Analyzing Cognitive Demands: Ten Sample Tasks

For each problem, analyze the task as written (*Use M for memorization, PWOC for procedures without connections to meaning, PWC for procedures with connections, and DM for doing mathematics.*) **Our goal as teachers is to challenge our students with worthwhile mathematical tasks requiring high cognitive demand (PWC or DM).** Also solve each problem, showing work to support the solution(s).

1. Solve the following problem.

    A man entered an orchard that had 7 guards and picked some apples. When he left, he gave the first guard half his apples and 1 apple more. To the second guard, he gave half his remaining apples and 1 more. He did the same to each of the remaining 5 guards and left the orchard with 1 apple. How many apples did he gather in all? Explain how you solved the problem. (Source: H)

2.

"What's My Rule?"

Use the Addition/Subtraction Facts Table to help you solve the following problems.

    (Source: C)

3. What number follows five? What number comes just before five? (Source: B)

4. If pizza is served in four different sizes and can be ordered plain or with any one of five different toppings, how many different types of pizza are there? (Source: A)

5. Determine the value of the underlined digit and its place value.

    14,702,301

    (Source: A)

6. Use the hundred chart to answer these questions.

    (a) What sets of multiples have only even numbers?

    (b) What sets of multiples have only odd numbers?
        (Sources: D, www.math-drills.com)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

7. Use this number line to help you add. (Source: E)
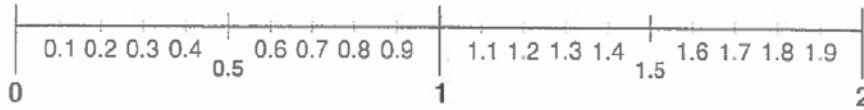
(a) 0.2 + 0.7   (b) 0.4 + 0.4   (c) 0.5 + 0.3
(d) 0.6 + 0.2   (e) 0.5 + 0.5   (f) 0.6 + 0.4
(g) 0.8 + 0.2   (h) 0.9 + 0.1   (i) 0.8 + 0.4

8.

The Price War

Two shopkeepers are comparing their prices. Barbara's store sells a watch for $20. Dennis's store sells the same watch for $40. Barbara says, "Your store price is 100 percent more expensive!"

"That's not true," says Dennis. "Your store price is only 50 percent less."

Who is right?

Explain your reasoning.   (Source: G)

9.

SUBMARINE Sandwiches

At Booker T. Washington Middle School, a class is planning a nature hike. The class is divided into groups of students. Each group of students pools their money to buy submarine sandwiches for lunch. When lunchtime arrives, each group shares the subs *equally*.
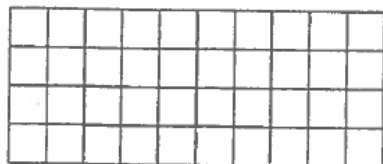
Above, you see four groups and the number of subs they have to share.

1. In which group do the students get the most to eat? Explain your answer.

2. In which group do the students get the least to eat? Explain your answer.

(Source: F)

10.   Shade 6 of the small squares in the rectangle shown below.

Using the diagram, explain how to determine each of the following:

(a) the percent of area that is shaded
(b) the decimal part of area that is shaded
(c) the fractional part of area that is shaded

(Source: H)

Sources:

A. Bennett, A. B., Jr., & Nelson, L. T. (2007). Mathematics for elementary teachers: A conceptual approach (7th ed.). New York: McGraw-Hill.

B. Math trailblazers. (1994, 2004). Grade 1 Unit 3: Pennies, Pockets, and Parts. Dubuque, IA: Kendall/Hunt.

C. Everyday mathematics. (2004). First grade math masters. Chicago: McGraw-Hill.

D. Investigations in number, data, and space. (1998). Grade 3 Unit: Things that come in groups. White Plains, NY: Scott Foresman.

E. Mathematics in action. (2004). Book 4B. Singapore: Longman.

F. Mathematics in context. (1997). Grade 5 Unit: Some of the parts. Chicago: Britannica Education.

G. Mathematics in context. (1997). Grade 5 Unit: Per sense. Chicago: Britannica Education.

H. Stein, Smith, Henningsen, & Silver. (2000). Implementing standards-based mathematics instruction: A casebook for professional development. New York: Teachers College Press.