2018

LATYMER UPPER SCHOOL
INDEPENDENT & CO-EDUCATIONAL

AWAITED FROM PDM

Entrance Examination

MATHEMATICS

SAMPLE PAPER

Time allowed: 60 minutes

Instructions
- Calculators are NOT allowed. You may use a ruler.
- Attempt all questions.
- If you cannot do a question, go on to the next one and try again later on.
- Do not ask the teacher to explain a question to you.
- If you finish before the end, check your answers and then wait quietly in your place.
- If you do not finish, or if you cannot understand all the questions, do not worry.

Section A
- You should spend about 20 minutes on this section. Each question is worth 1 mark. There are **20** marks for section A.
- Each question is provided with FIVE possible answers, only ONE answer is correct.
- Write the correct answer in the box on the right, if you make a mistake, rub it out and try again.

Section B
- You should spend about 40 minutes on this section. Marks for each question are shown in square brackets after the question. There are **40** marks for section B
- Write your answers **and working** in the spaces provided. **DO NOT** use extra paper.

Section A

1. What number is twenty-three less than seventy thousand?

   A: 67700   B: 69987   C: 69977   D: 50003   E: 47000

2. Multiply 304 by 12.

   A: 3648   B: 3048   C: 3016   D: 3042   E: 3608

3. I think of a number. When I subtract it from 24, the answer is the same as when I double it. What's my number?

   $$24 - x = 2x$$
   $$3x = 24$$

   A: 12   B: 10   C: 8   D: 6   E: 9

4. What remainder do you get when you divide 283 by 9?

   $$9 \overline{)283} \quad 4$$

   31

   A: 4   B: 5   C: 6   D: 7   E: 8

5. What is 842 − 658?

   A: 184   B: 194   C: 294   D: 284   E: 394

2018

6. Bob makes a sequence using the following rule: 'double and subtract 3'. If the first number in his sequence is 5, what will the fifth number in his sequence be?

$5, 7, 11, 19, 35$

A: 157   B: 77   C: 19   D: 35   E: 67

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7. What digit should replace the * below?

$$\begin{array}{ccc} \cancel{8}\,7\,* & {}^{1}3 & 9 \\ -\quad\; 2 & 6 & 1 \\ \hline 5 & 7 & 8 \end{array}$$

A: 8   B: 7   C: 6   D: 5   E: 4

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8. Two-thirds of a number is 66. What's the number?

$\dfrac{2}{3}x = 66$

A: 100   B: 99   C: 44   D: 33   E: 132

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9. Femi takes 2 hours and 53 minutes to cycle from London to Reading. If he arrived at 3:21pm, at what time must he have set off?

$-3\ hrs = 12:21\ PM$

$+7 \qquad = 12:28\ PM$

A: 12:24pm   B: 1:24pm   C: 12:28pm   D: 12:18pm   E: 1:28pm

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10. Two-thirds of a number is 3 more than three-fifths of the number. What's the number?

$\dfrac{2}{3}x = \dfrac{3}{5}x + 3 \qquad\qquad \dfrac{1}{15}x = 3$

$x = 45$

A: 20   B: 90   C: 54   D: 60   E: 45

11. Work out: $\frac{1}{5}+\frac{2}{3}$

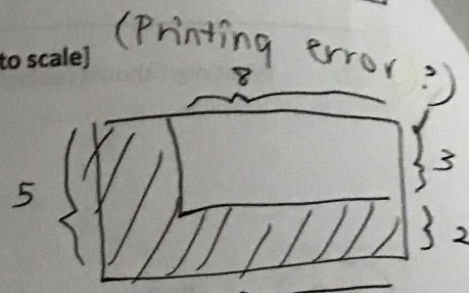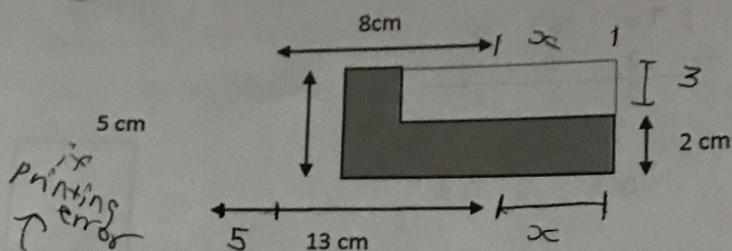A: $\frac{3}{15}$ 　　 B: $\frac{3}{8}$ 　　 (C) $\frac{13}{15}$ 　　 D: $\frac{11}{15}$ 　　 E: $\frac{2}{15}$

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12. What is the area of the shaded shape below? [Diagram not to scale] **(Printing error :)** 　8

Printing error →

8cm

5 cm

x 　 1

I 3 　 5

2 cm

5 　 13 cm 　 x

}3

}3 2

$13(5) - 8(3)$ 　 13

(A: 41cm²) 　 B: 49cm² 　 C: 56cm² 　 D: 89cm² 　 (E: More information needed *(from what given)*

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13. I buy 7 bags of Cheezos at 55 pence each and 4 bags of Nuttees at 63 pence each. How much change do I get from £10?

$$10 - 7(.55) - 4(.63)$$

A: £3.73 　 (B: £3.63) 　 C: £4.73 　 D: £4.63 　 E: £6.37

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14. Three **different**, positive odd numbers add together to make 23. What is the smallest possible value of the largest of the three numbers?

$23 = 1 + 3 + 19$

$= 3 + 9 + 11$

1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21

Won't work with 9 or 7

if A, B not possible so

look @ 11 onwards

A: 7 　 B: 9 　 (C: 11) 　 D: 13 　 E: 19

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15. A train travels 80km in 24 minutes. How long will it take to travel 150km?

×1.875 { 80 km = 24 min

150 km = 45 min }

$\frac{80}{150} = \frac{24}{x}$

$\frac{16}{30} = \frac{24}{x} \Rightarrow \frac{8}{15} = \frac{24}{x}$

A: 48 minutes 　 B: $\frac{1}{2}$ hour 　 C: 42 minutes 　 D: 1 hour 　 (E: 45 minutes)

16. Which of these could be the correct measurement for the length of a bus?

14 m

140 m

1.4 m

A: 140 m   B: 1400 cm   C: 140 mm   D: 140 000 mm   E: 0.0014 km
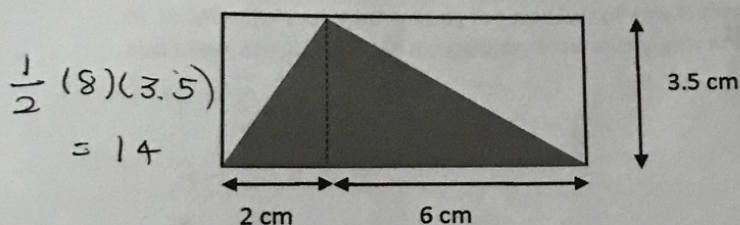
.14 m

17. I'm thinking of a number. When I triple it and subtract the result from 70, I get half my original number. What's my number?

$70 - 3x = \frac{1}{2}x$ $70 = 3.5x$
$x = 20$

A: 24   B: 30   C: 18   D: 20   E: 25

18. What is the area of the shaded triangle below? [**Diagram not to scale**]

$\frac{1}{2}(8)(3.5)$
$= 14$

3.5 cm

2 cm   6 cm

A: 42 cm²   B: 14 cm²   C: 28 cm²   D: 24.5 cm²   E: 17.5 cm²

19. How many different ways are there of paying exactly £1 using 5p and/or 10p pieces?

Satisfy bigger unit first

5	10
20	0
18	1
16	2
14	3
12	4
10	5
8	6
6	7
4	8
2	9
0	10

A: 15   B: 10   C: 21   D: 11   E: 100

20. I'm thinking of two numbers. When I double the first and add it to the second I get 160. One of the numbers is half of the other. Which of these could be one of my numbers?

$2x + y = 160$

$x = \frac{1}{2}y$ or $y = \frac{1}{2}x$

$y + y = 160$ $2x + \frac{1}{2}x = 160$
$y = 80$ $x = 64$

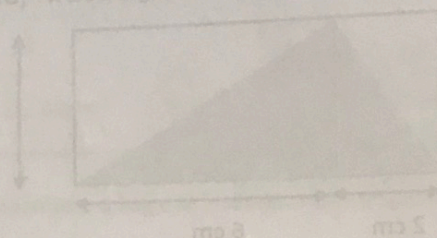A: 30   B: 45   C: 60   D: 64   E: 96

check: 64, 32 X
40, 80 ·

Section B

21. a) Work out 287 + 365

Answer: 652

[1 mark]

b) Subtract -23 from -81

Answer: -58

[1 mark]

c) Divide 1898 by 26

Answer: 73

[2 marks]

22. a) Mr Humberstone's maths class has 26 pupils. There are 8 more girls than there are boys. How many girls are there?

$$b + g = 26$$
$$g - b = 8$$

$$b + g = 26$$
$$- b + g = 8$$
_____
$$2g = 34$$
$$g = 17$$
$$B = 9$$

Answer: 17 .... [1 mark]

b) In Miss Homes' maths class, the number of girls is three-quarters the number of boys, and there are 28 children altogether. How many girls are there?

$$g = \frac{3}{4}b$$

$$g + b = 28$$

$$\frac{3}{4}b + b = 28$$

$$\frac{7}{4}b = 28 \qquad \text{So} \quad g = \frac{3}{4}(16) = 12$$

$$b = 16$$

Answer: 12 .... [2 marks]

c) In Miss Thompson's class, there are 5 girls for every 4 boys, and one-fifth of the girls wear glasses. There are three girls and two boys in the class who wear glasses. What fraction of all the pupils in the class wear glasses?

$$5G = 4B$$

$$\frac{1}{5} \wedge \text{ of Girls wear glasses}$$
$$\downarrow$$
$$3G, 2B$$

$$\frac{1}{5}G = 3$$
$$G = 15 \text{ (total number)}$$

[2 marks]

Answer: $\frac{5}{17}$ ....

5 girls for every 4 boys
So $3(4) = 12$ boys total
So 17 total

23. a) Mr Sahota is cycling around a track at a constant speed. He completes 5 laps every 4 minutes. How long will it take him to complete 8 laps? Give your answer in minutes and seconds.

5 laps = 4 mins
1 lap = 0.8 mins
8 laps = 6.4 mins

.4 (60) = 24

Answer: 6 mins 24 seconds   [3 marks]

b) Mr Aldham is also cycling around the track at a constant speed. He completes 5 laps every 6 minutes. How long is it between the first time that Mr Sahota overtakes Mr Aldham and the second time that Mr Sahota overtakes Mr Aldham?

Aldham (slower)
5 laps = 6 mins

• 1 lap = 1.2 mins
       = 72 seconds

Sahota (quicker)
5 laps = 4 mins

1 lap = 0.8 mins
     = 48 seconds

LCM: 72, 48   or   1.2, 0.8
                     ‿‿‿
                     easier
                  2.4 mins = 144 seconds
144 (2) = 288 seconds   (2 mins 24 secs)
            ↓
        (4 mins 48 seconds)
144 seconds inbetween = 2 mins 24 seconds

Answer: 2 mins 24 seconds   [3 marks]

24. For each part of this question you should try to find **all** the different possible answers. You don't need to worry about different orderings of the piles – 3 beads, 2 beads, 1 bead is the same as 3 beads, 1 bead, 2 beads. *repeats ok*

a) I have six identical beads which I want to put into three piles. Each pile must have at least one bead in it. How many beads could be in each pile? One possible answer is given to you.

6 beads (sum of 6) *using* 1,2,3,4,5,6

1st pile	2nd pile	3rd pile
3 beads	2 beads	1 bead
2	2	2
4		1

2 options

1: 5   2: 4   3: 3 ✗   4: 2

2,3 (Done)   2,2   1,2 ✗   1,1 ✗

4,1   1,3 ✗

5: 1

[2 marks]

b) List all the ways of placing eight beads into four piles, with at least one bead in each pile. One possible answer is given to you.   0, 1, 2, 3, 4, 5, 6, 7, 8

Ans.
1 2 1 4
1 3 1 3
5 1 1 1

3 options

If four number fix the first 2 now not fixing

1st pile	2nd pile	3rd pile	4th pile	
3 beads	2 beads	2 beads	1 bead	Done above
1	2	2	3	
1	2	1	4	
1	3	1	3	
1	3	2	2	✗ Same
2	3	1	2	✗ Same
1	1	4	2	✗ Same

1,2: 5   1,3: 4   1,5:2   1,6: 1
2,3   1,3   1,1   1,1 ✗
1,4   2,2

2,3: 3   2,4: 2   2,5: 1
1,2   1,1

[2 marks]

25. a) Sarah thinks of a number. When she triples the number and then adds 15, she gets the answer 39. What was her number?

$$3x + 15 = 39$$
$$x = 8$$

[1 mark]

Answer:....8.....

b) Kirsty thinks of a number. When she adds 15 to the number and then triples the answer, she gets 39. What was her number?

$$3(x + 15) = 39$$
$$x = -2$$

Answer:.....- 2..... [1 mark]

c) Zack thinks of a number. When he triples the number and subtracts the answer from 71, he gets one more than double his original number. What was his number?
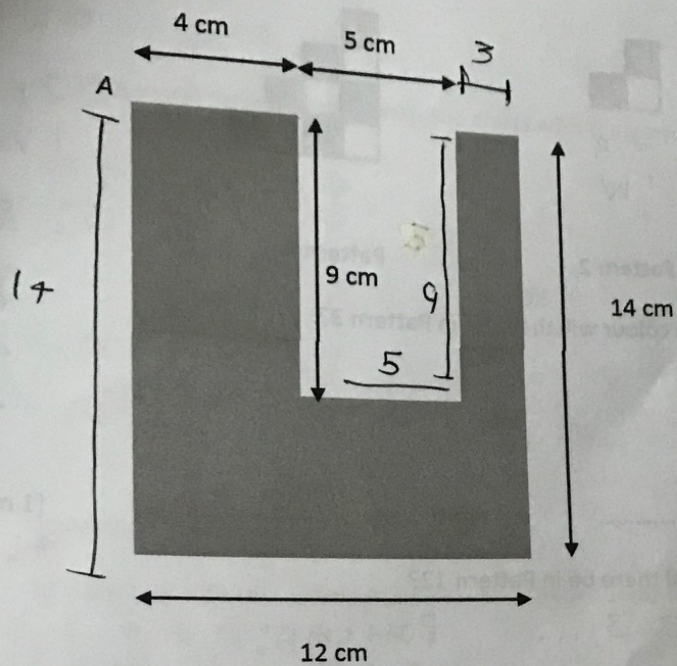
$$71 - 3x = 2x + 1$$
$$-5x = -70$$
$$x = 14$$

Answer:....14..... [2 marks]

26. Sid the spider goes for a walk around the whole perimeter of the shape below, starting at the point marked A. How far does he have to walk?
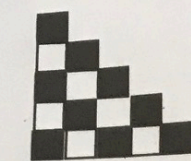
4 cm   5 cm   3

A

14

9 cm   9

5

14 cm

12 cm

(Diagram not to scale)

$4 + 9 + 5 + 9 + 3 + 14 + 12 + 14$

Answer:......76.....cm...   [3 marks]

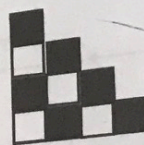**27.** Jonny makes patterns from black and white tiles. His patterns always start with a black tile at the top. Here are some of his patterns:

1: ∎
   1 B
   0 W

2: 2 B
   1 W

3:
   4 B
   2 W

4: 6 B
   4 W

5: 9 B
   6 W

9 B, 6 W
Pattern 5
3 levels

2 B
1 W
Pattern 2
2 levels

6 B, 4 W
Pattern 4
3 levels

a) How many tiles of each colour will there be in Pattern 3?

Black tiles: ....4........

White tiles: .....2.....

[1 mark]

b) How many black tiles will there be in Pattern 12?

B levels: 1, 1, 2, 3, 3, 3, ...
(heights)

1: ∎
0 W, 1 B (1)

2:
0 W, 1 B (1)
1 W, 1 B (2)

W levels: 0, 1, 1, 2, 2, 3, 3 (heights)

3:
0 W, 1 B (1)
1 W, 1 B (2)
1 W, 2 B (3)

Pattern n:
n black levels
n−1 white level

1 + 1 + 2 + 2 + 3 + 3
+ 4 + 4 + 5 + 5 + 6 + 6 → 12
levels

Answer:....42....

[2 marks]

Robin notices that he can take two copies of Pattern 4 and make them into a 4x5 rectangle: 20 tiles
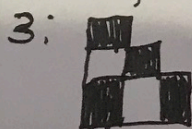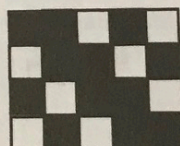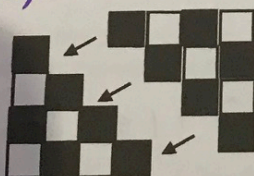
c) Can you use Robin's idea to work out the total number of tiles in Pattern 20?

1: 1   5: 15   triangular numbers
2: 3
3: 6   1, 3, 6, 10, 15 $\frac{1}{2}n(n+1)$
4: 10   ↑
     n=1 $\frac{1}{2}(20)(21) = 210$

Answer:....210....

[2 marks]

OR:

Pattern 20 = 20 × 21 rectangle (420)
Divide by 2 to get the pattern 420/2 = 210

Tess is playing a game with whole numbers. She takes each of the digits of the number, squares them and then finds the total. So if she starts with the number 47, she gets the result 65, because:

- $4^2 + 7^2 = 16 + 49 = 65$

a) What result does Tess get when she starts with the number 732?

$$732 = 7^2 + 3^2 + 2^2$$
$$= 62$$

Answer: 62 .... [2 marks]

b) Find four different whole numbers, each under 1000 which all give Tess a result of 25.

$0, 1, 4, 9, 16, 25, ...$

$0 + 25 = 0^2 + 5^2$ 5

$9 + 16 = 3^2 + 4^2$ 50

$\underbrace{9 + 4 + 4 + 4 + 4}$ 500

not necessary   340

and too big!   34

Answer: 50, 500, 340, 34 .... [2 marks]

c) Explain why it's not possible to find a two-digit number which gives Tess a result of 14.

$0, 1, 4, 9$

any pairs (ie no 2)

None of these numbers make a
Sum (total) of 14. We'd need 3 numbers ie $9+4+1$
eg 149 [1 mark]

In Rainbow Land there are lots of wuzzles. Wuzzles are all green, pink or blue and have either big ears or small ears. They like to live together in houses.

a) In one wuzzle household, all the following statements are true:

② • There are more green wuzzles than any other colour
① • There are equal numbers of big-eared greens and small-eared greens
③ • There are three wuzzles with big ears
③ • There are twice as many big-eared greens as big-eared pinks
④ • There are three times as many pink wuzzles as blue wuzzles

How many of each kind of wuzzle (big-eared green, small-eared green, big-eared pink, ...) are there in this household?

① $G_B = G_S$

② $G > P$

~~③~~ $G > B$

③ $G_B + P_B + B_B = 3$

$G_B = 2P_B$

④ $P = 3B$

Ans.
2 G_B, 1 P_B, 0 B_B
2 G_S, **2** P_S, 1 B_S

③ $\Rightarrow$ 2 G_B, 1 P_B, 0 B_B

$\underbrace{\qquad}$, $\Downarrow$ ①

2 G_S

so 4 G total

② $\Rightarrow$ < 4 pink
< 4 blue

④ $\Rightarrow$ need sum of pink a multiple of 3 and know < 4
so 2 P_S and 1 B_S

[2 marks]

b) In another wuzzle household, all of these statements are true:

① • There are the same number of pink wuzzles as green wuzzles
② • There are twice as many big-eared green wuzzles as small-eared green wuzzles $\Rightarrow$ ④
③ • There are the same number of big-eared green wuzzles as big-eared blue wuzzles
④ • All but one of the wuzzles have big ears.

How many of each kind of wuzzle are there in this household?

① $P = G$

② $G_B = 2G_S$

③ $G_B = B_B$

④ only one doesn't have big ears, ie one small

P_B	B_B	G_B		P_S	B_S	G_S
a	b	c		d	e	f

$d = 0, e = 0$
so $f = 1$

① $\Rightarrow a + d = c + f$
② $\Rightarrow c = 2f$ $c = 2$ by ②
③ $\Rightarrow c = b$ $b = 2$
④ $d + e + f = 1$
$\downarrow \quad \downarrow$
try 0 try 0   since c=2f
so f wouldn't be 0

$a + d = c + f$
$a + d = 2 + 1$
$a = 3$

[2 marks]
Ans.
3 P_B 0 P_S
2 B_B 0 B_S
2 G_B 1 G_S