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Scale drawings are a fundamental skill in various fields, including architecture, engineering, design, and mapmaking. The core concept revolves around understanding and applying ratios to represent real-world objects or spaces accurately in a scaled-down or scaled-up format. In its simplest form, calculating scale drawings involves using the scale which is a ratio expressing the relationship between a distance on a drawing and the corresponding distance in reality. Essentially, you're either enlarging or reducing a real object proportionally to fit onto a drawing surface. Understanding the BasicsThe foundational idea when calculating scale drawings is to establish a scale ratio. This ratio is usually written in the form of 1:X, where 1 represents a unit of measurement on the drawing, and X represents the equivalent number of the same units in reality. For example, a scale of 1:100 means that 1 inch (or cm, or mm) on the drawing represents 100 inches (or cm, or mm) in real life.To calculate scale drawings, you need to either: determine the scale used in a drawing: Divide a measurement on the drawing by the corresponding measurement of the real object. The resulting number will be the scale factor, which can then be expressed as a ratio. For example, if a wall on a drawing measures 2 inches, and the actual wall measures 100 inches, divide the drawing length by the actual length (2/100), which simplifies to a scale of 1:50.Find the actual size from the drawing: Multiply the measurement on the drawing by the scale factor (the X in the scale ratio). For example, using a 1:100 scale, if a room is measured to be 5 inches on the drawing, the actual room size would be 5 inches x 100, equaling 500 inches. You can then convert this to feet (500 inches / 12 = 41.67 feet).Scale as a measurement: A smaller measurement is used for the real-world measurement by the scale factor. For instance, if a wall is 10 meters and you want to draw it as a scale of 1:100, you would draw it as 10 centimeters (since 10 meters / 100 = 0.1 meters, which equals 10 centimeters). This process requires a solid grasp of proportions, unit conversions, and basic arithmetic.Calculating Scale RatiosDetermining Scale from Given MeasurementsTo find the scale used in an existing drawing, the process involves these steps:Identify the corresponding measurements: Pick a length, width, or any dimension you have on both the drawing and the actual object or space.Divide the measurement from the drawing by the corresponding measurement in reality. Make sure both measurements are in the same units (inches, feet, centimeters, meters, etc.).Simplify: Simplify the resulting fraction (the scale factor) and present it as a ratio in its simplest form. If you have a scale factor of, say, 1/250, it's expressed as a ratio as 1:250.Calculating Actual Size from Drawing MeasurementsWhen you know the scale of a drawing, you can find the actual size using the following process:Identify the drawing measurement that you want to convert to its real-world size.Multiply the drawing measurement by the scale factor (the X in the ratio 1:X).Convert Units: If needed, convert the final answer to appropriate units (for example, from inches to feet).Creating a Drawing to ScaleWhen creating a drawing to a specific scale, the process is reversed:Identify the actual measurement of the object or space.Divide the actual measurement by the scale factor (the X in the ratio 1:X).Draw the object to the new reduced size (scaled dimension).Practical ExamplesLets look at a few real-world examples:Architecture: A blueprint might use a scale of 1:100. A wall that measures 12 feet (144 inches) in reality would be represented by a line of 1.44 inches on the drawing (144 inches / 100 = 1.44 inches).Mapmaking: A map with a scale of 1:250,000, where 1 cm on the map represents 250,000 cm (or 2.5 kilometers) in the real world.Modeling: A model car built at a scale of 1:24, where every inch in the model represents 24 inches on the real car.Common Mistakescrucial to avoid common mistakes when dealing with scale drawings:Unit inconsistency: Always convert measurements to the same unit before performing calculations to avoid Scale Factor errors: Applying a wrong scale factor to incorrect dimensions introduces Arithmetic Errors: Simple calculation errors can lead to major inaccuracies.Importance and clarity in drawings: In professional settings as architects and engineers, scale drawings are critical for planning, construction, and precise replication of real-world objects. Moreover, scaling is critical in mapmaking so the users can accurately visualize distances.ConclusionUnderstanding how to calculate scale drawings is an essential skill in many areas of life. By comprehending the principles of scale ratios, accurately dividing and multiplying measurements, and avoiding common errors, you can confidently create and work with scale drawings. The core concept remains consistent: establish a relationship between the drawing and reality and use that relationship to scale dimensions accurately. With practice, you can confidently work with various scales and appreciate their importance in real-world applications.Frequently Asked Questions (FAQs)1. What is a scale ratio?A scale ratio expresses the relationship between a measurement on a drawing and the corresponding measurement in reality. It's typically written as 1:X, where 1 represents a unit on the drawing and X represents the equivalent number of the same units in reality.2. What does a 1:50 scale mean?A 1:50 scale means that 1 unit of measurement on the drawing represents 50 of the same units in reality. For example, 1 cm on the drawing would represent 50 cm in the real world.3. How do I convert a drawing scale to actual size?To convert a drawing measurement to actual size, multiply the drawing measurement by the scale factor (the X in the scale ratio, i.e. the second number in the scale notation). For example, for a scale of 1:100, a length of 5 cm on the drawing would represent 500 cm (5 cm x 100) in reality.4. How do I determine the scale used in a drawing?To find the scale of an existing drawing, divide a measurement on the drawing by the corresponding real-world measurement. Simplify the result to obtain the scale ratio.5. What are some common scales for architectural drawings?Common architectural scales include 1:100, 1:50, 1:20, and 1:10. Larger scales (like 1:10 or 1:20) are used for detail drawings, while smaller scales (like 1:100) are used for overall building plans.6. How do I convert a drawing scale to a different unit?To convert a drawing scale to a different unit, you need to perform the same conversion on both the numerator and the denominator. For example, to convert a scale of 1:100 from inches to feet, you would divide both 1 and 100 by 12, resulting in a scale of 1:1200.7. What are some common mistakes to avoid when working with scale drawings?Common mistakes include using different measurement units, miscalculating the scale factor, and making simple arithmetic mistakes. Double-check all your calculations.8. How does scaling impact the dimensions in a drawing?Scaling alters the dimensions proportionally, meaning that all parts of the drawing are either reduced or enlarged by the same scale factor.9. Can I change scales on existing drawings?Yes, you can change the scale of an existing drawing using software or by manual recalculations of the existing dimensions to fit the new scale. However, you need to be precise.14. Are there apps that help create scale drawings?Yes, there are many apps available. Archisketch is an example of an app built for this purpose, however, depending on the device, other CAD apps or simple sketching software can assist with creating scale drawings.15. Whats the importance of accuracy in scale drawings?Accuracy is crucial in scale drawings, especially in fields like engineering and architecture, where even small inaccuracies can lead to significant problems in construction or production. A scale drawing must accurately represent the drawing and the actual measurement. For example, if you have a ratio of inches on a drawing to feet in reality, you can quickly find the scale factor for an engineering, or civic, scale by multiplying the feet portion by 12 (inches/foot). As an example, to find the scale factor for 1:30, multiply 30 by 12, which is 360. So, the scale factor for 1 = 30 is 1:360.Scale factors for common engineering scalesDrawing ScaleScale Factor = 101:2401 = 201:2401 = 301:3601 = 401:4801 = 501:6001 = 601:7201 = 701:8401 = 801:9601 = 901:10801 = 1001:1200Common Model ScalesThis table lists some common scale factors you may come across when dealing with different types of models.Common scale factors used for models and hobbiesScale FactorModel Type1:4steam trains, RC planes1:8steam trains, cars, motorcycles, military vehicles, figures1:8educast cars1:20formula one cars1:22.5G-gauge trains1:24cars, trucks, aircraft, dollhouses1:25cars, trucks1:312T-gauge trains, cars, aircraft, figures1:35military vehicles1:430-gauge trains, cars, trucks1:480-gauge trains, dollhouses, Lego minifig1:64S-gauge trains, diecast cars, Hotwheels/Matchbox1:72aircraft, military vehicles, boats, cars1:76aircraft, military vehicles1:87H0-gauge trains, military vehicles1:96ships1:100aircraft, spacecraft1:120T-gauge trains1:144ships, rockets, spacecraft1:160N-gauge trains, wargaming1:200aircraft, ships1:220Z-gauge trains1:285wargaming1:350ships1:700ships1:720shipsFrequently Asked Questions Yes, the scale factor can be represented as a fraction that describes the relative size between a model or drawing, and the actual object. No, the scale factor is not always greater than one. It will be greater than one if the model is smaller than the actual object, but smaller than one if the model is larger than the actual object. Typically we make models that are smaller than the object being modeled, hence why the scale factor is usually greater than one. You can calculate scale from a drawing by measuring what is finished on the drawing corresponding to what length on the actual object. For example, if a model of a Roman chariot is 1 inch on the drawing and the actual chariot is 3 inches in real life, the scale is 1:3. An example of a scale factor is the ratio used in a model airplane to describe how much bigger the actual airplane is than the model. If the actual airplane is ten times bigger than the model, then the scale factor is 1:10. The Engineering ToolBox provides a wide range of free tools, calculators, and information resources aimed at engineers and designers. It offers detailed technical data and calculations for various fields such as fluid mechanics, material properties, HVAC systems, electrical engineering, and more. The site includes resources for common engineering tasks, such as calculating physical properties (e.g., density, viscosity, thermal conductivity), converting units, and designing systems like heating and water distribution. With sections on everything from acoustics to hydraulics, it serves as a comprehensive tool for both students and professionals in technical and engineering disciplines. Download Article Download Article Scale drawings show an image either reduced or enlarged in size. The change between the original and the scaled drawing is generally represented by two numbers separated by a colon, like 1:10 (read as ten to one). The difference between the ratio numbers represents the factor by which the scaled image is enlarged or reduced. So for a 1:0.1 scale ratio, a 1 inch (2.5cm) drawing will be 10 inches (25cm) in real life. 1.Measure the object you'll be scaling. For images that are irregularly shaped, measuring with a ruler or tape measure can be difficult. In these cases, outline the perimeter with a piece of string, then measure the length of the string to find the perimeter.[1]For rough scaling of simple 2-D objects, you can probably get by with only measuring the width and height of the object.[2]It'll be helpful when you start drawing the scaled image if the perimeter is broken up into segments, like the top, bottom, and sides.[3]You may be able to break up the perimeter into small, regular shapes, like squares and triangles. These segments can be added together to find the perimeter. 2.Choose a ratio for your scaled drawing. Common ratios include 1:10, 1:100, 2:1, and 4:1.[4] When the first number is smaller than the second, it represents scaling down (reducing). When the first is larger than the second, it represents scaling up (enlarging).[5]When scaling down images that are especially large, expect the second number in the ratio to also be large. A 1:5000 ratio might be used to fit a building-sized object on a single sheet of paper. Enlarge small images by increasing the first number of your ratio in small increments. A 2:1 ratio will double the size of the original, a 4:1 ratio will be quadruple, and so on. Advertisement 3.Convert the actual measurements with the ratio. When scaling down, divide the original measurements by the second number in your ratio. When scaling up, multiply the original measurements the first number. Some ratios may be irregular, like 5:7. All this means is that for every 5 units of distance in the original, you'll have 7 units of distance in the original.[6]For example, if scaling down with a 1:2 ratio, a length of 4 inches (10cm) would become 2 inches (5.1cm) because 4 ÷ 2 = 2. When scaling up with a 2:1 ratio, a length of 4 inches (10cm) would become 8 inches (20cm) because 4 x 2 = 8.4.Start drawing the perimeter with a straight segment when possible. A straight segment will be easier to check against your converted length. This will also give you a better feel for how much the scaled image has changed from the original.[7]If your drawing doesn't have a suitable straight segment, one that is mostly straight might work just as well.If your image is highly irregular, try drawing the perimeter from the top down or bottom up.5.Refer to the original drawing frequently. Branch out from your starting segment by adding to the sides in the same fashion as the original. Continue adding to the perimeter until the entire scaled image is drawn.[8]Check your converted measurements against the drawn lines of your scaled image as you go along. Erase and adjust lengths as necessary.It may help to draw a grid over the original drawing and then putting another grid on the larger piece of paper to match the ratio you chose. That way, you can easily reference where something is supposed to be.[9]6.Use a piece of string to check the scaled lengths of irregular images. Cut a piece of string slightly longer than your longest scaled segment. When drawing irregular or arced segments, overlay the string on the segment then measure the string to see if it matches up with the scaled length.[Add details after finishing the perimeter. The lines inside the perimeter of your drawing will be similarly scaled. However, once the perimeter is finished, you may want to make buildings and bridges. A ratio and a scale are used to make a drawing of a map and a building. The scale is usually expressed as one of two ways: using units, such as 1 cm to 1 km, or by using a scale bar. Advertisement 7. Advertisement 8. Advertisement 9. Advertisement 10. Advertisement 11. Advertisement 12. Advertisement 13. Advertisement 14. Advertisement 15. Advertisement 16. Advertisement 17. Advertisement 18. Advertisement 19. Advertisement 20. Advertisement 21. Advertisement 22. Advertisement 23. Advertisement 24. Advertisement 25. Advertisement 26. Advertisement 27. Advertisement 28. Advertisement 29. Advertisement 30. Advertisement 31. Advertisement 32. Advertisement 33. Advertisement 34. Advertisement 35. Advertisement 36. Advertisement 37. Advertisement 38. Advertisement 39. Advertisement 40. Advertisement 41. Advertisement 42. Advertisement 43. Advertisement 44. Advertisement 45. Advertisement 46. Advertisement 47. Advertisement 48. Advertisement 49. Advertisement 50. Advertisement 51. Advertisement 52. Advertisement 53. Advertisement 54. Advertisement 55. Advertisement 56. Advertisement 57. Advertisement 58. Advertisement 59. Advertisement 60. Advertisement 61. Advertisement 62. Advertisement 63. Advertisement 64. Advertisement 65. Advertisement 66. Advertisement 67. Advertisement 68. Advertisement 69. Advertisement 70. Advertisement 71. Advertisement 72. Advertisement 73. Advertisement 74. Advertisement 75. Advertisement 76. Advertisement 77. Advertisement 78. Advertisement 79. Advertisement 80. Advertisement 81. Advertisement 82. Advertisement 83. Advertisement 84. Advertisement 85. Advertisement 86. Advertisement 87. Advertisement 88. Advertisement 89. Advertisement 90. Advertisement 91. Advertisement 92. Advertisement 93. Advertisement 94. Advertisement 95. Advertisement 96. Advertisement 97. Advertisement 98. Advertisement 99. Advertisement 100. Advertisement 101. Advertisement 102. Advertisement 103. Advertisement 104. Advertisement 105. Advertisement 106. Advertisement 107. Advertisement 108. Advertisement 109. Advertisement 110. Advertisement 111. Advertisement 112. Advertisement 113. Advertisement 114. Advertisement 115. Advertisement 116. Advertisement 117. Advertisement 118. Advertisement 119. Advertisement 120. Advertisement 121. Advertisement 122. Advertisement 123. Advertisement 124. Advertisement 125. Advertisement 126. Advertisement 127. Advertisement 128. Advertisement 129. Advertisement 130. Advertisement 131. Advertisement 132. Advertisement 133. Advertisement 134. Advertisement 135. Advertisement 136. Advertisement 137. Advertisement 138. Advertisement 139. Advertisement 140. Advertisement 141. Advertisement 142. Advertisement 143. Advertisement 144. Advertisement 145. Advertisement 146. Advertisement 147. Advertisement 148. Advertisement 149. Advertisement 150. Advertisement 151. Advertisement 152. Advertisement 153. Advertisement 154. Advertisement 155. Advertisement 156. Advertisement 157. Advertisement 158. Advertisement 159. Advertisement 160. Advertisement 161. Advertisement 162. Advertisement 163. Advertisement 164. Advertisement 165. Advertisement 166. Advertisement 167. Advertisement 168. Advertisement 169. Advertisement 170. Advertisement 171. Advertisement 172. Advertisement 173. Advertisement 174. Advertisement 175. Advertisement 176. Advertisement 177. Advertisement 178. Advertisement 179. Advertisement 180. Advertisement 181. Advertisement 182. Advertisement 183. Advertisement 184. Advertisement 185. Advertisement 186. Advertisement 187. Advertisement 188. Advertisement 189. Advertisement 190. Advertisement 191. Advertisement 192. Advertisement 193. Advertisement 194. Advertisement 195. Advertisement 196. Advertisement 197. Advertisement 198. Advertisement 199. Advertisement 200. Advertisement 201. Advertisement 202. Advertisement 203. Advertisement 204. Advertisement 205. Advertisement 206. Advertisement 207. Advertisement 208. Advertisement 209. Advertisement 210. Advertisement 211. Advertisement 212. Advertisement 213. Advertisement 214. Advertisement 215. Advertisement 216. Advertisement 217. Advertisement 218. Advertisement 219. Advertisement 220. Advertisement 221. Advertisement 222. Advertisement 223. Advertisement 224. Advertisement 225. Advertisement 226. Advertisement 227. Advertisement 228. Advertisement 229. Advertisement 230. Advertisement 231. Advertisement 232. Advertisement 233. Advertisement 234. Advertisement 235. Advertisement 236. Advertisement 237. Advertisement 238. Advertisement 239. Advertisement 240. Advertisement 241. Advertisement 242. Advertisement 243. Advertisement 244. Advertisement 245. Advertisement 246. Advertisement 247. Advertisement 248. Advertisement 249. Advertisement 250. Advertisement 251. Advertisement 252. Advertisement 253. Advertisement 254. Advertisement 255. Advertisement 256. Advertisement 257. Advertisement 258. Advertisement 259. Advertisement 260. Advertisement 261. Advertisement 262. Advertisement 263. Advertisement 264. Advertisement 265. Advertisement 266. Advertisement 267. Advertisement 268. Advertisement 269. Advertisement 270. Advertisement 271. Advertisement 272. Advertisement 273. Advertisement 274. Advertisement 275. Advertisement 276. Advertisement 277. Advertisement 278. Advertisement 279. Advertisement 280. Advertisement 281. Advertisement 282. Advertisement 283. Advertisement 284. Advertisement 285. Advertisement 286. Advertisement 287. Advertisement 288. Advertisement 289. Advertisement 290. Advertisement 291. Advertisement 292. Advertisement 293. Advertisement 294. Advertisement 295. Advertisement 296. Advertisement 297. Advertisement 298. Advertisement 299. Advertisement 300. Advertisement 301. Advertisement 302. Advertisement 303. Advertisement 304. Advertisement 305. Advertisement 306. Advertisement 307. Advertisement 308. Advertisement 309. Advertisement 310. Advertisement 311. Advertisement 312. Advertisement 313. Advertisement 314. Advertisement 315. Advertisement 316. Advertisement 317. Advertisement 318. Advertisement 319. Advertisement 320. Advertisement 321. Advertisement 322. Advertisement 323. Advertisement 324. Advertisement 325. Advertisement 326. Advertisement 327. Advertisement 328. Advertisement 329. Advertisement 330. Advertisement 331. Advertisement 332. Advertisement 333. Advertisement 334. Advertisement 335. Advertisement 336. Advertisement 337. Advertisement 338. Advertisement 339. Advertisement 340. Advertisement 341. Advertisement 342. Advertisement 343. Advertisement 344. Advertisement 345. Advertisement 346. Advertisement 347. Advertisement 348. Advertisement 349. Advertisement 350. Advertisement 351. Advertisement 352. Advertisement 353. Advertisement 354. Advertisement 355. Advertisement 356. Advertisement 357. Advertisement 358. Advertisement 359. Advertisement 360. Advertisement 361. Advertisement 362. Advertisement 363. Advertisement 364. Advertisement 365. Advertisement 366. Advertisement 367. Advertisement 368. Advertisement 369. Advertisement 370. Advertisement 371. Advertisement 372. Advertisement 373. Advertisement 374. Advertisement 375. Advertisement 376. Advertisement 377. Advertisement 378. Advertisement 379. Advertisement 380. Advertisement 381. Advertisement 382. Advertisement 383. Advertisement 384. Advertisement 385. Advertisement 386. Advertisement 387. Advertisement 388. Advertisement 389. Advertisement 390. Advertisement 391. Advertisement 392. Advertisement 393. Advertisement 394. Advertisement 395. Advertisement 396. Advertisement 397. Advertisement 398. Advertisement 399. Advertisement 400. Advertisement 401. Advertisement 402. Advertisement 403. Advertisement 404. Advertisement 405. Advertisement 406. Advertisement 407. Advertisement 408. Advertisement 409. Advertisement 410. Advertisement 411. Advertisement 412. Advertisement 413. Advertisement 414. Advertisement 415. Advertisement 416. Advertisement 417. Advertisement 418. Advertisement 419. Advertisement 420. Advertisement 421. Advertisement 422. Advertisement 423. Advertisement 424. Advertisement 425. Advertisement 426. Advertisement 427. Advertisement 428. Advertisement 429. Advertisement 430. Advertisement 431. Advertisement 432. Advertisement 433. Advertisement 434. Advertisement 435. Advertisement 436. Advertisement 437. Advertisement 438. Advertisement 439. Advertisement 440. Advertisement 441. Advertisement 442. Advertisement 443. Advertisement 444. Advertisement 445. Advertisement 446. Advertisement 447. Advertisement 448. Advertisement 449. Advertisement 450. Advertisement 451. Advertisement 452. Advertisement 453. Advertisement 454. Advertisement 455. Advertisement 456. Advertisement 457. Advertisement 458. Advertisement 459. Advertisement 460. Advertisement 461. Advertisement 462. Advertisement 463. Advertisement 464. Advertisement 465. Advertisement 466. Advertisement 467. Advertisement 468. Advertisement 469. Advertisement 470. Advertisement 471. Advertisement 472. Advertisement 473. Advertisement 474. Advertisement 475. Advertisement 476. Advertisement 477. Advertisement 478. Advertisement 479. Advertisement 480. Advertisement 481. Advertisement 482. Advertisement 483. Advertisement 484. Advertisement 485. Advertisement 486. Advertisement 487. Advertisement 488. Advertisement 489. Advertisement 490. Advertisement 491. Advertisement 492. Advertisement 493. Advertisement 494. Advertisement 495. Advertisement 496. Advertisement 497. Advertisement 498. Advertisement 499. Advertisement 500. Advertisement 501. Advertisement 502. Advertisement 503. Advertisement 504. Advertisement 505. Advertisement 506. Advertisement 507. Advertisement 508. Advertisement 509. Advertisement 510. Advertisement 511. Advertisement 512. Advertisement 513. Advertisement 514. Advertisement 515. Advertisement 516. Advertisement 517. Advertisement 518. Advertisement 519. Advertisement 520. Advertisement 521. Advertisement 522. Advertisement 523. Advertisement 524. Advertisement 525. Advertisement 526. Advertisement 527. Advertisement 528. Advertisement 529. Advertisement 530. Advertisement 531. Advertisement 532. Advertisement 533. Advertisement 534. Advertisement 535. Advertisement 536. Advertisement 537. Advertisement 538. Advertisement 539. Advertisement 540. Advertisement 541. Advertisement 542. Advertisement 543. Advertisement 544. Advertisement 545. Advertisement 546. Advertisement 547. Advertisement 548. Advertisement 549. Advertisement 550. Advertisement 551. Advertisement 552. Advertisement 553. Advertisement 554. Advertisement 555. Advertisement 556. Advertisement 557. Advertisement 558. Advertisement 559. Advertisement 560. Advertisement 561. Advertisement 562. Advertisement 563. Advertisement 564. Advertisement 565. Advertisement 566. Advertisement 567. Advertisement 568. Advertisement 569. Advertisement 570. Advertisement 571. Advertisement 572. Advertisement 573. Advertisement 574. Advertisement 575. Advertisement 576. Advertisement 577. Advertisement 578. Advertisement 579. Advertisement 580. Advertisement 581. Advertisement 582. Advertisement 583. Advertisement 584. Advertisement 585. Advertisement 586. Advertisement 587. Advertisement 588. Advertisement 589. Advertisement 590. Advertisement 591. Advertisement 592. Advertisement 593. Advertisement 594. Advertisement 595. Advertisement 596. Advertisement 597. Advertisement 598. Advertisement 599. Advertisement 600. Advertisement 601. Advertisement 602. Advertisement 603. Advertisement 604. Advertisement 605. Advertisement 606. Advertisement 607. Advertisement 608. Advertisement 609. Advertisement 610. Advertisement 611. Advertisement 612. Advertisement 613. Advertisement 614. Advertisement 615. Advertisement 616. Advertisement 617. Advertisement 618. Advertisement 619. Advertisement 620. Advertisement 621. Advertisement 622. Advertisement 623. Advertisement 624. Advertisement 625. Advertisement 626. Advertisement 627. Advertisement 628. Advertisement 629. Advertisement 630. Advertisement 631. Advertisement 632. Advertisement 633. Advertisement 634. Advertisement 635. Advertisement 636. Advertisement 637. Advertisement 638. Advertisement 639. Advertisement 640. Advertisement 641. Advertisement 642. Advertisement 643. Advertisement 644. Advertisement 645. Advertisement 646. Advertisement 647. Advertisement 648. Advertisement 649. Advertisement 650. Advertisement 651. Advertisement 652. Advertisement 653. Advertisement 654. Advertisement 655. Advertisement 656. Advertisement 657. Advertisement 658. Advertisement 659. Advertisement 660. Advertisement 661. Advertisement 662. Advertisement 663. Advertisement 664. Advertisement 665. Advertisement 666. Advertisement 667. Advertisement 668. Advertisement 669. Advertisement 670. Advertisement 671. Advertisement 672. Advertisement 673. Advertisement 674. Advertisement 675. Advertisement 676. Advertisement 677. Advertisement 678. Advertisement 679. Advertisement 680. Advertisement 681. Advertisement 682. Advertisement 683. Advertisement 684. Advertisement 685. Advertisement 686. Advertisement 687. Advertisement 688. Advertisement 689. Advertisement 690. Advertisement 691. Advertisement 692. Advertisement 693. Advertisement 694. Advertisement 695. Advertisement 696. Advertisement 697. Advertisement 698. Advertisement 699. Advertisement 700. Advertisement 701. Advertisement 702. Advertisement 703. Advertisement 704. Advertisement 705. Advertisement 706. Advertisement 707. Advertisement 708. Advertisement 709. Advertisement 710. Advertisement 711. Advertisement 712. Advertisement 713. Advertisement 714. Advertisement 715. Advertisement 716. Advertisement 717. Advertisement 718. Advertisement 719. Advertisement 720. Advertisement 721. Advertisement 722. Advertisement 723. Advertisement 724. Advertisement 725. Advertisement 726. Advertisement 727. Advertisement 728. Advertisement 729. Advertisement 730. Advertisement 731. Advertisement 732. Advertisement 733. Advertisement 734. Advertisement 735. Advertisement 736. Advertisement 737. Advertisement 738. Advertisement 739. Advertisement 740. Advertisement 741. Advertisement 742. Advertisement 743. Advertisement 744. Advertisement 745. Advertisement 746. Advertisement 747. Advertisement 748. Advertisement 749. Advertisement 750. Advertisement 751. Advertisement 752. Advertisement 753. Advertisement 754. Advertisement 755. Advertisement 756. Advertisement 757. Advertisement 758. Advertisement 759. Advertisement 760. Advertisement 761. Advertisement 762. Advertisement 763. Advertisement 764. Advertisement 765. Advertisement 766. Advertisement 767. Advertisement 768. Advertisement 769. Advertisement 770. Advertisement 771. Advertisement 772. Advertisement 773. Advertisement 774. Advertisement 775. Advertisement 776. Advertisement 777. Advertisement 778. Advertisement 779. Advertisement 780. Advertisement 781. Advertisement 782. Advertisement 783. Advertisement 784. Advertisement 785. Advertisement 786. Advertisement 787. Advertisement 788. Advertisement 789. Advertisement 790. Advertisement 791. Advertisement 792. Advertisement 793. Advertisement 794. Advertisement 795. Advertisement 796. Advertisement 797. Advertisement 798. Advertisement 799. Advertisement 800. Advertisement 801. Advertisement 802. Advertisement 803. Advertisement 804. Advertisement 805. Advertisement 806. Advertisement 807. Advertisement 808. Advertisement 809. Advertisement 810. Advertisement 811. Advertisement 812. Advertisement 813. Advertisement 814. Advertisement 815. Advertisement 816. Advertisement 817. Advertisement 818. Advertisement 819. Advertisement 820. Advertisement 821. Advertisement 822. Advertisement 823. Advertisement 824. Advertisement 825. Advertisement 826. Advertisement 827. Advertisement 828. Advertisement 829. Advertisement 830. Advertisement 831. Advertisement 832. Advertisement 833. Advertisement 834. Advertisement 835. Advertisement 836. Advertisement 837. Advertisement 838. Advertisement 839. Advertisement 840. Advertisement 841. Advertisement 842. Advertisement 843. Advertisement 844. Advertisement 845. Advertisement 846. Advertisement 847. Advertisement 848. Advertisement 849. Advertisement 850. Advertisement 851. Advertisement 852. Advertisement 853. Advertisement 854. Advertisement 855. Advertisement 856. Advertisement 857. Advertisement 858. Advertisement 859. Advertisement 860. Advertisement 861. Advertisement 862. Advertisement 863. Advertisement 864. Advertisement 865. Advertisement 866. Advertisement 867. Advertisement 868. Advertisement 869. Advertisement 870. Advertisement 871. Advertisement 872. Advertisement 873. Advertisement 874. Advertisement 875. Advertisement 876. Advertisement 877. Advertisement 878. Advertisement 879. Advertisement 880. Advertisement 881. Advertisement 882. Advertisement 883. Advertisement 884. Advertisement 885. Advertisement 886. Advertisement 887. Advertisement 888. Advertisement 889. Advertisement 890. Advertisement 891. Advertisement 892. Advertisement 893. Advertisement 894. Advertisement 895. Advertisement 896. Advertisement 897. Advertisement 898. Advertisement 899. Advertisement 900. Advertisement 901. Advertisement 902. Advertisement 903. Advertisement 904. Advertisement 905. Advertisement 906. Advertisement 907. Advertisement 908. Advertisement 909. Advertisement 910. Advertisement 911. Advertisement 912. Advertisement 913. Advertisement 914. Advertisement 915. Advertisement 916. Advertisement 917. Advertisement 918. Advertisement 919. Advertisement 920. Advertisement 921. Advertisement 922. Advertisement 923. Advertisement 924. Advertisement 925. Advertisement 926. Advertisement 927. Advertisement 928. Advertisement 929. Advertisement 930. Advertisement 931. Advertisement 932. Advertisement 933. Advertisement 934. Advertisement 935. Advertisement 936. Advertisement 937. Advertisement 938. Advertisement 939. Advertisement 940. Advertisement 941. Advertisement 942. Advertisement 943. Advertisement 944. Advertisement 945. Advertisement 946. Advertisement 947. Advertisement 948. Advertisement 949. Advertisement 950. Advertisement 951. Advertisement 952. Advertisement 953. Advertisement 954. Advertisement 955. Advertisement 956. Advertisement 957. Advertisement 958. Advertisement 959. Advertisement 960. Advertisement 961. Advertisement 962. Advertisement 963. Advertisement 964. Advertisement 965. Advertisement 966. Advertisement 967. Advertisement 968. Advertisement 969. Advertisement 970. Advertisement 971. Advertisement 972. Advertisement 973. Advertisement 974. Advertisement 975. Advertisement 976. Advertisement 977. Advertisement 978. Advertisement 979. Advertisement 980. Advertisement 981. Advertisement 982. Advertisement 983. Advertisement 984. Advertisement 985. Advertisement 986. Advertisement 987. Advertisement 988. Advertisement 989. Advertisement 990. Advertisement 991. Advertisement 992. Advertisement 993. Advertisement 994. Advertisement 995. Advertisement 996. Advertisement 997. Advertisement 998. Advertisement 999. Advertisement 1000. Advertisement 1001. Advertisement 1002. Advertisement 1003. Advertisement 1004. Advertisement 1005. Advertisement 1006. Advertisement 1007. Advertisement 1008. Advertisement 1009. Advertisement 1010. Advertisement 1011. Advertisement 1012. Advertisement 1013. Advertisement 1014. Advertisement 1015. Advertisement 1016. Advertisement 1017. Advertisement 1018. Advertisement 1019. Advertisement 1020. Advertisement 1021. Advertisement 1022. Advertisement 1023. Advertisement 1024. Advertisement 1025. Advertisement 1026. Advertisement 1027. Advertisement 1028. Advertisement 1029. Advertisement 1030. Advertisement 1031. Advertisement 1032. Advertisement 1033. Advertisement 1034. Advertisement 1035. Advertisement 1036. Advertisement 1037. Advertisement 1038. Advertisement 1039. Advertisement 1040. Advertisement 1041. Advertisement 1042. Advertisement 1043. Advertisement 1044. Advertisement 1045. Advertisement 1046. Advertisement 1047. Advertisement 1048. Advertisement 1049. Advertisement 1050. Advertisement 1051. Advertisement 1052. Advertisement 1053. Advertisement 1054. Advertisement 1055. Advertisement 1056. Advertisement 1057. Advertisement 1058. Advertisement 1059. Advertisement 1060. Advertisement 1061. Advertisement 1062. Advertisement 1063. Advertisement 1064. Advertisement 1065. Advertisement 1066. Advertisement 1067. Advertisement 1068. Advertisement 1069. Advertisement 1070. Advertisement 1071. Advertisement 1072. Advertisement 1073. Advertisement 1074. Advertisement 1075. Advertisement 1076. Advertisement 1077. Advertisement 1078. Advertisement 1079. Advertisement 1080. Advertisement 1081. Advertisement 1082. Advertisement 1083. Advertisement 1084. Advertisement 1085. Advertisement 1086. Advertisement 1087. Advertisement 1088. Advertisement 1089. Advertisement 1090. Advertisement 1091. Advertisement 1092. Advertisement 1093. Advertisement 1094. Advertisement 1095. Advertisement 1096. Advertisement 1097. Advertisement 1098. Advertisement 1099. Advertisement 1100. Advertisement 1101. Advertisement 1102. Advertisement 1103. Advertisement 1104. Advertisement 1105. Advertisement 1106. Advertisement 1107. Advertisement 1108. Advertisement 1109. Advertisement 1110. Advertisement 1111. Advertisement 1112. Advertisement 1113. Advertisement 1114. Advertisement 1115. Advertisement 1116. Advertisement 1117. Advertisement 1118. Advertisement 1119. Advertisement 1120. Advertisement 1121. Advertisement 1122. Advertisement 1123. Advertisement 1124. Advertisement 1125. Advertisement 1126. Advertisement 1127. Advertisement 1128. Advertisement 1129. Advertisement 1130. Advertisement 1131. Advertisement 1132. Advertisement 1133. Advertisement 1134. Advertisement 1135. Advertisement 1136. Advertisement 1137. Advertisement 1138. Advertisement 1139. Advertisement 1140. Advertisement 1141. Advertisement 1142. Advertisement 1143. Advertisement 1144. Advertisement 1145. Advertisement 1146. Advertisement 1147. Advertisement 1148. Advertisement 1149. Advertisement 1150. Advertisement 1151. Advertisement 1152. Advertisement 1153. Advertisement 1154. Advertisement 1155. Advertisement 1156. Advertisement 1157. Advertisement 1158. Advertisement 1159. Advertisement 1160. Advertisement 1161. Advertisement 1162. Advertisement 1163. Advertisement 1164. Advertisement 1165. Advertisement 1166. Advertisement 1167. Advertisement 1168. Advertisement 1169. Advertisement 1170. Advertisement 1171. Advertisement 1172. Advertisement 1173. Advertisement 1174. Advertisement 1175. Advertisement 1176. Advertisement 1177. Advertisement 1178. Advertisement 1179. Advertisement 1180. Advertisement 1181. Advertisement 1182. Advertisement 1183. Advertisement 1184. Advertisement 1185. Advertisement 1186. Advertisement 1187. Advertisement 1188. Advertisement 1189. Advertisement 1190. Advertisement 1191. Advertisement 1192. Advertisement 1193. Advertisement 1194. Advertisement 1195. Advertisement 1196. Advertisement 1197. Advertisement 1198. Advertisement 1199. Advertisement 1200. Advertisement 1201. Advertisement 1202. Advertisement 1203. Advertisement 1204. Advertisement 1205. Advertisement 1206. Advertisement 1207. Advertisement 1208. Advertisement 1209. Advertisement 1210. Advertisement 1211. Advertisement 1212. Advertisement 1213. Advertisement 1214. Advertisement 1215. Advertisement 1216. Advertisement 1217. Advertisement 1218. Advertisement 1219. Advertisement 1220. Advertisement 1221. Advertisement 1222. Advertisement 1223. Advertisement 1224. Advertisement 1225. Advertisement 1226. Advertisement 1227. Advertisement 1228. Advertisement 1229. Advertisement 1230. Advertisement 1231. Advertisement 1232. Advertisement 1233. Advertisement 1234. Advertisement 1235. Advertisement 1236. Advertisement 1237. Advertisement 1238. Advertisement 1239. Advertisement 1240. Advertisement 1241. Advertisement 1242. Advertisement 1243. Advertisement 1244. Advertisement 1245. Advertisement 1246. Advertisement 1247. Advertisement 1248. Advertisement 1249. Advertisement 1250. Advertisement 1251. Advertisement 1252. Advertisement 1253. Advertisement 1254. Advertisement 1255. Advertisement 1256. Advertisement 1257. Advertisement 1258. Advertisement 1259. Advertisement 1260. Advertisement 1261. Advertisement 1262. Advertisement 1263. Advertisement 1264. Advertisement 1265. Advertisement 1266. Advertisement 1267. Advertisement 1268. Advertisement 1269. Advertisement 1270. Advertisement 1271. Advertisement 1272. Advertisement 1273. Advertisement 1274. Advertisement 1275. Advertisement 1276. Advertisement 1277. Advertisement 1278. Advertisement 1279. Advertisement 1280. Advertisement 1281. Advertisement 1282. Advertisement 1283. Advertisement 1284. Advertisement 1285. Advertisement 1286. Advertisement 1287. Advertisement 1288. Advertisement 1289. Advertisement 1290. Advertisement 1291. Advertisement 1292. Advertisement 1293. Advertisement 1294. Advertisement 1295. Advertisement 1296. Advertisement 1297. Advertisement 1298. Advertisement 1299. Advertisement 1300. Advertisement 1301. Advertisement 1302. Advertisement 1303. Advertisement 1304. Advertisement 1305. Advertisement 1306. Advertisement 1307. Advertisement 1308. Advertisement 1309. Advertisement 1310. Advertisement 1311. Advertisement 1312. Advertisement 1313. Advertisement 1314. Advertisement 1315. Advertisement 1316. Advertisement 1317. Advertisement 1318. Advertisement 1319. Advertisement 1320. Advertisement 1321. Advertisement 1322. Advertisement 1323. Advertisement 1324. Advertisement 1325. Advertisement 1326. Advertisement 1327. Advertisement 1328. Advertisement 1329. Advertisement 1330. Advertisement 1331. Advertisement 1332. Advertisement 1333. Advertisement 1334. Advertisement 1335. Advertisement 1336. Advertisement 1337. Advertisement 1338. Advertisement 1339. Advertisement 1340. Advertisement 1341. Advertisement 1342. Advertisement 1343. Advertisement 1344. Advertisement 1345. Advertisement 1346. Advertisement 1347. Advertisement 1348. Advertisement 1349. Advertisement 1350. Advertisement 1351. Advertisement 1352. Advertisement 1353. Advertisement 1354. Advertisement 1355. Advertisement 1356. Advertisement 1357. Advertisement 1358. Advertisement 1359. Advertisement 1360. Advertisement 1361. Advertisement 1362. Advertisement 1363. Advertisement 1364. Advertisement 1365. Advertisement 1366. Advertisement 1367. Advertisement 1368. Advertisement 1369. Advertisement 1370. Advertisement 1371. Advertisement 1372. Advertisement 1373. Advertisement 1374. Advertisement 1375. Advertisement 1376. Advertisement 1377. Advertisement 1378. Advertisement 1379. Advertisement 1380. Advertisement 1381. Advertisement 1382. Advertisement 1383. Advertisement 1384. Advertisement 1385. Advertisement 1386. Advertisement 1387. Advertisement 1388. Advertisement 1389. Advertisement 1390. Advertisement 1391. Advertisement 1392. Advertisement 1393. Advertisement 1394. Advertisement 1395. Advertisement 1396. Advertisement 1397. Advertisement 1398. Advertisement 1399. Advertisement 1400. Advertisement 1401. Advertisement 1402. Advertisement 1403. Advertisement 1404. Advertisement 1405. Advertisement 1406. Advertisement 1407. Advertisement 1408. Advertisement 1409.

