DULWICH COLLEGE
FOUNDED 1619

YEAR 9 ENTRANCE AND SCHOLARSHIP EXAMINATION
Mathematics

Specimen Paper D – MARK SCHEME

Time allowed for this paper: 1 hour 30 mins

Instructions

- Attempt all the questions.
- Calculators may be used.
- Show all your working on this paper.
- 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.

1. Below is a sequence of numbers:

$$0.5,\ 3,\ 5.5,\ 8,\ \ldots$$

Calculate:

(a) the 8th term,

Answer: 18 (A1) [1]

(b) the 100th term,

$a_n = 2.5n - 2 = 2.5(100) - 2 = 248$ (M1) (A1)

Answer: 248 [2]

(c) which term has a value of 148.

$2.5n - 2 = 148 \quad n = 60$ (M1) (A1)

Answer: 60 [2]

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2. A train was scheduled to leave at 17.40. It departed 30 minutes late and the journey took 3 hours and 45 minutes. Find the time that it arrived at its destination.

(A1)

$17.40 + 4h\ 15m$

$= 21.55$

(A1) (A1)

Answer: 21.55 [3]

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3. (a) Simplify the ratio 25 : 15. 5 : 3 (A2)

Answer: 5 : 3 [2]

(b) Divide £400 in the ratio 25 : 15.

$\frac{400}{40} = 10$ (A1) (A1)

Answer: £ 250 , £ 150 [2]

(c) A recipe for a large cake uses 600 grams of flour and 450 grams of butter. A recipe for a smaller cake uses 400 grams of flour. Calculate how much butter is needed for the smaller cake if the ratio of flour to butter is to be the same in both cakes.

(M1) $\frac{450}{600} = \frac{x}{400}$ $x = 300$ (A2)

Answer: 300 grams [3]

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4. The value of a painting in 2010 was £12000. Its value rose by 40% in 2011, but then fell by 20% in 2013 and fell again by 20% in 2013.

(a) Calculate the value of the painting in 2011.

$12,000 \times 1.4 = 16800$ (M1) (A1)

Answer: £ 16,800 [2]

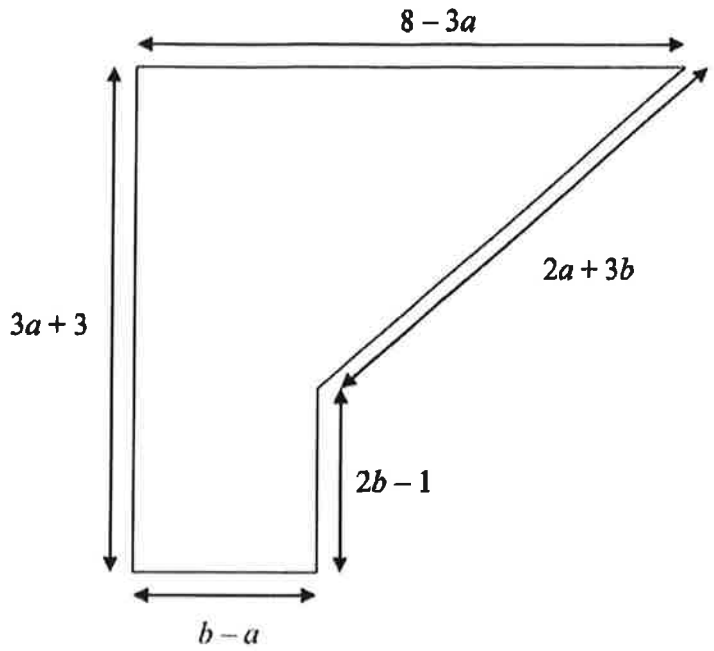
(b) Calculate the value of the painting in 2013.

$16,800 \times 0.8^2 = 10752$ (M1) (A1)

Answer: £ 10,752 [2]

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5. Write a simplified expression for the perimeter of the shape drawn below.



$3a+3+8-3a+2a+3b+2b-1+b-a$

$= a+6b+10$

A1 A1 A1

Answer: $a+6b+10$ [3]

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6. Expand and simplify the following:

(a) $-5(2-3y)$

A1 A1

Answer: $-10+15y$ [2]

(b) $2x(3x-y)-y(2y+x)$

$6x^2-2xy-2y^2-xy$ (-1 for each error)

Answer: $6x^2-3xy-2y^2$ [2]

(c) $(4x-5)(2-3x)$

$8x-12x^2-10+15x$

A1 A1 A1

Answer: $-12x^2+23x-10$ [3]

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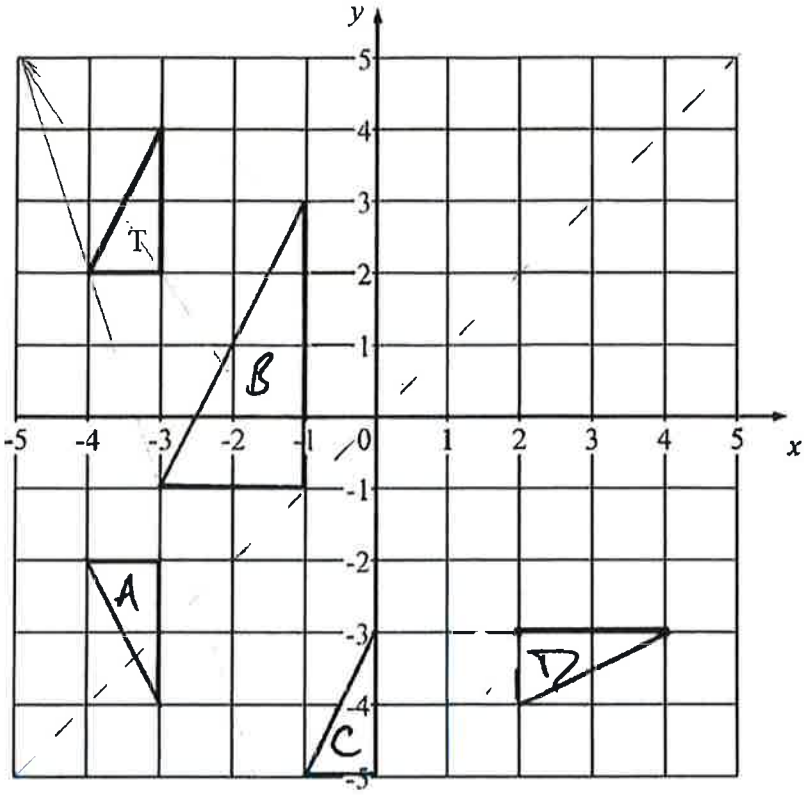
7. Simplify: $\frac{6b^2}{12b}$ $\frac{6^2}{26} = \frac{6}{2}$ (-1 if not fully simplified)

$\frac{6}{2}$

Answer: _____ [2]

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8.



On the grid above draw the result of:

(a) reflecting triangle T in the x-axis. Label your answer A. [2]

(b) enlarging **triangle T** by a scale factor of 2 with centre of enlargement (–5, 5). Label your answer B. [2]

(c) translating **triangle T** by the vector $\begin{pmatrix} 3 \\ -7 \end{pmatrix}$. Label your answer C. [2]

(d) reflecting **triangle T** in the line $y = x$. Label your answer D. [2]

(B1 for any reflection)

(B1 correct scale factor, B1 correct centre of enlargement)

(B1 for each correct x and y translation)

(M1 for any correct reflection)

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9. A baseball bat and some wax for the bat together cost £50. The bat costs £48 more than the wax. Find the cost of the bat.

$x + x + 48 = 50$

$2x = 2$

$x = 1$

A2

Answer: £ 49 [2]

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10. Calculate the total surface area of a cube whose volume is 27 cubic centimetres.

$x^3 = 27$

$x = 3$ M1

$6x^2 = 6(9) = 54\text{cm}^2$

M1

A1

Answer: 54 cm^2 [3]

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11. Factorise the following expressions fully:

(a) $18y^2 - 6y$

A1 A1

Answer: $6y(3y-1)$ [2]

(b) $4a^3b^2 - 12a^2b$

A1 A1

Answer: $4a^2b(ab-3)$ [2]

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12. Solve the following equations for x:

(a) $2(7-x) = 11$

M1

$7 - x = \frac{11}{2}$ $\quad x = \frac{3}{2}$

A1

Answer: $x = \frac{3}{2}$ [2]

(b) $3x^2 + 2(2x-3) = 3x(x-2)$

M1

$3x^2 + 4x - 6 = 3x^2 - 6x$

M1

$10x = 6$

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

A1

Answer: $x = \frac{3}{5}$ [3]

(c) $\frac{x}{3} - 2 = 4x$

M1

$4x - \frac{x}{3} = -2$ $\quad x = -\frac{6}{11}$

$\frac{11x}{3} = -2$

M1

A1

Answer: $x = -\frac{6}{11}$ [3]

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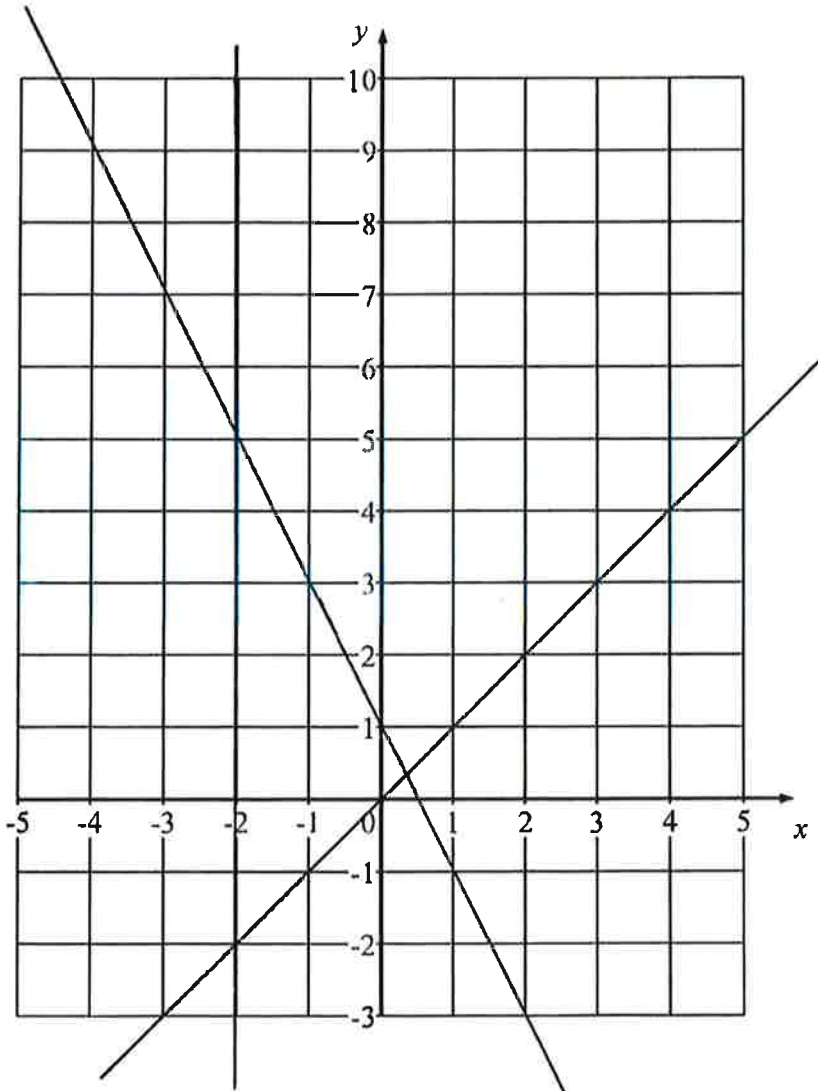
13. (a) Complete the table for $y = 1 - 2x$

x	–2	0	2
y	5	1	–3

A1 A1 [2]

(b) On the grid below, plot the lines:

$y = x$ $x = -2$ $y = 1 - 2x$



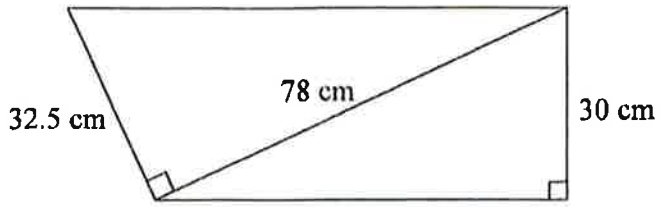
y = x A1

x = -2 A1

y = 1 - 2x A2

[4]

14. Find the perimeter of the trapezium below.



$32.5 + \sqrt{32.5^2 + 78^2} + 30 + \sqrt{78^2 - 30^2}$ (M1)

(B1) (B1)

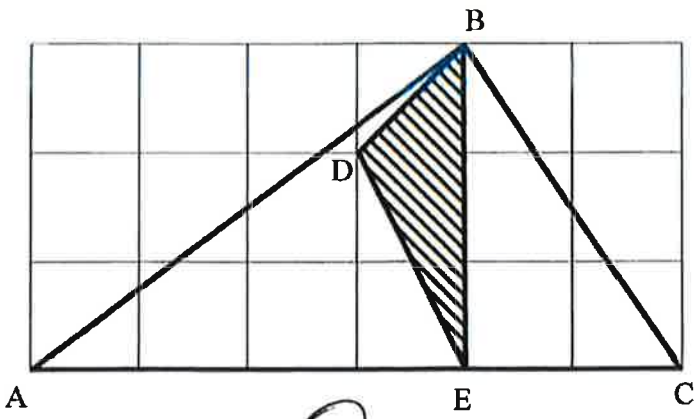
$= 32.5 + 84.5 + 30 + 72 = 219$

(A1)

Answer: 219 cm [4]

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15. Two triangles ABC and BDE are drawn on a square grid as shown. Express the area of triangle BDE as a fraction of the area of triangle ABC.



$\frac{\frac{1}{2}(3)(1)}{\frac{1}{2}(6)(3)} = \frac{1}{6}$ (B1) (B1)

(A1)

Answer: $\frac{1}{6}$ [3]

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16. 90% of the students at a school went on to go to university, and of these 30% stayed on to study a Master's degree. Calculate the percentage of the students at the school who went on to study a Master's degree.

$0.9 \times 0.3 = 0.27 = 27\%$

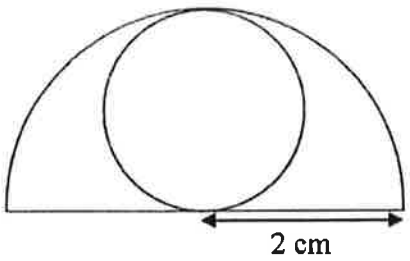
M1

A1

Answer: 27 % [2]

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17. The diagram shows a semicircle of radius 2 cm containing a smaller circle which touches the circumference and midpoint of the diameter of the semicircle as shown. Calculate the fraction of the semicircle that is shaded.



B1

B1

$\frac{3.14\ldots}{6.28\ldots} = \frac{\pi(1^2)}{\frac{1}{2}\pi(2^2)} = \frac{1}{2}$

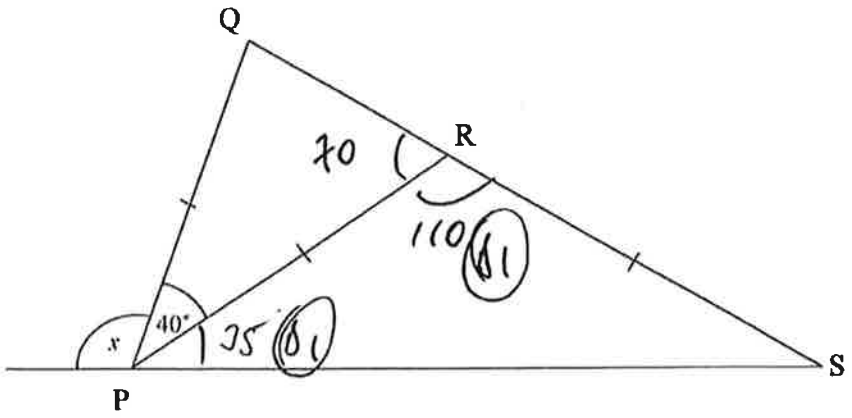
B1

A1

Answer: $\frac{1}{2}$ [4]

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18. In the diagram PQ = PR = RS and angle QPR = 40°. Find the size of angle x.



$x = 180 - 40 - 35 = 105$

(A1)

Answer: $x =$ 105 ° [3]

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19. The average height of 10 trees is 2.6 metres. One of the trees grows from 1.7 metres to 2.2 metres. Calculate the new average height of the 10 trees, giving your answer to two decimal places.

(M1) $\dfrac{10 \times 2.6 - 1.7 + 2.2}{10} = 2.65$

(A2)

Answer: 2.65 metres [3]

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20. Find two whole numbers, neither of which has a zero for any of its digits, whose product is:

(a) 100,

$2^2 \times 5^2$ (A1)

Answer: 4 , 25 [1]

(b) 1,000,000.

$2^6 \times 5^6$ (M1)

(A1) (A1)

Answer: 64 , 15625 [3]

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21. Sarah's wardrobe contains many T-shirts, each coloured red, white, blue or black. There are more than two T-shirts of each colour.

Sarah takes T-shirts randomly from the wardrobe, one at a time, and does not replace them. Write down how many T-shirts she must take from the wardrobe in order to ensure that she has taken at least three T-shirts of the same colour.

(A3)

Answer: 9 [3]

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22. Find the smallest possible value of $20a + 10b + c$ where a, b and c are different positive whole numbers.

$20(1) + 10(2) + 3$

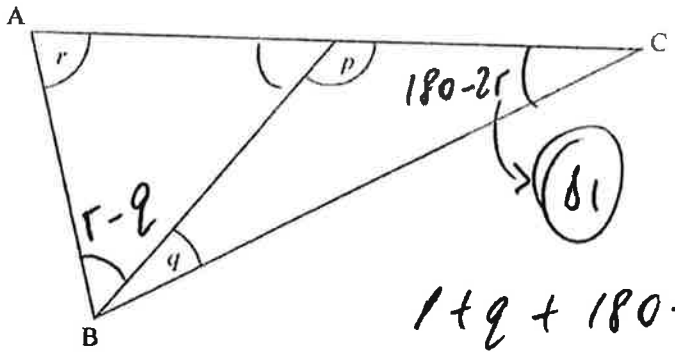
M1 (Correct choice of a, b, c)

A1

Answer: 43 [2]

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23. In the diagram shown, triangle ABC is isosceles with AC = BC. Find the size of angle r in terms of p and q.



B1

$r + q + 180 - 2r = 180$

$r = \frac{p+q}{2}$

A2

Answer: $r = \frac{p+q}{2}$ [3]

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24. I went to a store and picked up four items. The cost of three of them was £1.50, £3 and £4.

I was a bit bored whilst I was waiting at the checkout and happened to notice that the *sum* of the prices of all four items was the same as the *product* of the prices of all four items.

Calculate how much the fourth item cost.

$1.5 + 3 + 4 + x = 1.5 \times 3 \times 4 \times x$ (M1)

$8.5 + x = 18x$

$x = 0.5$

(A2)

Answer: £ 0.5 [3]

Page Total 3

25. Sixty 20p coins are lined up side by side. Every second 20p coin is then replaced by a 10p coin. Then every third coin in the resulting row is replaced by a 5p coin. Finally every fourth coin in the row is replaced by a 2p coin. Calculate the total value of the coins in the final line of coins.

12 Coins : (M1)

20 20 20 20 20 20 20 20 20 20 20 20
20 10 20 10 20 10 20 10 20 10 20 10
20 10 5 10 20 5 20 10 5 10 20 5
20 10 5 2 20 5 20 2 5 10 20 2

Total = £1.21

So total for 60 Coins = 121 × 5 = 605
= £6.05

(A1)

Answer: £ 6.05 [4]

THE END

IF YOU HAVE TIME THEN GO BACK AND CHECK YOUR ANSWERS

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