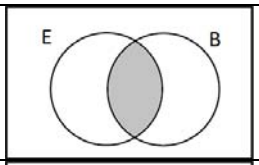
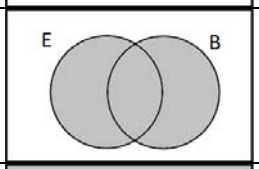
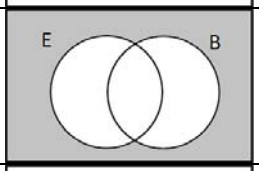
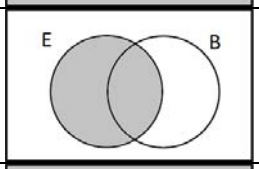
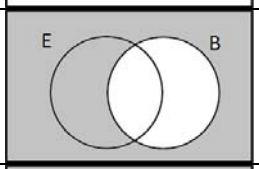
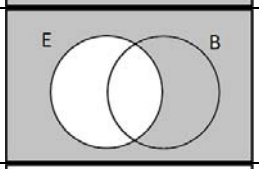
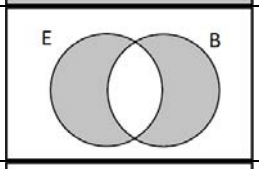
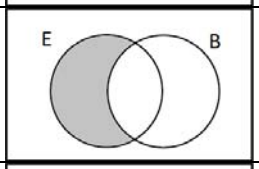
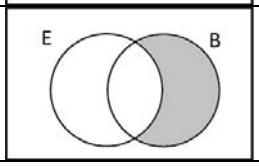
Practice test 1

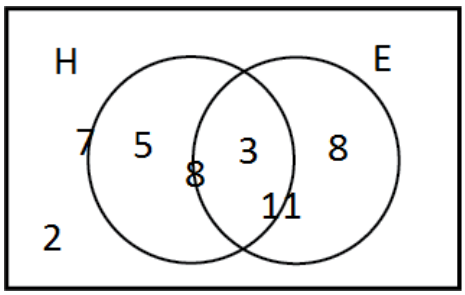
1. There will be some set problems like these on the test. The test section will be shorter than this.
The universe is things you can write with. The set E is things you can erase, and the set B is things write in black.

Things that write in black and erase	$E \cap B$		
Things that write in black or erase	$E \cup B$		
Things that do not erase and do not write in black OR Things that neither erase nor write in black**	$\overline{(E \cup B)}$ or $\overline{E} \cap \overline{B}$		
Things that erase	E		
Things that do not write in black	$\overline{B}$		
Things that do not erase	$\overline{E}$		
Things that erase or write in black but not both	$E \cup B - E \cap B$		
Things that erase and do not write in black	$E \cap \overline{B}$		
Things write in black and do not erase	$B \cap \overline{E}$ or $B - E$		

2. There will be 1-2 Venn diagram logic puzzle problems to solve. Try these:

A. There are 18 students in the class
2 students have neither a highlighter nor an eraser on their desk
8 students have a highlighter on their desk
7 students do not have an eraser on their desk
How many students have an eraser but not a highlighter on their desk?

- E is has an eraser
- H is has a highlighter
- 2 have neither—put that on the outside
- 8 have a highlighter: put that on the line
- 7 students do not have an eraser. There are 18 students that means 18-7=11 do have an eraser. Put that on the line.
- 7 goes on the line that is completely outside E
- 7-2 is 5: of those who do not have an eraser, 2 do not have a highlighter, so 5 do have a highlighter. Put 5 in the correct region
- 8 have a highlighter. Of those, 5 do not have an eraser, so 3 do have an eraser. Put 3 in the middle
- 11 have an eraser, 3 also have a highlighter, so 11-3=8 do not. That's the answer to the question: **8**
- Check your answer by adding 2+5+3+8=18.

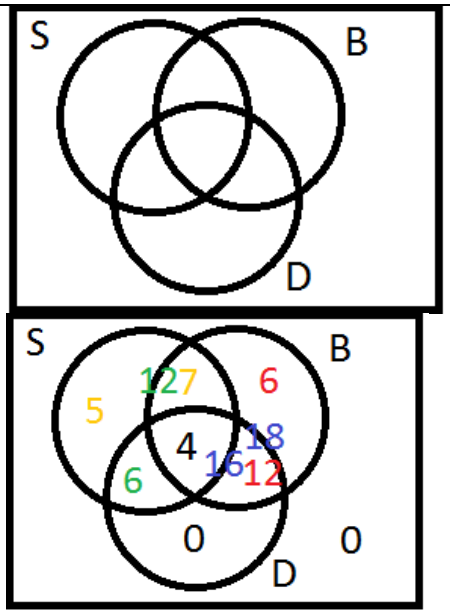


Specific suggestions:
Name your sets as positives not as negatives (has an eraser, has a highlighter is good, does not have an eraser, does not have a highlighter is confusing)

Information about how many do not have something can be turned into information about how many do have something by subtracting from the total

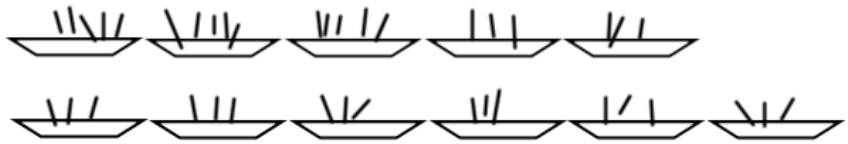
B. 40 students went to the zoo
All of the students went to at least one of the two animal shows (seals or birds)
22 students fed the deer in the petting zoo
4 students saw both shows and fed the deer in the petting zoo.
18 students did not see the seal show
16 students who saw the bird show also fed the deer
Of the students who saw the seal show and did not feed the deer in the petting zoo, two more watched both shows than watched only the seal show.
How many students saw the bird show?

- S is students who saw the seal show
- B is students who saw the bird show
- D is students who fed the deer
- All students saw at least one show, so there are 0 in the regions outside S and B both
- 22 fed the deer—tricky: that's 3 regions, come back to this one later.
- 4 students did all 3, so put 4 in the middle
- 18 did not see the seals. There are only 2 non-zero regions outside of S, put 18 on the line of those.
- 40 students total. 18 did not see the seals, so 40-18=22 did see the seal show. That's 4 regions—save this clue for later.
- 16 students who saw the bird show fed the deer. Put 16 on the line between the two regions of both D and B.
- 4 of the 16 is who saw the bird show and fed the deer also saw the seal show, so 16-4=12 did not see the seals. Put 12 in its region. (red)
- Of the 18 that saw the bird show but not the seals, 12 fed the deer, so 18-12=6 did not. Put that in the right spot. (red)
- Back to the 22 clue: 22 fed the deer: we have two of those regions accounted for: 4 and 12, so the remaining region is 22-(12+4)=6 (green)
- We can figure out the total of the 2 remaining regions by subtracting from either the total students (40-6-6-4-12=12) or subtracting from the number who saw the seals (22-6-4=12). Write that on the line.
- Of the 12 students who saw the seal show and did not feed the deer, two more watched both shows than watched only the seal show. 7 is 2 more than 5 and 5+7=12. (orange).
- The number who saw the bird show was 7+6+4+12=29



3. Solve this problem with both a diagram and a table:

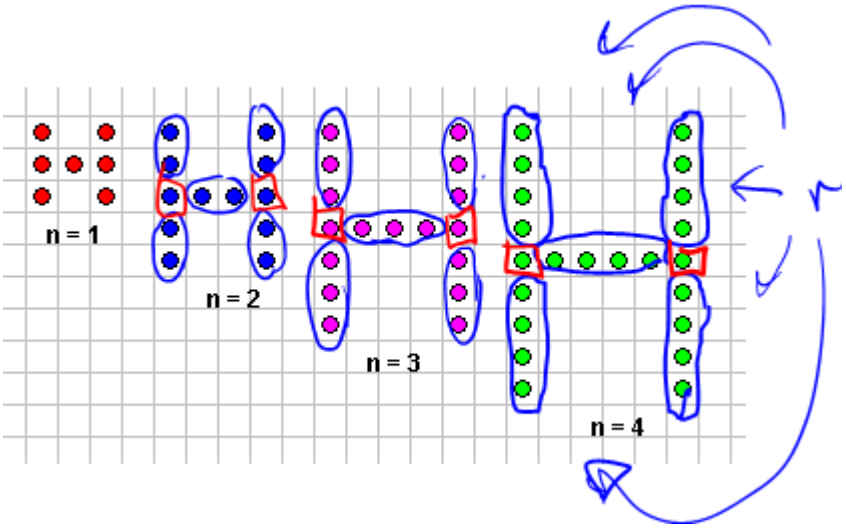
The restaurant sold some 3 piece and some 5 piece fish and chips baskets.
In all they sold 11 orders and 39 pieces of fish.
How many 3 piece and how many 5 piece baskets did they sell there?



3 5 piece baskets and 8 3 piece baskets

3 pc baskets	5 pc baskets	total baskets	total fish pieces
5	6	11	5x3+6x5=45
6	5	11	6x3+5x5=43
7	4	11	7x3+4x5=41
8	3	11	8x3+3x5=39

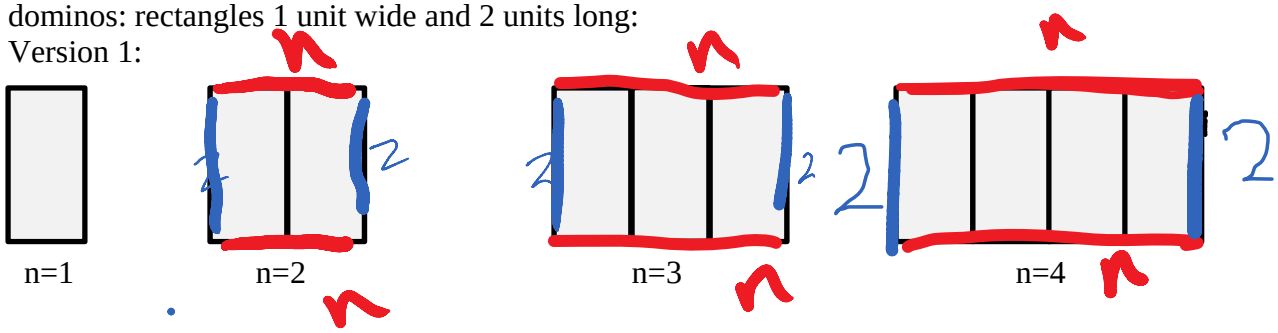
4. Label useful sets in the visual pattern diagram, and use your labelled sets to explain a formula that tells how many dots are in the nth step of the pattern:



At step n, there are 5 sets of n (blue loops) and 2 more (red boxes) so the total number of dots is 5n+2

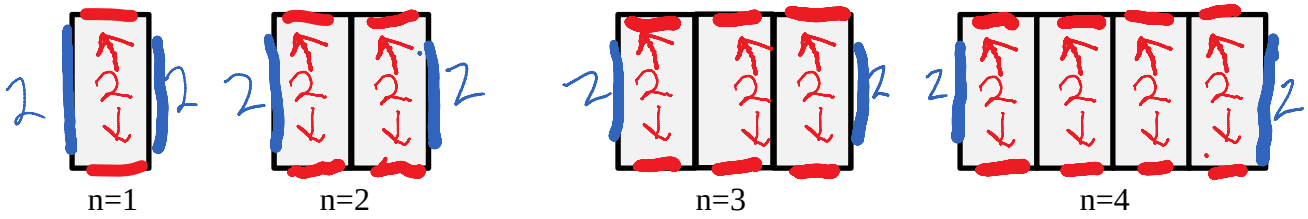
5. Label useful sets in the visual pattern diagram and use your labelled sets to explain a formula that tells how long the perimeter is at the nth step of the pattern. This pattern is made out of dominos: rectangles 1 unit wide and 2 units long:

Version 1:



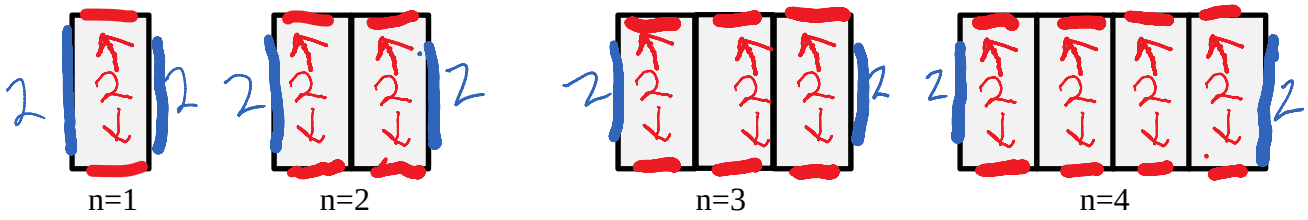
There are two sets of n: one on the top and one on the bottom (in red) so 2n
There are two on the left and two on the right (in blue) so +2+2 or +4
The formula is **2n+4**

Version 2:



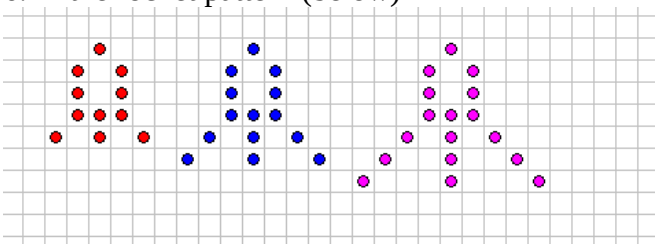
Each domino has 2 lengths showing on top and bottom, so that's n sets of 2 (in red) which is 2n
There are two on the left and two on the right (in blue) so +2+2 or +4
The formula is **2n+4**

Version 2:



Each domino has 2 lengths showing on top and bottom, so that's n sets of 2 (in red)
There are two more sets of 2 on the left and right, so that's (n+2) sets of 2 = **2(n+2)**

6. In the rocket pattern (below)



a. What is the biggest rocket you can make using only 80 dots?

It takes 8 dots to make the body of the rocket, so that leaves 80-8=72 dots for the tail fins/rocket fire. There are 3 tail fins/rocket fire, so $72 \div 3 = 24$ is the number of dots in each tail fin/rocket flame. That means I can make a stage 72 rocket with 80 dots.

b. Explain how to find the biggest rocket you can make using D dots.

If there are D dots, then subtract 8 from D, and then divide by 3: $\frac{D-8}{3}$. If it's not a whole number, round down to find the biggest rocket you have enough dots for.

c. What is the smallest rocket that has at least 100 dots?

100-8=92 (subtract dots for the body)
$92 \div 3 = 30R2$ a step 30 rocket will have not quite 100 dots, and a step 31 rocket will have just over 100 dots. **A step 31** rocket is the smallest one that has 100 or more dots.

d. Explain how to find the smallest rocket that has at least N dots.

If there are N dots, then subtract 8 from N, and then divide by 3: $\frac{N-8}{3}$. If it's not a whole number, round up to find the smallest rocket that has at least N dots.

7. Amy has **beads** in 7 rainbow colors (ROYGBIV) and she has **magnet beads (all the same length)**. She is using them to make necklaces. She made a necklace with one rainbow with magnet ends for a Barbie doll, and she made a necklace with 2 rainbows and magnet ends for another doll.

1 rainbow (9 beads) 

2 rainbows (16 beads) 

a. If Amy made a necklace with 3 rainbows, how many beads would it have?

7 beads per rainbow and 2 magnets, so 7x3+2=23 beads

b. Amy cut a length of bead wire long enough for 57 beads. ***Show*** how to figure out how many complete rainbows can she make on a necklace of this same style.

57-2=55 (2 are the 2 magnets)
55/7=7R6, so 7 full rainbows.

c. ***Explain*** how to figure out how many complete rainbows can be made on a necklace of this style on a bead wire that is long enough for N beads.

Subtract 2 from N (the two magnets), then divide by 7: $\frac{N-2}{7}$. If the answer isn't a whole number, round down (so it doesn't get too long for the wire).

8: Fix the equals signs (while keeping the thinking the same)

a. $86-2=84\div 4=21$

Two correct answers:

$86-2=84$ $84\div 4=21$	$(86-2)\div 4=84\div 4=21$

b. $\frac{1}{2}\times 3\times 4=\frac{1}{2}\times 12=6\times 4=24+16=40$

Three correct answers:

$3\times 4=12$ $\frac{1}{2}\times 12=6$ $6\times 4=24$ $24+16=40$	$\frac{1}{2}\times 3\times 4=\frac{1}{2}\times 12=6$ $6\times 4=24$ $24+16=40$	$\left(\frac{1}{2}\times 3\times 4\right)\times 4+16$ $=\left(\frac{1}{2}\times 12\right)\times 4+16=$ $6\times 4+16=$ $24+16=40$

9. Write down this numerical calculation (for 4x7) using correct equations:

Two 7's are 14, and another 7 is 21 and another 7 makes 28.

$7+7=14$

$14+7=21$

$21+7=28$

10. Use the order of operations correctly to calculate:

a. $12-7+3=$
$5+3=8$

b. $24\div 2\div 2\times 3$
$=12\div 2\times 3$
$=6\times 3$
$=18$

c. $80-5\cdot 2^3+20\div 5\times 2$
$=80-5\cdot 8+20\div 5\times 2$
$=80-40+4\times 2$
$=80-40+8$
$=40+8$
$=48$

d. $2\cdot 6^2\div 3$
$=2\cdot 36\div 3$
$=72\div 3$
$=24$