

Behold the program to the right.

- **Question 1:** What is the first line of this program's output?
- **Question 2:** What is the second line of this program's output?
- **Question 3:** What is the third line of this program's output?
- **Question 4:** What is the fourth line of this program's output?
- **Question 5:** What is the fifth line of this program's output?
- **Question 6:** What is the sixth line of this program's output?
- **Question 7:** What is the seventh line of this program's output?
- **Question 8:** On which line does a memory leak occur?

```
#include <iostream>
#include <vector>
using namespace std;

int main() /* Line 1 */
{ /* Line 2 */
    vector <int *> iv; /* Line 3 */
    vector <int> jv; /* Line 4 */
    int *ip, *jp, *kp; /* Line 5 */
    /* Line 6 */

    ip = new int; /* Line 7 */
    jp = new int; /* Line 8 */
    kp = new int; /* Line 9 */
    /* Line 10 */

    *ip = 22; /* Line 11 */
    *jp = 33; /* Line 12 */
    *kp = 44; /* Line 13 */
    /* Line 14 */

    iv.push_back(ip); /* Line 15 */
    iv.push_back(jp); /* Line 16 */
    /* Line 17 */

    jv.push_back(*(iv[1])); /* Line 18 */
    jv.push_back(*(iv[0])); /* Line 19 */
    /* Line 20 */

    *(iv[0]) = *kp; /* Line 21 */
    kp = jp; /* Line 22 */
    /* Line 23 */

    cout << *ip << endl; /* Line 24 */
    cout << *jp << endl; /* Line 25 */
    cout << *kp << endl; /* Line 26 */
    cout << *(iv[0]) << endl; /* Line 27 */
    cout << *(iv[1]) << endl; /* Line 28 */
    cout << jv[0] << endl; /* Line 29 */
    cout << jv[1] << endl; /* Line 30 */
    return 0; /* Line 31 */
} /* Line 32 */
```

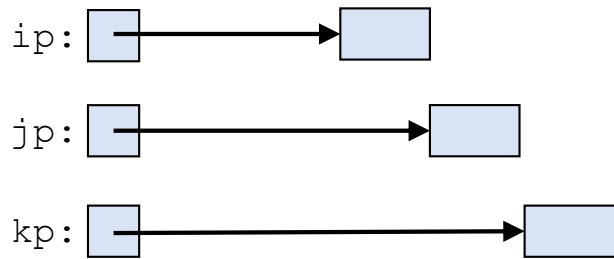
ip:

jp:

kp:

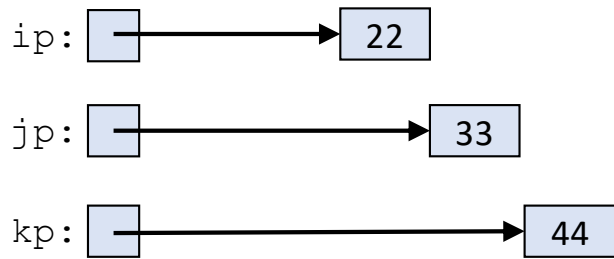
```
int main() /* Line 1 */
{ /* Line 2 */
    vector <int *> iv; /* Line 3 */
    vector <int> jv; /* Line 4 */
    int *ip, *jp, *kp; /* Line 5 */
    /* Line 6 */
    ip = new int; /* Line 7 */
    jp = new int; /* Line 8 */
    kp = new int; /* Line 9 */
    /* Line 10 */
    *ip = 22; /* Line 11 */
    *jp = 33; /* Line 12 */
    *kp = 44; /* Line 13 */
    /* Line 14 */
    iv.push_back(ip); /* Line 15 */
    iv.push_back(jp); /* Line 16 */
    /* Line 17 */
    jv.push_back(*iv[1]); /* Line 18 */
    jv.push_back(*iv[0]); /* Line 19 */
    /* Line 20 */
    *(iv[0]) = *kp; /* Line 21 */
    kp = jp; /* Line 22 */
}
```

Lines 7-9



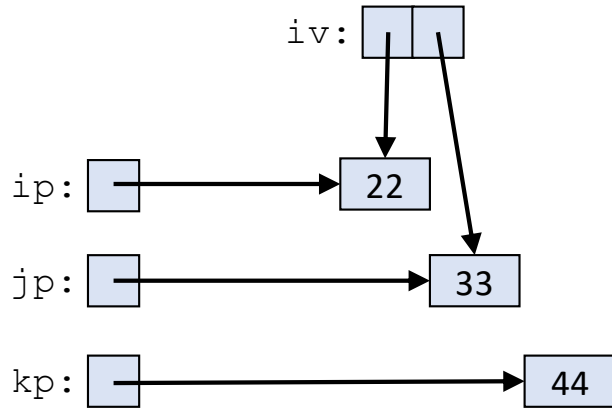
```
int main() /* Line 1 */
{ /* Line 2 */
    vector <int *> iv; /* Line 3 */
    vector <int> jv; /* Line 4 */
    int *ip, *jp, *kp; /* Line 5 */
    /* Line 6 */
    ip = new int; /* Line 7 */
    jp = new int; /* Line 8 */
    kp = new int; /* Line 9 */
    /* Line 10 */
    *ip = 22; /* Line 11 */
    *jp = 33; /* Line 12 */
    *kp = 44; /* Line 13 */
    /* Line 14 */
    iv.push_back(ip); /* Line 15 */
    iv.push_back(jp); /* Line 16 */
    /* Line 17 */
    jv.push_back(*iv[1]); /* Line 18 */
    jv.push_back(*iv[0]); /* Line 19 */
    /* Line 20 */
    *(iv[0]) = *kp; /* Line 21 */
    kp = jp; /* Line 22 */
}
```

Lines 11-13



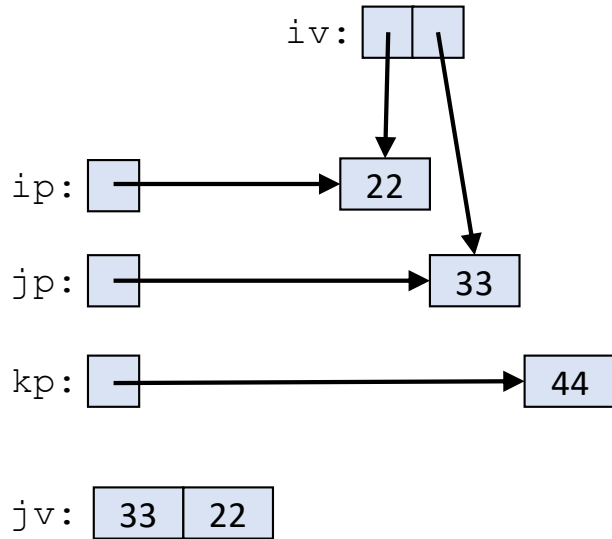
```
int main() /* Line 1 */
{ /* Line 2 */
    vector <int *> iv; /* Line 3 */
    vector <int> jv; /* Line 4 */
    int *ip, *jp, *kp; /* Line 5 */
    /* Line 6 */
    ip = new int; /* Line 7 */
    jp = new int; /* Line 8 */
    kp = new int; /* Line 9 */
    /* Line 10 */
    *ip = 22; /* Line 11 */
    *jp = 33; /* Line 12 */
    *kp = 44; /* Line 13 */
    /* Line 14 */
    iv.push_back(ip); /* Line 15 */
    iv.push_back(jp); /* Line 16 */
    /* Line 17 */
    jv.push_back(*iv[1]); /* Line 18 */
    jv.push_back(*iv[0]); /* Line 19 */
    /* Line 20 */
    *(iv[0]) = *kp; /* Line 21 */
    kp = jp; /* Line 22 */
}
```

Lines 15-16



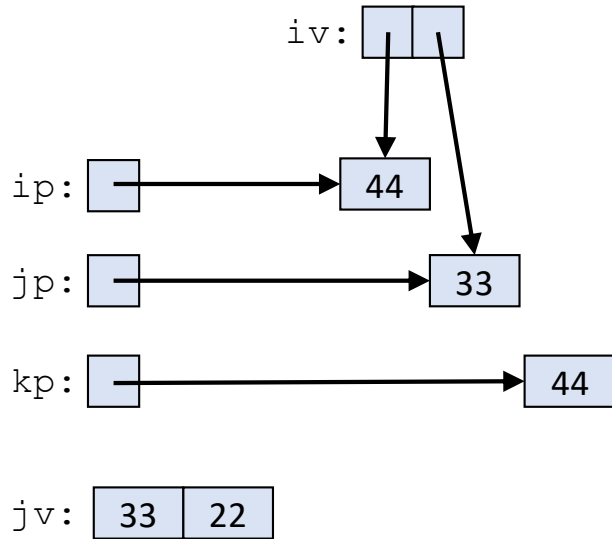
```
int main() /* Line 1 */
{ /* Line 2 */
    vector <int *> iv; /* Line 3 */
    vector <int> jv; /* Line 4 */
    int *ip, *jp, *kp; /* Line 5 */
    /* Line 6 */
    ip = new int; /* Line 7 */
    jp = new int; /* Line 8 */
    kp = new int; /* Line 9 */
    /* Line 10 */
    *ip = 22; /* Line 11 */
    *jp = 33; /* Line 12 */
    *kp = 44; /* Line 13 */
    /* Line 14 */
    iv.push_back(ip); /* Line 15 */
    iv.push_back(jp); /* Line 16 */
    /* Line 17 */
    jv.push_back(*iv[1]); /* Line 18 */
    jv.push_back(*iv[0]); /* Line 19 */
    /* Line 20 */
    *(iv[0]) = *kp; /* Line 21 */
    kp = jp; /* Line 22 */
}
```

Lines 18-19



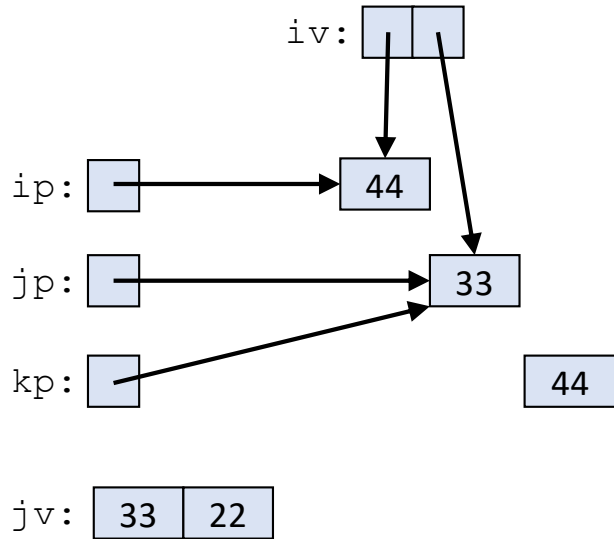
```
int main() /* Line 1 */
{ /* Line 2 */
    vector <int *> iv; /* Line 3 */
    vector <int> jv; /* Line 4 */
    int *ip, *jp, *kp; /* Line 5 */
    /* Line 6 */
    ip = new int; /* Line 7 */
    jp = new int; /* Line 8 */
    kp = new int; /* Line 9 */
    /* Line 10 */
    *ip = 22; /* Line 11 */
    *jp = 33; /* Line 12 */
    *kp = 44; /* Line 13 */
    /* Line 14 */
    iv.push_back(ip); /* Line 15 */
    iv.push_back(jp); /* Line 16 */
    /* Line 17 */
    jv.push_back(*iv[1]); /* Line 18 */
    jv.push_back(*iv[0]); /* Line 19 */
    /* Line 20 */
    *(iv[0]) = *kp; /* Line 21 */
    kp = jp; /* Line 22 */
}
```

Line 21



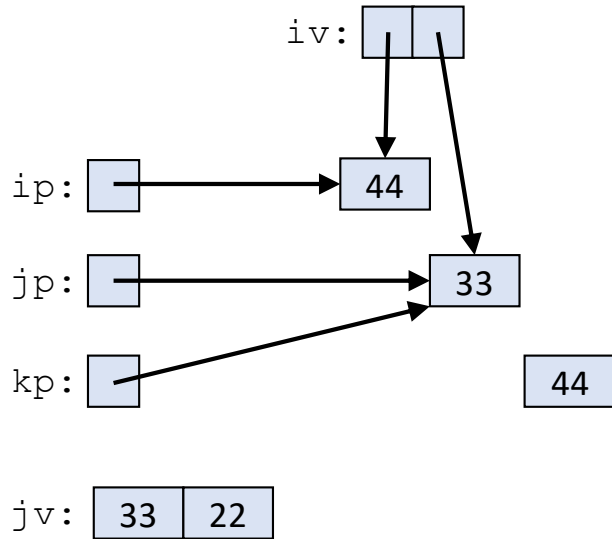
```
int main() /* Line 1 */
{ /* Line 2 */
    vector <int *> iv; /* Line 3 */
    vector <int> jv; /* Line 4 */
    int *ip, *jp, *kp; /* Line 5 */
    /* Line 6 */
    ip = new int; /* Line 7 */
    jp = new int; /* Line 8 */
    kp = new int; /* Line 9 */
    /* Line 10 */
    *ip = 22; /* Line 11 */
    *jp = 33; /* Line 12 */
    *kp = 44; /* Line 13 */
    /* Line 14 */
    iv.push_back(ip); /* Line 15 */
    iv.push_back(jp); /* Line 16 */
    /* Line 17 */
    jv.push_back(*iv[1]); /* Line 18 */
    jv.push_back(*iv[0]); /* Line 19 */
    /* Line 20 */
    *(iv[0]) = *kp; /* Line 21 */
    kp = jp; /* Line 22 */
}
```

Line 22



```
int main() /* Line 1 */
{ /* Line 2 */
    vector <int *> iv; /* Line 3 */
    vector <int> jv; /* Line 4 */
    int *ip, *jp, *kp; /* Line 5 */
    /* Line 6 */
    ip = new int; /* Line 7 */
    jp = new int; /* Line 8 */
    kp = new int; /* Line 9 */
    /* Line 10 */
    *ip = 22; /* Line 11 */
    *jp = 33; /* Line 12 */
    *kp = 44; /* Line 13 */
    /* Line 14 */
    iv.push_back(ip); /* Line 15 */
    iv.push_back(jp); /* Line 16 */
    /* Line 17 */
    jv.push_back(*iv[1]); /* Line 18 */
    jv.push_back(*iv[0]); /* Line 19 */
    /* Line 20 */
    *(iv[0]) = *kp; /* Line 21 */
    kp = jp; /* Line 22 */
}
```


Line 22



Output:

```
*ip:    44
*jp:    33
*kp:    33
*iv[0]: 44
*iv[1]: 33
jp[0]:  33
jp[1]:  22
```

```
int main() /* Line 1 */
{ /* Line 2 */
    vector <int *> iv; /* Line 3 */
    vector <int> jv; /* Line 4 */
    int *ip, *jp, *kp; /* Line 5 */
    /* Line 6 */
    ip = new int; /* Line 7 */
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    /* Line 10 */
    *ip = 22; /* Line 11 */
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    *kp = 44; /* Line 13 */
    /* Line 14 */
    iv.push_back(ip); /* Line 15 */
    iv.push_back(jp); /* Line 16 */
    /* Line 17 */
    jv.push_back(*iv[1]); /* Line 18 */
    jv.push_back(*iv[0]); /* Line 19 */
    /* Line 20 */
    *(iv[0]) = *kp; /* Line 21 */
    kp = jp; /* Line 22 */
}
```

Memory leak is on line 22.