Algebra 2
Chapter 11 - Chapter Review Solutions

1. A sample is part of a population.

2. An outlier has a value substantially different from other data in a set.

3. A function that gives the probability of each event in a sample space is a probability distribution.

4. The range of a set of data is the simplest measure of variation.

5. $3! = 3 \cdot 2 \cdot 1$
$= 6$

6. $9! = 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$
$= 362{,}880$

7. $\frac{4!}{2!} = \frac{4 \cdot 3 \cdot 2!}{2!}$
$= 4 \cdot 3$
$= 12$

8. $\frac{5!}{2!2!} = \frac{5 \cdot 4 \cdot 3 \cdot 2!}{2 \cdot 1 \cdot 2!}$
$= \frac{120}{4}$
$= 30$

9. ${}_7C_2 = \frac{7!}{2!(7-2)!}$
$= \frac{7 \cdot 6 \cdot 5!}{2!5!}$
$= \frac{7 \cdot 6}{2!}$
$= 21$

10. ${}_4C_3 + {}_6C_5 = \frac{4!}{3!(4-3)!} + \frac{6!}{5!(6-5)!}$
$\frac{4 \cdot 3!}{3!1!} + \frac{6 \cdot 5!}{5!1!}$
$= 4 + 6$
$= 10$

11. ${}_6P_2 = \frac{6!}{(6-2)!}$
$= \frac{6 \cdot 5 \cdot 4!}{4!}$
$= 6 \cdot 5$
$= 30$

12. ${}_4P_3 + {}_6P_5 = \frac{4!}{(4-3)!} + \frac{6!}{(6-5)!}$
$= \frac{4 \cdot 3 \cdot 2 \cdot 1}{1!} + \frac{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{1!}$
$= 744$

13. ${}_{12}C_3 = \frac{12!}{3!(12-3)!} = \frac{12 \cdot 11 \cdot 10}{6} = 220$
${}_9C_3 = \frac{9!}{3!(9-3)!} = \frac{9 \cdot 8 \cdot 7}{6} = 84$
${}_6C_3 = \frac{6!}{3!(6-3)!} = \frac{6 \cdot 5 \cdot 4}{6} = 20$
${}_3C_3 = \frac{3!}{3!(6-3)!} = \frac{3 \cdot 2 \cdot 1}{6} = 1$
You can choose 3 items in 220 ways for the first dinner, 84 ways for the second dinner, 20 ways for the third dinner, and 1 way for the fourth dinner.

14. ${}_{26}P_7 = \frac{26!}{(26-7)!}$
$= \frac{26 \cdot 25 \cdot 24 \cdot 23 \cdot 22 \cdot 21 \cdot 20 \cdot 19!}{19!}$
$= 3.315312 \times 10^9$
There are 3.315312×10^9 possible seven-letter arrangements.

15. $(6)^3 = 216$

16. $\frac{70-23}{70} = \frac{47}{70}$
≈ 0.67

17. A number cube is only numbered from 1 to 6, so the probability of rolling 13 is 0.

18. The prime numbers in the range 1 through 15 are 2, 3, 5, 7, 11, and 13.
$\frac{6}{15} = \frac{2}{5}$
The probability of picking a prime number at random from the numbers 1 through 15 is $\frac{2}{5}$.

19. Not necessarily; you may pick a 5 zero times, one time, or more than once. Each time you pick, the probability that it will be a 5 is $\frac{1}{20}$.

20. Dependent; the selection of the first student will affect the outcome of the second selection.

21. Independent; the first event has no effect on the second event.

22. $P(A \text{ and } B) = P(A) \cdot P(B)$
$= 0.3 \cdot 0.7$
$= 0.21$

23. $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
$= 0.3 + 0.7 - 0.3(0.7)$
$= 1 - 0.21$
$= 0.79$

24. $P(A \mid B) = \dfrac{P(A \text{ and } B)}{P(B)}$
$= \dfrac{0.3(0.7)}{0.7}$
$= 0.3$

25. $P(B \mid A) = \dfrac{P(A \text{ and } B)}{P(A)}$
$= \dfrac{0.3(0.7)}{0.3}$
$= 0.7$

26. $P(A \mid B) = \dfrac{P(A \text{ and } B)}{P(B)}$
$= \dfrac{0.1}{0.4}$
$= \dfrac{1}{4}$

27. $P(B \mid A) = \dfrac{P(A \text{ and } B)}{P(A)}$
$= \dfrac{0.1}{0.5}$
$= \dfrac{1}{5}$

28. $P(A \text{ and } B \mid A \text{ or } B)$
$P(A \text{ or } B) = 0.5 + 0.4 - 0.1 = 0.8$
$P(0.1 \mid 0.8) = \dfrac{1}{8}$

29. This will not necessarily result in a fair decision, because the principal may aim at a particular name, which means that not all students have an equally likely chance of being chosen.

30. Yes, this will result in a fair decision, because the probabilities of each goalie being chosen are the same.

31. Answers may vary. Check students' responses.

32. 17, 15, 16, 15, 9, 18, 16
9 is the outlier because it is much lower than the other values.

33. mean: $\dfrac{1+1+3+3+5+5+6+7+9+9+9+10+10}{13} = \dfrac{78}{13} = 6$
median: 1, 1, 3, 3, 5, 5, $\boxed{6}$, 7, 9, 9, 9, 10, 10 → The median is 6.
mode: 9

34. mean: $\dfrac{0+3+3+7+7+8+21+22+25}{9} = \dfrac{96}{9} = 10.\overline{6}$
median: 0, 3, 3, 7, $\boxed{7}$, 8, 21, 22, 25 → The median is 7.
modes: 3 and 7

35. mean: $\dfrac{8+9+11+12+13+15+16+18+18+18+27}{11} = \dfrac{165}{11} = 15$
median: 8, 9, 11, 12, 13, $\boxed{15}$, 16, 18, 18, 18, 27 → The median is 15.
mode: 18

36. mean: $\dfrac{11+6+9+4+19+10+15+2}{8} = \dfrac{76}{8} = 9.5$
median: 2, 4, 6, $\boxed{9, 10}$, 11, 15, 19 → The median is 9.5.
mode: none

37. 25, 25, <u>30</u>, 35, 45 | 45, 50, <u>55</u>, 60 60
range = $60 - 25 = 35$
$Q_1 = 30$; $Q_3 = 55$

38. 20, 23, <u>25</u>, 36, 37 | 38, 39, <u>50</u>, 52, 55
range = $55 - 20 = 35$
$Q_1 = 25$; $Q_3 = 50$

39. 36, <u>36, 48</u>, 65 | 75, <u>82, 92</u>, 101
range = $101 - 36 = 65$
$Q_1 = \dfrac{36+48}{2} = 42$; $Q_3 = \dfrac{82+92}{2} = 87$

40. The heights of three people are likely to have a greater standard deviation because there won't be enough samples for a normal curve.

41. The ages of thirty college students are likely to have a greater standard deviation because not everyone attends college at the same age, but everyone usually attends high school at a certain age.

42. The gas mileage of 18 automobiles of various types are likely to have a greater standard deviation because different types of vehicles will get greatly varied mileage.

43. The following solution uses exact values throughout the calculation, though for display purposes only a certain number of digits are shown.

$$\bar{x} = \frac{1+1+2+2+3+4+5+6+8+9+10+10+12+20}{14} \approx 6.64$$

$$\sigma^2 = \Big[(1-6.64)^2 + (1-6.64)^2 + (2-6.64)^2 + (2-6.64)^2 + (3-6.64)^2 + (4-6.64)^2 + (5-6.64)^2 + (6-6.64)^2 + (8-6.64)^2 + (9-6.64)^2 + (10-6.64)^2 + (10-6.64)^2 + (12-6.64)^2 + (20-6.64)^2\Big] \div 14 \approx 26.2296$$

$$\sigma \approx \sqrt{26.2296} \approx 5.12$$

44. The following solution uses exact values throughout the calculation, though for display purposes only a certain number of digits are shown.

$$\bar{x} = \frac{15+17+19+20+14+23+12}{7} \approx 17.14$$

$$\sigma^2 = \Big[(15-17.14)^2 + (17-17.14)^2 + (19-17.14)^2 + (20-17.14)^2 + (14-17.14)^2 + (23-17.14)^2 + (12-17.14)^2\Big] \div 7 \approx 12.4082$$

$$\sigma \approx \sqrt{12.4082} \approx 3.52$$

45. The following solution uses exact values throughout the calculation, though for display purposes only a certain number of digits are shown.

$$\bar{x} = \frac{3.1+4.5+7.8+7.9+8.0+9.6+11.6}{7} = 7.5$$

$$\sigma^2 = \Big[(3.1-7.5)^2 + (4.5-7.5)^2 + (7.8-7.5)^2 + (7.9-7.5)^2 + (8.0-7.5)^2 + (9.6-7.5)^2 + (11.6-7.5)^2\Big] \div 7 \approx 7.1543$$

$$\sigma \approx \sqrt{7.1543} \approx 2.67$$

46. Not a random sample; they will all begin with the letter "a".

47. Not a random sample; the lawyers will choose jurors that are likely to support their side.

48. Random sample; all students have an equal chance to be chosen.

49. Not a random sample; the five with the largest (or smallest) circulation will be picked.

50. People at the bus station may be less likely to own a car and therefore less likely to be in favor of a new garage.

51. $\frac{1}{2}$

52. $\frac{2}{6} = \frac{1}{3}$

53. $x = 13,\ n = 24,\ p = 0.6,\ q = 0.4$

$$P(13) = {}_{24}C_{13}(0.6)^{13}(0.4)^{11}$$
$$P(13) = \frac{24!}{13!(11!)}(0.6)^{13}(0.4)^{11}$$
$$P(13) = 2{,}496{,}144(0.6)^{13}(0.4)^{11}$$
$$P(13) \approx 0.14$$

54. $x = 9,\ n = 20,\ p = 0.6,\ q = 0.4$

$$P(9) = {}_{20}C_{9}(0.6)^{9}(0.4)^{11}$$
$$P(9) = \frac{20!}{9!(11!)}(0.6)^{9}(0.4)^{11}$$
$$P(9) = 167{,}960(0.6)^{9}(0.4)^{11}$$
$$P(9) \approx 0.0710$$

55. $x = 9,\ n = 15,\ p = 0.6,\ q = 0.4$

$$P(9) = {}_{15}C_{9}(0.6)^{9}(0.4)^{6}$$
$$P(9) = \frac{15!}{9!(6!)}(0.6)^{9}(0.4)^{6}$$
$$P(9) = 5005(0.6)^{9}(0.4)^{6}$$
$$P(9) \approx 0.2066$$

56. $x = 6,\ n = 12,\ p = 0.6,\ q = 0.4$

$$P(9) = {}_{12}C_{6}(0.4)^{6}(0.6)^{6}$$
$$P(9) = \frac{12!}{6!(6!)}(0.4)^{6}(0.6)^{6}$$
$$P(9) = 924(0.4)^{6}(0.6)^{6}$$
$$P(9) \approx 0.1766$$

57. The third term of $(a+b)^7$ is $21(a)^5(b)^2$

$21a^5b^2$

58. The sixth term of $(a+b)^8$ is $56(a)^3(b)^5$

$56a^3b^5$

59. Continuous; any point in the interval can be selected.

60. Discrete; sizes are not continuous.

61. Discrete; prices are not continuous.

62. Continuous; time is continuous.

63. $120 - 102 = 18$
$18 \div 18 = 1$
Find the percentage above 1 standard deviation to the right.
$50 - 34 = 16\%$
$66 - 102 = -36$
$-36 \div 18 = -2$
Find the percentage below 2 standard deviations to the left.
2.5%
The probability that a tune-up will take more than two hours is 16%. The probability that a tune-up will take under 66 minutes is 2.5%.