pp. 542-544 (#2-28 evens)

2. Theoretical probability is based on the number of outcomes and experimental probability is based on repeated trials.

4. 6; HP, HP, HW, TP, TP, TW

6. 42; GG, GG, GG, GG, GG, GG, GB, GB, GB, GB, GB, GB, GB, GB, GB, GB, GB, GB, BG, BG, BG, BG, BG, BG, BG, BG, BG, BG, BG, BG, BG, BB, BB, BB, BB, BB, BB, BB, BB, BB, BB, BB, BB, BB

8. $\frac{1}{16}$, or 6.25%

10. **a.** 80%

b. 26%

12. The event should be that the number is less than or equal to 4; $\frac{13}{15}$

14. **a.** about 0.23, or about 23%

b. about 0.03, or about 3%

c. about 0.47, or about 47%

d. about 0.24, or about 24%

16. black

18. *Sample answer:* drawing an orange marble from a bag containing blue and green marbles; drawing a red marble from a bag containing red marbles

20. about 0.22, or about 22%

22. B, A, C, D

24. no; Your friend calculated the experimental probability. The theoretical probability of the coin landing heads up is $\frac{1}{2}$.

26. $\frac{2}{3}$; $f(x) + c$ intersects the x-axis when c is 1, 2, 3, or 4.

28. *Sample answer:* Box A contains three cards numbered 1, 2, and 3. Box B contains 2 cards numbered 1 and 2. One card is removed at random from each box. Find the probability that the product of the two numbers is at least 5; $\frac{1}{6}$

pp. 550-551 (#3-20)

3. dependent; The occurrence of event A affects the occurrence of event B.

4. independent; The occurrence of event A does not affect the occurrence of event B.

5. dependent; The occurrence of event A affects the occurrence of event B.

6. independent; The occurrence of event A does not affect the occurrence of event B.

7. yes

8. no

9. yes

10. no

11. about 2.8%

12. 2.4%

13. about 34.7%

14. about 23.8%

15. The probabilities were added instead of multiplied;
$P(A \text{ and } B) = (0.6)(0.2) = 0.12$

16. $P(B \mid A)$ is incorrect; $P(B \mid A) = \frac{4}{6}$;
$P(A \text{ and } B) = \frac{2}{7} \approx 0.286$

17. 0.325

18. 0.25

19. **a.** about 1.2%

b. about 1.0%

You are about 1.2 times more likely to select 3 face cards when you replace each card before you select the next card.

20. **a.** about 9.1%

b. about 7.4%

You are about 1.23 times more likely to select 3 red marbles when you replace each marble before you select the next marble.

pp. 551-552 (#21-30)

21. **a.** about 17.1%

b. about 81.4%

22. **a.** about 46.2%

b. about 58.1%

23. about 53.5%

24. about 6.0%

25. **a.** *Sample answer:* Put 20 pieces of paper with each of the 20 students' names in a hat and pick one; 5%

b. *Sample answer:* Put 45 pieces of paper in a hat with each student's name appearing once for each hour the student worked. Pick one piece; about 8.9%

26. **a.** without

b. with

27. yes; The chance that it will be rescheduled is $(0.7)(0.75) = 0.525$, which is a greater than a 50% chance.

28. Event A represents rolling at least one 2. Event B represents the dice summing to 5; dependent; $P(A \text{ and } B) = \frac{2}{36}$ and $P(A)P(B) = \frac{11}{324}$

29. **a.** wins: 0%; loses: 1.99%; ties: 98.01%

b. wins: 20.25%; loses: 30.25%; ties: 49.5%

c. yes; Go for 2 points after the first touchdown, and then go for 1 point if they were successful the first time or 2 points if they were unsuccessful the first time; winning: 44.55%; losing: 30.25%

30. **a.** The occurrence of one event does not affect the occurrence of the other, so the probability of each event is the same whether or not the other event has occurred.

b. yes; $P(A \text{ and } B) = P(A) \cdot P(B)$ and $P(A) = P(A \mid B)$.

pp. 558-559 (#3-16)

3. 34; 40; 4; 6; 12

4. 42; 98; 3; 59; 108

5.

		Gender		
		Male	Female	Total
Response	Yes	132	151	283
	No	39	29	68
	Total	171	180	351

351 people were surveyed, 171 males were surveyed, 180 females were surveyed, 283 people said yes, 68 people said no.

6.

		Role		
		Teachers	Parents	Total
Response	Yes	49	18	67
	No	11	30	41
	Total	60	48	108

108 people were surveyed, 60 teachers were surveyed, 48 parents were surveyed, 67 people said yes, 41 people said no.

7.

		Dominant Hand		
		Left	Right	Total
Gender	Female	0.048	0.450	0.498
	Male	0.104	0.398	0.502
	Total	0.152	0.848	1

8.

		Gender		
		Male	Female	Total
Experience	Expert	0.151	0.015	0.166
	Average	0.670	0.059	0.729
	Novice	0.098	0.007	0.105
	Total	0.919	0.081	1

9.

		Gender		
		Male	Female	Total
Response	Yes	0.376	0.430	0.806
	No	0.111	0.083	0.194
	Total	0.487	0.513	1

10.

		Vaccination		
		Received	Not Received	Total
Health	Flu	0.1429	0.1518	0.2947
	No Flu	0.2946	0.4107	0.7053
	Total	0.4375	0.5625	1

11.

		Breakfast	
		Ate	Did Not Eat
Feeling	Tired	0.091	0.333
	Not Tired	0.909	0.667

12.

		Vaccination	
		Received	Not Received
Health	Flu	0.327	0.270
	No Flu	0.673	0.730

13. **a.** about 0.789

b. 0.168

c. The events are independent.

14. **a.** about 0.10

b. about 0.227

c. The events are not independent.

15. The value for $P(\text{yes})$ was used in the denominator instead of the value for $P(\text{Tokyo})$;

$$\frac{0.049}{0.39} \approx 0.126$$

16. The denominator should have been $P(\text{no})$; $\frac{0.112}{0.644} \approx 0.174$

pp. 559-560 (#17-26)

17. Route B; It has the best probability of getting to school on time.

18. Group 1; It has the greatest probability of exceeding expectations.

19. *Sample answer:*

		Transportation to School			
		Rides Bus	**Walks**	**Car**	**Total**
Gender	**Male**	6	9	4	19
	Female	5	2	4	11
	Total	11	11	8	30

		Transportation to School			
		Rides Bus	**Walks**	**Car**	**Total**
Gender	**Male**	0.2	0.3	0.133	0.633
	Female	0.167	0.067	0.133	0.367
	Total	0.367	0.367	0.266	1

20. **a.** the parents surveyed that said no

b. the total people that said yes

c. the total people surveyed

21. Routine B is the best option, but your friend's reasoning of why is incorrect; Routine B is the best choice because there is a 66.7% chance of reaching the goal, which is higher than the chances of Routine A (62.5%) and Routine C (63.6%).

22.

		Preference		
		Math	**Science**	**Total**
Gender	**Male**	93	57	150
	Female	148	52	200
	Total	241	109	350

23. **a.** about 0.438

b. about 0.387

24. *Sample answer:* Venn diagrams show a visual representation of the data, and two-way tables organize the information into rows and columns; An advantage of a Venn diagram is that people who learn visually will easily understand them. A disadvantage is that as more categories are used, the Venn diagram becomes harder to draw and interpret. An advantage of a two-way table is that it is very easy to read and interpret, even with many categories. A disadvantage is that they are not as visual as Venn diagrams.

25. **a.** More of the current consumers prefer the leader, so they should improve the new snack before marketing it.

b. More of the new consumers prefer the new snack than the leading snack, so there is no need to improve the snack.

26. *Sample answer:*

		Owns a Dog		
		Yes	**No**	**Total**
Gender	**Male**	5	3	8
	Female	7	5	12
	Total	12	8	20

$$P(A \mid B) = \frac{P(B \mid A) \cdot P(A)}{P(B)}$$

$$P(\text{Male} \mid \text{yes}) = \frac{P(\text{yes} \mid \text{Male}) \cdot P(\text{Male})}{P(\text{yes})}$$

$$= \frac{\frac{5}{8} \cdot \frac{8}{20}}{\frac{12}{20}}$$

$$= \frac{5}{12}$$

pp. 567-568 (#3-16)

3. 0.4

4. 0.75

5. $\frac{7}{12}$, or about 0.58

6. $\frac{13}{15}$, or about 0.87

7. $\frac{9}{20}$, or 0.45

8. 70%

9. $\frac{7}{10}$, or 0.7

10. $\frac{56}{81}$, or about 0.69

11. forgot to subtract $P(\text{heart and face card})$;
$P(\text{heart}) + P(\text{face card}) - P(\text{heart and face card}) = \frac{11}{26}$

12. added instead of subtracted $P(\text{club and 9})$;
$P(\text{club}) + P(9) - P(\text{club and 9}) = \frac{4}{13}$

13. $\frac{2}{3}$

14. $\frac{5}{6}$

15. 10%

16. $\frac{1}{6}$

p. 568 (#17-26)

17. 0.4742, or 47.42%

18. **a.** 0.09

b. 0.12

c. The coach should leave the goalie in the game.

19. $\frac{13}{18}$

20. no; The intersection of A and B is not empty.

21. $\frac{3}{20}$

22. **a.** $P(A \text{ or } B \text{ or } C) = P(A) + P(B) + P(C)$

b. $P(A \text{ or } B \text{ or } C) = P(A) + P(B) + P(C) - P(A \text{ and } B) - P(A \text{ and } C) - P(B \text{ and } C) + P(A \text{ and } B \text{ and } C)$

23. no; Until all cards, numbers, and colors are known, the conclusion cannot be made.

24. $a_1 = 4, a_2 = 11, a_3 = 25, a_4 = 53, a_5 = 109, a_6 = 221$

25. $a_1 = 1, a_2 = 2, a_3 = 3, a_4 = 4, a_5 = 5, a_6 = 6$

26. $a_1 = 2, a_2 = 6, a_3 = 12, a_4 = 10, a_5 = 5, a_6 = 3.5$

pp. 575-576 (#2-18 evens, #19, #20-36 evens, #37-44)

2. $\frac{7!}{(7-2)!}$; It is the only expression that does not equal 21.

3. **a.** 2

b. 2

4. **a.** 6

b. 6

5. **a.** 24

b. 12

6. **a.** 120

b. 20

7. **a.** 720

b. 30

8. **a.** 5040

b. 42

9. 20

10. 210

11. 9

12. 720

13. 20,160

14. 1

15. 870

16. 6,375,600

17. 990

18. 720

19. $\frac{1}{56}$

20. $\frac{1}{720}$

22. 6

24. 5

26. 56

28. 28

30. 330

32. 15,504

34. 21

36. The permutations formula was used;

$$_9C_4 = \frac{9!}{(9-4)!4!} = 126$$

37. combinations; The order is not important; 45

38. permutations; The order is important; 720

39. permutations; The order is important; 132,600

40. combinations; The order is not important; 80,730

41. $_{50}C_9 = {}_{50}C_{41}$; For each combination of 9 objects, there is a corresponding combination of the 41 remaining objects.

42. **a.** $_nC_n = \dfrac{n!}{n!0!} = 1$

b. $_nC_{n-r} = \dfrac{n!}{(n-(n-r))!(n-r)!} = \dfrac{n!}{(r)!(n-r)!} = {}_nC_r$

c. $$_nC_r + {}_nC_{r-1} = \frac{n!}{(n-r)!r!} + \frac{n!}{(n-r+1)!(r-1)!}$$

$$= \frac{n!(n-r+1) + n!r}{(n-r+1)!r!}$$

$$= \frac{n!n + n!}{(n-r+\mathbf{1})!r!}$$

$$= \frac{n!(n+1)}{(n-r+\mathbf{1})!r!}$$

$$= \frac{(n+1)!}{(n+1-r)!r!}$$

$$= {}_{n+1}C_r$$

43. **a.** neither, they are the same; $_4P_4 = {}_4P_3 = 24$

b. 3; $_4C_4 = 1$, $_4C_3 = 4$

c. $_nP_n = {}_nP_{n-1}$, but $_nC_n < {}_nC_{n-1}$ when $n > 1$, and $_nC_n = {}_nC_{n-1}$ when $n = 1$.

44. *Sample answer:* Two candidates are chosen from a group of 5 to be the president and vice president; Two candidates are chosen from a group of 5 to be on a committee.

pp. 576-577 (#45-48, #50-70 evens, #71-78)

45.

	$r = 0$	$r = 1$	$r = 2$	$r = 3$
${}_3P_r$	1	3	6	6
${}_3C_r$	1	3	3	1

${}_nP_r \geq {}_nC_r$; Because ${}_nP_r = \dfrac{n!}{(n-r)!}$ and ${}_nC_r = \dfrac{n!}{(n-r)! \cdot r!}$,

${}_nP_r > {}_nC_r$ when $r > 1$ and ${}_nP_r = {}_nC_r$ when $r = 0$ or $r = 1$.

46. $r! = \dfrac{{}_nP_r}{{}_nC_r}$; 24

47. $\dfrac{1}{44{,}850}$

48. $\frac{1}{21}$

50. $\frac{1}{5040}$

52. $c^5 - 20c^4 + 160c^3 - 640c^2 + 1280c - 1024$

54. $4096p^6 - 6144p^5q + 3840p^4q^2 - 1280p^3q^3 + 240p^2q^4 - 24pq^5 + q^6$

56. $32s^{20} + 400s^{16} + 2000s^{12} + 5000s^8 + 6250s^4 + 3125$

58. $x^{12} - 4x^9y^2 + 6x^6y^4 - 4x^3y^6 + y^8$

60. -945

62. 1080

64. -324

66. 67.5

68. **a.** ${}_2C_2, {}_3C_2, {}_4C_2, {}_5C_2$

b. $T_n = {}_{n+1}C_2$

70. 840

71. 30

72. **a.** $\frac{1}{2}$

b. $\frac{1}{2}$; The probabilities are the same.

73. $\frac{1061}{1250}$

74. **a.** 1; Each outcome has the same three marbles.

b. 6; Each outcome has a different permutation.

75. **a.** $\frac{1}{90}$

b. $\frac{9}{10}$

76. 376

77. **a.** 2,598,960

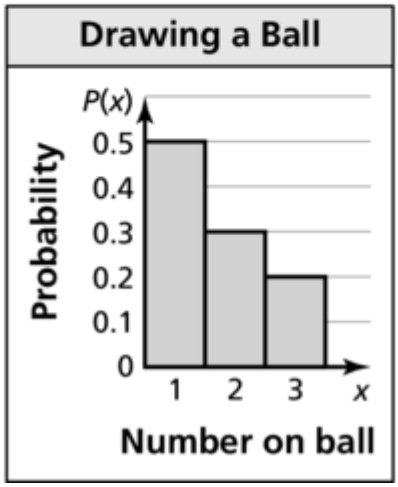
b. 5148

78. $\frac{1}{406}$; There are ${}_{30}C_5$ possible groups. The number of groups that will have you and your two best friends is ${}_{27}C_2$.

p. 583 (#3-12)

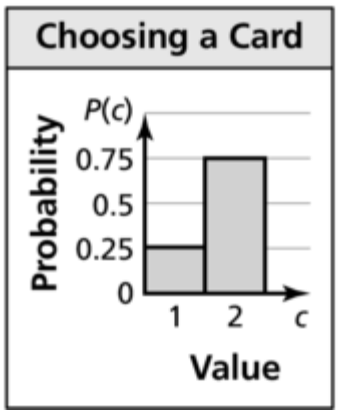
3.

x (value)	1	2	3
Outcomes	5	3	2
$P(x)$	$\frac{1}{2}$	$\frac{3}{10}$	$\frac{1}{5}$



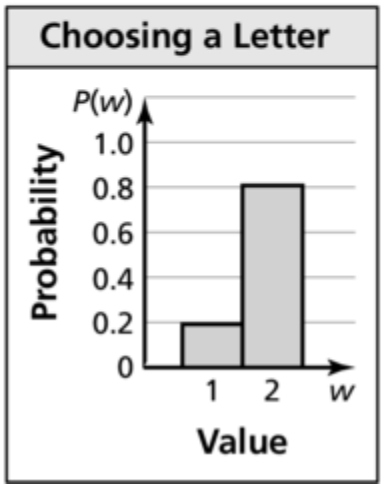
4.

c (value)	1	2
Outcomes	13	39
$P(c)$	$\frac{1}{4}$	$\frac{3}{4}$



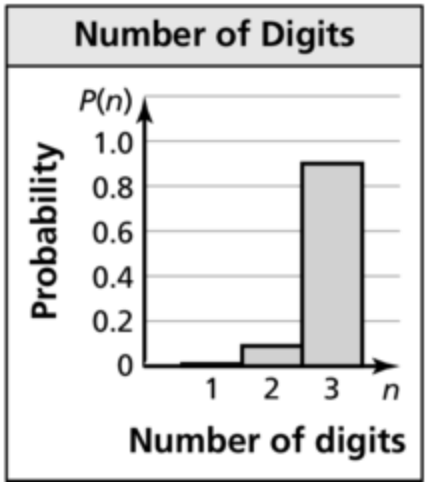
5.

w (value)	1	2
Outcomes	5	21
P(*w*)	$\frac{5}{26}$	$\frac{21}{26}$



6.

n (value)	1	2	3
Outcomes	10	90	900
P(*n*)	$\frac{1}{100}$	$\frac{9}{100}$	$\frac{9}{10}$



7. **a.** 2

b. $\frac{5}{8}$

8. **a.** 5

b. $\frac{1}{4}$

9. about 0.00002

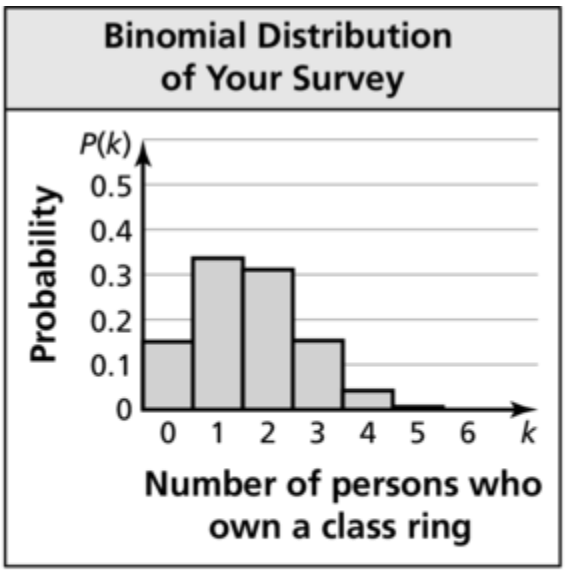
10. about 0.0046

11. about 0.00018

12. about 0.000001

pp. 583-584 (#13-22)

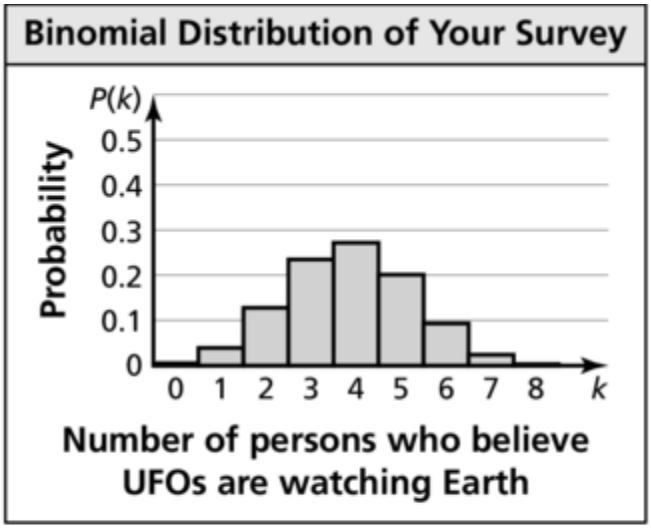
13. a.



b. The most likely outcome is that 1 of the 6 students owns a ring.

c. about 0.798

14. a.



b. The most likely outcome is that 4 of the 8 adults believe UFOs are watching planet Earth.

c. about 0.407

15. The exponents are switched;

$$P(k = 3) = {}_5C_3\left(\frac{1}{6}\right)^3\left(\frac{5}{6}\right)^{5-3} \approx 0.032$$

16. The combination part of the formula is missing;

$$P(k = 3) = {}_5C_3\left(\frac{1}{6}\right)^3\left(\frac{5}{6}\right)^{5-3} \approx 0.032$$

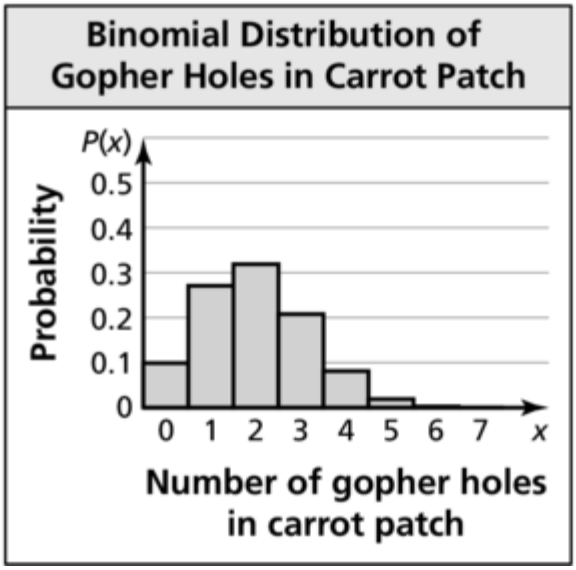
17. a. $P(0) \approx 0.099$, $P(1) \approx 0.271$, $P(2) \approx 0.319$, $P(3) \approx 0.208$, $P(4) \approx 0.081$, $P(5) \approx 0.019$, $P(6) \approx 0.0025$, $P(7) \approx 0.00014$

b.

x	0	1	2	3	4
$P(x)$	0.099	0.271	0.319	0.208	0.081

x	5	6	7
$P(x)$	0.019	0.0025	0.00014

c.



18. 0.2; 0.6

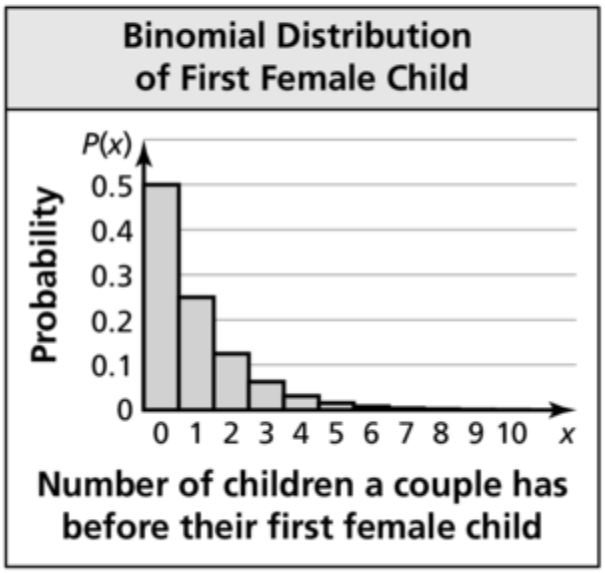
19. no; The data is skewed right, so the probability of failure is greater.

20. no; The probability of not choosing the coin 100 times is $\left(\frac{99}{100}\right)^{100} \approx 0.366$.

21. **a.** The statement is not valid, because having a male and having a female are independent events.

b. 0.03125

c.



skewed right

22. $p > 0.5$

pp. 586-588 (#1-17)

1. $\frac{2}{9}; \frac{7}{9}$

2. 20 points

3. **a.** 0.15625

b. about 0.1667

You are about 1.07 times more likely to pick a red then a green if you do not replace the first marble.

4. **a.** about 0.0586

b. 0.0625

You are about 1.07 times more likely to pick a blue then a red if you do not replace the first marble.

5. **a.** 0.25

b. about 0.2333

You are about 1.07 times more likely to pick a green and then another green if you replace the first marble.

6. about 0.529

7.

		Gender		
		Men	**Women**	**Total**
Response	**Yes**	200	230	430
	No	20	40	60
	Total	220	270	490

About 44.9% of responders were men, about 55.1% of responders were women, about 87.8% of responders thought it was impactful, about 12.2% of responders thought it was not impactful.

8. 0.68

9. 0.02

10. 5040

11. 1,037,836,800

12. 15

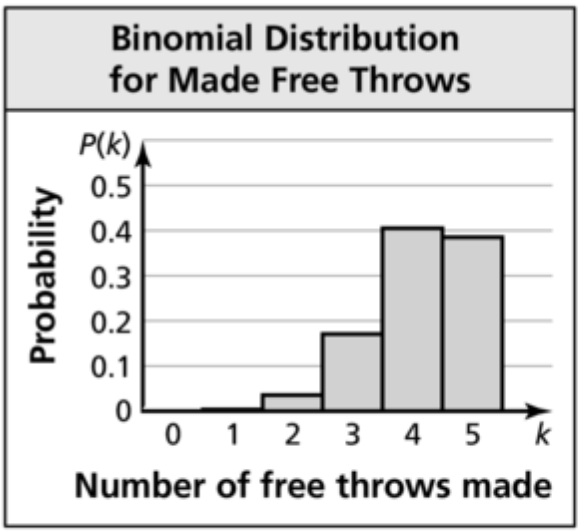
13. 70

14. $16x^4 + 32x^3y^2 + 24x^2y^4 + 8xy^6 + y^8$

15. $\frac{1}{84}$

16. about 0.12

17.



The most likely outcome is that 4 of the 5 free throw shots will be made.