Appalachian Rural Systemic Initiative

Diagnostic Mathematics Tests

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Instructions

The Diagnostic Mathematics Tests were designed to be end-of-the-year tests to assess how well students at the respective grade levels understood and could apply content that they would be expected to master. Each of the items is correlated to major content indicators that should be taught during the specified grade level. In order to fairly determine understanding, however, most of the test items are written at a level of difficulty that is higher than commonly found in many textbooks. Mastery tests normally require 3 or more items per concept in order to assign mastery. In order to shorten this test to a reasonable time, the decision was made to make this a diagnostic test rather than a mastery test, i.e., responses should give some indication of whether a student has understanding of a concept or skill, but it does not assure mastery – the items will provide some indication of skills/concepts a student does not know, but should.

These tests can also be used as pre-tests with the understanding that few students would be expected to perform well on most items. If, however, there were items on which most students were successful, then that topic could be eliminated (other than possible review) from the instructional sequence for that year. Any students who did not demonstrate mastery on these topics could receive instruction individually in class or in Extended School Service programs.

As with the CATS tests, there is no set time limit with these tests. As long as students are working and making satisfactory progress, they should be allowed to continue completing the test. The administration of the End-of-Primary Test is different. It is expected that the teacher read this test to the students, pausing after each question has been read twice to allow all students to indicate that they have completed the question (or decided to skip it) before proceeding. Teachers can develop various methods for students to be able to provide this indication (pencils down, eyes toward the teacher, cup turned over, etc.)

The Fourth, Fifth, Sixth Grade and Pre-Algebra Diagnostic Mathematics Tests can either be answered on scannable answer sheets or the answers can be circled on the test packet. The End-of-Primary Test is to be answered on the test form. Before beginning each test, the teacher should model how to ”bubble in” the circle on the End-of-Primary Test or on the scannable answer sheets if they are used in the other grade levels. In addition, all tests require some of the answers be written and scored using a rubric. It is suggested that a blank sheet of paper be provided to students in grades 4-7 to answer these specific questions. The teacher administering the test needs to model how to provide the answers to these types of questions, i.e., number the response according to the problem number, label any drawings, tables, or graphs according to the appropriate problem number, etc.

For the purposes of this test, calculators should not be used.
Special Instructions Specific to the First Grade Diagnostic Mathematics Test

Directions to Teacher:

This is a “power” test, i.e., it is not a timed test. Teachers need to dictate the test – allowing time for all students to answer each question before proceeding. The test items include only those objectives that the students should have had practice with, i.e., those skills/concepts at the Practice or Mastery Level. The objective is to determine which of these first grade skills/concepts the students show understanding versus which need continued development.

The solutions to the problems are correlated to Core Content for Assessment – Grade 5, Version 3.0. The problems are representative of the skills/concepts with which first grade students should have had practice – and many that they should have mastered – as prerequisites for the related fifth grade assessed objectives.
First Grade Diagnostic Mathematics Test

Directions: Shade in the circle below the correct answer.

1. Look at the calendar below. On what day of the week is the 20th?

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
<td>21</td>
<td>22</td>
</tr>
<tr>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>27</td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A Sunday  O Monday  O Tuesday  O Wednesday  O Thursday  O Friday  O Saturday  O

2. Count the tally marks. How many tally marks are there?

A 16 O  B 34 O  C 7 O  D 19 O
Below is part of a number chart. Use it to answer questions 3 – 5.

<table>
<thead>
<tr>
<th></th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
<th>27</th>
<th>28</th>
<th>29</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>31</td>
<td>32</td>
<td>33</td>
<td>34</td>
<td>35</td>
<td>36</td>
<td>37</td>
<td>38</td>
<td>39</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>41</td>
<td>42</td>
<td>43</td>
<td>44</td>
<td>45</td>
<td>46</td>
<td>47</td>
<td>48</td>
<td>49</td>
<td>50</td>
</tr>
</tbody>
</table>

3. What number should replace the ●?

<table>
<thead>
<tr>
<th></th>
<th>30</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>B</td>
<td>C</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30</td>
<td></td>
<td>31</td>
<td></td>
<td>44</td>
<td></td>
<td>None of these</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. What number should replace the ◆?

<table>
<thead>
<tr>
<th></th>
<th>30</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>B</td>
<td>C</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30</td>
<td></td>
<td>31</td>
<td></td>
<td>44</td>
<td></td>
<td>None of these</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. What number should replace the ♥?

<table>
<thead>
<tr>
<th></th>
<th>30</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>B</td>
<td>C</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30</td>
<td></td>
<td>31</td>
<td></td>
<td>44</td>
<td></td>
<td>None of these</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Which figure below is half-shaded?

|   |   |   |   |   |
|---|---|---|---|
| A | B | C | D |
| O | O | O | O |
7. Which of the following has a sum of 9?

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3</td>
<td>B</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>+ 6</td>
<td></td>
<td>+ 3</td>
</tr>
<tr>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

8. Sharon counted six blue balls and eight red balls. Which number sentence shows how many she counted in all?

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8 – 6 = 2</td>
<td>B</td>
<td>6 + 8 = 14</td>
</tr>
<tr>
<td></td>
<td>O</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>C</td>
<td>6 + 2 = 8</td>
<td>D</td>
<td>None of these</td>
</tr>
<tr>
<td></td>
<td>O</td>
<td></td>
<td>O</td>
</tr>
</tbody>
</table>

9. Which day of the week comes right after Tuesday?

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Monday</td>
<td>B</td>
<td>Sunday</td>
</tr>
<tr>
<td></td>
<td>O</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>C</td>
<td>Thursday</td>
<td>D</td>
<td>None of these</td>
</tr>
<tr>
<td></td>
<td>O</td>
<td></td>
<td>O</td>
</tr>
</tbody>
</table>
10. \[
\begin{array}{c}
10 \\
- 8
\end{array}
\]

is:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

- O

11. What time is shown on this clock face?

A 8 o’clock
B 7 o’clock
C 12 o’clock
D Half past 7

12. \[
\begin{array}{c}
2 \\
+7
\end{array}
\]

? 

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>8</td>
</tr>
</tbody>
</table>

- O

Revised December 17, 2001  8
13. What are the next three numbers in this pattern?

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>26, 27, 28, ___ , ___ , ___</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>28, 29, 30</td>
<td>O</td>
</tr>
<tr>
<td>B</td>
<td>30, 31, 32</td>
<td>O</td>
</tr>
<tr>
<td>C</td>
<td>25, 24, 23</td>
<td>O</td>
</tr>
<tr>
<td>D</td>
<td>29, 30, 31</td>
<td>O</td>
</tr>
</tbody>
</table>

14. What are the next three numbers in this pattern?

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>14, 16, 18, ___ , ___ , ___</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>19, 21, 23</td>
<td>O</td>
</tr>
<tr>
<td>B</td>
<td>20, 22, 24</td>
<td>O</td>
</tr>
<tr>
<td>C</td>
<td>19, 20, 21</td>
<td>O</td>
</tr>
<tr>
<td>D</td>
<td>20, 21, 22</td>
<td>O</td>
</tr>
</tbody>
</table>

15. What are the next three numbers in this pattern?

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20, 19, 18, ___ , ___ , ___</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>19, 20, 21</td>
<td>O</td>
</tr>
<tr>
<td>B</td>
<td>20, 22, 24</td>
<td>O</td>
</tr>
<tr>
<td>C</td>
<td>17, 16, 15</td>
<td>O</td>
</tr>
<tr>
<td>D</td>
<td>10, 9, 8</td>
<td>O</td>
</tr>
</tbody>
</table>

16. James found five pennies yesterday. He found four more today. How many pennies does he have now?

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>54 pennies</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 pennies</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 pennies</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 pennies</td>
<td>O</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
17. Billy put a toy on a sheet of paper. He then drew around it. Which shape did he draw?

<table>
<thead>
<tr>
<th></th>
<th>Circle</th>
<th>Square</th>
<th>Rectangle</th>
<th>Oval</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>B</td>
<td>O</td>
<td></td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>C</td>
<td>O</td>
<td>O</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>D</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

18. Which shape is a side of this box?

<table>
<thead>
<tr>
<th></th>
<th>Diamond</th>
<th>Oval</th>
<th>Rectangle</th>
<th>Triangle</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>O</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>B</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>C</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>D</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

19. How many pennies equal one nickel?

<table>
<thead>
<tr>
<th></th>
<th>5</th>
<th>10</th>
<th>25</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>B</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>C</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>D</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

20. One quarter is equal to how many pennies?

<table>
<thead>
<tr>
<th></th>
<th>5</th>
<th>10</th>
<th>25</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>B</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>C</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>D</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
21. What time is shown on this clock face?

A  8:30  
   O

B  9:30  
   O

C  6:30  
   O

D  6:10  
   O

22. Which number below is the number eighty-six?

A  68  
   O

B  806  
   O

C  86  
   O

D  None of these  
   O

23. Each of these boxes has three numbers. Which box has only odd numbers?

A  5, 9, 13  
   O

B  4, 8, 12  
   O

C  1, 2, 3  
   O

D  10, 30, 50  
   O
### Question 24.
Which number is one less than 79?

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>77</td>
<td>80</td>
<td>78</td>
<td>69</td>
</tr>
<tr>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

### Question 25.
Eric has one dime and three pennies.
Jennifer has three nickels.
Robin has one quarter.
Who has more?

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Eric</td>
<td>B</td>
<td>Jennifer</td>
<td>C</td>
</tr>
<tr>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

### Question 26.
Which symbol goes in the box to make this a true statement?

\[17 \quad \square \quad 23\]

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>&gt;</td>
<td>&lt;</td>
<td>=</td>
<td>→</td>
</tr>
<tr>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

### Question 27.
Subtract 17 – 9.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>12</td>
<td>8</td>
<td>26</td>
<td>Not here</td>
</tr>
<tr>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
28. Which shape should go in the box with the others?

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

29. A ♥ is inside which shape?

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>
30. How many inches long is this object?

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

The object is 3 inches long.
Solutions to First Grade Diagnostic Mathematics Test

1. C Thursday (E-2.2.6) Calendar [If the student selected a different answer, either s/he did not recognize the relationship between the number, 20, and the ordinal number, 20th; or the student cannot read a calendar/chart.]

2. D 19 (E-3.2.3) Interpret data [If the student answered 16, s/he recognized only four groups of 4; if the student selected 34, s/he thought the tally groups represented ten; if the student chose 7, s/he saw each group as one whole and then added four more to this for a total of 7.]

[Questions 3 – 6, if the students selected different answers from those which were correct, s/he is unable to read a place value chart and unable to recognize number patterns.]

3. C 44 (E-1.1.4) Place value

4. B 31 (E-1.1.4) Place value

5. A 30 (E-1.1.4) Place value

6. B \(\frac{3}{6}\) (E-1.1.1) Concept of fraction [If the student selected a different result, s/he does not understand “half.”]

7. A \(\frac{3}{6}\) (E-1.1.2) Add whole numbers [If the student made a different choice, does not know this basic fact.]

8. B 6 + 8 = 14 (E-4.2.3) Number sentences [If the student made a different choice, s/he cannot translate from a verbal statement to a number sentence; or, does not understand the phrase “in all.”]

9. D None of these (Wednesday) (E-2.2.6) Calendar [If the student was incorrect, s/he does not know the days of the week in order.]

10. C 2 (E-1.2.2) Subtract whole numbers [If incorrect, the student does not know the basic fact.]

11. B Seven o’clock (E-2.2.6) Time to the hour

12. A 9 (E-1.1.2) Add whole numbers
13. D  29, 30, 31  
(E-4.2.1) *Extend number patterns*  [If the student selected 28, 29, 30, s/he has difficulty with counting on patterns; if the student selected 30, 31, 32, s/he may not know how to count on with larger numbers; if the student answered 25, 24, 23, s/he failed to recognize the pattern and counted backwards.]

14. B  20, 22, 24  
(E-4.2.1) *Extend number patterns; skip counting*  [If the student selected 19, 21, 23, s/he recognized that the numbers differed by two, but did not recognize they were all even; if the student selected 19,20, 21, s/he counted on from 18 without recognizing that the pattern was every other number – the even numbers; if the student selected 20, 21, 22, s/he recognized that the next even number was 20, but failed to continue the pattern of evens.]

15. C  17, 16, 15  
(E-4.2.1) *Extend number patterns; count backwards from 20*  [If the student selected 19, 20, 21, s/he continued counting on from 18 without recognizing that the pattern was counting backwards; if the student chose 20, 22, 24, s/he perceived the pattern to be even numbers from 18; if the student picked 10, 9, 8, s/he recognized that the pattern was counting backwards, but did not continue on from 18.]

16. B  9 pennies  
(E-1.2.2) *Add whole numbers*  [If the student selected 54, s/he does not understand place value; if the student selected 8 pennies or 10 pennies, s/he missed the addition fact.]

17. D Oval  
(E-2.1.2) *Basic 2-dimensional shapes*  [If incorrect, the student can recognize neither an oval or the answer selected.]

18. C Rectangle  
(E-2.1.2) *Basic 2-dimensional shapes*  [If incorrect, the student can recognize neither a rectangle – in the context of a 3-dimensional shape – nor the shape s/he identified as the answer.]

19. A  5  
(E-2.2.6) *Money*  [If incorrect, the student does not know the value of either (or both) a penny or a nickel.]

20. C  25  
(E-2.2.6) *Money*  [If incorrect, the student does not know the value of either (or both) a quarter or a penny.]

21. B  9:30  
(E-2.2.6) *Measure time to the half hour*  [If the student selected 6:10, then s/he reads the clock face backwards; if s/he selected 6:30 or 8:30, s/he understands that the hand on
the six means “thirty” but does not know how to read the rest of the time.]

22. C 86  
(E-1.2.1) *Read whole numbers*  [If the student selected 68, s/he may be dyslexic and read the digits backwards; if s/he selected 806, s/he does not know place value.]

23. A 5, 9, 13  
(E-1.1.3) *Even and odd numbers*  [If the student selected 4, 8, 12 or 1, 2, 3, s/he does not understand the concept of odd; if s/he selected 10, 30, 50, she does not know how to interpret the 0’s with the numbers but likely knows the concept of odd.]

24. C 78  
(E-1.2.4) *Skip count forward and backward; one less than*  [If the student made a different choice, s/he does not know the concept “one less than.”]

25. C Robin  
(E-2.2.6) *Money*  [If the student was incorrect, either s/he does not know the value of the coins, or – more likely – cannot hold in place a multistep problem or developed a procedure to record the steps.]

26. B <  
(E-1.3.1) *Compare and order numbers*  [If incorrect, the student does not understand the order symbol.]

27. B 8  
(E-1.2.2) *Subtract whole numbers*  [If incorrect, the student either does not know the basic fact or does not recognize it when written horizontally.]

28. D  
(E-2.2.1) *Sort by attributes*  [If incorrect, the student is unable to extend patterns of shape and color.]

29. C  
(E-2.1.1) *Basic geometric elements (spatial relationships)*  [If incorrect, the student does not understand the concept of “inside.”]

30. C 3  
(E-2.2.5) *Use standard units to measure length*  [If incorrect, the student cannot read a ruler.]
Special Instructions Specific to the
Second Grade Diagnostic Mathematics Test

Directions to Teacher:

This is a “power” test, i.e., it is not a timed test. Teachers need to allow time for all students to answer each question before proceeding to the next question. For example, the teacher can ask each student to put his/her pencil down when a problem is finished. Then, the students can be instructed to answer the next question. The test items include only those objectives which the students should have had practice with, i.e., those skills/concepts at the Practice or Mastery Level. The objective is to determine which of these second grade skills/concepts the students show understanding versus which need continued development.

The solutions to the problems are correlated to Core Content for Assessment – Grade 5, Version 3.0. The problems are representative of the skills/concepts with which second grade students should have had practice— and many that they should have mastered — as prerequisites for the related fifth grade assessed objectives. Most are also relevant to the third grade Terra Nova assessment although no correlation is provided.
Second Grade Diagnostic Mathematics Test

Directions: Shade in the circle below the correct answer.

1. Find the sum.  
   \[ \begin{array}{c} 24 \\ + \ 7 \end{array} \]

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>94</td>
<td>21</td>
<td>211</td>
<td>31</td>
</tr>
</tbody>
</table>

2. Find the sum: 63¢ + 34¢.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>97¢</td>
<td>31¢</td>
<td>91¢</td>
<td>67¢</td>
</tr>
</tbody>
</table>

3. Jessica read 43 pages of her book on Monday. On Tuesday, she read another 28 pages. On Wednesday, she read 19 more pages to finish the book. How many pages did Jessica read all together?

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>71</td>
<td>80</td>
<td>90</td>
<td>None of these</td>
</tr>
</tbody>
</table>

4. What fraction of this object is shaded?

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/3</td>
<td>3/4</td>
<td>1/4</td>
<td>None of these</td>
</tr>
</tbody>
</table>

5. What number does this picture represent?

```
100 100 100 10 1 1 1 1
```

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>324</td>
<td>300204</td>
<td>30204</td>
<td>None of these</td>
</tr>
</tbody>
</table>

6. Three of these are fact family number sentences for the numbers 3, 5, and 8? Which is **not**?

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 + 5 = 8</td>
<td>8 = 5 + 3</td>
<td>8 − 3 = 5</td>
<td>3 + 5 + 8</td>
</tr>
<tr>
<td></td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
7. 5 hundreds, 8 tens, and 3 ones is the same as which of these numbers?

<table>
<thead>
<tr>
<th></th>
<th>A 500803</th>
<th>B 583</th>
<th>C 16 hundreds</th>
<th>D None of these</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. The 14\textsuperscript{th} of a certain month is on a Tuesday. What is the day of the next Tuesday?

<table>
<thead>
<tr>
<th></th>
<th>Sun</th>
<th>Mon</th>
<th>Tu</th>
<th>Wed</th>
<th>Th</th>
<th>Fri</th>
<th>Sat</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>A 20\textsuperscript{th}</td>
<td>B 21\textsuperscript{st}</td>
<td>C 22\textsuperscript{nd}</td>
<td>D None of these</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. Which of these is a correct number sentence?

<table>
<thead>
<tr>
<th></th>
<th>A 15&lt;12</th>
<th>B 26&lt;21</th>
<th>C 54&gt;36</th>
<th>D 19&gt;27</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
10. If you count on, what are the next three numbers in this pattern?

<p>| | | | | | | | | |</p>
<table>
<thead>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>129, 130, 131</td>
<td>O</td>
<td>B</td>
<td>127, 126, 125</td>
<td>O</td>
<td>C</td>
<td>226, 227, 228</td>
<td>O</td>
</tr>
</tbody>
</table>

11. The number 242 can best be described as a/an:

<p>| | | | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Odd number</td>
<td>O</td>
<td>B</td>
<td>Multiple of 5</td>
</tr>
</tbody>
</table>

12. Cindy gets $5.00 each day to take care of her little sister. How many days will it take her to have $40?

<table>
<thead>
<tr>
<th>Days</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dollars</td>
<td>$5</td>
<td>$10</td>
<td>$15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<p>| | | | | | | | | |</p>
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<tbody>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>8</td>
<td>O</td>
<td>B</td>
<td>25</td>
<td>O</td>
<td>C</td>
<td>9</td>
<td>O</td>
</tr>
</tbody>
</table>
13. What is $52 - 28$?

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>36</td>
<td>24</td>
<td>34</td>
<td>26</td>
</tr>
</tbody>
</table>

14. What number is shown by this chart?

<table>
<thead>
<tr>
<th></th>
<th>Hundreds</th>
<th>Tens</th>
<th>Ones</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>[diagram of hundreds]</td>
<td>[diagram of tens]</td>
<td>[diagram of ones]</td>
</tr>
<tr>
<td>B</td>
<td>[diagram of hundreds]</td>
<td>[diagram of tens]</td>
<td>[diagram of ones]</td>
</tr>
<tr>
<td>C</td>
<td>[diagram of hundreds]</td>
<td>[diagram of tens]</td>
<td>[diagram of ones]</td>
</tr>
<tr>
<td>D</td>
<td>[diagram of hundreds]</td>
<td>[diagram of tens]</td>
<td>[diagram of ones]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>300605</td>
<td>3651</td>
<td>365</td>
<td>3605</td>
</tr>
</tbody>
</table>
15. What is $9 + 6$?

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15</td>
<td>14</td>
<td>16</td>
<td>3</td>
</tr>
</tbody>
</table>

16. If $6 + 7 = 13$, then which statement below must be true?

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$13 &gt; 10$</td>
<td>$6 &lt; 7$</td>
<td>$7 + 9 = 16$</td>
<td>$13 - 7 = 6$</td>
</tr>
</tbody>
</table>

17. Find the difference: $40¢ - 28¢$

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>28¢</td>
<td>22¢</td>
<td>12¢</td>
<td>18¢</td>
</tr>
</tbody>
</table>

18. One face of this object is shaded with a checkerboard pattern. What is the shape of this face?

A  Diamond  O  B  Square  O  C  Rectangle  O  D  Triangle  O

19. What number should go in the box in the sentence 13 - □ = 5 to make it true?

A  18  O  B  8  O  C  12  O  D  7  O

20. Which of these figures is a cylinder?

A  O  B  O  C  O  D  O
21. What time is shown on this clock face?

A 5:12
B 2:25
C 2:05
D 5:23

22. What temperature is shown on this thermometer?

A 33º
B 36º
C 35º
D 37º
23. When 10 is added to four hundred thirty-four, the sum is:

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td><strong>B</strong></td>
<td><strong>C</strong></td>
<td><strong>D</strong></td>
</tr>
<tr>
<td>534</td>
<td>435</td>
<td>444</td>
<td>4314</td>
</tr>
</tbody>
</table>

24. Which city on the table at the right has the warmest temperature?

<table>
<thead>
<tr>
<th>City</th>
<th>High</th>
<th>low</th>
<th>Precipitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago</td>
<td>85</td>
<td>65</td>
<td>6</td>
</tr>
<tr>
<td>Denver</td>
<td>87</td>
<td>57</td>
<td>3</td>
</tr>
<tr>
<td>Miami</td>
<td>89</td>
<td>78</td>
<td>2</td>
</tr>
<tr>
<td>New Orleans</td>
<td>90</td>
<td>76</td>
<td>8</td>
</tr>
<tr>
<td>New York</td>
<td>83</td>
<td>68</td>
<td>9</td>
</tr>
<tr>
<td>Washington</td>
<td>86</td>
<td>69</td>
<td>5</td>
</tr>
</tbody>
</table>

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td><strong>B</strong></td>
<td><strong>C</strong></td>
<td><strong>D</strong></td>
</tr>
<tr>
<td>New Orleans</td>
<td>New York</td>
<td>Chicago</td>
<td>Miami</td>
</tr>
</tbody>
</table>

Revised December 17, 2001 27
25. According to the graph above, which counting book was the class’s favorite?

<table>
<thead>
<tr>
<th>Counting Book</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Anno’s Counting Book</td>
<td>O</td>
</tr>
<tr>
<td>The Right Number of Elephants</td>
<td>O</td>
</tr>
<tr>
<td>One Hundred Hungry Ants</td>
<td>O</td>
</tr>
<tr>
<td>Counting on Frank</td>
<td>O</td>
</tr>
</tbody>
</table>

26. How much money is this altogether?

<table>
<thead>
<tr>
<th>Amount (cents)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A, 74¢</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>B, 62¢</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>C, 71¢</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>D, 89¢</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>
27. Brad bought a small toy. It cost 39¢. He paid for it with two quarters. Which of these shows the change he received?

A  
B  
C  
D

28. Which shape should go in the set with the three others?

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
29. How long is this crayon to the nearest half-centimeter?

![Crayon measurement diagram]

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>6 cm</td>
<td>6 ½ cm</td>
<td>7 cm</td>
<td>7 ½ cm</td>
<td></td>
</tr>
</tbody>
</table>

30. Look at this picture. Count from left to right. Mikayla is in what position?

![Children in a row]

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>5th</td>
<td>4th</td>
<td>6th</td>
<td>7th</td>
<td></td>
</tr>
</tbody>
</table>

Revised December 17, 2001
Solutions to Second Grade Diagnostic Mathematics Test

1. D 31 (E-1.2.2) Add whole numbers [If the student answered 94, then s/he doesn’t recognize place value position; if the student answered 21, then s/he has failed to rename to the tens place; if the student answered 211, then s/he doesn’t understand place value.]

2. A 97¢ (E-1.2.2) Add whole numbers [If the student answered 31¢, then s/he has subtracted the digits; if the student answered 91¢, then s/he added the tens but subtracted the ones; if the student answered 67¢, s/he added the ones, but failed to add the tens.

3. C 90 (E-1.2.2) Add whole numbers; column addition [If the student answered 71, then s/he added only the first two numbers (43 and 28); if the student answered 80, s/he failed to rename correctly.]

4. B $\frac{3}{4}$ (E-1.1.1) Concept of fraction [If the student answered $\frac{1}{3}$, then s/he expressed the ratio of white region to shaded region and not the whole; if the student answered $\frac{1}{4}$, s/he reversed the answer, i.e., answered what part is not shaded.]

5. A 324 (E-1.1.4) Place value [If the student answered 300204, s/he does not understand the concept of place value, but writes each place as a separate sum; if the student answered 30204, s/he does not understand place value and uses 0’s as place holders between the place value positions.]

6. D 3 + 5 + 8 (E-1.1.2) The operations of addition and subtraction [If the student gave any other answer, s/he doesn’t understand that only 3 + 5 + 8 is not a number sentence.]

7. B 583 (E-1.1.4) Place value; expanded notation [If the student answered 500803, s/he doesn’t understand the concept of place value, but writes each position separately; if s/he selected 16 hundreds, s/he added all of the digits and wrote the 16 with the largest place value position.]

8. B 21st (E-2.2.6) Calendar; (E-4.2.1) Extend number patterns [If the student selected either the 20th or the 22nd, s/he did not count on correctly from 14.]
9. C 54 > 36  (E-1.3.1) **Compare and order numbers**  [If the student selected a different response, s/he does not know the correct order relationship expressed by the >, < symbols.]

10. A 129, 130, 131  (E-1.2.4) **Skip count; counting on from larger addend**  [If the student selected 127, 126, 125, s/he counted backwards; if the student selected 226, 227, 228, s/he focused on the pattern of the tens and ones together and not on the principle of counting on.]

11. C **Even number**  (E-1.1.3) **Even and odd numbers; multiples**  [If the student selected odd number, s/he either doesn’t understand the concept of even/odd or – more specifically – thought that since there were three digits, then the number was odd; if the student chose multiple of 5, s/he does not understand the concept of multiple; if the student selected decade number, s/he was unlikely to understand any of the terms well and chose the term with which s/he was least familiar.]

12. A 8  (E-1.2.4) **Skip count**;  (E-4.2.1) **Extend number patterns**;  (E-4.2.2) **Create tables to analyze number patterns**  [If the student selected 25, s/he subtracted 15 from 40 (or counted on); if the student chose 9, s/he added incorrectly; if she selected 5, it was because s/he counted on 5 more times (or spaces) and did not read the table correctly.]

13. B 24  (E-1.2.2) **Subtract whole numbers**  [If the student answered 36, s/he subtracted each of the smaller digits from the larger digits; if the student selected 34, s/he forgot to rename the tens place; if the student answered 26, s/he guessed without understanding.]

14. C 365  (E-1.1.4) **Place value**  [If the student answered 300605, s/he writes each sum without regard to place value notation; if the student selected 3651 or 3605, s/he has seen place value notation represented symbolically, but has not had enough concrete experience.]

15. A 15  (E-1.2.2) **Add whole numbers**  [If the student selected any other answer, s/he does not know the basic fact – nor does s/he have the confidence or ability to obtain the answer by another procedure, e.g., counting on.]

16. D 13 − 7 = 6  (E-1.2.2) **Add and subtract whole numbers** (fact families)  [If the student selected a different answer, s/he may
know order relations, but does not understand the concept of fact families and their relationships.]

17. C  12¢
   (E-2.2.6)  Money  [If the student selected 28¢, s/he subtracted the smaller digits from the larger; if the student selected 22¢, s/he forgot to rename in the tens place; if the student selected 18¢, s/he was guessing using the digits in the problem.]

18. D  Triangle
   (E-2.1.2)  Basic 2-dimensional shapes; (E-2.1.1)  Basic 2-dimensional elements  [If the student selected diamond, s/he does not know this term; if the student selected square or rectangle, s/he focused on the shaded figures on the face and not the face itself - or s/he focused on the dark shaded face.]

19. B  8
   (E-4.2.3)  Solutions to number sentences with a missing value  [If the student selected 18, s/he added the digits without understanding of missing values; if the student selected either 12 or 7, s/he guessed without understanding.]

20. D
   (E-2.1.3)  Basic 3-dimensional shapes  [If the student made any other choice, s/he not only does not recognize a cylinder, but also does not recognize the choice selected.]

   (E-2.2.6)  Measure time (to the five-minute interval)  [If the student selected 5:12, s/he can read the clock correctly, but does not recognize the relationship of the length of the hands to hours and minutes; if the student answered 2:05, s/he can read the positions of the hands on knows their respective hour and minute relationships, but does not know how to read minutes; if the student selected 5:23, s/he doesn’t know either the hand relationships or how to read the minutes.]

22. B  36°
   (E-2.2.6)  Measure temperature  [If the student selected any other choice, s/he can not read the scale marks on the temperature scale.]

23. C  444
   (E-1.1.4)  Place value; (E-1.1.5)  Multiple representations of numbers  [If the student answered 534 or 435, s/he does not know the place value representations; if the student selected 4314, s/he knows that 10 goes in the second place, but doesn’t understand that it must be added to the 3 (or 30) – still a misunderstanding of place value.]

24. A  New Orleans
   (E-3.2.3)  Interpret displays of data  [If the student made any other choice, s/he either cannot read a table/chart (e.g.,

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selected Miami because it had the highest low temperature even though it did not have the highest high temperature) or, less likely, does not recognize that 90 is the largest/highest value.]

25. D  *Counting on Frank*  (E-3.2.3) *Interpret displays of data*  [If the student made any other choice, s/he either cannot read a horizontal bar graph, or cannot transfer the information on the graph to the written text.]

26. D  89 ¢ (E-2.2.6) *Measure money*  [If the student chose a different answer, s/he either cannot recognize the faces (both heads and tails) of the various coins, does not know the value of the coins, or cannot add on.]

27. D  (E-2.2.6) *Measure money*  [If the student selected a different choice, s/he either cannot add on, or does not know the values of the coins.]

28. D  (E-2.2.1) *Sort by attributes*  [If the student made a different choice, then s/he does not recognize patterns of similar attributes – color and shape.]

29. B  6½ cm (E-2.2.6) *Measure units of length*  [If the student selected a different choice, s/he does not recognize the term and concept of “nearest half-centimeter.”]

30. C  6th (E-1.1.4) *Number magnitude (order, compare); ordinal numbers*  [If the student selected differently, then either s/he was selecting based on putting himself/herself in Mikayla’s position and chose 5th, or s/he does not understand ordinal position.]
# End-of-Primary Diagnostic Math Test

Blacken the circle next to the best answer for each of the following. If there are no circles then answer the questions.

1. In the number -- 4,183 -- the digit in the hundreds’ place is:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>1</td>
<td>8</td>
<td>3</td>
</tr>
</tbody>
</table>

2. The first four multiples of 6 are:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2, 3, 6, 12</td>
<td>6, 12, 18, 24</td>
<td>3, 9, 12, 15</td>
<td>6, 7, 8, 9</td>
</tr>
</tbody>
</table>

3. Four hundred four can be written as:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4004</td>
<td>40004</td>
<td>404</td>
<td>4040</td>
</tr>
</tbody>
</table>

4. \( 705 - 246 \) is:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>541</td>
<td>459</td>
<td>559</td>
<td>469</td>
</tr>
</tbody>
</table>

5. \( 3 + 5 + 23 = \)

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>103</td>
<td>13</td>
<td>31</td>
<td>211</td>
</tr>
</tbody>
</table>
6. $9 \times 6 =$

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>48 O</td>
<td>45 O</td>
<td>56 O</td>
<td>54 O</td>
</tr>
</tbody>
</table>

7. $72 \div 8 =$

<table>
<thead>
<tr>
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<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 O</td>
<td>6 O</td>
<td>9 O</td>
<td>7 O</td>
</tr>
</tbody>
</table>

8. Billy went to school with 9 small toys in his pockets. He gave 3 to his friend, Alan. How many toys did he have when he went back home? Which of the following number sentences will help you to solve this problem?

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$12 - 9 = O$</td>
<td>$9 + 3 = O$</td>
<td>$9 - 3 = O$</td>
<td>$6 + 3 = O$</td>
</tr>
</tbody>
</table>

9. Heather is in a reading contest. She read twice as many books the second week as she read the first week. She read as many books the third week as she read during both of the first two weeks. She read a total of 12 books during the three weeks. How many did she read the first week?

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 O</td>
<td>3 O</td>
<td>1 O</td>
<td>4 O</td>
</tr>
</tbody>
</table>
10. How much of this figure is shaded?

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>(\frac{5}{8})</td>
<td>(\frac{8}{7})</td>
<td>(\frac{5}{3})</td>
<td>(\frac{5}{9})</td>
</tr>
</tbody>
</table>

11. A bag contains 2 white marbles, 3 red marbles, and 5 green marbles. What fraction of all of the marbles are red?

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>(\frac{3}{8})</td>
<td>(\frac{10}{3})</td>
<td>(\frac{3}{7})</td>
<td>(\frac{3}{10})</td>
</tr>
</tbody>
</table>

12. Draw all of the lines of symmetry in the following shape.
13. \[
\begin{array}{c}
6 \\
+ 92 \\
\hline
14
\end{array}
\]

is:

A  
\begin{array}{c}
1012 \\
O \\
\end{array} 

B  
\begin{array}{c}
1022 \\
O \\
\end{array} 

C  
\begin{array}{c}
112 \\
O \\
\end{array} 

D  
\begin{array}{c}
122 \\
O \\
\end{array} 

14.

The timeline above shows the times that Sharon did some activities during a school day. They were:
- f – woke up and began dressing;
- g – began eating breakfast;
- h – began waiting for school bus;
- j – began riding bus to school;
- k – began morning classes;
- m – began eating lunch;
- n – began afternoon classes;
- o – started home on school bus.

Which took the most time?

A  
\begin{array}{c}
\text{getting dressed} \\
O \\
\end{array} 

B  
\begin{array}{c}
\text{Morning classes} \\
O \\
\end{array} 

C  
\begin{array}{c}
\text{Eating lunch} \\
O \\
\end{array} 

D  
\begin{array}{c}
\text{Afternoon classes} \\
O \\
\end{array}
15. The time on this clock is:

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10:06</td>
<td>B</td>
<td>10:01</td>
</tr>
<tr>
<td>O</td>
<td></td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>1:50</td>
<td>D</td>
<td>1:10</td>
</tr>
<tr>
<td>O</td>
<td></td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

16. Sean has a bag that contains 4 red balls, 3 yellow, 5 blue, and 1 white. What is the probability that he will reach in without looking and pull out a red ball?

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$\frac{4}{9}$</td>
<td>B</td>
<td>4</td>
</tr>
<tr>
<td>O</td>
<td></td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>$\frac{4}{12}$</td>
<td>D</td>
<td>$\frac{4}{13}$</td>
</tr>
<tr>
<td>O</td>
<td></td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

17. Draw the next two shapes in this pattern:

```
____  ____  _____  _____
```
18. Write the next two parts of this pattern.

A1a  B2b  C3c

19. Aaron, Brittany, Chase, and Della each have a different favorite number. Their favorite numbers are (not in order) 2,5,6, and 7. Della’s favorite number is even. Brittany’s favorite is a multiple of 3. Chase’s favorite is less than Brittany’s but greater than Della’s. Aaron’s number is the largest of all of the friends. What is each person’s favorite number? Explain how you found your answer.

20. Eric counted his collection of baseball cards on Sunday. On Monday, his friend, Charley, gave him 3 more cards. The next day another friend, Chris, gave him some more cards. He now had 28 cards. This was twice as many as he had on Monday. How many cards did he have on Sunday?

<table>
<thead>
<tr>
<th></th>
<th>11</th>
<th>14</th>
<th>7</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>B</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
21. Bethany watched 3 hours of T.V. on Friday night; 1 hour longer on Saturday; and 1 hour less on Sunday than she did on Friday. How many hours of T.V. did she watch over the weekend?

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
</tbody>
</table>

22. What number goes in the next box of the table?

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>??</td>
<td></td>
</tr>
</tbody>
</table>

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
23. What is the missing number in this table?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>??</td>
</tr>
</tbody>
</table>

A. 15  
B. 13  
C. 10  
D. 7

24. Which numbers are written in order from least to greatest?

A. 548, 692, 136, 428  
B. 345, 456, 123, 789  
C. 110, 101, 125, 138  
D. 285, 392, 516, 773
25. Add.  
26  
+ 65  

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>811</td>
<td>91</td>
<td>81</td>
<td>Not here</td>
</tr>
</tbody>
</table>

26. What time is shown on this clock?  

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 minutes after 6</td>
<td>10 minutes before 6</td>
<td>10 minutes before 7</td>
<td>10 minutes after 7</td>
</tr>
</tbody>
</table>

27. John had a quarter and four pennies. He found two more pennies and a nickel. How much money does he now have?  

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>41 ¢</td>
<td>36 ¢</td>
<td>61¢</td>
<td>Not here</td>
</tr>
</tbody>
</table>

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28. Sue had a quarter and two dimes. She bought a piece of candy for thirty-seven cents. How much change did she get back?

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>6¢</td>
<td>18¢</td>
<td>41¢</td>
<td>Not here</td>
</tr>
</tbody>
</table>

29. How long is this line segment to the nearest inch?

- A 3 inches
- B 4 inches
- C 5 inches
- D Not here

30. How long is this line segment to the nearest centimeter?

- A 8 cm
- B 9 cm
- C 10 cm
- D Not here
Solutions to End-of-Primary Diagnostic Test

1. b. 1  (develop understanding of place value—to 1000’s)
2. b. 6, 12, 18, 24  (introduce multiples) If a student answered: (a) s/he confuses the difference between multiples and factors; (c), s/he found multiples of 3; (d), s/he found the first four whole numbers beginning with 6.
3. c. 404  (use number words, numerals, diagrams, & concrete models to represent whole numbers to 1000)
4. b. 459  (add/subtract 2- & 3-digit numbers with regrouping) If student answered: (a), s/he subtracted the smaller digits from the larger digits; (c), s/he didn’t rename hundreds’ place; (d), added 10 to both tens’ and ones’ place.
5. c. 31  (column addition) If student answered: (a), s/he wrote the columns from left-to-right and added; (b) added each digit; (d), added each column without renaming.
6. d. 54  (multiplication facts to 9)
7. c. 9  (perform simple division without remainders)
8. c. 9 – 3 =  (develop use of number sentences in solving 1- and 2-step story problems)
9. a. 2  (use strategies to solve logical thinking/deductive reasoning problems)
10. a. \(\frac{5}{8}\)  (concept of fraction – recognize simple fractions) If student answered: (b) or (c), s/he compared shaded to unshaded, not to the total.
11. d. \(\frac{3}{10}\)  (concept of fraction – recognize simple fractions) If student answered: (b), s/he compared all to red; (c) s/he compared red to “not red.”
12. “Proficient” will draw both lines of symmetry. (explore line symmetry) “Apprentice” will draw only one line of symmetry.
13. c. 112 (column addition) If student answered: (a) or (b), s/he added without renaming.
14. d. afternoon classes (read simple timelines)
15. a. 10:06  (tell time to minute)
16. d. \(\frac{4}{13}\)  (conduct simple probability experiments)
17.  (extend geometric patterns)
18. D4d, E5e  (identify/describe/create patterns in real-life situations using pictures, symbols, & concrete objects)

19. Aaron: 7; Brittany: 6; Chase: 5; Della: 2  (introduce multiples; use strategies to solve logical thinking/deductive reasoning problems)
   “Distinguished” will not only be correct, but will also clearly explain/illustrate the strategy used and will indicate that s/he had verified the solution. “Proficient” will be correct and will clearly explain the strategy used. “Apprentice” will be correct, but may only write the answers, or the strategy used is either not given or not clear. “Novice” has incorrect answers.

20. a. 11  (use strategies to solve logical thinking/deductive reasoning problems; develop the use of number sentences in solving 1- and 2-step problems)

21. c. 9  (collect/organize/interpret data; use strategies to solve logical thinking/deductive reasoning problems)

22. a. 8  (construct/read/interpret charts/tables; recognize/extend/find rules in number patterns)

23. d. 7  (construct/read/interpret charts/tables; recognize/extend/find rules in number patterns)

24. d. 285, 392, 516, 773  (compare/order whole numbers) If student answered: (b), s/he ordered digits in each number rather than the numbers.

25. b. 91  (add/subtract 2-digit numbers with regrouping) If student answered: (a), s/he added each column separately without renaming; (c) s/he added without renaming.

6. c. ten minutes before 7  (telling time to minutes – before & after hour)

27. b. 36¢  (add/subtract amounts of money)

28. d. not here -- 8¢  (add/subtract amounts of money)

29. b. 4 inches  (use of metric/customary measures – length; estimate measures by rounding)

30. c. 10 cm  (use of metric/customary measures – length; estimate measures by rounding)
Fourth Grade Diagnostic Math Test

1. The number shown in the shaded area is:
   a. 400308  b. 418  c. 408  d. 438

2. In the number 145,263,098, the digit in the ten-million's place is:
   a. 1  b. 6  c. 4  d. 5

3. Four hundred thousand, fifty-six can be written:
   a. 40056  b. 400,056  c. 400,000,056  d. 400,560

4. Which fraction is closest to 1?
   a. \(\frac{5}{6}\)  b. \(\frac{3}{4}\)  c. \(\frac{9}{10}\)  d. \(\frac{8}{7}\)

5. In which list are the numbers written in order from least to greatest?
   a. 1.5 4.7 3.8
   b. 8.6 7.2 5.4
   c. 3.2 5.1 7.4
   d. 2.9 9.6 3.7

6. The first four multiples of 7 are:
   a. 1, 2, 3, 4
   b. 7, 14, 21, 28
   c. 7, 77, 777, 7777
   d. 7, 17, 27, 37

7. In which of the following lists are the numbers factors of 36?
   a. 18, 2, 12, 36
   b. 2, 3, 15, 6
   c. 6, 13, 1, 9
   d. 4, 9, 17, 6
8. 803
   - 546  a. 357  b. 267  c. 343  d. 257

9. 2318
   562
   +352
   a. 3232  b. 3122  c. 21313  d. 2141212

10. $19.37
    - 7.38
    a. $12.01  b. $12.09  c. $11.09  d. $11.99

11. 9x7= a. 54  b. 56  c. 72  d. 63

12. If pencils cost 8¢ each and Janice bought 6 pencils, the total cost was:
    a. 4.8¢  b. 42¢  c. 56¢  d. not given

13. George mailed 4 postcards for $0.28 each and 5 letters for $0.32 each. How much
did he pay in postage? (Show all of your work in solving this problem.)

14. Multiply 48 x 63. (Show all of your work.)

15. Which is a factor pair of 24?
    a. 2, 4  b. 6, 18  c. 4, 20  d. 3, 8
16. 8 \div 48 \quad \text{a. 5  b. 6  c. 7  d. not given}

17. Divide 129 by 6 (show your work.)

18. The figure at the left is what type of angle?
   a. acute  b. obtuse  c. right  d. not given

19. A hexagon has how many sides?
   a. 5  b. 8  c. 10  d. 6

20. Which sentence is true?
   a. \( \frac{9}{10} < \frac{7}{10} \)  b. \( \frac{1}{4} > \frac{1}{3} \)  c. \( \frac{1}{8} < \frac{1}{6} \)  d. \( \frac{1}{3} > \frac{1}{2} \)

21. What is the area of the shaded rectangle \( A \)?
   a. 119 square units  b. 144 square units  c. 96 square units  d. 126 square units

22. Which of the following shows the rotational symmetry of \( \) ?
   a.  b.  c.  d.
23. Choose the figure that has a line of symmetry.

a.  

b.  

c.  

d.  

24.

In the above spinner, what is the probability of the spinner stopping on red?

a.  \( \frac{1}{8} \)  
b.  \( \frac{3}{5} \)  
c.  \( \frac{3}{8} \)  
d.  Not given

25. A local band got $100 for playing at a party. The 4 members of the band split the money equally. Should you add, subtract, multiply, or divide to find out how much each member earned?

a.  add  
b.  subtract  
c.  multiply  
d.  divide

26. What number goes in the next box of the table?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
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<tr>
<td>3</td>
<td>8</td>
<td></td>
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<tr>
<td>4</td>
<td></td>
<td>??</td>
</tr>
</tbody>
</table>

a.  8  
b.  5  
c.  9  
d.  11

27. Write the decimal that has the same meaning as \( \frac{56}{100} \).
28. There are 24 people in 6 cars on a field trip. There are the same number of people in each car. The trip will take 1 1/2 hours if the drivers travel at 55 miles per hour. What is the key idea in finding how many people are in each car?

   a. They travel for 1 1/2 hours at 55 miles per hour, so you can multiply.
   b. There are 24 people in 6 cars, so you can multiply.
   c. They travel for 1 1/2 hours at 55 miles per hour, so you can divide.
   d. There are 24 people in 6 cars, so you can divide.

29. There were 16 girls in Mrs. Jones’ class that played team sports. Nine played basketball and 12 played soccer. How many in the class played both sports?

   a. 7  b. 6  c. 5  d. 4

30. How much money would you have if you had 3 one-dollar bills, 1 quarter, 3 dimes, 5 nickels, and 4 pennies?
Solutions to Fourth Grade Diagnostic Test

1. d. 438 (use number words, numerals, diagrams, concrete materials, & expanded form to represent numbers to 100 millions)

2. c. 4 (place value to 100 millions) If student answered: (b), then s/he identified ten-thousands place; (d), one millions' place.

3. b. 400,056 (use number words, numerals, diagrams, concrete materials, & expanded form to represent numbers to 100 millions) If student answered (c), then s/he wrote four hundred and fifty-six as two numbers; (d), s/he didn't know how to insert 0 as a place holder.

4. c. $\frac{9}{10}$ (compare and order fractions--halves, thirds, fourths, sixths, eighths, tenths)

5. c. 3.2, 5.1, 7.4 (compare and order decimals) If student answered: (a), then s/he ordered individual digits in each number; (b), then s/he ordered from greatest to least.

6. b. 7, 14, 21, 28 (multiples) If student answered: (a), s/he wrote the first four natural numbers; (c), s/he wrote the first four numbers containing only 7's; (d), she wrote first four numbers with 7's in one's place.

7. a. 18, 2, 12, 36 (factors) If student answered; (b) s/he doesn't recognize that 15 is not a factor of 36; (c), s/he doesn't recognize that 13 is not a factor of 36; (d), s/he thinks that factors means numbers which add to the given numbers.

8. d. 257 (add/subtract 3- & 4-digit numbers) If students answered: (a), s/he didn't rename digit "borrowed" from; (b), s/he renamed both ten's and one's with 10+; (c), s/he subtracted smaller digit from larger digit.

9. a. 3232 (column addition to 4 places) If student answered: (b), s/he didn't rename (carry); (c), s/he added left-to-right; (d), s/he added each column separately without renaming.

10. d. $11.99$ (add & subtract decimals, including amounts of money) If student answered: (a), s/he subtracted the smaller digit from the larger digit; (b) or (c), renamed tens' place by adding 1 instead of 10.

11. d. 63 (multiplication facts to 9's)

12. d. not given (add, subtract, multiply amounts of money) If student answered: (a), s/he doesn’t understand that $\ell$ represents 2 decimal places; (b) or (c), s/he doesn’t know multiplication fact.
13. $2.72 (add, subtract, multiply amounts of money; multistep word problems using combination of operations) "Level 4" -- everything correct and work clearly shows the process; "Level 3" -- final answer correct, but process not clear as to how it was reached; "Level 2" -- final answer incorrect, but correct answers to each multiplication problem, i.e. postcard for $1.12 and letters for $1.60; "Level 1" -- major errors; "Level 0" -- no attempt or attempts are not reasonable, e.g., adds all of the money and then multiplies by total mailings.

14. 3024 (multiplication by 2-digit factors) "Level 4" -- everything correct, including an attempt at checking work; "Level 3" -- solution correct, but no attempt at checking work; "Level 2" -- facts correct, but incorrect place value positions, i.e., does not indent during multiplication by second digit; "Level 1" -- error with one or more multiplication facts; "Level 0" -- no attempt or multiple errors with multiplication facts.

15. d 3,8 (factor pairs) If student answered: (a) s/he doesn't know "factor" and identifies each digit in the number; (b) or (c), s/he thinks that "factor" means those digits that add to the given number.

16. b. 6 (division by 1-digit divisor)

17. 21 \frac{1}{2} or 21 r 3 (division with remainder) "Level 4" -- solution correct and checked; "Level 3" -- solution correct; "Level 2" -- gets the 21 but doesn't know what to do with the remainder; "Level 1" -- major errors; "Level 0" -- no attempt.

18. b. obtuse (recognize/describe/model/draw/compare right, obtuse, and acute angles)

19. d. 6 (recognize/describe/model/draw/compare pentagon, hexagon, octagon)

20. c. \frac{1}{8} < \frac{1}{6} (compare and order fractions)

21. a. 119 square units (measure areas of square, rectangle, triangle)

22. c. (symmetry - line, rotational)

23. d. (symmetry - line, rotational)

24. c. \frac{3}{8} (determine possible outcomes of simple probability experiments; relationship of fractions to probability)

25. d. divide (choosing the correct operation)

26. d. 11 (recognize/extend/find rules for number patterns)

27. 0.56 (relate fractions and decimals) "Level 4" -- correct, including the 0 place hold; "Level 3" - writes solution as .56; "Level 1" - attempts a decimal representation, but it is incorrect; "Level 0" -- no attempt.

28. d. There are 24 people in 6 cars, so you can divide. (explore the use of variables and open sentences to express relationships; choosing the correct operation)
29. c. 5 (organize/interpret data; Venn diagrams)

30. $3.84 (add, subtract, multiply amounts of money) "Level 4" -- totally correct; "Level 2" -- correct process, but one minor error, e.g., got an answer of $3.64 by misreading misinterpreting the 5 nickels as 1 nickel worth five cents; "Level 1" -- used correct values for each coin, but did not multiply by the correct number of each coin, or added results incorrectly; "Level 0" -- no attempt.
Fifth Grade Diagnostic Mathematics Test

1. The standard form for the number
   \((5 \times 1,000,000) + (8 \times 10,000) + (9 \times 1,000) + (3 \times 100) + (6 \times 10)\) is:
   a. 58,936  b. 508,931  c. 5,089,360  d. 5,809,310

2. The standard form for five hundred sixty-three million, eighty-two thousand, forty one is:
   a. 563,820,410  b. 563,082,041  c. 500,063,082,041  d. 506,382,041

3. Which numbers are written in order from least to greatest?
   a. \(\frac{1}{8}, 0.133, \frac{2}{3}, 0.72\)
   b. 0.099, 0.89, \(\frac{9}{10}, \frac{81}{90}\)
   c. \(\frac{2}{5}, 0.33, 0.45, \frac{6}{7}\)
   d. 0.15, \(\frac{1}{5}, \frac{3}{8}, 0.35\)

4. What is the LCM of 8, 24, and 20?
   a. 4  b. 8  c. 3840  d. 120

5. The sum of the square of 6 and the cube of 4 is:
   a. 24  b. 100  c. 52  d. Not given

6. The prime factorization of 504 is:
   a. \(2 \times 2 \times 2 \times 9 \times 7\)  b. \(2 \times 2 \times 3 \times 3 \times 7\)  c. \(2 \times 3 \times 3 \times 3 \times 7\)  d. Not given

7. Multiply
   \[
   \begin{array}{c}
   724 \\
   \times 36 \\
   \end{array}
   \]
   a. 6516  b. 26,064  c. 25,064  d. Not given

8. Divide 8334 by 18.
   a. 457.44  b. 518.55  c. 463  d. Not given
9.  Add 14.06, 8.183, 0.5318, and 72.9.
   a.  95.6748   b.  156.36   c.  95.4748   d.  Not given

10. Subtract
    31.006
    - 8.097
    a.  37.091   b.  22.919   c.  22.909   d.  Not given

11. Multiply 18.45 x 0.27.
    a.  5.1855   b.  4.9815   c.  1.8915   d.  Not given

12. A 4-sided figure that has exactly one pair of opposite sides parallel is called:
    a.  a parallelogram   b.  a trapezoid   c.  a rhombus   d.  Not given

13. ▼ is a picture of a/an:
    a.  equilateral triangle   c.  isosceles triangle
    b.  scalene triangle   d.  Not given

14. If six cans of corn sell for $4.14, how much is one can?
    a.  6.9¢   b.  69¢   c.  690¢   d.  Not given

   The following information relates to questions 15 and 16. A teacher surveyed her class about their summer vacations. The circle graph shows the results.

   A = 7, the number who went to Disney World only
   B = 8, the number who went to Sea World only
   C = 7, the number who went to both
   D = 6, the number who went to neither

15. What fraction of the students went only to Sea World?
    a.  \( \frac{7}{30} \)   b.  \( \frac{7}{28} \)   c.  \( \frac{6}{28} \)   d.  Not given

16. In the data shown in the circle graph above, what fraction of all the students surveyed went to Sea World?
    a.  \( \frac{15}{28} \)   b.  \( \frac{15}{30} \)   c.  \( \frac{8}{28} \)   d.  Not given
Use the following information to answer questions 17 - 19 to the nearest whole number. Ryan made the following grades on his math tests: 86, 88, 100, 88, 85, and 80.

17. What was the mean of his math scores?
   a. 87  
   b. 86  
   c. 88  
   d. Not given

18. What was the median of his math scores?
   a. 87  
   b. 86  
   c. 88  
   d. Not given

19. What was the range of his math scores?
   a. 87  
   b. 86  
   c. 88  
   d. Not given

For questions 20 and 21: Betsy and Alicia were playing a game using a spinner like the one on the right. On each spin, Betsy won a point if the spinner landed on an odd number and Alicia won a point if it landed on a number that was greater than 5.

20. What is the probability of Betsy winning a point?
    a. \( \frac{4}{8} \)  
    b. \( \frac{3}{8} \)  
    c. \( \frac{2}{8} \)  
    d. Not given

21. Is this a fair game for Betsy and Alicia?
    a. Yes, it is fair as described  
    b. No, but it would be fair if it were changed so that Alicia won the point if it landed on a number greater than 4.  
    c. No, but it would be fair if the "2" was changed to a "7."  
    d. Not given.

22. For the spinners on the right, what is the probability of spinning a 3 on the first spinner and then an R on the second spinner?
    a. \( \frac{1}{7} \)  
    b. \( \frac{1}{12} \)  
    c. \( \frac{1}{10} \)  
    d. Not here
23. Draw the next two figures in the pattern shown below and then write a rule that would tell someone how you did it.

![Figure Pattern]

24. Draw the next figure in the pattern and then complete the corresponding table.

<table>
<thead>
<tr>
<th>Number of figure</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<td>Number in longest row</td>
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<tr>
<td>Number of squares</td>
<td>1</td>
<td>4</td>
<td>9</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

25. What is the value of $9 + 6 \div 3 - 1 \times 5$?
   a. 5  b. 6  c. 20  d. Not given

26. What is the value of the expression $(18 \div 3) \times 7 - (45 \div 9)$?
   a. 1  b. 12  c. 37  d. Not given

27. The relationship between two numbers is described by the rule $B = 3A$. Complete the following table using this rule.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>
28. According to the graph at the right, what is the value of $y$ when $x = 10$?
   a. 5
   b. 20
   c. 10
   d. Not given

29. A formula that is often used to mentally approximate temperature conversion is: $C = \frac{1}{2} (F - 30)$. Using this formula, what Celsius temperature would be found for 72° Fahrenheit?
   a. 6°  
   b. 42°  
   c. 21°  
   d. Not given

30. What are all of the combinations of $1, $5, and $10 bills that can be used to make $18? Show the strategy that you used to find your answer.
Solutions and Analysis of Fifth Grade Diagnostic Mathematics Test

1. c. 5,089,360  (use expanded notation to represent numbers to billions) If student answered (a), then student wrote the digits without regard to their place value. If student answered (b) or (d), then the student has misunderstanding of place positions.

2. b. 563,082,041  (use number words to represent numbers to billions) If student answered (a), (c), or (d), then there are misunderstandings with place value.

3. a. $\frac{1}{8}$, 0.133, $\frac{2}{3}$, 0.72  (compare and order whole numbers, fractions, and decimals) If student answered (b), then the student did not reduce the fractions to determine they were equivalent. If student answered (a) or (d), then it is likely the student is not converting the fractions to decimal equivalents for comparison.

4. d. 120  (multiples, LCM) If student answered (a), there is confusion over the difference between LCM and GCF; (b), only examined the first two numbers; (c), found a common multiple by multiplying all three numbers.

5. b. 100  (square and cube numbers) If student answered (a), then multiplied by 2 and 3, respectively, instead of squaring and cubing; ©, squared both numbers.

6. d. Not given, i.e., 2x2x2x3x3x7  (prime factorization) If student answered (a), then student didn't recognize that 9 is not prime.

7. b. 26,064  (multiply 3- & 4-digit number by 2-digit numbers) If student answered (a), then student did not indent when multiplying by the tens' digit; (c), had a renaming error when adding the subproducts.

8. c. 463  (divide by 2-digit divisor) If student answered (a), then there was a computation error; (b), made a multiplication facts error.

9. a. 95.6748  (add decimals) If student answered (b), then the numbers were added without regard to decimal place value; (c), renaming error.

10. c. 22.909  (subtract decimals) It student answered (a), then the smaller digit was subtracted from the larger without regard to position -- minuend & subtrahend; (b), renaming error.

11. b. 4.9815  (multiply decimals) If student answered (a), then the factor was multiplied times the digit carried rather than the digit in the multiplicand; (c) did not indent when multiplying by the second digit of the multiplier.

12. b. a trapezoid  (recognize trapezoid, parallelogram; introduce rhombus)

13. a. equilateral triangle  (recognize, describe, model, draw, and compare triangles)

14. b. 69¢  (divide amounts of money - unit pricing)

15. d. Not given -- $\frac{8}{28}$. (interpret data; interpret graphs)
16. a. $\frac{15}{28}$ (interpret data; interpret graphs) If the student answered: (b), s/he did not add the total parts; (c), s/he counted only those who were indicated as attending Sea World and did not include those who attended both.

17. c. 88 (find mean, median, mode, range of data) Rounded to the nearest number - the actual mean is $87 \frac{5}{6}$.

18. a. 87 (find mean, median, mode, range of data)

19. d. Not given (20, or 100-80) (find mean, median, mode, range of data)

20. b. $\frac{3}{8}$ (determine the possible outcomes of simple probability activities)

21. a. Yes (both have $\frac{3}{8}$ chance of winning) (determine the fairness of simple probability activities)

22. b. $\frac{1}{12}$ (use fractions/percents to describe the probability of an event)

23. Rule: Any that appropriately locates the next point, for example, "the boxes are filled in order from left to right and down each row." (develop and use input and output tables; extend a wide variety of patterns)

24. (develop and use input/output tables; extend a wide variety of patterns)

<table>
<thead>
<tr>
<th>Number of figure</th>
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<td>4</td>
<td>9</td>
<td>16</td>
<td>25</td>
<td>36</td>
</tr>
</tbody>
</table>

25. b. 6 (order of operations)

26. c. 37 (order of operations)
27. (use functions through tables; extend patterns)

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<table>
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</table>

28. a. 5 (use functions to solve problems) If student answered: (b), s/he read the x- and y-axes backwards; (c), s/he couldn't read the graph.

29. c. 21° (use formulas) If student answered: (a), s/he found half of 72 before subtracting 30, i.e., did not use grouping symbol within order of operations; (b), s/he subtracted, but then did not find half of this value.

30.

<table>
<thead>
<tr>
<th></th>
<th>$5</th>
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<td>3</td>
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</tbody>
</table>

(add subtract, multiply amounts of money; collect/organize/interpret data; represent and describe mathematical relationships through the use of listing in a table) "Level 4" - totally correct; "Level 3" - uses a table or organized list, but misses 1 or 2 of the possibilities; "Level 2" - uses a table or organized list, but misses at least 3 of the possibilities; "Level 1" - has some of the possibilities, but no organized way to identify all of the possibilities; "Level 0" - no attempt.
Sixth Grade Diagnostic Math Test

1. Thirty-eight thousand ninety can be written in standard form as:
   A. 3800090   B. 380090   C. 38090   D. 38009

2. In the number 123,456,789,000, the digit in the hundred-million's place is:
   A. 1   B. 4   C. 7   D. Not given

3. What is the place value of digit, 3, in the number 1.5084372?
   A. millionths   B. ten-millionths   C. hundred-thousandths   D. Not given

4. Given the number sentence: 47,098,241  ___  47,101,045
   Which symbol should go in the blank space to make the sentence true?
   A. >   B. <   C. =   D. ⇒

5. Which numbers are written in order from largest to smallest?
   A. \(\frac{2}{5}, 0.133, \frac{1}{3}, 0.25\)
   B. 0.099, 0.0099, \(\frac{1}{100}, \frac{3}{1000}\)
   C. 0.15, \(\frac{1}{5}, \frac{3}{8}, 0.38\)
   D. \(\frac{6}{7}, \frac{2}{5}, 0.33, 0.05\)

6. What is the GCF of 20 and 8?
   A. 2   B. 4   C. 5   D. Not given

7. Which fraction is in simplest form?
   A. \(\frac{7}{16}\)   B. \(\frac{12}{18}\)   C. \(\frac{11}{33}\)   D. \(\frac{10}{15}\)

8. What is the least common denominator for \(\frac{5}{6}\) and \(\frac{3}{4}\)?
   A. 24   B. 16   C. 12   D. 2
9. What is the perimeter of a rectangular field that is 125 meters long and 75 meters wide?
   A. 200 m     B. 9375 m     C. 325 m     D. Not given

10. In simplest form, what is \( \frac{14}{15} - \frac{2}{15} \)?
    A. \( \frac{12}{30} \)     B. \( \frac{4}{5} \)     C. \( \frac{6}{15} \)     D. Not given

11. What is 380.43 divided by 54?
    A. 7.23     B. 7.45     C. 7.045     D. Not given

12. 3.5 grams is the same as:
    A. 35 mg     B. 350 mg     C. 3,500 mg     D. Not given

13. What is the mean of the following scores: 91, 96, 80, 56, 96, 77, 78?
    A. 82     B. 80     C. 96     D. Not given

14. Which dashed line is a line of symmetry?
    A. 
    B. 
    C. 
    D. 

15. What percent of the rectangle is shaded?
    A. 4%     B. 40%     C. 33 \( \frac{1}{3} \) %     D. Not given

16. Express 60% as a fraction in simplest form.
    A. \( \frac{15}{25} \)     B. \( \frac{30}{50} \)     C. \( \frac{60}{100} \)     D. Not here
17. Triangle $ABC$ has vertices $A(1,1)$, $B(2,1)$, and $C(2,3)$. Which graph below shows a translation of triangle $ABC$ that is 3 units to the right and 1 unit down?

A. ![Graph A]
B. ![Graph B]
C. ![Graph C]
D. Not here

18. At the right is the base plan of a construction. Which of the following is its front view?

A. ![Front View A]
B. ![Front View B]
C. ![Front View C]
D. Not here
19. What part of the figure at the right is shaded?
A. $\frac{9}{31}$  B. $\frac{7}{10}$
C. $\frac{1}{3}$  D. $\frac{7}{12}$

20. Which of the following could NOT be the missing numbers on this number line with its equal intervals?

\[ \text{2.6} \]
A. 2.5, 2.55, 2.65, 2.7  B. 2.56, 2.58, 2.62, 2.64
C. 2, 2.5, 2.7, 3  D. 2.2, 2.4, 2.8, 3

21. A set of 15 cards is numbered 1, 2, 3, …, 15. It is equally likely to choose any one card. What is P(5)?
A. 5  B. $\frac{1}{3}$  C. 15  D. Not here

22. The diagram at the right represents a dartboard. If a dart is thrown randomly at the dartboard, what is the probability it will land in the shaded region?

A. $\frac{1}{3}$  B. $\frac{8}{25}$  C. $\frac{8}{17}$  D. Not here
23. A coin is tossed and a number is picked at random from the set \(\{1, 2, 3, 4\}\). Which tree diagram correctly identifies the possible outcomes?

A. \[
\begin{array}{c}
H \\
2 \\
T \\
\end{array} 
\begin{array}{c}
1 \\
H1 \\
\end{array}
\begin{array}{c}
2 \\
H2 \\
\end{array}
\begin{array}{c}
3 \\
T3 \\
\end{array}
\begin{array}{c}
4 \\
T4 \\
\end{array}
\]

B. \[
\begin{array}{c}
H \\
2 \\
T \\
\end{array} 
\begin{array}{c}
1 \\
H1 \\
\end{array}
\begin{array}{c}
2 \\
H2 \\
\end{array}
\begin{array}{c}
3 \\
H3 \\
\end{array}
\begin{array}{c}
4 \\
H4 \\
\end{array}
\]

C. \[
\begin{array}{c}
H \\
1 \\
T \\
\end{array} 
\begin{array}{c}
2 \\
H \\
\end{array}
\begin{array}{c}
1 \\
HT1 \\
\end{array}
\begin{array}{c}
2 \\
H \\
\end{array}
\begin{array}{c}
1 \\
HT2 \\
\end{array}
\begin{array}{c}
2 \\
H \\
\end{array}
\begin{array}{c}
3 \\
HT3 \\
\end{array}
\begin{array}{c}
2 \\
T \\
\end{array}
\begin{array}{c}
3 \\
HT4 \\
\end{array}
\]

D. Not here

24. What is the best interval to form a scale for this set of data:

\[149, 135, 177, 145, 190, 187, 158, 162\]

A. 10 B. 5 C. 50 D. 2

25. Evaluate \(4 \cdot 3^2 - 2 (18 - 9) + 7\).

A. 1285 B. 133 C. 25 D. Not here

26. Felicia and Travis were hired at the same company in 1992. Felicia earned $22,000 per year and Travis earned $18,000. Each year Felicia received a $1000 raise and Travis a $1500 raise. What will the annual salary be the year they both earn the same amount?

A. $24,000 B. $30,000 C. $36,000 D. Not here

27. Using the letters of the phrase “BASEBALL AND BASKETBALL,” what is the ratio of the number of B’s to the number of A’s in simplest form.

A. 1 B. \(\frac{4}{5}\) C. \(\frac{5}{4}\) D. Not here

28. What is the area of the parallelogram shown at the right?

A. 70 m\(^2\) B. 110 m\(^2\)

C. 42 m\(^2\) D. Not here

Use a ruler to answer questions 29 and 30.
29. To the nearest $\frac{1}{8}$", how long is the line segment below?

A. 4"	B. $4\frac{1}{8}$	C. $3\frac{1}{2}$"	D. $3\frac{3}{8}$

30. To the nearest centimeter, what is the perimeter of the figure shown below?

A. 7 cm	B. 4 cm	C. 8 cm	D. Not here
Solutions to Sixth Grade Diagnostic Test

1. C. 38090 (use number words, numerals, diagrams, concrete materials, and expanded form to represent numbers to billions)

2. B. 4 (place value to billions)

3. C. hundred-thousandths (decimal place value - to 100 thousandths)

4. B. < (compare and order whole numbers, fractions, and decimals)

5. D. $\frac{6}{7}$, $\frac{2}{5}$, 0.33, 0.05 (compare and order whole numbers, fractions, and decimals)

6. B. 4 (factors, GCF)

7. A. $\frac{7}{16}$ (rewrite fractions in lowest terms)

8. C. 12 (use factors and multiples to write equivalent fractions)

9. D. Not given - perimeter is 400 m. (compute perimeter, area, and volume)

10. B. $\frac{4}{5}$ (add/subtract fractions with like denominators; rewrite fractions in lowest terms)

11. C. 7.045 (divide decimals with zeros in the quotient)

12. C. 350 mg (change units within the metric system and within the customary system)

13. A. 82 (find mean, median, mode, and range)

14. C. (line symmetry)

15. C. $33\frac{1}{3}$ % (concept/meaning of percent)

16. D. Not here -- $\frac{3}{5}$ (related decimals, fractions, percents)

17. C. (transformations: reflections, translations)

18. C. (identify and model basic 3-D shapes by appearance and in different orientation)

19. B. $\frac{7}{10}$ (concept of fractions and relationship to area model)

20. C. 2, 2.5, 2.7, 3 (concept of mean; understanding of number line)
21. D. Not here -- \( P(5) = \frac{1}{15} \). (relationship of fractions to probability; theoretical probability)

22. B. \( \frac{8}{25} \) (relationship of area to probability)

23. B (use tables and/or tree diagrams to find theoretical probability)

24. A. 10 (construct/read/interpret Venn Diagrams, line graphs, bar graphs, circle graphs, stem-and-leaf graphs, box-and-whiskers plots, line plots, charts/tables)

25. C. 25 (order of operations)

26. B. $30,000 (recognize/extend/find rules for number patterns)

27. B. \( \frac{4}{5} \) (introduce ratios and rates)

28. A. 70 sq. meters (compute perimeter, area, and volumes using formulas; use formulas in geometry applications)

29. C. \( 3\frac{1}{2} \) " (use ruler to measure segments -- nearest cm; \( \frac{1}{4} \); \( \frac{1}{8} \); whole inch)

30. D. Not here (6 cm) (use ruler to measure segments -- nearest cm; \( \frac{1}{4} \); \( \frac{1}{8} \); whole inch; use measurements to find perimeter and area of polygons)
Pre-Algebra Test

To the teacher:

This test can be used in either of two ways--

1) an end-of-the-year mastery test in which students who are successful move on to Algebra I, or those who are unsuccessful repeat a pre-algebra course.
2) a pre-test given to all students (or to new students entering the school later than the traditional opening days) to determine which skills/concepts have already been mastered and do not need re-teaching, but perhaps only a short review.

The solution key includes a cross-reference descriptor for each question to the Pre-Algebra Course of Study as appropriately related to the Core Content for Assessment.

The pre-algebra and algebra teachers should--

1) use this test as only one of the several indicators of course success; other indicators could include grade in class, Terra Nova results, etc.
2) determine what constitutes a "passing" grade on this test.
Pre-Algebra Test

1. One angle of a quadrilateral is 94°, another is 87°, and a third is 43°. What is the measure of the fourth angle?
   
   A. 137°  
   B. 136°  
   C. 86°  
   D. 93°  
   E. Not Here

2. This graph shows the service charge per hour for computer repairs at InfoRepair and CompuDoc.

   ![Graph showing service charge per hour for computer repairs]

   Which statement is true about the relationship shown in the graph?
   
   A. InfoRepair's service charge per hour is always greater than CompuDoc's charge per hour.
   B. CompuDoc's service charge per hour is always greater than InfoRepair's charge per hour.
   C. InfoRepair's charge per hour is less when the repair time is less than 5 hours.
   D. CompuDoc's charge per hour is less when the repair time is less than 5 hours.
   E. None of the above statements is true.
3. Find the area of the rectangle shown below.

\[ \begin{array}{ccc}
  x & y & z \\
  a & & \\
  b & & 
\end{array} \]

A. \( ab + xyz \)
B. \( ax + ay + az + bx + by + bz \)
C. \( (a + b)(x + y + z) \)
D. Both B and C are correct
E. None of the above answers is correct

4. Your math teacher tells you to construct a general quadrilateral and then find the midpoint of each segment that forms the quadrilateral. Then connect the midpoints of adjacent sides so that another quadrilateral is formed. Finally, your teacher tells you to measure the lengths of the sides and the sizes of the angles in this new quadrilateral to name the quadrilateral that you have formed. Your teacher asks you to repeat this procedure for, in turn, a parallelogram, a trapezoid, and isosceles trapezoid, a rhombus, and a rectangle. What generalization can you make as the result of your investigations?

A. The figure formed when the midpoints of any quadrilateral are joined is a parallelogram.
B. If the original figure is a parallelogram or a trapezoid, the figure formed by joining the midpoints is a parallelogram.
C. If the original figure is an isosceles trapezoid or a rectangle, the resulting figure is a rhombus.
D. If the original figure is a rhombus, the resulting figure is a rectangle.
E. All of the above statements are true.

5. Solve the following for \( y \):

\[ 18y - 16 = 26y \]

A. \( y = 2 \)
B. \( y = -2 \)
C. \( y = \frac{1}{2} \)
D. \( y = -\frac{1}{2} \)
E. Not here
6. A box of doughnuts contains 5 glazed doughnuts, 3 cream-filled doughnuts, and 2 jelly doughnuts. What is the probability of getting a glazed doughnut, eating it, and then getting a cream-filled doughnut?
   A. \( \frac{5}{6} \)
   B. \( \frac{1}{3} \)
   C. \( \frac{4}{27} \)
   D. \( \frac{1}{12} \)
   E. Not here

7. What is the probability of rolling a 3 on a die and then tossing a coin and having heads land up?
   A. \( \frac{1}{12} \)
   B. \( \frac{1}{10} \)
   C. \( \frac{5}{6} \)
   D. \( \frac{2}{3} \)
   E. Not here

8. If a die is rolled 24 times, how many times is the number 3 expected to come up?
   A. 3 times
   B. 4 times
   C. 6 times
   D. 8 times
   E. Not here

9. This circle graph shows how Lisa spent her time during the last 24 hours. What percent of time did she spend watching television?
   A. 17%
   B. 12%
   C. 20%
   D. 22%
   E. Not here

\[ \text{Diagram:}\]

- a - 25% (at school)
- b - 17% (talking to friends on telephone)
- c - 5% (studying and doing homework)
- d - 8% (eating)
- e - (watching television)
- f - 33% (sleeping)
10. Which of these is the quickest way to estimate the area of this figure?

A. Expand the figure into a larger triangle by extending the sides of length 8 cm. Then subtract the area of the rectangle which has one side of length 10 cm.
B. Divide the figure into two equilateral triangles and a rectangle. Then compute the area of each and add them together.
C. Transfer the figure to a piece of graph paper. Then count the number of square centimeters contained in the figure.
D. Divide the figure into a rectangle and two triangles. Then compute the area of each and add the areas together.

11. A rectangle with a perimeter of 32 inches might have adjacent sides measuring

A. 8 inches and 4 inches
B. 27 inches and 5 inches
C. 12 inches and 4 inches
D. 16 inches and 2 inches
E. None of these

12. If the ratio of boys to girls is 3 to 4 and there are 16 girls, which proportion should you use to find out the number of boys?

A. \( \frac{3}{4} = \frac{16}{b} \)
B. \( \frac{3}{16} = \frac{4}{b} \)
C. \( \frac{4}{16} = \frac{b}{3} \)
D. \( \frac{3}{4} = \frac{b}{16} \)
E. None of these
13. Which statement is correct?
   A. 28% < \( \frac{1}{4} \)
   B. 12% = \( \frac{1}{8} \)
   C. \( \frac{2}{3} > 66\% \)
   D. 3\( \frac{4}{5} = 345\% \)
   E. None of these

14. Which problem has an answer of 25%?
   A. 10 is what percent of 50?
   B. 20 is what percent of 80?
   C. 25 is what percent of 125?
   D. 25 is what percent of 75?
   E. None of these

15. Ronald needs 3,600 slats to build a model rocket. Each slat must be 4 feet long. If boards are sold in 12-foot lengths, how many boards must Ronald buy and cut into 4 foot pieces to get the 3,600 he needs? (Note: Ignore the kerf, i.e., the width of the cut a saw makes)
   A. 1,200
   B. 900
   C. 300
   D. 600
   E. None of these

16. What is 6\( \frac{1}{2} \div \frac{1}{2} \) ?
   A. 3\( \frac{1}{4} \)
   B. 7
   C. 3\( \frac{1}{2} \)
   D. 13
   E. None of these

17. What is 12.8 divided by 0.04?
   A. 32
   B. 320
   C. 3.2
   D. 0.32
   E. None of these
18. On a number line, which of these numbers would be farthest to the right?
   A. 0.002
   B. 0.0012
   C. 0.00091
   D. 0.0003

19. On a number line, which of these numbers would be farthest to the left?
   A. 0.002
   B. 0.0012
   C. 0.00091
   D. 0.0003

20. Solve for $x$:
    \[
    \frac{3}{x} = \frac{7}{12}
    \]
   A. $1\frac{1}{4}$
   B. $5\frac{1}{7}$
   C. 7
   D. 28
   E. None of these

21. Evaluate $24 - 8 \cdot 4 \div 2$
   A. 32
   B. 8
   C. 14
   D. 3
   E. None of these

22. Evaluate $b^2c - 2a$ if $a = \frac{1}{2}$, $b = \frac{1}{4}$, and $c = 8$.
   A. $\frac{1}{2}$
   B. $\frac{1}{4}$
   C. 3
   D. 0
   E. None of these

23. Solve $-3n + 7 < -2$.
    A. $n > 3$
    B. $n > -3$
    C. $n < 3$
    D. $n < -3$
    E. None of these
24. Find \((-3x)(4x^3) + 5x^4\).
   A. \(-7x^4\)
   B. \(-12x^3 + 5x^4\)
   C. \(-\frac{12}{x^4} + 5x^4\)
   D. \(-7\)
   E. None of these

25. Find the next term in the arithmetic sequence 6, 3½, 1, -1½, …
   A. 1
   B. 1½
   C. -3½
   D. -4
   E. None of these

26. A blouse is on sale for 30% off. If the original price was $42, what is the sale price?
   A. $12.60
   B. $140
   C. $29.40
   D. $46.60
   E. None of these

27. Find the median of the data in the stem-and-leaf plot below.

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
<th>Leaf</th>
<th>Leaf</th>
<th>Leaf</th>
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</thead>
<tbody>
<tr>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
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<td>8</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

   A. 70
   B. 75
   C. 75.5
   D. 76
   E. None of these
28. What is the slope of the line given by the equation, \( y = 3x - 4 \)?
   A. 3 
   B. -4 
   C. \(-\frac{4}{3}\) 
   D. \(-\frac{3}{4}\) 
   E. None of these

29. Find the coordinate \( P' \) if \( P(3, 1) \) is reflected over the \( y \)-axis.
   A. (1, 3) 
   B. (-3, -1) 
   C. (-3, 1) 
   D. (3, -1) 
   E. None of these

30. What is the range of \( f(x) = x - 3 \) when the domain is \{-4, -1, 5\}? 
   A. \{-7, -4, 2\} 
   B. \{1, -2, 2\} 
   C. \{1, -2, -8\} 
   D. \{-7, -4, -2\} 
   E. None of these

31. Jupiter is approximately 486,450,000 miles from the sun. Which of the following is this number in scientific notation?
   A. \(4.8645 \times 10^8\) 
   B. \(4.8645 \times 10^7\) 
   C. \(48.645 \times 10^7\) 
   D. \(48.645 \times 10^6\) 
   E. None of these
32. If you are given a solid with dimensions, length = $a$, width = $b$, and height = $c$ and then are asked to compare another solid to this one except the new solid has twice the height of the first, then which of the following statements are always true?

![Diagram of solids](image)

A. Both the volume and the total surface area double.
B. The volume doubles and the surface area doubles for four of its faces.
C. The volume doubles and the surface area doubles for two of its faces.
D. The volume doubles and the surface area doubles for six of its faces.
E. None of these

33. What is the probability of rolling a sum of 7 with a pair of dice?

A. $\frac{1}{12}$
B. $\frac{1}{36}$
C. $\frac{1}{7}$
D. $\frac{1}{18}$
E. None of these

34. $(-3)^3 =$

A. $3^3$
B. -9
C. $+9$
D. $-3^3$
E. None of these

35. What is the greatest common factor of the expression: $5x^2 + 30x^3y$?

A. 5
B. $x$
C. $5x^2$
D. $5x^3$
E. None of these
36. What is the largest of three consecutive even numbers such that the largest is 3 times the smallest?

A. 6
B. 12
C. 18
D. 24
E. None of these

37. For all real numbers \( x \) and \( y \), where \( x \neq 0 \), \( x \oplus y = \frac{y + 1}{x} \). What is \( (2 \oplus 3) \)?

A. 5
B. 2
C. 6
D. 1
E. None of these

38. \( 5a^3 + 2b^3 + 3b^3 = \)

A. \( 10a^3b^3 \)
B. \( 5a^3 + 5b^6 \)
C. \( 10a^3b^6 \)
D. \( 10a^3b^9 \)
E. None of these

39. If \( x < 0 \), then

A. \( x + 1 > 0 \)
B. \( x - 3 < 0 \)
C. \( x^2 < x \)
D. \( 2x > 0 \)
E. None of these

40. At the family reunion, 21 people liked fruit punch, 26 liked lime soda, 29 liked root beer. Twelve liked root beer and fruit punch and twelve also liked lime soda and root beer. Eight liked all three. How many people were at the reunion?

A. 76
B. 108
C. 52
D. 48
E. None of these
Solutions to Pre-Algebra Test

1. Use formulas to find measurements of two-dimensional shapes; identify characteristics of two-dimensional shapes.
   B. 136°

2. Given "real world" problems, solve linear equations and convert these solutions into answers to the problem; identify the relationships between two functions from their graphs.
   C. InfoRepair's charge per hour is less when the repair time is less than 5 hours.

3. The student will calculate the area of rectangles; know and use the distributive property.
   C. Both B and C are correct.

4. Properties of geometric figures.
   C. All of the above statements are true.

5. Solve linear equations in one variable.
   B. y = \frac{1}{2}

6. Recognize the relationship between probability statements and fractions; determine the theoretical probability of events.
   E. Not here (the probability is \frac{1}{2} \cdot \frac{1}{3} = \frac{1}{6})

7. Recognize the relationship between probability statements and fractions; determine the theoretical probability of events.
   A. \frac{1}{12}

8. Recognize the relationship between probability statements and fractions; determine the theoretical probability of events.
   A. 4 times

9. Plot and read data in various graphical formats and answer questions based on information given in graphs.
   B. 12%
10. Calculate the area of rectangles and triangles; calculate the area of more complicated shapes by subdividing them into pieces such as rectangles, triangles, and fractions of circles.
   
   B. Divide the figure into a rectangle and two triangles. Then compute the area of each and add the areas together.

11. Calculate the perimeter of rectangles, parallelograms, trapezoids, and triangles.
   
   B. 12 inches and 4 inches

12. Solve "real world" problems involving proportions.
   
   B. \[
   \frac{3}{4} = \frac{b}{16}
   \]

13. Convert fractions to decimals, decimals to fractions, fractions to percents, percents to fractions, decimals to percents, and percents to decimals.
   
   A. \(\frac{2}{3} > 66\%\)

14. Solve problems using fractions, decimals, and percents, including problems involving determining what fraction or percent of one quantity another quantity is, or determining what value is a set fraction or percent of a given quantity?
   
   B. 20 is what percent of 80?

15. Solve problems using fractions, decimals, and percents, including problems involving determining what fraction or percent of one quantity another quantity is, or determining what value is a set fraction or percent of a given quantity?
   
   A. 1,200

16. Add, subtract, multiply, and divide fractions.
   
   A. 13

17. Add, subtract, multiply, and divide decimals.
   
   A. 320

17. Order decimal numbers.
   
   A. 0.002

19. Order decimal numbers.
   
   D. 0.0003
20. Solve linear equations in one variable.
   B. \(5\frac{1}{7}\)

21. Know and use the order of operations to evaluate numerical expressions.
   B. 8

22. Know and use the order of operations to evaluate algebraic expressions in which the variables are replaced by specific values.
   E. None of these (solution = -\(\frac{1}{2}\))

23. Solve inequalities in one variable.
   A. \(n > 3\)

24. Simplify expressions involving one, two, or three variables.
   A. \(-7x^3\)

25. Recognize and extend arithmetic and geometric sequences.
   D. -4

26. Solve "word" or "real world" problems using fractions, decimals, and percents.
   C. $29.40

27. Plot data in various graphical formats (scatter plots, stem-and-leaf pots, box-and-whisker plots, …) and will answer questions and make predictions based on information given in graphs; calculate the mean, median, mode, and range of a set of data.
   C. 75.5

28. Understand and use the terms domain, range, x-axis, y-axis, x-coordinate, y-coordinate, slope, x-intercept, and y-intercept.
   A. 3

29. Plot ordered pairs of points in all quadrants of the coordinate plane.
   C. (-3, 1)

30. Understand and use the terms domain, range, …
   A. \{-7, -4, 2\}

31. Manipulate numbers expressed as powers of 10 and in scientific notation.
   A. \(4.8645 \times 10^8\)
32. Understand how changing the dimensions of a solid affects its surface area and volume.
   B. The volume doubles and the surface area doubles for four of its faces.

33. Determine the theoretical probability of simple events, such as rolling a particular number with a pair of dice.
   E. None of these -- probability is $\frac{1}{6}$ of rolling a sum of 7.

34. Simplify numerical and algebraic expressions; exponents.
   D. $-3^3$

35. Determine greatest common factor; understand variable, equation, inequality, algebraic expression.
   C. $5x^2$

36. Understand how whole numbers, integers, rational numbers, irrational numbers relate to each other; solve simple equations.
   A. 6

37. Understand how applications of properties such as commutative, associative, distributive, and identities show relationships among numbers.
   B. 2

38. Simplify numerical and algebraic expressions; exponents.
   D. None of these ($5a^3 + 5b^3$)

39. Solve simple equations and inequalities.
   B. $x - 3 < 0$

40. Gather, organize, represent, analyze, and interpret large sets of data.
   C. 52 (using Venn diagram)