

CHAPTER 6-1

EXPONENTS AS RADICALS

1. 080601b, P.I. A2.N.1

The expression $4^{\frac{1}{2}} \cdot 2^3$ is equal to

[A] 16 [B] $8^{\frac{3}{2}}$ [C] 4 [D] $4^{\frac{3}{2}}$

2. 080218b, P.I. A2.N.1

The expression $\frac{3^{\frac{1}{3}}}{3^{-\frac{2}{3}}}$ is equivalent to

[A] $\sqrt{3}$ [B] 1 [C] 3 [D] $\frac{1}{\sqrt[3]{3}}$

3. 010217b, P.I. A2.N.1

The value of $(\frac{3^0}{27^{\frac{2}{3}}})^{-1}$ is

[A] 9 [B] -9 [C] $\frac{1}{9}$ [D] $-\frac{1}{9}$

4. 060208b, P.I. A2.A.10

If x is a positive integer, $4x^{\frac{1}{2}}$ is equivalent to

[A] $4\frac{1}{x}$ [B] $4\sqrt{x}$ [C] $\frac{2}{x}$ [D] $2x$

5. 010413b, P.I. A2.A.10

The expression $b^{-\frac{3}{2}}$, $b > 0$, is equivalent to

[A] $(\sqrt[3]{b})^2$ [B] $-(\sqrt{b})^3$
[C] $\frac{1}{(\sqrt{b})^3}$ [D] $\frac{1}{(\sqrt[3]{b})^2}$

6. 060708b, P.I. A2.A.11

The volume of a soap bubble is represented by the equation $V = 0.094\sqrt{A^3}$, where A represents the surface area of the bubble. Which expression is also equivalent to V ?

[A] $0.094A^{\frac{2}{3}}$ [B] $(0.094A^3)^{\frac{1}{2}}$
[C] $0.094A^{\frac{3}{2}}$ [D] $0.094A^6$

7. 060419b, P.I. A2.A.11

The expression $\sqrt[4]{16a^6b^4}$ is equivalent to

[A] $4a^2b$ [B] $4a^{\frac{3}{2}}b$
[C] $2a^{\frac{3}{2}}b$ [D] $2a^2b$

8. 010617b, P.I. A2.A.8

When simplified, the expression $(\sqrt[3]{m^4})(m^{-\frac{1}{2}})$ is equivalent to

[A] $\sqrt[4]{m^3}$ [B] $\sqrt[6]{m^5}$
[C] $\sqrt[5]{m^{-4}}$ [D] $\sqrt[3]{m^{-2}}$

9. 080322b, P.I. A2.N.1

Find the value of $(x+2)^0 + (x+1)^{-\frac{2}{3}}$ when $x = 7$.

10. 060602b, P.I. A2.A.8

If $f(x) = x^{-\frac{3}{2}}$, then $f(\frac{1}{4})$ is equal to

[A] 8 [B] -2 [C] -4 [D] $-\frac{1}{8}$

11. 060516b

If $(a^x)^{\frac{2}{3}} = \frac{1}{a^2}$, what is the value of x ?

[A] -1 [B] 1 [C] -3 [D] 2

12. 080325b

Meteorologists can determine how long a storm lasts by using the function

$t(d) = 0.07d^{\frac{3}{2}}$, where d is the diameter of the storm, in miles, and t is the time, in hours. If the storm lasts 4.75 hours, find its diameter, to the *nearest tenth of a mile*.

14. 010831b, P.I. A2.S.7

Water is draining from a tank maintained by the Yorkville Fire Department. Students measured the depth of the water in 15-second intervals and recorded the results in the accompanying table.

Time (x) (in seconds)	Depth of Water (y) (in feet)
15	11.8
30	9.9
45	8.2
60	6.3
75	5.9

Write the power regression equation for this set of data, rounding all values to the *nearest ten thousandth*. Using this equation, predict the depth of the water at 2 minutes, to the *nearest tenth of a foot*.

CHAPTER 6-2

REGRESSION

13. 010730b, P.I. A2.S.7

The accompanying table shows the number of new cases reported by the Nassau and Suffolk County Police Crime Stoppers program for the years 2000 through 2002.

Year (x)	New Cases (y)
2000	457
2001	369
2002	353

If $x = 1$ represents the year 2000, and y represents the number of new cases, find the equation of best fit using a power regression, rounding all values to the *nearest thousandth*. Using this equation, find the estimated number of new cases, to the *nearest whole number*, for the year 2007.

CHAPTER 6-7

BINOMIAL EXPANSIONS

15. 010820b, P.I. A2.A.36

What is the coefficient of the fifth term in the expansion of $(x + 1)^8$?

[A] 28 [B] 8 [C] 70 [D] 56

16. 080208b, P.I. A2.A.36

What is the *last* term in the expansion of $(x + 2y)^5$?

[A] y^5 [B] $32y^5$ [C] $10y^5$ [D] $2y^5$

17. 080412b, P.I. A2.A.36

What is the middle term in the expansion of $(x + y)^4$?

[A] $6x^2y^2$ [B] $4x^2y^2$
[C] $2x^2y^2$ [D] x^2y^2

18. 060619b, P.I. A2.A.36
What is the fourth term in the expansion of $(y-1)^7$?
- [A] $-35y^3$ [B] $35y^4$
[C] $-35y^4$ [D] $35y^3$
19. 010726b, P.I. A2.A.36
What is the fourth term in the expansion of $(2x-y)^5$?
20. 060517b, P.I. A2.A.36
What is the third term in the expansion of $(\cos x + 3)^5$?
- [A] $90\cos^2 x$ [B] $60\cos^3 x$
[C] $270\cos^2 x$ [D] $90\cos^3 x$

BINOMIAL PROBABILITY

21. 010302b, P.I. A2.S.15
The probability that Kyla will score above a 90 on a mathematics test is $\frac{4}{5}$. What is the probability that she will score above a 90 on three of the four tests this quarter?
- [A] $\frac{3}{4}\left(\frac{4}{5}\right)^3\left(\frac{1}{5}\right)^1$ [B] ${}_4C_3\left(\frac{4}{5}\right)^1\left(\frac{1}{5}\right)^3$
[C] ${}_4C_3\left(\frac{4}{5}\right)^3\left(\frac{1}{5}\right)^1$ [D] $\frac{3}{4}\left(\frac{4}{5}\right)^1\left(\frac{1}{5}\right)^3$
22. 010805b, P.I. A2.S.15
Sean tells prospective clients that the probability of rain at the dive location is .2 each day. Which expression can be used to calculate the probability that it will rain on *exactly* 5 days of the 7 days at the dive location?
- [A] ${}_7C_2(.5)(.7)$ [B] ${}_7C_5(.2)^5(.8)^2$
[C] ${}_7C_5(.2)^2(.8)^5$ [D] ${}_7C_5(.5)(.7)$
23. 060402b, P.I. A2.S.15
The Hiking Club plans to go camping in a State park where the probability of rain on any given day is 0.7. Which expression can be used to find the probability that it will rain on *exactly* three of the seven days they are there?
- [A] ${}_4C_3(0.4)^4(0.3)^3$ [B] ${}_7C_3(0.3)^3(0.7)^4$
[C] ${}_7C_3(0.7)^3(0.3)^4$ [D] ${}_4C_3(0.7)^3(0.7)^4$
24. 060702b, P.I. A2.S.15
During a single day at radio station WMZH, the probability that a particular song is played is .38. Which expression represents the probability that this song will be played on *exactly* 5 days out of 7 days?
- [A] ${}_7C_5(.38)^2(.62)^5$ [B] ${}_5C_2(.38)^5(.62)^2$
[C] ${}_7P_5(.38)^5(.62)^2$ [D] ${}_7C_5(.38)^5(.62)^2$
25. 080201b, P.I. A2.S.15
Which fraction represents the probability of obtaining *exactly* eight heads in ten tosses of a fair coin?
- [A] $\frac{64}{1,024}$ [B] $\frac{90}{1,024}$
[C] $\frac{45}{1,024}$ [D] $\frac{180}{1,024}$
26. 060122b, P.I. A2.S.15
At a certain intersection, the light for eastbound traffic is red for 15 seconds, yellow for 5 seconds, and green for 30 seconds. Find, to the *nearest tenth*, the probability that out of the next eight eastbound cars that arrive randomly at the light, exactly three will be stopped by a red light.

27. 060223b, P.I. A2.S.15

After studying a couple's family history, a doctor determines that the probability of any child born to this couple having a gene for disease X is 1 out of 4. If the couple has three children, what is the probability that *exactly* two of the children have the gene for disease X ?

28. 080723b, P.I. A2.S.15

Mr. and Mrs. Doran have a genetic history such that the probability that a child being born to them with a certain trait is $\frac{1}{8}$. If they have four children, what is the probability that *exactly* three of their four children will have that trait?

29. 010524b, P.I. A2.S.15

If the probability that it will rain on any given day this week is 60%, find the probability it will rain *exactly* 3 out of 7 days this week.

30. 080522b, P.I. A2.S.15

The Coolidge family's favorite television channels are 3, 6, 7, 10, 11, and 13. If the Coolidge family selects a favorite channel at random to view each night, what is the probability that they choose *exactly* three even-numbered channels in five nights? Express your answer as a fraction or as a decimal rounded to *four decimal places*.

31. 010625b, P.I. A2.S.15

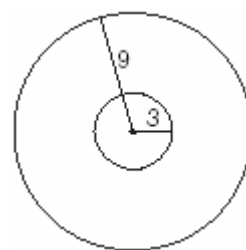
During a recent survey, students at Franconia College were asked if they drink coffee in the morning. The results showed that two-thirds of the students drink coffee in the morning and the remainder do not. What is the probability that of six students selected at random, *exactly* two of them drink coffee in the morning? Express your answer as a fraction or as a decimal rounded to *four decimal places*.

32. 060625b, P.I. A2.S.15

Ginger and Mary Anne are planning a vacation trip to the island of Capri, where the probability of rain on any day is 0.3. What is the probability that during their five days on the island, they have *no* rain on *exactly* three of the five days?

33. 080128b, P.I. A2.S.15

As shown in the accompanying diagram, a circular target with a radius of 9 inches has a bull's-eye that has a radius of 3 inches. If five arrows randomly hit the target, what is the probability that *at least* four hit the bull's-eye?



34. 010229b, P.I. A2.S.15

Team A and team B are playing in a league. They will play each other five times. If the probability that team A wins a game is $\frac{1}{3}$, what is the probability that team A will win *at least* three of the five games?

35. 060331b, P.I. A2.S.15

On any given day, the probability that the entire Watson family eats dinner together is $\frac{2}{5}$. Find the probability that, during any 7-day period, the Watsons eat dinner together *at least* six times.

36. 080430b, P.I. A2.S.15

Tim Parker, a star baseball player, hits one home run for every ten times he is at bat. If Parker goes to bat five times during tonight's game, what is the probability that he will hit *at least* four home runs?

37. 060529b, P.I. A2.S.15
The probability that a planted watermelon seed will sprout is $\frac{3}{4}$. If Peyton plants seven seeds from a slice of watermelon, find, to the *nearest ten thousandth*, the probability that *at least* five will sprout.
38. 080630b, P.I. A2.S.15
On mornings when school is in session in January, Sara notices that her school bus is late one-third of the time. What is the probability that during a 5-day school week in January her bus will be late *at least* three times?
39. 010428b, P.I. A2.S.15
A board game has a spinner on a circle that has five equal sectors, numbered 1, 2, 3, 4, and 5, respectively. If a player has four spins, find the probability that the player spins an even number *no more than* two times on those four spins.
40. 010731b, P.I. A2.S.15
Dr. Glendon, the school physician in charge of giving sports physicals, has compiled his information and has determined that the probability a student will be on a team is 0.39. Yesterday, Dr. Glendon examined five students chosen at random. Find, to the *nearest hundredth*, the probability that at least four of the five students will be on a team. Find, to the *nearest hundredth*, the probability that exactly one of the five students will not be on a team.
41. 080334b, P.I. A2.S.15
When Joe bowls, he can get a strike (knock down all the pins) 60% of the time. How many times more likely is it for Joe to bowl *at least* three strikes out of four tries as it is for him to bowl zero strikes out of four tries? Round your answer to the *nearest whole number*.

[1] A

[2] C

[3] A

[4] B

[5] C

[6] C

[7] C

[8] B

[2] $1\frac{1}{4}$ or an equivalent answer, and

appropriate work is shown.

[1] Appropriate work is shown, but one computational error is made.

or [1] Appropriate work is shown, but one conceptual error is made.

or [1] $1\frac{1}{4}$ or an equivalent answer, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[9] incorrect procedure.

[10] A

[11] C

[2] 16.6, and appropriate work is shown.

[1] Appropriate work is shown, but one computational or rounding error is made.

or [1] Appropriate work is shown, but one conceptual error is made.

or [1] A correct substitution of 4.75 for t is made, but no further correct work is shown.

or [1] 16.6, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[12] incorrect procedure.

[4] $y = 451.431x^{-0.243}$ and 272, and

appropriate work is shown.

[3] Appropriate work is shown, but one computational or rounding error is made.

or [3] $y = 451.431x^{-0.243}$, but 7, instead of 8, is substituted for x to find the number of new cases.

or [3] $y = 451.431x^{-0.243}$ and 272, but no work is shown to find the number of cases.

or [3] The expression $451.431x^{-0.243}$ is written, and appropriate work is shown to find 272, but no equation is written.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or [2] Appropriate work is shown, but one conceptual error is made.

or [2] The correct regression equation is written, but no further correct work is shown.

or [2] An incorrect regression equation of equal difficulty is solved appropriately for the number of new cases, and appropriate work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or [1] An incorrect regression equation of a lesser degree of difficulty is solved appropriately for the number of new cases, and appropriate work is shown.

or [1] The expression $451.431x^{-0.243}$ is written, but no further correct work is shown.

or [1] 272, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[13] incorrect procedure.

- [4] $y = 42.2326x^{-0.4494}$ and 4.9, and appropriate work is shown.
 [3] Appropriate work is shown, but one computational or rounding error is made.
 or [3] A correct regression equation is written and 4.9, but the substitution is not shown.
 or [3] The expression $42.2326x^{-0.4494}$ is written and 4.9, and the substitution is shown.
 [2] Appropriate work is shown, but two or more computational or rounding errors are made.
 or [2] Appropriate work is shown, but one conceptual error is made, such as not changing 2 minutes to 120 seconds.
 or [2] An incorrect power regression equation is solved appropriately, and the substitution is shown.
 or [2] A correct regression equation is written, but no further correct work is shown.
 [1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
 or [1] An incorrect equation of a lesser degree of difficulty is solved appropriately.
 or [1] 4.9, but no work is shown.
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [14] _____
- [15] C _____
- [16] B _____
- [17] A _____
- [18] C _____
- [2] $-40x^2y^3$, and appropriate work is shown.
 [1] Appropriate work is shown, but one computational error is made.
 or [1] Appropriate work is shown, but one conceptual error is made.
 or [1] $-40x^2y^3$, but no work is shown.
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [19] _____

- [20] D _____
- [21] C _____
- [22] B _____
- [23] C _____
- [24] D _____
- [25] C _____
- [2] 0.3 or an equivalent answer, and appropriate work is shown.
 [1] Appropriate work is shown, but one computational or rounding error is made.
 or [1] Appropriate work is shown, but no answer is found.
 or [1] 0.3 or an equivalent answer, but no work is shown.
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [26] _____
- [2] $\frac{9}{64}$, and appropriate work is shown, such as ${}_3C_2\left(\frac{1}{4}\right)^2\left(\frac{3}{4}\right)^1$.
 [1] Only ${}_3C_2\left(\frac{1}{4}\right)^2\left(\frac{3}{4}\right)^1$ is shown.
 or [1] Appropriate work is shown, but one computational error is made.
 or [1] $\frac{9}{64}$, but no work is shown.
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [27] _____

[2] $\frac{28}{4096}$ or an equivalent answer, and appropriate work is shown, such as evaluating the expression ${}_4C_3\left(\frac{1}{8}\right)^3\left(\frac{7}{8}\right)^1$.

[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but one conceptual error is made.

or [1] The expression ${}_4C_3\left(\frac{1}{8}\right)^3\left(\frac{7}{8}\right)^1$ is written, but no further correct work is shown.

or [1] $\frac{28}{4096}$ or an equivalent answer, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[28] incorrect procedure.

[2] $\frac{15,120}{78,125}$ or 19.35% or an equivalent answer, and appropriate work is shown, such as ${}_7C_3(.6)^3(.4)^4$.

[1] Appropriate work is shown, but one computational error is made.

or [1] Appropriate work is shown, but one conceptual error is made.

or [1] A correct expression, such as ${}_7C_3(.6)^3(.4)^4$, is written, but no further correct work is shown.

or [1] An incorrect expression of equal difficulty is evaluated appropriately.

or

[1] $\frac{15,120}{78,125}$ or 19.35% or an equivalent

answer, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[29] incorrect procedure.

[2] $\frac{40}{243}$ or an equivalent fraction or .1646, and appropriate work is shown, such as ${}_5C_3\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^2$.

[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but one conceptual error is made, such as finding the probability of choosing at least three even-numbered channels.

or [1] $\frac{40}{243}$ or an equivalent fraction or .1646, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[30] incorrect procedure.

[2] $\frac{60}{729}$ or $\frac{20}{243}$ or .0823, and appropriate work is shown, such as ${}_6C_2\left(\frac{2}{3}\right)^2\left(\frac{1}{3}\right)^4$.

[1] Appropriate work is shown, but one computational or rounding error is made.

or [1] Appropriate work is shown, but one conceptual error is made.

or [1] A correct expression is written, such as ${}_6C_2\left(\frac{2}{3}\right)^2\left(\frac{1}{3}\right)^4$, but no further correct work is shown.

or [1] $\frac{60}{729}$ or $\frac{20}{243}$ or .0823, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[31] incorrect procedure.

- [2] .3087 or an equivalent answer, and appropriate work is shown.
 [1] Appropriate work is shown, but one computational error is made.
 or [1] Appropriate work is shown, but one conceptual error is made, such as evaluating ${}_5C_3(0.3)^3(0.7)^2$.
 or [1] .3087 or an equivalent answer, but no work is shown.
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-
- [32] [4] $\frac{41}{59,049}$, and appropriate work is shown,
 such as ${}_5C_5\left(\frac{1}{9}\right)^5 + {}_5C_4\left(\frac{1}{9}\right)^4\left(\frac{8}{9}\right)^1$.
 [3] Appropriate work is shown, but one computational error is made.
 or [3] The combination includes an incorrect setup for determining the probability of hitting the bull's-eye five times but a correct setup for determining the probability of hitting the bull's-eye four times, but an appropriate probability is found.
 [2] The probability of "exactly 4" is found.
 or [2] The probability of "at most 3" is found.
 [1] A probability of $\frac{1}{9}$ is found, based on the area of the two circles.
 or [1] $\frac{41}{59,049}$, but no work is shown.
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-
- [33] [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [4] $\frac{51}{243}$, and appropriate work is shown.
 [3] Appropriate work is shown, but one computational error is made.
 [2] Appropriate work is shown, but the probabilities for the teams are switched.
 or [2] Correct substitution is made, but no further work is shown.
 or [2] Correct substitution is made, but an incorrect mathematical operation is used, such as multiplication instead of addition.
 or [2] The probability for "at most three" or "more than 3" is found, but appropriate work is shown.
 [1] $\frac{40}{243}$, and exactly three games are shown.
 or [1] $\frac{51}{243}$, but no work is shown.
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-
- [34] [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-

[4] $\frac{1,472}{78,125}$, and appropriate work is shown,

such as ${}_7C_6\left(\frac{2}{5}\right)^6\left(\frac{3}{5}\right)^1 + {}_7C_7\left(\frac{2}{5}\right)^7\left(\frac{3}{5}\right)^0$.

[3] Appropriate work is shown, but one computational error is made.

or [3] The probabilities for exactly six times and exactly seven times are calculated correctly, but they are not added.

or [3] The probability for at most six times is calculated correctly.

[2] Appropriate work is shown, but more than one computational error is made.

or [2] Appropriate work is shown, but one conceptual error is made, such as multiplying the probabilities.

[1] A correct expression is written for finding the probability, but no further correct work is shown.

or [1] The probability for exactly six times is calculated correctly.

or [1] $\frac{1,472}{78,125}$, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[35] incorrect procedure.

[4] .00046 or $\frac{46}{100,000}$ or an equivalent

answer, and appropriate work is shown.

[3] Appropriate work is shown, but one computational error is made.

or [3] Appropriate work is shown, but the probability of hitting at most four home runs is found.

[2] Appropriate work is shown, but two or more computational errors are made.

or [2] Appropriate work is shown, but one conceptual error is made.

or [2] The probabilities of hitting exactly four and exactly five home runs are found, but the probabilities are not added.

[1] Appropriate work is shown, but the probability of hitting exactly four home runs is found.

or [1] Correct substitution into the Bernoulli equation for exactly four and exactly five home runs is made, but no further correct work is shown.

or [1] .00046 or $\frac{46}{100,000}$ or an equivalent

answer, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[36] incorrect procedure.

- [4] .7564 or an equivalent answer, and appropriate work is shown, such as finding the sum of the exact probabilities that five, six, or seven seeds will sprout.
 [3] Appropriate work is shown, but one computational or rounding error is made.
 or [3] The probability that at most five seeds will sprout is calculated correctly, and appropriate work is shown.
 [2] Appropriate work is shown, but two or more computational or rounding errors are made.
 or [2] Appropriate work is shown, but one conceptual error is made.
 or [2] The three exact probabilities are found correctly, but they are not added.
 or [2] The sum of only two of the three probabilities is found correctly, such as exactly six plus exactly seven, and appropriate work is shown.
 [1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
 or [1] The probability that exactly five seeds will sprout is determined appropriately.
 or [1] The substitution for the sum of the three probabilities is indicated, but no further correct work is shown.
 or [1] .7564 or an equivalent answer, but no work is shown.
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [37]

- [4] $\frac{51}{243}$ or an equivalent answer, and appropriate work is shown.
 [3] Appropriate work is shown, but one computational or rounding error is made.
 [2] Appropriate work is shown, but two or more computational or rounding errors are made.
 or [2] Appropriate work is shown, but one conceptual error is made, such as finding the probability for *at most* three times.
 [1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
 or [1] An incorrect expression of a lesser degree of difficulty is evaluated appropriately, such as finding the probability for *exactly* three times.
 or [1] $\frac{51}{243}$ or an equivalent answer, but no work is shown.
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [38]

[4] $\frac{513}{625}$ or 0.821 or an equivalent answer,

and appropriate work is shown, such as

$${}_4C_2\left(\frac{2}{5}\right)^2\left(\frac{3}{5}\right)^2 + {}_4C_1\left(\frac{2}{5}\right)^1\left(\frac{3}{5}\right)^3 + {}_4C_0\left(\frac{2}{5}\right)^0\left(\frac{3}{5}\right)^4.$$

[3] Appropriate work is shown, but one computational error is made.

or [3] Appropriate work is shown, but a value for at least two, $\frac{328}{625}$, is found.

[2] Appropriate work is shown, but two or more computational errors are made.

or [2] An appropriate answer is found, but one conceptual error is made, such as multiplying the probabilities or using five as the number of spins.

or [2] Appropriate work is shown, but a value for less than two, $\frac{297}{625}$, is found.

[1] Appropriate work is shown, but a value for exactly two, $\frac{216}{625}$, is found.

or [1] $\frac{513}{625}$ or 0.821 or an equivalent answer, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[39] incorrect procedure.

[4] .08 and .07, and appropriate work is shown.

[3] Appropriate work is shown, but one computational or rounding error is made.

or [3] The probability that at least four students will be on a team is found correctly, and appropriate work is shown, but the probability that exactly one student will not be on a team is not found or is found incorrectly.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or [2] Appropriate work is shown, but one conceptual error is made, such as finding the probability that at most four or exactly four students will be on the team.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or [1] The probability that at least one student will not be on a team is found correctly, and appropriate work is shown, but the probability that at least four students will be on a team is not found.

or [1] .08 and .07, but no work is shown.

[0] .08 or .07, but no work is shown.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[40] obviously incorrect procedure.

[6] 19, and appropriate work is shown, such as $P(\text{at least three}) =$

$${}_4C_3(0.6)^3(0.4) + {}_4C_4(0.6)^4 \text{ and } P(0) = (0.4)^4.$$

[5] Appropriate work is shown, but one computational error is made.

or [5] Correct probabilities are computed, but no answer or an incorrect answer is found.

[4] Appropriate work is shown, but two or more computational errors are made.

or [4] Only the probability for at least three strikes is found correctly, but an appropriate ratio is determined.

[3] The probability for at least three strikes is found correctly, and no further correct work is shown.

or [3] Only the probability for zero strikes is found correctly, but an appropriate ratio is determined.

[2] Only the probability for zero strikes is found correctly, and no further correct work is shown.

or [2] Only the equation for the probability for at least three strikes is written, and it is not solved.

[1] Conceptual errors are made in finding the probabilities, but an appropriate ratio is determined, based on the incorrect probabilities.

or [1] 19, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[41] incorrect procedure.