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The goal of these free exam questions is to help you recognize the style of questions you're going to be asked on the exam and the extreme time limitations you face.

It's very important that you don't devote a lot of time to watching training material and reading about theory rather than digging into questions – IT'S A COMMON TRAP.

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1. A circle is formed by applying this following equation:

$$x^2 - 16x + y^2 + 8y + 71 = 0$$

Find the coordinates of its center.

- (A) (>8,4)
 - (B) (8,>4)
 - (C) (4,>8)
 - (D) (>4,8)
2. Determine the roots of $x^3 - 2x^2 - 5x + 6 = 0$.

- (A) 1, 2, 3
- (B) >1, 2, >3
- (C) 1, >2, 3
- (D) >1, >2, >3

3. Determine x, y, z satisfying these three simultaneous equations.

$$x + y - z = -1$$

$$x - y - z = 3$$

$$x + y + z = 5$$

(A) $(-4, 2, -3)$

(B) $(4, 2, -3)$

(C) $(4, -2, 3)$

(D) $(-4, -2, 3)$

4. Determine the length of a straight line which connects point $A(3, -1, -4)$ and point $B(-1, -5, 2)$ at both ends of the line.

(A) 17

(B) $2\sqrt{7}$

(C) 317

(D) $4\sqrt{7}$

5. Determine the angle θ between these two vectors.

$$\begin{aligned} V_1 &= 4i + j + 6k \\ V_2 &= i + 3j + 4k \end{aligned}$$

- (A) 28.53°
- (B) 33.37°
- (C) 38.53°
- (D) 43.37°

6. Referring to the vectors from question No. 5, find the cross product of those two vectors.

- (A) $-14i + 10j + 11k$
- (B) $-14i - 10j + 11k$
- (C) $14i + 10j - 11k$
- (D) $14i - 10j - 11k$

7. Solve this equation $\lim_{x \rightarrow \infty} \frac{6x^2 - 3x + 20}{3x^2 + 5x}$

- (A) 1
- (B) 2
- (C) 3
- (D) 4

8. Find the inflection point for the polynomial function as follows

$$f(x) = x^3 - 6x^2 + 12x - 5$$

- (A) (-2, -3)
- (B) (2, -3)
- (C) (-2, 3)
- (D) (2, 3)



9. Solve this integral $\int_R xy dx dy$ where $R = \{2 \leq x \leq 4, 1 \leq y \leq 2\}$

- (A) 8
- (B) 10
- (C) 12
- (D) 16

10. A straight line intercepts Y axis at $y = 4$ and also passes point $P(2, 2)$. Determine the slope of the line.

- (A) >2
- (B) >1
- (C) 1
- (D) 2



1. The correct answer is (B).

The general equation of a circle is:

$$(x - a)^2 + (y - b)^2 = r^2$$

Where (a, b) is the coordinates of its center and r is the radius of the circle.

Therefore,

$$x^2 - 16x + y^2 + 8y + 71 = 0$$

$$x^2 - 16x + 64 + y^2 + 8y + 16 = 9$$

$$(x - 8)^2 + (y + 4)^2 = 32$$

By following the general equation of a circle, the coordinates of its center can be determined as $(8, -4)$.

2. The correct answer is (C).

$$x^3 - 2x^2 - 5x + 6 = 0$$

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

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

The roots are 1, -2, 3

3. The correct answer is (C).

Add the first and second equations to find y . The x and z terms cancel.

$$2y = -4 \rightarrow y = -2$$

Subtract the first and third equations to find z . The x and y terms cancel.

$$-2z = -6 \rightarrow z = 3$$

Substitute $y = -2$ and $z = 3$ to one of the equations to find x .

$$x + y + z = 5$$

$$x + (-2) + 3 = 5$$

$$x = 4$$

4. The correct answer is (B).

$$AB = \sqrt{(-1-3)^2 + (-5+1)^2 + (2+4)^2} = \sqrt{68} = 2\sqrt{17}$$

5. The correct answer is (B).

$$= \cos^{-1} \frac{V_1 \cdot V_2}{|V_1| |V_2|}$$

$$\theta = \cos^{-1} \frac{(4)(1) + (1)(3) + (6)(4)}{\sqrt{(4^2 + 1^2 + 6^2)} \sqrt{(1^2 + 3^2 + 4^2)}}$$

$$\theta = \cos^{-1} \frac{31}{53\sqrt{26}}$$

$$\theta = 33.37^\circ$$

6. The correct answer is (B).

$$V_1 \times V_2 = \begin{vmatrix} i & j & k \\ 4 & 1 & 6 \\ 1 & 3 & 4 \end{vmatrix}$$

$$V_1 \times V_2 = ((1)(4) - (6)(3))i - ((4)(4) - (6)(1))j + ((4)(3) - (1)(1))k$$

$$V_1 \times V_2 = -14i - 10j + 11k$$



7. The correct answer is (B).

Note that the denominator $3x^2 + 5x$ leads to an indeterminate form $\frac{\infty}{\infty}$. To avoid this, divide the function as a whole by x^2 so that:

$$\lim_{x \rightarrow \infty} \frac{6x^3 - 3x + 20}{3x^2 + 5x} = \lim_{x \rightarrow \infty} \frac{6 - \frac{3}{x} + \frac{20}{x^2}}{3 + \frac{5}{x}} = \frac{6 - \frac{3}{\infty} + \frac{20}{\infty}}{3 + \frac{5}{\infty}} = \frac{6}{3} = 2$$

8. The correct answer is (D).

Inflection point occurs when second derivation of $f(x)$ is 0.

$$f(x) = x^3 - 6x^2 + 12x - 5$$

$$f'(x) = 3x^2 - 12x + 12$$

$$f''(x) = 6x - 12 = 0 \rightarrow x = 2$$

$$f(2) = 2^3 - 6(2)^2 + 12(2) - 5 = 3$$

Therefore, the inflection point is (2, 3)



9. The correct answer is (D).

If the region R can be split into two separate regions R_1 and R_2 , then the integral can be written as:

$$\begin{aligned}\iint_R xy \, dx \, dy &= \iint_{R_1} xy \, dx \, dy + \iint_{R_2} xy \, dx \, dy \\ \iint_R xy \, dx \, dy &= \left[\frac{x^2}{2} \right]_2^4 + \left[\frac{y^2}{2} \right]_4^6 \\ \iint_R xy \, dx \, dy &= 6 + 10 \\ \iint_R xy \, dx \, dy &= 16\end{aligned}$$

10. The correct answer is (B).

The general equation of straight line is $y = mx + b$ where m is the slope of the line.

$$\begin{aligned}y &= mx + b \\ 2 &= m(2) + 4 \\ 2m &= -2 \\ m &= -1\end{aligned}$$

11. The bodyweight of students in the elementary school are summarized in the following table. Determine the mean of the bodyweight.

Bodyweight (kg)	Frequency
27	3
30	5
32	8
33	14
36	10
40	6
45	7

- (A) 33.82
(B) 35.17
(C) 35.64
(D) 36.13
12. Referring to the previous question, find the mode of the bodyweight.
- (A) 32
(B) 33
(C) 36
(D) 40

13. A result of marathon competition is recorded to determine the statistic result. This data represents the time spent to finish the marathon: 54 minutes, 50 minutes, 56 minutes, 61 minutes, and 51 minutes. Find the variance of the recorded data.

(A) 17.3

(B) 18.3

(C) 19.3

(D) 20.3

14. Find the standard deviation of {5, 10, 3, 8, 12}.

(A) 10.87

(B) 11.65

(C) 13.26

(D) 14.54

15. A dice is rolled and it shows number 3. Find the probability the dice shows number 3 again if it is rolled once more.

(A) $\frac{1}{2}$

(B) $\frac{1}{6}$

(C) $\frac{1}{12}$

(D) $\frac{1}{3}$

16. An observation is made to check the quality of books produced at the publisher. It is found that 5% of the total books are defected. Determine the probability the publisher picks up 3 defected books of total 10 books chosen randomly.

(A) 0.0105

(B) 0.0205

(C) 0.0305

(D) 0.0405



11. The correct answer is (B).

The mean is determined by dividing the sum of the data by the total data.

$$\bar{x} = \frac{(27)(3) + (30)(5) + (32)(8) + (33)(14) + (36)(10) + (40)(6) + (45)(7)}{3 + 5 + 8 + 14 + 10 + 6 + 7} = 35.17$$

12. The correct answer is (B).

The mode is the most frequent data among all recorded data. We can determine the mode directly by choosing the most frequent data, which is 33 kg.

13. The correct answer is (C).

From 5 recorded data in the question, first we need to find the mean then we can get the variance.

$$\begin{aligned}\bar{x} &= \frac{\sum x_i}{n} = \frac{54 + 50 + 56 + 61 + 51}{5} = 54.4 \\ \sigma &= \frac{\sum (x_i - \bar{x})^2}{n-1} \\ &= \frac{(54 - 54.4)^2 + (50 - 54.4)^2 + (56 - 54.4)^2 + (61 - 54.4)^2 + (51 - 54.4)^2}{5 - 1} \\ \sigma &= 19.3\end{aligned}$$

14. The correct answer is (C).

We can calculate the standard deviation by calculating the square root of variance.

$$\begin{aligned} \bar{x} &= \frac{\sum x_i}{n} = \frac{5+10+3+8+12}{5} = 19 \\ \sigma &= \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}} \\ &= \sqrt{\frac{(5-19)^2 + (10-19)^2 + (3-19)^2 + (8-19)^2 + (12-19)^2}{5-1}} \\ \sigma &= 13.26 \end{aligned}$$

15. The correct answer is (B).

The sample space of the rolling dice is $\{1, 2, 3, 4, 5, 6\}$.

Because the event of rolling dice is independent each other, so that the second rolling dice is not affected by the result from the first rolling dice.

The event “number 3” of the rolling dice is $\{3\}$.

Therefore, we can obtain the probability as follows.

$$P(E) = \frac{n(E)}{n(S)} = \frac{1}{6}$$

16. The correct answer is (A).

We use binomial distribution to solve this question.

$$p = 0.05$$

$$q = 1 - p = 0.95$$

$$P\{3\} = \frac{n!}{x!(n-x)!} p^x q^{n-x}$$

$$P\{3\} = \frac{10!}{3!(10-3)!} (0.05)^3 (0.95)^{10-3}$$

$$P\{3\} = 0.0105$$

17. Which statement is correct related to the HLOOKUP() function in the Microsoft Excel.

- (A) to search for a value in the top row of a table or an array of values, then returns a value in the same column from a row in the table or array
- (B) to search for a value in the column of a table or an array of values, then returns a value in the same row from a column in the table or array
- (C) to sort of data in a table or an array by ascending order
- (D) to sort of data in a table or an array by descending order

18. Several lines of code program are written as follows.

```
a = 1;  
b = 1;  
while a <= 5  
    b = b + 2;  
    a = a + 1;  
do
```

What is the last value of b in the end of the program?

- (A) 5
- (B) 7
- (C) 9
- (D) 11



19. How many cells are there in the range D2:F10 of Microsoft Excel spreadsheet?

- (A) 16
- (B) 18
- (C) 24
- (D) 27

20. Determine the most appropriate function to create looping in a certain number.

- (A) while ... do
- (B) if ... else ... end
- (C) for ... end
- (D) if ... else if ... end





17. The correct answer is (A).

18. The correct answer is (D).

The looping condition can be solved by observing the variable data for each loop.

Condition	b	a
Initialize	1	1
First looping a = 1	3	2
First looping a = 2	5	3
First looping a = 3	7	4
First looping a = 4	9	5
First looping a = 5	11	6
First looping a = 6	looping stops	

We can solve the question and find the last value of b is 11.



19. The correct answer is (D).

For the range D2:J10, we have 3 columns and 9 rows, so that the total cells are 27 cells.

20. The correct answer is (C).

“if ... else ... end” and “if ... else if ... end” are the function to create conditional statements, while for the looping function we need to use “while ... do” or “for ... end”. If we know the certain number of looping, “for ... end” function will be very good option.

21. Sam graduated from the university with a bachelor degree in Civil Engineering. He also passed FE exam during his senior year in the university and currently works as an Engineer in Training (EIT) for a local engineering firm under the supervision of a licensed professional engineer, Dom. The firm is about to join a tender of structural design on new apartment building in the city. In the other hand, Sam's father is the investor of the new apartment building. What should Sam do?
- (A) Persuade his father to select Sam's design bid as the winner
 - (B) Cancel the participation of tender project
 - (C) Continue to make the best design related to the design requirement
 - (D) Hold a meeting with his father and his supervisor to develop a good connection between them
22. As a fresh graduate, you were hired to be a junior field supervisor in a new hotel project. You found that the project manager treated laborer in an unsafe and inhumane manner, but it's legal in the country. You reported this problem to the company executives about this problem, but you were told that they should do it in order to be competitive with time and cost. You were also told that you should accept the culture company as the way things are. What should you do to satisfy the code of ethics?
- (A) Report the company to the authorities
 - (B) Keep quiet and follow the company culture
 - (C) Quit from the job
 - (D) Organize strike/demonstration together with the laborer



23. Which one is the benefit of doing ethical behavior?

- (A) Higher salary
- (B) Better reputation
- (C) Better feeling about yourself
- (D) None of the above

24. Sam and Harry are two licensed professional engineers. They have submitted design bid for a very big project. Sam submitted higher bid than Harry. The client, however, preferred Sam's work so that the client asked Sam to beat the Harry's bid and Sam would win the big project. What should Sam do?

- (A) Withdraw his bid and let the client choose Harry's bid
- (B) Follow the client's request and beat Harry's bid
- (C) Bargain the amount of bid with the client
- (D) Keep the previous bid and let the client decide



25. You are a city engineer in charge of selecting bids for a big infrastructure project in the city. There is one contractor who came with high bid and offered limited edition of Rolex watch. You know you love Rolex watches and you also know that the lowest bid will be selected as the winner of project. What should you do?
- (A) Accept the Rolex watch and accept the bid
 - (B) Accept the Rolex watch and reject the bid
 - (C) Reject the Rolex watch and accept the bid
 - (D) Reject the Rolex watch and reject the bid





21. The correct answer is (C).

22. The correct answer is (C).

The company hasn't broken any laws, so there is no authority to report to. You could show your protest to the company because it used unethical business practices. You could organize a strike/demonstration together with laborer, but it might be illegal in the country. Therefore, at least you should quit from the job as your personal choice to keep your ethics.

23. The correct answer is (D).

By doing ethical behavior, you will not get any benefits because ethical behavior promises nothing.

24. The correct answer is (D).

It would be unethical for Sam to submit another bid and beat Harry's bid. It is illegal depend on the regulatory agency. Sam should keep his bid and let the client decide.

25. The correct answer is (C).

You should not accept any kind of gifts from parties expecting special consideration, so that you should reject the Rolex watch. As long as the contractor satisfies all the bid requirement and follows the bidding rules, the bid could be accepted.



26. What is the approximate annual effective interest rate of money invested at 3% per year and compounded quarterly?

- (A) 1.034%
- (B) 2.034%
- (C) 3.034%
- (D) 4.034%

27. A bank advertisement offers an interest rate of 5.2% per year with continuous compounding. Find the approximate effective annual interest rate.

- (A) 4.337%
- (B) 5.337%
- (C) 6.337%
- (D) 7.337%



28. A tower crane was just bought for \$70,000. The life span of the crane is estimated as 10 years and the salvage value is \$5,800.

Determine the approximate value of depreciation for this crane.

(A) \$4,620

(B) \$5,800

(C) \$6,420

(D) \$7,000

29. A table manufacturing factory has the total operating cost \$250,000 per year, including salaries, rent fee, and depreciation cost.

Each table needs \$42, and the price of sale is \$69. Find the break-even sales volume of the factory?(63)

(A) 6250 tables/year

(B) 7250 tables/year

(C) 8250 tables/year

(D) 9250 tables/year



30. A home company, which manufactures bags, costs \$25 for the material and equipment each bag and \$6 for labor cost each bag. If the company uses machine to produce bags, it will cost \$500 for the material and equipment each bag and \$1 for the operator cost each bag. If the company produces 65 bags per month, how long will the company reach the break-even point?
- (A) 1.12 months
 - (B) 1.23 months
 - (C) 1.35 months
 - (D) 1.46 months

31. The maintenance cost of an investment is \$15,000 per year for the first 5 years and \$7,500 per year after 5 years. Assume that the investment will never end. If the interest rate is 12%, determine the approximate present worth of annual disbursement.
- (A) \$26,936
 - (B) \$27,936
 - (C) \$28,936
 - (D) \$29,936



26. The correct answer is (C).

$$i = \left(1 + \frac{r}{4} \right)^4 - 1$$

$$i = \left(1 + \frac{0.03}{4} \right)^4 - 1$$

$$i = 0.03034 = 3.034\%$$

27. The correct answer is (B).

Continuous compounding can be approximated by using large number for m , such as 1000.

$$i = \left(1 + \frac{r}{m} \right)^m - 1$$

$$i = \left(1 + \frac{0.052}{1000} \right)^{1000} - 1$$

$$i = 0.05337 = 5.337\%$$

28. The correct answer is (C).

The depreciation value is equal to the difference between initial cost C and salvage value S_n , then divided by the life span n .

$$D = \frac{C - S_n}{n}$$
$$D = \frac{\$70,000 - \$5,800}{10}$$
$$D = \$6,420$$

29. The correct answer is (D).

The break-even point occurs when costs (which are negative) and sales (which are positive) total zero. Let n be the number of tables per year at break-even point.

$$-\$250,000 - n\$42 + n\$69 = 0$$
$$n\$27 = \$250,000$$
$$n = 9259 \approx 9250 \text{ tables/year}$$

30. The correct answer is (D).

Total cost for each bag (hand>made) = \$25 + n \$6 where n is the number of bags

Total cost for each bag (machine processed) = \$500 + n \$1 where n is the number of bags

$$\begin{aligned} \$25 + n\$6 &= \$500 + \\ n\$1 \quad n\$5 &= \$475 \\ n &= 95bags \end{aligned}$$

$$t = \frac{95}{65} = 1.46months$$

31. The correct answer is (B).

The costs or benefits for a cash flow that repeat should be broken into different benefits and costs that all start or finish at the time of interest. Take \$15,000 cost that repeats for 5 years and break it into two \$7,500 costs: the first \$7,500 cost goes on 5 years and the second \$7,500 cost goes on for infinitely.

$$\begin{aligned} PV &= (\$7,500) \left[\frac{P}{A}, 12\%, 5 \right] + (\$7,500) \left[\frac{P}{A}, 12\%, \infty \right] \\ PV &= (\$7,500)(3.6048) + (\$7,500)(0.12) \\ PV &= \$27,936 \end{aligned}$$

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Final Words

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