Ed iGCSE 2H June '19

Answer ALL TWENTY FOUR questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 The table shows information about the heights, in cm, of 48 sunflowers in a garden centre.

Height of sunflower (h cm)	Frequency
$90 < h \leqslant 100$	8
$100 < h \leqslant 110$	12
$110 < h \leqslant 120$	15
$120 < h \leqslant 130$	10
$130 < h \leqslant 140$	3

x
95
105
115
125
135

760
1260
1725
1250
405

Work out an estimate for the mean height of the sunflowers.

5400
48

112·5 cm

(Total for Question 1 is 4 marks)

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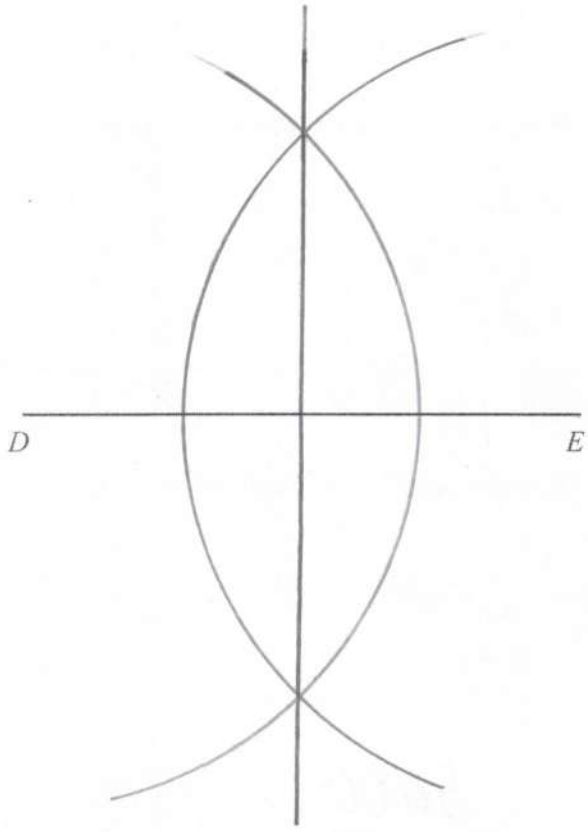
2 Use ruler and compasses to construct the perpendicular bisector of the line DE.
You must show all your construction lines.



(Total for Question 2 is 2 marks)

3 $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$A = \{2, 3, 5, 7\}$
$B = \{4, 6, 8, 10\}$

(a) Explain why $A \cap B = \varnothing$

A and B have no numbers in common

(1)

$x \in \mathscr{E}$ and $x \notin A \cup B$

(b) Write down the **two** possible values of x.

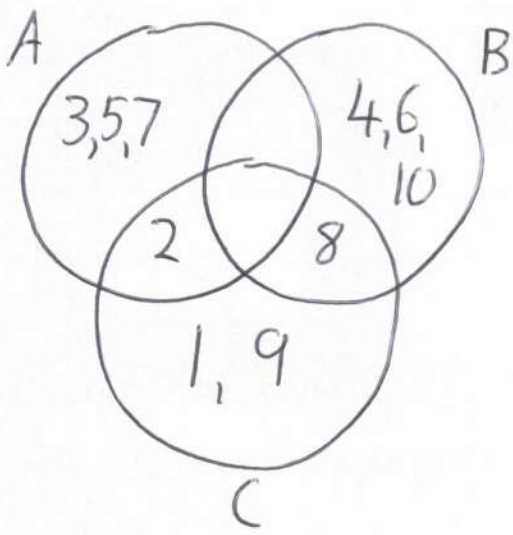
1 9

(1)

Set C is such that

$A \cup B \cup C = \mathscr{E}$
$A \cap C = \{2\}$
$B \cap C' = \{4, 6, 10\}$

(c) List all the members of set C.



1, 2, 8, 9

(2)

(Total for Question 3 is 4 marks)

4 A cylinder has diameter 14 cm and height 20 cm.

Work out the volume of the cylinder.
Give your answer correct to 3 significant figures.

$r = 7$
$h = 20$

$V = \pi \times 7^2 \times 20$

$= 980\pi$

$= 3078.76...$

3080 cm^3

(Total for Question 4 is 2 marks)

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5 Josh buys and sells books for a living.

He buys 120 books for £4 each. = £480

He sells $\frac{1}{2}$ of the books for £5 each.

He sells 40% of the books for £7 each.
He sells the rest of the books for £8 each.

(a) Calculate Josh's percentage profit.

$\frac{1}{2} \times 120 \times 5 = 300$

$0.4 \times 120 \times 7 = 336$

$0.1 \times 120 \times 8 = 96$

} 732

$$\frac{732 - 480}{480} \times 100$$

52.5 %

(5)

One book that Josh owns had a value of £15 on the 1st May 2019
The value of this book had increased by 20% in the last year.

(b) Find the value of the book on the 1st May 2018

$? \times 1.2 = 15$

$15 \div 1.2 =$ £ 12.50

(3)

(Total for Question 5 is 8 marks)

6 *ABC* and *DEF* are similar triangles.

$\frac{15}{6} = 2.5$

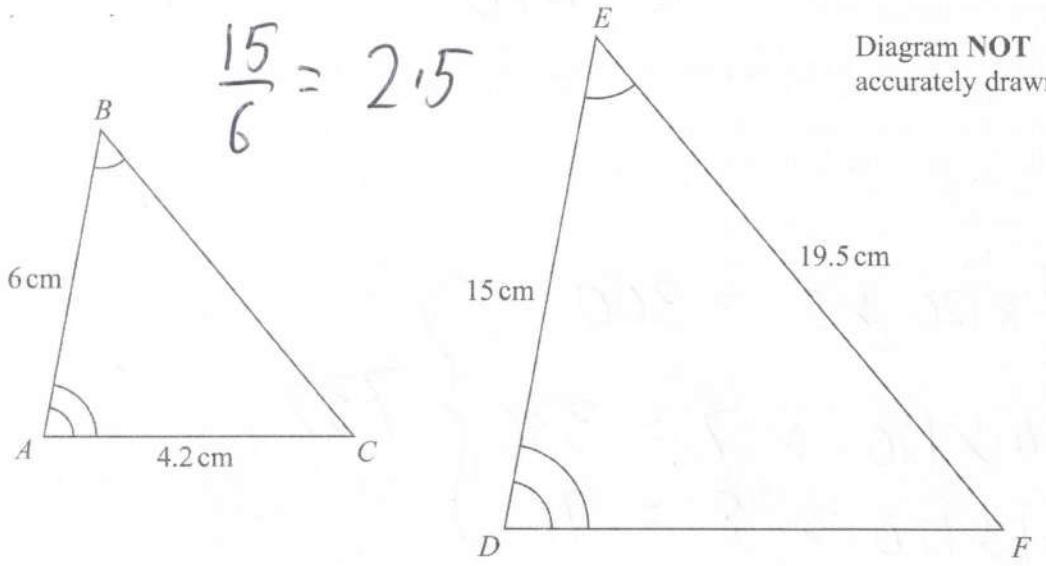

Diagram **NOT** accurately drawn

(a) Work out the length of *DF*.

4.2×2.5

$= 10.5$ cm

(2)

(b) Work out the length of *BC*.

$19.5 \div 2.5$

$= 7.8$ cm

(2)

(Total for Question 6 is 4 marks)

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7 30 students in a class sat a Mathematics test.
The mean mark in the test for the 30 students was 26.8

$30 \times 26.8 = 804$

13 of the 30 students in the class are boys.
The mean mark in the test for the boys was 25

(B) $13 \times 25 = 325$

Find the mean mark in the test for the girls.
Give your answer correct to 3 significant figures.

(9) $\frac{804 - 325}{17} = 28.176...$

28.2

(Total for Question 7 is 3 marks)

8 Change a speed of x kilometres per hour into a speed in metres per second.
Simplify your answer.

$\frac{x \times 1000}{60 \times 60} = \frac{10x}{36}$

or $\frac{5x}{18}$ (oe)

..... m/s

(Total for Question 8 is 3 marks)

9 Solve the simultaneous equations

$$x + 2y = -0.5 \quad (1)$$
$$3x - y = 16 \quad (2)$$

Show clear algebraic working.

(1)
(2)×2

$$x + 2y = -0.5 \quad +$$
$$6x - 2y = 32$$
$$7x = 31.5$$
$$x = 4.5$$

(1) $4.5 + 2y = -0.5$

$2y = -5$

$y = -\frac{5}{2}$

$x = 4.5$

$y = -2.5$

(Total for Question 9 is 3 marks)

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10 The straight line **L** has gradient 5 and passes through the point with coordinates (0, −3)

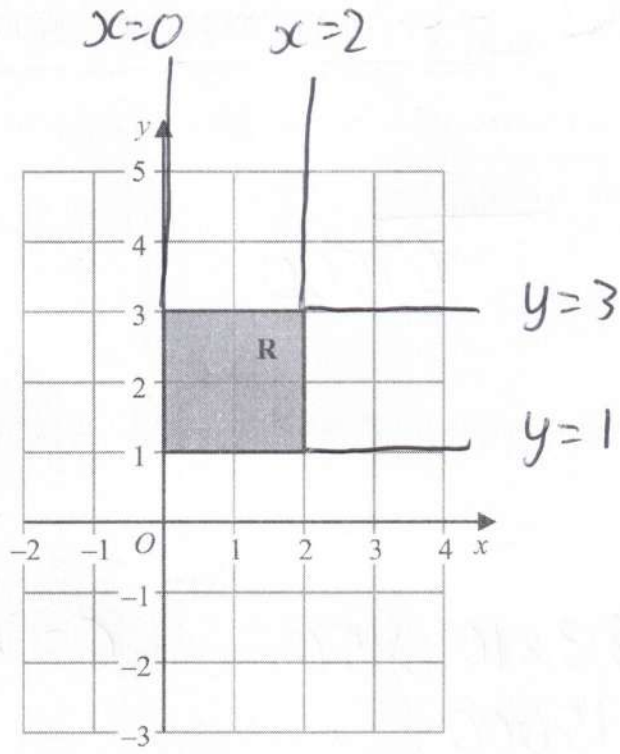
(a) Write down an equation for **L**.

intercept

$y = 5x - 3$

(2)

(b)



The region **R**, shown shaded in the diagram, is bounded by four straight lines.

Write down the inequalities that define **R**.

$1 \leqslant y \leqslant 3$, $0 \leqslant x \leqslant 2$

(2)

(Total for Question 10 is 4 marks)

11 The table gives the average crowd attendance per match for each of five football clubs for one season.

Football club	Average crowd attendance
Monaco	9.5×10^3
Chelsea	4.2×10^4
Juventus	3.9×10^4
Oxford United	8.3×10^3
Barcelona	7.7×10^4

(a) Find the difference between the average crowd attendance for Barcelona and the average crowd attendance for Monaco.
Give your answer in standard form.

67500

6.75×10^4

(2)

Antonio says,

"The average crowd attendance for Chelsea is approximately 50 times that for Oxford United."

(b) Is Antonio correct?
You must give a reason for your answer.

$OU = 8.3 \times 10^3 \times 50$ $C = 42000$

$= 415{,}000$

no

(2)

During last season the cost of a ticket to watch Seapron United increased by 15% and then decreased by 8%

(c) Work out the overall percentage change in the cost of a ticket to watch Seapron United during last season.

$100 \times 1.15 \times 0.92 = 105.8$

5.8 %

(2)

(Total for Question 11 is 6 marks)

12 *ABCD* is a trapezium.

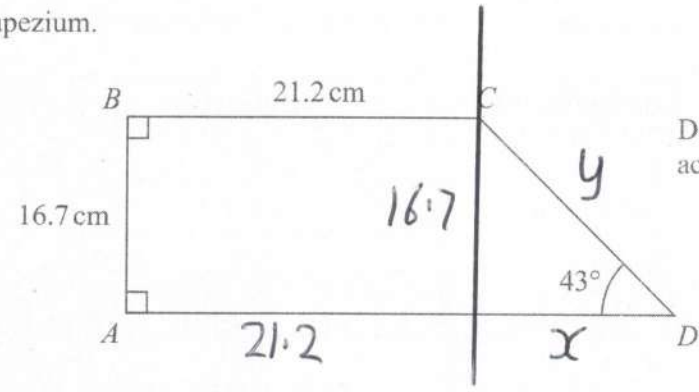
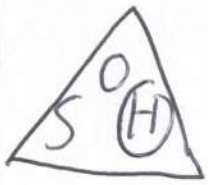


Diagram **NOT** accurately drawn

Calculate the perimeter of the trapezium.
Give your answer correct to 3 significant figures.

$$x = \frac{16.7}{\tan 43} = 17.9085\ldots$$



$$y = \frac{16.7}{\sin 43} = 24.4868\ldots$$

$$P = 21.2 \times 2 + 16.7 + 17.9 + 24.4$$

$$= 101.4$$

101 cm

(Total for Question 12 is 4 marks)

13 The table gives information about the times taken, in minutes, for 80 taxi journeys.

Time taken (t minutes)	Frequency
$0 < t \leqslant 5$	7
$5 < t \leqslant 10$	10
$10 < t \leqslant 15$	12
$15 < t \leqslant 20$	19
$20 < t \leqslant 25$	18
$25 < t \leqslant 30$	14

(a) Complete the cumulative frequency table.

Time taken (t minutes)	Cumulative frequency
$0 < t \leqslant 5$	7
$0 < t \leqslant 10$	17
$0 < t \leqslant 15$	29
$0 < t \leqslant 20$	48
$0 < t \leqslant 25$	66
$0 < t \leqslant 30$	80

(1)

(b) On the grid opposite, draw a cumulative frequency graph for your table.

14 Here are two vectors.

$$\overrightarrow{AB} = \begin{pmatrix} 6 \\ -9 \end{pmatrix} \qquad \overrightarrow{CB} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

Find the magnitude of $\overrightarrow{AC}$.

$AC = \begin{bmatrix} 5 \\ 12 \end{bmatrix}$

$\sqrt{5^2+12^2}$

13

(Total for Question 14 is 3 marks)

15 Make x the subject of the formula $y = \sqrt{\dfrac{3x-2}{x+1}}$

$y^2 = \dfrac{3x-2}{x+1}$

$y^2x + y^2 = 3x - 2$

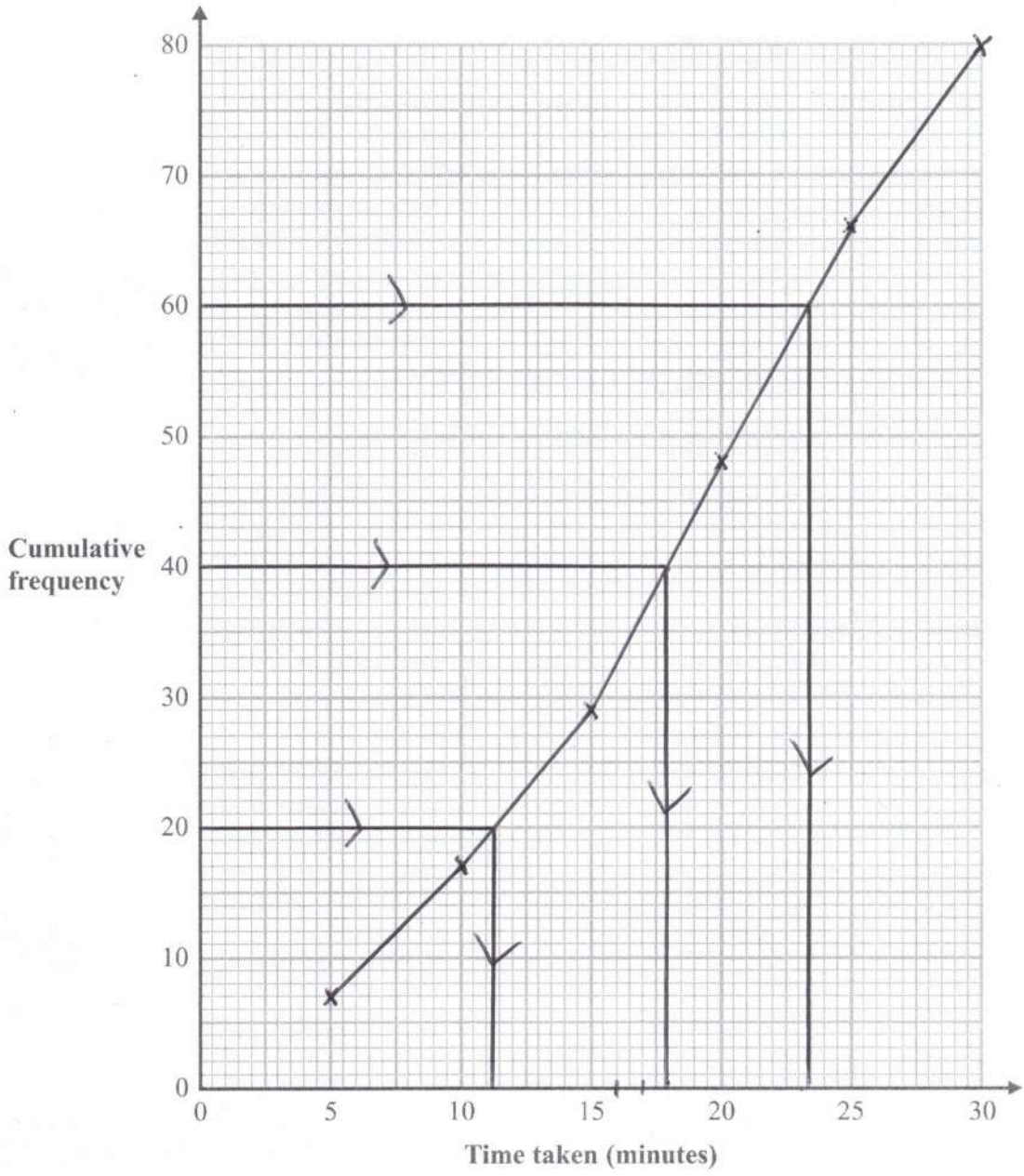
$y^2x - 3x = -2 - y^2$

$x(y^2-3) = -2-y^2$

$x = \dfrac{-2-y^2}{y^2-3}$

OR $\dfrac{y^2+2}{3-y^2}$

(Total for Question 15 is 4 marks)



(2)

(c) Use your graph to find an estimate for the median.

[MS: 17-19]

18 minutes

(1)

(d) Use your graph to find an estimate for the interquartile range.

23.5 - 11.5

12 minutes

[MS: 9-13]

(2)

(Total for Question 13 is 6 marks)

$\sqrt{8} = \sqrt{4}\sqrt{2} = 2\sqrt{2}$

16 Show that $\frac{4+\sqrt{8}}{\sqrt{2}-1}$ can be written in the form $a + b\sqrt{2}$, where a and b are integers.

Show each stage of your working clearly and give the value of a and the value of b.

$$\frac{4+2\sqrt{2}}{\sqrt{2}-1} \times \frac{\sqrt{2}+1}{\sqrt{2}+1} = \frac{4\sqrt{2}+4+2\sqrt{4}+2\sqrt{2}}{2-1}$$

$$= \frac{6\sqrt{2}+4+4}{1}$$

$$= 8 + 6\sqrt{2}$$

(Total for Question 16 is 3 marks)

17 y is directly proportional to the cube of x
$y = 20h$ when $x = h$ $(h \neq 0)$

(a) Find a formula for y in terms of x and h

$y = k \times x^3$

$20h = k \times h^3$

$k = \frac{20}{h^2}$

$y = \frac{20x^3}{h^2}$

(3)

(b) Find x in terms of h when $y = 67.5h$
Give your answer in its simplest form.

$x^3 = \frac{yh^2}{20}$

$x^3 = \frac{67.5h^3}{20} = \frac{27h^3}{8}$

$x = \frac{3h}{2}$ (OE)

(2)

(Total for Question 17 is 5 marks)

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18 The diagram shows a solid cuboid.

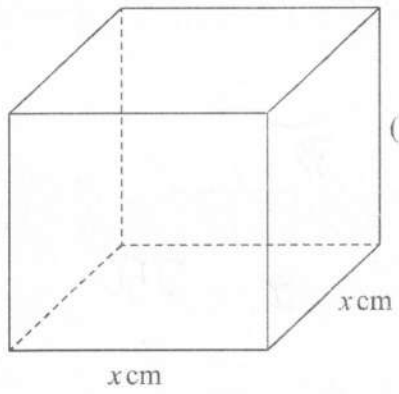

Diagram **NOT** accurately drawn

The total surface area of the cuboid is A cm^2

Find the maximum value of A.

$A = 2 \times x \times x + 4 \times x (12 - 3x)$

$= 2x^2 + 48x - 12x^2$

$= 48x - 10x^2$

$\frac{dA}{dx} = 48 - 20x = 0$

$x = \frac{48}{20} = 2.4$

$A = 48 \times 2.4 - 10 \times 2.4^2$

$= 57.6 \text{ cm}^2$

(Total for Question 18 is 5 marks)

19 *ABCD* is a quadrilateral.

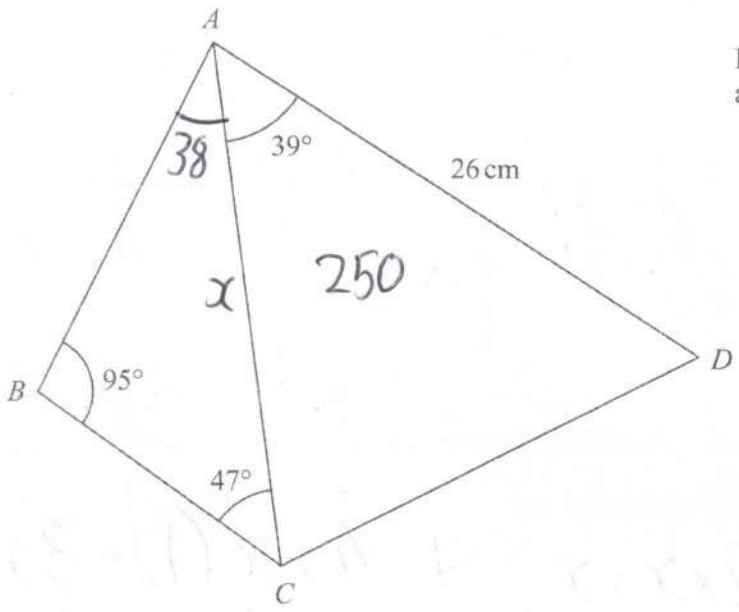

Diagram **NOT** accurately drawn

The area of triangle *ACD* is 250 cm²

Calculate the area of the quadrilateral *ABCD*.
Show your working clearly.
Give your answer correct to 3 significant figures.

$250 = \frac{1}{2} \times 26 \times x \times \sin 39$ $\quad x = 30.55799...$

$\frac{AB}{\sin 47} = \frac{30.56}{\sin 95}$ $\quad AB = 22.435...$

Area $ABCD = 250 + \frac{1}{2} \times 30.56 \times 22.435 \times \sin 38$

$= 461.058...$

$= 461 \text{ cm}^2$

20 The equation of the line **L** is $y = 9 - x$
The equation of the curve **C** is $x^2 - 3xy + 2y^2 = 0$

L and **C** intersect at two points.

Find the coordinates of these two points.
Show clear algebraic working.

$$\Rightarrow x^2 - 3x(9-x) + 2(9-x)^2 = 0$$

$$x^2 - 27x + 3x^2 + 162 + 2x^2 - 36x = 0$$

$$6x^2 - 63x + 162 = 0$$

$$2x^2 - 21x + 54 = 0$$

$$x = \frac{21 \pm \sqrt{441 - 432}}{4}$$

$x = 6$ | $x = 4.5$

$y = 9 - 6 = 3$ | $y = 9 - 4.5 = 4.5$

(6, 3) and (4.5, 4.5)

(Total for Question 20 is 5 marks)

21 The diagram shows cuboid *ABCDEFGH*.

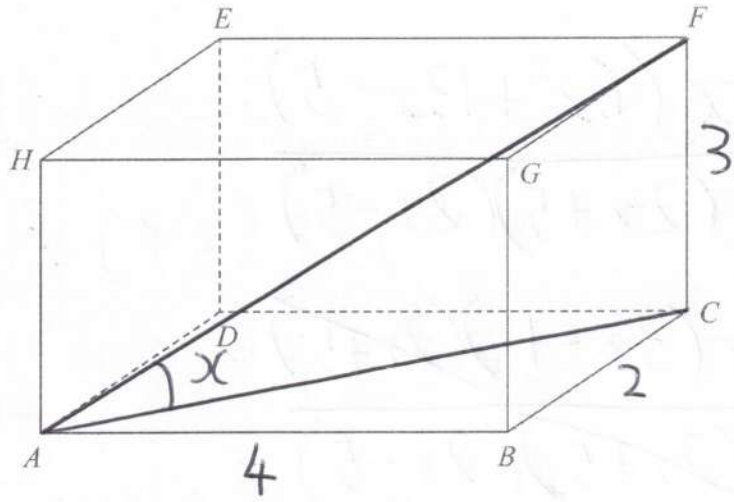

Diagram **NOT** accurately drawn

For this cuboid

the length of *AB* : the length of *BC* : the length of *CF* = 4 : 2 : 3

Calculate the size of the angle between *AF* and the plane *ABCD*.
Give your answer correct to one decimal place.

$AC = \sqrt{4^2 + 2^2} = \sqrt{20} = 2\sqrt{5}$

$x = \tan^{-1}\left(\frac{3}{2\sqrt{5}}\right) = 33.85...$

33.9 °

(Total for Question 21 is 3 marks)

22 Simplify fully $\dfrac{6x^3 + 13x^2 - 5x}{4x^2 - 25}$

$$= \frac{x(6x^2 + 13x - 5)}{(2x+5)(2x-5)}$$

$$= \frac{x(3x-1)(2x+5)}{(2x+5)(2x-5)}$$

$$\frac{x(3x-1)}{2x-5}$$

(Total for Question 22 is 3 marks)

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23 Boris has a bag that only contains red sweets and green sweets.

Boris takes at random 2 sweets from the bag.

The probability that Boris takes exactly 1 red sweet from the bag is $\frac{12}{35}$

Originally there were 3 red sweets in the bag.

Work out how many green sweets there were originally in the bag.
Show your working clearly.

R	G
3	$x-3$

$$P(1\text{Red}) = 2 \times \frac{3}{x} \times \frac{x-3}{x-1} = \frac{12}{35}$$

$$210x - 630 = 12x^2 - 12x$$

$$12x^2 - 222x + 630 = 0$$

$$2x^2 - 37x + 105 = 0$$

$$x = \frac{37 \pm \sqrt{37^2 - 4 \times 2 \times 105}}{4} = \begin{matrix} 15 \\ 3.5 \text{ (reject)} \end{matrix}$$

15 sweets so green = 12

(Total for Question 23 is 5 marks)

24 The function f is such that $f(x) = 3x - 2$

(a) Find f(5)

$= 3 \times 5 - 2$

13

(1)

The function g is such that $g(x) = 2x^2 - 20x + 9$ where $x \geqslant 5$

(b) Express the inverse function g^{-1} in the form $g^{-1}(x) = ...$

$y = 2[x^2 - 10x] + 9$

$y = 2[(x-5)^2 - 25] + 9$

$y = 2(x-5)^2 - 41$

$\frac{y+41}{2} = (x-5)^2$

$\pm\sqrt{\frac{y+41}{2}} = x - 5$

$x = 5 \pm \sqrt{\frac{y+41}{2}}$

$g^{-1}(x) = 5 + \sqrt{\frac{x+41}{2}}$

(4)

(Total for Question 24 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS