

# Working Solutions

# With

# Vectors

## Solution 1

```
u <- 4
v <- 8
u + v
## [1] 12

u - v
## [1] -4

u * v
## [1] 32

u / v
## [1] 0.5

u^v
## [1] 65536
```

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## Solution 2

```
u <- c(4, 5, 6)
v <- c(1, 2, 3)
u + v
## [1] 5 7 9

u - v
## [1] 3 3 3

u * v
```

```
## [1] 4 10 18
```

```
u / v
```

```
## [1] 4.0 2.5 2.0
```

```
u^v
```

```
## [1] 4 25 216
```

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## Solution 3

```
u <- c(5, 6, 7, 8)
```

```
v <- c(2, 3, 4)
```

```
u + v
```

```
## Warning in u + v: longer object length is not a multiple of  
shorter object
```

```
## length
```

```
## [1] 7 9 11 10
```

```
u - v
```

```
## Warning in u - v: longer object length is not a multiple of  
shorter object
```

```
## length
```

```
## [1] 3 3 3 6
```

```
u * v
```

```
## Warning in u * v: longer object length is not a multiple of  
shorter object
```

```
## length
```

```
## [1] 10 18 28 16
```

```
u / v
```

```
## Warning in u/v: longer object length is not a multiple of  
shorter object
```

```
## length
```

```
## [1] 2.50 2.00 1.75 4.00
```

```
u^v
```

```
## Warning in u^v: longer object length is not a multiple of  
shorter object
```

```
## length
```

```
## [1] 25 216 2401 64
```

R uses the *recycle rule* when vectors have different lengths, i.e. it re-uses elements from the shorter vector (starting at the beginning of the vector). In this case, it treats `v` as `c(2, 3, 4, 2)` (re-using its first element 2).

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## Solution 4

### Part a

```
u <- c(8, 9, 10)
```

```
v <- c(1, 2, 3)
```

```
w <- 0.5 * v
```

```
w <- u + w
```

```
w <- w^2
```

```
w
```

```
## [1] 72.25 100.00 132.25
```

Now check with the original approach:

```
w <- (u + 0.5 * v) ^ 2
```

```
w
```

```
## [1] 72.25 100.00 132.25
```

### Part b

```
w1 <- u + 2
```

```
w2 <- u - 5
```

```
w <- w1 * w2
```

```
w <- w + v
w
## [1] 31 46 63
```

Now check with the original approach:

```
w <- (u + 2) * (u - 5) + v
w
## [1] 31 46 63
```

## Part c

```
w1 <- u + 2
w2 <- u - 5
w2 <- w2 * v
w <- w1 / w2
w
## [1] 3.333333 1.375000 0.800000
```

Now check with the original approach:

```
w <- (u + 2) / ((u - 5) * v)
w
## [1] 3.333333 1.375000 0.800000
```

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## Solution 5

### Part a

```
w <- ((u + v) / 2) + u
w
## [1] 12.5 14.5 16.5
```

Now check with the original approach:

```
w <- u + v
```

```
w <- w / 2
w <- w + u
w
## [1] 12.5 14.5 16.5
```

## Part b

```
w <- (u^3) / (u-v)
w
## [1] 73.14286 104.14286 142.85714
```

Now check with the original approach:

```
w1 <- u^3
w2 <- u - v
w <- w1 / w2
w
## [1] 73.14286 104.14286 142.85714
```

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## Solution 6

The solution for this exercise is available in our eBook [Start Here To Learn R – vol. 1: Vectors, arithmetic, and regular sequences](#).

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## Solution 7

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## **Solution 8**

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## **Solution 9**

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