WORD PROBLEMS INVOLVING QUADRATIC EQUATIONS. Write your answers on separate paper.

1(a) When a number "x" is squared, the result is 12 less than 8 times x.Form an equation and solve it to find x.	6. A special bomb is designed to explode when a pressure device inside it reaches 240 Pascals. The pressure P, at t secs after the pin is pulled is given by $P = 100t - 10t^2$. (a) Find P when $t = 1$ sec
(b) When a certain positive number is squared the result is 14 plus 5 times the original number.Form an equation and solve it to find <i>x</i>.	(b) Find P when t = 2 sec(c) At what time will P reach 240 Pa?
2(a) One side of a rectangle is 4 cm longer than the other side. The area of the rectangle is 96 cm ^{2^{-}} . Form an equation and solve it to find the length of each side.	7. The temperature (T) in a laboratory heater at t minutes from turning it on, is given by: $T = 20 + 8t - t^2$ (a) Find the temperature at the instant it is turned on at t = 0 sec.
(b) One side of a rectangle 1 cm longer than twice the shorter side. The area is 36 cm^2 . Form an equation and solve it to find the length of each side.	 (b) Find T at t = 1 min. (c) A certain bacterial culture has to be removed the instant the temperature reaches 35^oC. Find at what time this will be.
3(a) If "x" is any whole number, what would the next consecutive whole number?(b) If two consecutive whole numbers are squared then added together, the sum is 85. Form an equation and solve it to find them.	 8. A rectangular room has an area of 42 m². When a square carpet is put in one corner, the width of the strips of floor left uncovered are 1m and 2m. (a) Draw a diagram and use x to represent the length of each side of the carpet. (b) Find the area of the carpet square. 9. An area can be covered by 100 square tiles for it for the stript of the square tiles for the square tiles tiles for the square tiles for the square tiles tiles
4(a) If an EVEN number is <i>x</i> , what would be the next even number?	of side "x" cm. (a) What is the area in terms of x ?
(b) If two consecutive even numbers are squared then added together, the sum is 164. Form an equation and solve it to find them.	(b) A smaller tile is used which has each side 10 cm smaller than the other tiles. What is the area of each smaller tile in terms of " x "?
5. A display rocket is fired vertically upwards. Its height h, at t secs is $h = 60t - 5t^2$. The rocket explodes when it reaches a height of 160 metres. Find the time when it explodes. (why do you get 2 answers?)	the same area as 100 of the larger tiles, find the size of each type of tile and the total area to be covered.

ANSWERS

1(a) When a number "x" is squared, the result is 12 less than 8 times x.

Form an equation and solve it to find *x*.

 $x^{2} = 8x - 12$ so $x^{2} - 8x + 12 = 0$ (x - 2)(x - 6) = 0x could be 2 or 6. Both are valid.

(b) When a certain positive number is squared the result is 14 plus 5 times the original number.

Form an equation and solve it to find *x*.

 $x^{2} = 5x + 14$ so $x^{2} - 5x - 14 = 0$ (x + 2)(x - 7) = 0x could be -2 or 7. The number is positive so only x = 7 is valid

2(a) One side of a rectangle is 4 cm longer than the other side. The area of the rectangle is 96 cm². Form an equation and solve it to find the length of each side.

Let sides be x and x + 4Area is x(x + 4) = 96 $x^2 + 4x - 96 = 0$ (x - 8)(x + 12) = 0x = 8 or -12but only valid value is 8 sides are 8 and 12

(b) One side of a rectangle 1 cm longer than twice the shorter side. The area is 36 cm^2 . Form an equation and solve it to find the length of each side.

Let sides be x and 2x + 1Area is x(2x + 1) = 36 $2x^2 + x - 36 = 0$ (2x + 9)(x - 4) = 0 x = -4.5 or -4but only valid value is 4 sides are 4 and 9 3(a) If "*x*" is any whole number, what would the next consecutive whole number?

x + *1*

(b) If two consecutive whole numbers are squared then added together, the sum is 85. Form an equation and solve it to find them.

 $x^{2} + (x + 1)^{2} = 85$ $x^{2} + x^{2} + 2x + 1 = 85$ $2x^{2} + 2x - 84 = 0$ $x^{2} + x - 42 = 0$ (x - 6)(x + 7) = 0So x = 6 or -7 but this is not a whole N^{o} So numbers are 6 and 7

4(a) If an EVEN number is *x*, what would be the next even number?

(b) If two consecutive even numbers are squared then added together, the sum is 164. Form an equation and solve it to find them.

x+2

 $x^{2} + (x + 2)^{2} = 164$ $x^{2} + x^{2} + 4x + 4 = 164$ $2x^{2} + 4x - 160 = 0$ $x^{2} + 2x - 80 = 0$ (x - 8)(x + 10) = 0So x = 8 or -10 both are even There are two sets of answers. Numbers could be 8 and 10 or -10 and -8

5. A display rocket is fired vertically upwards. Its height h, at t secs is $h = 60t - 5t^2$. The rocket explodes when it reaches a height of 160 metres. Find the time when it explodes. (why do you get 2 answers?)

 $60t - 5t^{2} = 160$ $So \quad 0 = 5t^{2} - 60t + 160$ $0 = 5(t^{2} - 12t + 32)$ 0 = 5(t - 4)(t - 8)So t could be 4 or 8 The answer is t = 4 sec when it 1st reaches a height of 160 m. If it did not explode it would be at 160m again on the way down at 8 sec. 6. A special bomb is designed to explode when a pressure device inside it reaches 240 Pascals. The pressure P, at t secs after the pin is pulled is given by $P = 100t - 10t^2$. (a) Find P when t = 1 sec

(b) Find P when t = 2 sec

(c) At what time will P reach 240 Pa?

7. The temperature (T) in a laboratory heater at t minutes from turning it on, is given by: $T = 20 + 8t - t^{2}$

(a) Find the temperature at the instant it is turned on at t = 0 sec.

 $T = 20^{\theta}C$ (b) Find T at t = 1 min.

 $T = 20 + 8 - 1 = 27^{0}C$

(c) A certain bacterial culture has to be removed the instant the temperature reaches 35^{0} C. Find at what time this will be.

 $20 + 8t - t^{2} = 35$ $0 = t^{2} - 8t + 15$ 0 = (t - 3)(t - 5)So t = 3 or 5 The temp 1st reaches $35^{0}C$ at t = 3 min

8. A rectangular room has an area of 42 m^2 . When a square carpet is put in one corner, the width of the strips of floor left uncovered are 1m and 2m.

(a) Draw a diagram and use *x* to represent the length of each side of the carpet.



(b) Find the area of the carpet square.

Area = (x + 1)(x + 2) = 42So $x^{2} + 3x + 2 = 42$ $x^{2} + 3x - 40 = 0$ (x - 5)(x + 8) = 0So x = 5 or -8 but this is not valid So area of carpet $= 25m^{2}$

9. An area can be covered by 100 square tiles of side "*x*" cm.

(a) What is the area in terms of *x* ?

$$x \square Area = 100x^2$$

(b) A smaller tile is used which has each side 10 cm smaller than the other tiles. What is the area of each smaller tile in terms of "x"?



(c) If it takes 400 of the smaller tiles to cover the same area as 100 of the larger tiles, find the size of each type of tile and the total area to be covered.

$$400(x - 10)^{2} = 100x^{2}$$
$$4(x - 10)^{2} = x^{2}$$
$$4(x^{2} - 20x + 100) = x^{2}$$
$$4x^{2} - 80x + 400 = x^{2}$$
$$3x^{2} - 80x + 400 = 0$$
$$(3x - 20)(x - 20) = 0$$
So $x = 6.67$ or 20

If the larger tile is 6.67 the smaller one can't be 10 less! The large tile has sides of 20 cm and the small tile has sides of 10 cm. The total area = 100×20^2 or 400×10^2 which is 40,000 cm²