These problems address topics from the NCEES FE Civil CBT Exam Specifications at https://ncees.org/wp-content/uploads/FE-Civil-CBT-specs-1.pdf, see below.

YouTube Playlist

FE Civil Review 2022

Mathematics and Statistics

NCEES Fundamentals of Engineering (FE)
CIVIL CBT Exam Specifications

Effective Beginning with the July 2020 Examinations

Knowledge	Number of Questions
1. Mathematics and Statistics	**8–12**

A. Analytic geometry
B. Single-variable calculus
C. Vector operations
D. Statistics (e.g., distributions, mean, mode, standard deviation, confidence interval, regression and curve fitting)

Updates
V1.0 published 1/24/2022
V1.01 minor formatting
V1.02 added question numbers
V1.03 minor updates per live session
V1.1 title sheet 3/29/2022

A. Analytic Geometry

Question 1: A line with a slope of 12/5 and passes through the point (5,3) also passes through all the following points except:

A. (-5, -21)

B. (-3, -16)

C. (10, 15)

D. (15, 27)

A. Analytic Geometry

Question 2: A circle with center (2,4) and a point on the circle of (5,8) can be described by which of the following equations:

A. $(x-4)^2+(y-2)^2=5$

B. $(x+2)^2+(y+4)^2=25$

C. $x(x-4)+y(y-8)=25$

D. $x(x-4)+y(y-8)=5$

A. Analytic Geometry

Question 3: The solution to the three linear equations shown is which of the following points in coordinate form:

$4x + 4y + z = -2$	Equation 1
$2x + y + z = 8$	Equation 2
$x + 2y + 2z = 4$	Equation 3

A. (4, -6, 6)

B. (2, 2, 4)

C. (2, -3, 4)

D. (-4, 6, -2)

A. Analytic Geometry

Question 4: The inverse of $y = 3^x$ can be written as which of the following:

A. $y = e^{3x}$

B. $y = 3 \log x$

C. $y = \log_3 x$

D. $y = \log_x 3$

A. Analytic Geometry

Question 5: The trigonometric expression below is equivalent to which of the following:

$\cos x + \sin x \tan x$

A. $\sec x$

B. $\cos x$

C. $\csc x$

D. $\sin x$

A. Analytic Geometry

Question 6: The value of $\cos x$ is not equivalent to which of the following when $x = \pi/2$ radians:

A. $\tan(2x)$

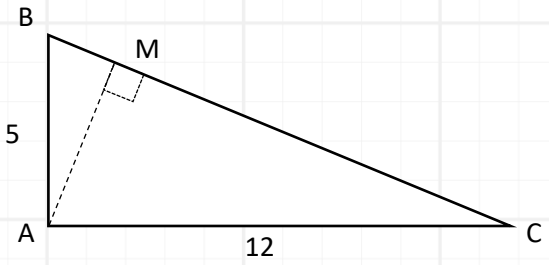
B. $\sec(2x) + 1$

C. $2\sin^2 x - 1$

D. $\csc(x) - 1$

A. Analytic Geometry

Question 7: In the right triangle below AM is perpendicular to BC. The ratio of AM:BM:CM is most nearly:



A. 12: 5: 13

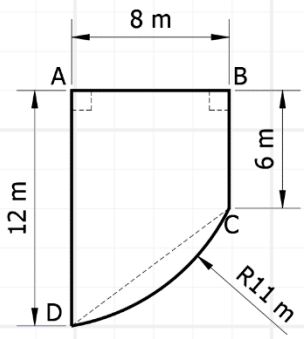
B. 60: 25: 144

C. 81: 36 :169

D. 90: 121: 169

A. Analytic Geometry

Question 8: The enclosed area ABCD shown below is most nearly:



A. 74 m^2

B. 76 m^2

C. 78 m^2

D. 80 m^2

B. Single-variable calculus

Question 9: The functions below define a parabola and line segment where the value b is unknown.

$f_1(x) = x^2 - 4x + 2$ Function 1

$f_2(x) = 2x + b$ Function 2

The value of b that will make the line tangent to the parabola is:

A. -7

B. -3

C. 1

D. 3

B. Single-variable calculus

Question 10: The derivative dy/dx of the following equation is equivalent to which of the following equations.

$y = \cos(2x)\, e^{4x}$

A. $-8\sin(2x)\, e^{4x}$

B. $8\sin(2x)\, e^{4x}$

C. $e^{4x}(4\cos(2x) - 2\sin(2x))$

D. $8e^{4x}(\cos(2x) - \sin(2x))$

B. Single-variable calculus

Question 11: The functions below intersect in two locations and create an enclosed area.

$f_1(x) = -x^2 + 4x + 1$ Function 1

$f_2(x) = x + 1$ Function 2

The area bounded by these two functions is most nearly:

A. 3.0 units^2

B. 4.5 units^2

C. 7.5 units^2

D. 10.5 units^2

B. Single-variable calculus

Question 12: The following integral is equivalent to which of the following equations.

$\int \sec^2 x - 1$

A. $\tan^2 x + C$

B. $\tan x - x + C$

C. $\tan\frac{x}{2} + x + C$

D. $\frac{\tan x}{2} - x + C$

C. Vector operations

Question 13: For vectors $\boldsymbol{A} = 5i + 4j - 3k$ and $\boldsymbol{B} = 2i - 3j + 4\text{k}$ the dot product $\boldsymbol{A} \cdot \boldsymbol{B}$ is:

A. $10i + 12j - 12k$

B. $10i - 12j - 12k$

C. 10

D. -14

C. Vector operations

Question 14: For vectors $\boldsymbol{A} = 5i + 4j - 3k$ and $\boldsymbol{B} = 2i - 3j + 4\text{k}$ the cross product $\boldsymbol{A} \times \boldsymbol{B}$ is:

A. $10i + 12j - 12k$

B. $25i - 14j - 23k$

C. $7i - 26j - 23k$

D. $7i + 26j - 23k$

C. Vector operations

Question 15: For vectors $\boldsymbol{A} = 5i + 4j - 3k$ and $\boldsymbol{B} = 2i - 3j + 4\text{k}$ the unit vector for the sum of $\boldsymbol{A} + \boldsymbol{B}$ is:

A. $10i + 12j - 12k$

B. $7i + j + k$

C. $0.78i + 0.11j + 0.11k$

D. $0.98i + 0.14j + 0.14k$

C. Vector operations

Question 16: Given vectors $\boldsymbol{A} = 2i + 4j$ and $\boldsymbol{B} = -i + 3j$, what is true about the vectors?

A. $\boldsymbol{A}$ is perpendicular to $\boldsymbol{B}$

B. $\boldsymbol{A}$ is parallel to $\boldsymbol{B}$

C. $\boldsymbol{A}$ is the same length as $\boldsymbol{B}$

D. $\boldsymbol{A}$ is at an angle of 45° to $\boldsymbol{B}$

D. Statistics

Question 17: A sample of 6 concrete cylinders were broken at 28 days to estimate the concrete's compressive strength. The test results in psi were: 3900, 4150, 4450, 4275, 4350 and 4250. The sample mean and standard deviation are most nearly:

A. 4,229 psi and 173 psi

B. 4,229 psi and 190 psi

C. 4,263 psi and 173 psi

D. 4,263 psi and 190 psi

D. Statistics

Question 18: A concrete mix design produces normally distributed concrete with a mean strength of 4,400 psi and standard deviation of 200 psi. The probability that a sample would be greater than 4,000 psi is most nearly:

A. 98%

B. 97%

C. 96%

D. 94%

D. Statistics

Question 19: The points below can be modeled using a best-fit linear regression model.

Point
(2, 2)
(4, 5)
(5, 12)
(8, 16)

The value estimated by the linear regression model for x = 10 is most nearly:

A. 20

B. 21

C. 22

D. 23

D. Statistics

Question 20: A bag contains three blue marbles and two red marbles. If a marble is selected five times out of the bag with replacement after each pick, the probability of obtaining at least four blue marbles is most nearly:

A. 19%

B. 21%

C. 25%

D. 34%