

Appalachian Rural Systemic Initiative

Diagnostic Mathematics Tests



This material was developed by
Dr. Ron Pelfrey
For the
Appalachian Rural Systemic Initiative
200 East Vine St., Ste. 420
Lexington, KY 40507
<http://www.arsi.org/>

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 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. | | | |
| $\begin{array}{r} 24 \\ + 7 \\ \hline \end{array}$ | | | |
| A | B | C | D |
| 94 | 21 | 211 | 31 |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | | | |
|--|-----------------------|-----------------------|-----------------------|
| 2. Find the sum: $63\text{¢} + 34\text{¢}$. | | | |
| A | B | C | D |
| 97¢ | 31¢ | 91¢ | 67¢ |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | | | |
|---|-----------------------|-----------------------|-----------------------|
| 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? | | | |
| A | B | C | D |
| 71 | 80 | 90 | None of these |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

4. What fraction of this object is shaded?



A

$$\frac{1}{3}$$

B

$$\frac{3}{4}$$

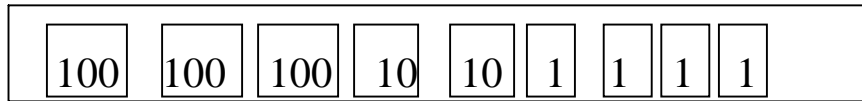
C

$$\frac{1}{4}$$

D

None of these

5. What number does this picture represent?



A

324

B

300204

C

30204

D

None of these

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

A

$$3 + 5 = 8$$

B

$$8 = 5 + 3$$

C

$$8 - 3 = 5$$

D

$$3 + 5 + 8$$

7. 5 hundreds, 8 tens, and 3 ones is the same as which of these numbers?

| | | | |
|----------------------|-------------------|---------------------------|-----------------------------|
| A 500803 O | B 583 O | C 16 hundreds O | D None of these O |
|----------------------|-------------------|---------------------------|-----------------------------|

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

| Sun | Mon | Tu | Wed | Th | Fri | Sat |
|-----|-----|----|-----|----|-----|-----|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| | | | |
|----------------------------|----------------------------|----------------------------|-------------------------|
| A 20 th O | B 21 st O | C 22 nd O | D None of these O |
|----------------------------|----------------------------|----------------------------|-------------------------|

9. Which of these is a correct number sentence?

| | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|
| A 15 < 12 O | B 26 < 21 O | C 54 > 36 O | D 19 > 27 O |
|-----------------------|-----------------------|-----------------------|-----------------------|

10. If you count on, what are the next three numbers in this pattern?

126, 127, 128, ____, ____, ____

| | | | |
|-----------------------------|-----------------------------|-----------------------------|--------------------------------|
| A 129, 130, 131 ○ | B 127, 126, 125 ○ | C 226, 227, 228 ○ | D 1026, 1027, 1028 ○ |
|-----------------------------|-----------------------------|-----------------------------|--------------------------------|

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


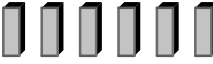



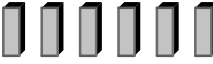



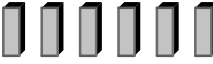


| | | | |
|--------------------------|-----------------------------|---------------------------|-----------------------------|
| A Odd number ○ | B Multiple of 5 ○ | C Even number ○ | D Decade number ○ |
|--------------------------|-----------------------------|---------------------------|-----------------------------|

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

| | | | | | | | | |
|---------|-----|------|------|---|---|---|---|---|
| Days | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Dollars | \$5 | \$10 | \$15 | | | | | |

| | | | |
|-------------|--------------|-------------|-------------|
| A 8 ○ | B 25 ○ | C 9 ○ | D 5 ○ |
|-------------|--------------|-------------|-------------|

| | | | |
|-------------------------|-----------------------|-----------------------|-----------------------|
| 13. What is $52 - 28$? | | | |
| A | B | C | D |
| 36 | 24 | 34 | 26 |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

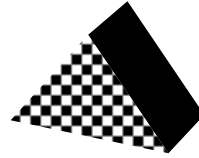
| 14. What number is shown by this chart? | | | | | | | | | | | | |
|--|---|---|-----------------------|----------|------|------|---|---|---|--|--|---|
| <table border="1"> <thead> <tr> <th>Hundreds</th> <th>Tens</th> <th>Ones</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table> | | | | Hundreds | Tens | Ones |  |  |  | | |  |
| Hundreds | Tens | Ones | | | | | | | | | | |
|  |  |  | | | | | | | | | | |
| | |  | | | | | | | | | | |
| A | B | C | D | | | | | | | | | |
| 300605 | 3651 | 365 | 3605 | | | | | | | | | |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | | | | | | | | | |

| | | | |
|---|-----------------------|-----------------------|-----------------------|
| 15. What is $\begin{array}{r} 9 \\ + 6 \\ \hline \end{array}$ | | | |
| A | B | C | D |
| 15 | 14 | 16 | 3 |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | | | |
|--|-----------------------|-----------------------|-----------------------|
| 16. If $6 + 7 = 13$, then which statement below must be true? | | | |
| A | B | C | D |
| $13 > 10$ | $6 < 7$ | $7 + 9 = 16$ | $13 - 7 = 6$ |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | | | |
|--|-----------------------|-----------------------|-----------------------|
| 17. Find the difference: $\begin{array}{r} 40\text{¢} \\ - 28\text{¢} \\ \hline \end{array}$ | | | |
| A | B | C | D |
| 28¢ | 22¢ | 12¢ | 18¢ |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

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



A

Diamond

B

Square

C

Rectangle

D

Triangle

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

A

18

B

8

C

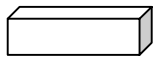
12

D

7

20. Which of these figures is a cylinder?

A



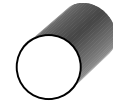
B



C



D



21. What time is shown on this clock face? ...



A

5:12

B

2:25

C

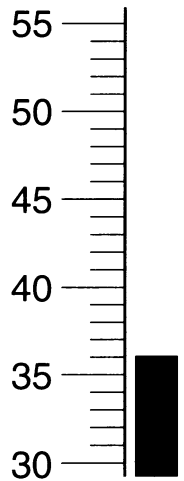
2:05

D

5:23

22. What temperature is shown on this thermometer?

°F



A

33°

B

36°

C





35°


D

37°

| | | | |
|---|-----------------------------------|-----------------------------------|------------------------------------|
| 23. When 10 is added to four hundred thirty-four, the sum is: | | | |
| A 534 <input type="radio"/> | B 435 <input type="radio"/> | C 444 <input type="radio"/> | D 4314 <input type="radio"/> |

| | | | | |
|---|--|---------------------------------------|-------------------------------------|---------------|
| 24. Which city on the table at the right has the warmest temperature? | City | High | low | Precipitation |
| | Chicago | 85 | 65 | 6 |
| | Denver | 87 | 57 | 3 |
| | Miami | 89 | 78 | 2 |
| | New Orleans | 90 | 76 | 8 |
| | New York | 83 | 68 | 9 |
| | Washington | 86 | 69 | 5 |
| A New Orleans <input type="radio"/> | B New York <input type="radio"/> | C Chicago <input type="radio"/> | D Miami <input type="radio"/> | |

| | | | |
|---|--|--|--|
| 25. <i>Anno's Counting Book</i> |  | | |
| <i>The Right Number of Elephants</i> |  | | |
| <i>One Hundred Hungry Ants</i> |  | | |
| <i>Counting on Frank</i> |  | | |
| According to the graph above, which counting book was the class's favorite? | | | |
| A Anno's Counting Book <input type="radio"/> | B The Right Number of Elephants <input type="radio"/> | C One Hundred Hungry Ants <input type="radio"/> | D Counting on Frank <input type="radio"/> |

| | | | |
|--|-----------------------------------|-----------------------------------|-----------------------------------|
| 26. How much money is this altogether? | | | |
|  | | | |
| A 74¢ <input type="radio"/> | B 62¢ <input type="radio"/> | C 71¢ <input type="radio"/> | D 89¢ <input type="radio"/> |

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

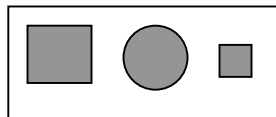


C



D

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



A



B



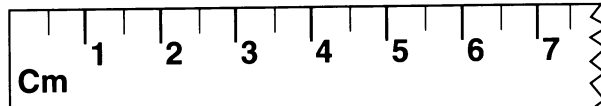
C



D

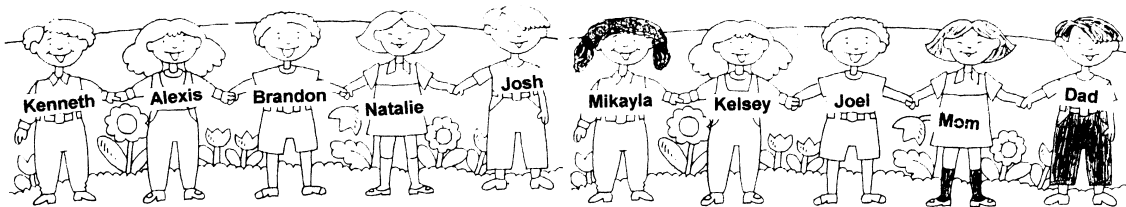


29. How long is this crayon to the nearest half-centimeter?



| | | | |
|------------------------------------|--------------------------------------|------------------------------------|--------------------------------------|
| A 6 cm <input type="radio"/> | B 6 ½ cm <input type="radio"/> | C 7 cm <input type="radio"/> | D 7 ½ cm <input type="radio"/> |
|------------------------------------|--------------------------------------|------------------------------------|--------------------------------------|

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



| | | | |
|---|---|---|---|
| A 5 th <input type="radio"/> | B 4 th <input type="radio"/> | C 6 th <input type="radio"/> | D 7 th <input type="radio"/> |
|---|---|---|---|

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.]

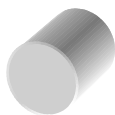
18. D Triangle

(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.]

21. B 2:25

(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.,

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 6 ½ 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.]