

REV-QE-2223-ASM-SET 1-MATH**Suggested solutions****Multiple Choice Questions**1. ☐ C

$$(x - k)^2 = 4k^2$$

$$x - k = \pm 2k$$

$$x = -k \quad \text{or} \quad 3k$$

2. ☐ C

$$x + 2 = 0 \quad \text{or} \quad 5x - 2 = 2$$

$$x = -2 \quad \text{or} \quad x = \frac{4}{5}$$

3. ☐ C

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

$$x + 4 = \pm 3$$

$$x = -1 \quad \text{or} \quad -7$$

4. ☐ C

$$2x(3x - 1) = (2 - 3x)(3x - 1)$$

$$2x = 2 - 3x \quad \text{or} \quad 3x - 1 = 0$$

$$x = \frac{2}{5} \quad \text{or} \quad x = \frac{1}{3}$$

5. ☐ C

$$3x^2 = 9x$$

$$3x(x - 3) = 0$$

$$x = 0 \quad \text{or} \quad 3$$

6. ☐ D

The equation holds for $x = k$.

When $x = k - 1$,

$$(x - 1)(x - 2) = (k - 2)(k - 3)$$

$$\neq (k - 1)(k - 2)$$

When $x = 3 - k$,

$$(x - 1)(x - 2) = (2 - k)(1 - k)$$

$$= (k - 1)(k - 2)$$

Thus, $x = k$ or $3 - k$.

7. C

$$(x - a)^2 = 9a^2$$

$$x - a = 3a \quad \text{or} \quad x - a = -3a$$

$$x = 4a \quad \text{or} \quad x = -2a$$

8. C

$$x - 3 = 2x + 1 \quad \text{or} \quad x = 0$$

$$x = -4 \quad \text{or} \quad x = 0$$

9. C

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

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

$$5x^2 - x - 6 = 0$$

$$x = \frac{6}{5} \quad \text{or} \quad -1$$

10. D

$$3x - 2x^2 - 1 = 0$$

$$-2x^2 + 3x - 1 = 0$$

$$x = \frac{1}{2} \quad \text{or} \quad 1$$

11. A

β is a root.

$$4\beta^2 - 5\beta - 1 = 0$$

$$4\beta^2 - 5\beta = 1$$

$$7 + 10\beta - 8\beta^2 = 7 - 2(4\beta^2 - 5\beta)$$

$$= 7 - 2(1)$$

$$= 5$$

12. D

We have $3\alpha^2 - 4\alpha - 2 = 0$.

$$9 + 12\alpha - 9\alpha^2 = 9 - 3(3\alpha^2 - 4\alpha)$$

$$= 9 - 3(0 + 2)$$

$$= 3$$

13. C

x -intercepts are -2 and $6 \Rightarrow f(x) = A(x+2)(x-6)$ for some constant A .

$$f(0) = -6 = A(2)(-6)$$

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

$$f(x) = \frac{1}{2}(x+2)(x-6) = \frac{1}{2}(x^2 - 4x + 12)$$

14. B

$$c = 6.$$

$$0 = (3)^2 + b(3) + 6$$

$$b = -5$$

15. C

$(-4, 0)$ and $(-1, 0) \rightarrow$ options A and D are false.

$(0, -8) \Rightarrow$ option B is false.

The answer is C.

16. C

$$0 = x(5x - 1) + 3 - x^2$$

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

$$\Delta = 1^2 - 4(4)(3) = -47 < 0$$

The equation has no real roots.

Thus, the graph has 0 x -intercept.

17. C

We have

$$\begin{cases} \alpha - \beta = 2 \\ \alpha + \beta = 3 \end{cases}$$

Solving, we have $\alpha = \frac{5}{2}$ and $\beta = \frac{1}{2}$.

$$\alpha\beta = \frac{m}{3}$$

$$\frac{5}{4} = \frac{m}{3}$$

$$m = \frac{15}{4}$$

18. C

$$\frac{4}{a} = \frac{2}{3}$$

$$a = 6$$

19. C

$$\alpha^2 + \beta^2 = 11$$

$$(\alpha + \beta)^2 - 2\alpha\beta = 11$$

$$(4)^2 - 2(m) = 11$$

$$m = \frac{5}{2}$$

20. A

$$-4 = -\frac{-(2a + 3b)}{a}$$

$$\frac{b}{a} = -2$$

$$\text{Product of roots} = -\frac{b}{a} = 2$$

21. C

a and b are roots of the equation $x^2 + 4x + 1 = 0$.

$$a + b = -4 \text{ and } ab = 1.$$

$$a^2 + b^2 = (a + b)^2 - 2ab$$

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

$$= 14$$

22. D

α and β are roots of $x^2 = 3x - 4$, i.e., $x^2 - 3x + 4 = 0$.

$$\alpha^2\beta^2 = (\alpha\beta)^2 = 4^2 = 16$$

23. D

α and β are roots of the equation $x^2 + px + 2p = 0$.

$$\alpha + \beta = -p \text{ and } \alpha\beta = 2p.$$

$$\begin{aligned} \frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha} &= \frac{\alpha^3 + \beta^3}{\alpha\beta} \\ &= \frac{(\alpha + \beta)[(\alpha + \beta)^2 - 3\alpha\beta]}{\alpha\beta} \\ &= \frac{-p(p^2 - 6p)}{2p} \\ &= \frac{-p^2 + 6p}{2} \end{aligned}$$

24. C

α and β are roots of the equation $x^2 = 4x + 3$, i.e., $x^2 - 4x - 3 = 0$.
 $\alpha + \beta = 4$ and $\alpha\beta = -3$.

$$\begin{aligned}(\alpha + 1)(\beta + 1) &= \alpha\beta + (\alpha + \beta) + 1 \\ &= -3 + 4 + 1 \\ &= 2\end{aligned}$$

25. A

$$\begin{aligned}\beta^2 - 2\beta + k &= 0 \\ \beta^2 &= 2\beta - k \\ 2\alpha + \beta^2 &= 2\alpha + (2\beta - k) \\ &= 2(\alpha + \beta) - k \\ &= 2(2) - k \\ &= 4 - k\end{aligned}$$

26. C

Let the smaller number be x .

$$\begin{aligned}x^2 + (x + 6)^2 &= 30x + 140 \\ 2x^2 - 18x - 104 &= 0 \\ x &= 13 \quad \text{or} \quad -4 \text{ (rejected)}\end{aligned}$$

$$\text{Sum of two numbers} = 13 + (13 + 6) = 32$$

27. B

Sum of roots $= 2\alpha + 2\beta = 2(-6) = -12$
 Product of roots $= 4\alpha\beta = 4(-3) = -12$
 Required equation is $x^2 + 12x - 12 = 0$.

28. B

$$\begin{aligned}\alpha + \beta &= \frac{3}{2} \text{ and } \alpha\beta = \frac{7}{2}. \\ (\alpha - 3) + (\beta - 3) &= (\alpha + \beta) - 6 \\ &= -\frac{9}{2} \\ (\alpha - 3)(\beta - 3) &= \alpha\beta - 3(\alpha + \beta) + 9 \\ &= 8\end{aligned}$$

Required equation is

$$\begin{aligned}x^2 + \frac{9}{2}x + 8 &= 0 \\ 2x^2 + 9x + 16 &= 0\end{aligned}$$

29. A

$$(\alpha + 1)(\beta + 1) = 3$$

$$\alpha\beta + (\alpha + \beta) + 1 = 3$$

$$\alpha\beta = -2$$

Required equation is $x^2 - 4x - 2 = 0$.

30. D

$$\alpha + \beta = 3 \text{ and } \alpha\beta = 2.$$

$$(\alpha - 5) + (\beta - 5) = (\alpha + \beta) - 10$$

$$= -7$$

$$(\alpha - 5)(\beta - 5) = \alpha\beta - 5(\alpha + \beta) + 25$$

$$= 12$$

Required equation is $x^2 + 7x + 12 = 0$.