
MATHEMATICS PREPARATION WORKBOOK

ANSWERS

FP15 Finance

UNIVERSITY OF WARWICK

Contents

Expanding brackets and simplifying expressions	2
Surds and rationalising the denominator	3
Rules of indices	4
Factorising expressions	5
Completing the square	6
Solving quadratic equations by factorisation	7
Solving quadratic equations by completing the square	8
Solving quadratic equations by using the formula	9
Sketching quadratic graphs	10
Solving linear simultaneous equations using the elimination method	12
Solving linear simultaneous equations using the substitution method	13
Solving linear and quadratic simultaneous equations	14
Solving simultaneous equations graphically	15
Linear inequalities	16
Quadratic inequalities	17
Straight line graphs	18

Expanding brackets and simplifying expressions

Answers

1 a $6x - 3$

b $-10pq - 8q^2$

2 a $21x + 35 + 12x - 48 = 33x - 13$

b $40p - 16 - 12p - 27 = 28p - 43$

3 a $12x^2 + 24x$

b $20k^3 - 48k$

4 a $-y^2 - 4$

b $5x^2 - 11x$

5 a $-1 - 2m$

b $5p^3 + 12p^2 + 27p$

6 $7x(3x - 5) = 21x^2 - 35x$

7 a $x^2 + 9x + 20$

b $x^2 + 10x + 21$

c $x^2 + 5x - 14$

d $x^2 - 25$

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

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

g $4x^2 - 28x + 49$

h $16x^2 - 24xy + 9y^2$

8 a $x^2 - 1 - \frac{2}{x^2}$

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

Surds and rationalising the denominator

Answers

- 1 a $3\sqrt{5}$ b $5\sqrt{5}$
c $4\sqrt{3}$ d $5\sqrt{7}$
- 2 a $15\sqrt{2}$ b $\sqrt{5}$
c $3\sqrt{2}$ d $\sqrt{3}$
- 3 a -1 b $9-\sqrt{3}$
c $10\sqrt{5}-7$ d $26-4\sqrt{2}$
- 4 a $\frac{2\sqrt{7}}{7}$ b $\frac{\sqrt{2}}{2}$
c $\frac{\sqrt{3}}{3}$ d $\frac{1}{3}$
- 5 a $\frac{3+\sqrt{5}}{4}$ b $\frac{2(4-\sqrt{3})}{13}$
- 6 $x-y$
- 7 a $3+2\sqrt{2}$ b $\frac{\sqrt{x}+\sqrt{y}}{x-y}$

Rules of indices

Answers

1 a 1 b 1

2 a 7 b 4

3 a 125 b 32

4 a $\frac{1}{25}$ b $\frac{1}{64}$

5 a $\frac{3x^3}{2}$ b $5x^2$
c $2x^6$ d x

6 a $\frac{1}{2}$ b $\frac{1}{9}$ c $\frac{8}{3}$

7 a x^{-1} b x^{-7} c $x^{\frac{1}{4}}$

8 a $\sqrt[5]{x^2}$ b $\frac{1}{\sqrt{x}}$ c $\frac{1}{\sqrt[4]{x^3}}$

9 a $5x^{\frac{1}{2}}$ b $2x^{-3}$ c $\frac{1}{3}x^{-4}$

10 a $x^3 + x^{-2}$ b $x^3 + x$ c $x^{-2} + x^{-7}$

Factorising expressions

Answers

- 1 **a** $2x^3y^3(3x - 5y)$ **b** $7a^3b^2(3b^3 + 5a^2)$
 c $5x^2y^2(5 - 2x + 3y)$
- 2 **a** $(x + 3)(x + 4)$ **b** $(x + 7)(x - 2)$
 c $(x - 5)(x - 6)$ **d** $(x - 8)(x + 3)$
- 3 **a** $(6x - 7y)(6x + 7y)$ **b** $(2x - 9y)(2x + 9y)$
 c $2(3a - 10bc)(3a + 10bc)$
- 4 **a** $(x - 1)(2x + 3)$ **b** $(3x + 1)(2x + 5)$
 c $(2x + 1)(x + 3)$ **d** $(3x - 1)(3x - 4)$
- 5 **a** $\frac{2(x+2)}{x-1}$ **b** $\frac{x}{x-1}$
 c $\frac{x+2}{x}$ **d** $\frac{x}{x+5}$
- 6 **a** $\frac{3x+4}{x+7}$ **b** $\frac{2x+3}{3x-2}$
 c $\frac{2-5x}{2x-3}$ **d** $\frac{3x+1}{x+4}$
- 7 $\frac{4(x+2)}{x-2}$

Completing the square

Answers

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

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

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

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

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

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

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

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

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

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

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

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

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

Solving quadratic equations by factorisation

Answers

1 a $x = 0$ or $x = -\frac{2}{3}$

c $x = -5$ or $x = -2$

e $x = -1$ or $x = 4$

b $x = 0$ or $x = \frac{3}{4}$

d $x = 2$ or $x = 3$

f $x = -5$ or $x = 2$

2 a $x = -2$ or $x = 5$

c $x = -3$ or $x = 2\frac{1}{2}$

b $x = -1$ or $x = 3$

d $x = -\frac{1}{3}$ or $x = 2$

Solving quadratic equations by completing the square

1 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 $x = 1 - \sqrt{7}$

2 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 $x = \frac{5 - \sqrt{13}}{2}$

Solving quadratic equations by using the formula

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

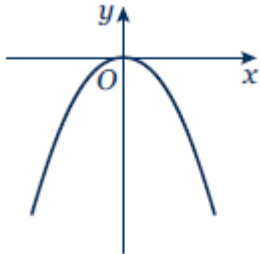
2 $x = \frac{7 + \sqrt{41}}{2}$ or $x = \frac{7 - \sqrt{41}}{2}$

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

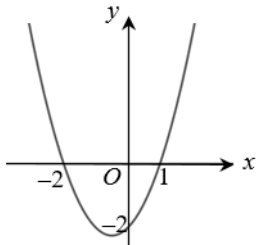
Sketching quadratic graphs

Answers

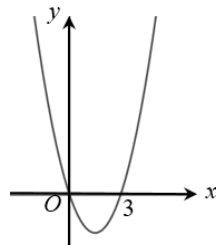
1



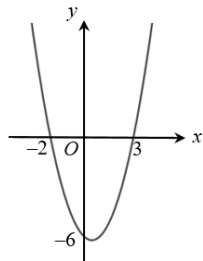
2 a



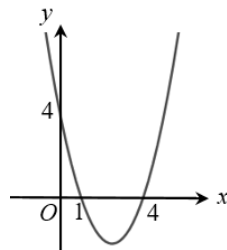
b



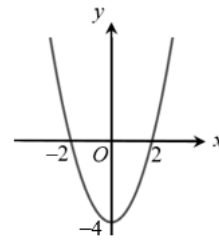
3 a



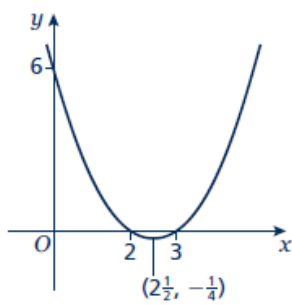
b



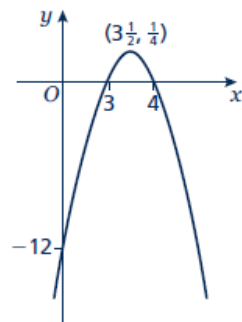
c



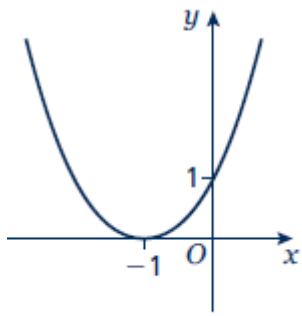
4 a



b



5



Line of symmetry at $x = -1$.

Solving linear simultaneous equations using the elimination method

Answers

1 $x = 1, y = 4$

2 $x = 3, y = -2$

3 $x = 2, y = -5$

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

Solving linear simultaneous equations using the substitution method

1 $x = 9, y = 5$

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

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

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

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

Solving linear and quadratic simultaneous equations

Answers

1 $x = 1, y = 3$

$$x = -\frac{9}{5}, y = -\frac{13}{5}$$

2 $x = 2, y = 4$

$$x = 4, y = 2$$

3 $x = 3, y = 4$

$$x = 2, y = 1$$

4 $x = 7, y = 2$

$$x = -1, y = -6$$

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

$$x = 2, y = 4$$

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

$$x = 3, y = 5$$

Solving simultaneous equations graphically

Answers

- 1** **a** $x = 2, y = 5$
 b $x = 2, y = -3$
- 2** **a** $x = -2, y = 2$
 b $x = 0.5, y = 0.5$
- 3** **a** $x = 1, y = 0$ and $x = 4, y = 3$
 b $x = -2, y = 7$ and $x = 2, y = -5$
- 4** $x = -3, y = 4$ and $x = 4, y = -3$

Linear inequalities

Answers

1 **a** $x > 4$ **b** $x \leq 2$ **c** $x \leq -1$

2 **a** $x < -20$ **b** $x \leq 3.5$ **c** $x < 4$

3 **a** $x \leq -4$ **b** $-1 \leq x < 5$ **c** $x \leq 1$

4 **a** $t < \frac{5}{2}$ **b** $n \geq \frac{7}{5}$

5 $x > 5$ (which also satisfies $x > 3$)

Quadratic inequalities

Answers

1 $-7 \leq x \leq 4$

2 $\frac{1}{2} < x < 3$

3 $-3 \leq x \leq 4$

4 $2 < x < 2\frac{1}{2}$

5 $x \leq -\frac{3}{2}$ or $x \geq \frac{5}{3}$

Straight line graphs

Answers

1 a $m = 3, c = 5$

b $m = -\frac{1}{2}, c = -7$

c $m = 2, c = -\frac{3}{2}$

d $m = -1, c = 5$

2 a $x + 2y + 14 = 0$

b $2x - y = 0$

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

4 a $y = 2x - 3$

b $y = -\frac{1}{2}x + 6$