

TD6-exo

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Analyse des lancés de dés

Appel des librairies :

```
library(dplyr);

##
## Attaching package: 'dplyr'
## The following objects are masked from 'package:stats':
##
##   filter, lag
## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union
library(ggplot2);
```

Fonction lancé de dés

```
dice <- function(faces = 6, n=100)
{
  sample(x=seq(from = 1, to = faces, by = 1), size=n, replace = TRUE);
}

dice(6,400);

##   [1] 6 3 2 1 4 3 1 2 1 3 1 4 3 2 1 1 3 5 4 6 2 2 1 3 3 5 6 4 2 2 2 2 4 6 4
##  [36] 1 6 2 1 1 2 4 6 2 2 3 1 6 5 5 2 4 3 4 3 6 1 3 5 5 2 1 2 1 2 2 5 6 5 1
##  [71] 6 2 3 3 4 5 1 2 5 5 6 3 4 5 4 6 5 1 2 4 2 6 2 4 3 1 5 6 3 4 6 1 2 6 2
## [106] 2 6 5 4 4 2 2 5 4 2 6 3 6 5 5 3 4 6 4 4 6 2 1 4 3 6 2 1 6 1 2 3 4 2 1
## [141] 6 5 1 2 6 4 4 1 6 3 4 2 4 3 6 6 5 1 5 3 1 1 4 6 3 2 3 6 3 1 6 1 4 5 3
## [176] 3 1 5 1 6 5 1 5 2 2 1 3 4 3 5 4 3 3 1 4 4 2 3 3 6 5 4 1 6 5 2 3 3 3 2
## [211] 5 4 3 2 3 4 5 4 1 3 3 6 1 1 4 1 3 6 5 5 4 2 2 4 2 5 4 4 5 1 5 4 6 3 4
## [246] 4 5 3 1 6 5 6 5 2 2 3 4 3 2 5 6 1 5 1 6 4 1 6 4 1 6 3 1 3 3 6 5 6 1 3
## [281] 4 3 6 2 1 5 5 1 1 2 3 3 4 3 6 6 3 1 1 6 3 3 1 6 2 3 4 5 3 6 4 3 3 1 1
## [316] 2 5 3 4 1 1 5 2 4 2 5 6 5 6 3 5 1 3 1 1 2 4 4 2 4 5 5 1 2 4 6 5 3 5 4
## [351] 3 4 1 1 4 6 3 4 5 1 4 2 6 4 4 1 1 2 1 3 4 3 4 6 6 3 1 5 3 2 1 2 5 2 6
## [386] 1 5 6 6 3 4 4 6 1 5 1 3 3 5 2
```

Fonction pour lancer 3 dés

```
experiment <- function(faces=6, n=100)
{
  dice1 <- dice(faces,n);
```

```

dice2 <- dice(faces,n);
dice3 <- dice(faces,n);

data.frame(Dice1 = dice1,
           Dice2 = dice2,
           Dice3 = dice3)
}

```

Somme des trois dés dans une nouvelle colonne “Sum”

```

# 400 lancés pour un dé à 6 faces
experiment(6,400) %>% mutate(Sum = Dice1 + Dice2 + Dice3)

```

| ## | Dice1 | Dice2 | Dice3 | Sum |
|-------|-------|-------|-------|-----|
| ## 1 | 2 | 3 | 3 | 8 |
| ## 2 | 6 | 3 | 4 | 13 |
| ## 3 | 4 | 3 | 4 | 11 |
| ## 4 | 2 | 3 | 1 | 6 |
| ## 5 | 3 | 3 | 2 | 8 |
| ## 6 | 6 | 5 | 2 | 13 |
| ## 7 | 4 | 4 | 5 | 13 |
| ## 8 | 3 | 4 | 3 | 10 |
| ## 9 | 2 | 1 | 5 | 8 |
| ## 10 | 5 | 3 | 3 | 11 |
| ## 11 | 4 | 6 | 6 | 16 |
| ## 12 | 2 | 5 | 3 | 10 |
| ## 13 | 2 | 4 | 1 | 7 |
| ## 14 | 5 | 6 | 6 | 17 |
| ## 15 | 6 | 6 | 3 | 15 |
| ## 16 | 6 | 4 | 3 | 13 |
| ## 17 | 2 | 2 | 6 | 10 |
| ## 18 | 2 | 3 | 6 | 11 |
| ## 19 | 1 | 5 | 5 | 11 |
| ## 20 | 1 | 2 | 4 | 7 |
| ## 21 | 4 | 2 | 3 | 9 |
| ## 22 | 5 | 6 | 6 | 17 |
| ## 23 | 5 | 2 | 6 | 13 |
| ## 24 | 6 | 1 | 2 | 9 |
| ## 25 | 3 | 3 | 5 | 11 |
| ## 26 | 6 | 2 | 4 | 12 |
| ## 27 | 4 | 4 | 4 | 12 |
| ## 28 | 1 | 6 | 5 | 12 |
| ## 29 | 3 | 4 | 5 | 12 |
| ## 30 | 5 | 5 | 5 | 15 |
| ## 31 | 5 | 6 | 6 | 17 |
| ## 32 | 6 | 2 | 4 | 12 |
| ## 33 | 3 | 2 | 5 | 10 |
| ## 34 | 5 | 6 | 1 | 12 |
| ## 35 | 3 | 1 | 4 | 8 |
| ## 36 | 5 | 6 | 5 | 16 |
| ## 37 | 5 | 4 | 4 | 13 |
| ## 38 | 5 | 1 | 3 | 9 |

| | | | | |
|-------|---|---|---|----|
| ## 39 | 6 | 5 | 1 | 12 |
| ## 40 | 3 | 6 | 5 | 14 |
| ## 41 | 6 | 6 | 3 | 15 |
| ## 42 | 4 | 3 | 5 | 12 |
| ## 43 | 5 | 1 | 1 | 7 |
| ## 44 | 5 | 5 | 2 | 12 |
| ## 45 | 5 | 6 | 2 | 13 |
| ## 46 | 1 | 5 | 5 | 11 |
| ## 47 | 1 | 2 | 5 | 8 |
| ## 48 | 6 | 1 | 3 | 10 |
| ## 49 | 3 | 6 | 6 | 15 |
| ## 50 | 4 | 2 | 5 | 11 |
| ## 51 | 6 | 1 | 4 | 11 |
| ## 52 | 6 | 6 | 6 | 18 |
| ## 53 | 3 | 2 | 3 | 8 |
| ## 54 | 2 | 6 | 6 | 14 |
| ## 55 | 6 | 1 | 2 | 9 |
| ## 56 | 4 | 4 | 1 | 9 |
| ## 57 | 3 | 5 | 3 | 11 |
| ## 58 | 1 | 4 | 6 | 11 |
| ## 59 | 3 | 3 | 6 | 12 |
| ## 60 | 5 | 2 | 5 | 12 |
| ## 61 | 1 | 2 | 2 | 5 |
| ## 62 | 5 | 1 | 1 | 7 |
| ## 63 | 6 | 5 | 5 | 16 |
| ## 64 | 6 | 4 | 6 | 16 |
| ## 65 | 1 | 1 | 3 | 5 |
| ## 66 | 1 | 3 | 2 | 6 |
| ## 67 | 6 | 3 | 1 | 10 |
| ## 68 | 3 | 3 | 4 | 10 |
| ## 69 | 3 | 6 | 1 | 10 |
| ## 70 | 2 | 6 | 1 | 9 |
| ## 71 | 4 | 2 | 1 | 7 |
| ## 72 | 4 | 3 | 6 | 13 |
| ## 73 | 6 | 1 | 6 | 13 |
| ## 74 | 2 | 3 | 5 | 10 |
| ## 75 | 6 | 6 | 5 | 17 |
| ## 76 | 3 | 1 | 2 | 6 |
| ## 77 | 3 | 5 | 1 | 9 |
| ## 78 | 3 | 1 | 4 | 8 |
| ## 79 | 6 | 2 | 2 | 10 |
| ## 80 | 4 | 2 | 2 | 8 |
| ## 81 | 4 | 4 | 6 | 14 |
| ## 82 | 4 | 3 | 3 | 10 |
| ## 83 | 3 | 4 | 6 | 13 |
| ## 84 | 4 | 3 | 4 | 11 |
| ## 85 | 6 | 5 | 3 | 14 |
| ## 86 | 4 | 1 | 2 | 7 |
| ## 87 | 4 | 3 | 2 | 9 |
| ## 88 | 6 | 6 | 4 | 16 |
| ## 89 | 2 | 3 | 5 | 10 |
| ## 90 | 5 | 3 | 2 | 10 |
| ## 91 | 3 | 5 | 6 | 14 |
| ## 92 | 5 | 2 | 3 | 10 |

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|--------|---|---|---|----|
| ## 93 | 2 | 5 | 2 | 9 |
| ## 94 | 6 | 3 | 4 | 13 |
| ## 95 | 4 | 5 | 4 | 13 |
| ## 96 | 6 | 4 | 4 | 14 |
| ## 97 | 5 | 1 | 6 | 12 |
| ## 98 | 4 | 3 | 2 | 9 |
| ## 99 | 6 | 4 | 1 | 11 |
| ## 100 | 1 | 2 | 6 | 9 |
| ## 101 | 1 | 3 | 5 | 9 |
| ## 102 | 4 | 3 | 5 | 12 |
| ## 103 | 3 | 2 | 3 | 8 |
| ## 104 | 3 | 3 | 5 | 11 |
| ## 105 | 1 | 3 | 5 | 9 |
| ## 106 | 3 | 3 | 4 | 10 |
| ## 107 | 4 | 1 | 1 | 6 |
| ## 108 | 6 | 2 | 6 | 14 |
| ## 109 | 2 | 3 | 3 | 8 |
| ## 110 | 4 | 1 | 3 | 8 |
| ## 111 | 3 | 3 | 6 | 12 |
| ## 112 | 1 | 2 | 2 | 5 |
| ## 113 | 5 | 2 | 5 | 12 |
| ## 114 | 2 | 4 | 3 | 9 |
| ## 115 | 3 | 2 | 1 | 6 |
| ## 116 | 3 | 1 | 3 | 7 |
| ## 117 | 2 | 4 | 4 | 10 |
| ## 118 | 4 | 1 | 6 | 11 |
| ## 119 | 1 | 5 | 1 | 7 |
| ## 120 | 5 | 2 | 4 | 11 |
| ## 121 | 4 | 6 | 1 | 11 |
| ## 122 | 2 | 3 | 1 | 6 |
| ## 123 | 1 | 5 | 6 | 12 |
| ## 124 | 6 | 5 | 3 | 14 |
| ## 125 | 4 | 5 | 1 | 10 |
| ## 126 | 3 | 1 | 4 | 8 |
| ## 127 | 3 | 4 | 5 | 12 |
| ## 128 | 1 | 6 | 4 | 11 |
| ## 129 | 5 | 2 | 6 | 13 |
| ## 130 | 3 | 4 | 4 | 11 |
| ## 131 | 4 | 5 | 1 | 10 |
| ## 132 | 3 | 1 | 4 | 8 |
| ## 133 | 1 | 1 | 2 | 4 |
| ## 134 | 3 | 1 | 6 | 10 |
| ## 135 | 1 | 6 | 2 | 9 |
| ## 136 | 3 | 2 | 2 | 7 |
| ## 137 | 2 | 2 | 5 | 9 |
| ## 138 | 1 | 6 | 5 | 12 |
| ## 139 | 5 | 4 | 2 | 11 |
| ## 140 | 2 | 1 | 5 | 8 |
| ## 141 | 1 | 1 | 4 | 6 |
| ## 142 | 2 | 4 | 6 | 12 |
| ## 143 | 1 | 5 | 6 | 12 |
| ## 144 | 2 | 6 | 5 | 13 |
| ## 145 | 2 | 3 | 2 | 7 |
| ## 146 | 6 | 2 | 3 | 11 |

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| ## 147 | 3 | 3 | 5 | 11 |
| ## 148 | 5 | 3 | 4 | 12 |
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| ## 151 | 5 | 5 | 3 | 13 |
| ## 152 | 3 | 4 | 2 | 9 |
| ## 153 | 6 | 3 | 6 | 15 |
| ## 154 | 4 | 4 | 5 | 13 |
| ## 155 | 2 | 5 | 2 | 9 |
| ## 156 | 3 | 3 | 6 | 12 |
| ## 157 | 1 | 1 | 4 | 6 |
| ## 158 | 3 | 2 | 4 | 9 |
| ## 159 | 6 | 6 | 3 | 15 |
| ## 160 | 4 | 5 | 4 | 13 |
| ## 161 | 6 | 1 | 6 | 13 |
| ## 162 | 2 | 4 | 3 | 9 |
| ## 163 | 4 | 6 | 5 | 15 |
| ## 164 | 4 | 1 | 4 | 9 |
| ## 165 | 6 | 6 | 5 | 17 |
| ## 166 | 3 | 6 | 3 | 12 |
| ## 167 | 2 | 4 | 6 | 12 |
| ## 168 | 2 | 3 | 6 | 11 |
| ## 169 | 2 | 4 | 2 | 8 |
| ## 170 | 6 | 1 | 3 | 10 |
| ## 171 | 6 | 2 | 6 | 14 |
| ## 172 | 1 | 3 | 4 | 8 |
| ## 173 | 6 | 6 | 4 | 16 |
| ## 174 | 1 | 1 | 1 | 3 |
| ## 175 | 6 | 5 | 1 | 12 |
| ## 176 | 6 | 5 | 3 | 14 |
| ## 177 | 5 | 6 | 5 | 16 |
| ## 178 | 2 | 1 | 1 | 4 |
| ## 179 | 6 | 6 | 4 | 16 |
| ## 180 | 1 | 5 | 3 | 9 |
| ## 181 | 1 | 3 | 6 | 10 |
| ## 182 | 3 | 6 | 3 | 12 |
| ## 183 | 6 | 2 | 6 | 14 |
| ## 184 | 2 | 1 | 6 | 9 |
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| ## 188 | 6 | 6 | 1 | 13 |
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| ## 190 | 6 | 2 | 5 | 13 |
| ## 191 | 1 | 3 | 2 | 6 |
| ## 192 | 1 | 3 | 4 | 8 |
| ## 193 | 3 | 1 | 3 | 7 |
| ## 194 | 6 | 3 | 3 | 12 |
| ## 195 | 5 | 2 | 2 | 9 |
| ## 196 | 6 | 2 | 4 | 12 |
| ## 197 | 4 | 2 | 5 | 11 |
| ## 198 | 3 | 5 | 5 | 13 |
| ## 199 | 4 | 4 | 5 | 13 |
| ## 200 | 6 | 5 | 2 | 13 |

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| ## 201 | 4 | 3 | 5 | 12 |
| ## 202 | 5 | 4 | 3 | 12 |
| ## 203 | 3 | 1 | 5 | 9 |
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| ## 205 | 5 | 5 | 1 | 11 |
| ## 206 | 5 | 4 | 2 | 11 |
| ## 207 | 3 | 1 | 5 | 9 |
| ## 208 | 6 | 6 | 6 | 18 |
| ## 209 | 3 | 4 | 4 | 11 |
| ## 210 | 1 | 1 | 4 | 6 |
| ## 211 | 6 | 4 | 6 | 16 |
| ## 212 | 4 | 1 | 2 | 7 |
| ## 213 | 4 | 1 | 1 | 6 |
| ## 214 | 1 | 4 | 2 | 7 |
| ## 215 | 4 | 6 | 2 | 12 |
| ## 216 | 5 | 5 | 5 | 15 |
| ## 217 | 6 | 3 | 6 | 15 |
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| ## 248 | 4 | 6 | 4 | 14 |
| ## 249 | 1 | 4 | 3 | 8 |
| ## 250 | 4 | 5 | 2 | 11 |
| ## 251 | 6 | 1 | 3 | 10 |
| ## 252 | 4 | 6 | 3 | 13 |
| ## 253 | 5 | 4 | 6 | 15 |
| ## 254 | 2 | 4 | 3 | 9 |

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| ## 255 | 2 | 3 | 6 | 11 |
| ## 256 | 2 | 1 | 3 | 6 |
| ## 257 | 2 | 5 | 4 | 11 |
| ## 258 | 6 | 5 | 1 | 12 |
| ## 259 | 4 | 1 | 2 | 7 |
| ## 260 | 3 | 1 | 3 | 7 |
| ## 261 | 2 | 5 | 4 | 11 |
| ## 262 | 5 | 6 | 2 | 13 |
| ## 263 | 1 | 6 | 1 | 8 |
| ## 264 | 5 | 1 | 2 | 8 |
| ## 265 | 3 | 5 | 1 | 9 |
| ## 266 | 4 | 6 | 4 | 14 |
| ## 267 | 6 | 2 | 4 | 12 |
| ## 268 | 1 | 2 | 6 | 9 |
| ## 269 | 3 | 6 | 3 | 12 |
| ## 270 | 6 | 3 | 5 | 14 |
| ## 271 | 5 | 3 | 6 | 14 |
| ## 272 | 6 | 6 | 2 | 14 |
| ## 273 | 5 | 2 | 5 | 12 |
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| ## 278 | 3 | 4 | 1 | 8 |
| ## 279 | 2 | 4 | 2 | 8 |
| ## 280 | 5 | 2 | 3 | 10 |
| ## 281 | 1 | 6 | 1 | 8 |
| ## 282 | 5 | 3 | 5 | 13 |
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| ## 284 | 2 | 4 | 2 | 8 |
| ## 285 | 1 | 4 | 1 | 6 |
| ## 286 | 4 | 2 | 2 | 8 |
| ## 287 | 4 | 3 | 3 | 10 |
| ## 288 | 2 | 1 | 1 | 4 |
| ## 289 | 3 | 6 | 6 | 15 |
| ## 290 | 4 | 4 | 6 | 14 |
| ## 291 | 6 | 2 | 5 | 13 |
| ## 292 | 4 | 1 | 3 | 8 |
| ## 293 | 3 | 4 | 5 | 12 |
| ## 294 | 3 | 3 | 4 | 10 |
| ## 295 | 6 | 1 | 4 | 11 |
| ## 296 | 3 | 5 | 4 | 12 |
| ## 297 | 3 | 2 | 5 | 10 |
| ## 298 | 6 | 5 | 4 | 15 |
| ## 299 | 4 | 2 | 6 | 12 |
| ## 300 | 2 | 2 | 2 | 6 |
| ## 301 | 5 | 6 | 1 | 12 |
| ## 302 | 1 | 6 | 3 | 10 |
| ## 303 | 2 | 2 | 4 | 8 |
| ## 304 | 6 | 2 | 1 | 9 |
| ## 305 | 3 | 5 | 3 | 11 |
| ## 306 | 3 | 5 | 3 | 11 |
| ## 307 | 1 | 2 | 5 | 8 |
| ## 308 | 6 | 1 | 6 | 13 |

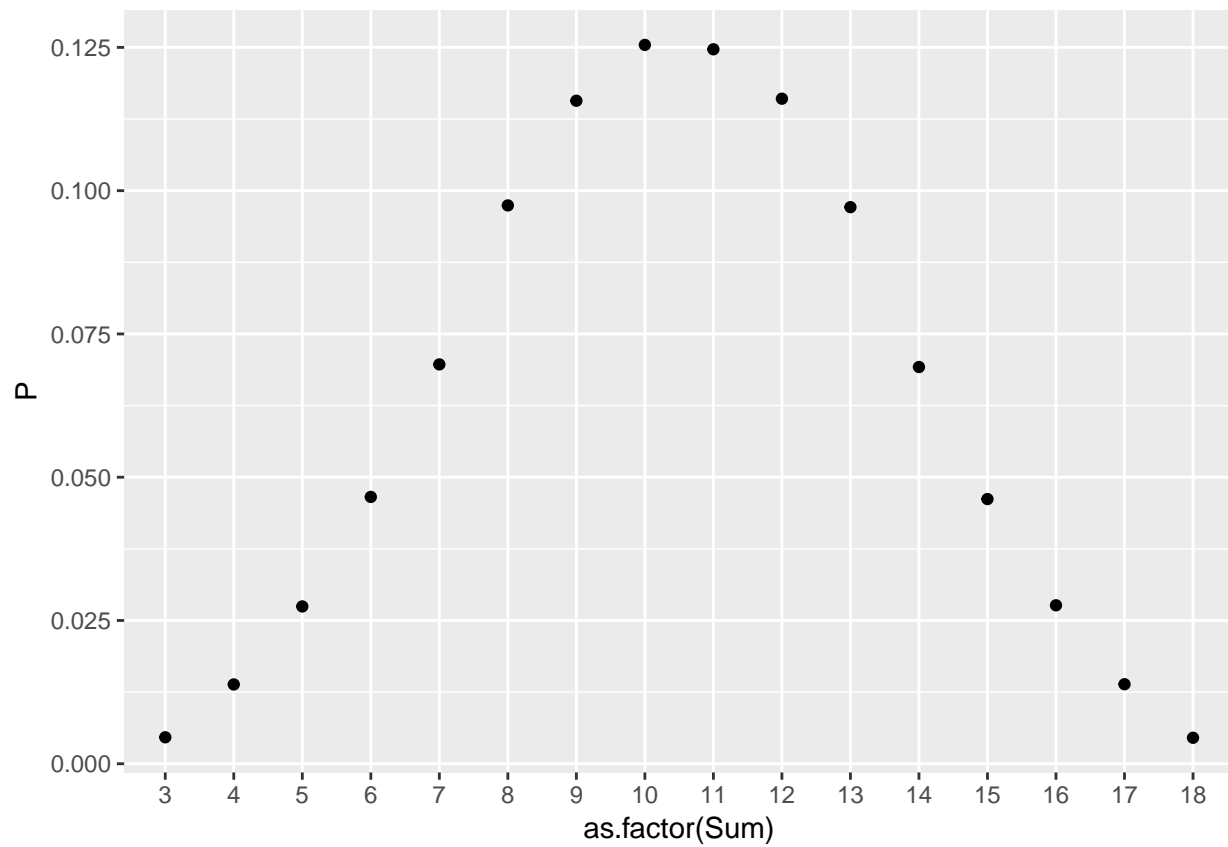
| | | | | |
|--------|---|---|---|----|
| ## 309 | 6 | 2 | 4 | 12 |
| ## 310 | 5 | 5 | 4 | 14 |
| ## 311 | 2 | 1 | 3 | 6 |
| ## 312 | 5 | 2 | 1 | 8 |
| ## 313 | 6 | 1 | 6 | 13 |
| ## 314 | 1 | 3 | 2 | 6 |
| ## 315 | 2 | 1 | 4 | 7 |
| ## 316 | 4 | 5 | 4 | 13 |
| ## 317 | 2 | 5 | 2 | 9 |
| ## 318 | 2 | 3 | 5 | 10 |
| ## 319 | 6 | 3 | 4 | 13 |
| ## 320 | 4 | 3 | 1 | 8 |
| ## 321 | 1 | 3 | 2 | 6 |
| ## 322 | 3 | 3 | 2 | 8 |
| ## 323 | 2 | 4 | 6 | 12 |
| ## 324 | 1 | 3 | 2 | 6 |
| ## 325 | 1 | 2 | 4 | 7 |
| ## 326 | 6 | 3 | 3 | 12 |
| ## 327 | 5 | 6 | 3 | 14 |
| ## 328 | 4 | 2 | 6 | 12 |
| ## 329 | 5 | 5 | 4 | 14 |
| ## 330 | 4 | 4 | 3 | 11 |
| ## 331 | 3 | 5 | 6 | 14 |
| ## 332 | 5 | 6 | 3 | 14 |
| ## 333 | 1 | 5 | 1 | 7 |
| ## 334 | 4 | 1 | 1 | 6 |
| ## 335 | 2 | 3 | 3 | 8 |
| ## 336 | 4 | 2 | 4 | 10 |
| ## 337 | 4 | 6 | 6 | 16 |
| ## 338 | 5 | 1 | 2 | 8 |
| ## 339 | 6 | 1 | 5 | 12 |
| ## 340 | 2 | 6 | 6 | 14 |
| ## 341 | 3 | 3 | 5 | 11 |
| ## 342 | 2 | 6 | 2 | 10 |
| ## 343 | 3 | 6 | 1 | 10 |
| ## 344 | 4 | 6 | 6 | 16 |
| ## 345 | 3 | 1 | 2 | 6 |
| ## 346 | 1 | 6 | 1 | 8 |
| ## 347 | 2 | 5 | 6 | 13 |
| ## 348 | 3 | 5 | 2 | 10 |
| ## 349 | 1 | 1 | 2 | 4 |
| ## 350 | 4 | 2 | 6 | 12 |
| ## 351 | 6 | 5 | 5 | 16 |
| ## 352 | 4 | 3 | 1 | 8 |
| ## 353 | 5 | 1 | 4 | 10 |
| ## 354 | 2 | 3 | 6 | 11 |
| ## 355 | 5 | 5 | 3 | 13 |
| ## 356 | 2 | 3 | 5 | 10 |
| ## 357 | 1 | 5 | 1 | 7 |
| ## 358 | 1 | 5 | 3 | 9 |
| ## 359 | 5 | 5 | 6 | 16 |
| ## 360 | 2 | 4 | 3 | 9 |
| ## 361 | 3 | 2 | 3 | 8 |
| ## 362 | 3 | 3 | 4 | 10 |


```
## 363      2      4      6 12
## 364      1      4      3  8
## 365      4      4      6 14
## 366      2      1      1  4
## 367      5      5      4 14
## 368      2      4      3  9
## 369      5      3      5 13
## 370      4      6      6 16
## 371      5      5      2 12
## 372      2      1      5  8
## 373      5      1      1  7
## 374      1      5      5 11
## 375      5      4      2 11
## 376      3      5      2 10
## 377      6      6      5 17
## 378      4      2      1  7
## 379      4      4      1  9
## 380      6      3      1 10
## 381      4      3      4 11
## 382      4      2      5 11
## 383      2      2      4  8
## 384      6      1      1  8
## 385      5      5      6 16
## 386      2      6      3 11
## 387      1      1      1  3
## 388      5      2      1  8
## 389      4      6      4 14
## 390      5      1      4 10
## 391      4      3      5 12
## 392      3      2      5 10
## 393      5      3      5 13
## 394      4      6      5 15
## 395      4      3      2  9
## 396      2      4      5 11
## 397      3      2      1  6
## 398      2      4      5 11
## 399      6      5      3 14
## 400      4      3      1  8
```

Comptage

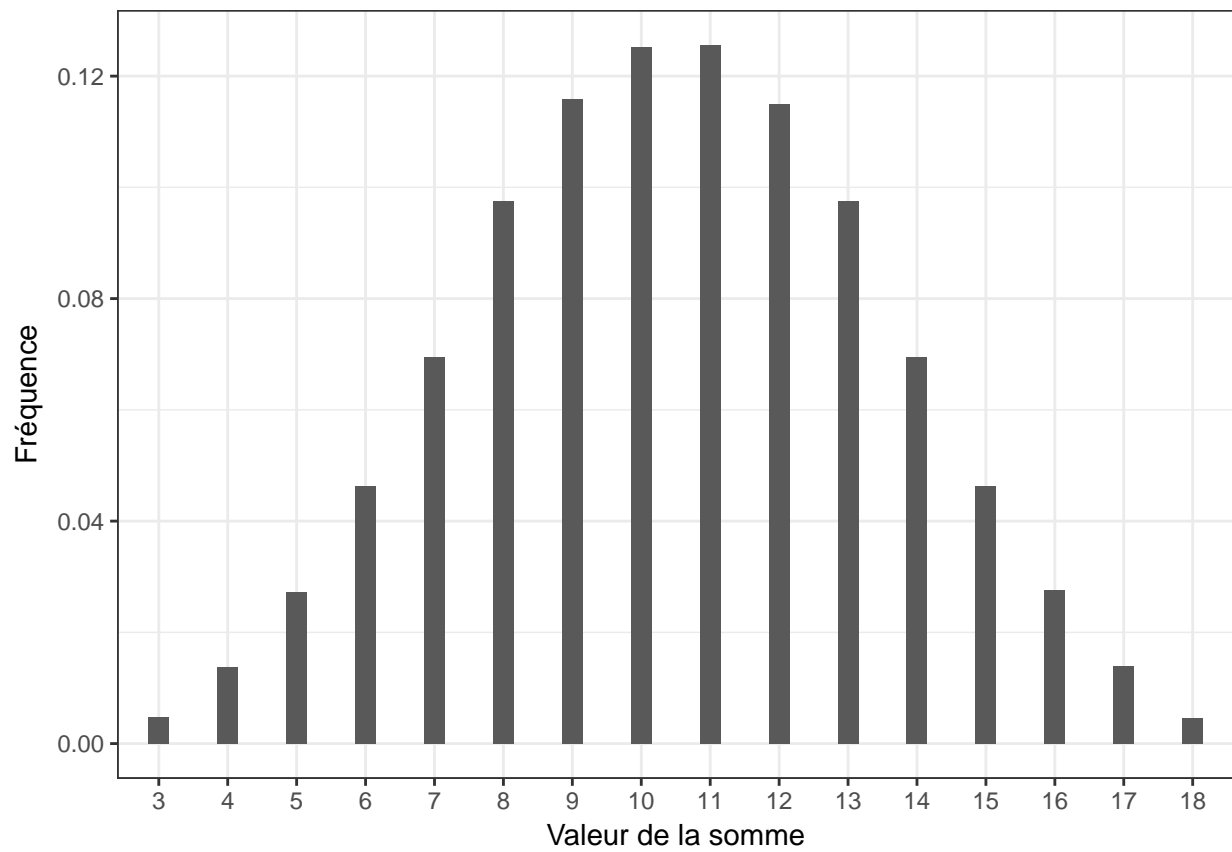
```
# On place le tableau précédent dans une variable df02
nb <- 1E6;
experiment(n=nb) %>% mutate(Sum = Dice1 + Dice2 + Dice3) -> df02;

df02 %>% group_by(Sum) %>% summarise(N=n()) %>% mutate(P=N/nb) %>% ggplot(aes(x=as.factor(Sum), y=P)) +
```



Histogramme

```
experiment(n=1E6) %>%
  mutate(Sum = Dice1 + Dice2 + Dice3) %>%
  ggplot(aes(x=as.factor(Sum))) +
    geom_bar(aes(y=(..count..)/sum(..count..)), width=.3) +
    xlab("Valeur de la somme") + ylab("Fréquence") +
    ylim(0,NA) +
    theme_bw();
```



```
# ...  
#library(gridExtra);  
#Toscane <- function(faces=6, n=400);
```