

Name: _____

Date: Jan 5th

Knowledge	Application	TIPS	Communication
18/18	8/18	4/8	3/3

- Show full solutions for full marks. Leave answers in exact form unless a degree of accuracy is given.
- Communication mark will be based on proper form and use of symbols.

(KNOWLEDGE)

1. Solve by factoring.

a) $n^2 + 7n + 12 = 0$ 2/2

$(3) + (4) = 7$

$(3)(4) = 12$

$n^2 + 3n + 4n + 12 = 0$

$n(n+3) + 4(n+3) = 0$

$(n+4)(n+3) = 0$

$n+4=0 \quad n+3=0$

$n=-4, \quad n=-3$

b) $3m^2 + 9m - 30 = 0$ 2/2

$3(m^2 + 3m - 10) = 0$

$(-2) + (5) = 3$

$(-2)(5) = -10$

$3(m^2 + 5m - 2m - 10) = 0$

$3[m(m+5) - 2(m+5)] = 0$

$3(m+5)(m-2) = 0$

$m+5=0 \quad m-2=0$

$m=-5, \quad m=2$

c) $3a^2 + 7a - 6 = 0$ 2/2

$(-2) + (9) = 7$

$(-2)(9) = -18$

$3a^2 + 9a - 2a - 6 = 0$

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

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

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

$3a=2$

$a = \frac{2}{3}, \quad a = -3$

2. Solve using the quadratic formula.

a) $2x^2 - 3x + 1 = 0$ 2/2

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

$a=2$

$b=-3$

$c=1$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(1)}}{2(2)}$$

$$x = \frac{3 \pm \sqrt{9-8}}{4}$$

$$x = \frac{3 \pm 1}{4}$$

$$x = \frac{3+1}{4} = 1 \quad x = \frac{3-1}{4} = \frac{1}{2}$$

$x=1$

$x=\frac{1}{2}$

b) $2x^2 - 5x - 12 = 0$ 2/2

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

$a=2$

$b=-5$

$c=-12$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-12)}}{2(2)}$$

$$x = \frac{5 \pm \sqrt{25+96}}{4}$$

$$x = \frac{5 \pm \sqrt{121}}{4}$$

$$x = \frac{5+11}{4}$$

$$x = \frac{5+11}{4}$$

$x=4$

$$x = \frac{5-11}{4}$$

$x = -\frac{3}{2}$

c) $8x^2 + 6x - 9 = 0$ 2/2

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

$a=8$

$b=6$

$c=-9$

$$x = \frac{-6 \pm \sqrt{6^2 - 4(8)(-9)}}{2(8)}$$

$$x = \frac{-6 \pm \sqrt{36+288}}{16}$$

$$x = \frac{-6 \pm \sqrt{324}}{16}$$

$$x = \frac{-6 \pm 18}{16}$$

$$x = \frac{-6+18}{16}$$

$x = \frac{3}{4}$

$$x = \frac{-6-18}{16}$$

$x = -\frac{3}{2}$

3. Without solving, determine how many real roots the following quadratic equations have.

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

2/2

$$D = b^2 - 4ac$$

$$D = (-2)^2 - 4(3)(3)$$

$$D = 4 - 36$$

$$D = -32 \checkmark$$

\therefore this has no real roots \checkmark

b) $-x^2 + 6x - 9 = 0$

2/2

$$D = b^2 - 4ac$$

$$D = (6)^2 - 4(-1)(-9)$$

$$D = 36 - 36$$

$$D = 0 \checkmark$$

\therefore this has 1 real root \checkmark

c) $4x^2 + x - 3 = 0$

2/2

$$D = b^2 - 4ac$$

$$D = (1)^2 - 4(4)(-3)$$

$$D = 1 + 48$$

$$D = 49 \checkmark$$

\therefore this has 2 real roots \checkmark

(APPLICATION)

4. Sketch the graph of the following quadratic function by first factoring to find the x-intercepts and then finding the coordinates of the vertex. Do not complete the square!

a) $y = x^2 - 4x - 5$

$$x(x-5) = -5$$

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

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

$$y = x(x-5) - 5(x-5)$$

$$y = (x-5)(x+1)$$

$$x-5=0 \quad x+1=0$$

$$x=5, \quad x=-1$$

$$V_x = \frac{r+s}{2}$$

$$V_x = \frac{5-1}{2}$$

$$V_x = 2 \checkmark$$

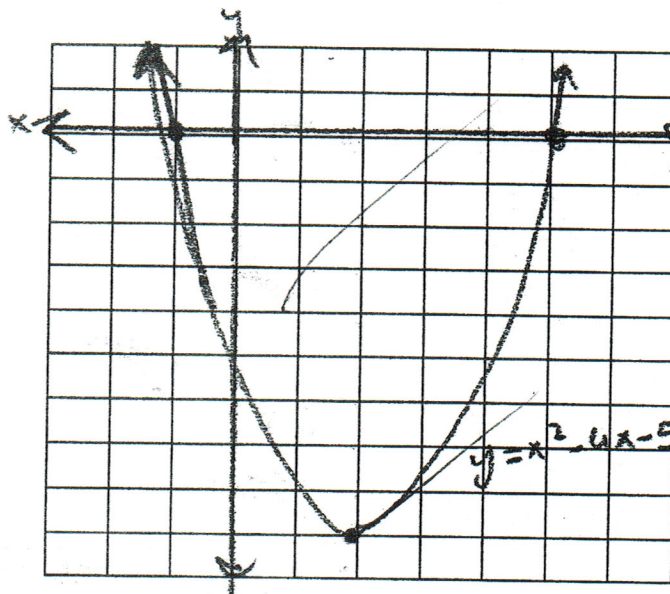
$$y = x^2 - 4x - 5$$

$$y = (2)^2 - 4(2) - 5$$

$$y = 4 - 8 - 5$$

$$y = -9$$

$$V = (2, -9)$$



6/6

5. The sum of the squares of three consecutive positive integers is 194. Find the integers.

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$$x^2 + (x+1)^2 + (x+2)^2 = 194$$

$$x^2 + x^2 + 2x + 1 + x^2 + 4x + 4 = 194$$

$$3x^2 + 6x + 5 = 194$$

$$3x^2 + 6x - 189 = 0$$

$$x^2 + 2x - 63 = 0$$

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

$$x = -9 \text{ or } x = 7$$

$$x = 7$$

$$x+1 = 8$$

$$x+2 = 9$$

$$7^2 = 49$$

$$8^2 = 64$$

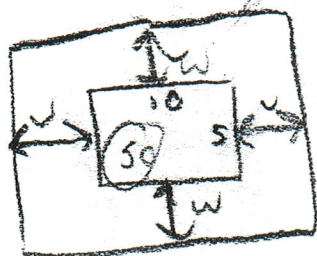
$$9^2 = 81$$

$$\begin{array}{r} 49 \\ 64 \\ 81 \\ \hline 194 \end{array}$$

The integers are 7, 8, 9.

7. A picture measuring 10cm by 5cm is to be surrounded by a frame of uniform width. The area of the frame is twice that of the picture. What is the width of the frame?

2/6



$$A_p = 50$$

$$A_m = 100$$

$$A_f = 150$$

$$100 = (10+2w)(5+2w)$$

$$100 = 10w + 2w^2$$

$$0 = 2w^2 + 10w - 100$$

$$0 = 2w^2 + 20w - 10w - 100$$

$$0 = 2w(w+10) - 10(w+10)$$

$$0 = (2w-10)(w+10)$$

$$2w-10=0 \quad w+10=0$$

$$2w=10$$

$$w=5$$

$$100 = (10+2w)(5+2w)$$

$$100 = 50 + 20w + 10w + 4w^2$$

$$0 = 50 - 100 + 30w + 4w^2$$

$$0 = 4w^2 + 30w - 50$$

$$0 = 2(2w^2 + 15w - 25)$$

∴ The width is 10m

(11PS)

8. If -3 is one root of the equation $3x^2 + mx + 3 = 0$,

a) what is the value of m?

b) what is the other root?

$$3x^2 + mx + 3 = 0$$

$$3(-3)^2 + m(-3) + 3 = 0$$

$$3(9) + m(-3) + 3 = 0$$

$$27 - 3m + 3 = 0$$

$$-3m = 0 - 27 - 3$$

$$-3m = -30$$

$$m = 10$$

∴ the value of

m is 10.

$$b) 3x^2 + 10x + 3 = 0$$

$$3x^2 + x + 9x + 3 = 0$$

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

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

$$x+3=0 \quad 3x+1=0$$

$$x=-3 \quad 3x=-1$$

$$x = -\frac{1}{3}$$

∴ the other root

$$\text{is } -\frac{1}{3}.$$

2/2

2/2

9. a) Write the equation of the quadratic in standard form whose roots are -2 and -3 and has a value of 1.

$$y = ax^2 + bx + c$$

$$x = (1)^2 + bx + c$$

$$= 1 + bx + c$$

$$Vx = \frac{-2 + -3}{2}$$

$$Vx = -2.5$$

6/2

b) Is it possible to write another quadratic equation in standard form with the same roots and a value? Explain.

yes it is because you just change the order of the roots and you will get a new equation.

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