1 (c) (i) Factorise $y^2 - 2y - 48$

.....

(2)

(ii) Hence, solve $y^2 - 2y - 48 = 0$

.....

(1)

(Total for Question 1 is 3 marks)

2 A bag contains X counters.

There are only red counters and blue counters in the bag.

There are 4 more blue counters than red counters in the bag.

Finty takes at random 2 counters from the bag.

The probability that Finty takes 2 blue counters from the bag is $\frac{3}{8}$

Work out the value of X.
Show clear algebraic working.

.....

(Total for Question 2 is 5 marks)

3 Solve $x^2 - 5x - 36 = 0$
Show clear algebraic working.

.....

(Total for Question 3 is 3 marks)

4 A particle moves along a straight line.
The fixed point O lies on this line.
The displacement of the particle from O at time t seconds, $t \geqslant 0$, is s metres where

$$s = t^3 + 4t^2 - 5t + 7$$

At time T seconds the velocity of P is V m/s where $V \geqslant -5$

Find an expression for T in terms of V.

Give your expression in the form $\dfrac{-4 + \sqrt{k + mV}}{3}$ where k and m are integers to be found.

$T =$ .....

(Total for Question 4 is 6 marks)

5

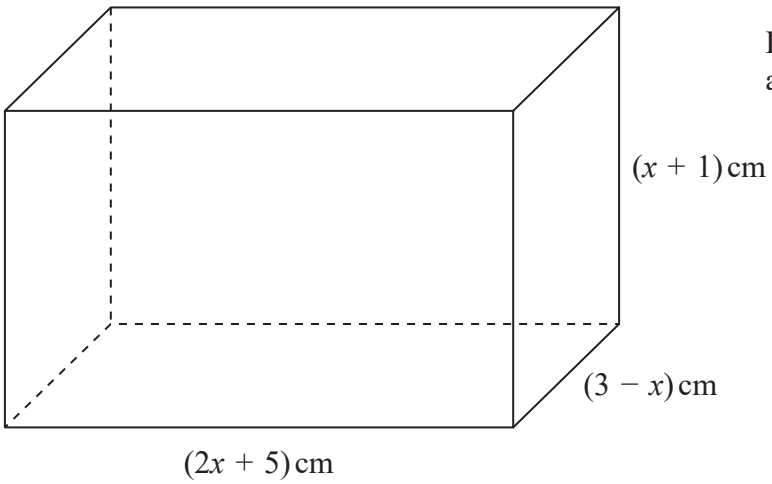


Diagram **NOT** accurately drawn

The diagram shows a cuboid of volume V cm^3

There is a value of x for which the volume of the cuboid is a maximum.

(b) Find this value of x.
Show your working clearly.
Give your answer correct to 3 significant figures.

$x =$ .....

(5)

(Total for Question 5 is 5 marks)

6 Triangle HJK is isosceles with $HJ = HK$ and $JK = \sqrt{80}$

H is the point with coordinates $(-4, 1)$
J is the point with coordinates $(j, 15)$ where $j < 0$
K is the point with coordinates $(6, k)$

M is the midpoint of JK.
The gradient of HM is 2

Find the value of j and the value of k.

$j =$ .....

$k =$ .....

(Total for Question 6 is 6 marks)

7 (b) Solve $x^2 - 3x - 40 = 0$

Show clear algebraic working.

.....

(3)

(Total for Question 7 is 3 marks)

8 (i) Factorise $x^2 + 2x - 24$

.....

(2)

(ii) Hence solve $x^2 + 2x - 24 = 0$

.....

(1)

(Total for Question 8 is 3 marks)

9 Solve the simultaneous equations

$$y = 3 - 2x$$
$$x^2 + y^2 = 18$$

Show clear algebraic working.

.....

(Total for Question 9 is 5 marks)

10 Pippa has a box containing N pens.

There are only black pens and red pens in the box.
The number of black pens in the box is 3 more than the number of red pens.

Pippa is going to take at random 2 pens from the box.

The probability that she will take a black pen **followed** by a red pen is $\frac{9}{35}$

Find the possible values of N.
Show clear algebraic working.

.....

(Total for Question 10 is 5 marks)

11 Solve $x^2 - 21x + 20 = 0$

Show your working clearly.

.....

(Total for Question 11 is 3 marks)

12 The functions f and g are defined as

$f(x) = x^2 + 6$
$g(x) = x - 10$

(b) Solve the equation $fg(x) = f(x)$
Show clear algebraic working.

.....

(3)

(Total for Question 12 is 3 marks)

13 Solve the equation

$$\frac{5}{x+2} + \frac{3}{x^2+2x} = 2$$

Show clear algebraic working.

.....

(Total for Question 13 is 5 marks)

14 (b) (i) Factorise $x^2 + 5x - 36$

.....

(2)

(ii) Hence, solve $x^2 + 5x - 36 = 0$

.....

(1)

(Total for Question 14 is 3 marks)

15 A particle P is moving along a straight line.
The fixed point O lies on this line.

At time t seconds where $t \geqslant 0$, the displacement, s metres, of P from O is given by

$$s = t^3 + 5t^2 - 8t + 10$$

Find the displacement of P from O when P is instantaneously at rest.

Give your answer in the form $\frac{a}{b}$ where a and b are integers.

..... metres

(Total for Question 15 is 5 marks)

16 (b) (i) Factorise $x^2 + 8x - 9$

.....

(2)

(ii) Hence, solve $x^2 + 8x - 9 = 0$

.....

(1)

(Total for Question 16 is 3 marks)

17 Elliot has x counters.

Each counter has one red face and one green face.

Elliot spreads all the counters out on a table and sees that the number of counters showing a red face is 5

Elliot then picks at random one of the counters and turns the counter over.
He then picks at random a second counter and turns the counter over.

The probability that there are still 5 counters showing a red face is $\frac{19}{32}$

Work out the value of x
Show clear algebraic working.

$x =$ .....

(Total for Question 17 is 5 marks)

18 (i) Factorise $x^2 + 5x - 24$

.....

(2)

(ii) Hence, solve $x^2 + 5x - 24 = 0$

.....

(1)

(Total for Question 18 is 3 marks)

19 Here is a rectangle.

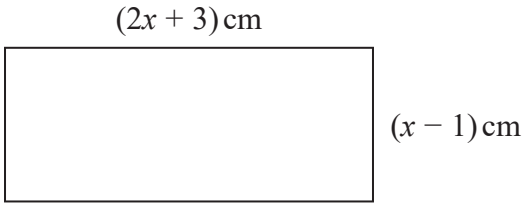


Diagram **NOT** accurately drawn

Given that the area of the rectangle is less than 75 cm^2

find the range of possible values of x

.....

(Total for Question 19 is 5 marks)

20 A particle P moves along a straight line that passes through the fixed point O

The displacement, x metres, of P from O at time t seconds, where $t \geqslant 0$, is given by

$$x = 4t^3 - 27t + 8$$

The direction of motion of P reverses when P is at the point A on the line.

The acceleration of P at the instant when P is at A is $a\,\text{m/s}^2$

Find the value of a

$a =$ .....

(Total for Question 20 is 5 marks)

21 (a) Factorise fully $18c^3d^2 - 21c^2$

.....

(2)

(b) (i) Factorise $y^2 - 3y - 18$

.....

(2)

(ii) Hence, solve $y^2 - 3y - 18 = 0$

.....

(1)

(Total for Question 21 is 5 marks)

22 The radius of a right circular cylinder is x cm.

The height of the cylinder is $\left(\frac{800}{°x} - x\right)$ cm.

The volume of the cylinder is $V\text{cm}^3$

Find the maximum value of V
Give your answer correct to the nearest whole number.

.....

(Total for Question 22 is 5 marks)

23 The curve **C** has equation $y = 4x^3 + x^2 - 20x$

(a) Find $\frac{dy}{dx}$

$\frac{dy}{dx} =$ .....

(2)

(b) Find the x coordinates of the points on **C** where the gradient is 4
Show clear algebraic working.

.....

(4)

(Total for Question 23 is 6 marks)

24 The functions g and h are such that

$$g(x) = \frac{11}{2x - 5}$$

$$h(x) = x^2 + 4 \qquad x \geqslant 0$$

(b) Solve $gh(x) = 1$

.....

(3)

(Total for Question 24 is 3 marks)