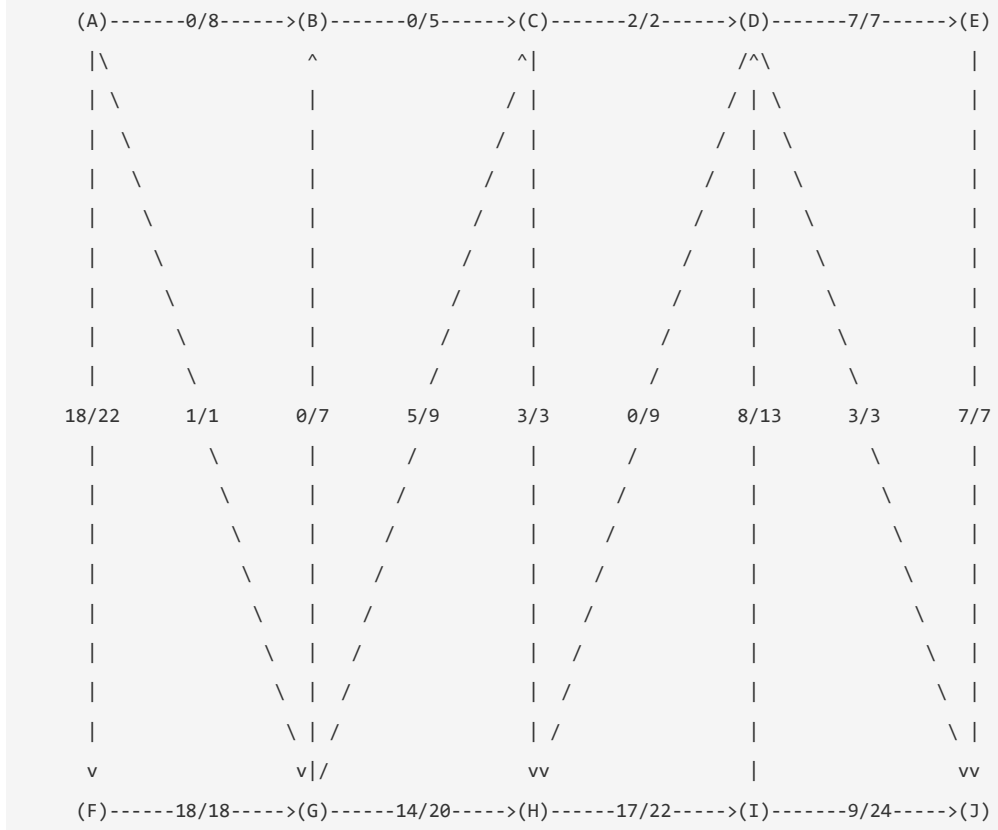
Question Explanation

```
The correct answer is: A B H C I D J



augmenting path:     A->B->H->C->I->D->J
bottleneck capacity: 7
value of flow:       57

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B     45  /  46
    A->F      5  /   5
    A->G      7  /  13
    B->C     36  /  36
    B->H     15  /  19
    C->D     34  /  34
    C->H      2  /   9
    D->E      6  /  13
    D->I      1  /  13
    D->J     27  /  35
    E->J      6  /   6
    F->G      5  /   9
    G->B      6  /   6
    G->H      6  /   6
    H->I     23  /  23
    I->C      0  /  14
    I->J     24  /  24
```

Here is a graphical representation of the final flow network:



Question 3

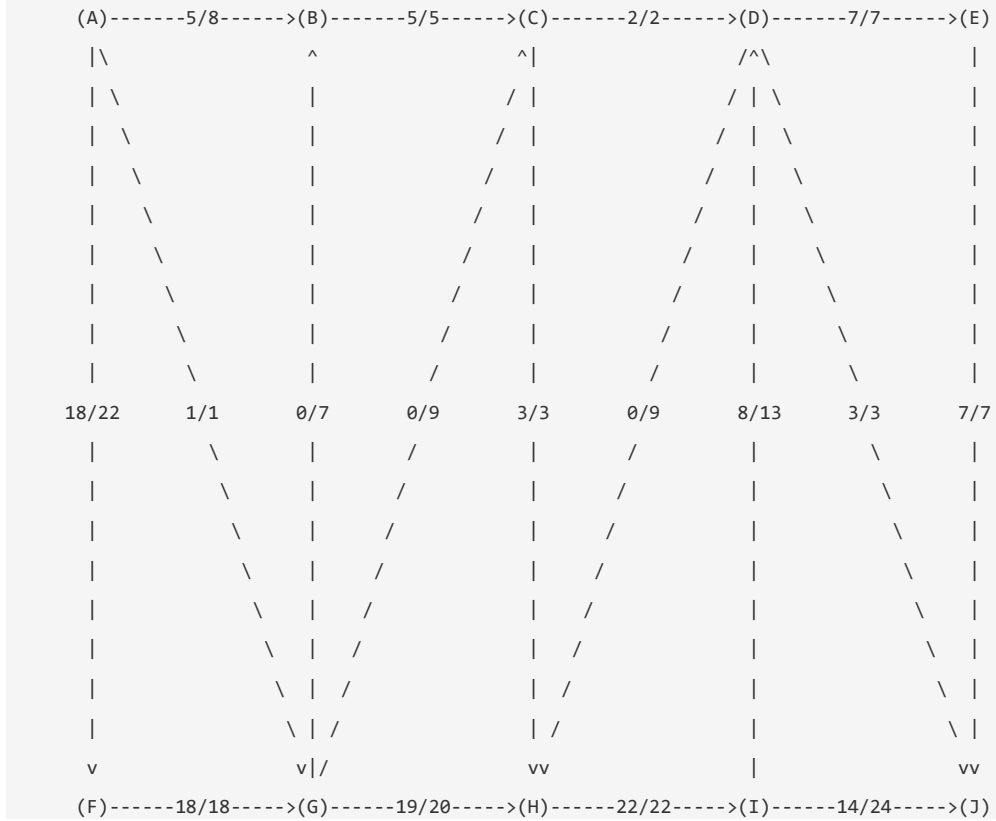


Starting from the given flow (of value 19), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

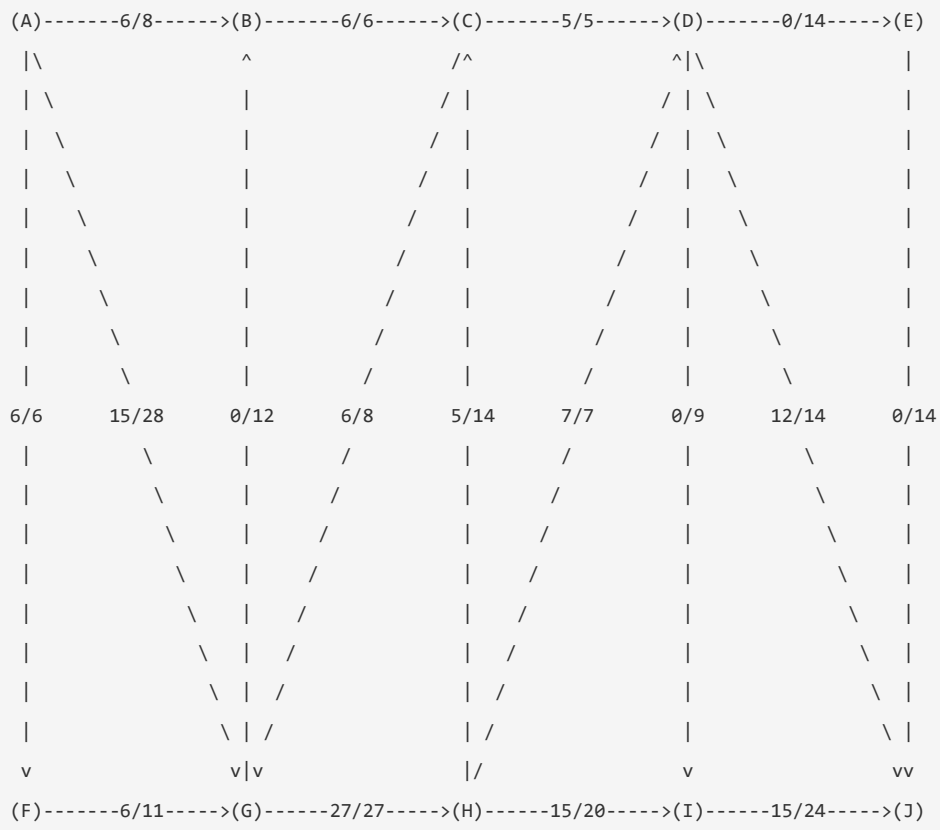
Question Explanation

```
The correct answer is: A B C G H I J



augmenting path:     A->B->C->G->H->I->J
bottleneck capacity: 5
value of flow:       24

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B      5  /   8
    A->F     18  /  22
    A->G      1  /   1
    B->C      5  /   5
    C->D      2  /   2
    C->H      3  /   3
    D->E      7  /   7
    D->H      0  /   9
    D->J      3  /   3
    E->J      7  /   7
    F->G     18  /  18
    G->B      0  /   7
    G->C      0  /   9
    G->H     19  /  20
    H->I     22  /  22
    I->D      8  /  13
    I->J     14  /  24
```

Here is a graphical representation of the final flow network:



Question 4

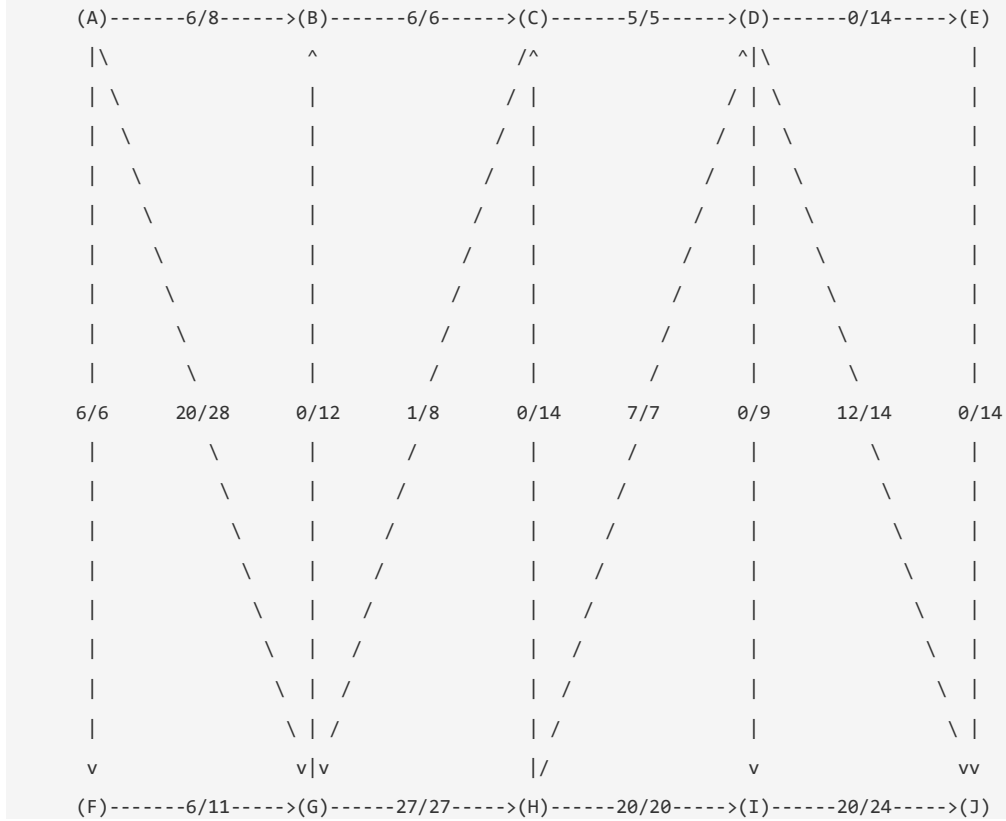


Starting from the given flow (of value 27), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

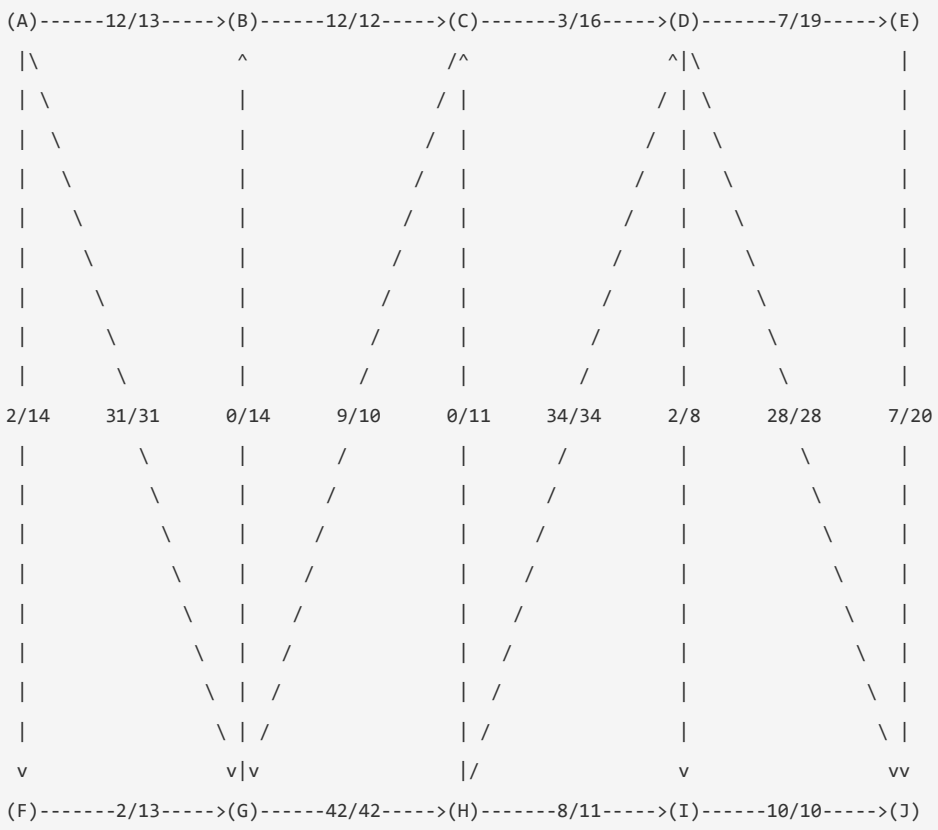
Question Explanation

```
The correct answer is: A G C H I J



augmenting path:     A->G->C->H->I->J
bottleneck capacity: 5
value of flow:       32

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B      6  /   8
    A->F      6  /   6
    A->G     20  /  28
    B->C      6  /   6
    C->D      5  /   5
    C->G      1  /   8
    D->E      0  /  14
    D->I      0  /   9
    D->J     12  /  14
    E->J      0  /  14
    F->G      6  /  11
    G->B      0  /  12
    G->H     27  /  27
    H->C      0  /  14
    H->D      7  /   7
    H->I     20  /  20
    I->J     20  /  24
```

Here is a graphical representation of the final flow network:



Question 5

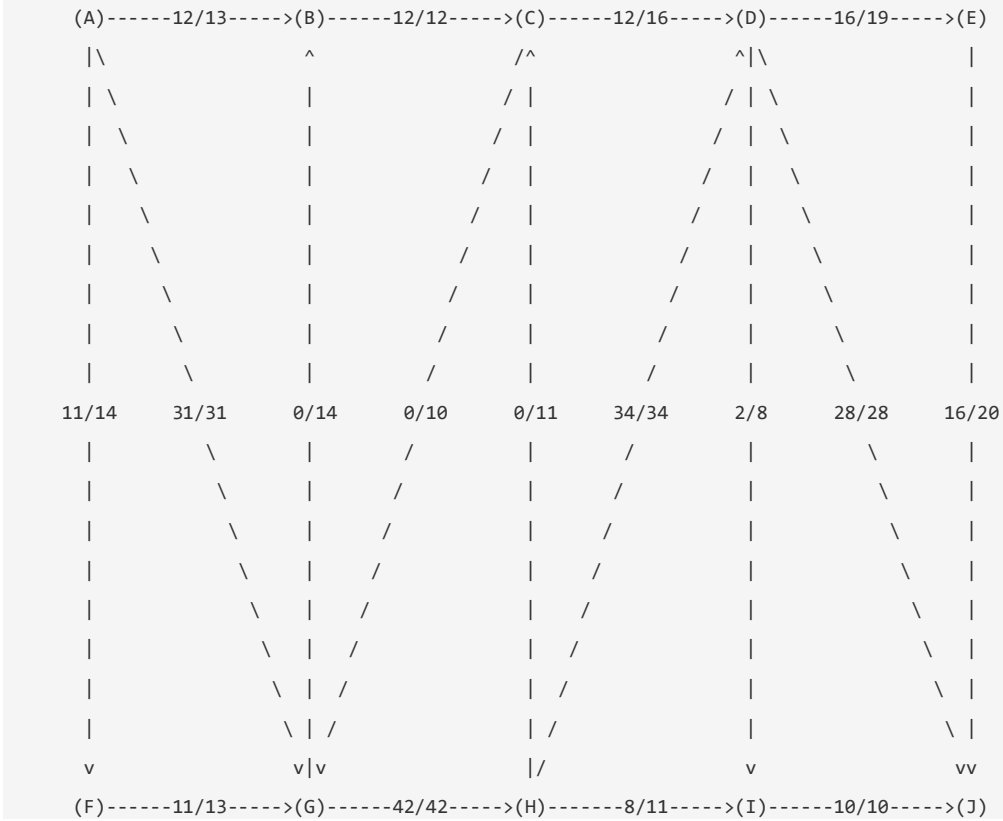


Starting from the given flow (of value 45), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

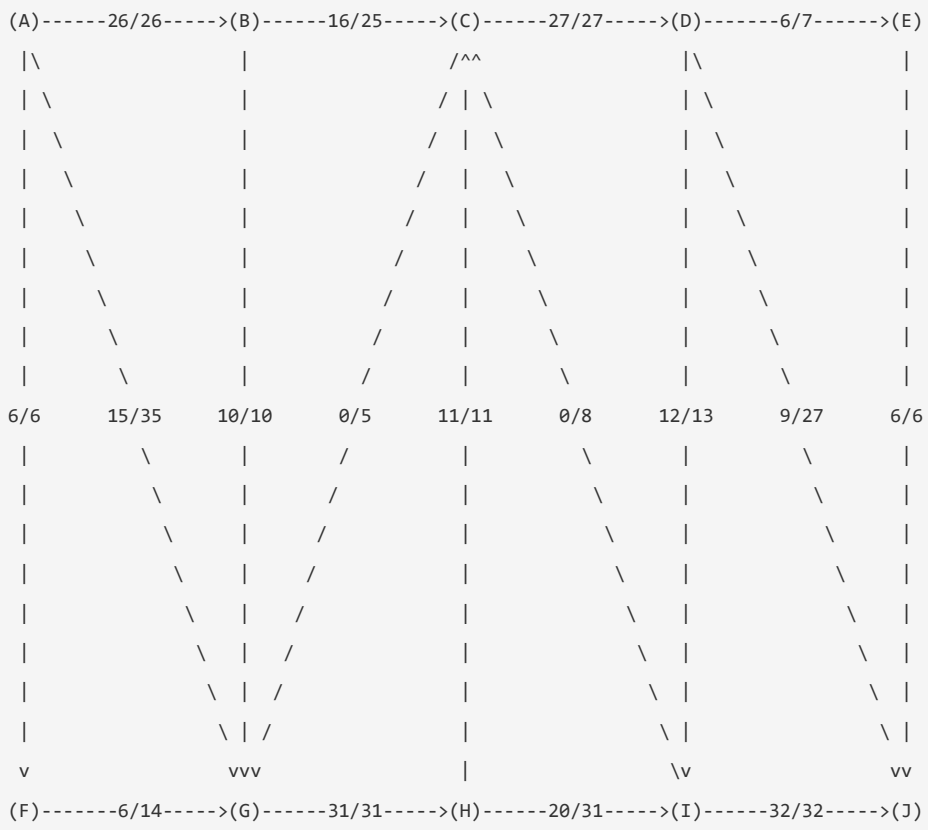
Question Explanation

```
The correct answer is: A F G C D E J



augmenting path:     A->F->G->C->D->E->J
bottleneck capacity: 9
value of flow:       54

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B     12  /  13
    A->F     11  /  14
    A->G     31  /  31
    B->C     12  /  12
    C->D     12  /  16
    C->G      0  /  10
    D->E     16  /  19
    D->I      2  /   8
    D->J     28  /  28
    E->J     16  /  20
    F->G     11  /  13
    G->B      0  /  14
    G->H     42  /  42
    H->C      0  /  11
    H->D     34  /  34
    H->I      8  /  11
    I->J     10  /  10
```

Here is a graphical representation of the final flow network:



Question 6

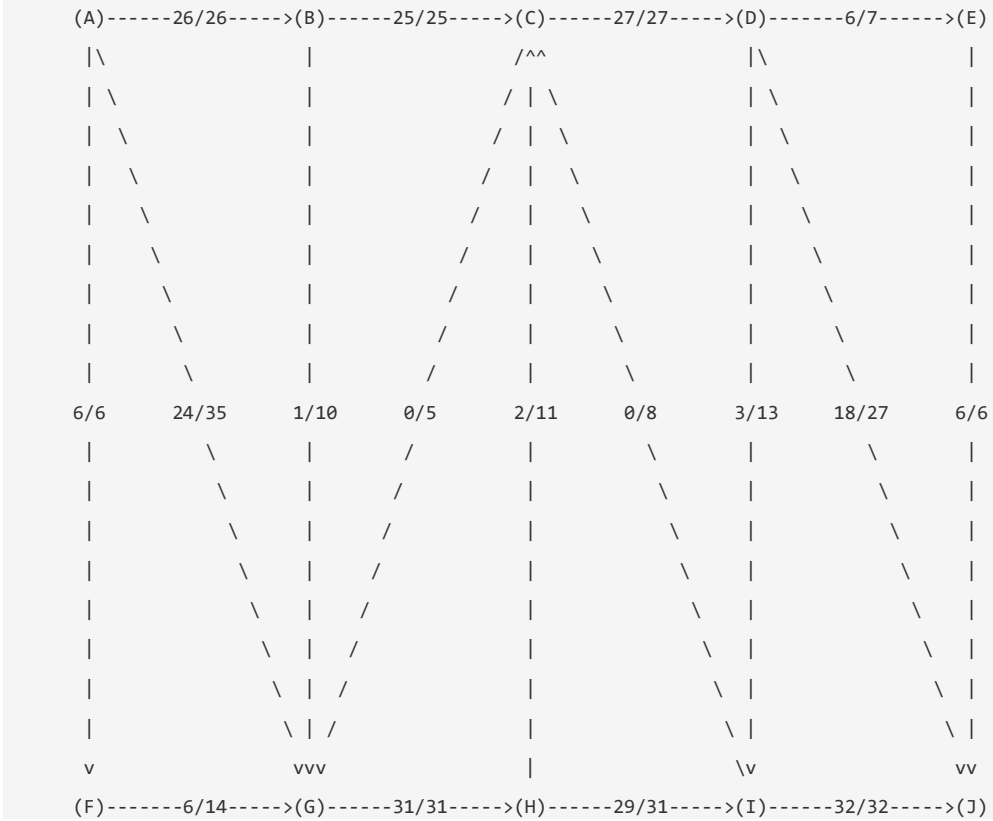


Starting from the given flow (of value 47), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

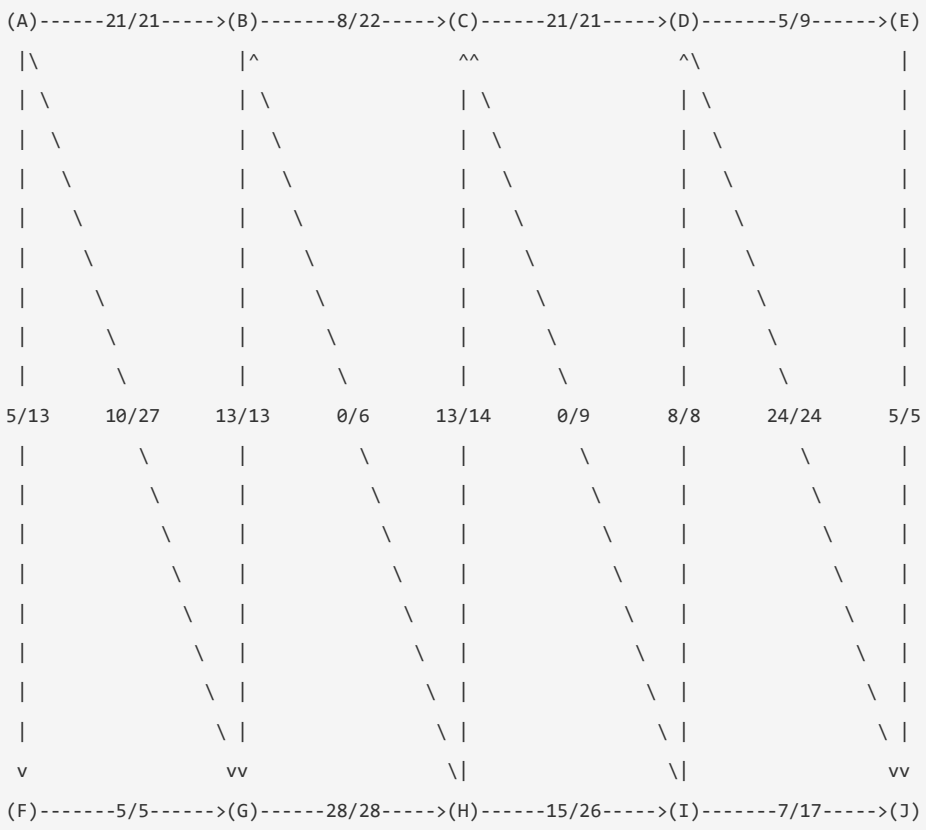
Question Explanation

```
The correct answer is: A G B C H I D J



augmenting path:     A->G->B->C->H->I->D->J
bottleneck capacity: 9
value of flow:       56

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B     26  /  26
    A->F      6  /   6
    A->G     24  /  35
    B->C     25  /  25
    B->G      1  /  10
    C->D     27  /  27
    C->G      0  /   5
    D->E      6  /   7
    D->I      3  /  13
    D->J     18  /  27
    E->J      6  /   6
    F->G      6  /  14
    G->H     31  /  31
    H->C      2  /  11
    H->I     29  /  31
    I->C      0  /   8
    I->J     32  /  32
```

Here is a graphical representation of the final flow network:



Question 7

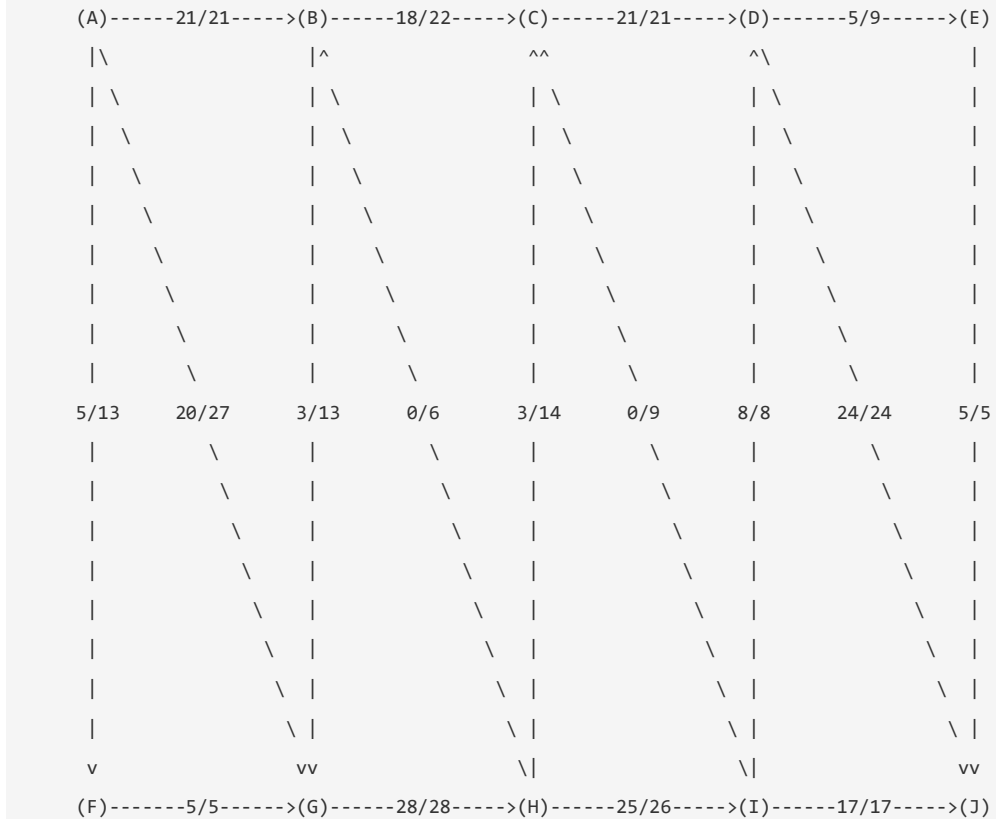


Starting from the given flow (of value 36), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

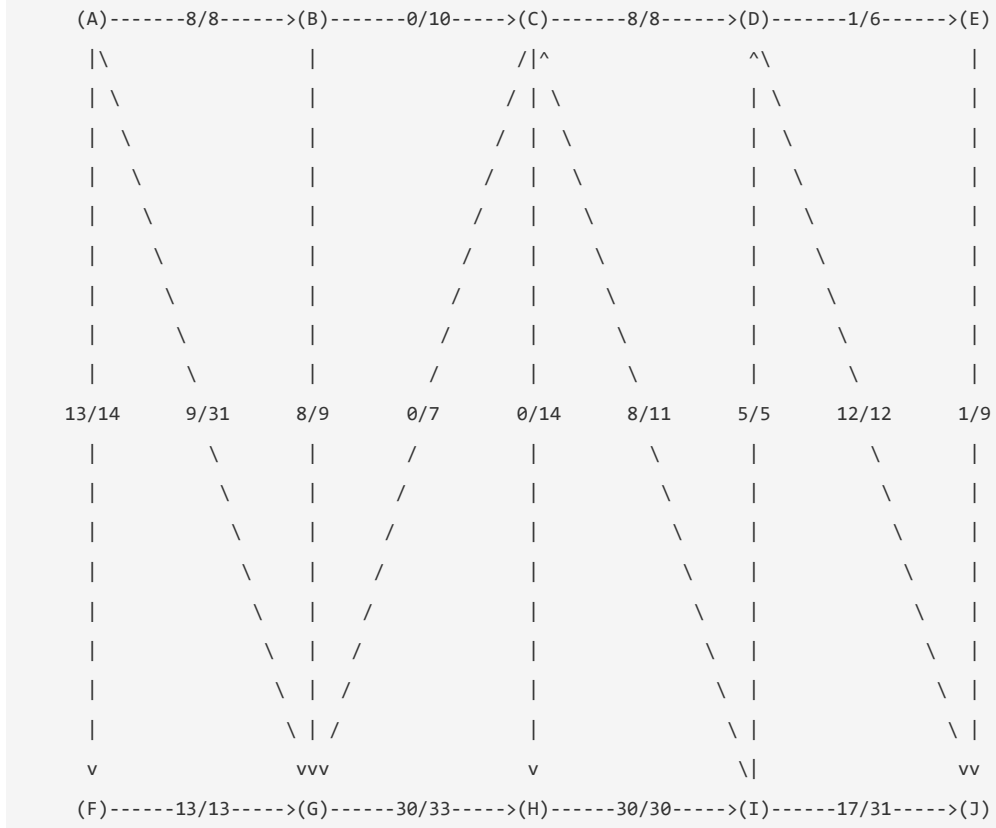
Question Explanation

```
The correct answer is: A G B C H I J



augmenting path:     A->G->B->C->H->I->J
bottleneck capacity: 10
value of flow:       46

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B     21  /  21
    A->F      5  /  13
    A->G     20  /  27
    B->C     18  /  22
    B->G      3  /  13
    C->D     21  /  21
    D->E      5  /   9
    D->J     24  /  24
    E->J      5  /   5
    F->G      5  /   5
    G->H     28  /  28
    H->B      0  /   6
    H->C      3  /  14
    H->I     25  /  26
    I->C      0  /   9
    I->D      8  /   8
    I->J     17  /  17
```

Here is a graphical representation of the final flow network:



Question 8

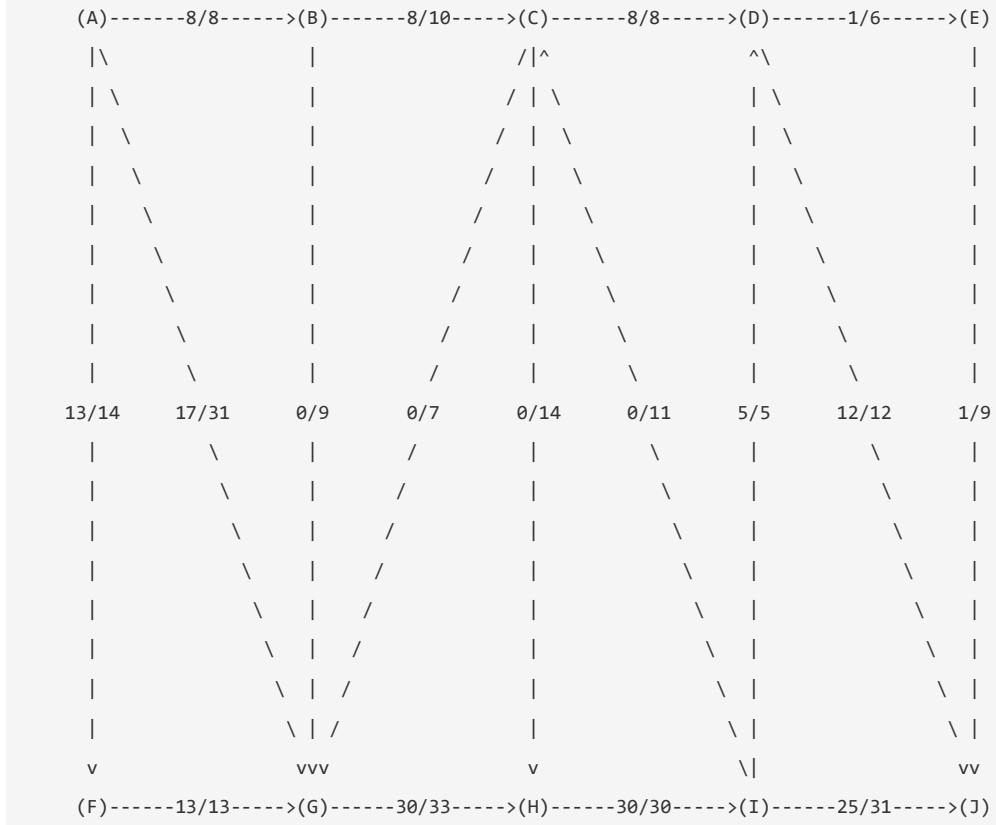


Starting from the given flow (of value 30), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

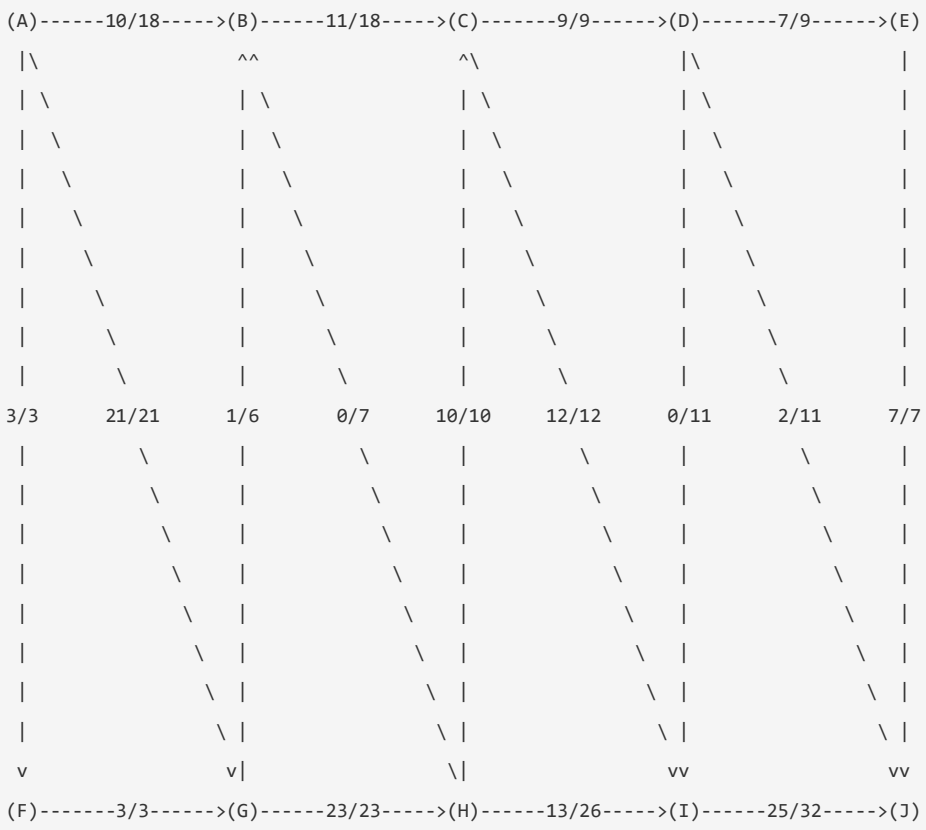
Question Explanation

```
The correct answer is: A G B C I J



augmenting path:     A->G->B->C->I->J
bottleneck capacity: 8
value of flow:       38

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B      8  /   8
    A->F     13  /  14
    A->G     17  /  31
    B->C      8  /  10
    B->G      0  /   9
    C->D      8  /   8
    C->G      0  /   7
    C->H      0  /  14
    D->E      1  /   6
    D->J     12  /  12
    E->J      1  /   9
    F->G     13  /  13
    G->H     30  /  33
    H->I     30  /  30
    I->C      0  /  11
    I->D      5  /   5
    I->J     25  /  31
```

Here is a graphical representation of the final flow network:



Question 9

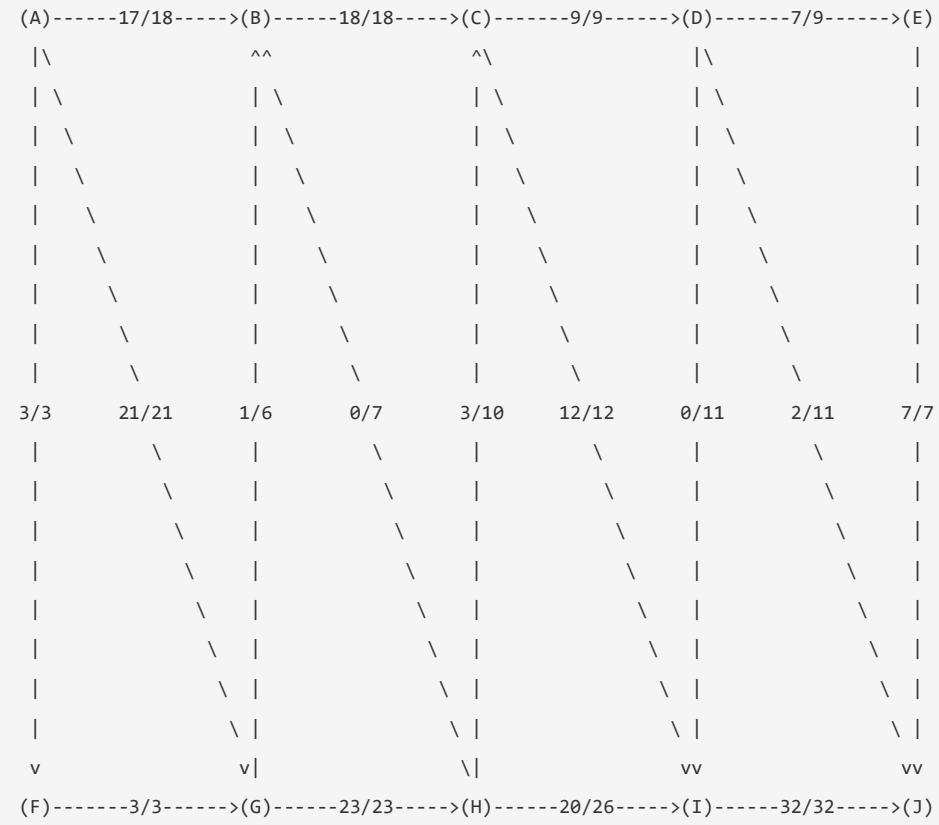


Starting from the given flow (of value 34), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

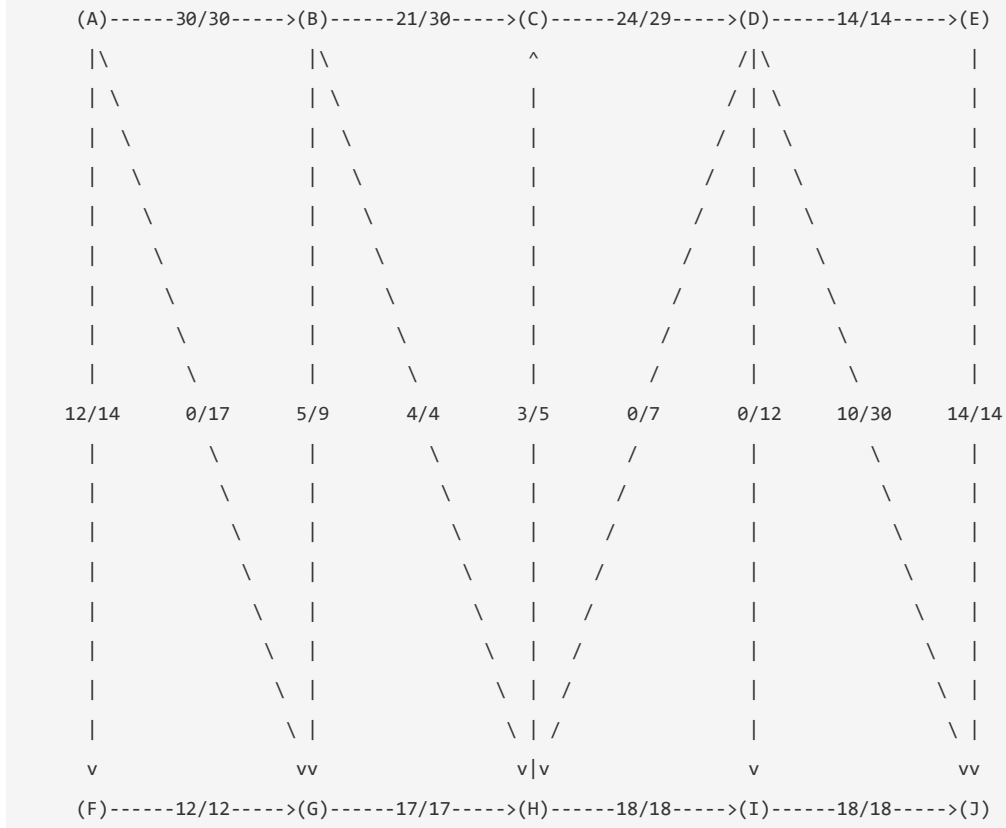
Question Explanation

```
The correct answer is: A B C H I J



augmenting path:     A->B->C->H->I->J
bottleneck capacity: 7
value of flow:       41

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B     17  /  18
    A->F      3  /   3
    A->G     21  /  21
    B->C     18  /  18
    C->D      9  /   9
    C->I     12  /  12
    D->E      7  /   9
    D->I      0  /  11
    D->J      2  /  11
    E->J      7  /   7
    F->G      3  /   3
    G->B      1  /   6
    G->H     23  /  23
    H->B      0  /   7
    H->C      3  /  10
    H->I     20  /  26
    I->J     32  /  32
```

Here is a graphical representation of the final flow network:



Question 10

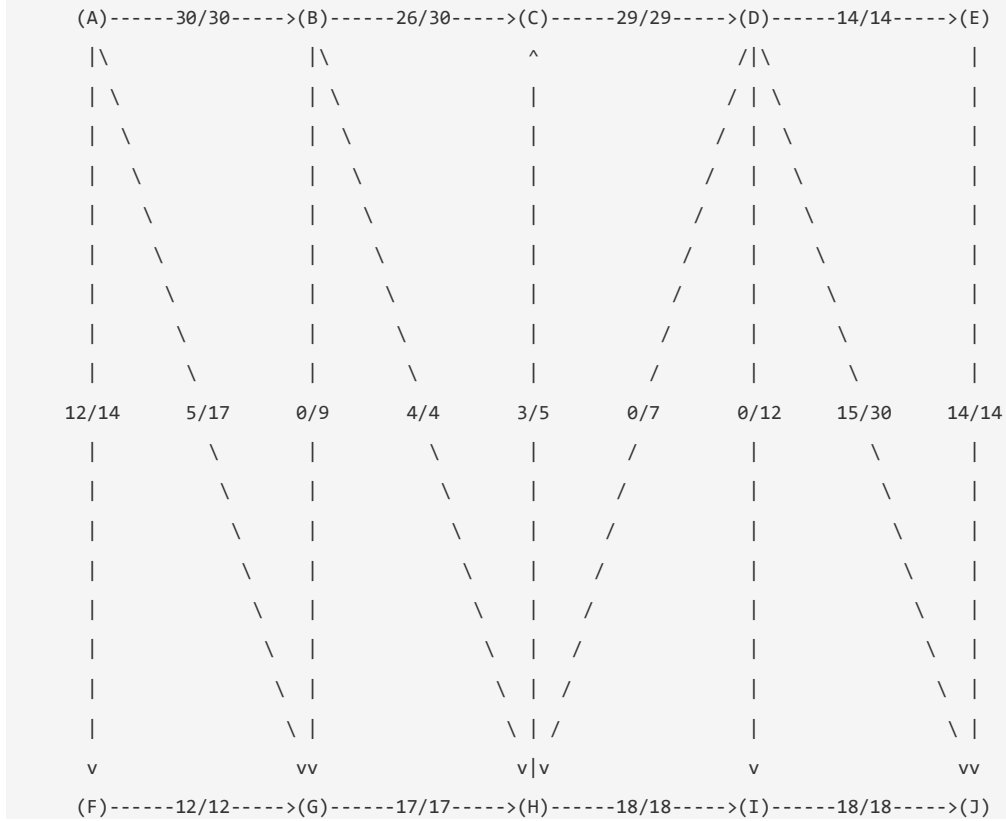


Starting from the given flow (of value 42), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

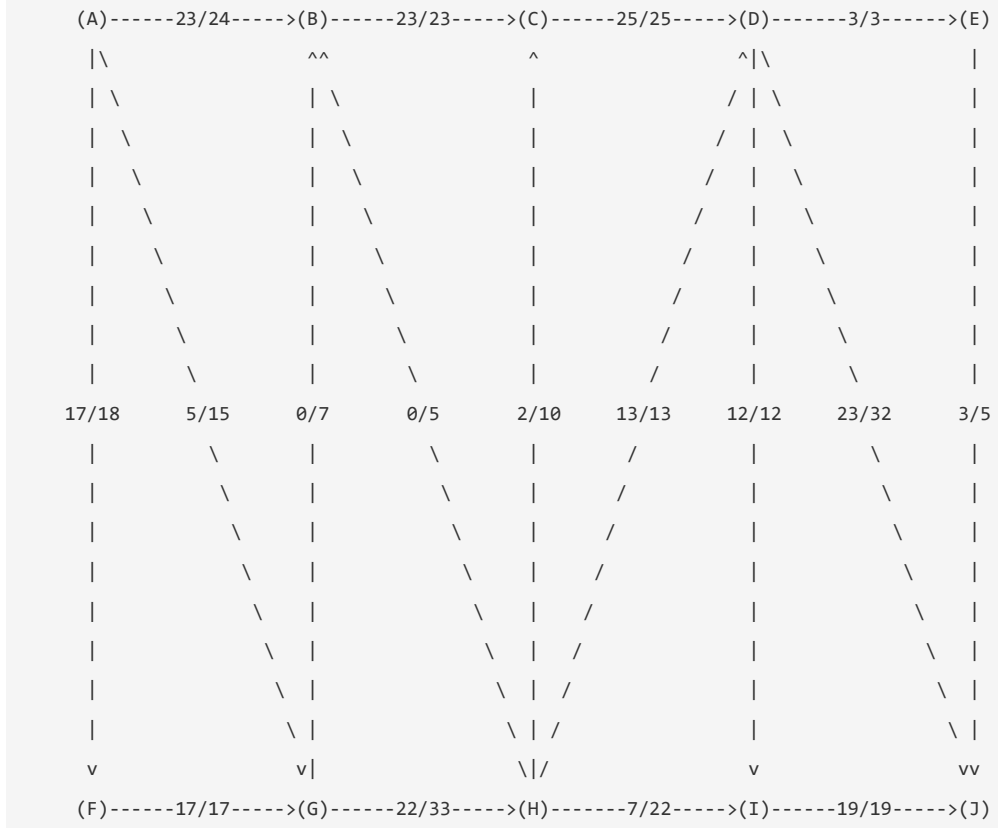
Question Explanation

```
The correct answer is: A G B C D J



augmenting path:     A->G->B->C->D->J
bottleneck capacity: 5
value of flow:       47

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B     30  /  30
    A->F     12  /  14
    A->G      5  /  17
    B->C     26  /  30
    B->G      0  /   9
    B->H      4  /   4
    C->D     29  /  29
    D->E     14  /  14
    D->H      0  /   7
    D->I      0  /  12
    D->J     15  /  30
    E->J     14  /  14
    F->G     12  /  12
    G->H     17  /  17
    H->C      3  /   5
    H->I     18  /  18
    I->J     18  /  18
```

Here is a graphical representation of the final flow network:



Question 11

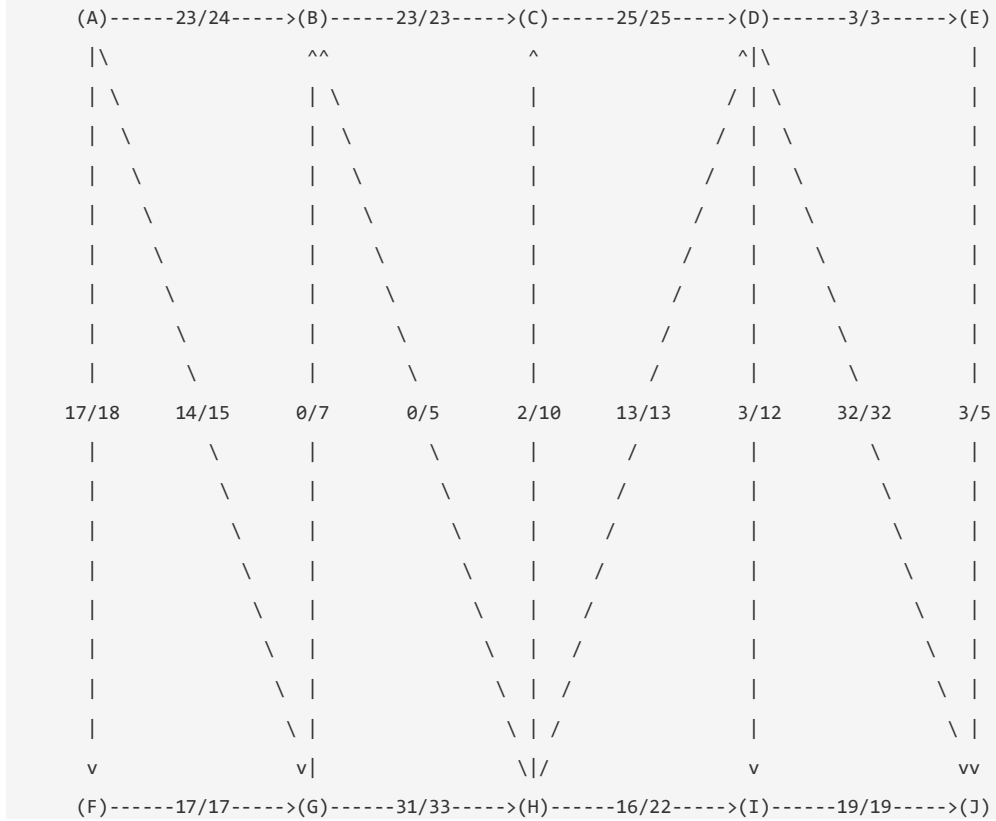


Starting from the given flow (of value 45), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

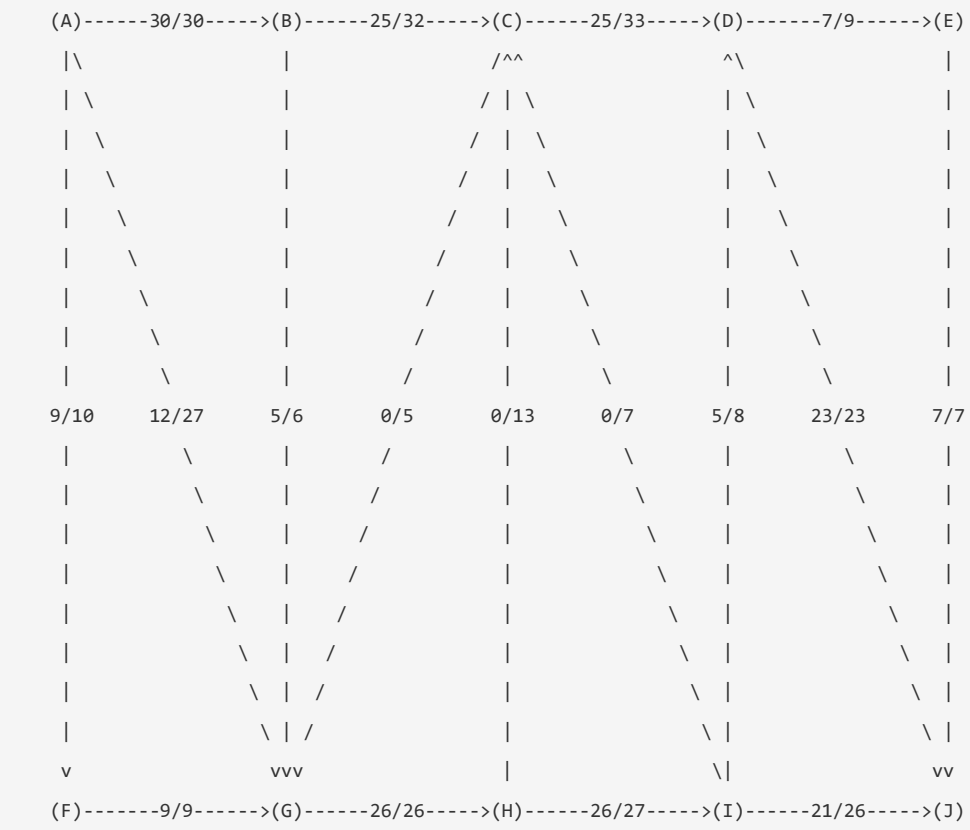
Question Explanation

```
The correct answer is: A G H I D J



augmenting path:     A->G->H->I->D->J
bottleneck capacity: 9
value of flow:       54

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B     23  /  24
    A->F     17  /  18
    A->G     14  /  15
    B->C     23  /  23
    C->D     25  /  25
    D->E      3  /   3
    D->I      3  /  12
    D->J     32  /  32
    E->J      3  /   5
    F->G     17  /  17
    G->B      0  /   7
    G->H     31  /  33
    H->B      0  /   5
    H->C      2  /  10
    H->D     13  /  13
    H->I     16  /  22
    I->J     19  /  19
```

Here is a graphical representation of the final flow network:



Question 12

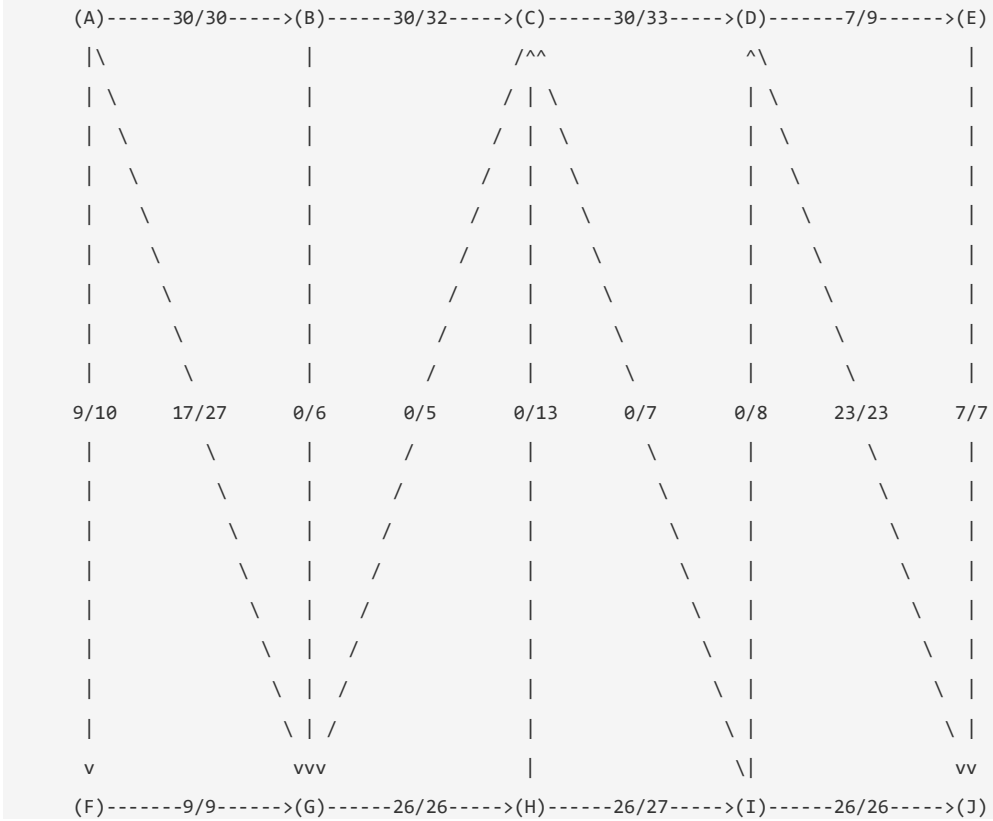


Starting from the given flow (of value 51), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

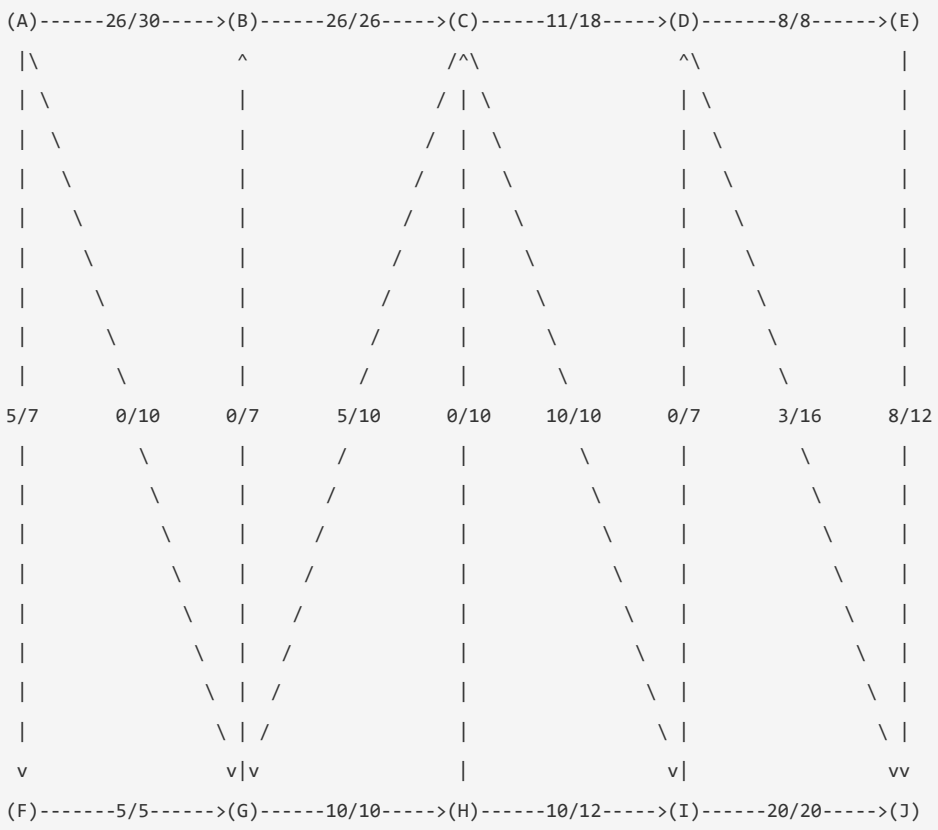
Question Explanation

```
The correct answer is: A G B C D I J



augmenting path:     A->G->B->C->D->I->J
bottleneck capacity: 5
value of flow:       56

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B     30  /  30
    A->F      9  /  10
    A->G     17  /  27
    B->C     30  /  32
    B->G      0  /   6
    C->D     30  /  33
    C->G      0  /   5
    D->E      7  /   9
    D->J     23  /  23
    E->J      7  /   7
    F->G      9  /   9
    G->H     26  /  26
    H->C      0  /  13
    H->I     26  /  27
    I->C      0  /   7
    I->D      0  /   8
    I->J     26  /  26
```

Here is a graphical representation of the final flow network:



Question 13

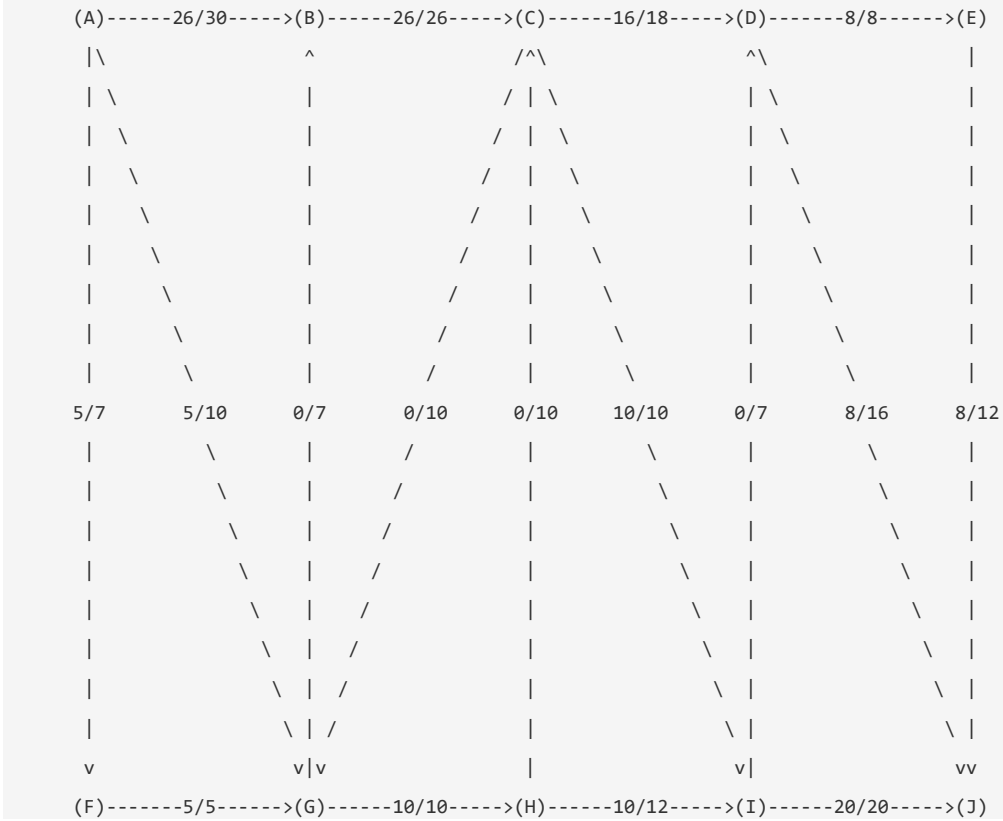


Starting from the given flow (of value 31), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

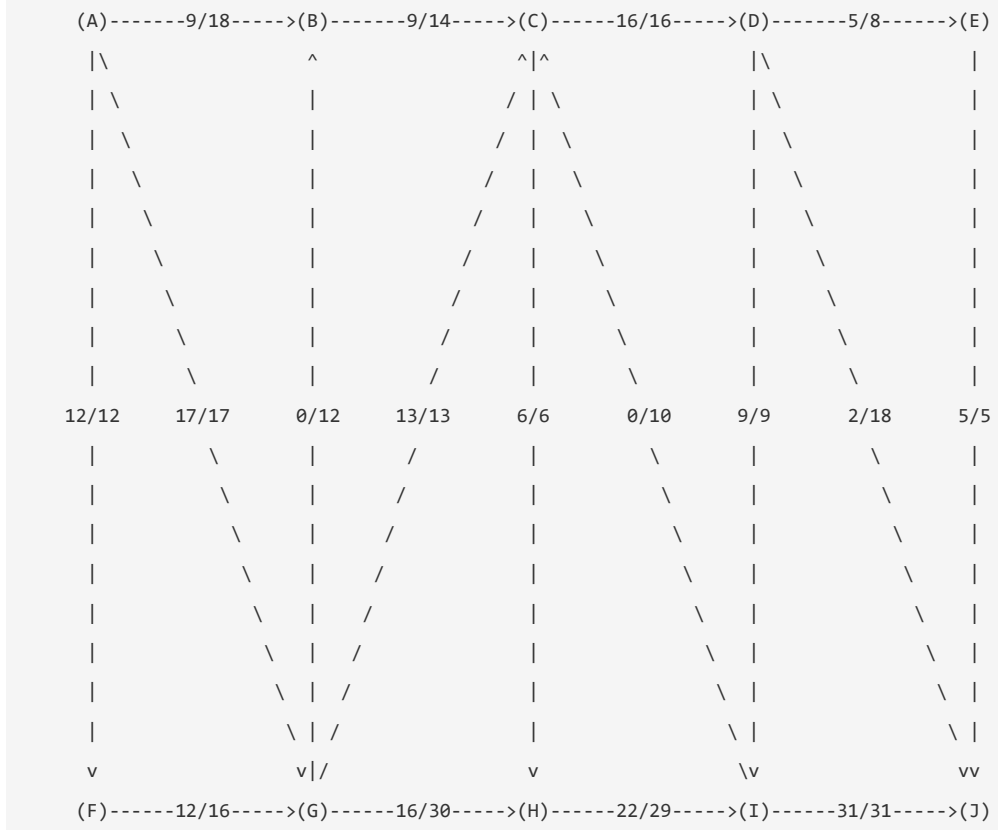
Question Explanation

```
The correct answer is: A G C D J



augmenting path:     A->G->C->D->J
bottleneck capacity: 5
value of flow:       36

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B     26  /  30
    A->F      5  /   7
    A->G      5  /  10
    B->C     26  /  26
    C->D     16  /  18
    C->G      0  /  10
    C->I     10  /  10
    D->E      8  /   8
    D->J      8  /  16
    E->J      8  /  12
    F->G      5  /   5
    G->B      0  /   7
    G->H     10  /  10
    H->C      0  /  10
    H->I     10  /  12
    I->D      0  /   7
    I->J     20  /  20
```

Here is a graphical representation of the final flow network:



Question 14

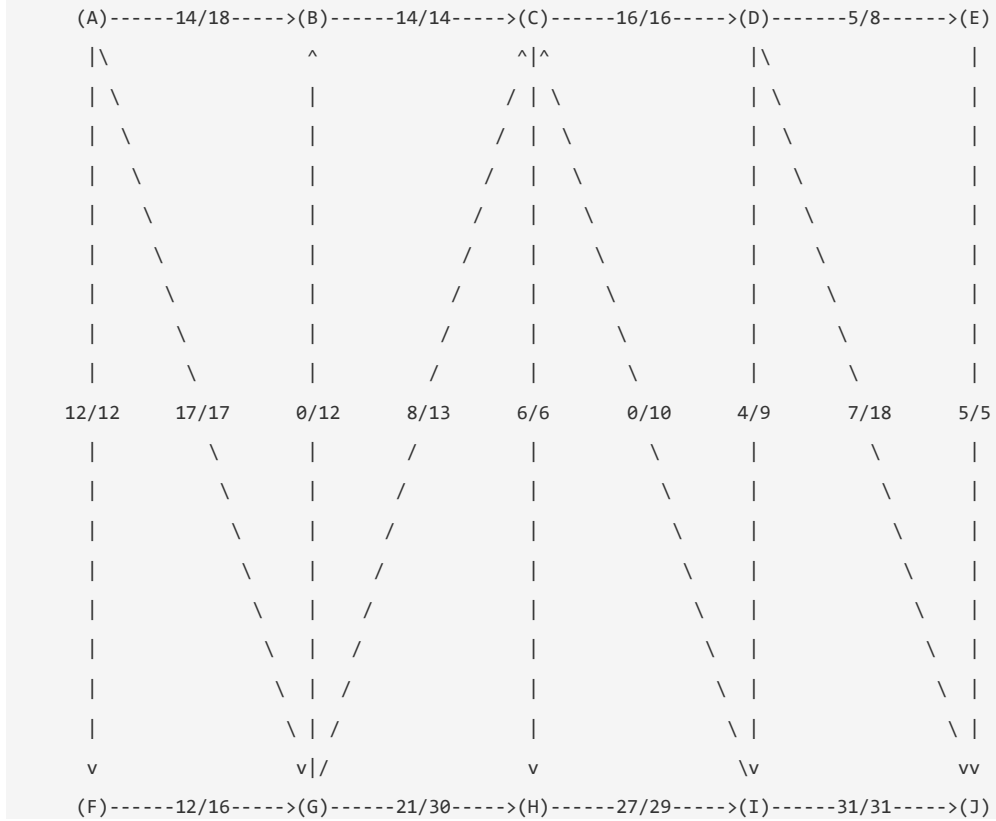


Starting from the given flow (of value 38), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

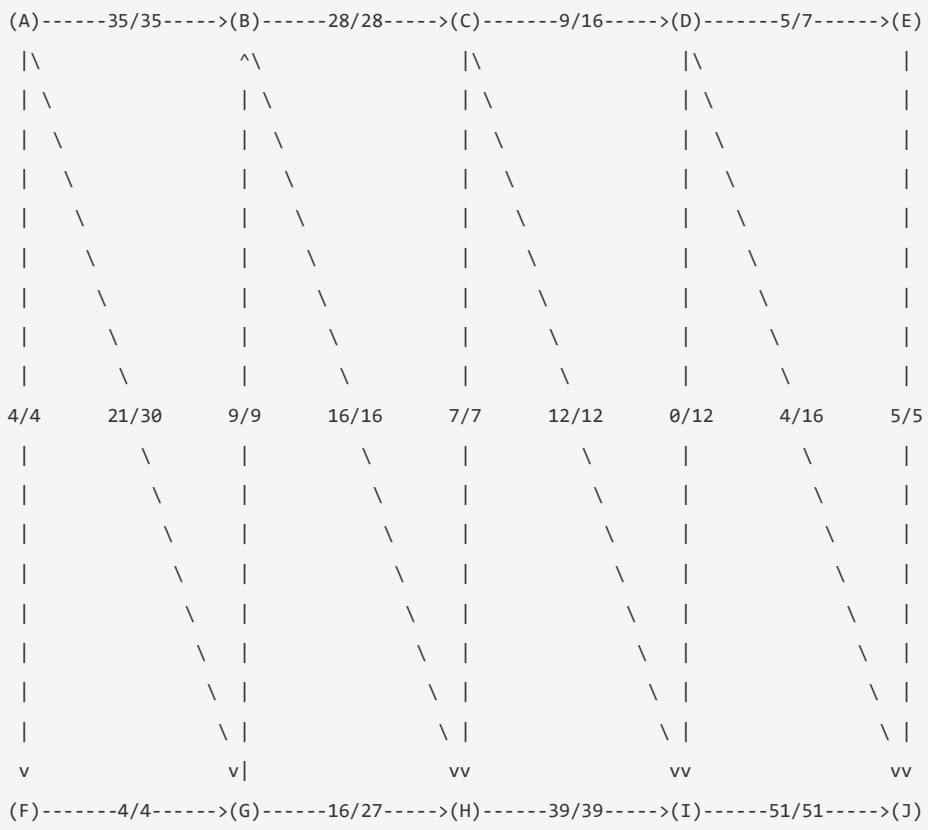
Question Explanation

```
The correct answer is: A B C G H I D J



augmenting path:     A->B->C->G->H->I->D->J
bottleneck capacity: 5
value of flow:       43

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B     14  /  18
    A->F     12  /  12
    A->G     17  /  17
    B->C     14  /  14
    C->D     16  /  16
    C->H      6  /   6
    D->E      5  /   8
    D->I      4  /   9
    D->J      7  /  18
    E->J      5  /   5
    F->G     12  /  16
    G->B      0  /  12
    G->C      8  /  13
    G->H     21  /  30
    H->I     27  /  29
    I->C      0  /  10
    I->J     31  /  31
```

Here is a graphical representation of the final flow network:



Question 15

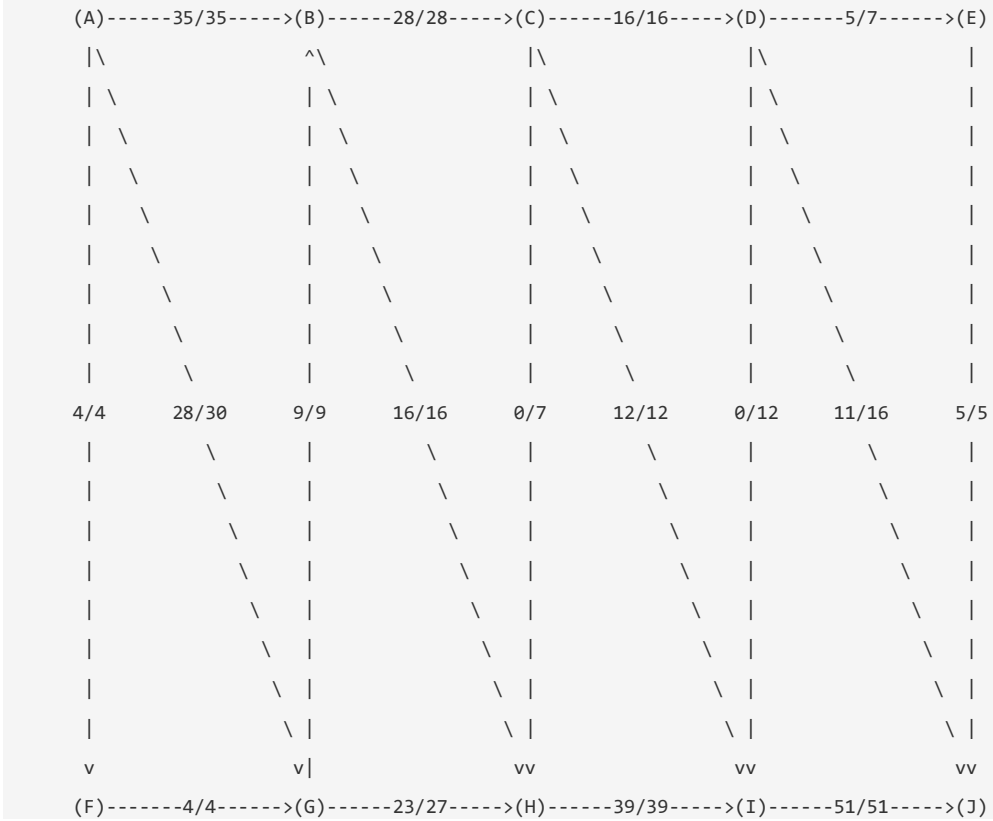


Starting from the given flow (of value 60), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

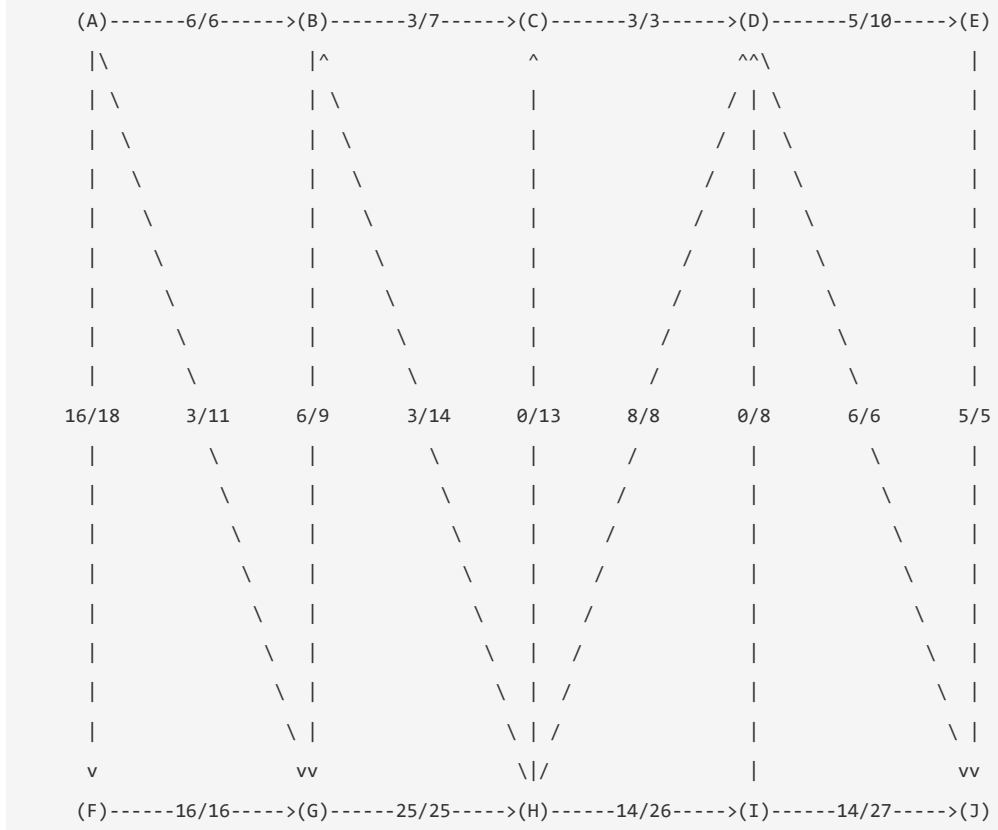
Question Explanation

```
The correct answer is: A G H C D J



augmenting path:     A->G->H->C->D->J
bottleneck capacity: 7
value of flow:       67

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B     35  /  35
    A->F      4  /   4
    A->G     28  /  30
    B->C     28  /  28
    B->H     16  /  16
    C->D     16  /  16
    C->H      0  /   7
    C->I     12  /  12
    D->E      5  /   7
    D->I      0  /  12
    D->J     11  /  16
    E->J      5  /   5
    F->G      4  /   4
    G->B      9  /   9
    G->H     23  /  27
    H->I     39  /  39
    I->J     51  /  51
```

Here is a graphical representation of the final flow network:



Question 16

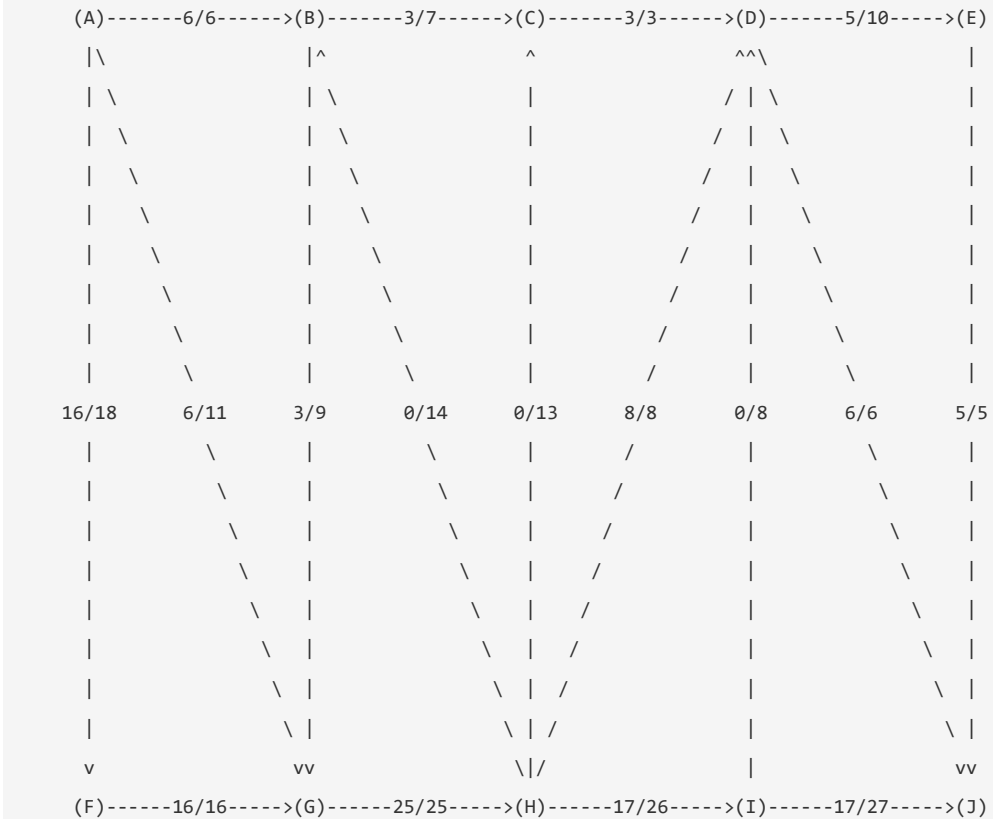


Starting from the given flow (of value 25), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

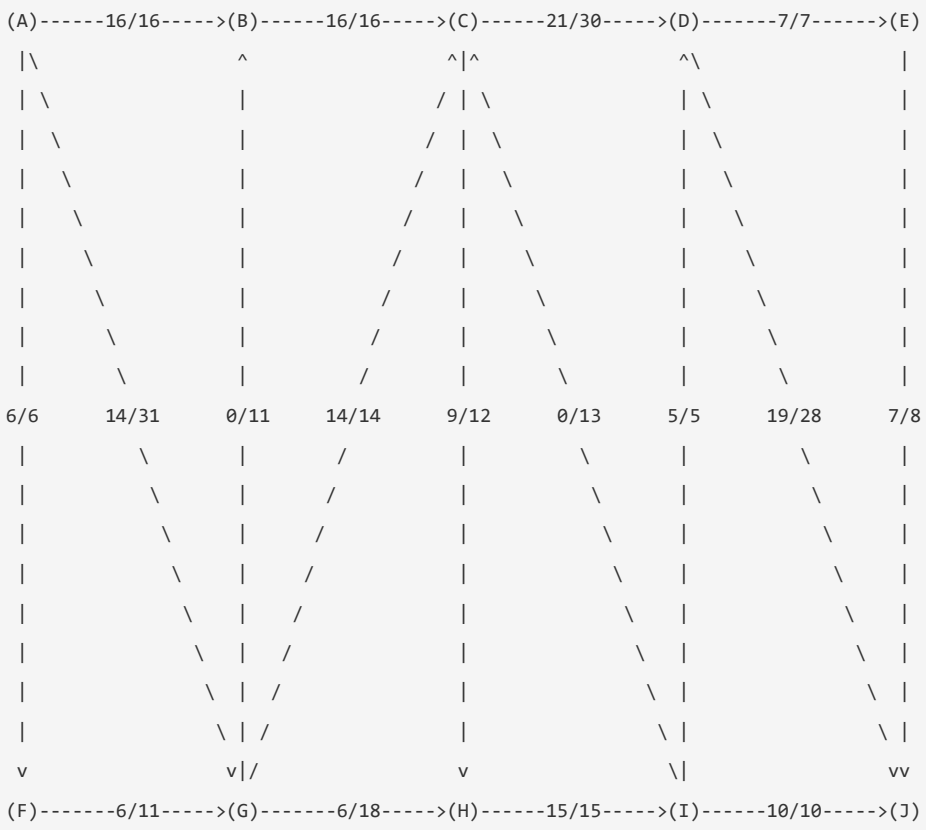
Question Explanation

```
The correct answer is: A G B H I J



augmenting path:     A->G->B->H->I->J
bottleneck capacity: 3
value of flow:       28

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B      6  /   6
    A->F     16  /  18
    A->G      6  /  11
    B->C      3  /   7
    B->G      3  /   9
    C->D      3  /   3
    D->E      5  /  10
    D->J      6  /   6
    E->J      5  /   5
    F->G     16  /  16
    G->H     25  /  25
    H->B      0  /  14
    H->C      0  /  13
    H->D      8  /   8
    H->I     17  /  26
    I->D      0  /   8
    I->J     17  /  27
```

Here is a graphical representation of the final flow network:



Question 17

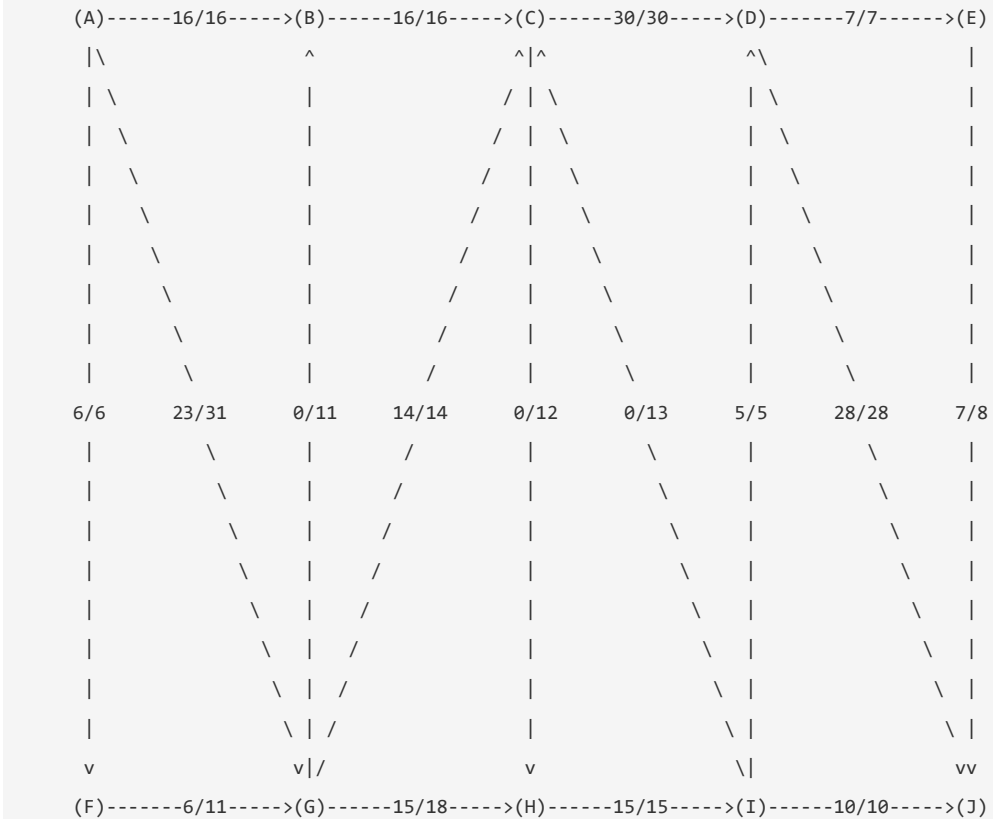


Starting from the given flow (of value 36), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

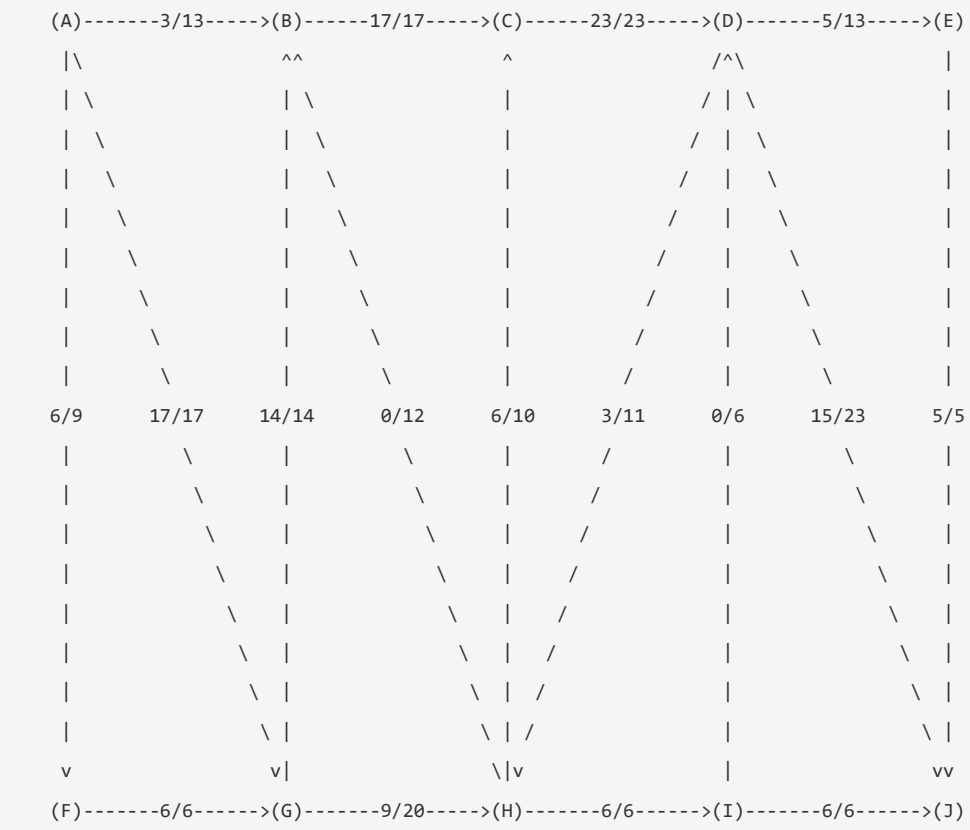
Question Explanation

```
The correct answer is: A G H C D J



augmenting path:     A->G->H->C->D->J
bottleneck capacity: 9
value of flow:       45

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B     16  /  16
    A->F      6  /   6
    A->G     23  /  31
    B->C     16  /  16
    C->D     30  /  30
    C->H      0  /  12
    D->E      7  /   7
    D->J     28  /  28
    E->J      7  /   8
    F->G      6  /  11
    G->B      0  /  11
    G->C     14  /  14
    G->H     15  /  18
    H->I     15  /  15
    I->C      0  /  13
    I->D      5  /   5
    I->J     10  /  10
```

Here is a graphical representation of the final flow network:



Question 18

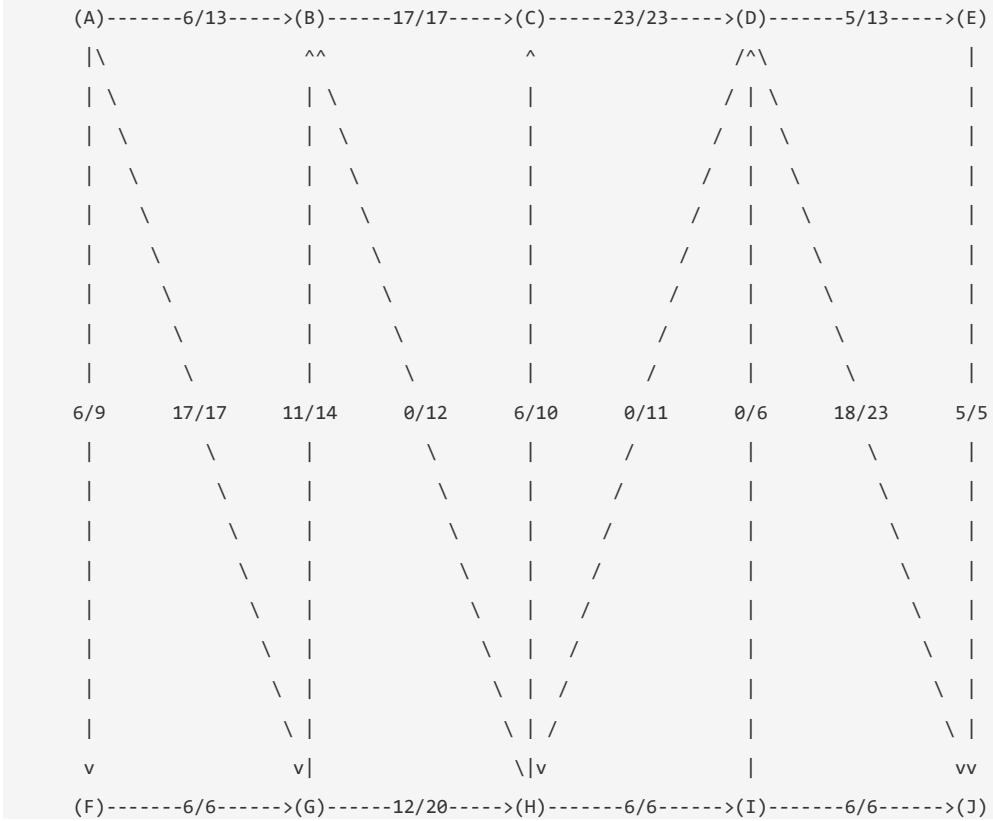


Starting from the given flow (of value 26), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

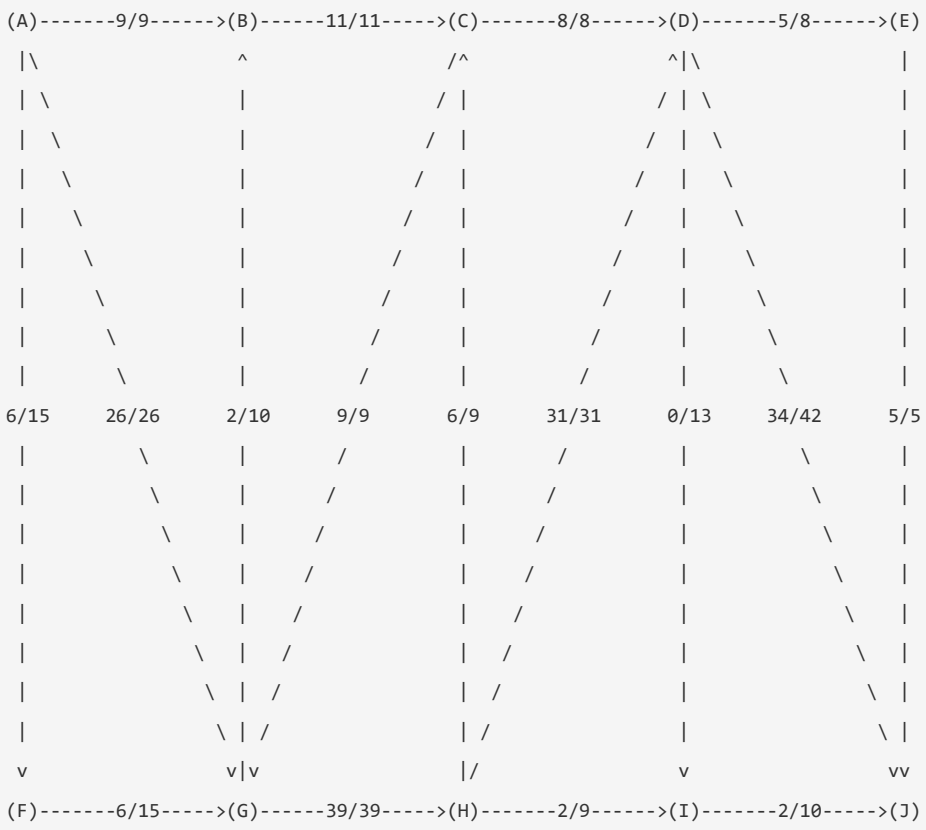
Question Explanation

```
The correct answer is: A B G H D J



augmenting path:     A->B->G->H->D->J
bottleneck capacity: 3
value of flow:       29

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B      6  /  13
    A->F      6  /   9
    A->G     17  /  17
    B->C     17  /  17
    C->D     23  /  23
    D->E      5  /  13
    D->H      0  /  11
    D->J     18  /  23
    E->J      5  /   5
    F->G      6  /   6
    G->B     11  /  14
    G->H     12  /  20
    H->B      0  /  12
    H->C      6  /  10
    H->I      6  /   6
    I->D      0  /   6
    I->J      6  /   6
```

Here is a graphical representation of the final flow network:



Question 19



Starting from the given flow (of value 41), give the sequence of vertices in the next (and final) augmenting path discovered by the Ford-Fulkerson algorithm.

Question Explanation

```
The correct answer is: A F G C H I J



augmenting path:     A->F->G->C->H->I->J
bottleneck capacity: 6
value of flow:       47

Here is the final flow network:

    edge   flow  /  capacity
    ------------------------
    A->B      9  /   9
    A->F     12  /  15
    A->G     26  /  26
    B->C     11  /  11
    C->D      8  /   8
    C->G      3  /   9
    D->E      5  /   8
    D->I      0  /  13
    D->J     34  /  42
    E->J      5  /   5
    F->G     12  /  15
    G->B      2  /  10
    G->H     39  /  39
    H->C      0  /   9
    H->D     31  /  31
    H->I      8  /   9
    I->J      8  /  10
```

Here is a graphical representation of the final flow network: