

LESSON
6.4**Problem Solving Workshop:**
Worked Out Example*For use with the lesson "Select and Draw Conclusions from Samples"*

PROBLEM **Voting** In a survey of 1600 voters, 51% said they voted for candidate A. What is the margin of error? Give an interval that is likely to contain the exact percent of all voters who voted for candidate A.

STEP 1 Read and Understand*What do you know?*

The number of voters and the percent that voted for candidate A

What do you want to find out?

The margin of error for the survey

STEP 2 Make a Plan Use the formula for margin of error to solve the problem.

STEP 3 Solve the Problem Use the formula for margin of error.

$$\begin{aligned} \text{Margin of error} &= \pm \frac{1}{\sqrt{n}} && \text{Write margin of error formula.} \\ &= \pm \frac{1}{\sqrt{1600}} = \pm 0.025 && \text{Substitute 1600 for } n \text{ and simplify.} \end{aligned}$$

The margin of error is $\pm 2.5\%$.

To find the interval, subtract and add 2.5% to the percent of people surveyed who voted for candidate A (51%).

$$51\% - 2.5\% = 48.5\%$$

$$51\% + 2.5\% = 53.5\%$$

It is likely that the exact percent of all voters who voted for candidate A is between 48.5% and 53.5%.

STEP 4 Look Back The answer seems reasonable. In Example 4 on page 768, there were 1011 people surveyed and a margin of error of $\pm 3.1\%$. Because more people are surveyed, the percent should be lower.

PRACTICE **1. Juice** In a survey of 400 people, 18% named grape as their favorite juice. What is the margin of error? Give an interval that is likely to contain the exact percent of all people who named grape as their favorite juice.

2. Gym Class A survey of 2100 students found that 65% prefer having gym class during the last period of the day. What is the margin of error? Give an interval that is likely to contain the exact percent of all students who prefer to have gym class during the last period.

3. What If? In Exercise 2, 35% of the students did not prefer gym class during the last period of the day. What is the margin of error? Give an interval that is likely to contain the exact percent of all students who did not prefer to have gym class during the last period.

4. Pizza Toppings In a survey of 500 people, 64% said their favorite pizza topping was pepperoni. What is the margin of error? Give an interval that is likely to contain the exact percent of all people who said their favorite pizza topping was pepperoni.

Answers for Chapter 6

Counting Methods and Probability

Lesson 6.1 Use Combinations and the Binomial Theorem

Teaching Guide

1.

Row 0:				1							
Row 1:			1	1							
Row 2:			1	2	1						
Row 3:			1	3	3	1					
Row 4:			1	4	6	4	1				
Row 5:			1	5	10	10	5	1			
Row 6:			1	6	15	20	15	6	1		
Row 7:			1	7	21	35	35	21	7	1	
Row 8:			1	8	28	56	70	56	28	8	1

2. They occur in the third diagonal.

3. 1, 2, 4, 8, 256; 2^n

4. $a^2 + 2ab + b^2$, $a^3 + 3a^2b + 3ab^2 + b^3$; the coefficients appear in rows 2 and 3, respectively.

Graphing Calculator Activity

1. 720 2. 1 3. 9240 4. 360,360 5. 504
 6. 665,280 7. 190 8. 462 9. 10 10. 455
 11. 35 12. 1

Practice Level A

1. 35 2. 6 3. 56 4. 10 5. 1 6. 126 7. 924
 8. 8008 9. 65,780 10. 24 11. 652,080
 12. 131,560 13. 2,490,624
 14. $x^4 + 12x^3 + 54x^2 + 108x + 81$
 15. $x^5 - 25x^4 + 250x^3 - 1250x^2 + 3125x - 3125$
 16. $x^3 - 27x^2 + 243x - 729$
 17. $32x^5 + 80x^4 + 80x^3 + 40x^2 + 10x + 1$
 18. $27x^3 + 27x^2y + 9xy^2 + y^3$
 19. $x^5 - 20x^4y + 160x^3y^2 - 640x^2y^3 + 1280xy^4 - 1024y^5$ 20. $x^6 - 3x^4y + 3x^2y^2 - y^3$
 21. $81x^{12} + 108x^9y + 54x^6y^2 + 12x^3y^3 + y^4$
 22. -18 23. -3430 24. 184,757,760
 25. -70,000 26. 36 dishes 27. 252 pizzas
 28. 4845 students

Practice Level B

1. 15 2. 56 3. 35 4. 36 5. 715 6. 210
 7. 495 8. 1001 9. 65,780 10. 27,885
 11. 171,600 12. 103,776 13. 1,645,020
 14. 886,656 15. $x^4 - 8x^3 + 24x^2 - 32x + 16$
 16. $x^3 + 9x^2 + 27x + 27$ 17. $32x^5 + 400x^4 + 2000x^3 + 5000x^2 + 6250x + 3125$
 18. $4096x^6 - 6144x^5 + 3840x^4 - 1280x^3 + 240x^2 - 24x + 1$
 19. $x^3 + 18x^2y + 108xy^2 + 216y^3$

20. $x^5 - 25x^4y + 250x^3y^2 - 1250x^2y^3 + 3125xy^4 - 3125y^5$
 21. $729x^6 - 1458x^5y + 1215x^4y^2 - 540x^3y^3 + 135x^2y^4 - 18xy^5 + y^6$
 22. $4096x^4 + 2048x^3y + 384x^2y^2 + 32xy^3 + y^4$
 23. 1,088,640 24. -26,730 25. 115,200
 26. 3,041,280 27. 6435 28. 700 29. 205,800

Practice Level C

1. 28 2. 1 3. 220 4. 13 5. 4 6. 3744
 7. 247,104 8. 180
 9. $32x^5 - 80x^4 + 80x^3 - 40x^2 + 10x - 1$
 10. $16x^4 - 32x^3y^2 + 24x^2y^4 - 8xy^6 + y^8$
 11. $256x^4 + 256x^3y^3 + 96x^2y^6 + 16xy^9 + y^{12}$
 12. $x^{21} + 7x^{18}y + 21x^{15}y^2 + 35x^{12}y^3 + 35x^9y^4 + 21x^6y^5 + 7x^3y^6 + y^7$ 13. 69,672,960
 14. 1,980,000,000 15. combinations; 56 ways
 16. permutations; 39,270 ways

$$17. {}_n C_{n-1} = \frac{n!}{(n - (n - 1))!(n - 1)!}$$

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

$$18. {}_m C_m - {}_n C_n = \frac{m!}{(m - m)!(m)!} - \frac{n!}{(n - n)!(n)!}$$

$$= 1 - 1 = 0$$

$$19. {}_{n+1} C_{n-1} = \frac{(n + 1)!}{(n + 1 - (n - 1))!(n - 1)!}$$

$$= \frac{(n + 1)!}{(2)!(n - 1)!} = \frac{(n + 1)(n)(n - 1)!}{2(n - 1)!} = \frac{n(n + 1)}{2}$$

20. a. 4725 b. 10,640 21. 793

Study Guide

1. 15 2. 120 3. 84 4. 78 5. 11 6. 70
 7. $x^{12} + 8x^9 + 24x^6 + 32x^3 + 16$ 8. 4320

Problem Solving Workshop:

Worked Out Example

1. 6545 2. 595 3. 330 4. 80 5. 252 6. 588

Challenge Practice

1. $x^2 - 16x^{3/2} + 96x - 256x^{1/2} + 256$
 2. $8x^{3/2} + 12x + 6x^{1/2} + 1$
 3. $x^2 - 3x^{4/3}y^{2/3} + 3x^{2/3}y^{2/3} - y$
 4. $x^3 + 10x^{12/5} + 40x^{9/5} + 80x^{6/5} + 80x^{3/5} + 32$
 5. 164,833 + 354,144i 6. -142 - 65i
 7. $-\frac{1}{2} + \frac{\sqrt{3}}{2}i$ 8. $162 - 105i\sqrt{3}$

Lesson 6.4 Select and Draw Conclusions from Samples, continued

Practice Level C

1. self-selected; unbiased; People visiting the team web site would not be biased toward any one particular player. 2. convenience; biased; People purchasing movie tickets are more likely to attend movies regularly than the average person.

3. random; unbiased; Selecting employees at random would eliminate any chances of bias.

4. ± 4.1 5. ± 3.5 6. ± 3.3 7. ± 3.9 8. ± 1.3
 9. ± 1.1 10. ± 1.2 11. ± 0.9 12. 1736 people
 13. 384 people 14. 693 people 15. 6944 people
 16. 287 people 17. 918 people 18. 473 people
 19. 20,408 people 20. ± 4.7 21. between 67.5% and 76.9% 22. about 567 people
 23. between 42.5% and 50.9% 24. 308 people

Study Guide

1. systematic 2. unbiased; The sample is representative of first-time home buyers.

3. between 25.8% and 32.2 4. about 2.9%; between 38.1% and 43.9%

Problem Solving Workshop:

Worked Out Example

1. $\pm 5\%$, 13% to 23% 2. $\pm 2.2\%$, 62.8% to 67.2% 3. $\pm 2.2\%$, 32.8% to 37.2% 4. $\pm 4.5\%$, 59.5% to 68.5%

Challenge Practice

1. Convenience sample; *Sample answer:* One advantage is it will lower costs for the polling agency. One disadvantage is there tends to be a lower response rate and this can introduce a bias into the sample. 2. *Sample answer:* The survey did not account for households with unlisted phone numbers. Also, the survey did not include people who were not home or who did not agree to participate in the phone survey. The sample is biased toward people who have listed phone numbers, tend to be home in the evening, and are willing to participate in surveys.

3. $\$20.47 < \mu < \21.83 ; With 95% confidence, you can say that the true mean closing stock price is between \$20.47 and \$21.83.

4. $11.7 < \mu < 12.3$; With 95% confidence, you can say that the true mean length of time spent reading the newspaper is between 11.7 minutes and 12.3 minutes.

$$5. \quad E = 1.96 \frac{\sigma}{\sqrt{n}}$$

$$E\sqrt{n} = 1.96\sigma$$

$$\sqrt{n} = \frac{1.96\sigma}{E}$$

$$n = \left(\frac{1.96\sigma}{E}\right)^2$$

6. 7

Lesson 6.5 Compare Surveys, Experiments, and Observational Studies

Teaching Guide

1. *Sample answer:* Yes, sometimes there are links to surveys on the bottoms of receipts.

2. *Sample answer:* The population would be from people who have eaten at the restaurant or purchased something at the store.

3. *Sample answer:* The questions would probably try to get good reviews out of people.

4. *Sample answer:* If I was not happy with my service, I would probably not want to tell the server that to their face. I would be more likely to state unhappiness in a written survey when the server would not know it was me who answered it.

5. *Sample answer:* It would depend on the situation. If someone was just studying me without it harming me, I might not mind. But if someone did something that affected me, like changing food I eat or medicines I was taking, I don't think that would be right.

Practice Level A

1. The question assumes that the respondent is aware of the school board's plan for a new dress code for all schools.

2. The question encourages the respondent to answer in a particular way since a state employee will most likely be affected if there are cuts to state worker benefits.

3. The question encourages the respondent to answer in a particular way suggesting that adding a lane is a solution to the heavy traffic.