Chapter 2

Algebra and graphs

01. 0580_m24_qp_22 Q: 3

Simplify $4m+7k-m+3k$.

..... [2]

---

02. 0580_m24_qp_22 Q: 8

(a) The nth term of a sequence is n^2-3.

Find the first three terms of this sequence.

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

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

1 3 9 27 81

Find the nth term of this sequence.

..... [2]

---

03 . 0580_m24_qp_22 Q: 18

Find the highest common factor (HCF) of $28x^5$ and $98x^3$.

..... [2]

---

04 . 0580_m24_qp_22 Q: 21

(a) $\sqrt[5]{3} = 3^h$

Write down the value of h.

$h =$ ..... [1]

(b) Simplify $\left(4x^3\right)^3$.

..... [2]

---

05 . 0580_m24_qp_22 Q: 22

y is inversely proportional to the square of $(x+3)$.
When $x = 5,\ y = 0.375$.

Find y in terms of x.

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

---

06 . 0580_m24_qp_22 Q: 24

$x^2 - 16x + a$ can be written in the form $(x+b)^2$.

Find the value of a and the value of b.

$a =$ .....

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

---

07 . 0580_s24_qp_21 Q: 3

The table shows some information about two sequences.

	nth term	5th term
Sequence A	$60 - 4n$	
Sequence B	$n^2 - 300$	

(a) Complete the table.

[2]

(b) Find the smallest **positive** number in sequence B.

..... [2]

---

08 . 0580_s24_qp_21 Q: 8

These are the first five terms of a sequence.

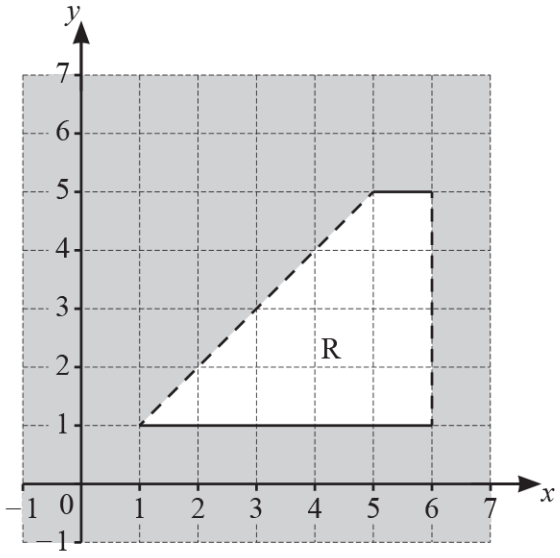
11 18 25 32 39

Find an expression for the nth term of the sequence.

..... [2]

---

09 . 0580_s24_qp_21 Q: 11



Find the inequalities that define the unshaded region, R.

..... [4]

10. 0580_s24_qp_21 Q: 12

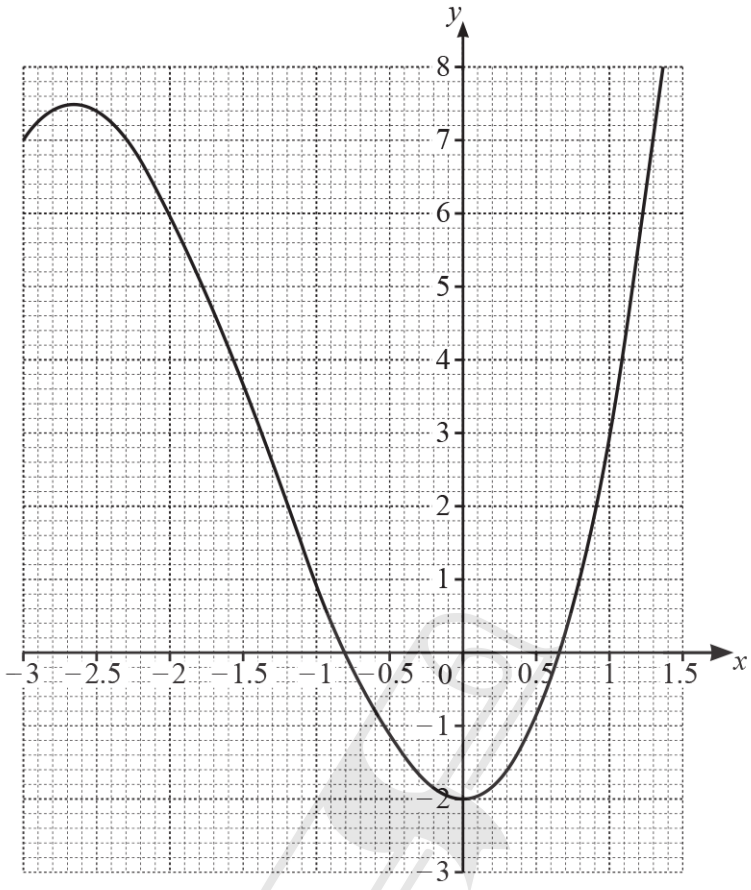
Solve the simultaneous equations.
You must show all your working.

$$\frac{3x}{2} + 5y = 5$$
$$4x - 3y = 46$$

$x =$ .....

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

11. 0580_s24_qp_21 Q: 18



The diagram shows the graph of $y = x^3 + 4x^2 - 2$ for $-3 \leqslant x \leqslant 1.5$.

By drawing a suitable straight line, solve the equation $x^3 + 4x^2 - 2 = 2x$ for $-3 \leqslant x \leqslant 1.5$.

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

12. 0580_s24_qp_21 Q: 19

Factorise completely.

(a) $12m^2 - 75t^2$

..... [3]

(b) $xy + 15 + 3y + 5x$

..... [2]

---

13. 0580_s24_qp_22 Q: 19

(a) y is directly proportional to $(x-1)^2$.
When $x = 4$, $y = 3$.

Find y when $x = 7$.

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

(b) m is inversely proportional to the square root of p.

Explain what happens to the value of m when the value of p is multiplied by 9.

..... [1]

---

14. 0580_s24_qp_22 Q: 21

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

$$4y + 3x = 13$$
$$y = x^2 - 18$$

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

or $x =$ ..... $y =$ ..... [5]

---

15. 0580_s24_qp_23 Q: 3

Simplify.

$$7x - 8y - x - y$$

..... [2]

---

16. 0580_s24_qp_23 Q: 6

Factorise completely.

$$4x^2y - 5xy^2$$

..... [2]

---

17. 0580_s24_qp_23 Q: 11

Solve the simultaneous equations.

$$5t - 2w = 19$$
$$3t + 2w = 5$$

$t =$ .....

$w =$ ..... [2]

---

18. 0580_s24_qp_23 Q: 12

Simplify.

(a) $\dfrac{32g^{16}}{16g^{8}}$

..... [2]

(b) $\left(625k^{8}\right)^{\frac{3}{4}}$

..... [2]

---

19. 0580_s24_qp_23 Q: 16

$$A = \pi r^2 + \pi dh$$

Rearrange the formula to make h the subject.

$h =$ ..... [2]

---

20. 0580_s24_qp_23 Q: 20

$f(x) = 3^x + 2$

(a) Find x when $f(x) = 245$.

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

(b) Find x when $f^{-1}(x) = 7$.

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

---

21. 0580_s24_qp_23 Q: 23

Simplify.

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

Give your answer as a single fraction in its simplest form.

..... [3]

---

22. 0580_s24_qp_23 Q: 25

Simplify.

$$\frac{pt-p-t+1}{1-t^2}$$

..... [4]

---

23. 0580_m23_qp_22 Q: 4

23, 17, 11, 5, ...

(a) Write down the next number in this sequence.

..... [1]

(b) Find the nth term of this sequence.

..... [2]

---

24. 0580_m23_qp_22 Q: 5

Factorise completely.

$$8g-2g^2$$

..... [2]

---

25. 0580_m23_qp_22 Q: 7

Solve.

(a) $15t+8=4-t$

$t =$ ..... [2]

(b) $\frac{25-2u}{3}=2$

$u =$ ..... [2]

---

26. 0580_m23_qp_22 Q: 9

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

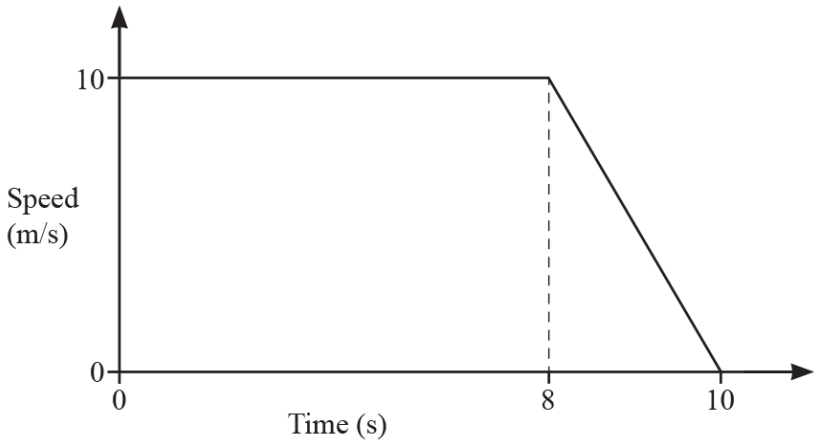
$$3x-2y=19$$
$$x+y=3$$

$x =$ .....

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

---

27. 0580_m23_qp_22 Q: 13



NOT TO
SCALE

The diagram shows the speed–time graph for part of a car journey.

Calculate the total distance travelled during the 10 seconds.

..... m [2]

28. 0580_m23_qp_22 Q: 15

Simplify $\left(3125w^{3125}\right)^{\frac{1}{5}}$.

..... [2]

29. 0580_m23_qp_22 Q: 16

y is inversely proportional to x^2.
When $x = 3$, $y = 2$.

Find y when $x = 2$.

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

---

30. 0580_m23_qp_22 Q: 19

Find the values of x when $6x + y = 10$ and $y = x^2 - 3x + 10$.

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

---

31. 0580_m23_qp_22 Q: 20

Find the nth term of each sequence.

(a) –1, 0, 7, 26, 63, …

..... [2]

(b) 24, 12, 6, 3, 1.5, …

..... [2]

---

32. 0580_m23_qp_22 Q: 23

Simplify.

$$\frac{5x^2 - 19x + 12}{x^2 - 9}$$

..... [4]

---

33. 0580_m23_qp_22 Q: 25

$f(x) = x^3 + 1$

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

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

---

34. 0580_s23_qp_21 Q: 8

(a) The nth term of a sequence is $10 - n^2$.

Write down the first three terms of this sequence.

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

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

7 10 13 16

Find an expression for the nth term of this sequence.

..... [2]

---

35. 0580_s23_qp_21 Q: 14

y is directly proportional to the square of $(x + 3)$.
When $x = 2$, $y = 5$.

Find y when $x = 1$.

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

---

36. 0580_s23_qp_21 Q: 17

Simplify $\left(81x^{12}\right)^{\frac{3}{4}}$.

..... [2]

---

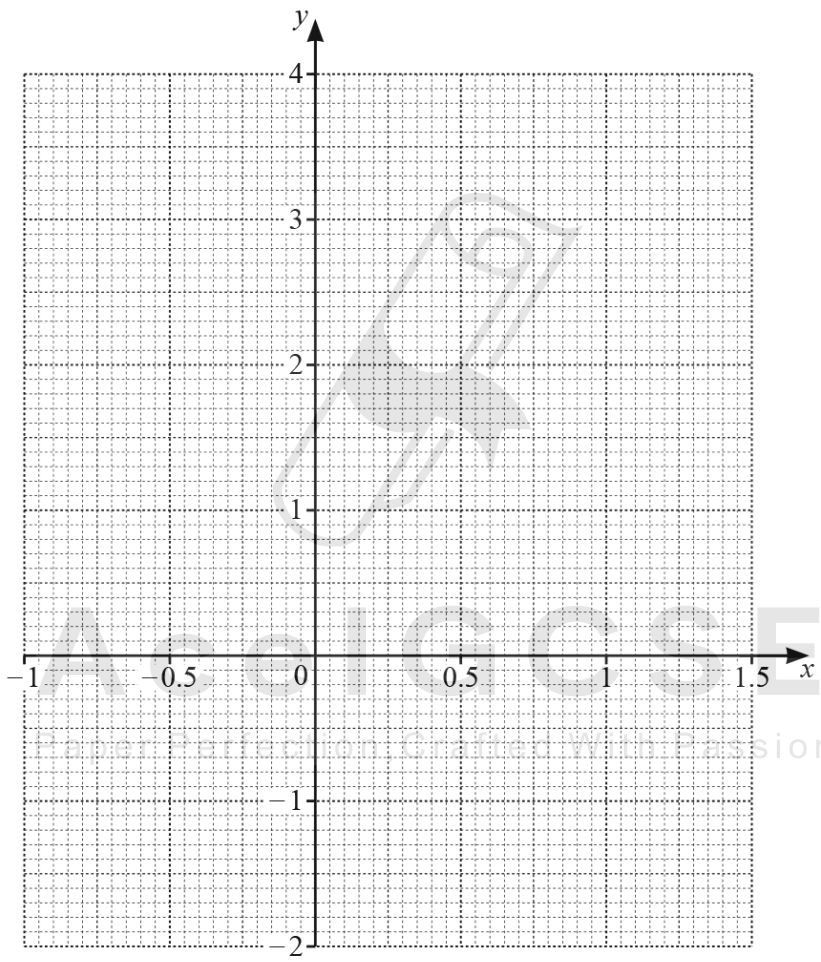
37. 0580_s23_qp_21 Q: 20

The table shows some values for $y = 3x^2 - 2x - 1$.

x	-1	-0.5	0	0.5	1	1.5
y	4		-1		0	2.75

(a) Complete the table. [1]

(b) On the grid, draw the graph of $y = 3x^2 - 2x - 1$ for $-1 \leqslant x \leqslant 1.5$.



[3]

(c) By drawing a suitable straight line, solve the equation $3x^2 - 4x - 2 = 0$ for $-1 \leqslant x \leqslant 1.5$.

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

38. 0580_s23_qp_21 Q: 21

A curve has equation $y = x^3 - 12x$.

(a) Find the gradient of the curve at the point (1,−11).

..... [3]

(b) Find the coordinates of the turning points of the curve.

(..... , ...) and (..... , ...) [3]

39. 0580_s23_qp_22 Q: 8

Solve.

(a) $\frac{30}{x} = 6$

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

(b) $11x - 3 \geqslant 2(2x + 9)$

..... [3]

---

40. 0580_s23_qp_22 Q: 12

One solution of the equation $ax^2 + b = 181$ is $x = 8$.
a and b are both positive integers **greater than 1**.

(a) Find the value of b.

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

(b) Write down the other solution of the equation $ax^2 + b = 181$.

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

---

41. 0580_s23_qp_22 Q: 14

$f(x) = 5x + 2$

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

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

---

42. 0580_s23_qp_22 Q: 18

Make x the subject of the formula.

$$c = \frac{3x}{2x - 5}$$

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

---

43. 0580_s23_qp_22 Q: 19

m is inversely proportional to the square of $(t + 2)$.
$m = 0.64$ when $t = 3$.

Find m when $t = 8$.

$m =$ ..... [3]

---

44. 0580_s23_qp_22 Q: 22

Write as a single fraction in its simplest form.

$$\frac{5}{3x+2}+\frac{4}{2x-1}$$

..... [3]

---

45. 0580_s23_qp_23 Q: 4

$$v = u - 9.8t$$

Find the value of v when $u = 4$ and $t = -7$.

$v =$ ..... [2]

---

46. 0580_s23_qp_23 Q: 5

Simplify $d^8 \div d^2$.

..... [1]

---

47. 0580_s23_qp_23 Q: 6

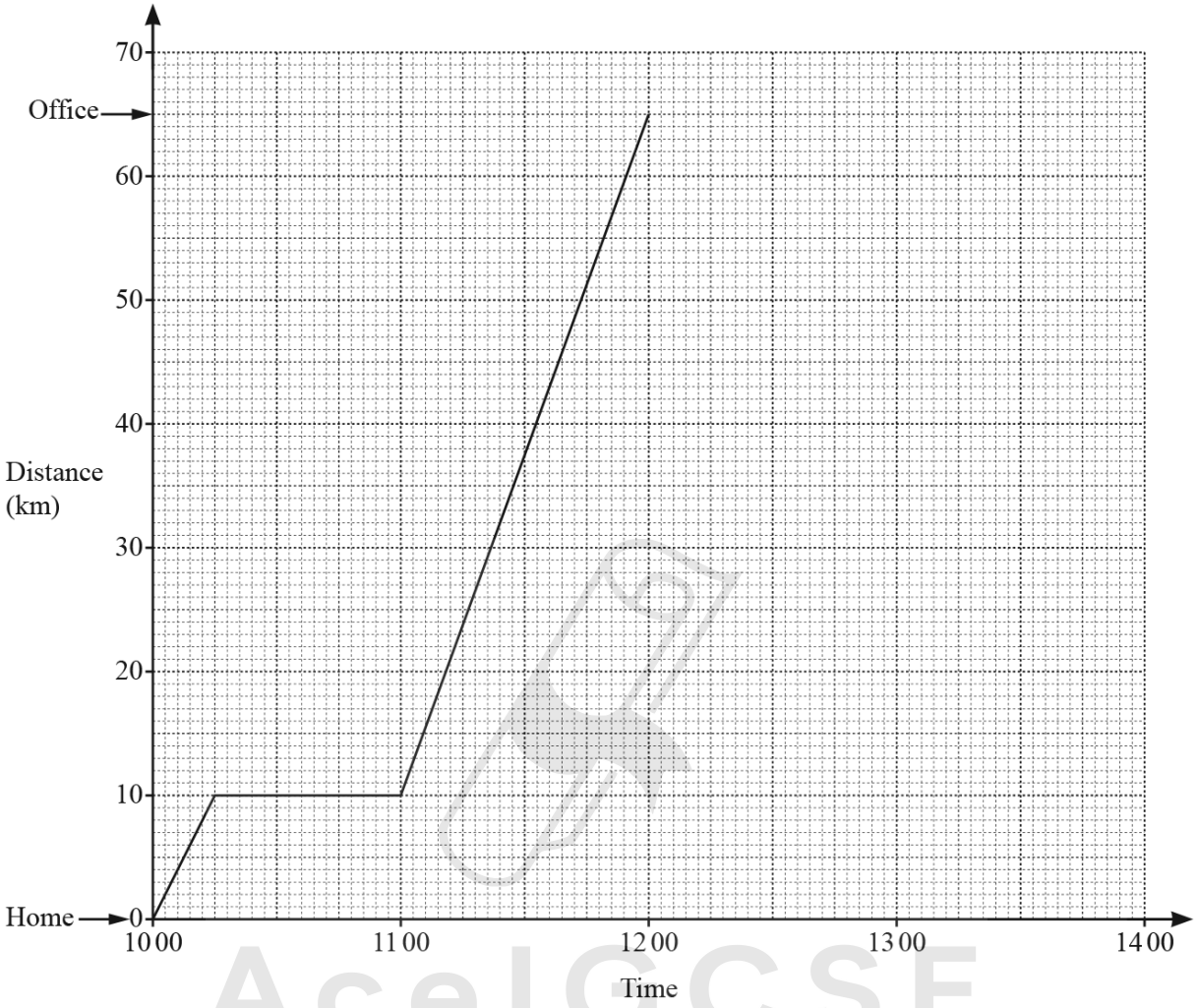
At the end of the day, a shopkeeper has 12 tins of cat food left.
This is $\frac{3}{13}$ of the number he had at the beginning of the day.

Calculate the number of tins he had at the beginning of the day.

..... [2]

48. 0580_s23_qp_23 Q: 9

The distance–time graph shows information about Kai's journey from home to the office.



(a) Calculate the average speed, in km/h, for Kai's journey from home to the office.

..... km/h [2]

(b) When Kai arrives at the office, he finds his meeting is cancelled. He immediately returns home at a constant speed of 50 km/h.

Complete the distance–time graph to show his journey home. [1]

49. 0580_s23_qp_23 Q: 17

Rearrange the formula to make m the subject.

$$R = \frac{2(m-k)}{m}$$

$m =$ ..... [4]

---

50. 0580_s23_qp_23 Q: 18

y is inversely proportional to the cube root of $(x + 5)$.
When $x = 3$, $y = 12$.

Find y when $x = 22$.

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

---

51. 0580_s23_qp_23 Q: 19

Solve the equation $x^2 + 5x - 7 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

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

---

52. 0580_s23_qp_23 Q: 20

$$f(x) = 6x - 7 \qquad g(x) = x^{-3}$$

(a) Find $f(x+2)$.
Give your answer in its simplest form.

..... [2]

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

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

(c) Find x when $g(x) = f(22)$.

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

---

53. 0580_s23_qp_23 Q: 21

Simplify.

$$\frac{2x^2+5x-12}{4x^2-9}$$

..... [4]

54. 0580_s23_qp_23 Q: 22

These are the first four terms of a sequence.

2.75 6 11.25 20

The nth term of this sequence is $\frac{1}{4}n^3 + an^2 + bn$.

Calculate the value of a and the value of b.

$a =$ .....

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

---

55. 0580_w23_qp_21 Q: 3

Complete these statements.

(a) When $x =$ ..... , $x + 3 = 8$.

[1]

(b) When $7y = 63$, $10y =$ .....

[1]

---

56. 0580_w23_qp_21 Q: 5

Factorise completely.

(a) $42mk - 35m$

..... [2]

(b) $h^2 - 144$

..... [1]

---

57. 0580_w23_qp_21 Q: 10

Simplify.

(a) $n^5 \times n$

..... [1]

(b) $8x^6 \div 2x^2$

..... [2]

(c) $(243y^{20})^{\frac{2}{5}}$

..... [2]

---

58. 0580_w23_qp_21 Q: 11

Solve.

$$4(2x - 3) \geqslant 43 + 3x$$

..... [3]

---

59. 0580_w23_qp_21 Q: 16

$P = 2w + 2h$

$w = 11$ and $h = 9.5$, both correct to 2 significant figures.

Find the lower bound and the upper bound for P.

Lower bound = ...

Upper bound = ... [3]

---

60. 0580_w23_qp_21 Q: 20

Write as a single fraction in its simplest form.

(a) $\dfrac{10x^2 - 60x}{x^2 - x - 30}$

..... [3]

(b) $\dfrac{7}{x+3} + \dfrac{5}{8x-1}$

..... [3]

---

61. 0580_w23_qp_22 Q: 3

$v = u + at$

Find the value of v when $u = 30$, $a = -2$ and $t = 7$.

$v =$ ..... [2]

---

62. 0580_w23_qp_22 Q: 10

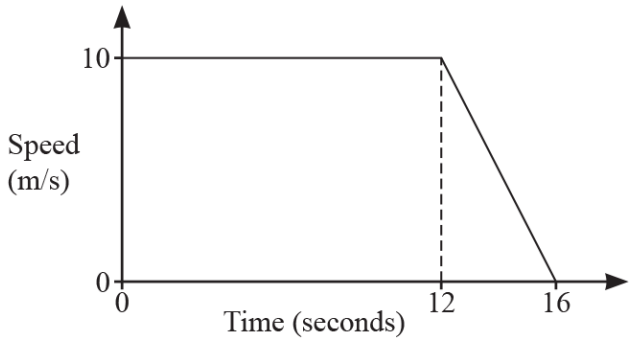
Expand and simplify.

$2(t + w) + 3(w - t)$

..... [2]

---

63. 0580_w23_qp_22 Q: 12



NOT TO SCALE

The diagram shows a speed–time graph for 16 seconds of a car journey.

(a) Find the deceleration of the car in the final 4 seconds.

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

(b) Find the total distance travelled during the 16 seconds.

..... m [2]

---

64. 0580_w23_qp_22 Q: 13

(a) $3^{3p} \times 3^{2p} = 729$

Find the value of p.

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

(b) Simplify.

$$(32x^{10})^{\frac{1}{5}}$$

..... [2]

---

65. 0580_w23_qp_22 Q: 14

$y = 2w^2 - x$

Rearrange the formula to make w the subject.

$w =$ ..... [3]

---

66. 0580_w23_qp_22 Q: 16

Find the lowest common multiple (LCM) of $12x^8$ and $8x^{12}$.

..... [2]

---

67. 0580_w23_qp_22 Q: 19

Find the nth term of each sequence.

(a) 11, 8, 5, 2, −1, …

..... [2]

(b) 1, 5, 25, 125, 625, …

..... [2]

---

68. 0580_w23_qp_22 Q: 22

x is inversely proportional to the square root of w.
When $w = 16$, $x = 3$.

Find x in terms of w.

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

---

69. 0580_w23_qp_22 Q: 24

Simplify.

$$\frac{ax-2a-x+2}{a^2-1}$$

..... [4]

---

70. 0580_w23_qp_22 Q: 25

The derivative of $2ax^7 + 3x^k$ is $42x^6 + 15x^{k-1}$.

Find the value of a and the value of k.

$a =$ .....

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

---

71. 0580_w23_qp_23 Q: 9

$$P = \frac{2wy^2}{3}$$

Find the positive value of y when $P = 108$ and $w = 8$.

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

---

72. 0580_w23_qp_23 Q: 15

$T = \sqrt{3d - e}$

Rearrange the formula to make d the subject.

$d =$ ..... [3]

---

73. 0580_w23_qp_23 Q: 17

(a) Simplify.

$$\left(64y^{27}\right)^{\frac{2}{3}}$$

..... [2]

(b) Simplify.

$$\frac{x-5}{x^2-25}$$

..... [2]

---

74. 0580_w23_qp_23 Q: 18

F is proportional to the product of m and a.

Calculate the percentage change in F when m is increased by 40% and a is decreased by 15%.

..... % [3]

75. 0580_w23_qp_23 Q: 20

$(x+a)(x+2)(2x+3)$ is equivalent to $2x^3+bx^2+cx-18$.

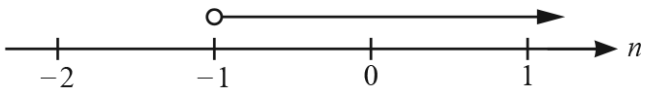
Find the value of each of a, b and c.

$a =$ .....

$b =$ .....

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

76. 0580_m22_qp_22 Q: 7



Write down the inequality, in terms of n, shown by the number line.

..... [1]

77. 0580_m22_qp_22 Q: 9

Factorise completely.

$$12a^3 - 21a$$

..... [2]

---

78. 0580_m22_qp_22 Q: 10

(a) The nth term of a sequence is $n^2 + 7$.

Find the first three terms of this sequence.

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

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

$$15 \quad 7 \quad -1 \quad -9$$

Find the nth term of this sequence.

..... [2]

---

79. 0580_m22_qp_22 Q: 13

(a) Simplify $h^2 \times h^5$.

..... [1]

(b) Simplify $\left(\frac{7}{x}\right)^{-3}$.

..... [1]

(c) $a^8 \div a^p = a^2$

Find the value of p.

$p =$ ..... [1]

---

80. 0580_m22_qp_22 Q: 18

Mrs Kohli buys a jacket, 2 shirts and a hat.
The jacket costs $\$x$.
The shirts each cost \$24 less than the jacket and the hat costs \$16 less than the jacket.
Mrs Kohli spends exactly \$100.

Write down an equation in terms of x.
Solve this equation to find the cost of the jacket.

\$ ..... [3]

---

81. 0580_m22_qp_22 Q: 19

y is inversely proportional to the square root of $(x+4)$.
When $x = 5$, $y = 2$.

Find y when $x = 77$.

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

82. 0580_m22_qp_22 Q: 20

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

$$3x + y = 11$$
$$x^2 - 2y = 18$$

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

$x =$ ..... $y =$ ..... [5]

83. 0580_s22_qp_21 Q: 8

$$s = \frac{1}{2}at^2$$

(a) Work out the value of s when $a = 0.9$ and $t = 4$.

$s =$ ..... [1]

(b) Rearrange the formula to find t in terms of s and a.

$t =$ ..... [2]

---

84. 0580_s22_qp_21 Q: 9

Factorise completely.

$$14xy - 7y^2$$

..... [2]

---

85. 0580_s22_qp_21 Q: 10

22, 17, 12, 7, 2, …

(a) Find the next term of the sequence.

..... [1]

(b) Find the nth term of the sequence.

..... [2]

---

86. 0580_s22_qp_21 Q: 15

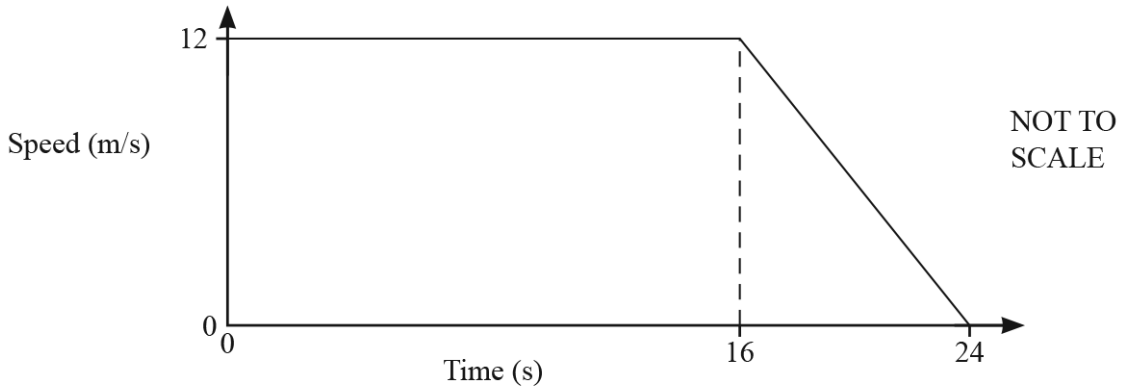
$$4^x = \frac{1}{64}$$

Find the value of x.

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

---

87. 0580_s22_qp_21 Q: 20



The diagram shows the speed–time graph for 24 seconds of a car journey.

Calculate

(a) the deceleration of the car in the final 8 seconds,

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

(b) the total distance travelled during the 24 seconds.

..... m [2]

---

88. 0580_s22_qp_21 Q: 21

Factorise completely.

$$1 - q - a + aq$$

..... [2]

---

89. 0580_s22_qp_21 Q: 22

Simplify fully $(216y^{216})^{\frac{2}{3}}$.

..... [2]

---

90. 0580_s22_qp_21 Q: 23

$$x^2 + 8x + 10 = (x + p)^2 + q$$

(a) Find the value of p and the value of q.

$p =$ .....

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

(b) Solve.

$$x^2 + 8x + 10 = 30$$

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

---

91. 0580_s22_qp_21 Q: 25

w is proportional to the square root of y.
y is inversely proportional to x.
When $x = 4$, $y = 16$ and $w = 8$.

Find w in terms of x.

$w =$ ..... [3]

92. 0580_s22_qp_21 Q: 27

The line $y = x + 1$ intersects the graph of $y = x^2 - 3x - 11$ at the points A and B.

Find the coordinates of A and the coordinates of B.
You must show all your working.

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

B (..... , ...) [4]

---

93. 0580_s22_qp_22 Q: 8

The nth term of a sequence is $n^2 + 12$.

Find the first three terms of this sequence.

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

---

94. 0580_s22_qp_22 Q: 11

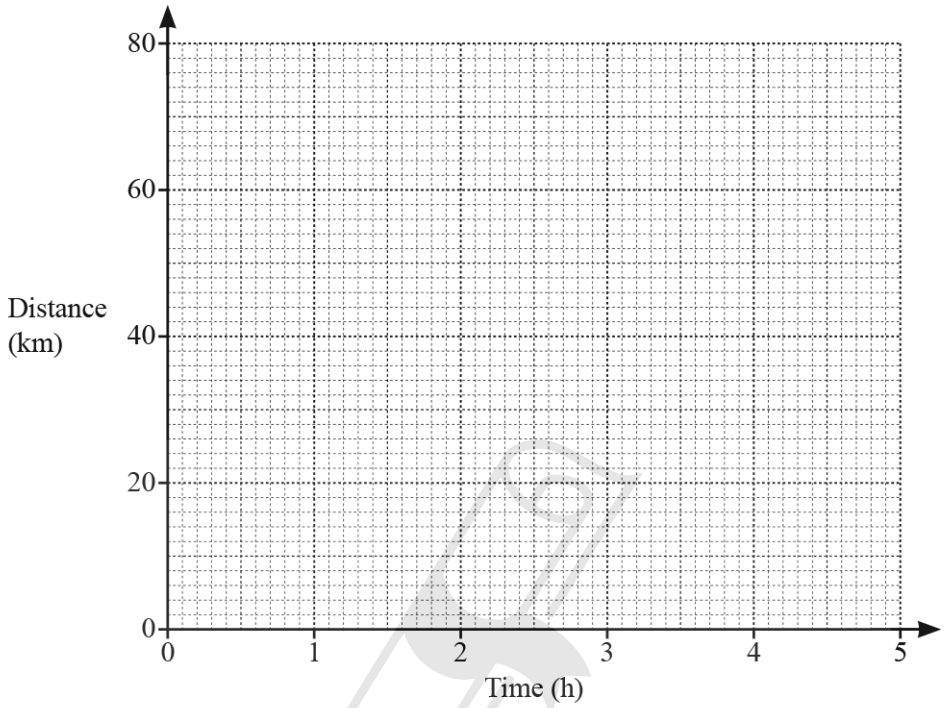
Find the value of p when $6^p \times 6^4 = 6^{28}$.

$p =$ ..... [1]

---

95. 0580_s22_qp_22 Q: 12

Annette cycles a distance of 70 km from Midville to Newtown.
Leaving Midville, she cycles for 1 hour 30 minutes at a constant speed of 20 km/h and then stops for 30 minutes.
She then continues the journey to Newtown at a constant speed of 16 km/h.



(a) On the grid, draw the distance–time graph for the journey. [3]

(b) Calculate the average speed for the whole journey.

..... km/h [3]

96. 0580_s22_qp_22 Q: 18

(a) y is directly proportional to the cube root of $(x+1)$.
When $x = 7,\ y = 1$.

Find the value of y when $x = 124$.

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

(b) F is inversely proportional to the square of d.

Explain what happens to F when d is halved.

..... [1]

97. 0580_s22_qp_22 Q: 19

$$f(x) = 7x - 8 \qquad g(x) = \frac{4}{x} + 5 \qquad h(x) = 2^x + 1$$

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

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

(b) Find the value of x when $h(x) = g\left(\frac{1}{3}\right)$.

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

98. 0580_s22_qp_22 Q: 20

Factorise completely.

(a) $2m+3p-8km-12kp$

..... [2]

(b) $5x^2-20y^2$

..... [3]

99. 0580_s22_qp_22 Q: 21

The nth term of a sequence is $an^2 + bn - 4$.

The first term is -3 and the second term is 2.

Find the value of a and the value of b.

$a =$ .....

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

---

100. 0580_s22_qp_23 Q: 2

Work out the value of $\frac{m\,k^3}{\sqrt{3}}$ when $m = 4$ and $k = 7$.

..... [2]

---

101. 0580_s22_qp_23 Q: 5

The nth term of a sequence is $n^2 - 1$.

Find the first three terms of this sequence.

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

---

102. 0580_s22_qp_23 Q: 6

Simplify.

(a) $y^3 \div y^5$

..... [1]

(b) $7x^0$

..... [1]

---

103. 0580_s22_qp_23 Q: 13

Factorise completely.

(a) $18px - 27p$

..... [2]

(b) $mt - n - m + nt$

..... [2]

---

104. 0580_s22_qp_23 Q: 14

Find the nth term of this sequence.

8, 17, 32, 53, 80, …

..... [2]

---

105. 0580_s22_qp_23 Q: 15

Solve.

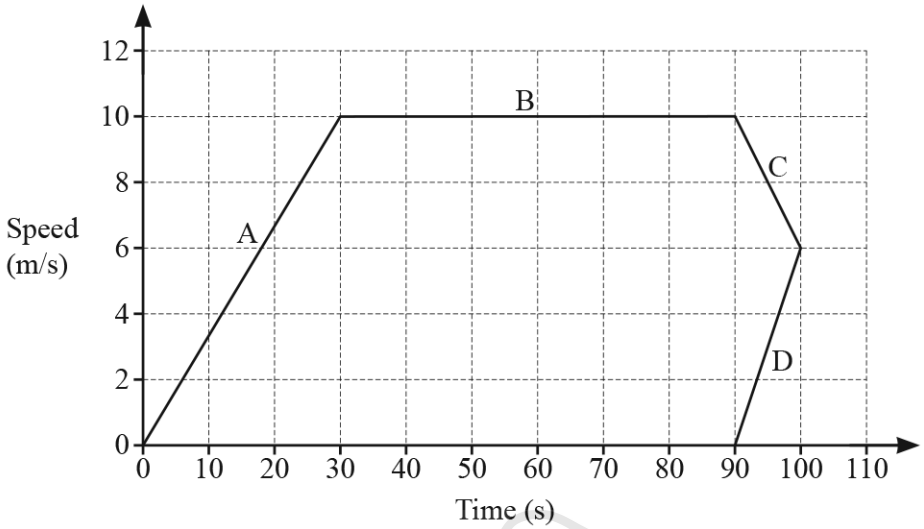
$12x - 3 \geqslant 4x + 13$

..... [2]

---

106. 0580_s22_qp_23 Q: 16

Abdul draws this speed–time graph for a journey.
The graph has four sections A, B, C and D.



Complete these statements about the speed–time graph.

Section ..... cannot be correct.

Section ..... shows constant speed.

Section ..... shows deceleration.

Section A shows acceleration of ..... m/s^2.

The distance travelled in the first 30 seconds of the journey is ..... m.

[4]

107. 0580_s22_qp_23 Q: 19

$f(x) = kx^2$ $\quad g(x) = \frac{1}{x}$ $\quad h(x) = \frac{7x-2}{5}$ $\quad j(x) = \frac{3-10x}{14}$

(a) $f(-5k) = 675$

Find the value of k.

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

(b) Find $gh(x)$.

..... [1]

(c) Find $h^{-1}(x) + j(x)$.
Give your answer in its simplest form.

..... [4]

108. 0580_s22_qp_23 Q: 22

Simplify.

$$\frac{5x-x^2}{25-x^2}$$

..... [3]

---

109. 0580_s22_qp_23 Q: 24

y is inversely proportional to the cube of $(x-1)$.
$y = 9.45$ when $x = 3$.

Find y when $x = 4$.

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

---

110. 0580_s22_qp_23 Q: 25

$m^{-\frac{1}{4}} = 27m^{-1}$

Find the value of m.

$m =$ ..... [3]

---

111. 0580_w22_qp_21 Q: 8

(a) $P = \{$ ..... $\}$ [1]

(b) $n(P \cup Q) =$ ..... [1]

(a) 3, 9, 27, 81, …

Write down the next term in this sequence.

..... [1]

(b) 13, 17, 21, 25, …

Find the nth term of this sequence.

..... [2]

---

112. 0580_w22_qp_21 Q: 10

Simplify $18x^{18} \div 9x^{9}$.

..... [2]

---

113. 0580_w22_qp_21 Q: 11

Solve the simultaneous equations.

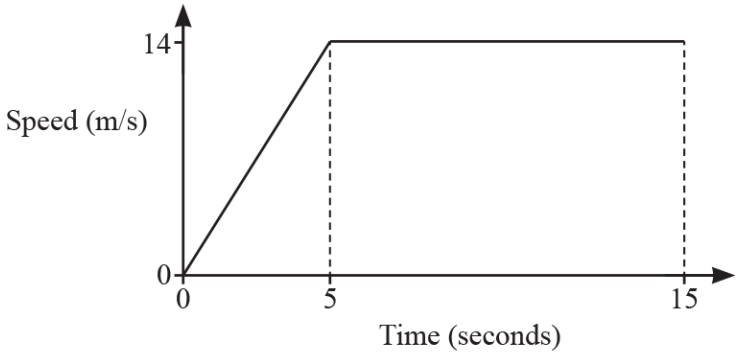
$$x - 3y = 7$$
$$2x - 3y = 11$$

$x =$ .....

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

---

114. 0580_w22_qp_21 Q: 13



NOT TO SCALE

The diagram shows the speed–time graph of the first 15 seconds of a car journey.

(a) Find the acceleration of the car during the first 5 seconds.

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

(b) Find the distance travelled during the 15 seconds.

..... m [2]

---

115. 0580_w22_qp_21 Q: 17

Simplify $\left(3125x^{3125}\right)^{\frac{1}{5}}$.

..... [2]

---

116. 0580_w22_qp_21 Q: 19

Expand and simplify.

$$(2x+3)(x-2)^2$$

..... [3]

---

117. 0580_w22_qp_21 Q: 20

Factorise completely.

(a) $1+x-y-xy$

..... [2]

(b) $2x^3-18xy^2$

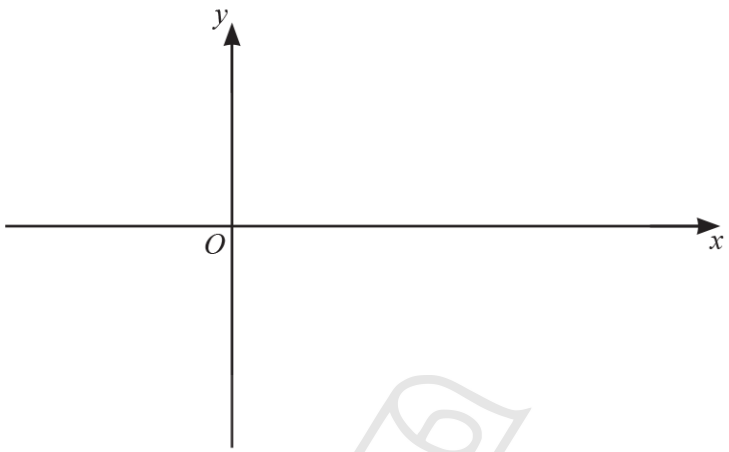
..... [3]

---

118. 0580_w22_qp_21 Q: 21

The graph of a cubic function has two turning points.
When $x < 0$ and when $x > 4$ the gradient of the graph is positive.
When $0 < x < 4$ the gradient of the graph is negative.
The graph passes through the origin.

Sketch the graph.



[2]

---

119. 0580_w22_qp_21 Q: 23

y is inversely proportional to $\sqrt{x}$ and x is directly proportional to w^2.
When $w = 12$, $y = 12$.

Find y in terms of w.

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

---

120. 0580_w22_qp_22 Q: 2

Simplify.

$y \times 27 - y \times 77$

..... [1]

---

121. 0580_w22_qp_22 Q: 4

Expand.

$x(3 + x^2)$

..... [2]

---

122. 0580_w22_qp_22 Q: 6

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

27 26 23 18 11

Find the next two terms in the sequence.

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

(b) The table shows information about two different sequences.

	First five terms of sequence					*n*th term
Sequence A	3	10	17	24	31	
Sequence B	2	11	26	47	74	

Complete the table.

[4]

---

123. 0580_w22_qp_22 Q: 11

The graph of $y = (x-3)(x+b)(x+2)$ intersects the y-axis at -30.

(a) Find the value of b.

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

(b) When $x > 0$ the graph crosses the x-axis once.

Write down the coordinates of this point.

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

124. 0580_w22_qp_22 Q: 17

$f(x) = x^2$ $\quad$ $g(x) = \frac{x+5}{2}$ $\quad$ $h(x) = 7x - 3$

(a) Find $f(-3)$.

..... [1]

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

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

(c) Solve $gf(x) = hh^{-1}(63)$ where $x > 0$.

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

125. 0580_w22_qp_22 Q: 20

Simplify fully.

(a) $(81x^{16})^{\frac{3}{4}}$

..... [2]

(b) $\left(\frac{1}{y^2}\right)^{-\frac{1}{2}}$

..... [1]

---

126. 0580_w22_qp_22 Q: 23

Solve $\frac{4}{x+1}+\frac{2}{2x-5}=3$.

You must show all your working.

$x =$ ..... or $x =$ ..... [7]

---

127. 0580_w22_qp_23 Q: 9

Solve the simultaneous equations.

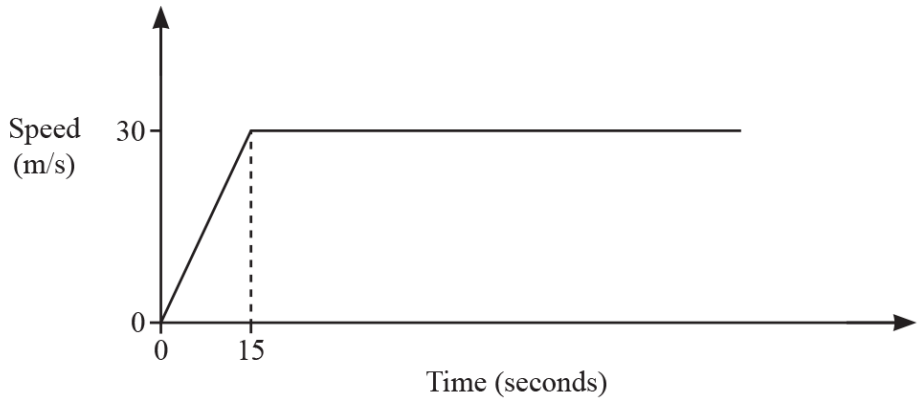
$$3x - 2y = 21$$
$$5x + 2y = 51$$

$x =$ .....

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

128. 0580_w22_qp_23 Q: 15

The diagram shows the speed–time graph for part of the journey of a car.



The car starts from rest and accelerates at a uniform rate for 15 seconds before reaching a constant speed of 30 m/s.

(a) Calculate the acceleration for the first 15 seconds.

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

(b) After T **minutes**, the total distance travelled is 45 **kilometres**.

Find the value of T.

T = ... min [4]

129. 0580_w22_qp_23 Q: 17

y is proportional to the square of $(x-7)$.
When $x = 12$, $y = 2$.

Find y when $x = 17$.

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

130. 0580_w22_qp_23 Q: 19

$f(x) = 5x - 3,\ x > 1$

$g(x) = \frac{10}{x-2},\ x \neq 2$

(a) Find $gf(x)$.
Give your answer in its simplest form.

..... [2]

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

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

(c) Find $ff^{-1}(x-1)$.

..... [1]

131. 0580_w22_qp_23 Q: 22

(a) Expand and simplify.

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

..... [3]

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

$$\frac{4}{2x-3} \div \frac{2x^2+14x}{2x^2+11x-21}$$

..... [4]

132. 0580_m21_qp_22 Q: 14

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

29 22 15 8

Write down the next two terms.

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

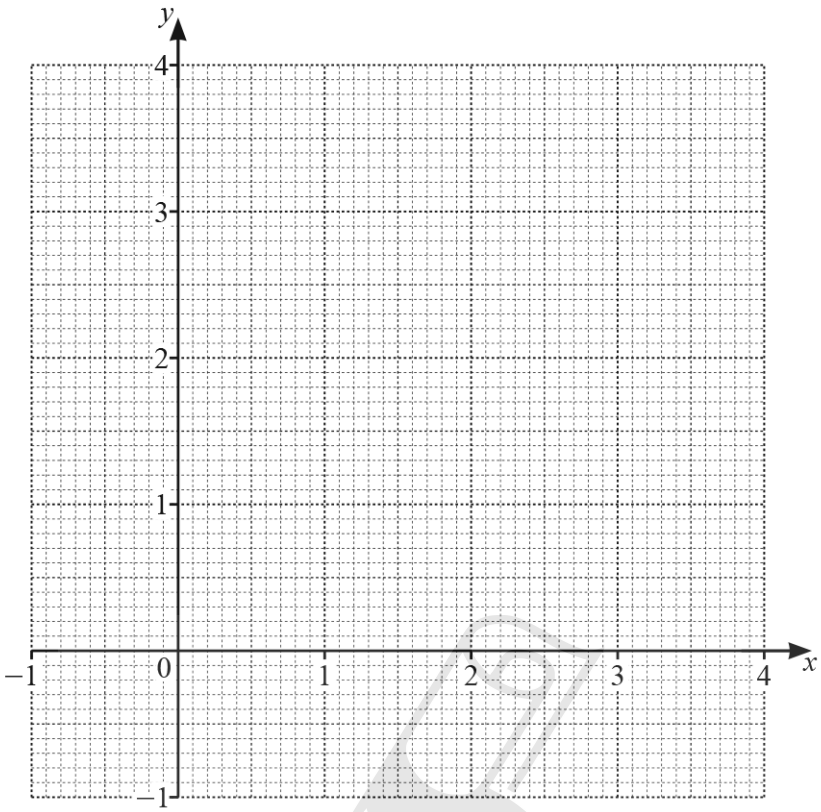
(b) These are the first five terms of another sequence.

4 7 12 19 28

Find the nth term.

..... [2]

133. 0580_m21_qp_22 Q: 16



The region R satisfies these three inequalities.

$$y > 1 \qquad y < 2x + 2 \qquad x + y \leqslant 3$$

By drawing three suitable lines, and shading unwanted regions, find and label the region R. [5]

---

134. 0580_m21_qp_22 Q: 18

Simplify $\left(343x^9\right)^{\frac{2}{3}}$.

..... [2]

---

135. 0580_m21_qp_22 Q: 19

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

$$x - y = 7$$
$$x^2 + y = 149$$

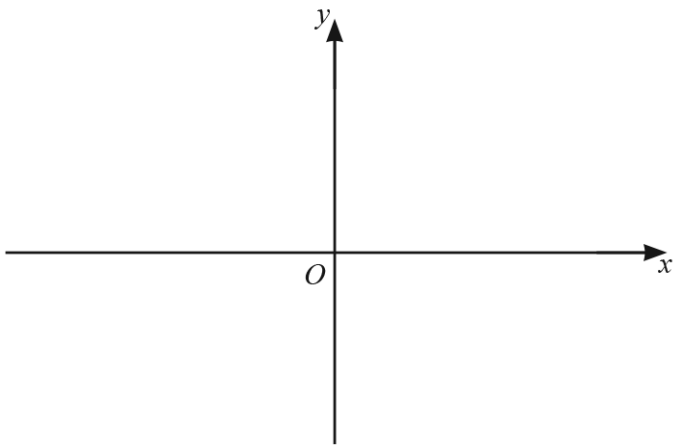
$x =$ ..... $y =$ .....

$x =$ ..... $y =$ ..... [5]

136. 0580_m21_qp_22 Q: 21

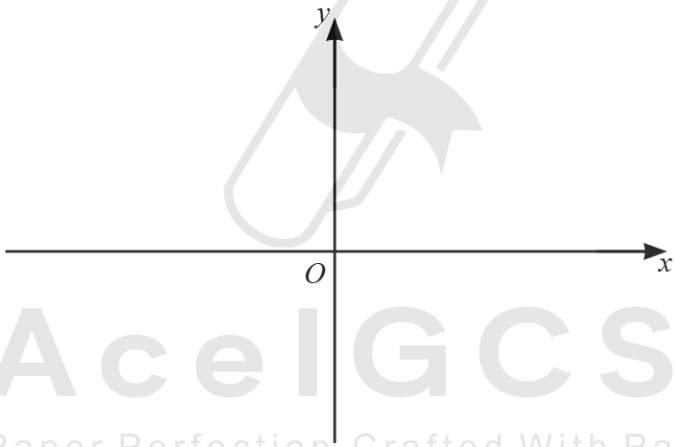
On the axes, sketch the graph of each of these functions.

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



[2]

(b) $y = 4^x$



[2]

137. 0580_m21_qp_22 Q: 24

A curve has equation $y = x^3 - 2x^2 + 5$.

Find the coordinates of its two stationary points.

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

138. 0580_s21_qp_21 Q: 6

(a) The nth term of a sequence is $n^2 + 3n$.

Find the first three terms of this sequence.

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

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

25 18 11 4 −3

Find the nth term of this sequence.

..... [2]

139. 0580_s21_qp_21 Q: 7

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

$$2x + y = 3$$
$$x - 5y = 40$$

$x =$ .....

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

140. 0580_s21_qp_21 Q: 11

(a) Simplify fully.

$(4ab^5)^4$

..... [2]

(b) $2p^{\frac{1}{3}} = 6$

Find the value of p.

$p =$ ..... [1]

(c) $81^2 \div 3^t = 9$

Find the value of t.

$t =$ ..... [2]

141. 0580_s21_qp_21 Q: 14

y is directly proportional to the square root of $(x-3)$.
When $x = 28$, $y = 20$.

Find y when $x = 39$.

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

---

142. 0580_s21_qp_21 Q: 15

Make h the subject of the formula $2mh = g(1-h)$.

$h =$ ..... [4]

---

143. 0580_s21_qp_22 Q: 8

$$a = \frac{b^2}{5c}$$

Find b when $a = 5.625$ and $c = 2$.

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

---

144. 0580_s21_qp_22 Q: 18

$$f(x) = x^2 - 25 \qquad g(x) = x + 4$$

Solve $fg(x+1) = gf(x)$.

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

---

145. 0580_s21_qp_22 Q: 20

Expand and simplify.

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

..... [3]

146. 0580_s21_qp_22 Q: 21

The force of attraction, F Newtons, between two magnets is inversely proportional to the square of the distance, d cm, between the magnets.

When $d = 1.5$, $F = 48$.

(a) Find an expression for F in terms of d.

$F =$ ..... [2]

(b) When the distance between the two magnets is doubled the new force is n times the original force.

Work out the value of n.

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

147. 0580_s21_qp_22 Q: 22

Simplify.

$$\frac{2x^2-5x-12}{3x^2-12x}$$

..... [4]

---

148. 0580_s21_qp_22 Q: 24

Solve.

$$\frac{1}{x+1}+\frac{9}{x+9}=1$$

$x =$ ..... or $x =$ ..... [5]

---

149. 0580_s21_qp_23 Q: 2

Write as a fraction in its simplest form.

(a) 72%

..... [1]

(b) 0.004

..... [1]

---

150. 0580_s21_qp_23 Q: 6

Maria buys n pencils that cost p cents each.
She pays with a $\$y$ note.

Find, in terms of n, p and y, the amount of change Maria receives.
Give your answer in cents.

..... cents [2]

---

151. 0580_s21_qp_23 Q: 11

Simplify $3x^3 \times 4x^4$.

..... [2]

---

152. 0580_s21_qp_23 Q: 12

x is an integer and $-3 \leqslant 2x-1 < 3$.

Find the values of x.

..... [2]

---

153. 0580_s21_qp_23 Q: 13

Expand and simplify.

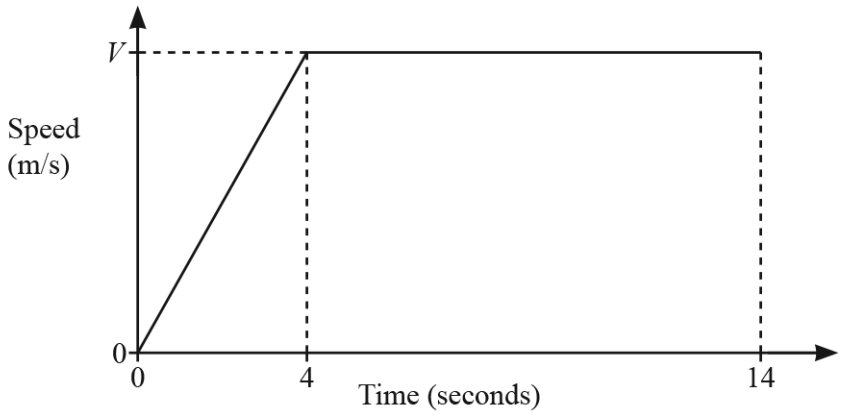
$$6(t-q)-2(t-3q)$$

..... [2]

---

154. 0580_s21_qp_23 Q: 18

A car starts from rest and accelerates at a rate of 3 m/s^2 for 4 seconds.
The car then travels at a constant speed for 10 seconds.



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The diagram shows the speed–time graph for this journey.

(a) Find the value of V.

$V =$ ..... [1]

(b) Calculate the total distance travelled by the car during the 14 seconds.

..... m [2]

155. 0580_s21_qp_23 Q: 22

z is inversely proportional to the square of $(y-2)$.
When $y = 5, z = 9$.

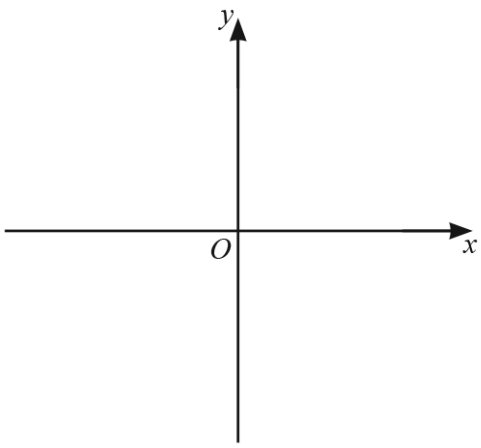
Find z in terms of y.

$z =$ ..... [2]

156. 0580_s21_qp_23 Q: 24

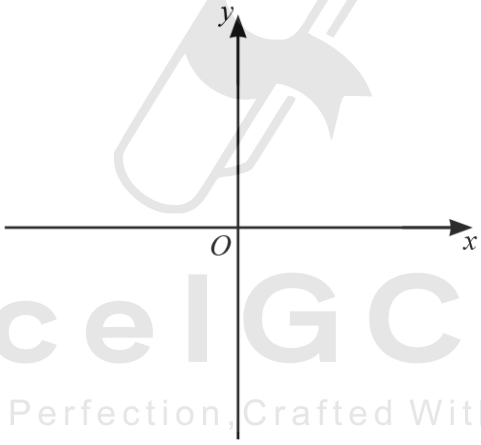
On the axes, sketch the graph of each of these functions.

(a) $y = \frac{2}{x}$



[2]

(b) $y = 2^{-x}$



[2]

157. 0580_s21_qp_23 Q: 25

Find the x-coordinates of the points on the graph of $y = x^5 - 5x^4$ where the gradient is 0.

..... [4]

---

158. 0580_w21_qp_21 Q: 8

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

$$4x - 2y = -13$$
$$-3x + 4y = 11$$

$x =$ .....

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

---

159. 0580_w21_qp_21 Q: 13

Solve.

$$4-3x \geqslant \frac{6-x}{5}$$

..... [3]

---

160. 0580_w21_qp_21 Q: 14

y is inversely proportional to the square root of $(x-2)$.
When $x = 4.25$, $y = 12$.

Find x when $y = 3$.

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

---

161. 0580_w21_qp_21 Q: 16

Find the nth term of each sequence.

(a) 8, 15, 34, 71, 132, ...

..... [2]

(b) $\frac{2}{1}$, $\frac{3}{4}$, $\frac{4}{16}$, $\frac{5}{64}$, $\frac{6}{256}$, ...

..... [3]

---

162. 0580_w21_qp_21 Q: 17

$$y = \frac{3x-2}{1-x}$$

Make x the subject of the formula.

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

---

163. 0580_w21_qp_21 Q: 19

Write as a single fraction in its simplest form.

$$\frac{2}{x+3} - \frac{x+2}{7}$$

..... [3]

164. 0580_w21_qp_21 Q: 22

(a) Simplify.

$$\frac{x^{\frac{2}{3}}}{x^{\frac{8}{3}}}$$

..... [1]

(b) $16 = 64^k$

Find the value of k.

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

(c) Solve.

$$3^{3x} \times \left(\frac{1}{9}\right)^{4-3x} = 3$$

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

165. 0580_w21_qp_22 Q: 5

Angelique rents a room for a party.
The cost of renting the room is $15.50 for the first hour and then $7.25 for each additional hour.
She pays $95.25 in total.

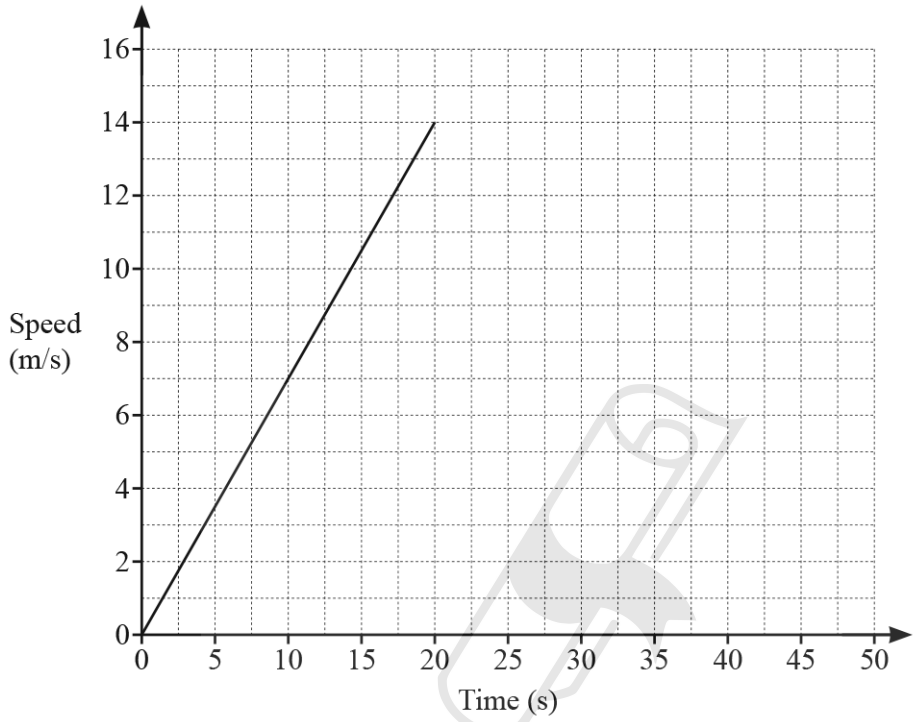
Work out the total number of hours she rents the room for.

..... hours [3]

166. 0580_w21_qp_22 Q: 11

A car starts its journey by accelerating from rest at a constant rate of 0.7 m/s² for 20 seconds, before reaching a constant speed of 14 m/s.
It then travels at 14 m/s for a distance of 210 m.
The car then decelerates at a constant rate of 1.4 m/s^2, before coming to a stop.

On the grid, complete the speed–time graph for the car's journey.



[3]

167. 0580_w21_qp_22 Q: 12

The table shows the first five terms of sequences A, B and C.

	1st term	2nd term	3rd term	4th term	5th term	nth term
Sequence A	8	3	-2	-7	-12	
Sequence B	2	$\frac{3}{2}$	$\frac{4}{3}$	$\frac{5}{4}$	$\frac{6}{5}$	
Sequence C	$\frac{1}{2}$	1	2	4	8	

Complete the table to show the nth term of each sequence.

[5]

---

168. 0580_w21_qp_22 Q: 17

Solve.

$$(5x-3)(2x+7)=0$$

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

---

169. 0580_w21_qp_22 Q: 18

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

$$y = x^2 - 9x + 21$$
$$y = 2x - 3$$

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

$x =$ ..... $y =$ ..... [5]

170. 0580_w21_qp_22 Q: 20

$f(x) = 2^{x-3}$ $g(x) = 2x-1$ $h(x) = \frac{5}{x-4}$

(a) Find ff(6).

..... [2]

(b) Find $g^{-1}g(x+21)$.

..... [1]

(c) Find x when $f(x) = h(84)$.

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

171. 0580_w21_qp_22 Q: 21

Expand and simplify.

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

..... [3]

---

172. 0580_w21_qp_22 Q: 23

Simplify.

$$\frac{3xy+36y-5x-60}{2x^2-288}$$

..... [4]

---

173. 0580_w21_qp_23 Q: 7

Simplify.

$$32g^{32} \div 4g^{4}$$

..... [2]

---

174. 0580_w21_qp_23 Q: 10

These are the first four terms of a sequence.

3 $\quad -1 \quad -5 \quad -9$

(a) Find the next term in this sequence.

..... [1]

(b) Find the nth term.

..... [2]

---

175. 0580_w21_qp_23 Q: 11

$P = M(g^2 + h^2)$

(a) Find the value of P when $M = 100$, $g = 3$ and $h = 4.5$.

$P =$ ..... [2]

(b) Rearrange the formula to write g in terms of P, M and h.

$g =$ ..... [3]

176. 0580_w21_qp_23 Q: 21

Simplify fully.

$(243y^{10})^{\frac{3}{5}}$

..... [2]

177. 0580_w21_qp_23 Q: 22

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

$$y = x^2 - 3x - 13$$
$$y = x - 1$$

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

$x =$ ..... , $y =$ ..... [5]

178. 0580_w21_qp_23 Q: 25

Simplify.

$$\frac{3x^2 - 18x}{ax - 6a + 2cx - 12c}$$

..... [4]

---

179. 0580_m20_QP_22 Q: 9

(a) Factorise completely.

$3x^2 - 12xy$

..... [2]

(b) Expand and simplify.

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

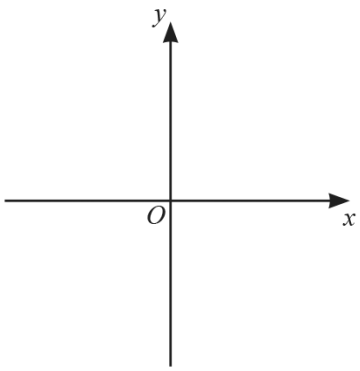
..... [2]

---

180. 0580_m20_QP_22 Q: 10

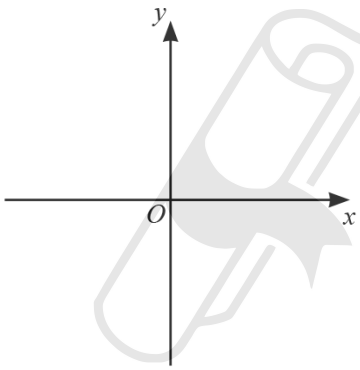
Sketch the graph of each function.

(a) $y = x - 3$



[1]

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



[2]

181. 0580_m20_QP_22 Q: 16

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

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

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

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

---

182. 0580_m20_QP_22 Q: 20

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

Find the value of a and the value of b.

$a =$ .....

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

---

183. 0580_P20_QP_20 Q: 5

$y = mx + c$.

Find the value of y when $m = -2$, $x = -7$ and $c = -3$.

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

---

184. 0580_P20_QP_20 Q: 9

Rearrange the formula $5w - 3y + 7 = 0$ to make w the subject.

$w =$ ..... [2]

---

185. 0580_P20_QP_20 Q: 13

Solve the inequality $n + 7 < 5n - 8$.

..... [2]

---

186. 0580_P20_QP_20 Q: 15

Here is a sequence of numbers.

7, 5, 3, 1, – 1, …

(a) Find the next term in this sequence.

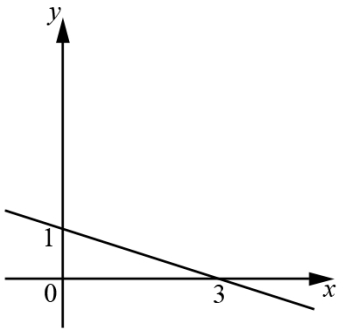
..... [1]

(b) Find an expression for the nth term of this sequence.

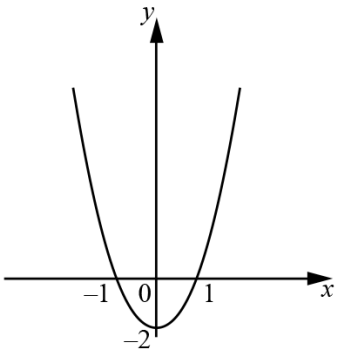
..... [2]

187. 0580_P20_QP_20 Q: 21

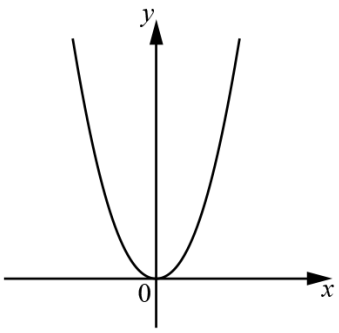
The diagrams A, B, C, D, E and F are six graphs of different functions.



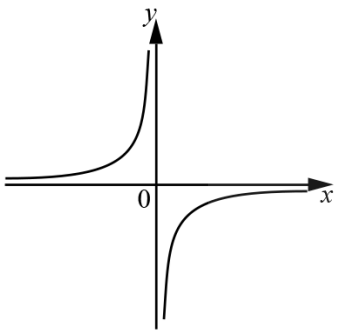
A



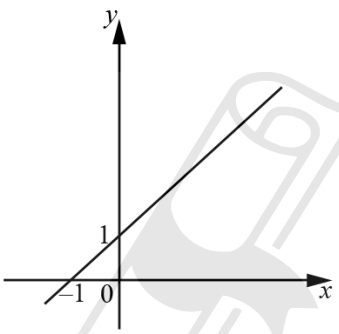
B



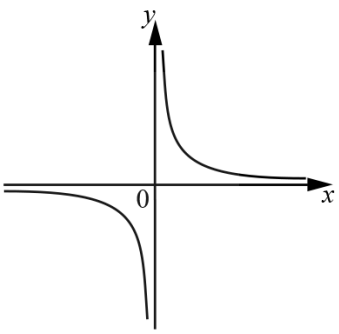
C



D



E



F

Complete the table to identify the correct graph for each function.
One has been done for you.

Function	$y = x + 1$	$y = 1 - \frac{x}{3}$	$y = 2x^2$	$y = -\frac{4}{x}$
Diagram	E			

[3]

188. 0580_P20_QP_20 Q: 25

Find the turning point of $y = x^2 + 4x - 3$ by completing the square.

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

---

189. 0580_P20_QP_20 Q: 27

(a) Simplify $(27x^6)^{\frac{1}{3}}$.

..... [2]

(b) Find the value of $(64x^4)^{0.5} \times 4x^{-2}$.

..... [3]

---

190. 0580_P20_QP_20 Q: 28

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

$$y = 5x^2 + 4x - 19$$
$$y = 4x + 1$$

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

$x =$ ..... $y =$ ..... [5]

---

191. 0580_s20_QP_21 Q: 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]

---

192. 0580_s20_QP_21 Q: 9

Factorise completely.

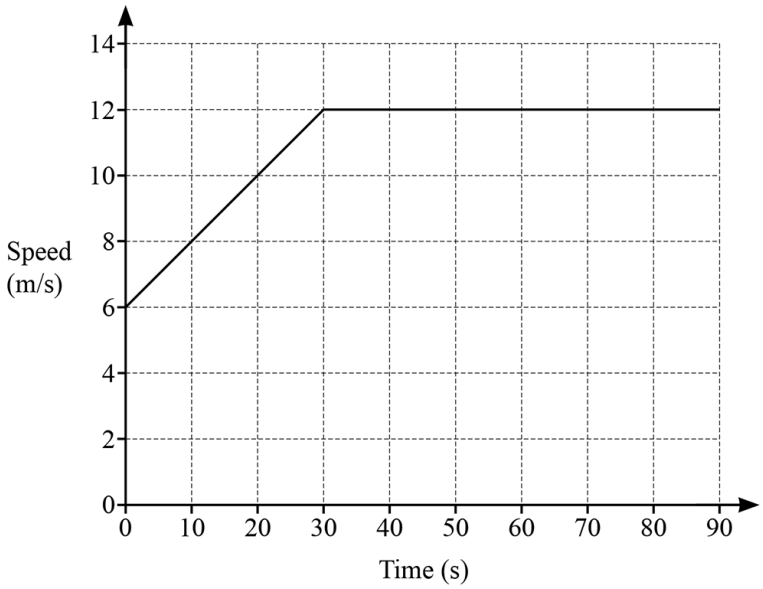
(a) $21a^2 + 28ab$

..... [2]

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

..... [3]

193. 0580_s20_QP_21 Q: 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]

194. 0580_s20_QP_21 Q: 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]

195. 0580_s20_QP_21 Q: 16

m is inversely proportional to the square of $(p-1)$.
When $p=4, m=5$.

Find m when $p=6$.

$m =$ ..... [3]

---

196. 0580_s20_QP_21 Q: 21

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

..... [3]

---

197. 0580_s20_QP_22 Q: 5

$y = mx + c$

Find the value of y when $m=-3$, $x=-2$ and $c=-8$.

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

---

198. 0580_s20_QP_22 Q: 10

Simplify.

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

..... [2]

---

199. 0580_s20_QP_22 Q: 13

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

..... [2]

---

200. 0580_s20_QP_22 Q: 14

Solve the equation.

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

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

---

201. 0580_s20_QP_22 Q: 19

Make y the subject of the formula.

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

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

---

202. 0580_s20_QP_22 Q: 21

Simplify.

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

..... [2]

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

..... [2]

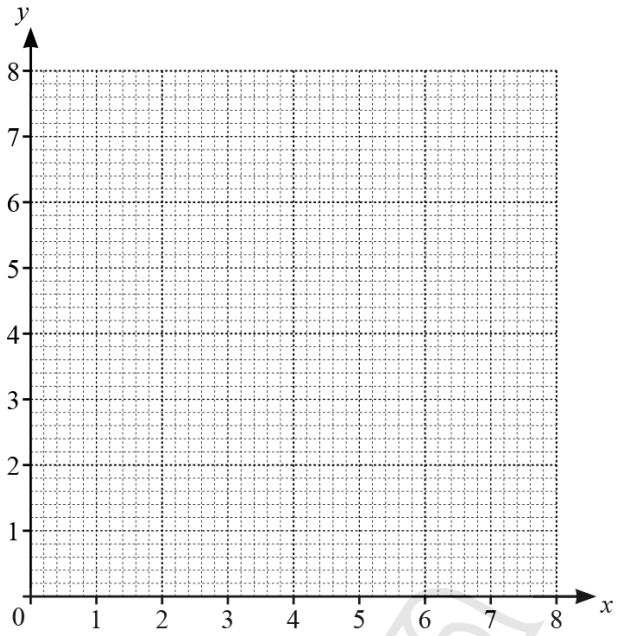
---

203. 0580_s20_QP_22 Q: 22

p is directly proportional to $(q+2)^2$.
When $q = 1$, $p = 1$.

Find p when $q = 10$.

$p =$ ..... [3]



(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]

205. 0580_s20_QP_22 Q: 25

Simplify.

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

..... [5]

---

206. 0580_s20_QP_22 Q: 26

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

Find the value of n.

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

---

207. 0580_s20_QP_23 Q: 6

Simplify.

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

..... [1]

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

..... [1]

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

..... [1]

---

208. 0580_s20_QP_23 Q: 11

y is directly proportional to the cube root of $(x+3)$.

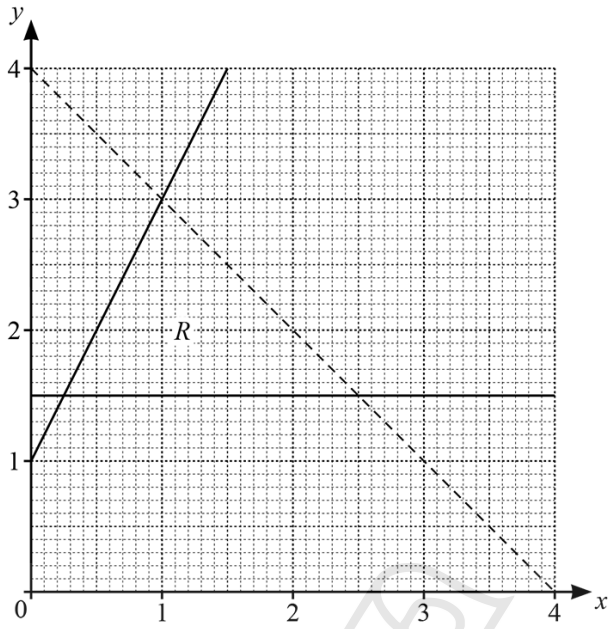
When $x = 5$, $y = \frac{2}{3}$.

Find y when $x = 24$.

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

---

209. 0580_s20_QP_23 Q: 13



Write down the three inequalities that define the region R.

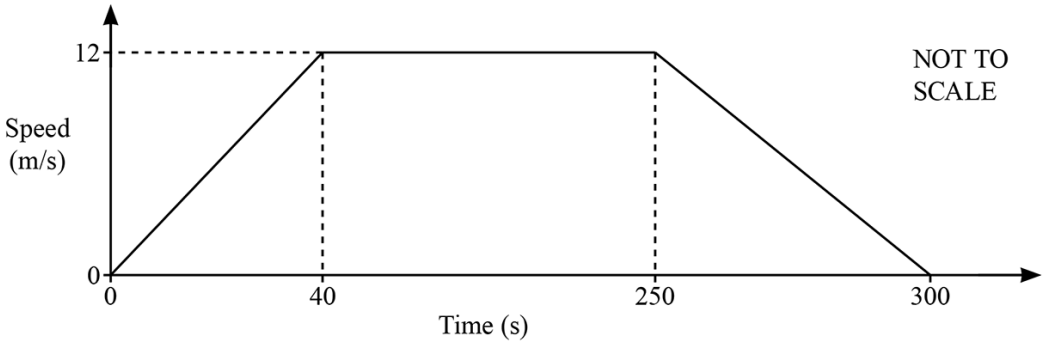
.....

.....

..... [4]

210. 0580_s20_QP_23 Q: 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]

211. 0580_s20_QP_23 Q: 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]

---

212. 0580_w20_qp_21 Q: 1

Simplify.

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

..... [2]

---

213. 0580_w20_qp_21 Q: 3

Rangan buys 3.6 kg of potatoes and 2.8 kg of leeks.
The total cost is $13.72 .
Leeks cost $2.65 per kilogram.

Find the cost of 1 kg of potatoes.

$ ..... [3]

---

214. 0580_w20_qp_21 Q: 7

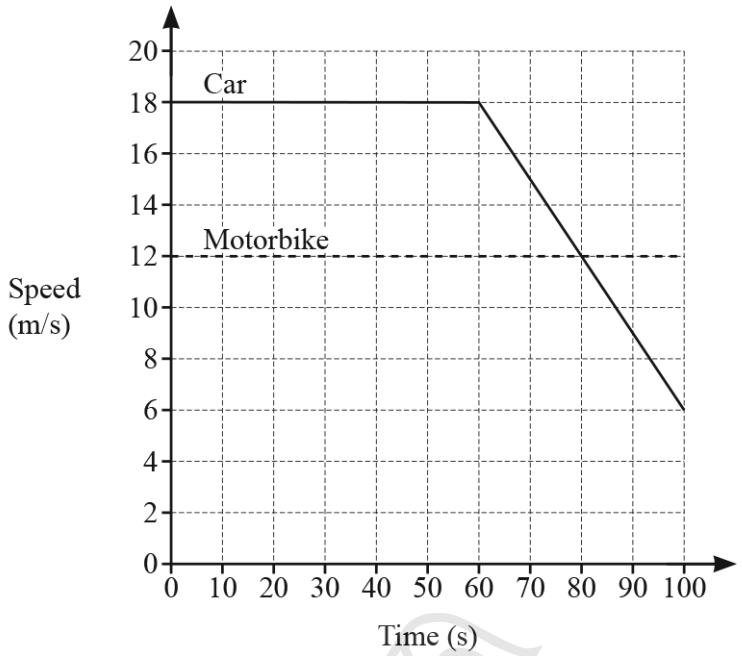
Make x the subject of this formula.

$$2y = 5x - 7$$

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

---

215. 0580_w20_qp_21 Q: 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]

216. 0580_w20_qp_21 Q: 16

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

..... [2]

217. 0580_w20_qp_21 Q: 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]

218. 0580_w20_qp_21 Q: 22

Simplify.

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

..... [4]

---

219. 0580_w20_qp_22 Q: 3

Solve the equation.

$$6 - 2x = 3x$$

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

---

220. 0580_w20_qp_22 Q: 6

Factorise completely.

$$4 - 8x$$

..... [1]

---

221. 0580_w20_qp_22 Q: 9

Solve the simultaneous equations.

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

$x =$ .....

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

---

222. 0580_w20_qp_22 Q: 11

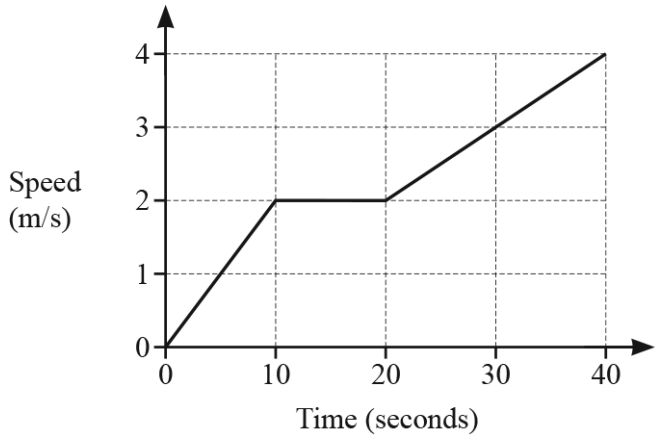
Simplify.

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

..... [2]

---

223. 0580_w20_qp_22 Q: 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]

---

224. 0580_w20_qp_22 Q: 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]

---

225. 0580_w20_qp_22 Q: 23

Write as a single fraction in its simplest form.

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

..... [3]

---

226. 0580_w20_qp_22 Q: 26

Simplify.

$$\frac{ux-2u-x+2}{u^2-1}$$

..... [4]

---

227. 0580_w20_qp_23 Q: 4

Simplify.

$$a^2 \div a^6$$

..... [1]

---

228. 0580_w20_qp_23 Q: 10

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

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

$x =$ .....

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

---

229. 0580_w20_qp_23 Q: 15

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

Make x the subject of this formula.

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

---

230. 0580_w20_qp_23 Q: 18

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

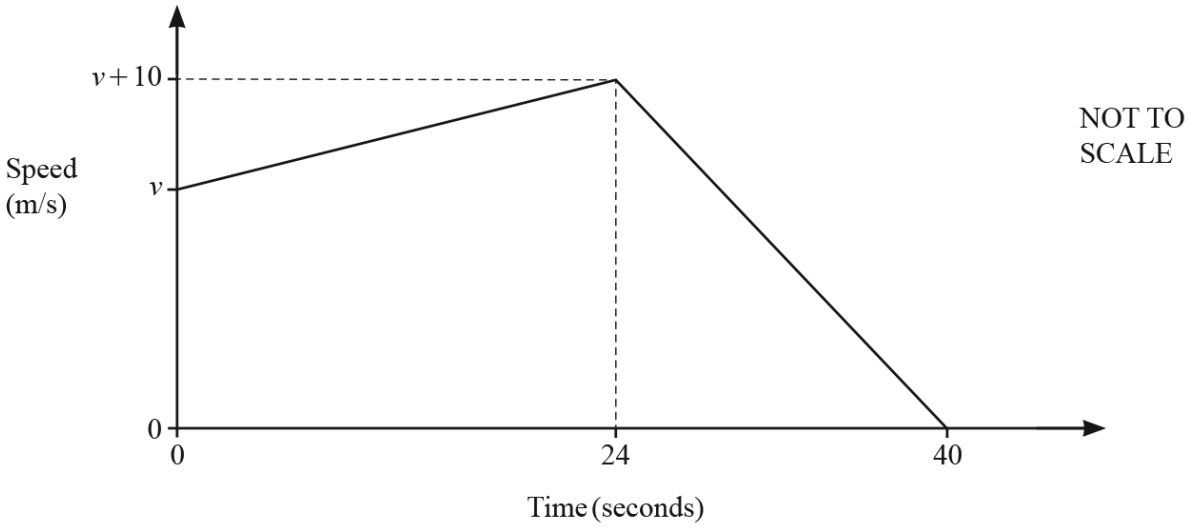
..... [2]

(b) $25 = 125^k$

Find the value of k.

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

231. 0580_w20_qp_23 Q: 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]

232. 0580_w20_qp_23 Q: 20

Factorise.

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

..... [2]

---

233. 0580_w20_qp_23 Q: 23

y is inversely proportional to the square root of x.
When $y = 7$, $x = 2.25$.

Write y in terms of x.

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

---

234. 0580_w20_qp_23 Q: 24

Simplify.

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

..... [4]

---

235. 0580_m19_QP_22 Q: 9

y is directly proportional to $(x-4)$.
When $x = 16$, $y = 3$.

Find y in terms of x.

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

---

236. 0580_m19_QP_22 Q: 13

Factorise.

(a) $7k^2 - 15k$

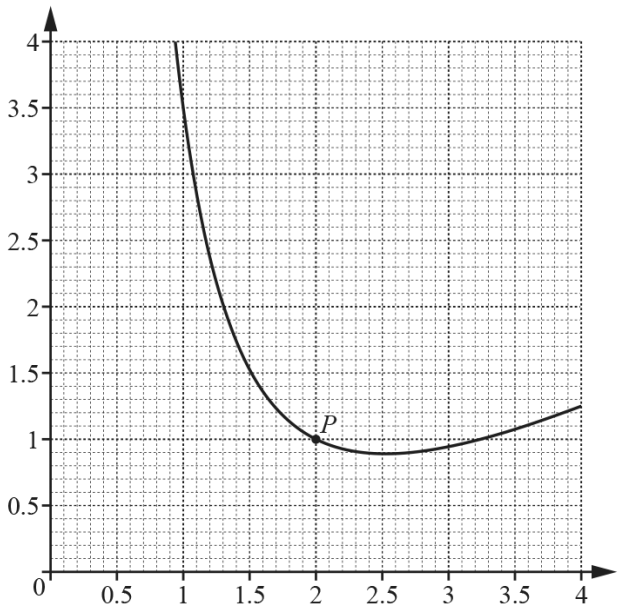
..... [1]

(b) $12(m+p) + 8(m+p)^2$

..... [2]

---

237. 0580_m19_QP_22 Q: 16



By drawing a suitable tangent, estimate the gradient of the curve at the point P.

..... [3]

---

238. 0580_m19_QP_22 Q: 17

(a) Find the value of n when $5^n = \frac{1}{125}$.

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

(b) Simplify $\left(\frac{64}{m^3}\right)^{-\frac{1}{3}}$.

..... [2]

---

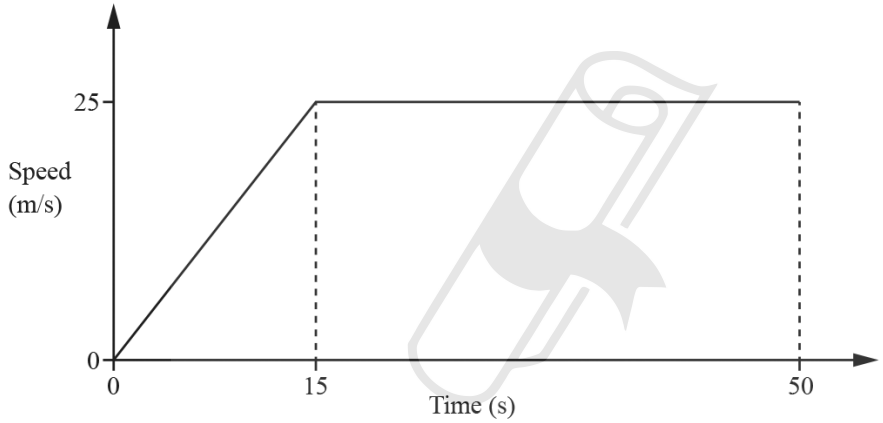
239. 0580_m19_QP_22 Q: 19

Simplify. $\frac{ab-b^2}{a^2-b^2}$

..... [3]

---

240. 0580_m19_QP_22 Q: 22



The speed–time graph shows the first 50 seconds of a journey.

Calculate

(a) the acceleration during the first 15 seconds,

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

(b) the distance travelled in the 50 seconds.

..... m [3]

---

241. 0580_s19_QP_21 Q: 2

Factorise $5y - 6py$.

..... [1]

---

242. 0580_s19_QP_21 Q: 3

Calculate $\sqrt[3]{8.1^2 - 1.3^{0.8}}$.

..... [1]

---

243. 0580_s19_QP_21 Q: 6

Simplify.

(a) $t^{21} \div t^7$

..... [1]

(b) $(u^5)^5$

..... [1]

---

244. 0580_s19_QP_21 Q: 10

$f(x) = 2x + 3$

Find $f(1 - x)$ in its simplest form.

..... [2]

---

245. 0580_s19_QP_21 Q: 13

$$x^2 + 4x - 9 = (x + a)^2 + b$$

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

---

246. 0580_s19_QP_21 Q: 15

Expand and simplify.

$$(x + 1)(x + 2) + 2x(x - 3)$$

..... [3]

---

247. 0580_s19_QP_21 Q: 16

y is inversely proportional to the square root of $(x + 1)$.
When $x = 8$, $y = 2$.

Find y when $x = 99$.

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

---

248. 0580_s19_QP_21 Q: 17

(a) Factorise $p^2 - q^2$.

..... [1]

(b) $p^2 - q^2 = 7$ and $p - q = 2$.

Find the value of $p + q$.

..... [2]

---

249. 0580_s19_QP_21 Q: 18

(a) Simplify $\left(81y^{16}\right)^{\frac{3}{4}}$.

..... [2]

(b) $2^3 = 4^p$

Find the value of p.

$p =$ ..... [1]

---

250. 0580_s19_QP_21 Q: 20

Write as a single fraction in its simplest form.

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

..... [3]

---

251. 0580_s19_QP_21 Q: 22

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

5 8 11 14

(i) Write down the next term.

..... [1]

(ii) Find an expression, in terms of n, for the nth term.

..... [2]

(b) These are the first five terms of another sequence.

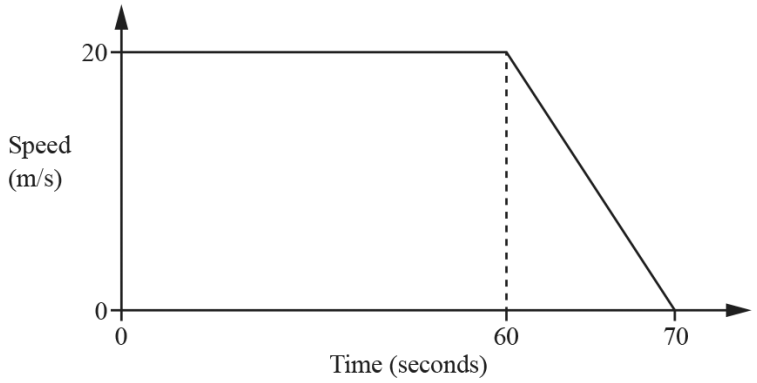
$$\frac{1}{2} \quad \frac{3}{4} \quad \frac{7}{6} \quad \frac{13}{8} \quad \frac{21}{10}$$

Find the next term.

..... [1]

---

252. 0580_s19_QP_21 Q: 24



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The diagram shows information about the final 70 seconds of a car journey.

(a) Find the deceleration of the car between 60 and 70 seconds.

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

(b) Find the distance travelled by the car during the 70 seconds.

.....m [3]

---

253. 0580_s19_QP_22 Q: 6

Solve the equation.

$$9f + 11 = 3f + 23$$

$f =$ ..... [2]

---

254. 0580_s19_QP_22 Q: 12

Simplify.

(a) $5m^2 \times 2m^3$

..... [2]

(b) $\left(x^8\right)^3$

..... [1]

---

255. 0580_s19_QP_22 Q: 14

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

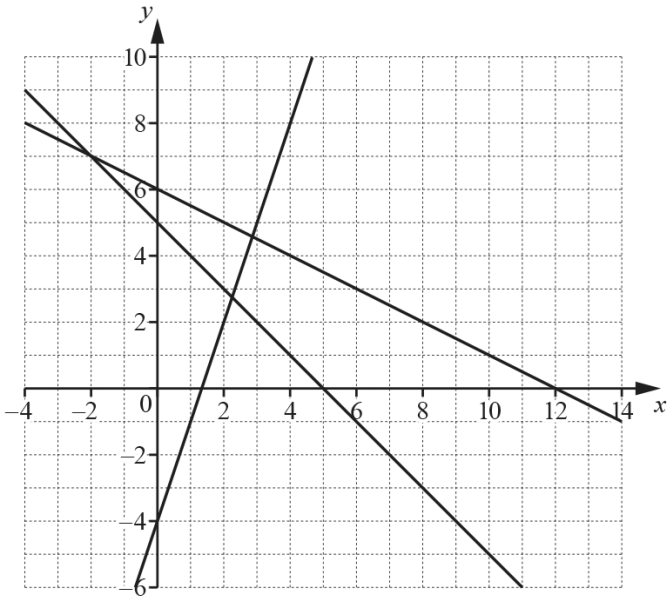
$$5x + 8y = 4$$
$$\tfrac{1}{2}x + 3y = 7$$

$x =$ .....

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

---

256. 0580_s19_QP_22 Q: 16



$y \leqslant -\frac{1}{2}x + 6$ $y \geqslant 3x - 4$ $x + y \geqslant 5$

(a) By shading the **unwanted** regions of the grid, find and label the region R that satisfies the three inequalities. [2]

(b) Find the largest value of $x + y$ in the region R, where x and y are integers.

..... [1]

257. 0580_s19_QP_22 Q: 17

Write as a single fraction in its simplest form.

$$\frac{2x}{x+3}+\frac{x+3}{x-5}$$

..... [3]

---

258. 0580_s19_QP_22 Q: 19

Rearrange this formula to make m the subject.

$$P=\frac{k+m}{m}$$

..... [4]

---

259. 0580_s19_QP_22 Q: 20

Solve the equation $3x^2 - 2x - 10 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

---

260. 0580_s19_QP_23 Q: 2

Factorise $2x^2 - x$.

..... [1]

---

261. 0580_s19_QP_23 Q: 10

Rearrange $2(w+h) = P$ to make w the subject.

$w =$ ..... [2]

---

262. 0580_s19_QP_23 Q: 11

Complete this statement with an expression in terms of m.

$$18m^3 + 9m^2 + 14m + 7 = (9m^2 + 7)(\ldots\ldots\ldots\ldots\ldots)$$

[2]

---

263. 0580_s19_QP_23 Q: 14

One solution of the equation $ax^2 + a = 150$ is $x = 7$.

(a) Find the value of a.

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

(b) Find the other solution.

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

---

264. 0580_s19_QP_23 Q: 17

Simplify $\frac{x^3 + 5x^2}{x^2 - 25}$, giving your answer as a single fraction.

..... [3]

---

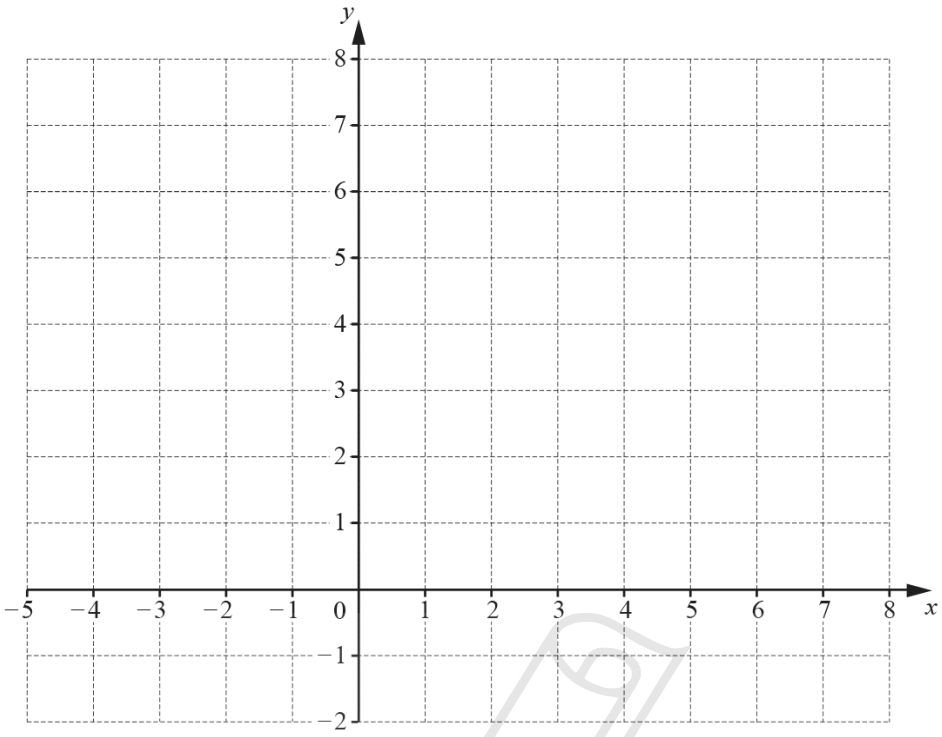
265. 0580_s19_QP_23 Q: 18

y is inversely proportional to the square of $(x+1)$.
$y = 0.875$ when $x = 1$.

Find y when $x = 4$.

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

266. 0580_s19_QP_23 Q: 24



By shading the **unwanted** regions of the grid, draw and label the region R which satisfies the following three inequalities.

$y \leqslant 2$ $x < 3$ $y \leqslant x+4$

[5]

---

267. 0580_w19_QP_21 Q: 2

Factorise $5p + pt$.

..... [1]

---

268. 0580_w19_QP_21 Q: 5

Simplify $5c - d - 3d - 2c$.

..... [2]

---

269. 0580_w19_QP_21 Q: 6

Solve.

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

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

---

270. 0580_w19_QP_21 Q: 7

Simplify $2x^3 \times 3x^2$.

..... [2]

---

271. 0580_w19_QP_21 Q: 10

Simplify.

$$\left(\frac{x^3}{8}\right)^{-\frac{4}{3}}$$

..... [2]

---

272. 0580_w19_QP_21 Q: 11

$$P = 2r + \pi r$$

Rearrange the formula to write r in terms of P and π.

$r =$ ..... [2]

---

273. 0580_w19_QP_21 Q: 15

y is inversely proportional to x^2.
When $x = 4$, $y = 2$.

Find y when $x = \frac{1}{2}$.

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

---

274. 0580_w19_QP_21 Q: 18

Write $\frac{x}{2} - \frac{2x+4}{x+1}$ as a single fraction, in its simplest form.

..... [3]

---

275. 0580_w19_QP_21 Q: 24

$f(x) = 3x - 5$ $g(x) = 2^x$

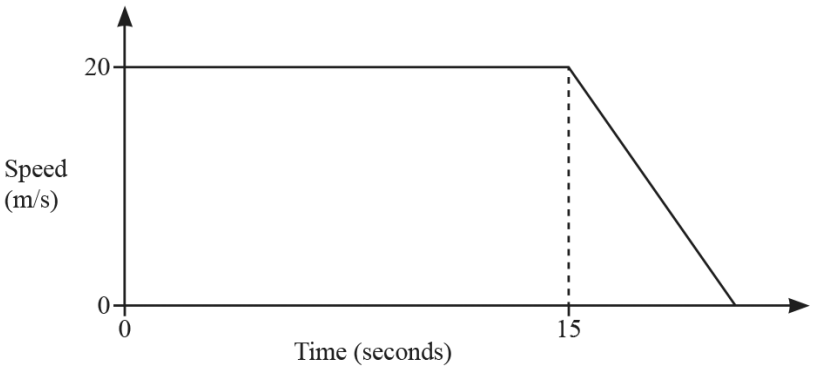
(a) Find fg(3).

..... [2]

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

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

276. 0580_w19_QP_21 Q: 26



NOT TO SCALE

. car travels at 20 m/s for 15 seconds before it comes to rest by decelerating at 2.5 m/s^2.

ind the total distance travelled.

..... m [5]

---

277. 0580_w19_QP_22 Q: 3

Expand.

$a(a^3+3)$

..... [1]

---

278. 0580_w19_QP_22 Q: 9

Solve the inequality.

$\frac{x}{2}-13 > 12+3x$

..... [2]

---

279. 0580_w19_QP_22 Q: 15

Esme buys x magazines at \$2.45 each and y cards at \$3.15 each.

(a) Write down an expression, in terms of x and y, for the total cost, in dollars, of the magazines and the cards.

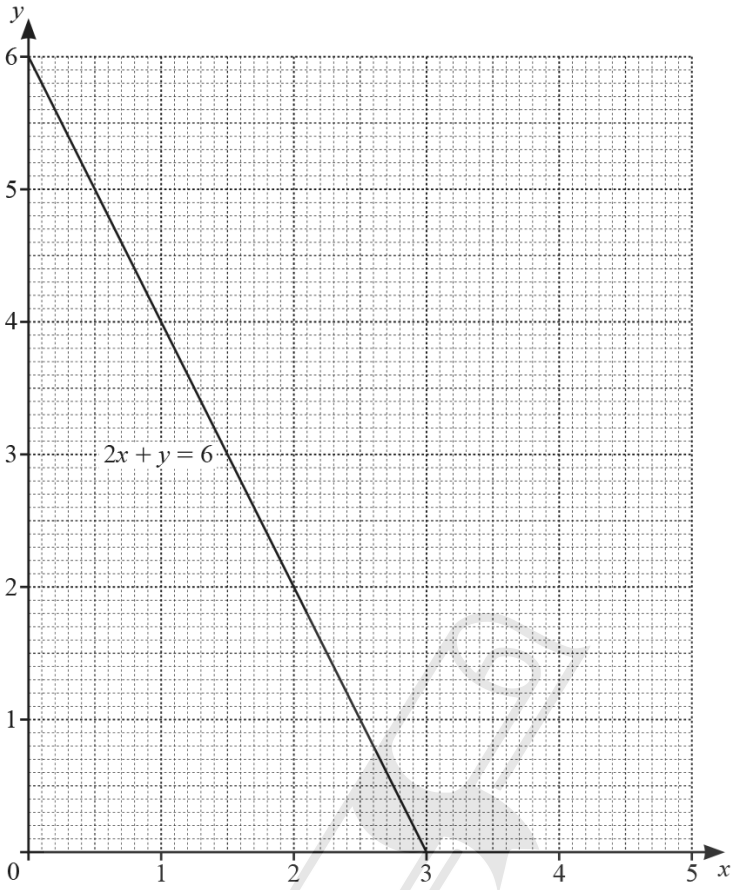
\$ ..... [2]

(b) Esme spends \$60.55 in total.
She buys 8 magazines.

How many cards does she buy?

..... [2]

280. 0580_w19_QP_22 Q: 16



By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following inequalities.

$y \leqslant 5$ $2x + y \geqslant 6$ $y \geqslant x + 1$ [4]

281. 0580_w19_QP_22 Q: 20

(a) Factorise.

$18y - 3ay + 12x - 2ax$

..... [2]

(b) Factorise.

$3x^2 - 48y^2$

..... [3]

282. 0580_w19_QP_22 Q: 21

(a) $3^{-2} \times 3^{x} = 81$

Find the value of x.

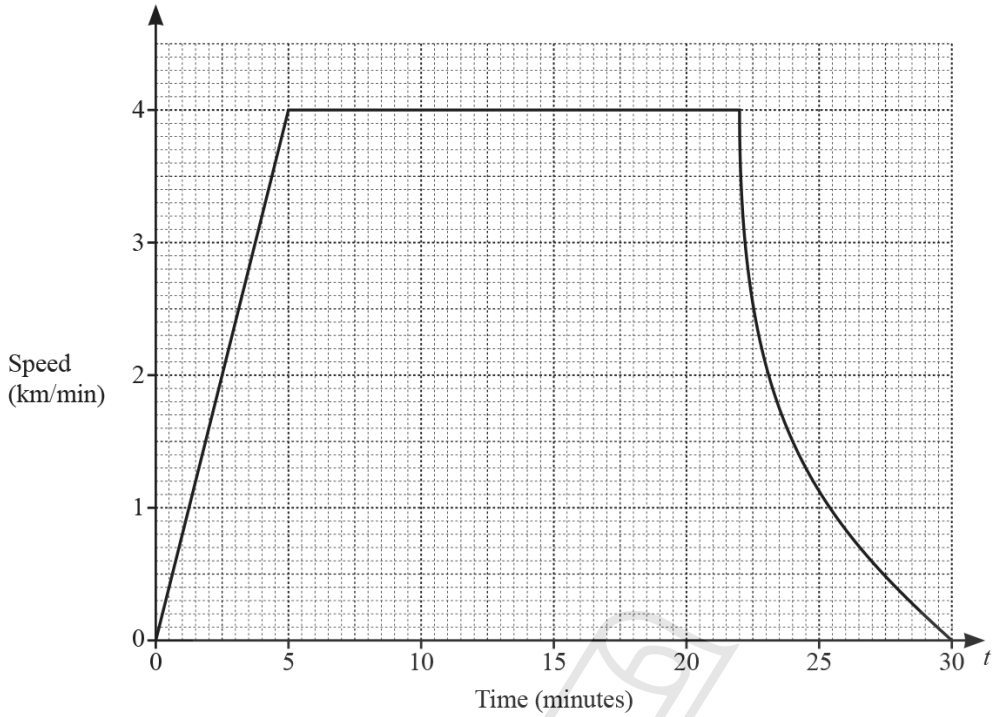
$x =$ ..... [2]

(b) $x^{-\frac{1}{3}} = 32x^{-2}$

Find the value of x.

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

283. 0580_w19_QP_22 Q: 23



The speed–time graph shows information about a train journey.

(a) By drawing a suitable tangent to the graph, estimate the gradient of the curve at $t = 24$.

..... [3]

(b) What does this gradient represent?

..... [1]

(c) Work out the distance travelled by the train when it is travelling at constant speed.

..... km [2]

284. 0580_w19_QP_23 Q: 6

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

..... [2]

---

285. 0580_w19_QP_23 Q: 11

Factorise.

(a) $12x + 15$

..... [1]

(b) $xy-2x+3y-6$

..... [2]

---

286. 0580_w19_QP_23 Q: 14

Find the nth term of each sequence.

(a) $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}, \ldots$

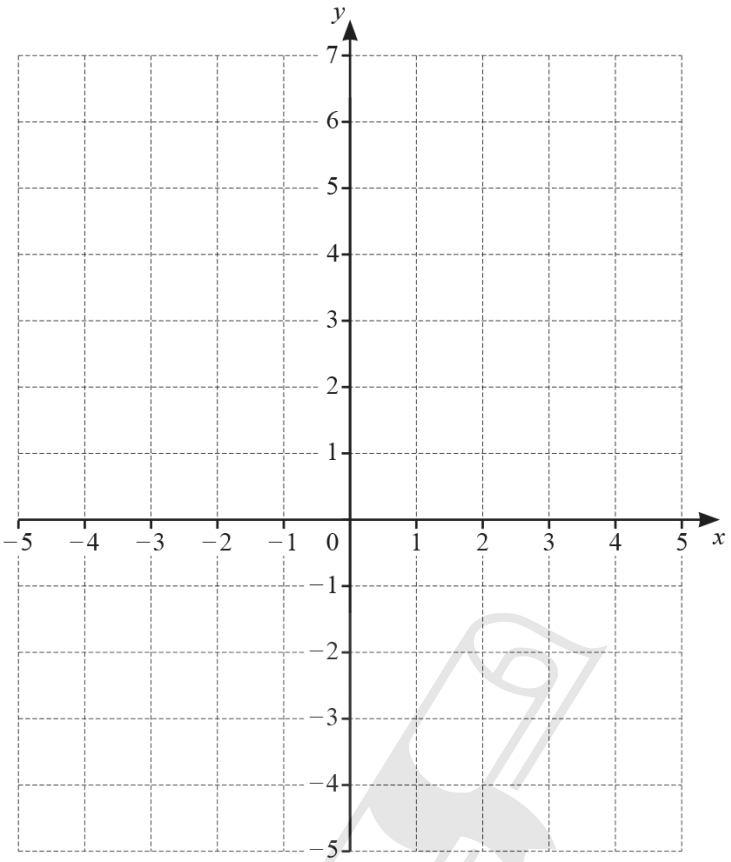
..... [1]

(b) 1, 5, 25, 125, 625, ...

..... [2]

---

287. 0580_w19_QP_23 Q: 17

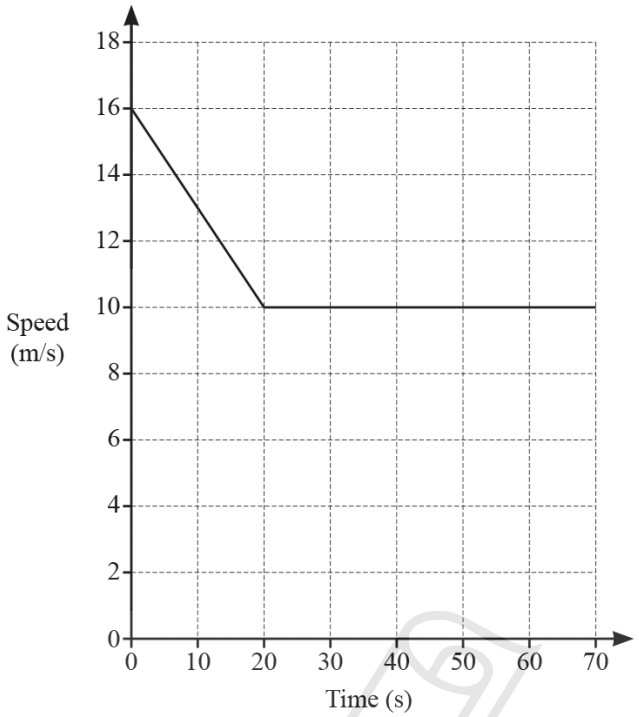


By shading the **unwanted** regions on the grid, draw and label the region R that satisfies the following inequalities.

$-2 < x \leqslant 3$ $y \leqslant x+3$

[4]

288. 0580_w19_QP_23 Q: 19



The diagram shows the speed–time graph for 70 seconds of a car journey.

(a) Calculate the deceleration of the car during the first 20 seconds.

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

(b) Calculate the total distance travelled by the car during the 70 seconds.

..... m [3]

289. 0580_w19_QP_23 Q: 20

t is inversely proportional to the square of $(x + 1)$.
When $x = 2$, $t = 5$.

(a) Write t in terms of x.

$t =$ ..... [2]

(b) When $t = 1.8$, find the positive value of x.

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

---

290. 0580_m18_QP_22 Q: 6

Factorise completely.

$$15k^2m - 20m^4$$

..... [2]

---

291. 0580_m18_QP_22 Q: 9

$$2^p = \frac{1}{8^4}$$

Find the value of p.

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

---

292. 0580_m18_QP_22 Q: 10

y is inversely proportional to x.
When $x = 9$, $y = 8$.

Find y when $x = 6$.

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

---

293. 0580_m18_QP_22 Q: 13

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

$$2x + \frac{1}{2}y = 13$$
$$3x + 2y = 17$$

$x =$ .....

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

---

294. 0580_m18_QP_22 Q: 17

Solve the equation $2x^2 + 7x - 3 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

---

295. 0580_m18_QP_22 Q: 21

$f(x) = 7 - x$ $g(x) = 4x + 2$ $h(x) = 15 - x^2$

(a) Find $ff(2)$.

..... [2]

(b) Find $gf(x)$ in its simplest form.

..... [2]

(c) Find $h(2x)$ in its simplest form.

..... [2]

---

296. 0580_s18_QP_21 Q: 4

Find the value of $7x + 3y$ when $x = 12$ and $y = -6$.

..... [2]

---

297. 0580_s18_QP_21 Q: 8

Expand and simplify.

$$6(2y - 3) - 5(y + 1)$$

..... [2]

---

298. 0580_s18_QP_21 Q: 12

Solve the inequality.

$$3n - 5 > 17 + 8n$$

..... [2]

---

299. 0580_s18_QP_21 Q: 15

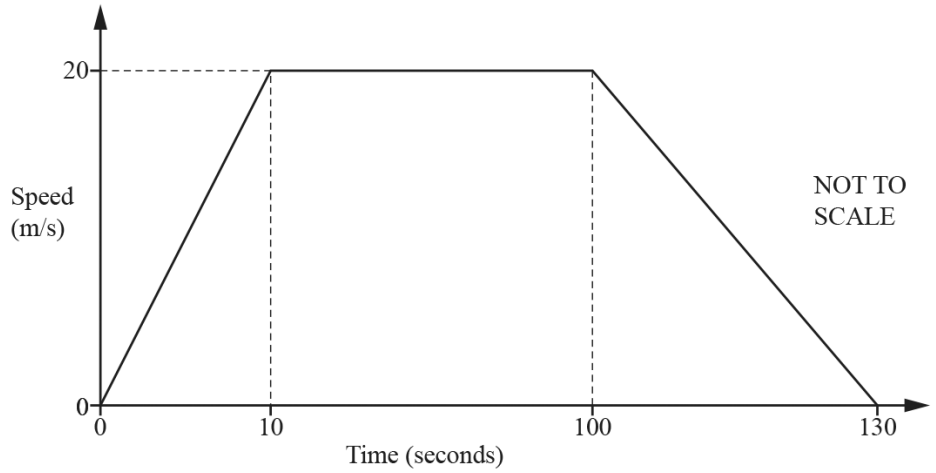
y is directly proportional to $(x-1)^2$.
When $x = 5$, $y = 4$.

Find y when $x = 7$.

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

---

300. 0580_s18_QP_21 Q: 17



The speed–time graph shows information about the journey of a tram between two stations.

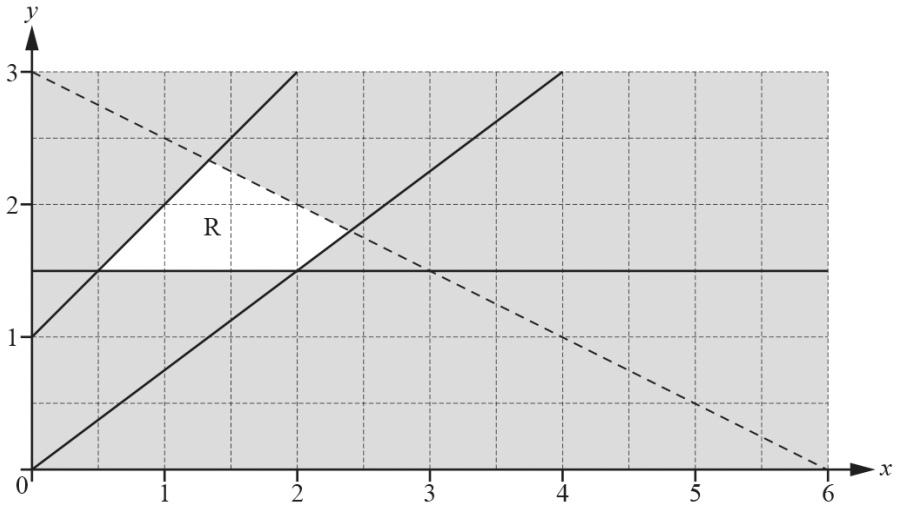
(a) Calculate the distance between the two stations.

..... m [3]

(b) Calculate the average speed of the tram for the whole journey.

..... m/s [1]

301. 0580_s18_QP_21 Q: 21



There are four inequalities that define the region R.
One of these is $y \leqslant x + 1$.

Find the other three inequalities.

.....

.....

..... [4]

---

302. 0580_s18_QP_21 Q: 22

$f(x) = 5 - 2x$ $g(x) = x^2 + 8$

(a) Calculate ff(−3).

..... [2]

(b) Find

(i) g(2x),

..... [1]

(ii) $f^{-1}(x)$.

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

---

303. 0580_s18_QP_22 Q: 2

Expand.

$7(x - 8)$

..... [1]

---

304. 0580_s18_QP_22 Q: 3

Here is a sequence.

a, 13, 9, 3, –5, –15, b, …

Find the value of a and the value of b.

a = ...

b = ... [2]

---

305. 0580_s18_QP_22 Q: 4

Complete these statements.

(a) When w = ... , $10w = 70$. [1]

(b) When $5x = 15$, $12x$ = ... [1]

---

306. 0580_s18_QP_22 Q: 10

Factorise completely.

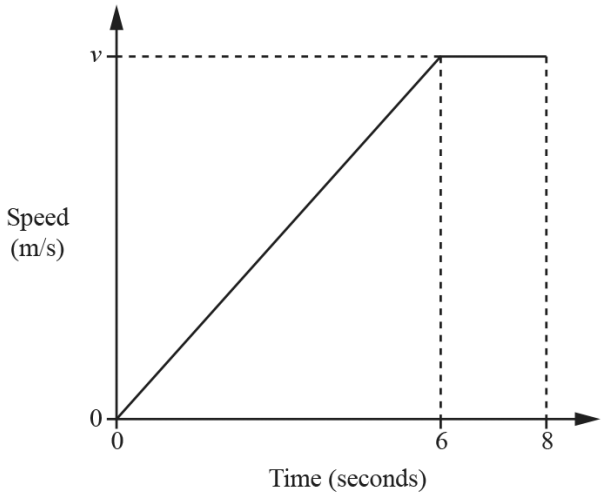
$xy + 2y + 3x + 6$

..... [2]

---

307. 0580_s18_QP_22 Q: 17

The diagram shows information about the first 8 seconds of a car journey.



NOT TO
SCALE

The car travels with constant acceleration reaching a speed of v m/s after 6 seconds.
The car then travels at a constant speed of v m/s for a further 2 seconds.
The car travels a total distance of 150 metres.

Work out the value of v.

v = ... [3]

308. 0580_s18_QP_22 Q: 18

A ball falls d metres in t seconds.
d is directly proportional to the square of t.
The ball falls 44.1 m in 3 seconds.

(a) Find a formula for d in terms of t.

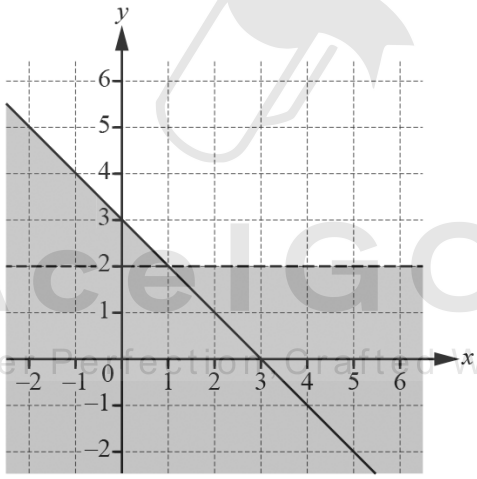
$d =$ ..... [2]

(b) Calculate the distance the ball falls in 2 seconds.

..... m [1]

---

309. 0580_s18_QP_22 Q: 19



Find the two inequalities that define the region on the grid that is **not** shaded.

.....

..... [3]

---

310. 0580_s18_QP_23 Q: 2

Factorise.

$w + w^3$

..... [1]

---

311. 0580_s18_QP_23 Q: 9

Solve.

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

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

---

312. 0580_s18_QP_23 Q: 10

Factorise completely.

$2a + 4b - ax - 2bx$

..... [2]

---

313. 0580_s18_QP_23 Q: 11

$A = (2\pi + y)x^2$

Rearrange the formula to make x the subject.

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

---

314. 0580_s18_QP_23 Q: 13

Simplify.

$$\frac{3+x}{9-x^2}$$

..... [2]

---

315. 0580_s18_QP_23 Q: 17

(a) Find the value of $\left(\frac{1}{81}\right)^{-\frac{3}{4}}$.

..... [1]

(b) Simplify. $\sqrt[3]{27t^{27}}$

..... [2]

---

316. 0580_s18_QP_23 Q: 18

Expand the brackets and simplify.

$$(2p+3)(3p-2)$$

..... [3]

---

317. 0580_s18_QP_23 Q: 19

y is directly proportional to $(x-1)^2$.
When $x = 3$, $y = 24$.

Find y when $x = 6$.

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

---

318. 0580_s18_QP_23 Q: 21

Write as a single fraction in its simplest form.

$$\frac{1}{y-1} - \frac{1}{y}$$

..... [3]

---

319. 0580_s18_QP_23 Q: 22

Find an expression for the nth term of each sequence.

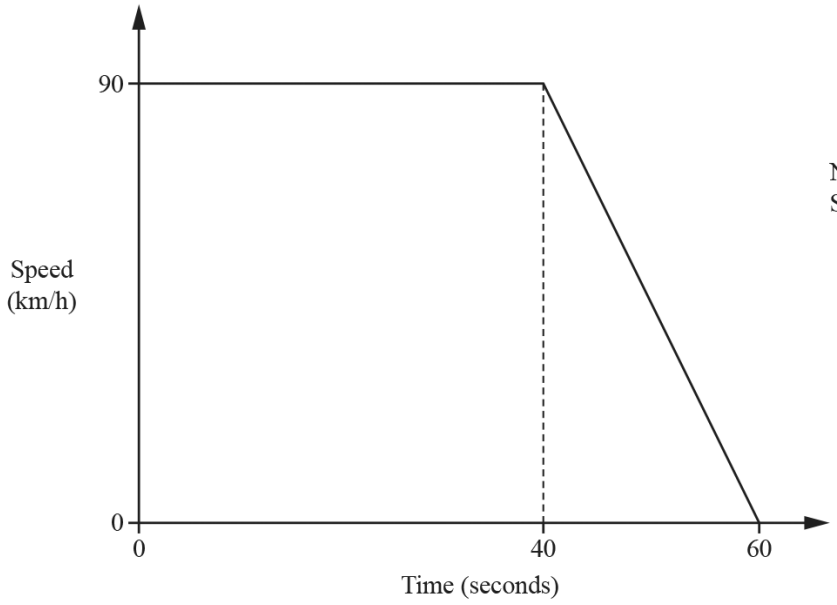
(a) 11, 7, 3, –1, …

..... [2]

(b) 3, 6, 12, 24, …

..... [2]

320. 0580_s18_QP_23 Q: 24



The diagram shows the speed–time graph for 60 seconds of a car journey.

(a) Change 90 km/h to m/s.

..... m/s [2]

(b) Find the deceleration of the car in m/s^2.

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

(c) Find the distance travelled, in metres, in the 60 seconds.

..... m [2]

321. 0580_w18_QP_21 Q: 5

Expand and simplify.

$$(3x-7)(2x+9)$$

..... [2]

---

322. 0580_w18_QP_21 Q: 7

y is inversely proportional to x^3.
When $x = 2$, $y = 0.5$.

Find y in terms of x.

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

---

323. 0580_w18_QP_21 Q: 11

These are the first five terms in a sequence.

8 11 14 17 20

(a) Find the next term.

..... [1]

(b) Find an expression for the nth term.

..... [2]

---

324. 0580_w18_QP_21 Q: 12

Find the integer values of n that satisfy the inequality $15 \leqslant 4n < 28$.

..... [3]

---

325. 0580_w18_QP_21 Q: 15

Write as a single fraction in its simplest form.

$$\frac{x-5}{3} + \frac{6}{x+2}$$

..... [3]

---

326. 0580_w18_QP_21 Q: 17

(a) $t^x \times t^2 = t^{10}$

Find the value of x.

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

(b) Simplify.

(i) $\left(\frac{4}{x}\right)^{-2}$

..... [1]

(ii) $a^3b^7 \div a^6b^2$

..... [2]

---

327. 0580_w18_QP_21 Q: 18

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

$$2x + 3y = -12$$
$$5x + 2y = 14$$

$x =$ .....

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

---

328. 0580_w18_QP_21 Q: 19

Use the quadratic formula to solve the equation $3x^2 + 7x - 11 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

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

---

329. 0580_w18_QP_21 Q: 23

$f(x) = 7 + 3x$ $g(x) = x^4$ $h(x) = 3^x$

(a) $h(3x) = k^x$

Find the value of k.

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

(b) Find the value of x when $f(x) = g(2)$.

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

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

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

---

330. 0580_w18_QP_22 Q: 4

Expand.

$2x(3 - x^2)$

..... [2]

---

331. 0580_w18_QP_22 Q: 6

Solve.

$7m - 2 \geqslant 19$

..... [2]

---

332. 0580_w18_QP_22 Q: 8

Factorise.

$xy + 5y + 2x + 10$

..... [2]

---

333. 0580_w18_QP_22 Q: 13

These are the first five terms of a sequence.

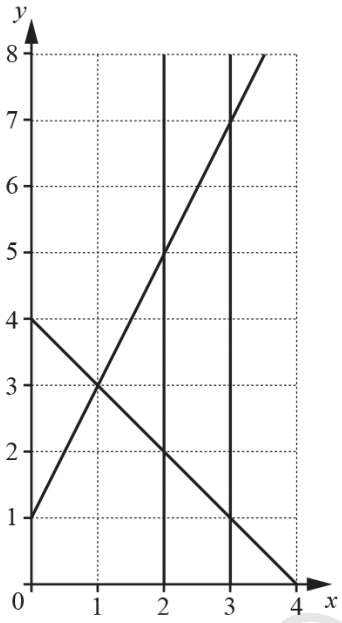
$-4 \quad 2 \quad 8 \quad 14 \quad 20$

Find an expression for the nth term of this sequence.

..... [2]

---

334. 0580_w18_QP_22 Q: 14



By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following four inequalities.

$x \leqslant 3$ $x \geqslant 2$ $y \leqslant 2x+1$ $y \geqslant 4-x$

[3]

---

335. 0580_w18_QP_22 Q: 16

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

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

---

336. 0580_w18_QP_22 Q: 20

Make m the subject of the formula.

$$x = \frac{3m}{2-m}$$

$m =$ ..... [4]

337. 0580_w18_QP_22 Q: 25

(a) $f(x) = x^3$ $g(x) = 5x + 2$

(i) Find $gf(x)$.

..... [1]

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

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

(b) $h(x) = ax^2 + 1$

Find the value of a when $h(-2) = 21$.

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

---

338. 0580_w18_QP_23 Q: 2

Factorise.

$y - 2y^2$

.....[1]

---

339. 0580_w18_QP_23 Q: 7

Simplify.

$2p - q - 3q - 5p$

.....[2]

---

340. 0580_w18_QP_23 Q: 10

Solve.

$3w - 7 = 32$

$w =$ ..... [2]

---

341. 0580_w18_QP_23 Q: 11

$A = \pi rl + \pi r^2$

Rearrange this formula to make l the subject.

$l =$ ..... [2]

---

342. 0580_w18_QP_23 Q: 16

(a) Simplify $\frac{w^2}{w^3}$.

..... [1]

(b) Simplify $(3w^3)^3$.

..... [2]

---

343. 0580_w18_QP_23 Q: 17

y is directly proportional to the square root of x.
When $x = 9$, $y = 6$.

Find y when $x = 25$.

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

---

344. 0580_w18_QP_23 Q: 18

Write as a single fraction in its simplest form.

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

..... [3]

---

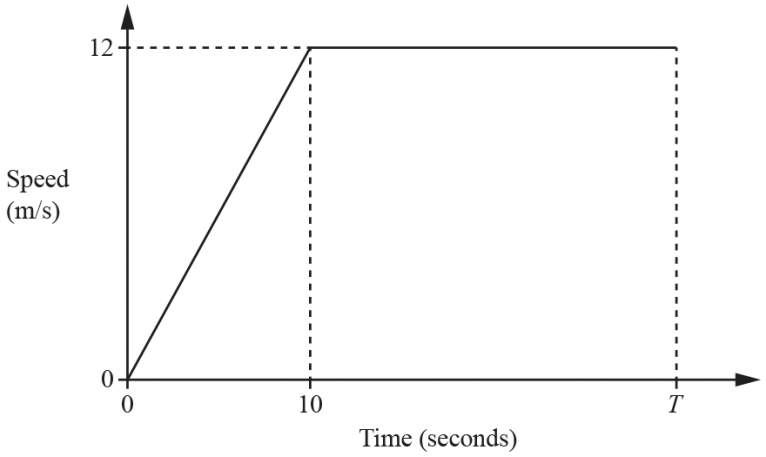
345. 0580_w18_QP_23 Q: 20

Solve the equation $3x^2 - 2x - 2 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

---

346. 0580_w18_QP_23 Q: 21



NOT TO
SCALE

The diagram shows the speed–time graph for the first T seconds of a car journey.

(a) Find the acceleration during the first 10 seconds.

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

(b) The total distance travelled during the T seconds is 480 m.

Find the value of T.

$T =$ ..... [3]

---

347. 0580_w18_QP_23 Q: 22

Simplify.

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

..... [4]

---

348. 0580_w18_QP_23 Q: 25

Factorise completely.

(a) $px+py-x-y$

..... [2]

(b) $2t^2-98m^2$

..... [3]

---

349. 0580_m17_QP_22 Q: 1

Expand the brackets and simplify.

$$4(5w+3)-2(w-1)$$

..... [2]

---

350. 0580_m17_QP_22 Q: 5

$s = ut + 16t^2$

Find the value of s when $u = 2$ and $t = 3$.

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

---

351. 0580_m17_QP_22 Q: 12

y is inversely proportional to x^2.
When $x = 5$, $y = 16$.

Find y when $x = 10$.

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

---

352. 0580_m17_QP_22 Q: 13

Factorise completely.

(a) $15c^2 - 5c$

..... [2]

(b) $2kp - km + 6p - 3m$

..... [2]

---

353. 0580_m17_QP_22 Q: 15

Work out.

(a) $t^{24} \div t^4$

..... [1]

(b) $(x^5)^2$

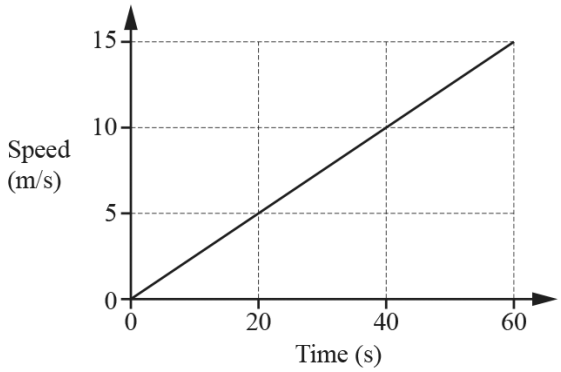
..... [1]

(c) $(81m^8)^{\frac{3}{4}}$

..... [2]

354. 0580_m17_QP_22 Q: 16

The speed-time graph shows the first 60 seconds of a train journey.



(a) Find the acceleration of the train.

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

(b) Calculate the distance the train has travelled in this time.
Give your answer in kilometres.

.....km [3]

355. 0580_m17_QP_22 Q: 21

$f(x) = \frac{x}{4} - 3$ $g(x) = 6x - 7$ $h(x) = 2^x$

(a) Work out the value of x when $f(x) = -0.5$.

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

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

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

(c) Work out the value of x when $h(x) = f(13)$.

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

---

356. 0580_s17_QP_21 Q: 1

Simplify.

$(x^2)^5$

..... [1]

---

357. 0580_s17_QP_21 Q: 5

Factorise completely.

$12n^2 - 4mn$

..... [2]

---

358. 0580_s17_QP_21 Q: 9

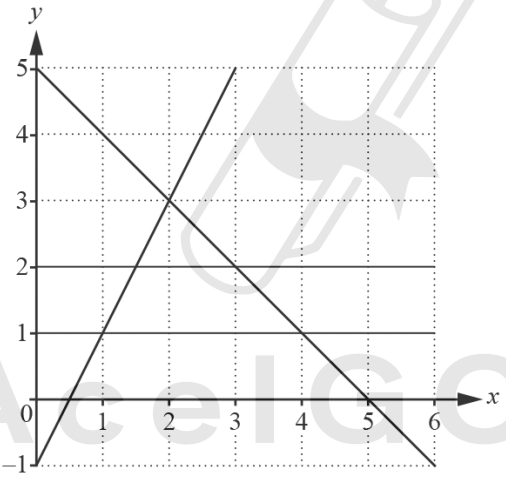
h is directly proportional to the square root of p.
$h = 5.4$ when $p = 1.44$.

Find h when $p = 2.89$.

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

---

359. 0580_s17_QP_21 Q: 10



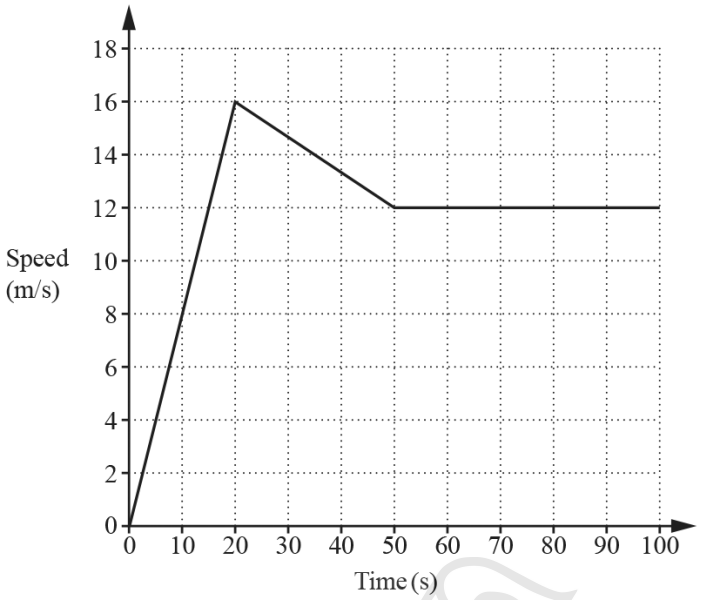
By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following four inequalities.

$y \leqslant 2$ $y \geqslant 1$ $y \leqslant 2x - 1$ $y \leqslant 5 - x$ [3]

---

360. 0580_s17_QP_21 Q: 15

The diagram shows information about the first 100 seconds of a car journey.



(a) Calculate the acceleration during the first 20 seconds of the journey.

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

(b) Work out the total distance travelled by the car in the 100 seconds.

.....m [3]

361. 0580_s17_QP_21 Q: 22

Write as a single fraction in its simplest form.

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

..... [3]

(b) $\frac{3}{x-4}+\frac{2}{2x+5}$

..... [3]

---

362. 0580_s17_QP_22 Q: 6

Factorise.

$14x-21y$

..... [1]

---

363. 0580_s17_QP_22 Q: 7

Find the value of $5a-3b$ when $a=7$ and $b=-2$.

..... [2]

---

364. 0580_s17_QP_22 Q: 10

Solve.

$$2-x=5x+1$$

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

---

365. 0580_s17_QP_22 Q: 13

Solve the inequality.

$$3n-11>5n-18$$

..... [2]

---

366. 0580_s17_QP_22 Q: 15

Make q the subject of the formula $p = 2q^2$.

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

---

367. 0580_s17_QP_22 Q: 20

Write as a single fraction in its simplest form.

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

..... [3]

---

368. 0580_s17_QP_22 Q: 21

y is inversely proportional to $\sqrt{1+x}$.
When $x = 8$, $y = 2$.

Find y when $x = 15$.

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

---

369. 0580_s17_QP_22 Q: 22

Factorise completely.

(a) $9t^2 - u^2$

..... [2]

(b) $2c - 4d - pc + 2pd$

..... [2]

---

370. 0580_s17_QP_22 Q: 25

(a) Simplify.

$(16x^{16})^{\frac{3}{4}}$

..... [2]

(b) $2p^{\frac{3}{2}} = 54$

Find the value of p.

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

---

371. 0580_s17_QP_23 Q: 2

Factorise completely.

$4x^2 - 8xy$

..... [2]

---

372. 0580_s17_QP_23 Q: 4

Make a the subject of the formula.

$x = y + \sqrt{a}$

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

---

373. 0580_s17_QP_23 Q: 7

y is inversely proportional to x^2.
When $x = 2$, $y = 8$.

Find y in terms of x.

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

---

374. 0580_s17_QP_23 Q: 8

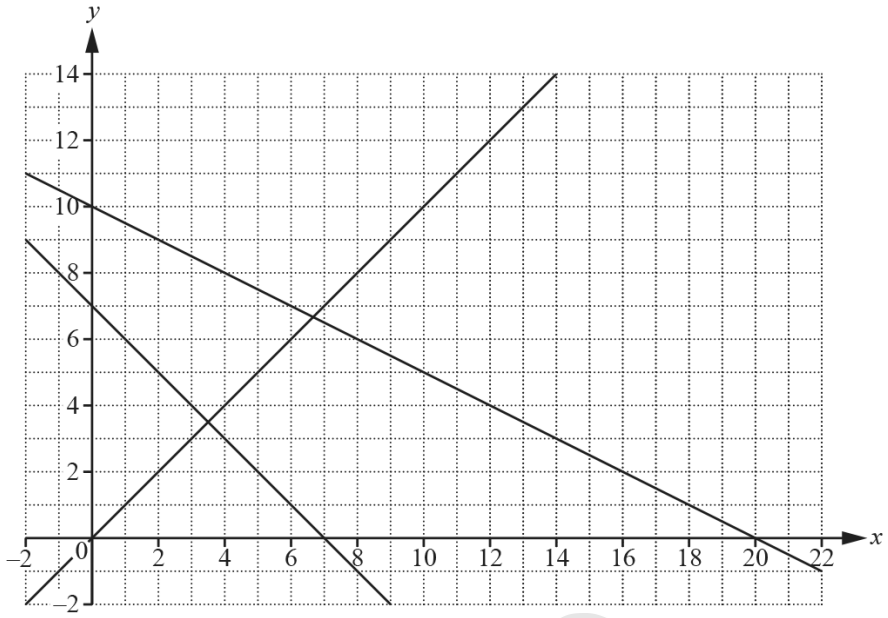
Simplify.

$$\left(\frac{8}{a^{12}}\right)^{\frac{1}{3}}$$

..... [2]

---

375. 0580_s17_QP_23 Q: 11



By shading the unwanted regions of the grid above, find and label the region R that satisfies the following four inequalities.

$x \geqslant 0$ $x + y \geqslant 7$ $y \geqslant x$ $x + 2y \leqslant 20$

[3]

---

376. 0580_s17_QP_23 Q: 12

$f(x) = 3 + 4x$ $g(x) = 6x + 7$

Find, in its simplest form,

(a) $f(3x)$,

.....[1]

(b) $fg(x)$.

.....[2]

---

377. 0580_s17_QP_23 Q: 16

(a) Solve the inequality.

$$x + 13 \geqslant 3x + 7$$

.....[2]

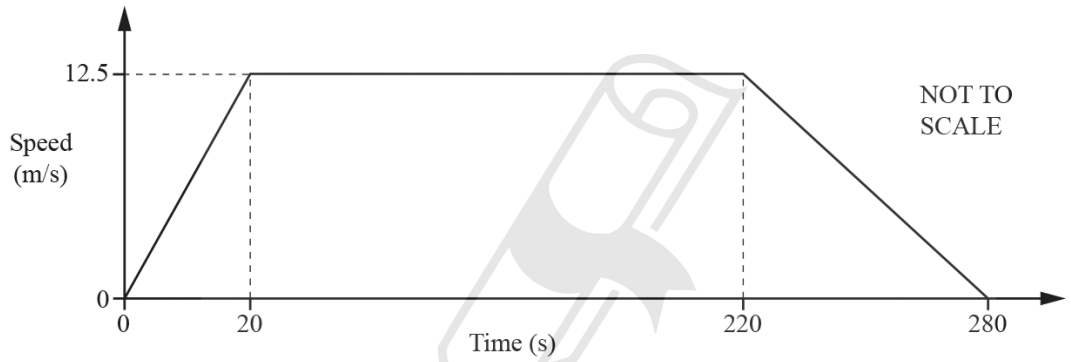
(b) List the positive integers that satisfy the inequality in **part (a)**.

.....[1]

---

378. 0580_s17_QP_23 Q: 18

The diagram shows a speed-time graph for the journey of a car.



Calculate the total distance travelled.

.....m [3]

---

379. 0580_s17_QP_23 Q: 20

Simplify.

(a) $6w^0$

..... [1]

(b) $5x^3 - 3x^3$

..... [1]

(c) $3y^6 \times 5y^{-2}$

..... [2]

---

380. 0580_s17_QP_23 Q: 21

Solve the equation $5x^2 + 10x + 2 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

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

---

381. 0580_s17_QP_23 Q: 23

(a) Simplify.

$$\frac{4(x-6)^2}{(x-6)}$$

.....[1]

(b) Expand the brackets and simplify.

$$(x+4)^2+5(3x+2)$$

.....[3]

---

382. 0580_w17_QP_21 Q: 5

Factorise completely.

$$12x^2+15xy-9x$$

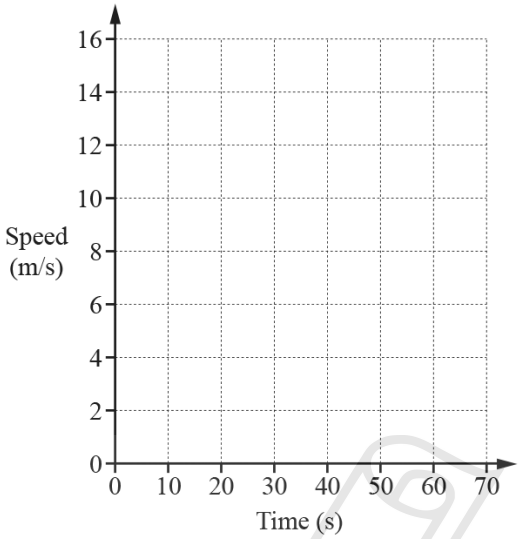
.....[2]

---

383. 0580_w17_QP_21 Q: 7

Petra begins a journey in her car.
She accelerates from rest at a constant rate of 0.4 m/s^2 for 30 seconds.
She then travels at a constant speed for 40 seconds.

On the grid, draw the speed-time graph for the first 70 seconds of Petra's journey.



[2]

---

384. 0580_w17_QP_21 Q: 13

Simplify.

(a) $(m^5)^2$

..... [1]

(b) $4x^3y \times 5x^2y$

..... [2]

---

385. 0580_w17_QP_21 Q: 17

y is inversely proportional to $(x+1)^2$.
$y = 50$ when $x = 0.2$.

(a) Write y in terms of x.

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

(b) Find the value of y when $x = 0.5$.

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

---

386. 0580_w17_QP_21 Q: 19

Write as a single fraction in its simplest form.

$$\frac{5}{x-3} + \frac{3}{x+7} + \frac{1}{2}$$

..... [4]

---

387. 0580_w17_QP_21 Q: 23

In one week, Neha spends x hours cooking and y hours cleaning.
The time she spends cleaning is at least equal to the time she spends cooking.
This can be written as $y \geqslant x$.

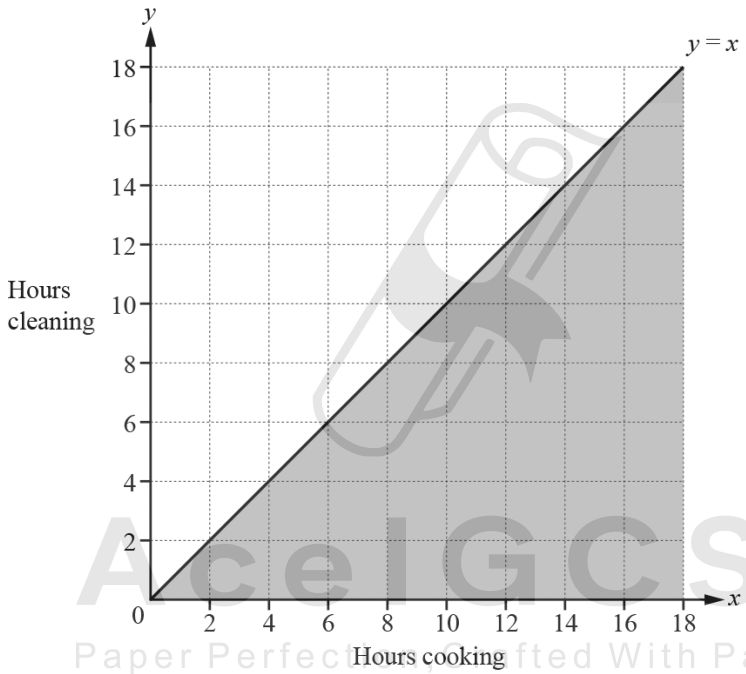
She spends no more than 16 hours in total cooking and cleaning.
She spends at least 4 hours cooking.

(a) Write down two more inequalities in x and/or y to show this information.

.....

..... [2]

(b) Complete the diagram to show the three inequalities.
Shade the **unwanted** regions.



[3]

(c) Neha receives \$10 for each hour she spends cooking and \$8 for each hour she spends cleaning.

Work out the largest amount she could receive.

\$..... [2]

388. 0580_w17_QP_22 Q: 12

Expand the brackets and simplify.

$$(5-n)(3+n)$$

..... [2]

---

389. 0580_w17_QP_22 Q: 14

Find the integers which satisfy the inequality.

$$-5 < 2n-1 \leqslant 5$$

..... [3]

---

390. 0580_w17_QP_22 Q: 15

Write as a single fraction in its simplest form.

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

..... [3]

---

391. 0580_w17_QP_22 Q: 16

Here are the first four terms of a sequence.

23 17 11 5

(a) Find the next term.

..... [1]

(b) Find the *n*th term.

..... [2]

---

392. 0580_w17_QP_22 Q: 18

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

$$y = \frac{x}{2}$$
$$2x - y = 1$$

$x =$ .....

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

---

393. 0580_w17_QP_22 Q: 19

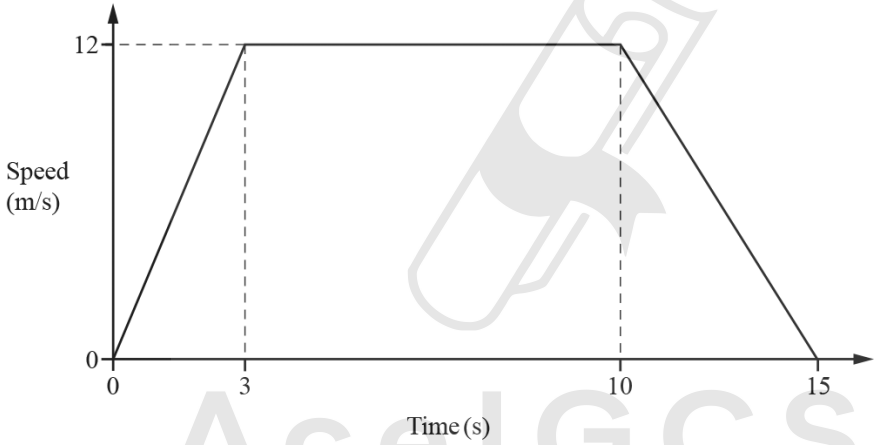
Make x the subject of the formula.

$$y = \sqrt{x^2 + 1}$$

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

---

394. 0580_w17_QP_22 Q: 20



The diagram shows a speed-time graph.

Calculate the total distance travelled.

..... m [3]

---

395. 0580_w17_QP_22 Q: 24

Solve the equations.

(a) $7-3n=11n+2$

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

(b) $\frac{p-3}{5}=3$

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

---

396. 0580_w17_QP_22 Q: 25

Factorise completely.

(a) $x^2-x-132$

..... [2]

(b) x^3-4x

..... [2]

---

397. 0580_w17_QP_22 Q: 27

Simplify.

(a) $81^{\frac{3}{4}}$

..... [1]

(b) $x^{\frac{2}{3}} \div x^{-\frac{4}{3}}$

..... [1]

(c) $\left(\frac{8}{y^6}\right)^{-\frac{1}{3}}$

..... [2]

---

398. 0580_w17_QP_23 Q: 5

Factorise completely.

$18x + 27y$

..... [1]

---

399. 0580_w17_QP_23 Q: 6

$(\sqrt[3]{10})^2 = 10^p$

Find the value of p.

$p =$ ..... [1]

---

400. 0580_w17_QP_23 Q: 9

Solve the inequality.

$$7 - 8x \geqslant 19 + 2x$$

..... [2]

---

401. 0580_w17_QP_23 Q: 14

Solve by factorising.

$$3x^2 - 7x - 20 = 0$$

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

---

402. 0580_w17_QP_23 Q: 15

$f(x) = 5x - 3$ $g(x) = x^2 + 6x + 1$

Find $gf(x)$.
Give your answer in its simplest form.

..... [3]

---

403. 0580_w17_QP_23 Q: 16

Make x the subject of $3m+xy=\frac{xp}{4}$.

x = ... [4]

---

404. 0580_w17_QP_23 Q: 17

(a) The nth term of a sequence is $6-5n$.

Write down the first three terms of this sequence.

..... , ... , ... [1]

(b) The nth term of another sequence is $5n^2+3$.

Is 848 a term in this sequence?
Explain how you decide.

..... because ..... [3]

---

405. 0580_m16_QP_22 Q: 1

Solve $(x-7)(x+4)=0$.

x = ... or x = ...[1]

---

406. 0580_m16_QP_22 Q: 2

Factorise $2x - 4xy$.

..... [2]

---

407. 0580_m16_QP_22 Q: 4

Solve the inequality.

$$6n + 3 > 8n$$

..... [2]

---

408. 0580_m16_QP_22 Q: 14

Simplify.

(a) $x^3y^4 \times x^5y^3$

..... [2]

(b) $(3p^2m^5)^3$

..... [2]

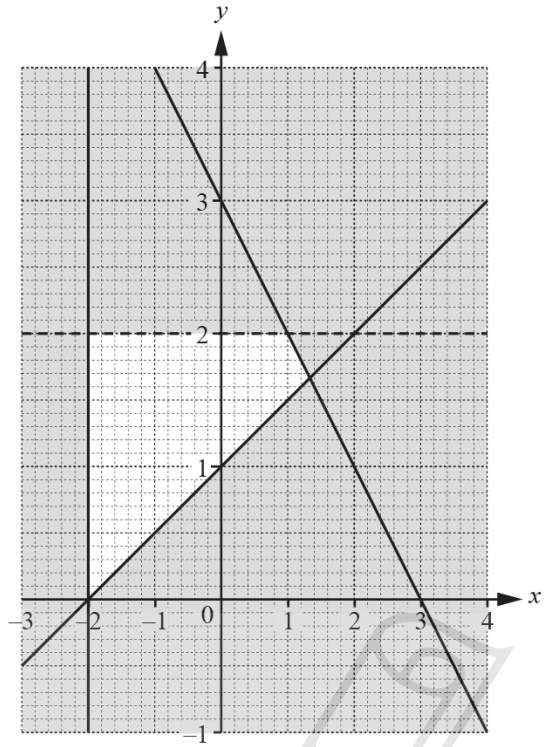
---

409. 0580_m16_QP_22 Q: 17

Solve the equation $3x^2 - 11x + 4 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

410. 0580_m16_QP_22 Q: 19



Find the four inequalities that define the region that is **not** shaded.

.....

.....

.....

..... [5]

411. 0580_m16_QP_22 Q: 20

The nth term of a sequence is $an^2 + bn$.

(a) Write down an expression, in terms of a and b, for the 3rd term.

..... [1]

(b) The 3rd term of this sequence is 21 and the 6th term is 96.

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

a = ...

b = ... [4]

---

412. 0580_s16_QP_21 Q: 7

$y = mx + c$

Find the value of y when $m = -2$, $x = -7$ and $c = -3$.

y = ... [2]

---

413. 0580_s16_QP_21 Q: 8

$$y = \frac{qx}{p}$$

Write x in terms of p, q and y.

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

---

414. 0580_s16_QP_21 Q: 12

Simplify $(16p^{16})^{\frac{1}{4}}$.

..... [2]

---

415. 0580_s16_QP_21 Q: 13

Solve the inequality.

$$n + 7 < 5n - 8$$

..... [2]

---

416. 0580_s16_QP_21 Q: 15

7, 5, 3, 1, – 1, …

(a) Find the next term in this sequence.

..... [1]

(b) Find the *n*th term of the sequence.

..... [2]

---

417. 0580_s16_QP_21 Q: 21

y is directly proportional to the positive square root of x.
When $x = 9$, $y = 12$.

Find y when $x = \frac{1}{4}$.

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

---

418. 0580_s16_QP_21 Q: 24

Factorise completely.

(a) $2a+4+ap+2p$

..... [2]

(b) $162-8t^2$

..... [2]

---

419. 0580_s16_QP_22 Q: 6

Simplify.

$$\left(\frac{1}{2}x^{\frac{2}{3}}\right)^3$$

..... [2]

---

420. 0580_s16_QP_22 Q: 8

Solve the inequality $\frac{x}{3}+5>2$.

..... [2]

---

421. 0580_s16_QP_22 Q: 10

Make p the subject of the formula.

$$rp + 5 = 3p + 8r$$

$p =$ ..... [3]

---

422. 0580_s16_QP_22 Q: 15

$y = x^2 + 7x - 5$ can be written in the form $y = (x + a)^2 + b$.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

---

423. 0580_s16_QP_22 Q: 16

Solve the simultaneous equations.
Show all your working.

$$3x + 4y = 14$$
$$5x + 2y = 21$$

$x =$ .....

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

---

424. 0580_s16_QP_22 Q: 18

Find the nth term of each of these sequences.

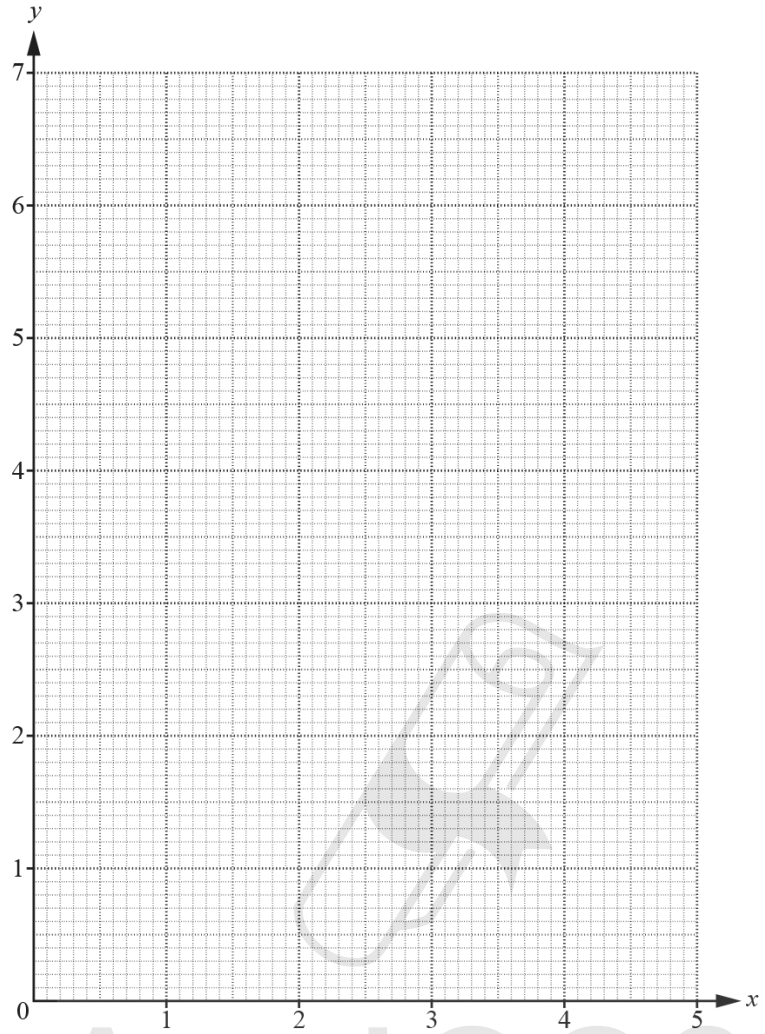
(a) 16, 19, 22, 25, 28, …

..... [2]

(b) 1, 3, 9, 27, 81, …

..... [2]

425. 0580_s16_QP_22 Q: 23



The region R satisfies these inequalities.

$y \leqslant 2x$ $\quad 3x + 4y \geqslant 12$ $\quad x \leqslant 3$

On the grid, draw and label the region R that satisfies these inequalities.
Shade the **unwanted** regions.

[5]

---

426. 0580_s16_QP_23 Q: 4

Solve the equation.

$$6(y + 1) = 9$$

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

---

427. 0580_s16_QP_23 Q: 7

Simplify.

$(32x^{10})^{\frac{3}{5}}$

..... [2]

---

428. 0580_s16_QP_23 Q: 16

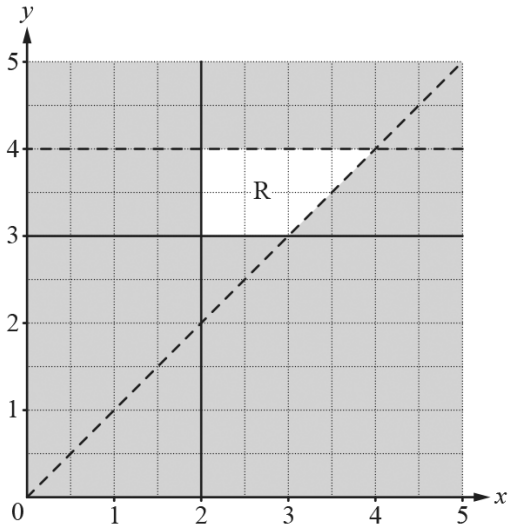
y is directly proportional to $(x + 2)^2$.
When $x = 8$, $y = 250$.

Find y when $x = 4$.

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

---

429. 0580_s16_QP_23 Q: 20



Find four inequalities that define the region, R, on the grid.

.....

.....

.....

..... [4]

---

430. 0580_w16_QP_21 Q: 7

Simplify. $\dfrac{x^3y+2xy^3}{x^2y^2}$

..... [2]

---

431. 0580_w16_QP_21 Q: 10

Simplify. $(36x^{16})^{\frac{1}{2}}$

..... [2]

---

432. 0580_w16_QP_21 Q: 11

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

$$2x + 3y = 13$$
$$x + 2y = 9$$

$x =$ .....

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

---

433. 0580_w16_QP_21 Q: 13

Factorise completely.

(a) $4p^2 - 9$

..... [1]

(b) $2ax - 4bx - ay + 2by$

..... [2]

---

434. 0580_w16_QP_21 Q: 14

y is directly proportional to the square root of $(x + 2)$.
When $x = 7$, $y = 2$.

Find y when $x = 98$.

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

---

435. 0580_w16_QP_21 Q: 18

$y = p^2 + qr$

(a) Find y when $p = -5$, $q = 3$ and $r = -7$.

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

(b) Write p in terms of q, r and y.

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

---

436. 0580_w16_QP_21 Q: 19

Find the nth term of each sequence.

(a) 7, 13, 19, 25, 31, …

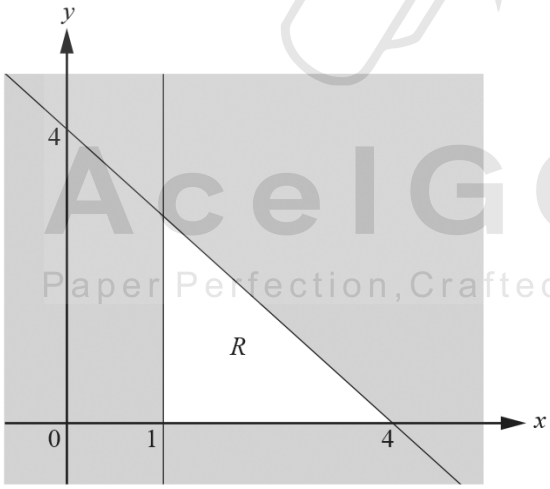
..... [2]

(b) 9, 16, 25, 36, 49, …

..... [2]

---

437. 0580_w16_QP_21 Q: 21



NOT TO SCALE

Write down the three inequalities that define the unshaded region, R.

.....

.....

..... [4]

---

438. 0580_w16_QP_21 Q: 23

Solve the equation $2x^2 + 3x - 3 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

---

439. 0580_w16_QP_22 Q: 3

Solve the equation.

$$6(k - 8) = 78$$

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

---

440. 0580_w16_QP_22 Q: 5

Simplify.

$$36y^5 \div 4y^2$$

..... [2]

---

441. 0580_w16_QP_22 Q: 7

Find the positive integers that satisfy the inequality $t+2 > 3t-6$.

..... [3]

---

442. 0580_w16_QP_22 Q: 8

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

$$\frac{1}{2}x+y=8$$
$$x-2y=2$$

$x =$ .....

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

---

443. 0580_w16_QP_22 Q: 13

Factorise.

(a) m^3+m

..... [1]

(b) $25-y^2$

..... [1]

(c) $x^2+3x-28$

..... [2]

---

444. 0580_w16_QP_23 Q: 1

$V = 4p^2$

Find V when $p = 3$.

$V =$ .....[1]

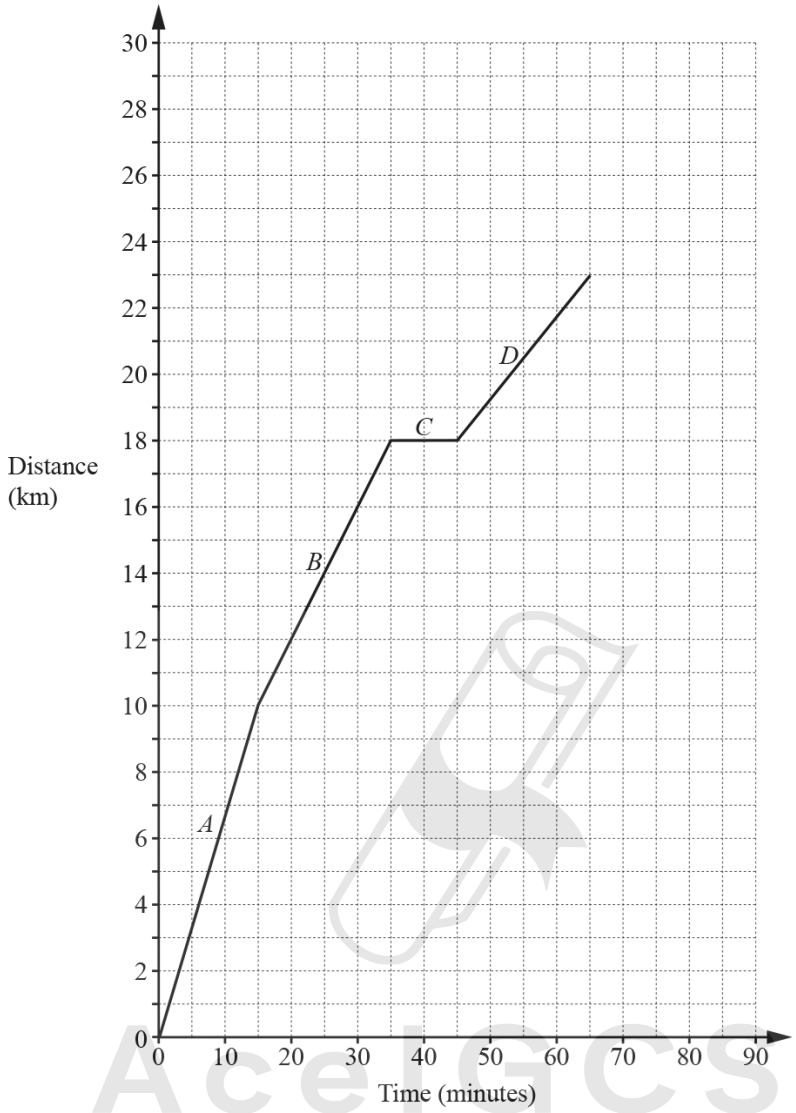
---

445. 0580_w16_QP_23 Q: 2

Simplify.

$n^2 \times n^5$

.....[1]



The diagram shows the distance-time graph for the first 65 minutes of a bicycle journey.

(a) There are four different parts to the journey labelled *A*, *B*, *C* and *D*.

Write down the part of the journey with the fastest speed.

..... [1]

(b) After the first 65 minutes the bicycle travels at a constant speed of 20 km/h for 15 minutes.

Draw this part of the journey on the diagram. [1]

447. 0580_w16_QP_23 Q: 13

Write the recurring decimal $0.\dot{2}$ as a fraction.
[$0.\dot{2}$ means 0.222…]

..... [2]

---

448. 0580_w16_QP_23 Q: 18

$f(x) = x^2$ $\quad$ $g(x) = \frac{x-3}{2}$

Find

(a) f(– 5),

..... [1]

(b) gf(x),

..... [1]

(c) $g^{-1}(x)$.

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

---

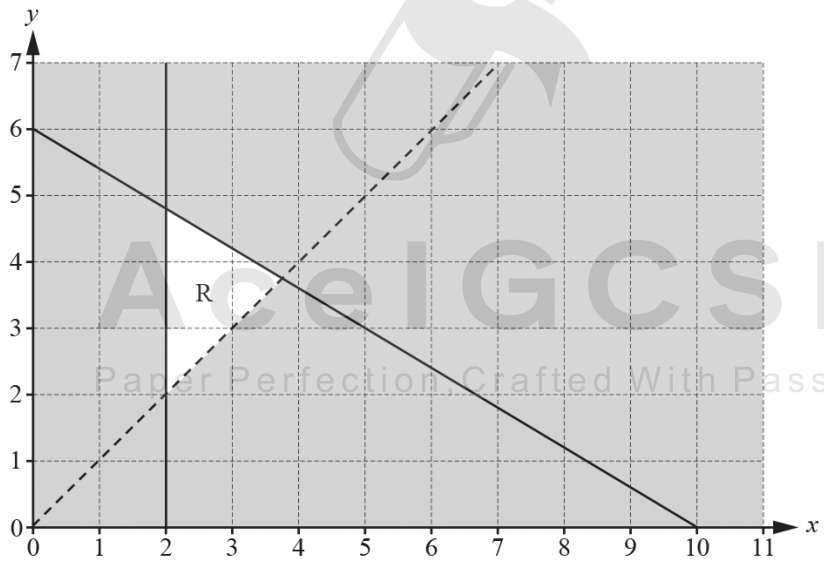
449. 0580_w16_QP_23 Q: 23

Simplify. $\dfrac{42np-7n}{12pt-2t+18mp-3m}$

..... [4]

---

450. 0580_w16_QP_23 Q: 24



Find the three inequalities that define the unshaded region, R.

.....

.....

..... [5]

---

451. 0580_m15_QP_22 Q: 4

Factorise $14p^2 + 21pq$.

Answer ..... [2]

---

452. 0580_m15_QP_22 Q: 5

These are the first five terms of a sequence.

13 8 3 –2 –7

Find the nth term of this sequence.

Answer ..... [2]

---

453. 0580_m15_QP_22 Q: 10

Pavan saves \$$x$ each month.
His two brothers **each** save \$4 more than Pavan each month.

Altogether the three boys save \$26 each month.

(a) Write down an equation in x.

Answer(a) ..... [1]

(b) Solve your equation to find the amount Pavan saves each month.

Answer(b) \$..... [2]

---

454. 0580_m15_QP_22 Q: 11

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

$$\tfrac{1}{2}x - 8y = 1$$
$$x + 2y = 6\tfrac{1}{2}$$

Answer $x =$ .....

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

---

455. 0580_m15_QP_22 Q: 13

x varies directly as the cube root of y.
$x = 6$ when $y = 8$.

Find the value of x when $y = 64$.

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

---

456. 0580_m15_QP_22 Q: 21

(a) Simplify

(i) x^0,

Answer(a)(i) ..... [1]

(ii) $m^4 \times m^3$,

Answer(a)(ii) ..... [1]

(iii) $(8p^6)^{\frac{1}{3}}$.

Answer(a)(iii) ..... [2]

(b) $243^x = 3^2$

Find the value of x.

Answer(b) $x =$ ..... [2]

457. 0580_m15_QP_22 Q: 22

$f(x) = 5x - 3$ $g(x) = x^2$

(a) Find $fg(-2)$.

Answer(a) ..... [2]

(b) Find $gf(x)$, in terms of x, in its simplest form.

Answer(b) ..... [2]

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

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

458. 0580_P15_QP_20 Q: 14

$$T = 2\pi\sqrt{\frac{\ell}{g}}$$

(a) Find T when $g = 9.8$ and $\ell = 2$.

Answer(a) $T =$ ..... [2]

(b) Make g the subject of the formula.

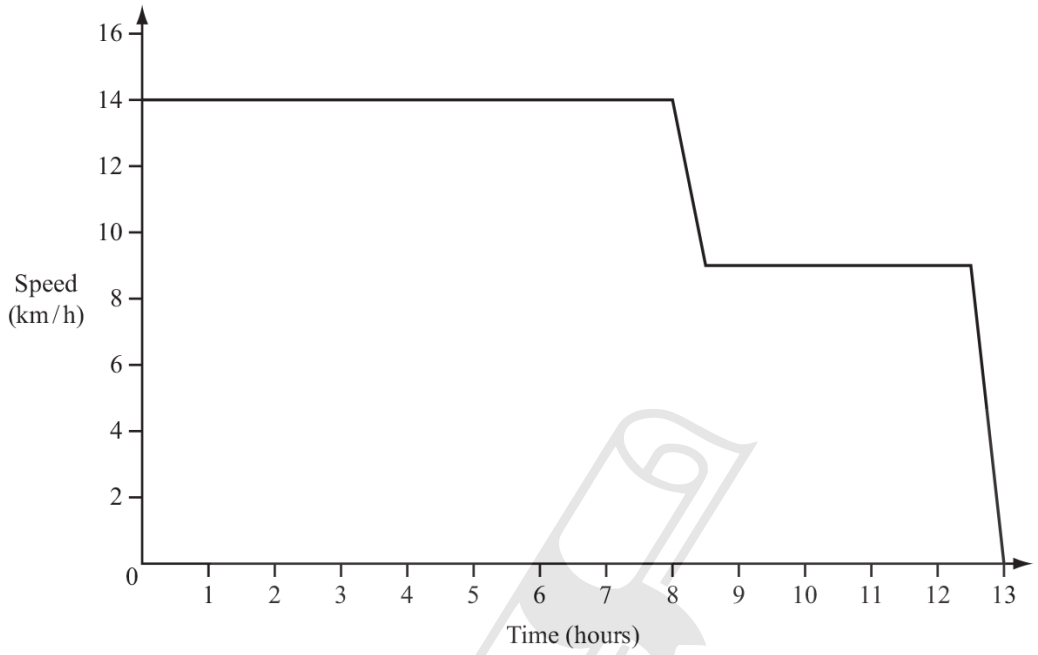
Answer(b) $g =$ ..... [3]

459. 0580_P15_QP_20 Q: 15

A container ship travelled at 14 km/h for 8 hours and then slowed down to 9 km/h over a period of 30 minutes.

It travelled at this speed for another 4 hours and then slowed to a stop over 30 minutes.

The speed-time graph shows this voyage.



(a) Calculate the total distance travelled by the ship.

Answer(a) ..... km [4]

(b) Calculate the average speed of the ship for the whole voyage.

Answer(b) ..... km/h [1]

460. 0580_P15_QP_20 Q: 16

The mass of a radioactive substance is decreasing by 10% a year.

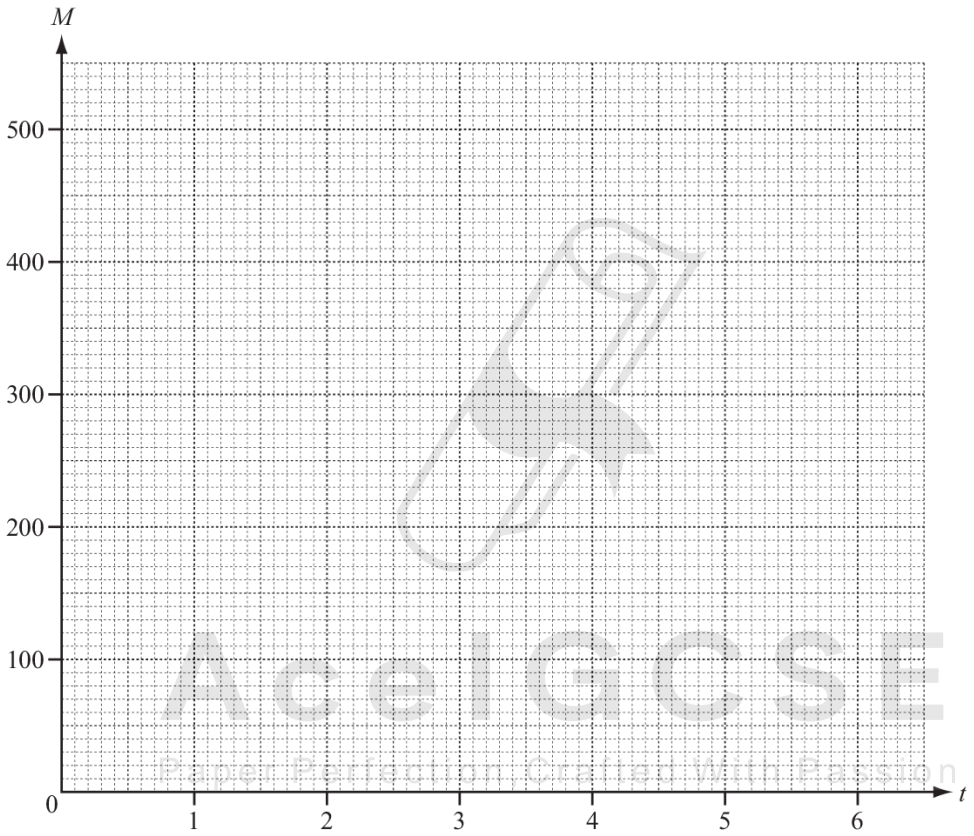
The mass, M grams, after t years, is given by the formula $M = 500 \times 0.9^t$.

(a) Complete this table.

t (years)	0	1	2	3	4	5	6
M (grams)		450			328		266

[2]

(b) Draw the graph of $M = 500 \times 0.9^t$.



[2]

(c) **(i)** Use your graph to estimate after how long the mass will be 350 grams.

Answer(c)(i) ..... years [1]

(ii) When will the mass of the radioactive substance be zero grams?

Answer(c)(ii) ..... years [1]

461. 0580_P15_QP_20 Q: 17

$$f(x) = \frac{1}{x+4} \quad (x \neq -4)$$

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

$$h(x) = x^3 + 1$$

(a) Work out fg(1).

Answer(a) ..... [2]

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

Answer(b) $h^{-1}(x) =$ ..... [2]

(c) Solve the equation $g(x) = -2$.

Answer(c) $x =$ ..... or $x =$ ..... [3]

462. 0580_P15_QP_20 Q: 18

The first four terms of a sequence are

$T_1 = 1^2$ $T_2 = 1^2 + 2^2$ $T_3 = 1^2 + 2^2 + 3^2$ $T_4 = 1^2 + 2^2 + 3^2 + 4^2$.

(a) The nth term is given by $T_n = \frac{1}{6} n(n + 1)(2n + 1)$.

Work out the value of T_{23}.

Answer(a) T_{23} = ... [2]

(b) A new sequence is formed as follows.

$U_1 = T_2 - T_1$ $U_2 = T_3 - T_2$ $U_3 = T_4 - T_3$ .....

(i) Find the values of U_1 and U_2.

Answer(b)(i) U_1 = ... and U_2 = ... [2]

(ii) Write down a formula for the nth term, U_n .

Answer(b)(ii) U_n = ... [1]

(c) The first four terms of another sequence are

$V_1 = 2^2$ $V_2 = 2^2 + 4^2$ $V_3 = 2^2 + 4^2 + 6^2$ $V_4 = 2^2 + 4^2 + 6^2 + 8^2$.

By comparing this sequence with the one in **part (a)**, find a formula for the nth term, V_n .

Answer(c) V_n = ... [2]

463. 0580_s15_QP_21 Q: 4

Expand and simplify.

$x(2x + 3) + 5(x - 7)$

Answer ..... [2]

---

464. 0580_s15_QP_21 Q: 7

Simplify.

$6uw^{-3} \times 4uw^{6}$

Answer ..... [2]

---

465. 0580_s15_QP_21 Q: 10

A tram leaves a station and accelerates for 2 **minutes** until it reaches a speed of 12 metres per second.
It continues at this speed for 1 minute.
It then decelerates for 3 minutes until it stops at the next station.
The diagram shows the speed-time graph for this journey.

Calculate the distance, in metres, between the two stations.

Answer ..... m [3]

---

466. 0580_s15_QP_21 Q: 11

Find the nth term of each sequence.

(a) 4, 8, 12, 16, 20, ...

Answer(a) ..... [1]

(b) 11, 20, 35, 56, 83, ...

Answer(b) ..... [2]

---

467. 0580_s15_QP_21 Q: 12

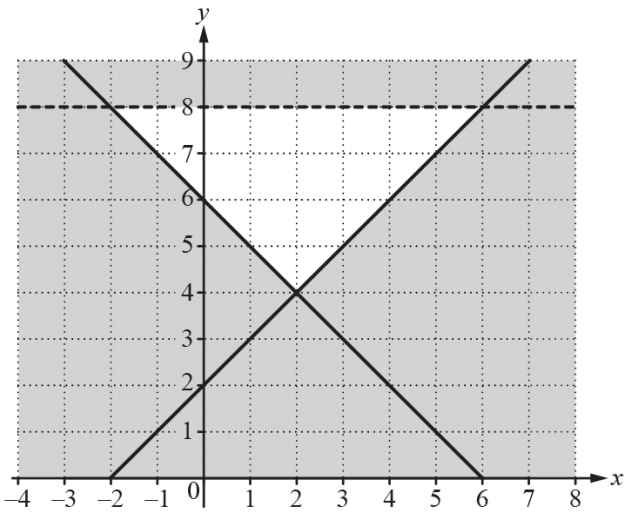
p is inversely proportional to the square of $(q + 4)$.
$p = 2$ when $q = 2$.

Find the value of p when $q = -2$.

Answer p = ... [3]

---

468. 0580_s15_QP_21 Q: 15



Write down the 3 inequalities which define the unshaded region.

Answer .....

.....

..... [4]

---

469. 0580_s15_QP_21 Q: 18

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

$5x + 2y = -2$
$3x - 5y = 17.4$

Answer $x =$ .....

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

---

470. 0580_s15_QP_21 Q: 20

Factorise completely.

(a) $yp + yt + 2xp + 2xt$

Answer(a) ..... [2]

(b) $7(h + k)^2 - 21(h + k)$

Answer(b) ..... [2]

471. 0580_s15_QP_21 Q: 23

$f(x) = 5 - 3x$

(a) Find f(6).

Answer(a) ..... [1]

(b) Find $f(x + 2)$.

Answer(b) ..... [1]

(c) Find $ff(x)$, in its simplest form.

Answer(c) ..... [2]

(d) Find $f^{-1}(x)$, the inverse of $f(x)$.

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

---

472. 0580_s15_QP_22 Q: 3

$81^x = 3$

Find the value of x.

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

---

473. 0580_s15_QP_22 Q: 6

Solve.

$$5(w + 4 \times 10^3) = 6 \times 10^4$$

Answer $w =$ ..... [2]

---

474. 0580_s15_QP_22 Q: 8

5, 11, 21, 35, 53, ...

Find the nth term of this sequence.

Answer ..... [2]

---

475. 0580_s15_QP_22 Q: 15

Write as a single fraction in its simplest form.

$$\frac{3}{x+2} \quad \frac{4}{2x-5}$$

Answer ..... [3]

---

476. 0580_s15_QP_22 Q: 21

$f(x) = x^2 + 4x - 6$

(a) $f(x)$ can be written in the form $(x + m)^2 + n$.

Find the value of m and the value of n.

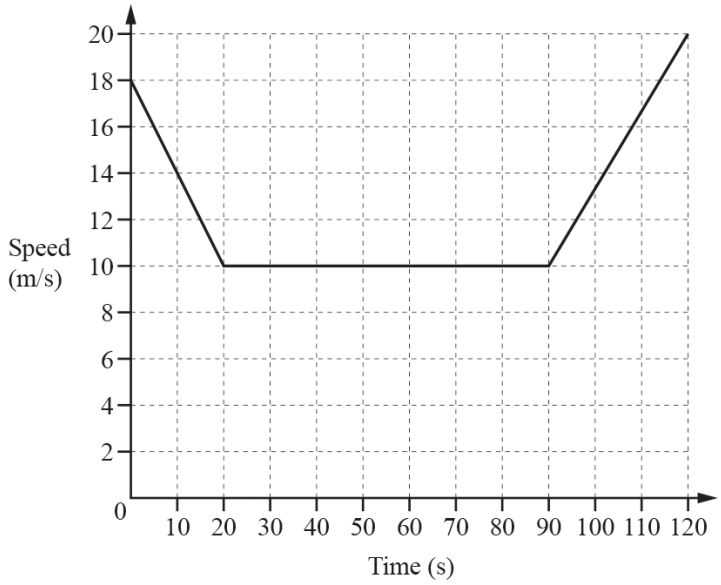
Answer(a) m = ...

n = ... [2]

(b) Use your answer to **part (a)** to find the positive solution to $x^2 + 4x - 6 = 0$.

Answer(b) x = ... [2]

477. 0580_s15_QP_22 Q: 23



The diagram shows the speed-time graph for 120 seconds of a car journey.

(a) Calculate the deceleration of the car during the first 20 seconds.

Answer(a) ..... m/s^2 [1]

(b) Calculate the total distance travelled by the car during the 120 seconds.

Answer(b) ..... m [3]

(c) Calculate the average speed for this 120 second journey.

Answer(c) ..... m/s [1]

478. 0580_s15_QP_22 Q: 24

$f(x) = 3x + 5$ $g(x) = x^2$

(a) Find $g(3x)$.

Answer(a) ..... [1]

(b) Find $f^{-1}(x)$, the inverse function.

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

(c) Find $ff(x)$.
Give your answer in its simplest form.

Answer(c) ..... [2]

479. 0580_s15_QP_23 Q: 2

Factorise completely.

$9x^2 - 6x$

Answer ..... [2]

---

480. 0580_s15_QP_23 Q: 5

Factorise $2x^2 - 5x - 3$.

Answer ..... [2]

---

481. 0580_s15_QP_23 Q: 9

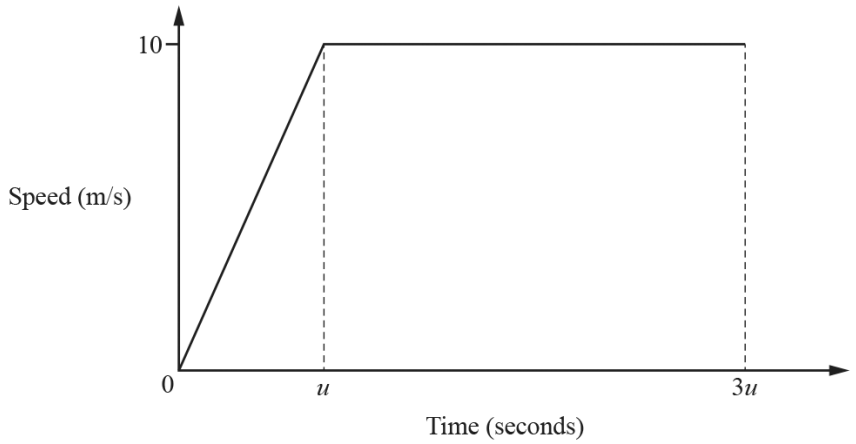
Solve the equation.

$3(x + 4) = 2(4x - 1)$

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

---

482. 0580_s15_QP_23 Q: 12



NOT TO SCALE

A car starts from rest and accelerates for u seconds until it reaches a speed of 10 m/s.
The car then travels at 10 m/s for $2u$ seconds.
The diagram shows the speed-time graph for this journey.

The distance travelled by the car in the first $3u$ seconds is 125 m.

(a) Find the value of u.

Answer(a) u = ... [3]

(b) Find the acceleration in the first u seconds.

Answer(b) ..... m/s^2 [1]

---

483. 0580_s15_QP_23 Q: 13

Simplify.

(a) $12x^{12} \div 3x^3$

Answer(a) ..... [2]

(b) $(256y^{256})^{\frac{1}{8}}$

Answer(b) ..... [2]

---

484. 0580_s15_QP_23 Q: 14

Solve the equation.

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

Show your working and give your answers correct to 2 decimal places.

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

485. 0580_w15_QP_21 Q: 9

Factorise completely.

(a) $ax + ay + 3cx + 3cy$

Answer(a) ..... [2]

(b) $3a^2 - 12b^2$

Answer(b) ..... [3]

---

486. 0580_w15_QP_21 Q: 12

V is directly proportional to the cube of $(r + 1)$.
When $r = 1$, $V = 24$.

Work out the value of V when $r = 2$.

Answer $V =$ ..... [3]

---

487. 0580_w15_QP_21 Q: 13

Make x the subject of the formula.

$$y = ax^2 + b$$

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

---

488. 0580_w15_QP_21 Q: 15

Simplify. $\dfrac{x^2 - 16}{x^2 - 3x - 4}$

Answer ..... [4]

---

489. 0580_w15_QP_21 Q: 21

$f(x) = x^3$ $g(x) = 3x - 5$ $h(x) = 2x + 1$

Work out

(a) ff(2),

Answer(a) ..... [2]

(b) gh(x) and simplify your answer,

Answer(b) ..... [2]

(c) $h^{-1}(x)$, the inverse of h(x).

Answer(c) $h^{-1}(x)$ = ... [2]

490. 0580_w15_QP_22 Q: 15

Factorise

(a) $9w^2 - 100$,

Answer(a) ..... [1]

(b) $mp + np - 6mq - 6nq$.

Answer(b) ..... [2]

---

491. 0580_w15_QP_22 Q: 17

y is directly proportional to the square of $(x - 1)$.
$y = 63$ when $x = 4$.

Find the value of y when $x = 6$.

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

---

492. 0580_w15_QP_22 Q: 19

Solve the equation $5x^2 - 6x - 3 = 0$.
Show all your working and give your answers correct to 2 decimal places.

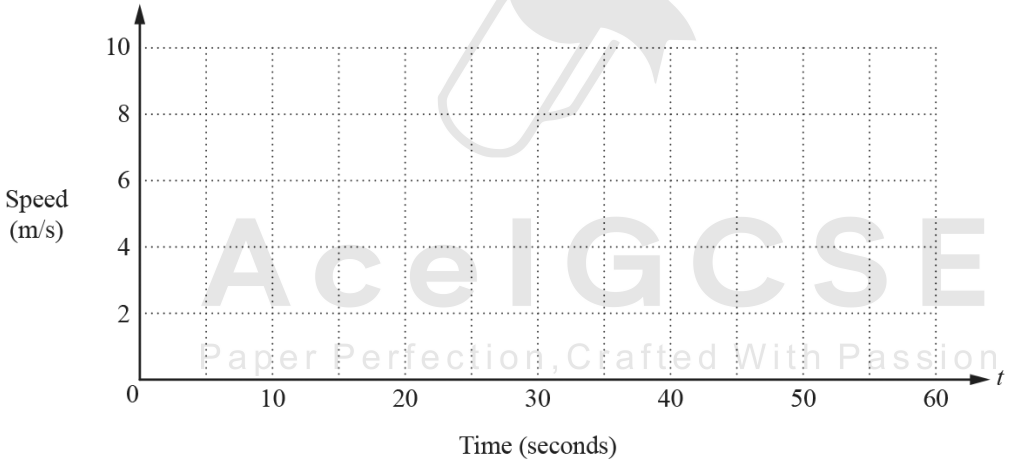
Answer x = ... or x = ... [4]

---

493. 0580_w15_QP_22 Q: 20

A car passes through a checkpoint at time $t = 0$ seconds, travelling at 8 m/s.
It travels at this speed for 10 seconds.
The car then decelerates at a constant rate until it stops when $t = 55$ seconds.

(a) On the grid, draw the speed-time graph.



[2]

(b) Calculate the total distance travelled by the car after passing through the checkpoint.

Answer(b) ..... m [3]

---

494. 0580_w15_QP_23 Q: 6

Simplify.

$1 - 2u + u + 4$

Answer ..... [2]

---

495. 0580_w15_QP_23 Q: 7

Factorise completely.

$2x - 4x^2$

Answer ..... [2]

---

496. 0580_w15_QP_23 Q: 11

Write the following as single fractions.

(a) $x + \frac{x}{2}$

Answer(a) ..... [1]

(b) $x + \frac{2}{x}$

Answer(b) ..... [1]

---

497. 0580_w15_QP_23 Q: 16

Make a the subject of the formula $s = ut + \frac{1}{2}at^2$.

Answer $a =$ ..... [3]

---

498. 0580_w15_QP_23 Q: 17

Simplify.

$$\left(\frac{x^{64}}{16y^{16}}\right)^{\frac{1}{4}}$$

Answer ..... [3]

---

499. 0580_w15_QP_23 Q: 19

y is inversely proportional to $(x + 2)^2$.
When $x = 1$, $y = 2$.

Find y in terms of x.

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

---

500. 0580_w15_QP_23 Q: 21

Solve the equation $3x^2 + 4x - 5 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

---

501. 0580_w15_QP_23 Q: 22

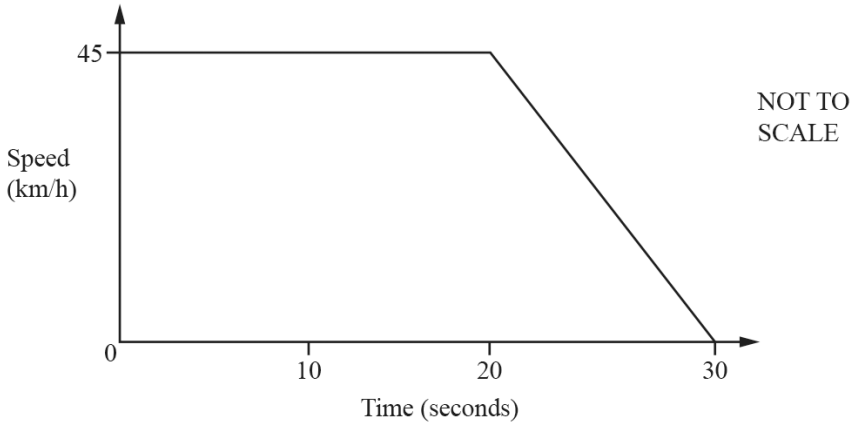
Simplify.

$$\frac{4 + 10w}{8 - 50w^2}$$

Answer ..... [4]

---

502. 0580_w15_QP_23 Q: 26



The diagram shows the speed-time graph of a car.
The car travels at 45 km/h for 20 seconds.
The car then decelerates for 10 seconds until it stops.

(a) Change 45 km/h into m/s.

Answer(a) ..... m/s [2]

(b) Find the deceleration of the car, giving your answer in m/s^2.

Answer(b) ..... m/s^2 [1]

(c) Find the distance travelled by the car during the 30 seconds, giving your answer in metres.

Answer(c) ..... m [3]

503. 0580_s14_QP_21 Q: 2

$$y = \frac{2}{x^2} + \frac{x^2}{2}$$

Find the value of y when $x = 6$.
Give your answer as a mixed number in its simplest form.

Answer y = ... [2]

---

504. 0580_s14_QP_21 Q: 3

Solve the equation.

$$\frac{n-8}{2} = 11$$

Answer n = ... [2]

---

505. 0580_s14_QP_21 Q: 7

Make x the subject of the formula.

$$y = (x-4)^2 + 6$$

Answer x = ... [3]

---

506. 0580_s14_QP_21 Q: 8

Write as a single fraction in its simplest form.

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

Answer ..... [3]

---

507. 0580_s14_QP_21 Q: 10

Factorise completely.

(a) $ax + ay + bx + by$

Answer(a) ..... [2]

(b) $3(x-1)^2 + (x-1)$

Answer(b) ..... [2]

---

508. 0580_s14_QP_21 Q: 15

Solve the inequality for positive integer values of x.

$$\frac{21+x}{5} > x+1$$

Answer ..... [4]

---

509. 0580_s14_QP_21 Q: 16

(a) $(2^{24})^{\frac{1}{2}} = p^4$

Find the value of p.

Answer(a) $p =$ ..... [2]

(b) Simplify $\dfrac{q^2+q^2}{q^{\frac{1}{4}} \times q^{\frac{1}{4}}}$.

Answer(b) ..... [3]

---

510. 0580_s14_QP_22 Q: 3

Solve the simultaneous equations.

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

Answer x = ...

y = ... [2]

---

511. 0580_s14_QP_22 Q: 10

$$V = \frac{1}{3}Ah$$

(a) Find V when $A = 15$ and $h = 7$.

Answer(a) V = ... [1]

(b) Make h the subject of the formula.

Answer(b) h = ... [2]

---

512. 0580_s14_QP_22 Q: 12

Solve the equation.

$$\frac{3}{2x} + \frac{1}{x+1} = 0$$

Answer x = ... [3]

---

513. 0580_s14_QP_22 Q: 13

w varies inversely as the square root of x.
When $x = 4$, $w = 4$.

Find w when $x = 25$.

Answer w = ... [3]

---

514. 0580_s14_QP_22 Q: 16

Factorise completely.

(a) $4p^2q - 6pq^2$

Answer(a) ..... [2]

(b) $u + 4t + ux + 4tx$

Answer(b) ..... [2]

---

515. 0580_s14_QP_22 Q: 17

(a) Simplify $(3125t^{125})^{\frac{1}{5}}$.

Answer(a) ..... [2]

(b) Find the value of p when $3^p = \frac{1}{9}$.

Answer(b) $p =$ ..... [1]

(c) Find the value of w when $x^{72} \div x^w = x^8$.

Answer(c) $w =$ ..... [1]

---

516. 0580_s14_QP_22 Q: 19

Simplify.

$$\frac{x^2 + 6x - 7}{3x + 21}$$

Answer ..... [4]

---

517. 0580_s14_QP_22 Q: 20

32 25 18 11 4

These are the first 5 terms of a sequence.

Find

(a) the 6th term,

Answer(a) ..... [1]

(b) the nth term,

Answer(b) ..... [2]

(c) which term is equal to –332.

Answer(c) ..... [2]

---

518. 0580_s14_QP_23 Q: 4

Factorise completely.

$15a^3 - 5ab$

Answer ..... [2]

---

519. 0580_s14_QP_23 Q: 6

Simplify.

$3x^2y^3 \times x^4y$

Answer ..... [2]

---

520. 0580_s14_QP_23 Q: 9

Solve the inequality.

$5t + 23 < 17 - 2t$

Answer ..... [2]

---

521. 0580_s14_QP_23 Q: 11

y varies as the cube root of $(x + 3)$.
When $x = 5$, $y = 1$.

Find the value of y when $x = 340$.

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

---

522. 0580_s14_QP_23 Q: 12

(a) Factorise $3x^2 + 2x - 8$.

Answer(a) ..... [2]

(b) Solve the equation $3x^2 + 2x - 8 = 0$.

Answer(b) $x =$ ..... or $x =$ ..... [1]

---

523. 0580_s14_QP_23 Q: 19

Robbie pays $10.80 when he buys 3 notebooks and 4 pencils.
Paniz pays $14.50 when she buys 5 notebooks and 2 pencils.

Write down simultaneous equations and use them to find the cost of a notebook and the cost of a pencil.

Answer Cost of a notebook = $.....

Cost of a pencil = $..... [5]

---

524. 0580_w14_QP_21 Q: 10

Solve the equation.

$$\frac{x+5}{x} = \frac{7}{3}$$

Answer x = ... [3]

---

525. 0580_w14_QP_21 Q: 11

(a) Simplify $x^8 \div x^2$.

Answer(a) ..... [1]

(b) Simplify $\left(\frac{x^6}{27}\right)^{\frac{1}{3}}$.

Answer(b) ..... [2]

---

526. 0580_w14_QP_21 Q: 12

Solve the simultaneous equations.

$0.4x - 5y = 27$
$2x + 0.2y = 9$

Answer x = ...

y = ... [3]

---

527. 0580_w14_QP_21 Q: 13

y varies directly with $\sqrt{x+5}$.
$y = 4$ when $x = -1$.

Find y when $x = 11$.

Answer y = ... [3]

---

528. 0580_w14_QP_21 Q: 20

$f(x) = 3x - 2$ $\quad$ $g(x) = \frac{2}{x+1}$, $\quad x \neq -1$

(a) Find $gf(2)$.

Answer(a) ..... [2]

(b) Solve $g(x) = 10$.

Answer(b) $x =$ ..... [2]

(c) Simplify.

$f(2x) - f(x + 2)$

Answer(c) ..... [3]

529. 0580_w14_QP_22 Q: 5

Make r the subject of this formula.

$$v = \sqrt[3]{p + r}$$

Answer $r =$ ..... [2]

---

530. 0580_w14_QP_22 Q: 10

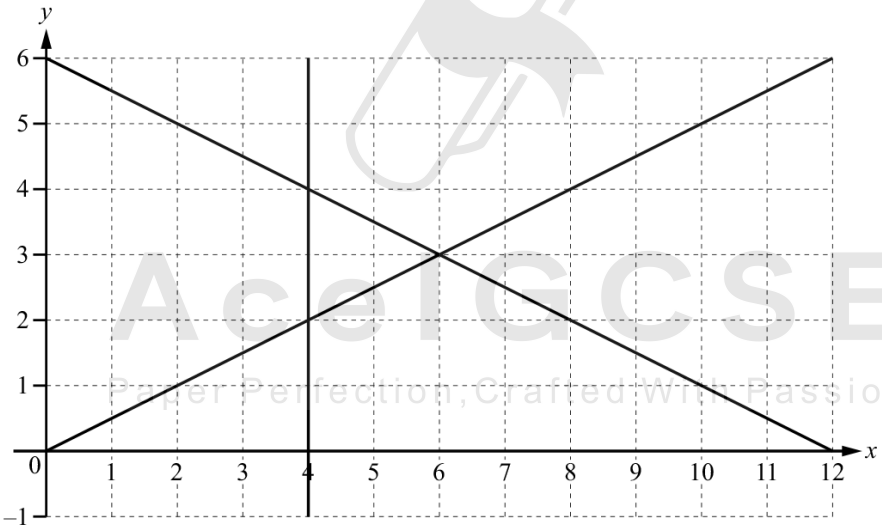
The cost of a circular patio, \$ C, varies as the square of the radius, r metres.
$C = 202.80$ when $r = 2.6$.

Calculate the cost of a circular patio with $r = 1.8$.

Answer \$..... [3]

---

531. 0580_w14_QP_22 Q: 12



By shading the **unwanted** regions of the grid, find and label the region R which satisfies the following four inequalities.

$y \geqslant 0$ $x \geqslant 4$ $2y \leqslant x$ $2y + x \leqslant 12$

[3]

---

532. 0580_w14_QP_22 Q: 21

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

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

Answer(a) ..... [3]

(b) Simplify.

$$\frac{4x^2 - 16x}{2x^2 + 6x - 56}$$

Answer(b) ..... [4]

---

533. 0580_w14_QP_23 Q: 6

Solve the equation.

$$\frac{2x+5}{3} = 8$$

Answer x = ... [3]

---

534. 0580_w14_QP_23 Q: 8

Make x the subject of the formula.

$$y = 2 + \sqrt{x - 8}$$

Answer x = ... [3]

---

535. 0580_w14_QP_23 Q: 9

y varies inversely as $(x + 5)$.
$y = 6$ when $x = 3$.

Find y when $x = 7$.

Answer y = ... [3]

---

536. 0580_w14_QP_23 Q: 11

(a) Here are the first three terms of a sequence.

$U_1 = 1^3$ $U_2 = 1^3 + 2^3$ $U_3 = 1^3 + 2^3 + 3^3$

The nth term is given by $U_n = \frac{1}{4}n^2 (n + 1)^2$.

Work out the value of U_{39} .

Answer(a) U_{39} = ... [2]

(b) Here are the first three terms of another sequence.

$V_1 = 2^3$ $V_2 = 2^3 + 4^3$ $V_3 = 2^3 + 4^3 + 6^3$

By comparing this sequence with the sequence in **part (a)**, find a formula for the nth term, V_n .

Answer(b) V_n = ... [1]

---

537. 0580_w14_QP_23 Q: 13

Write as a single fraction, in its simplest form.

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

Answer ..... [4]

---

538. 0580_w14_QP_23 Q: 16

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

Find

(a) hf(1),

Answer(a) ..... [2]

(b) $g^{-1}(x)$,

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

(c) gh(x),

Answer(c) gh(x) = ... [1]

(d) the solution to the equation $f(x) = 0$.

Answer(d) x = ... [1]

539. 0580_s13_QP_21 Q: 6

Factorise completely.

$12xy - 3x^2$

Answer ..... [2]

---

540. 0580_s13_QP_21 Q: 8

Solve the inequality.

$3x - 1 \leqslant 11x + 2$

Answer ..... [2]

---

541. 0580_s13_QP_21 Q: 10

Factorise completely.

$ap + bp - 2a - 2b$

Answer ..... [2]

---

542. 0580_s13_QP_21 Q: 11

Write $(27x^{12})^{\frac{1}{3}}$ in its simplest form.

Answer ..... [2]

---

543. 0580_s13_QP_21 Q: 18

(a) Factorise $x^2 + x - 30$.

Answer(a) ..... [2]

(b) Simplify $\dfrac{(x-5)(x+4)}{x^2+x-30}$.

Answer(b) ..... [1]

---

544. 0580_s13_QP_21 Q: 19

t varies inversely as the square root of u.
$t = 3$ when $u = 4$.

Find t when $u = 49$.

Answer $t =$ ..... [3]

---

545. 0580_s13_QP_21 Q: 22

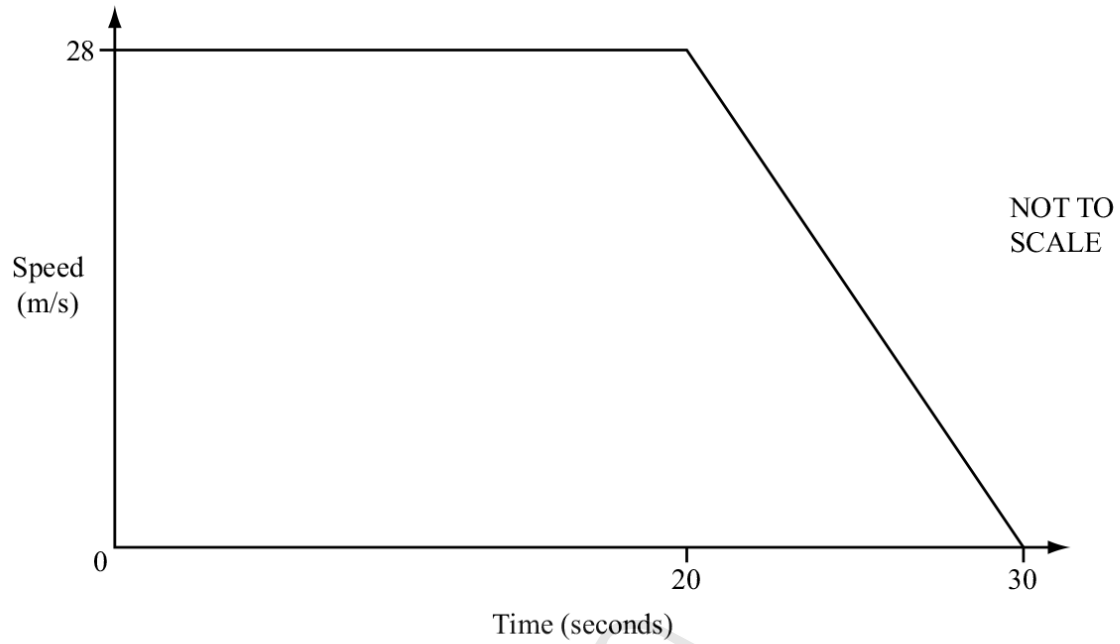
Write as a single fraction in its simplest form.

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

Answer ..... [3]

---

546. 0580_s13_QP_21 Q: 25



The diagram shows the speed-time graph of a car.
It travels at 28 m/s for 20 seconds and then decelerates until it stops after a further 10 seconds.

(a) Calculate the deceleration of the car.

Answer(a) ..... m/s^2 [1]

(b) Calculate the distance travelled during the 30 seconds.

Answer(b) ..... m [3]

547. 0580_s13_QP_22 Q: 2

Factorise completely.

$kp + 3k + mp + 3m$

Answer ..... [2]

---

548. 0580_s13_QP_22 Q: 3

The first five terms of a sequence are shown below.

13 9 5 1 –3

Find the nth term of this sequence.

Answer ..... [2]

---

549. 0580_s13_QP_22 Q: 12

Solve the equation.

$$5(2y - 17) = 60$$

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

---

550. 0580_s13_QP_22 Q: 14

y is inversely proportional to x^3.
$y = 5$ when $x = 2$.

Find y when $x = 4$.

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

---

551. 0580_s13_QP_22 Q: 15

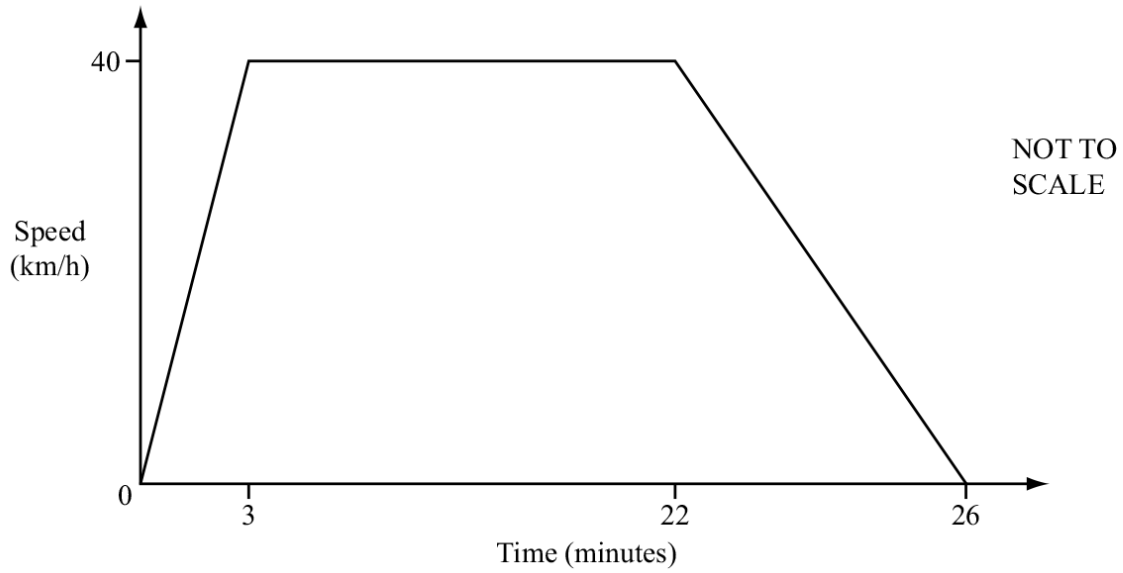
Use the quadratic equation formula to solve

$$2x^2 + 7x - 3 = 0 .$$

Show all your working and give your answers correct to 2 decimal places.

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

552. 0580_s13_QP_22 Q: 16



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

The train accelerates for 3 minutes, travels at a constant maximum speed of 40 km/h, then takes 4 minutes to slow to a stop.

Calculate the distance in kilometres between the two stations.

Answer ..... km [4]

553. 0580_s13_QP_22 Q: 18

Solve $6x + 3 < x < 3x + 9$ for **integer** values of x.

Answer ..... [4]

554. 0580_s13_QP_22 Q: 21

$f(x) = 5x + 4$ $\quad g(x) = \frac{1}{2x}, \quad x \neq 0 \quad$ $h(x) = \left(\frac{1}{2}\right)^x$

Find

(a) $fg(5)$,

Answer(a) ..... [2]

(b) $gg(x)$ in its simplest form,

Answer(b) $gg(x) =$ ..... [2]

(c) $f^{-1}(x)$,

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

(d) the value of x when $h(x) = 8$.

Answer(d) $x =$ ..... [2]

555. 0580_s13_QP_23 Q: 8

The mass, m, of a sphere varies directly with the **cube** of its radius, r.
$m = 160$ when $r = 2$.

Find m when $r = 5$.

Answer $m =$ ..... [3]

556. 0580_s13_QP_23 Q: 10

Find the value of $2x + y$ for the simultaneous equations.

$$3x + 5y = 48$$
$$2x - y = 19$$

Answer $2x + y =$ ..... [4]

557. 0580_s13_QP_23 Q: 13

Write as a single fraction in its simplest form.

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

Answer ..... [4]

558. 0580_s13_QP_23 Q: 14

(a) Solve $3n + 23 < n + 41$.

Answer(a) ..... [2]

(b) Factorise completely $ab + bc + ad + cd$.

Answer(b) ..... [2]

559. 0580_s13_QP_23 Q: 16

$f(x) = x + \frac{2}{x} - 3, \ x \neq 0$ $\qquad$ $g(x) = \frac{x}{2} - 5$

Find

(a) fg(18),

Answer(a) ..... [2]

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

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

560. 0580_s13_QP_23 Q: 20

$$y = \sqrt{8 + \frac{4}{x}}$$

Find y when $x = 2$.
Give your answer correct to 4 decimal places.

Answer(a) $y =$ ..... [2]

(b) Rearrange $y = \sqrt{8 + \frac{4}{x}}$ to make x the subject.

Answer(b) $x =$ ..... [4]

561. 0580_w13_QP_21 Q: 5

Solve the equation.

$$5 - 2x = 3x - 19$$

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

---

562. 0580_w13_QP_21 Q: 9

Find the nth term in each of the following sequences.

(a) $\frac{1}{3}, \quad \frac{2}{4}, \quad \frac{3}{5}, \quad \frac{4}{6}, \quad \frac{5}{7}, \quad \ldots\ldots$

Answer(a) ..... [1]

(b) 0, 3, 8, 15, 24, ...

Answer(b) ..... [2]

---

563. 0580_w13_QP_21 Q: 10

Make b the subject of the formula.

$$c = \sqrt{a^2 + b^2}$$

Answer $b =$ ..... [3]

---

564. 0580_w13_QP_21 Q: 13

(a) $3^x = \sqrt[4]{3^5}$

Find the value of x.

Answer(a) $x =$ ..... [1]

(b) Simplify $(32y^{15})^{\frac{2}{5}}$.

Answer(b) ..... [2]

---

565. 0580_w13_QP_21 Q: 14

Write as a single fraction in its simplest form.

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

Answer ..... [3]

---

566. 0580_w13_QP_21 Q: 17

Factorise completely.

(a) $a + b + at + bt$

Answer(a) ..... [2]

(b) $x^2 - 2x - 24$

Answer(b) ..... [2]

---

567. 0580_w13_QP_22 Q: 6

Rearrange the formula to make x the subject.

$y = x^2 + 4$

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

---

568. 0580_w13_QP_22 Q: 11

The speed, v, of a wave is inversely proportional to the square root of the depth, d, of the water.
$v = 30$ when $d = 400$.

Find v when $d = 25$.

Answer $v =$ ..... [3]

---

569. 0580_w13_QP_22 Q: 15

Find the co-ordinates of the point of intersection of the two lines.

$$2x - 7y = 2$$
$$4x + 5y = 42$$

Answer (..... , ...) [3]

---

570. 0580_w13_QP_22 Q: 16

Solve the inequality.

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

Answer ..... [4]

---

571. 0580_w13_QP_23 Q: 3

Solve the equation $1 + 2x = -15$.

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

---

572. 0580_w13_QP_23 Q: 7

The solutions of the equation $x^2 - 6x + d = 0$ are both integers.
d is a prime number.

Find d.

Answer $d =$ ..... [3]

---

573. 0580_w13_QP_23 Q: 9

(a) Expand and simplify $(a + b)^2$.

Answer(a) ..... [2]

(b) Find the value of $a^2 + b^2$ when $a + b = 6$ and $ab = 7$.

Answer(b) ..... [1]

---

574. 0580_w13_QP_23 Q: 14

(a) Simplify $(64q^{-2})^{\frac{1}{2}}$.

Answer(a) ..... [2]

(b) $5^7 \div 5^9 = p^2$

Find p.

Answer(b) $p =$ ..... [2]

575. 0580_w13_QP_23 Q: 19

$f(x) = 2x + 3$ $g(x) = x^2$

(a) Find $fg(6)$.

Answer(a) ..... [2]

(b) Solve the equation $gf(x) = 100$.

Answer(b) $x =$ ..... or $x =$ ..... [3]

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

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

(d) Find $ff^{-1}(5)$.

Answer(d) ..... [1]

576. 0580_s12_QP_21 Q: 3

Factorise completely.

$$15p^2 + 24pt$$

Answer ..... [2]

---

577. 0580_s12_QP_21 Q: 8

Find r when $(5)^{\frac{r}{3}} = 125$.

Answer $r =$ ..... [2]

---

578. 0580_s12_QP_21 Q: 11

Solve the simultaneous equations.

$$3x + 5y = 24$$
$$x + 7y = 56$$

Answer $x =$ .....

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

---

579. 0580_s12_QP_21 Q: 13

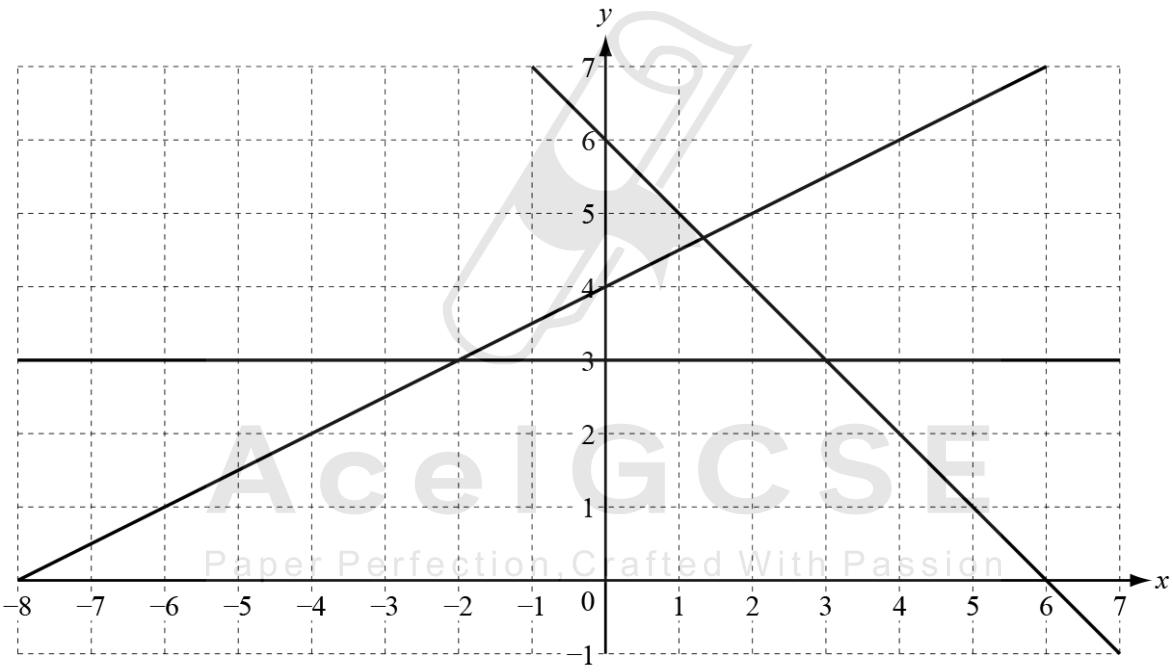
y is **inversely** proportional to x^2.
When $x = 4$, $y = 3$.

Find y when $x = 5$.

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

---

580. 0580_s12_QP_21 Q: 14



The region ***R*** contains points which satisfy the inequalities

$$y \leqslant \frac{1}{2}x + 4, \qquad y \geqslant 3 \quad \text{and} \quad x + y \geqslant 6.$$

On the grid, label with the letter ***R*** the region which satisfies these inequalities.

You must shade the **unwanted** regions. [3]

---

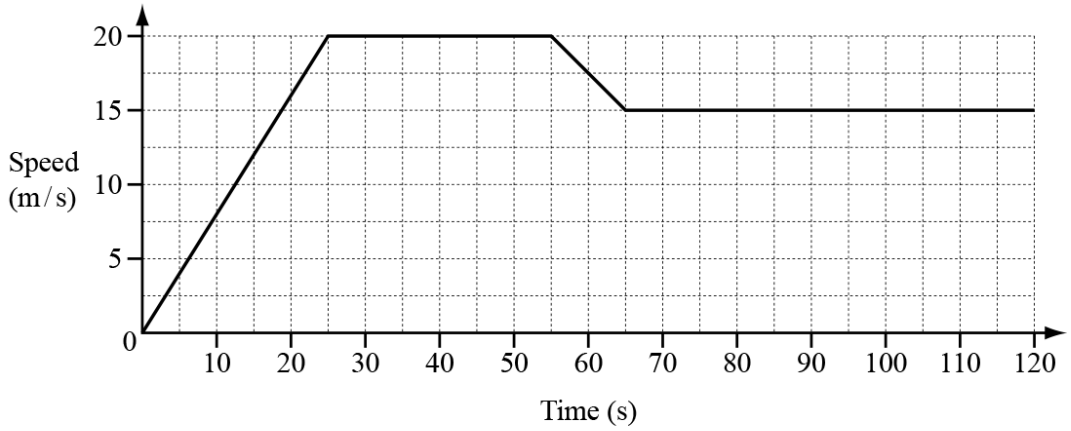
581. 0580_s12_QP_21 Q: 17

Make w the subject of the formula.

$$c = \frac{4 + w}{w + 3}$$

Answer $w =$ ..... [4]

582. 0580_s12_QP_21 Q: 18



The diagram shows the speed-time graph for the first 120 seconds of a car journey.

(a) Calculate the acceleration of the car during the first 25 seconds.

Answer(a) ..... m/s^2 [1]

(b) Calculate the distance travelled by the car in the first 120 seconds.

Answer(b) ..... m [4]

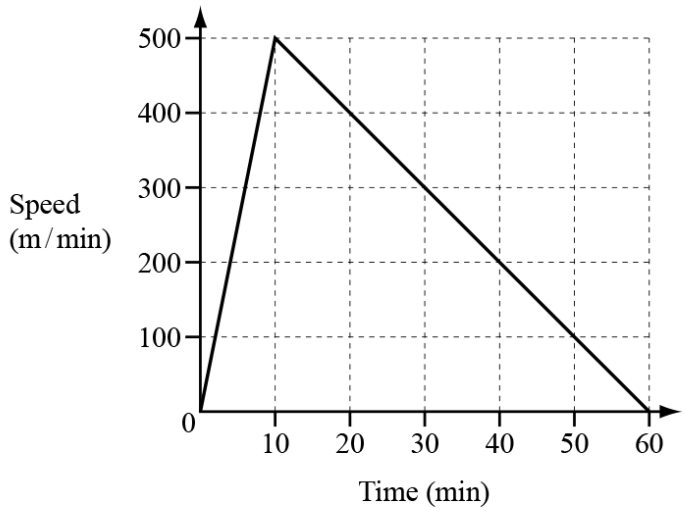
583. 0580_s12_QP_22 Q: 6

x is a positive integer and $15x - 43 < 5x + 2$.

Work out the possible values of x.

Answer ..... [3]

584. 0580_s12_QP_22 Q: 10



The diagram shows the speed-time graph for a boat journey.

(a) Work out the acceleration of the boat in metres/minute^2.

Answer(a) ..... m/min^2 [1]

(b) Calculate the total distance travelled by the boat.
Give your answer in **kilometres**.

Answer(b) ..... km [2]

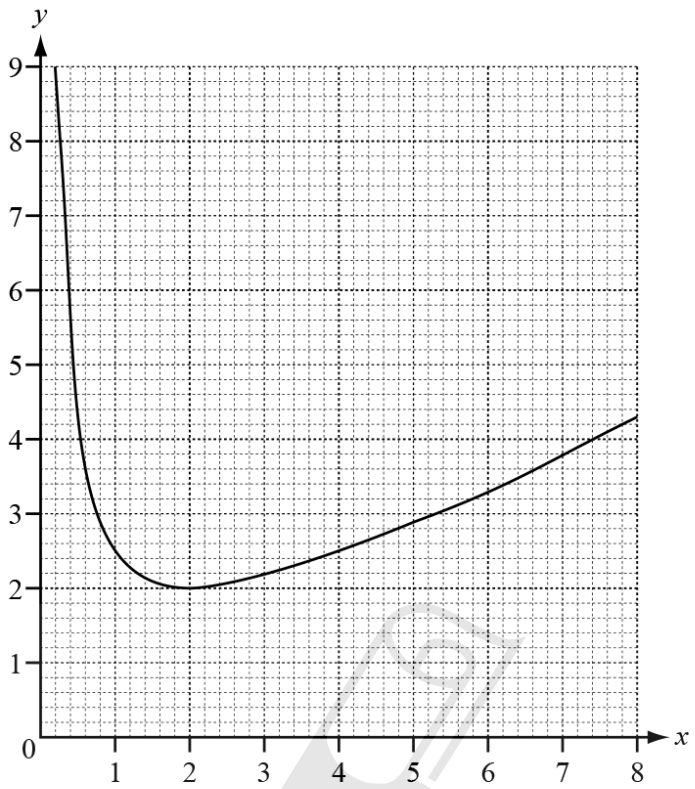
585. 0580_s12_QP_22 Q: 11

y varies directly as the square of $(x - 3)$.
$y = 16$ when $x = 1$.

Find y when $x = 10$.

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

586. 0580_s12_QP_22 Q: 16



The diagram shows the graph of $y = \frac{x}{2} + \frac{2}{x}$, for $0 < x \leqslant 8$.

(a) Use the graph to solve the equation $\frac{x}{2} + \frac{2}{x} = 3$.

Answer (a) $x =$ ..... or $x =$ ..... [2]

(b) By drawing a suitable tangent, work out an estimate of the gradient of the graph where $x = 1$.

Answer(b) ..... [3]

587. 0580_s12_QP_22 Q: 18

$f(x) = (x + 2)^3 - 5$ $g(x) = 2x + 10$ $h(x) = \frac{1}{x}, \ x \neq 0$

Find

(a) $gf(x)$,

Answer(a) $gf(x) =$ ..... [2]

(b) $f^{-1}(x)$,

Answer(b) $f^{-1}(x) =$ ..... [3]

(c) $gh(-\frac{1}{5})$.

Answer(c) ..... [2]

588. 0580_s12_QP_23 Q: 4

Solve the inequality.

$$3y + 7 \leqslant 2 - y$$

Answer ..... [2]

---

589. 0580_s12_QP_23 Q: 9

Make w the subject of the formula.

$$t = 2 - \frac{3w}{a}$$

Answer $w =$ ..... [3]

---

590. 0580_s12_QP_23 Q: 10

The periodic time, T, of a pendulum varies directly as the square root of its length, l.
$T = 6$ when $l = 9$.

Find T when $l = 25$.

Answer $T =$ ..... [3]

---

591. 0580_s12_QP_23 Q: 13

(a) Find the value of $7p - 3q$ when $p = 8$ and $q = -5$.

Answer(a) ..... [2]

(b) Factorise completely.

$3uv + 9vw$

Answer(b) ..... [2]

---

592. 0580_s12_QP_23 Q: 14

Simplify the following.

(a) $(4pq^2)^3$

Answer(a) ..... [2]

(b) $(16x^8)^{-\frac{1}{4}}$

Answer(b) ..... [2]

---

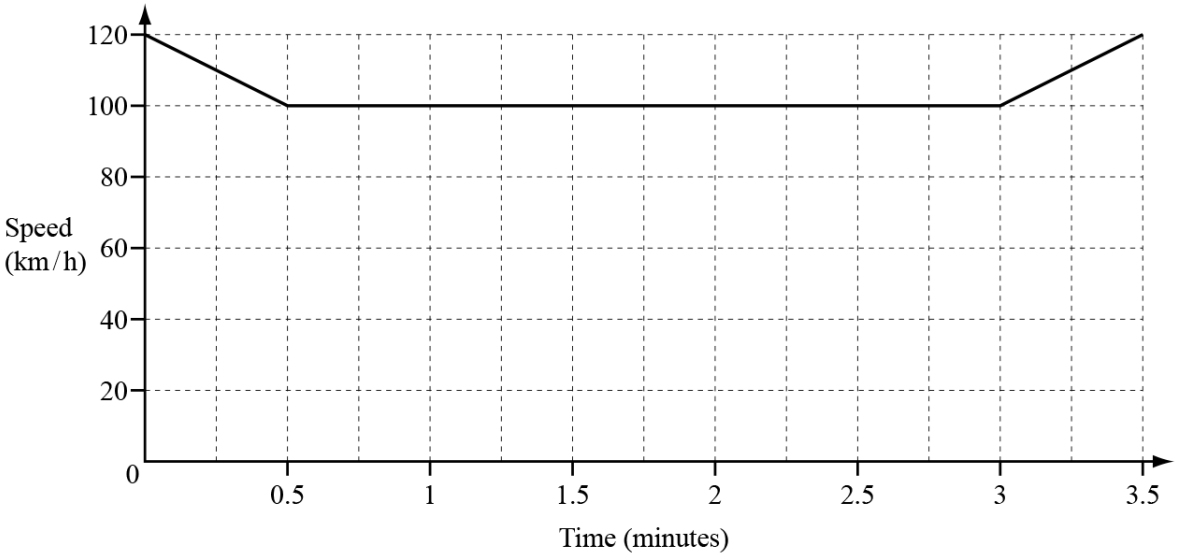
593. 0580_s12_QP_23 Q: 15

Solve the equation $2x^2 + 6x - 3 = 0$.
Show your working and give your answers correct to 2 decimal places.

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

---

594. 0580_s12_QP_23 Q: 19



The diagram shows the speed-time graph for part of a car journey.
The speed of the car is shown in kilometres/**hour**.

Calculate the distance travelled by the car during the 3.5 **minutes** shown in the diagram.
Give your answer in kilometres.

Answer ..... km [4]

595. 0580_s12_QP_23 Q: 20

Simplify fully.

$$\frac{x^2 - x - 20}{x^3 - 10x^2 + 25x}$$

Answer ..... [5]

---

596. 0580_w12_QP_21 Q: 5

Simplify the expression.

$$(a^{\frac{1}{2}} - b^{\frac{1}{2}})(a^{\frac{1}{2}} + b^{\frac{1}{2}})$$

Answer ..... [2]

---

597. 0580_w12_QP_21 Q: 9

Solve the inequality.

$$\frac{2x-3}{5} - \frac{x}{3} \leqslant 2$$

Answer ..... [3]

---

598. 0580_w12_QP_21 Q: 11

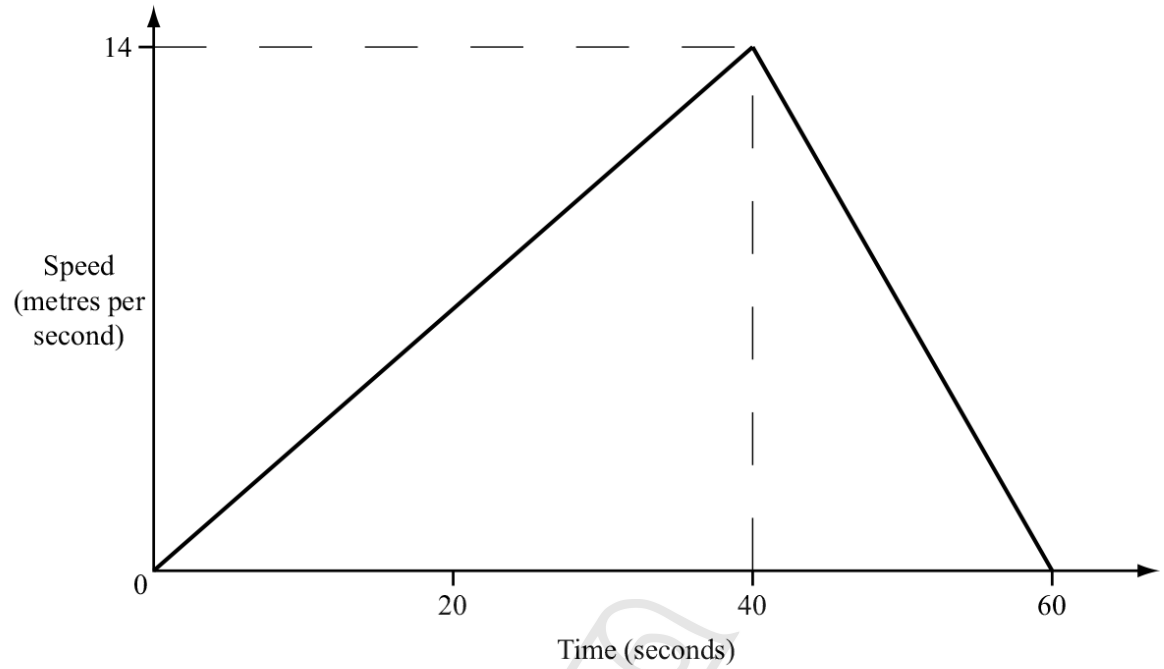
The electrical resistance, R, of a length of cylindrical wire varies inversely as the square of the diameter, d, of the wire.
$R = 10$ when $d = 2$.

Find R when $d = 4$.

Answer $R =$ ..... [3]

---

599. 0580_w12_QP_21 Q: 15



The diagram shows the speed-time graph of a bus journey between two bus stops.
Hamid runs at a constant speed of 4 m/s along the bus route.
He passes the bus as it leaves the first bus stop.
The bus arrives at the second bus stop after 60 seconds.

How many metres from the bus is Hamid at this time?

Answer ..... m [3]

600. 0580_w12_QP_21 Q: 16

Rearrange the formula $y = \dfrac{x+2}{x-4}$ to make x the subject.

Answer $x =$ ..... [4]

601. 0580_w12_QP_21 Q: 20

$$f(x) = 4(x + 1) \qquad g(x) = \frac{x^3}{2} - 1$$

(a) Write down the value of x when $f^{-1}(x) = 2$.

Answer(a) $x =$ ..... [1]

(b) Find $fg(x)$. Give your answer in its simplest form.

Answer(b) $fg(x) =$ ..... [2]

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

Answer(c) $g^{-1}(x) =$ ..... [3]

602. 0580_w12_QP_22 Q: 3

$$m = \frac{1}{4}[3h^2 + 8ah + 3a^2]$$

Calculate the exact value of m when $h = 20$ and $a = -5$.

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

---

603. 0580_w12_QP_22 Q: 10

Solve the equation $4x - 12 = 2(11 - 3x)$.

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

---

604. 0580_w12_QP_22 Q: 11

List all the **prime numbers** which satisfy this inequality.

$$16 < 2x - 5 < 48$$

Answer ..... [3]

---

605. 0580_w12_QP_22 Q: 13

The mass, m, of an object varies directly as the **cube** of its length, l.

$m = 250$ when $l = 5$.

Find m when $l = 7$.

Answer $m =$ ..... [3]

---

606. 0580_w12_QP_22 Q: 14

(a) $\left(\frac{3}{8}\right)^{\frac{3}{8}} \times \left(\frac{3}{8}\right)^{\frac{1}{8}} = p^q$

Find the value of p and the value of q.

Answer(a) $p =$ .....

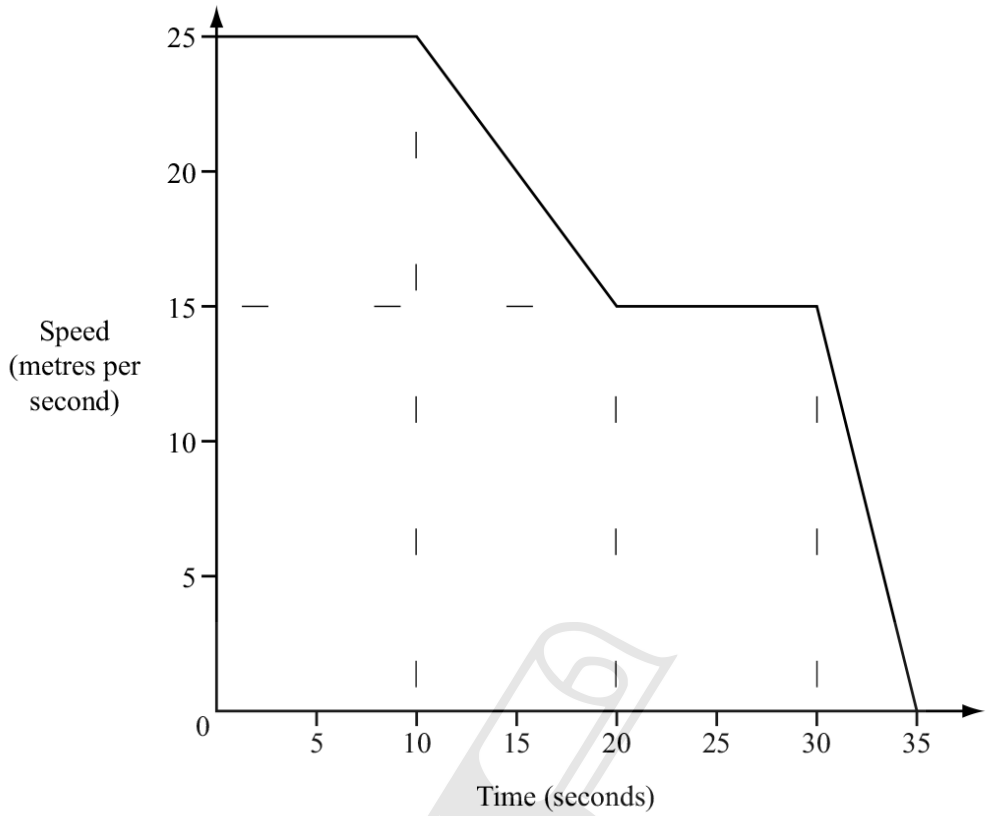
$q =$ ..... [2]

(b) $5^{-3} + 5^{-4} = k \times 5^{-4}$

Find the value of k.

Answer(b) $k =$ ..... [2]

607. 0580_w12_QP_22 Q: 15



The diagram shows the speed-time graph for the last 35 seconds of a car journey.

(a) Find the deceleration of the car as it came to a stop.

Answer(a) ..... m/s^2 [1]

(b) Calculate the total distance travelled by the car in the 35 seconds.

Answer(b) ..... m [3]

608. 0580_w12_QP_22 Q: 19

$f(x) = x^2 + 1$ $\quad g(x) = \dfrac{x+2}{3}$

(a) Work out ff(−1).

Answer(a) ..... [2]

(b) Find gf($3x$), simplifying your answer as far as possible.

Answer(b) gf($3x$) = ... [3]

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

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

---

609. 0580_w12_QP_23 Q: 4

Expand the brackets.

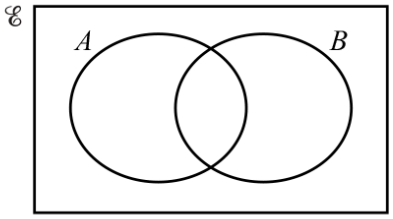
$y(3 - y^3)$

Answer ..... [2]

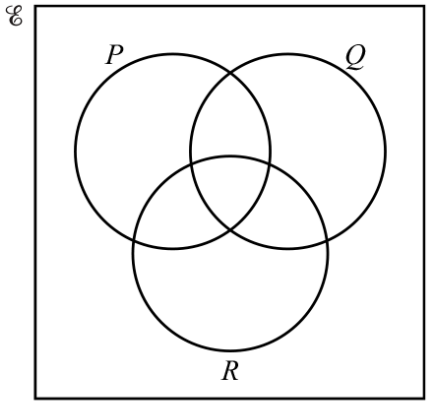
---

610. 0580_w12_QP_23 Q: 9

Shade the required region in each of the Venn diagrams.



A'



$(P \cap R) \cup Q$

[2]

---

611. 0580_w12_QP_23 Q: 11

Simplify $(256w^{256})^{\frac{1}{4}}$.

Answer ..... [2]

---

612. 0580_w12_QP_23 Q: 13

Write the following as a single fraction in its simplest form.

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

Answer ..... [3]

---

613. 0580_w12_QP_23 Q: 14

y varies inversely as the square root of x.
When $x = 9$, $y = 6$.

Find y when $x = 36$.

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

---

614. 0580_w12_QP_23 Q: 16

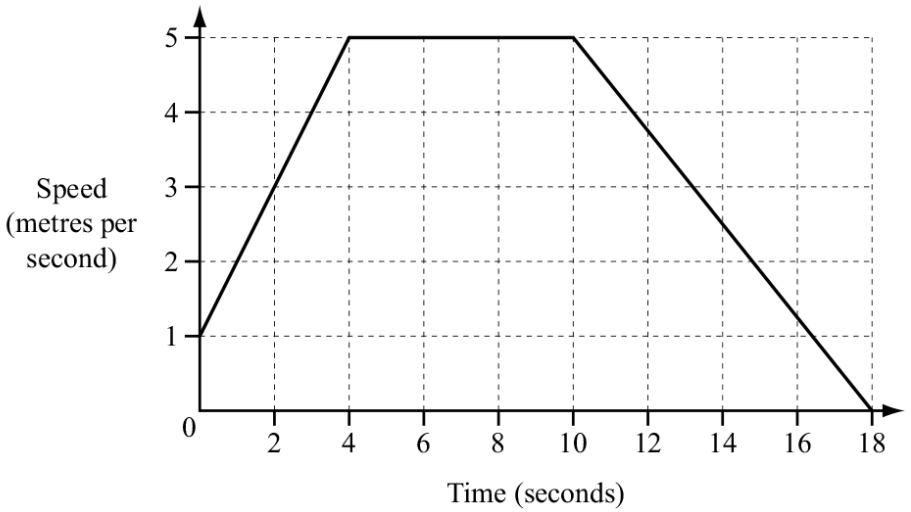
Make y the subject of the formula.

$$A = \pi x^2 - \pi y^2$$

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

---

615. 0580_w12_QP_23 Q: 19



The diagram shows the speed-time graph for the last 18 seconds of Roman's cycle journey.

(a) Calculate the deceleration.

Answer(a) ..... m/s^2 [1]

(b) Calculate the total distance Roman travels during the 18 seconds.

Answer(b) ..... m [3]

616. 0580_w12_QP_23 Q: 21

Simplify the following.

$$\frac{h^2 - h - 20}{h^2 - 25}$$

Answer ..... [4]

617. 0580_w12_QP_23 Q: 23

$f(x) = 3x + 5$ $g(x) = 4x - 1$

(a) Find the value of gg(3).

Answer(a) ..... [2]

(b) Find fg(x), giving your answer in its simplest form.

Answer(b) fg(x) = ... [2]

(c) Solve the equation.

$f^{-1}(x) = 11$

Answer(c) x = ... [1]
