Gold Level

Model Answers 9

Level	IGCSE
Subject	Maths
Exam Board	Edexcel
Difficulty Level	Gold
Booklet	Model Answers 9

Time Allowed: **52 minutes**

Score: **/ 43**

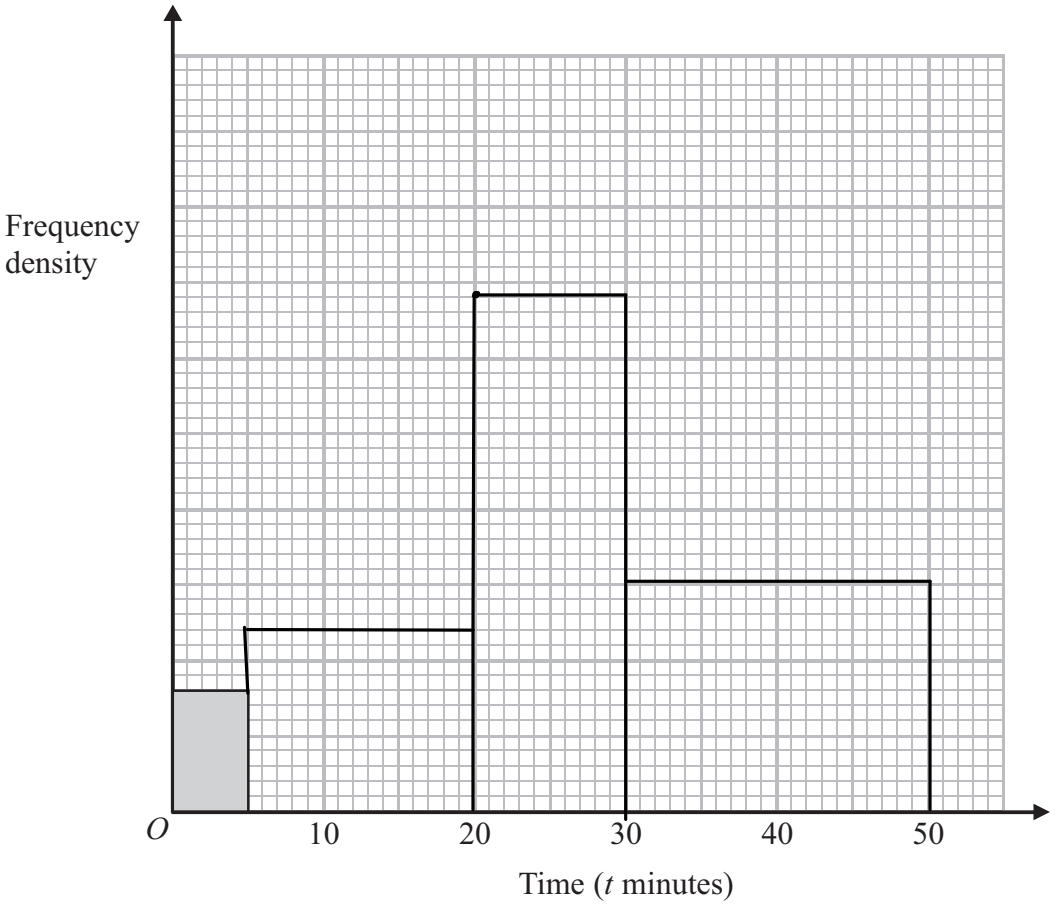
Percentage: **/100**

1 The table shows information about the times, in minutes, that some people took to complete a sudoku puzzle.

Time (t minutes)	$0 < t \leqslant 5$	$5 < t \leqslant 20$	$20 < t \leqslant 30$	$30 < t \leqslant 50$
Number of people	4	18	34	30

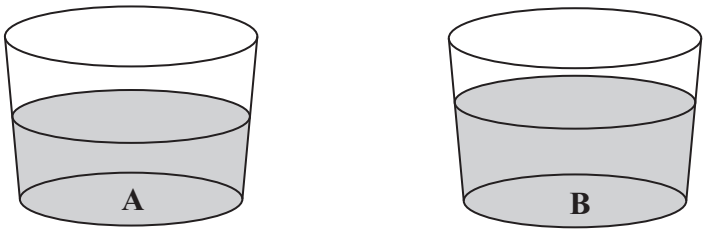
Complete the histogram for this information.

1 person = 10 squares.



(Total for Question is 3 marks)

2



Glass **A** contains 122 millilitres of water, correct to the nearest millilitre.
Glass **B** contains 168 millilitres of water, correct to the nearest millilitre.

Calculate the upper bound of the difference, in millilitres, between the volume of water in glass **A** and the volume of water in glass **B**.

Upper bound is the largest value, so the largest possible value of B minus the smallest possible value of A

$168.4\dot{9} - 121.5$

$168.5 - 121.5 = 47$

47 millilitres

(Total for Question is 2 marks)

3 Make n the subject of the formula

$$t = \sqrt{\frac{n+3}{n}}$$

Square both sides

$$t^2 = \frac{n+3}{n}$$

Multiply through by n

$$t^2 n = n + 3$$

Take n to one side

$$t^2 n - n = 3$$

Factorise out n

$$n(t^2 - 1) = 3$$

Divide by $(t^2 - 1)$

$$n = \frac{3}{t^2 - 1}$$

$n =$ $\frac{3}{t^2 - 1}$

(Total for Question is 4 marks)

4 Boris and Nigel play games of chess against each other in a match.
In each game, Boris wins or Nigel wins or the game is a draw.

When a player wins a game, he wins the match.
When a game is a draw, the players play another game against each other.
Boris and Nigel play a maximum of 3 games.

The probability that Boris wins a game is $\frac{1}{3}$

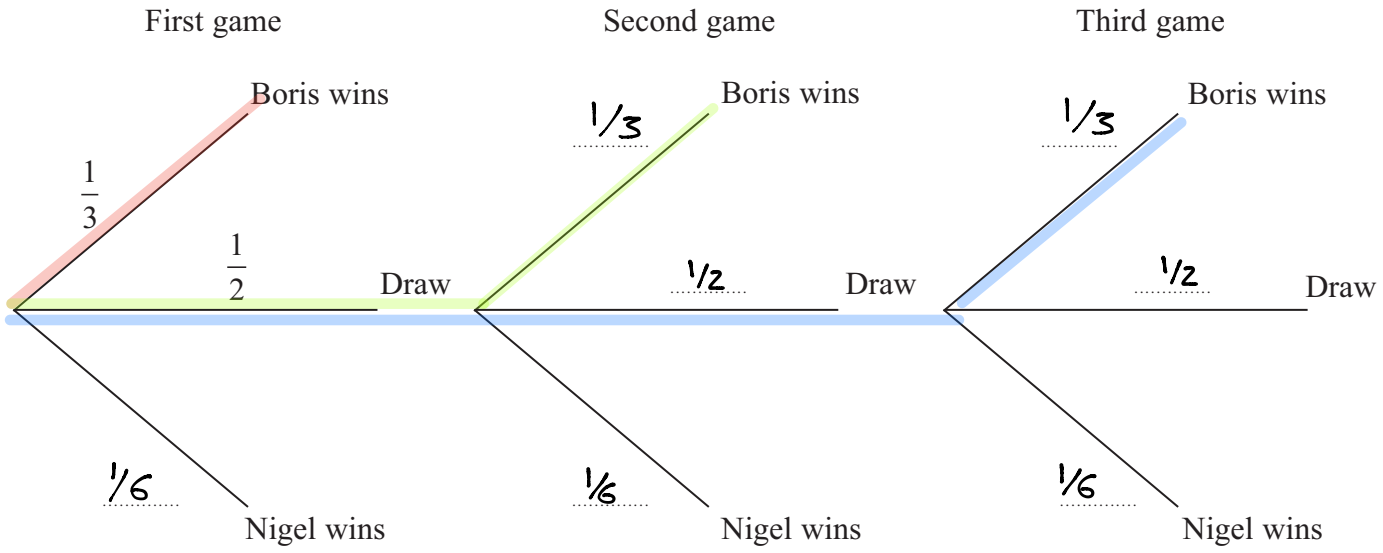
The probability that a game is a draw is $\frac{1}{2}$

Total probability of each event must be 1

$\frac{1}{3}+\frac{1}{2}+P_N = 1$

$P_N = \frac{1}{6}$

(a) Complete the probability tree diagram.



(3)

(b) Calculate the probability that Boris wins the match.

To win the match boris must win a game

Possible paths are marked in red, green and blue

$P_1 = \frac{1}{2}$

$P_2 = \frac{1}{3}\left(\frac{1}{2}\right)$

$P_3 = \frac{1}{3}\left(\frac{1}{3}\right)\left(\frac{1}{2}\right)$

$P_1 + P_2 + P_3 = \frac{7}{12}$

$\frac{7}{12}$

(3)

(Total for Question is 6 marks)

5 A particle is moving in a straight line which passes through a fixed point O.
The displacement, s metres, of the particle from O at time t seconds is given by

$$s = 10 + 9t^2 - t^3$$

(a) Find an expression for the velocity, v m/s, of the particle at time t seconds.

Differentiate displacement to get velocity

$\frac{ds}{dt} = 9(2)(t) - 3t^2$
$= 18t - 3t^2$

$v =$ $18t - 3t^2$

(2)

(b) Find the time at which the acceleration of the particle is zero.

Acceleration is the differential of velocity

$a = \frac{d^2s}{dt^2} = 18 - 3(2)(t)$

Accélération is zero: $0 = 18 - 6(t)$

$18 = 6t$

$t = 3$

$t = 3$ seconds

(2)

(Total for Question is 4 marks)

6 PTR and QTS are chords of a circle.

$PT = 3$ cm.
$ST = 10$ cm.
$RT = 15$ cm.
$QT = x$ cm.

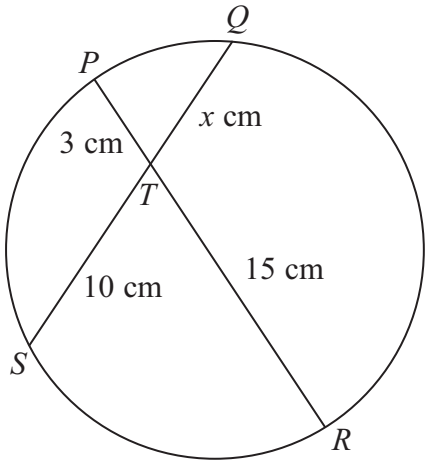


Diagram **NOT** accurately drawn

Calculate the value of x.

PTQ and STR are similar triangles so their sides are proportional in length

$x \times k = 15$, $3 \times k = 10$

$\frac{x}{15} = \frac{3}{10}$

$\therefore x = \frac{3(15)}{10} = 4.5$

$x =$ 4.5

(Total for Question is 2 marks)

7 A bag contains x counters.
7 of the counters are blue.
Sam takes at random a counter from the bag and does not replace it.
Jill then takes a counter from the bag.
The probability they both take a blue counter is 0.2

(a) Form an equation involving x.
Show that your equation can be expressed as $x^2 - x - 210 = 0$

Probability = (number of blue left in bag) / (total number of counters left in bag)

$P_1 = \frac{7}{x}$

$P_2 = \frac{6}{x-1}$

$P_1 + P_2 = 0.2$

$\frac{7}{x} \times \frac{6}{x-1} = 0.2$

$7 \times 6 = 0.2(x)(x-1)$

$42 = 0.2(x^2 - x)$

$210 = x^2 - x$

$x^2 - x - 210 = 0$

(2)

(b) Solve $x^2 - x - 210 = 0$
Show clear algebraic working.

Factorise

$(x-15)(x+14) = 0$

$x = 15, -14$

$x = 15, -14$

(3)

(Total for Question is 5 marks)

8 $\left(\sqrt{a} + \sqrt{8a}\right)^2 = 54 + b\sqrt{2}$

a and b are positive integers.
Find the value of a and the value of b.
Show your working clearly.

$(\sqrt{a} + \sqrt{8a})(\sqrt{a} + \sqrt{8a}) \equiv R + 15$

$(\sqrt{a})^2 + \sqrt{a} \times \sqrt{8a} + (\sqrt{a}) \times \sqrt{8a}) + (\sqrt{8a})^2 =$

$a + a\sqrt{8} + a\sqrt{8} + 8a \equiv$

$9a + 2a\sqrt{8} \equiv 54 + b\sqrt{2}$

$9a + 4a\sqrt{2} \equiv$ "

$9a = 54, \quad 4a = b$

$a = 6, \quad 24 = b$

$a =$ 6

$b =$ 24

(Total for Question is 3 marks)

9

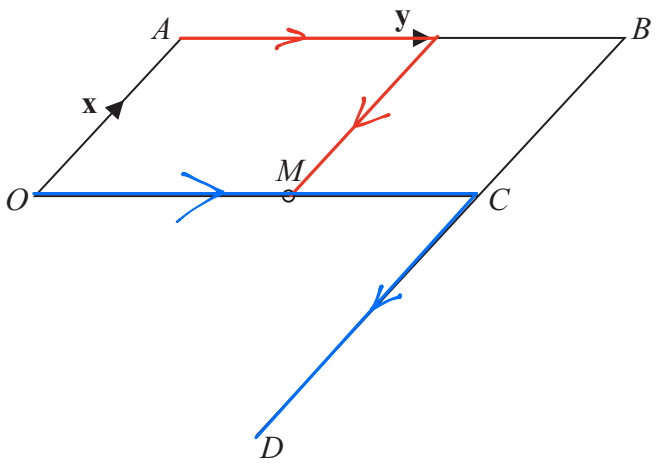


Diagram **NOT** accurately drawn

OABC is a parallelogram.

BCD is a straight line.

$BD = 3BC$.

M is the midpoint of *OC*.

$\overrightarrow{OA} = \mathbf{x}$ $\overrightarrow{AB} = \mathbf{y}$

(a) Find, in terms of **x** and **y**,

(i) $\overrightarrow{AM}$

$\frac{1}{2}y - x$

$\frac{1}{2}y - x$

(ii) $\overrightarrow{OD}$

$y - 2x$

$y - 2x$

(2)

(b) Use your answers to (a)(i) and (ii) to write down two different geometric facts about the lines *AM* and *OD*.

OD is parallel to AM

OD is twice the length of AM

(2)

(Total for Question is 4 marks)

10 The diagram shows a cube *ABCDEFGH*.
The sides of the cube are of length 5 cm.

Calculate the size of the angle between the diagonal *AH* and the base *EFGH*.
Give your answer correct to 1 decimal place.

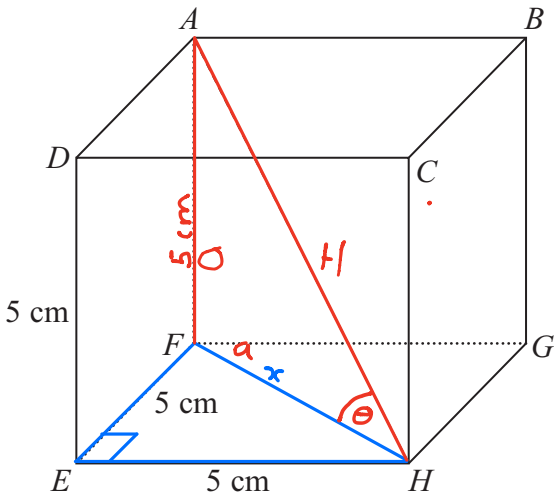


Diagram **NOT** accurately drawn

Using Pythagoras

$x^2 = 5^2 + 5^2$

$x = 5\sqrt{2}$

SOH CAH TOA

Using trigonometry

$\tan(\theta) = \frac{O}{a}$

$\tan\theta = \frac{5}{5\sqrt{2}} = \frac{1}{\sqrt{2}}$

$\theta = \tan^{-1}\left(\frac{1}{\sqrt{2}}\right)$

$\theta \approx 35.3°$

35.3° °

(Total for Question is 4 marks)

11 Solve the simultaneous equations

$$x^2 + y^2 = 26 \quad (1)$$

$$y = 3 - 2x \quad (2)$$

Show clear algebraic working.

Sub equation 2 into equation 1

$$x^2 + (3-2x)^2 = 26$$

Simplify

$$x^2 + (9 - 12x + 4x^2) = 26$$

$$5x^2 - 12x + 9 - 26 = 0$$

Factorise

$$5x - 12x - 17 = 0$$

$$(5x - 17)(x + 1)$$

$$x = \frac{17}{5} \quad , \quad x = -1$$

Substitue values of X back into equation 2

$$y = 3 - 2\left(\frac{17}{5}\right) = -3.8 \quad , \quad y = 3 - 2(-1) = 5$$

$$(3.4, -3.8) \quad , \quad (-1, 5)$$

(3.4, 3.8) , (-1, 5)

(Total for Question is 6 marks)