

MC Final Review

Find the probability of each event.

- 1) A test consists of eight true/false questions. A student who forgot to study guesses randomly on every question. What is the probability that the student answers exactly two questions correctly?
- A) $\frac{15}{64} \approx 23.438\%$
 B) $\frac{15}{128} \approx 11.719\%$
 C) $\frac{7}{32} = 21.875\%$
 D) $\frac{7}{64} \approx 10.938\%$
- 2) A test consists of eleven true/false questions. A student who forgot to study guesses randomly on every question. What is the probability that the student answers exactly two questions correctly?
- A) $\frac{35}{128} \approx 27.344\%$
 B) $\frac{105}{512} \approx 20.508\%$
 C) $\frac{45}{1024} \approx 4.395\%$
 D) $\frac{55}{2048} \approx 2.686\%$
- 3) A gambler places a bet on a horse race. To win, he must pick the top three finishers in any order. Eight horses of equal ability are entered in the race. Assuming the horses finish in a random order, what is the probability that the gambler will win his bet?
- A) $\frac{1}{1001} \approx 0.1\%$ B) $\frac{1}{56} \approx 1.786\%$
 C) $\frac{1}{715} \approx 0.14\%$ D) $\frac{1}{2730} \approx 0.037\%$
- 4) You've purchased a lottery ticket and your numbers are: 4-8-3. A lottery official randomly selects three balls from a set of eight balls that are numbered from #1 to #8. To win, your numbers must match the selected numbers in order. What is the probability of winning the lottery?
- A) $\frac{1}{462} \approx 0.216\%$ B) $\frac{1}{42} \approx 2.381\%$
 C) $\frac{1}{336} \approx 0.298\%$ D) $\frac{1}{30} \approx 3.333\%$
- 5) A gardener has fourteen identical-looking tulip bulbs, of which ten will produce yellow tulips and four will become pink. He randomly selects and plants seven of them and then gives the rest away. When the flowers start to bloom, what is the probability that exactly five of them are yellow?
- A) $\frac{10}{21} \approx 47.619\%$
 B) $\frac{63}{143} \approx 44.056\%$
 C) $\frac{60}{143} \approx 41.958\%$
 D) $\frac{175}{429} \approx 40.793\%$
- 6) A meeting takes place between a diplomat and ten government officials. However, six of the officials are actually spies. If the diplomat gives secret information to five of the attendees, what is the probability that the diplomat gave secret information to exactly three spies?
- A) $\frac{10}{21} \approx 47.619\%$
 B) $\frac{1225}{3432} \approx 35.693\%$
 C) $\frac{882}{2431} \approx 36.281\%$
 D) $\frac{35}{143} \approx 24.476\%$

- 7) A small pond contains six catfish and five bluegill. If five fish are caught at random, what is the probability that at least two catfish have been caught?
- A) $\frac{53}{66} \approx 80.303\%$ B) $\frac{94}{143} \approx 65.734\%$
 C) $\frac{431}{462} \approx 93.29\%$ D) $\frac{124}{143} \approx 86.713\%$

- 8) There are thirteen songs on your playlist. Seven of them are country and six are pop. With random shuffle and no repetition, you listen to nine songs. What is the probability that you listened to at most five country songs?
- A) $\frac{9}{11} \approx 81.818\%$
 B) $\frac{84}{143} \approx 58.741\%$
 C) $\frac{112}{143} \approx 78.322\%$
 D) $\frac{37}{39} \approx 94.872\%$

Classify each conic section and write its equation in standard form.

9) $4x^2 + 4y^2 - 4x - 8y - 59 = 0$

A) Circle

$$(x + 1)^2 + \left(y + \frac{1}{2}\right)^2 = 4$$

B) Circle

$$\left(x + \frac{1}{2}\right)^2 + (y - 1)^2 = 16$$

C) Hyperbola

$$\frac{(y - 1)^2}{16} - \frac{\left(x - \frac{1}{2}\right)^2}{16} = 1$$

D) Circle

$$\left(x - \frac{1}{2}\right)^2 + (y - 1)^2 = 16$$

10) $-x^2 + 12x + y - 34 = 0$

A) Parabola

$$y = -(x + 2)^2 - 6$$

B) Parabola

$$x = -(y + 2)^2 + 6$$

C) Parabola

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

D) Parabola

$$y = (x - 6)^2 - 2$$

Classify each conic section and write its equation in standard form. For parabolas, identify the vertex and focus. For circles, identify the center. For ellipses and hyperbolas identify the center, vertices, and foci.

11) $y^2 + x + 2y + 5 = 0$

A) Parabola

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

$$\text{Vertex: } (-4, 1)$$

$$\text{Focus: } \left(-\frac{17}{4}, 1\right)$$

B) Parabola

$$y = (x + 3)^2 + 1$$

$$\text{Vertex: } (-3, 1)$$

$$\text{Focus: } \left(-3, \frac{5}{4}\right)$$

C) Circle

$$(x + 4)^2 + y^2 = 7$$

$$\text{Center: } (-4, 0)$$

D) Parabola

$$x = -(y + 1)^2 - 4$$

$$\text{Vertex: } (-4, -1)$$

$$\text{Focus: } \left(-\frac{17}{4}, -1\right)$$

12) $x^2 - 8x + y + 16 = 0$

A) Circle

$$\left(x + \frac{5}{2}\right)^2 + \left(y - \frac{7}{2}\right)^2 = 1$$

$$\text{Center: } \left(-\frac{5}{2}, \frac{7}{2}\right)$$

B) Parabola

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

$$\text{Vertex: } (0, -4)$$

$$\text{Focus: } \left(-\frac{1}{4}, -4\right)$$

C) Circle

$$(x - 2)^2 + (y + 2)^2 = 17$$

$$\text{Center: } (2, -2)$$

D) Parabola

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

$$\text{Vertex: } (4, 0)$$

$$\text{Focus: } \left(4, -\frac{1}{4}\right)$$

Use the information provided to write the standard form equation of each hyperbola.

13) Vertices: $(11, -4), (1, -4)$

Endpoints of Conjugate Axis: $(6, 7)$
 $(6, -15)$

A) $\frac{(x - 6)^2}{121} - \frac{(y + 4)^2}{25} = 1$

B) $\frac{(x - 6)^2}{25} - \frac{(y + 4)^2}{121} = 1$

C) $\frac{(y + 4)^2}{121} - \frac{(x - 6)^2}{25} = 1$

D) $\frac{(y - 6)^2}{25} - \frac{(x - 4)^2}{121} = 1$

14) Vertices: $(-9, -3), (-9, -13)$

Endpoints of Conjugate Axis: $(-7, -8)$
 $(-11, -8)$

A) $\frac{(x - 8)^2}{25} - \frac{(y + 9)^2}{4} = 1$

B) $\frac{(x + 9)^2}{4} - \frac{(y + 8)^2}{25} = 1$

C) $\frac{(y - 9)^2}{25} - \frac{(x + 8)^2}{4} = 1$

D) $\frac{(y + 8)^2}{25} - \frac{(x + 9)^2}{4} = 1$

Identify the vertices and foci of each.

$$15) \frac{(x-7)^2}{81} + \frac{(y-7)^2}{36} = 1$$

- A) Vertices: $(16, 7), (-2, 7)$
 Foci: $(7 + 3\sqrt{5}, 7), (7 - 3\sqrt{5}, 7)$
 B) Vertices: $(-7, 2), (-7, -16)$
 Foci: $(-7, -7 + 3\sqrt{5}), (-7, -7 - 3\sqrt{5})$
 C) Vertices: $(0, -9), (-18, -9)$
 Foci: $(-9 + 3\sqrt{5}, -9), (-9 - 3\sqrt{5}, -9)$
 D) Vertices: $(7, 16), (7, -2)$
 Foci: $(7, 7 + 3\sqrt{5}), (7, 7 - 3\sqrt{5})$

$$16) \frac{(x-10)^2}{9} + \frac{y^2}{81} = 1$$

- A) Vertices: $(9, 10), (-9, 10)$
 Foci: $(6\sqrt{2}, 10), (-6\sqrt{2}, 10)$
 B) Vertices: $(19, 0), (1, 0)$
 Foci: $(10 + 6\sqrt{2}, 0), (10 - 6\sqrt{2}, 0)$
 C) Vertices: $(10, 9), (10, -9)$
 Foci: $(10, 6\sqrt{2}), (10, -6\sqrt{2})$
 D) Vertices: $(0, 19), (0, 1)$
 Foci: $(0, 10 + 6\sqrt{2}), (0, 10 - 6\sqrt{2})$

Solve each equation for $0 \leq \theta < 2\pi$. Round your answers to the nearest hundredth.

$$17) 7.32 = 3 + \cot\left(\theta + \frac{\pi}{6}\right)$$

- A) $\{5.99\}$
 B) $\{2.84, 5.99\}$
 C) $\{1.45, 4.6\}$
 D) $\{1.45, 2.84, 4.6\}$

$$18) 2 + \cos\left(\theta + \frac{\pi}{3}\right) = 2.91$$

- A) $\{4.81, 5.66\}$ B) $\{0.02, 4.17\}$
 C) $\{4.81\}$ D) $\{0.02, 5.66\}$

Solve each equation for $-\frac{\pi}{2} \leq \theta \leq \frac{\pi}{2}$. Round your answers to the nearest hundredth.

$$19) 2 + \cos 3\theta = 2.14$$

- A) $\{-0.68, 0.48, 0.64\}$
 B) $\{-0.48, 0.48\}$
 C) No solution.
 D) $\{-0.68, 0.48\}$

$$20) 0.12 = -\frac{1}{5} \cdot \cos \frac{\theta}{3}$$

- A) $\{-1.3, 0.27, 0.88\}$
 B) $\{-1.3, 0.27\}$
 C) $\{-1.3, 0.88\}$
 D) No solution.

Find a positive and a negative coterminal angle for each given angle.

$$21) 165^\circ$$

- A) 435° and -105°
 B) 705° and -285°
 C) 525° and -195°
 D) 525° and -105°

$$22) 465^\circ$$

- A) 105° and -255°
 B) 195° and -165°
 C) 15° and -165°
 D) 105° and -75°

Use the given point on the terminal side of angle θ to find the value of the trigonometric function indicated.

23) $\sin \theta; (-\sqrt{7}, -3)$

A) $-\frac{\sqrt{7}}{4}$ B) $-\frac{3}{4}$

C) $-\frac{4\sqrt{7}}{7}$ D) $-\frac{4}{3}$

24) $\cot \theta; (-12, -8)$

A) $\frac{3}{2}$ B) $-\frac{\sqrt{13}}{3}$

C) $-\frac{2\sqrt{13}}{13}$ D) $-\frac{3\sqrt{13}}{13}$

Find each measurement indicated. Round your answers to the nearest tenth.

25) $a = 15$ km, $m\angle C = 115^\circ$, $b = 28$ km

Find c

A) 35.4 km B) 42.8 km

C) 40.7 km D) 36.9 km

26) $b = 8$ cm, $m\angle C = 75^\circ$, $a = 27$ cm

Find c

A) 18.9 cm B) 26.1 cm

C) 22.8 cm D) 24.3 cm

27) $c = 24.3$ km, $b = 21.5$ km, $a = 18.9$ km

Find $m\angle B$

A) 58.1° B) 50.3°

C) 52.9° D) 59.8°

28) $m\angle C = 90^\circ$, $c = 24$ in, $b = 7$ in

Find $m\angle B$

A) 20° B) 20.1°

C) 17° D) 14°

29) $m\angle C = 119^\circ$, $m\angle B = 11^\circ$, $b = 7$ km

Find c

A) 32.1 km B) 29 km

C) 31 km D) 37 km

30) $m\angle A = 123^\circ$, $m\angle B = 31^\circ$, $a = 44$ cm

Find b

A) 28 cm B) 30 cm

C) 27 cm D) 25 cm

Use a double-angle identity to find the exact value of each expression.

31) $\cos \theta = \frac{24}{25}$ and $\frac{3\pi}{2} < \theta < 2\pi$

Find $\tan 2\theta$

A) $\frac{625}{527}$ B) $-\frac{336}{527}$

C) $-\frac{336}{625}$ D) $-\frac{625}{336}$

32) $\cos \theta = -\frac{4}{5}$ and $\pi < \theta < \frac{3\pi}{2}$

Find $\sin 2\theta$

A) $\frac{25}{7}$ B) $\frac{24}{25}$

C) $\frac{25}{24}$ D) $\frac{24}{7}$

Find the area of each triangle to the nearest tenth.

33) In $\triangle YZX$, $y = 14.6$ yd, $x = 8$ yd, $m\angle Y = 101^\circ$

A) 48.9 yd² B) 40.7 yd²

C) 42.4 yd² D) 47.1 yd²

34) In $\triangle PKH$, $k = 6$ in, $h = 8$ in, $m\angle P = 15^\circ$

A) 18.4 in² B) 6.2 in²

C) 7.2 in² D) 7.8 in²

Using radians, find the amplitude and period of each function.

$$35) y = \frac{1}{3} \cdot \tan\left(5\theta - \frac{11\pi}{6}\right)$$

A) Amplitude: None

Period: $\frac{\pi}{4}$

B) Amplitude: None

Period: $\frac{\pi}{2}$

C) Amplitude: None

Period: $\frac{\pi}{5}$

D) Amplitude: None

Period: $\frac{\pi}{3}$

$$36) y = 8\cos\left(5\theta + \frac{\pi}{6}\right) + 2$$

A) Amplitude: $\frac{1}{2}$

Period: 2π

B) Amplitude: 8

Period: $\frac{2\pi}{5}$

C) Amplitude: 2

Period: 10π

D) Amplitude: 8

Period: π

Solve each equation. Remember to check for extraneous solutions.

$$37) \frac{5}{x^2 + 8x + 12} - \frac{1}{x + 6} = \frac{x + 5}{x + 2}$$

A) $\{-9, -3\}$

B) $\{1, -3\}$

C) $\{5, -3\}$

D) $\{0, -3\}$

$$38) 5 + \frac{1}{m - 5} = \frac{4m + 12}{m}$$

A) $\left\{10, -\frac{17}{6}\right\}$

B) $\left\{10, -\frac{11}{6}\right\}$

C) $\{10, 6\}$

D) $\left\{10, \frac{11}{6}\right\}$

$$39) 1 = \frac{5a + 20}{a + 6} + \frac{a}{a + 6}$$

A) $\left\{-\frac{14}{5}, -4\right\}$

B) $\{4\}$

C) $\{0\}$

D) $\left\{-\frac{14}{5}\right\}$

$$40) \frac{3}{v^2 + 9v + 18} = \frac{1}{v^2 + 9v + 18} + \frac{1}{v + 3}$$

A) $\{-4\}$

B) $\{4\}$

C) $\{-6\}$

D) $\{0\}$

Identify the domain and range of each.

$$41) y = \sqrt[3]{x + 4} + 1$$

A) Domain: $x \geq 1$

Range: $y \geq -4$

B) Domain: $x \geq -4$

Range: $y \leq 1$

C) Domain: { All real numbers. }

Range: { All real numbers. }

D) Domain: $x \geq 4$

Range: $y \geq -1$

$$42) y = 2 + \frac{1}{2}\sqrt[3]{x + 3}$$

A) Domain: { All real numbers. }

Range: { All real numbers. }

B) Domain: $x \geq 3$

Range: $y \geq -2$

C) Domain: $x \geq -3$

Range: $y \geq -2$

D) Domain: $x \geq 2$

Range: $y \geq -3$

43) $y = \log_6 (3x - 5) - 5$

- A) Domain: $x > \frac{5}{3}$
Range: All reals
- B) Domain: All reals
Range: $x < -\frac{5}{3}$
- C) Domain: $x > -\frac{5}{3}$
Range: All reals
- D) Domain: $x < \frac{5}{3}$
Range: All reals

44) $y = \log_2 (2x - 6) - 3$

- A) Domain: All reals
Range: $x < -3$
- B) Domain: $x > 3$
Range: All reals
- C) Domain: All reals
Range: $x < 3$
- D) Domain: $x > -3$
Range: All reals

Determine if the sequence is arithmetic. If it is, find the explicit formula.

45) $-\frac{4}{9}, \frac{8}{9}, \frac{20}{9}, \frac{32}{9}, \dots$

- A) $a_n = -\frac{16}{9} + \frac{4}{3}n$
- B) $a_n = -\frac{25}{9} + \frac{4}{3}n$
- C) $a_n = -\frac{31}{9} + \frac{4}{3}n$
- D) $a_n = -\frac{43}{9} + \frac{4}{3}n$

46) 2, 4, 12, 48, ...

- A) $a_n = 2n$
- B) Not arithmetic
- C) $a_n = -2 + 4n$
- D) $a_n = -3 + 4n$

Evaluate the related series of each sequence.

47) $-\frac{19}{6}, -\frac{23}{6}, -\frac{9}{2}, -\frac{31}{6}, -\frac{35}{6}, -\frac{13}{2}$

- A) -38
- B) -29
- C) -90
- D) -58

48) 3.2, 5.5, 7.8, 10.1, 12.4, 14.7, 17

- A) 170
- B) 77.6
- C) 166
- D) 70.7

State if each scenario involves a permutation or a combination. Then find the number of possibilities.

49) There are 200 students at a meeting. They each shake hands with everyone else. How many handshakes were there?

- A) Permutation; 39,800
- B) Combination; 4,975
- C) Combination; 19,900
- D) Permutation; 59,700

50) A group of 20 people are going to run a race. The top 8 finishers advance to the finals.

- A) Combination; 96,365
- B) Combination; 125,970
- C) Combination; 31,492
- D) Permutation; 784,143,104

Determine if the sequence is geometric. If it is, find the explicit formula.

51) 0.2, 1, 5, 25, ...

A) $a_n = 0.24 \cdot 2^{n-1}$

B) $a_n = 0.2 \cdot 5^{n-1}$

C) $a_n = 1.2 \cdot 5^{n-1}$

D) $a_n = 0.24 \cdot 5^{n-1}$

52) $-1, -\frac{1}{2}, -\frac{1}{4}, -\frac{1}{8}, \dots$

A) $a_n = -2 \cdot \left(\frac{1}{2}\right)^{n-1}$

B) $a_n = -\left(\frac{1}{2}\right)^{n-1}$

C) $a_n = \left(-\frac{1}{2}\right)^{n-1}$

D) $a_n = -3 \cdot \left(\frac{1}{2}\right)^{n-1}$

Evaluate each infinite geometric series described.

53) $\sum_{m=1}^{\infty} 2 \cdot \left(\frac{1}{2}\right)^{m-1}$

A) 4

B) 1

C) No sum

D) 2

54) $\sum_{k=1}^{\infty} -25 \cdot \left(\frac{1}{5}\right)^{k-1}$

A) No sum

B) -125

C) -126

D) $-\frac{125}{4}$

Determine if each geometric series converges or diverges.

55) $\sum_{n=1}^{\infty} -3.4 \cdot 0.2^{n-1}$

A) Converges

B) Diverges

56) $\sum_{m=1}^{\infty} -4 \cdot 3^{m-1}$

A) Converges

B) Diverges

Evaluate each geometric series described.

57) $\sum_{i=1}^7 4^{i-1}$

A) 5461

B) 5102

C) $-\frac{1}{3}$

D) 4127

58) $\sum_{i=1}^9 \left(\frac{1}{3}\right)^{i-1}$

A) $\frac{9841}{6561}$

B) $\frac{9839}{6559}$

C) $\frac{9839}{6561}$

D) $\frac{3}{2}$

Find the probability.

59) A spinner has an equal chance of landing on each of its seven numbered regions. After spinning, it lands in region two or five.

A) $\frac{6}{11} \approx 0.545$

B) $\frac{9}{13} \approx 0.692$

C) $\frac{1}{4} = 0.25$

D) $\frac{2}{7} \approx 0.286$

60) You roll a fair six-sided die. The die shows a three or a six

A) $\frac{8}{9} \approx 0.889$

B) $\frac{10}{13} \approx 0.769$

C) $\frac{1}{3} \approx 0.333$

D) $\frac{3}{4} = 0.75$

61) A box of chocolates contains four milk chocolates and five dark chocolates. You randomly pick a chocolate and eat it. Then you randomly pick another piece. Both pieces are milk chocolate.

- A) $\frac{1}{6} \approx 0.167$ B) $\frac{1}{11} \approx 0.091$
 C) $\frac{10}{39} \approx 0.256$ D) $\frac{5}{39} \approx 0.128$

62) You flip a coin twice. The first flip lands heads-up and the second flip also lands heads-up.

- A) $\frac{10}{39} \approx 0.256$ B) $\frac{1}{4} = 0.25$
 C) $\frac{2}{9} \approx 0.222$ D) $\frac{28}{121} \approx 0.231$

Find the tenth term in each sequence.

63) $a_n = -0.5 \cdot (-2)^{n-1}$

- A) $a_{10} = 256$
 B) $a_{10} = 9841.5$
 C) $a_{10} = -9841.5$
 D) $a_{10} = 29524.5$

64) $a_n = n^2 - 3$

- A) $a_{10} = 97$ B) $a_{10} = 83$
 C) $a_{10} = 88$ D) $a_{10} = 75$

Write the explicit formula for each sequence.

65) 8, 108, 208, 308, 408, ...

- A) $a_n = -92 + 100n$
 B) $a_n = 8 + 100n$
 C) $a_n = 106 + 100n$
 D) $a_n = 6 + 100n$

66) 22, 27, 32, 37, 42, ...

- A) $a_n = 25 - 3n$
 B) $a_n = 16 + 6n$
 C) $a_n = 27 - 5n$
 D) $a_n = 17 + 5n$

Evaluate each series.

67) $\sum_{n=1}^{40} n^2$

- A) 23821 B) 22140
 C) 1601 D) 20540

68) $\sum_{k=1}^7 (30 - k)$

- A) 159 B) 204
 C) 182 D) 52

Rewrite each series using sigma notation.

69) $1 + 2 + 3 + 4$

- A) $\sum_{a=3}^5 a$ B) $\sum_{a=1}^4 \frac{6}{a}$
 C) $\sum_{a=1}^5 a$ D) $\sum_{a=1}^4 a$

70) $9 + \frac{9}{2} + 3 + \frac{9}{4} + \frac{9}{5} + \frac{3}{2}$

- A) $\sum_{k=1}^5 \frac{1}{3^k}$
 B) $\sum_{k=1}^6 (k + 200)$
 C) $\sum_{k=1}^6 (k + 500)$
 D) $\sum_{k=1}^6 \frac{9}{k}$

Answers to MC Final Review

1) D
5) B
9) D
13) B
17) B
21) C
25) D
29) A
33) C
37) A
41) C
45) A
49) C
53) A
57) A
61) A
65) A
69) D

2) D
6) A
10) D
14) D
18) A
22) A
26) B
30) C
34) B
38) C
42) A
46) B
50) B
54) D
58) A
62) B
66) D
70) D

3) B
7) C
11) D
15) A
19) B
23) B
27) A
31) B
35) C
39) D
43) A
47) B
51) B
55) A
59) D
63) A
67) B

4) C
8) C
12) D
16) C
20) D
24) A
28) C
32) B
36) B
40) A
44) B
48) D
52) B
56) B
60) C
64) A
68) C