Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Friday 19 May 2023

Morning (Time: 1 hour 30 minutes)

Paper reference **1MA1/1H**

Mathematics

PAPER 1 (Non-Calculator)

Higher Tier

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, Formulae Sheet (enclosed). Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may not be used**.

Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P75148A

P 7 5 1 4 8 A 0 1 2 4

Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Work out $8.46 \div 0.15$

×100 ×100

$846 \div 15$

$$15 \overline{)\,8^{6}4^{9}6\,^{6}0} = 056.4$$

15 30 45 60 75 90 105 120 135

56.4

(Total for Question 1 is 3 marks)

2 Work out $7\frac{3}{8} - 2\frac{1}{2}$

Give your answer as a mixed number.

$7 - 2 = 5$

$\frac{3}{8} - \frac{1}{2}$ ×4 ×4

$\frac{3}{8} - \frac{4}{8} = -\frac{1}{8}$

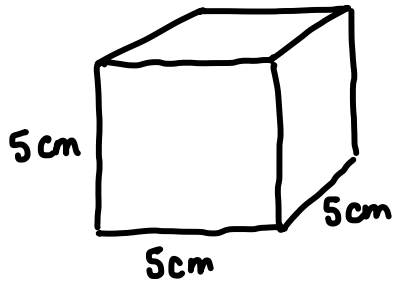
$5 - \frac{1}{8} = 4\frac{7}{8}$

$4\frac{7}{8}$

(Total for Question 2 is 3 marks)

3 A cube has a total surface area of $150\,cm^2$

Work out the volume of the cube.



S.A. = $150\,cm^2$

$150\,cm^2 \div 6 = 25cm^2$

$A = 25cm^2$

$\sqrt{25} = 5$

Volume = l x w x h

= 5 x 5 x 5

= $125\,cm^3$

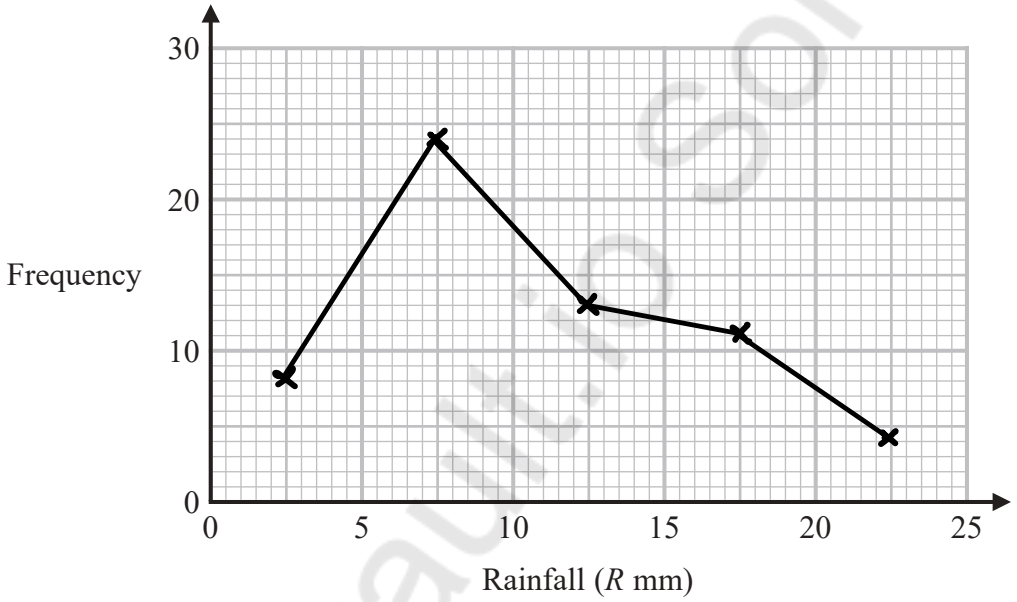
125 cm^3

(Total for Question 3 is 4 marks)

4 The table shows information about the daily rainfall in a town for 60 days.

Rainfall (R mm)	Frequency
$0 \leqslant R < 5$	8
$5 \leqslant R < 10$	24
$10 \leqslant R < 15$	13
$15 \leqslant R < 20$	11
$20 \leqslant R < 25$	4

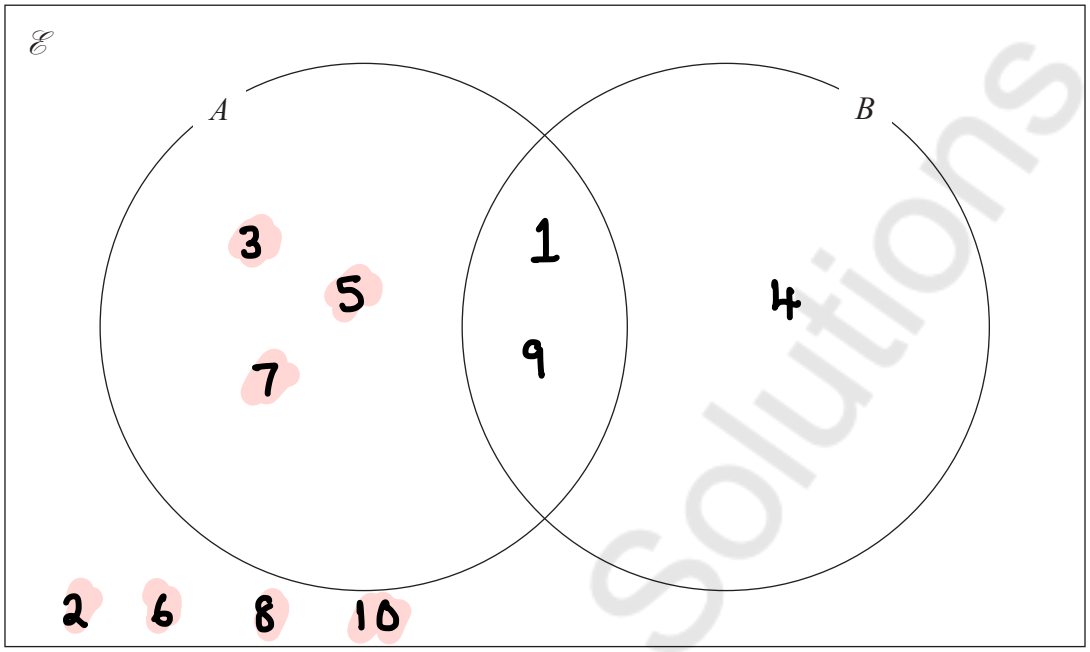
Draw a frequency polygon for this information.



(Total for Question 4 is 2 marks)

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

(a) Complete the Venn diagram for this information.



(3)

A number is chosen at random from the universal set $\mathscr{E}$

(b) Find the probability that this number is in the set B'

↳ not in B

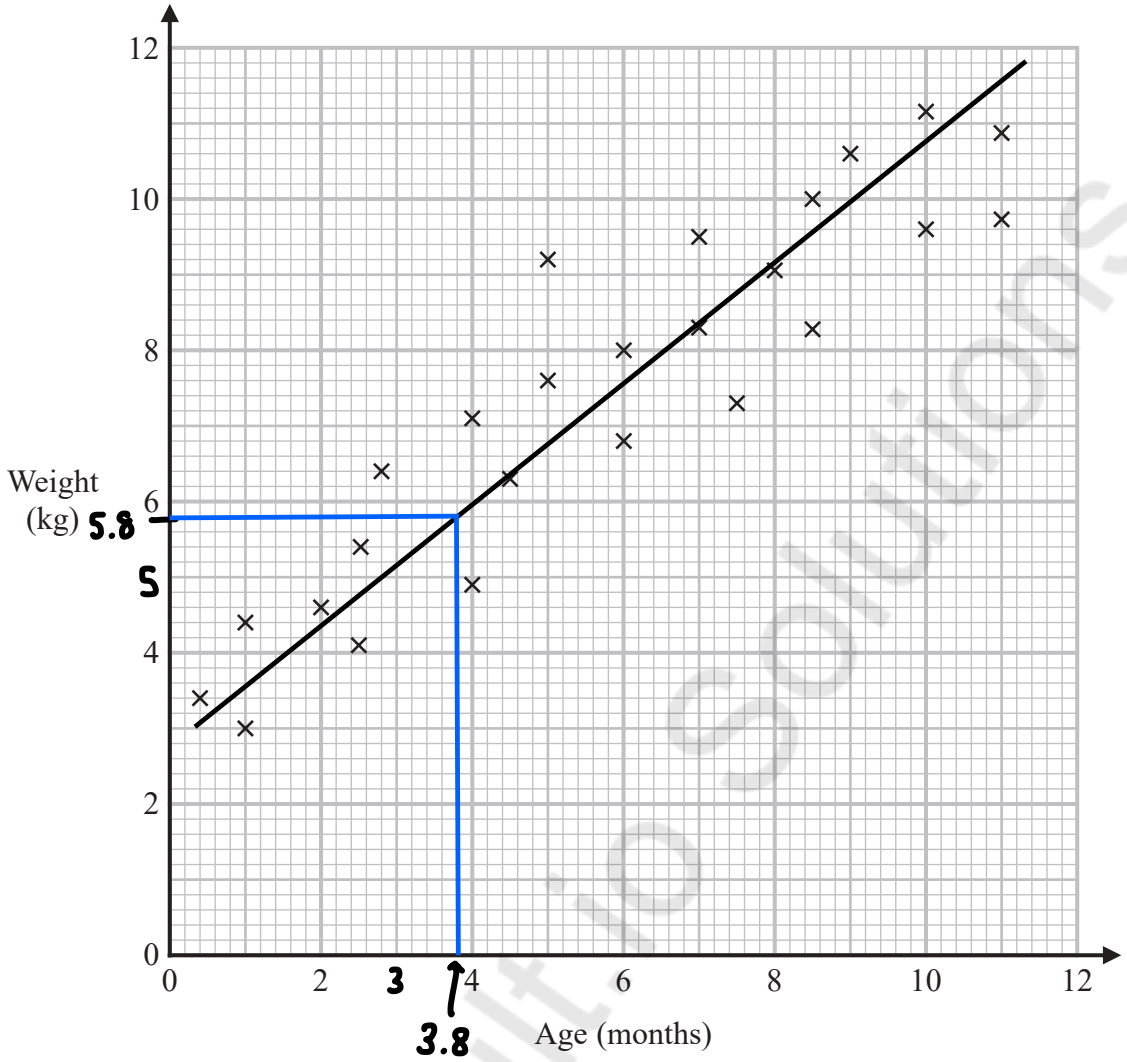
$\frac{7}{10}$

$\frac{7}{10}$

(2)

(Total for Question 5 is 5 marks)

6 The scatter graph shows information about the ages and weights of some babies.



(a) Describe the relationship between the age and the weight of the babies.

As age increases, weight increases.

(1)

Another baby has a weight of 5.8 kg

(b) Using the scatter graph, find an estimate for the age of this baby.

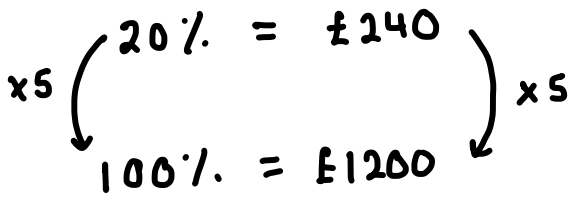
3.8 months

(2)

(Total for Question 6 is 3 marks)

7 The price of a holiday increases by 20%
This 20% increase adds £240 to the price of the holiday.

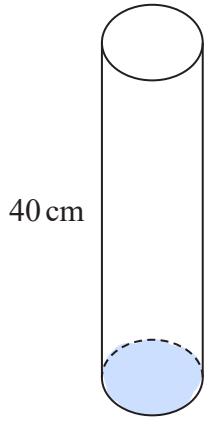
Work out the price of the holiday before the increase.



£ 1200

(Total for Question 7 is 2 marks)

8 The diagram shows a solid cylinder on a horizontal floor.



$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

The cylinder has a

volume of $1200\,\text{cm}^3$
height of 40 cm.

The cylinder exerts a force of 90 newtons on the floor.

Work out the pressure on the floor due to the cylinder.

Area ?

Volume = $\pi r^2 h$ ← Area of circle

$1200 = \pi r^2 (40)$

$\div 40 \qquad \div 40$

$30 = \pi r^2$ = Area of circle

$P = \frac{F}{A}$

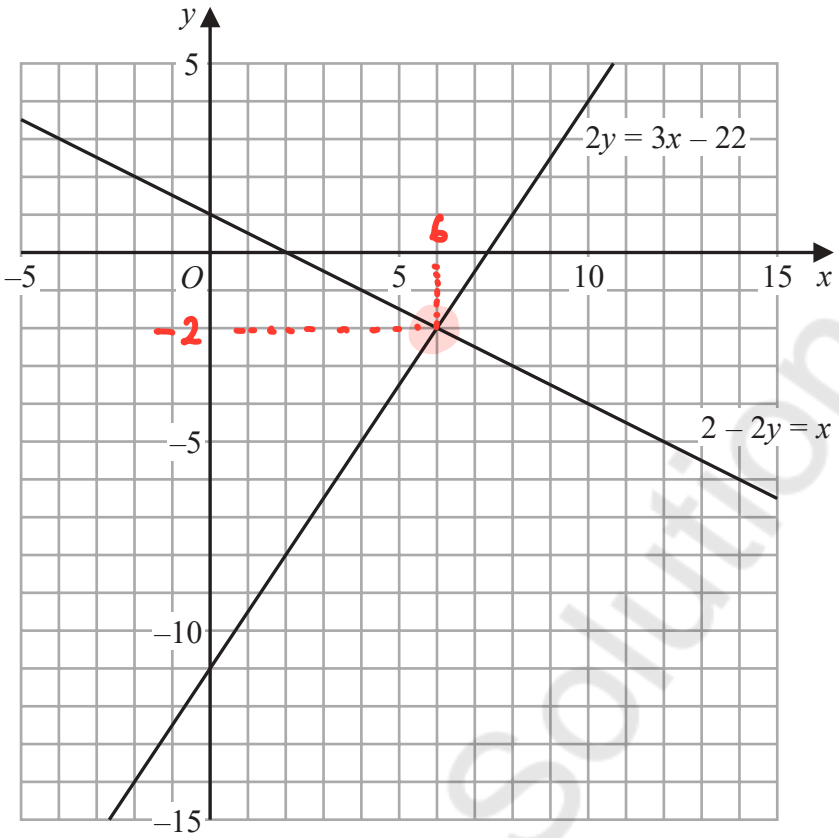
$= \frac{90\,N}{30\,cm^2}$

$= 3\,N/cm^2$

3 newtons/cm^2

(Total for Question 8 is 3 marks)

9



Use these graphs to solve the simultaneous equations

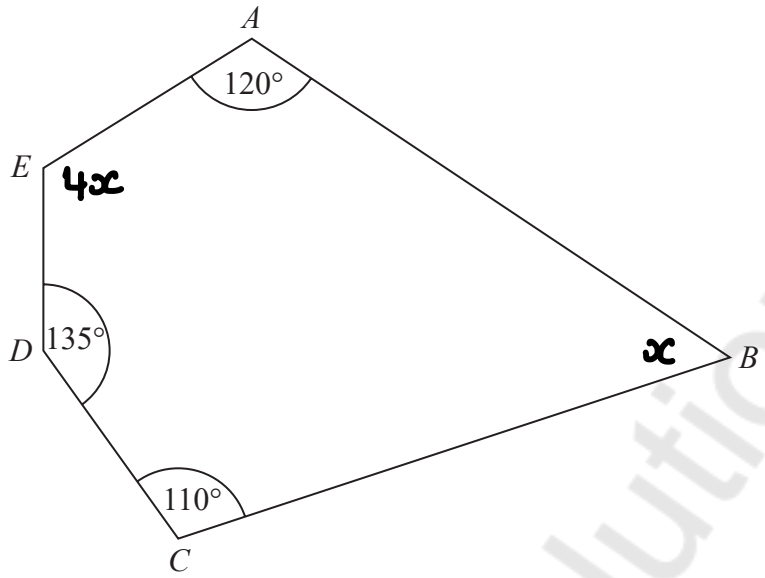
$$2 - 2y = x$$
$$2y = 3x - 22$$

$x =$ 6

$y =$ −2

(Total for Question 9 is 1 mark)

10 Here is a pentagon.



Angle $AED = 4 \times$ angle ABC

Work out the size of angle AED.
You must show all your working.

Sum of interior angles : $(n-2) \times 180$

$(5-2) \times 180$

3×180

$540°$

$120° + 135° + 110° = 365°$

$540° - 365° = 175°$

$\angle AED + \angle ABC = 175°$

$4x + x = 175°$

$5x = 175°$

$\div 5 \qquad \div 5$

$x = 35°$

$\angle AED = 4x = 4(35°) = 140°$

140 °

(Total for Question 10 is 4 marks)

11 Write $\dfrac{(6x^5y^3)^2}{3x^2y^7 \times 4xy^{-3}}$ in the form ax^by^c where a, b and c are integers.

$$\frac{36x^{10}y^6}{12x^3y^4} \quad \div$$

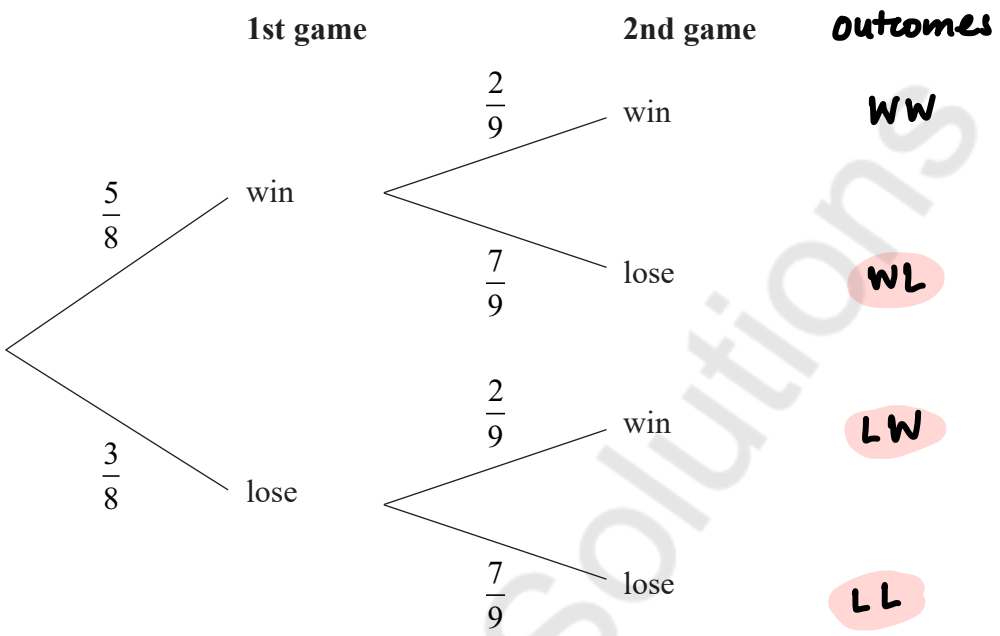
$$3x^7y^2$$

$3x^7y^2$

(Total for Question 11 is 3 marks)

12 Martha plays a game twice.

The probability tree diagram shows the probabilities that Martha will win or lose each game.



Find the probability that Martha will lose at least one game.

$P(WW) = \frac{5}{8} \times \frac{2}{9}$

$= \frac{10}{72}$

$1 - \frac{10}{72} = \frac{62}{72}$

$\frac{62}{72}$

(Total for Question 12 is 3 marks)

13 y is directly proportional to x.

$y = 24$ when $x = 1.5$

Work out the value of y when $x = 5$

$y \propto x$

$y = kx$

$24 = k(1.5)$

$\div 1.5 \qquad \div 1.5$

$\frac{24}{1.5} = k$

$\frac{48}{3} = k$

$16 = k$

$y = 16x$

$y = 16(5)$

$= 80$

$y =$ 80

(Total for Question 13 is 3 marks)

14 (a) Write $\frac{1}{16}$ in the form 4^n where n is an integer.

$\frac{1}{16} = \frac{1}{4^2} = 4^{-2}$

4^{-2}

(1)

(b) Work out the value of $8^{\frac{5}{3}} - 9^{\frac{3}{2}}$

$x^{\frac{a}{b}} = (\sqrt[b]{x})^a$

$8^{\frac{5}{3}} = (\sqrt[3]{8})^5$

$= 2^5$

$= 32$

$9^{\frac{3}{2}} = (\sqrt[2]{9})^3$

$= 3^3$

$= 27$

$32 - 27 = 5$

5

(3)

(Total for Question 14 is 4 marks)

15 The equation of line $\mathbf{L_1}$ is $y = 2x - 5$
The equation of line $\mathbf{L_2}$ is $6y + kx - 12 = 0$

$\mathbf{L_1}$ is perpendicular to $\mathbf{L_2}$

Find the value of k.
You must show all your working.

L_1 $y = 2x - 5$ $m = 2$

L_2 $6y + kx - 12 = 0$
$-kx + 12 \quad -kx + 12$

$6y = -kx + 12$
$\div 6 \qquad \div 6$

$y = -\frac{1}{6}kx + 2$

Perpendicular gradient $= -\frac{1}{2}$

$-\frac{1}{6}k = -\frac{1}{2}$

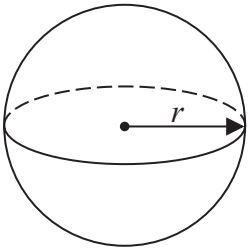
$\frac{1}{6}k = \frac{1}{2}$
$\times 6 \qquad \times 6$

$k = 3$

$k =$ 3

(Total for Question 15 is 3 marks)

16 Here is a sphere.



Surface area of sphere = $4\pi r^2$

$\frac{3}{8}$ of the surface area of this sphere is $75\pi\,\text{cm}^2$

Find the diameter of the sphere.
Give your answer in the form $a\sqrt{b}$ where a is an integer and b is a prime number.

$\frac{3}{8} \times 4\pi r^2 = 75\pi$

$\frac{3}{2}\pi r^2 = 75\pi$

$3\pi r^2 = 150\pi$

$\div \pi \qquad \div \pi$

$3r^2 = 150$

$r^2 = 50$

$r = \sqrt{50}$

$= \sqrt{25}\sqrt{2}$

$= 5\sqrt{2}$

$\frac{3}{8} \times 4 = \frac{12}{8} = \frac{3}{2}$

$d = 2 \times 5\sqrt{2}$

$= 10\sqrt{2}$

$10\sqrt{2}$ cm

(Total for Question 16 is 4 marks)

17 Make x the subject of the formula $y = \dfrac{4(2x - 7)}{5x + 3}$

$$y = \frac{4(2x-7)}{5x+3}$$

$\times(5x+3)$ $\times(5x+3)$

$$y(5x+3) = 4(2x-7)$$

$$5xy + 3y = 8x - 28$$

$-8x$ $-3y$ $-8x$ $-3y$

$$5xy - 8x = -28 - 3y$$

$$x(5y-8) = -28 - 3y$$

$\div(5y-8)$ $\div(5y-8)$

$$x = \frac{-28-3y}{5y-8}$$

$$x = \frac{-28-3y}{5y-8}$$

(Total for Question 17 is 4 marks)

18 7 kg of carrots and 5 kg of tomatoes cost a total of 480p

cost of 1 kg of carrots : cost of 1 kg of tomatoes = 5 : 9 → c : t, 5 : 9

$\dfrac{c}{t} = \dfrac{5}{9}$ $9c = 5t$ $\div 5$ $\div 5$

$t = \dfrac{9}{5}c$

Work out the cost of 1 kg of carrots and the cost of 1 kg of tomatoes.

$$7c + 5t = 480$$

$$7c + 5\left(\frac{9}{5}c\right) = 480$$

$$7c + 9c = 480$$

$$16c = 480$$

$\div 16$ $\div 16$

$$c = 30$$

$$t = \frac{9}{5}c$$

$$= \frac{9}{5}(30)$$

$$= \frac{270}{5} = 54$$

carrots ..... 30 ..... p

tomatoes ..... 54 ..... p

(Total for Question 18 is 4 marks)

19 The menu in a restaurant has starters, main courses and desserts.

There are 5 starters.
There are 12 main courses.
There are x desserts.

There are 420 different ways to choose one starter, one main course and one dessert.

Work out the value of x.

$5 \times 12 \times x = 420$

$60 \times x = 420$

$\div 60 \qquad \div 60$

$x = 7$

$x =$ 7

(Total for Question 19 is 2 marks)

20 For $x \geqslant 0$, the functions f and g are such that

$$f(x) = 3x + 4 \qquad g(x) = \frac{\sqrt{x} + 2}{5}$$

(a) Find $g^{-1}(x)$

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

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

$\times 5 \qquad \times 5$

$5x = \sqrt{y} + 2$

$-2 \quad -2$

$5x - 2 = \sqrt{y}$

$2 \qquad 2$

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

$g^{-1}(x) =$ $(5x-2)^2$

(2)

(b) Solve $gf(x) = 3$

$gf(x) = \frac{\sqrt{3x+4} + 2}{5}$

$\frac{\sqrt{3x+4} + 2}{5} = 3$

$\sqrt{3x+4} + 2 = 15$

$\sqrt{3x+4} = 13$

$3x + 4 = 169$

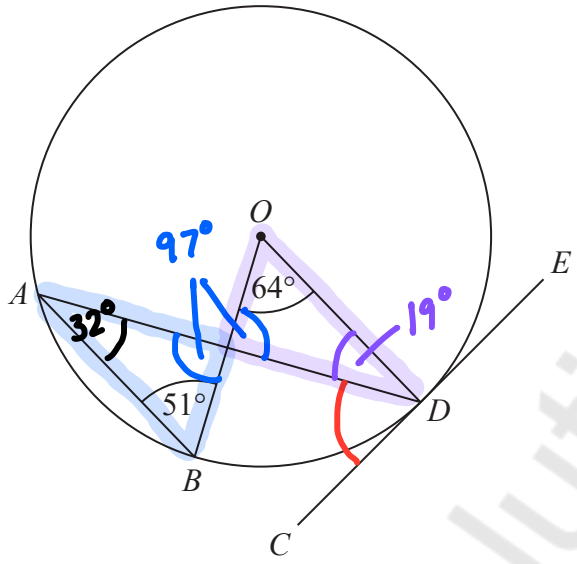
$3x = 165 \qquad x = 55$

$x =$ 55

(3)

(Total for Question 20 is 5 marks)

21 A, B and D are points on a circle with centre O.
CDE is the tangent to the circle at D.



Work out the size of angle ADC.
Write down any circle theorems you use.

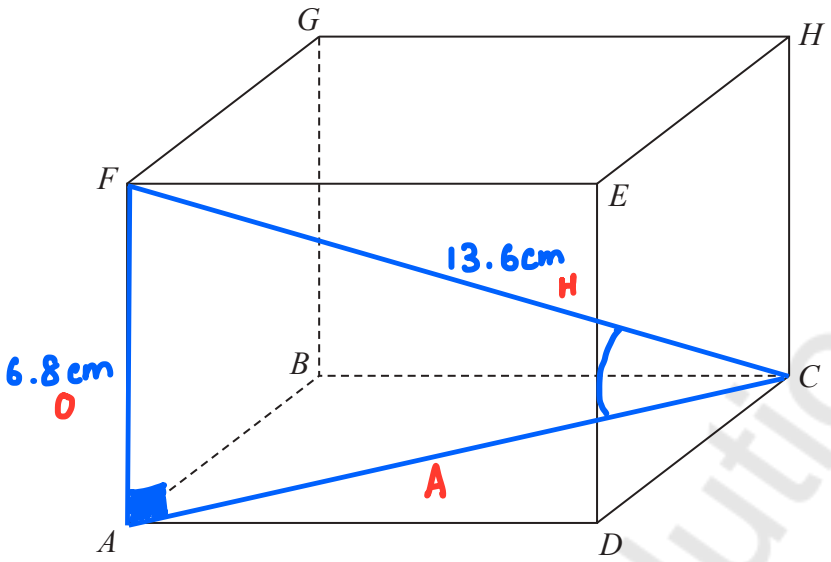
$\angle DAB = 32°$ Angle at centre is twice the angle at the circumference.

$\angle ADC = 90 - 19$ Tangent meets radius at 90°
$= 71°$

71 °

(Total for Question 21 is 4 marks)

22 *ABCDEFGH* is a cuboid.



$AF = 6.8\,\text{cm}$
$FC = 13.6\,\text{cm}$

Work out the size of the angle between FC and the plane $ABCD$.

$\sin\theta = \frac{O}{H}$

$\sin\theta = \frac{6.8}{13.6}$

$\sin\theta = \frac{1}{2}$

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

$\theta = 30°$

30 °

(Total for Question 22 is 2 marks)

23 Write $\dfrac{3\sqrt{3}}{4-\sqrt{3}} - \dfrac{2}{\sqrt{3}}$ in the form $\dfrac{a\sqrt{3}+b}{c}$ where a, b and c are integers.

$$\frac{\sqrt{3}(3\sqrt{3}) - 2(4-\sqrt{3})}{\sqrt{3}(4-\sqrt{3})}$$

$$\frac{9-(8-2\sqrt{3})}{4\sqrt{3}-3}$$

$$\frac{1+2\sqrt{3}}{4\sqrt{3}-3} \quad \times (4\sqrt{3}+3) \quad \times (4\sqrt{3}+3)$$

$$\frac{(1+2\sqrt{3})(4\sqrt{3}+3)}{(4\sqrt{3}-3)(4\sqrt{3}+3)}$$

$$\frac{4\sqrt{3}+3+24+6\sqrt{3}}{48+12\sqrt{3}-12\sqrt{3}-9}$$

$$\frac{27+10\sqrt{3}}{39}$$

$$\frac{10\sqrt{3}+27}{39}$$

$$\frac{10\sqrt{3}+27}{39}$$

(Total for Question 23 is 4 marks)

24 Find the set of possible values of x for which

$$4x^2 - 25 < 0 \quad \textbf{and} \quad 12 - 5x - 3x^2 > 0$$

You must show all your working.

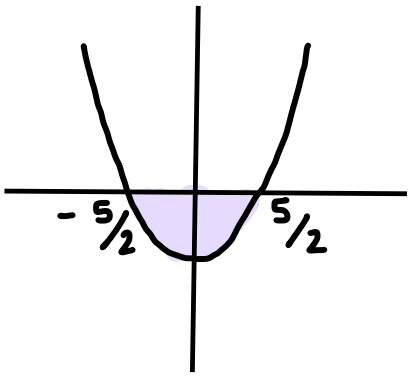
$4x^2 - 25 < 0$

$\surd \quad \surd$

$(2x + 5)(2x - 5) = 0$

$2x + 5 = 0 \qquad 2x - 5 = 0$

$x = -\frac{5}{2} \qquad x = \frac{5}{2}$



$-\frac{5}{2} < x < \frac{5}{2}$

$12 - 5x - 3x^2 > 0$

$x\,-1 \qquad x\,-1$

$3x^2 + 5x - 12 < 0$

$3 \times 12 = 36$

$9 \quad -4$

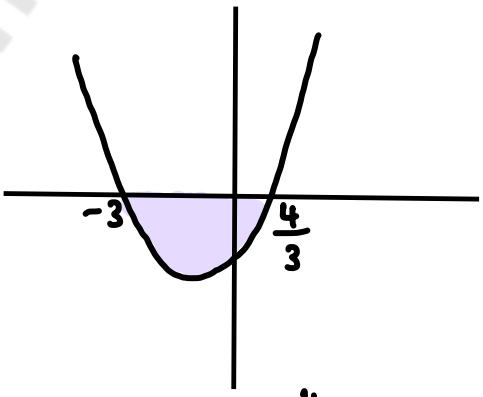
$3x^2 + 9x - 4x - 12 < 0$

$3x(x + 3) - 4(x + 3)$

$(3x - 4)(x + 3) = 0$

$3x - 4 = 0 \qquad x + 3 = 0$

$x = \frac{4}{3} \qquad x = -3$



$-3 < x < \frac{4}{3}$

$-\frac{5}{2} < x < \frac{4}{3}$

$-\frac{5}{2} < x < \frac{4}{3}$

(Total for Question 24 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS

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