How many are there? – Analysis of strategies

Link to the assessment resource, *How many are there?* (NM1327).

This table gives detailed breakdowns of the use of different strategies and their success rates.

Table 1: Frequency of use and success rates of different strategies

Strategy	a) 3's in 24	b)8's in 40	c) 5's in 75	Total
Numerical				
Vertical division algorithm	2 (2)	3 (3)	3 (3)	8 (3, 100%)
Fully multiplicative	6 (6)	4 (2)	10(8)	20 (16, 80%)
Mix of mult. and additive	5 (3)	2 (2)	1 (1)	8 (6, 75%)
Skip counting				
- Shows multiplication table	4 (4)	4 (4)	3(2)	11 (10, 91%)
- Shows tally marks	3 (3)	3 (3)	4 (4)	10 (10, 100%)
- Gives number sequence **or** states "skip counting"	30 (24)	22 (16)	29 (24)	81 (64, 79%)
Repeated addition	8 (7)	3 (2)	1 (0)	12 (9, 75%)
All numerical	***58 (49)***	***41 (32)***	***51 (42)***	***150 (123,82%)***
Diagrams				
Drawing an array of objects	5 (4)	5 (4)	3 (2)	13 (10,7%)
Drawing equal sets of objects	5 (4)	3 (1)	3 (3)	11 (8, 73%)
All diagrams	***10 (8)***	***8 (5)***	***6 (5)***	***24 (18, 75%)***
ALL STRATEGIES	**68 (57)**	**49 (37)**	**57 (47)**	**174 (141,81%)**
States equation(s)				
- one equation with ×	16 (14)	22 (20)	12 (11)	50 (45, 90%)
- one equation with ÷	6 (6)	9 (9)	8 (7)	23 (22, 96%)
- two equations with × & ÷	8 (8)	13 (12)	5 (5)	26 (25, 96%)
All equations	**30 (28)**	**44 (41)**	**25 (23)**	**99 (92, 93%)**
States answer only	**5 (0)**	**1 (0)**	**5 (0)**	**11 (0, 0%)**
Adds numbers	**12 (0)**	**12 (0)**	**12 (1)**	**36 (1, 3%)**
Multiplies numbers	**4 (0)**	**4 (0)**	**3 (0)**	**11 (0, 0%)**
Other statements	**3 (0)**	**3 (0)**	**5 (0)**	**11 (0, 0%)**
Missing	**20 (8)**	**29 (7)**	**35 (10)**	**84 (25, 30%)**
TOTAL	**142 (93)**	**142(85)**	**142 (81)**	**426 (258,71%)**

Based on a representative sample of *142* students

The first number is the number of students using the strategy.
The number in parentheses is the number who obtained a correct answer.

Patterns within the strategies used

- The numerical methods had a similar overall success rate to diagrammatic methods.
- Students who used partitioning strategies had the highest mean ability.
- Students who showed no working or just stated "3 × 8 = 24", "24 ÷ 3 = 8" or both were somewhat more successful than those who showed strategies. This may be because they "just knew" the answer, i.e. used Basic Facts.
- Students using the vertical algorithm were more likely to be of equal mean ability as the students who stated equations.
- Students who used repeated addition and those using skip counting were of roughly equal mean ability. This questions whether these two strategies should be at different stages of the Number Framework, or at least questions what constitutes skip counting. It may be that skip counting is

automated repeated addition. Alternatively, it could be that only a few very well known sequences (such as 2, 4, 6, 8 … or 5, 10, 25, 20, …) constitute skip counting as defined in the framework, whereas other sequences are a form of automated repeated addition.

- Students who used some identifiable form of tallying with their skip counting were somewhat more likely to get a correct answer.
- Less able students were more likely to use diagrams (often linked with counting or skip counting).
- Array diagrams were used by students of higher mean ability than grouping diagrams.
- Students who just gave an answer were of similar mean ability as those who used array diagrams, but were far less likely to give a correct answer.
- The least able students often treated the problems as additive (e.g., 24 + 3) or multiplicative (24 × 3).