Developing Conceptual Understanding of Number

Set E: Whole Number Operations

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Whole Number Operations 1

Vocabulary

- product
- calculating
- method

Notes

- Question #4 is a great discussion question that deals with front-end multiplication.

Answers

1. a) 23×1
   b) $12 \div 3$

2. 2 or 7

3. Possible Answers:
   - Less than 2 because if you take 32 items and divide them equally into 16 groups, you have 2 items in each group. If you take the same 32 items and divide them into 17 groups, you have less than 2 items in each group.
   - Less than 2 because when you divide by a larger number you get a smaller answer or quotient.
   - …

4. Erika multiplied 20 by 5 to get 100. Then, she multiplied 4 by 5 to get 20. She added 100 and 20 to get her final answer.

$$
\begin{array}{r}
23 \\
\times\ 8 \\
\hline
160 \quad\longleftarrow\ 20 \times 8 \\
24 \quad\longleftarrow\ 3 \times 8 \\
\hline
184
\end{array}
$$

Whole Number Operations 1

1. Place each of the digits 1, 2, and 3 in the boxes to get the smallest possible answer.

   a) $\boxed{}\boxed{}$
   $\times \boxed{}$

   b) $\boxed{}\boxed{} \div \boxed{} =$

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2. 412 multiplied by a 1-digit number equals a product that ends with a 4. What numbers could be used?

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3. It is known that $32 \div 16 = 2$. Without actually calculating, tell whether the answer to $32 \div 17$ is greater than, less than, or equal to 2. Why?

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4. Erika does her multiplication like this:

$$\begin{array}{r} 24 \\ \times 5 \\ \hline 100 \\ 20 \\ \hline 120 \end{array}$$

   Explain what you think Erika did.
   Try Erika's method to multiply 23 and 8.

Whole Number Operations 2

Vocabulary

- remainder

Notes

- For #1, have students discuss the patterns found when talking about multiples of 5 plus 2.

Answers

1. Possible Answers:
   37, 42, 47, 52, 12, 107, etc.

2. Circle: 8
   Square: 4

3. 900

4. Lana has more.
   Possible Explanations:
   - Lana has $4 more than Wayne to begin with. Lana buys a cassette player costing $2 more than the one bought by Wayne. Lana still has $2 more than Wayne.
   - By subtraction, Lana has $14 left and Wayne has $12 left.
   - …

Whole Number Operations 2

1. If you divide 32 by 5 you get a remainder of 2. Find four other numbers that have a remainder of 2 when you divide by 5.

- -

2. ☐ and ◯ are single digits in the following addition problem:

$$
\begin{array}{r}
2\ \bigcirc \\
+\ \square\ 7 \\
\hline
7\quad 5
\end{array}
$$

   Find values for ☐ and ◯ to make the addition correct.

- -

3.
$$
\begin{array}{r}
1008 \\
-\ \boxed{} \\
\hline
108
\end{array}
$$

If the subtraction problem is correct, what number does the box cover?

- -

4. Lana and Wayne go shopping for cassette players. Wayne has $52 and buys a player for $40. Lana has $56 and buys a player for $42. Who has more money left? Why?

$56

$52

$40

$42
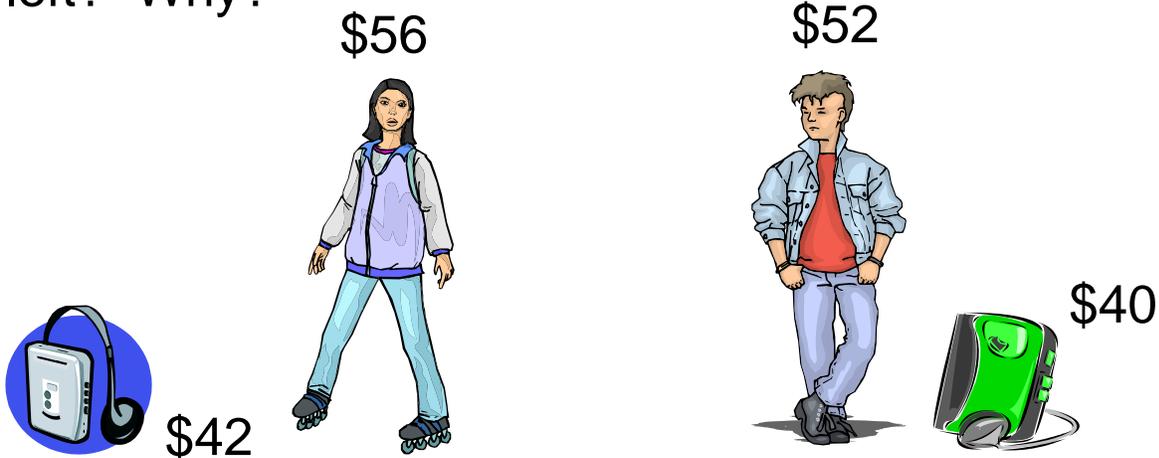
Whole Number Operations 3

Vocabulary

- multiplication table

Notes

Answers

1. There are more even products.
    Possible Explanations:
    - A row with an odd multiplier (1, 3 or 5) has 2 even products. A row with an even multiplier has 5 even products. This means that 7 out of 10 products in two consecutive rows are even.
    - You get an even product from multiplying even and even or even and odd. But, you only get an odd product by multiplying odd and odd.

      Approximately $\frac{2}{3}$ of the chart would have even products.
    - …

2. Possible Answers:
    - 30 x 3 = 90. If this is added to 1200, the answer is 1290.
    - 30 x 43 = 30 x (40 + 3)
      $$= 30 \times 40 + 30 \times 3$$
      $$= 1200 + 90$$
      $$= 1290$$
    -  ```
          43
        x 30
        1290
       ```
    - …

Whole Number Operations 3

1. Without completing the multiplication table on the right, would there be more, less, or equal numbers of even and odd products? Why?

X	1	2	3	4	5
1					
2					
3					
4					
5					

- -

2. If you know that 30×40 is 1200, show how to find 30×43.

Whole Number Operations 4

Vocabulary

- estimate

Notes

- For #1, students should be discouraged from calculating the exact answer and then rounding. An estimate is all that is expected.

Answers

1. a) Since 4 × 40 = 160, 4 packages of gum would be greater than $1.50
    b) Since 20¢ + 90¢ + 40¢ = $1.50, and all the values were rounded up, these 3 items would be less than $1.50

2. Possible Answers:
    - 4 × 7 or 4 × 2 have products that end in an 8. So, either 2 or 7 seem to be a possible value for the circle. Note, however, that only 7 is possible to get the given product.
    - …

3. a) 43
    b) 52
    c) 909
    d) 305

4. a) 1975
    b)   In 2004, Mary is 24 years old.

Whole Number Operations 4

1. For each of the following, estimate whether the total cost without tax is less than, greater than, or equal to $1.50. Why?

   a) 4 packages of gum at 43¢ per pack.
   b) items that cost 17¢, 89¢, and 39¢.

2. Look at the multiplication problem shown:

$$
\begin{array}{r}
2\, \bigcirc \\
\times\ \square\, 4 \\
\hline
1\ 7\ 2\ 8
\end{array}
$$

   What single-digit value(s)
   seem possible for $\bigcirc$?

3. Find one-half of each number:

   a) 86
   b) 104
   c) 1818
   d) 610

4. John was born 5 years before Mary. Mary was born in 1980.

   a) In what year was John born?
   b) How old is Mary?

Whole Number Operations 5

Vocabulary

Notes

- For #4, similar questions were introduced in Set A.
- For #5, 52 × 7 = 364 while 72 × 5 = 360.

Answers

1. a) >   b) >
    c) =   d) >

2. Possible Answers:
    - 32 ÷ 10
    - Split $32 into 32 loonies. Create 10 groups. Distribute the loonies equally to each group. For any extra loonies, exchange each loonie for 10 dimes and then distribute the dimes equally to the ten groups.
    - …

3. 310

4. a) Possible Answers:
        - R is negative
        - R < 0
        - - 4 < R < 0
        - R > -2
        - …
    b) Possible Answers:
        - R is between 30 and 60
        - 30 < R < 60
        - R < 60
        - R > 50
        - …

5. a) 75 ÷ 2
    b) 52 × 7

Whole Number Operations 5

1. Fill in the blank with < , = , or > to make each statement true.
   a) 4×5 _____ 4
   b) $27 \div 5$ _____ 5
   c) $38 \div 1$ _____ 38
   d) $15 \div 1.5$ _____ 8

2. Ten students paid a total of $32 for tickets to the zoo. Show how to calculate the price of one ticket.

3. If the addition problem is correct, what number does the box cover?

$$\begin{array}{r} 1203 \\ + \boxed{} \\ \hline 1513 \end{array}$$

4. For each number line, give two facts about the value of the number at R.

   a)

   b)
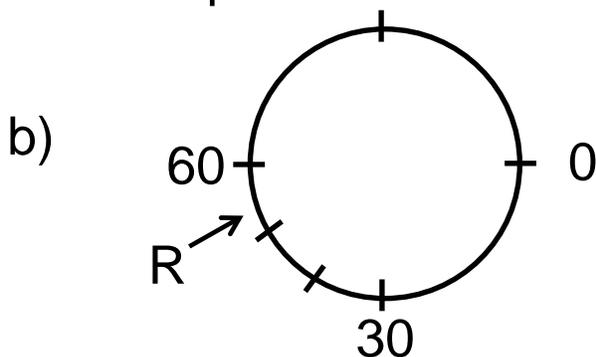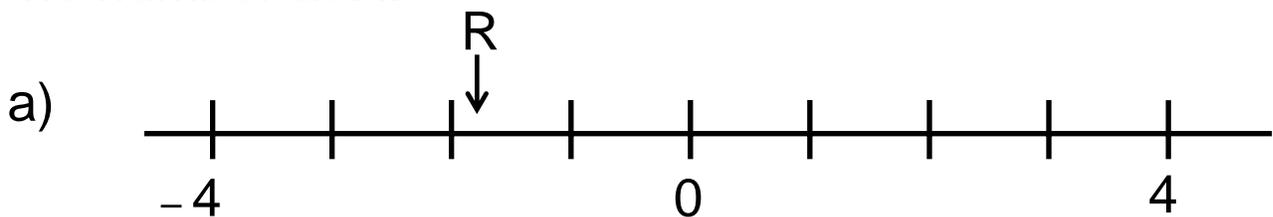
5. Use the digits 2, 5, and 7 to get the largest possible answer.
   a) $\boxed{}\boxed{} \div \boxed{} =$
   b) $\boxed{}\boxed{} \times \boxed{} =$

Whole Number Operations 6

Vocabulary

Notes

Answers

1. a) Greater than $1.50
    b) 30 ¢ + 40 ¢ + 90 ¢ = $1.60. I have
        added 3 ¢ + 1 ¢ +1 ¢ or 5 ¢ too
        much. Therefore the actual cost is
        $1.60 - $0.05 = $1.55

2. Either 3 or 8 could go in the circle since the
    product of each number with 6 ends in 8.
    Note that only 3 is possible to get the given
    product.

3. a) 22.5
    b) 54
    c) 900.5
    d) 1007

4. In 2004, John is 29 years old.

Whole Number Operations 6

1. You go to a garage sale. Three items are on sale for 27¢, 39¢, and 89¢ each.

    a) Estimate whether the total cost without tax for the 3 items is less than, greater than, or equal to $1.50.

    b) By rounding, show how you could find the actual cost of the 3 items.

2. Look at the multiplication problem shown:

    What values seem possible for ◯?

    $$\begin{array}{r} \square\ 6 \\ \times\ 4\ \bigcirc \\ \hline 2\ 4\ 0\ 8 \end{array}$$

3. Find one-half of each number:

    c) 45
    d) 108
    e) 1801
    f) 2014

4. John was born 5 years before Mary. Mary was 10 years old in 1990. How old is John?

Whole Number Operations 7

Vocabulary

Notes

- For #5, students need to read carefully to make sure they are looking for even answers only.

Answers

1. a) =
    b) >
    c) >

2. 6

3. 190

4. a) Possible Answers:
    - $-9 < T < 0$
    - Less than 0
    - Between -3 and 0
    - close to -3
    - $T > -3$
    - …

    b) Possible Answers:
    - Greater than 0
    - $30 > T > 0$
    - close to 25
    - $T < 25$
    - Between 20 and 25
    - …

5. a) 32×8
    b) $32 \div 8$

Whole Number Operations 7

1. Fill in the blank with < , = , or > to make each statement true.

   a) 4×0.5 _____ 2   b) $29 \div 14$ _____ 2

   d) $200 \div 21$ _____ 2

2. A group of students has a total of 30 pens. Six students have 1 pen each, 4 students have 3 pens each and the rest have 2 pens each. How many students have only 2 pens?

3. If the addition problem is correct, what number does the box cover?

   $$\begin{array}{r} 1410 \\ + \boxed{} \\ \hline 1600 \end{array}$$

4. For each number line, explain what you know about the value of the number at T.

   a)
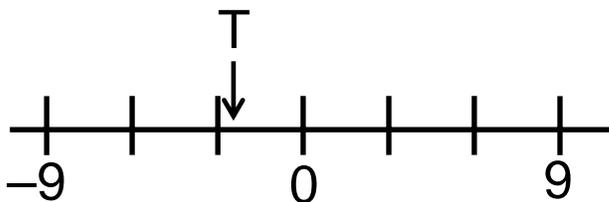
   b)
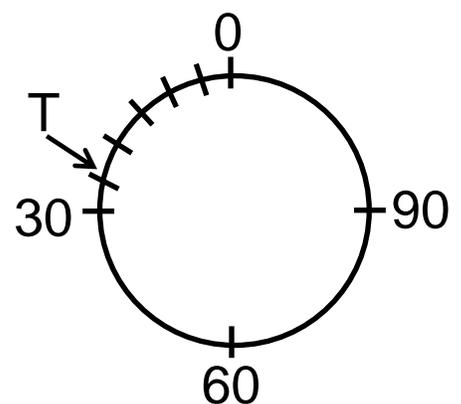
5. Use the digits 2, 3, and 8 to get the largest possible even answer.

   a) $\boxed{}\boxed{} \times \boxed{} =$ b) $\boxed{}\boxed{} \div \boxed{} =$