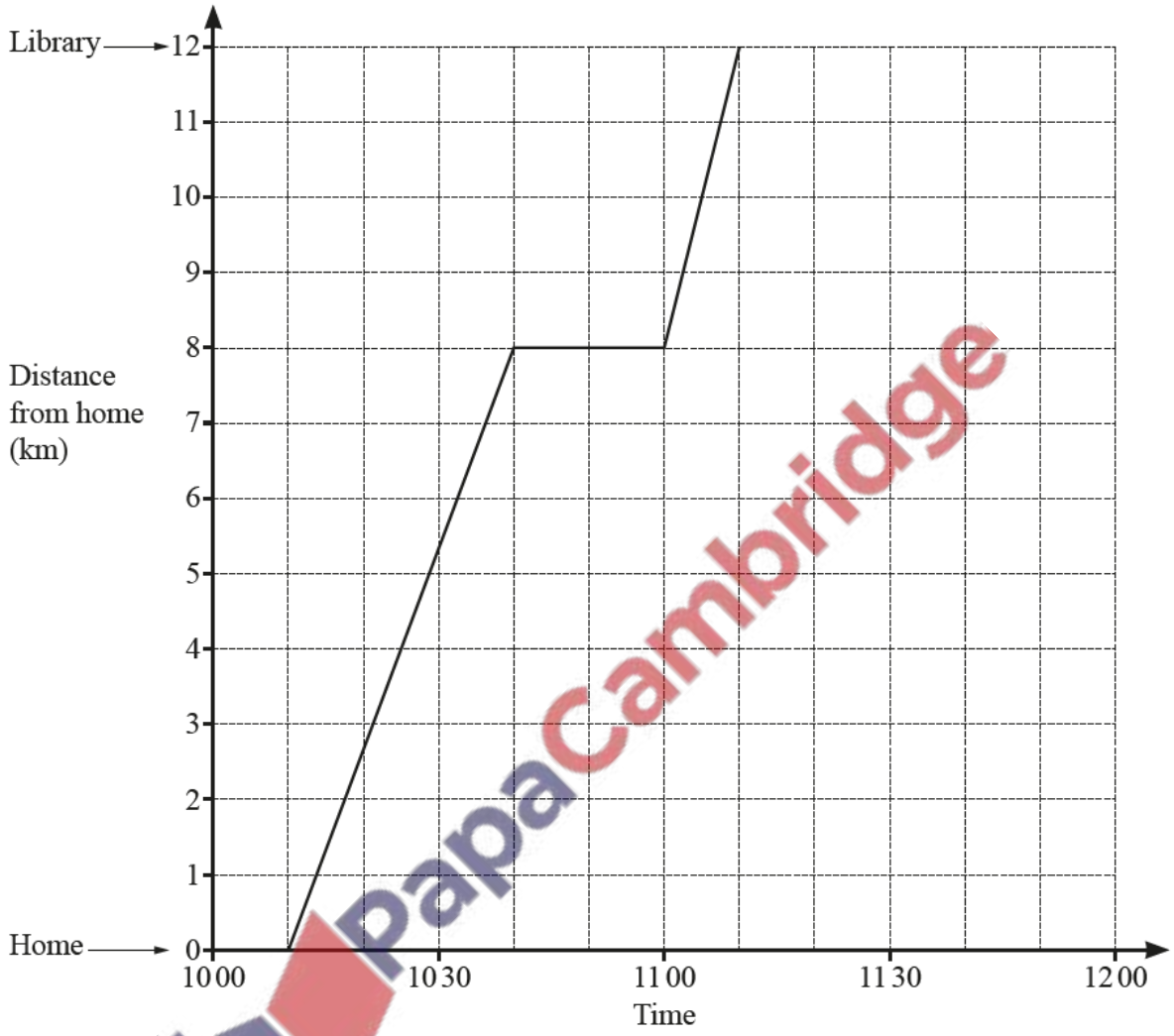
1. Nov/2020/Paper_11/No.7

Hua cycles from her home to the library.
The travel graph shows this journey.



(a) At what time does she start her journey?

..... [1]

(b) **(i)** Find her distance from home when she stops for a rest.

..... km [1]

(ii) How long does she stop for a rest?

..... min [1]

(c) Hua stays at the library for 10 minutes.
She then cycles home at a constant speed of 24 km/h.

Complete the travel graph. [2]

2. Nov/2020/Paper_11/No.16

Make x the subject of this formula.

$$2y = 5x - 7$$

$x =$ ..... [2]

3. Nov/2020/Paper_12/No.7

Solve the equation.

$$6 - 2x = 3x$$

$x =$ ..... [2]

4. Nov/2020/Paper_12/No.9

$$A = \frac{1}{4}bc^2$$

Calculate the value of A when $b = 3$ and $c = 6$.

..... [2]

5. Nov/2020/Paper_12/No.14

These are the first four terms of a sequence.

17 10 3 −4

(a) (i) Find the next term.

..... [1]

(ii) Write down the term to term rule for continuing this sequence.

..... [1]

(b) These are the first four terms of a different sequence.

−2 2 6 10

Find an expression for the nth term.

..... [2]

6. Nov/2020/Paper_13/No.17

Expand the brackets and simplify.

$$4(2m+3)-5(m-2)$$

..... [2]

7. Nov/2020/Paper_13/No.23

Solve the simultaneous equations.
You must show all your working.

$$3x - 8y = 22$$
$$x + 4y = 4$$

$x =$ .....

$y =$ ..... [3]

8. Nov/2020/Paper_21/No.1

Simplify.

$3a+7b-4a+b$

..... [2]

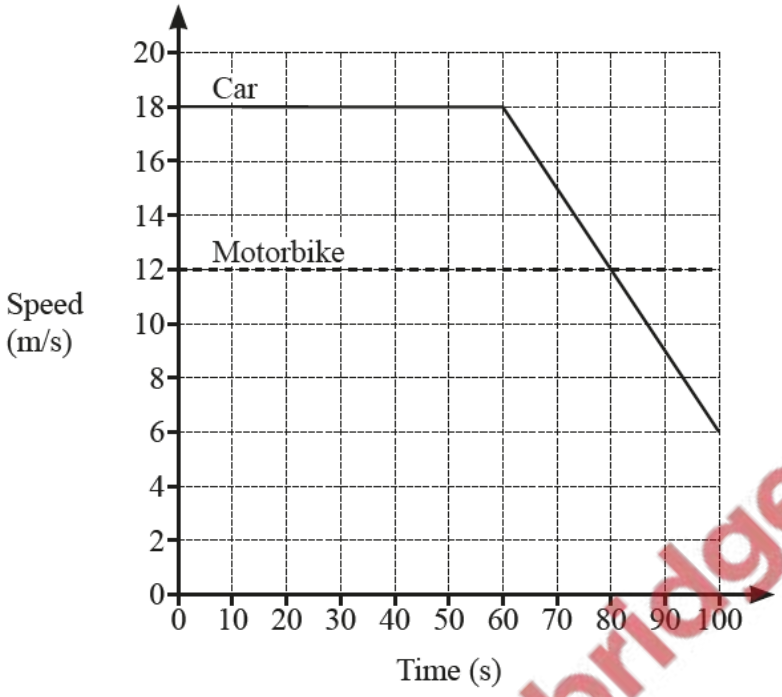
9. Nov/2020/Paper_21/No.7

Make x the subject of this formula.

$$2y = 5x - 7$$

$x =$ ..... [2]

10. Nov/2020/Paper_21/No.15



The diagram shows the speed–time graph for 100 seconds of the journey of a car and of a motorbike.

(a) Find the deceleration of the car between 60 and 100 seconds.

..... m/s^2 [1]

(b) Calculate how much further the car travelled than the motorbike during the 100 seconds.

..... m [3]

11. Nov/2020/Paper_21/No.16

Factorise $6x^2 + 7x - 20$.

..... [2]

12. Nov/2020/Paper_21/No.17

(a) $f(x) = 3x^2 + a$ where a is an integer.
$f(-2) = 19$

Find the value of a.

$a =$ ..... [2]

(b) $g(x) = 2x + 7$ $h(x) = 3x - 8$

(i) Find $gh(x)$ in its simplest form.

..... [2]

(ii) Find $g^{-1}(x)$.

$g^{-1}(x) =$ ..... [2]

13. Nov/2020/Paper_21/No.22

Simplify.

$$\frac{x^2 - 5x}{2x^2 - 50}$$

..... [4]

14. Nov/2020/Paper_22/No.3

Solve the equation.

$$6 - 2x = 3x$$

$x =$ ..... [2]

15. Nov/2020/Paper_22/No.9

Solve the simultaneous equations.

$$2x + y = 7$$
$$3x - y = 8$$

$x =$ .....

$y =$ ..... [2]

16. Nov/2020/Paper_22/No.11

Simplify.

$2x^2 \times 5x^5$

..... [2]

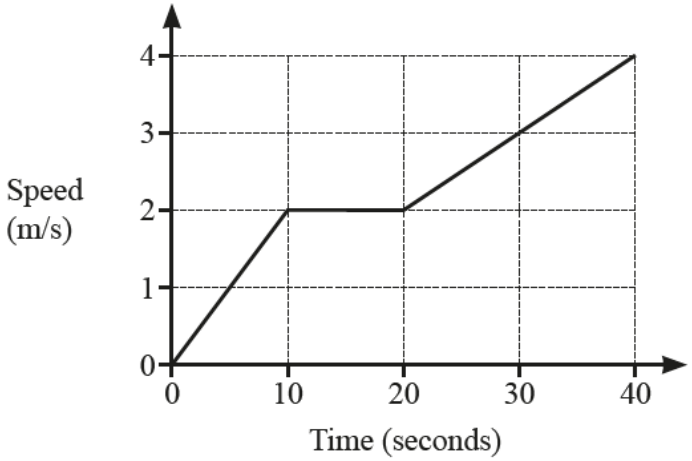
17. Nov/2020/Paper_22/No.16

The selling price of a shirt is $26.50 .
This includes a tax of 6%.

Calculate the price of the shirt before the tax was added.

$ ..... [2]

18. Nov/2020/Paper_22/No.17



The diagram shows the speed–time graph for the first 40 seconds of a cycle ride.

(a) Find the acceleration between 20 and 40 seconds.

..... m/s^2 [1]

(b) Find the total distance travelled.

..... m [3]

19. Nov/2020/Paper_22/No.21

(a) Differentiate $6+4x-x^2$.

..... [2]

(b) Find the coordinates of the turning point of the graph of $y = 6+4x-x^2$.

(..... , ...) [2]

20. Nov/2020/Paper_22/No.23

Write as a single fraction in its simplest form.

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

..... [3]

21. Nov/2020/Paper_23/No.4

Simplify.

$a^2 \div a^6$

..... [1]

22. Nov/2020/Paper_23/No.10

Solve the simultaneous equations.
You must show all your working.

$$3x - 8y = 22$$
$$x + 4y = 4$$

$x =$ .....

$y =$ ..... [3]

23. Nov/2020/Paper_23/No.15

$$m = 2p + \sqrt{\frac{x}{y}}$$

Make x the subject of this formula.

$x =$ ..... [3]

24. Nov/2020/Paper_23/No.18

(a) Simplify. $(4xy^2)^3$

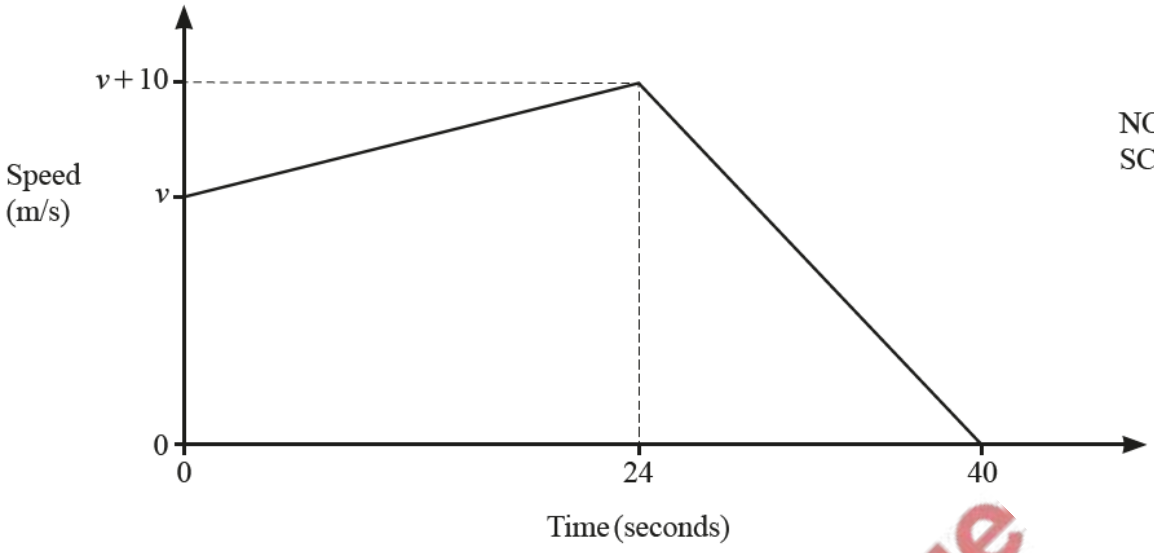
..... [2]

(b) $25 = 125^k$

Find the value of k.

$k =$ ..... [1]

25. Nov/2020/Paper_23/No.19



The diagram shows the speed–time graph for the final 40 seconds of a car journey.
At the start of the 40 seconds the speed is v m/s.

(a) Find the acceleration of the car during the first 24 seconds.

..... m/s^2 [1]

(b) The total distance travelled during the 40 seconds is 1.24 **kilometres**.

Find the value of v.

$v =$ ..... [4]

26. Nov/2020/Paper_23/No.20

Factorise.

$3x + 8y - 6ax - 16ay$

..... [2]

27. Nov/2020/Paper_23/No.24

Simplify.

$$\frac{x^2-25}{x^2-17x+60}$$

..... [4]

28. Nov/2020/Paper_31/No.4

(a) Simplify.

$6a - 3b + 2a - 4b$

..... [2]

(b) Expand.

$5(x - 3)$

..... [1]

(c) Solve these equations.

(i) $\frac{x}{3} = 18$

$x =$ ..... [1]

(ii) $5x + 18 = 8$

$x =$ ..... [2]

(iii) $12x - 3 = 4x + 21$

$x =$ ..... [2]

(d) $6^{10} \times 6^{x} = 6^{2}$

Find the value of x.

$x =$ ..... [1]

(e) The Fraser family and the Singh family go to the cinema.
The Fraser family buys 6 adult tickets and 2 child tickets for $124.
The Singh family buys 3 adult tickets and 5 child tickets for $100.

Find the price of an adult ticket and the price of a child ticket.

Adult ticket $ .....

Child ticket $ ..... [5]

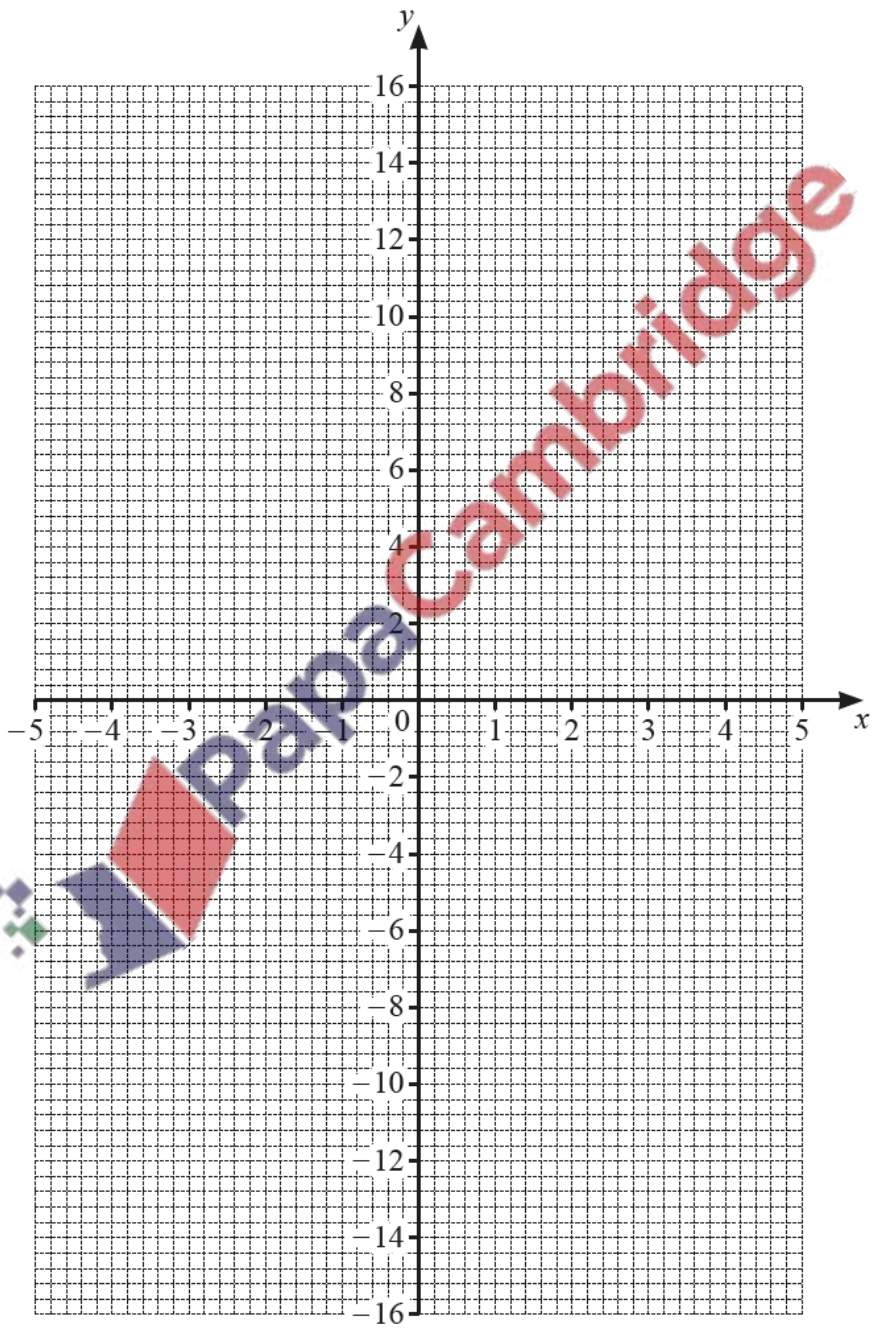
29. Nov/2020/Paper_31/No.9

(a) Complete the table of values for $y = \frac{15}{x}$.

x	-5	-3	-2	-1		1	2	3	5
y				-15		15			

[3]

(b) On the grid, draw the graph of $y = \frac{15}{x}$ for $-5 \leqslant x \leqslant -1$ and $1 \leqslant x \leqslant 5$.



[4]

(c) On the grid, draw the line $y = 6$. [1]

(d) Use your graph to solve $\frac{15}{x} = 6$.

$x =$ ..... [1]

30. Nov/2020/Paper_31/No.10

(a) These are the first four terms of a sequence.

8 15 22 29

(i) Write down the next term.

..... [1]

(ii) Write down the term to term rule for continuing this sequence.

..... [1]

(iii) Find an expression for the nth term.

..... [2]

(b) Find the next term in each of these sequences.

(i) 18, 21, 26, 33, 42, …

..... [1]

(ii) 18, 20, 24, 32, 48, …

..... [1]

(c) Find the first three terms of the sequence with nth term $n^2 + 5n$.

..... , ... , ... [2]

31. Nov/2020/Paper_32/No.9

(a) Simplify.

$4x+3y+2x-8y$

..... [2]

(b) A pen costs 60 cents and a ruler costs 29 cents.

Write down an expression for the total cost, in cents, of x pens and y rulers.

..... cents [2]

(c) Solve.

$5(2x+4)=85$

$x =$ ..... [3]

(d) **(i)** $2^8 \times 2^m = 2^6$

Work out the value of m.

$m =$ ..... [1]

(ii) $5^n \div 5^4 = 5^6$

Work out the value of n.

$n =$ ..... [1]

(e) A plant costs p dollars and a bush costs b dollars.
Ana buys 2 plants and 4 bushes for \$42.
Paola buys 7 plants and 9 bushes for \$107.

Write down a pair of simultaneous equations and solve them to find the value of p and the value of b.
You must show all your working.

p = ...

b = ... [6]

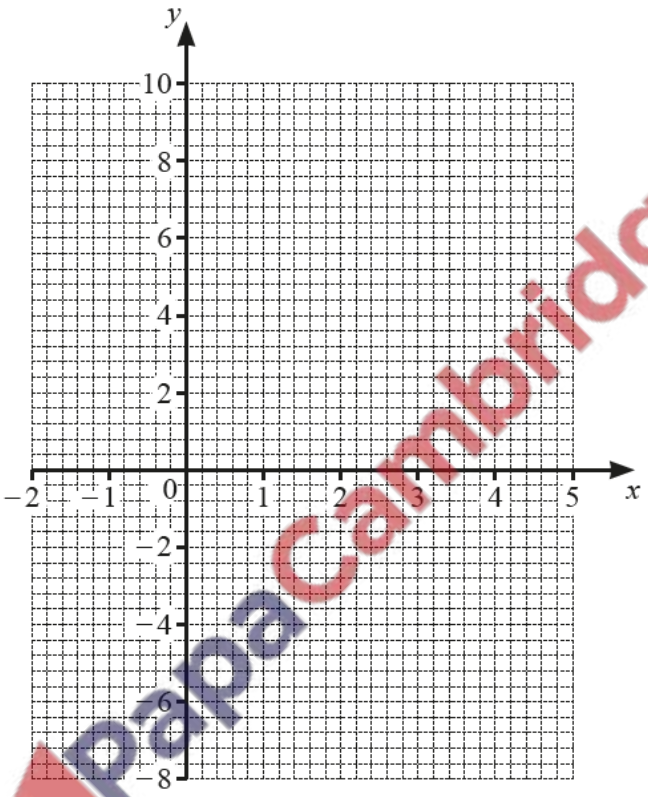
32. Nov/2020/Paper_32/No.10

(a) Complete the table of values for $y = x^2 - 4x - 3$.

x	-2	-1	0	1	2	3	4	5
y		2	-3	-6		-6	-3	2

[2]

(b) On the grid, draw the graph of $y = x^2 - 4x - 3$ for $-2 \leqslant x \leqslant 5$.



[4]

(c) Use your graph to solve the equation $x^2 - 4x - 3 = 0$.

$x =$ ..... or $x =$ ..... [2]

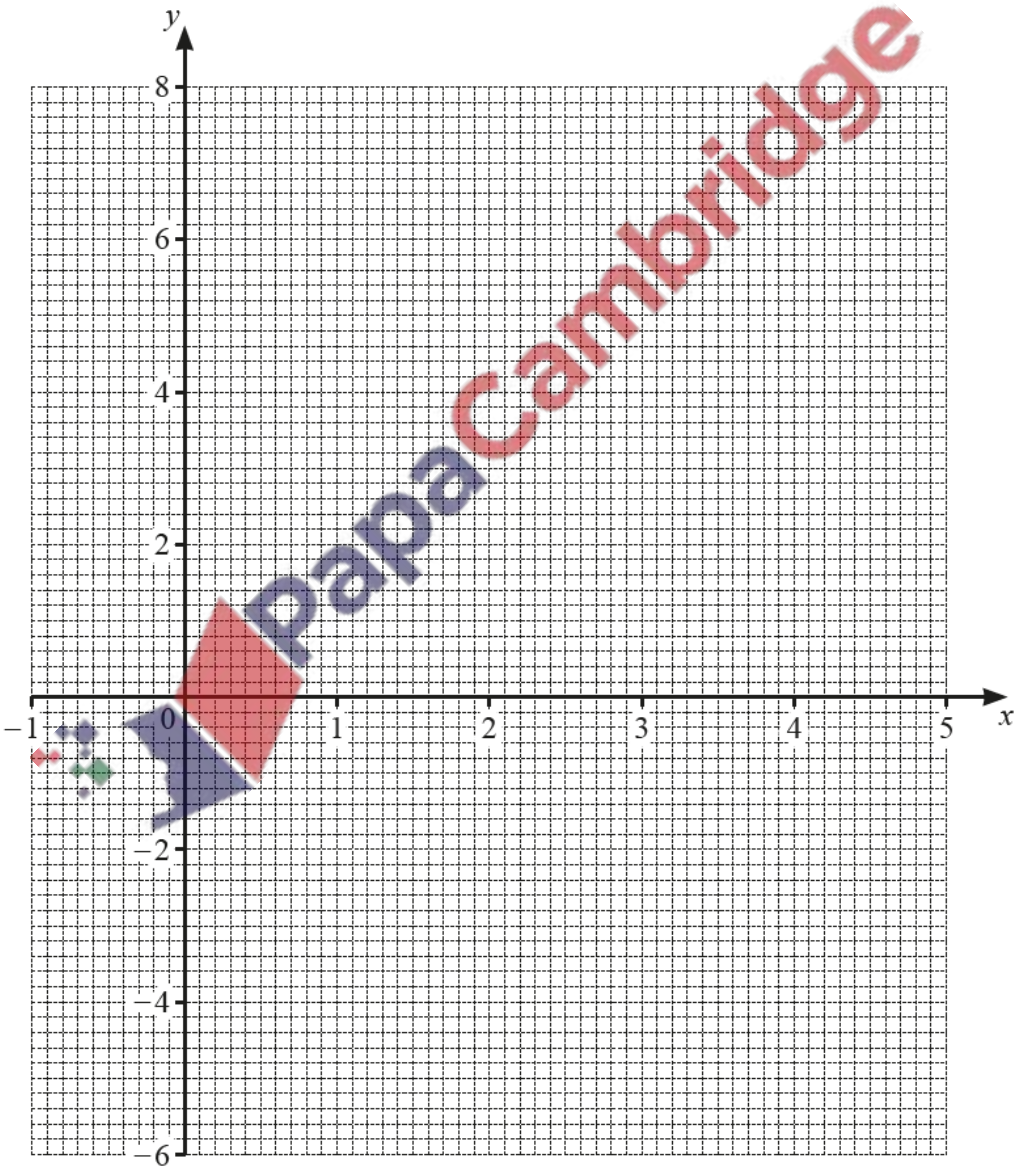
33. Nov/2020/Paper_33/No.3

(a) Complete the table of values for $y = 1 + 5x - x^2$.

x	-1	0	1	2	3	4	5
y		1	5		7		1

[2]

(b) On the grid, draw the graph of $y = 1 + 5x - x^2$ for $-1 \leqslant x \leqslant 5$.



[4]

(c) **(i)** On the grid, draw the line $y = 3$. [1]

(ii) Use your line to solve the equation $1 + 5x - x^2 = 3$.

$x =$ ..... or $x =$ ..... [2]

34. Nov/2020/Paper_33/No.7

(a) $W = 3a + 5c$

Find the value of W when $a = 6$ and $c = 2$.

$W =$ ..... [2]

(b) Factorise completely.

$12b + 8b^2$

..... [2]

(c) Make m the subject of the formula $y = 4m - p$.

$m =$ ..... [2]

(d) Find the value of x when $5^x \times 5^3 = 5^{12}$.

$x =$ ..... [1]

(e) Find the value of

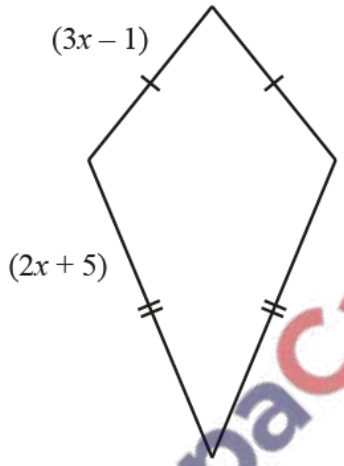
(i) 3^0,

..... [1]

(ii) 5^{-2}.

..... [1]

(f) In this part, all measurements are in centimetres.



NOT TO SCALE

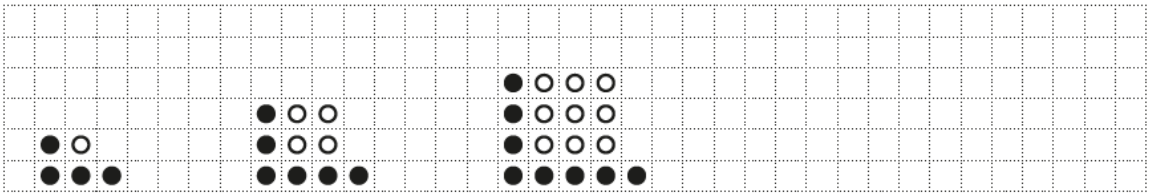
The diagram shows a kite with sides $(2x+5)$ and $(3x-1)$.
The perimeter of the kite is 33 cm.

Work out the length of a shorter side.

..... cm [5]

35. Nov/2020/Paper_33/No.9

A sequence of patterns is made using black counters and white counters.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

(a) Draw Pattern 4. [1]

(b) Complete the table.

Pattern	1	2	3	4	5
Number of black counters	4	6	8		
Number of white counters	1	4	9		

[2]

(c) Write an expression, in terms of n, for

(i) the number of black counters in Pattern n.

..... [2]

(ii) the number of white counters in Pattern n.

..... [1]

(d) Elena has 30 black counters and 140 white counters.

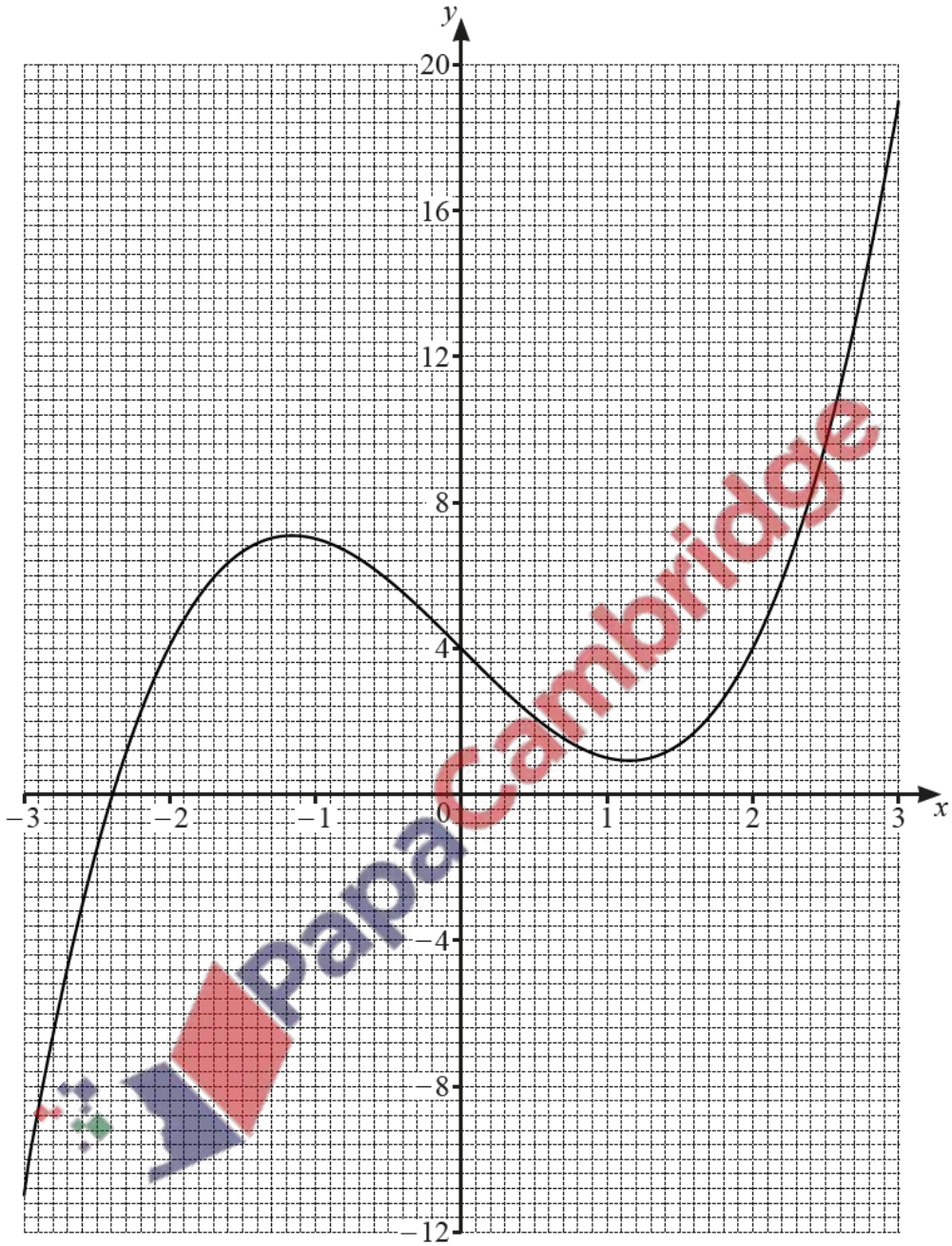
Can she make Pattern 12 using her counters?
Explain your answer.

..... because .....

..... [2]

36. Nov/2020/Paper_41/No.5

(a) The diagram shows the graph of $y = f(x)$ for $-3 \leqslant x \leqslant 3$.



(i) Solve $f(x) = 14$.

$x =$ ..... [1]

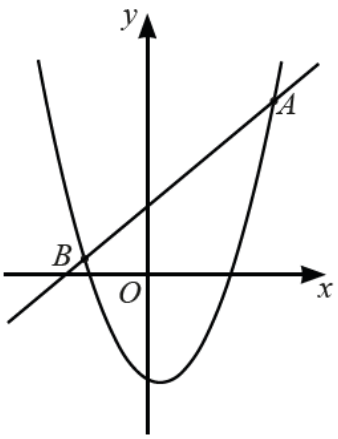
(ii) By drawing a suitable tangent, find an estimate of the gradient of the graph at the point $(-2, 4)$.

..... [3]

(iii) By drawing a suitable straight line on the grid, solve $f(x) = 2x - 2$ for $-3 \leqslant x \leqslant 3$.

$x =$ ..... [3]

(b)



NOT TO SCALE

The diagram shows a curve with equation $y = 2x^2 - 2x - 7$.
The straight line with equation $y = 3x + 5$ intersects the curve at the points A and B.

Find the coordinates of the points A and B.

A (..... , ...)

B (..... , ...) [5]

37. Nov/2020/Paper_41/No.7

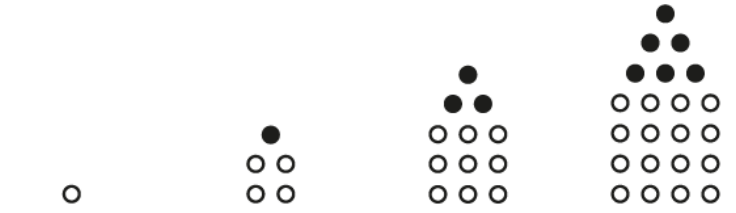


Diagram 1 Diagram 2 Diagram 3 Diagram 4

These are the first four diagrams of a sequence.
The diagrams are made from white dots and black dots.

(a) Complete the table for Diagram 5 and Diagram 6.

Diagram	1	2	3	4	5	6
Number of white dots	1	4	9	16		
Number of black dots	0	1	3	6		
Total number of dots	1	5	12	22		

[2]

(b) Write an expression, in terms of n, for the number of white dots in Diagram n.

..... [1]

(c) The expression for the total number of dots in Diagram n is $\frac{1}{2}(3n^2 - n)$.

(i) Find the total number of dots in Diagram 8.

..... [1]

(ii) Find an expression for the number of black dots in Diagram n.
Give your answer in its simplest form.

..... [2]

(d) T is the total number of dots used to make **all** of the first n diagrams.

$$T = an^3 + bn^2$$

Find the value of a and the value of b.
You must show all your working.

$a =$ .....

$b =$ ..... [5]

38. Nov/2020/Paper_41/No.8

(a) Factorise completely.

$3a^2b - ab^2$

..... [2]

(b) Solve the inequality.

$3x + 12 < 5x - 3$

..... [2]

(c) Simplify.

$(3x^2y^4)^3$

..... [2]

(d) Solve.

$\frac{2}{x} = \frac{6}{2-x}$

$x =$ ..... [3]

(e) Expand and simplify.

$(x-2)(x+5)(2x-1)$

..... [3]

(f) Alan invests \$200 at a rate of r% per year compound interest.
After 2 years the value of his investment is \$206.46 .

(i) Show that $r^2 + 200r - 323 = 0$.

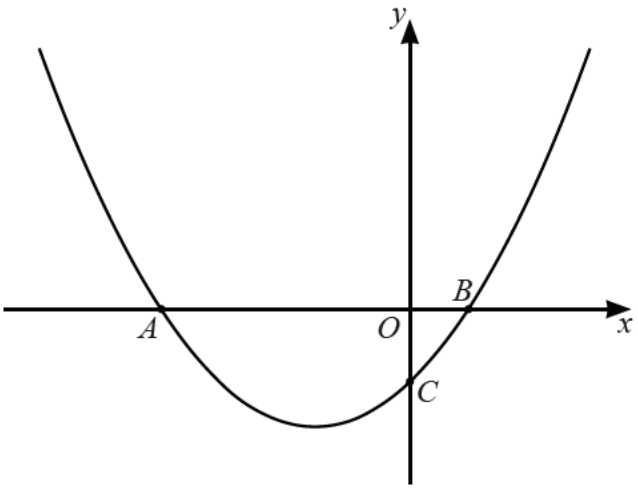
[3]

(ii) Solve the equation $r^2 + 200r - 323 = 0$ to find the rate of interest.
Show all your working and give your answer correct to 2 decimal places.

$r =$ ..... [3]

39. Nov/2020/Paper_41/No.10

(a)



NOT TO SCALE

The diagram shows a sketch of the curve $y = x^2 + 3x - 4$.

(i) Find the coordinates of the points A, B and C.

A (..... , ...)

B (..... , ...)

C (..... , ...) [4]

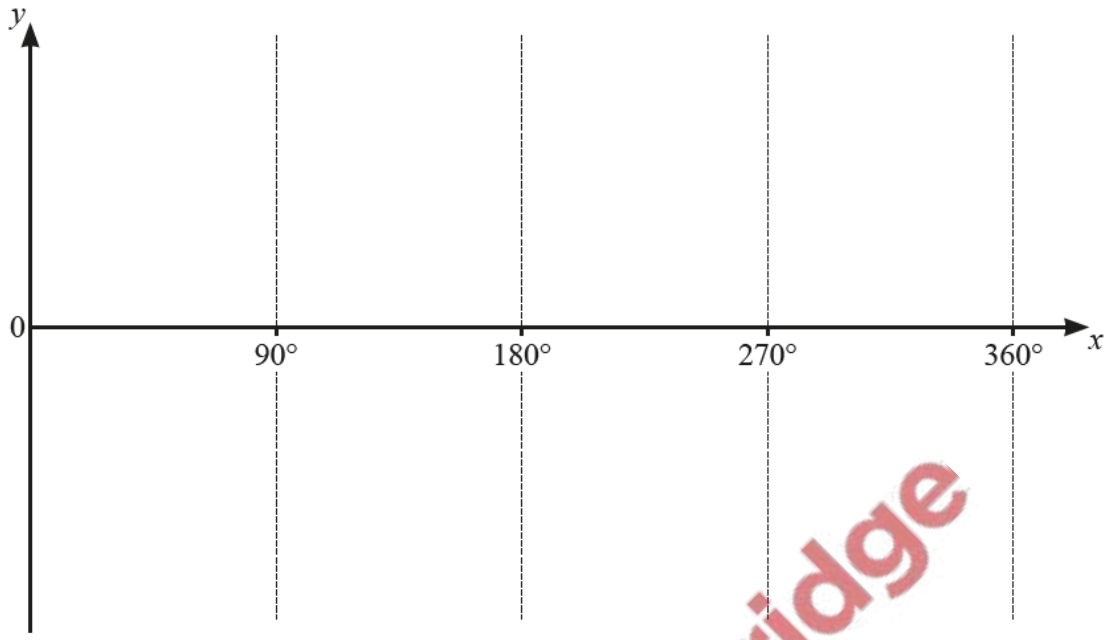
(ii) Differentiate $x^2 + 3x - 4$.

..... [2]

(iii) Find the equation of the tangent to the curve at the point (2, 6).

..... [3]

(b)



(i) On the diagram, sketch the graph of $y = \tan x$ for $0° \leqslant x \leqslant 360°$. [2]

(ii) Solve the equation $5\tan x = -7$ for $0° \leqslant x \leqslant 360°$.

$x =$ ..... or $x =$ ..... [3]

40. Nov/2020/Paper_42/No.5

Ahmed sells different types of cake in his shop.
The cost of each cake depends on its type and its size.

Every small cake costs $\$x$ and every large cake costs $\$(2x + 1)$.

(a) The total cost of 3 small lemon cakes and 2 large lemon cakes is \$12.36 .

Find the cost of a small lemon cake.

\$ ..... [3]

(b) The cost of 18 small chocolate cakes is the same as the cost of 7 large chocolate cakes.

Find the cost of a small chocolate cake.

\$ ..... [3]

(c) The number of small cherry cakes that can be bought for \$4 is the same as the number of large cherry cakes that can be bought for \$13.

Find the cost of a small cherry cake.

\$ ..... [3]

(d) Petra spends \$20 on small coffee cakes and \$10 on large coffee cakes.
The total number of cakes is 45.

Write an equation in terms of x.
Solve this equation to find the cost of a small coffee cake.
Show all your working.

\$ ..... [7]

41. Nov/2020/Paper_42/No.7

$$y = x^2 + \frac{1}{x}, \quad x \neq 0$$

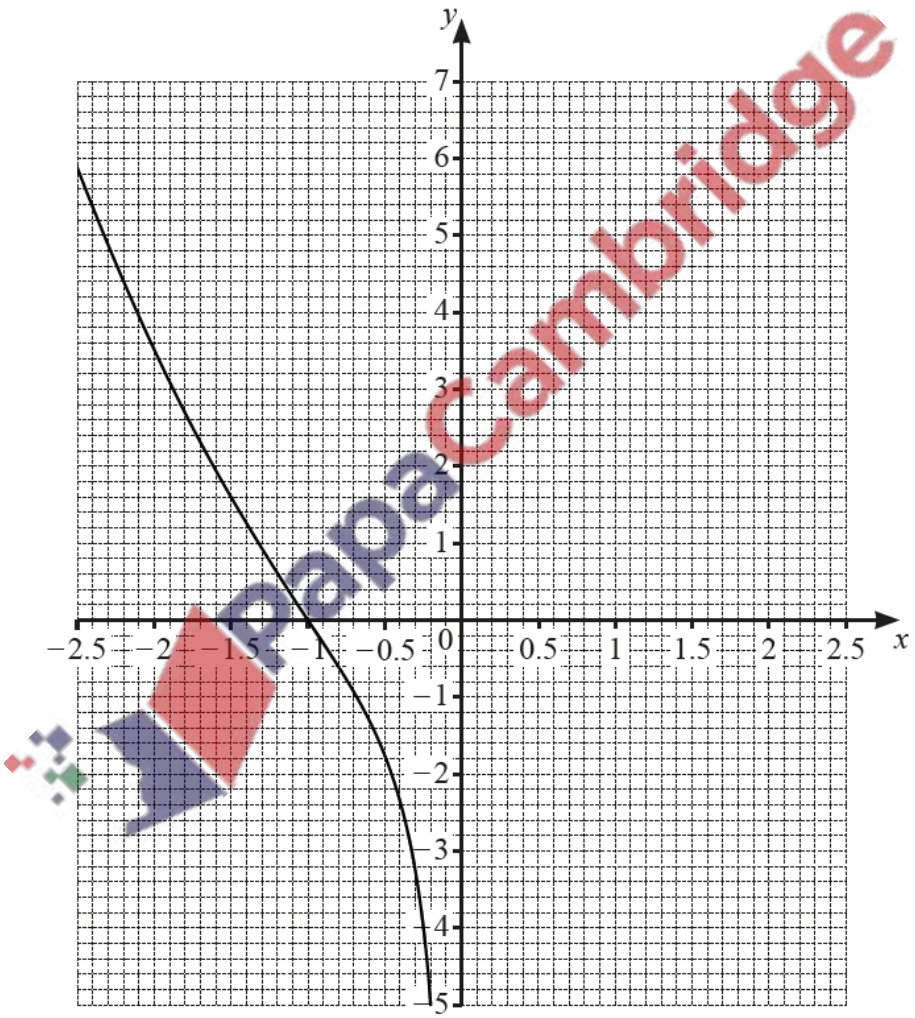
(a) Complete the table.

x	0.2	0.3	0.5	1	1.5	2	2.5
y	5.0	3.4	2.3		2.9		6.7

[2]

(b) On the grid, draw the graph of $y = x^2 + \frac{1}{x}$ for $0.2 \leqslant x \leqslant 2.5$.

The graph of $y = x^2 + \frac{1}{x}$ for $-2.5 \leqslant x \leqslant -0.2$ has been drawn for you.



[4]

(c) By drawing suitable straight lines on the grid, solve the following equations.

(i) $x^2 + \frac{1}{x} = -2$

$x =$ ..... [1]

(ii) $x^2 + \frac{1}{x} + x - 1 = 0$

$x =$ ..... [2]

(d) k is an integer and the equation $x^2 + \frac{1}{x} = k$ has three solutions.

Write down a possible value of k.

$k =$ ..... [1]

42. Nov/2020/Paper_42/No.10

$f(x) = x^2 + 1$ $\quad g(x) = 1 - 2x$ $\quad h(x) = \frac{1}{x},\ x \neq 0$ $\quad j(x) = 5^x$

(a) Find the value of

(i) f(3),

..... [1]

(ii) gf(3).

..... [1]

(b) Find $g^{-1}(x)$.

$g^{-1}(x) =$ ..... [2]

(c) Find x when $h(x) = 2$.

$x =$ ..... [1]

(d) Find $g(x)g(x) - gg(x)$, giving your answer in the form $ax^2 + bx + c$.

..... [4]

(e) Find $\mathrm{hh}(x)$, giving your answer in its simplest form.

..... [1]

(f) Find $\mathrm{j}(5)$.

..... [1]

(g) Find x when $\mathrm{j}^{-1}(x) = 2$.

$x =$ ..... [1]

(h) $\mathrm{j}(x) = \mathrm{hg}(-12)$

Find the value of x.

$x =$ ..... [2]

43. Nov/2020/Paper_42/No.11

Sequence	1st term	2nd term	3rd term	4th term	5th term		*n*th term
A	13	9	5	1			
B	0	7	26	63			
C	$\frac{7}{8}$	$\frac{8}{16}$	$\frac{9}{32}$	$\frac{10}{64}$			

(a) Complete the table for the three sequences.

[10]

(b) One term in Sequence C is $\frac{p}{q}$.

Write down the next term in Sequence C in terms of p and q.

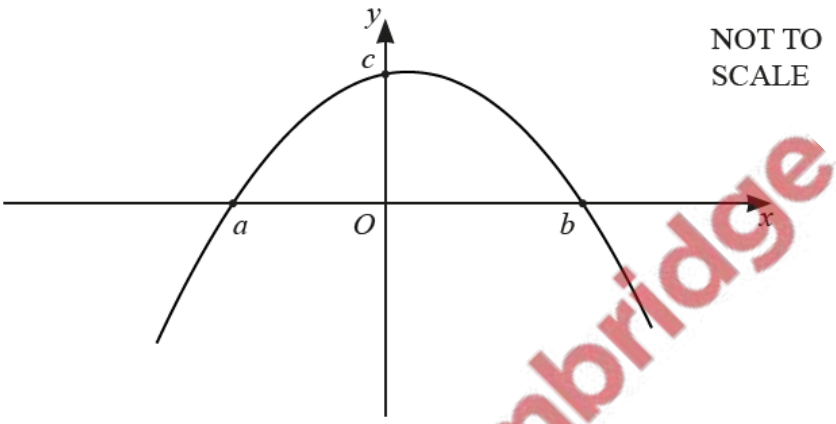
..... [2]

44. Nov/2020/Paper_43/No.7

(a) **(i)** Factorise $24+5x-x^2$.

..... [2]

(ii) The diagram shows a sketch of $y=24+5x-x^2$.



NOT TO SCALE

Work out the values of a, b and c.

$a =$ .....

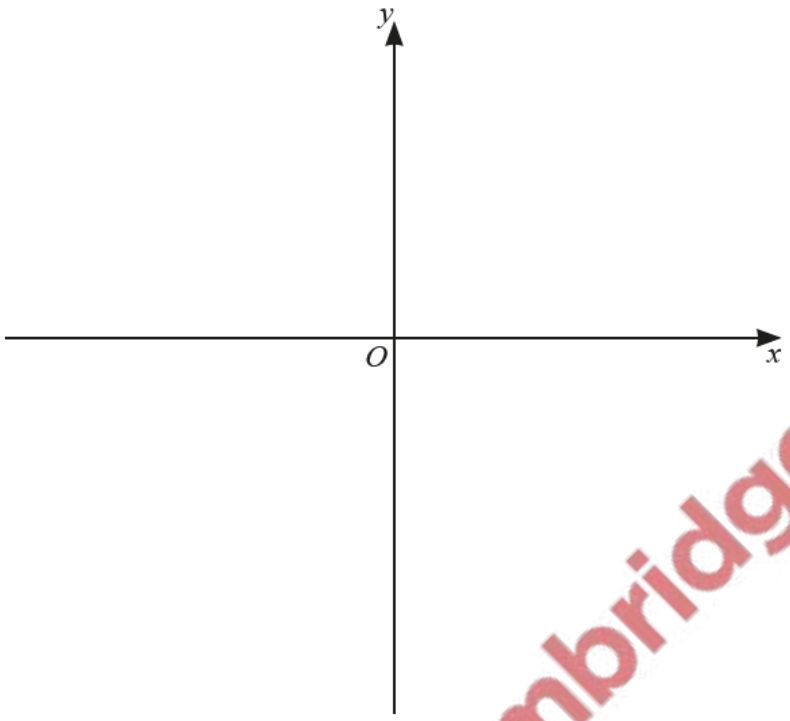
$b =$ .....

$c =$ ..... [3]

(iii) Calculate the gradient of $y=24+5x-x^2$ at $x=-1.5$.

..... [3]

(b) **(i)** On the diagram, sketch the graph of $y = (x+1)(x-3)^2$.
Label the values where the graph meets the x-axis and the y-axis.



[4]

(ii) Write $(x+1)(x-3)^2$ in the form ax^3+bx^2+cx+d.

..... [3]

45. Nov/2020/Paper_43/No.9

(a) Find the integer values that satisfy the inequality $2 < 2x \leqslant 10$.

..... [2]

(b) Factorise completely.

(i) $6y^2 - 15xy$

..... [2]

(ii) $y^2 - 9x^2$

..... [2]

(c) Simplify.

$$\frac{3}{x-1} - \frac{2}{2x+1}$$

..... [3]

(d) The straight line $y = 3x + 2$ intersects the curve $y = 2x^2 + 7x - 11$ at two points.

Find the coordinates of these two points.
Give your answers correct to 2 decimal places.

(..... , ...)

(..... , ...) [6]

46. Nov/2020/Paper_43/No.10

$f(x) = 4 - 3x$ $g(x) = x^2 + x$ $h(x) = 3^x$

(a) Find $fh(2)$.

..... [2]

(b) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(c) Simplify.

(i) $f(1 - 2x)$

..... [2]

(ii) $gf(x) - 9g(x)$

..... [4]

(d) $\frac{1}{\mathrm{h}(x)} = 9^{kx}$

Find the value of k.

$k =$ ..... [2]

47. Nov/2020/Paper_43/No.11

The table shows the first four terms in sequences A, B, and C.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	4	9	14	19			
B	3	10	29	66			
C	1	4	16	64			

Complete the table.

[9]

48. March/2020/Paper_12/No.16

(a) Simplify.

$5 \times x^0$

..... [1]

(b) $9^{12} \div 9^w = 9^4$

Find the value of w.

$w =$ ..... [1]

49. March/2020/Paper_12/No.18

(a) Factorise completely.

$3x^2 - 12xy$

..... [2]

(b) Expand and simplify.

$(m-3)(m+2)$

..... [2]

50. March/2020/Paper_22/No.9

(a) Factorise completely.

$3x^2 - 12xy$

..... [2]

(b) Expand and simplify.

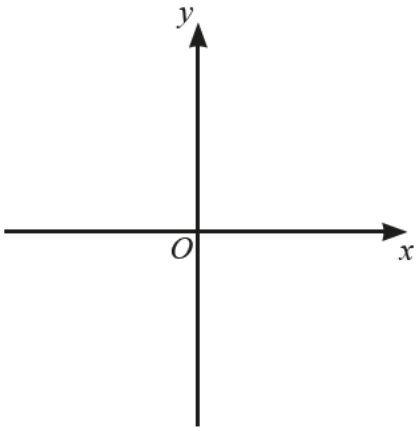
$(m-3)(m+2)$

..... [2]

51. March/2020/Paper_22/No.10

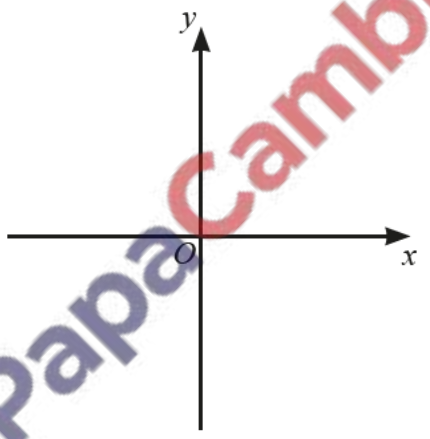
Sketch the graph of each function.

(a) $y = x - 3$



[1]

(b) $y = \frac{1}{x}$



[2]

52. March/2020/Paper_22/No.16

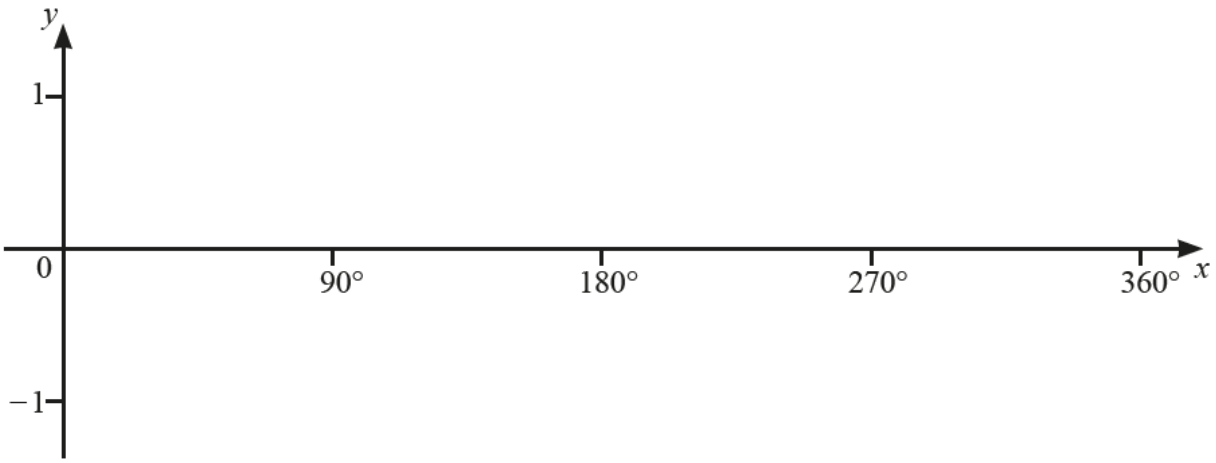
Solve the simultaneous equations.
You must show all your working.

$$x = 7 - 3y$$
$$x^2 - y^2 = 39$$

$x =$ ..... $y =$ .....

$x =$ ..... $y =$ ..... [6]

53. March/2020/Paper_22/No.19



(a) On the diagram, sketch the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$. [2]

(b) Solve the equation $4\cos x + 2 = 3$ for $0° \leqslant x \leqslant 360°$.

$x =$ ..... and $x =$ ..... [3]

54. March/2020/Paper_22/No.20

$$x^2 - 12x + a = (x + b)^2$$

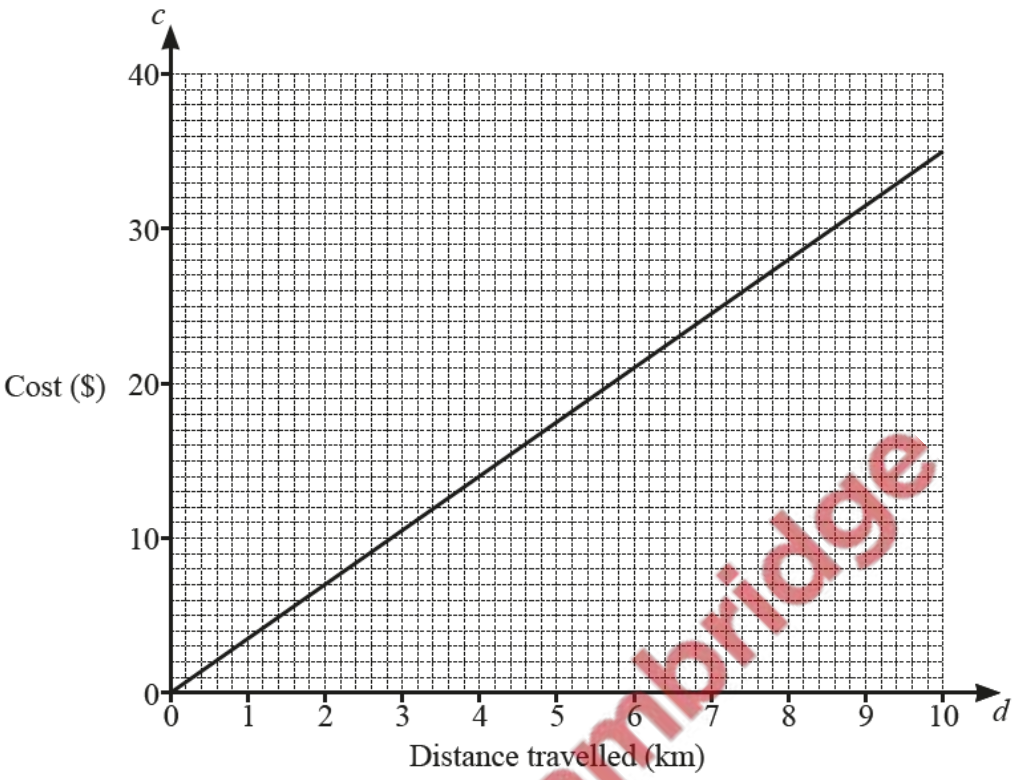
Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [2]

55. March/2020/Paper_32/No.5

(a)



(i) The graph shows the cost, $\$c$, of travelling a distance, d km, with *Saanvi's Taxis*.

(a) Write down the cost of a 4 km journey.

$ ..... [1]

(b) Complete this statement.

Saanvi's Taxis cost $ ..... for each kilometre travelled. [1]

(c) Find the equation of the line.

$c =$ ..... [1]

(ii) *Krishna's Taxis* cost \$5 to hire plus \$2 for each kilometre travelled.

(a) Show that the cost of a 4 km journey with *Krishna's Taxis* is \$13.

[1]

(b) Find an equation for the cost, $\$c$, of travelling d kilometres with *Krishna's Taxis*.

$c =$ ..... [2]

(c) On the grid, draw a line to show the cost of travelling with *Krishna's Taxis*. [2]

(d) Mrs Singh wants to hire a taxi.
She says that *Saanvi's Taxis* are always cheaper than *Krishna's Taxis*.

Is Mrs Singh correct?
Give a reason for your answer. Use your graph to help you.

..... because .....

..... [1]

(b) A minibus can be hired from *Dhruv's Minibuses*.
The cost is $\$h$ per hour plus $\$p$ per passenger.

(i) When the minibus is hired for 3 hours with 10 passengers the cost is \$61.

Complete the equation.

$3h + 10p =$ .....

[1]

(ii) When the minibus is hired for 5 hours with 8 passengers the cost is \$80.

Write this information as an equation.

..... = ...

[2]

(iii) Solve your two simultaneous equations to find h and p.
You must show all your working.

$h =$ .....

$p =$ ..... [4]

56. March/2020/Paper_32/No.8

The grid shows the first three diagrams in a sequence.

Each diagram is made using small squares that are white or grey.

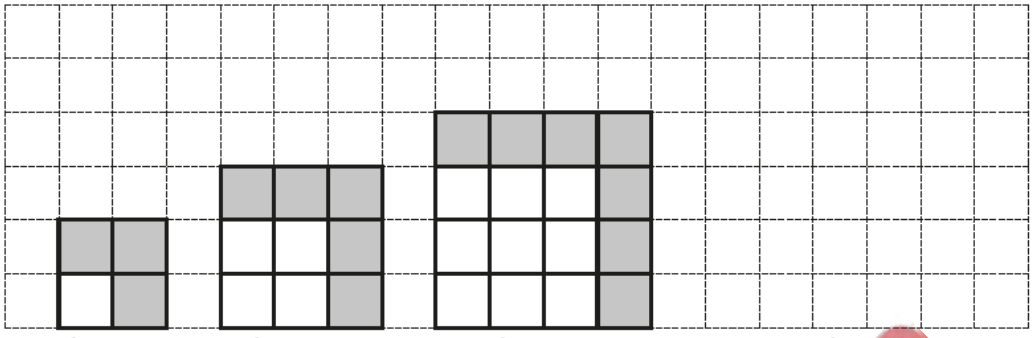


Diagram 1 Diagram 2 Diagram 3 Diagram 4

(a) On the grid, draw Diagram 4. [1]

(b) Write down the term to term rule for the number of grey squares.

..... [1]

(c)

Diagram number	1	2	3	4		n
Number of small white squares	1	4	9			
Number of small grey squares	3	5	7			
Total number of small squares	4	9	16			

Complete the table. [6]

(d) Work out the number of small white squares in Diagram 18.

..... [1]

(e) One of the diagrams has a total of 900 small squares.

Work out its Diagram number.

Diagram ..... [2]

(f) Another diagram has 43 small grey squares.

Work out the total number of small squares in this diagram.

..... [3]

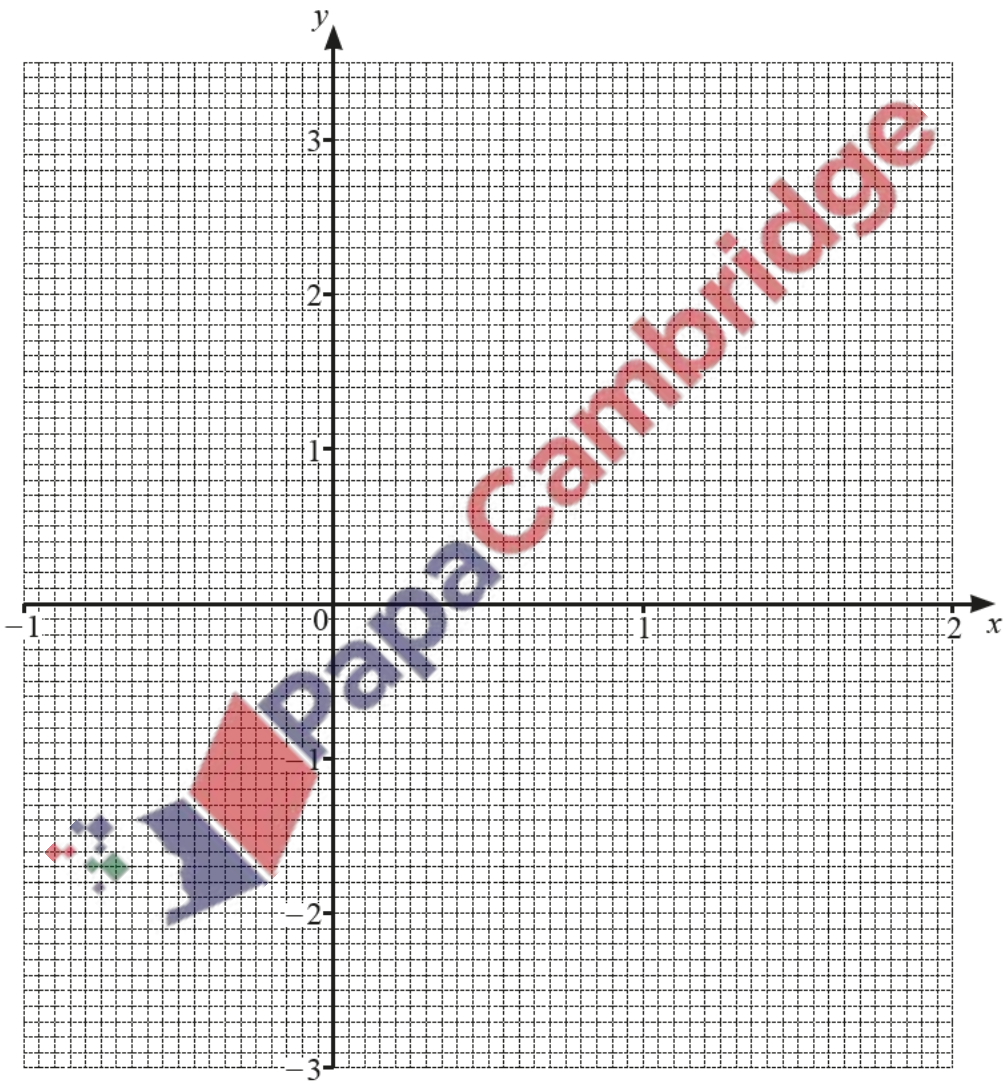
57. March/2020/Paper_42/No.2

(a) The table shows some values for $y = 2x^3 - 4x^2 + 3$.

x	-1	-0.5	0	0.5	1	1.5	2
y	-3	1.75				0.75	3

(i) Complete the table. [3]

(ii) On the grid, draw the graph of $y = 2x^3 - 4x^2 + 3$ for $-1 \leqslant x \leqslant 2$.



[4]

(iii) Use your graph to solve the equation $2x^3 - 4x^2 + 3 = 1.5$.

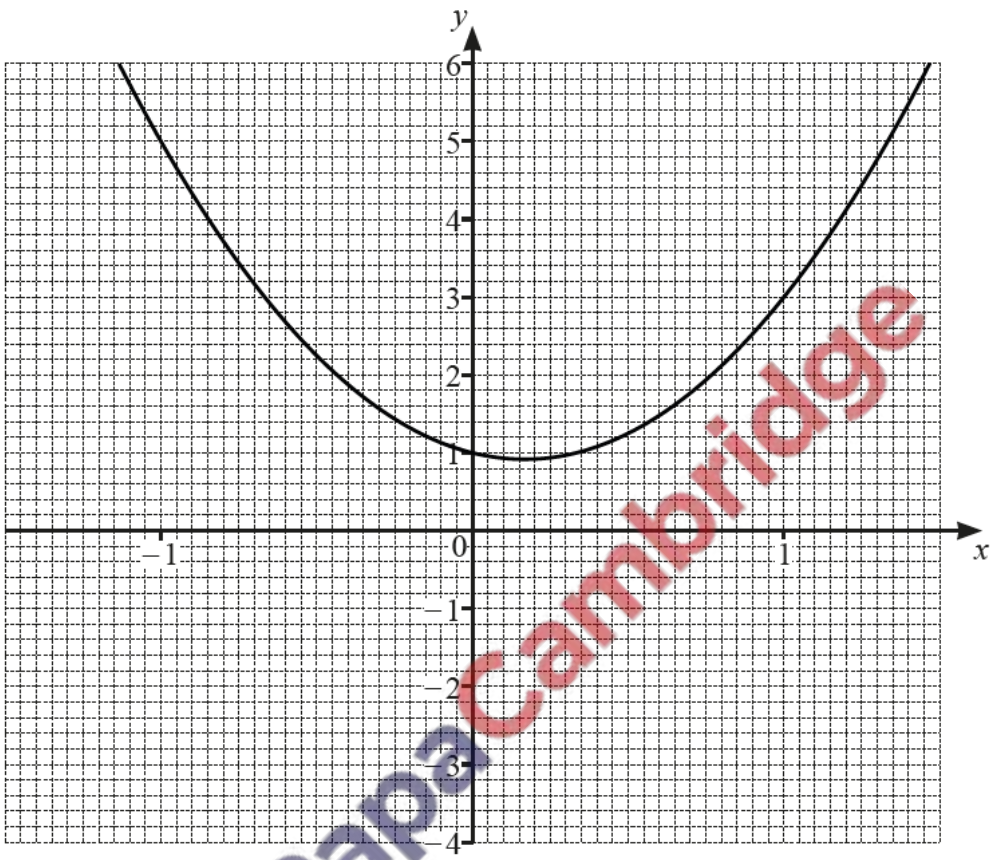
$x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(iv) The equation $2x^3 - 4x^2 + 3 = k$ has only one solution for $-1 \leqslant x \leqslant 2$.

Write down a possible integer value of k.

..... [1]

(b)



(i) On the grid, draw the tangent to the curve at $x = 1$. [1]

(ii) Use your tangent to estimate the gradient of the curve at $x = 1$.

..... [2]

(iii) Write down the equation of your tangent in the form $y = mx + c$.

$y =$ ..... [2]

58. March/2020/Paper_42/No.5

(a) Write as a single fraction in its simplest form.

$$\frac{x+3}{x-3} - \frac{x-2}{x+2}$$

..... [4]

(b) $2^{12} \div 2^{\frac{k}{2}} = 32$

Find the value of k.

$k =$ ..... [2]

(c) Expand and simplify.

$$(y+3)(y-4)(2y-1)$$

..... [3]

(d) Make x the subject of the formula.

$$x = \frac{3+x}{y}$$

$x =$ ..... [3]

59. March/2020/Paper_42/No.7

(a) Naga has n marbles.
Panav has three times as many marbles as Naga.
Naga loses 5 marbles and Panav buys 10 marbles.
Together they now have more than 105 marbles.

Write down and solve an inequality in n.

..... [3]

(b) y is inversely proportional to x^2.
When $x = 4$, $y = 7.5$.

Find y when $x = 5$.

$y =$ ..... [3]

(c) Find the nth term of each sequence.

(i) 4 2 0 −2 −4 ...

..... [2]

(ii) 1 7 17 31 49 …

..... [2]

60. March/2020/Paper_42/No.10

$f(x) = 4x - 1$ $g(x) = x^2$ $h(x) = 3^{-x}$

(a) Find in its simplest form

(i) $f(x-3)$,

..... [1]

(ii) $g(5x)$.

..... [1]

(b) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(c) Find the value of $hh(1)$, correct to 4 significant figures.

..... [3]

(d) **(i)** Show that $g(3x-2)-h(-3)$ can be written as $9x^2-12x-23$.

[2]

(ii) Use the quadratic formula to solve $9x^2-12x-23=0$.
Give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

(e) Find x when $f(61) = h(x)$.

$x =$ ..... [2]

61. March/2020/Paper_42/No.11

A curve has equation $y = x^3 - 3x + 4$.

(a) Work out the coordinates of the two stationary points.

(..... , ...)

(..... , ...) [5]

(b) Determine whether each stationary point is a maximum or a minimum.
Give reasons for your answers.

[3]

62. June/2020/Paper_11/No.12

(a) The nth term of a sequence is $60 - 8n$.

Find the largest number in this sequence.

..... [1]

(b) Here are the first five terms of a different sequence.

12 19 26 33 40

Find an expression for the nth term of this sequence.

..... [2]

63. June/2020/Paper_11/No.13

Factorise completely.

$$21a^2 + 28ab$$

..... [2]

64. June/2020/Paper_11/No.15

Simplify.

$$4p^5q^3 \times p^2q^{-4}$$

..... [2]

65. June/2020/Paper_11/No.17

Expand and simplify.

$$(x-5)(x-7)$$

..... [2]

66. June/2020/Paper_12/No.20

Simplify $8t^8 \div 4t^4$.

..... [2]

67. June/2020/Paper_13/No.6

Simplify.

$5w + 3h - 7w + 8h$

..... [2]

68. June/2020/Paper_13/No.14

Simplify.

(a) $p^2 \times p^4$

..... [1]

(b) $m^{15} \div m^5$

..... [1]

(c) $(k^3)^5$

..... [1]

69. June/2020/Paper_21/No.5

(a) The nth term of a sequence is $60 - 8n$.

Find the largest number in this sequence.

..... [1]

(b) Here are the first five terms of a different sequence.

12 19 26 33 40

Find an expression for the nth term of this sequence.

..... [2]

70. June/2020/Paper_21/No.9

Factorise completely.

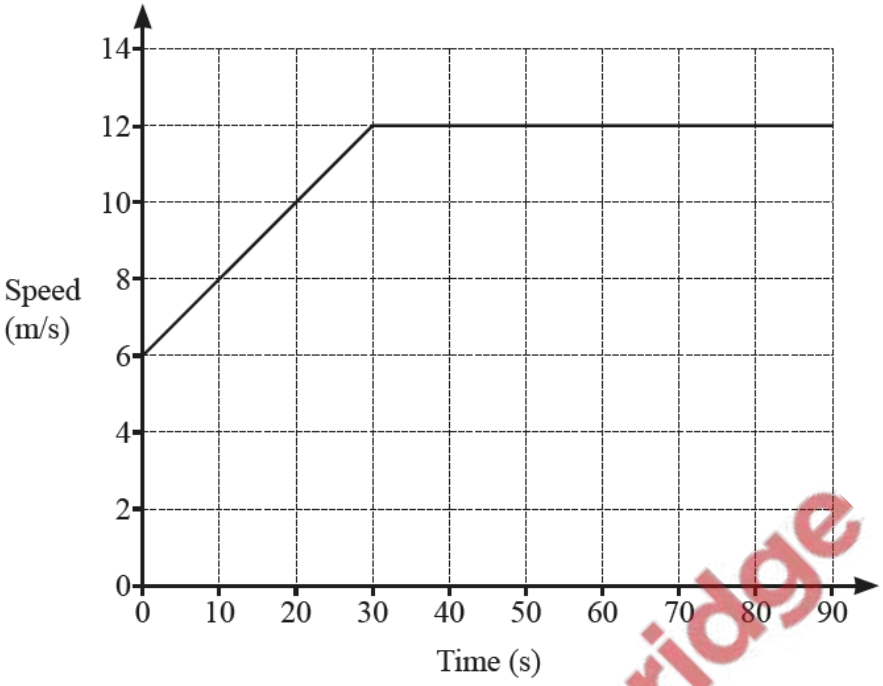
(a) $21a^2 + 28ab$

..... [2]

(b) $20x^2 - 45y^2$

..... [3]

71. June/2020/Paper_21/No.11



The diagram shows the speed–time graph for 90 seconds of a journey.

Calculate the total distance travelled during the 90 seconds.

..... m [3]

72. June/2020/Paper_21/No.14

(a) $f(x) = 4x+3$ $g(x) = 5x-4$

$fg(x) = 20x+p$

Find the value of p.

$p =$ ..... [2]

(b) $h(x) = \frac{5x-1}{3}$

Find $h^{-1}(x)$.

$h^{-1}(x) =$ ..... [3]

73. June/2020/Paper_21/No.20

The curve $y = x^2 - 2x + 1$ is drawn on a grid.
A line is drawn on the same grid.
The points of intersection of the line and the curve are used to solve the equation $x^2 - 7x + 5 = 0$.

Find the equation of the line in the form $y = mx + c$.

$y =$ ..... [1]

74. June/2020/Paper_21/No.21

Expand and simplify $(x+3)(x-5)(3x-1)$.

..... [3]

75. June/2020/Paper_22/No.10

Simplify.

$$\frac{p}{2q} \times \frac{4pq}{t}$$

..... [2]

76. June/2020/Paper_22/No.13

Simplify $8t^8 \div 4t^4$.

..... [2]

77. June/2020/Paper_22/No.14

Solve the equation.

$$\frac{1-x}{3} = 5$$

$x =$ ..... [2]

78. June/2020/Paper_22/No.19

Make y the subject of the formula.

$$h^2 = x^2 + 2y^2$$

$y =$ ..... [3]

79. June/2020/Paper_22/No.21

Simplify.

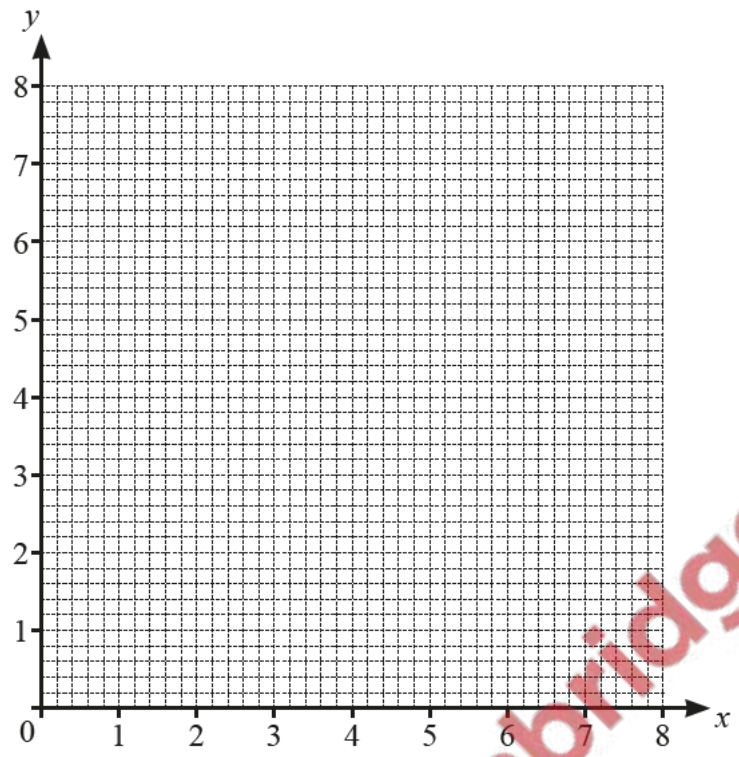
(a) $(5x^4)^3$

..... [2]

(b) $(256x^{256})^{\frac{3}{8}}$

..... [2]

80. June/2020/Paper_22/No.23



(a) By drawing suitable lines and shading unwanted regions, find the region, R, where

$x \geqslant 2, \quad y \geqslant x$ and $2x + y \leqslant 8$. [5]

(b) Find the largest value of $x + y$ in the region R.

..... [1]

81. June/2020/Paper_22/No.25

Simplify.

$$\frac{2x^2+x-15}{ax+3a-2bx-6b}$$

..... [5]

82. June/2020/Paper_22/No.26

$\sqrt[3]{y^2} = \sqrt[6]{x}$ and $y = \sqrt[n]{x}$.

Find the value of n.

$n =$ ..... [2]

83. June/2020/Paper_23/No.6

Simplify.

(a) $p^2 \times p^4$

..... [1]

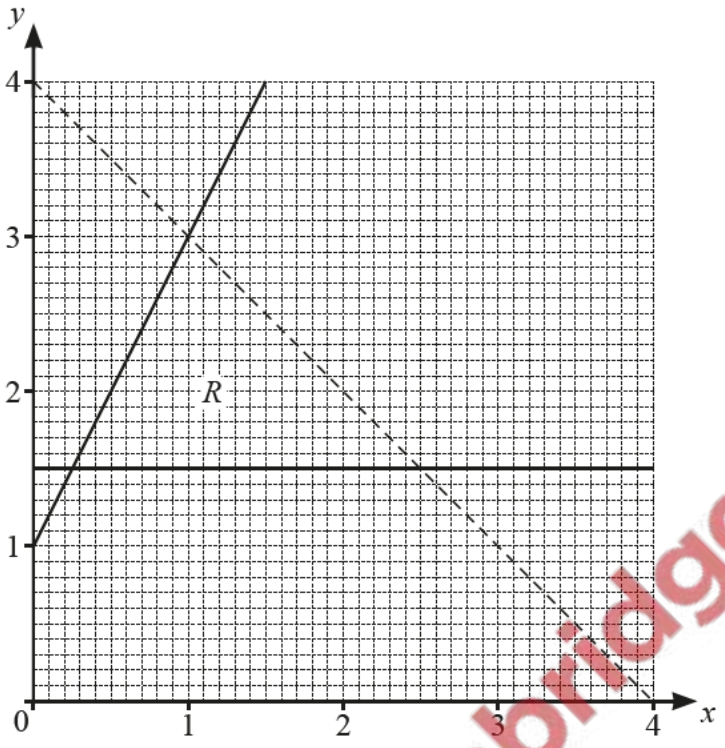
(b) $m^{15} \div m^5$

..... [1]

(c) $(k^3)^5$

..... [1]

84. June/2020/Paper_23/No.13



Write down the three inequalities that define the region R.

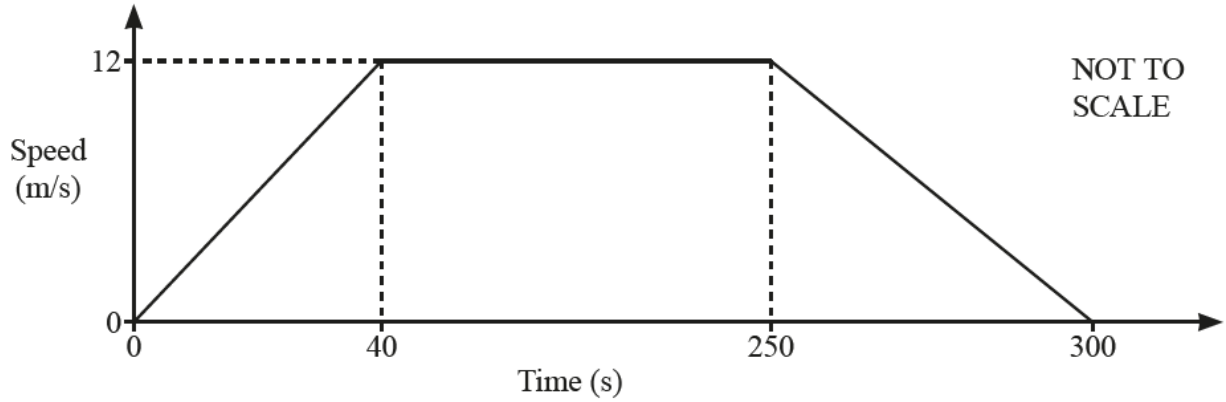
.....

.....

..... [4]

85. June/2020/Paper_23/No.14

The diagram shows the speed–time graph of a train journey between two stations.



(a) Find the acceleration of the train during the first 40 seconds.

..... m/s^2 [1]

(b) Calculate the distance between the two stations.

..... m [3]

86. June/2020/Paper_23/No.18

(a) Write $x^2 - 18x - 27$ in the form $(x+k)^2 + h$.

..... [2]

(b) Use your answer to **part (a)** to solve the equation $x^2 - 18x - 27 = 0$.

$x =$ ..... or $x =$ ..... [2]

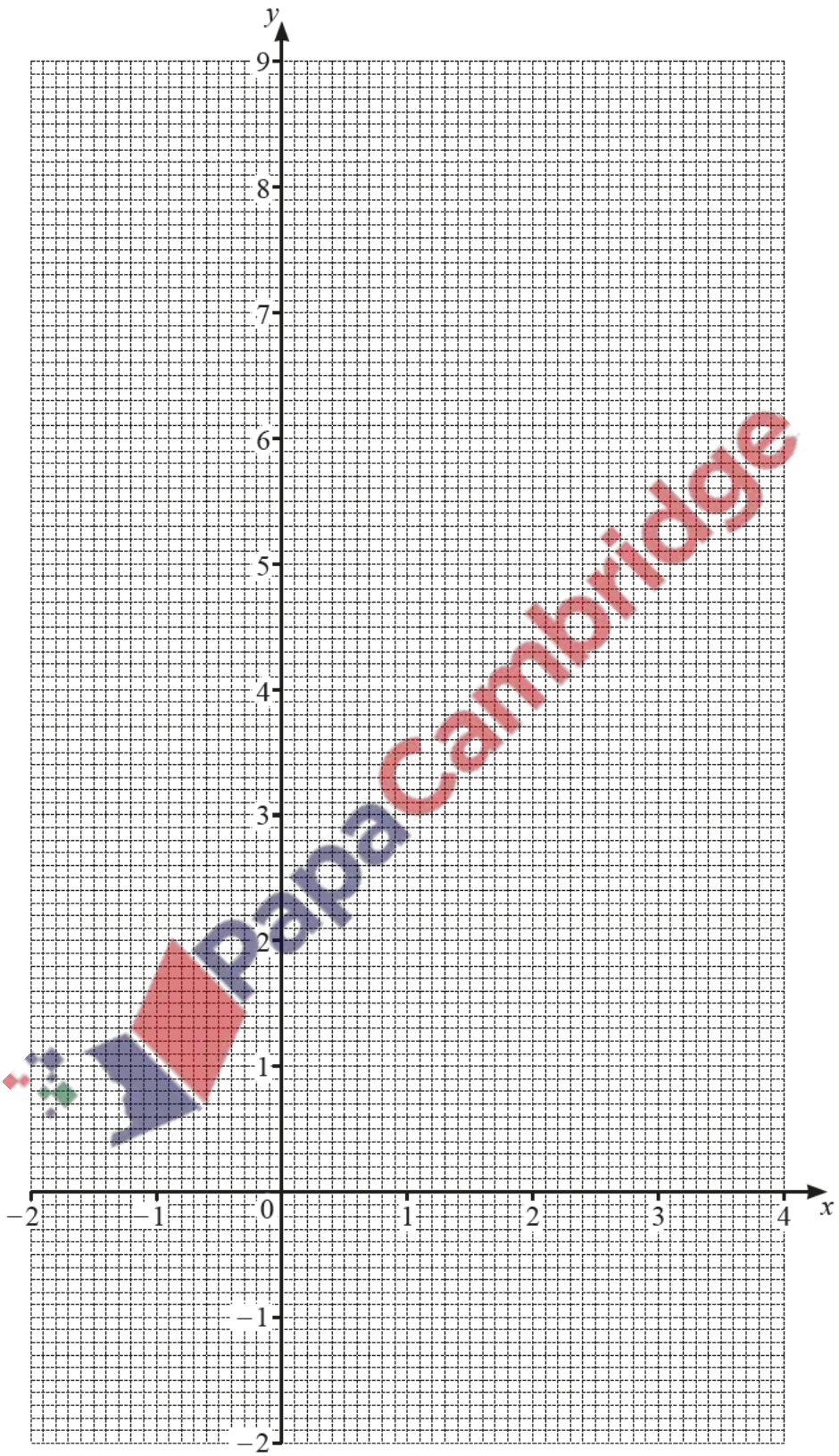
87. June/2020/Paper_31/No.4

(a) Complete the table of values for $y = 7 + 2x - x^2$.

x	-2	-1	0	1	2	3	4
y	-1			8	7		-1

[2]

(b) On the grid, draw the graph of $y = 7 + 2x - x^2$ for $-2 \leqslant x \leqslant 4$.



[4]

(c) Write down the equation of the line of symmetry of the graph.

..... [1]

(d) Use your graph to solve the equation $7+2x-x^2=0$.

$x =$ ..... or $x =$ ..... [2]

88. June/2020/Paper_31/No.8

(a) Simplify $3c-5d-c+2d$.

..... [2]

(b) Solve the equation $12x-7=23$.

$x =$ ..... [2]

(c) Multiply out.

$$9(3-x)$$

..... [1]

(d) $$A=\frac{(a+b)h}{2}$$

Work out the value of h when $A=38.64$, $a=5.5$ and $b=3.7$.

$h =$ ..... [3]

(e) Alphonse is x years old and Beatrice is y years old.
Three times Alphonse's age is equal to 5 times Beatrice's age.
Twice Beatrice's age is 4 years more than Alphonse's age.

(i) Use this information to write down two equations in x and y.

.....

..... [2]

(ii) Find the age of Alphonse and the age of Beatrice.

Alphonse ..... years old

Beatrice ..... years old [3]

89. June/2020/Paper_32/No.5

(a) $T = 3a^2b$

Find the value of T when $a = 4$ and $b = 5$.

$T =$ ..... [2]

(b) **(i)** Multiply out the brackets.

$x(3-5x)$

..... [2]

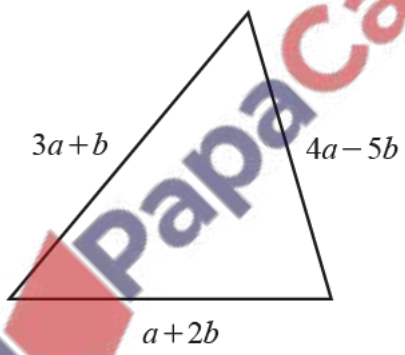
(ii) Factorise fully.

$5x - 20x^2$

..... [2]

(c)

NOT TO SCALE



Find an expression for the perimeter of this triangle.
Give your answer in its simplest form.

..... [3]

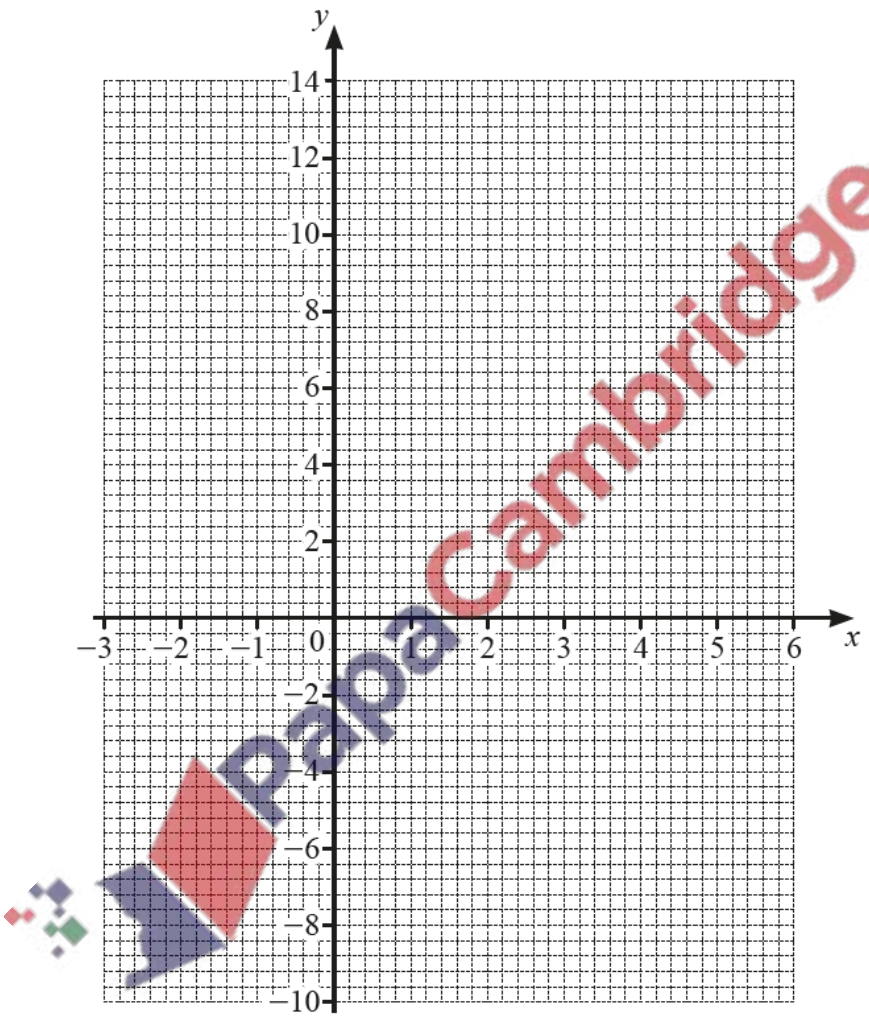
90. June/2020/Paper_32/No.9

(a) Complete the table of values for $y = x^2 - 3x - 6$.

x	−3	−2	−1	0	1	2	3	4	5	6
y	12		−2					−2		12

[3]

(b) On the grid, draw the graph of $y = x^2 - 3x - 6$ for $-3 \leqslant x \leqslant 6$.



[4]

(c) Write down the equation of the line of symmetry of the graph.

..... [1]

(d) Use your graph to solve the equation $x^2 - 3x - 6 = 0$.

$x =$ ..... or $x =$ ..... [2]

91. June/2020/Paper_32/No.10

(a) Solve these equations.

(i) $5x = -30$

$x =$ ..... [1]

(ii) $4x - 2 = 28$

$x =$ ..... [2]

(iii) $3(2x + 7) = 12$

$x =$ ..... [3]

(b) Solve the simultaneous equations.
You must show all your working.

$$5x - 2y = 44$$
$$2x + 3y = 10$$

$x =$ .....

$y =$ ..... [4]

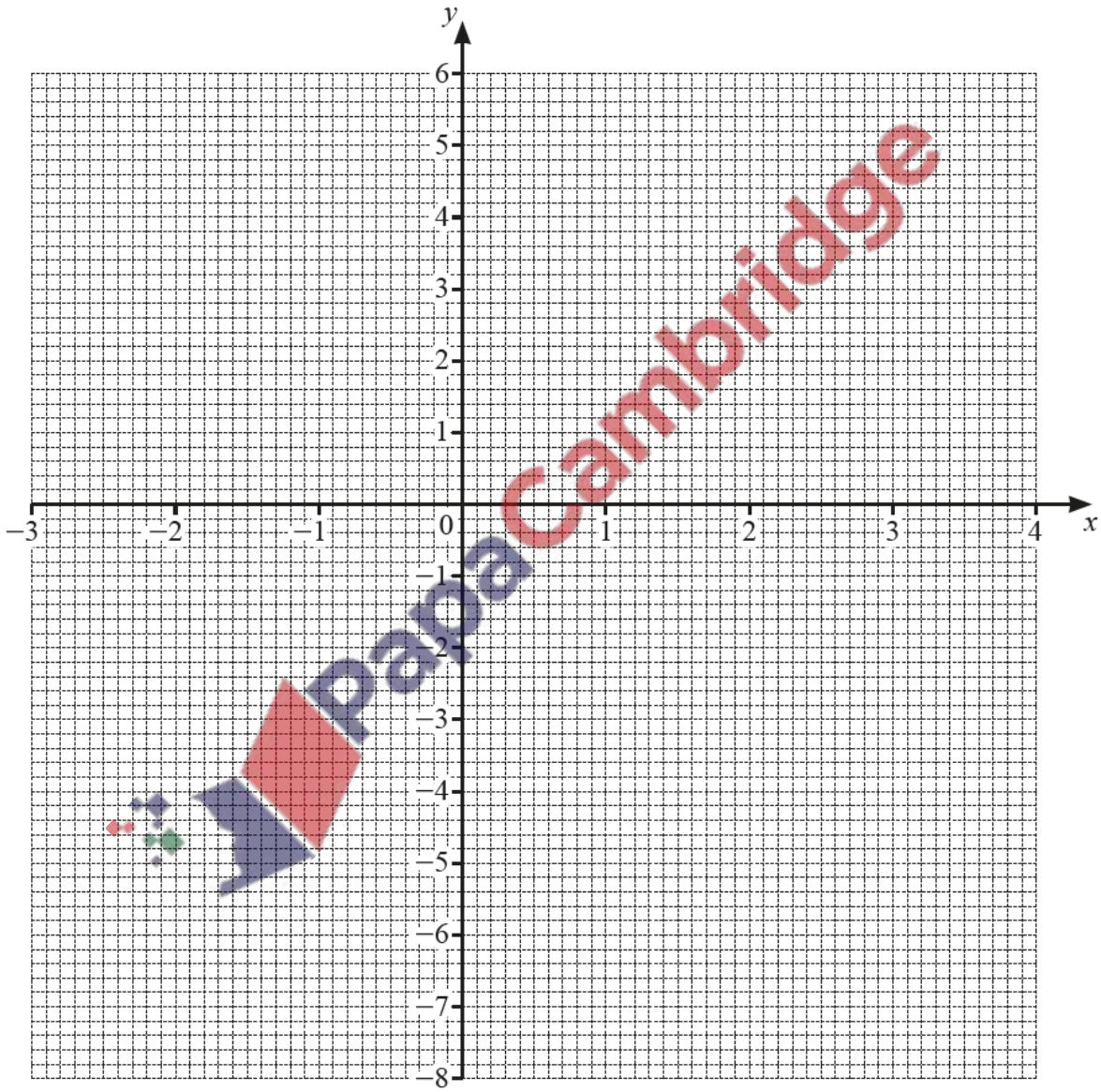
92. June/2020/Paper_33/No.8

(a) Complete the table of values for $y = -x^2 + x + 5$.

x	-3	-2	-1	0	1	2	3	4
y		-1	3			3		

[3]

(b) On the grid, draw the graph of $y = -x^2 + x + 5$ for $-3 \leqslant x \leqslant 4$.



[4]

(c) Write down the coordinates of the highest point of the graph.

(..... , ...) [1]

(d) Write down the equation of the line of symmetry of the graph.

..... [1]

(e) **(i)** On the grid, draw the line $y = x$ for $-3 \leqslant x \leqslant 4$. [1]

(ii) Write down the values of x where the line $y = x$ crosses the curve $y = -x^2 + x + 5$.

$x =$ ..... and $x =$ ..... [2]

93. June/2020/Paper_41/No.3

(a) $s = ut + \frac{1}{2}at^2$

Find the value of s when $u = 5.2$, $t = 7$ and $a = 1.6$.

$s =$ ..... [2]

(b) Simplify.

(i) $3a - 5b - a + 2b$

..... [2]

(ii) $\frac{5}{3x} \times \frac{9x}{20}$

..... [2]

(c) Solve.

(i) $\frac{15}{x} = -3$

$x =$ ..... [1]

(ii) $4(5 - 3x) = 23$

$x =$ ..... [3]

(d) Simplify.

$$(27x^9)^{\frac{2}{3}}$$

..... [2]

(e) Expand and simplify.

$$(3x - 5y)(2x + y)$$

..... [2]

94. June/2020/Paper_41/No.6

Raheem makes baskets and mats.
Each week he makes x baskets and y mats.

He makes fewer than 10 mats.
The number of mats he makes is greater than or equal to the number of baskets he makes.

(a) One of the inequalities that shows this information is $y < 10$.

Write down the other inequality.

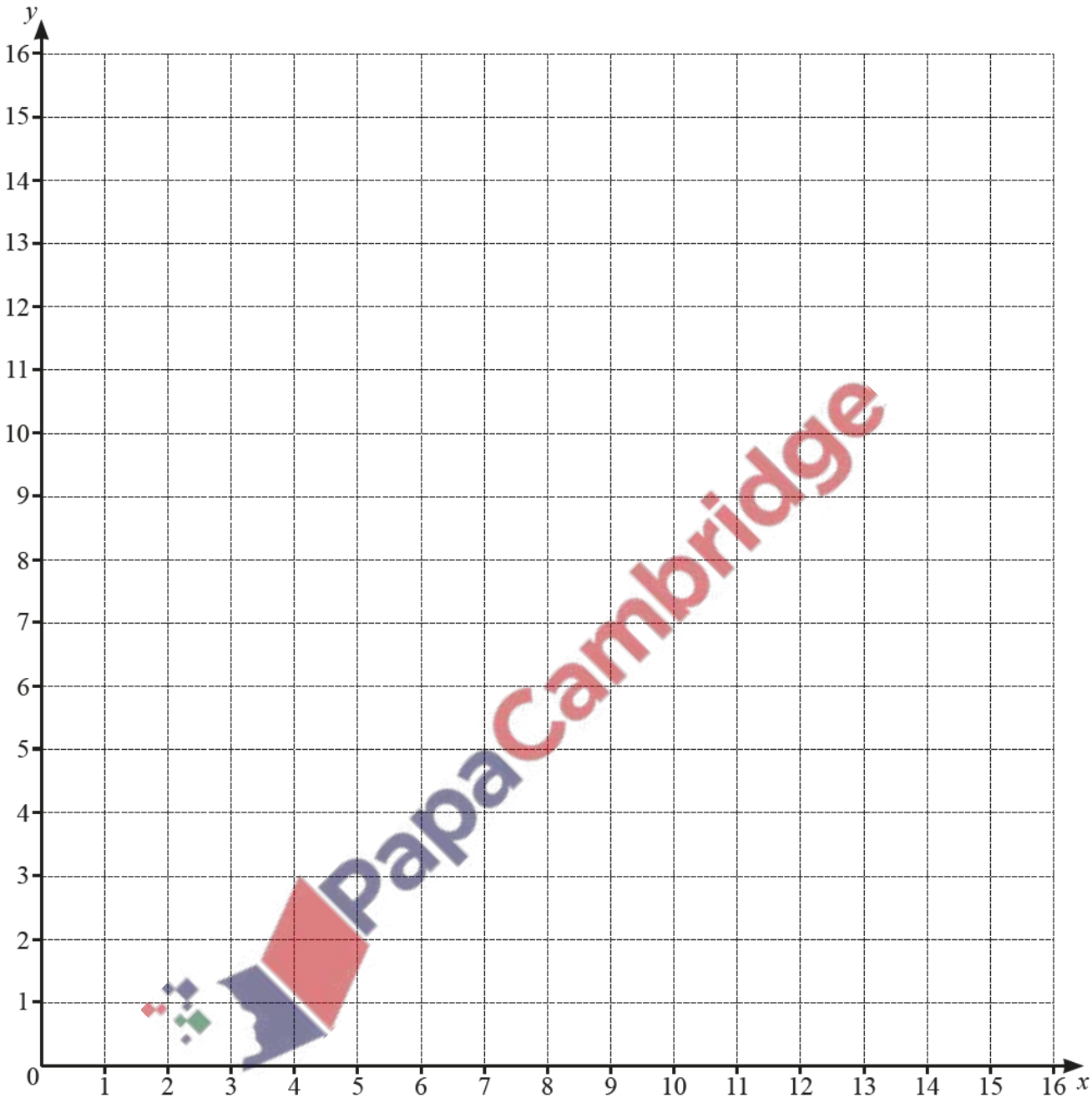
..... [1]

(b) He takes $2\frac{1}{4}$ hours to make a basket and $1\frac{1}{2}$ hours to make a mat.
Each week he works for a maximum of 22.5 hours.

Show that $3x + 2y \leqslant 30$.

[2]

(c) On the grid, draw three straight lines and shade the **unwanted** regions to show these inequalities.



[5]

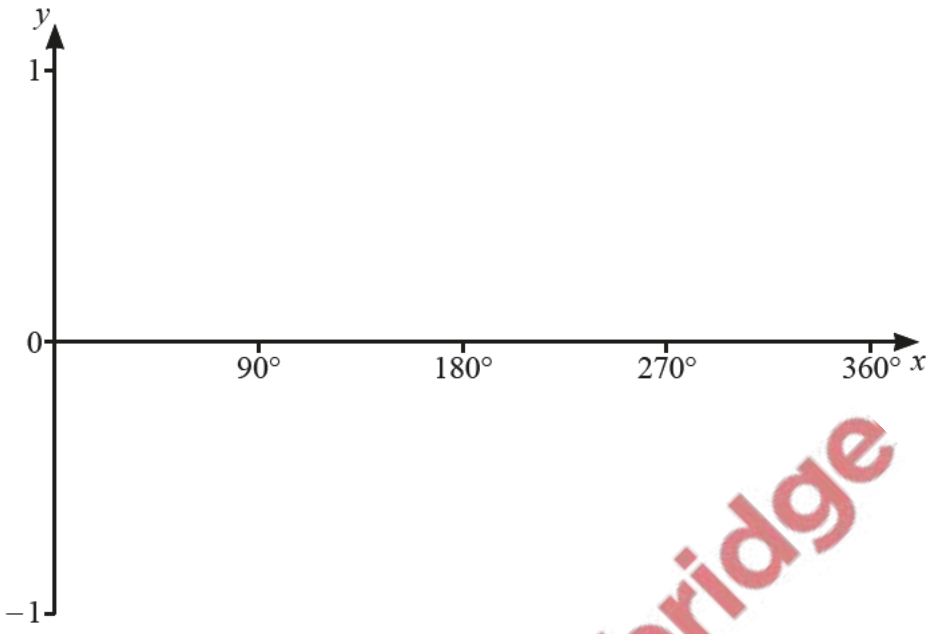
(d) He makes \$40 profit on each basket he sells and \$28 profit on each mat he sells.

Calculate the maximum profit he can make each week.

\$ ..... [2]

95. June/2020/Paper_41/No.8

(a) **(i)** On the axes, sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.



[2]

(ii) Describe fully the symmetry of the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.

.....

..... [2]

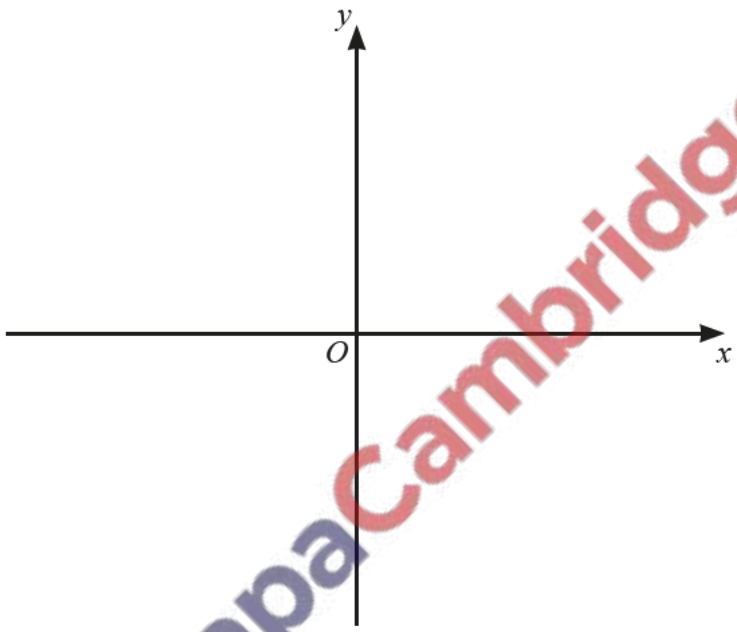
(b) Solve $4\sin x - 1 = 2$ for $0° \leqslant x \leqslant 360°$.

$x =$ ..... and $x =$ ..... [3]

(c) **(i)** Write $x^2 + 10x + 14$ in the form $(x+a)^2 + b$.

..... [2]

(ii) On the axes, sketch the graph of $y = x^2 + 10x + 14$, indicating the coordinates of the turning point.



[3]

96. June/2020/Paper_41/No.10b

(b) A curve has the equation $y = x^3 + 8x^2 + 5x$.

(i) Work out the coordinates of the two turning points.

(..... , ...) and (..... , ...) [6]

(ii) Determine whether each of the turning points is a maximum or a minimum.
Give reasons for your answers.

[3]

97. June/2020/Paper_42/No.6

$f(x) = 3x+2$ $g(x) = x^2+1$ $h(x) = 4^x$

(a) Find h(4).

..... [1]

(b) Find fg(1).

..... [2]

(c) Find gf(x) in the form ax^2+bx+c.

..... [3]

(d) Find x when $f(x) = g(7)$.

$x =$ ..... [2]

(e) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(f) Find $\dfrac{g(x)}{f(x)} + x$.

Give your answer as a single fraction, in terms of x, in its simplest form.

..... [3]

(g) Find x when $h^{-1}(x) = 2$.

$x =$ ..... [1]

98. June/2020/Paper_42/No.9

(a) (i) Write x^2+8x-9 in the form $(x+k)^2+h$.

..... [2]

(ii) Use your answer to **part (a)(i)** to solve the equation $x^2+8x-9=0$.

$x =$ ..... or $x =$ ..... [2]

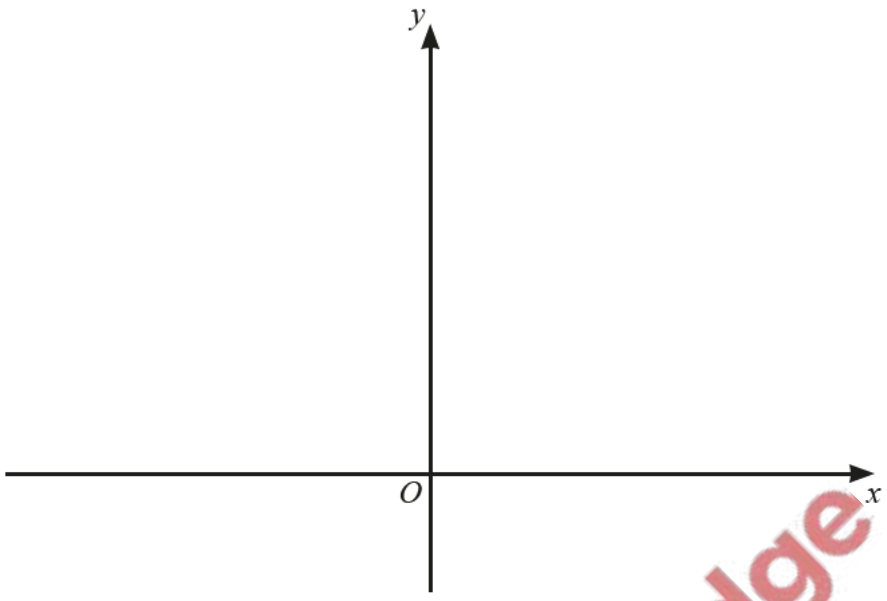
(b) The solutions of the equation $x^2+bx+c=0$ are $\frac{-7+\sqrt{61}}{2}$ and $\frac{-7-\sqrt{61}}{2}$.

Find the value of b and the value of c.

$b =$ .....

$c =$ ..... [3]

(c) **(i)**



On the diagram,

(a) sketch the graph of $y = (x-1)^2$, [2]

(b) sketch the graph of $y = \frac{1}{2}x + 1$. [2]

(ii) The graphs of $y = (x-1)^2$ and $y = \frac{1}{2}x + 1$ intersect at A and B.

Find the length of AB.

$AB =$ ..... [7]

99. June/2020/Paper_42/No.10

(a) $y = x^4 - 4x^3$

(i) Find the value of y when $x = -1$.

$y =$ ..... [2]

(ii) Find the two stationary points on the graph of $y = x^4 - 4x^3$.

(..... , ...)

(..... , ...) [6]

(b) $y = x^p + 2x^q$

$\frac{dy}{dx} = 11x^{10} + 10x^4$, where $\frac{dy}{dx}$ is the derived function.

Find the value of p and the value of q.

$p =$ .....

$q =$ ..... [2]

100. June/2020/Paper_43/No.4

(a) Solve the inequality.

$$3m+12 \leqslant 8m-5$$

..... [2]

(b) Solve the equation. $\dfrac{2x+5}{3-x} = \dfrac{14}{15}$

$x =$ ..... [3]

(c) Solve the simultaneous equations.
You must show all your working.

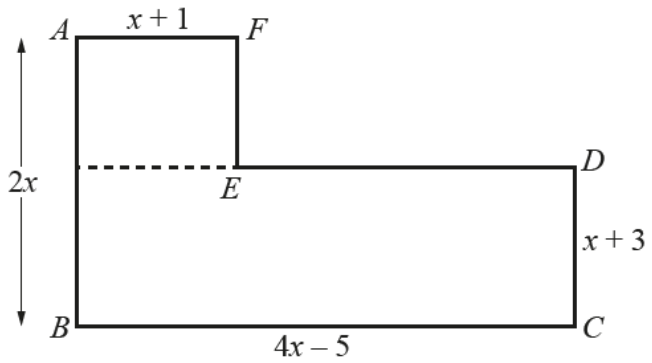
$$y = 4 - x$$
$$x^2 + 2y^2 = 67$$

$x =$ ..... , $y =$ .....

$x =$ ..... , $y =$ ..... [6]

101. June/2020/Paper_43/No.5

All the lengths in this question are in centimetres.



NOT TO SCALE

The diagram shows a shape $ABCDEF$ made from two rectangles.
The total area of the shape is $342\,\text{cm}^2$.

(a) Show that $x^2 + x - 72 = 0$.

[5]

(b) Solve by factorisation.

$x^2 + x - 72 = 0$

$x =$ ..... or $x =$ ..... [3]

(c) Work out the perimeter of the shape *ABCDEF*.

..... cm [2]

(d) Calculate angle *DBC*.

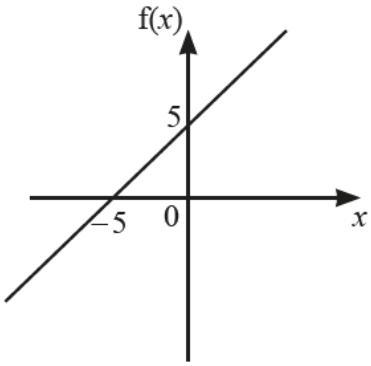
Angle *DBC* = ... [2]

102. June/2020/Paper_43/No.10

(a) The diagrams show the graphs of two functions.

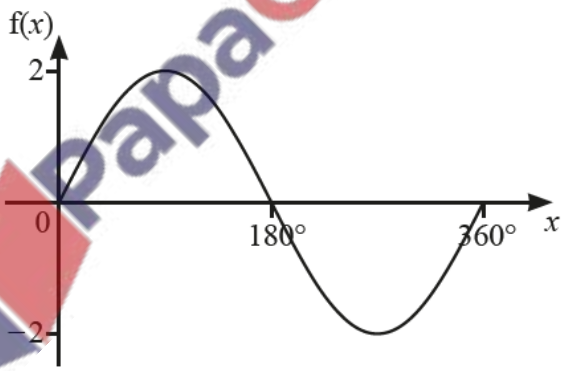
Write down each function.

(i)



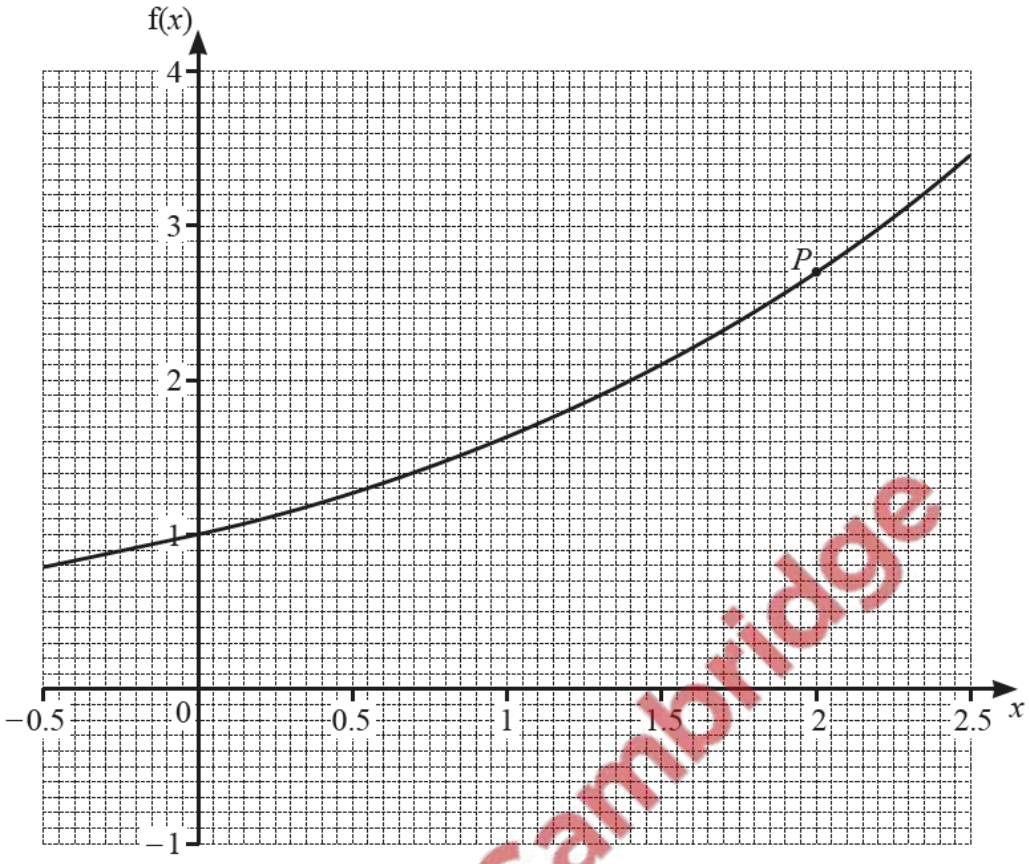
f(x) = ... [2]

(ii)



f(x) = ... [2]

(b)



The diagram shows the graph of another function.

By drawing a suitable tangent, find an estimate for the gradient of the function at the point P.

..... [3]

103. June/2020/Paper_43/No.11

$f(x) = 7x - 4$ $\quad$ $g(x) = \frac{2x}{x-3}$, $x \neq 3$ $\quad$ $h(x) = x^2$

(a) Find $g(6)$.

..... [1]

(b) Find $fg(4)$.

..... [2]

(c) Find $fh(x)$.

..... [1]

(d) Find $\frac{f(x)}{2} + g(x)$.

Give your answer as a single fraction, in terms of x, in its simplest form.

..... [3]

(e) Find the value of x when $f(x+2) = -11$.

$x =$ ..... [2]

(f) Find the values of p that satisfy $h(p) = p$.

..... [2]

104. June/2020/Paper_43/No.12

(a) A curve has equation $y = 4x^3 - 3x + 3$.

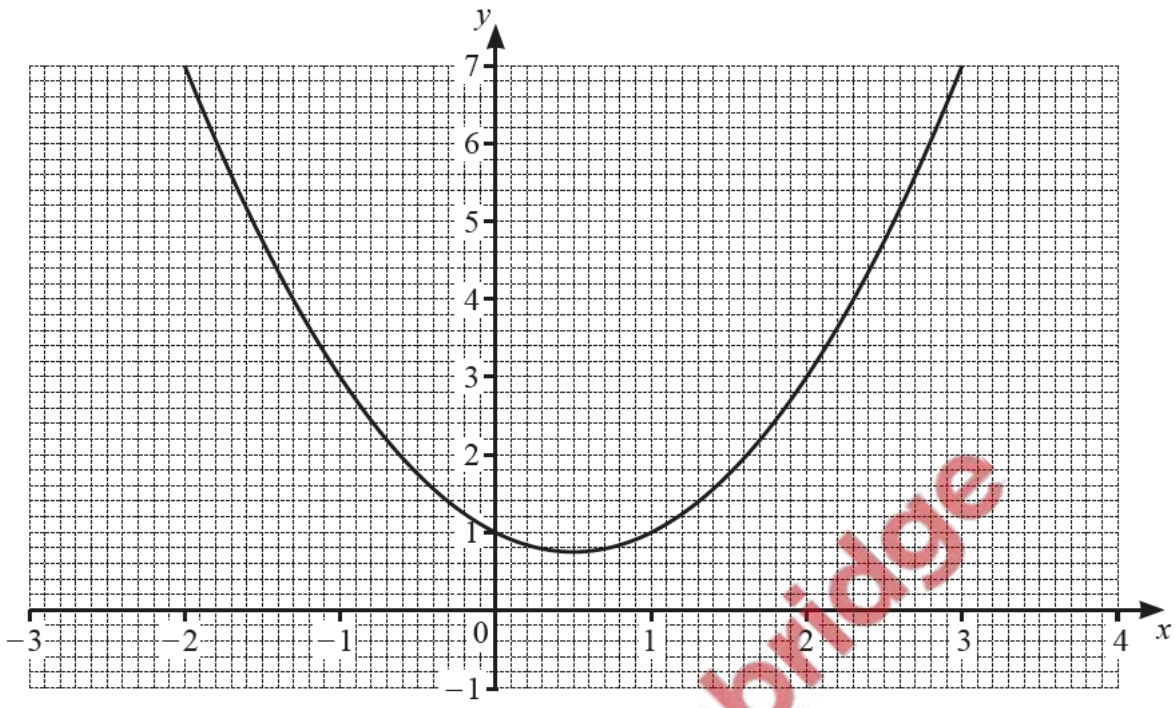
(i) Find the coordinates of the two stationary points.

(..... , ...) and (..... , ...) [5]

(ii) Determine whether each of the stationary points is a maximum or a minimum.
Give reasons for your answers.

[3]

(b) The graph of $y = x^2 - x + 1$ is shown on the grid.



By drawing a suitable line on the grid, solve the equation $x^2 - 2x - 2 = 0$.

$x =$ ..... or $x =$ ..... [3]