DULWICH COLLEGE
FOUNDED 1619

YEAR 7 ENTRANCE AND SCHOLARSHIP EXAMINATION
Mathematics

Specimen Paper E

Mark Scheme

Time allowed for this paper: 1 hour

Instructions

- Attempt all the questions.
- Calculators must not be used.
- Show all of your working on this paper.
- There are 100 marks available in total for this test.
- You must not write in the squares on the bottom right of each page.
- The marks available for each part of a question are given in square brackets.

Q1-4 Award M1 for a sensible attempt using a standard method with a minor numerical error.

For all questions award M1A1 for correct final answer even with no working.

Calculate:

1. 397 + 784 + 86

397
784
86
1267

M1

A1

Answer: 1267 [2]

2. 89 × 19

89
19 ×
801
890
1691

M1

A1

Answer: 1691 [2]

3. 60.2 ÷ 7

8.6
7 | 60.2

M1

A1

Answer: 8.6 [2]

4. 3.88 – 1.111

3.880
1.111 −
2.769

M1

A1

Answer: 2.769 [2]

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PAGE ONE

5. Write down the next two terms in each of the sequences below:

(a) 5, 9, 13, 17, 21, 25 [1]

A1 for both

A1 A1

(b) 1000, 100, 10, 1, 0·1 (or $\frac{1}{10}$) [2]

A1 A1

(c) 1, 3, 4, 7, 11, 18, 29 [2]

A1 A1

(d) 2, 3, 5, 7, 11, 13, 17 [2]

A1 A1

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6. Circle the factors of 150:

100	30	7	11
10	3	8	45

A2 3 correct, no other incorrect answer

M1 for either: two correct, no extra incorrect

or: three correct, one additional incorrect answer. [2]

7. Subtract $4 + (2 \times 13)$ from $(4 + 2) \times 13$.

$4 + (2 \times 13) = 30$

$(4 + 2) \times 13 = 78$ M1

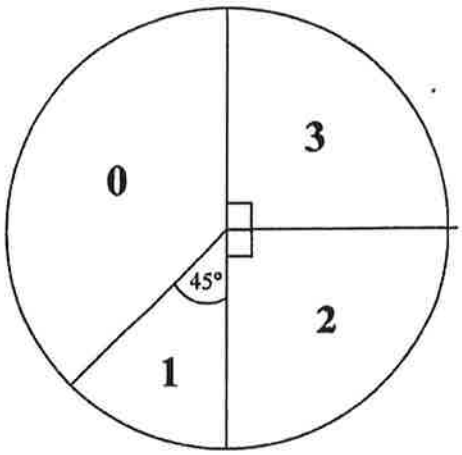
$78 - 30 = 48$

Answer: 48 [2] A1

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8. In a survey a group of children were asked how many siblings (i.e. brothers and sisters) they have. No-one in the group had more than three siblings, and the results are shown in the pie chart below.



(a) Write down the percentage of children who have two siblings

A1

Answer: 25 % [1]

(b) Work out the fraction of children who have no siblings, giving your answer in its lowest terms.

$\frac{1}{4} + \frac{1}{8}$ or $\frac{135}{360}$

M1

A1

Answer: $\frac{3}{8}$ [2]

8 of the children who were surveyed had one sibling.

(c) Fill in the table below to show the number of children who have 0, 2 and 3 siblings.

Number of siblings	0	1	2	3
Number of children surveyed	24	8	16	16

A1 A1 A1 [3]

(d) Write down the mode of the number of siblings.

Answer: 0 [1]

A1

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9. (a) Calculate $0.75+\frac{2}{5}+\frac{17}{100}$, leaving your answer as a decimal.

(M1) for conversion to decimals

0·75
0·40 +
0·17 +
1·32

(M1) attempt to add

(A1)

Answer: 1·32 [3]

(b) Write $\frac{12}{75}$ as a decimal.

(M1) for a sensible attempt

eg $\frac{12}{75} = \frac{4}{25} = \frac{16}{100}$

or $75\overline{)12.0^{\circ}0}$ 0·16

(A1)

Answer: 0·16 [2]

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10. Write down a fraction whose numerator and denominator are both whole numbers and whose value is between $\frac{7}{13}$ and $\frac{8}{13}$.

Accept any correct answer. The most obvious would be $\frac{15}{26}$ but please check each answer.

$\frac{7}{13} = 0.538461538\ldots$

$\frac{8}{13} = 0.6153846154\ldots$

(A3) for any correct answer, even unsimplified. eg $\frac{30}{52}$ is fine.

Answer: Check! [3]

Method marks: (M2) for eg writing $\frac{7.5}{13}$ or $\frac{7.2}{13}$ then attempting to make the top + bottom whole numbers.

(M1) for writing eg $\frac{7}{13} = \frac{14}{26}$ but getting no further.

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11. *In this question you may use the clock pictures to help you but you do not have to draw on them and there are no marks for doing so.*

(a) Work out the angle the hour hand of a clock turns through between:

(i) 4pm and 6pm



1hr = 30° M1

30° × 2 = 60°

A1

Answer: 60° [2]

(ii) 2.30pm and 3.50pm



230 - 300 = 15° M1

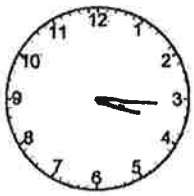
300 - 350 = $\frac{5}{6}$ × 30 = 25° M1

15° + 25° = 40°

A1

Answer: 40° [3]

(b) Work out the angle between the hour and minute hands when the time is 3.15pm



M1

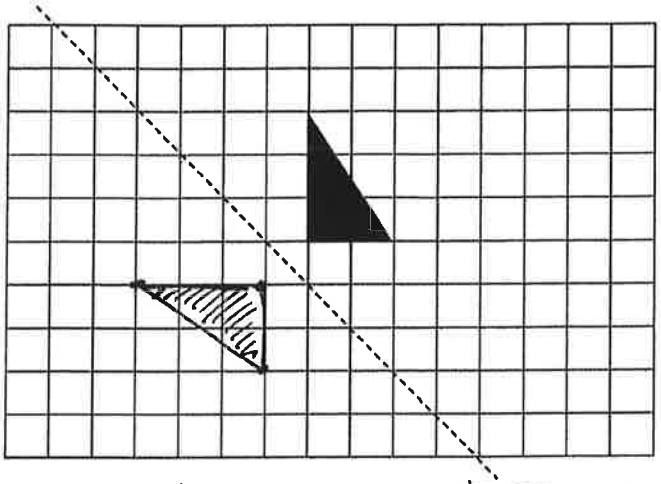
$\frac{1}{4}$ × 30 = 7.5°

A1

Answer: 7.5° [2]

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12. (a) Draw the reflection of this triangle in the mirror line shown.



Ignore shading or lack thereof.

A1 for correct shape eg ◹ in any position

A1 also in correct position [2]

(b) If the side of each square on the grid represents 1 metre, work out the area of the triangle.

$\frac{1}{2} \times 2 \times 3 = 3$

M1

A1

Answer: 3 m^2 [2]

(c) Work out the percentage of the total area of the grid that the original triangle covers.

grid = $15 \times 10 = 150$ M1

so $\frac{3}{150} = \frac{1}{50} = \frac{2}{100}$ M1 A1

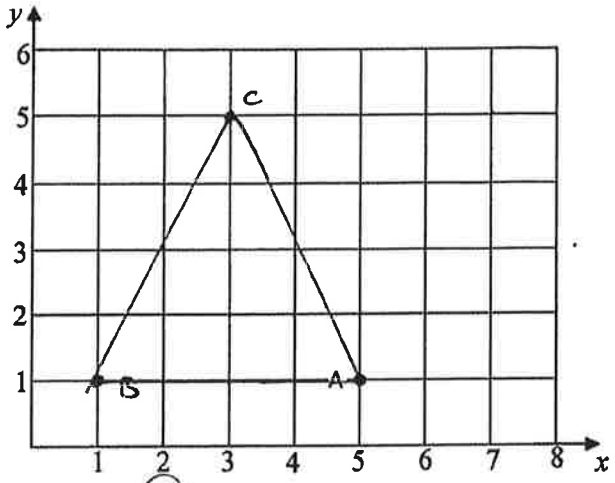
Answer: 2 % [3]

also accept other methods eg counting 3×2 rectangles.

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13. A, B and C are 3 points on a grid. A is at (5, 1), B is at (1, 1) and C is at (3, 5).



A1 one point correct

(a) Plot the points B and C and then join A to B, B to C and C to A. [2]

A2 for both points correct and joined by lines.

(b) State what type of triangle has been formed.

Answer: isosceles [1] A1

Accept reasonable mis-spellings eg isosceles

The points A, B, C and a new point D will form a parallelogram when joined in that order.

(c) Write down the co-ordinates of D.

Answer: D is at (7 , 5) [2]

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14. A bottle contains 150 ml of juice. Alex drinks 50% more than Jane and these two friends finish the bottle between them. Calculate how much Alex drinks.

Ratio 3:2 M1

1 part = 30ml M1

90 : 60

A1

Answer: 90 ml [3]

Or $x + 1.5x = 150$ M1

M1 $2.5x = \frac{150}{2.5} = 60$ so Alex drinks 150 − 90

Or $x + \frac{2}{3}x = 150$ M1

M1 $\frac{5}{3}x = 150$

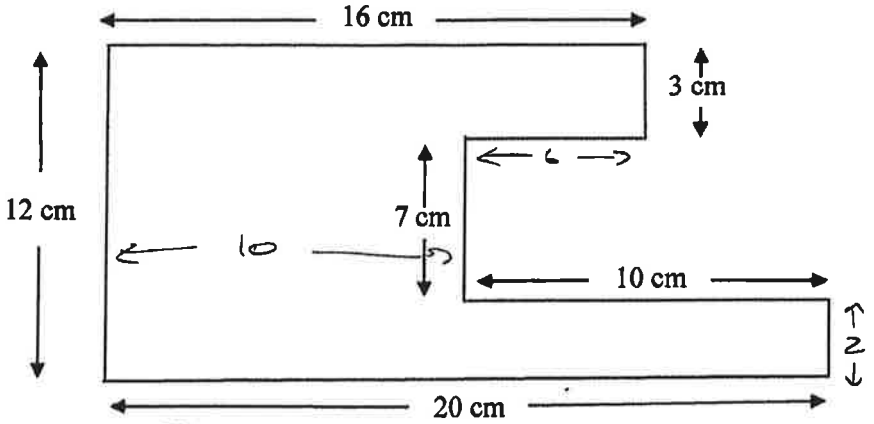
$x = 90$

Or any other sensible method.

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15. Work out the area and perimeter of this shape.

Note: all angles are right angles but the diagram has not been drawn to scale.



M1 M1

$16 \times 3 = 48$

$+ \ 7 \times 10 \quad 70 +$

$+ \ 2 \times 20 \quad 40 +$

(Other methods possible)

A1

Answer: Area = 158 cm² [3]

M1 for correctly working out lengths of 6cm and 2cm not marked on diagram (Can be shown on diagram or written here)

$16 + 3 + 6 + 7 + 10 + 2 + 20 + 12$ M1

Answer: Perimeter = 76 cm [3] A1

Page total:

16. John takes the train to school from Brixton to West Dulwich every day. Here is part of his train timetable:

London Victoria	0740	0755	0809	0825
Brixton	0747	0802	0816	0832
Herne Hill	0749	0804	0818	0834
West Dulwich	0752	0807	0821	0837
Sydenham Hill	0754	0809	0823	0839
Penge East	0757	0812	0826	0842
Kent House	0759	0814	0828	0844
Beckenham Junction	0801	0816	0830	0846

(a) It is an 8 minute walk from John's house to Brixton station, and a 6 minute walk from West Dulwich to his form room at Dulwich College. Work out what time John will arrive at his form room if he leaves home at 0805.

Arr Brixton 813
gets 816 train
Arr W. Dulwich 821
Form room at 827 (M1)

Answer: 08:27 [2] accepts 827 (A1)

(b) On another day, John leaves home at 0803, but the 0809 train from London Victoria is cancelled. Work out how many minutes late will John be for registration, which starts at 0835.

(M1) Arr Brixton 811
gets 832 train
arr W. Dulwich 837
arr Form Room 843

(M1) late by 843 − 835
= 8 minutes

Answer: 8 (A1) [3] minutes

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17. The mean (average) of seven numbers is 9. One number is removed and the mean increases to 10. Find the number which was removed.

$7 \times 9 = 63$ (M1)
$6 \times 10 = 60$ (M1)
$63 - 60 = 3$

Answer: 3 (A1) [3]

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18. Write each of the numbers 31, 32, 33, 34, 35 and 36 in the spaces below, using each number only once, to make all of the statements true.

A1 32 is a multiple of 8

A1 34 has exactly four factors

A1 36 is a square number

A1 31 is a prime number

A1 35 is a factor of 105

A1 33 is a multiple of 3

NB This order only

eg no mark for writing 36 as a multiple of 3 or any others even if they ~~are~~ create correct statements.

[6]

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19. Sachin can clean his flat in 3 hours, and Peter can clean the same flat in 6 hours. Calculate how long it will take to clean the flat if they work together.

In 1 hour Sachin cleans $\frac{1}{3}$ of a flat

Peter cleans $\frac{1}{6}$ of a flat (M1)

$\frac{1}{3} + \frac{1}{6} = \frac{1}{2}$ (M1)

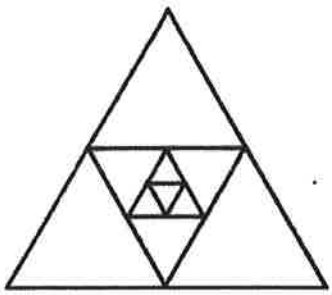
Together they clean $\frac{1}{2}$ a flat per hour (M1)

Answer: 2 (A1) hours [4]

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20. Four equilateral triangles have been drawn, one inside the other, as shown in the diagram below.



The area of the smallest triangle is 1 cm^2.

(a) Work out the area of the largest triangle.

second smallest triangle = 4 (M1)
next largest = 16
largest = 64 (A1)

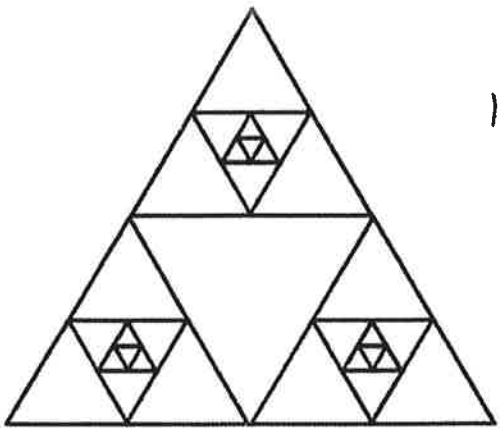
Answer: 64 cm^2 [2]

(b) Work out how many triangles there are in total in the diagram above.

4 + 4 + 4 + 1 (M1)
clear attempt to count number of triangles of different sizes (A1)

Answer: 13 [2]

Three copies of the triangle above are put together to form the diagram below.
Work out how many triangles there are in total in this diagram.



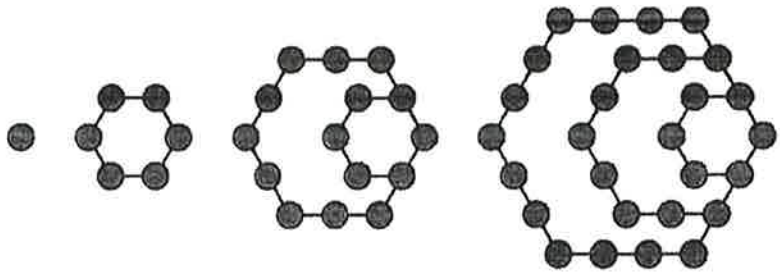
13 + 13 + 13 + 1 + 1
= 41 (M1)
eg for
39 + 1 = 40

Answer: 41 [2] (A1)

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PAGE ELEVEN

21. The number of dots in each of the four diagrams below give the first four hexagonal numbers.



Complete the table below to show the first four hexagonal numbers

First Hexagonal Number	1
Second Hexagonal Number	6 (AC)
Third Hexagonal Number	15
Fourth Hexagonal Number	28 (A1)

[2]

The hexagonal numbers also follow a numerical pattern.

First Hexagonal Number	$(2 \times 1) \div 2$	1
Second Hexagonal Number	$(4 \times 3) \div 2$	6
Third Hexagonal Number	$(6 \times 5) \div 2$	15
Fourth Hexagonal Number	$(8 \times 7) \div 2$	28

no marks here !

Complete the table below to work out the Fifth and Twentieth Hexagonal Numbers, **showing your working in exactly the same way as in the table above.**

Fifth Hexagonal Number	$(10 \times 9) \div 2$ (A1)	45 (A1)
Twentieth Hexagonal Number	~~$(20 \times 19) \div 2$~~ $(40 \times 39) \div 2$ (A1)	~~190~~ 780 (A1)

[4]

must be exactly as written
award one out of two for left-to-right if structurally correct but eg missing brackets.

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22. The instruction $x \clubsuit y$ means square x and then add y.

For example: $2 \clubsuit 3 = 2^2 + 3 = 4 + 3 = 7$

(a) Work out the value of $4 \clubsuit 5$

M1

$4^2 + 5 = 16 + 5$

Answer: 21 [2] A1

(b) What is the value of a if $6 \clubsuit a = 25$

$6^2 + a = 25$ M1

$36 + a = 25$

$a = -11$

Answer: -11 [2] A1

The instruction $(x \clubsuit y) \clubsuit z$ means work out $x \clubsuit y$ first, and then apply $\clubsuit$ again to your answer and z.

For example: $(2 \clubsuit 3) \clubsuit 4 = (2^2 + 3) \clubsuit 4$
$= 7 \clubsuit 4$
$= 7^2 + 4$
$= 49 + 4$
$= 53$

(c) Work out the value of $(3 \clubsuit 2) \clubsuit 8$

$3^2 + 2 = 9 + 2 = 11$ M1

$11^2 + 8 = 121 + 8 = 129$

Answer: 129 [2] A1

(d) Work out the value of b if $(b \clubsuit 1) \clubsuit 7 = 107$

$(b^2 + 1)^2 + 7 = 107$ M1

$(b^2 + 1)^2 = 100$

$b^2 + 1 = 10$ A1

Answer: 3 [2]

$b^2 = 9$

$b = 3$

$b = \pm 3$ or

NB for (d) also accept $b = -3$ but do not penalise this being missing

NB ~~or~~ $b^2 + 1 = -10$

leads to $b^2 = -11$

$b = \pm\sqrt{11}\, i$

Please let me know if anyone gives this as an answer!

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