

Question 1

a) Factorise

$$\underline{12x^2} + \underline{15xy}$$

$$\underline{3x(4x+5y)}$$

 HCF

STEP 1
Identify type of
factorising
SIMPLE

STEP 2
Apply and
factorise

b) Factorise

$$\underline{18x^2y^3} - \underline{12xy^2}$$

$$\underline{6xy^2(3xy-2)}$$

Question 2

Simplify

$$a) \frac{x^2 + x - 12}{x^2 - 9}$$

$$= \frac{(x+4)(x-3)}{(x+3)(x-3)}$$

$$= \frac{(x+4)}{(x+3)}$$

Topic: Quadratic Equations

$\begin{array}{r} +4 \\ +4 \end{array}$	$\times$	$\begin{array}{r} -3 \\ -3 \end{array}$	$= -12$
$\begin{array}{r} +4 \\ +4 \end{array}$	$+$	$\begin{array}{r} -3 \\ -3 \end{array}$	$= 1$

Question 3

Simplify

STEP 1
UnRelated
Denominators

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

$$\frac{2y + 3x}{xy}$$

STEP 2
Apply technique
(CAMPING
METHOD)

Question 4

Simplify

STEP 1
Related
Denominators

$$\frac{(x)1}{(x)x} + \frac{2}{x^2}(x1)$$

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

STEP 2
Apply technique
(Pick Highest
Denominator)

Question 5

a) Factorise $3x^2 + 4x - 4$

$ax^2 + bx + c$

Step 1: Quad Box
(+ insert)

$$\begin{array}{r} 6x^{-2} = +12 \\ 6 + -2 = 4 \end{array}$$

$3x^2 + 6x - 2x - 4$

Step 2: Split + factorise

$$3x^2 + 6x - 2x - 4$$

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

Step 3: Combine

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

Hence solve $3x^2 + 4x - 4 = 0$

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

$3x-2=0 \quad x+2=0$

$3x = 2 \quad x = -2$

$x = 2/3$

b) Solve $6x^2 - 7x - 3 = 0$

(1)

$$\begin{array}{r} -9x^2 = -18 \\ -9 + 2 = -7 \end{array}$$

$6x^2 - 9x + 2x - 3$

(2) $6x^2 - 9x + 2x - 3$

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

(3)

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

c) Solve $8x^2 - 12x$

$4x(2x-3) = x=0, \quad 2x-3=0$

$2x = 3$

$x = 3/2$

Question 6

Solve

$ax^2 + bx + c = 0$

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

Give your solutions correct to 3 significant figures.

Step 1

Identify
a, b, c
 $a=1, b=2, c=-1$

$= \frac{-2 + \sqrt{4 - (-4)}}{2}$

Step 3

Calculate 2nd
solution

$\frac{-2 - \sqrt{8}}{2}$

Step 2

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

$\frac{b}{a}$

$= \frac{-2 + \sqrt{8}}{2}$

$= 0.414$

$= 2.41$

Apply
Formula

$= \frac{-2 \pm \sqrt{(2)^2 - (4 \times 1 \times -1)}}{2}$

Question 7

The area of the shape is 40cm^2 .

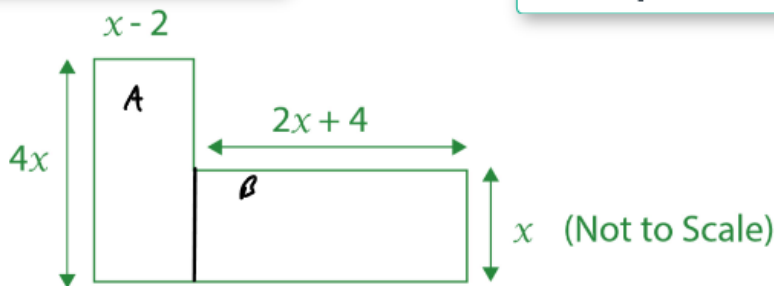
a) Show that $3x^2 - 2x - 20 = 0$.

$$4x(x-2) + x(2x+4) = 40$$

$$6x^2 - 4x = 40$$

$$6x^2 - 4x - 40 = 0$$

$$2(3x^2 - 2x - 20) = 0$$



b) Solve $3x^2 - 2x - 20 = 0$.

Give your solutions correct to 3 significant figures.

$$\frac{2 + \sqrt{244}}{6} \div 0 = 2.94 \text{ or } -2.27$$

$$\approx 2.94 \text{ cm}$$

c) Hence, work out the shortest side.

$$0.94$$

Question 8

Solve

Core 8 - Silver

Topic: Quadratic Equations

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

Write answer to 3 significant figures.

Step 1 Simplify expression

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

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

Step 2

Introduce $\boxed{=}$
+ apply

$$= \frac{x^2 + 3x - 4}{2x + 6} = 4$$

$$= x^2 + 3x - 4 = 4(2x + 6)$$

$$x^2 + 3x - 4 = 8x + 24$$

$$x^2 - 5x - 28 = 0$$

Step 3

Solve

$$a = 1, b = -5, c = -28$$

$$= \frac{-5 \pm \sqrt{(-5)^2 - (4 \times 1 \times -28)}}{2}$$

$$= \frac{-5 \pm \sqrt{25 - (-112)}}{2} = \frac{-5 \pm \sqrt{137}}{2}$$

$$= \frac{-5 \pm 11.7}{2}$$

$$= -3.35$$

Question 9

a) Write $x^2 - 3x - 2$ in the form $(x+p)^2 + q$

$$\left(x - \frac{3}{2}\right)^2 - \frac{9}{4} - 2$$

$$-\frac{9}{4} - \frac{2}{1} = \frac{-9-8}{4} = \frac{-17}{4}$$

$$= \left(x - \frac{3}{2}\right)^2 - \frac{17}{4}$$

$$p = -\frac{3}{2}, q = -\frac{17}{4}$$

b) Hence find the roots of $x^2 - 3x - 2 = 0$. Give your answer in surd form.

$$\left(x - \frac{3}{2}\right)^2 - \frac{17}{4} = 0$$

$$\left(x - \frac{3}{2}\right)^2 = \frac{17}{4}$$

$$x - \frac{3}{2} = \pm \sqrt{\frac{17}{4}}$$

$$x = \frac{\sqrt{17}}{2} + \frac{3}{2} = \frac{3+\sqrt{17}}{2}$$

$$x = -\frac{\sqrt{17}}{2} + \frac{3}{2} = \frac{3-\sqrt{17}}{2}$$

Question 10

a) Find two consecutive even numbers whose product is 168.

$$\text{Even} = 2n$$

$$(2n) \times (2n+2) = 168$$

$$2n(2n+2) = 168$$

$$4n^2 + 4n = 168$$

$$4n^2 + 4n - 168 = 0$$

$$4(n^2 + n - 42) = 0$$

$$(n-6)(n+7) = 0$$

$$n = 6, n = -7 \Rightarrow n = 6$$

$$\begin{matrix} 2n & 2n+2 \\ (6 \times 2) & (8 \times 2) \\ 12 & 14 \\ 12 \times 14 = 168 \end{matrix}$$

$$\begin{matrix} \underline{6} \times \underline{7} = -42 \\ \underline{-6} + \underline{7} = 1 \end{matrix}$$

12 and 14

Question 11

$$4^2 + (4+1)^2 = 4^2 + 5^2 = 16 + 25 = 41$$

a) The sum of the squares of two consecutive positive numbers is 41. Find the numbers.

$n, n+1$

$$(n)^2 + (n+1)^2 = 41$$

$$n^2 + (n+1)(n+1) = 41$$

$$n^2 + n^2 + n + n + 1 = 41$$

$$2n^2 + 2n + 1 = 41$$

$$2n^2 + 2n - 40 = 0$$

$$2[n^2 + n - 20]$$

Q.B

$$\begin{array}{r} 5 \\ \times -4 \\ \hline -20 \end{array}$$

$$\begin{array}{r} 5 \\ + -4 \\ \hline 1 \end{array}$$

$$(n+5)(n-4) = 0$$

$$n = -5, n = 4$$

$$\underline{\underline{n = 4}}$$

Question 12

Sam is five years younger than Joanne. In 2 years to come, the product of their ages will be 126 years.

Formulate a quadratic equation representing this information and present their ages.

$J = x, S = x - 5$

$$\boxed{J = x + 2, S = x - 3}$$

Q.B

$$\begin{array}{r} -12 \\ \times 11 \\ \hline -132 \end{array}$$

$$\begin{array}{r} -12 \\ + 11 \\ \hline -1 \end{array}$$

$$(x-12)(x+11) = 0$$

$$\underline{x = 12}, \underline{x = -11}$$

$$(x+2)(x-3) = 126$$

$$x^2 - x - 6 = 126$$

$$x^2 - x - 132 = 0$$

Test: $14 \times 9 = 126 \checkmark$

Work out their ages

Sam: 9

Joanne: 14

Question 13

a) Two numbers differ by 4. If the sum of their reciprocals is $\frac{2}{3}$, find the numbers.

$$\begin{aligned} \textcircled{1} \quad x - y &= 4 \Rightarrow \textcircled{3} \quad x = y + 4 \\ \textcircled{2} \quad \frac{1}{x} + \frac{1}{y} &= \frac{2}{3} \end{aligned}$$

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

$$\frac{y + y + 4}{y(y+4)} = \frac{2}{3}$$

$$\frac{2y+4}{y^2+4y} = \frac{2}{3}$$

$$3(2y+4) = 2(y^2+4y)$$

$$6y+12 = 2y^2+8y$$

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

$$2[y^2+y-6] = 0$$

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

$$y = -3, y = 2$$

$$x = 2+4 = 6$$

$$\begin{aligned} 3x - 2 &= -6 \\ 3x - 2 &= 1 \end{aligned}$$

Question 14

a) Write $2x^2 - 10x + 3$ in the form $a(x+b)^2 + c$ where a , b and c are integers.

$$\begin{aligned} &= 2[x^2 - 5x] + 3 \\ &= 2\left[\left(x - \frac{5}{2}\right)^2 - \frac{25}{4}\right] + 3 \\ &= 2\left(x - \frac{5}{2}\right)^2 - \frac{50}{4} + 3 = 2\left(x - \frac{5}{2}\right)^2 - \frac{38}{4} \end{aligned}$$

$$-\frac{50}{4} + \frac{3}{1} = \frac{-50+12}{4} = -\frac{38}{4}$$

b) Hence or otherwise, write down the coordinates of the turning points

$$\left(\frac{5}{2}, -\frac{38}{4}\right)$$