

1. a) commutative

b) (i) Problem 3 - set model  
 Problem 4 - measurement model  
 Problem 5 - set model

(ii) measurement model

(iii) Problem 6 - rectangular array  
 Problem 9 - measurement

(iv) rectangular array

c) that division is the opposite operation of multiplication

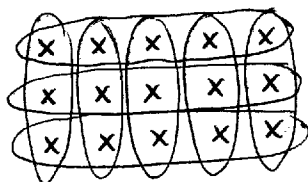
note on Problem 4: think of the problem as doubling the number of rings each time, so whatever is the number of rings on the pole, we will hop that many steps of size 2 on the number line to give the total points scored

2. b) rectangular array; commutative property of mult.

c) distributive property

e) commutative property

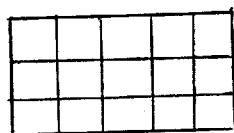
3. a) rectangular array model showing  $3 \times 5 = 5 \times 3$



ROWS: 3 groups of 5 ( $3 \times 5$ )

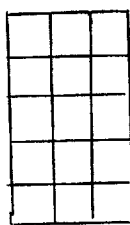
COLUMNS: 5 groups of 3 ( $5 \times 3$ )

alt



$3 \times 5$

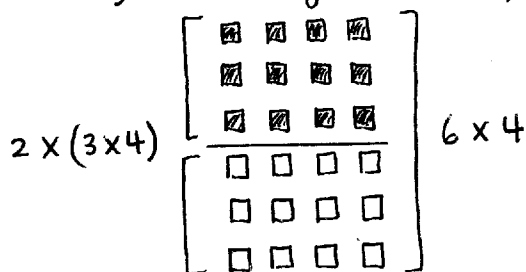
rotate



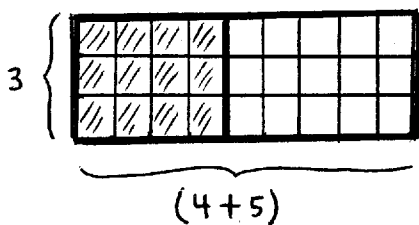
$5 \times 3$

SAME NUMBER OF SQUARES

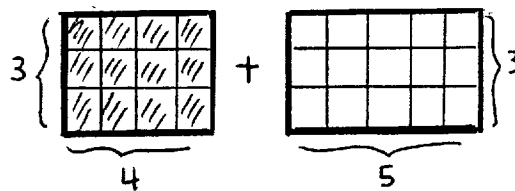
b) rectangular array model showing  $2 \times (3 \times 4) = 6 \times 4$



c) Show  $3(4+5) = (3 \times 4) + (3 \times 5)$



Think of splitting  
this apart  
This is the same as



d) Show  $6 \times 1 = 6$



4. a) commutative property of mult.

b) additive identity

c) associative property of addition

d) multiplicative identity

e) multiplicative identity

f) associative property of mult.

g) distributive property of multiplication over addition

5. To MULTIPLY a number by 5, TAKE HALF THE NUMBER and MULTIPLY BY 10  
(For an odd number like 17, one can find  $16 \times 5$  and add 5)

$$6 \times 5 = \frac{6}{2} \times 10 = 3 \times 10 = 30 \quad \left( \begin{array}{l} \text{really using associative prop of mult.} \\ 6 \times 5 = (3 \times 2) \times 5 = 3 \times (2 \times 5) = 3 \times 10 \end{array} \right)$$

$$8 \times 5 = 4 \times 10 = 40$$

$$7 \times 5 = 6 \times 5 + 5 = 3 \times 10 + 5 = 30 + 5 = 35$$

$$12 \times 5 = 6 \times 10 = 60$$

$$23 \times 5 = 22 \times 5 + 5 = 11 \times 10 + 5 = 110 + 5 = 115$$

$$84 \times 5 = 42 \times 10 = 420$$

6.  $24 \times 15 = 24 \times (10 + 5)$

$$= (24 \times 10) + (24 \times 5) \quad \leftarrow \text{distributive prop}$$

$$= 240 + \left( \frac{24}{2} \times 10 \right)$$

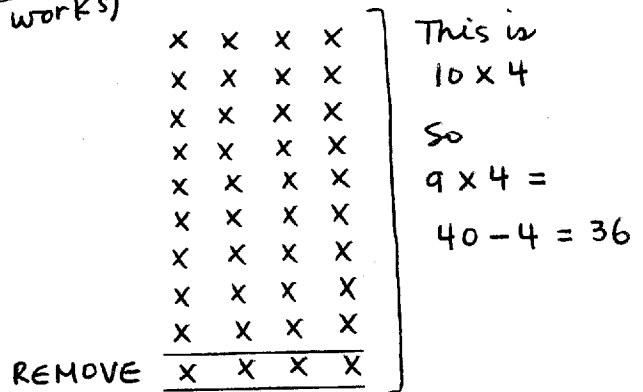
$$= 240 + (12 \times 10) = 240 + 120 = \boxed{360}$$

7. TO MULTIPLY a number by 9,  
TAKE 10 TIMES THE NUMBER and SUBTRACT THE NUMBER

a)  $9 \times 4 = (10 - 1) \times 4 = (10 \times 4) - (1 \times 4) = 40 - 4 = 36$

*the process is to multiply 10 x 4 and subtract 4 →  
(I filled in the reason why this works)*

- b)  $9 \times 5 = 50 - 5 = 45$   
 $9 \times 7 = 70 - 7 = 63$   
 $9 \times 8 = 80 - 8 = 72$   
 $9 \times 9 = 90 - 9 = 81$   
 $9 \times 21 = 210 - 21 = 189$   
 $9 \times 33 = 330 - 33 = 297$   
 $9 \times 89 = 890 - 89 = 801$



c) one; yes

- e) Problem 5  $9 \times 18 = 180 - 18 = 162$  m  
 Problem 6  $25 \times 9 = 9 \times 25 = 250 - 25 = 225$  cans

8. a)  $5 \times 87 \times 2 = 5 \times (2 \times 87) = (5 \times 2) \times 87 = 10 \times 87 = \textcircled{870}$

↑ comm                  ↑ assoc

b)  $4 \times 13 \times 25 = (13 \times 4) \times 25 = 13 \times (4 \times 25) = 13 \times 100 = \textcircled{1300}$

↑ comm                  ↑ assoc

c)  $16 \times 11 = 16 \times (10 + 1) = (16 \times 10) + (16 \times 1) = 160 + 16 = \textcircled{176}$

↑ distributive

d)  $17 \times 30 = 17 \times (3 \times 10) = (17 \times 3) \times 10 = 51 \times 10 = \textcircled{510}$

↑ assoc