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Learn through sports

PRINTABLE · GRADES 6-8 · AGES 11–14

Sampling the Stands

Teams can't ask every fan what they think, so they ask a **sample** and use it to predict what the whole crowd thinks. The made-up Riverton Rockets run a halftime survey at a sold-out basketball game. Use it for problems 1–8.

Name _____

Date _____

SAMPLING TOOLKIT

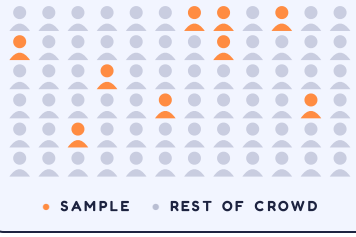
Population — the whole group you want to learn about

Sample — the part of the group you actually ask

Random — every member has the same chance to be picked

Biased — a sample that leans toward some answers

Predict — sample fraction × population



Riverton Rockets
HALFTIME SURVEY
RANDOM SAMPLE · 80 FANS

T-SHIRT TOSS	HALF-COURT SHOT CONTEST	KIDS' DRIBBLE RACE	DANCE TEAM SHOW
32	28	12	8

Survey question: **"Which halftime event do you want to see most?"** Each fan picked one answer. The bars show how many of the 80 fans picked each event.

ROOKIE

1 The Rockets' gym holds **6,000** fans, and every seat is full. Staff survey **80** of them. How many fans are in the **population**? How many are in the **sample**?

WORK SPACE

population _____ **sample** _____

ROOKIE

2 Use the survey results above. What **percent** of the sample picked the **T-shirt toss**?

WORK SPACE

_____ %

STARTER

3 Use the sample to **predict** how many of the **6,000** fans would pick the **T-shirt toss**.

WORK SPACE

_____ **fans**

STARTER

4 Predict how many **more** of the 6,000 fans would pick the **half-court shot contest** than the **dance team show**.

WORK SPACE

_____ **more fans**

PRO

5 Which plan gives a **random sample** of the crowd?

A. Ask the first 80 fans who walk in.
B. A computer picks 80 seat numbers from all 6,000 seats.
C. Ask 80 fans waiting in the T-shirt toss line.

WORK SPACE

plan _____

PRO

6 Plan C in problem 5 is **biased**. In one or two sentences, explain why it would not give a fair picture of the whole crowd.

_____

_____

ALL-STAR

7 A fan says, "More than **1,000** fans here want the **kids' dribble race**." Use the sample to predict the number. Does the sample back up her claim?

WORK SPACE

_____ **fans; yes or no** _____

CHALLENGE ★

8 Challenge: A second random sample of **120** fans finds **54** who pick the T-shirt toss. Combine both samples (200 fans). Predict how many of the 6,000 fans pick the T-shirt toss.

WORK SPACE

_____ **fans**

A Many Samples, One Crowd

The Rockets' staff takes **five** different random samples of 50 fans and asks: **"Should home games start at 7 PM instead of 6 PM?"** Fill in boxes 1–4, then answer 5 and 6.

50 FANS PER SAMPLE	SAMPLE 1 · EXAMPLE	SAMPLE 2	SAMPLE 3	SAMPLE 4	SAMPLE 5
Fans who said yes	31	27	34	28	30
Percent who said yes	62%	BOX 1 %	BOX 2 %	BOX 3 %	BOX 4 %

5 What is the **mean** of the five percents?

_____ %

6 Use that mean to predict how many of the **6,000** fans want the **7 PM** start.

_____ **fans**

B Fair or Biased?

Read each survey plan. Write **fair** or **biased**, then give a short reason.

1 To find out if fans like the Rockets' coach, staff ask only fans wearing **Rockets jerseys**.

Fair or biased? _____ **Why?** _____

2 At a hockey game, a computer picks **60 ticket numbers** at random from every ticket sold, and staff survey those fans.

Fair or biased? _____ **Why?** _____

3 A soccer club posts a poll on its fan page. Anyone can vote, **as many times** as they want.

Fair or biased? _____ **Why?** _____

4 The Lakeview Lynx football stadium has **20** seating sections. Staff pick **5 seats at random** from **every** section.

Fair or biased? _____ **Why?** _____

FAIR SAMPLE CHECKLIST

- ☐ Could **every** member of the population be picked?
- ☐ Does each one have the **same chance**?
- ☐ Does each person get only **one** answer?
- ☐ Is anyone more likely to answer one way **because of where** they were found?

C Predict the Crowd

Find the fraction of the sample, then use it on the whole population. Every sample here is random.

1 In a random sample of **75** fans at the Rockets' sold-out game, **9** drove more than 30 miles to get there. Predict how many of the **6,000** fans did.

WORK SPACE

_____ **fans**

2 The Lakeview Lynx football stadium holds **18,000** fans. In a random sample of **150**, **66** bought hot cocoa. Predict the number of cocoa buyers in the full stadium.

WORK SPACE

_____ **fans**

3 From a random sample of **80** fans, the Rockets predict that **2,250** of 6,000 fans want more dance team shows. How many fans in the **sample** said yes?

WORK SPACE

_____ **fans**

4 Challenge: A soccer crowd has **12,000** fans. Random sample X: **22** of **40** want a new team song. Random sample Y: **96** of **200**. Which sample is more trustworthy, and what does it predict?

WORK SPACE

sample _____ ; _____ **fans**

BONUS · NOT SCORED

Your school team wants to know which jersey color students like best. Describe a fair way to pick a random sample of 40 students.

Answer Key (for teachers & parents)

Answers for **Sampling the Stands**, with the work shown. Print pages 1 and 2 for students and keep this page for checking. Percents can also be written as decimals or fractions (for example, 0.4 or 2/5 for 40%). Every team, fan and survey result is made up.

Page 1 Problems

1. **Answer: population 6,000 fans; sample 80 fans**
   Population is the whole crowd; the sample is the fans asked
2. **Answer: 40%**
   32 ÷ 80 = 0.4 = 40%
3. **Answer: 2,400 fans**
   0.4 × 6,000 = 2,400
4. **Answer: 1,500 more fans**
   (28 − 8) ÷ 80 = 0.25; 0.25 × 6,000 = 1,500
5. **Answer: plan B**
   Every seat has the same chance; A favors early arrivals, C favors T-shirt fans
6. **Answer: biased; sample reason: fans in the T-shirt line already want the T-shirt toss, so the sample leans toward that answer**
   Any reason saying the plan favors one answer earns credit
7. **Answer: 900 fans; no**
   12 ÷ 80 = 0.15; 0.15 × 6,000 = 900, which is less than 1,000
8. **Answer: 2,580 fans**
   (32 + 54) ÷ 200 = 86 ÷ 200 = 0.43; 0.43 × 6,000 = 2,580

A · Many Samples, One Crowd

1. **Answer: box 1 is 54%**
   27 ÷ 50 = 0.54
2. **Answer: box 2 is 68%**
   34 ÷ 50 = 0.68
3. **Answer: box 3 is 56%**
   28 ÷ 50 = 0.56
4. **Answer: box 4 is 60%**
   30 ÷ 50 = 0.6
5. **Answer: 60%**
   (62 + 54 + 68 + 56 + 60) ÷ 5 = 300 ÷ 5 = 60
6. **Answer: 3,600 fans**
   0.6 × 6,000 = 3,600

Quick score

Page 1 problems	_____ / 8
A · Many Samples (6)	_____ / 6
B · Fair or Biased?	_____ / 4
C · Predict the Crowd	_____ / 4
Total	_____ **/ 22**

Skills practiced

Populations & samples · Random sampling · Spotting bias · Making predictions · Percents · Sample variation

Teaching tip: Section A is the big idea: five fair samples gave five different answers (54% to 68%), yet they cluster around 60%. Ask students why no single sample is "wrong," and why a bigger sample usually lands closer to the truth.

B · Fair or Biased?

1. **Answer: Biased**
   Fans in team jerseys are big fans, so they are more likely to say yes.
2. **Answer: Fair**
   Every fan with a ticket has the same chance to be picked.
3. **Answer: Biased**
   Only fans who choose to vote are counted, and one fan can vote many times.
4. **Answer: Fair**
   Every section is included, and seats are picked at random.

C · Predict the Crowd

1. **Answer: 720 fans**
   9 ÷ 75 = 0.12; 0.12 × 6,000 = 720
2. **Answer: 7,920 fans**
   66 ÷ 150 = 0.44; 0.44 × 18,000 = 7,920
3. **Answer: 30 fans**
   2,250 ÷ 6,000 = 0.375; 0.375 × 80 = 30
4. **Answer: sample Y; 5,760 fans**
   Bigger random samples tend to be more reliable. 96 ÷ 200 = 0.48; 0.48 × 12,000 = 5,760

   Bonus (not scored): answers vary. Example: number every student on the school list and have a computer pick 40 numbers.

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