

Key Idea

There are several appropriate strategies for estimating products.

Vocabulary

- overestimate
- underestimate
- rounding (p. 26)
- compatible numbers (p. 22)

**Think It Through**

I only need an **estimate** because I just need to know if there's enough.

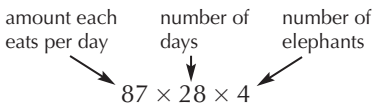
Estimating Products

LEARN

Exact answer or estimate?

An adult zoo elephant eats about 87 pounds of hay each day. A zookeeper needs to feed 4 elephants for 28 days in February. The zookeeper has 12,000 pounds of hay. Is this enough hay for the month?

You need to estimate $87 \times 28 \times 4$.

**WARM UP**

- 72×10
720
- 973×10
9,730
- 38×100
3,800
- $3 \times 10 \times 8$
240
- $8 \times 100 \times 9$
7,200

What are some ways to estimate products?

When you only round factors to larger numbers, you get an **overestimate**. When you only round factors to smaller numbers, you get an **underestimate**.

Example

Estimate $87 \times 28 \times 4$.

One Way

Tim rounded 87 to 100 and 28 to 30.

$$\begin{array}{l} 87 \times 28 \times 4 \\ \downarrow \quad \downarrow \\ 100 \times 30 \times 4 = 3,000 \times 4 \\ = 12,000 \end{array}$$

Another Way

Sally substituted compatible numbers. She substituted 25 for 28.

$$\begin{array}{l} 87 \times 28 \times 4 \\ \downarrow \\ 87 \times 25 \times 4 = 87 \times 100 \\ = 8,700 \end{array}$$

Compatible numbers are numbers that are easy to compute with mentally.

Since the zookeeper has 12,000 pounds of hay, there is enough to feed the elephants for the month.

Talk About It

2. **Tim, because he rounded two factors to a larger number and did not change the other.**

1. Why did Sally adjust 28 to 25? **Sample answer: 25 × 4 is easy to compute mentally, and the product 100 is easy to multiply by any factor.**
2. Which student arrived at an overestimate? How do you know?
See above.
3. Which student arrived at an underestimate? How do you know?
Sally, because she rounded one factor to a smaller number but did not change the other factors.

Estimate each product. **Sample answers are given.**

1. $53 \times 4 \times 28$
6,000

2. $33 \times 58 \times 3$
5,400

3. $7 \times 63 \times 10$
4,200

4. $18 \times 19 \times 50$
20,000

5. **Number Sense** What are two different ways you could estimate $4 \times 259 \times 5$?5. **Sample answer:** $4 \times 300 \times 5 = 6,000$ or
 $4 \times 250 \times 5 = 5,000$

For more practice, see Set 2-2 on p. 126.

PRACTICE

A Skills and UnderstandingEstimate each product. **Sample answers are given.**

6. $98 \times 14 \times 3$
3,000

7. $51 \times 9 \times 21$
9,000

8. $4 \times 79 \times 24$
8,000

9. $38 \times 59 \times 5$
12,000

10. $76 \times 22 \times 9$
16,000

11. $24 \times 39 \times 3$
2,400

12. $41 \times 27 \times 52$
60,000

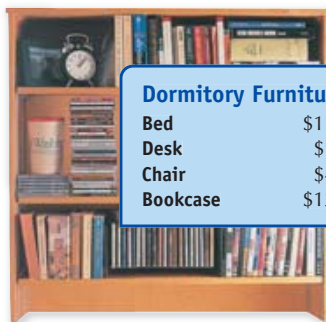
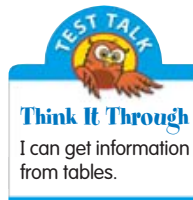
13. $38 \times 12 \times 18$
8,000

14. $26 \times 54 \times 40$
60,000

15. $12 \times 72 \times 11$
7,000

16. **Number Sense** Give three numbers whose product is about 6,000. **Sample answer:** 21, 29, 1019. **6,000 is an overestimate, because factors were rounded to larger numbers. 4,800 is an underestimate, because a factor was rounded to a smaller number.****B** Reasoning and Problem Solving

The table shows the cost of several items that are needed to furnish a college dormitory room.

17. About how much will it cost to purchase 28 desks and 31 bookcases?
About \$5,40018. Estimate to decide which costs more—9 bookcases or 20 desks.
20 desks19. **Reasoning** To find $4 \times 27 \times 48$, Tim used rounding and wrote $4 \times 30 \times 50 = 6,000$. Sally substituted compatible numbers and wrote $4 \times 25 \times 48 = 4,800$. Which is an overestimate and which is an underestimate? Explain. **See above.**20. **Writing in Math** Pat needs to estimate the product of $91 \times 24 \times 4$. Explain two different ways that Pat could use to make a reasonable estimate for this product. **Sample answer:** Round 91 and 24 to get $90 \times 20 \times 4 = 7,200$, or replace 24 with 25, to get $91 \times 25 \times 4 = 9,100$.**Dormitory Furniture**

Bed	\$175
Desk	\$79
Chair	\$48
Bookcase	\$120

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Find each product. Use patterns and properties to compute using mental math.

21. 2×70
140

22. 15×40
600

23. $9 \times 4 \times 50$
1,800

24. How many hundreds are in 50,000?

A. 5

B. 50

C. 500

D. 5,000