

a)

Code:

```
# Daily cigarettes consumed by Scottish smokers
scottish_smokers <- c(5, 5, 10, 12, 20, 10, 2, 15, 15, 20, 20, 15, 15, 15,
20, 16, 18, 20, 15, 25, 60, 5, 10, 15, 10, 10, 10, 20, 3)

# Daily cigarettes consumed by English smokers
english_smokers <- c(4, 24, 19, 2, 15, 5, 16, 10, 24, 26, 21, 28, 7, 22, 20,
27, 20, 27, 11, 1, 29, 27, 19, 10, 17, 23, 13, 39, 6, 24, 11, 16, 20, 18,
16, 46, 2, 18, 20, 6, 13, 12, 12, 16, 17, 12, 16, 13)

# Calculate the sample standard deviations
sd_scottish <- sd(scottish_smokers)
sd_english <- sd(english_smokers)

sd_scottish
sd_english
```

Output:

```
> sd_scottish
[1] 10.4488
> sd_english
[1] 9.113547
```

b)

Code:

```
# Ratio of the standard deviations
ratio_sd <- sd_scottish / sd_english
ratio_sd
```

Output:

```
[1] 1.146513
```

Assumption: The ratio of the standard deviations is approximately 1.15, which is close to 1. This suggests that the variances of the two groups could be considered equal.

c)

1. Define the Parameters:

- Let μ_1 be the mean number of cigarettes consumed daily by Scottish smokers.
- Let μ_2 be the mean number of cigarettes consumed daily by English smokers.

2. State the Hypotheses:

- Null hypothesis (H_0): $\mu_1 = \mu_2$
- Alternative hypothesis (H_1): $\mu_1 \neq \mu_2$

3. Conduct the Hypothesis Test Using R:

```
# Perform the two-sample t-test
t_test_result <- t.test(scottish_smokers, english_smokers, var.equal = TRUE)
t_test_result
```

Output:

```
Two Sample t-test

data:  scottish_smokers and english_smokers
t = -0.90425, df = 75, p-value = 0.3688
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -6.562534  2.464832
sample estimates:
mean of x mean of y
 15.03448  17.08333
```

d)

- **Test Statistic:** $t = -0.90425$
- **P-value:** 0.3688

Since the p-value (0.3688) is greater than the significance level $\alpha=0.10$, we do not reject the null hypothesis H_0 .

e)

Based on the hypothesis test, there is not enough evidence to suggest that the mean number of cigarettes consumed daily by English smokers is different from that of Scottish smokers.

f)

80% confidence interval for the mean difference (English-Scottish) in daily cigarettes consumed by English and Scottish smokers:

Code:

```
# Perform the two-sample t-test with 80% confidence interval
t_test_ci <- t.test(scottish_smokers, english_smokers, var.equal = TRUE,
  conf.level = 0.80)
t_test_ci$conf.int
```

Output:

```
[1] -4.9783831  0.8806819
attr(,"conf.level")
[1] 0.8
```

The 80% confidence interval for the mean difference (English - Scottish) in daily cigarettes consumed is (-4.9783831, 0.8806819)