A Minimal Book Example

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2023-01-05

Contents

Chapter 1

About

This is a *sample* book written in **Markdown**. You can use anything that Pandoc's Markdown supports; for example, a math equation $a^2 + b^2 = c^2$.

1.1 Usage

Each **bookdown** chapter is an .Rmd file, and each .Rmd file can contain one (and only one) chapter. A chapter *must* start with a first-level heading: `# A good chapter`, and can contain one (and only one) first-level heading.

Use second-level and higher headings within chapters like: `## A short section` or `### An even shorter section`.

The `index.Rmd` file is required, and is also your first book chapter. It will be the homepage when you render the book.

1.2 Render book

You can render the HTML version of this example book without changing anything:

1. Find the **Build** pane in the RStudio IDE, and

2. Click on **Build Book**, then select your output format, or select "All formats" if you'd like to use multiple formats from the same book source files.

Or build the book from the R console:

```
bookdown::render_book()
```

To render this example to PDF as a `bookdown::pdf_book`, you'll need to install XeLaTeX. You are recommended to install TinyTeX (which includes XeLaTeX): https://yihui.org/tinytex/.

1.3   Preview book

As you work, you may start a local server to live preview this HTML book. This preview will update as you edit the book when you save individual .Rmd files. You can start the server in a work session by using the RStudio add-in "Preview book", or from the R console:

```
bookdown::serve_book()
```

Chapter 2

Hello bookdown

All chapters start with a first-level heading followed by your chapter title, like the line above. There should be only one first-level heading (`#`) per .Rmd file.

2.1 A section

All chapter sections start with a second-level (`##`) or higher heading followed by your section title, like the sections above and below here. You can have as many as you want within a chapter.

An unnumbered section

Chapters and sections are numbered by default. To un-number a heading, add a `{.unnumbered}` or the shorter `{-}` at the end of the heading, like in this section.

Chapter 3

12 Groups of Fun Data

dataset	x	y
dino	55.38460	97.1795000
dino	51.53850	96.0256000
dino	46.15380	94.4872000
dino	42.82050	91.4103000
dino	40.76920	88.3333000
dino	38.71790	84.8718000
dino	35.64100	79.8718000
dino	33.07690	77.5641000
dino	28.97440	74.4872000
dino	26.15380	71.4103000
dino	23.07690	66.4103000
dino	22.30770	61.7949000
dino	22.30770	57.1795000
dino	23.33330	52.9487000
dino	25.89740	51.0256000
dino	29.48720	51.0256000
dino	32.82050	51.0256000
dino	35.38460	51.4103000
dino	40.25640	51.4103000
dino	44.10260	52.9487000
dino	46.66670	54.1026000
dino	50.00000	55.2564000
dino	53.07690	55.6410000
dino	56.66670	56.0256000
dino	59.23080	57.9487000
dino	61.28210	62.1795000
dino	61.53850	66.4103000
dino	61.79490	69.1026000
dino	57.43590	55.2564000
dino	54.87180	49.8718000
dino	52.56410	46.0256000
dino	48.20510	38.3333000
dino	49.48720	42.1795000
dino	51.02560	44.1026000
dino	45.38460	36.4103000
dino	42.82050	32.5641000
dino	38.71790	31.4103000

```
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#> 1       dino 55.38460 97.17950000
#> 2       dino 51.53850 96.02560000
#> 3       dino 46.15380 94.48720000
#> 4       dino 42.82050 91.41030000
#> 5       dino 40.76920 88.33330000
#> 6       dino 38.71790 84.87180000
#> 7       dino 35.64100 79.87180000
#> 8       dino 33.07690 77.56410000
#> 9       dino 28.97440 74.48720000
#> 10      dino 26.15380 71.41030000
#> 11      dino 23.07690 66.41030000
#> 12      dino 22.30770 61.79490000
#> 13      dino 22.30770 57.17950000
#> 14      dino 23.33330 52.94870000
#> 15      dino 25.89740 51.02560000
#> 16      dino 29.48720 51.02560000
#> 17      dino 32.82050 51.02560000
#> 18      dino 35.38460 51.41030000
#> 19      dino 40.25640 51.41030000
#> 20      dino 44.10260 52.94870000
#> 21      dino 46.66670 54.10260000
#> 22      dino 50.00000 55.25640000
#> 23      dino 53.07690 55.64100000
#> 24      dino 56.66670 56.02560000
#> 25      dino 59.23080 57.94870000
#> 26      dino 61.28210 62.17950000
#> 27      dino 61.53850 66.41030000
#> 28      dino 61.79490 69.10260000
#> 29      dino 57.43590 55.25640000
#> 30      dino 54.87180 49.87180000
#> 31      dino 52.56410 46.02560000
#> 32      dino 48.20510 38.33330000
#> 33      dino 49.48720 42.17950000
#> 34      dino 51.02560 44.10260000
#> 35      dino 45.38460 36.41030000
#> 36      dino 42.82050 32.56410000
#> 37      dino 38.71790 31.41030000
#> 38      dino 35.12820 30.25640000
#> 39      dino 32.56410 32.17950000
#> 40      dino 30.00000 36.79490000
#> 41      dino 33.58970 41.41030000
#> 42      dino 36.66670 45.64100000
#> 43      dino 38.20510 49.10260000
#> 44      dino 29.74360 36.02560000
#> 45      dino 29.74360 32.17950000
```

```
#> 46        dino 30.00000 29.10260000
#> 47        dino 32.05130 26.79490000
#> 48        dino 35.89740 25.25640000
#> 49        dino 41.02560 25.25640000
#> 50        dino 44.10260 25.64100000
#> 51        dino 47.17950 28.71800000
#> 52        dino 49.48720 31.41030000
#> 53        dino 51.53850 34.87180000
#> 54        dino 53.58970 37.56410000
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#> 59        dino 64.87180 46.79490000
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#> 70        dino 56.66670 86.02560000
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#> 73        dino 51.28210 78.71800000
#> 74        dino 50.00000 78.71800000
#> 75        dino 47.94870 77.56410000
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#> 77        dino 29.74360 62.17950000
#> 78        dino 31.28210 62.56410000
#> 79        dino 57.94870 99.48720000
#> 80        dino 61.79490 99.10260000
#> 81        dino 64.87180 97.56410000
#> 82        dino 68.46150 94.10260000
#> 83        dino 70.76920 91.02560000
#> 84        dino 72.05130 86.41030000
#> 85        dino 73.84620 83.33330000
#> 86        dino 75.12820 79.10260000
#> 87        dino 76.66670 75.25640000
#> 88        dino 77.69230 71.41030000
#> 89        dino 79.74360 66.79490000
#> 90        dino 81.79490 60.25640000
#> 91        dino 83.33330 55.25640000
```

```
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#> 98        dino 98.20510 33.71800000
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```

```
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```

```
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#> 226        away 45.37802 29.16921665
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```

```
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```

```
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```

```
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```

```
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#> 404      h_lines 54.85463 10.46391519
#> 405      h_lines 54.92484 10.49833194
#> 406      h_lines 63.30955 10.48881424
#> 407      h_lines 49.74950 10.48580291
#> 408      h_lines 41.16931 10.49730024
#> 409      h_lines 46.68834 10.50753214
#> 410      h_lines 52.41892 10.49590636
#> 411      h_lines 50.87849 10.50308987
#> 412      h_lines 57.05331 10.51406924
#> 413      h_lines 70.78645 10.51369504
```

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#> 414      h_lines 56.77215 10.50327235
#> 415      h_lines 75.47722 10.51856804
#> 416      h_lines 76.76591 10.49699906
#> 417      h_lines 77.62105 10.49587423
#> 418      h_lines 65.41449 10.68184013
#> 419      h_lines 69.96478 10.50723293
#> 420      h_lines 64.96974 10.48215951
#> 421      h_lines 38.05024 30.40794603
#> 422      h_lines 42.22412 30.49803716
#> 423      h_lines 87.69846 50.48993653
#> 424      h_lines 52.36033 89.70431701
#> 425      h_lines 51.40679 89.71213855
#> 426      h_lines 43.58847 89.74553655
#> 427      v_lines 50.48151 93.22270137
#> 428      v_lines 50.28241 97.60998357
#> 429      v_lines 50.18670 99.69468014
#> 430      v_lines 50.32691 90.02205349
#> 431      v_lines 50.45621 89.98741013
#> 432      v_lines 30.46485 82.08923208
#> 433      v_lines 30.50160 82.30712635
#> 434      v_lines 30.48957 77.72988014
#> 435      v_lines 30.45025 79.83489440
#> 436      v_lines 30.51839 68.25258294
#> 437      v_lines 30.51166 66.09371818
#> 438      v_lines 30.49808 62.38498503
#> 439      v_lines 30.62023 60.86008215
#> 440      v_lines 30.49219 55.87891689
#> 441      v_lines 30.47463 52.32215964
#> 442      v_lines 30.50100 48.06969968
#> 443      v_lines 30.49442 45.77347553
#> 444      v_lines 30.49954 49.38209975
#> 445      v_lines 50.14439 47.01428364
#> 446      v_lines 49.91290 55.58783891
#> 447      v_lines 50.33743 57.95531428
#> 448      v_lines 50.41898 60.52491173
#> 449      v_lines 50.20526 57.92421717
#> 450      v_lines 50.43532 56.43932247
#> 451      v_lines 69.50579 59.28492483
#> 452      v_lines 69.53407 64.89297733
#> 453      v_lines 69.51011 61.32962443
#> 454      v_lines 69.52632 56.99527913
#> 455      v_lines 49.94724 48.22957673
#> 456      v_lines 50.06310 58.08503756
#> 457      v_lines 50.48990 39.20541197
#> 458      v_lines 49.68886 42.01851441
#> 459      v_lines 50.33348 43.58867148
```

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#> 460     v_lines 50.44675 57.23058894
#> 461     v_lines 50.42091 43.34795690
#> 462     v_lines 50.37405 32.91824062
#> 463     v_lines 30.47683 39.42460559
#> 464     v_lines 30.50347 38.34855614
#> 465     v_lines 30.50483 28.77148799
#> 466     v_lines 30.46222 32.75047203
#> 467     v_lines 30.49130 43.56137408
#> 468     v_lines 30.44965 44.99512300
#> 469     v_lines 30.48599 47.34794647
#> 470     v_lines 30.50208 36.44121292
#> 471     v_lines 30.47806 28.02058049
#> 472     v_lines 30.50116 38.31413856
#> 473     v_lines 30.50477 26.41662567
#> 474     v_lines 30.50912 22.82554712
#> 475     v_lines 50.11563 16.69400655
#> 476     v_lines 50.44830 21.64025646
#> 477     v_lines 50.17318 29.17786439
#> 478     v_lines 49.92274 38.44047291
#> 479     v_lines 50.31130 26.86048827
#> 480     v_lines 50.39941 38.96383892
#> 481     v_lines 50.33736 40.91338614
#> 482     v_lines 50.20232 47.21294800
#> 483     v_lines 50.27493 49.62349934
#> 484     v_lines 69.49438 52.61241071
#> 485     v_lines 69.51934 47.38453371
#> 486     v_lines 69.52918 57.84126668
#> 487     v_lines 69.49576 58.78507316
#> 488     v_lines 69.19906 60.41895732
#> 489     v_lines 69.55109 58.40109827
#> 490     v_lines 69.50668 68.08446679
#> 491     v_lines 50.44412 75.01329951
#> 492     v_lines 50.46723 90.28146451
#> 493     v_lines 50.21088 80.94177171
#> 494     v_lines 50.20541 90.64053590
#> 495     v_lines 50.43829 92.35476027
#> 496     v_lines 50.37352 82.21920572
#> 497     v_lines 50.25368 81.74382872
#> 498     v_lines 50.25047 71.95138521
#> 499     v_lines 50.08706 73.95187363
#> 500     v_lines 50.23107 80.64738706
#> 501     v_lines 50.20774 73.11450352
#> 502     v_lines 30.49951 53.61252767
#> 503     v_lines 30.52036 65.10040907
#> 504     v_lines 30.45496 63.50177878
#> 505     v_lines 50.41648 97.26969196
```

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#> 506      v_lines 69.52507 93.59805021
#> 507      v_lines 69.52026 97.19387602
#> 508      v_lines 69.49897 92.12048993
#> 509      v_lines 69.52862 91.62208824
#> 510      v_lines 69.49977 84.47968329
#> 511      v_lines 69.50380 81.81540562
#> 512      v_lines 69.48759 81.83598756
#> 513      v_lines 69.51912 71.11596722
#> 514      v_lines 69.50438 70.49344382
#> 515      v_lines 69.51257 61.49756395
#> 516      v_lines 89.49420 62.23432697
#> 517      v_lines 89.50012 53.21633062
#> 518      v_lines 89.49025 48.89079655
#> 519      v_lines 89.49779 46.62990667
#> 520      v_lines 89.50485 48.42340816
#> 521      v_lines 89.50105 43.34734370
#> 522      v_lines 89.48884 40.62509122
#> 523      v_lines 89.50162 45.81517919
#> 524      v_lines 89.49753 33.90137267
#> 525      v_lines 50.43909 37.67077180
#> 526      v_lines 50.17985 36.80755934
#> 527      v_lines 69.50507 33.74015250
#> 528      v_lines 69.57987 21.93523675
#> 529      v_lines 69.50647 22.72866287
#> 530      v_lines 69.49948 16.33746998
#> 531      v_lines 69.50026 27.13602399
#> 532      v_lines 69.50416 23.66891810
#> 533      v_lines 69.53228 21.85090082
#> 534      v_lines 69.50011 11.79162601
#> 535      v_lines 69.50482 15.61435826
#> 536      v_lines 69.50347 17.16908977
#> 537      v_lines 50.37740 16.50601506
#> 538      v_lines 50.33943 18.72345069
#> 539      v_lines 50.09365 11.60771342
#> 540      v_lines 49.93413 22.25613974
#> 541      v_lines 50.28882 13.43641047
#> 542      v_lines 50.28799 12.87228221
#> 543      v_lines 50.23472 20.40447292
#> 544      v_lines 50.27970 15.60873757
#> 545      v_lines 50.25301 11.30208425
#> 546      v_lines 50.47414 12.46199667
#> 547      v_lines 50.10844 18.25904434
#> 548      v_lines 49.91906  3.71685389
#> 549      v_lines 50.08366 10.23588190
#> 550      v_lines 50.35226 12.46860053
#> 551      v_lines 50.49757  7.40962523
```

```
#> 552     v_lines 50.01631 16.25368479
#> 553     v_lines 50.46822 13.35670246
#> 554     v_lines 69.55068  9.03298757
#> 555     v_lines 69.51867 15.18048643
#> 556     v_lines 69.50346 16.87831327
#> 557     v_lines 69.49949 10.20782668
#> 558     v_lines 69.52753  9.99229667
#> 559     v_lines 69.51910 11.42268570
#> 560     v_lines 69.56190 15.99980379
#> 561     v_lines 69.50104  5.95583354
#> 562     v_lines 69.52464  2.73476017
#> 563     v_lines 30.49959 26.08556157
#> 564     v_lines 30.48739 19.77947037
#> 565     v_lines 89.50018 31.97891744
#> 566     v_lines 50.41027 98.62836944
#> 567     v_lines 50.32592 94.99463085
#> 568     v_lines 50.10403 95.08853802
#> 569     x_shape 38.33776 92.47271905
#> 570     x_shape 35.75187 94.11676803
#> 571     x_shape 32.76722 88.51829458
#> 572     x_shape 33.72961 88.62226579
#> 573     x_shape 37.23825 83.72492841
#> 574     x_shape 36.02720 82.04078065
#> 575     x_shape 39.23928 79.26372384
#> 576     x_shape 39.78452 82.26056590
#> 577     x_shape 35.16603 84.15649198
#> 578     x_shape 40.62212 78.54210421
#> 579     x_shape 39.18191 79.81903720
#> 580     x_shape 42.43089 75.13363464
#> 581     x_shape 43.08126 75.34670164
#> 582     x_shape 44.36072 70.47420705
#> 583     x_shape 44.32478 71.04590440
#> 584     x_shape 47.55216 66.46040372
#> 585     x_shape 48.66492 64.96100494
#> 586     x_shape 46.28063 68.02842315
#> 587     x_shape 50.56324 62.62382797
#> 588     x_shape 52.63096 59.96393579
#> 589     x_shape 54.63621 57.49384244
#> 590     x_shape 51.34603 61.60055304
#> 591     x_shape 57.13486 53.87796580
#> 592     x_shape 54.17124 58.05980790
#> 593     x_shape 50.94238 62.09739394
#> 594     x_shape 66.51292 59.07128185
#> 595     x_shape 64.39791 56.17487540
#> 596     x_shape 68.68659 62.23734399
#> 597     x_shape 65.02779 57.09625735
```

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#> 598        x_shape 53.30450 40.88384455
#> 599        x_shape 52.94518 40.38462569
#> 600        x_shape 45.22574 30.55522592
#> 601        x_shape 50.84330 37.74462810
#> 602        x_shape 49.65929 36.27344274
#> 603        x_shape 47.14279 32.02506417
#> 604        x_shape 41.27006 21.72181715
#> 605        x_shape 47.13013 31.30990292
#> 606        x_shape 40.91597 23.54159239
#> 607        x_shape 38.66016 21.68954964
#> 608        x_shape 42.61255 24.19505377
#> 609        x_shape 41.20904 24.12870919
#> 610        x_shape 50.64922 37.48379074
#> 611        x_shape 52.13190 39.36460208
#> 612        x_shape 39.79727 16.08354965
#> 613        x_shape 43.54988 24.30721094
#> 614        x_shape 36.71466 17.38180986
#> 615        x_shape 37.22461 17.98006448
#> 616        x_shape 40.51245 22.96221457
#> 617        x_shape 40.22206 20.61462170
#> 618        x_shape 44.12496 23.36624529
#> 619        x_shape 42.34626 24.55832694
#> 620        x_shape 44.18908 28.77262547
#> 621        x_shape 45.81425 31.05697967
#> 622        x_shape 46.64312 31.40721906
#> 623        x_shape 52.18989 39.36779649
#> 624        x_shape 51.10032 38.09569998
#> 625        x_shape 65.40083 42.61403204
#> 626        x_shape 64.85204 43.13373484
#> 627        x_shape 63.40381 44.84749369
#> 628        x_shape 65.37155 42.69597132
#> 629        x_shape 61.90804 53.19035207
#> 630        x_shape 71.82665 65.68623036
#> 631        x_shape 72.65462 66.87827761
#> 632        x_shape 76.88858 72.16547208
#> 633        x_shape 43.74462 71.26796108
#> 634        x_shape 39.05425 83.11902070
#> 635        x_shape 39.93167 79.93918800
#> 636        x_shape 39.76283 76.40596745
#> 637        x_shape 41.32338 80.21186860
#> 638        x_shape 41.78732 83.98807799
#> 639        x_shape 39.75565 79.65709664
#> 640        x_shape 40.74988 77.20465729
#> 641        x_shape 43.85690 77.60984365
#> 642        x_shape 42.36782 73.63827183
#> 643        x_shape 39.46296 78.45997390
```

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#> 644      x_shape 44.51733 70.36934983
#> 645      x_shape 41.63609 76.24922292
#> 646      x_shape 45.42293 69.09550167
#> 647      x_shape 42.00286 97.83761472
#> 648      x_shape 76.10563 95.30498058
#> 649      x_shape 79.20256 92.40721563
#> 650      x_shape 84.84824 95.42480453
#> 651      x_shape 81.56448 83.79290723
#> 652      x_shape 85.44619 83.07829384
#> 653      x_shape 80.31249 76.51623895
#> 654      x_shape 80.76623 79.89606568
#> 655      x_shape 82.67011 81.71147984
#> 656      x_shape 77.16363 73.52371896
#> 657      x_shape 74.07070 68.47956429
#> 658      x_shape 74.11423 71.92636352
#> 659      x_shape 68.94208 62.63515058
#> 660      x_shape 73.24200 67.35327113
#> 661      x_shape 71.86701 34.32915759
#> 662      x_shape 71.56919 34.69921861
#> 663      x_shape 71.48291 34.68051699
#> 664      x_shape 78.12852 23.13923184
#> 665      x_shape 78.78983 25.59719335
#> 666      x_shape 77.78155 23.44721447
#> 667      x_shape 48.53063 34.15245001
#> 668      x_shape 65.53078 42.28108470
#> 669      x_shape 70.11803 36.44818479
#> 670      x_shape 70.47226 36.08805306
#> 671      x_shape 76.79113 28.07200817
#> 672      x_shape 72.40935 33.03925697
#> 673      x_shape 76.27130 25.56954415
#> 674      x_shape 76.95326 27.77061074
#> 675      x_shape 75.10773 30.01698342
#> 676      x_shape 75.96929 29.03886538
#> 677      x_shape 75.28389 24.87475317
#> 678      x_shape 77.05224 27.90563909
#> 679      x_shape 42.82676 25.55695941
#> 680      x_shape 42.08066 24.94652645
#> 681      x_shape 39.87830 18.32492922
#> 682      x_shape 36.47550 17.71894779
#> 683      x_shape 37.10307 15.44561165
#> 684      x_shape 34.14897 13.52386987
#> 685      x_shape 37.57942 15.01589013
#> 686      x_shape 41.06431 12.21446893
#> 687      x_shape 42.19527 20.91937219
#> 688      x_shape 36.60558 15.74887589
#> 689      x_shape 39.43116 19.32384075
```

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#> 690      x_shape 37.56208 11.92844570
#> 691      x_shape 34.23811 13.71315823
#> 692      x_shape 34.14094  4.57766135
#> 693      x_shape 36.65927 17.68196446
#> 694      x_shape 40.64372 20.24086137
#> 695      x_shape 36.79248 13.39213473
#> 696      x_shape 75.94830 22.74479591
#> 697      x_shape 76.84069 20.91854722
#> 698      x_shape 81.95048 19.87455821
#> 699      x_shape 81.64371 16.59175998
#> 700      x_shape 84.61022 14.24776190
#> 701      x_shape 84.10288  8.98065579
#> 702      x_shape 80.18003 19.08884413
#> 703      x_shape 80.57327  8.36563890
#> 704      x_shape 79.00433 10.62819777
#> 705      x_shape 40.04819 24.26148793
#> 706      x_shape 34.79459 13.96968346
#> 707      x_shape 79.22176 22.09459148
#> 708      x_shape 36.03088 93.12173324
#> 709      x_shape 34.49956 86.60998505
#> 710      x_shape 31.10687 89.46163524
#> 711         star 58.21361 91.88189151
#> 712         star 58.19605 92.21498865
#> 713         star 58.71823 90.31053209
#> 714         star 57.27837 89.90760672
#> 715         star 58.08202 92.00814501
#> 716         star 57.48945 88.08528556
#> 717         star 28.08874 63.51079443
#> 718         star 28.08547 63.59019695
#> 719         star 28.08727 63.12328281
#> 720         star 27.57803 62.82103866
#> 721         star 27.77992 63.51814752
#> 722         star 28.58900 63.02408057
#> 723         star 28.73914 62.72086389
#> 724         star 27.02460 62.90185886
#> 725         star 28.80134 63.38904039
#> 726         star 27.18646 63.55872965
#> 727         star 29.28515 63.38360583
#> 728         star 39.40295 51.15085720
#> 729         star 28.81133 61.35785406
#> 730         star 34.30396 56.54212591
#> 731         star 29.60276 60.15734672
#> 732         star 49.11616 63.66000062
#> 733         star 39.61755 62.92518796
#> 734         star 43.23308 63.16521872
#> 735         star 64.89279 65.81417676
```

```
#> 736        star 62.49015 74.58428961
#> 737        star 68.98808 63.23214730
#> 738        star 62.10562 75.99087076
#> 739        star 32.46185 62.88190292
#> 740        star 41.32720 49.07025127
#> 741        star 44.00715 46.44967378
#> 742        star 44.07406 34.55320389
#> 743        star 44.00132 33.90420735
#> 744        star 45.00630 38.29901955
#> 745        star 44.44384 36.01908330
#> 746        star 42.17871 26.49211948
#> 747        star 44.04457 35.66223828
#> 748        star 41.64045 27.09309542
#> 749        star 41.93833 24.99152298
#> 750        star 44.05393 33.55639249
#> 751        star 39.20672 51.53371570
#> 752        star 28.70445 61.77752540
#> 753        star 31.70866 58.83775437
#> 754        star 42.81171 30.02044842
#> 755        star 43.30061 31.52642620
#> 756        star 40.39863 16.34700838
#> 757        star 40.43569 20.23267068
#> 758        star 40.93655 16.91300484
#> 759        star 39.66157 15.60935558
#> 760        star 40.89926 20.79852895
#> 761        star 41.96862 26.49707260
#> 762        star 40.38341 21.39122552
#> 763        star 56.53813 32.44424547
#> 764        star 52.97069 29.04019669
#> 765        star 54.62095 30.34452445
#> 766        star 65.09904 27.24155756
#> 767        star 63.05599 29.70909567
#> 768        star 70.96014 41.25950129
#> 769        star 69.89582 43.45375927
#> 770        star 70.59589 41.96474387
#> 771        star 69.64702 44.04444502
#> 772        star 77.39298 63.37145906
#> 773        star 64.40079 67.44871845
#> 774        star 63.86896 70.21373883
#> 775        star 56.59442 86.92700622
#> 776        star 56.53134 87.49981107
#> 777        star 59.65216 87.80946159
#> 778        star 56.63651 85.63749556
#> 779        star 58.67229 90.07716031
#> 780        star 58.22161 90.41101877
#> 781        star 57.91466 89.95380277
```

```
#> 782          star 55.31551 80.25186069
#> 783          star 54.57573 77.53628847
#> 784          star 54.41309 78.22908659
#> 785          star 55.07451 79.81754642
#> 786          star 29.43296 60.80177654
#> 787          star 29.42269 63.06846482
#> 788          star 29.00561 63.39075133
#> 789          star 58.46184 90.26532639
#> 790          star 57.99780 92.15990861
#> 791          star 57.54947 90.74890656
#> 792          star 59.52993 88.32727415
#> 793          star 58.24939 92.12968148
#> 794          star 58.02451 91.69442117
#> 795          star 58.38212 90.55347607
#> 796          star 62.56676 77.74393476
#> 797          star 72.17582 63.12892942
#> 798          star 79.47276 63.40868612
#> 799          star 80.35770 63.29543754
#> 800          star 78.75724 53.33262001
#> 801          star 82.54024 56.54105229
#> 802          star 86.43590 59.79276181
#> 803          star 79.48868 53.65167426
#> 804          star 81.53042 56.02536457
#> 805          star 79.18679 53.23479185
#> 806          star 77.89906 51.82245833
#> 807          star 75.13071 23.37244197
#> 808          star 76.05801 16.38374969
#> 809          star 57.61467 33.82244765
#> 810          star 56.17140 32.11798877
#> 811          star 66.28789 26.11710975
#> 812          star 67.88172 24.23601841
#> 813          star 64.02808 27.67268551
#> 814          star 77.49665 14.94852356
#> 815          star 77.63465 14.46185393
#> 816          star 77.86373 14.61067765
#> 817          star 77.33816 15.89005466
#> 818          star 76.18042 15.91257375
#> 819          star 77.25265 15.15151702
#> 820          star 77.41338 15.22192798
#> 821          star 76.73185 16.21684614
#> 822          star 49.47111 25.06301931
#> 823          star 42.47654 18.33847356
#> 824          star 43.59512 19.99420098
#> 825          star 50.33997 26.47139661
#> 826          star 40.74898 16.18214166
#> 827          star 38.38653 14.58021515
```

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#> 828        star 38.40402 14.45194845
#> 829        star 38.76428 14.36559047
#> 830        star 41.47014 17.27803344
#> 831        star 47.15540 22.37793253
#> 832        star 39.58257 17.64845284
#> 833        star 41.74024 17.82932431
#> 834        star 39.31187 15.64071697
#> 835        star 41.67985 17.74591901
#> 836        star 39.08746 15.12230394
#> 837        star 41.48150 18.04743744
#> 838        star 77.60609 15.16287254
#> 839        star 75.98266 16.30692238
#> 840        star 76.94576 15.85847833
#> 841        star 77.54372 15.25394915
#> 842        star 77.58474 15.83003939
#> 843        star 76.82230 15.59516532
#> 844        star 77.34857 15.77452924
#> 845        star 77.57315 14.78064583
#> 846        star 77.97261 14.95569875
#> 847        star 41.52892 24.91642519
#> 848        star 43.72255 19.07732780
#> 849        star 79.32608 52.90039129
#> 850        star 56.66397 87.94012501
#> 851        star 57.82179 90.69316655
#> 852        star 58.24317 92.10432787
#> 853 high_lines 57.61323 83.90517080
#> 854 high_lines 51.27439 82.81798294
#> 855 high_lines 50.75390 76.75412895
#> 856 high_lines 37.02118 81.95447000
#> 857 high_lines 42.88176 80.18477005
#> 858 high_lines 37.15571 84.95411141
#> 859 high_lines 38.73186 83.78935643
#> 860 high_lines 31.00053 82.57948060
#> 861 high_lines 25.98550 74.34938755
#> 862 high_lines 23.71457 75.09804908
#> 863 high_lines 23.07732 71.72053967
#> 864 high_lines 24.93914 72.58028581
#> 865 high_lines 17.89350 71.10968734
#> 866 high_lines 23.67308 64.87083914
#> 867 high_lines 23.74907 63.55717190
#> 868 high_lines 32.21518 65.60095802
#> 869 high_lines 29.43684 67.55452811
#> 870 high_lines 40.05010 71.88903357
#> 871 high_lines 37.57480 69.98874444
#> 872 high_lines 49.31047 67.16876032
#> 873 high_lines 47.34802 72.59161154
```

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#> 874    high_lines 50.15741 71.16172582
#> 875    high_lines 58.21001 68.04453807
#> 876    high_lines 56.60891 70.40894609
#> 877    high_lines 52.83382 72.55188627
#> 878    high_lines 61.81859 76.11282402
#> 879    high_lines 61.72763 77.06923841
#> 880    high_lines 62.19225 76.15681921
#> 881    high_lines 58.11877 73.11896147
#> 882    high_lines 58.27041 35.59689504
#> 883    high_lines 59.76653 32.62125160
#> 884    high_lines 52.53553 27.17412294
#> 885    high_lines 50.89252 29.14528394
#> 886    high_lines 49.96755 28.46020333
#> 887    high_lines 51.34788 27.36426023
#> 888    high_lines 37.55512 24.53766384
#> 889    high_lines 39.19959 23.68049566
#> 890    high_lines 36.38272 25.23800523
#> 891    high_lines 41.10069 26.55261322
#> 892    high_lines 28.21781 28.28029248
#> 893    high_lines 33.79707 28.69975074
#> 894    high_lines 43.91939 27.79784459
#> 895    high_lines 44.41640 28.94769233
#> 896    high_lines 28.03760 26.80382436
#> 897    high_lines 31.68958 26.66640021
#> 898    high_lines 27.27961 19.25728097
#> 899    high_lines 31.22188 26.44085578
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#> 901    high_lines 39.73633 23.49480698
#> 902    high_lines 42.84184 20.33390044
#> 903    high_lines 47.09373 26.99347063
#> 904    high_lines 51.45366 26.02294175
#> 905    high_lines 49.36771 22.00558070
#> 906    high_lines 48.25348 29.27085553
#> 907    high_lines 61.00296 30.01531443
#> 908    high_lines 60.80656 27.86831349
#> 909    high_lines 59.06743 26.78828402
#> 910    high_lines 61.41463 31.03937506
#> 911    high_lines 68.93437 31.61989309
#> 912    high_lines 63.06524 34.23574659
#> 913    high_lines 72.27252 67.64444379
#> 914    high_lines 75.35988 75.42161458
#> 915    high_lines 72.83363 72.11469381
#> 916    high_lines 70.81041 79.35046183
#> 917    high_lines 45.80193 81.65826775
#> 918    high_lines 45.83502 82.74259199
#> 919    high_lines 40.07881 80.24718526
```

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#> 920   high_lines 51.98292 82.20438347
#> 921   high_lines 57.33791 84.99951887
#> 922   high_lines 62.33623 83.24656790
#> 923   high_lines 58.50591 81.74558634
#> 924   high_lines 56.24794 83.51394949
#> 925   high_lines 55.40652 80.26667197
#> 926   high_lines 53.28397 84.26359922
#> 927   high_lines 44.67676 80.23828555
#> 928   high_lines 30.01126 68.14675637
#> 929   high_lines 29.74525 74.40452683
#> 930   high_lines 37.30995 72.58615520
#> 931   high_lines 61.13595 82.53756936
#> 932   high_lines 61.72062 85.70569345
#> 933   high_lines 63.60938 83.36002884
#> 934   high_lines 70.72372 87.15220752
#> 935   high_lines 75.00639 82.42583516
#> 936   high_lines 75.09255 83.43739071
#> 937   high_lines 70.32793 82.02935470
#> 938   high_lines 70.86333 79.40817475
#> 939   high_lines 75.77990 79.88619942
#> 940   high_lines 78.09366 77.75955818
#> 941   high_lines 76.74576 71.97336009
#> 942   high_lines 78.46460 69.74930082
#> 943   high_lines 76.74568 70.04405726
#> 944   high_lines 85.16168 65.51240471
#> 945   high_lines 91.80835 34.96559448
#> 946   high_lines 91.88745 34.76925386
#> 947   high_lines 92.24840 32.37715443
#> 948   high_lines 91.78253 34.38429465
#> 949   high_lines 96.08052 28.05360050
#> 950   high_lines 92.24790 28.07075149
#> 951   high_lines 57.66228 24.06060793
#> 952   high_lines 59.84692 26.17771249
#> 953   high_lines 64.06710 27.77650056
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#> 957   high_lines 69.19524 22.70979217
#> 958   high_lines 65.59236 20.69417310
#> 959   high_lines 64.61710 22.44314555
#> 960   high_lines 59.19116 17.76790181
#> 961   high_lines 55.83963 21.61856967
#> 962   high_lines 59.00076 21.17100749
#> 963   high_lines 56.45937 25.14456421
#> 964   high_lines 52.35811 19.41705412
#> 965   high_lines 51.81166 17.03349460
```

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#> 966   high_lines 54.22285 19.50366554
#> 967   high_lines 49.01876 23.48927402
#> 968   high_lines 35.65358 17.51450806
#> 969   high_lines 46.96579 16.78920162
#> 970   high_lines 49.58424 16.75791601
#> 971   high_lines 51.85630 21.96908401
#> 972   high_lines 55.95289 16.78975760
#> 973   high_lines 51.66379 19.92512520
#> 974   high_lines 45.85967 17.12890368
#> 975   high_lines 39.74038 18.74105141
#> 976   high_lines 52.81122 17.85498812
#> 977   high_lines 56.78910 17.30611552
#> 978   high_lines 54.11453 17.67353439
#> 979   high_lines 55.57112 17.36957458
#> 980   high_lines 65.30646 18.19735483
#> 981   high_lines 66.99075 17.22287065
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#> 984   high_lines 72.22208 19.36928170
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#> 986   high_lines 64.24916 14.91396246
#> 987   high_lines 66.94329 20.18913250
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#> 989   high_lines 39.64827 22.73136637
#> 990   high_lines 37.94978 26.52174923
#> 991   high_lines 86.50439 34.89402529
#> 992   high_lines 50.81549 78.95083881
#> 993   high_lines 51.18347 85.12885465
#> 994   high_lines 40.86386 82.92614530
#> 995         dots 51.14792 90.86741233
#> 996         dots 50.51713 89.10239459
#> 997         dots 50.20748 85.46004740
#> 998         dots 50.06948 83.05766953
#> 999         dots 50.56285 82.93782178
#> 1000        dots 50.28853 82.97525357
#> 1001        dots 25.58348 82.91489113
#> 1002        dots 25.48358 82.92908498
#> 1003        dots 25.44353 82.87420050
#> 1004        dots 25.56511 82.92409777
#> 1005        dots 25.92884 82.82118411
#> 1006        dots 27.55148 51.48738653
#> 1007        dots 27.53047 51.41484656
#> 1008        dots 27.09557 52.07679944
#> 1009        dots 27.43925 51.71207905
#> 1010        dots 27.87826 50.70890793
#> 1011        dots 27.33887 51.65304675
```

```
#> 1012       dots 27.67840 51.18198917
#> 1013       dots 52.63566 51.41855226
#> 1014       dots 52.02521 52.12301105
#> 1015       dots 52.88116 50.62155476
#> 1016       dots 52.95261 50.07473901
#> 1017       dots 52.52055 51.50244210
#> 1018       dots 52.34282 51.86195209
#> 1019       dots 51.92759 52.25779061
#> 1020       dots 52.71377 51.19794432
#> 1021       dots 50.44380 82.94182882
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#> 1023       dots 52.18418 51.97525067
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#> 1027       dots 52.72925 51.20176505
#> 1028       dots 52.88431 50.44143545
#> 1029       dots 52.50930 51.41620515
#> 1030       dots 50.86268 17.14563109
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#> 1032       dots 25.85513 17.08190869
#> 1033       dots 26.02564 16.92501353
#> 1034       dots 27.89317 50.66196341
#> 1035       dots 27.63997 51.39909748
#> 1036       dots 27.89266 50.79528152
#> 1037       dots 52.79773 50.68603709
#> 1038       dots 27.58064 51.52476126
#> 1039       dots 26.49140 17.40539097
#> 1040       dots 25.98532 17.20372213
#> 1041       dots 26.20142 17.09382391
#> 1042       dots 25.85757 17.11384266
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#> 1051       dots 51.83564 52.33576553
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#> 1053       dots 77.31060 51.74673004
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#> 1056       dots 76.24316 52.12368985
#> 1057       dots 77.08448 51.96713670
```

```
#> 1058        dots 75.22805 82.98566202
#> 1059        dots 50.65835 83.11447934
#> 1060        dots 50.20337 82.98265686
#> 1061        dots 50.92955 82.84604113
#> 1062        dots 50.17867 83.18462233
#> 1063        dots 50.42270 82.90990147
#> 1064        dots 50.46422 82.93532841
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#> 1066        dots 49.92838 82.99366549
#> 1067        dots 50.48801 83.09951912
#> 1068        dots 49.96491 83.70831770
#> 1069        dots 50.75211 82.90195010
#> 1070        dots 27.42243 51.43887623
#> 1071        dots 27.67408 51.30411215
#> 1072        dots 27.53740 51.59365408
#> 1073        dots 52.26335 94.24932783
#> 1074        dots 51.73728 92.97911753
#> 1075        dots 75.87096 88.38644174
#> 1076        dots 75.24433 83.90349738
#> 1077        dots 75.19830 83.46230334
#> 1078        dots 75.70104 82.91945886
#> 1079        dots 75.47934 82.88405139
#> 1080        dots 75.19457 82.93211578
#> 1081        dots 74.82025 82.96238879
#> 1082        dots 75.16434 83.03499717
#> 1083        dots 75.26336 82.94527930
#> 1084        dots 77.75642 51.15177033
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#> 1086        dots 77.08334 52.15779927
#> 1087        dots 76.06355 52.10465206
#> 1088        dots 77.68202 51.16563781
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#> 1090        dots 76.94850 51.90751654
#> 1091        dots 77.86405 49.66254553
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#> 1093        dots 52.33157 51.87886035
#> 1094        dots 52.59282 51.39159152
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#> 1097        dots 75.57395 17.06219214
#> 1098        dots 75.40053 17.04110689
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#> 1101        dots 75.89558 17.16994971
#> 1102        dots 75.74656 17.10571651
#> 1103        dots 75.14234 16.75492389
```

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#> 1104        dots 50.66178 17.07814052
#> 1105        dots 50.69985 17.08518438
#> 1106        dots 50.91894 17.14760476
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#> 1109        dots 51.25092 17.24045586
#> 1110        dots 50.78516 17.18019648
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#> 1122        dots 50.55976 17.09388377
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#> 1128        dots 75.96184 16.69484223
#> 1129        dots 75.44806 17.04514941
#> 1130        dots 75.75938 16.94292965
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#> 1133        dots 77.50091 50.16698595
#> 1134        dots 50.69112 87.51396042
#> 1135        dots 49.99039 83.99735692
#> 1136        dots 50.12718 82.99075000
#> 1137      circle 55.99303 79.27726370
#> 1138      circle 50.03225 79.01307120
#> 1139      circle 51.28846 82.43593984
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#> 1141      circle 44.37791 78.16462800
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#> 1143      circle 48.55982 78.78837060
#> 1144      circle 42.14227 76.88063455
#> 1145      circle 41.02697 76.40958846
#> 1146      circle 34.57531 72.72484118
#> 1147      circle 31.16860 69.24542132
#> 1148      circle 32.64425 70.73255503
#> 1149      circle 26.66665 62.98097121
```

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#> 1150      circle 26.45926 62.63467337
#> 1151      circle 25.53801 60.63023611
#> 1152      circle 26.32071 62.39628112
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#> 1155      circle 26.85953 63.14183467
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#> 1157      circle 39.79329 75.80796422
#> 1158      circle 45.61744 78.11997023
#> 1159      circle 53.77146 79.30293164
#> 1160      circle 56.45143 79.24710702
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#> 1164      circle 57.90227 79.08086782
#> 1165      circle 64.81287 77.48693892
#> 1166      circle 60.34979 78.72944587
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#> 1168      circle 47.54951 17.07140452
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#> 1190      circle 52.18812 16.41821747
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#> 1192      circle 82.14431 33.19522187
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#> 1194      circle 85.34496 52.88641987
#> 1195      circle 83.84465 58.61606023
```

```
#> 1196      circle 85.66476 45.54275277
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#> 1203      circle 53.71968 79.30693617
#> 1204      circle 54.20023 79.32500234
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#> 1211      circle 49.57091 79.03812388
#> 1212      circle 37.62770 74.55750434
#> 1213      circle 32.26370 70.31663890
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#> 1219      circle 54.25640 79.31386485
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#> 1221      circle 68.08561 76.11231750
#> 1222      circle 65.11812 77.39918845
#> 1223      circle 68.74563 75.79005545
#> 1224      circle 63.09023 78.04140949
#> 1225      circle 77.20459 69.31214977
#> 1226      circle 82.03391 62.68186979
#> 1227      circle 81.57795 63.89492550
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#> 1229      circle 84.28682 57.25616809
#> 1230      circle 85.62249 45.02416586
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#> 1236      circle 73.50745 22.85698876
#> 1237      circle 63.35649 17.72406884
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```

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#> 1242      circle 69.51358 20.27935789
#> 1243      circle 58.57214 16.64270381
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#> 1246      circle 65.31504 18.33374830
#> 1247      circle 64.01024 17.92447819
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#> 1251      circle 52.08176 16.45387453
#> 1252      circle 42.87904 18.48941103
#> 1253      circle 51.56699 16.48571364
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#> 1255      circle 60.75579 17.03323151
#> 1256      circle 54.76116 16.36618910
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#> 1264      circle 63.39471 17.70053514
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#> 1272      circle 61.91561 17.28219122
#> 1273      circle 45.02900 17.72444730
#> 1274      circle 39.92136 19.70184953
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#> 1276      circle 55.66296 83.35647962
#> 1277      circle 50.49225 78.99753207
#> 1278      circle 51.46710 79.20184458
#> 1279     bullseye 51.20389 83.33977661
#> 1280     bullseye 58.97447 85.49981761
#> 1281     bullseye 51.87207 85.82973763
#> 1282     bullseye 48.17993 85.04511674
#> 1283     bullseye 41.68320 84.01794060
#> 1284     bullseye 37.89042 82.56749300
#> 1285     bullseye 39.54897 80.81260177
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#> 1287     bullseye 34.75060 80.01109099
```

```
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#> 1703 slant_down 53.17861 98.60386119
#> 1704 slant_down 37.62705 93.06067295
#> 1705 wide_lines 65.81554 95.58837406
#> 1706 wide_lines 65.67227 91.93340181
#> 1707 wide_lines 39.00272 92.26183816
#> 1708 wide_lines 37.79530 93.53245536
#> 1709 wide_lines 35.51390 89.59919011
#> 1710 wide_lines 39.21945 83.54348184
#> 1711 wide_lines 31.58820 77.02805242
#> 1712 wide_lines 32.65778 80.11386130
#> 1713 wide_lines 31.64160 77.61083319
#> 1714 wide_lines 30.98714 63.94402803
#> 1715 wide_lines 27.43963 65.74446296
#> 1716 wide_lines 30.57837 65.52194547
#> 1717 wide_lines 28.80940 59.62100447
#> 1718 wide_lines 27.93952 50.98506213
#> 1719 wide_lines 33.84995 46.28447445
#> 1720 wide_lines 32.62846 54.06372049
#> 1721 wide_lines 32.43865 49.90301949
#> 1722 wide_lines 35.83829 53.35148834
#> 1723 wide_lines 37.14204 49.74198795
#> 1724 wide_lines 34.64455 54.44410778
#> 1725 wide_lines 35.67540 49.62564335
#> 1726 wide_lines 64.99459 49.46217283
#> 1727 wide_lines 66.12915 61.64371789
#> 1728 wide_lines 65.79065 55.94537372
#> 1729 wide_lines 67.50178 60.85022747
#> 1730 wide_lines 67.62951 61.42910607
#> 1731 wide_lines 63.91006 62.97233493
#> 1732 wide_lines 66.54936 67.72558866
#> 1733 wide_lines 64.05154 48.82009398
#> 1734 wide_lines 68.19329 46.54354081
#> 1735 wide_lines 65.27839 44.82035293
#> 1736 wide_lines 34.99766 28.63299394
#> 1737 wide_lines 33.92377 53.55868852
#> 1738 wide_lines 66.00445 52.68466915
#> 1739 wide_lines 37.02326 32.11848168
#> 1740 wide_lines 34.69827 36.47535413
#> 1741 wide_lines 34.86344 30.93927452
#> 1742 wide_lines 31.09007 32.38375472
#> 1743 wide_lines 34.92131 35.41843805
#> 1744 wide_lines 30.34336 32.52456317
#> 1745 wide_lines 35.48333 44.49163493
#> 1746 wide_lines 33.23491 38.50248372
#> 1747 wide_lines 35.43994 47.79751769
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#> 1748 wide_lines 33.87351 37.05602845
#> 1749 wide_lines 28.56414 34.62639972
#> 1750 wide_lines 31.31955 31.66399053
#> 1751 wide_lines 30.79617 23.51903436
#> 1752 wide_lines 34.23336 22.49591160
#> 1753 wide_lines 36.63079 31.47683126
#> 1754 wide_lines 34.54862 26.11108787
#> 1755 wide_lines 37.51964 29.26760589
#> 1756 wide_lines 62.42570 34.04420627
#> 1757 wide_lines 64.32038 31.78562948
#> 1758 wide_lines 65.44553 43.27349919
#> 1759 wide_lines 64.32563 41.61597638
#> 1760 wide_lines 65.26434 35.71754478
#> 1761 wide_lines 66.38870 38.84474434
#> 1762 wide_lines 68.19142 45.16948648
#> 1763 wide_lines 68.54066 48.43852634
#> 1764 wide_lines 67.66143 51.06858459
#> 1765 wide_lines 68.67552 50.46523481
#> 1766 wide_lines 69.08171 55.47405310
#> 1767 wide_lines 69.04872 66.36604575
#> 1768 wide_lines 67.30822 71.59029658
#> 1769 wide_lines 38.71490 76.39697782
#> 1770 wide_lines 35.54809 89.30497584
#> 1771 wide_lines 36.71067 86.07496700
#> 1772 wide_lines 64.91266 87.64579606
#> 1773 wide_lines 66.06414 89.20866858
#> 1774 wide_lines 64.93593 87.07213812
#> 1775 wide_lines 67.02655 76.22251533
#> 1776 wide_lines 65.31403 77.93874403
#> 1777 wide_lines 64.29522 84.12585721
#> 1778 wide_lines 38.79801 74.61063043
#> 1779 wide_lines 34.67576 79.63759877
#> 1780 wide_lines 30.71926 58.81206008
#> 1781 wide_lines 34.10515 64.12919723
#> 1782 wide_lines 33.42337 67.09574336
#> 1783 wide_lines 66.31381 98.93102704
#> 1784 wide_lines 65.30963 98.16515684
#> 1785 wide_lines 65.71408 99.28376395
#> 1786 wide_lines 67.59345 90.95190982
#> 1787 wide_lines 66.38802 89.28123047
#> 1788 wide_lines 67.80619 91.68817735
#> 1789 wide_lines 70.96261 86.51812135
#> 1790 wide_lines 71.99364 78.82094807
#> 1791 wide_lines 72.47983 80.80068306
#> 1792 wide_lines 74.07843 72.95153085
#> 1793 wide_lines 72.03629 69.71604842
```

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#> 1794 wide_lines 72.99819 59.66564471
#> 1795 wide_lines 74.81213 57.58988376
#> 1796 wide_lines 73.02731 46.27418787
#> 1797 wide_lines 77.06711 51.48691819
#> 1798 wide_lines 75.01714 46.62244265
#> 1799 wide_lines 76.66531 38.44025097
#> 1800 wide_lines 77.91587 45.92684338
#> 1801 wide_lines 73.74205 39.12098532
#> 1802 wide_lines 75.32982 32.83035192
#> 1803 wide_lines 63.41044 38.37773561
#> 1804 wide_lines 68.85649 43.08414721
#> 1805 wide_lines 66.33779 33.30651000
#> 1806 wide_lines 64.20372 26.64411430
#> 1807 wide_lines 64.49863 22.86350133
#> 1808 wide_lines 68.89099 27.29620567
#> 1809 wide_lines 72.37152 21.96163975
#> 1810 wide_lines 69.76542 19.99985045
#> 1811 wide_lines 68.62131 18.91567644
#> 1812 wide_lines 64.29774 20.42874969
#> 1813 wide_lines 66.69927 18.59108534
#> 1814 wide_lines 67.54453 16.44793813
#> 1815 wide_lines 63.94695 18.69284545
#> 1816 wide_lines 64.38819 15.77281228
#> 1817 wide_lines 65.57005 23.76575822
#> 1818 wide_lines 38.40284 19.04685867
#> 1819 wide_lines 37.83236 14.46948945
#> 1820 wide_lines 36.90416 13.58381575
#> 1821 wide_lines 36.28614 17.10577073
#> 1822 wide_lines 62.78663 13.91899310
#> 1823 wide_lines 66.81768 11.41249716
#> 1824 wide_lines 66.75502 18.08530514
#> 1825 wide_lines 65.41553 10.46351221
#> 1826 wide_lines 36.94633 13.51437750
#> 1827 wide_lines 37.82543  9.60103430
#> 1828 wide_lines 36.72284  9.33330211
#> 1829 wide_lines 67.07332  6.04921458
#> 1830 wide_lines 64.60182 12.00191696
#> 1831 wide_lines 65.43728 15.54538608
#> 1832 wide_lines 67.00402 15.34582664
#> 1833 wide_lines 66.72419  5.24980548
#> 1834 wide_lines 68.30762 13.28091652
#> 1835 wide_lines 68.76805 13.52145655
#> 1836 wide_lines 74.16727  5.34988087
#> 1837 wide_lines 64.90036 16.24525837
#> 1838 wide_lines 68.76343  8.70057294
#> 1839 wide_lines 66.81691 12.27329434
```

```
#> 1840 wide_lines 67.30935  0.21700627
#> 1841 wide_lines 34.73183 19.60179507
#> 1842 wide_lines 33.67444 26.09049021
#> 1843 wide_lines 75.62726 37.12875195
#> 1844 wide_lines 40.61013 89.13623987
#> 1845 wide_lines 39.11437 96.48175132
#> 1846 wide_lines 34.58383 89.58890199
```

Chapter 4

Parts

You can add parts to organize one or more book chapters together. Parts can be inserted at the top of an .Rmd file, before the first-level chapter heading in that same file.

Add a numbered part: `# (PART) Act one {-}` (followed by `# A chapter`)

Add an unnumbered part: `# (PART\*) Act one {-}` (followed by `# A chapter`)

Add an appendix as a special kind of un-numbered part: `# (APPENDIX) Other stuff {-}` (followed by `# A chapter`). Chapters in an appendix are prepended with letters instead of numbers.

Chapter 5

Footnotes and citations

5.1 Footnotes

Footnotes are put inside the square brackets after a caret `^[]`. Like this one [1].

5.2 Citations

Reference items in your bibliography file(s) using `@key`.

For example, we are using the **bookdown** package (Xie, 2022) (check out the last code chunk in index.Rmd to see how this citation key was added) in this sample book, which was built on top of R Markdown and **knitr** (Xie, 2015) (this citation was added manually in an external file book.bib). Note that the `.bib` files need to be listed in the index.Rmd with the YAML `bibliography` key.

The `bs4_book` theme makes footnotes appear inline when you click on them. In this example book, we added `csl: chicago-fullnote-bibliography.csl` to the `index.Rmd` YAML, and include the `.csl` file. To download a new style, we recommend: https://www.zotero.org/styles/

The RStudio Visual Markdown Editor can also make it easier to insert citations: https://rstudio.github.io/visual-markdown-editing/#/citations

---

[1]This is a footnote.

Chapter 6

Blocks

6.1 Equations

Here is an equation.

$$f(k) = \binom{n}{k} p^k (1-p)^{n-k} \tag{6.1}$$

You may refer to using `\@ref(eq:binom)`, like see Equation (6.1).

6.2 Theorems and proofs

Labeled theorems can be referenced in text using `\@ref(thm:tri)`, for example, check out this smart theorem 6.1.

Theorem 6.1. *For a right triangle, if c denotes the* length *of the hypotenuse and a and b denote the lengths of the **other** two sides, we have*

$$a^2 + b^2 = c^2$$

Read more here https://bookdown.org/yihui/bookdown/markdown-extensions-by-bookdown.html.

6.3 Callout blocks

The `bs4_book` theme also includes special callout blocks, like this `.rmdnote`.

You can use **markdown** inside a block.

```
head(beaver1, n = 5)
#>   day time  temp activ
#> 1 346  840 36.33     0
#> 2 346  850 36.34     0
#> 3 346  900 36.35     0
#> 4 346  910 36.42     0
#> 5 346  920 36.55     0
```

It is up to the user to define the appearance of these blocks for LaTeX output.

You may also use: `.rmdcaution`, `.rmdimportant`, `.rmdtip`, or `.rmdwarning` as the block name.

The R Markdown Cookbook provides more help on how to use custom blocks to design your own callouts: https://bookdown.org/yihui/rmarkdown-cookbook/custom-blocks.html

Chapter 7

Sharing your book

7.1 Publishing

HTML books can be published online, see: https://bookdown.org/yihui/bookdown/publishing.html

7.2 404 pages

By default, users will be directed to a 404 page if they try to access a webpage that cannot be found. If you'd like to customize your 404 page instead of using the default, you may add either a `_404.Rmd` or `_404.md` file to your project root and use code and/or Markdown syntax.

7.3 Metadata for sharing

Bookdown HTML books will provide HTML metadata for social sharing on platforms like Twitter, Facebook, and LinkedIn, using information you provide in the `index.Rmd` YAML. To setup, set the `url` for your book and the path to your `cover-image` file. Your book's `title` and `description` are also used.

This `bs4_book` provides enhanced metadata for social sharing, so that each chapter shared will have a unique description, auto-generated based on the content.

Specify your book's source repository on GitHub as the `repo` in the `_output.yml` file, which allows users to view each chapter's source file or suggest an edit. Read more about the features of this output format here:

https://pkgs.rstudio.com/bookdown/reference/bs4_book.html

Or use:

```
?bookdown::bs4_book
```

Bibliography

Xie, Y. (2015). *Dynamic Documents with R and knitr*. Chapman and Hall/CRC, Boca Raton, Florida, 2nd edition. ISBN 978-1498716963.

Xie, Y. (2022). *bookdown: Authoring Books and Technical Documents with R Markdown*. R package version 0.25.