Lineariy_error_example

Unknown Author

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In [57]:
```
# Linearity error example
```

In [58]:
```
import numpy as np
x = np.array(range(20,220,20)+range(180,0,-20))
y = np.array([20,40,59,77,97,117,137,156,175,195,176,156,136,117,97,78,58,39,20])
```

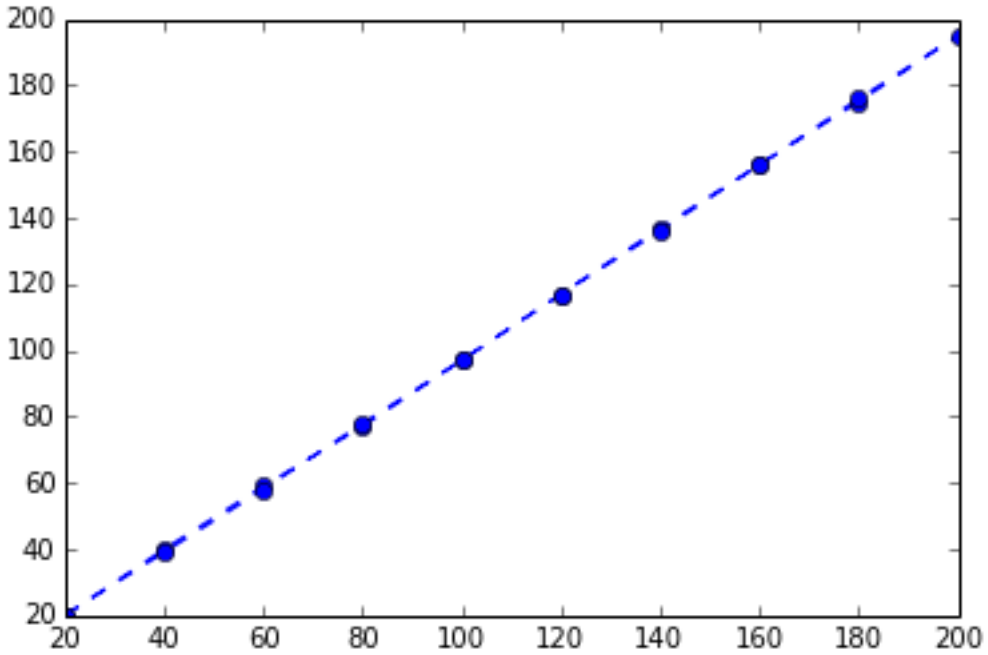
In [59]:
```
print 'x = '; print x
print 'y = '; print y
```

```
x =
[ 20  40  60  80 100 120 140 160 180 200 180 160 140 120 100  80  60
40
  20]
y =
[ 20  40  59  77  97 117 137 156 175 195 176 156 136 117  97  78  58
39
  20]
```

In [60]:
```
plot(x,y,'--o')
```

```
[<matplotlib.lines.Line2D at 0x1061c26d0>]
```

Out [60]:

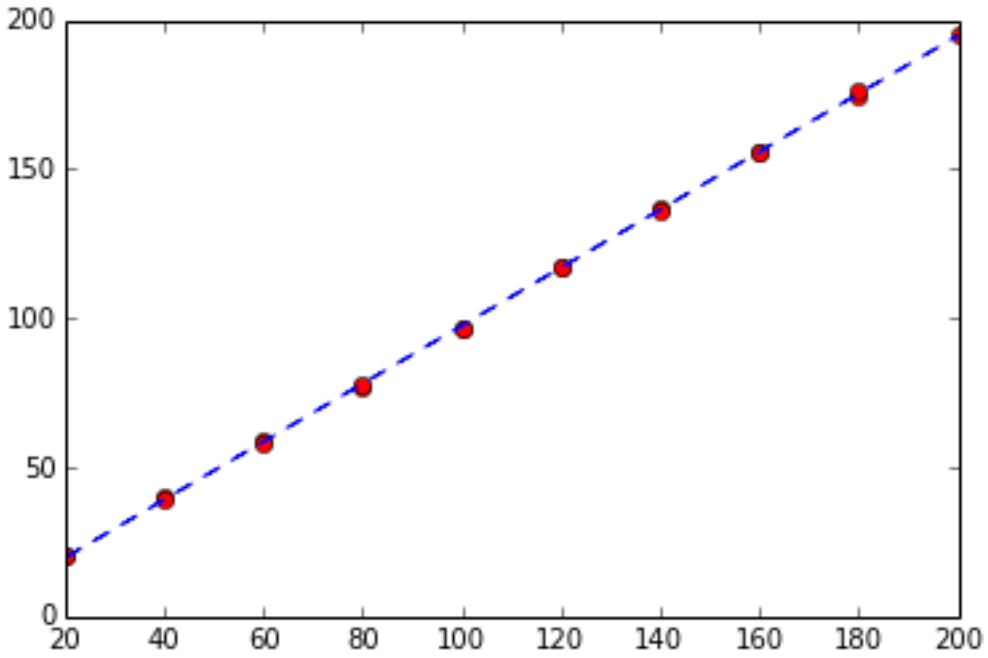


In [61]:
```
# create best fit
p = polyfit(x,y,1)
print p
y_fit = polyval(p,x)
```

```
[ 0.97291209  0.21978022]
```

In [62]:
```
plot(x,y,'ro',x,y_fit,'b--')
```

Out [62]:
```
[<matplotlib.lines.Line2D at 0x1062a9710>,
 <matplotlib.lines.Line2D at 0x1062a9950>]
```



In [63]:
```
print 'measured y = '; print y
print 'estimated y = '; print y_fit
```

```
measured y =
[ 20  40  59  77  97 117 137 156 175 195 176 156 136 117  97  78  58
39
  20]
estimated y =
[  19.67802198   39.13626374   58.59450549   78.05274725   97.51098901
  116.96923077  136.42747253  155.88571429  175.34395604  194.8021978
  175.34395604  155.88571429  136.42747253  116.96923077   97.51098901
   78.05274725   58.59450549   39.13626374   19.67802198]
```

1 Linearity error

$\epsilon_L = |y_L - y|$

$\epsilon_{L_{max}} = max(\epsilon_L)$

$r_0 = y_{max} - y_{min}$

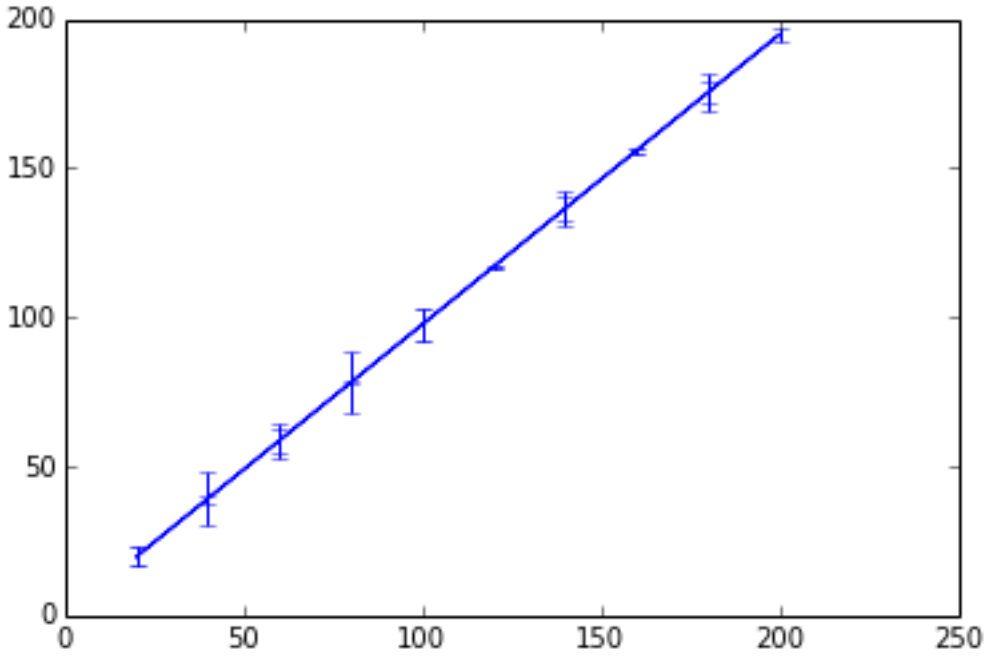
$\%\epsilon_{L_{max}} = \frac{\epsilon_{L_{max}}}{r_0} \times 100$

In [64]:
```
epsilon_L = abs(y - y_fit)
epsilon_L_max = max(epsilon_L)
r0 = max(y) - min(y)
percent_epsilon_L_max = epsilon_L_max/r0 * 100.
```

In [65]:
```
errorbar(x,y_fit,10*epsilon_L)

print epsilon_L_max
print r0
print percent_epsilon_L_max
```

```
1.05274725275
175
0.601569858713
```



In [65]: