Name:

GCSE Maths 2022
Edexcel Higher Paper 1
Set B
Non-Calculator

Corbettmaths

Equipment

1. A black ink ball-point pen.
2. A pencil.
3. An eraser.
4. A ruler.
5. A pair of compasses.
6. A protractor.

Guidance

1. Read each question carefully.
2. Check your answers seem right.
3. Always show your workings

Information

1. This paper has been created based on topics in the Advance Information.
2. Also see Corbettmaths for the checklist for the entire GCSE as these topics may still be useful for Paper 1
3. There is one question per topic - this paper is designed to give an opportunity to practice each topic rather than replicate the actual paper.
4. The marks for questions are shown in brackets

1. Work out

$$4\frac{1}{3} - 3\frac{4}{9}$$

Give your answer as a fraction.

$$\frac{13}{3} - \frac{31}{9}$$

$$\frac{39}{9} - \frac{31}{9}$$

$\frac{8}{9}$ ....

(3)

2. Work out

$$5\frac{1}{2} \times 1\frac{2}{3}$$

Give your answer as a mixed number.

$$\frac{11}{2} \times \frac{5}{3} = \frac{55}{6}$$

$9\frac{1}{6}$ ....

(3)

3. Work out

$$6\frac{2}{3} \div \frac{3}{4}$$

Give your answer as a mixed number.

$$\frac{20}{3} \div \frac{3}{4}$$

$$\frac{20}{3} \times \frac{4}{3} = \frac{80}{9}$$

$8\frac{8}{9}$ ....

(2)

4.   What is the reciprocal of 0.35? $\frac{7}{20} \rightarrow \frac{20}{7}$

Circle the correct answer.

$2\frac{6}{7}$

$\left(2\frac{6}{7}\right)$ 1.35 $\frac{7}{20}$ −0.35

(1)

5.   A new snack bar contains 7.5g of sugar.

$\frac{3}{10}$ of the snack bar is sugar.

Work out the mass of the snack bar.

$7.5 \div 3 = 2.5$

$2.5 \times 10 = 25$

25g

(2)

6.   (a) Express 108 as a product of its prime factors.
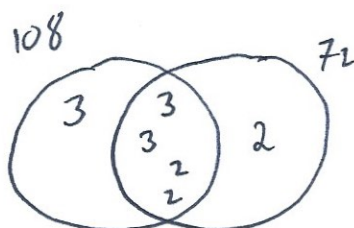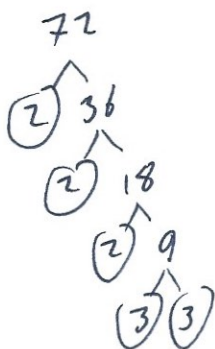   Give your answer in index form.

108

$2 \times 2 \times 3 \times 3 \times 3$

$2^2 \times 3^3$

(3)

(b) Find the Highest Common Factor (HCF) of 108 and 72.

72

108   72

HCF = $3 \times 3 \times 2 \times 2$

= 36

36

(2)

7.   Work out

$$125^{1/3} \times 2^{-3}$$

$5 \times \dfrac{1}{2^3}$

$5 \times \dfrac{1}{8} = \dfrac{5}{8}$

$\dfrac{5}{8}$

(2)

8. Work out $(4.5 \times 10^7) \div (5 \times 10^{-2})$
   Give your answer in standard form.

   0.9×10^9

   9×10^8

   ....9×10^8.......

   (2)

9. In a school, there are 120 Year 12 students and 180 Year 11 students.

   20% of the Year 12 students are left handed $0.2 \times 120 = 24$
   70% of the Year 11 students are right handed $0.3 \times 180 = 54$
   30% left

   What percentage of all the students are left handed?

   $24 + 54 = 78$

   $\dfrac{78}{300} = 0.26$

   ....26%.......

   (3)

10. Write $0.5\overset{\cdot\cdot}{12}$ as a fraction.
    Give your answer in its simplest form.

    $x = 0.5|12|12|2\ldots$

    $10x = 5.1212\ldots$

    $1000x = 512.1212\ldots$

    $990x = 507$

    $x = \dfrac{507}{990}$

    $\dfrac{169}{330}$
    ....

    (3)

11. There are green, yellow and blue counters in a box.
The ratio of yellow to blue is 2:3.
The ratio of yellow to green is 7:6.

What fraction of all the counters are green?

$G : Y : B$

$2 : 3$

$\times 2 \left(\begin{array}{c} 6 : 7 \\ 12 : 14 : 21 \end{array} \right) \times 7$

$12 + 14 + 21 = 47$

$\dfrac{12}{47}$

....

(3)

12. H varies directly to the cube of c.
When H = 40, c = 2.

(a) Express H in terms of c.

$H \propto c^3$

$H = kc^3$

$40 = k \times 2^3$

$40 = k \times 8$

$k = 5$

H = $\dfrac{5c^3}{}$ ....

(3)

(b) Find the value of H when c = 5.

5×5^3

5×125

H = $\dfrac{625}{}$ ....

(1)

(c) Find the value of c when H = 5000.

$5000 = 5c^3$

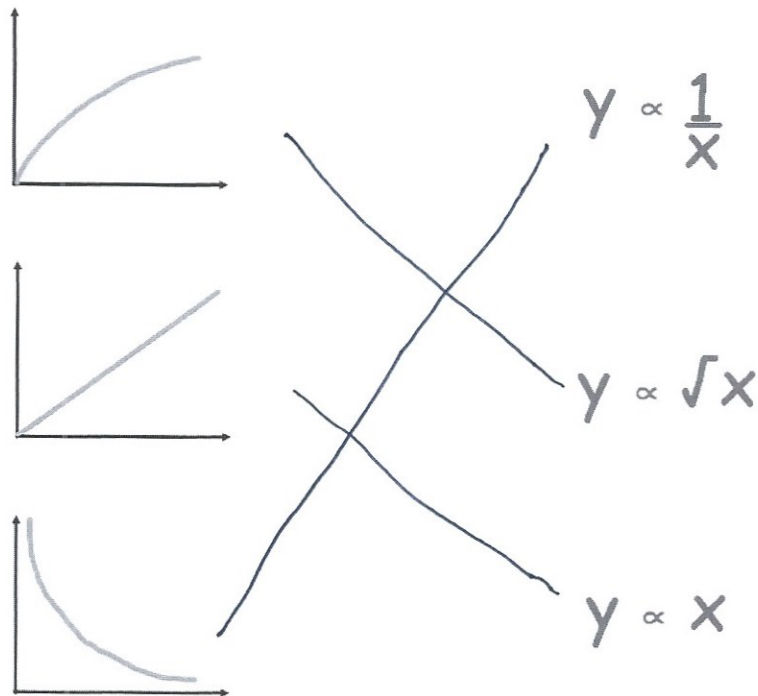$1000 = c^3$

c = $\dfrac{10}{}$ ....

(1)

13. A and B are positive numbers.
    A is inversely proportional to B.
    When A = 4, B = 36.

    Find the value of A when B = A.

    $A \propto \dfrac{1}{B}$ $A = \dfrac{144}{B}$

    $A = \dfrac{k}{B}$

    $A = \dfrac{144}{A}$

    $4 = \dfrac{k}{36}$

    $A^2 = 144$

    $k = 144$

    A = ...12....

    (4)

14. Match each graph to the correct relationship.

$y \propto \dfrac{1}{x}$

$y \propto \sqrt{x}$

$y \propto x$

(3)

15. It takes 6 hours for 20 workers to seed 40 acres.

How long would it take 10 workers to seed 90 acres?

$6 \times 20 = 120$ hours (for 1 worker to seed 40 acres)

$120 \div 40 = 3$ hours (for 1 worker to seed 1 acre)

$90 \times 3 = 270$ hours (for 1 worker to seed 90 acres)

$270 \div 10 = 27$ hours

....27 hours....

(3)

16. Show that $(\sqrt{2} + 3\sqrt{8})^2 = 98$

$\left(\sqrt{2} + 3\sqrt{8}\right)\left(\sqrt{2} + 3\sqrt{8}\right)$

$\sqrt{4} + 3\sqrt{16} + 3\sqrt{16} + 9\sqrt{64}$

$2 + (3 \times 4) + (3 \times 4) + (9 \times 8)$

$2 + 12 + 12 + 72 = 98$

....

(3)

17. Simplify $6a + 7w - 2(3a - 9w)$

$6a + 7w - 6a + 18w$

$25w$

$25w$
....

(2)

18. (a) Expand and simplify $(x + 7)^2$

$$(x+7)(x+7)$$

$$\underline{x^2 + 14x + 49}$$

(2)

(b) Expand and simplify $(x – 5)(x – 2)(x – 1)$

$$\left(x^2 - 7x + 10\right)(x - 1)$$

$$x^3 - 7x^2 + 10x - x^2 + 7x - 10$$

$$\underline{x^3 - 8x^2 + 17x - 10}$$

(4)

19. (a) Solve $y^2 – 12y – 64 = 0$

$$(y - 16)(y + 4) = 0$$

$$\underline{y = 16 \text{ or } y = -4}$$

(2)

(b) Solve $2y^2 + 7y – 15 = 0$

$$(2y - 3)(y + 5) = 0$$

$$y = \frac{3}{2} \quad \text{or} \quad y = -5$$

$$\underline{y = \frac{3}{2} \text{ or } y = -5}$$

(2)

(c) Solve $4y^2 - 49 = 0$

$$(2y - 7)(2y + 7) = 0$$

$$2y = 7 \quad \text{or} \quad 2y = -7$$

$$y = \frac{7}{2} \quad \text{or} \quad y = -\frac{7}{2}$$

(2)

20. (a) Simplify

$$\frac{x^2 - 3x + 2}{x^2 + 5x - 6}$$

$$\frac{(x - 2)(x - 1)}{(x + 6)(x - 1)}$$

$$\frac{x - 2}{x + 6}$$

(3)

(b) Simplify fully.

$$\frac{v + 3}{2} \div \frac{3v + 9}{5}$$

$$\frac{v + 3}{2} \times \frac{5}{3v + 9}$$

$$\frac{5(v + 3)}{2(3v + 9)} \quad = \quad \frac{5(v + 3)}{6(v + 3)}$$

$$\frac{5}{6}$$

(2)

(c)   Solve

$$\frac{7}{x+2} + \frac{10}{2x-5} = 3$$

$$\frac{7(2x-5) + 10(x+2)}{(x+2)(2x-5)} = 3$$

$14x - 35 + 10x + 20 = 3(x+2)(2x-5)$

$24x - 15 = 3[2x^2 - 5x + 4x - 10]$

$24x - 15 = 3(2x^2 - x - 10)$
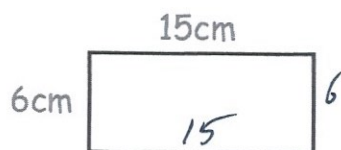
$24x - 15 = 6x^2 - 3x - 30$

$0 = 6x^2 - 27x - 15$

$0 = 2x^2 - 9x - 5$
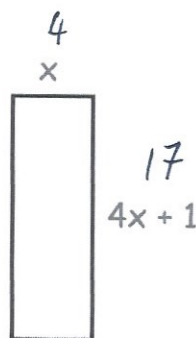
$(2x+1)(x-5) = 0$

$x = -\frac{1}{2}$ or $x = 5$

(5)

21.

15cm

6cm [15] 6

Rectangle A

P = 42cm

4
x

17

4x + 1

Rectangle B

Rectangles A and B have the same perimeter.

Find the area of Rectangle B.

$10x + 2 = 42$

$x = 4$

4×17

68

..............................cm²
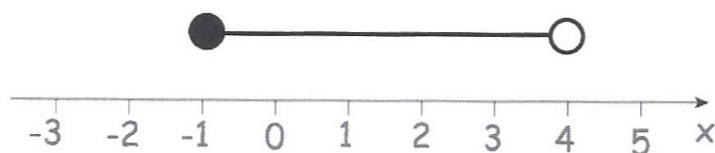
(4)

22. (a) Solve the inequality $3(x - 4) \leq 15$

$$x - 4 \leq 5$$
$$x \leq 9$$

$x \leq 9$

(2)

(b) Write down the inequality shown by the diagram.

$-1 \leq x < 4$

(2)

23. A straight line, L, is perpendicular to the line with equation $y = 2x + 3$
L passes through the point (10, 3)
$\qquad x \quad y$

Find an equation for the straight line L.
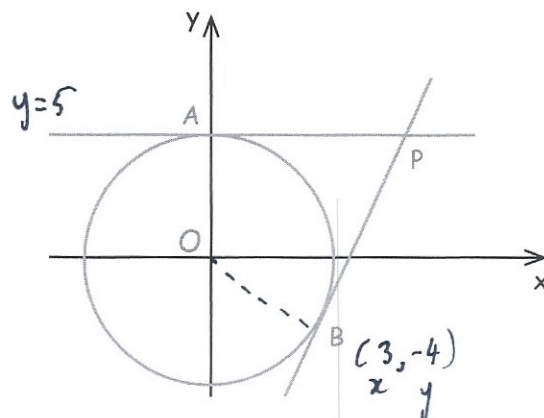
$$m = -\frac{1}{2}$$

$$y = -\frac{1}{2}x + c$$

$$3 = -5 + c$$

$$c = 8$$

$y = -\frac{1}{2}x + 8$

(3)

24. The circle $x^2 + y^2 = 25$ has tangents at the points A and B.
The point A has coordinates (0, 5)
The point B has coordinates (3, −4)

The tangents meet at the point P.

Work out the coordinates of the point P.

gradient of OB = $-\frac{4}{3}$

$y = \frac{3}{4}x + c$

$-4 = \frac{9}{4} + c$

$c = -\frac{25}{4}$

$y = \frac{3}{4}x - \frac{25}{4}$
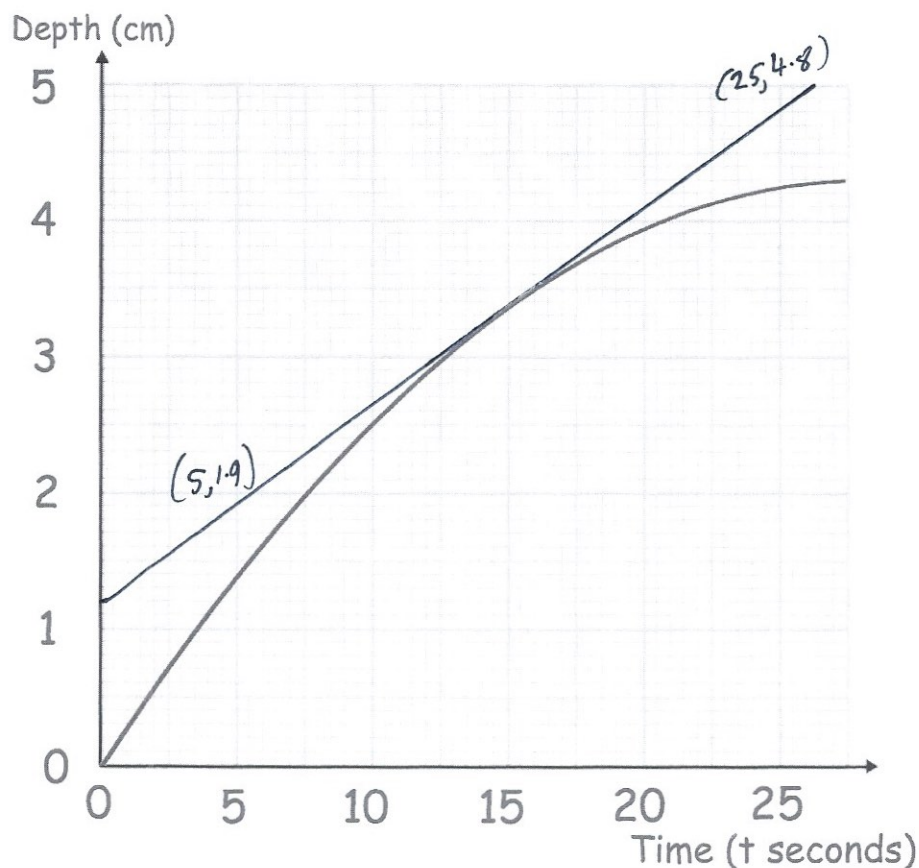
$y = 5$

$\frac{3}{4}x - \frac{25}{4} = 5$

$\frac{3}{4}x = 11.25$

$x = 15$

(15, 5)

(5)

25. Jack is filling a container with water.

The graph shows the depth of the water, in centimetres, t seconds after the start of filling the container.

Depth (cm)

(25, 4.8)

(5, 1.9)

Time (t seconds)

(a) Calculate an estimate for the gradient of the graph when t = 15 seconds.

$$\frac{4.8 - 1.9}{25 - 5} = \frac{2.9}{20}$$
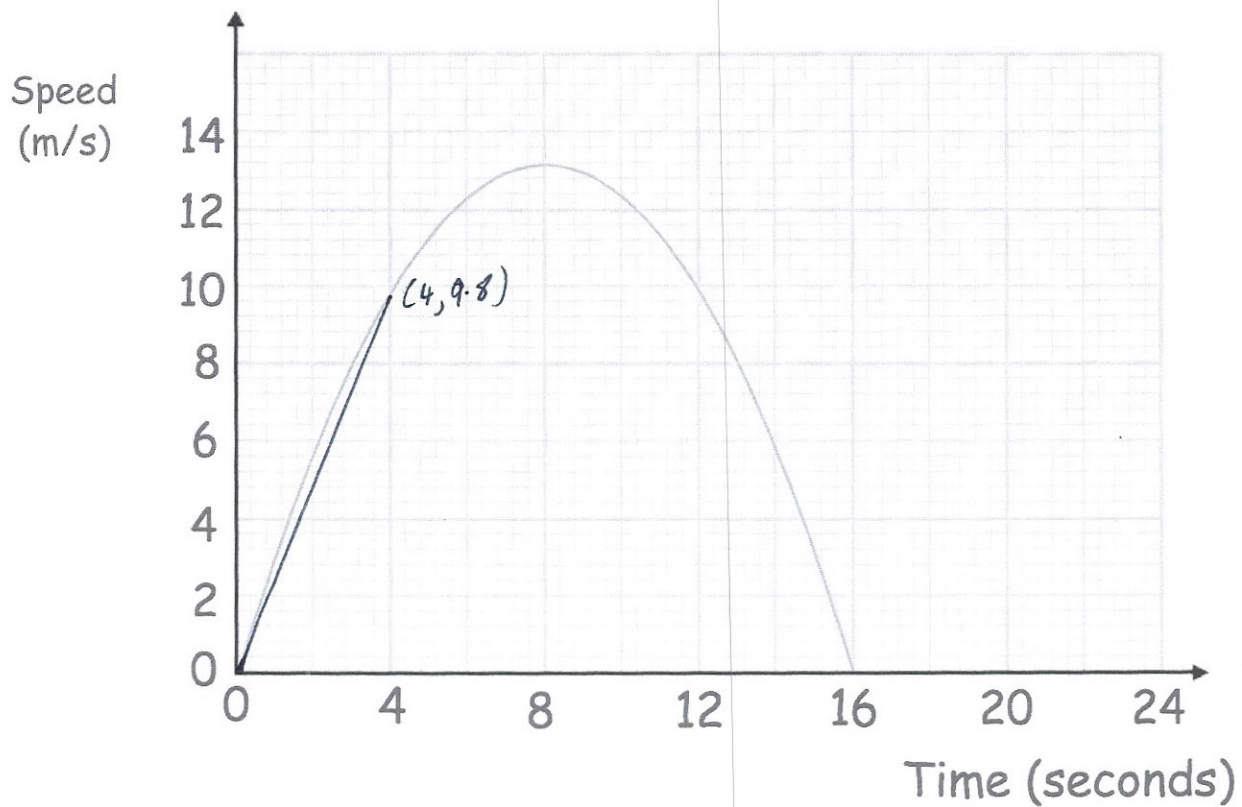
$$= \frac{1.45}{10}$$

0.145 cm/s

(3)

(b) Describe fully what your answer to (a) represents

The rate at which the depth of the water is increasing (at 15 seconds), which is 0.145 cm per second.

(2)

(c) Explain why your answer to (a) is only an estimate

It is a hand drawn tangent - it may not be precise.

(1)

26. Here is a speed-time graph for a toy rocket.

Speed (m/s)

(4, 9.8)

Time (seconds)

Work out the average rate of acceleration between 0 and 4 seconds.

$$\frac{9.8 - 0}{4 - 0} \; = \; \frac{9.8}{4}$$

2.45 .....m/s²

(3)

27. (a) Complete the table of values for $y = x^2 - x - 5$

x	-3	-2	-1	0	1	2	3
y	7	1	-3	-5	-5	-3	1

(2)

(b) Draw the graph of $y = x^2 - x - 5$ for the values of x from -3 to 3
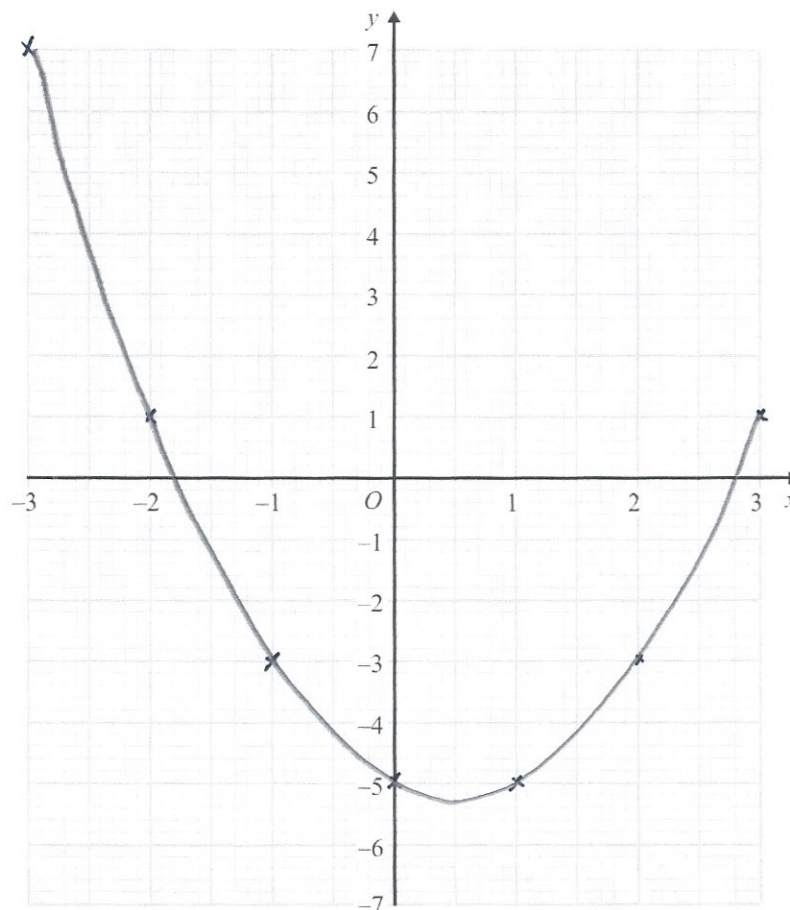
(2)

(c) Write down the coordinates of the turning point of the graph

$(0.5, -5.3)$

....

(1)

28. Dominic sketches the graph of $y = x^2 + 3x - 54$
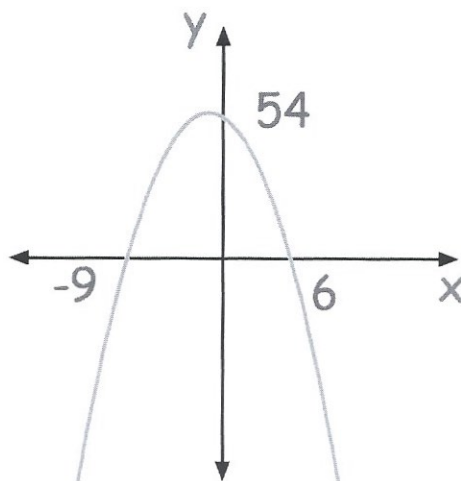
Can you spot any mistakes?

1) y - intercept should be (0,-54)
2) Parabola should be a U shape.

(2)

---

29. Heidi is solving a quadratic equation in the form ax² + bx + c = 0
She has got to this point in her working out.

$$x = \frac{-6 \pm \sqrt{12}}{4}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Find possible values of a, b and c for the equation Heidi is solving.

$a = 2$
$b = 6$

$b^2 - 4ac = 12$
$36 - 8c = 12$
$24 = 8c$
$c = 3$

a = 2

b = 6

c = 3

(3)

30. Write $x^2 + 8x + 6$ in the form $(x + a)^2 + b$, where a and b are constants.

$$(x + 4)^2 - 16 + 6$$

$$(x+4)^2 - 10$$

(3)

31. The table shows information about the beads in a bag.

Colour	Red	White	Black	Brown
Frequency	3x - 1	x	4	x + 8

A bead is picked at random.

The probability of a black bead is $\dfrac{2}{33}$

Work out the probability of a red bead.

$$\frac{4}{5x + 11} = \frac{2}{33} \quad \left(\frac{4}{66}\right)$$

$$5x + 11 = 66$$
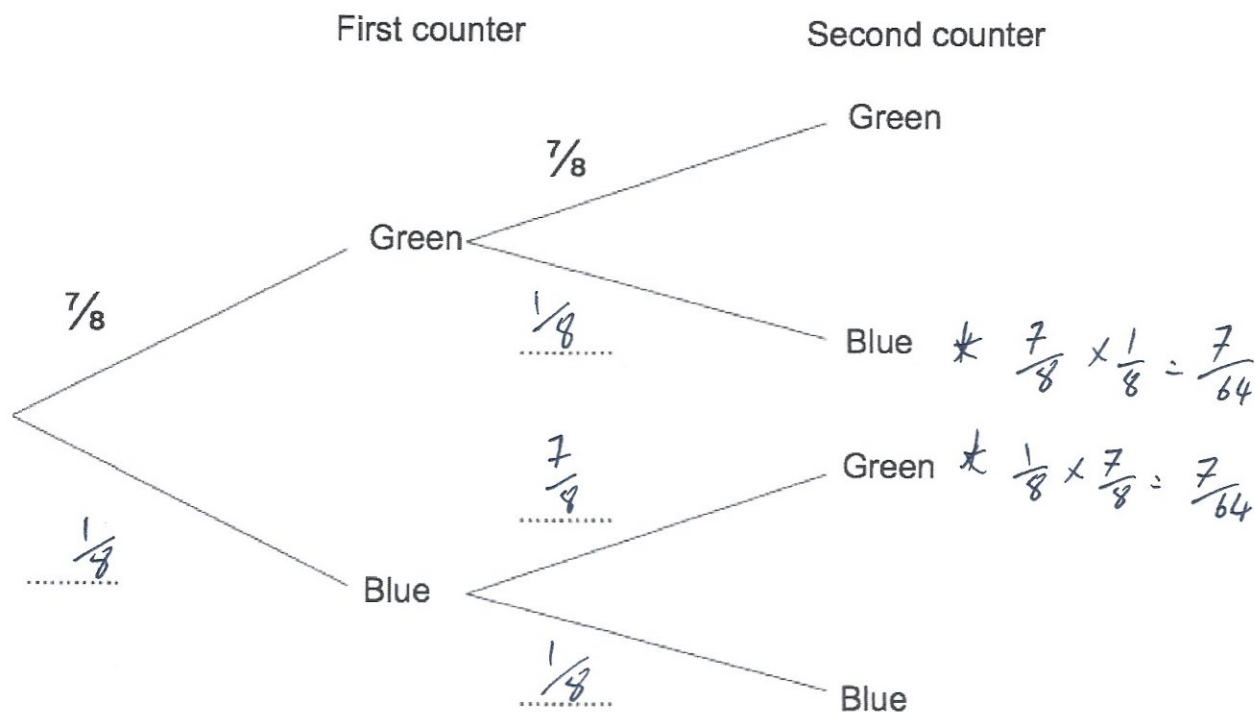
$$5x = 55$$

$$x = 11$$

$$\frac{16}{33}$$

(4)

$$\frac{3 \times 11 - 1}{66} = \frac{32}{66}$$

32. There are green and blue counters in a container.

Kevin takes at random a counter from the container.
He replaces the counter in the container.

Kevin takes at random a second counter from the container.

(a) Complete the probability tree diagram.

First counter   Second counter

                                                    Green
                              $\frac{7}{8}$
                  Green
$\frac{7}{8}$ $\frac{1}{8}$
                                          Blue * $\frac{7}{8} \times \frac{1}{8} = \frac{7}{64}$

                              $\frac{7}{8}$
                                          Green * $\frac{1}{8} \times \frac{7}{8} = \frac{7}{64}$
$\frac{1}{8}$
                  Blue
                              $\frac{1}{8}$
                                                    Blue

(2)

(b) Work out the probability that Kevin picks counters that are different colour.

$\frac{14}{64} = \frac{7}{32}$

....

(2)

33. A teacher gave 100 boys and 100 girls a maths test.
The test was out of 45 marks.
The cumulative frequency curves show how each group performed.
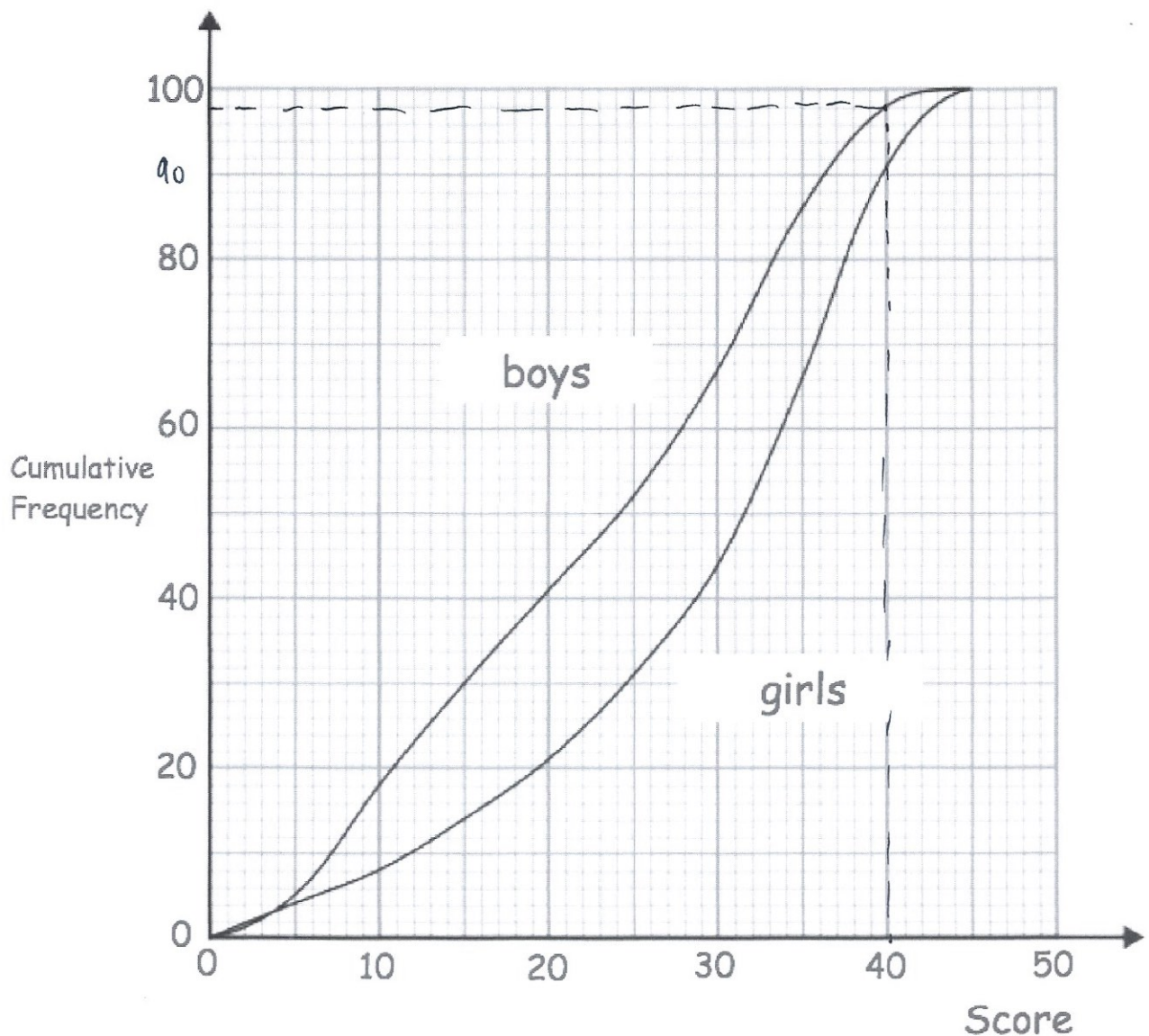
(a) Find an estimate for the number of boys who scored over 40 marks.

boys   girls

Median   24   31·5

IQR   19   14·5

............2............

(1)

(b) Make two comparisons between the distributions of the boys and girls scores.

The girls scored higher than the boys on average,
with a median of 31·5, compared to 24.

The boys results were more spread out as their IQR
was higher (19 compared to 14·5).

(3)

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34. The table shows information about the delivery times of pizzas.

Delivery Time	Frequency	fx
$0 < t \le 10$ 5	3	15
$10 < t \le 20$ 15	10	150
$20 < t \le 30$ 25	14	350
$30 < t \le 40$ 35	19	665
$40 < t \le 50$ 45	4	180
	50	1360

(a) Work out an estimate for the mean delivery time.

$$50\overline{)1360.0} \quad 0027.2$$

..........27.2 mins...........

(3)

Evelyn says,

"The mean may **not** be the best average to use to represent this information."

(b) Do you agree with Evelyn?
You must justify your answer

There are no outliers, so I do not agree.

(1)

35. 10 girls and 15 boys sit a test.

$$10 \times 82 = 820$$

The mean mark for the boys is 70.
The mean mark for the girls is 82.

$$15 \times 70 = 1050$$
$$\overline{1870}$$

Work out the mean mark for the whole class.

$$25\overline{)1870.00} \quad 0074.8$$

..........74.8...........

(3)

36. The frequency polygon shows information on how long people spend in a swimming pool.
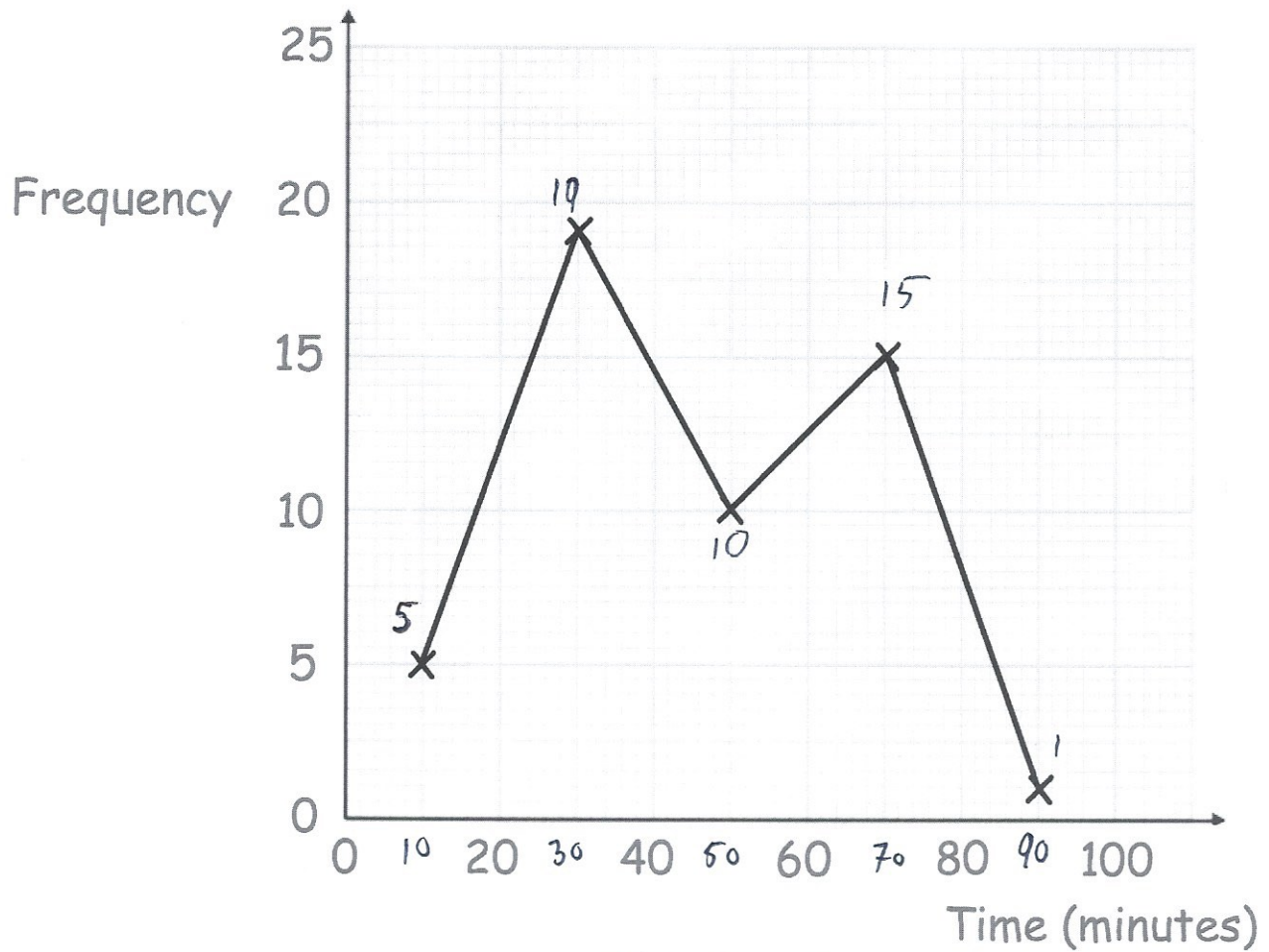
5 + 19 + 10 + 15 + 1 = 50

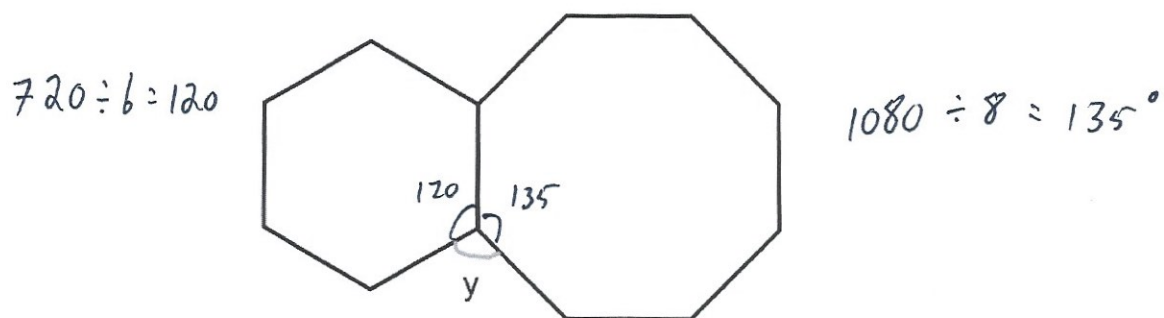Calculate an estimate of the mean time spent in the swimming pool.

5 x 10 = 50

19 x 30 = 570

10 x 50 = 500

15 x 70 = 1050

1 x 90 = 90

2260

$50 \overline{\smash{)}2260.00}$ 0045.2

45.2 min.

....

(3)

37. Shown is a regular hexagon and a regular octagon.

$720 \div 6 = 120$

$1080 \div 8 = 135°$

120 135

y

Calculate the size of angle y.

$360 - 120 - 135 =$

y = ...105...°

(3)

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38. Shown below is a right-angled triangle.

Not drawn accurately

6cm

y
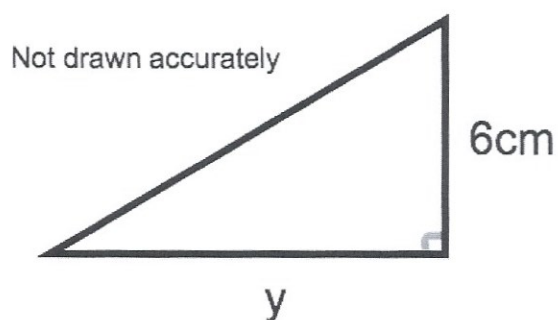
The area of the triangle is 21cm²
Calculate y, the length of the base.

$\frac{1}{2} \times y \times 6 = 21$

$3 \times y = 21$

$y = 7$

...7...cm

(2)

39.
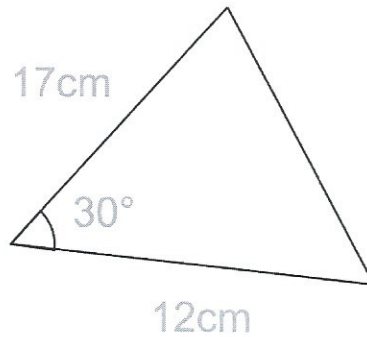
Calculate the area of the triangle.
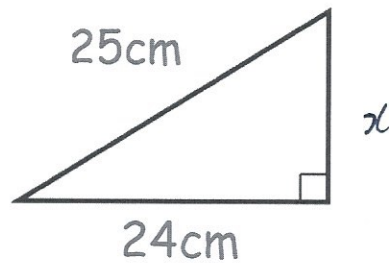
$$\frac{1}{2} \times 17 \times 12 \times \sin 30$$

$$\frac{1}{2} \times 17 \times 12 \times \frac{1}{2}$$

$$= 3 \times 17$$

........51.........cm²

(2)

40. Shown is a right angle triangle.

Find the perimeter of the triangle.

$$x^2 + 24^2 = 25^2$$

$$x^2 + 576 = 625$$
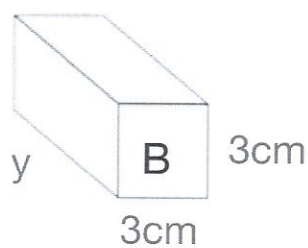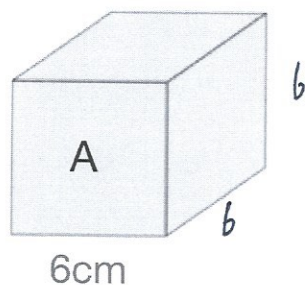
$$x^2 = 49$$

$$x = 7$$

$$7 + 25 + 24 =$$

........56........cm

(2)

41. Find the exact value of Sin(45°) + Cos(30°)

$$\frac{\sqrt{2}}{2} + \frac{\sqrt{3}}{2}$$

$$\frac{\sqrt{2} + \sqrt{3}}{2}$$
....
(3)

42. Cube A and cuboid B have the same volume.

6cm

y   B   3cm
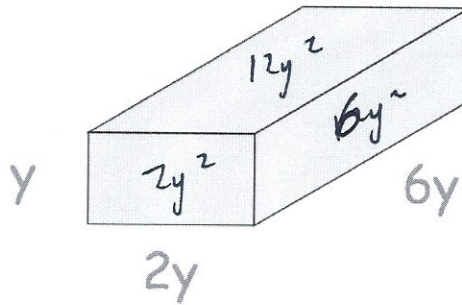
3cm

Calculate the missing length on the cuboid, y

$$6 \times 6 \times 6 = 216$$

$$3 \times 3 = 9$$

$$216 \div 9 = 24$$

24
....................cm
(3)

43. The surface area of the cuboid is 90cm²

$12y^2$

$6y^2$

Y $2y^2$ $6y$

$2y$

Find the value of y

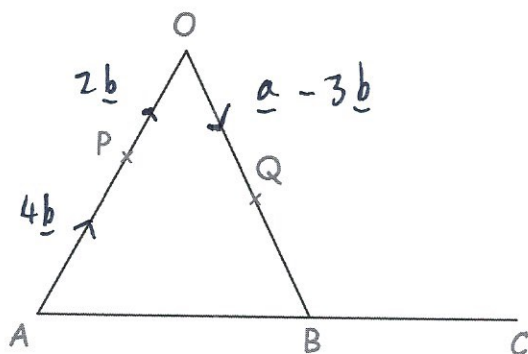$$2y^2 + 2y^2 + 12y^2 + 12y^2 + 6y^2 + 6y^2$$

$$= 40y^2$$

$$40y^2 = 90$$

$$y^2 = 2.25$$

$$y = 1.5$$

.........1.5.........cm

(4)

44.

AOB is a triangle.
P is a point on AO.

$$\overrightarrow{AB} = 2a \qquad \overrightarrow{AO} = 6b \qquad AP:PO = 2:1$$

(a) Find the vector $\overrightarrow{OB}$ in terms of **a** and **b**

$$\overrightarrow{OB} = \overrightarrow{OA} + \overrightarrow{AB}$$
$$= -6\underline{b} + 2\underline{a}$$

$$\underline{2a - 6b}$$

(1)

Q is the midpoint of OB.
B is the midpoint of AC.

Show PQC is a straight line.

$$\overrightarrow{PQ} = \overrightarrow{PO} + \overrightarrow{OQ}$$
$$= 2\underline{b} + \underline{a} - 3\underline{b}$$
$$= 2\underline{b} - 3\underline{b} + \underline{a}$$
$$= \underline{a} - \underline{b}$$

$$\overrightarrow{QC} = \overrightarrow{QB} + \overrightarrow{BC}$$
$$= \underline{a} - 3\underline{b} + 2\underline{a}$$
$$= 3\underline{a} - 3\underline{b}$$

$$\therefore \overrightarrow{QC} = 3\overrightarrow{PQ}$$
So they are parallel.
As $\overrightarrow{QC}$ & $\overrightarrow{PQ}$ are parallel and both pass through Q, they must be in a straight line.

(3)

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45. Kelvin completes a journey in three stages.

In stage 1 of his journey, he drives at an average speed of 32 miles per hour for 45 minutes.

(a) How far does Kelvin travel in stage 1 of his journey?

$$\frac{3}{4} \times 32$$

$$\frac{3}{4} \text{ of } 32 = 24$$

.... 24 ....miles

(2)

In stage 2 of his journey, Lee drives at an average speed of 44 miles per hour for 2 hours 45 minutes.

Altogether, over all three stages, Lee drives 150 miles in 4 hours.

What is his average speed, in miles per hour, in stage 3 of his journey?

2 hr 45 mins = $2\frac{3}{4}$ hours

$44 \times 2\frac{3}{4} = 121$ miles

$\frac{3}{4} + 2\frac{3}{4} = 3\frac{1}{2}$.

121 + 24 = 145

150 − 145 = 5 miles

stage 3 : 5 miles in $\frac{1}{2}$ hr.

$5 \div \frac{1}{2} = 10$

.... 10 ....miles per hour

(3)

46. The speed-time graph below shows the speed of a train between two underground stations.

Speed (m/s)

30

$A: \frac{1}{2} \times 20 \times 30$
$= 300$

50×30
$= 1500$

$B: \frac{1}{2} \times 30 \times 30$
$= 450$

(A)

(B)

0   20   70   100

Time (s)
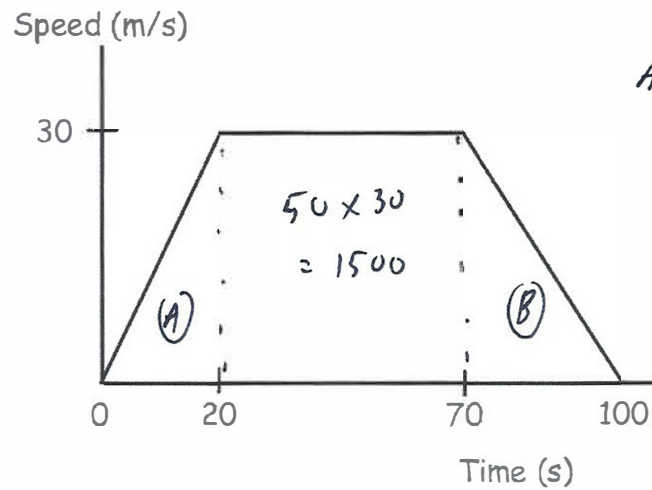
(a) Calculate the distance between the stations.

$300 + 450 + 1500 = 2250$

2250
..........................m

(3)

(b) Calculate the average speed for the journey.

$2250 \div 100$

22.5
.........................m/s

(2)

47. A solid cube made of iron has side length of 2cm. $2 \times 2 \times 2 = 8$
    The mass of the iron cube is 62.4g.

    Find the density of iron.
    Give your answer in g/cm³

    $d \quad \frac{m}{v}$

    $62.4 \div 8 = 7.8$

    $8 \overline{)62.4}$ 07.8

    .... 7.8 .... g/cm³

                                    (3)

48. OAB is a sector of a circle.
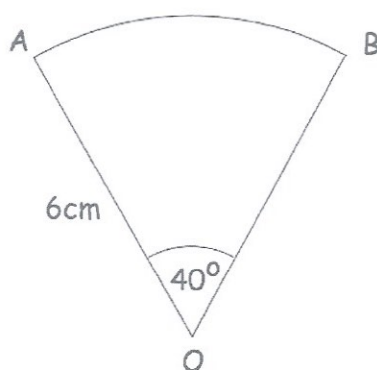
    Find the area of the sector.
    Give your answer in terms of π.

    $\frac{40}{360} \times \pi \times 6^2$

    $\frac{1}{9} \times \pi \times 36$

    .... 4π ....cm²

                                    (3)

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