Number Sense Item Bank

Introduction


“Number sense refers to a person’s general understanding of number and operations along with the ability and inclination to make mathematical judgments and to develop useful and efficient strategies for managing numerical situations. It results in a view of numbers as meaningful entities and the expectation that mathematical manipulations and outcomes should make sense. Those who view mathematics in this way continually utilise a variety of internal “checks and balances” to judge the reasonableness of numerical outcomes. When an outcome conflicts with the perceived expectation, the person revisits the mathematical situation to view it externally, often through another lens, and attempts to resolve the conflict.

Number sense exhibits itself in various ways as the learner engages in mathematical thinking, including awareness of various levels of accuracy and sensitivity for the reasonableness of calculations. It is characterised by a desire to make sense of numerical situations, by looking for links between new information and previously acquired knowledge, and an innate drive within the learner to make the forming of these connections a priority.”

The items that follow were used in assessing student performance in number sense in four countries. Student ages ranged from 8 years to 14 years. The items assess a wide range of abilities in number sense.

Acknowledgement is made to the authors as mentioned above.

The answers to the items should be worked out mentally without recourse to use of the calculator or by writing anything on paper.

A comprehensive number sense development programme needs to accompany any use of items in a classroom situation.
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## Counting and Computation with Whole Numbers

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</table>
| 1 | About how many days has a child in year 1 at school lived? | A 200  
B 2000  
C 20 000  
D 200 000 |
| 2 | About how many triangles are there here? | A 20  
B 50  
C 100  
D 200  
E 400 |
| 3 | A school has 610 children. If 98 children are away on a trip, about how many are still at school? | A 400  
B 500  
C 600  
D 700 |
| 4 | Whitney has ten dollars. She has six dollars less than Rebecca does. How many dollars does Rebecca have? |   |
| 5 | Barb is a nine year old at my school. She says that she is 30 000 days old. Is that possible? Say why. | A Yes  
B No  
C Maybe.  
Tell how you decided.  |
| 6 | Without calculating the exact answer, circle the best estimate for:  
145 x 4 | A Greater than 450  
B Less than 450  
C Impossible to tell without calculating |
7. Without calculating the exact answer, circle the best estimate for:
   \[21 \times 19\]
   
   A 299  
   B 399  
   C 499  

8. Which two numbers multiplied together give an answer closest to the target number?
   \[4 \quad 18 \quad 50 \quad 37\]
   Target Number: 75
   
   _____ and _____

9. Which two numbers multiplied together give an answer closest to the target number?
   \[4 \quad 18 \quad 50 \quad 37\]
   Target Number: 1000
   
   _____ and _____

10. 930 \times 134 is equal to 124620. Use this to find the answer to:
    \[124620 \div 93\]
    
    ______________

11. A cat eats 600 g of fish in 4 days. How many grams will the cat eat in 6 days?
    
    A 400 g  
    B 600 g  
    C 800 g  
    D 900 g  
    E 1000 g

12. A trip took 6 hours travelling at an average speed of 80 kilometres per hour. The return trip took 4 hours. What was the average speed for the round trip?
    
    ______________

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Effect of Operations - Whole Numbers

13. The digits are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. Put one digit in each box so that the answer will be as big as possible. Note that digits 4, 2, 3, and 8 have already been used and therefore should not be used again. Use any digit only once.

   \[4\underline{\hspace{1cm}}\underline{\hspace{1cm}} - 238 = ?\]

14. The digits are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. Put one digit in each box so that the answer will be as big as possible. Note that digits 4, 3, 1, and 2 have already been used and therefore should not be used again. Use any digit only once.

   \[431 - 2\underline{\hspace{1cm}}\underline{\hspace{1cm}} = ?\]

15. Five bugs each have fifteen spots on their back. Which of these tells us how many spots there are altogether?

   A 5 + 15  
   B 15+15+15+15+15  
   C 15 + 5  
   D 5 + 5 + 5 + 5 + 5
16. When a 3 digit number is added to a 3 digit number the result is:

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<tr>
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<tbody>
<tr>
<td>A</td>
<td>always a 3 digit number</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>always a 4 digit number</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>always a 5 digit number</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>either a 3,4 or 5 digit number</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>either a 3 or 4 digit number</td>
<td></td>
</tr>
</tbody>
</table>

17. When a 2-digit number is multiplied by a 2-digit number, the result is:

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<tbody>
<tr>
<td>A</td>
<td>Always a 3 digit number</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Always a 4 digit number</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Either a 3 or 4 digit number</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Sometimes a 5 digit number</td>
<td></td>
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18. Austin has a $50 note and he spends $29. He gets $24 in change.
Which sum could he do to check if this is the right change?

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<tbody>
<tr>
<td>A</td>
<td>29 + 24</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>24 + 50</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>50 + 24</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>50 + 29</td>
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</table>

19. Without calculating the exact answer, circle the best estimate for: $45 \times 105$

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<tbody>
<tr>
<td>A</td>
<td>4000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>4600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>5200</td>
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**Equivalent Expressions - Whole Numbers**

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<tr>
<td>A</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>33</td>
<td></td>
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</tbody>
</table>

20. Jim has balanced some bags of marbles. The numbers show how many marbles are in each bag. How many marbles are in the bag marked A?
(Circle the correct answer)

21. Barbara has balanced some bags of marbles. The numbers show how many marbles are in the bags. How many marbles are in the bag marked M?

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<tr>
<td>B</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>42</td>
<td></td>
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</tbody>
</table>
22. The farmer has stored all his apples in 80 boxes with 40 apples in each box. He now needs to repack them all into 40 new boxes. How many apples will there be in each new box?

   A 2  
   B 40  
   C 80  
   D 120

23. Without calculating the exact answer, circle the largest answer.

   A 18 x 17  
   B 16 x 18  
   C 17 x 19

24. Without calculating answers, circle the expression that represents the larger amount.

   A 145 x 4  
   B 144+146+148+150

25. \[16 \times 0 = \boxed{\phantom{0}}\]

   The number in the box ...

   A must be 16  
   B must be 160  
   C must be 0  
   D could be any number

26. \[15 \times \boxed{\phantom{0}} = 15\]

   The number in the box ...

   A must be 0  
   B must be \(\frac{1}{15}\)  
   C must be 1  
   D must be 15  
   E could be any number

27. 93 x 134 is equal to 12462. Use this to write the answer to 93 x 135 _________.

28. Write > or = or < to make this a true statement. 456 ÷ 8 456 x \(\boxed{\phantom{0}}\) 456 x \(\frac{1}{8}\)

29. A four digit number is represented by \(\boxed{\phantom{0}}\). If \(\boxed{\phantom{0}} \div 30 > 40\), then which of these statements is true?

   A 30 x 40 > \(\boxed{\phantom{0}}\)  
   B 30 x 40 < \(\boxed{\phantom{0}}\)  
   C 30 x \(\boxed{\phantom{0}}\) < 40  
   D 40 x \(\boxed{\phantom{0}}\) < 30

30. Jim bought 3 sleeping bags at $98 each. How could he work out how much he spent?

   A 3 x $100 minus $1  
   B 3 x $100 minus $2  
   C 3 x $100 minus $3  
   D 3 x $100 minus $6

Multiple Representations - Whole Numbers

31. Estimate the number shown by each arrow:

   A \(\boxed{\phantom{0}}\)  
   B \(\boxed{\phantom{0}}\)  
   C \(\boxed{\phantom{0}}\)

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Page 5
### Number Concepts - Whole Numbers

<table>
<thead>
<tr>
<th>Question</th>
<th>Text</th>
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<tbody>
<tr>
<td>32</td>
<td>Here are five digits: 2, 6, 3, 5, 1. Arrange all these digits to make the smallest number possible. Use each digit only once.</td>
</tr>
<tr>
<td>33</td>
<td>Here are five digits: 2, 6, 3, 5, 1. Arrange them to make the number nearest to 20 000. Use each digit once.</td>
</tr>
<tr>
<td>34</td>
<td>There is a cross on the first circle. Put a cross on the seventh circle.</td>
</tr>
<tr>
<td>35</td>
<td>Thirty-four is the same as 34. Four hundred and three is the same as:</td>
</tr>
<tr>
<td>36</td>
<td>Thirty-four is the same as 34. Six thousand and ninety-two is the same as:</td>
</tr>
<tr>
<td>37</td>
<td>If I have $378 in my savings account and withdraw all my money what is the maximum number of 10 dollar notes would the bank be willing to give me?</td>
</tr>
</tbody>
</table>

### Counting and Computation - Fractions

<table>
<thead>
<tr>
<th>Question</th>
<th>Text</th>
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</thead>
<tbody>
<tr>
<td>38</td>
<td>Peter took one third of the apples from a bag. Here are Peter’s apples: 🍏🍏🍏🍏</td>
</tr>
</tbody>
</table>
| 39 | A watermelon is cut into quarters. Then each quarter is cut in half. How many pieces of watermelon are there now? Circle your answer. | A 2  
 B 4  
 C 6  
 D 8  
 | 40 | Austin had a $5 note which he changes into 20 cent coins. How many coins will he get? | A 4  
 B 5  
 C 9  
 D 20  
 E 25  
 | 41 | Use two of the numbers 3, 4, 9, 12 to make a fraction as close as possible to \( \frac{1}{2} \). |  

Number Concepts - Fractions

42 Without calculating, which total is more than 1?
   - A \(\frac{2}{5} + \frac{3}{7}\)
   - B \(\frac{1}{2} + \frac{4}{9}\)
   - C \(\frac{3}{8} + \frac{2}{11}\)
   - D \(\frac{4}{7} + \frac{1}{2}\)

43 Circle the number you can put in the box to make this sentence true:
   \(\frac{1}{2} \times \square = \frac{3}{6}\)
   - A \(\frac{2}{4}\)
   - B \(\frac{2}{3}\)
   - C 1
   - D 3

44 On the number line above, which letter best represents the following: A \times G

45 On the number line above, which letter best represents the following: B + F

Equivalent Expressions - Fractions

46 Write < or = or > to make this a true statement.
   \(5 \times 7\frac{1}{2} \square 35 + \frac{1}{2}\)

Multiple Representations - Fractions

47 About how much of this box is shaded? Give your answer as a fraction.

48 Shade \(\frac{3}{4}\) of this rectangle.
49 What fraction matches the letter X on this number line? Circle the correct answer.

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<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\frac{1}{2}$</td>
<td>$\frac{1}{3}$</td>
<td>$\frac{1}{7}$</td>
<td>$\frac{1}{5}$</td>
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50 Circle the fraction, which shows how much has been shaded.

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<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\frac{1}{2}$</td>
<td>$\frac{2}{6}$</td>
<td>$\frac{4}{6}$</td>
<td>$\frac{4}{2}$</td>
<td></td>
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</table>

51 Shade in one quarter of this rectangle.

52 Place the numbers $\frac{1}{10}$ and $\frac{4}{5}$ in their correct positions on this number line:

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<tr>
<td></td>
<td>0</td>
<td>1</td>
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53 You are going to walk once around a square-shaped field. You start at the corner marked S and move in the direction shown by the arrow. Mark with an X where you will be after $\frac{1}{3}$ of your walk.

54 Circle all the statements that are true about the number $\frac{2}{5}$.

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<td>A</td>
<td>B</td>
<td>C</td>
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</tr>
<tr>
<td></td>
<td>It is greater than $\frac{1}{2}$</td>
<td>It is the same as 2.5</td>
<td>It is equivalent to 0.4</td>
<td>It is greater than $\frac{1}{3}$</td>
<td></td>
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</tbody>
</table>

55 Which letter in the number line above names a fraction where the numerator is **slightly more** than the denominator?

|   |   |   |   |   |
|---|---|---|---|
|   | A | B | C | D |
|   | E | F | G |
|   | 0 | 1 | 2 | 3 |
Which letter in the number line above names a fraction where the numerator is *nearly* twice the denominator? ________________

Shade in two thirds (\(\frac{2}{3}\)) of this shape. 

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<td>60</td>
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<td>61</td>
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<tr>
<td>62</td>
</tr>
<tr>
<td>63</td>
</tr>
<tr>
<td>64</td>
</tr>
<tr>
<td>65</td>
</tr>
</tbody>
</table>
66 Circle all fractions listed here that are greater than \(\frac{3}{4}\) but less than 1.
\[
\begin{array}{cccccc}
\frac{2}{3} & \frac{5}{8} & \frac{4}{5} & \frac{7}{10} & \frac{4}{3}
\end{array}
\]

67 \(\frac{1}{3}\) is a fraction between \(\frac{1}{2}\) and \(\frac{1}{4}\). Name another fraction between \(\frac{1}{2}\) and \(\frac{1}{4}\).

<table>
<thead>
<tr>
<th>Counting and Computation - Decimals</th>
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</table>
| 68 Ten bottles of juice cost $7.95 at one store. I can get five bottles for $4.15 at a second store. Where is the juice cheaper - at the first or second store? | A First store  
B Second store  
Tell how you decided:  


<table>
<thead>
<tr>
<th>Effect of Operations - Decimals</th>
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</thead>
</table>
| 69 Without calculating the exact answer circle the best estimate for:  
\[29 \times 0.98\] | A more than 29  
B less than 29  
C impossible to tell without working it out |
| 70 Which is the greatest number? | A \(29 + 0.8\)  
B \(29 \times 0.8\)  
C \(29 \div 0.8\)  
D \(29 - 0.8\) |
| 71 Without calculating the exact answer, circle the best estimate for: \(87 \times 0.09\) | A a lot less than 87  
B a little less than 87  
C a little more than 87  
D a lot more than 87 |
| 72 Only one of the answers is correct. Without calculating, decide which one it is, and circle it. | A \(45 \times 1.05 = 39.65\)  
B \(4.5 \times 6.5 = 292.5\)  
C \(87 \times 1.076 = 93.61\)  
D \(585 \times 0.95 = 595.45\) |
| 73 Without calculating the exact answer, circle the best estimate for: \(54 \div 0.09\) | A a lot less than 54  
B a little less than 54  
C a little more than 54  
D a lot more than 54 |
| 74 Without calculating the exact answer, circle the best estimate for: \(29 \div 0.8\) | A less than 29  
B equal to 29  
C greater than 29  
D impossible to tell without calculating |
75. Mary had $426 and spent 0.9 of it on clothes. Without calculating the exact answer, circle the best estimate for how much she spent.

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<tbody>
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<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>slightly less than $426</td>
<td>much less than $426</td>
<td>slightly more than $426</td>
<td>impossible to tell without calculating</td>
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**Equivalent Expressions - Decimals & Mixed**

76. 0.5 x 840 is the same as

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<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>840 ÷ 2</td>
<td>5 x 840</td>
<td>5 x 8400</td>
<td>840 ÷ 5</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>0.50 x 84</td>
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77. Circle the number which can be put in both boxes to make the sentence true:

243 x □ = □ x 24.3

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<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
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<tr>
<td></td>
<td>0</td>
<td>0.1</td>
<td>1</td>
<td>10</td>
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**Multiple Representations - Decimals and Mixed**

78. Place the numbers 0.1 and 0.8 in their correct positions on this number line.

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79. Which letter on the number line above best represents 2.19?

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<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
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80. Estimate the decimal shown by the arrow on the number line:

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81. Estimate the decimal shown by the arrow on the number line:

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<td>Question</td>
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| 82 | Circle the decimal which best represents the amount of the box shaded. | A 0.018  
B 0.15  
C 0.4  
D 0.801  
E 0.52 | A 0.15 |
| 83 | Circle the decimal which best represents the amount of the box shaded. | A 0.018  
B 0.15  
C 0.45  
D 0.801  
E 0.52 | B 0.15 |
| 84 | Estimate the decimal shown by the arrow on the number line: | | 0.01 |
| 85 | Put these numbers in order, starting with the smallest on the top row. | 0.595  
\( \frac{3}{5} \)  
61%  
0.3  
30.5% | 0.3  
\( \frac{3}{5} \)  
61%  
0.3  
30.5% |

**Number Concepts - Decimals**

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<td>86</td>
<td>For a long time Jane has been putting only 10 cent coins in her piggy bank. Last night she opened it and counted her money. She had $46.70. How many 10 cent coins were in the bank?</td>
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| 87 | Scott ran 100 metres in 14.52 seconds. Kelly took 2 tenths of a second longer. How long did it take Kelly to run 100 metres? | A 34.52 seconds  
B 16.52 seconds  
C 14.72 seconds  
D 14.54 seconds  
E 14.50 seconds | C 14.72 seconds |
| 88 | How many different decimals are there between 1.52 and 1.53? Circle your answer and, if there is a blank, fill it in. | A None.  
B One. What is it?  
C A few. Give two: and  
D Lots. Give two: and | D Lots. Give two: and |
### Counting and Computation - Percentages

| 89 | A student increased his exam score from 40 to 50. What percentage increase is this? | A 10%  
B 25%  
C 50%  
D 90% |
| 90 | Last week a diary cost $4.50. This week there is 10% off the cost of all diaries. What is the cost of the diary this week? | ____________ |

### The Effect of Operations Percentages

| 91 | Mary had $426 and spent 90% of the money on clothes. *Without calculating an exact answer*, circle the best estimate for how much she spent. | A slightly less than $426  
B much less than $426  
C slightly more than $426  
D impossible to tell without calculating |
| 92 | A tank holds 1000 fish. If I increase the number by 50%, how many fish will there be now in the tank? | A 500  
B 1050  
C 1500  
D 2000 |
| 93 | Dale had $150. She spent 100% of it. How much money did she have left? | A $0  
B $50  
C $100  
D $150  
E $250  
F $300 |
Answers

= means approximately equal to.
Answers are in plain type.
Explanations are in Italics.

1 B.
2 E.
3 B.
4 $16
5 B. 9 \times 365 \approx 10 \times 300 = 3000
6 A. 145 \times 4 \approx 150 \times 4 = 600 > 450
7 B. 21 \times 19 \approx 20 \times 20 = 400 \approx 399
8 4 and 18. 4 \times 18 = 72
9 18 and 50. 18 \times 50 = 20 \times 50 = 1000
10 1340. 124620 \div 930 = 134. So 124620 \div 93 is ten times larger.
11 D. The cat eats 300 grams in two days. So it eats 900 grams in six days.
12 96 km/h. Outward trip is 6 \times 80 = 480 km. So the total distance is 2 \times 480 = 960 km.
   Total time = 10 hours.
   So average = 960 \div 10 = 96 km/h.
13 First box has 9 and second box has 7.
14 First box has 0 and second box has 5.
15 B.
16 E. Smallest possible answer is 100 + 100 = 200 which has 3 digits, and
   the largest is 999 + 999 = 1998 which has 4 digits.
17 C. Smallest possible answer is 10 \times 10 = 100 which has 3 digits, and the largest is
   99 \times 99 which has 4 digits.
18 A.
19 B. 45 \times 105 is a bit more than 45 \times 100 = 4500 = 4600.
20 C.
21 D.
22 C. 80 lots of 40 = 40 lots of 80.
23 C.
24 B. 145 \times 4 = 4 \times 145 = 145 + 145 + 145 + 145 < 144 + 146 + 148 + 150.
25 C. Any number times zero is zero.
26 C.
27 12555.
28 = . Division by eight is the same as multiplying by an eighth.
29 B.
30 D. 3 \times 98 = 3 \times 100 - 3 \times 2.
31 A \approx 100, B \approx 450 and C \approx 700.
32 12356
33 21356.
34
35 403
36 6092
37 37
38 12. Each third is 4 apples. There are 3 thirds originally. So 3 \times 4 = 12.
39 D.
40 E.
41 \frac{4}{5}
42 D. \frac{4}{7} is over \frac{1}{2}. So \frac{4}{7} + \frac{1}{2} > \frac{1}{2} + \frac{1}{2} = 1
43 C. \frac{1}{2} = \frac{3}{6}. And multiplying by 1 leaves any number unchanged.
44 B.
45 G.
46 >. 5 \times \frac{7}{2} = 5 \times 7 + 5 \times \frac{1}{2}
   = 35 + 2 \frac{1}{2}
   > 35 + \frac{1}{2}
47 About \frac{1}{5}.
48
49 D.
50 A
51
52
C and D true.

D.

E.

There are infinitely many answers. Examples: $\frac{2}{3}$ and $\frac{4}{5}$.

A.

$\frac{9}{12}$

D. (Infinite number actually.) Examples: $\frac{1}{2}$ and $\frac{9}{20}$.

$\frac{17}{8}$ or $\frac{18}{8}$ or $\frac{19}{8}$ or $\frac{20}{8}$ or $\frac{21}{8}$ or $\frac{22}{8}$ or $\frac{23}{8}$

There are infinitely many answers. In all cases denominator > 10 x numerator.

$\frac{4}{5}$

There are infinitely many answers. In all cases Denominator > 2 x numerator. *And* Denominator < 4 x numerator

A. Ten bottles at second store costs $2 \times 4.15 = $8.30 > $7.95

B. 0.98 is just a little less than 1. Multiplying by a number just under 1 reduces the number a little.

C. Dividing by a number just less than 1 increases the answer a little.

A. 9 hundredths times 87 is a lot less than 87.

C. 87 x 1.076 is a number just over 87.

D. 0.09 is a small number. Dividing by a small number creates much larger numbers.

C.

A.

A. 0.5 x 840 = half of 840 = 840 ÷ 2.