

REVISION FOR CHAPTER 7 TEST

Question 1

Expand and simplify the following:

a. $(x - 11)^2$

$$\begin{aligned}(x - 11)^2 &= x^2 - 2 \times 11x + 11^2 \\ &= x^2 - 22x + 121\end{aligned}$$

b. $(5x + 2)^2$

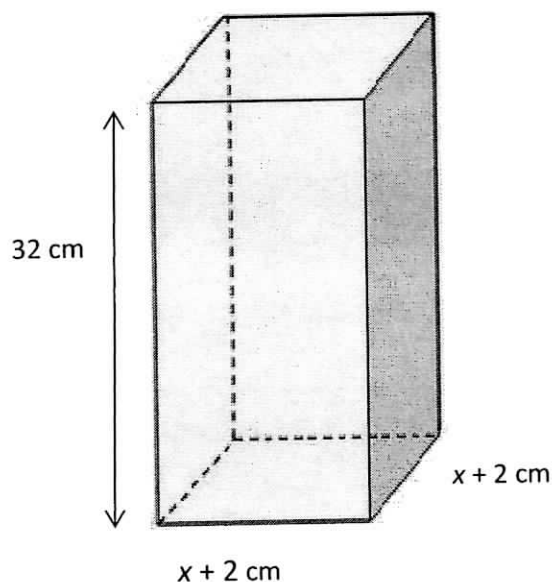
$$\begin{aligned}(5x + 2)^2 &= (5x)^2 + 2 \times (5x) \times 2 + 2^2 \\ &= 25x^2 + 20x + 4\end{aligned}$$

c. $-2(x - 5)(x + 8)$

$$\begin{aligned}&= -2 \left((x - 5)(x + 8) \right) \\ &= -2 \left(x^2 + 8x - 5x - 40 \right) \\ &= -2 \left(x^2 + 3x - 40 \right) = -2x^2 - 6x + 80\end{aligned}$$

Question 2

A large storage box has a square base with sides measuring $(x + 2)$ cm and has a height of 32 cm.



- a. Write an expression for the area of the base of the box. Expand your expression.

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

- b. Write an expression for the volume V of the box. ($V = \text{area of base} \times \text{height}$)

$$32(x^2 + 4x + 4)$$

- c. If $x = 30$, find the volume of the box.

$$\begin{aligned}32(30^2 + 4 \times 30 + 4) \\ = 36992 \text{ cm}^3\end{aligned}$$

Question 3

Factorize:

a. $4x^2 - 10x$ $2x(2x - 5)$ HCF = $2x$	b. $(p+3)^2 + 5(p+3)$ $= (p+3)((p+3) + 5)$ $= (p+3)(p+8)$	c. $(x-4)(x+2) - (x-4)$ $(x-4)((x+2) - 1)$ $= (x-4)(x+1)$
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Question 4

Factorize:

a. $v^2 - 25 = v^2 - 5^2$ $= (v-5)(v+5)$	b. $3m^2 - 300$ $= 3(m^2 - 100)$ $= 3(m^2 - 10^2)$ $= 3(m-10)(m+10)$	c. $(x-4)^2 - 9$ $= (x-4)^2 - 3^2$ $= (x-4-3)(x-4+3)$ $= (x-7)(x-1)$
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Question 5

Factorize by Grouping:

a. $ax - ay + bx - by$

$$\begin{aligned} & \underbrace{ax - ay} + \underbrace{bx - by} \\ &= a(x-y) + b(x-y) \\ &= (x-y)(a+b) \end{aligned}$$

b. $xy + 2y + 5x + 10$

$$\begin{aligned} & \underbrace{xy + 2y} + \underbrace{5x + 10} \\ &= y(x+2) + 5(x+2) \\ &= (x+2)(y+5) \end{aligned}$$

c. $uv - u + 9v - 9$

$$\begin{aligned} & \underbrace{uv - u} + \underbrace{9v - 9} \\ &= u(v-1) + 9(v-1) \\ &= (v-1)(u+9) \end{aligned}$$

Question 6

Factorize by grouping:

a. $a^2 - b^2 + 5a - 5b$
 $= (a-b)(a+b) + 5(a-b)$
 $= (a-b)(a+b+5)$

b. $2 + 2m + 1 - m^2$
 $= 2(1+m) + (1-m)(1+m)$
 $= (1+m)(2+1-m)$
 $= (1+m)(3-m)$

since $1-m^2$
 $= 1^2 - m^2$
 $= (1-m)(1+m)$

c. $mn - q - 2q^2 + 2mnq$
 $= mn + 2mnq - (q + 2q^2)$
 $= mn(1+2q) - q(1+2q)$
 $= (mn-q)(1+2q)$

Question 7

Factorize: $x^2 + 12x + 36 - y^2$
 $= (x+6)^2 - y^2$
 $= (x+6-y)(x+6+y)$

Question 8

Factorize each of the following:

<p>a. $x^2 + 7x + 10$ $= (x+5)(x+2)$ (Factors of 10 which add to 7)</p>	<p>b. $x^2 - 11x + 18$ $(x-9)(x-2)$ (Factors of 18 which add to -11)</p>	<p>c. $x^2 - 4x - 21$ Factors of -21 which add to -4 are: -7, 3 $(x-7)(x+3)$</p>
<p>d. $-x^2 + 5x - 6$ $= -(x^2 - 5x + 6)$ $= -(x-3)(x-2)$</p>	<p>e. $3x^2 + 33x - 78$ $= 3(x^2 + 11x - 26)$ $= 3(x+13)(x-2)$</p>	<p>f. $-3x^2 + 24x - 45$ $= -3(x^2 - 8x + 15)$ $= -3(x-5)(x-3)$</p>
<p>g. $-2x^2 + 12x + 10$ $= -2(x^2 + 6x + 5)$ $= -2(x^2 - 6x + 5)$ $= -2(x-5)(x-1)$</p>		

-Question 9

A rectangular soccer field has an area given by the expression: $x^2 + 4x - 45$ square metres.

- a. Factorize the expression: $x^2 + 4x - 45$

$$x^2 + 4x - 45 \\ = (x + 9)(x - 5)$$

Factors of -45
which add up to 4
are: 9, -5

- b. Hence, write down an expression for the longer side.

$$x + 9$$

- c. Write down an expression for the shorter side.

$$x - 5$$

- d. If the **shorter** side is equal to 47 m, find the value of x .

$$x - 5 = 47 \quad \therefore x = 52$$

- e. Hence, find the area of the soccer field.

$$\therefore \text{Area} = (52 + 9)(52 - 5) = 61 \times 47 \\ = 2867 \text{ m}^2$$

Question 10

Factorize:

a. $8x^2 + 2x - 1$ ac: $8 \times -1 = -8$

$$8x^2 + 4x - 2x - 1 \\ = 4x(2x + 1) - (2x + 1) \\ = (2x + 1)(4x - 1)$$

b. $6x^2 + x - 1$ $6 \times -1 = -6$

$$6x^2 + 3x - 2x - 1 \\ = 3x(2x + 1) - (2x + 1) \\ = (2x + 1)(3x - 1)$$

c. $10x^2 - 11x - 6$ $10 \times -6 = -60$

$$10x^2 - 15x + 4x - 6 \\ = 5x(2x - 3) + 2(2x - 3) \\ = (2x - 3)(5x + 2)$$

Question 11

Use completing the square to factorize the following:

a. $x^2 + 6x + 1$

$$= x^2 + 6x + 3^2 - 3^2 + 1$$

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

$$= (x+3)^2 - (\sqrt{8})^2 = (x+3-\sqrt{8})(x+3+\sqrt{8})$$

b. $x^2 - 10x - 5$

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

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

$$= (x-5)^2 - (\sqrt{5})^2$$

$$= (x-5-\sqrt{5})(x-5+\sqrt{5})$$

c. $x^2 + 8x + 2$

$$= (x^2 + 8x + 16) - 16 + 2$$

$$= (x+4)^2 - 14$$

$$= (x+4)^2 - (\sqrt{14})^2$$

d. $x^2 - 12x - 9$

$$= (x+4-\sqrt{14})(x+4+\sqrt{14})$$

$$x^2 - 12x - 9$$

$$= x^2 - 12x + 6^2 - 36 - 9$$

$$= (x-6)^2 - 45$$

$$= (x-6)^2 - (\sqrt{45})^2$$

$$= (x-6-\sqrt{45})(x-6+\sqrt{45})$$

Question 12

First factorize and then simplify the following:

a. $\frac{x+4}{5x-30} \times \frac{2x-12}{x+1}$

$$= \frac{x+4}{5(x-6)} \times \frac{2(x-6)}{x+1}$$

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

b. $\frac{3x+6}{4x-24} \times \frac{7x-42}{6x+12}$

$$= \frac{3(x+2)}{4(x-6)} \times \frac{7(x-6)}{6(x+2)}$$

$$= \frac{3}{4} \times \frac{7}{6} = \frac{7}{8}$$

c. $\frac{x^2-4}{x^2+5x} \times \frac{x^2+4x-5}{x^2-2x-8}$

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

$$= \frac{(x-2)(x-1)}{x(x-4)}$$