Godolphin & Latymer

Entrance Examination – Group 2

Friday 16th January 2009

MATHEMATICS

Time: 1 hour 15 minutes

Name: _____

Instructions:

Work through the paper without rushing.

Do your work clearly in the space near each question.

Don't rub out your working: you may get marks for it.

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

NO CALCULATORS OR RULERS ARE ALLOWED.

1. $484 + 365 = 849$

2. $7608 - 495 = 7113$

3. $297 \times 8 = 2376$

4. $9\overline{)2016} = 224$

5. Write the number thirty thousand, two hundred and ninety seven in figures.

Answer: 30,297

6. On Monday it was -12°C. The temperature rose by 1 °C each day for the next week. What was the temperature on Friday?

$-12+4$

Answer: -8

7. Which of these letters do not look the same when reflected in the mirror line shown below?

X A E D Z

mirror line

Answer: A

Note: you should know which letters have vertical, horizontal or both symmetries for general types that could come up

8. Write down the next two terms in each sequence:

15, 24, 33, 42, 51, 60 (+9)

2.2, 2.5, 2.8, 3.1, 3.4, 3.7

$\frac{1}{3}$, 1, 3, 9, 27, 81

9. a) May is 14 years old and her father is 39 years older than her. May's mother is 8 years younger than her father. How old is May's mother?

M = 14

F = 39 + 14 = 53

Mother = 53 − 8

= 45

Answer: 45

ie have horizontal symmetry

b) Five glass marbles cost a total of £7.50. How many marbles could I buy with £24? 1 costs 1.50

$\frac{24}{1.50} = 16$

Answer: 16

10. Add the smallest of the following numbers to the largest:

1, 0.13, 0.8, 0.012, 1.238, 0.028

1.238 + 0.012

Answer: 1.25

11. I arrived at the station at 7.47 a.m. My train was due at five past eight but was 13 minutes late.

How long did I have to wait for my train?

7:47 am

8:18 am

7:50

DO 7:47 - 8

8 - 8:18

8:00

Answer: 31 mins

12. You multiply a number by itself. You then multiply the new number by three. The answer is 192.

What is your starting number?

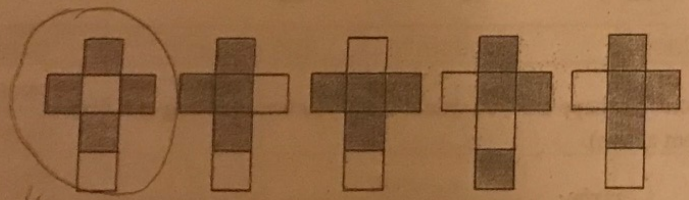
$3x^2 = 192$

$x^2 = 64$

$x = 8$

Answer: 8

13. Circle the net which can be folded into a cube that looks different from the others.



White on opp sides, not next to eachother

14. Disc B turns twice when A turns 5 times. If disc A turns 45 times, how many times does disc B turn?

$\frac{45}{5} = 9$

$9 \times 2 = 18$

Answer: 18

15. A box contains 48 pieces of fruit. Five eighths of them are apples and the rest of them are pears. How many pears are there?

$\frac{5}{8} \times 48 = 30$ apples

$48 - 30 = 18$

Answer: 18

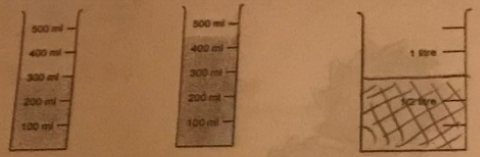
16. Use the symbols +, -, ÷, or x to make each calculation correct.

i. 5 [+] 3 = 12 [−] 4

ii. 2 [x] 3 = 12 [÷] 2

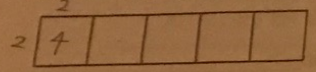
iii. 5 [÷] 5 = 4 [÷] 4

17. All the water from these two beakers is poured into the empty beaker. Draw a line to show the level of the water in the new beaker.



450 + 300 = 750 = $\frac{3}{4}$ litre

18. A square has a perimeter of 8cm. Five of these squares are put together in a line to make a rectangle.
What is the area of the rectangle?



4 x 5 = 20

Answer: 20

19.

For Sale	
Tomatoes	£1.50 per pound
Green Peppers	40p each
Cucumbers	30p each

Brendan and Sophie got £0.20 change when they paid with £5 for some tomatoes, green peppers and cucumbers which they bought at a farm stand.

- They bought 5 tomatoes, which weighed 2 pounds altogether.
- They bought two more tomatoes than green peppers.

How many cucumbers did they buy?

5 - 3 - 1.20 = 0.80 left over

- .20 = .60

spend 0.60 on peppers

so 2 peppers

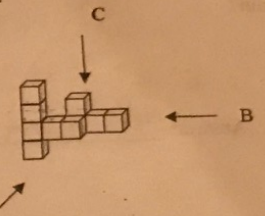
Answer: 2

3 green peppers £1.20

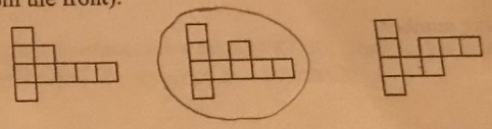
so bought 3 green peppers 1.20

SIM to 2008 #34

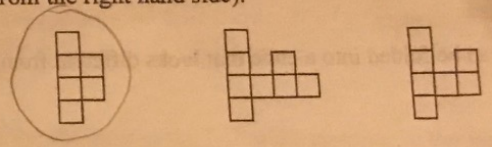
20. The following is a representation of a 3-dimensional shape, made up of cubes.



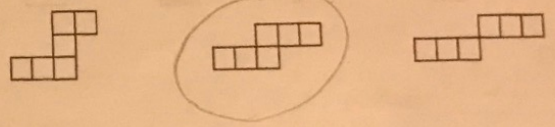
a) Circle the shape that you would see if you were looking at it from A (from the front).



b) Circle the shape that you would see if you were looking at it from B (from the right hand side).



b) Circle the shape that you would see if you were looking at it from C, (from above).



21. Three neighbouring families chose different holidays abroad this year.

Use the clues below to work out their house numbers, their chosen destinations and the months during which they were away.

The families: Brown, Green, Smith
The house numbers: 6, 8, 10
The destinations: Cyprus, Portugal, Spain
The months: May, June, July

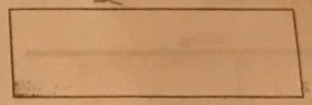
Clues:

1. The Browns, who don't live at No. 8, went to Spain.
2. The Smiths took their holiday in June.
3. One family went to Portugal in July. → so may must be spain
4. The Greens live at No. 6.

Name	House No.	Destination	Month	
Brown	10 (4)	Spain (1)	May	(6)
Green	6 (3)	portugal (2)	July	(5)
Smith	8 (5)	cyprus (3)	June	(2)

22. A rectangle has an area of 60 cm^2. Its length is 11cm more than its width.

What is the perimeter of the rectangle?

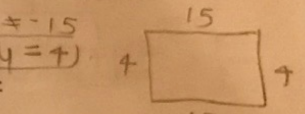


tells you sum and product

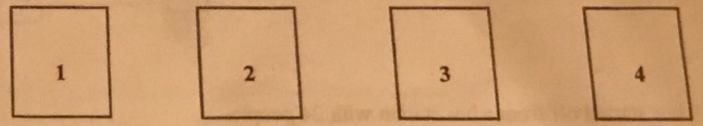
Without algebra: think what numbers multiply to make 60 with a difference of 11

With algebra:
$xy = 60$
$x = y + 11$
$(y+11)y = 60$
$y^2 + 11y = 60$
$y^2 + 11y - 60 = 0$
$(y-4)(y+15) = 0 \Rightarrow \boxed{y = 4}$ $y \neq -15$

Answer: 38



23. Here are four cards which you can use to make numbers:



Can we repeat the numbers? Assume not if not told!

Write down all the possible 4-digit even numbers you can make which are greater than 3000. Write your answers from smallest to biggest.

If ends in 4: $1 \times 2 \times 1 \times 1 = 2$ ways
if ends in 2: $2 \times 2 \times 1 \times 1 = 4$ ways
6 ways total

3124, 3142, 3214, 3412, 4132, 4312

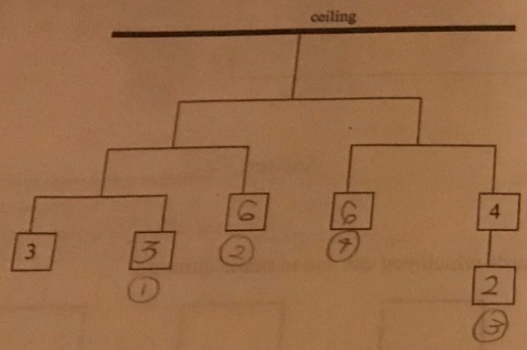
if starts with 3 must end in 2 OR 4

if starts with 4 must end in 2

3124, 3142, 3214, 3412, 4132, 4312

24. A child's mobile (not phone!) is suspended from a ceiling and has some weights suspended so that each bar is balanced as shown.

Fill in the weights that are missing.



Needs to be 12 total so 6 each

25. A bus started off from a bus station with 24 people.

At the first stop 4 people got off and some people got on.
At the second stop, no one got off but 3 people got on.
There were then 34 people.

How many people got on at the first stop?

$24 - 4 + x + 3 = 34$

$23 + x = 34$

$x = 11$

Answer: 11

26. Hayfield School girls' football team played Greentops School at home last week. The final score was 3:1. (The home team is listed first.)

Below is a list of possible half time scores, but one has been missed out. Can you find it?

✓ 2:1 ✓ 0:0 ✓ 2:0 ✓ 1:1

✓ 3:0 ✓ 3:1 ✓ 1:0

1:2 not possible

Answer: 0:1

27. The Jones children take their dogs for a walk.
There are 3 times as many dogs as children.
The total number of legs is 56. How many Jones children are there?

let c = number children

D = 3c

children have 2 legs
Dogs have 4 legs

$2c + 12c = 56$

$14c = 56$

$c = 4$

2c
3(4c)

Answer: 4

Without algebra:

$\frac{56}{4} = 14$ so < 14 dogs

has to be >2 legs for children

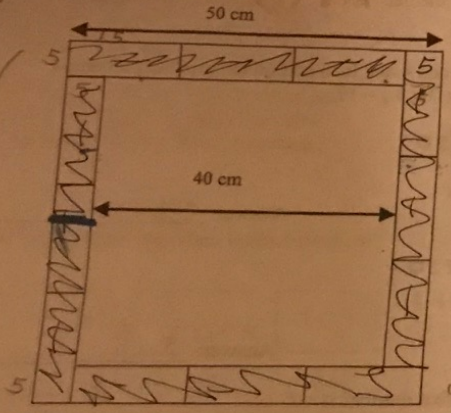
2 children = 4 legs 56 − 4 = 52 52/4 = 13

but 13 isn't 3×2. Repeat for 3 children etc

Area

Sept 2011

28. #35 215



50 - 40 = 10

$\frac{10}{2} = 5$

50 - 5 = 45

$\frac{45}{3} = 15$. 15 x 5 = 75

OR other way

$50^2 - 40^2 = 900$

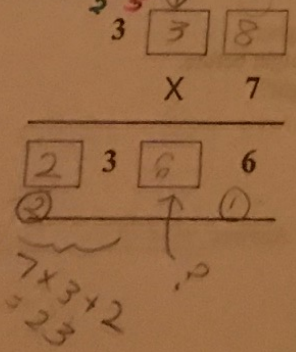
$\frac{900}{12} = 75$

Twelve rectangles, all the same size, are arranged to make a square, as shown in the diagram above.

Calculate the area of one of the rectangles.

Answer: 75

29. Fill in the missing digits in this multiplication:



① only multiple of 7 ending in 6 is 56

② 7 x 3 = 21 but ends in 3 so must have added 2

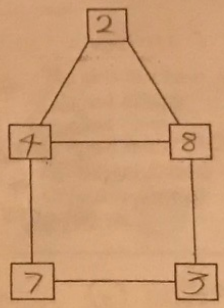
③ 7x + 5 = 2?

so, 7x + 5 = 26

7x = 21 ÷ 7 = 3

MUST be 28 or 21 to be divided by 7 but need to minus 5 first so must be 28, if -5 to get 23 would be 23 but need 28

30. Enter the numbers 2, 3, 4, 7, 8 into the boxes on the shape according to the following rules: trial and error



a) All 3 numbers in the triangle are even

b) The total of the 4 numbers on the square is 22.

c) The total of numbers on the left hand edge of the square is equal to the total of numbers on the right hand edge.

d) The number in the bottom left hand corner of the square is greater than the number in the bottom right hand corner.

31. Use the fact that 742 x 36 = 26712 to work out these sums:

742 x 360 = 267120

26712 ÷ 36 = 742 $\frac{26712}{36} = 742$

742 x 72 = 53424 Double 26712

743 x 36 = 26748 Add 36

like 2008 # 28
2011 # 32

32. Bernard thinks of a number.
When the number is divided by 2, the remainder is 1.
When the number is divided by 3, the remainder is 2.
When the number is divided by 4, the remainder is 3.
When the number is divided by 5, the remainder is 4.
It is less than 80. What is the number?

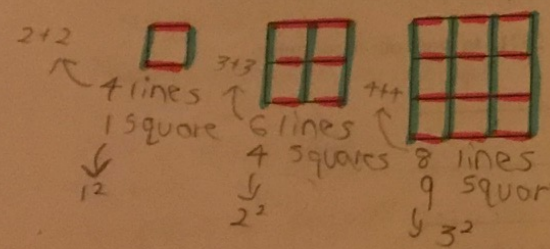
① ÷2 ⇒ r1. This tells you number is odd
② ÷3 ⇒ r2
③ ÷4 ⇒ r3
④ ÷5 ⇒ r4. This tells you doesn't end in 0 or 5.

Number < 80 since remainder is 4 can only end in 4, 9, since when divisible by 5 ends in 0 or 5

so number can only end in 9 Answer: 59

Now trial and error, use ② and ③
use ③ first
15 no, 19 OK but not a remainder of 2 when divided by 3 keep going

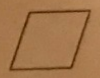
33. The second pattern has four small squares and is made from six lines.
How many lines are needed to draw 64 small squares?



64 = 8²

so 9+9 lines = 18 Answer: 18

Hint: Number of lines is always 1 more than number of cubes making the side



34. On the planet Nodnol, the natives have a special sort of arithmetic using the symbol ✪.

3 ✪ 4 means add 3 and 4 and then add on the product of 3 and 4,
so 3 ✪ 4 = 3 + 4 + (3 x 4) = 19

(a) Find the value of 5 ✪ 7
12 + 35
Answer: 47

(b) Find the value of 2 ✪ $\frac{1}{2}$
$2\frac{1}{2} + 1$
= 3.5
Answer: 3.5

(c) If x ✪ 2 = 23, what number is x?
$x + 2 + 2x = 23$
$3x = 21$
$x = 7$
Answer: 7

(d) If n ✪ n = 99, what number is n?
$n + n + n^2 = 99$
$n^2 + 2n - 99 = 0$
$(n - 9)(n + 11) = 0$
$n \neq -11$, $\boxed{n = 9}$
Answer: 9

35. A bat ate 1,050 mosquitoes in four nights.
Each night she ate 25 more than the night before.
How many did she eat on the first night?
$x + (x + 25) + (x + 50) + (x + 75) = 1050$
$4x + 150 = 1050$
$4x = 900$
$x = 225$
Answer: 225

36. A box of chocolates contains 24 chocolates. Each chocolate is either milk chocolate or dark chocolate. All the chocolates have centres, which are either toffee or nut (not both).

There are 5 milk chocolates with a nut centre. There are 10 dark chocolates altogether, and 15 toffees altogether.

How many dark chocolate toffees are there?

	Milk	Dark	total
toffee	9	6	15
nut	5	4	9
total	14	10	24

Answer: 6

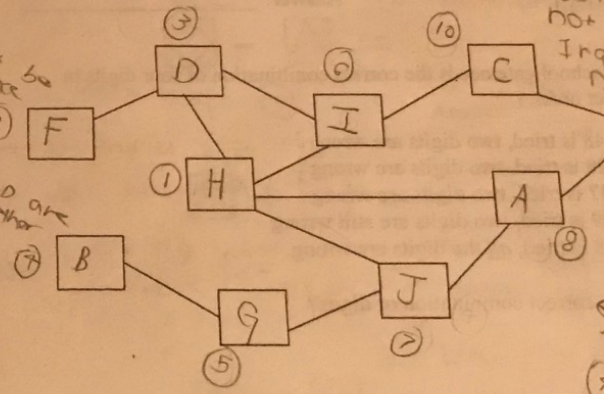
37. Ten girls live in ten different houses.

The boxes on the diagram represent the girls' houses.

The lines joining the houses show that the two girls from these houses have met.

The girls that have met are:

Ella and Alison
Dee and Fiona
Gita and Bella
Alison and Justyna
Crystal and Ingrid
Ingrid and Dee
Hiba and Justyna
Justyna and Gita
Ingrid and Hiba
Hiba and Alison
Dee and Hiba
Crystal and Ella



Put the first letter of the girl's name in the correct house.

F must be here since D is linked to H and F,D are together so B is below We know F,B only have 1 friend

1 Hiba with 4 J,I,J,D
Justyna Ingrid Alison Dee } with 3
Justyna & Ingrid not together
Ingrid and Alison not together but Justyna and Alison together and Dee and Ingrid are together

2, 3 Fiona is only friends with I = D and Bella with I = G
F,D } is same as B,G } 2 and 3 together

7 Gita with Bella, Justyna

38. (a) A school gate can be opened using the correct combination of digits in the correct order.

When 418 is tried, one digit is wrong. 2 right
When 238 is tried, one digit is wrong. 2 right
When 437 is tried, one digit is still wrong. 2 right

What is the correct combination?

438

Answer: 438

(b) Another school gate needs the correct combination of four digits in the correct order.

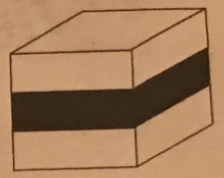
When 5648 is tried, two digits are wrong } if 6, 8 wrong then 5, 4 and
When 3628 is tried, two digits are wrong } 3, 2 right
When 3147 is tried, two digits are wrong can't be true so 6 must be right
When 5629 is tried, two digits are still wrong
When 1258 is tried, *all* the digits are wrong. with ① tells you 8 not last digit

What is the correct combination of digits?

Answer: 3649

39. A sweet is in the shape of a cube. It is made up of three layers of equal thickness, as shown in the diagram.

What fraction of the outside is black?



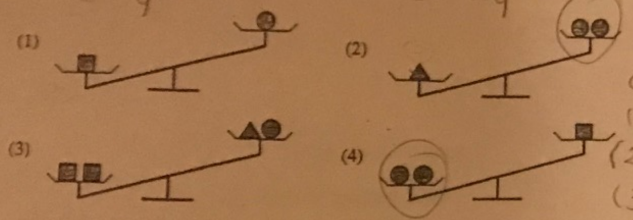
6 faces

$\frac{4}{18} = \frac{2}{9}$

Answer: $\frac{2}{9}$

40. Jane is trying to work out the weights of some shapes. She knows that the weights are whole numbers less than 10kg. The pictures show what Jane finds out. For example, picture (1) shows that the square is heavier than the circle.

x = square
y = circle
z = triangle



x > y
z > 2y
2x > 4z
2y > x

(1) x > y
(4) x < 2y
(2) 2y < z
(3) 2x > 4z

(a) What does picture (2) show?

Answer: a triangle is heavier than 2 circles

(b) Is the square heavier than the triangle?

is x > z ?

Answer: No

x < 2y and 2y < z (can use transitivity)
x < 2y < z so x < z

(c) What are the possible weights of the shapes?

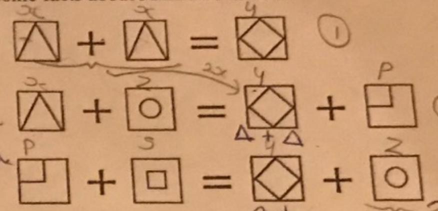
4 — y — square can't be 1, try 2 etc
7 — x
9 — z

all < 10
and whole numbers
1, 2, 3, 4, 5, 6, 7, 8, 9 are options

trial & error?

41. On the island of Mathia the people use patterns instead of numbers like ours.

Here are some facts about Mathian numbers.



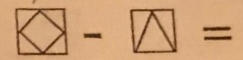
x + x = y ①
x + z = y + p ②
p + s = y + z ③

take off △ from each side
Replace △ + ▢ with 2, knock out ▢ from each side

OR: b) x + x = y from ① Adding x both sides x + (2) = y + p ② so z = x + p to make true using common sense and ①

Now answer these questions (Each answer is one Mathian number).

a)

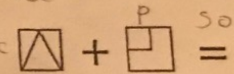


so want x − y

Answer: (triangle)

Rearrange ①
y − x = x

b)

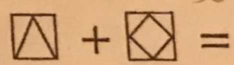


so want x + p

Answer: (circle)

② x + z = y + p (want x, p and 1 other var) elim y
sub ① x + z = x + x + p
z = x + p

c)



so want x + y

Answer: (square)

③ p + s = y + z (want x, y and 1 other var)
sub ② p + s = y + y + p − x
s = y + y − x
use ① for y: s = y + x + x − x
s = y + x
s = x + y

c) p + s = y + z ③
know that x + x = y ①, x + z = y + p ②
so p + s = x + x + z use ②
so s = x + y