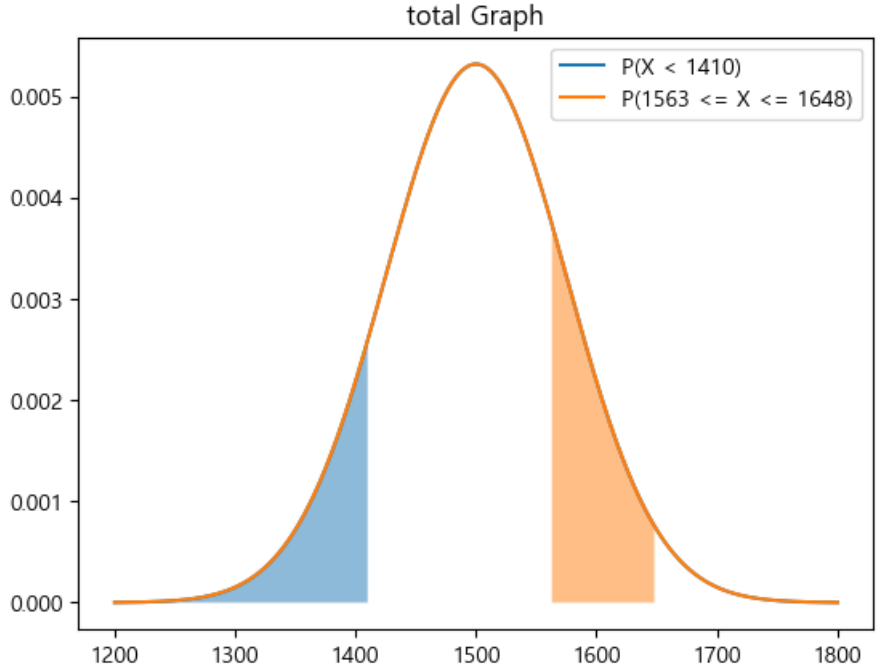
In [14]:

```
# 연습문제 5 / 예제(5.23), p174
from scipy.stats import norm
import matplotlib.pyplot as plt
import numpy as np

plt.rc('font', family='Malgun Gothic')

mu = 1500
sigma = 75

# P(X < 1410)
prob = norm.cdf(1410, mu, sigma)

# P(1563 <= X <= 1648)
prob2 = norm.cdf(1648, mu, sigma) - norm.cdf(1563, mu, sigma)

# 백열전구의 수명이 1410시간 이하일 확률
print(f"P(X < 1410) = {prob:.4f}")
print(f"P(1536 < X < 1648) = {prob2:.4f}")

x = np.linspace(mu - 4 * sigma, mu + 4 * sigma, 1000)
y = norm.pdf(x, mu, sigma)

# P(X < 1410)
x_fill = np.linspace(mu - 4 * sigma, 1410, 100)
y_fill = norm.pdf(x_fill, mu, sigma)

plt.plot(x, y, label="P(X < 1410)")
plt.fill_between(x_fill, y_fill, alpha=0.5)
plt.title("P(X < 1410) / P(Z <= -1.2)")

x = np.linspace(mu - 4 * sigma, mu + 4 * sigma, 1000)
y = norm.pdf(x, mu, sigma)

# P(1563 <= X <= 1648)
x_fill = np.linspace(1563, 1648, 100)
y_fill = norm.pdf(x_fill, mu, sigma)

plt.plot(x, y, label="P(1563 <= X <= 1648)")
plt.fill_between(x_fill, y_fill, alpha=0.5)
plt.title("total Graph")
plt.legend()
# legend = 범례

plt.show()
```

P(X < 1410) = 0.1151
P(1536 < X < 1648) = 0.1762



In [11]:

```
# 연습문제 5-1 / 예제(5.23), p174 / 분할 그래프 그리기
from scipy.stats import norm
import matplotlib.pyplot as plt
import numpy as np

plt.rc('font', family='Malgun Gothic')

mu = 1500
sigma = 75

x = np.linspace(mu - 4 * sigma, mu + 4 * sigma, 1000)
y = norm.pdf(x, mu, sigma)

# P(X < 1410)
x_fill = np.linspace(mu - 4 * sigma, 1410, 100)
y_fill = norm.pdf(x_fill, mu, sigma)

plt.subplot(121)
plt.plot(x, y)
plt.fill_between(x_fill, y_fill, alpha=0.5)
plt.title("P(X < 1410) / P(Z <= -1.2)")

x = np.linspace(mu - 4 * sigma, mu + 4 * sigma, 1000)
y = norm.pdf(x, mu, sigma)

# P(1563 <= X <= 1648)
x_fill = np.linspace(1563, 1648, 100)
y_fill = norm.pdf(x_fill, mu, sigma)

plt.subplot(122)
plt.plot(x, y)
plt.fill_between(x_fill, y_fill, alpha=0.5)
plt.title("P(1563 <= X <= 1648)")

plt.show()
```