

Name: _____

Date: _____

Payroll Two Ways, Compared

GRADE 5

MATHEMATICS

B2.6

D1.3

The area model and the standard algorithm are the same arithmetic arranged differently: the algorithm's two lines are the area model's four parts, added in pairs. Work both ways and say where each part went.

PART A: TWO METHODS, ONE ANSWER

1. 23×14 by parts. Work out all four parts yourself, then write the total: _____.
2. In the standard algorithm for 23×14 , the first line is $23 \times 4 =$ _____.
3. The second line is $23 \times 10 =$ _____.
4. Adding the two lines: $92 + 230 =$ _____.

PART B: PAYROLL AT SCALE

5. 28 students each earn \$19 on payday. Find the total with the area model and again with the algorithm, and check that they agree.

SHOW YOUR WORK

Answer: _____

6. A class of 24 buys reward bundles at \$16 each. Find the total, then say where each of the area model's four parts ends up in the algorithm's two lines.

SHOW YOUR WORK

Answer: _____

7. A payday of 32 students at \$18 each was written down as \$676. Use estimation to show the record must be wrong, then give the correct total and the size of the error.

SHOW YOUR WORK

Answer: _____

Three Paydays

Week	Earnings	Spending
Week 1	\$532	\$310
Week 2	\$384	\$250
Week 3	\$576	\$400

Source: the class payroll records

PART C: WHAT WAS KEPT

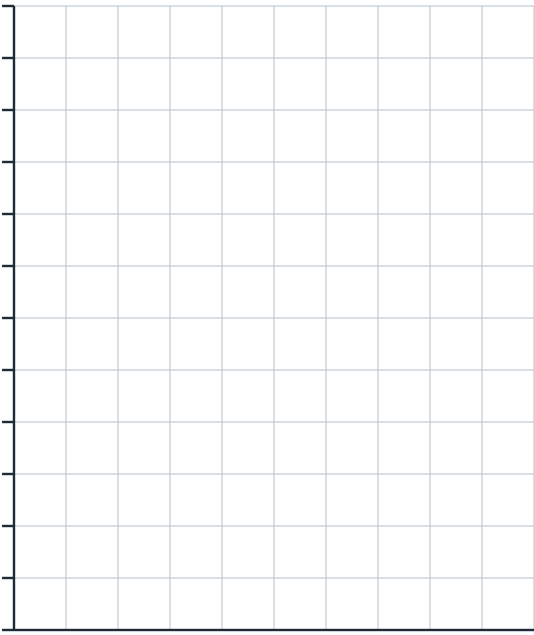
8. From the Three Paydays table, Week 1 kept \$_____.
9. Week 2 kept \$_____.
10. Week 3 kept \$_____.

PART D: CHOOSE AND DEFEND A GRAPH

11. Draw the graph that shows spending and saving as the two parts of each payday's earnings. Choose the scale yourself, and give the graph a title, both axis labels, a legend and the source.

TITLE _____

AXIS LABEL



LEGEND

☐

☐

AXIS LABEL

WHERE THE NUMBERS CAME FROM _____

12. Justify both choices: why this type of graph suits the data, and why your scale fits every bar.

Payroll Two Ways, Compared

ANSWER KEY

1. 322
2. 92
3. 230
4. 322
5. \$532 both ways. The four parts are $20 \times 10 = 200$, $20 \times 9 = 180$, $8 \times 10 = 80$ and $8 \times 9 = 72$, which add to 532. By algorithm: $28 \times 9 = 252$ and $28 \times 10 = 280$, and $252 + 280 = 532$.
6. \$384. The four parts are $20 \times 10 = 200$, $20 \times 6 = 120$, $4 \times 10 = 40$ and $4 \times 6 = 24$. The algorithm's first line $24 \times 6 = 144$ holds the two ones-parts, and its second line $24 \times 10 = 240$ holds the two tens-parts.
7. Rounding the rate up to \$20 gives $32 \times 20 = \$640$, and the real rate is lower than that, so the true total has to be under \$640. A record of \$676 is above it, so the record must be wrong. The exact total is \$576, which makes the record \$100 too high.
8. 222
9. 134
10. 176
11. A stacked-bar graph with three bars reaching \$532, \$384 and \$576, each split into a spent part (\$310, \$250, \$400) and a kept part (\$222, \$134, \$176). The weeks under their bars, "Week" along the bottom and "Dollars" up the side, a scale such as \$0 to \$600 in steps of \$50 or \$100, a title such as "Where Each Payday Went", a legend naming spent and kept, and a source line naming the payroll records.
12. A stacked-bar graph works because each bar is one week's earnings split into what was spent and what was kept, so the whole and its two real parts are both visible. Week 3 is the tallest at \$576, so a scale rising in steps of \$100 to \$600 fits every bar. Stacking spending on top of earnings would be wrong, because spending comes out of earnings rather than adding to them. A multiple-bar graph is also defensible if the student wants to compare earnings against spending side by side rather than show the split, so accept either with a reason.

TEACHER NOTES

Extension beyond the grade-level expectation: Part A asks students to generate the four parts rather than add ones they are given, and students must map the algorithm's lines back onto the area model's parts rather than simply computing both, and Part B question 3 uses estimation to find an

error rather than to predict an answer. Part D asks students to draw the graph, choose its scale and justify both, which is the part of D1.3 that is easiest to skip.