

LITERATURE IN ENGLISH

**Dost thou love life?
Then do not squander time, for that is the
stuff life is made of.
- Benjamin Franklin**

LITERATURE IN ENGLISH

[2005/2006 QUESTIONS]

SECTION A

Indicate the correct option in each of the following questions

1. In Dennis Brutu's "A Troubadour I traverse," the poet
 - A. sees his country as wild and undeveloped
 - B. loves his country inspite of the difficulties he faces there
 - C. hates his country because it is run by dictators
 - D. does not care about what happens to his country
2. Ofeimun's "We Must Learn Again to Fly"
 - A. expresses hope in the future
 - B. pretends that all is well with his country
 - C. urges the reader to accept his misfortunes
 - D. blames foreigners for the problems of his people
3. In Milton's "On his Blindness" the poet
 - A. expresses a deep anger with God for making him blind
 - B. believes that any one who goes blind must beg
 - C. states that even with blindness one can still serve God
 - D. believes that blindness is a just punishment for sin
4. In Keats' "On the Grasshopper and Cricket" the poet
 - A. sees these insect as nuisance which should be eradicated
 - B. emphasizes that each is active in

different time of day

- C. describes the difference in the physical features
- D. establishes the fact that the insect lives on nectar

SECTION B

5. "*And their sun does never shine
And their fields are bleak and bare
And their ways are filled with thorn
It is eternal winter there*" - Blake
The dominant literary device employ in the above lines is
 - A. apostrophe
 - B. allusion
 - C. simile
 - D. repetition
6. "*Cruelty has a human heart and jealousy
a human terror
The human form divine and secrecy the
human dress*" - Blake
From the lines above Blake's perspective on man is
 - A. inspiring
 - B. hopeful
 - C. gloomy
 - D. fortunate
7. "*The curfew tells the knell of parting day
The lowing herd wind slowly over
The plowman homeward plods the way,
And leaves the world to darkling me*"
- Gray
The time of the capture in the lines above is
 - A. early morning
 - B. mid-afternoon
 - C. Sunday
 - D. evening
8. "*Air love let us be true
To one another for the world which
seems
To lie before us like a land of drams
So various, so beautiful, so new
Hath really better joy, nor love, nor light
Nor certificate nor peace nor help from
pain...."*
The tone or mood expressed in the

lines above is

- A. optimistic
- B. elated
- C. melancholic
- D. expectant

Section C: Drama and Fiction

Questions 9 to 10 are based on Thomas Hardy's "*Tess of the D'Urbervilles*"

9. John Durbeyfield's action of ordering a carriage on learning of his noble ancestors instead of walking home shows that
- A. he will become a night like his ancestors
 - B. he has inherited a great fortune
 - C. he is rather foolish and easily carried away
 - D. he will soon become the May of Mariot
10. "Daze my eyes..." said Durbeyfield, "and here have I been knocklug about year after year, from pillar to post, as if he is more than the commonest feller in the parish..."
- From the statement above, the reader can deduce that the society in which Durbeyfield lives is
- A. very rural and undeveloped
 - B. class conscious
 - C. oppressive
 - D. superstitious

Questions 11 to 12 are based on William Shakespeare's "*Hamlet*"

11. When Ophelia tells her father; hamlet's love interest in her, he
- A. decides to send Ophelia to England
 - B. ask the queen to speak to hamlet and encourage hint
 - C. tells Ophelia to stop further contact with hamlet
 - D. encourages Ophelia to love hamlet

12. *Polonius: yet here Laertes? Aboani, boar for Shamel.*
The wind, fits in the shoulder of your sail

And you are stayed for.

Polonius is sending his son to

- A. Wittenberg
- B. Sweden
- C. Ireland
- D. France

SECTION D - General Literary Principle

13. A literary work which is a mocking unit of another work is called
- A. a copy-write
 - B. a slander
 - C. pornography
 - D. a parody
14. A literary work whose meaning can be understood at two different levels is called
- A. biography
 - B. epic
 - C. free verse
 - D. allegory
15. A subordinate or minor multiple running through a work of fiction is called
- A. an underdevelopment
 - B. an understatement
 - C. parallelism
 - D. subplot

SUMMARY OF ANSWERS (LITERATURE 2005/2006)

- | | | | | |
|------|------|------|------|------|
| 1.B | 2.A | 3.C | 4.B | 5.D |
| 6.C | 7.D | 8.C | 9.C | 10.B |
| 11.C | 12.D | 13.D | 14.D | 15.D |

SUCCESS QUOTE

"Defer no time,
Delays have dangerous ends."
- William Shakespeare

LITERATURE IN ENGLISH

[2006/2007 QUESTIONS]

Questions 1 to 3 are based on
The Search by Chukwuemeka Ike

1. The novel, *The Search* by Chukwuemeka Ike can be described as a....

- A. fiction
- B. non-fiction
- C. historical novel
- D. biography

2. The theme of the novel is

- A. the Nigerian civil war
- B. the devastating effect of ethnic religious chauvism and national integretion and stability
- C. the arrogance of the Moslem Hausa/Fulani ruling class
- D. why people in coup d'etat in religion

3. The greatest obstacle that Ola Akigba thinks stands between him and full integration with the whole northern elites is

- A. his ability to speak Hausa fluently
- B. his being married to a minority northern woman
- C. his not belonging to Moslem religion
- D. his open condemnation of the northerners

4. questions 4 and 5, fiction is one of the three classifications in Literature. The others are

- A. character
- B. poetry
- C. tragedy
- D. comedy

- 5. A. drama
- B. plot
- C. mime
- D. flash back

Questions 6 to 11 came from the poem below

*Eat of this poem I offer
Like an apple
Fliced from the tree forbidden
Eat of it, swallow it sour wholesomeness
And your eyes will fast
Shed scales snakes mouth*

*Awake to the evil contraction
That emasculates the many agonizing people
And empowers few despoiling lords.*

6. What figure of speech is contained in the line "eat of this poem I offer"?

- A. Simile
- B. Metaphor
- C. Euphemism
- D. Irony

7. In the poem there is an allusion to

- A. the way people enjoy eating apples
- B. the enjoyment derivable from eating poems
- C. the biblical apple eaten by Adam and Eve
- D. the danger posed by snake

8. The poem can have the following effects on the reader **except**

- A. creates awareness
- B. gives pleasure
- C. warns of the dangers of snakebites
- D. highlights the class difference in Nigeria

9. The expression "the tree forbidden" is an example of

- A. Allusion
- B. Metaphor
- C. Simile
- D. Synecdoche

10. What sound device is used in the line
"fliched from the tree forbidden"?
- A. Onomatopoeia B. Rhyme
C. Alliteration D. Consonant
11. "Evil contraption" in the poem means
- A. the evil done by Nigerian elites
B. the unjust and inequitable
C. the poem itself
D. the Nigerian society filled with all kinds of evil

Identify the Figure of Speech used in each sentence

12. The moon has gone to bed.
- A. Synecdoche B. Oxymoron
C. Personification D. Comedy
13. More hands are needed for the job.
- A. Tragedy B. Metaphor
C. Alliteration D. Synecdoche
14. O Lord bless this house.
- A. Apostrophe B. Assonance
C. Simile D. Climax
15. That mad dog, James, is at it again.
- A. Simile B. Comedy
C. Oxymoron D. Metaphor

**SUMMARY OF ANSWERS
(LITERATURE 2006/2007)**

- | | | | | |
|------|------|------|------|------|
| 1.C | 2.A | 3.C | 4.B | 5.A |
| 6.B | 7.C | 8.C | 9.A | 10.C |
| 11.A | 12.C | 13.D | 14.A | 15.D |

SUCCESS QUOTE

"Determine to rise again because condemning yourself after a failure is double failure..." - OMBP

**LITERATURE IN ENGLISH
[2007/2008 QUESTIONS]**

Questions 1 to 3 are based on Ahmed Yerima's "Attahiru"

1. As the play opens, Abbas tells his friends about the loss of his money to
- A. high way robbers
B. Luggard's soldiers
C. a boy disguised as a girl
D. customs inspectors
2. *Caliph: I am becoming the Caliph at a time when the history of our life is at a delicate balance.*
In the above statement, the Caliph is alluding to
- A. the difficulties pilgrims encounter on their way to Mecca
B. the civil strife between the various emirates
C. the problem of befitting burial for the dead Caliph
D. the imminent invasion of the caliphate by foreign forces
3. One reason given by the Sokoto caliphate for refusing the friends of whites is that
- A. the white man is not a true believer
B. the whites have become friends with the enemies of Sokoto
C. the white man is against polygamy
D. the white will close down their trade routes

Questions 4 and 5 are based on William Shakespeare's "Hamlet"

4. *Laertes: Farewell, farewell, Ophelia; and remember well. What I have said to you.*

Laertes has told Ophelia

- A. to join him in France very soon
- B. to serve the queen diligently
- C. to find another lover and flee from the palace
- D. not to yield herself to Hamlet's love advances

Even though the ghost of Hamlet's father demand vengeance, it specifically warns Hamlet against harming

- A. Ophelia
- B. Horatio
- C. the Queen
- D. Polonius

Questions 6 and 7 are based on Angus's Poem "A Taxi Driver on His Path"

The person in the above poem is

- A. determined to survive no matter the odds
- B. certain that he will end up prosperous
- C. rather reckless and fatalistic
- D. certain of life after death

The driver is certain that after his death the society will

- A. give him a befitting funeral
- B. reprimand the vehicle owner
- C. condemn reckless taxi drivers
- D. merely note him as one more victim of technology

Question 8 is based on J. P. Clark's "Neighbor Dancer"

In the above poem, the poet contrasts the dancer's total involvement in the music with his own

- A. indifference to the girl's performance
- B. alienation from his own roots
- C. inability to understand African cult
- D. stiffness when dancing

9. In Literature generally, a stock character is a character

- A. who plays the role of stock broker or merchant
- B. who deceives the audience
- C. whose actions, speech style and role are predictable
- D. whose manner is as stiff as a dry stockfish?

10. A light or amusing interlude inserted in the middle of a tragic play is called

- A. comic relief
- B. pungent interlude
- C. panorama
- D. digression

11. When one author produces a mocking invitation of another author's work we call his product

- A. a conceit
- B. an aggression
- C. a contrast
- D. a parody

12. A type of poem which may be sung and which embodies tale is called

- A. sentimental poem
- B. sonorous poetry
- C. musical interlude
- D. a ballad

13. *Ladejo turned to her, his befuddled look entreating her to give the appropriate response. Sade's mother sat on her seat's edge, fidgeting nervously on her dress.... The hall was mule with consternation. A pin drop at that moment could have caused a stampede. Drummer's held their drumsticks ready... a word from her and hell would be let loose.*

Femi Ademiluyi: The New Man

In the above extract, the atmosphere could be described as

- A. cajoling
- B. frightening
- C. threatening
- D. expectant

14. *Fear no more the heat of the sun
Nor the furious winter's rages;
Thou thy worldly task has done
Home art gone, and taken thy wages
Golden lads and girls all must,
As chimney sweepers, come to dust*
William Shakespeare: Fear No More

The person addressed in the above extract

- A. is preparing to forecast the weather
B. has just being paid his salary
C. is dead
D. is a young lad who likes playing in the dust
15. *Lakunle: A savage custom, barbaric, out of date, rejected, denounced, accursed, excommunicated, archaic, degrading, humiliating, unspeakable, redundant, retrogressive.*
Lakunle is being
- A. amorous and elated
B. tautological and hyperbolic
C. sociological and historical
D. oppressive and dictatorial

SUMMARY OF ANSWERS (LITERATURE 2007/2008)

- | | | | | |
|------|------|------|------|------|
| 1.B | 2.D | 3.B | 4.D | 5.C |
| 6.C | 7.D | 8.B | 9.C | 10.A |
| 11.D | 12.D | 13.D | 14.C | 15.B |

SUCCESS QUOTE

“Determine never to be idle.
No person will have occasion
to complain of the want of time
who never loses any. It is
wonderful how much can be
done if we are always doing.”

~ Thomas Jefferson

LITERATURE IN ENGLISH [2008/2009 QUESTIONS]

Questions 1 and 2 are based on
Shakespeare's Romeo and Juliet

- Romeo's melancholic mood at the play's beginning is because
 - he is unhappy with the quarrel between the Capulets and the Montagues
 - he finds the morning air disagreeable to his health
 - he cannot convince Benrolio to follow him to the party
 - he is suffering from the pangs of unrequited love
- Which of the following phrases represents most accurately Old Capulet's reaction to Juliet's refusal to marry Paris?
 - gentle and tolerant
 - indifferent and rough
 - impatient and tyrannical
 - boastful and unctuous

Questions 3 and 4 are based on
George Orwell's 1984

- In this novel, the term "proles" is
 - a term for underground moles
 - a reference to subversive elements
 - a term of contempt for the common people
 - gangsters who oppose big brother
- In this novel, Orwell creates the picture of
 - a welfare state
 - a brutal totalitarian state
 - a community of strong worshipers
 - a nation of vibrant and loving citizens

15. *The rivers and streams shrank, vaporized into a leaven that hoarded the precious drops; beast and man panted in the heat; the earth's surface wore wrinkles and deep cracks, parched and devoid of a blade of green nature.*

The description above is concerned with

- A. famine B. drought
C. forest fires D. ravages of war

SUMMARY OF ANSWERS (LITERATURE 2008/2009)

- | | | | | |
|------|------|------|------|------|
| 1.D | 2.A | 3.C | 4.B | 5.D |
| 6.C | 7.B | 8.A | 9.D | 10.C |
| 11.D | 12.B | 13.C | 14.D | 15.B |

BONUS TIP

During study times, make study your only focus.

You will need to sacrifice every other thing including 2go, bbm, whatsapp, facebook, video games and TV for the sake of study. When you only have one focus for your mind, your mind will specialize to help you study effectively. I know that it might be difficult to let go of certain things due to them being habits, but you must realize that studying effectively is critical to success in UTME and post-UTME.

LITERATURE IN ENGLISH [2010/2011 QUESTIONS]

Questions 1 to 2 are based on Ahmed Yerima's *"Attahiru"*

- Luggard wants to capture the Caliphate so that it will not fall into the hands or authority of

A. Americans	B. Frenchmen
C. German	D. Italians
- The land dispute in the play is inserted to demonstrate

A. The authority of the Caliph over all land matters
B. the unreasonableness of Sarkin Zango and Sarkin Fatake
C. the judicial wisdom of the Caliph
D. the importance of arable land in the Caliphate

Questions 3 to 4 are based on William Shakespeare's *"Hamlet"*

- Ber: sit down awhile
and let us once again absail your ears,
that are so fortified against our story
What we have two nights seen.*
The speaker and his friends have seen:

A. a soothsayer foretelling the death of Polonius
B. a ghost
C. a heavy mist surrounding the castle
D. a witch flying in the dark
- ...O most wicked speed, to post
With such dexterity to incestuous sheets!
It is not nor it cannot come to good...*
In the above lines, Hamlet is alluding to

A. the quick succession to the throne by Claudius
B. the marriage of his mother to his

- uncle
- C. the failure to deliver a letter to Norway
 - D. the use of unclean sheets to bury his dead father

Questions 5 to 8 are based on Femi Ademuluyi's "The New Man"

5. The eventual conflict between Ayo Badejo and the people of Ipaja was most pointedly foretold by
- A. Prophet Elijah
 - B. Hon. Bulawayo
 - C. Chief Layeni
 - D. the school Headmaster
6. A strong or prominent feature of "The New Man" is
- A. Sermons
 - B. political rallies
 - C. festivals
 - D. violence
7. The author's use of his name as a character in the novel is intended to
- A. display his mastery of fiction
 - B. give the story an impression of truth
 - C. displace the prominence of the hero
 - D. convert the story into a historical document
8. The religious life of the people of Ipaja could be described as
- A. pure and devout
 - B. exclusively heathenish
 - C. contentious and rowdy
 - D. a mixture of superstitions and Christian beliefs

Questions 9 to 13 are based on Thomas Hardy's "Tess of the D'Urbervilles"

9. The society described in the novel could be described as
- A. class-conscious

- B. highly religious
- C. egalitarian
- D. highly prosperous

10. John Durbeyfield's behavior after hearing of his noble ancestry shows him up
- A. unbothered by past events
 - B. constant in character
 - C. foolishly excitable
 - D. an ancestor worshipper
11. "Tess of the D'Urbervilles" is mainly set in
- A. an industrialized city
 - B. a mining community
 - C. an agrarian community
 - D. a fishing village
12. The three brothers who saw Tess and her friends when they were dancing are named
- A. Angel, Frederick and Cuthbert
 - B. William, Alex and Felix
 - C. John, Filbert and Bobby
 - D. Felix, Angel, and Cuthbert
13. Angel Clare's choice of Tess as his wife is received by his parents with
- A. warmth and excitement
 - B. anger and rejection
 - C. doubt and reservation
 - D. cold and indifference

Questions 14 and 15 are based on Brutu's poem "A Troubadour I Traverse"

14. In this poem, the poet's image of the land is that of
- A. a beloved woman that is also dangerous
 - B. a harsh, unfeeling desert
 - C. an unfaithful treacherous male friend
 - D. a war-devastated terrain

15. The poet's feelings are inspired by his struggle against
- religious fanatics
 - colonialism
 - injustice
 - communism

SUMMARY OF ANSWERS [LITERATURE 2010/2011]

- | | | | | |
|------|------|------|------|------|
| 1.B | 2.D | 3.B | 4.B | 5.D |
| 6.C | 7.B | 8.D | 9.A | 10.C |
| 11.C | 12.D | 13.C | 14.A | 15.B |

DON'T FORGET

SURE SUCCESS is more than just a book. It's a Divine Project. Don't fall into the temptation of photocopying or preparing with a photocopy of the book. You may be sowing the seed for your frustration in life.

LITERATURE IN ENGLISH [2011/2012 QUESTIONS]

Questions 1 and 2 are based on Gbemisola Adeoti's "*Naked Soles*"

- According to the poem, one of these does not pierce the soles.
 - Spikes
 - Glass chips
 - Pricks
 - Thrones of thorns
- The atmosphere created in the poem is that of
 - disappointment
 - pain
 - rebellion
 - anger

Questions 3 and 4 are based on T. S. Eliot's poem, "*The Journey of the Magi*".

- What is not a reason the magi had a hard time in their journey?
 - The journey was becoming expensive.
 - The camel men were abandoning the trip.
 - There were no accommodations.
 - They were no longer at ease.
- The expression, "*an old horse galloped in the meadow*" is
 - A metaphor
 - An allusion
 - A synecdoche
 - A metonymy
- In **Strugnell's Sonnet (VI)**, the expression "*I have no spare; henceforth I will bear the scar*" refers to
 - true swine
 - a big car
 - a heart
 - the poet's wings
- One of the causes of the tragedy in

Shakespeare's *Romeo and Juliet* is

- A. quack doctor B. the banishment
C. misinformation D. too much love

7. Which of the following is not a figurative expression in *An African Thunderstorm* by Rubadiri?

- A. pregnant clouds
B. plague of locusts
C. tattered flags
D. dangling breasts

Questions 8 to 13 are based on general literary concepts.

8. The line "Your mouth, O Katty, is a museum with many monuments" is both

- A. metaphoric and hyperbolic
B. a synecdoche and a metonymy
C. metaphoric and epigrammatic
D. a metaphor and an allusion

9. A premiere is

- A. a soap opera
B. the first play by a playwright
C. a play with social criticism in it
D. the first performance of a play

10. A long narrative in which the fate of a community is dependent on the life and activities of the hero is

- A. A tragedy B. A legend
C. An epic D. A historical narrative

11. *Let my love like incense from Abel's palms rise to the golden temple of your face*

The above contains both

- A. A simile and a paradox
B. A simile and a litotes
C. A simile and a metaphor
D. A simile and a personification

12. Point of view in Literature is related to

- A. the narrator B. the author
C. the setting D. the hero

13. Setting refers to both

- A. time and place
B. place and space
C. place and mood
D. place and culture

Questions 14 and 15 are taken from Buchi Emecheta's *The Joys of Motherhood*

14. *Nnu Ego, the daughter of Agbadi, don't be greedy. Manage with Nnaife's income and look after your child. That is your duty. Be satisfied with his earnings. Let him do his duty.*

Who said the above?

- A. Nwakusor B. Nnu Ego
C. Adaku D. Dilibe

15. *If you were not the mother of my sons, I would have taught you a lesson this evening. But don't push me too far, or I may still do it... Who brought you here? You think you can be defiant...*

The bone of contention above is

- A. rent B. sacrifice
C. feeding money D. baby napkins

SUMMARY OF ANSWERS

[LITERATURE 2011/2012]

- | | | | | |
|------|------|------|------|------|
| 1.D | 2.B | 3.D | 4.A | 5.C |
| 6.C | 7.D | 8.A | 9.D | 10.C |
| 11.C | 12.A | 13.A | 14.A | 15.C |

SUCCESS QUOTE

"In your quest to actualize your admission dreams, always do the right things so that God can bless your efforts. Do not prepare with a pirated/photocopy of this book. You may end up frustrated if you do. Call 08060848179 to get an original copy of the book SURE SUCCESS."

~ Henry Divine

LITERATURE IN ENGLISH

[2012/2013 QUESTIONS (DE)]

The following questions 1 to 6 are based on general literary concepts

1. Which of the following was not written by Chinua Achebe?
A. Girls at War
B. Anthills of the Salvador
C. No Longer at Ease
D. Arrow of God
2. *"Even now that the typhoon of your tongue
Is blowing away the roof of my refuge
Leaving me with showers of your kindness"*
The most prominent figure of speech in the above is
A. hyperbole
B. contrast
C. metonymy
D. metaphor
3. *"I have been here for two weeks now
And I've made friends
As many as stars by the seashore"*
What figure of speech is the above?
A. exaggeration B. irony
C. simile D. pathos
4. A sonnet is identified by the number of
A. lines and syllables per line
B. stress and accent per line
C. lines and stress per syllable
D. lines and rhyme scheme
5. Rhyme and rhythm are elements of

- A. cultural poetry
B. musical poetry
C. colonial poetry
D. pastoral poetry
6. A mental picture created with words is referred to as
A. illusion
B. image
C. symbol
D. fiction
7. One of the following is not a reason why the bats in D.H Lawrence's "Bat" are disgusting:
A. they grin in their sleep
B. they hang upside down
C. they are like old rags
D. they are symbolic in China
8. In Gbemisola's "Naked Soles", dancing is associated with
A. happiness
B. acropolis
C. suffering
D. thrones of thorns
9. According to Launke's poem "End of the War", one of the following is not a result of the war
A. silence of the battlefield
B. deserted houses
C. slums in the city
D. fallen rafters
10. The atmosphere created in Eliot's "The Journey of the Magi" is that of
A. a birthday
B. an adventure

- C. summer palaces
D. a pilgrimage
11. In Marvell's "To His Coy Mistress", the expression "Time's winged chariot" is both a
- synecdoche and metonymy
 - metaphor and personification
 - metaphor and hyperbole
 - personification and apostrophe
12. The representation of a thing with something closely associated with it is
- epigram
 - metonymy
 - synecdoche
 - symbolism
13. Parallelism involves similarity in
- structure
 - syntax
 - sound
 - lines
14. An iambic pentameter poem without a rhyme scheme is a
- free verse
 - blind verse
 - blank verse
 - iambus
15. Which of the following is not a kind of imagery?
- offertory imagery
 - tactile imagery
 - visual imagery
 - kinesthetic imagery

SUMMARY OF ANSWERS

[LITERATURE 2012/2013 (DE)]

1.A	2.D	3.C	4.D	5.B
6.B	7.D	8.C	9.A	10.B
11.B	12.B	13.A	14.C	15.A

FEATURES OF THIS BOOK

- ☛ Quick Subject Revision Aids
- ☛ Admission Success Secrets
- ☛ Bonus Tips
- ☛ Success Quotes
- ☛ Answers to Frequently Asked Questions (FAQ's)

In the *Quick Subject Revision Aids*, efforts were made to highlight the basic concepts of the subjects and to provide insights into the likely examination questions. The *Admission Success Secrets* are geared towards solving the problem of lack of admission orientation among candidates and providing answers to their *Frequently Asked Questions*.

The *Bonus Tips* provide you with those extra information you need to have an edge over others. *Success Quotes* were also included to get you motivated, because if you are motivated, then you are already half-way to your success.

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MATHEMATICS

**“It’s not that I’m so smart, it’s just
that I stay with problems longer.”
- Albert Einstein**

11.

Score	0	1	2	3	4	5
No of Student	2	8	14	16	12	8

The distribution above shows the scores of sixty students in a class test. What percentage of the students scored at least 3?

- A. 60% B. 36% C. 66% D. 40%

12. The first derivative of $y = (2 + 3x)^4$ at $x = -1$ is

- A. 12 B. -12 C. 4 D. -4

13. The minimum value of $(x) = x^2 - 4x + 5$ in the interval $[1, -1]$ is

- A. -2 B. 10 C. 4 D. 5

14.

Score	1	2	3	5	6
Frequency	3	6	7	x	4

The table above shows the marks scored by a group of students in a class test. If the mean score is 3.4, find x.

- A. 3 B. 4 C. 5 D. 2

15. A company is to select three different handset phones from five different types of Nokia brand and two different types of Samsung brand. In how many ways can the company choose the handsets, so as to include at least one Samsung brand?

- A. 15 B. 25 C. 35 D. 45

SUCCESS QUOTE

“Many who have sought admission for years are in the habit of blaming their father, mother, uncles, teachers, the schools and even the country for their failures - they don't ever believe it's their fault. But it's always their fault because if they really want to gain admission, they'd be willing to pay the price for it.

What's the price? Sacrifice of immediate pleasures in order to ensure adequate preparation.”

~Henry Divine

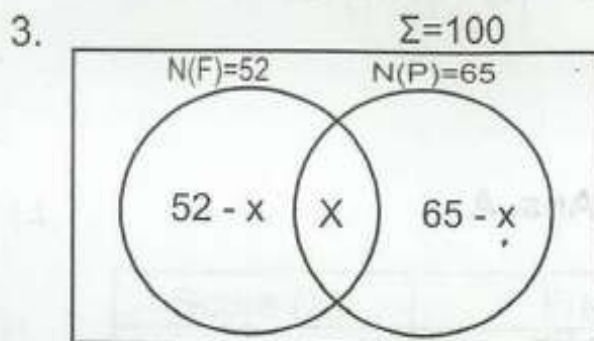
MATHEMATICS 2005/2006 SOLUTIONS

1. $314_{10} - 256_7 = 340_n$
 $314_{10} - (2 \times 7^2 + 5 \times 7^1 + 6 \times 7^0) = 3 \times n^2 + 4 \times n^1 + 0 \times n^0$
 $314 - 139 = 3n^2 + 4n$
 $3n^2 + 4n - 175 = 0$
 $(n - 7)\left(n + \frac{25}{3}\right) = 0$
 $n = 7$ or $n = -25/3$ (impossible)
 $\therefore n = 7$

Ans. A

2. 1.867551 to 4 sig. fig. = 1.868
 1.867551 to 4 d.p. = 1.8676
 Difference: $1.868 - 1.8676 = 0.0004 = 4 \times 10^{-4}$

Ans B



Let x be the percentage that offered both French and English.

Percentage that offered French alone = $52 - x$

Percentage that offered English alone = $65 - x$

$$\rightarrow 52 - x + x + 65 - x = 100$$

$$117 - x = 100$$

$$x = 117 - 100 = 17$$

\therefore Percentage that offered French only = $52\% - 17\% = 35\%$

Ans. B

4. $2x^2 + x - 3 \overline{) 6x^3 + 5x^2 - 8x - 3}$

$$\begin{array}{r} 3x + 1 \\ 2x^2 + x - 3 \overline{) 6x^3 + 5x^2 - 8x - 3} \\ \underline{6x^3 + 3x^2 - 9x} \\ -2x^2 + x - 3 \\ \underline{2x^2 + x - 3} \\ 0 \quad 0 \quad 0 \end{array}$$

Hence, the quotient = $3x + 1$

Ans. C

5. $2x - 5 < 7$ and $25 + 2x > 15$
 $2x < 12$ and $2x > -10$
 $x < 6$ and $2x > -10$ (or $x > -5$)
 $-5 < x < 6$

Ans. B

DON'T FORGET

SURE SUCCESS is more than just a book. It's a Divine Project. Don't fall into the temptation of photocopying or preparing with a photocopy of the book. You may be sowing the seed for your frustration in life.

6. $U_8 = 3U_2$, $S_3 = 18$, $U_1 = ?$
 $a + 7d = 3(a + d) \longrightarrow a + 7d = 3a + 3d \longrightarrow a + 7d - 3a - 3d = 0$
 $-2a + 4d = 0 \longrightarrow 2a - 4d = 0 \dots \dots \dots (1)$

$S_n = \frac{n}{2} [2a + (n - 1)d]$

$S_3 = 18 = \frac{3}{2} [2a + (3-1)d] \longrightarrow 2a + 2d = \frac{18 \times 2}{3} \longrightarrow 2a + 2d = 12$

$\therefore a + d = 6 \dots \dots \dots (2)$

From equation (2), $a = 6 - d$.

Substitute $6 - d$ for a into equation (1), $2(6 - d) - 4d = 0$

$\rightarrow 12 - 2d - 4d = 0 \rightarrow -6d = -12 \quad \therefore d = 2$

Hence, $a + 2 = 6 \rightarrow a = 6 - 2 = 4$

$U_1 = a = 4$

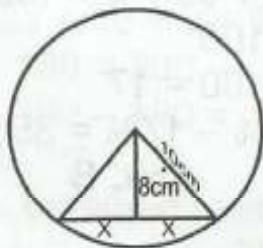
Ans. A

7. $S_\infty = \frac{a}{1-r}$; $r = \frac{9/4}{3} = \frac{3}{4}$; $a = 4$

$S_\infty = \frac{4}{1-3/4} = 16 \longrightarrow S_\infty = 16$

Ans. A

8.



Length of chord = $2x$

Using Pythagoras rule, $x = \sqrt{10^2 - 8^2} = 6\text{cm}$

Length of chord = $2 \times 6 = 12\text{cm}$

Ans. C

9. Equation of the given line is $4x - 2y + 1 = 0$ i.e. $y = 2x + \frac{1}{2}$

Gradient of the line, $m_1 = 2$

Let the gradient of the perpendicular line be m_2 .

For perpendicular lines, $m_1 m_2 = -1 \longrightarrow m_2 = -1/m_1$

$m_2 = -\frac{1}{2}$ through $(-2, 1)$

Hence, the required equation is $y - 1 = -\frac{1}{2}[x - (-2)]$

$\longrightarrow y - 1 = -\frac{1}{2}(x + 2)$ or $2y + x = 0$

Ans. B

10. Line 1 is $2y - rx + 4 = 0$ i.e. $y = \frac{r}{2}x - 2$

Line 2 is $4y + x - 28 = 0$ i.e. $y = -\frac{1}{4}x + 7$

gradient of line 1 = $m_1 = \frac{r}{2}$ gradient of line 2 = $m_2 = -\frac{1}{4}$

If line 1 and line 2 are perpendicular, then $m_1 m_2 = -1$

$$\longrightarrow \frac{r}{2} x - \frac{1}{4} = -1 \longrightarrow r = 8$$

Ans. B

11. No of student that scored at least 3 = $16 + 12 + 8 = 36$ students

Total no of students = 60

Percentage that Scored at least 3 = $36/60 \times 100\% = 60\%$

Ans. A

12. $y = (2 + 3x)^4$

$$\frac{dy}{dx} = 4(2 + 3x)^3 \cdot 3 = 12(2 + 3x)^3$$

$$\text{At } x = -1, \frac{dy}{dx} = 12[2 + 3(-1)]^3 = -12$$

Ans. B

SUCCESS QUOTE

“The root of education is bitter but the fruit is sweet.”

~Aristotle

13. $f(x) = x^2 - 4x + 5$

$$f'(x) = 2x - 4$$

$$\text{In the interval } [1, -1], f'(x) = 2(1) - 4 = -2$$

Ans. A

14.

Score (X)	Frequency (f)	fx
1	3	3
2	6	12
3	7	21
5	X	5x
6	4	24
	$\Sigma f = 20 + x$	$\Sigma fx = 60 + 5x$

$$\text{Mean} = \frac{\Sigma fx}{\Sigma F} = 3.4 \longrightarrow \frac{60 + 5x}{20 + x} = 3.4$$

$$60 + 5x = 3.4(20 + x) \longrightarrow 60 + 5x = 68 + 3.4x$$

$$5x - 3.4x = 68 - 60 \longrightarrow 1.6x = 8$$

Therefore, $x = 5$

Ans. C

15. No of Nokia brand = 5, No of Samsung brand = 2

If 3 different handset phones are to be selected and at least 1 Samsung brand must be included, then it is either they select 2 Nokia brand from 5 and 1

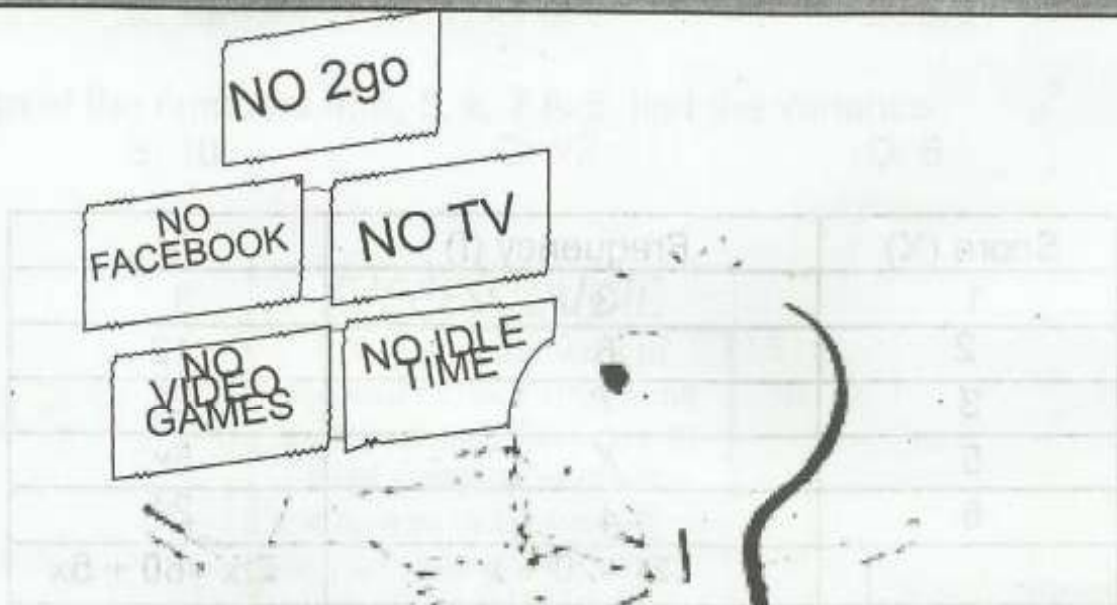
Samsung brand from 2 OR 1 Nokia brand from 5 and 2 Samsung brand from 2. That is, ${}^5C_2 \times {}^2C_1$ or ${}^5C_1 \times {}^2C_2 = 10 \times 2 + 5 \times 1 = 20 + 5 = 25$ ways

Ans. B

SUMMARY OF ANSWERS (MATHEMATICS 2005/2006)

1.A	2.B	3.B	4.C	5.B
6.A	7.A	8.C	9.B	10.B
11.A	12.B	13.A	14.C	15.B

BONUS TIP



MATHEMATICS 2007/08 QUESTIONS

- Express $8 \times 10^{-6} \div 2 \times 10^{-5}$ as a fraction
 A. $\frac{1}{4}$ B. $\frac{3}{2}$ C. $\frac{3}{5}$ D. $\frac{1}{5}$
- Find the values of x for which $2^{2x+3} - 33 \times 2^x + 4 = 0$
 A. $x = 2, x = -3$ B. $x = -2, x = 3$ C. $x = 4, x = 1/8$ D. $x = 2, x = 3$
- If $260_9 \div 100_2 = 66_n$, find n .
 A. 7 B. 9 C. 10 D. 8
- Find the values of x such that $\begin{pmatrix} 2 & 7 \\ 3 & \frac{1}{2} \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 10 \\ 7 \end{pmatrix}$
 A. $x = y = 2$ B. $x = 2, y = -2$ C. $x = -2, y = 2$ D. $x = y = -2$
- A chord of a circle of radius 13cm is drawn 5cm from the centre of the circle. Find the length of the chord.
 A. 12cm B. 24cm C. 18cm D. $\sqrt{194}$ cm
- If $x - 2$ is a factor of $px^3 + 2x^2 - 2p + 12$, find the value of p .
 A. $\frac{8}{5}$ B. $-\frac{10}{3}$ C. 2 D. -2
- In a regular pentagon ABCDE, AC intersects BD at P. Calculate $\angle CPD$.
 A. 108° B. 36° C. 72° D. 48°
- | | | | | |
|---------|---------|-----------|-------|---------|
| Subject | Biology | Chemistry | Maths | Physics |
| Marks | 95 | $2x + 10$ | X | 75 |

The table above shows the marks obtained by a student in an examination. If the total mark obtained is 300, what is the angle corresponding to the mark obtained in Chemistry if the information is represented in a pie chart?

 A. 120° B. 144° C. 48° D. 108°
- A ladder 17m rests against a vertical wall so that its foot is 8.5m from the wall. Find the angle of inclination of the ladder to the horizontal floor.
 A. 30° B. 60° C. 45° D. 55°

10. Evaluate $\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x - 2}$
- A. 0 B. 5 C. ∞ D. 1
11. If $\frac{dy}{dx} = 6x - 3$ and $y(-1) = 8$, find $y(x)$.
- A. $3x^2 - 3x - 8$ B. $3x^2 - 3x + 8$ C. $3x^2 - 3x - 2$ D. $3x^2 - 3x + 2$
12. The minimum of the function $f(x) = 2x^2 - 12x + 5$ is
- A. 59 B. -59 C. 3 D. -3
13. A basket contains 5 MTN cards, 6 GLO cards, 3 MTEL cards and 6 Vmobiles cards. What is the probability that a card selected from the basket at random will be MTN or MTEL card?
- A. $\frac{3}{20}$ B. $\frac{3}{4}$ C. $\frac{1}{4}$ D. $\frac{3}{5}$
14. Find the range of the numbers $\frac{1}{3}, \frac{1}{2}, \frac{3}{5}, \frac{4}{5}, \frac{2}{3}, \frac{6}{7}, \frac{8}{9}$
- A. $\frac{7}{27}$ B. $\frac{13}{45}$ C. $\frac{9}{5}$ D. $\frac{5}{9}$
15. If the mean of the numbers 4, 3, 5, x, 7 is 5, find the variance.
- A. 2 B. 10 C. $\sqrt{2}$ D. 5

SUCCESS QUOTE

"Do you really want to succeed in the forthcoming examination? The key is to keep company only with people who uplift you, whose presence calls forth your best."
-Henry Divine

MATHEMATICS 2007/2008 SOLUTIONS

$$1. 8 \times 10^6 \div 2 \times 10^5 = \frac{8}{10^6} \div \frac{2}{10^5} = \frac{8}{10^6} \times \frac{10^5}{2} = \frac{8}{2} \times \frac{10^5}{10^6} = 4/10 = \frac{2}{5}$$

Ans. C

$$2. 2^{2x+3} - 33 \times 2^x + 4 = 0$$

$$2^{2x} \times 2^3 - 33 \times 2^x + 4 = 0$$

$$8 \times (2^x)^2 - 33(2^x) + 4 = 0$$

$$\text{Let } 2^x = p$$

$$8p^2 - 33p + 4 = 0$$

$$(8p - 1)(p - 4) = 0$$

$$P = 1/8 \text{ or } p = 4$$

$$\text{But } 2^x = p = 1/8$$

$$2^x = 8^{-1} = 2^{-3}, x = -3 \quad \text{OR}$$

$$2^x = p = 4 = 2^2, x = 2$$

$$\therefore x = 2 \text{ or } -3$$

Ans. A

SUCCESS QUOTE

"In your quest to actualize your admission dreams, always do the right things so that God can bless your efforts. Do not prepare with a pirated/photocopy of this book. You may end up frustrated if you do. Call 08060848179 to get an original copy of the book SURE SUCCESS."

~ Henry Divine

$$3. \frac{260_9}{100_2} = 66_n$$

$$\frac{(2 \times 9^2) + (6 \times 9^1) + (0 \times 9^0)}{(1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0)} = 6 \times n^1 + 6 \times n^0$$

$$\frac{216}{4} = 6n + 6$$

$$4$$

$$4(6n + 6) = 216$$

$$4 \times 6(n + 1) = 216$$

$$n + 1 = \frac{216}{4 \times 6} = 9$$

$$4 \times 6$$

$$n + 1 = 9$$

$$n = 9 - 1 = 8$$

Ans. D

SUCCESS QUOTE

"The beautiful thing about learning is that no one can take it away from you."

~ B B King

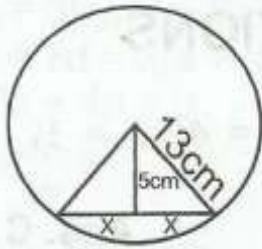
$$4. 2x - 7y = 10 \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

$$3x + \frac{1}{2}x = -7 \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

Solving equations 1 and 2 simultaneously gives $x = -2$ and $y = -2$

Ans. D

5.



$$\text{Length of chord} = 2x$$

$$x = \sqrt{13^2 - 5^2}$$

$$x = 12\text{cm}$$

$$\text{Length of chord} = 2 \times 12 = 24\text{cm}$$

Ans. B

6. Let $f(x) = px^3 + 2x^2 - 2p + 12$

If $x - 2$ is a factor of $f(x)$, $f(2) = 0$

$$f(2) = p(2)^3 + 2(2)^2 - 2p + 12 = 0$$

$$8p + 8 - 2p + 12 = 0$$

$$8p - 2p + 8 + 12 = 0$$

$$6p = -20$$

$$p = -20/6 = -10/3$$

Ans. B

7. A regular pentagon has five equal sides and all the angles are equal.

Sum of interior angles = $(2n - 4) \times 90^\circ$

Where $n = 5$, sum of interior angles = $[(2 \times 5) - 4] \times 90^\circ = 540^\circ$

Therefore, each angle = $540^\circ/5 = 108^\circ$

Required angle = $180^\circ - 108^\circ = 72^\circ$

Ans. C

8. $95 + 2x + 10 + x + 75 = 300$

$$3x + 180 = 300$$

$$3x = 300 - 180 = 120$$

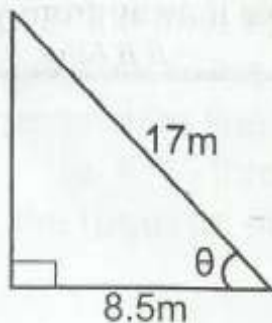
$$x = 120/3 = 40$$

Mark obtained in chemistry = $2x + 10 = 2 \times 40 + 10 = 90$

Angle of mark = $\frac{90}{300} \times 360^\circ = 108^\circ$

Ans. D

9.



$$\cos \theta = 8.5/17 = 0.5$$

$$\theta = \cos^{-1}(0.5) = 60^\circ$$

Ans. B**SUCCESS QUOTE**

"You were born to win, but to be a winner, you must plan to win, prepare to win and expect to win."

~ Zig Ziglar

10. $\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x - 2}$

Using L'Hopital's rule, we let $g(x) = x^2 + x - 6$, $h(x) = x - 2$

$$\frac{g'(x)}{h'(x)} = \frac{2x + 1}{1}$$

$$\text{As } x \rightarrow 2, \quad \frac{g'(x)}{h'(x)} = \frac{2(2) + 1}{1} = 5$$

Ans. B

11. $\frac{dy}{dx} = 6x - 3$, $y(-1) = 8$

$$dy = (6x - 3)dx$$

$$\int dy = \int (6x - 3)dx$$

$$y = \frac{6x^2}{2} - 3x + C$$

$$y = 3x^2 - 3x + C$$

$$\rightarrow y(x) = 3x^2 - 3x + C$$

$$y(-1) = 3(-1)^2 - 3(-1) + C = 8$$

$$3 + 3 + C = 8$$

$$C = 2$$

Therefore, $y(x) = 3x^2 - 3x + 2$

Ans. D

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

$$f'(x) = 4x - 12 = 0$$

$$4x - 12 = 0$$

$$4x = 12$$

$$x = 3$$

Ans. C

13. MTN Cards = 5, Glo Cards = 6, MTEL Cards = 3, Vmobile Cards = 6

Total Cards = 20

$$\text{Prob(MTN or MTEL Cards)} = \frac{5}{20} + \frac{3}{20} = \frac{8}{20} = \frac{2}{5}$$

Ans. D

14. Range = $\frac{8}{9} - \frac{1}{3} = \frac{5}{9}$

Ans. D

15. $\frac{4 + 3 + 5 + x + 7}{5} = 5 \quad \rightarrow \quad \frac{19 + x}{5} = 5$

$$19 + x = 25, x = 25 - 19 = 6$$

Variance = (standard deviation)²

$$\rightarrow \text{Variance} = \left(\sqrt{\frac{\sum(x - \bar{x})^2}{n}} \right)^2 = \frac{\sum(x - \bar{x})^2}{n}$$

SUCCESS QUOTE

"Failure is simply the opportunity to begin again, this time more intelligently."

~Henry Ford

$$\text{Variance} = \frac{(4 - 5)^2 + (3 - 5)^2 + (5 - 5)^2 + (6 - 5)^2 + (7 - 5)^2}{5} = \frac{1 + 4 + 0 + 1 + 4}{5} = 10/5 = 2$$

Ans. A

SUMMARY OF ANSWERS (MATHEMATICS 2007/2008)

1.C	2.A	3.D	4.D	5.B
6.B	7.C	8.D	9.B	10.B
11.D	12.C	13.D	14.D	15.A

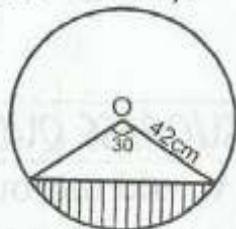
SUCCESS QUOTE

“Follow your dreams, work hard, practice and persevere. Make sure you eat a variety of foods, get plenty of exercise and maintain a healthy lifestyle.”

~Sasha Cohen

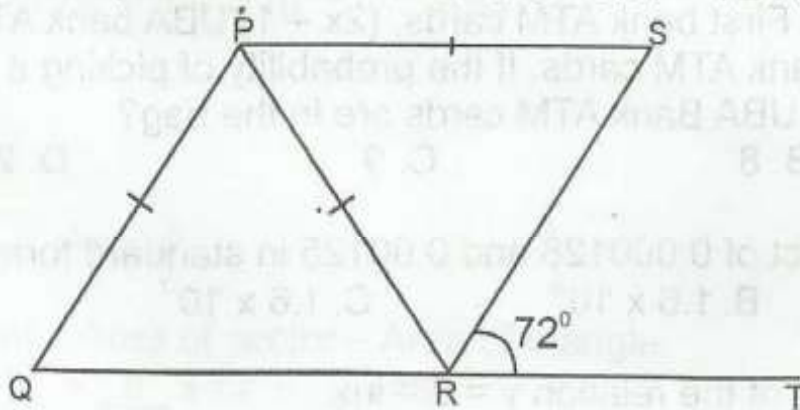
MATHEMATICS 2008/2009 QUESTIONS

1. The average of three numbers is 32_6 . If the sum of two of the numbers is 131_6 , find the third number in base 6.
 A. 43_6 B. 34_6 C. 23_6 D. 32_6
2. Three times the second term plus the seventh term of an AP is equal to the twelfth term. Find the relationship between the first term a and the common difference d .
 A. $3a - 2d = 0$ B. $3a + 2d = 0$ C. $3a + d = 0$ D. $3a - d = 0$
3. A fence of 36m is to be built to make three sides of a rectangular compound, the fourth side being a building. Find the possible lengths of the shorter sides of the compound if the area enclosed is 160m^2 .
 A. 20m, 10m B. 16m, 8m C. 20m, 16m D. 10m, 8m
4. Find $\frac{dy}{dx}$ if $y = 2x^2 - \sin 2x$
 A. $4x + 2\cos x$ B. $4x - 2\cos 2x$ C. $4x + 2\cos 2x$ D. $4x - 2\cos x$
5. A bag contains $4x$ First bank ATM cards, $(2x - 1)$ UBA bank ATM cards and $3(x + 1)$ Zenith Bank ATM cards. If the probability of picking a First Bank ATM is $\frac{2}{5}$; how many UBA Bank ATM cards are in the bag?
 A. 3 B. 8 C. 9 D. 20
6. Express the product of 0.000128 and 0.00125 in standard form.
 A. 1.6×10^{-11} B. 1.6×10^{-5} C. 1.6×10^{-7} D. 1.6×10^{-4}
7. Make x the subject of the relation $y = 3 - \ln x$
 A. e^{3-y} B. e^{y-3} C. $y/3$ D. $3/y$
8. In the diagram below, O is the centre of the circle of radius 42cm. Find the area of the shaded portion (Take $\pi = \frac{22}{7}$).



- A. 903cm^2 B. 441cm^2 C. 462cm^2 D. 21cm^2

9. A student dropped an object from a building 100m high. If the height of the object above the ground after t seconds is $100 + 4.9t^2$ m, how fast is it falling 3 seconds after it is dropped?
 A. 14.7m/sec B. 85.3m/sec C. 29.4m/sec D. 70.6m/sec
10. An investor who invested N6,500.00 at some simple interest rate collected a total amount of N7,800.00 after four years. How much simple interest would he have collected after two years if he had invested N9,000.00?
 A. N1,000.00 B. N10,000.00 C. N5,400.00 D. N900.00
11. Differentiate $(\cos\theta + \sin\theta)^2$ with respect to θ .
 A. $2\cos 2\theta$ B. $2\sin 2\theta$ C. $-2\cos 2\theta$ D. $-2\sin 2\theta$
12. If the sum of the roots of the equation $2x^2 - 5px + 8 = 0$ is five times the product of the roots, find the value of p .
 A. -8 B. $1/8$ C. 8 D. $-1/8$
13. Find the area of region enclosed by the curve $y = 2 - x^2$ and the line $y = -x$.
 A. $3/2$ B. 9 C. 3 D. $-9/2$
14. In the figure below, $\angle PQ = \angle PR = \angle PS$ and $\angle SRT = 72^\circ$. Find $\angle QPS$.



- A. 72° B. 108° C. 144° D. 54°
15. If $x - 1$ is a factor of $3x^3 - px^2 + 5x - 3p$, find the value of p .
 A. -2 B. 2 C. $1/2$ D. $-1/2$

SUCCESS QUOTE

"If you would thoroughly know anything, teach it to others."

~Tryon Edwards

MATHEMATICS 2008/2009 SOLUTIONS

1. Let the three numbers be x , y and z .

$$\frac{x + y + z}{3} = 32_{\text{five}}$$

$$\frac{x + y + z}{3} = 3 \times 5 + 2 \times 1$$

$$\frac{x + y + z}{3} = 17$$

$$x + y + z = 17 \times 3 = 51$$

$$x + y + z = 51 \dots \dots \dots (1)$$

$$\text{But, } x + y = 13_{\text{four}}$$

$$x + y = 1 \times 4^2 + 3 \times 4^1 + 1 \times 4^0$$

$$x + y = 16 + 12 + 1 = 29$$

$$x + y = 29 \dots \dots \dots (2)$$

Subst. 29 for $(x + y)$ in eqn (1).

$$29 + z = 51$$

$$z = 51 - 29 = 22$$

$$z = 22$$

In base 6,

$$\begin{array}{r|l} 6 & 22 \\ 6 & 3 + 4 \uparrow \\ & 0 + 3 \uparrow \end{array}$$

Therefore, $z = 34_{\text{six}}$

Ans. B

2. $3(a + d) + (a + 6d) = a + 11d$

$$3a + 3d + a + 6d = a + 11d$$

$$4a + 9d = a + 11d$$

$$4a - a + 9d - 11d = 0$$

$$3a - 2d = 0$$

Ans. A

3. Let L be the longer side and w the shorter side.

$$\text{Perimeter of compound} = L + w + w = 36$$

$$L + 2w = 36 \dots \dots \dots (1)$$

$$\text{Area of compound} = Lw = 160$$

$$L = \frac{160}{w} \dots \dots \dots (2)$$

Substitute for L in eqn. (1)

$$\frac{160}{w} + 2w = 36$$

SUCCESS QUOTE

“Striving for success without hard work is like trying to harvest where you haven’t planted.”

~David Bly

SUCCESS QUOTE

“It is better to look ahead and prepare than to look back and regret.”

~ Jackie Joyner Kersee

$$160 + 2w^2 = 36w$$

$$2w^2 - 36w + 160 = 0$$

$$w^2 - 18w + 80 = 0$$

$$(w - 10)(w - 8) = 0$$

$w = 10$ or $w = 8$ (the possible lengths are 10m and 8m).

Ans. D

4. $y = 2x^2 - \sin 2x$

$$\frac{dy}{dx} = 4x - 2(\cos 2x) = 4x - 2\cos 2x$$

Ans. B

5. First bank = $4x$, UBA = $(2x - 1)$, Zenith = $3(x + 1)$

$$\text{Total ATM card} = 4x + (2x - 1) + 3(x + 1) = 4x + 2x - 1 + 3x + 3 = 9x + 2$$

$$\text{Pr(First bank)} = \frac{2}{5} = \frac{4x}{9x + 2}$$

$$2(9x + 2) = 20x$$

$$18x + 4 = 20x$$

$$20x - 18x = 4$$

$$2x = 4$$

$$x = 2$$

$$\text{Therefore, UBA ATM Cards} = 2x - 1 = 2(2) - 1 = 3$$

Ans. A

6. $0.000128 \times 0.00125 = 1.6 \times 10^{-7}$

Ans. C

7. $y = 3 - \ln x$

$$\ln x = 3 - y$$

$$\log_e x = 3 - y$$

$$x = e^{3-y}$$

Ans. A

8. Area of segment = Area of sector - Area of triangle.

$$= \frac{\theta}{360} \times \pi r^2 - \frac{1}{2} r^2 \sin \theta$$

$$= \frac{30}{360} \times \pi \times 42^2 - \frac{1}{2} (42^2) \sin 30$$

$$= 462 - 441 = 21 \text{ cm}^2$$

Ans. D

9. $s = 100 + 4.9t^2$

$$\frac{ds}{dt} = v = 9.8t$$

$$v = 9.8t$$

$$\text{at } t = 3 \text{ seconds, } v = 9.8 \times 3$$

$$v = 29.4 \text{ m/sec}$$

Ans. C

10. From $I = \frac{PTR}{100}$, we have $\frac{R}{100} = \frac{I}{PT}$. This implies that, $\frac{I}{PT} = \text{constant}$.

Therefore, $\frac{I_1}{P_1 T_1} = \frac{I_2}{P_2 T_2}$. Also, $I_2 = \frac{P_2 T_2 I_1}{P_1 T_1}$

Amount = Principal + Interest \longrightarrow Interest = Amount - Principal

From the question, $I_1 = 7800 - 6500 = 1300$, $P_1 = 6500$, $T_1 = 4$, $I_2 = ?$, $P_2 = 9000$, $T_2 = 2$.

$$I_2 = \frac{9000 \times 2 \times 1300}{6500 \times 4} = \text{N}900$$

Ans. D

11. Let $y = (\cos\theta + \sin\theta)^2$

$$\begin{aligned} \frac{dy}{d\theta} &= 2(\cos\theta + \sin\theta)(-\sin\theta + \cos\theta) \\ &= 2(-\sin\theta\cos\theta + \cos^2\theta - \sin^2\theta + \sin\theta\cos\theta) = 2(\cos^2\theta - \sin^2\theta) \end{aligned}$$

But $\cos^2\theta - \sin^2\theta = \cos 2\theta$

$$\frac{dy}{d\theta} = 2(\cos 2\theta) = 2\cos 2\theta$$

Ans. A

12. $2x^2 - 5px + 8 = 0$

$$x^2 - \frac{5px}{2} + 4 = 0$$

From the equation above: product of roots = 4, sum of roots = $-\left(\frac{-5p}{2}\right) = \frac{5p}{2}$

But, (sum of roots) = 5 x (product of roots). This implies that,

$$\frac{5p}{2} = 5 \times 4 \longrightarrow p = \frac{5 \times 4 \times 2}{5} = 8$$

Ans. C

13. $y = 2 - x^2$, $y = -x$

We obtain the ordinates by equating the curve and the line.

$$2 - x^2 = -x$$

$$x^2 - x - 2 = 0 \dots \dots \dots (*)$$

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

$$x = 2 \text{ or } -1$$

We then find the area using eqn. (*)

$$\text{Area} = \int_{-1}^2 (x^2 - x - 2) dx$$

$$= \left[\frac{x^3}{3} - \frac{x^2}{2} - 2x \right]_{-1}^2 = \left[\frac{x^3}{3} - \frac{x^2}{2} - 2x \right]^2 - \left[\frac{x^3}{3} - \frac{x^2}{2} - 2x \right]_{-1}$$

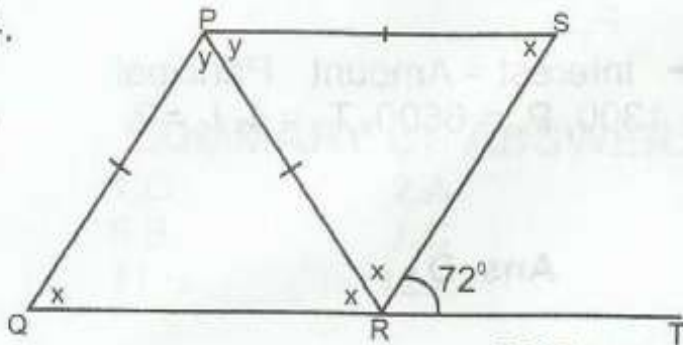
SUCCESS QUOTE

"A goal without a plan is just a wish."
~Larry Elder

$$= -\frac{10}{3} - \frac{7}{6} = -\frac{9}{2}$$

Ans. D

14.



$$\begin{aligned} \angle QPS &= y + y = 2y = 72 \times 2 \\ \angle QPS &= 144^\circ \end{aligned}$$

From the labelling of the figure,
 $x + x + 72^\circ = 180^\circ$ (adj. \angle s on a straight line)

$$2x = 180 - 72$$

$$x = 54^\circ$$

From ΔPQR , $54 + 54 + y = 180^\circ$ (\angle s in a Δ)

$$y = 72^\circ$$

Ans. C

15. $x - 1 = 0 \longrightarrow x = 1$

$$f(x) = 3x^3 - px^2 + 5x - 3p$$

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

$$3 - p + 5 - 3p = 0$$

$$8 - 4p = 0$$

$$4p = 8$$

$$p = 2$$

Ans. B

SUMMARY OF ANSWERS (MATHEMATICS 2008/2009)

1.B

2.A

3.D

4.B

5.A

6.C

7.A

8.D

9.C

10.D

11.A

12.C

13.D

14.C

15.B

SUCCESS QUOTE

“You’ve got to get up every morning with determination if you’re going to go to bed with satisfaction.”

~George Lorima

MATHEMATICS 2009/2010 QUESTIONS

- In a school, 180 students offer Mathematics or Physics or both. If 125 offer Mathematics and 105 offer Physics. How many students offer Mathematics only?
A. 75 B. 80 C. 55 D. 125
- Find the value of x for which $3(2^{4x+3}) = 96$
A. 2 B. -2 C. $\frac{1}{2}$ D. $-\frac{1}{2}$
- The cost of renovating a 5m square room is N500. What is the cost of renovating a 10m square room?
A. N1, 000 B. N2, 500 C. N2, 000 D. N10, 000
- Find the rate of change of the total surface area S of a sphere with respect to its radius r when $r = 2$.
A. 8π B. 16π C. 10π D. 14π
- Evaluate $\int_0^{\pi} \frac{\sin^2\theta - 1}{\cos^2\theta} d\theta$
A. π B. $-\pi$ C. $\pi + c$ D. $\pi/2$
- Differentiate $(\cos\theta + \sin\theta)^2$ with respect to θ .
A. $2\cos 2\theta$ B. $2\sin 2\theta$ C. $-2\cos 2\theta$ D. $-2\sin 2\theta$
- A binary operation $*$ on the set of rational numbers is defined as
$$x * y = 2x + \frac{x^2 - y^3}{x+y}, \quad \text{find } -1 * 2.$$

A. 11 B. -11 C. 8 D. -8
- A polynomial in x whose zeroes are 2, 1 and -3 is
A. $x^3 - 7x + 6 = 0$ B. $x^3 + 7x - 6 = 0$ C. $x^3 - 7x - 6 = 0$ D. $x^3 + 7x + 6 = 0$
- Find the range of values of x for which $7x - 3 > 3x + 4$
A. $x < 7/4$ B. $x > 7/4$ C. $7x < 4$ D. $-4 < x < 7$
- Let P be a probability function on set S , where $S = \{C_1, C_2, C_3, C_4\}$. Find $P(C_3)$ if $P(C_1) = 3/10$ and $P(C_4) = 1/4$.
A. $\frac{3}{5}$ B. $\frac{1}{2}$ C. $\frac{1}{6}$ D. $\frac{1}{3}$

11. Calculate the standard deviation of the following data 7, 8, 9, 10, 11, 12, 13.
A. 2 B. 4 C. 10 D. 11
12. If w is the mode and z is the median of the following set of numbers: 2.4, 2.1, 1.6, 2.6, 2.6, 3.7, 2.1 and 2.6, then $(3w, 2z)$ is
A. (2.6, 2.5) B. (2.1, 2.5) C. (7.8, 5.0) D. (6.2, 5.0)
13. A trapezium has two parallel sides of length 6cm and 8cm. If the area is 42cm^2 , find the distance between the parallel sides.
A. 6cm B. 7cm C. 8cm D. 5cm
14. An arc of a circle of length 22cm subtends an angle of $3y^\circ$ at the centre of the circle. Find the value of y , if the radius of the circle is 7cm.
A. 30° B. 60° C. 120° D. 150°
15. Find the locus of a point which moves such that its distance from the line $y = 3$ is a constant k .
A. $y = 3 + k$ B. $y = 3 - k$ C. $y = 3 + k$ D. $y = k - 3$

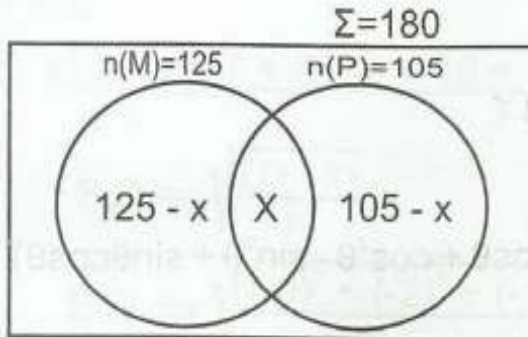
SUCCESS QUOTE

“If you wish to succeed in life, make perseverance your bosom friend, experience your wise counselor, caution your elder brother and hope your guardian genius.”

- Joseph Addison

MATHEMATICS 2009/2010 SOLUTION

1.



If the number of students that offer both Mathematics and Physics is x , then the number of students that offer:

Mathematics only = $125 - x$

Physics only = $105 - x$

Therefore, $125 - x + x + 105 - x = 180$

$$230 - x = 180$$

$$x = 230 - 180 = 50$$

Number of students that offer Maths only = $125 - x = 125 - 50 = 75$

Ans. A

2. $3(2^{4x+3}) = 96$

$$(2^{4x+3}) = 32$$

$$(2^{4x+3}) = 2^5$$

Since the bases are the same, we equate the powers.

$$4x + 3 = 5$$

$$x = \frac{5 - 3}{4} = \frac{1}{2}$$

Ans. C

3. $5\text{m square} = (5\text{m})^2 = 25\text{m}^2$, $10\text{m square} = (10\text{m})^2 = 100\text{m}^2$

$$25\text{m}^2 \text{ room} = \text{N}500$$

$$100\text{m}^2 \text{ room} = p$$

$$p = \frac{\text{N}500 \times 100\text{m}^2}{25\text{m}^2} = \text{N}2000$$

Ans. C

4. Total surface area of a sphere, $S = 4\pi r^2$ sq. units

$$\frac{ds}{dr} = 8\pi r$$

when $r = 2$, $\frac{ds}{dr} = 8\pi \times 2 = 16\pi$

Ans. B

SUCCESS QUOTE

“Any great achievement is preceded by many difficulties and many lessons; great achievements are not possible without them.”

- Brian Tracy

5. $\int_0^\pi \frac{\sin^2\theta - 1}{\cos^2\theta} d\theta$

Recall that $\sin^2\theta + \cos^2\theta = 1$

$$\rightarrow \int_0^\pi \frac{\sin^2\theta - 1}{\cos^2\theta} d\theta = \int_0^\pi \frac{\sin^2\theta - (\sin^2\theta + \cos^2\theta)}{\cos^2\theta} d\theta$$

$$= \int_0^{\pi} \frac{\sin^2\theta - \cos^2\theta - \sin^2\theta}{\cos^2\theta} d\theta = \int_0^{\pi} -\frac{\cos^2\theta}{\cos^2\theta} d\theta = -\int_0^{\pi} d\theta$$

$$= -[\theta]_0^{\pi} = -(\pi - 0) = -\pi$$

Ans. B

6. Let $y = (\cos\theta + \sin\theta)^2$

$$\frac{dy}{d\theta} = 2(\cos\theta + \sin\theta)(-\sin\theta + \cos\theta) = 2(-\sin\theta\cos\theta + \cos^2\theta - \sin^2\theta + \sin\theta\cos\theta)$$

$$= 2(\cos^2\theta - \sin^2\theta)$$

But $\cos^2\theta - \sin^2\theta = \cos 2\theta$

$$\longrightarrow \frac{dy}{d\theta} = 2(\cos 2\theta) = 2\cos 2\theta$$

Ans. A

7. $x * y = 2x + \frac{x^3 - y^3}{x + y}$

$$-1 * 2 = 2(-1) + \frac{(-1)^3 - (2)^3}{-1 + 2} = -2 + \frac{(-1 - 8)}{1} = -2 + (-9)$$

$$= -2 - 9 = -11$$

Ans. B

8. A polynomial in x having the zeros 2, 1 and -3 implies that

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

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

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

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

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

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

$$x^3 - 3x^2 + 2x + 3x^2 - 9x + 6 = 0$$

$$x^3 - 7x + 6 = 0$$

Ans. A

9. $7x - 3 > 3x + 4$

$$7x - 3x > 3 + 4$$

$$4x > 7$$

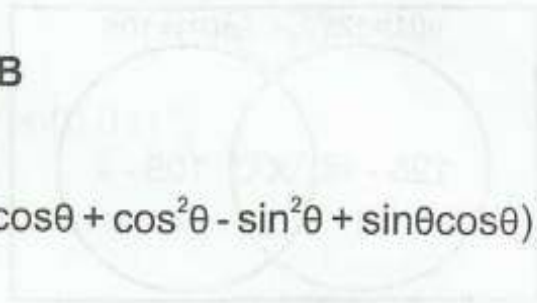
$$x > 7/4$$

Ans. B

10. $S = \{C_1, C_2, C_3, C_4\}$, $P(C_1) = 3/10$, $P(C_2) = 1/3$, $P(C_4) = 1/5$

$$P(C_1) + P(C_2) + P(C_4) = 3/10 + 1/3 + 1/5 = 5/6$$

$$P(C_3) = 1 - [P(C_1) + P(C_2) + P(C_4)]$$



SUCCESS QUOTE

"Give me six hours to chop down a tree, and I will spend the first four hours sharpening the axe."

-Abraham Lincoln

$= 1 - \frac{5}{6} = \frac{1}{6}$

Ans. C

11. Mean = $\frac{7 + 8 + 9 + 10 + 11 + 12 + 13}{7} = \frac{70}{7} = 10$

S.D = $\sqrt{\frac{\sum(x - \bar{x})^2}{N}}$

S.D = $\sqrt{\frac{(-3)^2 + (-2)^2 + (-1)^2 + 0 + 1^2 + 2^2 + 3^2}{7}} = \sqrt{\frac{28}{7}} = 2$

Ans. A

12. Mode, $w = 2.6$

For the median, z , we rearrange the given data: 1.6, 2.1, 2.1, 2.4, 2.6, 2.6, 2.6, 3.7

$z = \frac{2.4 + 2.6}{2} = 2.5$

Therefore, $(3w, 2z) = [3(2.6), 2(2.5)] = (7.8, 5.0)$

Ans. C

13. Area of trapezium, $A = \frac{1}{2}(a + b)h$; where $A = 42\text{cm}^2$, $a = 6\text{cm}$, $b = 8\text{cm}$, $h = ?$

$42 = \frac{1}{2}(6 + 8)h = \frac{1}{2}(14)h$

$h = \frac{42 \times 2}{14} = 6\text{cm}$

Ans. A

14. $l = 22\text{cm}$, $\theta = 3y$, $r = 7\text{cm}$

$l = \frac{\theta}{360} \times 2\pi r$

$22 = \frac{3y}{360} \times 2 \times \frac{22}{7} \times 7 = \frac{3y}{360} \times 44$

$7920 = 132y$

$y = \frac{7920}{132} = 60^\circ$

Ans. B

15. $y = 3 \pm k$

Ans. C

SUCCESS QUOTE

“The difference between the impossible and the possible lies in a person’s determination.”

~Tommy Lasorda

SUMMARY OF ANSWERS (MATHEMATICS 2009/2010)

1.A	2.C	3.C	4.B	5.B
6.A	7.B	8.A	9.B	10.C
11.A	12.C	13.A	14.B	15.C

MATHEMATICS 2010/2011 QUESTIONS

9. Simplify $\sqrt[3]{(243)^{-1}x^3}$
A. $x/3$ B. $3/x$ C. $-x/3$ D. $-3/x$
10. Without using tables, evaluate $(125)^{-0.3} \times (0.49)^{-0.2} \times (0.01)^{-0.4}$.
A. $7/20$ B. $20/7$ C. $5/7$ D. $7/5$
11. Convert 1231_4 to a number in base 6.
A. 105_6 B. 301_6 C. 103_6 D. 501_6
12. Find the slope of the curve $y = 3x^3 + 5x^2 - 3$ at $(-1, 5)$.
A. 1 B. -1 C. 19 D. -19
13. Find the area of the region bounded by $y = x^2 - x - 2$ and x-axis.
A. $9/2$ B. $-9/2$ C. $8/3$ D. $16/3$
14. The minimum value of $y = x^2 - 4x - 5$ is
A. 2 B. -2 C. 13 D. -13
15. Make x the subject of the relation $y = 3 - \ln x$.
A. e^{3-y} B. e^{y+3} C. $y/3$ D. $3/y$
16. Find x, y for which $\begin{pmatrix} 2x & 4 \\ 3 & y \end{pmatrix} \begin{pmatrix} 1 \\ 2 \end{pmatrix} = \begin{pmatrix} 10 \\ -1 \end{pmatrix}$
A. $(1, -2)$ B. $(1, 2)$ C. $(-1, 2)$ D. $(2, -1)$
17. Simplify $\frac{1\frac{1}{2}}{2 \div \frac{1}{4}}$ of 32
A. $3/256$ B. $3/32$ C. 6 D. 85
18. The probability of either event A or B is $\frac{1}{2}$, while that of event B is $\frac{1}{3}$. If the probability of both A and B is $\frac{1}{6}$, what is the probability of event A.
A. $\frac{3}{4}$ B. $\frac{5}{6}$ C. $\frac{1}{4}$ D. $\frac{2}{3}$
19. The chances of three independent events X, Y, Z occurring are $\frac{1}{2}, \frac{2}{3}, \frac{1}{4}$ respectively. What are the chances of Y and Z only occurring?
A. $\frac{1}{8}$ B. $1/24$ C. $1/12$ D. $\frac{1}{4}$

12. Some red balls were put in a basket containing 12 white balls and 16 blue balls. If the probability of picking a red ball from the basket is $\frac{3}{7}$, how many red balls were introduced?
 A. 13 B. 20 C. 12 D. 21
13. Find the coordinates of the mid-point of the line joining (2, 7) and (1, -6).
 A. $(\frac{1}{2}, \frac{13}{2})$ B. $(\frac{3}{2}, \frac{1}{2})$ C. $(\frac{1}{2}, \frac{1}{2})$ D. $(\frac{3}{2}, \frac{13}{2})$
14. An equilateral triangle of sides 2cm is inscribed in a circle. Find the area of the circle.
 A. $4\pi\text{cm}^2$ B. $8\pi\text{cm}^2$ C. $4\pi/3\text{cm}^2$ D. $3\pi/4\text{cm}^2$
15. The chord PQ of a circle is equal to the radius, r of the circle. Find the length of the arc PQ.
 A. $3\pi/4$ B. $\pi/4$ C. $\pi/3$ D. $\pi/6$

SUCCESS QUOTE

Four steps to achievement:

Plan purposefully.

Prepare prayerfully.

Proceed positively.

Pursue persistently.

~William Arthur Ward

MATHEMATICS 2010/2011 SOLUTIONS

$$1. \sqrt[5]{(243)^{-1}x^5} = [(243)^{-1}x^5]^{\frac{1}{5}}$$

$$= \left[\frac{x^5}{243}\right]^{\frac{1}{5}} = \left(\frac{x^5}{3^5}\right)^{\frac{1}{5}} = \left(\frac{x}{3}\right)^{5 \times \frac{1}{5}} = \frac{x}{3}$$

Ans. A

$$2. (125)^{-\frac{1}{5}} \times (0.49)^{-\frac{1}{2}} \times (0.01)^{-\frac{1}{2}}$$

$$= \left(\frac{1}{125}\right)^{\frac{1}{5}} \times \left(\frac{49}{100}\right)^{-\frac{1}{2}} \times \left(\frac{1}{100}\right)^{-\frac{1}{2}} = \left(\frac{1}{125}\right)^{\frac{1}{5}} \times \left(\frac{100}{49}\right)^{\frac{1}{2}} \times \left(\frac{100}{1}\right)^{\frac{1}{2}}$$

$$= \left(\frac{1}{5^3}\right)^{\frac{1}{5}} \times \left(\frac{10^2}{7^2}\right)^{\frac{1}{2}} \times (10^2)^{\frac{1}{2}} = \frac{1}{5} \times \frac{10}{7} \times 10 = \frac{20}{7}$$

Ans. B

3. To convert 1231_{four} to a number in base 6, we first convert to base 10.
 $1231_{\text{four}} = 1 \times 4^3 + 2 \times 4^2 + 3 \times 4^1 + 1 \times 4^0 = 64 + 32 + 12 + 1 = 109_{\text{ten}}$
 We then 109_{ten} convert to base 6

$$\begin{array}{r|l} 6 & 109 \\ 6 & 18+1 \\ 6 & 3+0 \\ & 0+3 \end{array}$$

Therefore, $1231_{\text{four}} = 301_{\text{six}}$

Ans. B

1. $y = 3x^3 + 5x^2 - 3$
 $\frac{dy}{dx} = 9x^2 + 10x = m$
 $\rightarrow m = 9x^2 + 10x$
 at $(-1, 5)$
 $m = 9(-1)^2 + 10(-1) = 9 \times 1 - 10 = -1$

Ans. B

SUCCESS QUOTE

“Some are Destined to Succeed,
 Some are Determined to Succeed.”

~H. H. Swami Tejomayanda

- i. Recall that the x-axis is the line where $y = 0$. This implies that we are asked to find the area of the region bounded by the curve, $y = x^2 - x - 2$ and the line $y = 0$. We obtain the ordinates by equating the curve and the line.

$$x^2 - x - 2 = 0 \dots\dots\dots (*)$$

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

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

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

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

$$x = -1 \text{ or } 2$$

We then find the area using eqn (*)

$$\text{Area} = \int_{-1}^2 (x^2 - x - 2) dx$$

$$= \left[\frac{x^3}{3} - \frac{x^2}{2} - 2x \right]_{-1}^2 = \left[\frac{x^3}{3} - \frac{x^2}{2} - 2x \right]_2 - \left[\frac{x^3}{3} - \frac{x^2}{2} - 2x \right]_{-1}$$

$$= \left(\frac{2^3}{3} - \frac{2^2}{2} - 2(2) \right) - \left(\frac{(-1)^3}{3} - \frac{(-1)^2}{2} - 2(-1) \right)$$

$$= \left(\frac{-10}{3} \right) - \left(\frac{7}{6} \right) = \frac{-9}{2}$$

Ans. B

6. $y = x^2 - 4x - 5$

$$\frac{dy}{dx} = 2x - 4$$

$$\frac{d^2y}{dx^2} = 2$$

Ans. A

7. $y = 3 - \ln x$

$$\ln x = 3 - y$$

$$\log_e x = 3 - y$$

$$x = e^{3-y}$$

Ans. A

SUCCESS QUOTE

“It is your Attitude more than your Aptitude that determines your Altitude.”

~Brian Tracy

8. $\begin{pmatrix} 2x & 4 \\ 3 & y \end{pmatrix} \begin{pmatrix} 1 \\ 2 \end{pmatrix} = \begin{pmatrix} 10 \\ -1 \end{pmatrix}$

$$2x(1) + 4(2) = 10 \dots\dots\dots (1)$$

$$3(1) + y(2) = -1 \dots\dots\dots (2)$$

From eqn. (1), $2x + 8 = 10$

$$2x = 10 - 8 = 2$$

$$2x = 2, \quad x = 1$$

From eqn. (2), $3 + 2y = -1$

$$2y = -3 - 1 = -4$$

$$y = -2$$

$$(x, y) = (1, -2)$$

Ans. A

$$\begin{aligned} 9. \quad \frac{1\frac{1}{2}}{2 \div \frac{1}{4} \text{ of } 32} &= \frac{1\frac{1}{2}}{2 \div (\frac{1}{4} \text{ of } 32)} = \frac{\frac{3}{2}}{2 \div (\frac{1}{4} \times 32)} \\ &= \frac{\frac{3}{2}}{2 \div 8} = \frac{\frac{3}{2}}{\frac{1}{4}} = \frac{3}{2} \times \frac{4}{1} = 6 \end{aligned}$$

Ans. C

$$10. \quad \Pr(A \text{ or } B) = \Pr(A \cup B) = \frac{5}{6}, \Pr(B) = \frac{1}{6}, \Pr(A \text{ and } B) = \Pr(A \cap B) = \frac{1}{2}$$

$$\Pr(A) = ?$$

$$\Pr(A \cup B) = \Pr(A) + \Pr(B) - \Pr(A \cap B)$$

$$\frac{5}{6} = \Pr(A) + \frac{1}{6} - \frac{1}{2}$$

$$\frac{5}{6} = \Pr(A) - \frac{1}{3}$$

$$\Pr(A) = \frac{5}{6} + \frac{1}{3} = \frac{7}{6} = 1.167$$

This answer is impossible because probability cannot be greater than 1. The values given are not correct; $\Pr(A \cap B)$ is not supposed to be greater than $\Pr(B)$.

$$11. \quad P(X) = \frac{1}{2}, P(Y) = \frac{2}{3}, P(Z) = \frac{1}{4}$$

Since X, Y and Z are independent events, $P(Y \text{ and } Z) = P(Y \cap Z)$

$$= P(Y) \cdot P(Z) = \frac{2}{3} \times \frac{1}{4} = \frac{1}{6}$$

Ans. D

$$12. \quad \text{Let the number of red balls} = x, \text{ Number of white balls} = 12$$

$$\text{Number of blue balls} = 16, \text{ Total number of balls} = x + 12 + 16 = x + 28$$

$$\Pr(\text{red}) = \frac{3}{7}$$

$$\text{but } \Pr(\text{red}) = \frac{x}{(28 + x)}$$

$$\text{Therefore, } \frac{x}{28 + x} = \frac{3}{7}$$

$$7x = 3(28 + x)$$

$$7x = 84 + 3x$$

$$7x - 3x = 84$$

$$4x = 84$$

$$x = 84/4 = 21$$

Ans. D

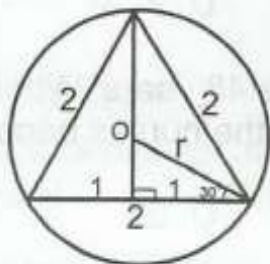
SUCCESS QUOTE

“Wisdom begins with the sacrifice of immediate pleasures for long-range purposes.”

~Louis Finkelstein

13. The coordinates of the mid-point of (x_1, y_1) and (x_2, y_2) are $[\frac{1}{2}(x_1 + x_2), \frac{1}{2}(y_1 + y_2)]$
 For points $(2, 7)$ and $(1, -6)$, the coordinates of the mid-point = $[\frac{1}{2}(2 + 1), \frac{1}{2}(7 - 6)]$
 $= [\frac{1}{2}(3), \frac{1}{2}(1)] = (\frac{3}{2}, \frac{1}{2})$
Ans. D

14.



$$\begin{aligned}\cos 30^\circ &= \frac{1}{r} \\ \frac{\sqrt{3}}{2} &= \frac{1}{r} \\ r &= \frac{2}{\sqrt{3}}\end{aligned}$$

Radius of circle, $r = \frac{2}{\sqrt{3}}$

Area of circle = $\pi r^2 = \pi \times \left(\frac{2}{\sqrt{3}}\right)^2 = \pi \times \frac{4}{3} = \frac{4}{3}\pi \text{ cm}^2$

Ans. C

15. Since the chord is equal to the radius, the triangle formed is equilateral and would subtend an angle of 60° or $\frac{\pi}{3}$ rad.

Length of arc = $\frac{\theta}{2\pi} \times 2\pi r$, where $\theta = \frac{\pi}{3}$ rad

$$\begin{aligned}\text{Length of arc} &= \frac{\frac{\pi}{3}}{2\pi} \times 2\pi r = \frac{\pi}{3} \times r \\ &= \frac{\pi}{3}r\end{aligned}$$

Ans. C

SUMMARY OF ANSWERS (MATHEMATICS 2010/2011)

1.A	2.B	3.B	4.B	5.B
6.A	7.A	8.A	9.C	10.
11.D	12.D	13.B	14.C	15.C

SUCCESS QUOTE

“When you know what you want and you want it badly enough, you will work hard enough to get it.”

~Henry Divine

MATHEMATICS 2011/2012 QUESTIONS

1. A bag contains x Nokia phones, $(2x-3)$ LG phones and $3x$ Samsungs phones. If the probability of picking an LG phone at random from the bag is $\frac{1}{5}$, how many Samsung phones are in the bag?
 A. 12 B. 3 C. 6 D. 9
2. The mean of the ages of fifteen doctors in a certain hospital is 48 years. When five nurses joined them, the mean of the ages of the doctors and the nurses becomes 42 years. Find the mean of the ages of the five nurses.
 A. 39 B. 24 C. 28 D. 33
3. If the probability of an event A is $\frac{3}{5}$ and the probability of both the event A and another event B is $\frac{3}{25}$, find the probability of B only.
 A. $\frac{12}{25}$ B. $\frac{1}{5}$ C. $\frac{9}{125}$ D. $\frac{18}{25}$

4. The identity element with respect to the multiplication shown in the table below is:

*	X	Y	Z	W
X	W	Z	X	W
Y	Z	W	Y	X
Z	X	Y	Z	W
W	X	Y	W	Z

- A. Y B. X C. W D. Z
5. Find the value of x such that $2^x \times 2^{x+1} = \sqrt{32}$
 A. $\frac{3}{2}$ B. $\frac{7}{4}$ C. $\frac{3}{4}$ D. $-\frac{3}{4}$
 6. If the sum of the first n terms of a sequence is $2n^2 + 1$, find the n th term of the sequence.
 A. $2(2n + 1)$ B. $4n + 1$ C. $4n - 1$ D. $2(2n - 1)$
 7. Express $\frac{312_3}{14_7}$ as a number in base 3.
 A. 201_3 B. 11_3 C. 102_3 D. 202_3
 8. Simplify $10^{\frac{x}{2}} \times 20^{x+1} \times 125^{\frac{x}{2}} \div 32^{\frac{x}{2}}$
 A. $\frac{1}{20}$ B. 20 C. 20^x D. 20^{x+1}
 9. In a class of 54 students, each student offers at least one of English and French. If the

sum of those that offer both subjects is half the number that offer English only and the number that offer French only is twice the number that offer both subjects, find the number of students that offer English only.

- A. 12 B. 30 C. 36 D. 18

10. Evaluate $\int_4^0 \sqrt{1-2x} \, dx$

- A. $\frac{52}{3}$ B. $-\frac{26}{3}$ C. $\frac{26}{3}$ D. $-\frac{1}{6}$

11. The first derivative of $y = 3\cos^2 4x$ is

- A. $24\sin 4x$ B. $-24\cos 4x \sin x$ C. $-12\sin 8x$ D. $12\sin 8x$

12. The integral of $3x - 2$ which passes the point $(1, -\frac{5}{6})$ is

- A. $\frac{1}{6}(3x-2)^2 - 1$ B. $-\frac{1}{6}(3x-2)^2 - 1$ C. $3x^2 - 2x + \frac{11}{6}$ D. $\frac{1}{6}(3x-2)^2 + 1$

13. A pyramid 12cm high stands on a rectangular base of length 7cm and width 5cm. Calculate the volume of the pyramid.

- A. 420cm^3 B. 140cm^3 C. 210cm^3 D. 47cm^3

14. Find the number of sides of a regular polygon if each of the interior angle of the polygon is 150.

- A. 6 B. 9 C. 8 D. 12

15. A fly at a point P moves such that its distance from a point O is 21cm. If the fly covers a distance of 22cm before reaching a point Q, calculate angle POQ.

- A. 63.2° B. 60° C. 31.6° D. 120°

FEATURES OF THIS BOOK

- ☛ Quick Subject Revision Aids & Admission Success Secrets
- ☛ Bonus Tips
- ☛ Success Quotes
- ☛ Answers to Frequently Asked Questions (FAQ's)

In the *Quick Subject Revision Aids*, efforts were made to highlight the basic concepts of the subjects and to provide insights into the likely examination questions. The *Admission Success Secrets* are geared towards solving the problem of lack of admission orientation among candidates and providing answers to their *Frequently Asked Questions*.

The *Bonus Tips* provide you with those extra information you need to have an edge over others. *Success Quotes* were also included to get you motivated, because if you are motivated, then you are already half-way to your success.

If you can't find the above features in the material you bought, please call 08060848179 to get an original copy of SureSuccess. God bless you.

MATHEMATICS 2011/2012 SOLUTIONS

1. From the question,

No of Nokia phones = x , No of LG phones = $2x - 3$, No of Samsung phones = $3x$.

$P(\text{LG phone}) = \frac{1}{5}$

Number of Samsung phones in the bag = ?

Total number of phones = $x + (2x - 3) + 3x = x + 2x - 3 + 3x = (6x - 3)$ phones

Probability = $\frac{\text{No of required outcome}}{\text{No of possible outcome}}$

$$\Rightarrow P(\text{LG phones}) = \frac{2x - 3}{6x - 3} = \frac{1}{5}$$

$$5(2x - 3) = 1(6x - 3)$$

$$10x - 15 = 6x - 3$$

$$10x - 6x = 15 - 3$$

$$4x = 12$$

$$x = 3$$

Therefore, no of Samsung phones = $3x = 3 \times 3 = 9$

Ans. D

2. Let the mean age of 15 doctors = \bar{x}_1 and the mean age of 15 doctors & 5 nurses = \bar{x}_2
From the question, $\bar{x}_1 = 48$ yrs, $\bar{x}_2 = 42$ yrs.

Mean, $\bar{x} = \frac{\sum x}{N}$

For the 15 doctors, $48 = \frac{\sum x}{15} \Rightarrow \sum x = 48 \times 15 = 720$ yrs

For the 15 doctors & 5 nurses, $42 = \frac{\sum x}{20} \Rightarrow \sum x = 42 \times 20 = 840$ yrs

For the nurses, $\sum x = 840 - 720 = 120$

$$\bar{x} = \frac{120}{5} = 24 \text{ yrs}$$

Ans. B

3. $P(A) = \frac{3}{5}$, $P(A \text{ and } B) = \frac{3}{25}$, $P(B) = ?$

$P(A \text{ and } B) = P(A) \times P(B)$

$$\Rightarrow P(B) = \frac{P(A \text{ and } B)}{P(A)} = \frac{\frac{3}{25}}{\frac{3}{5}} = \frac{3}{25} \times \frac{5}{3} = \frac{1}{5}$$

Ans. B

4. Note that an identity element is an element of a set which when combined with another element under some binary operation, leaves the latter element as it is. Thus, if e is the identity element of a set A under the binary operation $*$, then

$$a * e = e * a = a \text{ for all } a \in A.$$

For example, in a set of integers, 0 is the identity element with respect to the operation of addition and 1 is its identity element with respect to multiplication.

Ans. D

5. $2^x \times 2^{x+1} = \sqrt{32}$

$$2^{x+x+1} = 32^{\frac{1}{2}}$$

$$2^{2x+1} = (2^5)^{\frac{1}{2}}$$

BONUS TIP

Endeavor to read through the *Admission Success Tips* in this book. Read from the first one through to the last one. You may find out that you need to make one or two adjustments in certain areas to reposition yourself for a successful admission search.

$$2^{2x+1} = 2^{\frac{5}{2}}$$

$$\Rightarrow 2x + 1 = \frac{5}{2}$$

$$4x + 2 = 5$$

$$4x = 5 - 2 = 3$$

$$x = \frac{3}{4}$$

Ans. C

6. If S_n denotes sum of n terms and T_n denotes the n th term,

$$S_n = 2n^2 + 1 \text{ (i.e. from the question)}$$

but, $T_n = S_n - S_{n-1}$ {This is a law, note it carefully.}

$$\begin{aligned} \text{Therefore, } T_n &= 2n^2 + 1 - [2(n-1)^2 + 1] \\ &= 2n^2 + 1 - [2(n^2 - n - n + 1) + 1] \\ &= 2n^2 + 1 - (2n^2 - 4n + 3) \\ &= 2n^2 + 1 - 2n^2 + 4n - 3 \\ &= 4n - 2 = 2(2n - 1) \end{aligned}$$

Ans. D

FOLLOW-UP QUESTION

The sum of the first n terms of a series is given by the formula $S_n = n^2 + 3n$ for all values of n . Find an expression for the n th term of the series.

Answer: $2n+2$ or $2(n+1)$

$$7. \frac{321_8}{14_7} = \frac{3 \times 6^2 + 2 \times 6^1 + 1 \times 6^0}{1 \times 7^1 + 4 \times 7^0}$$

$$= \frac{3 \times 36 + 2 \times 6 + 1 \times 1}{1 \times 7 + 4 \times 1} = \frac{121}{11} = 11_{10}$$

Finally, we convert 11_{10} to base 3:

$$\begin{array}{r|l} 3 & 11 \\ 3 & 3 \text{ R } 2 \\ 3 & 1 \text{ R } 0 \\ 3 & 0 \text{ R } 1 \end{array} \quad 102_{\text{three}}$$

Ans. C

$$8. 10^{\frac{1}{2}} \times 20^{x+1} \times 125^{\frac{1}{2}} + 32^{\frac{1}{2}}$$

$$= 10^{\frac{1}{2}} \times 20^{x+1} \times \frac{1}{125^{\frac{1}{2}}} \times \frac{1}{32^{\frac{1}{2}}}$$

$$= \frac{10^{\frac{1}{2}}}{125^{\frac{1}{2}} \times 32^{\frac{1}{2}}} \times 20^{x+1}$$

$$= \left[\frac{10^{\frac{1}{2}}}{125^{\frac{1}{2}} \times 32^{\frac{1}{2}}} \right] \times 20^{x+1}$$

$$= \left(\frac{1}{25 \times 16} \right)^{\frac{1}{2}} \times 20^{x+1} = \left(\frac{1}{\sqrt{25 \times 16}} \right)^{\frac{1}{2}} \times 20^{x+1} = \left(\frac{1}{20} \right)^{\frac{1}{2}} \times 20^{x+1}$$

$$= 20^{-\frac{1}{2}} \times 20^{x+1} = 20^{x+\frac{1}{2}} = 20^1 = 20$$

Ans. B

9. If the universal set = ξ , English = E, French = F, then $n(\xi) = 54$,

$$FnE' + FnE = \frac{1}{2}(F'nE) \dots \dots \dots (1)$$

$$FnE' = 2(FnE) \dots \dots \dots (2)$$

$$\text{But } FnE' + F'nE + FnE = 54 \dots \dots \dots (3)$$

Substitute (2) into (1) [i.e. substitute for FnE' in eqn (1)]

$$2(FnE) + FnE = \frac{1}{2}(F'nE)$$

$$3(FnE) = \frac{1}{2}(F'nE) \dots \dots \dots (4)$$

SUCCESS QUOTE

“The will to win, the desire to succeed, the urge to reach your full potential... these are the keys that will unlock the door to personal excellence.” ~ Confucius

Substituting (2) into (3), we have

$$2(F'NE) + F'NE + F'NE = 54$$

$$3(F'NE) + F'NE = 54$$

$$(F'NE) = 54 - F'NE \dots \dots \dots (5)$$

Comparing (4) and (5), we note that since the Left Hand Sides of both equations are equal, the Right Hand Sides will also be equal.

$$\text{Therefore, } \frac{1}{2}(F'NE) = 54 - F'NE$$

$$F'NE = 108 - 2(F'NE)$$

$$F'NE + 2(F'NE) = 108$$

$$3(F'NE) = 108$$

$$(F'NE) = 108/3 = 36$$

Ans. C

10. $\int_{-4}^0 \sqrt{1-2x} \, dx = \int_{-4}^0 (1-2x)^{\frac{1}{2}} \, dx$

$$= \left[\frac{(1-2x)^{\frac{3}{2}}}{-\frac{2}{2} \cdot \frac{3}{2}} \right]_{-4}^0 = \left[\frac{(1-2x)^{\frac{3}{2}}}{-3} \right]_{-4}^0$$

$$= \left[\frac{(1-2(0))^{\frac{3}{2}}}{-3} \right] - \left[\frac{(1-2(-4))^{\frac{3}{2}}}{-3} \right] = -\frac{1}{3} - (-9)$$

$$= -\frac{1}{3} + 9 = \frac{26}{3}$$

Ans. D

11. $y = 3\cos^2 4x$

If we let $y = 3v^2$, where $v = \cos 4x$. Then,

$$\frac{dy}{dx} = \frac{dy}{dv} \cdot \frac{dv}{dx}, \quad \frac{dy}{dv} = 6v, \quad \frac{dv}{dx} = -4\sin 4x$$

$$\text{Therefore, } \frac{dy}{dx} = 6v \cdot -4\sin 4x = 6\cos 4x \cdot -4\sin 4x \\ = 6x \cdot -4\cos 4x \sin 4x = -24\cos 4x \sin 4x$$

NB: We may also treat this as a function of a function of a function i.e. $y = 3v^2$, where $v = \cos u$ and $u = 4x$ i.e. y is a function of v , which in turn is a function of u , which is a function of x . In that case, we simply use:

$$\frac{dy}{dx} = \frac{dy}{dv} \cdot \frac{dv}{du} \cdot \frac{du}{dx} \\ = 6v \cdot -\sin u \cdot 4 = -24v \sin u = -24\cos 4x \sin 4x$$

Ans. B

12. Given $3x - 2$, $(1, -\frac{5}{6})$, we assume that $3x - 2$ is the gradient of a curve which passes through the point $(1, -\frac{5}{6})$.

$$\text{Gradient} = \frac{dy}{dx} = 3x - 2$$

$$\text{This implies that } y = \int (3x - 2) dx = \frac{3x^2}{2} - 2x + c$$

$$y = \frac{3x^2}{2} - 2x + c$$

Substituting the given values of x and y in the equation, we have

$$-\frac{5}{6} = \frac{3}{2}(1)^2 - 2(1) + c$$

simplifying this further, we have that $c = -\frac{1}{3}$

$$\text{Therefore, } y = \frac{3x^2}{2} - 2x - \frac{1}{3} = \frac{1}{6}(9x^2 - 12x + 4) - 1 = \frac{1}{6}(9x^2 - 6x - 6x + 4) - 1$$

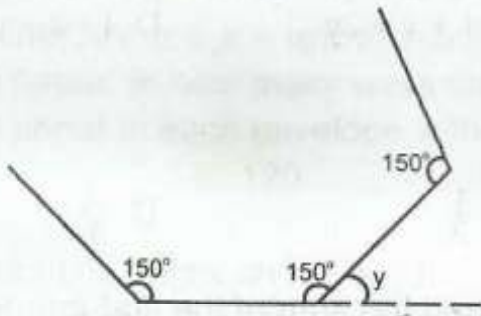
$$= \frac{1}{6}[3x(3x - 2) - 2(3x - 2)] - 1 = \frac{1}{6}[(3x - 2)(3x - 2)] - 1 = \frac{1}{6}(3x - 2)^2 - 1$$

Ans. A

13. Height = 12cm, Base length = 7cm, Base width = 5cm
 Volume = $\frac{1}{2}$ Base area x Height = $\frac{1}{2}$ Base length x Base width x Height
 = $\frac{1}{2} \times 7 \times 5 \times 12 = 210 \text{ cm}^2$

Ans. C

14. From the question, each interior angle = 150° .
 Let each of the exterior angles be y as shown in the diagram below.



$150^\circ + y = 180^\circ$ [sum of adjacent angles on a straight line is 180°]

$y = 180^\circ - 150^\circ = 30^\circ$ i.e., each exterior angle is 30°

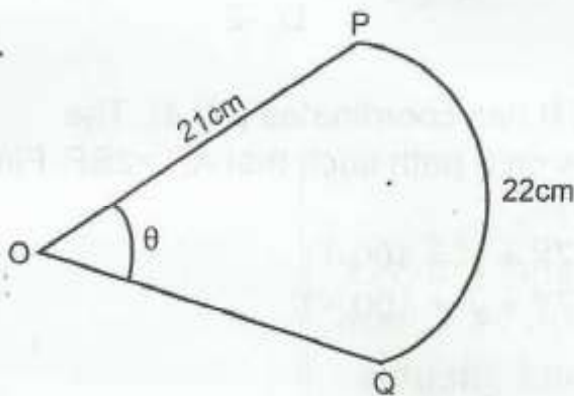
The sum of the exterior angles of a polygon is 360° . Therefore, if the polygon has n -sides, then

$$30 \times n = 360^\circ$$

$$n = 360^\circ \div 30^\circ = 12 \text{ sides}$$

Ans. D

15.



$$PQ = \frac{\theta}{360} \times 2\pi r$$

$$22 = \frac{\theta}{360} \times 2 \times \frac{22}{7} \times 21$$

$$\theta = \frac{22 \times 360 \times 7}{2 \times 22 \times 21}$$

$$\theta = 60^\circ$$

Ans. B

SUMMARY OF ANSWERS

[MATHEMATICS 2011/2012]

1.D	2.B	3.B	4.D	5.C
6.D	7.C	8.B	9.C	10.D
11.B	12.A	13.C	14.D	15.B

**SUCCESS
QUOTE**

“For every disciplined effort, there is a multiple reward.”

~Jim Rohn

Can any of the numbers: 100000040117, 00074204020, 07022043500, 000010110117 to get your copy.

MATHEMATICS 2012/2013 QUESTIONS

- If p , q and r are in the ratio 6: 4: 5, find the value of $\frac{3p - q}{4q + r}$
A. $\frac{2}{3}$ B. $\frac{3}{2}$ C. $\frac{3}{5}$ D. $\frac{5}{3}$
- If $\log_{10} 2 = x$ and $\log_{10} 3 = y$, express $\log_{10} 10 + 2\log_{10} 6$ in terms of x and y .
A. $1 - x + 2y$ B. $1 + 2x + 2y$ C. $1 + x + 2y$ D. $1 - x + y$
- Simplify $\frac{1\frac{1}{2}}{2 \div \frac{1}{4} \text{ of } 16}$
A. 3 B. $\frac{3}{16}$ C. $\frac{1}{3}$ D. $\frac{3}{4}$
- If the 7th term of an AP is twice the third term and the sum of the first four terms is 42, find the common difference.
A. $\frac{3}{2}$ B. 2 C. 3 D. 6
- Find the sum to infinity of the series $2 + \frac{3}{2} + \frac{9}{8} + \frac{27}{32} + \dots$
A. 8 B. $\frac{1}{2}$ C. 2 D. 4
- Evaluate $\begin{vmatrix} \cos 2\theta & -2\sin\theta \\ 2\sin\theta & 2 \end{vmatrix}$.
A. 4 B. 2 C. -4 D. -2
- The point A has coordinates (5, 16) and the point B has coordinates (-4, 4). The variable point P has coordinates (x, y) and moves on a path such that $AP = 2BP$. Find the Cartesian equation of the path of P.
A. $(x + 7)^2 + y^2 = 100$ B. $(x - 7)^2 + y^2 = 100$
C. $(x + 7)^2 + y^2 + 100 = 0$ D. $(x - 7)^2 + y^2 + 100 = 0$
- Simplify $4\sin\theta\sin(\frac{\pi}{3} - \theta)\sin(\frac{\pi}{3} + \theta)$
A. $\sin 3\theta$ B. $\cos 3\theta$ C. $\sin 3\theta$ D. $\cos 3\theta$
- The distance points P and Q with coordinates $(ap^2, 2ap)$ and $(aq^2, 2aq)$ respectively lie on the curve $y^2 = 4ax$. The tangents to the curve at P and Q meet at the point T. Find the coordinates of T if $pq \neq 0$
A. $(apq, a(p + q))$ B. $(a(p + q), apq)$
C. $(-apq, a(p + q))$ D. $(apq, -a(p + q))$
- If $y = 2\cos(3x - \pi)$, then $\frac{dy}{dx}$ is

11. Find the coordinates of the turning points of the curve $y = 27x^3 - 27x^2 + 4$
 A. (4, 0), (0, $\frac{2}{3}$) B. (0, 4), ($\frac{2}{3}$, 0) C. (0, -4), ($-\frac{2}{3}$, 0) D. (0, -4), ($\frac{2}{3}$, 0)
12. If $y = (1 + 2x)^3$, find $\frac{dy}{dx}$ at $x = -1$
 A. -3 B. 3 C. -6 D. 6
13. An examiner has five envelopes labeled A to E for each of the five options of a question paper. In how many ways can the examiner place one option of the question paper in each envelope without getting every option in the envelope?
 A. 119 B. 120 C. 25 D. 24
14. The distribution below shows the money received by a group of students who shared ₹12,000:00 with a teacher. How much did the teacher receive?
- | | | | | |
|--------------------|-----|-----|-----|------|
| Amt. Received in ₹ | 200 | 350 | 700 | 1000 |
| No of Students | 1 | 2 | 3 | 5 |
- A. ₹400:00 B. ₹1000:00 C. ₹9750:00 D. ₹4000:00
15. Two numbers are removed at random from the numbers -1, 0, 1. What is the probability that the product of the numbers removed is zero?
 A. $\frac{1}{3}$ B. $\frac{2}{3}$ C. $\frac{5}{9}$ D. $\frac{4}{9}$

SUCCESS QUOTE

“Having taught students for a few years now, I’ve discovered that a lot of them actually know what to do to achieve genuine academic success. Alas! Very few students actually do what they know. Knowing is not enough! You must learn to take the necessary actions.”

~ Henry Divine

MATHEMATICS 2012/2013 SOLUTIONS

1. $p : q : r = 6 : 4 : 5$

$$p : q = 6 : 4 \implies \frac{p}{q} = \frac{6}{4} \implies p = \frac{6q}{4}$$

$$\text{Also, } q : r = 4 : 5 \implies \frac{q}{r} = \frac{4}{5} \implies r = \frac{5q}{4}$$

$$\text{Therefore, } \frac{3p - q}{4q + r} = \frac{3\left(\frac{6q}{4}\right) - q}{4q + \frac{5q}{4}} = \frac{\frac{18q}{4} - q}{4q + \frac{5q}{4}}$$

$$= \frac{\frac{18q - 4q}{4}}{\frac{16q + 5q}{4}} = \frac{18q - 4q}{4} \times \frac{4}{16q + 5q} = \frac{4(14q)}{4(21q)} = \frac{14}{21} = \frac{2}{3}$$

Ans. A

2. $\log_{10} 2 = x, \log_{10} 3 = y$

$$\begin{aligned} \log_{10} 10 + 2\log_{10} 6 &= 1 + 2[\log_{10} (2 \times 3)] = 1 + 2[\log_{10} 2 + \log_{10} 3] \\ &= 1 + 2(x + y) = 1 + 2x + 2y \end{aligned}$$

Ans. B

3. $\frac{1\frac{1}{2}}{2 \div \frac{1}{4} \text{ of } 16} = \frac{\frac{3}{2}}{2 \div 4} = \frac{3}{2} \times \frac{4}{2} = 3$ **Ans. A**

4. $T_7 = 2T_3 \dots \dots \dots (1)$

$S_4 = 42 \dots \dots \dots (2)$

We are required to find the common difference, d .

But $T_7 = a + 6d$ and $T_3 = a + 2d$.

From (1),

$$a + 6d = 2(a + 2d)$$

$$a + 6d = 2a + 4d$$

$$a - 2d = 0$$

$$a = 2d \dots \dots \dots (3)$$

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

$$S_4 = \frac{4}{2}[2a + (4 - 1)d] = 42$$

$$2(2a + 3d) = 42$$

$$2a + 3d = 21 \dots \dots \dots (4)$$

Substituting for a in (4), we have

$$2(2d) + 3d = 21$$

$$4d + 3d = 21$$

$$7d = 21$$

$$d = 21 \div 7 = 3$$

Ans. C

5. Sum to infinity,

SUCCESS QUOTE

“In order to succeed in life, you need to ask yourself this pertinent question every morning: ‘How am I going to live today in order to create the tomorrow I desire?’”

~ Henry Divine

$$S_a = \frac{a}{1-r}$$

where $r = \frac{9}{8} \div \frac{3}{2} = \frac{9}{8} \times \frac{2}{3} = \frac{3}{4}$ and $a = 2$

$$\Rightarrow S_a = \frac{2}{1 - \frac{3}{4}} = \frac{2}{\frac{1}{4}} = 8 \quad \text{Ans. A}$$

6. Determinant = $2\cos 2\theta - [(-2\sin\theta \cdot 2\sin\theta)]$
 $= 2\cos 2\theta + 4\sin^2\theta \dots\dots\dots(1)$

But

$$\cos 2\theta = \cos^2\theta - \sin^2\theta \dots\dots\dots(2)$$

$$\sin^2\theta + \cos^2\theta = 1 \dots\dots\dots(3)$$

From (3), we have

$$\cos^2\theta = 1 - \sin^2\theta \dots\dots\dots(4)$$

substituting (4) in (2), we have

$$\cos 2\theta = 1 - \sin^2\theta - \sin^2\theta = 1 - 2\sin^2\theta$$

$$\cos 2\theta = 1 - 2\sin^2\theta \dots\dots\dots(5)$$

substituting (5) in (1), we have that

$$\text{Determinant} = 2(1 - 2\sin^2\theta) + 4\sin^2\theta = 2 - 4\sin^2\theta + 4\sin^2\theta = 2$$

Ans. B

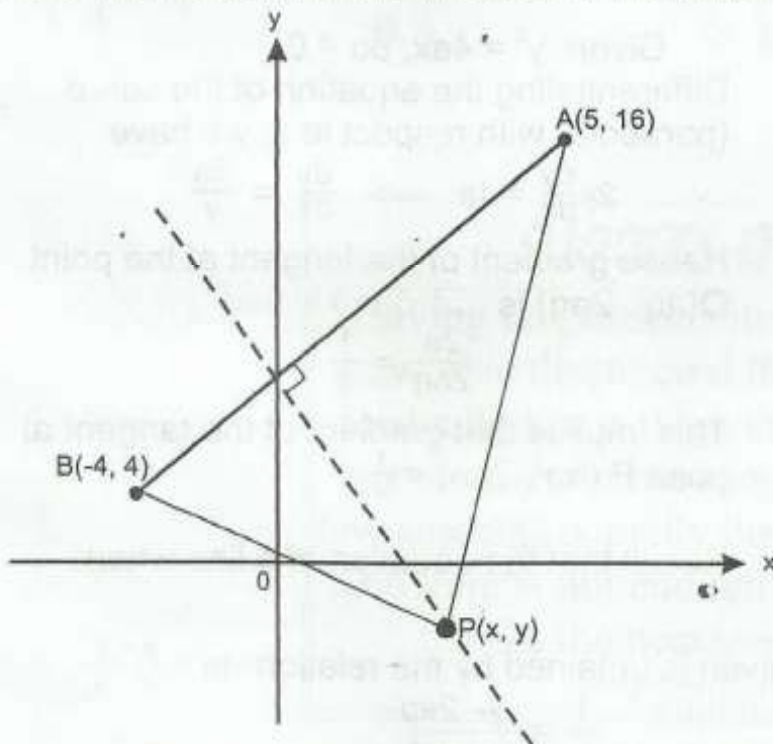
SUCCESS QUOTE

An investment in knowledge pays the best interest.

~Benjamin Franklin

7. A(5, 16), B(-4, 4) P(x, y)

Note that if a point (say P) moves in the Cartesian plane under certain conditions, the



equation of its path is the relationship between its coordinates. This equation is true for all its possible positions. Coordinate geometry can be used to find this equation. Consider the workings below:

Recall that the distance between two points is given by $(x_2 - x_1)^2 + (y_2 - y_1)^2$

$$|AP| = \sqrt{(5 - x)^2 + (16 - y)^2}$$

$$|BP| = \sqrt{(-4 - x)^2 + (4 - y)^2}$$

The condition is $AP = 2BP$.

$$(5 - x)^2 + (16 - y)^2 = 2 \times [(-4 - x)^2 + (4 - y)^2]$$

Squaring both sides, we have

$$\sqrt{(5 - x)^2 + (16 - y)^2} = 2\sqrt{(-4 - x)^2 + (4 - y)^2}$$

$$(5 - x)(5 - x) + (16 - y)(16 - y) = 4[(-4 - x)(-4 - x) + (4 - y)(4 - y)]$$

$$25 - 10x + x^2 + 256 - 32y + y^2 = 4(16 + 8x + x^2 + 16 - 8y + y^2)$$

$$281 - 10x - 32y + x^2 + y^2 = 4(32 + 8x - 8y + x^2 + y^2)$$

$$281 - 10x - 32y + x^2 + y^2 = 128 + 32x - 32y + 4x^2 + 4y^2$$

$$281 - 10x - 32y + x^2 + y^2 = 128 + 32x - 32y + 4x^2 + 4y^2$$

$$128 + 32x - 32y + 4x^2 + 4y^2 - 281 + 10x + 32y - x^2 - y^2 = 0$$

$$-153 + 42x + 3x^2 + 3y^2 = 0$$

$$-51 + 14x + x^2 + y^2 = 0$$

$$x^2 + y^2 + 14x - 51 = 0$$

Notice that the Cartesian equation of the path P is an equation of a circle.

Recall the following trigonometric identities:

- (i) $\sin^2\theta + \cos^2\theta = 1$
- (ii) $\sin(A+B) = \sin A \cos B + \cos A \sin B$
- (iii) $\sin(A-B) = \sin A \cos B - \cos A \sin B$
- (iv) $3\sin A - 4\sin^3 A = \sin 3A$

$$4\sin\theta \sin\left(\frac{\pi}{3} - \theta\right) \sin\left(\frac{\pi}{3} + \theta\right) = 4\sin\theta \sin(120^\circ - \theta) \sin(120^\circ + \theta)$$

$$= 4\sin\theta [\sin 120^\circ \cos\theta - \cos 120^\circ \sin\theta] [\sin 120^\circ \cos\theta + \cos 120^\circ \sin\theta]$$

$$= 4\sin\theta \left[\frac{\sqrt{3}}{2} \cos\theta + \frac{1}{2} \sin\theta\right] \left[\frac{\sqrt{3}}{2} \cos\theta - \frac{1}{2} \sin\theta\right]$$

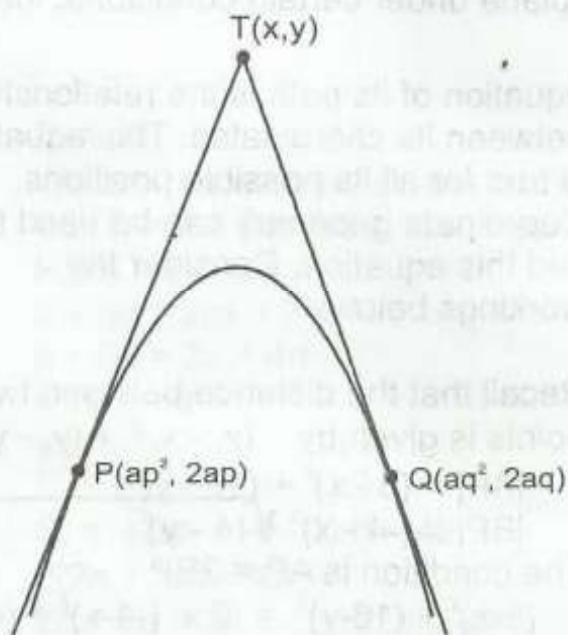
$$= 4\sin\theta \left[\frac{3}{4} \cos^2\theta - \frac{\sqrt{3}}{4} \cos\theta \sin\theta + \frac{\sqrt{3}}{4} \cos\theta \sin\theta - \frac{1}{4} \sin^2\theta\right]$$

$$= 4\sin\theta \left(\frac{3}{4} \cos^2\theta - \frac{1}{4} \sin^2\theta\right) = \sin\theta (3\cos^2\theta - \sin^2\theta)$$

$$= 3\sin\theta \cos^2\theta - \sin^3\theta = 3\sin\theta (1 - \sin^2\theta) - \sin^3\theta$$

$$= 3\sin\theta - 3\sin^3\theta - \sin^3\theta = 3\sin\theta - 4\sin^3\theta = \sin 3\theta$$

Ans. C



Given: $y^2 = 4ax$, $p, q \neq 0$
 Differentiating the equation of the curve (parabola) with respect to x , we have

$$2y \frac{dy}{dx} = 4a \implies \frac{dy}{dx} = \frac{2a}{y}$$

Hence gradient of the tangent at the point $Q(aq^2, 2aq)$ is

$$\frac{2a}{2aq} = \frac{1}{q}$$

This implies that gradient of the tangent at point $P(ap^2, 2ap) = \frac{1}{p}$

Recall that the equation of a line when

gradient (m) and one point (x_1, y_1) are given is obtained by the relation $m = \frac{y - y_1}{x - x_1}$.

Therefore, the equation of PT is obtained thus: $\frac{1}{p} = \frac{y - 2ap}{x - ap^2}$

$$\implies x - ap^2 = p(y - 2ap) \dots \dots \dots (1)$$

$$\text{Equation of QT: } \frac{1}{q} = \frac{y - 2aq}{x - aq^2}$$

$$\Rightarrow x - aq^2 = q(y - 2aq) \dots\dots\dots(2)$$

From (1), we have

$$x - ap^2 = py - 2ap^2$$

$$x - py = ap^2 - 2ap^2$$

$$x - py = -ap^2 \dots\dots\dots(3)$$

From (2), we have

$$x - aq^2 = q(y - 2aq)$$

$$x - aq^2 = qy - 2aq^2$$

$$x - qy = aq^2 - 2aq^2$$

$$x - qy = -aq^2 \dots\dots\dots(4)$$

$$x - py = -ap^2 \dots\dots\dots(3)$$

$$-qy + py = -aq^2 + ap^2$$

$$y(-q + p) = a(-q^2 + p^2)$$

$$y(p - q) = a(p^2 - q^2) = a[(p - q)(p + q)]$$

$$y = \frac{a[(p - q)(p + q)]}{(p - q)}$$

$$y = a(p + q)$$

From (3), we have

$$x = -ap^2 + py \dots\dots\dots(5)$$

Substituting for y in (5), we have

$$x = -ap^2 + p[a(p + q)] = -ap^2 + ap^2 + apq$$

$$x = apq$$

Therefore, T(x, y) = T(apq, a(p+q))

Ans. A

10. $y = 2\cos(3x - \pi)$

Let $u = 3x - \pi$, $y = 2\cos u$

$$\frac{du}{dx} = 3, \quad \frac{dy}{du} = -2\sin u$$

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

$$= -2\sin u \cdot 3 = -6\sin u$$

But $u = 3x - \pi$

$$\Rightarrow \frac{dy}{dx} = -6\sin(3x - \pi)$$

Ans. D

11. $y = 27x^3 - 27x^2 + 4$, $\frac{dy}{dx} = 81x^2 - 54x$

At the turning point,

$$81x^2 - 54x = 0$$

$$x(81x - 54) = 0$$

$$x = 0 \text{ or } 81x - 54 = 0$$

Therefore, $x = 0$ or $x = \frac{54}{81} = \frac{2}{3}$

$$\text{when } x = 0, y = 27(0)^3 - 27(0)^2 + 4 = 4$$

$$\text{when } x = \frac{2}{3}, y = 27(\frac{2}{3})^3 - 27(\frac{2}{3})^2 + 4 = 8 - 12 + 4 = 0$$

BONUS TIP

The Quick Subject Revision Aids in this book are repositories of likely examination questions for UNN post UTME/DE screening. Be wise enough to go through them thoroughly.

SUCCESS QUOTE

“He that walks with the wise shall become wise but the companion of fools shall tend to nothing.”

-Proverbs

Therefore, the turning points: (0, 4) and ($\frac{2}{3}$, 0)

Ans. B

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

Let $u = 1 + 2x$, $y = u^3$

$\frac{du}{dx} = 2$, $\frac{dy}{du} = 3u^2$

$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

$\frac{dy}{dx} = 3u^2 \cdot 2 = 6u^2$

Therefore, $\frac{dy}{dx} = 6(1 + 2x)^2$

At $x = -1$,

$\frac{dy}{dx} = 6[1 + 2(-1)]^2 = 6(-1)^2 = 6 \times 1 = 6$

Ans. D

SUCCESS QUOTE

“Always do your best. What you plant now, you will harvest later.”

Og Mandino

3. ${}^5P_5 = 5 \times 4 \times 3 \times 2 \times 1$

$= 20 \times 6 \times 1 = 120$ ways **Ans. B**

4.

Amt. Received in \square	No of Students	
x	f	fx
200	1	200
350	2	700
700	3	2100
1000	5	5000
		$\Sigma fx = 8000$

Amount received by teacher = Amount shared - Σfx
 $= 12,000 - 8000 = \square 4000$.

5.

x	-1	0	1
-1	1	0	-1
0	0	0	0
1	-1	0	1

Probability = $\frac{\text{Number of required outcomes}}{\text{Number of possible outcomes}} = \frac{5}{9}$

Ans. C

SUMMARY OF ANSWERS (MATHEMATICS 2012/2013)

- | | | | | |
|------|------|------|------|------|
| 1.A | 2.B | 3.A | 4.C | 5.A |
| 6.B | 7... | 8.C | 9.A | 10.D |
| 11.B | 12.D | 13.B | 14.D | 15.C |

SUCCESS QUOTE

“The key to learning Mathematics is constant practice. The more you practice, the more proficient you become.”

-Henry Divine

MATHEMATICS 2012/2013 QUESTIONS [DE]

- A bag contains x MTN cards, $(2x-3)$ Etisalat cards and $3x$ GLO cards. If the probability of picking an Etisalat card at random from the bag is $\frac{1}{5}$, how many GLO cards are in the bag?
A. 3 B. 9 C. 6 D. 12
- The mean deviation of 2, x^2+2 , $2+2x^2$ is 6. Find the value of x^2 ?
A. 9 B. 6 C. 16 D. 4
- The mean of the numbers 11, 6, 10, x , 7, 5, 9 is 8. Find the standard deviation.
A. $2\sqrt{2}$ B. 2 C. 4 D. 8
- A square tile has sides 30 cm. How many of these tiles will cover a rectangular floor of length 7.2 m and width 4.2 m?
A. 336 B. 420 C. 576 D. 720
- The length in cm of the sides of a right-angled triangle are L , $3L-1$ and $3L+1$. Find L .
A. 7 B. 12 C. 8 D. 10
- Find the range of values of x for which $\frac{x+4}{3} - \frac{(x-3)}{2} < 4$
A. $x < 7$ B. $x > 7$ C. $x < -7$ D. $x > -7$
- An operation $*$ is defined on the set of real numbers by $a * b = ab + 2(a + b + 1)$. Find the identity element.
A. -1 B. 1 C. 2 D. -2
- Which of the following operations is closed in the set of integers?
A. $a*b = \frac{a-2}{2}$ B. $a*b = \frac{2a+1}{2} + \frac{2b+1}{2}$
C. $a*b = \frac{a+2}{2}$ D. $a*b = \frac{ab}{2}$
- If $x + 1$ is a factor of the polynomial $5x^2 - 4px + 3$, find the value of p .
A. $\frac{1}{2}$ B. 2 C. -2 D. $-\frac{1}{2}$
- Find the point of intersection of the lines $2x + 3y - 21 = 0$ and $x - 2y - 7 = 0$
A. (9, 1) B. (1, 9) C. $(\frac{15}{2}, 2)$ D. (-9, -1)

11. Find the value of n if $13_n + 24_n = 41_n$
 A. 8 B. 7 C. 6 D. 5
12. Three commercial telephone operators shared some MTN recharge cards of equal units. The first received $\frac{1}{3}$ of the cards and the second received $\frac{2}{3}$ of the remainder. If the third operator received the remaining 12 cards, how many cards did they share?
 A. 42 B. 48 C. 60 D. 54
13. A polygamist decided to give 20% of his monthly income to his three wives as their monthly allowance. The eldest wife got 45% of the allowance and the youngest got 25%. How much was the man's monthly income if the second wife got ₦3,000.00?
 A. ₦50,000.00 B. ₦33,000.00 C. ₦60,000.00 D. ₦45,000.00
14. In a language class of 42 students, each student offers at least one of English and Igbo. If 22 students offer English and 28 students offer Igbo, find how many students offer English only.
 A. 8 B. 14 C. 12 D. 6
15. If x and y satisfy the equations $(x - y + 2)^2 + (y - 2x)^2 = 13$
 $2(x - y + 2) + (y - 2x)^2 = 22$
 Then
 A. $x - y + 2 = \pm 3$ and $y - 2x = \pm 2$
 B. $x - y + 2 = \pm 2$ and $y - 2x = \pm 3$
 C. $x - y + 2 = 9$ and $y - 2x = 4$
 D. $x - y + 2 = -9$ and $y - 2x = -4$

SUCCESS QUOTE

“There are two categories of people in the world:
 Losers and Winners.
 Losers quit when they're tired,
 Winners quit when they've won.”
 To which category do you belong - winners or losers?
 ~Henry Divine

MATHEMATICS 2012/2013 SOLUTIONS [DE]

1. MTN cards = x , Etisalat cards = $2x - 3$, Glo cards = $3x$, $P(\text{Etisalat}) = \frac{1}{5}$

Number of Glo cards = ?

Total number of cards = $x + (2x - 3) + 3x = 6x - 3$

$$P(\text{Etisalat}) = \frac{2x - 3}{6x - 3} = \frac{1}{5}$$

$$5(2x - 3) = 6x - 3$$

$$10x - 15 = 6x - 3$$

$$10x - 6x = 15 - 3$$

$$4x = 12$$

$$x = 3$$

Therefore, number of Glo cards = $3x = 3 \times 3 = 9$

Ans. B



2. Mean deviation = 6

$$\text{Mean, } \bar{x} = \frac{2 + x^2 + 2 + 2 + 2x^2}{3}$$

$$\bar{x} = \frac{6 + 3x^2}{3} = \frac{3(2 + x^2)}{3}$$

$$\bar{x} = x^2 + 2$$

$$\text{Mean deviation} = \frac{\sum |x - \bar{x}|}{n}$$

$$= \frac{|[2 - (x^2 + 2)]| + |[x^2 + 2 - (x^2 + 2)]| + |[x^2 + 2 - (2 + 2x^2)]|}{3}$$

$$= \frac{|2 - x^2 - 2 + 0 + x^2 + 2 - 2 - 2x^2|}{3} = \frac{-x^2 + x^2 - 2x^2}{3}$$

$$\text{Mean deviation} = \frac{2x^2}{3}$$

Equating to 6, we have

$$\frac{2x^2}{3} = 6 \implies 2x^2 = 6 \times 3 = 18$$

$$x^2 = 18 \div 2 = 9$$

Ans. A

3. Mean, $\bar{x} = 8$

$$\implies \frac{11 + 6 + 10 + x + 7 + 5 + 9}{7} = 8$$

$$\frac{48 + x}{7} = 8$$

$$48 + x = 7 \times 8 = 56$$

$$x = 56 - 48 = 8$$

$$\text{Standard deviation} = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} = \sqrt{\frac{(11-8)^2 + (6-8)^2 + (10-8)^2 + (8-8)^2 + (7-8)^2 + (5-8)^2 + (9-8)^2}{7}}$$

$$= \sqrt{\frac{9+4+4+0+1+9+1}{7}} = \sqrt{\frac{28}{7}} = \sqrt{4} = 2$$

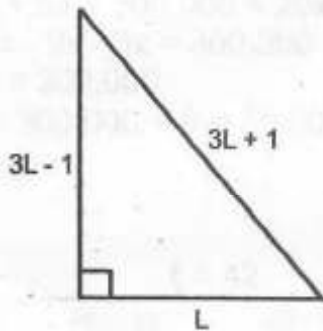
Ans. B

4. Length of square = 30cm = 0.3m
 Area of square = $0.3 \times 0.3 = 0.09\text{m}^2$
 Dimension of floor = 7.2m by 4.2m
 Area of floor = $7.2 \times 4.2 = 30.24\text{m}^2$

$$\begin{aligned} \text{No of square tiles needed} &= \frac{\text{Area of floor}}{\text{Area of one tile}} \\ &= \frac{30.24\text{m}^2}{0.09\text{m}^2} = 336 \text{ square tiles} \end{aligned}$$

Ans. A

5.



Using Pythagoras theorem,

$$\begin{aligned} L^2 + (3L - 1)^2 &= (3L + 1)^2 \\ L^2 + (3L - 1)(3L - 1) &= (3L + 1)(3L + 1) \\ L^2 + 9L^2 - 3L - 3L + 1 &= 9L^2 + 3L + 3L + 1 \\ 10L^2 - 6L + 1 &= 9L^2 + 6L + 1 \\ 10L^2 - 9L^2 - 6L - 6L + 1 - 1 &= 0 \\ L^2 - 12L &= 0 \\ L(L - 12) &= 0 \\ L = 0 \text{ or } L - 12 = 0 \\ L &= 0 \end{aligned}$$

Ans. B

$$\begin{aligned} 3. \quad \frac{x+4}{3} - \frac{x-3}{2} &< 4 \\ \frac{2(x+4) - 3(x-3)}{6} &< 4 \\ \frac{2x+8-3x-9}{6} &< 4 \\ 2x+8-3x-9 &< 4 \\ -x+17 &< 24 \\ -x &< 24-17 \\ -x &< 7 \text{ or } x > -7 \end{aligned}$$

Ans. D

SUCCESS QUOTE

“Success seems to be largely a matter of hanging on after others have let go.”

~William Feather

7. Refer to 2011/2012 solution to question no 4 for the definition of *Identity element*.

$$a*b = ab + 2(a + b + 1)$$

If e is the identity element, then

$$a*e = a$$

$$ae + 2(a + e + 1) = a$$

$$ae + 2a + 2e + 2 = a$$

$$ae + 2e = a - 2a - 2$$

$$e(a + 2) = -a - 2 = -(a + 2)$$

$$e = \frac{-(a+2)}{(a+2)} = -1$$

Ans. A

8. A binary operation $*$ on a set of integers is said to be closed if and only if for every $a, b \in \mathbb{Z}$,

$$a*b = b*a = c \text{ and } c \in \mathbb{Z}.$$

Testing each of the options, we find that only **B** is closed in the set of integers. Here is the working:

$$a * b = \frac{2a+1}{2} + \frac{2b+1}{2} = \frac{2a+1+2b+1}{2} = \frac{2a+2b+2}{2} = \frac{2(a+b+1)}{2}$$

Hence, $a * b = a + b + 1$

$a * b = a + b + 1$ is closed for every $a, b \in \mathbb{Z}$.

Ans. B

9. Using the factor theorem, we let $f(x) = 5x^2 - 4px + 3$.

If $x+1$ is a factor of $f(x)$, then $f(-1) = 0$

$$f(-1) = 5(-1)^2 - 4p(-1) + 3 = 0$$

$$5 + 4p + 3 = 0$$

$$4p = -8$$

$$p = -2$$

Ans. C

10. The x - y coordinate of the point of intersection is the solution of the simultaneous equations.

$$2x + 3y - 21 = 0 \implies 2x + 3y = 21 \dots\dots\dots(1)$$

$$x - 2y - 7 = 0 \implies x - 2y = 7 \dots\dots\dots(2) \times 2$$

$$- 2x - 4y = 14 \dots\dots\dots(3)$$

$$2x + 3y = 21 \dots\dots\dots(1)$$

$$-7y = -7$$

$$y = -7 \div -7 = 1$$

Substituting for y in (1), we have

$$2x + 3(1) = 21$$

$$2x = 21 - 3 = 18$$

$$x = 18 \div 2 = 9$$

Therefore, $(x, y) = (9, 1)$.

Ans. A



SUCCESS QUOTE

“The vision to see,
the faith to believe,
and
the will to work hard
will take you anywhere
you want to go.”

~ Henry Divine

11. $13_n + 24_n = 41_n$

$$1xn^1 + 3xn^0 + 2xn^1 + 4xn^0 = 4xn^1 + 1xn^0$$

$$1xn + 3x1 + 2xn + 4x1 = 4xn + 1x1$$

$$n + 3 + 2n + 4 = 4n + 1$$

$$3n + 7 = 4n + 1$$

$$4n - 3n = 7 - 1$$

$$n = 6$$

Ans. C

12. Let the total shared MTN cards = x

$$\text{First received} = \frac{1}{3} \text{ of } x = \frac{x}{3}$$

$$\text{The remainder} = \frac{2x}{3}$$

$$\text{Second received} = \frac{2}{3} \text{ of } \frac{2x}{3} = \frac{4x}{9}$$

$$\frac{x}{3} + \frac{4x}{9} + 12 = x \implies \frac{7x}{9} + 12 = x$$

Multiplying through by 9, we have

$$7x + 108 = 9x$$

$$9x - 7x = 108 \implies 2x = 108, x = 54$$

Ans. D

13. Let the man's monthly income = x
 The amount to be shared is 20% of $x = \frac{x}{5}$
- The eldest wife got = 45% of $\frac{x}{5} = \frac{45}{100} \times \frac{x}{5} = \frac{9x}{100}$
- The youngest wife got = 25% of $\frac{x}{5} = \frac{25}{100} \times \frac{x}{5} = \frac{x}{20}$
- The second wife got = \square 3,000
- $$\Rightarrow \frac{9x}{100} + \frac{x}{20} + 3000 = \frac{x}{5}$$
- $$9x + 5x + 300,000 = 20x$$
- $$20x - 9x - 5x = 300,000$$
- $$6x = 300,000$$
- $$x = 300,000 \div 6 = 50,000.$$

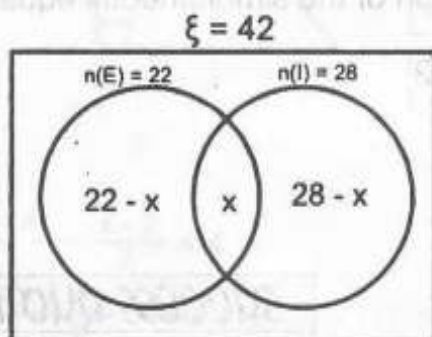
SUCCESS QUOTE

"The word *student* comes from the word *study*! Until you begin to genuinely study, you have no right to be called a student."

~Henry Divine

Ans. A

14.



Let the number of students that offer both languages be x .
 $22 - x + x + 28 - x = 42$

15. $(x - y + 2)^2 + (y - 2x)^2 = 13$(1)
 $2(x - y + 2)^2 + (y - 2x)^2 = 22$(2)
 Subtracting (1) from (2), we have
 $(x - y + 2)^2 = 9$(3)
 $x - y + 2 = \pm\sqrt{9}$
 $x - y + 2 = \pm 3$
 Substitute (3) into (1),
 $9 + (y - 2x)^2 = 13$
 $(y - 2x)^2 = 13 - 9 = 4$
 $y - 2x = \pm\sqrt{4} = \pm 2$

SUCCESS QUOTE

"Success is an inevitable reward for hard work."

~Fela Durotoye

Ans. A

SUMMARY OF ANSWERS [MATHEMATICS 2012/2013 (DE)]

1.B	2.A	3.B	4.A	5.B
6.D	7.A	8.B	9.C	10.A
11.C	12.D	13.A	14.B	15.A

SUCCESS QUOTE

"Success is dependent on effort." ~Sophocles