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Candidate surname		Other names	
Centre Number		Candidate Number	
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Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Wednesday 14 June 2023

Morning (Time: 1 hour 30 minutes)	Paper reference	1MA1/3H
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Mathematics
PAPER 3 (Calculator)
Higher Tier



You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator, 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 be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

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 ►

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (a) Simplify $(m^2)^3$

.....
(1)

(b) Simplify $x^5 \times x^8$

.....
(1)

(c) Expand $4p(p^2 + 3p)$

.....
(2)

(Total for Question 1 is 4 marks)

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- 2 Jonny wants to know how much coffee he will need for 800 people at a meeting.

Each person who drinks coffee will drink 2 cups of coffee.

10.6 g of coffee is needed for each cup of coffee.

Jonny assumes 68% of the people will drink coffee.

- (a) Using this assumption, work out the amount of coffee Jonny needs.
Give your answer correct to the nearest gram.

..... g
(4)

Jonny's assumption is wrong.

72% of the people will drink coffee.

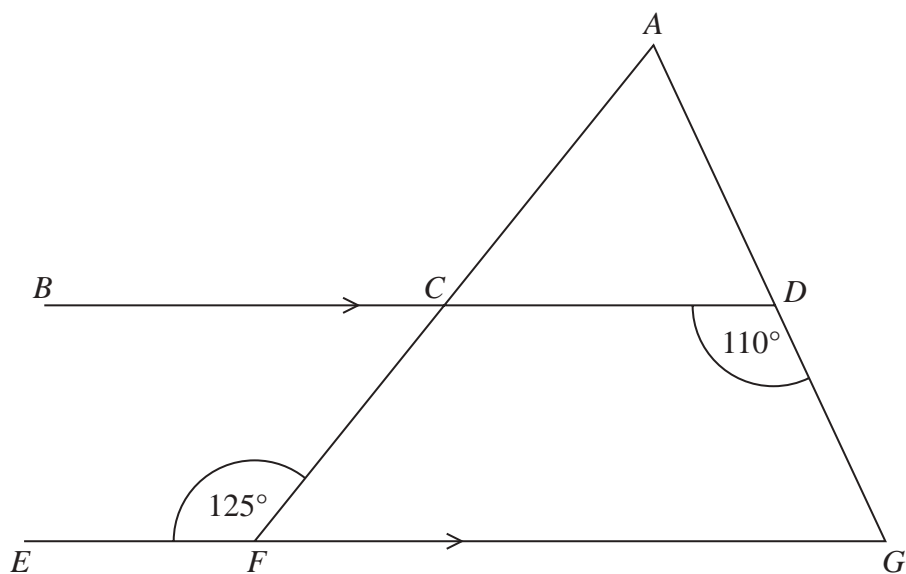
- (b) How does this affect your answer to part (a)?

.....
(1)

(Total for Question 2 is 5 marks)



- 3 ACF and ADG are straight lines.
 BCD and EFG are parallel lines.



Show that triangle ACD is isosceles.
Give a reason for each stage of your working.

(Total for Question 3 is 5 marks)



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- 4 It takes 14 hours for 5 identical pumps to fill a water tank.

How many hours would it take 4 of these pumps to fill another water tank of the same size?

..... hours

(Total for Question 4 is 2 marks)



5 A and B are numbers such that

$$A = 2^2 \times 3^4 \times 7$$

$$B = 3^2 \times 7^2$$

(a) Find the highest common factor (HCF) of A and B .

.....
(1)

(b) Find the lowest common multiple (LCM) of A and B .

.....
(2)

(Total for Question 5 is 3 marks)



- 6 Lava flows from a volcano at a constant rate of $11.9\text{ m}^3/\text{s}$

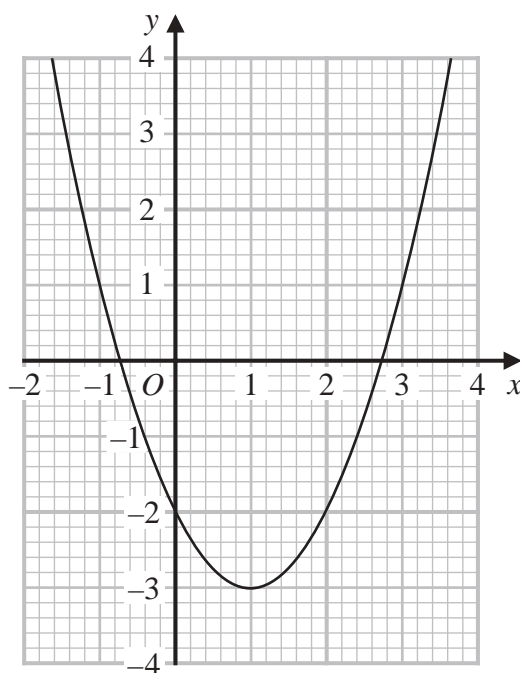
How many days does it take for $67\,205\,600\text{ m}^3$ of lava to flow from the volcano?
Give your answer correct to the nearest day.

..... days

(Total for Question 6 is 3 marks)



7 Here is the graph of $y = x^2 - 2x - 2$



(a) Write down the coordinates of the turning point on the graph of $y = x^2 - 2x - 2$

(.....,)
(1)

(b) Write down an estimate for one of the roots of $x^2 - 2x - 2 = 0$

.....
(1)

(Total for Question 7 is 2 marks)



- 8 A solid cuboid is made of metal.

The metal has a density of 9 g/cm^3

The volume of the cuboid is 72 cm^3

Work out the mass of the cuboid.

..... g

(Total for Question 8 is 2 marks)

- 9 Some people were asked if they wanted a new television.

70% of the people said yes.

80% of the people who said yes wanted a television with a large screen.

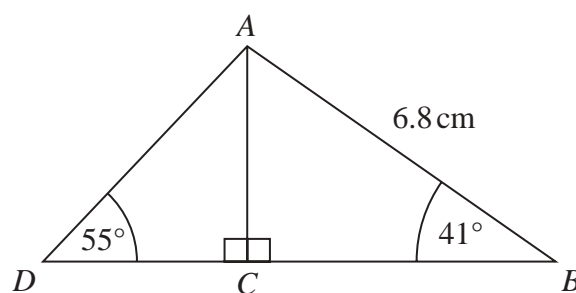
What percentage of the people asked said they wanted a television with a large screen?

..... %

(Total for Question 9 is 2 marks)



- 10 ABD is a triangle.
 C is a point on BD .



Work out the length of DC .
Give your answer correct to 1 decimal place.

..... cm

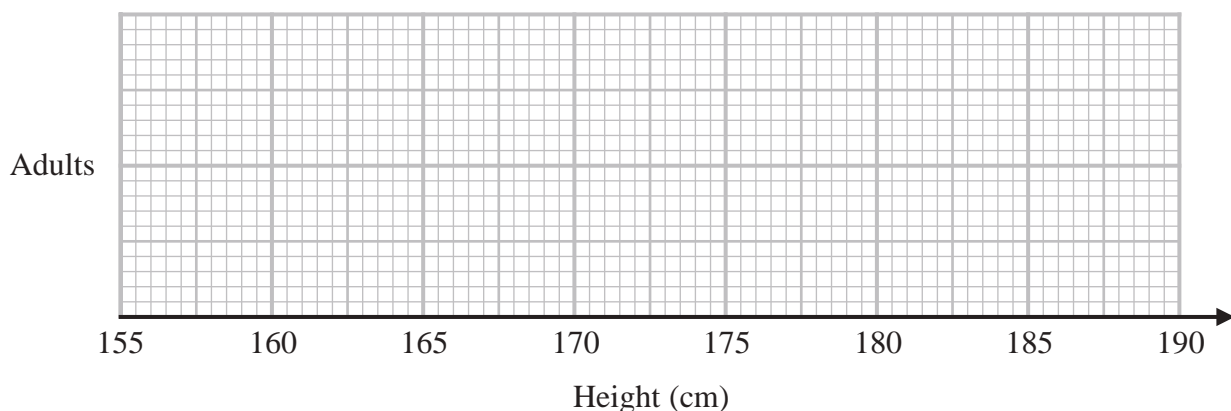
(Total for Question 10 is 3 marks)



11 The table shows some information about the heights of a group of adults.

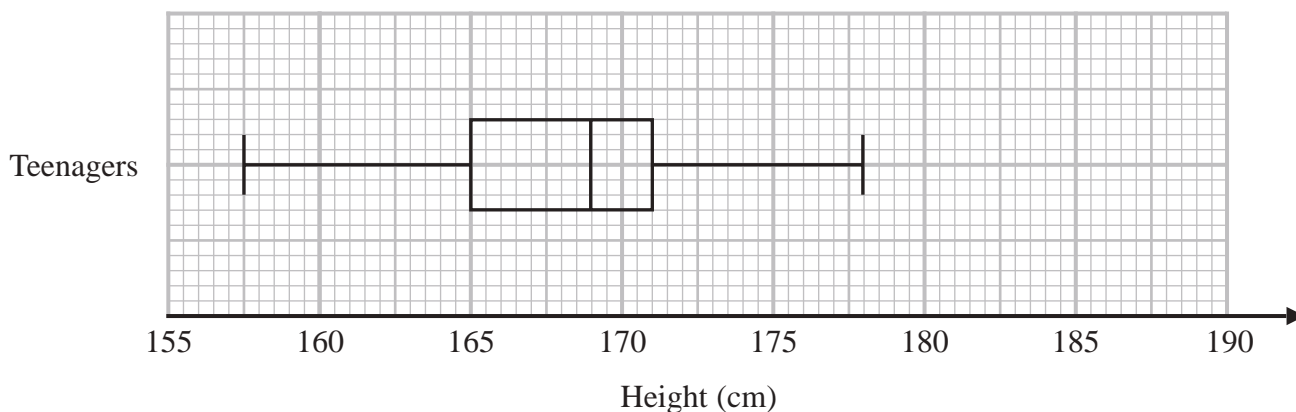
least height	169 cm
greatest height	186 cm
median	177 cm
lower quartile	174 cm
upper quartile	180 cm

(a) On the grid, draw a box plot for the information in the table.



(3)

The box plot below shows the distribution of the heights of a group of teenagers.



(b) Compare the distribution of the heights of the adults with the distribution of the heights of the teenagers.

(2)

(Total for Question 11 is 5 marks)

- 12 Show that $(x - 1)(x + 3)(x - 5)$ can be written in the form $ax^3 + bx^2 + cx + d$ where a , b , c and d are integers.

(Total for Question 12 is 3 marks)

- 13 An expression for the n th term of the sequence of triangular numbers is $\frac{n(n+1)}{2}$

Prove that the sum of any two consecutive triangular numbers is a square number.

(Total for Question 13 is 3 marks)



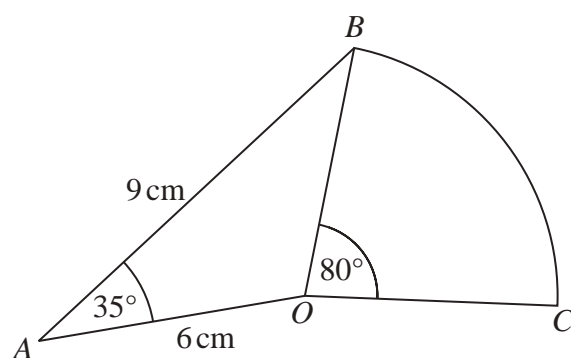
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14 OAB is a triangle.

OBC is a sector of a circle, centre O .



Calculate the area of OBC .

Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 14 is 4 marks)



15 (a) Factorise $a^2 - b^2$

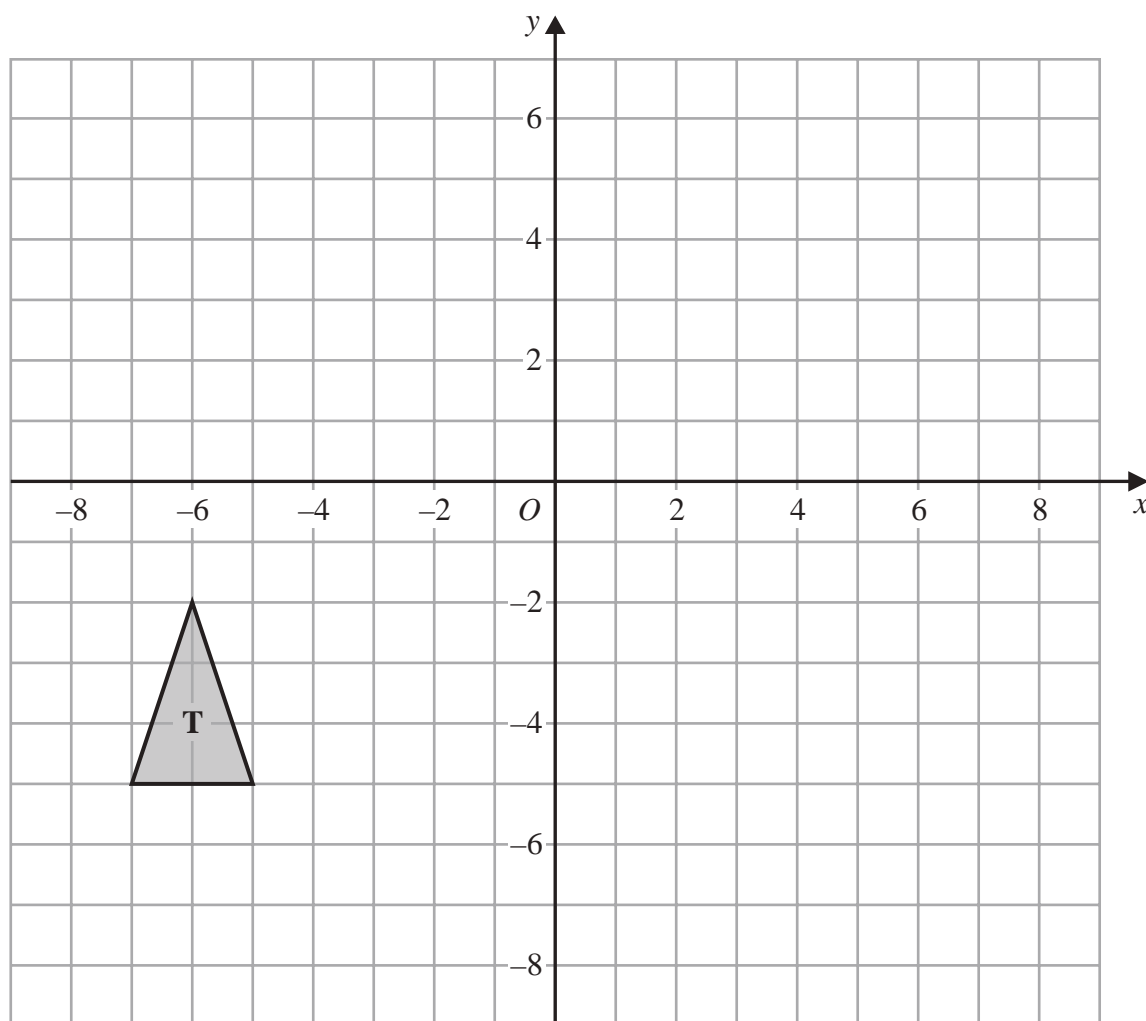
.....
(1)

(b) Show that $2^{40} - 1$ is the product of two consecutive odd numbers.

(2)

(Total for Question 15 is 3 marks)

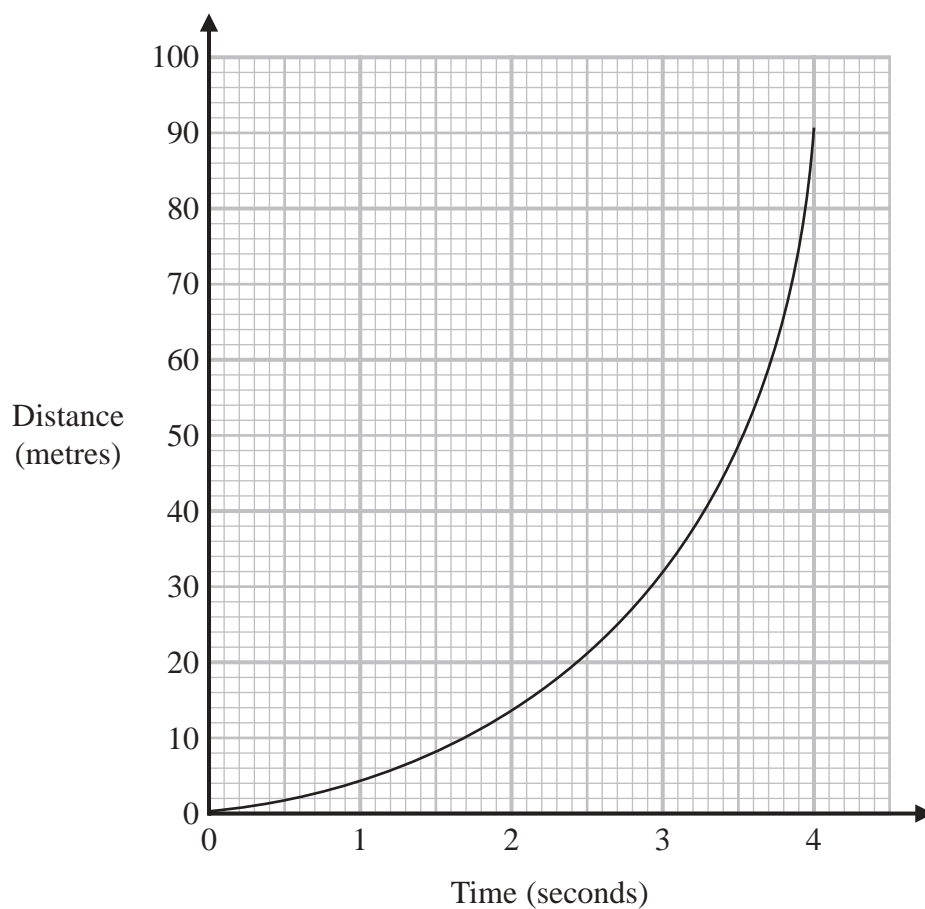




On the grid, enlarge triangle **T** by scale factor -2 with centre of enlargement $(-2, -2)$

(Total for Question 16 is 2 marks)

17 Here is a distance-time graph.



- (a) Find an estimate of the gradient of the graph at time 2.5 seconds.
You must show how you get your answer.

(3)

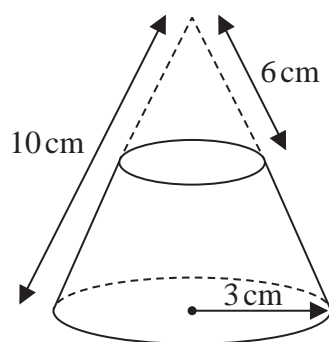
- (b) What does the gradient of the graph represent?

(1)

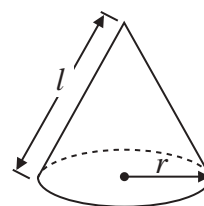
(Total for Question 17 is 4 marks)



- 18 A solid frustum is made by removing a small cone from a large cone as shown in the diagram.



Curved surface area of cone = $\pi r l$



The slant height of the small cone is 6 cm.
 The slant height of the large cone is 10 cm.
 The radius of the base of the large cone is 3 cm.

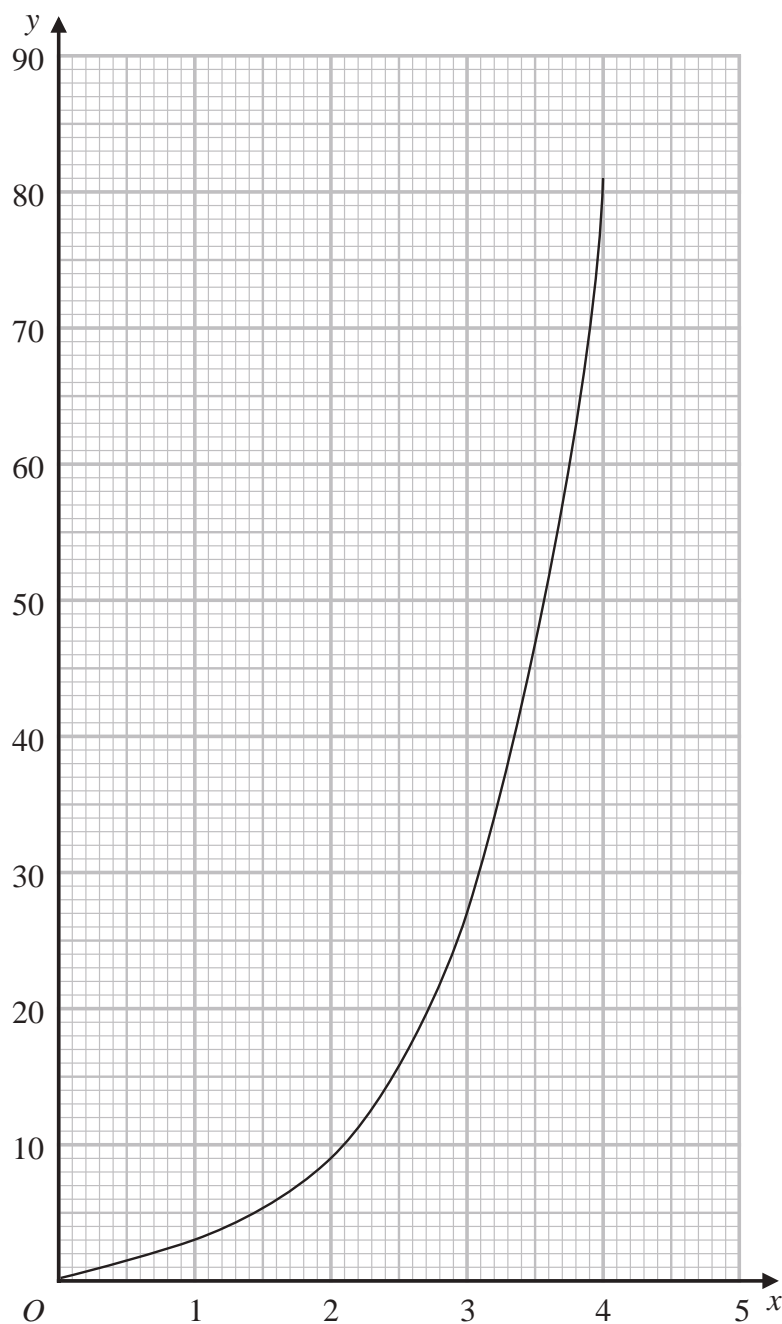
Calculate the total surface area of the frustum.
 Give your answer correct to 3 significant figures.

..... cm²

(Total for Question 18 is 5 marks)

19 Sana needs to draw the graph of $y = 3^x$ for $0 \leq x \leq 4$

She draws the graph shown on the grid.



Write down one thing Sana has done wrong.

.....

.....

.....

(Total for Question 19 is 1 mark)

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20 Prove algebraically that $0.1\dot{2}\dot{3}$ can be written as $\frac{61}{495}$

(Total for Question 20 is 3 marks)



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21 Solve $\frac{1}{x+4} + \frac{3}{2-2x} = 1$

(Total for Question 21 is 4 marks)



- 22 Given that the vector $a\begin{pmatrix} 2 \\ 6 \end{pmatrix} + b\begin{pmatrix} 8 \\ 2 \end{pmatrix}$ is parallel to the vector $\begin{pmatrix} 13 \\ 6 \end{pmatrix}$
find an expression for b in terms of a .

.....
(Total for Question 22 is 3 marks)



23 A circle has equation $x^2 + y^2 = 25$

The point P with coordinates $(-3, 4)$ lies on the circle.

Alex says that the tangent to the circle at P crosses the x -axis at the point $(-8, 0)$

Is Alex correct?

You must show how you get your answer.

(Total for Question 23 is 4 marks)



24 There is a total of y counters in a box.

There are x pink counters and 5 blue counters in the box.

The rest of the counters are green.

$$x:y = 1:3$$

Freda takes at random two counters from the box.

Find, in terms of x , an expression for the probability that Freda takes two counters of the same colour.

Give your answer as a fraction in the form $\frac{ax^2 + bx + c}{dx^2 + ex}$ where a , b , c , d and e are integers.

(Total for Question 24 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS



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