

Answers

1 Algebraic manipulation

1.1 Expanding two brackets

1 a $6x^2 - 15x$

b	x	x	+ 2
	x	x ²	+ 2x
	+ 3	+ 3x	+ 6

$$x^2 + 2x + 3x + 6 = x^2 + 5x + 6$$

c $2x^2 - 10x + 3x - 15 = 2x^2 - 7x - 15$

d $6x^2 - 8xy - 15xy + 20y^2 = 6x^2 - 23xy + 20y^2$

2 a $2x^2 + 8x$

b $18x^2 - 30x$

c $10x^2 - 10xy$

d $x^2 + 9x + 20$

e $x^2 + 10x + 21$

f $x^2 + 5x - 14$

g $x^2 - 25$

h $2x^2 + x - 3$

i $6x^2 - x - 2$

j $10x^2 - 31x + 15$

k $12x^2 + 13x - 14$

l $18x^2 + 39xy + 20y^2$

m $35x^2 + 14xy - 15x - 6y$

n $6x^2 - 16x - 9xy + 24y$

1.2 Factorising expressions

1 a $3x^2y(5y^2 + 3x^2)$

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

c $b = 3, ac = -10$

$$x^2 + 3x - 10 = x^2 + 5x - 2x - 10$$

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

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

d $b = -11, ac = -60$

Two numbers are -15 and 4

$$6x^2 - 11x - 10 = 6x^2 - 15x + 4x - 10$$

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

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

2 a $2x^3y^3(3x - 5y)$ b $7a^3b^2(3b^3 + 5a^2)$ c $5x^2y^2(5 - 2x + 3y)$

3 a $(x + 3)(x + 4)$ b $(x + 7)(x - 2)$ c $(x - 5)(x - 6)$

d $(x - 8)(x + 3)$ e $(x - 9)(x + 2)$ f $(x + 5)(x - 4)$

g $(x - 8)(x + 5)$ h $(x + 7)(x - 4)$

4 a $(6x - 7y)(6x + 7y)$ b $(2x - 9y)(2x + 9y)$

c $2(3a - 10bc)(3a + 10bc)$

5 a $(x - 1)(2x + 3)$ b $(3x + 1)(2x + 5)$ c $2(3x - 2)(2x - 5)$

d $(2x + 1)(x + 3)$ e $(3x - 1)(3x - 4)$ f $(5x + 3)(2x + 3)$

1.3 Using index laws

1 a 1

b $\sqrt{9} = 3$

c $(\sqrt[3]{27})^2 = 3^2 = 9$

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

e $3x^3$

f $\frac{x^8}{x^4} = x^4$

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

h $\frac{12x^2}{8x^6} = \frac{3}{2x^4}$

2 a 1 b 1 c 1

3 a 7 b 4 c 5 d 2

4 a 125 b 32 c 343 d 8

5 a $\frac{1}{25}$ b $\frac{1}{64}$ c $\frac{1}{32}$ d $\frac{1}{36}$

6 a $\frac{3x^3}{2}$ b $5x^2$ c $3x$ d $\frac{y}{2x^2}$ e $y^{\frac{1}{2}}$ f c^{-3}

g $2x^6$ h x

7 a $\frac{1}{2}$ b $\frac{1}{9}$ c $\frac{8}{3}$ d $\frac{1}{4}$ e $\frac{4}{3}$ f $\frac{16}{9}$

1.4 Algebraic fractions

1 a $\frac{2x(x - 2)}{6x(2 + x)} = \frac{x - 2}{3(x + 2)}$

b $\frac{(x + 3)(x - 7)}{(2x + 3)(x + 3)} = \frac{x - 7}{2x + 3}$

c $\frac{2x}{6} + \frac{6x + 3}{6} = \frac{8x + 3}{6}$

d $\frac{2x + 2}{(x - 3)(x + 1)} - \frac{5x - 15}{(x - 3)(x + 1)} = \frac{-3x + 17}{(x - 3)(x + 1)}$

2 a $\frac{2(x + 2)}{x - 1}$

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

c $\frac{x + 2}{x}$

d $\frac{x}{x + 5}$

e $\frac{x + 3}{x}$

f $\frac{x}{x - 5}$

3 a $\frac{13x}{15}$

b $\frac{11x + 5}{10}$

c $\frac{x}{28}$

d $\frac{x}{12}$

e $\frac{11x + 4}{12}$

f $\frac{7x + 13}{20}$

4 a $\frac{5x + 11}{(x + 3)(x + 1)}$

b $\frac{3(x + 1)}{x(x + 3)}$

c $\frac{x - 8}{x(x + 4)}$

d $\frac{2(x - 3)}{(x + 1)(x - 1)}$

e $\frac{5(x + 2)}{(2x - 3)(x + 1)}$

f $\frac{5x - 4}{(x + 1)(x - 2)}$

5 a $\frac{3x + 4}{x + 7}$

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

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

d $\frac{3x + 1}{x + 4}$

1.5 Completing the square

1 a $(x + 3)^2 - 2 - 9 = (x + 3)^2 - 11$

b $2(x^2 - \frac{5}{2}x + \frac{1}{2}) = 2[(x - \frac{5}{4})^2 + \frac{1}{2} - \frac{25}{16}] = 2[(x - \frac{5}{4})^2 - \frac{17}{16}]$
 $= 2(x - \frac{5}{4})^2 - \frac{17}{8}$

2 a $(x + 2)^2 - 1$

b $(x - 5)^2 - 28$

c $(x - 4)^2 - 16$

d $(x + 3)^2 - 9$

e $(x - 1)^2 + 6$

f $(x + \frac{3}{2})^2 - \frac{17}{4}$

3 a $2(x - 2)^2 - 24$

b $4(x - 1)^2 - 20$

c $3(x + 2)^2 - 21$

d $2(x + \frac{3}{2})^2 - \frac{25}{2}$

4 a $2(x + \frac{3}{4})^2 + \frac{39}{8}$

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

c $5(x + \frac{3}{10})^2 - \frac{9}{20}$

d $3(x + \frac{5}{6})^2 + \frac{11}{12}$

Don't forget!

* four

* $ax^2 + bx + c$

* $b; ac$

* the difference of two squares; $(x - y)(x + y)$

* $a^m + a^n$

* $a^m - a^n$

* a^m

* 1

* $\sqrt[n]{a}$

* $\sqrt[n]{(a^m)}$ or $(\sqrt[n]{a})^m$

* $\frac{1}{a^m}$

* numerator; denominator

* 1

* common denominator; equivalent

* $p(x + q)^2 + r$

Check up

1 a $3x^2 - 7x - 6$

b $6x^2y^2(2x + 5y^3)$

c x^2

2 a x^{-2}

b $(x - 5)(x + 7)$

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

3 $(x + 1\frac{1}{2})^2 - 7\frac{1}{4}$

4 $\frac{x + 2}{2x + 3}$

2 Formulae

2.1 Substitution

1 a $2 \times 8 + (-6) = 16 - 6 = 10$ b $8 + (-6) \times \frac{1}{3} = 8 - 2 = 6$

c $\frac{3 \times 8}{-6} = -4$

d $8\frac{1}{3} - (-6) = 2 + 6 = 8$

2 C = $\frac{5}{9}$ of $(50 - 32)$

C = $\frac{5}{9}$ of 18

C = $5 \times 18 \div 9$

C = 10

- 3 a 7 b 3 c $20\frac{1}{2}$ d 25
 e -324 f -18
 4 a -1.6 b 2.7 c 2.8 d -2.4
 5 a $-2\frac{2}{3}$ b $-\frac{1}{6}$ c $-1\frac{1}{6}$ d -7
 6 610

2.2 Changing the subject of a formula

- 1 $v - u = at$
 $t = \frac{v - u}{a}$
 3 $2(t + r) = 5 \times 3t$
 $2t + 2r = 15t$
 $2r = 13t$
 $t = \frac{2r}{13}$
 4 $r(t - 1) = 3t + 5$
 $rt - r = 3t + 5$
 $rt - 3t = 5 + r$
 $t(r - 3) = 5 + r$
 $t = \frac{5 + r}{r - 3}$
 5 $d = \frac{C}{\pi}$
 6 $v = \frac{P - 2I}{2}$
 7 $T = \frac{S}{D}$
 8 $t = \frac{q - r}{p}$
 9 $t = \frac{2u}{2a - 1}$
 10 $x = \frac{V}{a + 4}$
 11 $y = 2 + 3x$
 12 $a = \frac{3x + 1}{x + 2}$
 13 $d = \frac{b - c}{a}$
 14 $g = \frac{2h + 9}{7 - h}$
 15 $e = \frac{1}{x + 7}$

Don't forget!

- * replacing each letter with its value
- * everything else

Check up

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

3 Surds

3.1 Surds

- 1 $\sqrt{25 \times 2} = \sqrt{25} \times \sqrt{2} = 5 \times \sqrt{2} = 5\sqrt{2}$
 2 $\sqrt{49 \times 3} - 2\sqrt{4 \times 3} = \sqrt{49} \times \sqrt{3} - 2\sqrt{4} \times \sqrt{3}$
 $= 7 \times \sqrt{3} - 2 \times 2 \times \sqrt{3} = 3\sqrt{3}$
 3 $\sqrt{49} - \sqrt{7} \times \sqrt{2} + \sqrt{2} \times \sqrt{7} - \sqrt{4} = 7 - 2 = 5$
 4 a $3\sqrt{5}$ b $5\sqrt{5}$ c $4\sqrt{3}$ d $5\sqrt{7}$
 e $10\sqrt{3}$ f $2\sqrt{7}$ g $6\sqrt{2}$ h $9\sqrt{2}$
 5 a -1 b $9 - \sqrt{3}$ c $10\sqrt{5} - 7$ d $26 - 4\sqrt{2}$
 6 a $15\sqrt{2}$ b $\sqrt{5}$ c $3\sqrt{2}$ d $\sqrt{3}$
 e $6\sqrt{7}$ f $5\sqrt{3}$

3.2 Rationalising the denominator

- 1 a $\frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$
 b $\frac{\sqrt{2}}{\sqrt{12}} \times \frac{\sqrt{12}}{\sqrt{12}} = \frac{\sqrt{2} \times \sqrt{12}}{12} = \frac{\sqrt{6}}{6}$
 c $\frac{3}{2 + \sqrt{5}} \times \frac{2 - \sqrt{5}}{2 - \sqrt{5}} = \frac{3(2 - \sqrt{5})}{4 + 2\sqrt{5} - 2\sqrt{5} - 5} = \frac{3(2 - \sqrt{5})}{-1}$
 $= -3(2 - \sqrt{5}) = -6 + 3\sqrt{5}$
 2 a $\frac{\sqrt{5}}{5}$ b $\frac{\sqrt{11}}{11}$ c $\frac{2\sqrt{7}}{7}$ d $\frac{\sqrt{2}}{2}$
 e $\sqrt{2}$ f $\sqrt{5}$ g $\frac{\sqrt{3}}{3}$ h $\frac{1}{3}$
 3 a $\frac{3 + \sqrt{5}}{4}$ b $\frac{2(4 - \sqrt{3})}{13}$ c $\frac{6(5 + \sqrt{2})}{23}$

Don't forget!

- * the square root of a number that is not a square number
- * $\sqrt{2}, \sqrt{3}, \sqrt{5}$, etc.
- * $\sqrt{a} \times \sqrt{b}$
- * $\frac{\sqrt{a}}{\sqrt{b}}$
- * denominator
- * $\sqrt{b}$
- * $b - \sqrt{c}$

Check up

- 1 $2\sqrt{5}$ 2 $9 - 4\sqrt{2}$ 3 $10 + 5\sqrt{3}$ 4 $\frac{3\sqrt{5}}{5}$ 5 $7\sqrt{2}$

4 Quadratic equations

4.1 Solving by factorisation

- 1 a $5x^2 - 15x = 0$
 $5x(x - 3) = 0$
 So $5x = 0$ or $x - 3 = 0$
 $x = 0$ or $x = 3$
 b $(x + 4)(x + 3) = 0$
 So $x + 4 = 0$ or $x + 3 = 0$
 $x = -4$ or $x = -3$
 c $(3x + 4)(3x - 4) = 0$
 So $3x + 4 = 0$ or $3x - 4 = 0$
 $x = -1\frac{1}{3}$ or $x = 1\frac{1}{3}$
 d $(2x + 3)(x - 4) = 0$
 So $2x + 3 = 0$ or $x - 4 = 0$
 $x = -1\frac{1}{2}$ or $x = 4$
 2 a $x = 0$ or $x = -\frac{2}{3}$ b $x = 0$ or $x = \frac{3}{4}$
 c $x = -5$ or $x = -2$ d $x = 2$ or $x = 3$
 e $x = -1$ or $x = 4$ f $x = -5$ or $x = 2$
 g $x = 4$ or $x = 6$ h $x = -6$ or $x = 6$
 i $x = -7$ or $x = 4$ j $x = 3$
 k $x = -\frac{1}{2}$ or $x = 4$ l $x = -\frac{2}{3}$ or $x = 5$
 3 a $x = -2$ or $x = 5$ b $x = -1$ or $x = 3$
 c $x = -8$ or $x = 3$ d $x = -6$ or $x = 7$
 e $x = -5$ or $x = 5$ f $x = -4$ or $x = 7$
 g $x = -3$ or $x = 2\frac{1}{2}$ h $x = -\frac{1}{3}$ or $x = 2$

4.2 Solving by completing the square

- 1 $(x + 3)^2 + 4 - 9 = 0$
 $(x + 3)^2 - 5 = 0$
 $(x + 3)^2 = 5$
 $x + 3 = \pm\sqrt{5}$
 $x = -3 \pm\sqrt{5}$
 $x = -3 + \sqrt{5}$ or $x = -3 - \sqrt{5}$
 2 $2[x^2 - \frac{7}{2}x + 2] = 0$
 $2[(x - \frac{7}{4})^2 + 2 - \frac{49}{16}] = 0$
 $(x - \frac{7}{4})^2 - \frac{17}{16} = 0$
 $(x - \frac{7}{4})^2 = \frac{17}{16}$
 $x - \frac{7}{4} = \pm\sqrt{\frac{17}{16}}$
 $x - \frac{7}{4} = \pm\frac{1}{4}\sqrt{17}$
 $x = \frac{7 + \sqrt{17}}{4}$ or $x = \frac{7 - \sqrt{17}}{4}$
 3 a $x = 2 + \sqrt{7}$ or $x = 2 - \sqrt{7}$
 b $x = 5 + \sqrt{21}$ or $x = 5 - \sqrt{21}$
 c $x = -4 + \sqrt{21}$ or $x = -4 - \sqrt{21}$
 d $x = 1 + \sqrt{7}$ or $x = 1 - \sqrt{7}$
 e $x = -2 + \sqrt{6.5}$ or $x = -2 - \sqrt{6.5}$
 f $x = \frac{-3 + \sqrt{89}}{10}$ or $x = \frac{-3 - \sqrt{89}}{10}$
 4 a $x = 1 + \sqrt{14}$ or $x = 1 - \sqrt{14}$
 b $x = \frac{-3 + \sqrt{23}}{2}$ or $x = \frac{-3 - \sqrt{23}}{2}$
 c $x = \frac{5 + \sqrt{13}}{2}$ or $x = \frac{5 - \sqrt{13}}{2}$

4.3 Solving by using the formula

- 1 $x = \frac{-(6) \pm \sqrt{(6)^2 - 4 \times 1 \times 4}}{2 \times 1}$
 $x = \frac{-6 \pm \sqrt{36 - 16}}{2}$
 $x = \frac{-6 \pm \sqrt{20}}{2}$
 $x = \frac{-6 \pm \sqrt{4 \times 5}}{2}$
 $x = \frac{-6 + 2\sqrt{5}}{2}$ or $x = \frac{-6 - 2\sqrt{5}}{2}$
 $x = -3 + \sqrt{5}$ or $x = -3 - \sqrt{5}$

2 $a = 3, b = -7, c = -2$

$$x = \frac{7 \pm \sqrt{49 - 4 \times 3 \times -2}}{2 \times 3}$$

$$x = \frac{7 \pm \sqrt{49 + 24}}{6}$$

$$x = \frac{7 \pm \sqrt{73}}{6}$$

$$x = \frac{7 + \sqrt{73}}{6} \text{ or } x = \frac{7 - \sqrt{73}}{6}$$

3 a $x = -1 + \frac{\sqrt{3}}{3} \text{ or } x = -1 - \frac{\sqrt{3}}{3}$

b $x = 1 + \frac{3\sqrt{2}}{2} \text{ or } x = 1 - \frac{3\sqrt{2}}{2}$

4 a $x = \frac{7 + \sqrt{17}}{8} \text{ or } x = \frac{7 - \sqrt{17}}{8}$

b $x = -1 + \sqrt{10} \text{ or } x = -1 - \sqrt{10}$

Don't forget!

 * two; $b; ac$

$$* \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

* negative

Check up

1 $x = \frac{7 + \sqrt{41}}{2} \text{ or } x = \frac{7 - \sqrt{41}}{2}$ 2 $x = -1\frac{2}{3} \text{ or } x = 2$

3 $x = \frac{-3 + \sqrt{89}}{20} \text{ or } x = \frac{-3 - \sqrt{89}}{20}$

5 Simultaneous equations

5.1 Solving simultaneous linear equations using elimination

1 $2x = 4$

$x = 2, y = -1$

3 $x = 1, y = 4$

5 $x = 2, y = -5$

7 $x = 6, y = -1$

2 $6x = 18$

$x = 3, y = 5$

4 $x = 3, y = -2$

6 $x = 3, y = -\frac{1}{2}$

8 $x = -2, y = 5$

5.2 Solving simultaneous linear equations using substitution

1 $5x + 3(2x + 1) = 14$

$5x + 6x + 3 = 14$

$11x = 11$

$x = 1, y = 3$

3 $x = 9, y = 5$

5 $x = \frac{1}{2}, y = 3\frac{1}{2}$

7 $x = -4, y = 5$

9 $x = \frac{1}{4}, y = 1\frac{3}{4}$

2 $4x + 3(2x - 16) = -3$

$4x + 6x - 48 = -3$

$10x = 45$

$x = 4.5, y = -7$

4 $x = -2, y = -7$

6 $x = \frac{1}{2}, y = 3$

8 $x = -2, y = -5$

10 $x = -2, y = \frac{5}{2}$

5.3 Solving simultaneous equations where one is quadratic

1 $x^2 + (x + 1)^2 = 13$

$x^2 + x^2 + 2x + 1 - 13 = 0$

$2x^2 + 2x - 12 = 0$

$2(x^2 + x - 6) = 0$

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

$x = -3 \text{ or } x = 2$

when $x = -3, y = -2$

when $x = 2, y = 3$

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

$2y^2 + \frac{y(5 - 3y)}{2} = 12$

$2y^2 + \frac{5y - 3y^2}{2} - 12 = 0$

$4y^2 + 5y - 3y^2 - 24 = 0$

$y^2 + 5y - 24 = 0$

$(y + 8)(y - 3) = 0$

$y = -8 \text{ or } y = 3$

when $y = -8, x = 14\frac{1}{2}$

when $y = 3, x = -2$

3 $x = 0, y = 5$

$x = -5, y = 0$

4 $x = -\frac{8}{3}, y = -\frac{19}{3}$

$x = 3, y = 5$

5 $x = -2, y = -4$

$x = 2, y = 4$

6 $x = \frac{5}{2}, y = 6$

$x = 3, y = 5$

7 $x = \frac{1 + \sqrt{5}}{2}, y = \frac{-1 + \sqrt{5}}{2}$

$x = \frac{1 - \sqrt{5}}{2}, y = \frac{-1 - \sqrt{5}}{2}$

8 $x = \frac{-1 + \sqrt{7}}{2}, y = \frac{3 + \sqrt{7}}{2}$

$x = \frac{-1 - \sqrt{7}}{2}, y = \frac{3 - \sqrt{7}}{2}$

Don't forget!

* elimination; substitution

* two

Check up

1 $x = 4, y = -2$

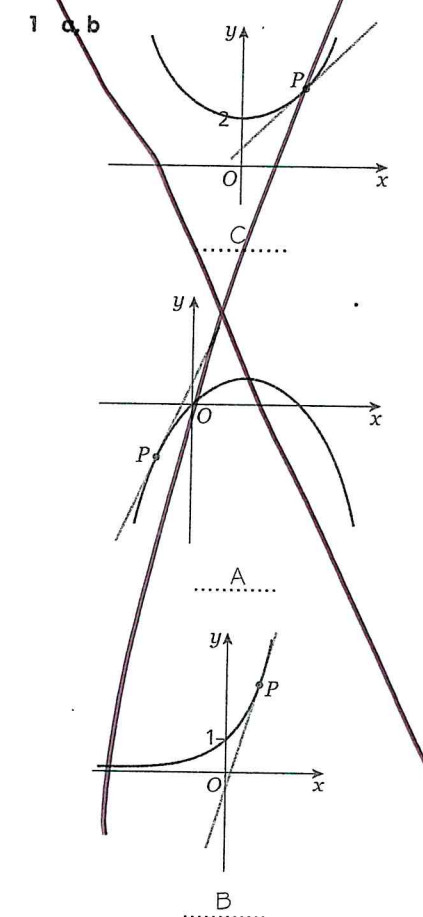
$x = -3\frac{1}{2}, y = 2\frac{1}{2}$

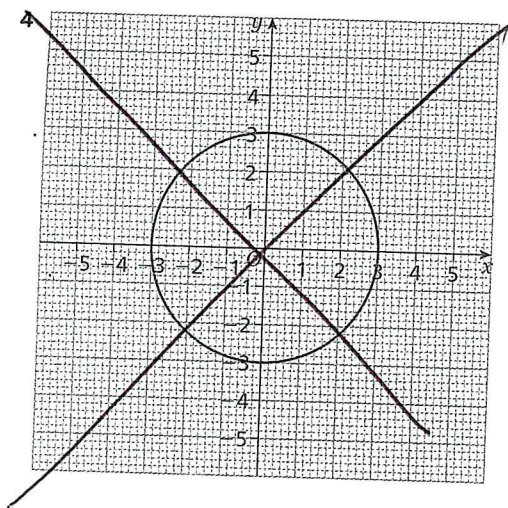
2 $x = 2\frac{1}{2}, y = \frac{1}{2}$

6 Graphs of functions

6.1 Recognising graphs

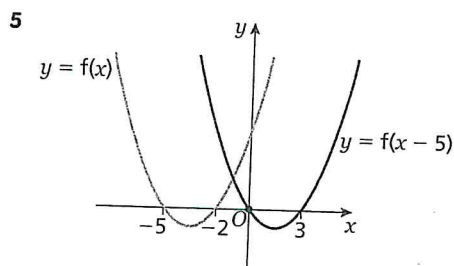
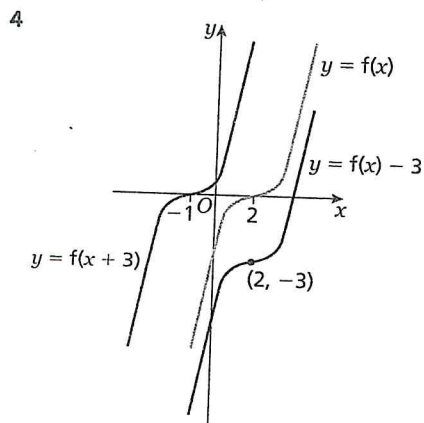
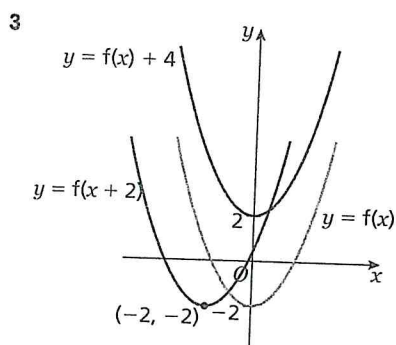
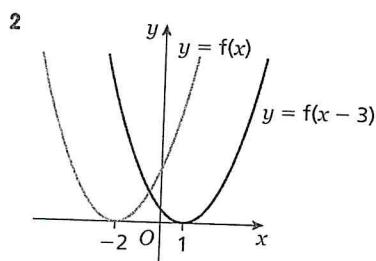
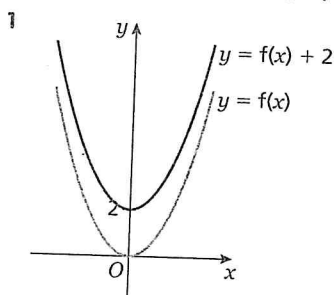
1 a, b





7 Transformations of functions

7.1 Applying the transformations $y = f(x) \pm a$ and $y = f(x \pm a)$ to the graph of $y = f(x)$

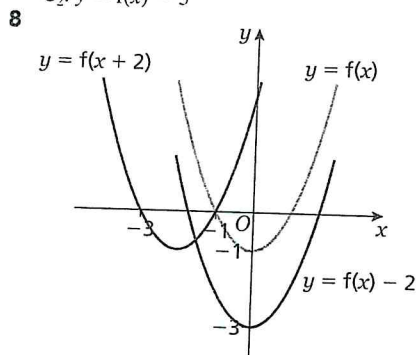


6 $C_1: y = f(x - 90^\circ)$

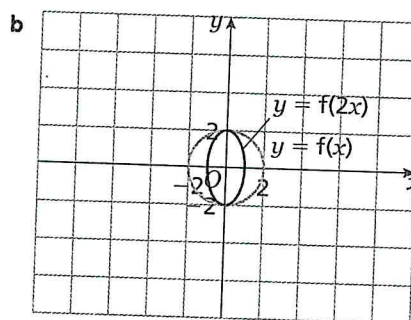
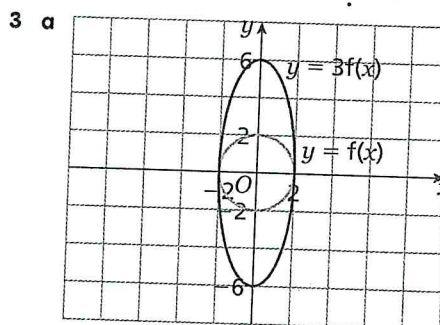
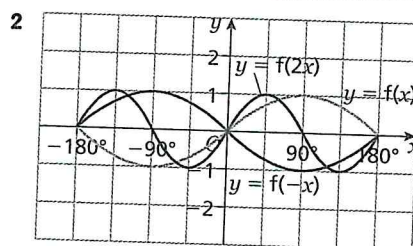
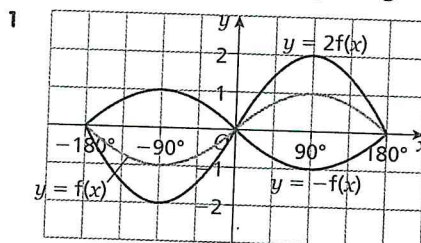
$C_2: y = f(x) - 2$

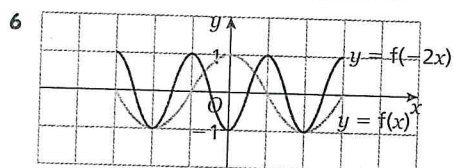
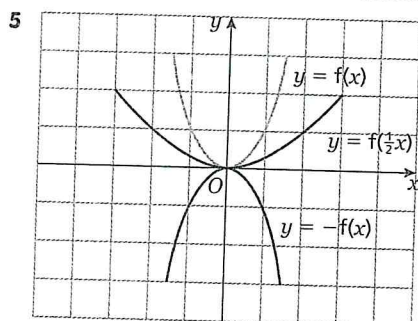
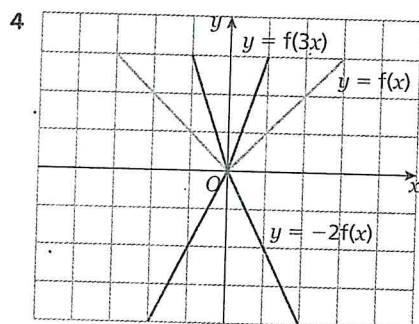
7 $C_1: y = f(x - 5)$

$C_2: y = f(x) - 3$



7.2 Applying the transformations $y = f(\pm ax)$ and $y = \pm af(x)$ to the graph of $y = f(x)$

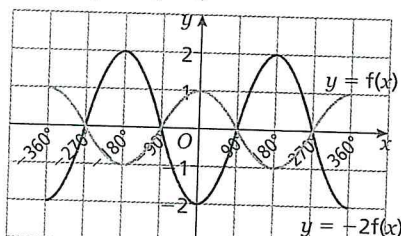




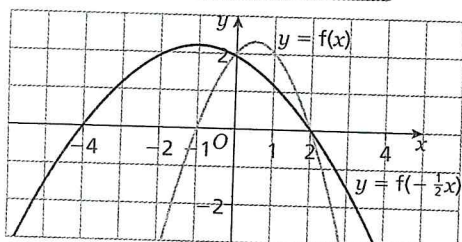
7 $y = f(2x)$

8 $y = -2f(2x)$ or $y = 2f(-2x)$

9 a, b



10 a, b

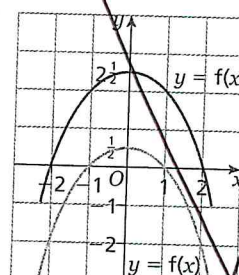


Don't forget!

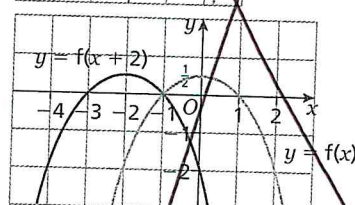
- * y
- * x ; left; right
- * $\frac{1}{a}$; x
- * $\frac{1}{a}$; x ; y
- * a ; y
- * a ; y ; x

Check up

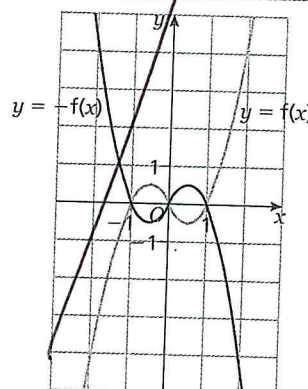
1 a



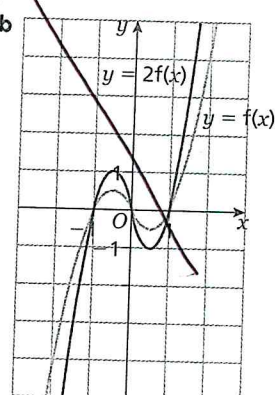
b



2 a



b



- 2 $5n - 2 = 73$
 $5n = 75$
 $n = 15$
- 3 $a = 3, d = 5$
 n th term $= 3 + (n - 1) \times 5$
 $= 3 + 5n - 5$
 $= 5n - 2$
- 4 $8 + 13 + 18$ 5 $3n + 2; 62$ 6 $17 - 2n; -3$ 7 $82; 402$
 8 $8; -97$ 9 25 10 53 11 5
 12 first term $= 1$, common difference $= 3$

7.2 The sum of an arithmetic series

- 1 $a = 1, d = 4, n = 30$ 2 $S_n = 432, a = 7, L = 41$
 $S_n = \frac{30}{2} [2 \times 1 + (30 - 1) \times 4]$ $432 = \frac{n}{2} (7 + 41)$
 $S_n = 15 \times (2 + 29 \times 4)$ $432 = 24n$
 $S_n = 1770$ $n = 18$
- 3 $S_n = 352, a = 7, d = 2$ 4 $S_n = 1, n = 2$
 $352 = \frac{n}{2} [2 \times 7 + (n - 1) \times 2]$ $1 = \frac{2}{2} [2a + (2 - 1)d]$
 $704 = n(14 + 2n - 2)$ $2a + d = 1$
 $704 = 2n^2 + 12n$ $93 = a + (20 - 1)d$
 $2n^2 + 12n - 704 = 0$ $a + 19d = 93$
 $n^2 + 6n - 352 = 0$ $a + 19(1 - 2a) = 93$
 $(n + 22)(n - 16) = 0$ $a + 19 - 38a = 93$
 $n = 16$ $19 - 37a = 93$
 $-37a = 74$
 $a = -2, d = 5$
- first term $= -2$; common difference $= 5$
- 5 610 6 1395 7 -5350 8 290
 9 341 10 1370 11 488 12 10
 13 first term $= 2$; common difference $= 3$

Don't forget!

- * sequence
- * n th term
- * the same amount
- * $a + (n - 1)d$
- * $\frac{n}{2} [2a + (n - 1)d]$
- * $\frac{n}{2} (a + L)$

Exam-style questions

- 1 a first term $= 60$; common difference $= -7$
 b -1245

8 Coordinate geometry

8.1 The equation of a line

- 1 $y = -\frac{1}{2}x + 3$
 $2y = -x + 6$
 $x + 2y - 6 = 0$
- 2 $3y = 2x - 4$
 $y = \frac{2}{3}x - \frac{4}{3}$
 gradient $= m = \frac{2}{3}$
 y -intercept $= c = -\frac{4}{3}$ or $-1\frac{1}{3}$
- 3 $m = 3$
 $y = 3x + c$
 $13 = 3 \times 5 + c$
 $13 = 15 + c$
 $c = -2$
 $y = 3x - 2$
- 4 $m = \frac{7 - 4}{8 - 2} = \frac{3}{6} = \frac{1}{2}$
 $y = \frac{1}{2}x + c$
 4 (or 7) $= \frac{1}{2} \times 2$ (or 8) $+ c$
 4 (or 7) $= 1$ (or 4) $+ c$
 $c = 3$
 $y = \frac{1}{2}x + 3$
- 5 a $m = 3, c = 5$ b $m = -\frac{1}{2}, c = -7$
 c $m = 2, c = -\frac{3}{2}$ d $m = -1, c = 5$
 e $m = \frac{2}{3}, c = -\frac{7}{3}$ or $-2\frac{1}{3}$ f $m = -5, c = 4$
- 6 $y = 5x$
 $y = -3x + 2$
 $y = 4x - 7$
- 7 a $x + 2y + 14 = 0$ b $2x - y = 0$
 c $2x - 3y + 12 = 0$ d $6x + 5y + 10 = 0$
- 8 $y = 4x - 3$
- 9 $y = -\frac{2}{3}x + 7$
- 10 a $y = 2x - 3$ b $y = -\frac{1}{2}x + 6$
 c $y = 5x - 2$ d $y = -3x + 19$

8.2 Parallel and perpendicular lines

- 1 $m = 2$
 $y = 2x + c$
 $9 = 2 \times 4 + c$
 $c = 1$
 $y = 2x + 1$
- 2 $m = 2$
 $-\frac{1}{m} = -\frac{1}{2}$
 $y = -\frac{1}{2}x + c$
 $5 = -\frac{1}{2} \times -2 + c = 1 + c$
 $c = 4$
 $y = -\frac{1}{2}x + 4$
- 3 $m = \frac{1}{2}$
 $-\frac{1}{m} = -2$
 $y = -2x + c$
 $3 = -2 \times -5 + c$
 $c = -7$
 $y = -2x - 7$
- 4 $m = \frac{-1 - 5}{9 - 0} = -\frac{6}{9} = -\frac{2}{3}$
 $-\frac{1}{m} = \frac{3}{2}$
 $y = \frac{3}{2}x + c$
 $\left(\frac{0 + 9}{2}, \frac{5 + -1}{2}\right) = \left(\frac{9}{2}, 2\right)$
 $y = \frac{3}{2}x + c$
 $2 = \frac{3}{2} \times \frac{9}{2} + c = \frac{27}{4} + c$
 $c = -\frac{19}{4}$
 $y = \frac{3}{2}x - \frac{19}{4}$
- 5 a $y = 3x - 7$ b $y = -2x + 5$
 c $y = -\frac{1}{2}x$ d $y = \frac{3}{2}x + 8$
- 6 a $y = -\frac{1}{2}x + 2$ b $y = 3x + 7$
 c $y = -4x + 35$ d $y = \frac{5}{2}x - 8$
- 7 a $y = -\frac{1}{2}x$ b $y = 2x$
- 8 a parallel b neither c perpendicular
 d perpendicular e neither f parallel

Don't forget!

- * $y = mx + c$
- * $ax + by + c = 0$
- * $m = \frac{y_2 - y_1}{x_2 - x_1}$
- * gradient
- * $-\frac{1}{m}$

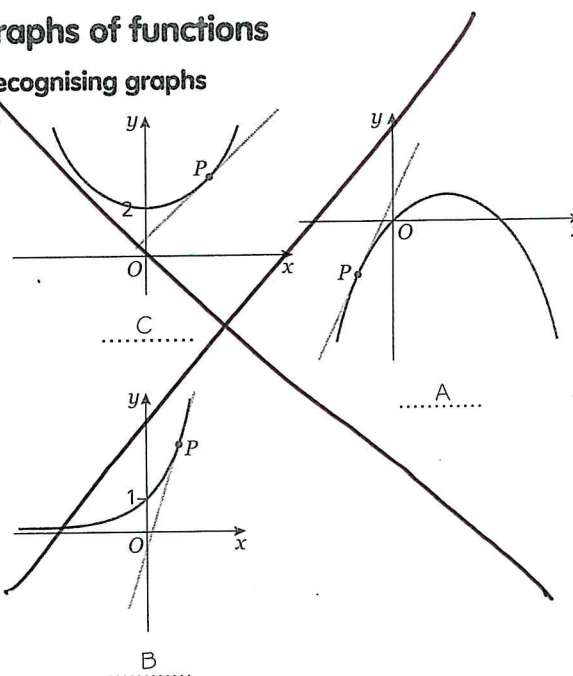
Exam-style questions

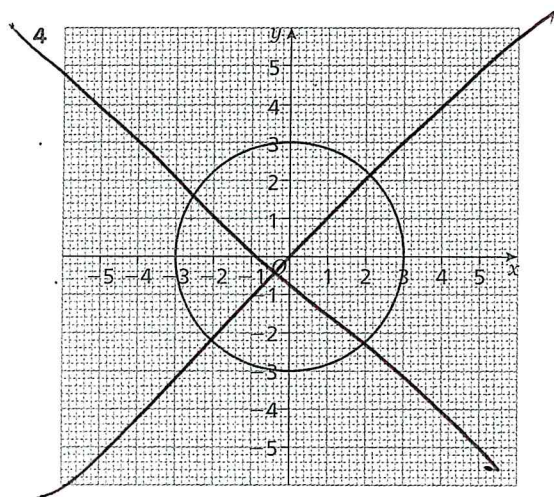
- 1 a $x + 2y - 4 = 0$ b $x + 2y + 2 = 0$ c $y = 2x$

9 Graphs of functions

9.1 Recognising graphs

- 1 a, b





10 Inequalities

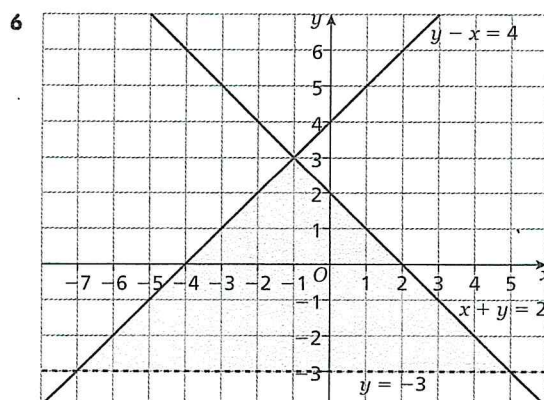
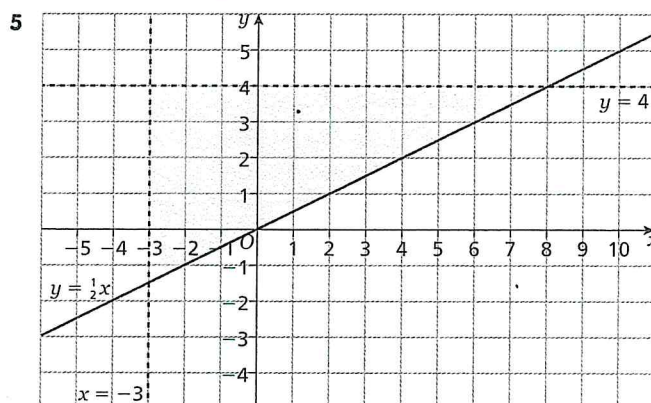
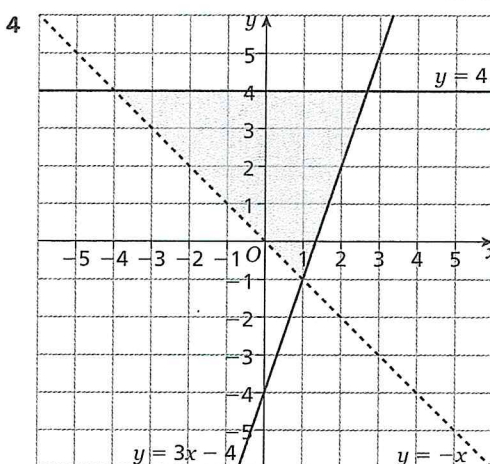
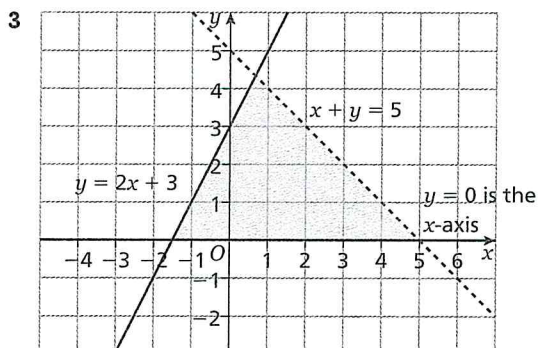
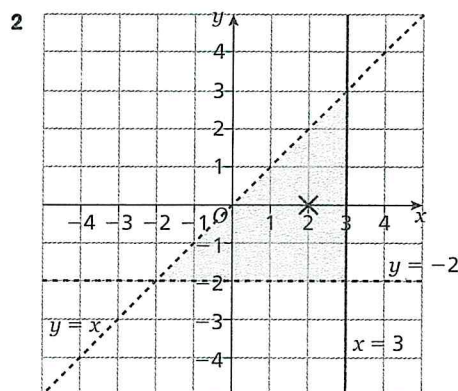
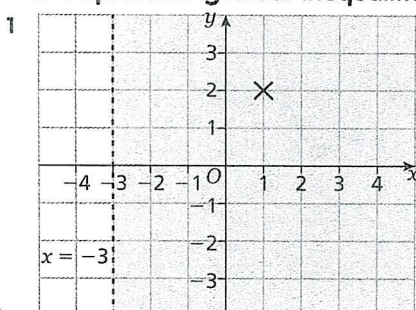
10.1 Solving linear inequalities

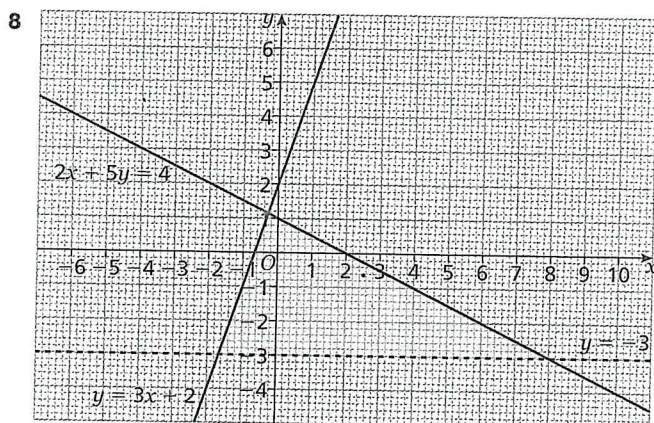
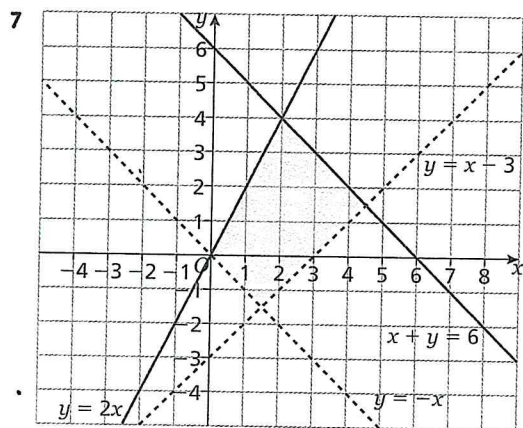
- 1 a $-2 \leq x < 4$
c $2x < 12$
 $x < 6$
e $4x - 8 > 27 - 3x$
 $7x > 35$
 $x > 5$
- 2 a $x \leq -4$
d $x < -3$
3 a $x < -6$
4 $x > 5$ (which also satisfies $x > 3$)
- b $\frac{4}{5} < x \leq 2$
d $-5x \geq -10$
 $x \leq 2$
- b $-1 \leq x < 5$
e $x > 2$
b $x < \frac{3}{2}$
- c $x \leq 1$
f $x \leq -6$

10.2 Solving quadratic inequalities

- 1 $(x+3)(x+2) = 0$
 $x = -3, x = -2$
 $x < -3$ or $x > -2$
- 2 $x(x-5) = 0$
 $x = 0, x = 5$
 $0 \leq x \leq 5$
- 3 $x^2 + 3x - 10 = 0$
 $(x+5)(x-2) = 0$
 $x = -5, x = 2$
 $-5 \leq x \leq 2$
- 4 $x \leq -2$ or $x \geq 6$
- 5 $-7 \leq x \leq 4$
- 6 $\frac{1}{2} < x < 3$
- 7 $x < -\frac{3}{2}$ or $x > \frac{1}{2}$
- 8 $-3 \leq x \leq 4$
- 9 $2 < x < 2\frac{1}{2}$
- 10 $x \leq -\frac{3}{2}$ or $x \geq \frac{5}{3}$

10.3 Representing linear inequalities on a graph



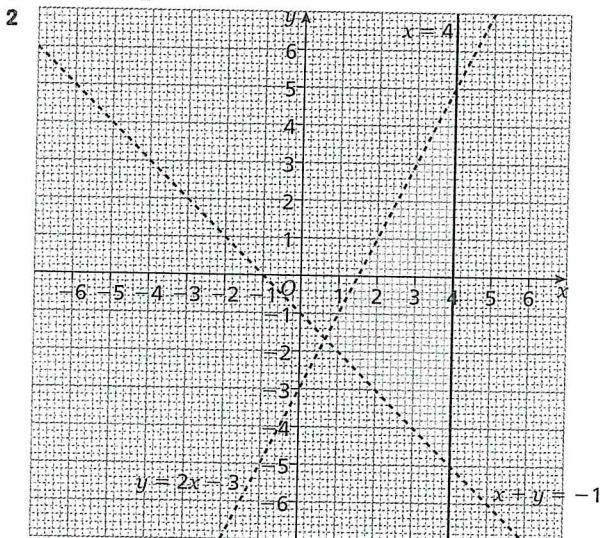


Don't forget!

- * a negative number
- * solve; sketch the graph; values
- * shading regions
- * unbroken (solid)
- * broken lines

Exam-style questions

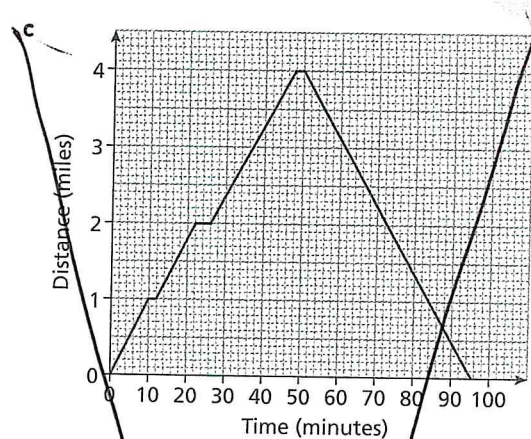
1 $-3 \leq x \leq 2$



11 Distance-time and speed-time graphs

11.1 Distance-time graphs

- 1 a 2 or 4 (depending on whether you've counted the start and finish)
 b $6 \div 10 = 0.6 \text{ m/s}$
 c $21 \div 20 = 1.05 \text{ m/s}$
 d Between 0 and 10 seconds
- 2 a 15 min b 15 miles
 c 6 mph d 48 mph
 3 a 2 min b 10 min



4 a C

b A

11.2 Speed-time graphs

1 a $9 \div 12 = 0.75 \text{ m/s}^2$

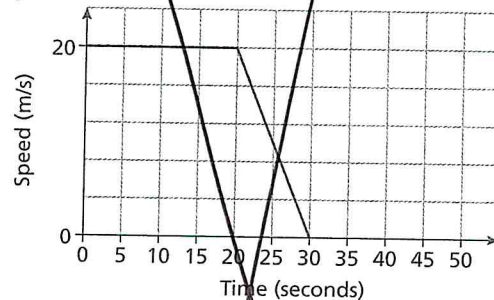
b Method 1: $\frac{1}{2} \times 9 \times (20 + 32) = \frac{1}{2} \times 9 \times 52 = 234 \text{ m}$

Method 2: $\frac{1}{2} \times 9 \times 12 + 9 \times 20 = 54 + 180 = 234 \text{ m}$

2 a $4 \div 8 = 0.5 \text{ m/s}^2$

b $\frac{1}{2} \times 4(12 + 22) = 68 \text{ m}$

3 a



b 2 m/s

4 a 100 km/h²

5 a 4 m/s²

6 a 30 m/s

7 a 5 s

c 100 m

b 57 miles

c -2 m/s^2

b 150 m

b 1 m/s²

b 275 m

Don't forget!

- * distance
- * the time taken
- * speed
- * faster
- * no movement
- * speed
- * the time taken to travel
- * constant speed
- * acceleration
- * deceleration
- * the distance travelled

Exam-style questions

1 a 4 m/s²

b 150 m

12 Direct and inverse proportion

12.1 Direct proportion

1 a $P \propto h$

$P = kh$

$56 = k \times 8$

$k = 56 \div 8 = 7$

$P = 7h$

b $P = 7h$

$P = 7 \times 11$

$P = £77$

2 a $y = kx^2$

$45 = k \times 3^2$

$k = 45 \div 9 = 5$

$y = 5x^2$

c $y = 5x^2$

$20 = 5 \times x^2$

$x^2 = 20 \div 5 = 4$

$x = 2$

b $y = 5x^2$

$y = 5 \times 5^2$

$y = 125$