# Newspaper Advertisements

This week's issue of my local paper contains 8 pages.

- Page 1 has all the headline news and no advertisements.
- Page 2 has 1 advertisement that takes up 1/2 of the page.
- Page 3 has ads for 2 local businesses, one takes up 1/2 of the page and the other is the size of 1/6 of the page.
- Page 4 has a grocery ad that takes up 1/4 of the page.
- 5/12 of page 5 advertises local products.
- 5/6 of page 6 is real estate ads.
- Page 7 is all sports news.
- Page 8 has only 1/6 of the page for news, and the rest is restaurant and movie ads.

What fractional part of the whole paper is taken up with news and not advertising?

If each page measures 11" x 16", what is the area of the entire paper available for printing the week's news?

Bonus:

How does this ratio of news to ads compare with that in the typical issue of the *Colchester Chronicle*?

**Grade Levels 6 - 8**

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## What This Task Accomplishes

This task assesses the students' ability to perform fraction computations, calculate area measurements, use reasoning and problem-solving skills, and connect problem-solving opportunities to real-life situations.

## What the Student Will Do

Students should use models or diagrams to determine the total amount of ad space in this eight-page newspaper, thus determining the amount of space available for printing the news. Students should use their life experience and realize that there is white space on all newspaper pages and account for this in their solutions. The task also includes a challenge question that encourages students to take a look at our local paper and determine the ratio of ads to news found in this paper.

## Time Required for Task

45 minutes

I gave this task as a homework assignment. The basic task could be accomplished in one 45-minute class period with the bonus done that evening. You could have copies of a local paper on hand and have students do the task in two-three class periods with the extension done as well.

## Interdisciplinary Links

There is a natural real-life connection, as students are encouraged to analyze the local newspaper for the ad to news ratio. Students might investigate this task while studying newspapers, printing or advertising. Students might even read some of the paper while they are at it!

## Teaching Tips

I suggest using the disk copy of this task and changing the wording in the "Bonus" to reflect the name of your local paper. I suggest using a paper, which has the same dimensions as the task rather than a full sized national paper. In our area, each town has its own local paper. Perhaps yours does too.

This task was given at the end of a unit of study in which students had been finding common denominators and adding fractions using fraction bars. Several of the students used them to solve this problem (see the Practitioner exemplar).

To adapt this task for students with lesser skills, you could have a four-page paper instead of eight, you could provide all fractions with common denominators, and/or you could eliminate the portion of the task dealing with area.

You could encourage all students to consider margins in their solutions to make the task slightly more complicated. You could also have more talented students investigate the cost of various sized ads and determine the revenue generated by the advertisements. You might want to invite a local newspaper editor or owner in to have a class discussion, or send a group of interested students out to interview the marketing manager of your local paper.

## Suggested Materials

- Fraction bars
- Copies of local papers
- Calculators

## Possible Solutions

There are three 1/2 pages of ads and four 1/2 pages for news.

Total area of the eight pages is 1,408 square inches, so 792 square inches are available for the

printing of news. If you consider a one-inch margin around the pages, then the available dimensions for printing would be 9" x 14" for an area of 126 square inches x 8 pages = 1008 square inches total space for all printing. This would only allow 567 square inches for the news.

## Benchmark Descriptors

### Novice

Novice problem solvers as a group were not able to add the fractional parts of pages accurately, nor did they communicate their solutions adequately. The exemplar for this level shows a student who organized the data in a table with the fractions all converted to twelfths. The reader has no idea how this was done, nor is the reader able to determine where the 7/16 or the 9/16 answers come from. The solution number two is the correct area measure for the amount of space for printing news, but there is absolutely no evidence to support this answer. The student does not understand the concept of common denominators as evidenced in the statement, "My rule worked with this problem and with others because making all the denominators twelfths would work in any addition problems with fractions."

### Apprentice

The Apprentice made mathematical errors, solved only parts of the problem, or were unsuccessful at communicating their solutions clearly. The work featured in this exemplar shows an incomplete solution. The approach used was workable. Using tables to organize the fractional parts of the pages and finding common denominators shows good reasoning and clear communication. The approach for finding the area of a page and the entire area of the paper worked and is easy to follow. The student never found the fractional part of the 1,408 square inches that was available for news rather than filled with ads. The student either stopped too soon or did not understand the question fully. This student did use good representations and did have a good command of mathematical language, despite the shortcomings of the solution. The reader has the sense that this student may not have read the problem carefully enough.

### Practitioner

This student does a great job of finding the fractional parts of the paper, which are filled with ads and news. The approach for finding the total area available for news is efficient and successful. The student used good reasoning in verifying the solution in paragraph number two of the text. The student has great communication skills and uses accurate and appropriate mathematical representation. This piece of work is very representational of the majority of the Practitioners who did this task. Those whom I considered to be Experts went the extra distance and did the bonus problem, as well as the basic task.

### Expert

Expert students got the correct answer, had a good representation and clearly described their processes. Many did the bonus for a comparison and saw that the local paper had more ads than the paper in the task. To my surprise, none of them considered the margins allowed in virtually all newspapers. This exemplar demonstrates clear understanding of the task and the bonus and takes it one step further by converting the fractions to percents. The table is accurate and clear in its comparison of the two papers. It should, however, have had an

additional column for the fractions as given in the task. When I mentioned this to the student, the response was that the conversion had taken place in the student's head, as the task was read and I believe that to be true. The reader would, however, benefit from this information. The color-coded graphs were good for comparing the two newspapers at a glance. A next step for this student would be to look at *USA Today*® or any other regional paper and see if the hypothesis put forth in the last paragraph is correct.

## Novice

### APPROACH AND REASONING

My rule was changing all the fractional parts of the pages into twelfths to make the addition easy!

This statement shows lack of understanding of common denominations for adding fractions.

### CONNECTIONS

This problem is based on testing our addition skills with fractions.

My rule worked with this problem and with others because making all the denominators twelfths would work in any addition problems with fractions.

### SOLUTIONS

Where did 9/16 come from?
Where did 792 sq. in. come from?

Solution #1 9/16

Solution 792 square in. of news

### MATH REPRESENTATION

| Pages | Ads | News |
|---|---|---|
| 1 | 2/12 | 12/12 |
| 2 | 4/12 | 0/16 |
| 3 | 8/12 | 4/12 |
| 4 | 3/12 | 9/12 |
| 5 | 5/12 | 7/12 |
| 6 | 10/12 | 2/12 |
| 7 | 0/12 | 12/12 |
| 8 | 10/12 | 2/12 |
| | 7/16 | 9/16 |

This table is appropriate, but where did the 9/16 come from? Should have had a column for fractions as given in the task, and a second column for fractions in 12th's.

## Apprentice

Table 1

| | ADS | News |
|---|---|---|
| Page #1 | 0 | 1 |
| #2 | 1/2 | 1/2 |
| #3 | 1/2 | 2/6 |
| #4 | 1/4 | 3/4 |
| #5 | 5/12 | 7/12 |
| #6 | 5/6 | 1/6 |
| #7 | 0 | 1 |
| #8 | 5/6 | 1/6 |

Nice, clear working tables.

Finding area of Newspaper  Adding News fractions

Table 2

$A = LXW$
$A = 11 \times 16$
$A = 176\ in^2$
$A = 176 \times 8$ = Final sum
$A = 1{,}408\ in^2$

Answers are highlighted. Note error in placement of "2". The inches are square, not the number.

$\frac{1}{2} \times 6 = \frac{6}{12}$
$\frac{2}{6} \times 2 = \frac{4}{12}$
$\frac{3}{4} \times 3 = \frac{9}{12}$
$\frac{7}{12} = \frac{7}{12}$
$\frac{1}{6} \times 2 = \frac{2}{12}$
$\frac{1}{6} \times 2 = \frac{2}{12}$

$\frac{6}{12}$
$\frac{4}{12}$
$\frac{9}{12}$
$\frac{7}{12}$
$\frac{2}{12}$
$\frac{2}{12}$
$+12$
$\frac{30}{12} \div 6 = \frac{5}{2}$

Final Sum = $2\frac{5}{12} + 2 = 4\frac{5}{12}$

$\frac{5}{2} = 2\frac{1}{2}$

## Apprentice

I approached this problem by making a table on this table I put the amount of pages the arrount of each page the ads take up and the amount the News take up.

| | Ads | News |
|---|---|---|
| Page 1. | 0 | 1 |
| 2. | $\frac{1}{2}$ | $\frac{1}{2}$ |
| 3. | $\frac{1}{2}+\frac{1}{6}=\frac{4}{6}$ | $\frac{2}{6}$ |
| 4. | $\frac{1}{4}$ | $\frac{3}{4}$ |
| 5. | $\frac{5}{12}$ | $\frac{7}{12}$ |
| 6. | $\frac{5}{6}$ | $\frac{1}{6}$ |
| 7. | 0 | 1 |
| 8. | $\frac{5}{6}$ | $\frac{1}{6}$ |

To get the sum number 1, I took all the fractions under the news colum and found a common denominator. Then I added the fractions up to get an improper fraction then I found its lowest terms and got a mixed number. $4\frac{1}{2}$ pages.

$$\begin{array}{r} 1 \\ 1 \\ \frac{6}{12} \\ \frac{4}{12} \\ \frac{9}{12} \\ \frac{7}{12} \\ \frac{2}{12} \\ +\ \frac{2}{12} \\ \hline \frac{30}{12} \div 6 = \frac{5}{2} = 4\frac{1}{2} \end{array}$$

Mathematical language and symbols show understanding of many fraction concepts.

## Apprentice

For sum 2 I used the area of one page which is a formula for a rectangle, 11×16. Then I multiplyd that by 8, because there are 8 pages. My answer is 1,408 $^2$in.

$A = L \times W$
$A = 11 \times 16$
$A = 107\ ^2\text{in.}$
$A = 107 \times 8$
$A = 1{,}408\ ^2\text{in.}$

Student finds the total area of the newspaper, but does not subtract the area taken up with advertisements to find area available for news.

I enjoyed this problem, it was very fun a nother. way I could have solved it is by adding the the fraction of the adds and sobtracting the sum from 8 pages. I got the same sums as before $4\frac{1}{2}$ and 1,408

one inportant rules I use to do this problem is that to add fractions you need to convert denominators so I had a common denominator. This rule must be used when doing any problem with adding or subtracting fractions.

The student understands the basic concepts of adding and subtracting fractions.

## Practitioner

(1) ■ = ads. □ = news

pg.1 = 0 = 0/12 ads

pg.2 = 1/2 = 6/12 ads.

pg.3 = 1/2 = 6/12 + 1/6 = 3/12 ads

pg.4 = 1/4 = 3/12 ads

pg.5 = 5/12 ads

pg.6 = 5/6 = 10/12 ads

pg 7 = 0 = 0/12 ads.

pg. 8 = 1/6 = 2/12 news

42/12 = 36/12 = 3 1/2 pages

Uses these diagrams to solve part of the problem.

(2)

pg.8 = 1 = 6/6
− 1/6 1/6
5/6

pg.1 = 0 = 0/6
pg.2 = 1/2 = 6/12
pg.3 = 1/2 = 6/12
pg.3 = 1/6 = 2/12
pg.4 = 1/4 = 3/12
pg 5. = 5/12 = 5/12
pg 6 = 5/6 = 10/12
pg 7 = 0 = 0/12
pg. 8 = + 5/6 = 10/12

42/12 = 36/12 = 3 1/2 pages of ads.

Efficient way of communicating solution is to number steps and refer to these numbered steps in the text rather than describing all the work you did on the scrap paper. The reader can easily find all the supporting work done to solve the problem.

**Practitioner**

Efficient method for finding area available for news.

③ each page =

$$\begin{array}{r} 11\text{ in} \\ \times 16\text{ in} \\ \hline 16 \\ +\,16 \\ \hline 176\text{ in}^2 \end{array}$$

length of sheet
width of sheet

area of 1 sheet

④

$8\frac{1}{2} = 7\frac{1}{2}$ # of sheets
$-\,3\frac{1}{2} = 3\frac{1}{2}$ # of sheets of ads
$4\frac{1}{2}$ # of sheets w/ no ads

⑤ $= 176\text{ in}^2$ area of 1 sheet
$\times\ 4.5$ # of sheets
880
$+\,204$
$792.0\text{ in}^2$ area of printing room for news

$792\text{ in}^2$ printing room for the news.

## Practitioner

To do this problem, I first needed to find how much of the paper was made up of ads. I did this in #1 by drawing diagrams of each page with fraction bars representing each page. I divided each page into 1/12's because 12 is the lowest common denominator of 4,2,12 and 6, the demoninators of each fraction of ads. This means that you can find the equivalent fractions of each one with the same denominator - 12. I then filled in the appropriate amounts of 1/12's and then went through and counted them all up. I got 42/12, which equals 3 1/2 pages.

I then checked my answer by doing it again in #2 mathematically. I did this by finding the equivalent fractions of each with a denominator of 12 and added them together. I got the same answer.

Next, I needed to find the area of each sheets in number 3, the amount of sheets, in number 4, and in number 5, the area of the printing room for ads. This was 792 in $^2$ of room.

This problem was very much like the work we have been doing in class. This is because it involves equivalent fractions, and using fraction bars to solve the problem.

Uses fractions and percents to compare the news:ad ratio in both papers clearly.

## Expert

Good use of pie graphs for comparison.

**News Paper Advertisements**

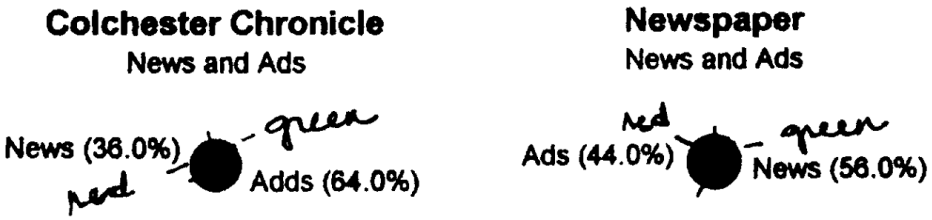
Good strategy for verifying the solution. Student moves from fractions to percents with ease.

In this problem I was asked to find the fraction of the given paper that is taken up by news and not advertising, and what the area of the available space for news is. I was also asked to compare this paper to the Colchester Chronicles news to ads ratio. I know that the newspaper measures 11"x16", and all of the fractions of ads for all eight pages, which are listed in the problem.

First I made a table showing the fractions of ads on every page of the newspaper, and then added them together for the fraction of ads in the whole paper. Then to check my answer I made column of the fractions of news on every page and added them together, and my answer was confirmed to be **54/96, or 56% available for the news and not advertisements.** Then I Multiplied that by the area of the total paper(1408"²) and got **792"² available for the news.**

Next I got the Colchester Chronicle and measured the area (length times width=area) of all of the ads for all 24 pages and put them into a table too. I rounded all of the fractions to twelfths to make the table more clearer and easier to read. Then I added them together to get the total fraction of space in the chronicle that is ads. Then to check my answer I put the fractions of space for the news on the table too, and then added them together. **So, the fraction of space available for news in the chronicle was 103/288 or 36%. Therefore, the newspaper has 21% more space for the news than the Colchester Chronicle does.**

Then to make the comparison of the to papers I made these two graphs.




Making this comparison shows how the chronicle is a local paper and the example isn't, because the chronicle has many more ads which are probably much cheaper than the example's, and if regional papers had this many advertisements compared to news, the newspaper would just have too many ads.

## Expert

| | News Paper | |
|---|---|---|
| Page | Fraction that is Ads. | Fraction that is news |
| #1 | O/12 | 12/12 |
| #2 | 7/12 | 5/12 |
| #3 | 7/12 | 5/12 |
| #4 | 3/12 | 9/12 |
| #5 | 5/12 | 7/12 |
| #6 | 10/12 | 2/12 |
| #7 | 0/12 | 12/12 |
| #8 | 10/12 | 2/12 |
| Total | 42/96 or 44% | **54/96 or 56%** |
| Area | 616"² | 792"² |

| | Chronicle | |
|---|---|---|
| Page | | |
| #1 | 0/12 | 12/12 |
| #2 | 7/12 | 5/12 |
| #3 | 4.5/12 | 7.5/12 |
| #4 | 9/12 | 3/12 |
| #5 | 6/12 | 6/12 |
| #6 | 6/12 | 6/12 |
| #7 | 12/12 | 0/12 |
| #8 | 8/12 | 4/12 |
| #9 | 12/12 | 0/12 |
| #10 | 7/12 | 5/12 |
| #11 | 6.5/12 | 5.5/12 |
| #12 | 6/12 | 6/12 |
| #13 | 7/12 | 5/12 |
| #14 | 10/12 | 2/12 |
| #15 | 6/12 | 6/12 |
| #16 | 7/12 | 5/12 |
| #17 | 6/12 | 6/12 |
| #18 | 8/12 | 4/12 |
| #19 | 7/12 | 5/12 |
| #20 | 12/12 | 0/12 |
| #21 | 8/12 | 4/12 |
| #22 | 12/12 | 0/12 |
| #23 | 12/12 | 0/12 |
| #24 | 6/12 | 6/12 |
| Total | 185/288 or 64% | **103/288 or 36%** |
| Area | 2528 1/3"² | 1407 2/3"² |