

Down the Babbling River

Some family and friends have asked you to plan an end of the summer getaway. A rafting company has agreed to take your group down the Babbling River. (It's actually a little smaller than a river, more like a brook.) The rafting company has given you specific details as to how much weight each raft can hold. A raft can safely carry the weight of 24 babies. As everyone knows, the weight of 12 babies is exactly equal to the weight of 4 teenagers; the weight of 6 teenagers is equal to the weight of 3 adults.

What is the fewest number of rafts needed for a trip with 11 adults, 5 teenagers, and 21 babies? Note: In this task only, supervision of the babies is NOT necessary!

Down the Babbling River

Suggested Grade Span

Grades 6–8

Grade(s) in Which Task Was Piloted

Grade 6

Task

Some family and friends have asked you to plan an end of the summer getaway. A rafting company has agreed to take your group down the Babbling River. (It's actually a little smaller than a river, more like a brook). The rafting company has given you specific details as to how much weight each raft can hold. A raft can safely carry the weight of 24 babies. As everyone knows, the weight of 12 babies is exactly equal to the weight of 4 teenagers; the weight of 6 teenagers is equal to the weight of 3 adults.

What is the fewest number of rafts needed for a trip with 11 adults, 5 teenagers, and 21 babies? **Note:** In this task only, supervision of the babies is NOT necessary!

Alternative Versions of Task

More Accessible Version:

Some family and friends have asked you to plan an end of the summer getaway. A rafting company has agreed to take your group down the Babbling River. (It's actually a little smaller than a river, more like a brook). The rafting company has given you specific details as to how much weight each raft can hold. A raft can safely carry the weight of 25 babies. As everyone knows, the weight of 12 babies is exactly equal to the weight of 4 teenagers; the weight of 6 teenagers is equal to the weight of 3 adults.

What is the fewest number of rafts needed for a trip with 10 adults, 5 teenagers, and 25 babies? **Note:** In this task only, supervision of the babies is NOT necessary!

More Challenging Version:

Some family and friends have asked you to plan an end of the summer getaway. A rafting company has agreed to take your group down the Babbling River. (It's actually a little smaller than a river, more like a brook). The rafting company has given you specific details as to how much weight each raft can hold. A raft can safely carry the weight of 24 babies. As everyone knows, the weight of 9 babies is exactly equal to the weight of 4 teenagers; the weight of 13 teenagers is equal to the weight of 5 adults.

What is the fewest number of rafts needed for a trip with 11 adults, 5 teenagers, and 21 babies? **Note:** In this task only, supervision of the babies is NOT necessary!

NCTM Content Standards and Evidence

Algebra Standard for Grades 6–8

Instructional programs from Pre–Kindergarten through grade 12 should enable students to...

- Understand patterns, relationships, and functions.
 - *NCTM Evidence:* Represent, analyze, and generalize a variety of patterns with tables, graphs, words and, when possible, symbolic rules.
 - *Exemplars Task Specific Evidence:* This task requires students to find the relationship between weights of babies, teens, and adults.

Time/Context/Qualifiers/Tip(s) From Piloting Teacher

This is a medium length task.

Links

This task could link to a unit on rivers or water.

Common Strategies Used to Solve This Task

Some students will represent relationships using algebraic notation. Others will take a strictly computational approach.

Possible Solutions

Original Version:

12 babies = 4 teens, so 1 teen equals 3 babies.

6 teens = 3 adults, so 1 adult equals 2 teens.

1 adult would then equal 6 babies.

A raft can hold 24 babies.

11 adults = 66 babies.

5 teens = 15 babies.

$66 + 15 + 21 = 102$ babies $\div 24 = 4.25$ rafts needed.

Since you can not have .25 rafts, a total of 5 rafts would be needed.

Raft 1 – 21 babies with 1 teen

Raft 2 – 4 teens with 2 adults

Raft 3 – 3 adults

Raft 4 – 3 adults

Raft 5 – 3 adults

More Accessible Version:

12 babies = 4 teens, so 1 teen equals 3 babies.

6 teens = 3 adults, so 1 adult equals 2 teens.

1 adult would then equal 6 babies.

A raft can hold 24 babies.

10 adults = 60 babies.

5 teens = 15 babies.

$60 + 15 + 25 = 100$ babies $\div 25 = 4$ rafts needed.

Raft 1 – 2 adults + 2 teen + 7 babies

Raft 2 – 2 adults + 1 teen + 10 babies

Raft 3 – 3 adults + 1 teen + 4 babies

Raft 4 – 3 adults + 1 teen + 4 babies

More Challenging Version:

9 babies = 4 teens, so 1 teen equals 2.25 babies.

13 teens = 5 adults, so 1 adult equals 2.6 teens.

1 adult would then equal 5.85 babies.

A raft can hold 20 babies.

11 adults = 64.35 babies.

5 teens = 11.25 babies.

$64.35 + 11.25 + 21 = 96.6$ babies $\div 20 = 4.83$ rafts needed.

Since you can not have .83 rafts, it seems that a total of 5 rafts would be needed.

Raft 1 – 3 adults, and 1 teen

Raft 2 – 2 adult, 1 teen, and 6 babies

Raft 3 – 2 adults, 1 teen, and 5 babies

Raft 4 – 2 adults, 1 teen, and 5 babies

Raft 5 – 2 adults, 1 teen, and 5 babies

Task Specific Assessment Notes

General Notes: This task does not lend itself well to requiring students to create a chart, diagram, or graph, and the student should not be penalized for omitting this.

Novice: The novice may have some type of answer with no work shown, or the work will have little or no relationship to the task. Little or no math reasoning will be present.

Apprentice: The apprentice will show some correct mathematical reasoning but will be unable to achieve a correct solution. Both parts of the task may not be addressed, or work will only be correct for one part.

Practitioner: The practitioner will have a correct answer of 5 rafts and will make sure that all parts of the task are addressed (that each raft may not carry more than the weight of 24 babies).

Expert: The expert will achieve correct solutions for both parts of the task and may have more than one correct answer. It is likely that the expert will use some algebraic notation in the solution.

Author

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Novice

The tale of the Scale

The raft could carry the weight of 24 Babies the weight of 12 babies is = to the weight of 4 teens. The weight of ~~twelve~~ teens is = to the weight of 3 Adults. How many rafts are needed for a trip with 11 Adults, 5 teens, 21 babies?

Process/solution

I began by dividing But as I went on it got more confusing. I did not get the answer

conclusion/Reflection

the problem was very hard.

The student is not able to find a strategy for solving the task.

Apprentice

Problem of the week
P.O.W.

Restatement -

A raft can safely carry the weight of 24 babies. The weight of 12 babies is exactly equal of 4 teenagers; The weight of 6 teenagers is equal to the weight of the adults. The questions they want to know are how many rafts are needed for a trip with 11 adults, 5 teenagers, and 21 babies? Make a diagram to show the occupants of each raft. Show your mathematical process including babies.

process and solution -

6 teenagers = $\frac{3}{2}$ Adults
 12 babies = 4 teenagers
 4 teenagers = 2 adults

5 teenagers =
 half 1 raft
 11 adults = 55
 rafts
 21 babies 1 raft

 total = 7 rafts

The student has a reasoning error — 4 teens = 1/2 raft, not 5.

Conclusion -

For this pow I think I used addition, multiplication, dividing, but not subtracting.

Reflection -

I thought this POW was very hard because this was very complicated. You really needed to use your head for this P.O.W.

An incorrect answer is achieved.

Some correct reasoning is present.

11 adults equal 55 babies; 66 (24 babies = 2.75 rafts needed.

Practitioner

The Tale of the Scale

① A raft can safely carry the weight of 24 babies. 12 babies is exactly equal to the weight of 4 teenagers; and the weight of 6 teenagers is equal to the weight of 3 adults.

How many rafts are needed for a trip with 11 adults, 5 teenagers, and 21 babies?

One raft equals 24 babies.
 One raft equals 8 teenagers.
 One raft equals 4 adults.

$$\begin{array}{r} \frac{21}{24} \text{ babies} + \frac{5}{8} \text{ teenagers} + \frac{11}{4} \text{ adults} \\ \text{or} \\ \frac{21}{24} \\ + \\ \frac{15}{24} \\ + \\ \frac{66}{24} \\ \hline = \frac{102}{24} = 4 \frac{6}{24} = 4 \frac{1}{4} \end{array}$$

Formal math language of fractions is used to communicate.

The student demonstrates evidence of prior knowledge of fractions.

The student clarifies the task and notes structures.

A correct answer is achieved, and work is shown.

You will need 5 rafts. If you only use 4 rafts a few people to left behind so you need 5 rafts

Expert

b = babies
r = raft
a = adults
t = teenagers
KEY

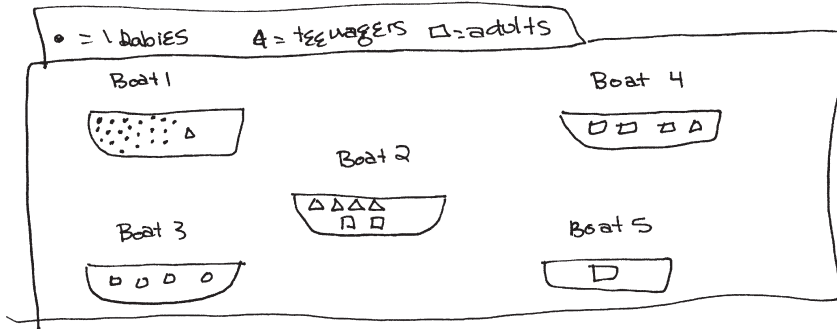
THE TALE OF THE SCALE

$$\begin{aligned} 24b &= 1r \\ 12b &= 4t \\ 6t &= 3a \end{aligned}$$

- $3b = 1t = (\frac{1}{3} \times 4 = 1\frac{1}{3}a)$
- $18b = 3a = (6t = 3a, 6t = 18b = 18b = 3a) (6 \times 3 = 18)$
- $18b = 6t (3 \times 6 = 18)$
- $6b = 12 (18b \div 3a = 6b)$
- $36b = 6a (18b \times 2 = 36b)$

Boat 1 = $21b + 1t + (24b)$
 Boat 2 = $4t + 2a + (24b)$
 Boat 3 = $4a + (24b)$
 Boat 4 = $4a + (24b)$
 Boat 5 = $1a + (6b)$

$$\begin{array}{r} 24b \\ 5t \\ 12a = 9a \\ \hline 12 \end{array} \quad \begin{array}{r} 36b = 2a \\ + 18b = 3a \\ \hline 54b = 5a \end{array} \quad \begin{array}{r} 54b = 2a \\ 2a = 12b \\ \times 2 \\ \hline 24b \end{array} \quad (54 \div 24 = 2\frac{1}{2}b)$$



An awareness of audience is present through use of keys.

The student analyzes the situation in mathematical terms.

The student uses evidence to support statements.

Precise language and notation are used.

Math thinking is consolidated.

The student justifies strategies and decisions in formal and informal proofs.