UNIT 1: Equations already in factorised form

QUESTION 1   Solve the following quadratic equations that are already expressed in factorised form.

a $(x-1)(x-2) = 0$

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

c $(x-1)(x-3) = 0$

d $x(x+5) = 0$

e $2x(x-4) = 0$

f $x(2x-1) = 0$

g $(x-3)(x-5) = 0$

h $(x+1)(x-3) = 0$

i $(x+2)(x-4) = 0$

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

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

l $(x-5)(x+5) = 0$

m $(x+6)(2x-1) = 0$

n $(x+3)(3x-1) = 0$

o $(x-2)(3x-1) = 0$

QUESTION 2   Solve the following quadratic equations.

a $(x-3)(x-7) = 0$

b $(x+1)(x-6) = 0$

c $(3x-2)(x+1) = 0$

d $x(x+8) = 0$

e $5x(2x-1) = 0$

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

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

h $4x(2x-5) = 0$

i $-2x(x-1) = 0$

j $(3x+1)x = 0$

k $(x-3)^2 = 0$

l $3x(x-3) = 0$

QUESTION 3   Solve the following equations.

a $(x-4)(x-5) = 0$

b $(x-8)(x+8) = 0$

c $x(x-3) = 0$

d $(2x-1)(x+4) = 0$

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

f $2x(x-2) = 0$

g $(x-7)(x-9) = 0$

h $(4x+5)(5x-4) = 0$

i $(x+1)(x-5) = 0$

Quadratic equations

UNIT 2: Equations involving the difference between two squares

QUESTION **1**   Solve the following quadratic equations.

a $x^2 - 4 = 0$

b $x^2 - 36 = 0$

c $x^2 - 9 = 0$

d $x^2 - 1 = 0$

e $x^2 - 49 = 0$

f $x^2 - 16 = 0$

g $x^2 - 25 = 0$

h $x^2 - 64 = 0$

i $x^2 - 81 = 0$

j $x^2 - 100 = 0$

k $x^2 - 121 = 0$

l $x^2 - 144 = 0$

QUESTION **2**   Solve the following equations.

a $4x^2 - 25 = 0$

b $9x^2 - 16 = 0$

c $16x^2 - 25 = 0$

d $x^2 - 2\frac{1}{4} = 0$

e $9x^2 - 1 = 0$

f $3x^2 - 3 = 0$

g $9 - x^2 = 0$

h $2x^2 - 18 = 0$

i $4x^2 - 9 = 0$

j $25x^2 - 36 = 0$

k $5x^2 - 20 = 0$

l $(x + 5)^2 - 4 = 0$

m $x^2 - 2 = 0$

n $x^2 - 7 = 0$

o $x^2 - 5 = 0$

Quadratic equations

UNIT 3: Equations involving a common factor

QUESTION **1**   Solve the following quadratic equations.

a $x^2 - 5x = 0$

b $x^2 - 4x = 0$

c $x^2 - 2x = 0$

d $x^2 + 7x = 0$

e $x^2 + 5x = 0$

f $x^2 + 9x = 0$

g $x^2 = 4x$

h $x^2 = 9x$

i $x^2 = 12x$

j $6x^2 - 12x = 0$

k $x^2 + 8x = 0$

l $x^2 - 10x = 0$

m $3x^2 + 21x = 0$

n $5x^2 - x = 0$

o $4x^2 = -12x$

QUESTION **2**   Solve the following equations.

a $6x^2 - 24x = 0$

b $5x^2 + 25x = 0$

c $5x^2 - 3x = 0$

d $8x^2 - 16x = 0$

e $3x^2 - 3x = 0$

f $6x^2 - 6x = 0$

g $6x^2 + 2x = 0$

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

i $9x^2 - 9x = 0$

j $7x^2 - 21x = 0$

k $9x^2 - 27x = 0$

l $8x^2 - 4x = 0$

Quadratic equations

UNIT 4: Factorising a quadratic trinomial

QUESTION 1   Solve the following quadratic equations by factorising.

a $x^2 + 5x + 6 = 0$

b $x^2 - 2x - 35 = 0$

c $x^2 + 5x - 6 = 0$

d $x^2 + 7x + 12 = 0$

e $x^2 - 5x + 6 = 0$

f $x^2 + 2x - 48 = 0$

g $x^2 - 8x + 16 = 0$

h $x^2 + 2x - 15 = 0$

i $x^2 = 3x + 18$

j $x^2 + 40 = 13x$

k $x^2 + 5x = 36$

l $x^2 = 15x - 54$

QUESTION 2   Factorise and solve the following quadratic equations.

a $2x^2 + 11x + 12 = 0$

b $3x^2 - 8x + 4 = 0$

c $6x^2 + 5x - 6 = 0$

d $2x^2 + x - 15 = 0$

e $6x^2 + 5x - 6 = 0$

f $2x^2 + 5x - 42 = 0$

g $6x^2 + x - 1 = 0$

h $4x^2 + 8x - 5 = 0$

i $x(2x + 7) = -6$

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

k $6x^2 = 20 - 7x$

l $(x + 3)^2 = 7x + 11$

Quadratic equations

UNIT 5: Completing the square

QUESTION **1**   What number must be added to make each of the following a perfect square?

a $x^2 + 6x$ _____

b $x^2 - 10x$ _____

c $x^2 + 9x$ _____

d $x^2 + 8x$ _____

e $x^2 + 5x$ _____

f $x^2 + 14x$ _____

g $x^2 - 12x$ _____

h $x^2 - 14x$ _____

i $x^2 - 18x$ _____

j $x^2 - 7x$ _____

k $x^2 - 3x$ _____

l $x^2 + 11x$ _____

m $x^2 - 6x + ...^2 = (x - ...)^2$

n $x^2 + 4x + ...^2 = (x + ...)^2$

o $x^2 - 2x + ...^2 = (x - ...)^2$

p $x^2 + 10x + ...^2 = (x + ...)^2$

q $x^2 + 3x + ...^2 = (x + ...)^2$

r $x^2 - 7x + ...^2 = (x - ...)^2$

QUESTION **2**   Solve the following quadratic equations by completing the square.

a $x^2 + 5x + 4 = 0$

b $x^2 + 6x + 4 = 0$

c $x^2 - 8x + 1 = 0$

d $x^2 + 9x = 4$

e $x^2 + 7x + 6 = 0$

f $x^2 = 8x + 9$

g $x^2 = 5x + 6$

h $x^2 + 10x = 5$

i $x^2 + 3x = 4$

j $x^2 + 4x = -4$

k $x^2 + 12x - 8 = 0$

l $x^2 - 10x = 3$

Quadratic equations

UNIT 6: The quadratic formula

QUESTION **1**   Solve the following equations using the quadratic formula. Leave your answer in surd form.

a $x^2 + 4x + 3 = 0$

b $2x^2 + 7x + 3 = 0$

c $2x^2 + 7x - 4 = 0$

d $10x^2 + 7x - 12 = 0$

e $x^2 - x - 1 = 0$

f $3x^2 + 8x + 5 = 0$

g $2x^2 - 8x - 3 = 0$

h $5x^2 - 9x - 1 = 0$

i $8x^2 + 5x - 2 = 0$

j $3x^2 + 10x - 5 = 0$

k $x(x + 6) = 35$

l $(x - 8)^2 = 15$

QUESTION **2**   Use the quadratic formula to solve. Give your answer correct to two decimal places.

a $2x^2 - 3x - 2 = 0$

b $x^2 - 3x + 1 = 0$

c $x^2 + 6x + 9 = 0$

d $x^2 + 6x + 2 = 0$

e $x^2 + 4x = -4$

f $x^2 - 5x = -7$

g $x^2 - 3x + 2 = 4x + 5$

h $x = \dfrac{3x + 7}{x}$

i $x(x - 7) = 5$

Quadratic equations

UNIT 7: Mixed quadratic equations

QUESTION **1**   Solve the following quadratic equations by any suitable method. Give your answer correct to one decimal place.

a $x^2 + 13x + 42 = 0$

b $6x^2 - 5x - 1 = 0$

c $4x^2 + 11x + 6 = 0$

d $2x^2 - 9x - 5 = 0$

e $24x^2 - 13x - 7 = 0$

f $2x^2 - 11x - 63 = 0$

g $3x^2 = 5 - 2x$

h $x^2 + 7x + 8 = 0$

i $x^2 + 3x = -2$

j $3x^2 - 11x + 8 = 0$

k $x^2 - 7x = 3$

l $x^2 + 10x - 75 = 0$

QUESTION **2**   Solve the following quadratic equations. Give your answer correct to two decimal places.

a $(2x + 5)^2 = (x + 1)(x + 2)$

b $\dfrac{2}{x} + 3x = 5$

c $x = \dfrac{8}{8 + x}$

d $7x^2 + 9x - 3 = 0$

e $x^2 - 7x - 2 = 0$

f $10x^2 + 29x + 21 = 0$

g $4x^2 + 21x - 49 = 0$

h $2x^2 + x - 3 = 0$

i $8x^2 - 9x - 4 = 0$

Quadratic equations

UNIT 8: Using quadratic equations to solve problems

QUESTION 1   In each of the following diagrams, find x. All measurements are in centimetres.

a

$(x + 1)$

$(x + 3)$
Area = 24 cm²

b

x

$x + 8$
Area = 9 cm²
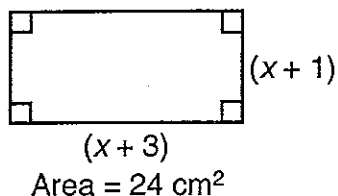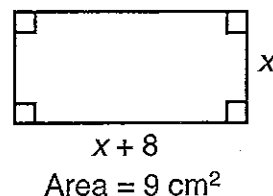
QUESTION 2

a   Find the number which when added to its square gives twelve.

b   The area of a rectangle is 15 cm² and its length is 2 cm longer than its width. Find the dimensions of the rectangle.

QUESTION 3

a   When a number is subtracted from its square, the result is 30. Find the number.

b   The square of a number is equal to nine times the number. What is the number?

c   The sum of the squares of two consecutive positive integers is 25. Find the integers.

Quadratic equations

UNIT 9: Simultaneous equations resulting in a quadratic

QUESTION 1   Solve the following simultaneous equations.

a $x + y = 3$

   $xy = 2$ _____

   _____

   _____

b $x + y = 5$

   $xy = 4$ _____

   _____

   _____

c $y = x^2 + 3x + 7$

   $y = x + 10$ _____

   _____

   _____

d $y = x^2 + 15x + 12$

   $y = x - 1$ _____

   _____

   _____

QUESTION 2   Solve the following simultaneous equations.

a $x + y = 7$

   $x^2 + y^2 = 85$ _____

   _____

   _____

b $x + y = 4$

   $x^2 + y^2 = 10$ _____

   _____

   _____

c $y = x$

   $y = x^2$ _____

   _____

   _____

d $y = x + 3$

   $y = x^2 - x$ _____

   _____

   _____

QUESTION 3   Solve simultaneously.

a $3x + y = 9$

   $y = x^2 - x - 6$ _____

   _____

   _____

b $2x + y = 8$

   $y = 6 - x^2 + x$ _____

   _____

   _____

c $y = 2x$

   $y = x^2$ _____

   _____

   _____

d $y = 2x - 1$

   $y = x^2$ _____

   _____

   _____

Quadratic equations

Instructions for SECTION 1
- You have 15 minutes to answer Section 1
- Each question is worth 2 marks
- Attempt ALL questions
- Calculators are NOT to be used
- Fill in only ONE CIRCLE for each question

Marks

1 If $(x+2)(x-3) = 0$ then the value of x is

Ⓐ 2 or –3　　　Ⓑ –2 or –3　　　Ⓒ 2 or 3　　　Ⓓ –2 or 3

2

2 If $x(x-2) = 0$ then the value of x is

Ⓐ 2　　　Ⓑ –2　　　Ⓒ 0 or 2　　　Ⓓ 0 or –2

2

3 If $x^2 - 9 = 0$ then the value of x is

Ⓐ 0　　　Ⓑ 3　　　Ⓒ ±3　　　Ⓓ 9

2

4 If $3x^2 - 48 = 0$ then the value of x is

Ⓐ 16　　　Ⓑ ±4　　　Ⓒ 4　　　Ⓓ 0

2

5 If $(x-5)(4x-3) = 0$ then the value of x is

Ⓐ $5 \text{ or } -\dfrac{3}{4}$　　　Ⓑ $-5 \text{ or } \dfrac{3}{4}$　　　Ⓒ $5 \text{ or } \dfrac{3}{4}$　　　Ⓓ $-5 \text{ or } -\dfrac{3}{4}$

2

6 If $x^2 - x - 5 = 0$ then the value of x is

Ⓐ $\dfrac{1 \pm \sqrt{21}}{2}$　　　Ⓑ $\dfrac{-1 \pm \sqrt{21}}{2}$　　　Ⓒ $\dfrac{1 \pm \sqrt{19}}{2}$　　　Ⓓ $\dfrac{-1 \pm \sqrt{19}}{2}$

2

7 Which is a factor of $2x^2 - x - 3$?

Ⓐ $2x - 3$　　　Ⓑ $2x - 1$　　　Ⓒ $2x + 1$　　　Ⓓ $2x + 3$

2

8 If $4y^2 - 12y + P = (2y + Q)^2$ then

Ⓐ $P = 9, Q = -3$　　Ⓑ $P = -9, Q = -3$　　Ⓒ $P = 9, Q = 3$　　Ⓓ $P = -9, Q = 3$

2

9 Which one of the following is a perfect square for all values of x?

Ⓐ $x^2 + 49$　　　Ⓑ $x^2 - 49$　　　Ⓒ $x^2 - 14x + 49$　　Ⓓ $x^2 + 7x + 49$

2

10 $(x-2)(x-3) = 0$ is the same as

Ⓐ $x^2 + 6$　　　Ⓑ $x^2 + 5x - 6$　　　Ⓒ $x^2 - 5x + 6$　　　Ⓓ $x^2 - 5x - 6$

2

Total marks achieved for SECTION 1

/ 20

Quadratic equations

Instructions for SECTION 2
- You have 20 minutes to answer ALL of Section 2
- Each question is worth 2 marks
- Attempt ALL questions
- Calculators may be used

Questions	Answers	Marks

Solve the following quadratic equations.

1 $3x(x-5)=0$ — — 2

2 $(x-4)(x-7)=0$ — — 2

3 $(2x-1)^2=0$ — — 2

4 $(3x+5)(x-2)=0$ — — 2

5 $x^2-16=0$ — — 2

6 $7x^2-28=0$ — — 2

7 $x^2-15x=0$ — — 2

8 $2x^2+9x-5=0$ — — 2

9 $x^2-12x+27=0$ — — 2

10   What must be added to x^2-6x to make it a perfect square? — — 2

11   Solve $x^2+4x-12=0$ by completing the square. — — 2

Solve the following equations using the quadratic formula.

12 $x^2-2x-5=0$ — — 2

13 $2x^2+7x-8=0$ — — 2

14   Find the number which when added to its square gives 30. — — 2

15   Solve this pair of simultaneous equations: $x^2+y^2=10$
$x+y=4$ — — 2

Total marks achieved for SECTION 2   / 3

Answers

PAGE 1

1. a $x=1$ or 2 b $x=2$ or -3 c $x=1$ or 3 d $x=0$ or -5 e $x=0$ or 4 f $x=0$ or $\frac{1}{2}$ g $x=3$ or 5 h $x=-1$ or 3 i $x=-2$ or 4
j $x=-3$ or 3 k $x=-2$ or 2 l $x=-5$ or 5 m $x=-6$ or $\frac{1}{2}$ n $x=-3$ or $\frac{1}{3}$ o $x=2$ or $\frac{1}{3}$ 2. a $x=3$ or 7 b $x=-1$ or 6 c $x=-1$ or $\frac{2}{3}$
d $x=0$ or -8 e $x=0$ or $\frac{1}{2}$ f $x=0$ or 2 g $x=-3$ or -2 h $x=0$ or $2\frac{1}{2}$ i $x=0$ or 1 j $x=0$ or $-\frac{1}{3}$ k $x=3$ l $x=0$ or 3
3. a $x=4$ or 5 b $x=8$ or -8 c $x=0$ or 3 d $x=-4$ or $\frac{1}{2}$ e $x=-1\frac{1}{2}$ or $1\frac{1}{2}$ f $x=0$ or 2 g $x=7$ or 9 h $x=-\frac{5}{4}$ or $\frac{4}{5}$ i $x=-1$ or 5

PAGE 2

1. a $x=2$ or -2 b $x=6$ or -6 c $x=3$ or -3 d $x=1$ or -1 e $x=7$ or -7 f $x=4$ or -4 g $x=5$ or -5 h $x=8$ or -8
i $x=9$ or -9 j $x=10$ or -10 k $x=11$ or -11 l $x=12$ or -12 2. a $x=2\frac{1}{2}$ or $-2\frac{1}{2}$ b $x=\frac{4}{3}$ or $-\frac{4}{3}$ c $x=\frac{5}{4}$ or $-\frac{5}{4}$ d $x=\frac{3}{2}$ or $-\frac{3}{2}$
e $x=\frac{1}{3}$ or $-\frac{1}{3}$ f $x=1$ or -1 g $x=3$ or -3 h $x=3$ or -3 i $x=\frac{3}{2}$ or $-\frac{3}{2}$ j $x=\frac{6}{5}$ or $-\frac{6}{5}$ k $x=2$ or -2 l $x=-3$ or -7
m $x=\sqrt{2}$ or $-\sqrt{2}$ n $x=\sqrt{7}$ or $-\sqrt{7}$ o $x=\sqrt{5}$ or $-\sqrt{5}$

PAGE 3

1. a $x=0$ or 5 b $x=0$ or 4 c $x=0$ or 2 d $x=0$ or -7 e $x=0$ or -5 f $x=0$ or -9 g $x=0$ or 4 h $x=0$ or 9 i $x=0$ or 12
j $x=0$ or 2 k $x=0$ or -8 l $x=0$ or 10 m $x=0$ or -7 n $x=0$ or $\frac{1}{5}$ o $x=0$ or -3 2. a $x=0$ or 4 b $x=0$ or -5 c $x=0$ or $\frac{3}{5}$
d $x=0$ or 2 e $x=0$ or 1 f $x=0$ or 1 g $x=0$ or $-\frac{1}{3}$ h $x=0$ or $\frac{7}{3}$ i $x=0$ or 1 j $x=0$ or 3 k $x=0$ or 3 l $x=0$ or $\frac{1}{2}$

PAGE 4

1. a $x=-3$ or -2 b $x=7$ or -5 c $x=-6$ or $+1$ d $x=-3$ or -4 e $x=2$ or 3 f $x=-8$ or 6 g $x=4$ h $x=3$ or -5 i $x=6$ or -3
j $x=5$ or 8 k $x=-9$ or 4 l $x=6$ or 9 2. a $x=-4$ or $\frac{-3}{2}$ b $x=2$ or $\frac{2}{3}$ c $x=\frac{2}{3}$ or $-\frac{3}{2}$ d $x=-3$ or $\frac{5}{2}$ e $x=\frac{2}{3}$ or $\frac{-3}{2}$ f $x=-6$ or $\frac{7}{2}$
g $x=-\frac{1}{2}$ or $\frac{1}{3}$ h $x=\frac{1}{2}$ or $-\frac{5}{2}$ i $x=-2$ or $-\frac{3}{2}$ j $x=-\frac{3}{2}$ or 3 k $x=\frac{4}{3}$ or $-\frac{5}{2}$ l $x=-1$ or 2

PAGE 5

1. a 9 b 25 c $\frac{81}{16}$ d 16 e $6\frac{1}{4}$ f 49 g 36 h 49 i 81 j $12\frac{1}{4}$ k $2\frac{1}{4}$ l $30\frac{1}{4}$ m 3 n 2 o 1 p 5 q $\frac{3}{2}$ r $\frac{7}{2}$
2. a $x=-1$ or -4 b $x=-3\pm\sqrt{5}$ c $x=4\pm\sqrt{15}$ d $x=\frac{-9\pm\sqrt{97}}{2}$ e $x=-1$ or -6 f $x=-1$ or 9 g $x=-1$ or 6 h $x=-5\pm\sqrt{30}$
i $x=-4$ or 1 j $x=-2$ k $x=-6\pm2\sqrt{11}$ l $x=5\pm2\sqrt{7}$

PAGE 6

1. a $x=-1$ or -3 b $x=-3$ or $-\frac{1}{2}$ c $x=-4$ or $\frac{1}{2}$ d $x=\frac{4}{5}$ or $\frac{-3}{2}$ e $x=\frac{1\pm\sqrt{5}}{2}$ f $x=-1$ or $-\frac{5}{3}$ g $x=\frac{4\pm\sqrt{22}}{2}$ h $x=\frac{9\pm\sqrt{101}}{10}$
i $x=\frac{-5\pm\sqrt{89}}{16}$ j $x=\frac{-5\pm2\sqrt{10}}{3}$ k $x=-3\pm2\sqrt{11}$ l $x=8\pm\sqrt{15}$ 2. a $x=2$ or $-\frac{1}{2}$ b $x=2.62$ or 0.38 c $x=-3$ d $x=-0.35$ or -5.65
e $x=-2$ f $x=6.14$ or -1.14 g $x=7.41$ or 0.41 h $x=4.54$ or -1.54 i $x=7.65$ or -0.65

PAGE 7

1. a $x=-6$ or -7 b $x=1$ or $-\frac{1}{6}$ c $x=-2$ or $-\frac{3}{4}$ d $x=5$ or $-\frac{1}{2}$ e $x=-\frac{1}{3}$ or $\frac{7}{8}$ f $x=-3\frac{1}{2}$ or 9 g $x=1$ or $1\frac{2}{3}$
h ~~$x=-1$ or 8~~ $x=\frac{-7\pm\sqrt{17}}{2}$ i $x=-1$ or -2 j $x=1$ or $2\frac{2}{3}$ k $x=7.4$ or -0.4 l $x=5$ or -15 2. a $x=-2.23$ or -3.43 b $x=1$ or $\frac{2}{3}$ c $x=0.90$ or -8.90
d $x=0.27$ or -1.56 e $x=7.27$ or -0.27 f $x=1.40$ or -1.50 g $x=1.75$ or -7 h $x=1$ or $1\frac{1}{2}$ i $x=1.47$ or -0.34

PAGE 8

1. a $x=3$ b $x=1$ 2. a $x=-4$ or 3 b. $W=3$ cm and $L=5$ cm 3. a -5 or 6 b 9 c 3 and 4 c $x=1,y=11$ or $x=-3,y=7$ d $x=-1,y=-2$ or $x=-13,y=-14$

PAGE 9

1. a $x=1,y=2$ or $x=2,y=1$ b $x=1,y=4$ or $x=4,y=1$ c $x=0,y=0$ or $x=1,y=1$ d $x=-1,y=2$ or $x=3,y=6$
2. a $x=9,y=-2$ or $x=-2,y=9$ b $x=1,y=3$ or $x=3,y=1$ c $x=0,y=0$ or $x=2,y=4$ d $x=1,y=1$
3. a $x=-5,y=24$ or $x=3,y=0$ b $x=1,y=6$ or $x=2,y=4$ c $x=0,y=0$ or $x=2,y=4$ d $x=1,y=1$

PAGE 10

1 D 2 C 3 C 4 B 5 C 6 A 7 A 8 A 9 C 10 C

4 $x=-\frac{5}{3}$ or 2 5 $x=4$ or -4 6 $x=2$ or -2 7 $x=0$ or 15 8 $x=-5$ or $\frac{1}{2}$ 9 $x=3$ or 9

PAGE 11

1 $x=0$ or 5 2 $x=4$ or 7 3 $x=\frac{1}{2}$ 4 $x=-\frac{5}{3}$ or 2 5 $x=4$ or -4 6 $x=2$ or -2 7 $x=0$ or 15 8 $x=-5$ or $\frac{1}{2}$ 9 $x=3$ or 9