#36

Name .....

Present School .....

The London Independent Girls' Schools Consortium

Group 1

Mathematics Entrance Examination

18th January 2008

Time allowed: **1 hour 15 minutes**

Write in pencil.

Do all your rough working in the space near the question. Do not rub it out.

If you cannot answer a question go on to the next one.

CALCULATORS AND RULERS ARE NOT ALLOWED.

1. Add these two numbers together:

Ten thousand and thirty four
Three thousand nine hundred and sixty eight

$$\begin{array}{r} {\scriptstyle 1\,1\,1} \\ 10{,}034 \\ +\ 3{,}968 \\ \hline 14\,002 \end{array}$$

Answer: 14002

2.

$$\begin{array}{r} {\scriptstyle 6\,9\,14} \\ 7004 \\ -\ 358 \\ \hline 6646 \end{array}$$

3. Multiply 34 by 17.

$$\begin{array}{r} {\scriptstyle 2} \\ 34 \\ \times\ 17 \\ \hline 238 \\ 340 \\ \hline 578 \end{array}$$

Answer: 578

4. Divide 1908 by 6.

$$\begin{array}{r|l} & 318 \\ \hline 6 & 1908 \\ & -18 \\ \hline & 108 \\ & 6 \\ \hline & 48 \\ & 48 \\ \hline & \times \end{array}$$

Answer: 318

5. If two numbers multiply to give 36 and their sum is 15, what are the two numbers? 36 can be factorize in these ways

$36 = 1 \times 36$	$36 + 1 = 37$
2×18	$18 + 2 = 20$
3×12	$12 + 3 = 15$
4×9	$9 + 4 = 13$
6×6	$6 + 6 = 12$

→ Sum is 15 the two numbers ar 12 and 3

Sum of two number

Answer: 12, 3

6. What is $\frac{2}{7}$ of 315?

$\frac{315}{7} = 7 \overline{)315} (45$
28
35
35
0

$\frac{315}{7} = 45$

$= \frac{2}{7} \times 315 = 2 \times \frac{315}{7}$

$= 2 \times 45$

$= 90$

Answer: 90

7. Put the following numbers in order of size, starting with the smallest first:

Note

$\frac{1}{4} = 0.25$

$\frac{3}{4} = 0.75$

$3\frac{1}{4}$ 3·34 $3\frac{3}{4}$ 3·025

$= 3 + 0.25$

$= 3.25$

$= 3 + 0.75$

$= 3.75$

Answer: $3.025 < 3.25 < 3.34 < 3.75$

$\Rightarrow 3.025, 3\ 1/4, 3.34, 3\ 3/4$

8. What is the difference, in cm, between 3.2 metres and 30 cm?

Note

1 meter = 100 cm

-> convert meter to Centimeter before subtracting

$\Rightarrow 3.2 \text{ meter} - 30 \text{cm}$

$= 3.2 \times 100 - 30 \text{cm} = 320 \text{cm} - 30 = 290 \text{cm}$

Answer: 290 cm

9. Put the correct number in the empty box.

20 - 8 = 4 x 3

$\square - 8 = 4 \times 3$

$\square - 8 = 12$

Add 8 on both sides

$\square - 8 + 8 = 12 + 8$

$\square = 20$

10. Write down the next two numbers in the sequence.

5, $6\frac{1}{2}$, 8, $9\frac{1}{2}$, 11, 12 1/2

5, 6.5, 9.5 are the first four numbers. 1.5 is the difference between two consecutive numbers So, fifth number is 9.5 + 1.5 = 11, sixth number is 11 + 1.5 = 12.5

11. Fill in the gaps

addition	subtraction	multiplication
$\overset{+1}{5}\ \boxed{6}\ 4$ $+\ \boxed{3}\ 7\ \boxed{0}$ $9\ 3\ 4$	$\boxed{9}\ \overset{6}{\cancel{7}}\ \boxed{\cancel{x}}\ {}^{11}$ $-\ 5\ \boxed{3}\ 8$ $4\ 3\ 3$	$\overset{+2}{\boxed{1}}\ 3\ \overset{+6}{\boxed{9}}$ $\times\ \ 7$ $9\ \boxed{7}\ 3$

12. Shakira has five cards with numbers on them, as shown below:

8	7	1	5	3

a) Write down the **largest even** number that Shakira can make using exactly **four** cards.

In Decreasing ② order ← 7 5 3 1 | 8

① For number to be even

Answer: 75318

b) Write down the **smallest odd** number that Shakira can make using all **five** cards.

1 3 5 8 | 7

② In Increasing Order

Longest ① possible odd number

Answer: 13587

13. A recipe for making 12 large chocolate chunk cookies includes the following ingredients:

300g plain chocolate

100g sugar

85g butter

1 large egg

$\frac{1}{2}$ teaspoon vanilla extract

100g self-raising flour

a) If Jamie makes 30 cookies, how much plain chocolate will he need?

12 cookies require 300g Plain Chocolate

So, 1 cookie require $\frac{300}{12}$ g Plain chocolate

$\frac{300}{12} = \frac{300}{12_4} \overset{100}{} 25 = 25$

So, 30 cookies require 30×25g chocolate $= 750$g chocolate

Answer: 750 g

b) Jamie calculates that the cost of making 30 cookies is £5.10. If he sells all 30 cookies at 26p each, how much profit will he make?

Each cookies Selling Price = 26p

30 cookies Selling Price $= 30 \times 26$

$= 780\text{p} = \frac{780}{100}\text{£} = 7.8\text{£}$

$\therefore$ Profit = Selling Price − Cost of making

$= 7.8 - 5.1$

$= 2.7\text{£}$

Answer: 2.7 £

14. Nikita pays £9.50 a month for her mobile phone and an extra 17p for each call that she makes. How much does she pay in a month when she makes 50 calls?

Cost of each call = 17p

Cost of 50 calls = 50 × 17p = 850p

$= \frac{850}{100}$ £ = 8.5 £

Basic charge + extra call charge

= 9.5 £ + 8.5 £

= £ 18

Answer: £ 18

15. Eleanor is 11 years and 4 months old. Her sister Mary is 3 years and 10 months younger than Eleanor.

How old is Mary? Give your answer in years and months.

Let us convert the age again into months

E = 11y 4m = (12×11)+4 = 136m

3y 10m = (3×12)+10

= 46

$12\overline{)90}$ 7, 84, (6)

=> 136 − 46 = 90

= 7y 6m

Answer: 7 year, 6 months

16. In the last year a library bought 237 new books and removed 67 books. There were 5745 books in the library at the end of the year.

How many books were in the library at the **start** of the year?

Let 'x' be number of books at start of the year

− 237 new books were added, 67 books were removed

So x + 237 − 67 is total books now.

=> x + 237 − 67 = 5745

x + 170 = 5745

x = 5745 − 170 = 5575

Answer: 5575 books

17. Here is part of a train timetable for trains running between Hereford and Shrewsbury.

Hereford	depart	0820
Ludlow	arrive	0843
Ludlow	depart	0845
Shrewsbury	arrive	0930

a) How long does the journey from Ludlow to Shrewsbury take?

Journey time b/w Lands } Arrival time at Shrewsbury − Departure time at Ludlow

$= 9{:}30 - 3{:}45$

$= (9 \times 60 + 30)\,\text{min} - (8 \times 60 + 45)\,\text{min} = 60 - 15 = 45\,\text{min}$

Answer: 45 min

b) The return journey starts at 1950 from Shrewsbury. If each part of the journey (including the wait at Ludlow) takes the same time as in the morning, complete the timetable for the return journey.

Shrewsbury	depart	1950
Ludlow	arrive	2035
Ludlow	depart	2037
Hereford	arrive	2100

18. Kristina bought a bag of sweets and ate $\frac{3}{5}$ of them.

If she ate 18 sweets, how many sweets were left over?

− Suppose Kristina had x sweets

− she ate $\frac{3}{5}$ xx sweets

$\Rightarrow \frac{3x}{5} = 18 \Rightarrow x = \frac{18 \times 5}{3} = \frac{18^{6}}{3} \times 5 = 30$

Answer: 12

→ So, leftover sweets $= x - 18$

$= 30 - 18 = 12$ sweets left over

19. In a money-bag there are an equal number of 2 pence and 5 pence pieces and no other coins. How many coins are in the bag altogether if the total amount of money is £1.26? Suppose there are 'x' 2 pence and 'x' 5 pence coin

Total amount of money = (2x + 5x) pence
= 7x p

Total amount is £ 1.26
=> 7x p = 1.26 £ = 1.26 × 100p
7x p = 126
=> x = 126/7 = 18

$\frac{126}{7} = \frac{126}{7}$ 18 = 18

Total Coin = 2x
= 36 Answer: 36 Coin

20. Suki buys 500g of sugar at £1.10 per kilogram and 750g of plain flour at £1.12 per kilogram. How much change did she receive from a £5 note?

1000g of sugar = 1.10£
=> 500g of sugar = $1.10 \times \frac{500}{1000}$ £ = $\frac{1.10}{2}$ £ = 0.55£
1000g of flour = 1.12£
750 of flour = $1.12 \times \frac{75}{1000}$ £ = $1.12 \times \frac{3}{4}$ £ = 0.84£

Total spent = (0.55 + 0.84)£ = 1.39£
Change she will get = (5 − 1.39)£
= 3.61

Answer: £ 3.61

21. In a bag of eleven marbles five of them are green, two are yellow and the rest are purple.

a) What fraction of the marbles are purple?

Number of purple marbles = 11 − (5 + 2) = 11 − 7 = 4
4 are purple out of 11
So, fraction = 4/11

Answer: 4/11

b) If the two yellow marbles are both removed, what fraction of the remaining marbles are green?

If two Yellow marbles removed ; Total number of the marble are 9 marble
5 are green out of 9
=> fraction of green marble = 5/9

Answer: 5/9

22. List the letters in the word

HEXAGON

which have **exactly one** line of symmetry?

H, 2 lines of symmetry
E, 1 line // //
X, 2 lines // //
A, 1 line // //
G, No lines // //

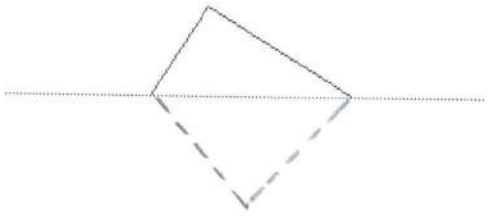
I - 2 lines of symmetry

N No lines of symmetry

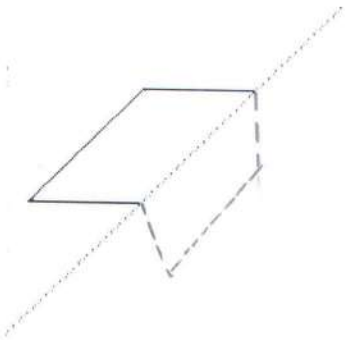
Answer: E, A

23. Draw the reflection of each shape in the given line.

a)

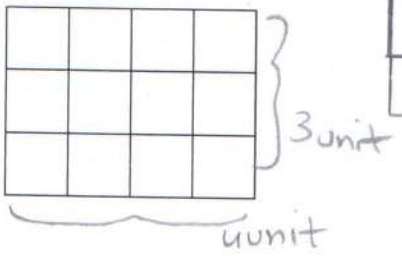


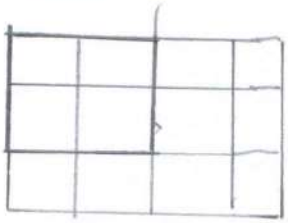
b)



24. How many squares are there in this diagram?

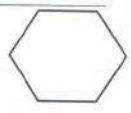
1 unit Square = 12
2 unit Square = 2 x 3 = 6
3 unit Square = 1 x 2 = 2



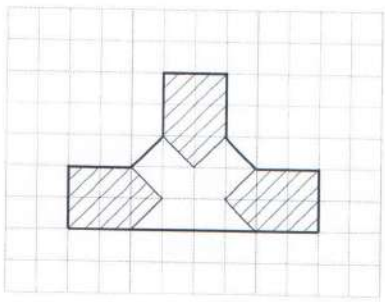


Total number of Square = 12 + 6 + 2 = 20

Answer: 20



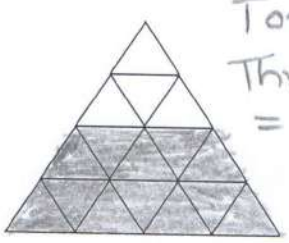
25. a) What fraction of the shape in this diagram is shaded?



Total area of shape
$= 22 + 2 \times \frac{1}{2} = 23$ units
Shadded area $= 3 \times [4 + 2 \times \frac{1}{2}]$
$= 3 \times 5 = 15$ units
Fraction shaded $= \frac{15}{23}$

Answer: 15/23

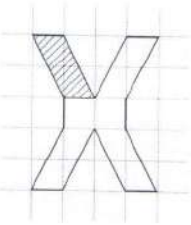
b) Shade in three quarters of this diagram.



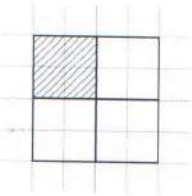
Total number of triangle = 16
Three quaters of 16
$= \frac{3}{4} \times 16 = 12$
So, 17 triangle should be shaded in this diagram

(c) Look at the diagrams below and tick the correct statement.

Shape A
Total area
= 10 units
Shaded area
= 2 units



A



B

Shap B
Total area
= 16 units
Shaded area
= 4 units

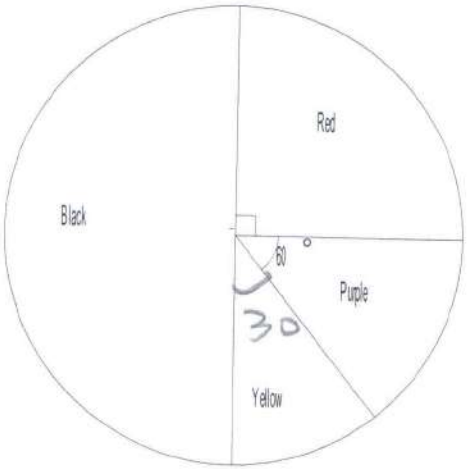
(i) Shape A has a greater fraction shaded than B. ☐

(ii) Shape B has a greater fraction shaded than A. ☑

(iii) Both A and B have the same fraction shaded. ☐

=> Shape A's fraction Shaded $= \frac{2}{10} = \frac{1}{5} = 0.2$
Shape B's fraction Shaded $= \frac{4}{10} = \frac{1}{4} = 0.25$
$\frac{1}{4} > \frac{1}{5}$

26. The pie chart shows the favourite colour of 180 pupils in Highfield School.



a) What angle has been used to show yellow?

$60 + y = 90$

$\Rightarrow y = 30°$

Answer: 30°

b) What percentage of pupils have red as their favourite colour?

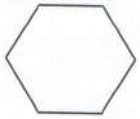
$\frac{90}{360} \times 100 = \frac{100}{4} = 25\%$

Answer: 25 %

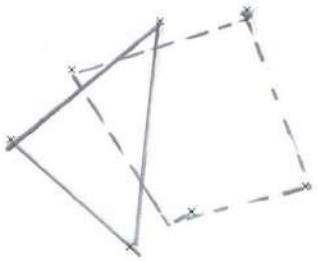
c) How many pupils have black as their favourite colour?

$\frac{180}{360} \times 180 = \frac{180}{2} = 90$

Answer: 90



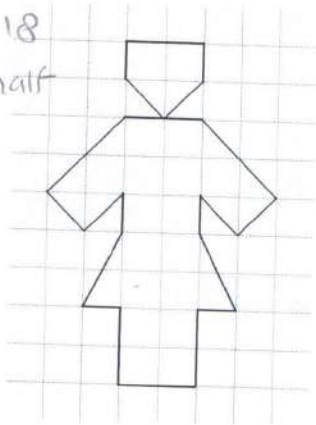
27. Each cross is a corner of a shape. Join the correct corners to make a square and an equilateral triangle.

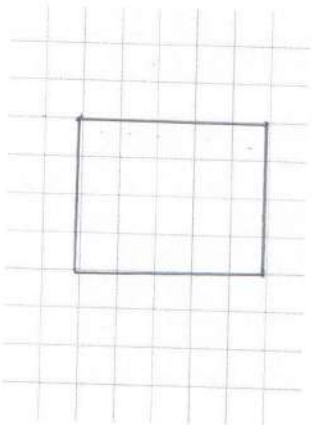


- solid blue line shows an equilaterval triangle
-> batted blue lines shows a square

28. Work out the area of the shape below and in the empty grid draw a **square** with the same area.

① number of □ = 18
② number of △ half square = 18
③ number of  = 2

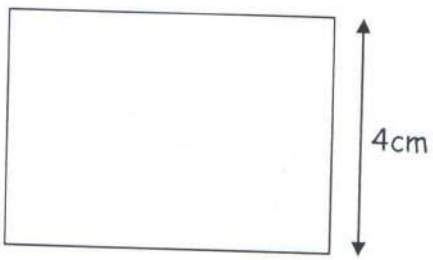




5 × 5 square

Area = 18 × 1 + 10 × $\frac{1}{2}$ + 2 × ($\frac{1}{2}$ × 1 × 2) = 25 units and
25 = 5^2

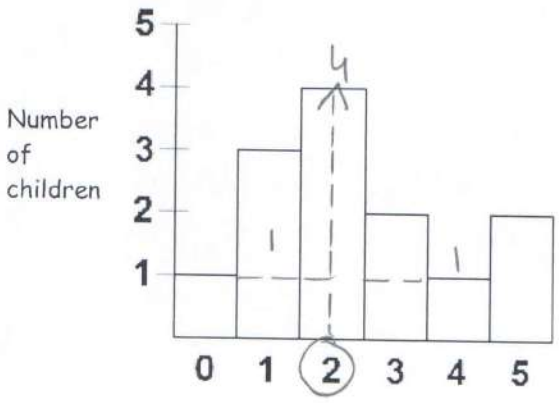
29. The area of this rectangle is 24cm^2. What is its perimeter in cm ?



Let the other side be 'x' cm
=> 4x is area of rectangle
4x cm^2 = 24 cm^2 => x = 6
=> Perimeter = 2(l + b) = 2(6 + a) cm
= 20 cm

Answer: 20 cm

30. This bar chart shows the number of pets owned by children in the Animal Club.



a) What is the most common number of pets?

Answer: (2)

b) How many children owned exactly 4 pets?

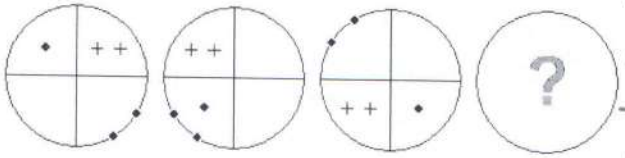
Answer: (1)

c) How many children are in the club?

C) 1+3+4+2+1+2 = 13

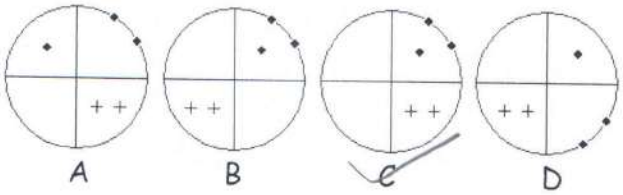
Answer: 13

31. In these diagrams, the positions of the dots and crosses are changing:



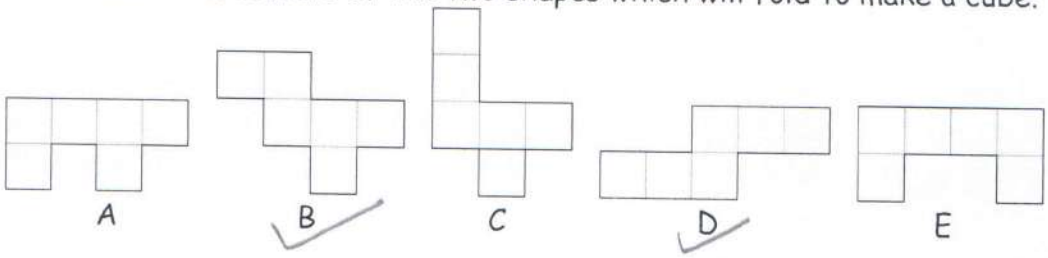
'++' sign moving one quarter anticlockwise
->. sign moving one one quarter anticlock wise
->'.–.' sign moving one quarter clockwise
so

Which of the diagrams below is the next in the sequence?



Answer: C

32. Write down the letters of the **two** shapes which will fold to make a cube.



Answer: B and D

33. a) What is the diameter of this two pence coin, in centimetres?

Diameter = 43 − 17 mm
= 26
As 10mm = 1cm
26mm = $\frac{26}{10}$ cm
= 2.6

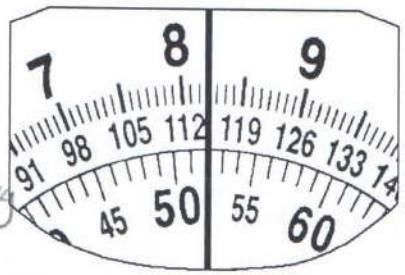
Answer: 2.6 cm

b) If it is evening, what 24 hour clock time does the watch show?

① Time displayed is 9 hrs 24 mins
As it is evening 24 hour clock will show 12 hrs + 9hrs 24min = 21 hrs 24min
= 21 hrs 24 min will be shown in 24 hours clock

Answer: 21 hrs 24 min

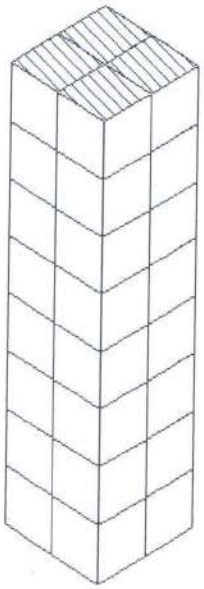
c) A teacher is weighing herself. The outer scale shows stones and lbs and the inner scale shows kg. What is the teacher's weight in kilograms?



① There are 5 divisions between 50 and 55kg
② So, each division Correspondus to $\frac{(55-50)}{5}$ kg
= 1 kg
③ So weight scale is at 50 + 2 kg division = 52 kg

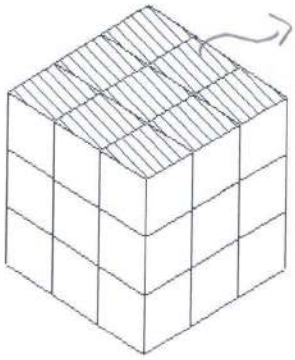
Answer: 52 kg

34. This tower is made of small cubes.



If the tower is taken apart and rebuilt into the big cube shown below, how many small cubes are left over?

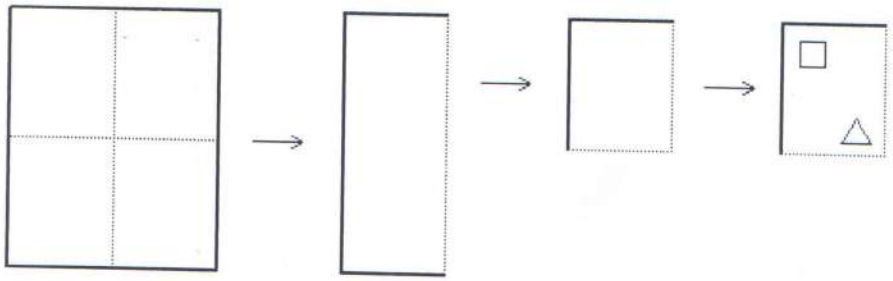
So leftover cubes = 32 - 27 = 5



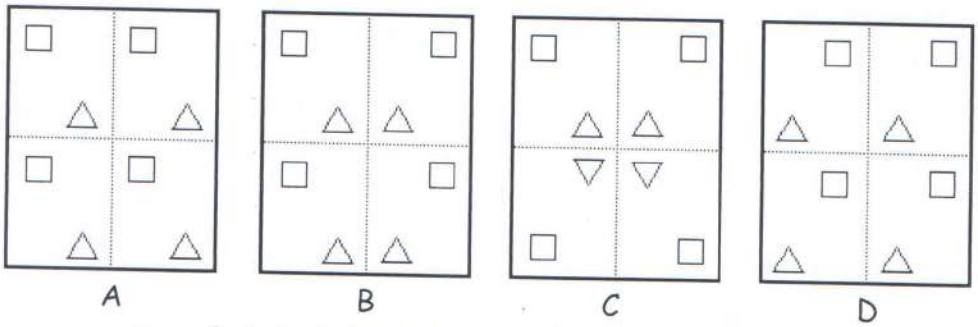
Here. No of cubes = 4 x 8 = 32 | No of cube = 9 x 3 = 27

Answer: 5 cubes

35. A piece of paper is folded in half and then folded in half again. Two shapes are then cut out of it.



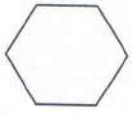
The paper is unfolded. Which diagram shows what the paper looks like?



As proper is folded both vertically and horizontally, there should be

Answer: C

(1) horizontal line of symmetry
(2) Vertical lines of symmetry



36. ● × ■ +

These shapes have been put in an endless pattern.
The first 21 shapes are shown below.

● × × ■ ■ ■ + + + + ● ● ● ● ● × × × × × ×

If the pattern continued what would be the

a) next shape ?

Answer: 

b) 30th shape ?

Answer: +

37. "David is 11", said Anne.
"I am 13", said David.
"David is older than me", said Meera.

Anne sometimes tells the truth, Meera always tells the truth and David never tells the truth. One of them is 11, another 12 and the other 13.

a) How old is David?

David age is 12
(explained above)

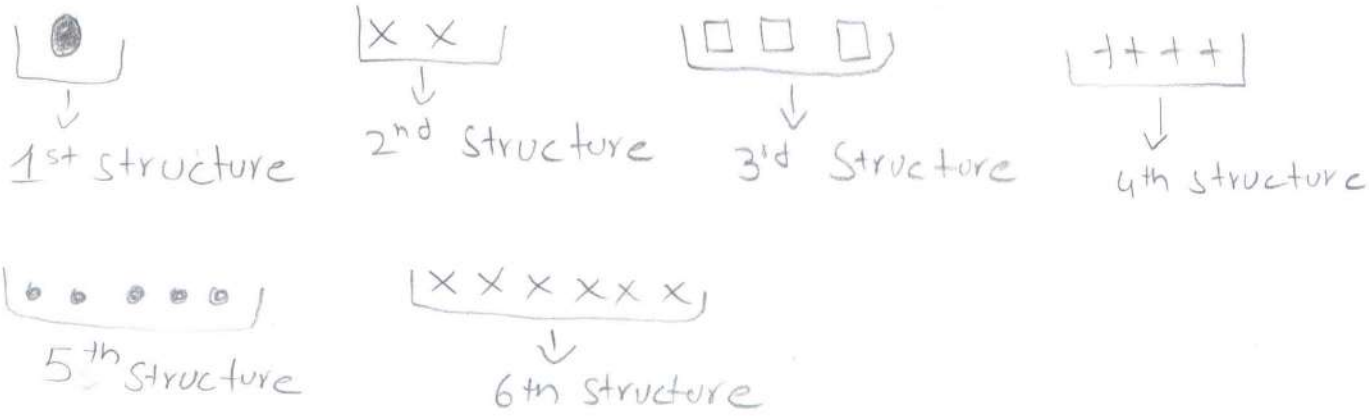
Answer: 12

b) How old is Anne?

As D > M, D = 12, so M = 11
that leaves ; A = 13

Answer: 13

Question no 36 (Answer)



→ In 4th structure, there will be 'n' number of Shapes

→ O, X, □, + will be repeating Structure by Structure

1st	Structure	●	5th	Structure	● . . . .
2nd	//	X	6th	//	X . . . .
3rd	//	□	7th	//	▣ . . . .
4th	//	+	8th	//	+ . . . .

→ If there are 'n' structure
there will be $1+2+\ldots\ldots n = \frac{n(n+1)}{2}$ number of Shape

→(a) Neat Shap

There are 6 Structures are 21 Shapes next will be 7th Structure with Symbol 20, Neat symbol ▣

(b) 30th shape

for 6 Structure $\frac{6\times2}{2} = 21$ shapes

For 7th Structure $\frac{7\times8}{2} = 28$ shapes

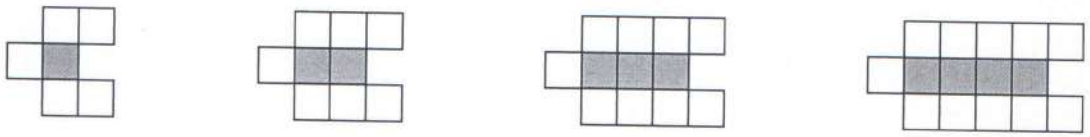
=> 29th and 30th symbol will be 8th structure

=> 30th symbol is '+'

A part from 1,2,3 labelled white square, there will be 2 'n' will square for 'n' Black square [below]

$\Rightarrow$ $W = 2D + 3$ | $T = W + D = 3D + 3$

38. Look at these patterns: A part from 1,2,3 labeled white square there will be



a) Complete the table below

Number of dark squares	1	2	3	4	5
Number of white squares	5	7	9	11	13
Total number of squares	6	9	12	15	18

b) How many white squares would be needed for a pattern with 9 dark squares?

$d = 9$

$\Rightarrow W = 2d + 3 = 2 \times 9 + 3 = 21$

Answer: 21

c) How many dark squares would be needed for a pattern with 23 white squares?

$W = 23$, $d = ?$

$2d + 3 = 23$

$\Rightarrow d = (23 - 3)/2 = \frac{20}{2} = 10$

Answer: 10

d) A pattern has 45 squares in total. How many of them are white?

$T = 3d + 3 = 45$

$\Rightarrow 3(d + 1) = 45$

$d + 1 = 15$

$d = 14$

$W = 2d + 3$

$= 2 \times 14 + 3 = 31$

Answer: 31

39. What is the acute angle between the hands of a clock at

a) 1p.m

At 1 pm, minute had at 12
hour had at 1

$= \frac{36}{12} = 30°$

Answer: 30°

b) 6.30p.m

6:30 minute had at 6
Hour had between 6 and 7 (Exactly in between)

$= \frac{30°}{2} = 15°$

Answer: 15°

40. Oni has 11 penpals. Last week she wrote to all of them.
She wrote a 4-page letter to some of her penpals and a 3-page letter to the rest. Altogether she wrote 38 pages.

To how many penpals did Oni write a 3-page letter ?

Suppose she wrote 3pages letter to 'x' penpals
=> // // 4 // // // '11-x' penpals

=> Total papes = $3x + 4(11 - x) = 44 - x$ pages

Given that, She wrote 38 pages total

=> $44 - x = 38$

=> $x = 44 - 38$

$x = 6$

Answer: 6

∴ She wrote 3pages letter to 6 penpals

41. If a and b are whole numbers, then **a ☺ b** means **(b × b) ÷ (a + 1)**

So for example, **2 ☺ 6 = (6 × 6) ÷ (2 + 1) = 36 ÷ 3 = 12**

a) Find **1 ☺ 10**

$= \frac{10 \times 10}{1+1} = \frac{100}{2} = 50$

Answer: 50

b) Find **(3 ☺ 4) ☺ 5**

① $3 ☺ 4 = \frac{4 \times 4}{3+1} = \frac{4 \times 4}{4} = 4$

$(3 ☺ 4) ☺ 5 = 4 ☺ 5 = \frac{5 \times 5}{4+1} = \frac{5 \times 5}{1} = 5$

Answer: 5

c) If **6 ☺ y = 7**, what is the value of **y**?

$6 ☺ y = \frac{y+y}{6+1} = \frac{y^2}{7} = 7$ (given)

$\Rightarrow \frac{y^2}{7} = 7$, $y^2 = y^2 = 7^2 \Rightarrow y = 7$ or -7

But only whole number are selected

So, $y = 7$

Answer: 7

42. Billy is given some toffees by his father. He eats one and then shares the rest out equally between himself and Emily. He then eats another and then shares the rest out equally between himself and Detti. He eats one more and gives the last one to Sean.

Suppose billy had 'x' toffees at the start

① He eats 1, Remaining = $x-1$

② hence equally between himself and Emily
So, each has $\frac{x-1}{2}$ toffee

③ He eats one more and so, Remaining = $\frac{x-3}{2}$

④ shares equally between himslef and Detty
So, each has $\frac{x-3}{4}$ toffee

⑤ He eat one more after which only one is meaning

$\Rightarrow \frac{x-3}{4} - 1 = 1 \Rightarrow (x-3)/4 = 2 \Rightarrow \boxed{x=11}$

a) How many toffees did Detti get?

Deti gets $\frac{x-3}{4}$ toffees

$\Rightarrow \frac{11-3}{4} = \frac{8}{4} = 2$

Answer: 2

b) How many toffees did Emily get?

Emily gets $\frac{x-1}{2}$ toffee

$\Rightarrow \frac{11-1}{2} = 5$

Answer: 5

c) How many toffees did Billy have at the start?

Billy had $x = 11$ toffee

Answer: 11

43. **A B C D E** are the first five letters of the alphabet in the usual order.

A and **B** are neighbours as they are next to each other in the alphabet.
B and **C** are also neighbours.
C and **D** are neighbours, **D** and **E** are neighbours.

The five letters have to be written down in some other order so that **no** neighbours are next to each other (in any order).
For example, **A C E D B** is **not allowed** because the neighbours **D** and **E** are next to each other.

a) If we start with **A** there are only two ways of writing the five letters with no neighbours next to each other. The first one is done for you. Complete the other way.

A D B, E, C

→ 3rd shouldn't be C and E
So, 3rd is B
→ 4th shouldn't be C
so 4th is E, = 5th is C

Answer 1: A C E B D

Answer 2: A D B E C

b) Now start with the letter **B**. There are three ways of writing the five letters with no neighbours next to each other. The first one is done for you. Complete the other two ways.

→ B D A E C
3rd is A, (can't be C, E)
4th is E, 5th is C

Answer 1: B D A C E

→ B, E, —, —, —
3rd is A (or) C
If 3rd is A, then C, D will be together
So
3rd is C
4th is A
5th is D

Answer 2: B D A E C

Answer 3: B E C A D

c) In total, how many ways are there of arranging the letters **A B C D E**, so that none are next to their neighbours?

Answer: 15

END