MBF3C – Quadratics II Name: _____ Date: _____

Performance Task
Quadratics II

Know	App	Think	Comm
11	15	8	10

SHOW YOUR WORK FOR FULL MARKS

KNOWLEDGE & UDERSTANDING

1. Write the expression $y=-2(x+3)^2+12$ in standard form. ❸

① square the brackets ( )( )
② multiply each term by -2
③ collect like terms

$y=-2(x+3)(x+3)+12$ FOIL
$y=-2(x^2+3x+3x+9)+12$ distribute -2
$y=-2x^2-6x-6x-18+12$ collect like terms
$y=-2x^2-12x-6$ → standard form

2. Factor **FULLY**

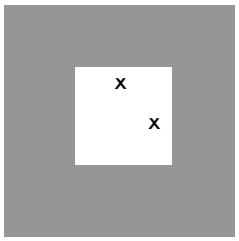
a) a) $x^2-9x+18$ ❷ $-3\times-6=18$, $-3+-6=-9$
$=(x-3)(x-6)$

b) $4x^2-8x-60$ ❸
① GCF first $=4$
② factor
$=4\left(\frac{4x^2}{4}-\frac{8x}{4}-\frac{60}{4}\right)$
$=4(x^2-2x-15)$ $3\times-5=-15$, $3+-5=-2$
$=4(x-3)(x-5)$

c) $3x^2-48$ ❸ ① GCF first $=3$
$=3\left(\frac{3x^2}{3}-\frac{48}{3}\right)$
$=3(x^2-16)$
$=3(x^2+0x-16)$ $-4\times4=-16$, $-4+4=0$
$=3(x-4)(x+4)$

APPLICATION

3. Write a SIMPLIFIED expression for the area of the shaded region. ❸
Remember to simplify as much as possible ($Area = length \times width$)



Area of The shaded region = Total Area ① − The area of the square inside ②

① Total Area $=(x+4)(x+4)$
$=x^2+4x+4x+16$
$=x^2+8x+16$

② Smaller square $=x\cdot x$
$=x^2$

∴ Shaded region $=x^2+8x+16-x^2=\boxed{8x+16}$

4. The path of a ball that was dropped and bounced can be modelled by the relation $y = x^2 - 6x + 9$, where x is the horizontal distance travelled and y is the height, both in metres.

a) Express the relation in intercept (factored) form. ❷

$y = x^2 - 6x + 9$

$= (x-3)(x-3)$

$-3 \times -3 = 9$

$-3 + -3 = -6$

b) Find the zeros (x-intercepts) of the relation. ❷

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

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c) Find the axis of symmetry (show your work). ❶

$x = \frac{3+3}{2} = \frac{6}{2} = 3$

$x = 3$

d) What is the y-intercept **AND** its reflection point? Express each as coordinate points. ❷

y-int is (0,9) and its reflection point is (6,9)

e) Find the optimal value. ❷

$y = (x-3)(x-3)$ sub "3" for x

$y = (3-3)(3-3)$

$y = 0$

f) What is the vertex? ❶

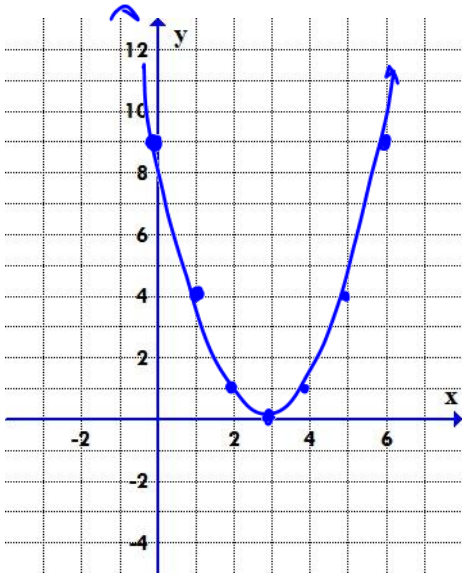
V(3,0)

g) Graph the parabola on the following grid. ❷

Hint: Use the **step pattern** to help draw an accurate graph.

Step 0 x (1, 3, 5)

= 1, 3, 5



THINKING

5. Write the equation for the following quadratic relation in standard form. ❸

a = – 2 and with a vertex at (– 3, 4)

$y = a(x-h)^2 + k$

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

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

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

$= -2(x^2+3x+3x+9) + 4$

$= -2x^2 - 6x - 6x - 18 + 4$

$= -2x^2 - 12x - 14$

6. A football is kicked from ground level. Its path is given by the relation $h = -4.8t^2 + 43.2t$ where h is the ball's height above the ground, in metres, and t is the time in seconds.

a) Write the relation in factored form. ❷

$h = -4.8t^2 + 43.2t$ GCF = $-4.8t$

$= -4.8t(t-9)$

b) Find the zeros (x-intercepts) of the relation. ❷

$\frac{-4.8t}{-4.8} = \frac{0}{-4.8}$ $t = 0$

$t - 9 = 0$ $t = 9$

c) When did the ball hit the ground? ❶

It hit the ground at 9 seconds

COMMUNICATION

7. State the steps needed to convert a quadratic relation in vertex from to standard form. ❸
You may want to make up an example to help you explain. ** **3 marks means write 3 points** **

8. **List** the four types of factoring learned in this unit AND provide an **example** of each.
The example may not have been used already in this test.
Solve each of your examples to show the equation in factored form. ❹

PLUS… 3 possible marks for proper communication ½ 1 1½ 2 2½ 3
(correct use of mathematical symbols, labels, form, and conventions)

8. What do you know about the graph given each form of a quadratic relation? ❹

The vertex form $y = a(x-h)^2 + k$ tells me…

- the coordinates of the vertex
- direction of opening
- transformations

The standard form $y = ax^2 + bx + c$ tells me…

- y-int (c)
- direction of opening (a)

The factored (intercept) form $y = a(x-r)(x-s)$ tells me…

- x intercepts r and s
- direction of opening (a)

Which form of the quadratic equation do you prefer? Explain why?

PLUS… 3 possible marks for proper communication ½ 1 1½ 2 2½ 3
(correct use of mathematical symbols, labels, form, and conventions)