Basic algebra answers

Page 55

1 a   24

   b   4

2 a $5x - 15$

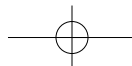   **b** $8x + 6$

   c $3x - 12 + 8x + 2$ *(1 mark)* $= 11x - 10$
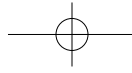
   d $2(2x + 3) + 2(x + 3)$ *(1 mark)* $= 6x + 12$

3 a $2(2x + 3)$

   b $x(5x + 2)$

Remember: Check which grade you are working at.

Linear equations answers

Page 56

1 a $3x = -3$ *(1 mark)* $x = -1$ *(1 mark)*

  b $7x = 14$ *(1 mark)* $x = 2$ *(1 mark)*

  c $4x = 10$ *(1 mark)* $x = 2\frac{1}{2}$ *(1 mark)*

2 a $12y = 24$ *(1 mark)* $y = 2$ *(1 mark)*

  b $4x = 12$ *(1 mark)* $x = 3$ *(1 mark)*

  c $2x = 3$ *(1 mark)* $x = 1\frac{1}{2}$ *(1 mark)*

Page 57

1 a $2x = -17$ *(1 mark)* $x = -8\frac{1}{2}$ *(1 mark)*
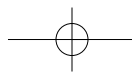
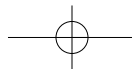 **b** $3x = 18$ *(1 mark)* $x = 6$ *(1 mark)*

2 $x + 3x - 1 + 2x + 5 = 25$ *(1 mark)*

  $6x + 4 = 25$ *(1 mark)*

  $x = 3.5$ cm *(1 mark)*

Remember: Check which grade you are working at.

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Trial and improvement answers

Page 58

1 *1 mark for finding the answer is between* 5.6 *and* 5.7

1 mark for testing 5.65
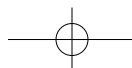
1 mark for $x = 5.7$

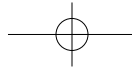**2** *1 mark for testing* 4 (8.5)

1 mark for finding the answer is between 3.7 *and* 3.8

1 mark for testing 3.75

1 mark for $x = 3.7$

Remember: Check which grade you are working at.

Simultaneous equations answers

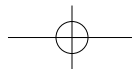## Page 59

1 a $x = 2\frac{1}{2}; y = -1\frac{1}{2}$
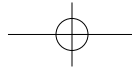
  b $x = 1\frac{1}{4}; y = \frac{1}{2}$

  c $x = 2.25; y = -1.75$

2 a $y = 5 - 3x$

  b $x = -1; y = 8$

Remember: Check which grade you are working at.

Simultaneous equations and formulae answers

Page 60

1 a $24x + 20y = 134$; $20x + 24y = 130$

  b 3.5 grams

2 a $x = \frac{C}{\pi}$

  b $3x = 6y + 9$ *(1 mark)*

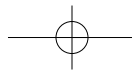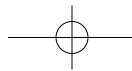 $x = 2y + 3$ *(1 mark)*

  c $x = \frac{(8 - 3q)}{2}$

  d $x = 2y + 1$ *(1 mark for $x = (4y + 2) \div 2$)*

  e $x = 2y + 5$ *(1 mark for $2y + 6 = x + 1$)*

Remember: Check which grade you are working at.

Algebra 2 answers

Page 61

1 a $3x + 6$

 b $x^2 + 2x$

 c $x^2 - 3x + 2x - 6$ *(1 mark)* $= x^2 - x - 6$ *(1 mark)*

 d $(x + 2)(x + 1)$ *(1 mark)* $= x^2 + 3x + 2$ *(1 mark)*

2 a $x^2 - 4x + x - 4$ *(1 mark)* $= x^2 - 3x - 4$ *(1 mark)*

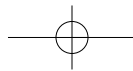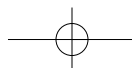 **b** $(x + 4)(x + 4)$ *(1 mark)* $= x^2 + 8x + 16$ *(1 mark)*

3 a 4

 b 52

 c i $200f + 50e$

  ii £10 000

Remember: Check which grade you are working at.

Factorising quadratic expressions answers

Page 62

1 a $x(x - 4)$

  b i $(x - 6)(x + 2)$ *(1 mark each bracket)*

    ii $6, -2$

2 a $x^2 - y^2$

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

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

3 a $6x^2 + 7x - 3$
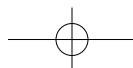
  b $(3x - 4)(2x - 3)$
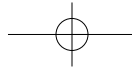
4 a $(x - 2)(x + 5) = 0$ *(1 mark)*

    $x = 2$ or -5 *(1 mark)*

  b $(x - 1)(x + 5) = 0$ *(1 mark)*

    $x = 1$ or $x = -5$ *(1 mark)*

Remember: Check which grade you are working at.

Solving quadratic equations answers

Page 63

1 a $(3x + 1)(4x + 1)$

   b $-\frac{1}{3}$ or $-\frac{1}{4}$

2 a $x = \pm\sqrt{4.5} = \pm2.12$

   b 0 or 5

3 a 1.54; −4.54

   b 0.64; −3.14

4 a $(3x - 1)(3x - 2) = 0$ *(1 mark)*

     $x = \frac{1}{3}$ or $x = \frac{2}{3}$ *(1 mark)*

   b $(2x - 1)(4x + 5) = 0$ *(1 mark)*

     $x = \frac{1}{2}$ or $x = -\frac{5}{4}$ *(1 mark)*

Page 64

1 a $a = 4$; $b = -23$

   b $x = -4 \pm \sqrt{23}$

2 a $a = 5$; $b = -28$

   b $x = 0.29$; −10.29

3 a $a = 1$; $b = 3$

   b Cannot have the square root of a negative

4 a $a = -4$; $b = -14$

   b 7.74 and 0.26

Page 65

1 $-5 \pm \frac{\sqrt{61}}{2}$

2 a $(6x + 1)^2 = (5x + 4)^2 + (2x - 1)^2$

   b $x = 4$

3 a $x + \frac{1}{x} = 2.9$; $10x^2 - 29x + 10 = 0$

   b $x = \frac{2}{5}$ or $\frac{5}{2}$

Remember: Check which grade you are working at.
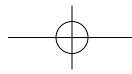
ALGEBRA
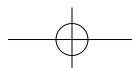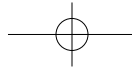
Real-life graphs answers

Page 66

1 a i 2 km

ii 5 minutes

b i 40 minutes

ii $7\frac{1}{2}$ km/h

2

Graph with y-axis labelled "Amount in tank (1000 litres)" from 0 to 11, and x-axis labelled "Time (minutes)" from 1 to 12. Line rises from (1, 0) to (3, 6), then to (7, 11), then falls to (11, 0).
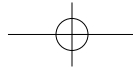
Trigonometry answers

Page 67

1 a 6.1 cm   *(1 mark for 15 ÷ tan 68)*

  b 10.6 cm   *(1 mark for AC = 16.7)*

2 a 14.5 cm   *(1 mark for 8 × cos 25)*

  b 65°

  c 13.5 cm   *(1 mark for 7.25 ÷ sin 32.5)*

Remember: Check which grade you are working at.

10
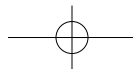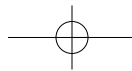
3-D trigonometry answers

Page 68

1 26.3°   *(1 mark for $\tan^{-1} (8 \div 16.15)$)*

2 31.4°   *(1 mark for $\tan^{-1} (6.9 \div 11.3)$)*

Remember: Check which grade you are working at.
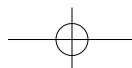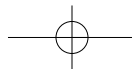
Trigonometric ratios of angles from 0° to 360° answers

Page 69

1 a   216.9° and 323.1°

  b   188.6° and 351.4°

2 a   41.4° and 318.6°

  b   104.5° and 255.5°
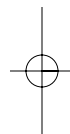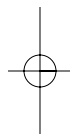
Remember: Check which grade you are working at.
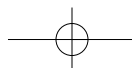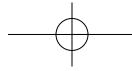
Sine rule answers

Page 70

1 51.5°   *(1 mark for sin⁻¹ 0.7825)*

2 a   17cm   *(1 mark for 15 × sin 68 ÷ sin 55)*

   b   127.4°   *(1 mark for 52.6°)*

Remember: Check which grade you are working at.
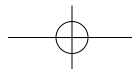
Cosine rule answers

Page 71

1 81.2°   *(1 mark for $\cos^{-1} 0.153$)*

2 a 26.4 cm   *(1 mark for $x^2 = 697.6$)*

b 106.2°   *(1 mark for $\cos^{-1} -0.279$)*

Remember: Check which grade you are working at.
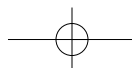
Solving triangles answers

Page 72

1 a 11.7 cm *(1 mark for x^2 = 136.8°)*

  b 58.7° *(1 mark for $\sin^{-1}$ 0.8545)*

2 a 23.1 cm^2 *(1 mark for 0.5 × 8 × 9 × sin 40)*

  b 26.9 cm^2 *(1 mark for angle R = 34.1°)*

Remember: Check which grade you are working at.
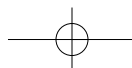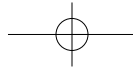
Linear graphs answers

Page 73

1
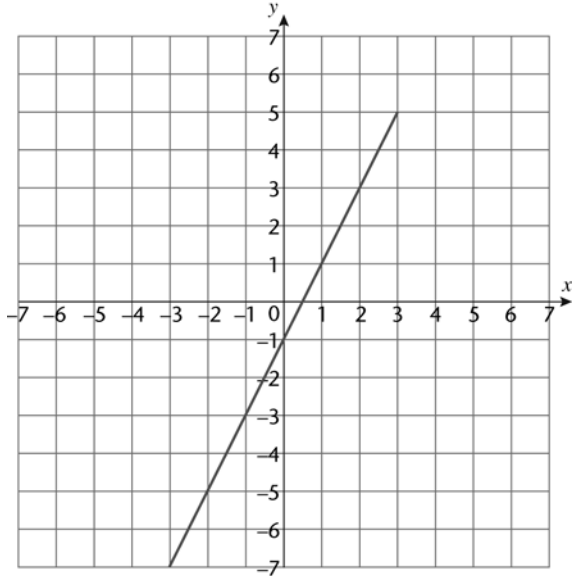
2 a Line A: 3; line B: $\frac{1}{2}$; line C: $-\frac{5}{3}$

b
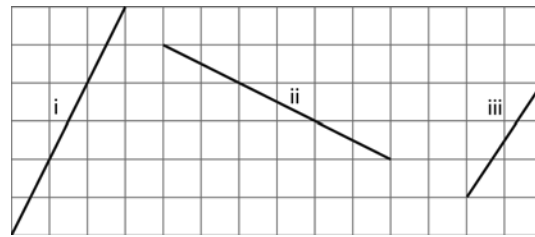
Page 74

1 a D

  b C

  c D and E

  d *Graph intercepting y-axis at –2 (1 mark);* *gradient 3 (1 mark)*
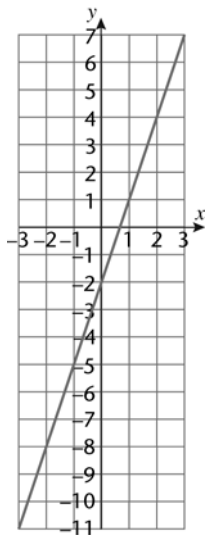
2 a Graph from (2, 0) to (0, –5)

  b Graph from (3, 0) to (0, –2)
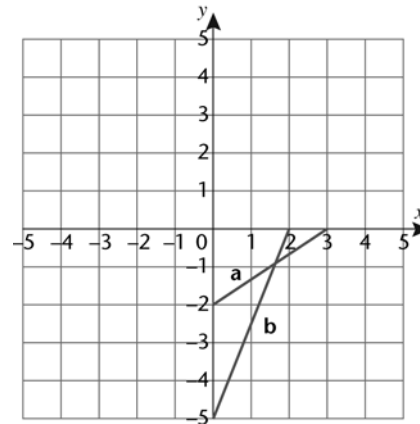
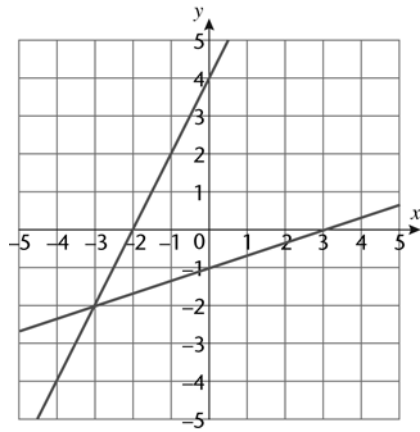**Remember:** Check which grade you are working at.
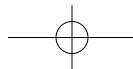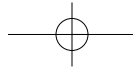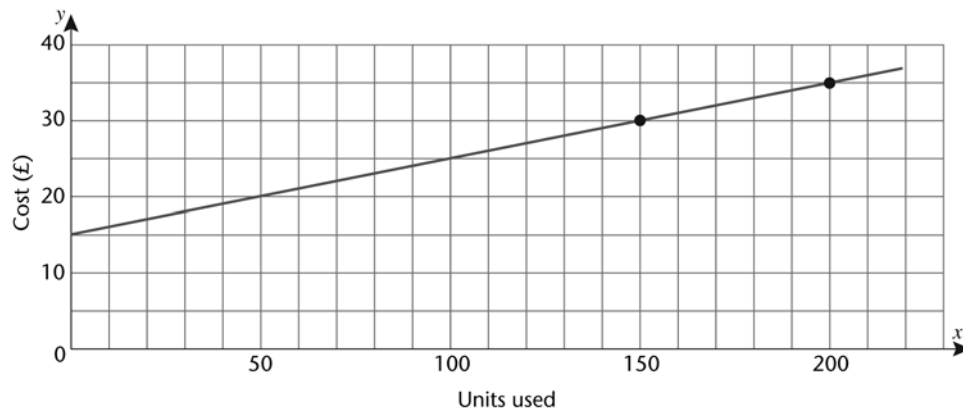
Equations of lines answers
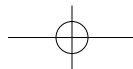
Page 75

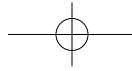**1 a** $y = \frac{1}{3}x - 1$

b

c $(-3, -2)$

2 a, b

c $C = 15 + \frac{1}{10}n$

Remember: Check which grade you are working at.

Linear graphs and equations answers
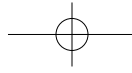
Page 76

1 a, b
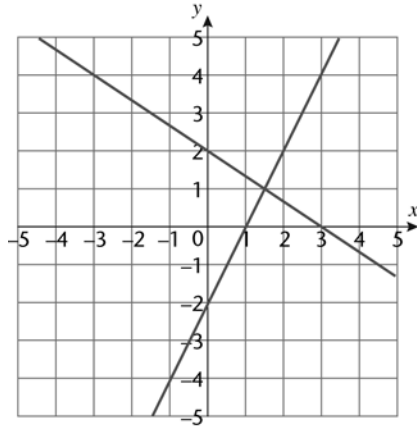
  c $(1\frac{1}{2}, 1)$

2 a $(\frac{1}{2}, -\frac{1}{2})$

  b $\frac{1}{3}$

  c $y = -3x + 1$

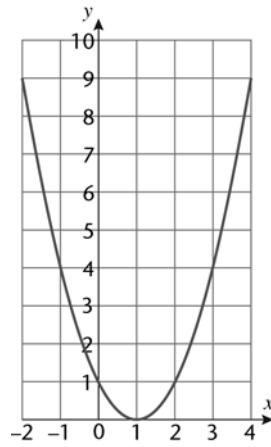**Remember:** Check which grade you are working at.

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Quadratic graphs answers

Page 77

1 a 0, 1, 4, 9

b

c −1.45, 3.45

d 1

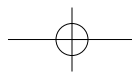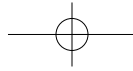**2 a** 7, −2, −1, 2

b
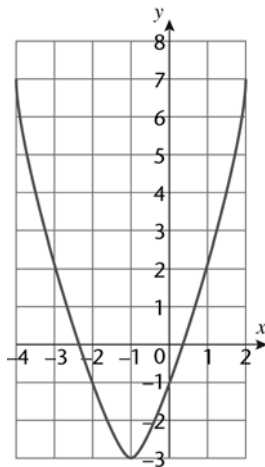
c −2.9, 0.9

d −2.4, 0.4

Remember: Check which grade you are working at.
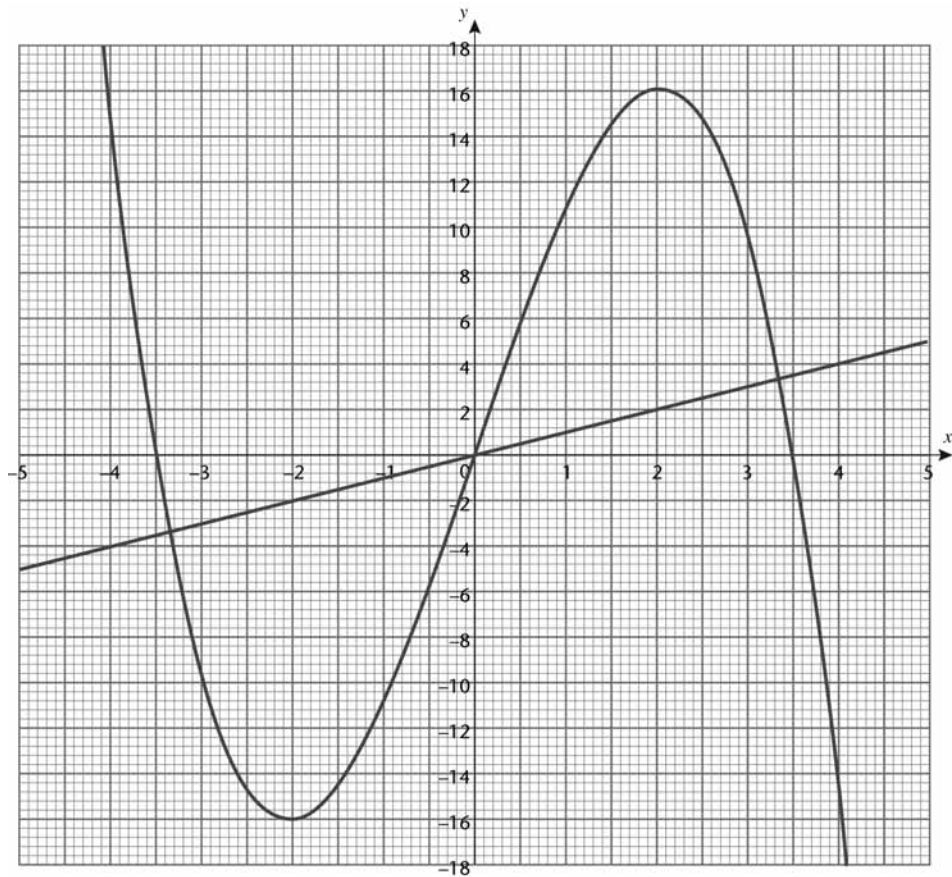
Non-linear graphs answers

Page 78

1 a   −2 and 3

   b   −3 and 4

   c   *Draw $y = x + 2$ (1 mark)*

       −2 and 4 (1 mark)

$y = x^2 - x - 6$
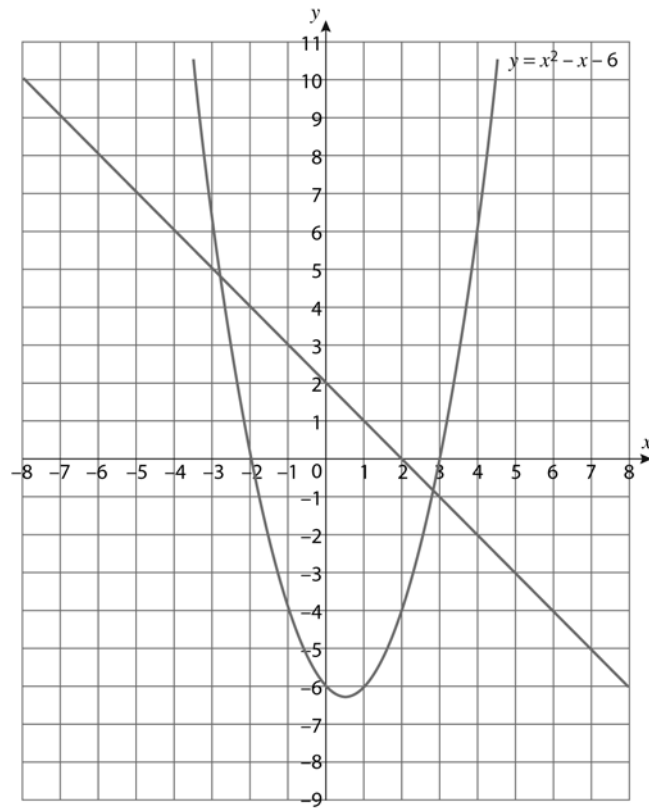
2 a   −3.5, 0, 3.5 *(1 mark)*

   b   *Draw $y = x$*

       −3.3, 0, 3.3 (1 mark)

Remember: Check which grade you are working at.
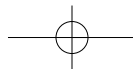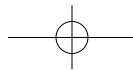
ALGEBRA

Other graphs answers

Page 79

1 a   0.125; 0.0625

b
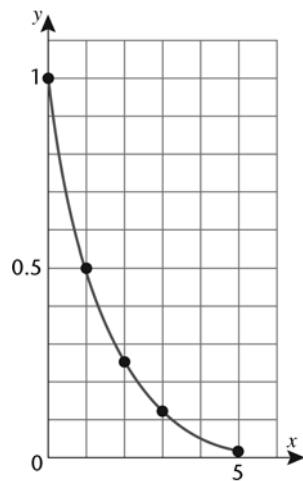
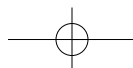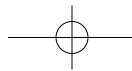

c   0.3

2 A (–4, 0)

B (–2, 0)

C (4, 0)

D (0, –32)

Remember: Check which grade you are working at.

Algebraic fractions answers

Page 80

1 a $\dfrac{12x + 7}{6}$ *(1 mark for numerator,
1 mark for denominator)*

b $\dfrac{-4x + 23}{10}$

c $\dfrac{8x^2 - 6x + 1}{6}$
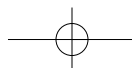
d $\dfrac{2x - 2}{3x - 1}$

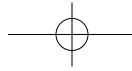**2 a** 1   *(1 mark for $\dfrac{2x + 3}{5} \times \dfrac{15}{6x + 9}$)*

b $\dfrac{2(x^2 - 3y^2)}{9}$ *(1 mark for $\dfrac{2x^2}{9} \times \dfrac{6y^2}{9}$)*

Remember: Check which grade you are working at.

Solving equations answers

Page 81

1 a $x = 3$ *(1 mark for 6x = 18)*

  b $x = 2$ *(1 mark for 11x = 22)*

  c $x = -\frac{1}{9}$ or *1 mark* for $(9x + 1)(x - 1) = 0$
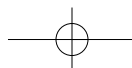
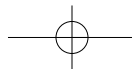**2 a** *1 mark* for $3(3x - 1) - 4(2x - 1)$
      $= (2x - 1)(3x - 1)$

      1 mark for $x + 1 = 6x^2 - 5x + 1$

  b $x = 0$ or 1

3 $x = \frac{1}{2}$ *(1 mark for $x^2 + x + 3x - 3 = x^2 - 1$)*

Remember: Check which grade you are working at.

Simultaneous equations 2 answers

Page 82

1 *1 mark* for $x^2 - x - 12 = 0$

1 mark for $(x - 4)(x + 3) = 0$

1 mark for (4, 0) or (–3, 7)

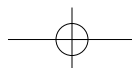**2 a** $y = \frac{3}{2}x + \frac{13}{2}$

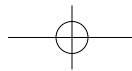**b** (4, 7) and (–1, –8)

(1 mark for $x^2 - 6x - 7 = 0$;
1 mark for $(x + 1)(x - 7) = 0$)

3 (–3, –1) and (3, 1)

(1 mark each; 1 mark for $11y^2 = 11$)

Remember: Check which grade you are working at.

The nth term answers

Page 83

1 a 5, 9, 13

  b 7th

  c Not odd

2 $7n - 4$ *(1 mark each term)*

3 a Always odd

  b Always even

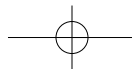 **c** Could be either

  d Always odd
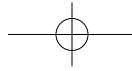
  e Always odd

4 a $2 \times$ anything is even

  b $2n \times 2n = 4n^2$ *(1 mark)* which is a multiple of 4 *(1 mark)*

Remember: Check which grade you are working at.

Formulae answers

Page 84

1 a 16, 21, 26

   b 101

   c $5n + 1$ *(1 mark each term)*
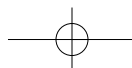
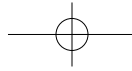**2** $x = \dfrac{2 + 4y}{y - 1}$ *(1 mark for $xy - x = 2 + 4y$)*

3 $6x + 2y = 4x + 12$ *(1 mark)*

   $2x = 12 - 2y$ *(1 mark)*

   $x = 6 - y$ *(1 mark)*

Remember: Check which grade you are working at.

ALGEBRA

Inequalities answers

Page 85

1 a $x \leqslant 2$

   b $x > -2$

   c −1, 0, 1, 2

2 a $-3 < x \leqslant 1$

   b i $\frac{x}{2} > -2$, $x > -4$

      ii $x + 3 \leqslant 2$ *(1 mark)*; $x \leqslant -1$

   c −3, −2, −1

3 a $x \geqslant 4\frac{1}{2}$ *(1 mark for $2x \leqslant 9$)*

   b $x < -1$ *(1 mark for $2x < -2$)*

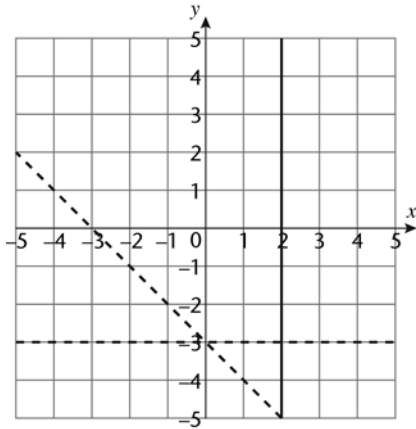**Remember:** Check which grade you are working at.
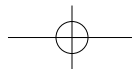
Graphical inequalities answers

ALGEBRA

Page 86

1 $x \geqslant -4$, $y \leqslant 3$ and $y \geqslant x$

2
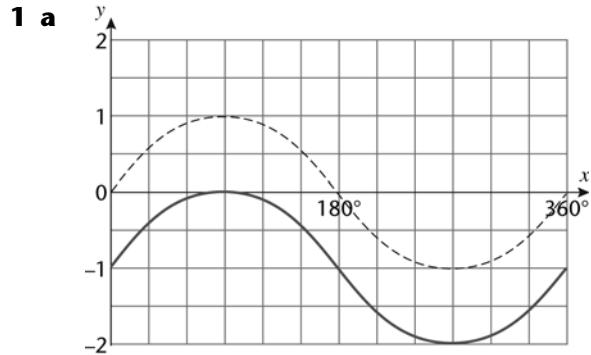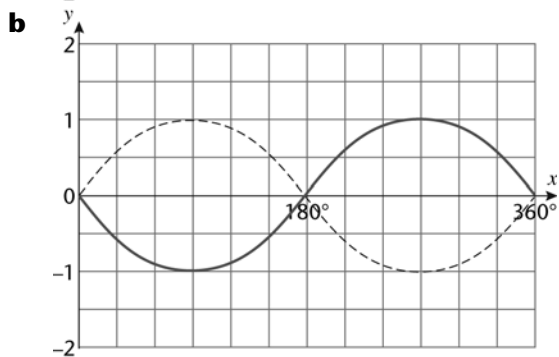

Remember: Check which grade you are working at.
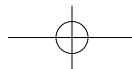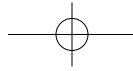
Graph transforms answers

Page 87

1 a

b

c

Page 88

1 a

b

c
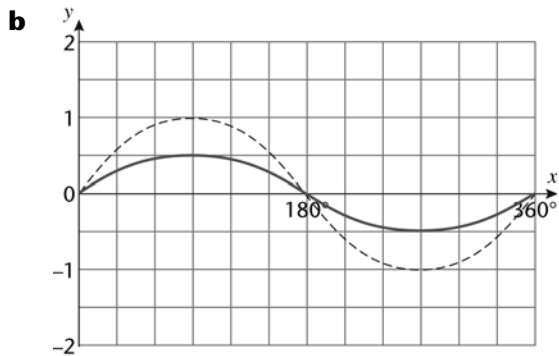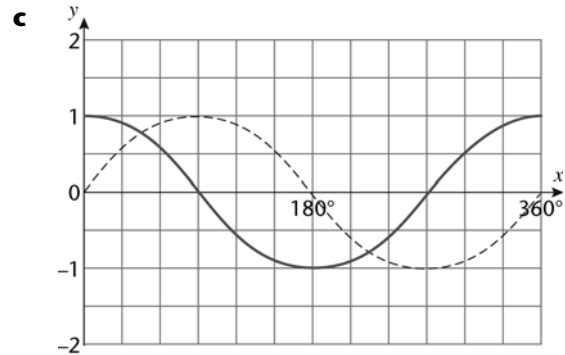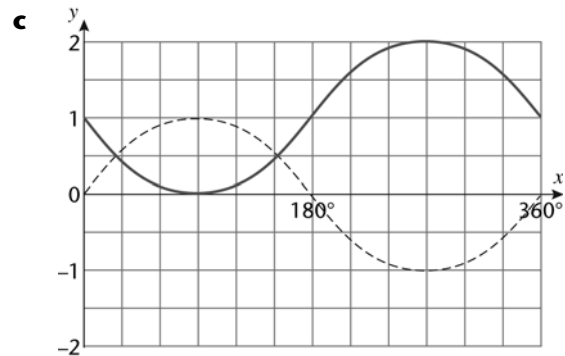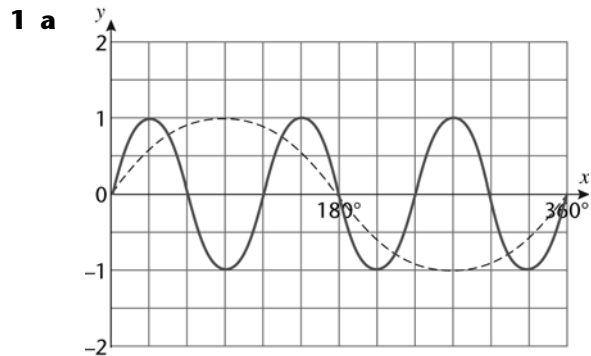
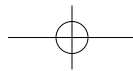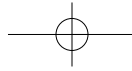**Remember:** Check which grade you are working at.

Proof answers

Page 89

1 $n^2 + 10n + 25 - (n^2 + 6n + 9)$ *(1 mark)*

$= 4n + 16$ *(1 mark)*

$= 4(n + 4)$ *(1 mark)*

2 *There are many ways to prove this but some angles will need to be found, 2 marks for 2 of these with reasons*

CDB = 75° (alternate segment)

CBD = 35° (alternates segment of angles in a triangle)

DAB = 110° (opposite angles in cyclic quad)

ADB = ABD = 35° (isosceles triangle)
(1 mark for a reason why AD parallel to BC, e.g. ADC + DCB = 180°; ADB = DBC (alternate angles))

3 $8 \times \frac{1}{2}n(n + 1) + 1 = 4n(n + 1) + 1$ *(1 mark)*

$= 4n^2 + 4n + 1$

$= (2n + 1)(2n + 1)$

$= (2n + 1)^2$ *(1 mark)*

Remember: Check which grade you are working at.