

KNOWLEDGE (KU)	135
APPLICATION (AP)	120
THINKING (TI)	115
COMMUNICATION (CO)	level

Name: ANSWERS

Test #3 Factoring Algebraic Expressions

Knowledge & Understanding (KU)

1. Factor each of the following fully.

a.) $24a^2 + 12b^2$

GCF = 12 ✓
 $= 12(2a^2 + b^2)$ ✓

b.) $-d^3 + d^2 + 30d$

GCF = -d ✓
 $= -d(d^2 - d - 30)$ ✓
 $= -d(d - 6)(d + 5)$ ✓
 p = -30
 s = -1
 -6, 5 ✓

c.) $2c^2 + 7c - 4$

p = -8
 s = 7
 $= (c + 4)(2c - 1)$ ✓
 $\begin{array}{r} 8 \\ -2 \\ \hline 4 \\ 1 \end{array}$ ✓

d.) $3x(5y - 2) + 5(5y - 2)$

GCF = (5y - 2) ✓
 $= (5y - 2)(3x + 5)$ ✓

e.) $4c^2 - 49$

$= (2c)^2 - (7)^2$ ✓
 $= (2c - 7)(2c + 7)$ ✓

f.) $z^4 - 13z^2 + 40$

p = 40
 s = -13
 $= (z^2 - 8)(z^2 - 5)$ ✓
 -8, -5 ✓

g.) $6xt - 2xy - 3t + y$

GCF = 2x & -1 ✓
 $= 2x(3t - y) - 1(3t - y)$ ✓
 GCF = (3t - y) ✓
 $= (3t - y)(2x - 1)$ ✓

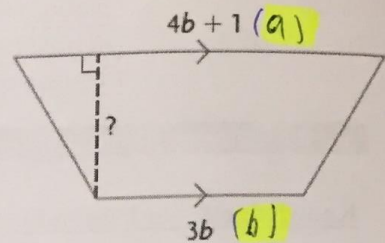
h.) $6n^2 - 11ny - 10y^2$

p = -60
 s = -11
 $= (2n - 5y)(3n + 2y)$ ✓
 $\begin{array}{r} -15, 4 \\ 6, 6 \\ \hline -5, 2 \\ 2, 3 \end{array}$ ✓
 Out of 20

2. The area of the trapezoid at the right is $A = 70b + 10$. Determine the height. (Hint: $A = \frac{(a+b)h}{2}$)

$$A = 70b + 10$$

$$\therefore 70b + 10 = \frac{(a+b)h}{2}$$



$$(2) 70b + 10 = \frac{[(4b+1) + (3b)]h}{2} \quad \checkmark$$

$$2(70b + 10) = (4b + 1 + 3b)h \quad \checkmark$$

$$140b + 20 = (7b + 1)h \quad \checkmark$$

$$\frac{20(7b + 1)}{(7b + 1)} = \frac{(7b + 1)h}{(7b + 1)} \quad \checkmark$$

$$20 = h \quad \checkmark$$

Out of 5

3. Examine the quadratic relation below.

- i) Express the relation in factored form.
- ii) Determine the zeros.
- iii) Determine the coordinates of the vertex.
- iv) Sketch the graph of the relation.

$$y = x^2 + 2x - 8$$

i.) $y = x^2 + 2x - 8$ $p = -8$ $q = 2$ \checkmark
 $y = (x+4)(x-2)$ \checkmark $\frac{p}{q} = \frac{-8}{2} = -4$ \checkmark
 $4, -2$ \checkmark

ii.) $0 = (x+4)(x-2)$

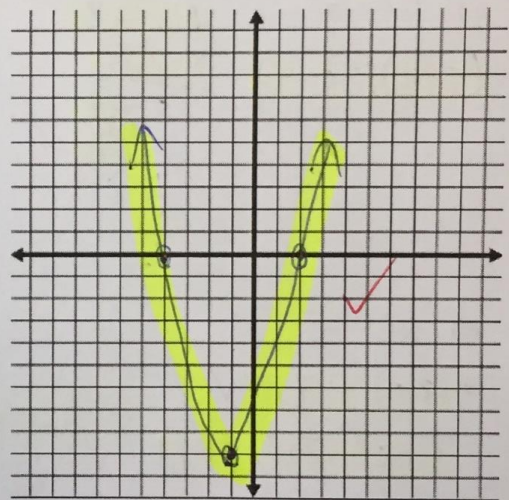
$x = -4$ \checkmark $x = 2$ \checkmark

Out of 10

iii.) x of the vertex $= \frac{-(-4) + 2}{2}$ \checkmark
 $= -1$ \checkmark

y of the vertex $y = (-1)^2 + 2(-1) - 8$ \checkmark
 $y = -9$ \checkmark

• vertex $(-1, -9)$ \checkmark



Application (AP)

1. Deanna throws a rock from the top of a cliff into the air. The height of the rock above the base of the cliff is modelled by the equation $h = -5t^2 + 10t + 75$, where h is the height of the rock in metres and t is the time in seconds.

- How high is the cliff?
- When does the rock reach its maximum height?
- What is the rock's maximum height?

a.) $t = 0$

$$h = -5(0)^2 + 10(0) + 75$$

$$h = 75$$

∴ the cliff is 75 m high

b.) $h = 0$

$$0 = -5t^2 + 10t + 75$$

$$0 = t^2 - 2t - 15$$

$$0 = (t - 5)(t + 3)$$

$$t = 5$$

$$t = -3$$

x of the vertex = $\frac{(5) + (-3)}{2} = 1$

∴ the rock will reach a max height after 1 s

e.) y of the vertex $h = -5(1)^2 + 10(1) + 75 = 80$

∴ the rock's max height will be 80 m

Out of 14

2. Determine a simplified expression for the area of the shaded region. (Hint: $A = s^2$)

Area (shaded) = $(4x + 5)^2 - (x - 2)^2$

$$= [(4x + 5) - (x - 2)] [(4x + 5) + (x - 2)]$$

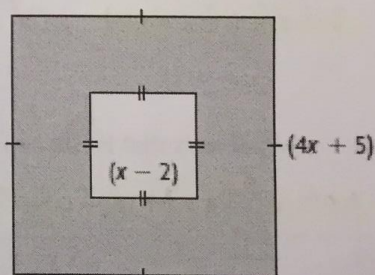
$$= (4x + 5 - x + 2)(4x + 5 + x - 2)$$

$$= (3x + 7)(5x + 3)$$

$$= 15x^2 + 9x + 35x + 21$$

$$= 15x^2 + 44x + 21$$

Out of 6



Thinking & Inquiry (TI)

1. Factor the following fully.

$$x^2 - c^2 - 8x + 16$$

$$= x^2 - 8x + 16 - c^2 \quad \checkmark \quad \begin{array}{l} p = 16 \\ s = -8 \end{array}$$

$$= (x-4)^2 - c^2 \quad \checkmark \quad \begin{array}{l} -4, -4 \end{array} \quad \checkmark$$

$$= (x-4-c)(x-4+c) \quad \checkmark$$

Out of 4

2. Show that 1 greater than the sum of the squares of any 3 consecutive integers is always divisible by 3.

Let x be one #

Let $(x+1)$ be another # \checkmark

Let $(x+2)$ be the last #

$$(x)^2 + (x+1)^2 + (x+2)^2 + 1 \quad \checkmark$$

$$= x^2 + (x+1)(x+1) + (x+2)(x+2) + 1 \quad \checkmark$$

$$= x^2 + x^2 + x + x + 1 + x^2 + 2x + 2x + 4 + 1 \quad \checkmark$$

$$= 3x^2 + 6x + 6 \quad \checkmark$$

$$= 3(x^2 + 2x + 2) \quad \checkmark$$

Out of 6

3. Paul says that if you can factor $x^2 - bx - c$, you can factor $x^2 + bx - c$. Do you agree? Explain.

Let b be 3 & c be 10

$$x^2 - 3x - 10$$

$$\begin{array}{l} p = -10 \\ s = -3 \quad \checkmark \\ -5, 2 \end{array}$$

Out of 5

$$(x-5)(x+2) \quad \checkmark$$

$$x^2 + 3x - 10$$

$$\begin{array}{l} p = -10 \quad \checkmark \\ s = 3 \\ 5, -2 \end{array}$$

$$(x+5)(x-2) \quad \checkmark$$

∴ yes I agree. The factors will be opposite in sign. \checkmark