DULWICH COLLEGE
FOUNDED 1619

YEAR 9 ENTRANCE AND SCHOLARSHIP EXAMINATION
Mathematics
Specimen Paper E

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.
- There are 100 marks available in total for 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. Use your calculator to work out the value of:

$$\sqrt{\frac{4+2.1^2}{3}}$$

(a) Write down all of the digits shown on your calculator:

A1

Answer: 1·6743157811 [1]

(b) Write your answer to (a) to 2 decimal places:

A1

Answer: 1·67 [1]

(c) Write your answer to (a) to 2 significant figures:

A1

Answer: 1·7 [1]

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2. Below is a sequence of numbers:

25, 19, 13, 7, ..., 1, −5, −11 (−6)

(a) Calculate the:

(i) 6th and 7th terms,

A1 A1

Answer: −5, −11 [2]

(ii) 98th term,

n^{th} term = −6n + 31 M1

−6(98) + 31 = −557

A1

Answer: −557 [2]

Page Total

~~delete~~

(b) Find which ~~the~~ number in the sequence that is closest to -1000.

$-6n + 31 = -1000$

$-6n = -1031$

$n = 172^{nd}$ term (M1)

$-6(172) + 31 = -1001$ (A1)

Answer: -1001 [2]

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3. I buy a rare stamp for £200. After 10 years it has risen 35% in value. Calculate how much the stamp is worth after the rise.

$200 \times 1.35 = 270$ (M1)

(A1)

Answer: £ 270 [2]

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4. I buy a table in a "20% off" sale for £120. Calculate how much the table cost before the sale.

$120 \div 0.8 = 150$ (M1)

OR

$120 = 80\%$ (M1)

$1.5 = 1\%$

$150 = 100\%$

(A1)

Answer: £ 150 [2]

Page Total

5. Steve is 13 years old. Chris is 12 years old. James is 10 years old.

Steve, Chris and James share £28 in the ratio of their ages. Chris then gives a third of his share to Mark. Calculate how much Chris has left.

13 : 12 : 10

'One Part' = $\frac{28}{35}$

Chris has £9.60 (M1)

(M1) $9.60 \times \frac{2}{3} = 6.4$

(A1)

Answer: £ 6.40 [3]

---

6. Simplify the following expression:

(a) $5x + 4xy + x^2 + 7x - 3x^2 - xy$

(A2) – All correct

(A1) – 2 out of 3 terms correct

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

Expand and simplify the following expressions:

(b) $(2x+1)(4x-2)$

$8x^2 - 4x + 4x - 2$ (M1)

(A1) (A1)

Answer: $8x^2 - 2$ [3]

(c) $y(2y-z) - 2z(y-4)$

$2y^2 - yz - 2yz + 8z$ (M1)

(A2) – All Correct

(A1) – 2 out of 3 correct

Answer: $2y^2 - 3yz + 8z$ [3]

Page Total

7. Factorise the following expressions fully:

(a) $4c^2 - 8c$

$4(c^2-2)$ or $c(4c-8)$ } Score (A1)

(A1) (A1)

Answer: $4c(c-2)$ [2]

(b) $5xy^3 + 15yx^3$

Partial factorising (A1)

(A1) (A1)

Answer: $5xy(y^2+3x^2)$ [2]

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8. Simplify fully: $\frac{8xy^3}{4xy}$

Partial simplification (A1)

(A2)

Answer: $2y^2$ [2]

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9. Solve the following equations for x:

(a) $3x-7=8x+8$

$5x = -15$ (M1)

(A1)

Answer: $x =$ -3 [2]

(b) $5x^2+3(4x-3)=5x(x+6)$

$5x^2 + 12x - 9 = 5x^2 + 30x$ (M1)

$18x = -9$ (M2)

Answer: $x =$ $-1/2$ [3]

(c) $2-\frac{x}{6}=4x$

$12 - x = 24x$ (M1)

$25x = 12$ (M2)

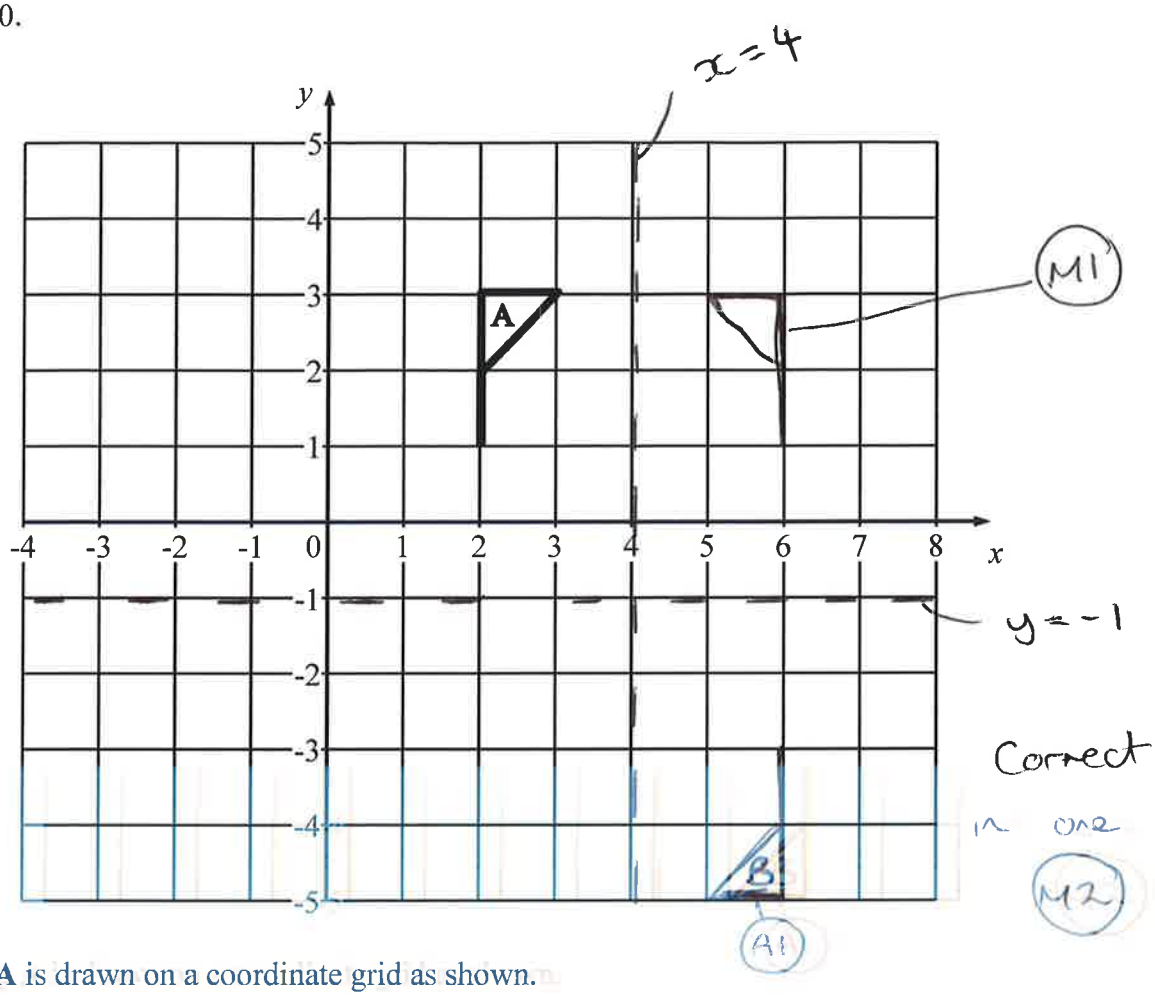
(A1)

Answer: $x =$ $12/25$ [3]

or 0.48

Page Total

10.



Flag **A** is drawn on a coordinate grid as shown.

The Flag **A** is reflected in the line $x = 4$ and then reflected in the line $y = -1$ to give Flag **B**

(a) Draw and label Flag **B** on the coordinate grid above

[3]

(b) Describe the single transformation that maps Flag **A** onto Flag **B.** M1 M2 M3

Rotation, 180°, About point (4, -1)

.....

.....

[3]

Page Total

11. A bag contains some beads which are red, green, blue or yellow. The table shows the number of beads of each colour in the bag.

Red	Green	Blue	Yellow
3	2	5	2

(a) Jeremy takes a bead at random from the bag.

Find the probability of Jeremy choosing a green bead.

(M1) $\frac{2}{3+2+5+2}$

Answer: $\frac{2}{12}$ or $\frac{1}{6}$ [2]

(b) Calculate the number of green beads Jeremy would expect to pick in 408 attempts.

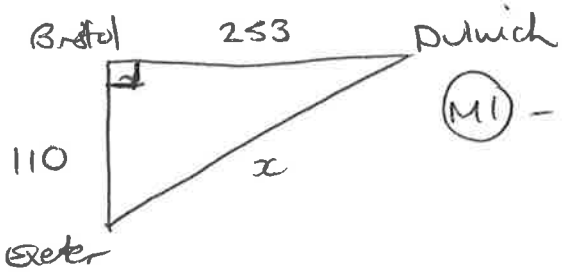
$\frac{1}{6} \times 408 =$ (M1) (A1)

Answer: 68 [2]

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12. Dulwich is 253 km due East of Bristol. Exeter is 110 km due South of Bristol.

Calculate the direct distance between Dulwich and Exeter. Give your answer correct to the nearest kilometre.



(M1) – for sketch

$253^2 + 110^2 = x^2$ (M2)

$x =$

(A1)

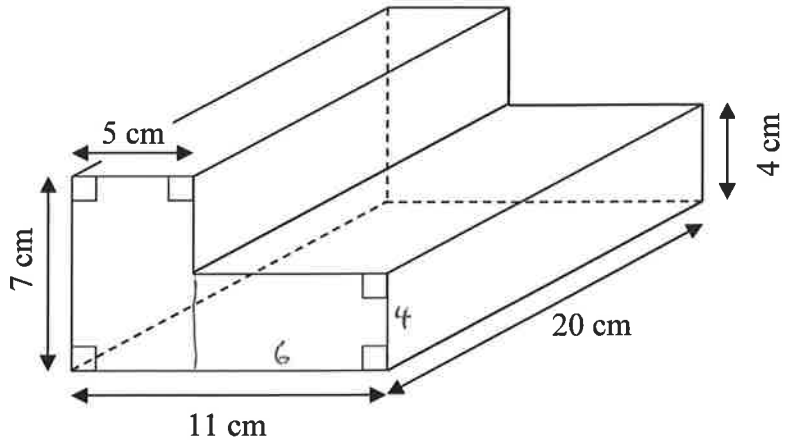
Answer: 276 km [3]

Must round to 276

Page Total

13. A solid prism has dimensions as shown.

Diagram **NOT** accurately drawn



Calculate the volume of the prism.

Cross Sectional Area = (7×5) + (6×4)

= 59 (M1)

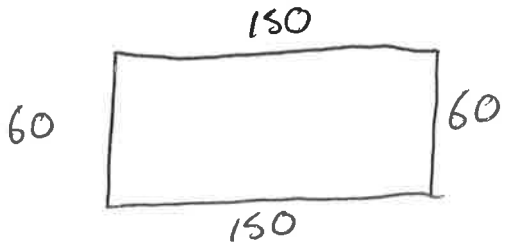
Volume = 59×20 = 1180 (M1)

(A1)

Answer: 1180 cm^3 [3]

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14. A rabbit runs around the edge of a rectangular field measuring 60 metres by 150 metres. Calculate how many seconds the rabbit takes to complete four full laps of the field if the rabbit runs at 6 metres per second.



4 laps distance = 420 m (M1)

$\frac{420}{6}$ = 70 (M2)

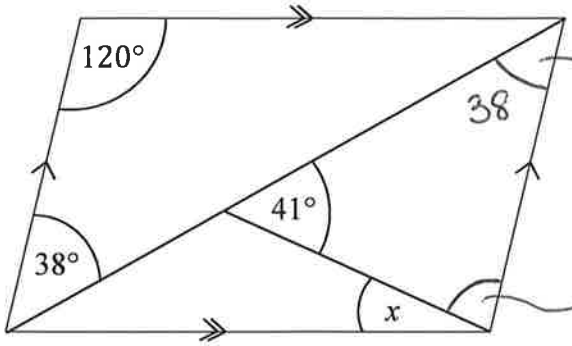
(A1)

Answer: 70 seconds [3]

Page Total

15.

Diagram **NOT** accurately drawn



M1

180 - 38 - 41 = 101°

M1

Calculate the size of the angle marked *x*.

$x + 101 = 120$

$\therefore \quad x = 19°$

A1

Answer: 19° [3]

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16. 40% of the members of a Mathematics Club are boys. There were 72 girls who are members of the club. Calculate how many members the club have in total.

M1

60% Girls.

M1

$72 \div 0.6 = 120$

OR

60% = 72

1% = 1.2

100% = 120.

A1

Answer: 120 [3]

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17.

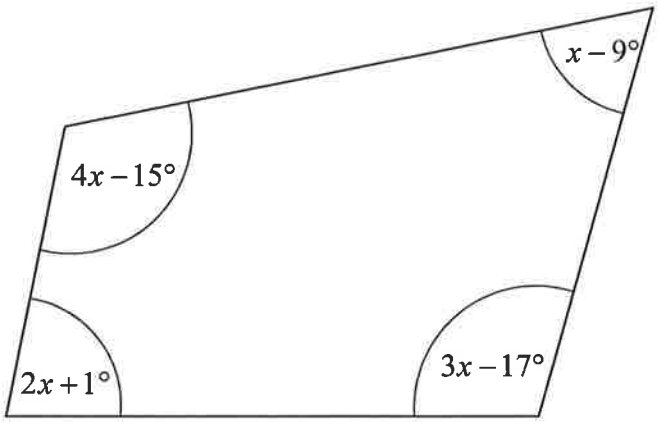


Diagram **NOT** accurately drawn

Calculate the value of x.

$4x - 15 + 2x + 1 + x - 9 + 3x - 17 = 360$ (M1)

$10x - 400 = 360$

$10x = 400$ (M1)

$x = 40$

Answer: 40 [3]

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18. Six students take a mathematics test gaining the marks:

70, 68, 52, 98, 42 and 84

a) Calculate the mean mark of the six students.

$$\frac{70+68+52+98+42+84}{6}$$ (M1)

Answer: 69 [2]

b) A new student joins the group and takes the test. Calculate the score he must obtain in order to raise the class average to 70.

$$\frac{414+x}{7} = 70$$ (M1)

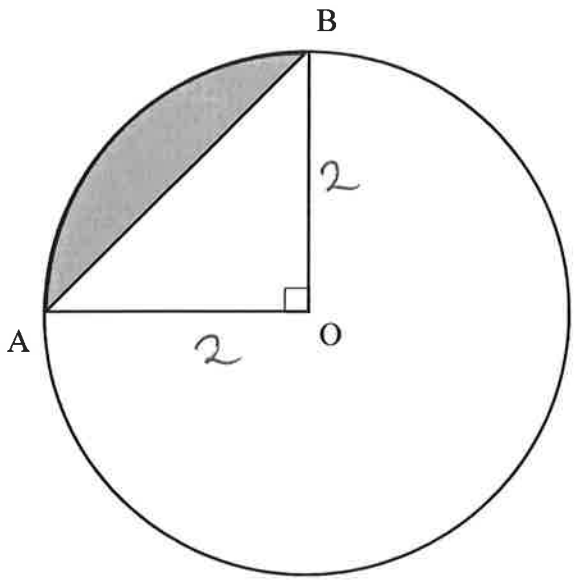
$$414+x = 490$$ (M2)

$$x = 76$$

Answer: 76 [3]

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19. O is the centre of a circle of radius 2 cm. OA and OB are radii and AOB is a right-angled triangle. Calculate the area of the shaded region, giving your answer correct to two decimal places.



Sector: $\frac{\pi(2)^2}{4} = \pi$ (M1)

Triangle: $\frac{2\times 2}{2} = 2$ (M1)

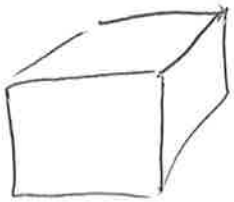
Their Sector - Triangle $= \pi - 2$ (M1)

$= 1.14$

Answer: 1.14 cm^2 [4]

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20. Calculate the total surface area of a cube whose volume is 64 cubic centimetres.



V = 64

M1

$\sqrt[3]{64} = 4$

$4^2 \times 6 =$

M2

A1

Answer: 96 cm^2 [3]

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21. The size of each interior angle of a regular polygon is 156°. Work out the number of sides of the polygon.

Exterior angle = 24°

M1

$\frac{360}{24} = 15$

M1

A1

Answer: 15 [3]

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22. The diagram shows an equilateral triangle and a square.

Find the size of angle x.

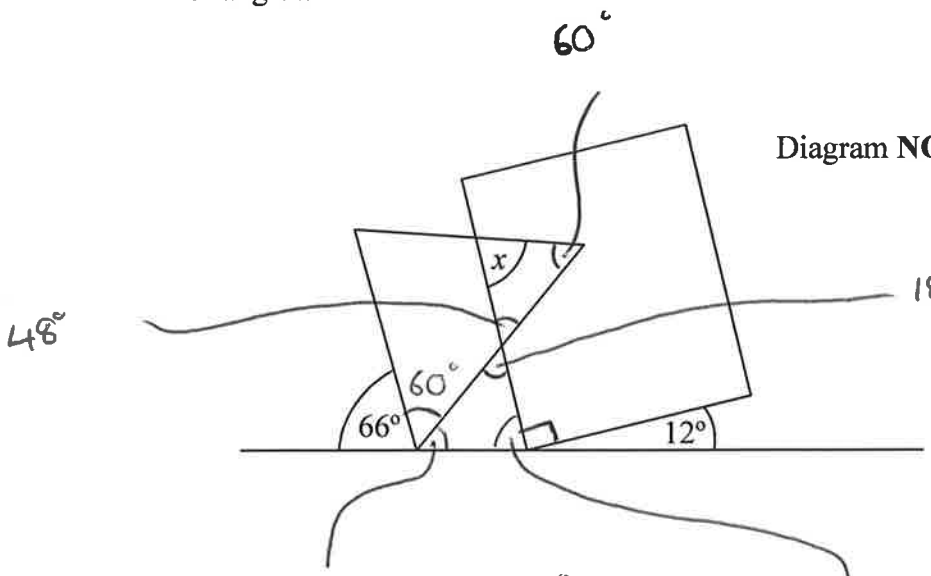


Diagram **NOT** accurately drawn

180 - 54 - 78 = 48

180 - 66 - 60 = 54°

180 - 90 - 12 = 78°

M1 for both of these.

180 - 60 - 48 = x M2

x = 72°

Answer: 72° [3]

Page Total

23. In a junior league each team plays each of the other teams twice during the season, once at home and once away. There are 56 matches in total during the season. Calculate how many teams there are in the league.

$n^2 - n = 56$ (M1)

$n^2 - n - 56 = 0$

$(n-8)(n+7) = 0$ (M2)

$n = 8$ or -7 (M3)

$n \neq -7$

$\therefore n = 8$

Offer (M1) for attempting to find pattern.

Answer: $n = 8$ [4]

Page Total

24. Michael chooses, at random, two different single digit numbers, not including zero. He then works out their sum. Calculate the probability that the sum is a single digit number. Give your answer as a fraction in its lowest terms.

	1	2	3	4	5	6	7	8	9
1	×	3	4	5	6	7	8	9	
2	3	×	5	6	7	8	9		
3	4	5	×	7	8	9			
4	5	6	7	×	9				
5	6	7	8	9	×				
6	7	8	9			×			
7	8	9					×		
8	9							×	
9									×

M2 for grid or listing options

M3 $\frac{32}{72}$

A1

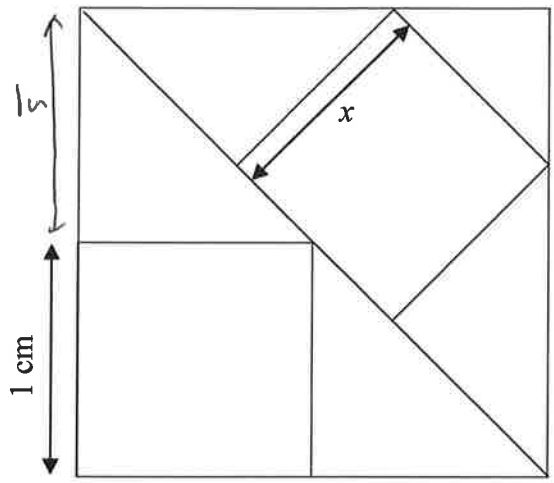
Answer: $\frac{4}{9}$ [4]

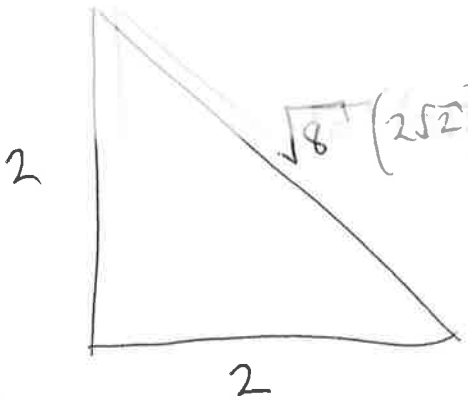
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25. The diagram below shows two smaller squares within a larger square.

The side of one of the smaller squares is 1 cm as shown.

Calculate the size of the length marked x (give your answer correct to 3 significant figures).





$\sqrt{8}$ $(2\sqrt{2})$

(M2) For working out diagonal

(M3)

$x = \frac{\sqrt{8}}{3}$

(A1)

Answer: 0.943 cm [4]

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26. All the letters in the question represent different positive whole numbers.

For example, if R = 5, O = 3 and S = 4 then ROS = 5 × 3 × 4 = 60

If BIBLE = 66 and BALL = 28, find the value of LIBEL.

B 28

(2) 14

(2) 7

L = 2 (M1)

BA = 7

BIBE = 33

∴ B = 1 (M2)

IE = 33

∴ LIBEL

= (IE)(B)(LL) (M3)

= 33 (1)(4) = 132

(A1)

Answer: 132 [4]

THE END
IF YOU HAVE TIME THEN GO BACK AND CHECK YOUR ANSWERS

Page Total