p4q5
p11q5
MR

Data Structures and Algorithms 2001

Answer notes:

(a)
Let dx and dy be the differences x2-x1, y2-y1
Let t = dy/(abs dy + abs dx)
if dx,dy >=0 a := t
if dx<0 a := 2-t
if dx>=0, dy<0 a := 4+t

Use a as the angle of a line segment relative to the x-axis.
Angle p1p2 < angle p2p3 => turn left
else turn right
or
use ccw funtion described by Sedgewick
or
dy2 *dx1 - dy1*dx2 > 0 => turn left
else turn right

(b)

```
                1  2  3  4  5  6  7  8  9 10 11
. . . . . . . . x  x  x  x  x  x  x  x  x  x  x . . . .
                A  B  R  A  C  A  D  A  B  R  A
                |           |     |     |  |  |
                ?           C     D     B  R  A
```

```
char fail cv['A'] = 0
          cv['R'] = 1
          cv['B'] = 3
          cv['D'] = 4
          cv['C'] = 6
          else    = 11
```

```
Fail at fv[11]                                 #  +1
        fv[10]                              #  A  +3
        fv[ 9]                           #  R  A  +10
        fv[ 8]                        #  B  R  A  +10
        fv[ 7]                     #  A  B  R  A  +7
        fv[ 6]                  #  D  A  B  R  A  +7
        fv[ 5]               #  A  D  A  B  R  A  +7
        fv[ 4]            #  C  A  D  A  B  R  A  +7
        fv[ 3]         #  A  C  A  D  A  B  R  A  +7
        fv[ 2]      #  R  A  C  A  D  A  B  R  A  +7
        fv[ 1]   #  B  R  A  C  A  D  A  B  R  A  +7
```

Match from fight hand end of the pattern
On failure at position i of pattern, move pattern to
the right by

```
    max(fv[i], cv[ch]+i-11)   // ch is failing string char
```

(b) i prob expected step

```
                        A  R  B  D  C  ?
fail at 11 25/26       (1 +1 +2 +4 +6 +11*21)/26 = approx 10
fail at 10 25/(26*26)  (3 +3 +3 +4 +6 +10*21)/26 = approx  9
fail at  9 approx 0    (10+10+10+10+10+ 9*21)/26
...

Expected step is about 10 so
about 100000 steps
all require 1 comparison
1/26 require a second comparison
very few require more
so expected number of comparisons = 100000(1 + 1/26 + ...)
                                  = 100000 approx
```