Section 1 – Reading Comprehension

4 passages, 10 questions each, 40 questions total, 2600 words total

In each set:

1. 1 Making Inferences questions
2. 2 Finding Details questions
3. 1 Main Idea question
4. 1 Themes and Point of View question
5. 1 Supporting Arguments (Evidence) question
6. 1 Vocabulary Use in Context questions
7. 1 Analysis of Evidence (Quantitative) in relevant sets, replacing one Finding Details question
8. 1 Structure question
9. 2 Analogy Questions

4 passages:
- 1 philosophy / religion (Jonathan Edwards, 693 words)
- 1 natural science (with figure) (Vitali Sintchenko, 541 words)
- 1 literature (Charles Dickens, 729 words)
- 1 pair of historical / founding documents American (Dual Passage: Nietzsche, 347 words / John F. Kennedy, 311 words)

Verbal Instructions:

Read each passage and answer the corresponding questions. 10 questions will follow each of the 4 passages, for a total of 40 questions. Choose your answer based on the evidence given in the passage; no outside knowledge is required.

The final two questions in each passage will be analogy questions. Use your knowledge of the passage and the relationships demonstrated within it to arrive at your answer and complete each analogy.
Philosophy/Religion

This passage is adapted from Jonathan Edward’s “A Farewell Sermon,” given in 1750. Here, Jonathan Edwards speaks to the congregation at First Church in Northampton, MA, after he was voted out as the pastor.

Ministers, and the people that have been under their care, must be parted in this world, no matter how well they have been united. If they are not separated before, they must be parted by death, and they may be separated while life is continued. We live in a world of change, where nothing is certain or stable, and where a little time, a few revolutions of the sun, brings to pass strange things and surprising alterations in particular persons, families, towns, churches, countries, and nations.

It often happens that those who seem most united are, in a little time, most disunited, and at the greatest distance. Thus ministers and people, between whom there has been the greatest mutual regard and strictest union, may not only differ in their judgments and be alienated in affection, but one may rend from the other and all relation between them be dissolved. The minister may be removed to a distant place, and they may never have any more to do one with another in this world. But if it be so, there is one meeting more that they must have, and that is in the last great day of accounts.

Since I have been settled in the work of the ministry in this place, I have always had a peculiar concern for the souls of the young people, and a desire that religion might flourish among them. Because I knew the special opportunity they had beyond others and that ordinarily those for whom God intended mercy were brought to fear and love him in their youth. And it has ever appeared to me a peculiarly amiable thing to see young people walking in the ways of virtue and Christian piety, having their hearts purified and sweetened with a principle of divine love. How exceedingly beautiful and conducive to the adorning and happiness of the town if the young people could be persuaded, when they meet together, to converse as Christians and as the children of God, avoiding impurity, levity, and extravagance, keeping strictly to rules of virtue and conversing together of the things of God and Christ and heaven!

This is what I have longed for, and it has been exceedingly grievous to me when I have heard of vice, vanity, and disorder among our youth. And so far as I know my own heart, it was from hence that I formerly led this church to some measures, for the suppressing of vice among our young people, which gave so great offense, and by which I became so obnoxious. I have sought the good and not the hurt of our young people. I have desired their truest honor and happiness, and not their reproach: knowing that true virtue and religion tended not only to the glory and felicity of young people in another world, but their greatest peace and prosperity and highest dignity and honor in this world, and above all things to sweeten, and render pleasant and delightful, even the days of youth.
But whether I have loved you, and sought your good more or less, now committing your souls to him who once committed the pastoral care of them to me—nothing remains, but only (as I am now taking my leave of you) earnestly to beseech you, from love to yourselves, if you have none to me, not to despise and forget the warnings and counsels I have so often given you. Remember the day when you and I must meet again before the great Judge of quick and dead, when it will appear whether the things I have taught you were true, whether the counsels I have given you were good, whether I truly sought your welfare, and whether you have well improved my endeavors.

I have, from time to time, earnestly warned you against some liberties commonly taken by young people in the land. And whatever some may say in justification of such liberties and customs, and may laugh at warnings against them, I now leave you my parting testimony against such things, not doubting but God will approve and confirm it in that day when we shall meet before him.

1. Based on the passage, how does the author likely feel about leaving his post?

A) Melancholic and reflective  
B) Angry and resentful  
C) Relieved and content  
D) Gleeful and giddy

2. In Paragraph 2, Sentence 2, the word "strictest" most closely means

A) sternest.  
B) harshest.  
C) closest.  
D) narrowest.

3. Over the course of the passage, the author expresses a particular concern for

A) ministers who no longer have congregations.  
B) young people in the church.  
C) orphans and widows.  
D) souls that are facing judgment.

4. Which lines in the passage best support the answer to the previous question?

A) Paragraph 1, Sentence 1 ("Ministers . . . united")  
B) Paragraph 2, Sentence 3 ("The minister . . . world")  
C) Paragraph 3, Sentence 1 ("Since I . . . them")  
D) Paragraph 5, Sentence 1 ("But whether . . . you")
5. According to the passage, what is the author’s observation about young people’s compliance with divine law?

A) They sometimes but not always adhere to its standards.
B) They are less likely than both children and adults to comply.
C) They mock all who try to adhere to its standards of behavior.
D) They are eager to please and afraid to disappoint.

6. The author implies in the fourth paragraph that he

A) used to fall prey to both vice and vanity in his youth before turning to religion.
B) failed to institute the strict standards of behavior necessary to properly instruct the church’s youth.
C) wishes he could go back to his own youth in order to seek prosperity and happiness.
D) may have been removed from his post because of overzealous care and policing of young people in his community.

7. The author indicates that he believes that one day the “great Judge” will

A) condemn him and all other sinners.
B) confirm the wisdom of the author’s counsel.
C) pardon all souls who defied his laws.
D) testify against the author’s wayward congregation.

8. The passage can primarily be classified as which of the following?

A) A direct threat
B) An offering of advice
C) A circular argument
D) A personal anecdote

9. Virtue and religion : peace ::

A) loyalty : warrior
B) kindness : modesty
C) diligence : success
D) prayer : church

10. Separation : death ::

A) youth : liberties
B) commitment : minister
C) glory : dignity
D) disunity : change
Natural Science

This passage is adapted from Vitali Sintchenko’s “Salmonella Kentucky: stopping the spread of a new superbug,” first published in 2011.

Recent outbreaks of enterohaemorrhagic Escherichia coli (e-coli) in Germany and reports about the emergence of “new superbug” Salmonella Kentucky have re-focused public attention on foodborne diseases. However, both pathogens aren’t new and have been recognized as bio-threats for decades. Salmonella, for instance, is a well-known bacterial cause of foodborne disease with a significant impact on the population and health-care systems. But improvements in sanitation have drastically reduced the frequency of people in the industrialized world getting ill from bacteria. It has essentially been reduced to a condition travelers contract in countries where it occurs naturally.

In the last century, microbiologists have discovered hundreds of other types of Salmonella that can infect humans and some warm-blooded animals. They are especially widespread in areas with sub-standard farming practices and supplies of drinking water. These types of Salmonella have been responsible for acute gastroenteritis following the ingestion of contaminated water and undercooked meat or other animal products.

Salmonella enterica serotype Kentucky represents one of the non-typhoidal types of Salmonella that microbiologists and public health professionals encounter from time to time. In Australia, more than 12,000 cases of Salmonella infection were reported in 2010, but only five of them were related to Salmonella Kentucky. What makes Salmonella Kentucky stand out and explains its rather hyperbolic label of “new superbug” is that this pathogen has managed to develop resistance to some antibiotics, making it more difficult to treat. Of particular concern is the fact that many strains of this serotype circulating in countries in the Middle East and Africa display high-level resistance to ciprofloxacin, which is one of the drugs used for treatment of Salmonella disease.

The development and dissemination of its antimicrobial resistance is thought to be caused by the antibiotics used in animals farmed for food. Multinational surveillance has noted a recent increase in the frequency of the detection of drug-resistant Salmonella enterica serotype Kentucky and its potential for global spread. A recently published report suggested this drug-resistant type spread from Africa and the Middle East to Western Europe and Asia.

The global human health impact of non-typhoidal Salmonella infection could be as high as one hundred million illnesses and 155,000 deaths each year. Many cases of salmonellosis would be prevented if common outbreak sources could be rapidly identified to allow for earlier public health interventions. But changes in foodborne disease epidemiology have complicated recognition and investigation of outbreaks.
The most important contributors to the evolution of disease epidemiology are many. Socioeconomic changes because of booming Southeast Asian economies have affected food production, food supply, and food consumption habits, resulting in an increase in the number of foodborne diseases like Salmonella. Increased mobility of people and complex food production, processing, and distribution systems, as well as the plethora of retail fast-food outlets, mean we need more efficient and effective ways to identify sources of foodborne outbreaks.

Salmonella-related outbreaks are increasingly linked to a diverse range of food sources, but the mechanisms of contamination often remain poorly understood. Health, food, and agriculture authorities need to coordinate their efforts to monitor and limit the spread of the drug-resistant strains like Salmonella Kentucky. Increasing the timeliness of case follow-up and linking laboratory results to public health actions are critical for reducing delays in the investigation of outbreaks.


11. According to the passage, which of the following persons would be MOST likely to contract Salmonella?

A) A man traveling to a foreign country where Salmonella outbreaks are rare
B) A woman consuming an unfamiliar food at a restaurant in her hometown
C) A man visiting a family member who lives in a country where Salmonella is prevalent
D) A woman who lives in a village where a visitor recently contracted Salmonella

12. Which lines in the passage best support the answer to the previous question?

A) Paragraph 1, Sentence 1 ("Recent outbreaks . . . diseases")
B) Paragraph 1, Sentence 5 ("It has . . . naturally")
C) Paragraph 2, Sentence 1 ("In the . . . animals")
D) Paragraph 3, Sentence 2 ("In Australia . . . Kentucky")

13. According to the passage, Salmonella can cause

A) pneumonia.
B) antibiotic resistance.
C) typhoid.
D) acute gastroenteritis.

14. In Paragraph 3, Sentence 3, the word “hyperbolic” most closely means

A) exaggerated.
B) false.
C) spectacular.
D) pretentious.

15. Based on the final paragraph, the author likely views current efforts to cope with Salmonella outbreaks as

A) insufficient.
B) misguided.
C) overcautious.
D) admirable.

16. In relation to the third paragraph of the passage, the fourth paragraph

A) presents a counterargument to a claim made in the third paragraph.
B) provides an additional example of a phenomenon discussed in the third paragraph.
C) offers a potential explanation for a phenomenon discussed in the third paragraph.
D) discusses a new theory that would contradict the conclusion drawn in the third paragraph.

17. The primary purpose of the passage is most likely to

A) assure the public that Salmonella contamination is unlikely and overblown.
B) detail the risks of Salmonella exposure and the best ways to respond to outbreaks.
C) lay out a plan to reduce Salmonella outbreaks by a third in the next few decades.
D) suggest that researchers must turn their attention to superbugs instead of local Salmonella outbreaks.
18. According to the table, the number of outbreaks of Salmonella in the United States was greatest in which of the following locations?

A) Camp  
B) Fast-food restaurants  
C) Sit-down dining restaurants  
D) Private homes

19. Salmonella Kentucky : superbug ::

A) tree : flower  
B) pathogen : resistance  
C) e-coli : salmonella  
D) flood : natural disaster

20. ciprofloxacin : Salmonella ::

A) finches : beak size  
B) pollution : moths  
C) serotypes : disease  
D) fish : ocean
The letter Toby had received from Alderman Cute was addressed to a great man in the great district of the town. It must have been the greatest district of the town, because it was commonly called ‘the world’ by its inhabitants. The letter positively seemed heavier in Toby’s hand than another letter. Not because the Alderman had sealed it with a very large coat of arms and no end of wax, but because of the weighty name on the superscription and the ponderous amount of gold and silver with which it was associated.

‘How different from us!’ thought Toby, in all simplicity and earnestness, as he looked at the direction.

With the involuntary homage due to such an exalted character, Toby interposed a corner of his apron between the letter and his fingers.

It was a hard frost, that day. The air was bracing, crisp, and clear. The wintry sun, though powerless for warmth, looked brightly down upon the ice it was too weak to melt, and set a radiant glory there. At other times, Toby might have learned a poor man’s lesson from the wintry sun; but he was past that, now.

The Year was Old, that day. The patient Year had lived through the reproaches and misuses of its slanderers, and faithfully performed its work. Spring, summer, autumn, winter. It had labored through the destined round, and now laid down its weary head to die. Shut out from hope, high impulse, active happiness, itself, but active messenger of many joys to others, it made appeal in its decline to have its toiling days and patient hours remembered, and to die in peace. Toby might have read a poor man’s allegory in the fading year; but he was past that, now.

And only he? Or has the like appeal been ever made, by seventy years at once upon an English laborer’s head, and made in vain!

The streets were full of motion, and the shops were decked out gaily. The New Year, like an Infant Heir to the whole world, was waited for, with welcomes, presents, and rejoicings. There were books and toys for the New Year, glittering trinkets for the New Year, dresses for the New Year, schemes of fortune for the New Year, new inventions to beguile it. Its life was parcelled out in almanacs and pocket-books; the coming of its moons, and stars, and tides, was known beforehand to the moment; all the workings of its seasons in their days and nights, were calculated with as much precision as Mr. Filer could work sums in men and women.

The New Year, the New Year. Everywhere the New Year! The Old Year was already looked upon as dead; and its effects were selling cheap, like some drowned mariner’s aboardship. Its patterns were Last Year’s, and going at a sacrifice, before its breath was gone. Its treasures were mere dirt, beside the riches of its unborn successor!

Toby had no portion, to his thinking, in the New Year or the Old.

‘Put ’em down, Put ’em down! Facts and Figures, Facts and Figures! Good old Times, Good old Times! Put ’em down, Put ’em down!’—his trot went to that measure, and would fit itself to nothing else.
But, even that one, melancholy as it was, brought him, in due time, to the end of his journey. To the mansion of Sir Joseph Bowley, Member of Parliament.

The door was opened by a Porter. Such a Porter! Not of Toby’s order—quite another thing. His place was the ticket though; not Toby’s.

This Porter underwent some hard panting before he could speak; having breathed himself by coming incautiously out of his chair, without first taking time to think about it and compose his mind. When he had found his voice—which it took him a long time to do, for it was a long way off, and hidden under a load of meat—he said in a fat whisper,

‘Who’s it from?’

Toby told him.

‘You’re to take it in, yourself,’ said the Porter, pointing to a room at the end of a long passage, opening from the hall. ‘Everything goes straight in, on this day of the year. You’re not a bit too soon; for the carriage is at the door now, and they have only come to town for a couple of hours, a’ purpose.’

21. Based on the information in the passage, Toby likely views his duties with

A) industriousness and enthusiasm.
B) annoyance and frustration.
C) fear and anxiety.
D) amusement and exhilaration.

22. Toby most likely feels that the difference between himself and the recipient of the letter is due to

A) education.
B) wealth.
C) religion.
D) parenting.

23. In the first paragraph, the phrase “positively seemed heavier” is used to indicate that

A) the letter was thicker than most others.
B) the sender used too much wax for the seal.
C) the letter appeared extremely important to Toby.
D) the envelope was made of high quality gold paper.

24. The author uses which of the following devices when describing the year in the fifth paragraph?

A) Allegory
B) Personification
C) Simile
D) Onomatopoeia
25. Which of the following best describes the scenes that Toby encounters on his journey?

   A) A bleak winter wasteland with hardly any human activity  
   B) A busy city landscape coming to life in the budding springtime  
   C) Streets and shops bustling despite the intense cold  
   D) Stormy roads through which Toby can barely see

26. The passage indicates that the porter is out of breath because he

   A) is an elderly and ailing gentleman.  
   B) is frightened of Toby and the news that he brings.  
   C) rose too quickly to answer the door.  
   D) overextends himself and is always busy.

27. Over the course of the passage, Toby reveals that he views himself as

   A) decidedly separate from the world of Sir Joseph Bowley, including even his servants.  
   B) on par in status with the porter of Sir Joseph Bowley, though not the lord himself.  
   C) blissfully ignorant of any class distinctions that separate him from Sir Joseph Bowley.  
   D) superior in character if not in status to Sir Joseph Bowley, his porter, and his household.

28. Which lines in the passage provide the best evidence for the answer to the previous question?

   A) Paragraph 5, Sentence 4 (“It had . . . die”)  
   B) Paragraph 7, Sentence 1 (“The streets . . . gaily”)  
   C) Paragraph 11, Sentence 2 (“To the . . . Parliament”)  
   D) Paragraph 12, Sentence 3 (“Not of . . . thing”)

29. Winter : old age ::

   A) autumn : middle age  
   B) rebirth : spring  
   C) New Year : change  
   D) Summer : warmth

30. Important letter : Toby ::

   A) Trusted guard : prison  
   B) Large envelope : stamp
C) Postal worker: expedited delivery
D) Set of valuables: bank
**Historical/Founding Documents**

*Passage 1* is adapted from Helen Zimmern’s translation of *Beyond Good and Evil* by Friedrich Nietzsche, first published in 1886. *Passage 2* is adapted from John F. Kennedy’s commencement address at Yale University, given on June 11, 1962.

**Passage 1**

The Will to Truth, which is to tempt us to many a hazardous enterprise, what questions has this Will to Truth not laid before us! What strange, perplexing, questionable questions! Is it any wonder if we at last grow distrustful, lose patience, and turn impatiently away? That this Sphinx teaches us at last to ask questions ourselves? Who is it really that puts questions to us here? What really is this "Will to Truth" in us? Granted that we want the truth: Why not rather untruth? And uncertainty? Even ignorance?

Having kept a sharp eye on philosophers and having read between their lines long enough, I now say to myself that the greater part of conscious thinking must be counted among the instinctive functions, and it is so even in the case of philosophical thinking; one has here to learn anew, as one learned anew about heredity and "innateness." The greater part of the conscious thinking of a philosopher is secretly influenced by his instincts, and forced into definite channels. And behind all logic and its seeming sovereignty of movement, there are valuations, or to speak more plainly, physiological demands, for the maintenance of a definite mode of life.

The falseness of an opinion is not for us any objection to it: it is here, perhaps, that our new language sounds most strangely. The question is, how far an opinion is life-furthering, life-preserving, species-preserving, perhaps species-rearing, and we are fundamentally inclined to maintain that the falsest opinions (to which the synthetic judgments a priori belong), are the most indispensable to us. Without a recognition of logical fictions, without a comparison of reality with the purely imagined world of the absolute and immutable, without a constant counterfeiting of the world by means of numbers, man could not live—the renunciation of false opinions would be a renunciation of life, a negation of life. To recognize untruth as a condition of life; that is certainly to impugn the traditional ideas of value in a dangerous manner, and a philosophy which ventures to do so, has thereby alone placed itself beyond good and evil.

**Passage 2**

As every past generation has had to disenthrall itself from an inheritance of truisms and stereotypes, so in our time we must move on from the reassuring repetition of stale phrases to a new, difficult, but essential confrontation with reality. For the great enemy of truth is very often not the lie—deliberate, contrived and dishonest—but the myth: persistent, persuasive, and unrealistic. Too often we hold fast to the
clichés of our forebears. We subject all facts to a prefabricated set of interpretations. We enjoy the comfort of opinion without the discomfort of thought.

Mythology distracts us everywhere, in government as in business, in politics as in economics, in foreign affairs as in domestic affairs. But today I want to particularly consider the myth and reality in our national economy. In recent months many have come to feel, as I do, that the dialogue between the parties—between business and government, between the government and the public—is clogged by illusion and platitude and fails to reflect the true realities of contemporary American society.

I speak of these matters here because of the self-evident truth that a great university is always enlisted against the spread of illusion and on the side of reality. No one has said it more clearly than your President Griswold: “Liberal learning is both a safeguard against false ideas of freedom and a source of true ones.” Your role as university men, whatever your calling, will be to increase each new generation’s grasp of its duties.

There are three great areas of our domestic affairs in which, today, there is a danger that illusion may prevent effective action. They are, first, the question of the size and the shape of government’s responsibilities; second, the question of public fiscal policy; and third, the matter of confidence, business confidence, or public confidence, or simply confidence in America.

31. The author of Passage 1 argues that distinguishing between truth and untruth is

A) impractical, given that many untruths have a special utility in life.
B) imperative, since men are not able to achieve morality without wisdom.
C) inconceivable, as philosophy has proven the impossibility of discerning truth.
D) intolerable, as it leads men towards false conceptions of good and evil.

32. Which lines in Passage 1 best support the answer to the previous question?

A) Paragraph 1, Sentence 2 ("What strange . . . questions")
B) Paragraph 2, Sentence 2 ("The greater . . . channels")
C) Paragraph 2, Sentence 3 ("And behind . . . life")
D) Paragraph 3, Sentence 2 ("The question . . . us")

33. As used in Paragraph 2, Sentence 1, of Passage 1, “counted among” most closely means

A) written down before
B) considered part of
C) regarded as encompassing
D) esteemed greater than

34. Over the course of Passage 2, the author moves from a
A) vague to detailed history of an institution.
B) targeted to generalized argument about a concept.
C) narrow to broad analysis of subjects.
D) general to specific discussion of topics.

35. Which of the following does the author of Passage 2 identify as the enemy of truth?

A) Lies
B) Religion
C) Myth
D) Instinct

36. The author of Passage 2 most likely sees universities as

A) institutions that safeguard the nation's myths and stories of origin.
B) supporters of liberal learning that questions established truths.
C) allies in the fight to promote truth in the face of falsehood and myth.
D) advocates of the national duties and obligations of each man and woman.

37. Which of the following best describes the different ways that the authors of Passage 1 and 2 view truth?

A) The author of Passage 1 sees truth as a worthy, immortal pursuit, while the author of Passage 2 views truth as only one part of the larger process of myth-making.
B) The author of Passage 1 sees truth as ultimately less important than the function of opinions, while the author of Passage 2 views truth as something that must be defended against encroachments of myth and illusion.
C) The author of Passage 1 sees truth as something that can be distorted in pursuit of a particular purpose, while the author of Passage 2 views truth as something that informs purpose.
D) The author of Passage 1 sees truth as a safeguard against the spread of illusion, while the author of Passage 2 sees truth as part of the instinctive functions within men and women.

38. How might the author of Passage 1 respond to the author of Passage 2's claim that "mythology distracts us everywhere, in government as in business, in politics as in economics, in foreign affairs as in domestic affairs?"

A) Mythology could be beneficial so long as it contributes to the general welfare and preservation of the human species.
B) Mythology is just another side of truth, and so should be championed rather than battled against.
C) Business, politics, and economics are so far removed from the realm of truth that it is pointless to engage with them.
D) Distractions from truth are inevitable, but universities and wise teachers can help center thought on national policies.

39. logic : instinct ::

A) hatred : fear
B) happiness : joy
C) truth : myth
D) error : philosophy

40. Stereotypes : university ::

A) education : mythology
B) reality : illusion
C) disease : immunologists
D) lawyers : teachers
Section 2 – Writing

4 passages, 10 questions each, 40 questions total, about 600 words each (total ~2400 words)

In each set:

- 5 Grammar
- 5 Writing and Arguments
  - Transitions
  - Conciseness/Clarity
  - Matching the Tone of a Passage
  - Insertion/Evidence
  - Word Choice

2 difficulty ratings each of 1, 2, 3, 4, 5

In the set:

- 1 philosophy / religion (William James, 547 words)
- 1 historical profile (T.S. Eliot and Pascal, 678 words)
- 1 natural science (Gareth J. Fraser, 567 words)
- 1 modern influential thinkers / issues (Robert Mueller, 610 words)

Verbal Instructions

Read each of the 4 passages in this section and answer the corresponding questions (40 total). Each question will ask you to either correct an error or suggest an improvement in the passage. If no change is necessary, select the option "NO CHANGE."

Note: Most questions correspond to a numbered portion of the passage. In these questions, answer choices represent alternatives that could be substituted for the numbered portion. Select the best answer choice out of the given options.
Philosophy/Religion

This passage is adapted from William James’ The Varieties of Religious Experience, first published in 1902.

Were one asked to characterize the life of religion in the broadest and most general terms possible, [41] you might say that it consists of the belief that there is an unseen order and that our supreme good lies in harmoniously adjusting ourselves thereto. This belief and this adjustment are the religious attitude in the soul. I wish during this hour to call your attention to some of the psychological peculiarities of such an attitude as this, of belief in an object that we cannot see. All our [42] attitudes—moral, practical, emotional, or religious, are due to the ‘objects’ of our consciousness, the things that we believe to exist, whether really or [43] ideally, along with ourselves.

Such objects may be present to our senses, or they may be present only to our thought. In either case, they elicit from us a reaction, and the reaction due to things of thought is notoriously in many cases as strong as that due to sensible presences. It may be even stronger. The memory of an insult may [44] dissipate over time. We are frequently more ashamed of our blunders afterwards than we were at the moment of making them, and in general our whole higher prudential and moral life is based on the fact that material sensations actually present may have a weaker influence on our action than ideas of remoter facts.

The more concrete objects of most men’s religion, the deities whom they worship, are known to them only in idea. It has been vouchsafed, [45] however, to very few Christian believers to have had a sensible vision of their Saviour, though enough appearances of this sort are on record, by way of miraculous exception, to merit our attention later. The whole force of the Christian religion, therefore, so far as belief in the divine personages determines the prevalent attitude of the believer, is in general exerted by the instrumentality of pure ideas, of which nothing in the [46] individuals’ past experience directly serves as a model.

But in addition to these ideas of the more concrete religious objects, religion is full of abstract objects that [47] proven to have an equal power. God’s attributes as such, His holiness, His justice, His mercy, His absoluteness, His infinity, His omniscience, His tri-unity, the various mysteries of the redemptive process, the operation of the sacraments, etc., have proved fertile wells of inspiring meditation for Christian believers. We shall see later that the absence of definite sensible images is positively insisted on by the mystical authorities in all religions as the sine qua non of a successful orison or contemplation of the higher divine truths. Such contemplations are expected to [48] make people behave.

This absolute determinability of our mind by abstractions [49] is one of the cardinal facts in our human constitution. Polarizing and magnetizing us as they do, we turn towards them and from them, [50] making turns around them as though they were
concrete beings to turn around. And beings they are, beings as real in the realm which they inhabit as the changing things of sense are in the realm of space.

41.

A) NO CHANGE
B) they
C) one
D) we

42.

A) NO CHANGE
B) attitudes—moral, practical, emotional, or religious—are
C) attitudes—moral practical emotional or religious—are
D) attitudes: moral, practical, emotional, or religious—are

43. If the author is trying to set up a contrast here, which of the following words best completes this phrase?

A) NO CHANGE
B) practically
C) honestly
D) verily

44. Which of the following examples would best complete the sentence?

A) NO CHANGE
B) make us angrier than the insult did when we received it.
C) prompt us to strong retaliatory action.
D) be distorted by later events that color our thoughts.

45.

A) NO CHANGE
B) instead
C) meanwhile
D) for example

46.

A) NO CHANGE
B) individually
C) individuals
D) individual's
47.

A) NO CHANGE
B) prove
C) proof
D) will have proved

48.

A) NO CHANGE
B) make people’s attitudes way better than they were before.
C) do a lot of good.
D) influence the believer’s subsequent attitude very powerfully for good.

49.

A) NO CHANGE
B) are
C) were
D) have been

50.

A) NO CHANGE
B) as if they were concrete beings, existing concretely.
C) just as if they were so many concrete beings.
D) considering they may be concrete beings to turn towards and away from.
Historical Profile

This passage is adapted from T.S. Eliot's introduction to Pascal's Pensées, first published in 1958.

It might seem that about Blaise Pascal, and about the two works on which his fame is founded, everything that there is to say had been said. The details of his life are as full known as we can expect to know them; his mathematical and physical discoveries have been treated many times; his religious sentiment and his theological views have been discussed again and again; and his prose style has been analyzed by French critics down to the finest particular. But Pascal is one of those writers who will be and who must be studied afresh by both scholars and statesmen. It is not he who changes, but we who changing. It is not our knowledge of him that increases, but our world and our attitudes towards it that alter. The history of human opinions of Pascal and of men of his stature is a part of the history of humanity. That indicates his permanent importance.

The facts of Pascal's life, so far as they are necessary for this brief introduction to the Pensées, are as follows. He was born at Clermont, in Auvergne, in 1623. His family were people of substance of the upper middle class. Their favorite place to vacation was to a town about thirty miles north. His father was a government official, who was able to leave, when he died, a sufficient patrimony to his one son and his two daughters. In 1631 the father moved to Paris, and a few years later took up another government post at Rouen. Whenever he lived, the elder Pascal seems to have mingled with some of the best society, and with men of eminence in science and the arts.

Blaise was educated entirely by his father in home. He was exceedingly precocious, indeed excessively precocious, for his application to studies in childhood and adolescence impaired his health and is held responsible for his death at thirty-nine. His mind was active rather than accumulative; he showed from his earliest years that disposition to find things out for himself, which has circumvented the infancy of Clerk-Maxwell and other scientists. Of his later discoveries in physics there is no need for mention here; it must only be remembered that he counts as one of the greatest physicists and mathematicians of all time and that his discoveries were made during the years when most scientists are still apprentices.

He appears to have led such a life as any cultivated intellectual man of good position and independent means might lead and consider himself a model of probity and virtue. He is said not even to have had one love affair, even though he did contemplate marriage, and decided against it ultimately. But Jansenism, as represented by the religious society of Port-Royal, was morally a Puritan movement within the Church, and its standards of conduct were at least as severe as those of any Puritanism in England or America. The period of fashionable society in Pascal's life is, however, of great importance in his development. It enlarged his knowledge of men and refined his tastes; he became a man of the world and never lost what he
had learnt, and when he turned his thoughts wholly towards religion, his worldly
knowledge was a part of his composition which is essential to the value of his work.

Pascal’s interest in society did not distract him from scientific research, nor did this
period occupy much space in what is [60] a speedy and action-packed time on earth.
Partly his natural dissatisfaction with such a life, once he had learned all it had to
teach him, partly the influence of his saintly sister Jacqueline, partly increasing
suffering as his health declined, directed him more and more out of the world and to
thoughts of eternity. I can think of no Christian writer, not Newman even, more to be
commended than Pascal to those who doubt, but who have the mind to conceive,
and the sensibility to feel, the disorder, the futility, the meaninglessness, the
mystery of life and suffering, and who can only find peace through a satisfaction of
the whole being.

51.

   A) NO CHANGE
   B) fully known
   C) full knowingly
   D) fuller known

52.

   A) NO CHANGE
   B) students of philosophy
   C) women and men alike
   D) men of every generation

53.

   A) NO CHANGE
   B) change
   C) changed
   D) have changed

54. The writer is considering deleting the underlined portion. Should the writer go
through with this deletion?

   A) Yes, because the sentence interrupts the flow of the paragraph and provides
      an irrelevant detail.
   B) Yes, because the sentence does not humanize Pascal the way that the rest of
      the paragraph does.
   C) No, because the sentence provides key information about Pascal’s family that
      is relevant to the paragraph.
   D) No, because the sentence summarizes the main idea about the paragraph on
      Pascal’s upbringing.
55.

A) NO CHANGE
B) Whomever
C) Wherever
D) Whatever

56.

A) NO CHANGE
B) by
C) for
D) at

57.

A) NO CHANGE
B) characterized
C) corrected
D) cloistered

58.

A) NO CHANGE
B) here. So it
C) here it;
D) here it

59.

A) NO CHANGE
B) Not even a love-affair is laid at his door, though he is said to have contemplated marriage.
C) Love affairs he contemplated, marriage he contemplated, but he did not have even one love affair, and did not end up marrying after all.
D) He contemplated love and marriage.

60.

A) NO CHANGE
B) a very short and crowded life
C) a quick, fast-paced, fast-living lifestyle
D) a life that was short and a life that was brief
Natural Science

This passage is adapted from Gareth J. Fraser’s “How sharks could help us regrow our own human teeth,” first published in 2016.

Sharks are the ultimate predators of the aquatic realm thanks to one character in particular: teeth. Not only are shark’s teeth razor sharp, but they are also constantly regrown throughout life. This is way different than humans, who only develop two sets of teeth in their lives (milk and adult). But with modern medicine greatly extending our lives and our diets growing much more abrasive and acidic, these two sets are often not enough, and many people need intravenous ceramic implants or impractical dentures. So what if we could find out the genetic basis for sharks’ ability to regrow their teeth and use it to develop novel methods of growing new, natural teeth in humans?

My colleagues and I recently studied the key genes involved in tooth regeneration in a small species of shark known as the catshark (*Scyliorhinus canicula*). Its eggs can easily be collected, and the embryos inside can be raised to show us the precise set of developmental stages that tooth formation and regeneration goes through. We found that within the epithelial cells that line sharks’ mouths, there are special compartments of stem cells that are key to the their continuous tooth regrowth. We analyzed the stem cell compartments in sharks’ mouths and deciphered all the active genes involved in shark tooth development and regeneration.

All vertebrate teeth, from sharks to mammals, are incredibly similar. For one thing: their structure is always composed of a hard mineral tissue known as dentine that is covered with even harder enamel or a similar material. But we have also found that the genes that control the process of tooth development are also very similar. This is important so it suggests that the key genetic information that we discover in sharks could be crucial to understanding how tooth regeneration works and how that process is prevented in humans.

The next phase of the research is to compare the shark tooth genetic signature to the human one to find out if sharks have some genes that are inactive in humans. That might offer clues to the mechanism of our lost regenerative ability and help us work out whether we can regain a way to start forming new teeth within the mouth using stem cells. We’ve now started a new study to compare human oral tissues that may still retain some ability to regenerate teeth. Specifically, we are comparing active and highly regenerative shark dental stem cells to intriguing cell clusters retained in the adult human jaw, that could be the target of a treatment to grow new teeth.

These are early stages of the research, and many labs around the world are focused on various ways to develop new human teeth. But the idea is that if we already retain cells with future regenerative potential, we might be able to culture...
our own sources of "stem-like" cells to start the process of early tooth development. We could then implant them into toothless regions of the jaw when new teeth are needed. Of course, many experiments and trials would need to be performed before we get to this stage. Thus, understanding sharks’ continuous regrowth could provide vital clues for the production of new teeth for humans.

61. Which of the following would NOT properly punctuate the underlined phrase?

A) NO CHANGE
B) particular, teeth
C) particular—teeth
D) particular; teeth

62.

A) NO CHANGE
B) This is in stark contrast to humans
C) This is a peculiar and intriguing difference when compared to humans
D) This is totally separate from humans

63.

A) NO CHANGE
B) incredible
C) invasive
D) introverted

64. The writer is considering inserting the following sentence here:

Without these stem cells, the sharks would suffer like humans with only a restricted set of teeth, which would in turn affect their success as hunters at the top of the food chain.

Should the writer make this insertion?

A) Yes, because it shows why humans have fewer teeth than sharks.
B) Yes, because it explains the importance of these stem cells in sharks.
C) No, because it provides unnecessary details about tooth development.
D) No, because it puts too much focus on stem cells rather than teeth.

65.

A) NO CHANGE
B) sharks
C) shark’s
D) shark
66.

A) NO CHANGE  
B) For one thing, they're  
C) For one thing, their  
D) For one thing they're

67.

A) NO CHANGE  
B) but  
C) even though  
D) because

68.

A) NO CHANGE  
B) have  
C) will  
D) must

69.

A) NO CHANGE  
B) human jaw that  
C) human jaw; that  
D) human jaw. That

70.

A) NO CHANGE  
B) research, many  
C) research—so many  
D) research, and many
Modern/Influential Thinkers

This passage is adapted from a speech given by Robert Mueller at the RSA Cyber Security Conference on March 1, 2012, in San Francisco, CA.

Technology has become pervasive as a target, and it has also been used as a means of attack. But with [71] interior thinking and fast action, we can stop those who have hijacked cyberspace for their own ends.

Traditional crime—from mortgage and health care fraud [72] to child exploitation—has migrated online. Terrorists use the Internet as a recruiting tool, a moneymaker, a training ground, and a virtual town square, all in one. At the same time, we [73] confronted hacktivists, organized criminal syndicates, hostile foreign nations that seek our state secrets and our trade secrets, and mercenaries willing to hack for the right price.

Just as traditional crime has migrated online, so, too, has espionage. Hostile foreign nations seek our intellectual property and our trade secrets for military and competitive advantage. [74] Stately-sponsored hackers are patient and calculating. They have the time, the money, and the resources to burrow in and to wait. They may come and go, conducting reconnaissance and exfiltrating bits of seemingly innocuous information—information that in the aggregate [75] may be super important. You may discover one breach, only to find that the real damage has been done at a much higher level.

[76] Including state-sponsored intruders, hackers for profit do not seek information for political power. Instead, they seek information for sale to the highest bidder. These once-isolated hackers have joined forces to create criminal syndicates. Organized crime in cyber space offers a higher profit with a lower probability of being identified and prosecuted. Unlike traditional crime families, these hackers may never meet, but they possess specialized skills in high demand. They exploit routine vulnerabilities. They move in [77] quick, make their money, and disappear. No company is immune, from the Fortune 500 corporation to [78] the neighborhood "mom and pop" business.

The end result of these developments is that we are losing data. We are losing money. We are losing ideas and we are losing innovation. And as citizens, we are increasingly vulnerable to losing our information. Together we must find a way to stop the bleeding. Borders and boundaries pose no obstacles for hackers. But they continue to pose obstacles for global law enforcement, with conflicting laws, different priorities, and diverse criminal justice systems. With each passing day, the need for a collective approach—for true collaboration and timely information sharing—becomes more pressing.

Several months ago, I read William Powers' book, *Hamlet's Blackberry*, about the impact of technology on civilization. In one chapter, he wrote about the Roman
philosopher Seneca. In the days of the Roman Empire, connectivity was on the rise—new roads, new ways of communicating, and a new postal system to handle the influx of written documents. Postal deliveries were the high point of the day. People coming from every direction would converge at the port to meet the delivery boats arriving from Egypt. Today we have the so-called "BlackBerry Jam," where several individuals—heads down, shoulders slumped, all furiously typing, talking, reading, or browsing at once—come to a head on a crowded corner. All those years ago, Seneca argued that the more connected society becomes, the greater the chance that the individual will become a slave to that connectivity. Today, one could argue that the more connected we become, the greater the risk to all of us.

We cannot turn back the clock. We cannot undo the impact of technology. Nor would we want to. But we must continue to build our collective capabilities to fight the cyber threat. We must share information. We must work together to safeguard our property, our privacy, our ideas, and our innovation. We must use our connectivity to stop everyone who seek to do us harm.

71.

A) NO CHANGE
B) intriguing
C) innovative
D) inculpable

72.

A) NO CHANGE
B) and
C) including
D) or

73.

A) NO CHANGE
B) confront hacktivists, organized criminal syndicates, hostile foreign nations that seek our state secrets and our trade secrets, and mercenaries willing to hack for the right price.
C) confront hacktivists, criminal syndicates, hostile foreign nations that seek our state secrets and our trade secrets, mercenaries willing to hack for the right price.
D) confront hacktivists and criminal syndicates and are hostile to foreign nations that seek our state and trade secrets as well as mercenaries willing to hack for the right price.
74.  
A) NO CHANGE  
B) Stately sponsored  
C) State-sponsored  
D) State sponsored

75.  
A) NO CHANGE  
B) may be of high value  
C) may be of worthy, admirable significance  
D) may be good to find out

76.  
A) NO CHANGE  
B) Barring  
C) In addition to  
D) Unlike

77.  
A) NO CHANGE  
B) quickly  
C) quicker  
D) quickened

78. Which choice would complete the sentence with the appropriate example?  
A) NO CHANGE  
B) the CEO running it.  
C) the multimillion dollar corporation.  
D) the global economy.

79. The writer wants to combine the two underlined sentences. Which choice best accomplishes this?  
A) Postal deliveries were the high point of the day; people coming from every direction would converge at the port to meet the delivery boats arriving from Egypt.  
B) Postal deliveries were the high point, and people would converge to deliver goods to boats arriving from Egypt.  
C) Postal deliveries were the high point of the day—and so people coming from every direction and every possible place would converge at the port to welcome and meet the delivery boats arriving from places like Egypt.
D) The high point of the day was postal deliveries, when people would come from all over to meet boats.

80.

A) NO CHANGE
B) them
C) the hacker
D) those
You will not need a calculator for the math portion of this exam. Keep in mind that accompanying figures are NOT necessarily drawn to scale.

You may use any of the following formulas to help you in your calculations.

Area of a circle = \( \pi r^2 \), where \( r \) is the radius of the circle

Circumference of a circle = \( 2\pi r \), where \( r \) is the radius of the circle

There are 360 degrees in a circle.

There are \( 2\pi \) radians in a circle.

Volume of a sphere = \( \frac{4}{3}\pi r^3 \), where \( r \) is the radius of the sphere

Surface area of a sphere = \( 4\pi r^2 \), where \( r \) is the radius of the sphere

Area of a rectangle = length \times width

Area of a triangle = \( \frac{1}{2} \) (base \times height)

The sum of the measures of the interior angles of a triangle is \( 180^\circ \).

Pythagorean theorem (for a right triangle): If \( a \), \( b \), and \( c \) are the side lengths of the triangle, and \( c \) is the hypotenuse, then \( a^2 + b^2 = c^2 \).

Trigonometry:

\[
\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}
\]

\[
\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}
\]

\[
\tan \theta = \frac{\text{opposite}}{\text{adjacent}}
\]

\[
csc \theta = \frac{1}{\sin \theta}
\]

\[
\sec \theta = \frac{1}{\cos \theta}
\]

\[
cot \theta = \frac{1}{\tan \theta}
\]

\[
\tan \theta = \frac{\sin \theta}{\cos \theta}
\]

\[
\sin^2 \theta + \cos^2 \theta = 1
\]
81. A right triangle has a hypotenuse measuring 26 units and one leg measuring 10 units. What is the length of its other leg, in units?

A. 10  
B. 16  
C. 20  
D. 24

82. A mother buys two types of shirts for her son: red shirts and blue shirts. Before she goes shopping, the ratio of red to blue shirts in the son’s closet is 11: 14. She buys 2 new red shirts and 4 new blue shirts. When she adds these to her son’s closet, what is the new ratio of red to blue shirts?

A. 3: 4  
B. 11: 14  
C. 13: 18  
D. It is impossible to determine from the given information.

83. How many numbers between 1 and 100 (inclusive) meet both of the conditions given in the statements below?

Statement 1: The number has factors of 5 and 10.
Statement 2: The number is divisible by 4.

A. 5  
B. 10  
C. 20  
D. 25

84. What are the solutions of the equation $0 = 3x^2 + 2x - 8$?

A. $-\frac{4}{3}$ and 2  
B. $\frac{4}{3}$ and $-2$  
C. $-\frac{1}{3}$ and 8  
D. $\frac{1}{3}$ and $-8$
85. Line $Q$ is perpendicular to $y = -2x + 6$ and contains the point $(4, 3)$. What is the $x$-intercept of Line $Q$?

A. $(-2, 0)$  
B. $(1, 0)$  
C. $(2, 0)$  
D. $(3, 0)$

86. For a triangle with two angles measuring $45^\circ$, which of the following must be false?

A. It is a right triangle.  
B. Two legs of the triangle are equal in length.  
C. The hypotenuse of the triangle is longer than its two sides.  
D. All three angles in the triangle are acute.

87. If $p \boxdot q = \frac{p^3}{q} + 5$, then which of the following is equivalent to $3 \boxdot 9$?

A. 3  
B. 6  
C. 8  
D. 248

88. If $w$ is an even integer, then which of the following is odd?

A. $25w$  
B. $w^3$  
C. $w^5 - 1$  
D. $3w^2 + 8$

89. Which of the following is equivalent to $|3x - 5| > 7$?

A. $x = 4$  
B. $x > 4$ or $x < \frac{-2}{3}$  
C. $x > \frac{2}{3}$ or $x < -4$  
D. $\frac{-2}{3} < x < 4$

90. A flower shop always chooses a different type of flower at random to feature in its front display case. The shop sells 22 different types of flowers in total,
including roses. If the store is out of stock of sunflowers and orchids, then what is the chance that the shop will feature roses in the display case that day?

A. 1%
B. 4.5%
C. 5%
D. 20%

91. Which points satisfy both of the following equations?

\[ y = 2x - 5 \]
\[ y = x^2 - 13 \]

A. (−4, 3) and (2, −9)
B. (4, 3) and (−2, −9)
C. (6, 7) and (3, 1)
D. (9, 13) and (2, −1)

92. Which of the following lines has the greatest slope?

A. A line with a y-intercept of 1 that passes through (2, 3)
B. A line that passes through the points (0, −5) and (1, −2)
C. A line with an x-intercept of −1 that passes through (3, 20)
D. A line with an x-intercept of −2 and a y-intercept of 8

93. A hotel offers two different specials packages. Package A offers rooms at a rate of $75/night for up to 5 nights and a weekly spa pass for an additional $55. Passage B offers rooms at a rate of $49 for the first two nights and $85 for every additional night after, but no discount on the weekly spa pass, which costs $105. If Jenna decides to stay at the hotel for 4 nights and purchase a weekly spa pass, which package will cost less?

A. Package A
B. Package B
C. Both packages cost the same.
D. It is impossible to determine from the given information.

94. What is the value of \(2\cos \frac{\pi}{2} + \sin \frac{\pi}{2}\)?
95. An astronomer is measuring the orbits of asteroids Osiris and Bennu around a planet. The ratio of the length of the orbit of asteroid Osiris to the length of the orbit of asteroid Bennu is 13: 4. The orbit of asteroid Osiris is 247 days. If the orbit of a third asteroid, Sobek, is 75% less than the orbit of Bennu, then how many days long is the orbit of Sobek, in days?

A. 4
B. 19
C. 57
D. 76

96. A point $(4, −3)$ is flipped across the $x$-axis. If this new point is on a line with the point $(2, 1)$, then what is the equation of that line?

A. $y = \frac{2}{3}x - \frac{1}{3}$
B. $y = -\frac{1}{3}x + \frac{5}{3}$
C. $y = x - 1$
D. $y = -2x + 5$

97. If $2x = \frac{5}{y}$, then which of the following is equivalent to the expression $2x^2$?

A. $\frac{25}{y^2}$
B. $\frac{25}{2y^2}$
C. $\frac{25}{4y^2}$
D. $\frac{50}{y^2}$

98. A circle in the $(x, y)$ coordinate plane is given by the equation $(x − 5)^2 + y^2 = 49$. What is the area of the circle, in units?

A. $14\pi$
99. A regular hexagon has one side that measures 6 inches. What is the area of the hexagon?

A. $3\sqrt{27}$ in.$^2$
B. 54 in.$^2$
C. $54\sqrt{3}$ in.$^2$
D. It cannot be determined from the given information.

100. If $y^3 = x^2 = z$, then which of the following is equivalent to the expression $\frac{12x^5z^2y^{16}}{6y^4x}$?

A. $2z^8$
B. $2x^{16}$
C. $2yz^6$
D. $2x^5y^4z^2$

101. A chemist is studying the density of four different gases. If Gas X and Gas Y are each less dense than Gas Z, and Gas Y is more dense than Gas W, then which of the following must be true?

I. Gas X is more dense than Gas W.
II. Gas W is less dense than Gas Z.
III. Gas X is less dense than Gas Y.

A. I only
B. II only
C. I and II only
D. I, II, and III

102. A sports equipment company needs to package baseballs into boxes for shipments to outlet stores. If each baseball has a radius of 1.5 inches, and the baseballs are perfect spheres, then how many baseballs would be able to fit into a cubic box with one side measuring 24 inches? Assume that each layer of baseballs has the same number of balls as the layer beneath it.
103. In the diagram below, triangle $XYZ$ is isosceles, with $\overline{XY} \cong \overline{YZ}$. If $\angle Z$ measures $35^\circ$, then what is the measure of $\angle WYZ$ if $\overline{YW}$ and $\overline{ZX}$ are parallel?

A. $35^\circ$
B. $55^\circ$
C. $125^\circ$
D. $145^\circ$

104. If $(yz)z = 40$ and $x = \frac{10}{z}$, then what is the value of $y^2$?

A. $4$
B. $16$
C. $20$
D. $400$
105. Right triangle $LMN$ is similar to right triangle $QRS$, shown below. If $\cos Q = \frac{3}{5}$, then what is $\tan N$?

![Diagram of triangles LMN and QRS]

A. $\frac{3}{5}$  
B. $\frac{3}{4}$  
C. $\frac{4}{3}$  
D. $\frac{4}{5}$

106. Which of the following is the solution to the system of inequalities?

\[-2x - 4 < 20 \quad x^3 + 6 < 14\]

A. $x < -12$ or $x < 2$  
B. $-12 < x < 2$  
C. $x < -8$ or $x > 2$  
D. $-8 < x < 2$

107. If $\cos \delta = 1$, which of the following could NOT be a value of $\delta$?

A. 0  
B. $\pi$  
C. $2\pi$  
D. $4\pi$
108. For a sphere with a radius of 4 units, which of the following statements is false?

A. The volume of the sphere is \( \frac{256\pi}{3} \) cubic units.
B. Each cross section of the sphere has an area of \( 16\pi \) square units.
C. The diameter of the sphere is 8 units.
D. The surface area of the sphere is \( 64\pi \) square units.

109. Line Z is tangent to the circle \((x - 4)^2 + (y - 3)^2 = 100\) at point \((4, 13)\). Line W is tangent to this circle at point B, with Line W parallel to (but distinct from) Line Z. What are the coordinates of point B?

A. \((4, 3)\)
B. \((4, -7)\)
C. \((-4, 13)\)
D. \((4, -13)\)

110. A student draws the following right triangle. \( \sin A = \frac{1}{2} \).

After performing some calculations, the student concludes that one leg of a right triangle is always half the length of the hypotenuse.

Which of the following is a counterexample that disproves the above statement?

A. A triangle with angles measuring 30°, 60°, and 90°.
B. A right triangle with the cosine of one angle equal to \( \frac{\sqrt{3}}{2} \).
C. A right triangle with the tangent of one angle equal to \( \frac{1}{2} \).
D. A right triangle with a hypotenuse of 10 feet and one leg measuring 60 inches.
111. A scientist is studying a population of ants. The scientist notes that, on average, for every 17 ants that are born in a day, 14 ants die. The scientist took her data over a period of one week. If 90 ants died and 112 ants were born in total during the first six days of her data collection, what is the ratio of ants born on the seventh day to ants that died on the seventh day?

A. 7: 8  
B. 17: 14  
C. 45: 56  
D. 95: 76

112. The circumference of Circle A is approximately 31 inches. Circle B has a radius of 8 inches. Circle C has a diameter twice the length of Circle B’s circumference. Which of the following ranks the area of the circles from least to greatest?

A. Circle A < Circle B < Circle C  
B. Circle B < Circle A < Circle C  
C. Circle A < Circle C < Circle B  
D. Circle C < Circle A < Circle B

113. A biologist is studying a flattened circular cell on a slide under a microscope. He determines that the cell has a radius of 8 nanometers, and also observes that an arc corresponding to an angle of about 60° on the cell is studded with proteins. About how long is the portion of the cell wall that is NOT studded with proteins?

A. $\frac{5\pi}{6}$ nm  
B. $\frac{8\pi}{3}$ nm  
C. $\frac{40\pi}{3}$ nm  
D. 16$\pi$ nm
114. Which of the following is equivalent to $2 \sin^2 \theta + \frac{1 - \cos^2 \theta}{\tan^2 \theta}$?

A. 3  
B. $\frac{1}{\tan^2 \theta}$  
C. $2 \sin^2 \theta + \frac{1}{\tan^2 \theta}$  
D. $\sin^2 \theta + 1$

115. What is the next term in the following sequence?

$$\frac{-1}{2}, 1, \frac{1}{6}, \frac{1}{13}, \ldots$$

A. $\frac{1}{19}$  
B. $\frac{1}{20}$  
C. $\frac{1}{22}$  
D. $\frac{1}{25}$

116. Which of the following is always true for the integers $w$ and $z$, if $w > z$ and $z$ is negative?

A. $w^2 > z^2$  
B. $w + 1 > z^3$  
C. $-w < z$  
D. $w^2 < z^3$

117. How many numbers between 1000 and 5000 (inclusive) meet both of the conditions given in the statements below?

Statement 1: Every digit is a nonzero multiple of 2.  
Statement 2: The sum of the digits is a perfect square.

A. 12  
B. 22  
C. 24  
D. 128
118. A cylinder 5 feet high, with a circumference of $2\pi$ feet, is about 40% full of water. The company that owns the cylinder plans to dye the water blue. If they need 4 ounces of dye for every 12 cubic inches of water, how much dye will they need to dye all of the water currently in the cylinder?

A. $\frac{2\pi}{3}$ ounces of dye  
B. $1152\pi$ ounces of dye  
C. $2880\pi$ ounces of dye  
D. $3456\pi$ ounces of dye

119. A new type of multi-player online game allows up to five players to choose avatars to represent them: a rabbit, an evergreen, a flower, a star, and a fish. Lydia, Clark, Marko, Priya, and Mike all decide to play together. Priya does not pick the evergreen or the star. Both Clark and Marko end up with animals as their avatars. When you combine the names of Mike and Marko’s avatars, you get a new type of animal. Which avatars did Priya and Lydia end up with?

A. Lydia chose the evergreen, and Priya chose the flower.  
B. Lydia chose the star, and Priya chose the flower.  
C. Lydia chose the star, and Priya chose the rabbit.  
D. Lydia chose the flower, and Priya chose the fish.

120. If $\sin \vartheta = \frac{\sqrt{3}}{2}$, what is the value of $\cot \vartheta$?

A. $\frac{\sqrt{3}}{3}$  
B. $\frac{2\sqrt{3}}{3}$  
C. $\sqrt{3}$  
D. It cannot be determined from the given information.