2006 POST-UME SCREENING EXERCISE

1. A regular polygon has each of its angles as 160^0. What is the number of sides of the polygon?
(a) 36 (b) 9 (c) 18 (d) 20

2. A girl walks 30m from a point P on a bearing of 040^0 to a point Q. She then walks 30m on a bearing of 140^0 to a point R. The bearing of R from P is
(a) 90^0 (b) 50^0 (c) 45^0 (d) 40^0

3. How many different three digit numbers can be formed using the integers 1 to 6 if no integer occurs twice in a number?
(a) 24 (b) 120 (c) 60 (d) 48

4. In how many different ways can the letters of the word GEOLOGY be arranged in order?
(a) 720 (b) 1260 (c) 2520 (d) 5040

5. A cyclist rode for 30 minutes at $x$km/h and due to a breakdown he had to push the byke for 2hrs at $x - 5$km/hr. If the total distance covered is less than 60km, what is the range of values for x?

(a) $x < 14$ (b) $x < 20$ (c) $x < 29$
(d) $x < 28$

6. A businessman invested a total of ₦200,000 in two companies which paid dividends of 5% and 7% respectively. If he received a total of ₦11,600 as dividend, how much did he invested at 5%?

(a) ₦160,000 (b) ₦140,000
(c) ₦120,000 (d) ₦80,000

7. In a class, 37 students take at least one of Chemistry, Economics and Government, 8 students take Chemistry, 19 take Economics and 25 take Government. 12 students take Economics and Government but nobody takes Chemistry and Economics. How many students take both Chemistry and Government?

(a) 3 (b) 4 (c) 5 (d) 6

8. Solve for p in the following equation given in base two:

$$11(p + 110) = 1001_p$$

(a) 10 (b) 11 (c) 110 (d) 111

9. Factorise

$$16(3x + 2y)^2 - 25(a + 2b)^2.$$

(a) $(12x + 8y + 5a + 10b)(12x + 8y - 5a - 10b)$
(b) $(12x + 8y - 5a - 10b)(12x + 8y - 5a - 10b)$
(c) $20(3x + 2y - a - 2b)(3x + 2y + a + 2b)$
(d) $20(3x + 2y + a + 2b)(3x + 2y + a + 2b)$

10. A cone has base radius 4cm and height 3cm. The area of its curved surface is

(a) $12\pi cm^2$ (b) $24\pi cm^2$
(c) $20\pi cm^2$ (d) $15\pi cm^2$

11. Let $\log y + 3 \log x = 3$. Then, y is

(a) $\left(\frac{10}{x}\right)^3$ (b) $\left(\frac{x}{10}\right)^3$ (c) $\left(\frac{x}{10}\right)^{-3}$
(d) $\left(\frac{10}{x}\right)^{-1/3}$

12. If $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, then y is

(a) $\pm\frac{b}{a}\sqrt{x^2 - a^2}$ (b) $\frac{a}{b}\sqrt{a^2 - x^2}$
(c) $\pm\frac{a}{b}\sqrt{x^2 - a^2}$ (d) $\pm\frac{b}{a}\sqrt{a^2 - x^2}$

13. z is partly constant and partly varies inversely as the square of d. When $d = 1$, $z = 11$ and when $d = 2$, $z = 5$. Find the value of z when $d = 4$.

(a) 2 (b) 3.5 (c) 5 (d) 5.5

14. Expand the expression:

$$(x^2 - 2x - 3)(x^2 + x + 1)$$

(a) $x^4 - 4x^2 - 5x - 3$
(b) $-x^3 - 4x^2 + 5x - 3$
(c) $x^4 - x^3 - 4x^2 - 5x - 3$
(d) $x^4 - 4x^2 - 5x - 3$

Suppose we have matrices

$$A = \begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix} \text{ and } B = \begin{pmatrix} 0 & 2 \\ 4 & 3 \end{pmatrix}$$

15. Find $A^2 + AB - 2B$

(a) $\begin{pmatrix} -5 & -9 \\ 12 & 14 \end{pmatrix}$ (b) $\begin{pmatrix} -1 & -4 \\ 8 & 7 \end{pmatrix}$

(b) $\begin{pmatrix} -4 & -4 \\ 12 & 13 \end{pmatrix}$ (d) $\begin{pmatrix} 0 & -4 \\ -8 & -6 \end{pmatrix}$

16. The inverse of matrix B is

(a) $\frac{1}{8}\begin{pmatrix} -3 & 2 \\ 4 & 0 \end{pmatrix}$ (b) $\begin{pmatrix} -3 & 2 \\ 4 & 0 \end{pmatrix}$

(c) $\frac{1}{8}\begin{pmatrix} 3 & -4 \\ -2 & 0 \end{pmatrix}$ (d) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

17. The indefinite integral of the function $f(x) = x \cos x$ for any constant k, is

(a) $x \cos x + \sin x + k$
(b) $x \sin x - \cos x$
(c) $x \sin x + \cos x + k$
(d) $x \sin x - \cos x + k$

18. Evaluate the integral

$$\int_1^2 \left(x^2 + \frac{1}{x}\right) dx$$

(a) $\frac{8}{3} + \ln 2$ (b) $\frac{7}{3} + \ln 2$
(b) $\frac{7}{3} - \ln 3$ (d) $\frac{8}{3}$

19. The trigonometric expression $\cos 2A + \sin 2A$ can be written as

(a) $\cos A(\cos A - \sin A)$
(b) $cos^2 A + sin^2 A - 2 \sin A \cos A$
(c) $2 \sin A \cos A + cos^2 A + sin^2 A$
(d) $cos^2 A - sin^2 A + 2 sinA\, cosA$

Suppose D, E and P are subsets of a universal set U. Let U be the set of natural numbers not greater than 10, while D, E and P are respectively the set of odd numbers, even numbers and prime numbers. For any set empty set.

20. Display the set $D \cap P$.
(a) {3, 5, 7} (b) {2}
(c) {4, 6, 8, 10} (d) {2, 3, 5, 7}

21. Find $D \cap E$
(a) {2} (b) {3, 5} (b) {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} (d) Φ

and 7 are white. Two balls are drawn at random. Find the probability of *none of the balls is red* if the draw is

22. With replacement:
(a) 0.9 (b) 1 (c) 0.4 (d) 0.49

23. Without replacement:
(a) 0.1 (b) 0.47 (c) 0.42 (d) 0.21

SOLUTION

1. Each angle of a regular polygon

$$= \frac{180^0(n-2)}{n}$$

$$160^0 = \frac{180^0(n-2)}{n}$$

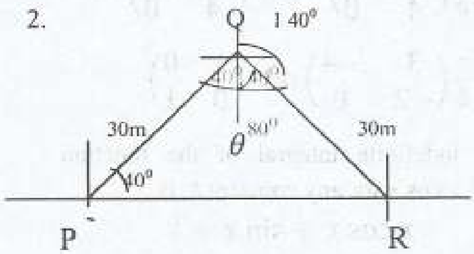
$$160^0 n = 180^0 n - 360^0$$

$$20^0 n = 360^0$$

$$n = \frac{360^0}{20^0} = 18$$

The number of sides of the polygon is 18. (C)

2.



From the figure above, the bearing of R from P = $40^0 + \theta$

Triangle PQR in isosceles, ∴ $\hat{P} = \hat{R}$

∴ $\hat{P} = \hat{R} = \theta$

$$\theta = \frac{180^0 - 80^0}{2} = 50^0$$

The bearing of R from P

$\theta = 40^0 + 50^0 = 90^0$ (A)

3. The number of three digit numbers from integers 1 to 6

$$= 6P_3 = \frac{6!}{(6-3)3!} = \frac{6!}{3!} = 120 \text{ (B)}$$

4. GEOLOGY has 7 letters = 7!

'O' occurs twice = 2!

'G' occurs twice = 2!

∴ The different arrangement

$$= \frac{7!}{2! \times 2!} = 1260 \text{ (B)}$$

5. Distance covered in the first part = speed x time taken

$$= x \times \frac{30}{60} = \frac{1}{2} x\text{km}$$

Distance covered in the second part = $2(x - 5)$km

$\therefore 2(x - 5)2 + ½x < 60$

$4x - 20 + x < 120$

$\Longrightarrow 5x < 140$

$x < 28$ (D)

6. Name the companies as A, B respectively Let the amount invested in A = x with the dividend 5%

Then the amount invested in B = $200{,}000 - x$

$\therefore$ 7% of $(200{,}000 - x)$ + 5% of $x = 11{,}600$

$$0.07(200{,}000 - x) + 0.05x = 11{,}600$$

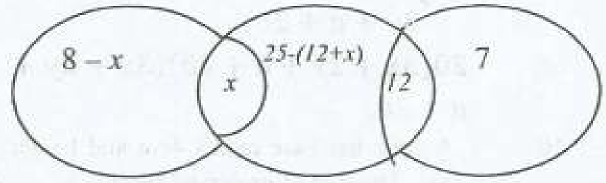
$14{,}000 - 0.07x + 0.05x = 11{,}600$

$-0.02x = -2{,}400$

$x = 120{,}000$

∴ The amount invested in A = ₦120,000(C)

7. n(C)=8 n(G)=25 n(E)=19



Let $n(C \cap G) = x$

From the Venn diagram above

$35 = 8x + x + 25 - (12 + x) + 12 + 7$

$35 = 40 - x$

$x = 5$

∴5 students take both Chemistry & Government (C)

8. $11(p + 110) = 1001p$

Note in base 2

Divide both sides by 11

$$p + 110 = \frac{1001p}{11} = 11p$$

$\therefore p + 110 = 11p$

$11p - p = 110$

$\Longrightarrow p = 11$ (B)

9. $16(3x+2y)^2 - 25(a+2b)^2$
$= [4(3x+2y)]^2 - [5(a+2b)]^2$
$= [4(3x+2y)+5(a+2b)\ ]\ [4(3x+2y)-5(a+2b)\ ]$
$= [12x+8y+5a+10b][12x+8y-5a-10b]$ (A)

10. Curved surface area of a cone $= \pi rl$
$l^2 = h^2 + r^2$
$= 3^2 + 4^2$
$l = \sqrt{25} = 5cm$
$\therefore$ C.S.A. $= \pi \times 4cm \times 5cm = 20\pi c$ (C)

11. $\log y + 3\log x = 3$
$\log y + \log x^3 = x^3$
$\log y = 3 - \log 3$
$\log_{10} y = \log_{10} 10^3 - \log_{10} x^3$
$y = \left(\frac{10}{x}\right)^3$ (A)

12 $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

$\frac{y^2}{b^2} = \frac{x^2}{a^2} - 1$

$\frac{y^2}{b^2} = \frac{x^2 - a^2}{a^2}$

$y^2 = \frac{b^2(x^2-a^2)}{a^2}$

Taking the root of both sides

$y = \pm\sqrt{\frac{b^2(x^2-a^2)}{a^2}}$
$= \pm\frac{b}{a}\sqrt{x^2-a^2}$ (A)

13. $z = k + c\ 1/d^2$ where k and c are constant, when $d = 1, z = 11$
$11 = k + c$ ---- (i)

When $d = 2, z = 5;\ 5 = k + \frac{c}{4}$

$\therefore 20 = 4k + c$ ---- (ii)
(ii) – (i)
$9 = 3k$
=> $k = 3$
then in (i)
$c = 11 - k = 11 - 3 = 8$
the connecting equation is
$z = k + cd^2$
$z = 3 + 8/d^2$
when $d=4$
$z = 3 + \frac{8}{16} = 3 + 0.5 = 3.5$ (B)

14. $(x^2-2x-3)(x^2+x+1)$
$= x^2(x^2+x+1) - 2x(x^2+x+1) - 3(x^2+x+1)$
$= x^4 + x^3 + x^2 - 2x^3 - 2x^2 - 2x - 3x^2 - 3x - 3$
$= x^4 - x^3 - 4x^2 - 5x - 3$ (C)

15. $A^2 = \begin{pmatrix}1 & -1\\ 2 & 3\end{pmatrix}\begin{pmatrix}1 & -1\\ 2 & 3\end{pmatrix}$

$= \begin{pmatrix}1-2 & -1-3\\ 2+6 & -2+9\end{pmatrix} = \begin{pmatrix}-1 & -4\\ 8 & 7\end{pmatrix}$

$AB = \begin{pmatrix}1 & -1\\ 2 & 3\end{pmatrix}\begin{pmatrix}0 & 2\\ 4 & 3\end{pmatrix}$
$= \begin{pmatrix}0-4 & 2-3\\ 0+12 & 4+9\end{pmatrix}$
$= \begin{pmatrix}-4 & -1\\ 12 & 13\end{pmatrix}$

$2B = 2\begin{pmatrix}0 & 2\\ 4 & 3\end{pmatrix} = \begin{pmatrix}0 & 4\\ 8 & 6\end{pmatrix}$
$\therefore A^2 + AB - 2B$

$= \begin{pmatrix}-1 & -4\\ 8 & 7\end{pmatrix} + \begin{pmatrix}-4 & -1\\ 12 & 13\end{pmatrix} - \begin{pmatrix}0 & 4\\ 8 & 6\end{pmatrix}$

$= \begin{pmatrix}-1-4-0 & -4-1+4\\ 8+12-8 & 7+13-6\end{pmatrix}$

$= \begin{pmatrix}-5 & -9\\ 12 & 14\end{pmatrix}$ (A)

16. $B^{-1} = \frac{\text{adj } B}{|B|} = \frac{1}{-8}\begin{pmatrix}3 & -2\\ -4 & 0\end{pmatrix}$

$= \frac{1}{8}\begin{pmatrix}-3 & 2\\ 4 & 0\end{pmatrix}$ (A)

17. $\int x\cos x\, dx$
Let u = x, dv = cos x dx
$\int u dv = uv - \int v du$
$du = 1dx,\ \ v = \sin x$
$\int x\cos x\, dx = x\sin x - \int \sin x\, dx$
$= x\sin x + \cos x + k$ (C)

18.
$\int_1^2 \left(x^2 + \frac{1}{x}\right) dx = \frac{x^3}{3} + \ln x\Big|_1^2$

$= \left(\frac{2^3}{3} + \ln 2\right) - \left(\frac{1^3}{3} + \ln 1\right)$
$= \frac{8}{3} + \ln 2 - \frac{1}{3}$

$= \frac{7}{3} + \ln 2$ (B)

19. cos 2A + sin 2A

$\cos 2A = \cos^2 A - \sin^2 A$

$\sin 2A = 2\sin A\cos A$

cos2A + sin2A

$= \cos^2 A + \sin^2 A - 2\sin A\cos A$ (D)

20. $D \cap P = \{3,5,7\}$ (A)

21. $D \cap E = \Phi$ (D)

22. Pr (none of the balls is red)

$= Pr(W_1 \times W_2)$

$= \frac{7}{10} \times \frac{7}{10} = 0.49$ (D)

23. $= Pr(W_1 \times W_{2/1})$

$= \left(\frac{7}{10} \times \frac{6}{9}\right) = 0.47$ (B)

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE
2007 POST-UME SCREENING EXERCISE

1. The interior angles of a pentagon are: $180^0, 118^0, 80^0, 78^0$ and x. The value of x is:(a) 75^0 (b) 108^0 (c) 120^0 (d) 134^0

2. All the vertices of an isosceles triangle lie on a circle and each of the base angles of the triangle is 65^0. The angle subtended at the centre of the circle by the base of the triangle is:
(a) 130^0 (b) 115^0 (c) 100^0 (d) 65^0

3. A square tile measures 20cm by 20cm. How many of such tiles will cover a floor measuring 5m by 4m?
(a) 500 (b) 400 (c) 320 (d) 250

4. The volume of a certain sphere is numerically equal to twice its surface area. The diameter of the sphere is:
(a) 6 (b) 9 (c) 12 (d) $\sqrt{6}$

5. A bearing of 310^0, expressed as a compass bearing is:(a) $N50^0W$ (b) $N40^0W$
(c) $S40^0W$ (d) $S50^0W$

6. Which of the following specified sets of data is not necessarily sufficient for the construction of a triangle?
(a) three angles (b) two sides and a right angle (c) two sides and an included angle (d) three sides

7. The average age of the three children in a family is 9 years. If the average age of their parent is 39 years, the average age of the whole family is: (a) 20years
(b) 21 years (c) 24 years (d) 27 years

8. Simplify: $1 + \frac{2}{3} - 3 \div \left(1 + \frac{2}{3} \text{ of } \frac{6}{7}\right)$
(a) $-\frac{8}{33}$ (b) $\frac{21}{11}$ (c) $\frac{33}{21}$ (d) $-\frac{21}{8}$

9. If $1 + \frac{1}{1+\frac{1}{1+\frac{1}{x}}} = 5$, find x.
(a) $\frac{3}{7}$ (b) $\frac{7}{3}$ (c) $-\frac{3}{7}$ (d) $-\frac{7}{3}$

10. Evaluate x in base 3 if
$41_x - 22_x = 17_x$
(a) 11 (b) 8 (c) 12 (d) 22

11. A woman buys 4 bags of rice for Ł56 per bag and 3 bags of beans for Ł26 per bag using the currency "LONI" (Ł) in base 7. What is the total cost of the items in another currency "MONI" (M̶) in base 8?
(a) M̶224 (b) M̶114 (c) M̶340 (d) M̶440

12. When the price of egg was raised by ₦2 an egg, the number of eggs which can be bought for ₦120 is reduced by 5. The present price of an egg is
(a) ₦6 (b) ₦7 (c) ₦8 (d) ₦10

13. How long will it take a sum of money invested at 8% simple interest to double the original sum?
(a) 8 years (b) 10.5 years
(c) 12 years (d) 12.5 years

14. The journey from Lagos to Ibadan usually takes motorist 1 hour 3 minutes. By increasing his average speed by 20km/hr, the motorist saves 15 minutes. His usual speed, in km/hr is
(a) 100 (b) 90 (c) 85 (d) 80

15. The smallest section of a rod which can be cut into exactly equal sections, each of either 30cm or 36cm in length is (a) 90cm (b) 180cm
(c) 360cm (d) 540cm

16. If $x = 0.0012 + 0.00074 + 0.003174$, what is the difference between x to 2 decimal places and x to 1 significant figure?
(a) 0.01 (b) 0.0051 (c) 0.1 (d) 0.005

17. The angle of depression of two points A and B on a plane field from the top of a mast erected between A and B are 30^0 and 45^0 respectively. If A is westward of B, find $|AB|$ if the height of the mast is 15m from the field.
(a) $15\sqrt{3m}$ (b) $5(3+\sqrt{3})m$
(c) $5(1+\sqrt{3})m$ (d) $15(\sqrt{3}-1)$

18. The radius of a circle is given as 10cm subject to an error of 0.2cm. The error in the area of the circle is
(a) $\frac{1}{4}$% (b) $\frac{1}{50}$% (c) 2% (d) 4%

19. If θ is acute, evaluate
$\frac{\cos(90-\theta)+\sin(180-\theta)}{\cos(180-\theta)-\sin(90-\theta)}$
(a) $\tan\theta$ (b) $-\tan\theta$ (c) $\cot\theta$ (d) $-\cot\theta$

20. In a survey of 100 students in an institution, 80 students speak Yoruba, 22 speak Igbo, while 6 speak neither Igbo nor Yoruba. How many students speak Yoruba and Igbo?
(a) 96 (b) 8 (c) 64 (d) 12

21. A bag contains 5 yellow balls, 6 green balls and 9 black balls. A ball is drawn from the bag. What is the probability that it is a black or yellow ball?
(a) $\frac{37}{160}$ (b) $\frac{133}{400}$ (c) $\frac{77}{800}$ (d) $\frac{133}{800}$

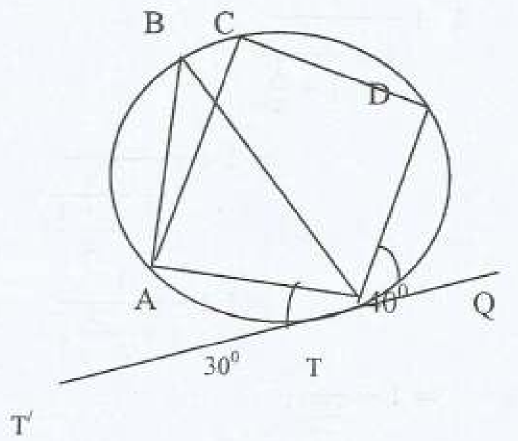
The table below shows the distribution of weight measure for 100 students.

Weight (kg)	60-62	63-65	66-68	69-71	71-74
f	5	18	42	27	8

22. Calculate the mean of the distribution to two decimal places.
(a) 64.45 (b) 62.45 (c) 67.45 (d) 65.45

23. Calculate the mode of the distribution to two decimal places
(a) 67.33 (b) 65.33 (c) 65.53 (d) 67. 3

24.



$T'Q$ is a tangent to the circle ABCDT, angle DTQ = 40^0, angle ATT' = 30^0, then angle ATD is
(a) 70^0 (b) 90^0 (c) 250^0 (d) 110^0.

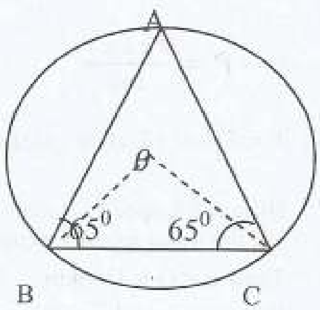
SOLUTION

1. Sum of int. angles of a pentagon = 540^0

$x = 540^0 - (180^0+118^0+80^0+78^0)$

$= 84^0$

2.



$\angle BAC = 180^0 - 2 \times 65^0 = 50^0$
(sum of angles in a Δ)

$\therefore \ \theta =$

2 xABC [angle at the centre]

$\therefore \ \theta = 100^0$ (C)

3. Number of tiles needed along each length
$= \frac{5m}{20cm} = \frac{500}{20} = 25$ tiles

Number of tiles needed across each width
$= \frac{4m}{20cm} = \frac{4 \times 100}{20} = 20$ tiles

Total number of tiles needed = 25 x 20 = 500 tiles (A)

4. Area of a sphere = $4\pi r^2$

Volume of a sphere = $\frac{4}{3}\pi r^3$

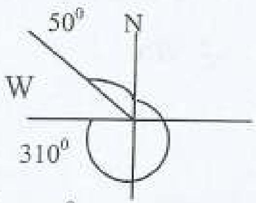
$\Rightarrow \frac{4}{3}\pi r^3 = 2 \times 4\pi r^2$

$\Rightarrow \frac{r}{3} = 2$

$\therefore \ r = 6$

Diameter = $2r = 2 \times 6 = 12$ (C)

5.



$310^0 = N50^0W$ (A)

6. A

7. Average age of the whole family

$= \frac{9(3)+39(2)}{5} = \frac{27+78}{5} = 21$ (B)

8. $1 + \frac{2}{3} - 3 \div \left(1 + \frac{2}{3} \text{ of } \frac{6}{7}\right)$

$= \frac{5}{3} - 3 \div \left(1 + \frac{4}{7}\right)$

$= \frac{5}{3} - 3 \div \frac{11}{7}$

$= \frac{5}{3} - 3 \times \frac{7}{11} = \frac{5}{3} - \frac{21}{11}$

$= \frac{55-63}{33} = \frac{-8}{33}$ (A)

9.

$$1+\cfrac{1}{1+\cfrac{1}{1+\frac{1}{x}}}$$

$$=1+\cfrac{1}{1+\cfrac{1}{\frac{x+1}{x}}}$$

$$=1+\cfrac{1}{1+\frac{x}{x+1}}$$

$$=1+\frac{1}{\frac{x+1+x}{x+1}}$$

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

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

Cross multiply

$3x+2=10x+5$

$$=2-5=10x-3x$$

$$-3=7x$$

$\therefore\ x=\frac{-3}{7}$ (C)

10.

$$\begin{array}{r} 41_x \\ -\ 22_x \\ \hline 17_x \\ \hline \end{array}$$

To get 7, one will subtract 2 from 9. Therefore, 1 becomes 9 when 8 is added to it. Hence x is 8 (B)

11. cost of 4 bags of rice $= 56_7 \times 4_7$
$= 323_7$

Cost of 3 bags of beans $= 26_7 \times 3_7 = 114_7$
Total cost in L $= 440_7$

$440_7 = 4 \times 7^2 + 4 \times 7^1 + 0 \times 7^0$

$= 196 + 28 = 224_{10}$

224 in base 8

8	224
8	28 r 0
8	3 r 4 ↑
	0 r 3

$= 340_8$

Hence the item cost ₦340 (C)

12. Let the present price of an egg $= x$ Then ₦$(x+2)$ bought 5 less Number of eggs that can be bought for N120 at Nx each

$= \frac{120}{x}$

$$\therefore\ \frac{120}{x+2}=\frac{120}{x}-5$$

Multiply both side $x(x+2)$

$120x = 120(x+2) - 5x(x+2)$

$120x = 120x + 240 - 5x^2 + 10x$

$5x^2 + 10x - 240 = 0$

$x^2 + 2x - 48 = 0$

$x(x+8) - 6(x+8) = 0$

$(x-6)(x+8) = 0$

$\therefore x = 6$ or -8

Hence, $x =$ ₦6 (A)

13. Amount = P + Interest
$\Rightarrow 2P = P + I$
$I = P$

Using $I = \frac{P \times R \times T}{100}$

$$\Rightarrow\ P=\frac{P \times 8 \times T}{100}$$

$T = \frac{100}{8} = 12.5yrs$ (D)

14. Distance = Speed x Time
Let the usual speed = $x$km/hr
Then $d = (x \times 1\frac{1}{2})$km $= \frac{3x}{2}km$
When the speed is increased by 20km/hr

$$t = 1\tfrac{1}{2}hr - \tfrac{1}{4}hr \quad = \quad 1\tfrac{1}{4}hr = \tfrac{5}{4}hr$$

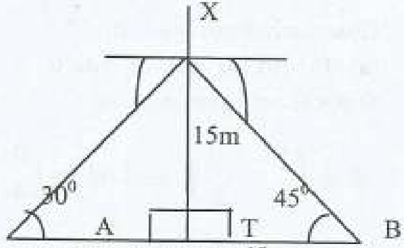
$$\therefore \frac{3x}{2} = (x+20) \times \frac{5}{4}$$

$12x = 10(x+20)$
$12x = 10x + 200$
$2x = 200$

$x = \frac{200}{2} = 100km$ (A)

15. Ans = L.C.M. of 30 & 36
= 180cm (B)

16. $x \simeq 0.01$ to 2 d.p.
$x \simeq 0.005$ to 1 s.f.
difference = 0.01 – 0.005
= 0.005 (D)

17. 

From ΔATX; $\tan 30^0 = \frac{15m}{|AT|}$

$$|AT| = \frac{15m}{\tan 30^0} = 15m \times \tan 60^0$$

$|TB| = 15m$ (ΔBXT is isosceles)

$\therefore |AB| = |AT| + |TB| = (15\sqrt{3} + 15)m = 15(\sqrt{3}+1)$m (C)

18. $A = \pi r^2$, $\frac{dA}{dr} = 2\pi r$

$$\delta A \approx \frac{dA}{dr} \times \delta r$$

where δA is change in Area and δr is change in the radius $\delta A \approx 2\pi r\ \delta r$

% change in $A \approx \frac{\delta A}{A} \times 100\%$

$$= \frac{2\pi r}{\pi r^2} \times \delta r \times 100\%$$

$= \frac{2}{r} \times 0.2 \times 100\% = \frac{2}{10} \times \frac{2}{10} \times 100\%$

= 4% (D)

19. $\frac{\cos(90-\theta)+\sin(180-\theta)}{\cos(180-\theta)-\sin(90-\theta)}$

$= \frac{\sin\theta + \sin\theta}{-\cos\theta - \cos\theta} = \frac{2\sin\theta}{-2\cos\theta}$

$= -\tan\theta$ (B)

20. $n(U) = n(Y \cup I) + n(Y \cup I)'$

$100 = n(Y \cup I) + 6$

$n(Y \cup I) = 94$ = number of those that speak Yoruba or Igbo

$n(Y \cup I) = n(Y) + n(I) - n(Y \cap I)$

$94 = 80 + 22 - n(Y \cap I)$

$94 = 102 - n(Y \cap I)$

$\therefore n(Y \cap I) = 102 - 94 = 8$ (B)

21. $\Pr(\text{B or Y}) = \frac{9}{20} + \frac{5}{20}$

$= \frac{14}{20} = \frac{7}{10}$ (No correct option)

22.

Weight (kg)	60-62	63-65	66-68	69-71	71-74	
x(mid value)	61	64	67	70	73	
f	5	18	42	27	8	
Fx	305	1152	2814	1890	584	6745

Mean $= \frac{\sum fx}{\sum f} = \frac{6745}{100} = 67.45$ C

23. Modal class = 66 – 68

Mode $= L_i + \left(\frac{\Delta_1}{\Delta_1 + \Delta_2}\right) C_t$

Δ_1 = Difference between the frequency of the modal weight and the preceeding class

Δ_2 = Difference between the frequency of the modal class and the succeeding class

$= 65.5 + \left(\frac{24}{24+15}\right)3$

$= 65.5 + \frac{72}{39}$

= 65.5 + 1.85

= 67.35 (D)

24. $A\hat{\hat{T}}T' + A\hat{T}D + D\hat{T}Q = 180^0$

(Angles on a straight line)

$A\hat{T}D = 180^0 - (40^0 + 30^0)$

$= 110^0$ (D)

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE
2008 POST-UME SCREENING EXERCISE

1. The expression $a^3 + b^3$ is equal to
   (a) $(a^2 + b)(a - ab + b^2)$
   (b) $(a - b^2)(a^2 - ab + b)$
   (c) $(a - b)(a^2 + ab + b^2)$
   (d) $(a + b)(a^2 - ab + b^2)$

2. Factorise
   $16(3x + 2y)^2 - 25(a + 2b)^2$
   (a) $(12x + 8y + 5a + 10b)(12x + 8y - 5a - 10b)$
   (b) $(12x + 8y - 5a - 10b)(12x + 8y - 5a - 10b)$
   (c) $20(3x + 2y - a - 2b)(3x + 2y + a + 2b)$
   (d) $20(3x + 2y + a + 2b)(3x + 2y + a + 2b)$

3. A cone has base radius 4cm and height 3cm. The area of its curved surface is
(a) $12\pi cm^2$ (b) $24\,\pi cm^2$
(c) $20\,\pi cm^2$ (d) $15\,\pi cm^2$

4. A cylinder has height 4cm and base radius 5cm. Its volume to 3 *significant figure* is
(a) $314.2cm^2$ (b) $31.42cm^2$
(c) $251.4cm^2$ (d) $251cm^2$

5. Let log y + log 3 = 3. Then, y is
(a) $\left(\frac{10}{x}\right)^3$ (b) $\left(\frac{x}{10}\right)^3$
(c) $\left(\frac{x}{10}\right)^{-3}$ (d) $\left(\frac{10}{x}\right)^{-1/3}$

6. If $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$, then y is
(a) $\pm\frac{b}{a}\sqrt{x^2-a^2}$ (b) $\frac{a}{b}\sqrt{a^2-x^2}$
(c) $\pm\frac{a}{b}\sqrt{x^2-a^2}$ (d) $\pm\frac{b}{a}\sqrt{a^2-x^2}$

7. A cyclist rode for 30 minutes at $x$km/h and due to a breakdown he had to push the byke for 2hrs at x – 5km/hr. If the total distance covered is less than 60km, what is the range of values for x?
(a) $x < 14$ (b) $x < 20$ (c) $x < 29$
(d) $x < 28$

8. The expression $ax^2 + bx$ takes the value 6 when $x = 1$ and 10 when $x = 2$. Find its value when $x = 5$.
(a) 10 (b) 12 (c) 6 (d) -10

9. The difference of two numbers is 10, while their product is 39. Find these numbers.
(a) - 3 and 10 or 13 and 10
(b) 3 and -10 or 3 and 13
(c) 3 and -3 or 3 and 13
(d) -3 and -13 or 13 and 3

10. The average age of x pupils in a class is 14 years 2months. A pupil of 15 years 2 months joins the class and the average age is increased by one month. Find x.
(a) 12 (b) 6 (c) 11 (d) 14

11. Dividing $2x^3-x^2-5x+1$ by $x+3$ gives the remainder
(a) -3 (b) 47 (c) 61 (d) -47

12. Let $f(x)=2x^3-3x^2-5x+6$. If $x-1$ divides $f(x)$ find the zeros of the function.
(a)$1,2,\frac{3}{2}$ (b) $1,2,-\frac{3}{2}$ (c) -1,2,3
(d) $1,-2,-\frac{3}{2}$

All the 120 pupils in a school learn Yoruba or Igbo or both. Given that 75 learn Yoruba and 60 learn Igbo.

13. How many learn both languages?
(a) 60 (b) 45 (c) 15 (d) 120

14. How many learn Igbo only?
(a) 45 (b) 30 (c) 15 (d) 6

15. Suppose we have matrices

$$A=\begin{pmatrix}1 & -1\\ 2 & 3\end{pmatrix} \text{ and } B=\begin{pmatrix}0 & 2\\ 4 & 3\end{pmatrix}$$

Find $A^2+AB-2B$

(c) $\begin{pmatrix}-5 & -9\\ 12 & 14\end{pmatrix}$ (b) $\begin{pmatrix}-1 & -4\\ 8 & 7\end{pmatrix}$

(d) $\begin{pmatrix}-4 & -4\\ 12 & 13\end{pmatrix}$ (d) $\begin{pmatrix}0 & -4\\ -8 & -6\end{pmatrix}$

16. Evaluate the integral

$\int_1^2\left(x^2+\frac{1}{x}\right)dx$
(a) $\frac{8}{3}+\ln 2$ (b) $\frac{7}{3}+\ln 2$
(b) $\frac{7}{3}-\ln 3$ (d) $\frac{8}{3}$

17. If the distance covered by a body in time t is $s=t^3-6t^2+5t$, what is its initial velocity?
(a) $0ms^{-1}$ (b) -$4ms^{-1}$
(c) $(3t^2-12t+5)ms^{-1}$(d) $5ms^{-1}$

18. The trigonometric expression cos2A+sin2A can be written as
(a) cosA(cosA - sinA)
(b) $\cos^2$A+$\sin^2$A – 2sinA cosA
(c) 2sinAcosA+$\cos^2$A+$\sin^2$A
(d) $\cos^2$A – $\sin^2$A+2sinA cosA

19. Display the set $D \cap P$.
(a) {3, 5, 7} (b) {2}
(c) {4, 6, 8, 10} (d) {2, 3, 5, 7}

20. Find $D \cap E$
(a) {2} (b) {3, 5} (d) Φ
(c) {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

21. In a throw of a fair die, the probability of obtaining an even number is
(a) 1 (b) $\frac{2}{3}$ (c) $\frac{1}{6}$ (d) $\frac{2}{3}$

22. Two fair coins are tossed simultaneously. What is the probability of obtaining *at least 1 tail turns up*?
(a) ¼ (b) ¾ (c) ½ (d) 1

23. A bag contains 10 balls of which 3 are red and 77 are white. Two balls are drawn at random. Find the probability of *none of the balls is red* if the draw is:
With replacement:
(a) 0.9 (b) 1 (c) 0.4 (d) 0.49

24. Without replacement:
(a) 0.1 (b) 0.47 (c) 0.42 (d) 0.21

25. A regular polygon has each of its angles as 160^0. What is the number of sides of the polygon?
(a) 36 (b) 9 (c) 18 (d) 20

26. One angle of an octagon is 100^0 while the other sides are equal. Find each of these exterior angles.

(a) 40^0 (b) 80^0 (c) 60^0 (d) 140^0

Let α and β be the roots of the equation $x^2 - 5x + 4 = 0$

27. Find the values of $\frac{1}{\alpha} - \frac{1}{\beta}$

(a) $\pm\frac{4}{3}$ (b) $\frac{3}{4}$ (c) $\pm\frac{3}{4}$ (d) $\frac{1}{5}$

SOLUTION

1. D
2. Check OAU 2006 POST UME Question 9 (A)
3. Curved surface area of a cone

$= \pi r l$

$l^2 = h^2 + r^2$

$= 4^2 + 3^2$

$l^2 = 25$

$l = 5cm$

$\therefore$ C.S.A.= π x $4cm$ x 5cm

$= 20\pi cm^2$ [C]

4. Volume of a cylinde $= \pi r^2 h$

$= \frac{22}{7}$ x 5 x 5 x 4

$= 314cm^2$ (A)

5. $\log y + \log 3 = 3$

$\log 3y = 3$

$3y = 10^3$

$=> y = \frac{10^3}{3}$

$y = \frac{10^3}{3}$

6. $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

$\frac{y^2}{b^2} = \frac{x^2}{a^2} - 1$

$\frac{y^2}{b^2} = \frac{x^2 - a^2}{a^2}$

$y^2 = \frac{b^2(x^2 - a^2)}{a^2}$

Taking the root of both sides $y = \pm\sqrt{\frac{b^2(x^2-a^2)}{a^2}}$

$= \pm\frac{b}{a}\sqrt{x^2 - a^2}$ (A)

7. Distance = Speed x Time For the first journey,

Distance = $\frac{30}{60}$ x $x = \frac{1}{2}xkm$

For the second journey,

Distance = 2 x $(x - 5)$km

Total Distance = 2 x $(x - 5) + \frac{x}{2} < 60$

$4x - 20 + x < 120$

$5x < 140$

$x < \frac{140}{5}$

$x < 28$ (D)

8. Let $y = ax^2 + bx$

When $x = 1, y = 6$

$6 = a + b$ --- (i)

When $x = 2, y = 10$

$10 = 4a + 2b$ ---- (ii)

Solving (i) and (ii) simultaneously

Multiply (1) by (2)

$12 = 2a + 2b$ --- (iii)

(ii) – (iii)

$-2 = 2a$

$==> a = -1$

Putting the value of a in (i)

$b = 6 + 1 = 7$

$\therefore y = -x^2 + 7x$

When $x = 5$ $y = -25 + 35 = 10$ (A)

9. Let the numbers be x and $x - 10$

Then $x(x - 10) = 39$

$x^2 - 10x - 39 = 0$

solving to get $x = 13$ or -3

$\therefore$ the numbers are 13 & 3 or -3, -13 (D)

10. Sum of the ages of x pupils

$= x$ x $\left(14\frac{2}{12}\right) = x$ x $\frac{85}{6} = \frac{85x}{6}$

Sum of the $(x+1)$ pupils $= \frac{85x}{6} + 15\frac{2}{12}$

$= \frac{85x}{6} + \frac{91}{6}$

$= \frac{85x + 91}{6}$

Average of $(x+1)$ pupils= $\frac{85x+91}{(x+1)6}$

$= 14\frac{2}{12} + \frac{1}{12}$

$\frac{85x + 91}{6x + 6} = \frac{57}{4}$

Cross multiply

$340x + 364 = 342x + 342$

$==> 340x - 342x = 342 - 364$

$= -2x = -22$ $x = \frac{22}{2} = 11$ [C]

11. Let $f(x) = 2x^3 - x^2 - 5x + 1.$

The remainder is $f(-3)$

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

$$= -54 - 9 + 15 + 1$$

$= -47$ (D)

12.

$$\begin{array}{r|l} & 2x^2 - x - 6 \\ \hline x - 1 & 2x^3 - 3x^2 - 5x + 6 \\ & 2x^3 - 2x^2 \\ \hline & -x^2 - 5x \\ & -x^2 + x \\ \hline & -6x + 6 \\ & -6x + 6 \\ \hline & 0 \end{array}$$

$$2x^2 - x - 6 = 2x^2 - 4x + 3x - 6$$
$$= 2x(x-2) + 3(x-2)$$
$$= (x-2)(2x+3)$$
$$2x^3 - 3x^2 - 5x + 6 = (x-1)(x-2)(2x+3)$$

∴ the zeros of $f(x)$ are

$1, 2, -^3/_2$ (B)

13. $n(Y \cup I) = n(Y) + n(I) - n(Y \cap I)$

∴ $n(Y \cap I) = 75 + 60 - 120$

$= 15$ (C)

14. $n(Y^C \cap I) = n(I) - n(Y \cap I)$

$= 60 - 15$

$= 45$ (A)

15. Check OAU 2006 POST UME Question

15 (A)

16. Check OAU 2006 POST UME Question 18(B)

17. $s = t^3 - 6t^2 + 5t$

$v = \frac{ds}{dt} = 3t^2 - 12t + 5$

At initial velocity, $t = 0$

$\mu = 5m/s$ (D)

18. Check OAU 2006 POST UME Question 19 (D)

19. Incomplete Question

20. Incomplete Question

21. $\Pr(E) = \frac{3}{6} = \frac{1}{2}$

22. Sample space = {HH, HT, TH, TT}

Ans = ¾ (B)

23. Pr (none is red)

$=> Pr(W_1, W_2)$

$= \frac{7}{10} \times \frac{7}{10} = \frac{49}{100} = 0.49$ (D)

24. $Pr(W_1/W_2 = \frac{7}{10} \times \frac{6}{9} = \frac{42}{90} = 0.47$ [B]

25. Each angle of a regular polygon

$= \frac{(n-2)180^0}{n}$

$=> 160^0 = \frac{180^0(n-2)}{n}$

$=> 160^0 = 180^0 n - 360^0$

$=> 20^0 n = 360^0$

$n = 18$ (C)

26. Sum of interior of an octagon

$= 180^0(8-2)$

$= 180^0(6)$

$= 1080^0$

Each remaining interior

$= \frac{1080^0 - 100^0}{7}$

$= 140^0$

∴ For each of these, the exterior angle

$= 180^0 - 140^0 = 40^0$ (D)

27. $x^2 - 5x + 4 = 0$

$a = 1, b = -5, c = 4$

$\alpha\beta = \frac{c}{a} = 4$

$\alpha + \beta = -\frac{b}{a} = 5$

∴ $\frac{1}{\alpha} - \frac{1}{\beta}$

$= \frac{\beta - \alpha}{\alpha\beta}$

But $(\beta - \alpha)^2 = \beta^2 + \alpha^2 - 2\alpha\beta$

$= (\beta + \alpha)^2 - 2\alpha\beta - 2\alpha\beta$

$= (\beta + \alpha)^2 - 4\alpha\beta$

$= 5^2 - 4(4)$

$= 25 - 16 = 9$

$\beta - \alpha = \sqrt{9} = \pm 3$

∴ $\frac{1}{\alpha} - \frac{1}{\beta} = \frac{\beta - \alpha}{\alpha\beta}$

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

$= \pm\frac{3}{4}$ (C)

OBAFEMI AWOLOWO UNIVERSITY,ILE-IFE

2009 POST UME TEST

1. A sector of a circle of radius 7.2cm which subtends an angle of 300^0 at the centre is used to form a cone. What is the radius of the base of the cone?
(a) 6cm (b) 7cm (c) 8cm
(d) 9cm (e) 5cm

2. If $pq + 1 = q^2$ and $t = 1/p - 1/pq$, express t in terms of q.
(a) $^1/p_q$ (b) $1/_{q^{-1}}$ (c) $1/_{q^{+1}}$
(d) $1+q$ (e) $1/1-q$

3. If $3^{2y} - 6(3^y) = 27$, find y
(a) 3 (b) -1 (c) 2 (d) -3 (e) 1

4. An $(n\ 2)^2$ sided figure has n diagonals, find the number n of diagonals for a 25 sided figure.
(a) 8 (b) 7 (c) 6 (d) 9 (e) 10

5. A sum of money was invested at 8% per annum simple interest. If after 4 years the money became ₦330.00, what is the amount originally invested?
(a) ₦180 (b) ₦165 (c) ₦150
(d) ₦200 (e) ₦250

6. Evaluate $\frac{xy^2 - x^2y}{x^2 - xy}$
(a) -3 (b) $^{-3}/_5$ (c) $^3/_5$ (d) 3 (e) 4

7. List all integers satisfying the inequality $2 < 2x - 6 < 4$
(a) 2,3,4,5 (b) 2,3,4 (c) 2,5
(d) 3,4,5 (e) 4,5

8. Two fair dice are rolled. What is the probability that both show up the same number of point?
(a) $^1/_{36}$ (b) $^3/_{36}$ (c) $^1/_x$
(d) $^1/_3$ (e) $^1/_6$

9. Find the probability of selecting a figure which is parallelogram from a square, a rectangle, a rhombus, a kite and a trapezium
(a) $^3/_5$ (b) $^2/_5$ (c) $^4/_5$
(d) $^1/_5$ (e) $^5/_5$

10. A man kept 6 black, 5 brown and 7 purple shirts in a drawer. What is the probability of his picking a purple shirt with his eyes closed.
(a) $^2/_7$ (b) $^2/_{18}$ (c) $^{11}/_{18}$
(d) $^7/_{11}$ (e) $^5/_{10}$

11. If P varies inversely as V and V varies directly as R^2, find the relationship between P and R given that $R = 7$ where $P = 2$.
(a) $P = 98R^2$ (b) $PR^2 = 98$ (c) $P^2R = 89$
(d) $P = 1/98R$ (e) $P = R^2/98$

12. If 7 and 189 are the first and fourth terms of a geometric progression respectively, find the sum of the first three terms of the progression.
(a) 182 (b) 180 (c) 91
(d) 63 (e) 28

13. Find the positive number n such that thrice its square is equal to twelve times the number
(a) 1 (b) 4 (c) 2
(d) 5 (e) 9

14. Given a regular hexagon, calculate each interior angle of the hexagon
(a) 60^0 (b) 30^0 (c) 120^0
(d) 45^0 (e) 135^0

15. Factorize $6x^2 - 14x - 12$
(a) $2(x+3)(3x-2)$ (b) $6(x-2)(x+1)$
(c) $2(x-3)(3x+2)$ (d) $6(x+2)(x-1)$
(e) $(3x-4)(2x+3)$

16. The value of $(0.303)^3 - (0.02)^3$ is
(a) 0.019 (b) 0.0019
(c) 0.00019 (d) 0.000019
(e) 0.00035

17. What is the product of $\left(^{27}/_5 \div 3^3\right)$ and $\left(^1/_5\right)$
(a) 5 (b) 3 (c) 2
(d) 1 (e) $^1/_{25}$

18. Find n if $\log_2 4 + \log_2 7 - \log_2 n = -1$
(a) 10 (b) 14 (c) 12
(d) 27 (e) 26

19. In 1984, Tolu was 24 years old and his father is 45 years. In what year was Tolu exactly half his father's age?
(a) 1982 (b) 1981 (c) 1983
(d) 1979 (e) 1978

20. If $x = 1$ is root of the equation $x^3 - 2x^2 - 5x + 6$, find the other roots.
(a) -3 and 2 (b) -2 and 2
(c) 3 and -2 (d) 1 and 3 (e) -3 and 1

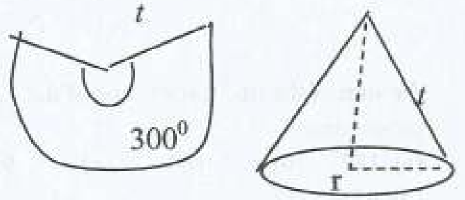
21. Find the probability that a number selected at random 40 to 50 is a prime.
(a) $^3/_{11}$ (b) $^5/_{12}$ (c) $^5/_{10}$
(d) $^4/_{10}$ (e) $^7/_{17}$

22. If the lengths of the sides of a right-angled rectangle are $(3x+1)cm, (3x-1)cm$ and $x$cm, what is x?
(a) 2 (b) 6 (c) 18
(d) 12 (e) 0

23. A number of pencils were shared out among Peter, Paul and Audu in the ratio 2:3:5 respectively. If Peter got 5, how many were shared.
(a) 15 (b) 25 (c) 30
(d) 50 (e) 55

SOLUTION

1.



Area = $\frac{\theta}{360} \times \pi l^2$ C.S.A. = πrl

Area of the sector = curved surface area of the cone formed

$$\frac{300}{360}\pi l^2 = \pi \times r \times l$$

$$\therefore r = \frac{300}{360} \times 7.2 = 6\text{cm} \quad (A)$$

2. $pq + 1 = q^2$

$$t = \frac{2}{p} - \frac{1}{pq}$$

$$pq + 1 = q^2$$

$$p = \frac{q^2 - 1}{q}$$

$$t = \frac{2}{\frac{q^2-1}{q}} - \frac{1}{\frac{(q^2-1)q}{q}}$$

$$= \frac{2q}{q^2-1} - \frac{1}{q^2-1}$$

$$= \frac{2q-1}{(q^2-1)} = \frac{1}{q+1} \ (C)$$

3. $3^{2y} - 6(3^y) = 27$

Put $3^y = p$

$$\Rightarrow (3^y)^2 - 6(3^y) - 27 = 0$$

$$p^2 - 6p - 27 = 0$$

$$p^2 - 9p + 3p - 27 = 0$$

$$p(p-9) + 3(p-9) = 0$$

$$(p+3)(p-9) = 0$$

=> p = -3 or 9

For p = -3, $3^y = -3$ has no solution

For p = 9, $3^y = 9 = 3^2$

=> $y = 2$ (C)

4. For 25 sided figure

$$(n-2)^2 = 25$$

Taking the square root of both sides

$$n - 2 \pm 5$$

$$n = 2 \pm 5$$

$$n = 7 \quad (B)$$

5. Amount (A) = Principal (P) + Interest (I)

$$A = P + \frac{PRT}{100}$$

$$A = P\left(1 + \frac{RT}{100}\right)$$

$$330 = P\left(\frac{100 + 32}{100}\right)$$

$$P = \frac{330 \times 100}{132} = ₦250 \ (C)$$

6. $\frac{xy^2 - x^2y}{x^2 - xy}$

$$= \frac{xy(y-x)}{x(x-y)}$$

$$= \frac{-y(x-y)}{x-y}$$

$$= -y$$

7. $2 < 2x - 6 < 4$

Solving the first part

$$2 < 2x - 6$$

$$2 + 6 < 2x$$

$$8 < 2x$$

=> $4 < x$

Solving the last part

$$2x - 6 < 4$$

$$2x < 4 + 6$$

$$2x < 10$$

$$x < 5$$

$$4 < x < 5$$

There is no such integer x!

8. There are 6 possible outcomes on a die. There are $6^2 = 36$ possible outcomes on two fair dice

Required outcomes are $\{(1,1),(2,2),(3,3),(4,4),(5,5),(6,6)\}$

Hence, the probability = $\frac{6}{36} = \frac{1}{6}$ (E)

9. There are five possible outcomes

The required outcomes are square, rectangle and rhombus because they are parallelogram.

Hence, probability of selecting a figure which is a parallelogram = $^3/_5$ (A)

10. $\frac{7}{6+5+7} = \frac{7}{18}$ (B)

11. $P \alpha \frac{1}{V}$, $V \alpha R^2$

Then $P = \frac{K}{V}$ and $V = CR^2$ where K and C are constants

Hence, $P = \frac{K}{CR^2}$

$P = \frac{m}{R^2}$ where $\frac{K}{C} = m$ is a constant

If $P = 2$, $R = 7$

$$2 = \frac{m}{7^2}$$

$$2 = \frac{m}{49}$$

$$m = 98$$

$$P = \frac{98}{R^2}$$

So, $PR^2 = 98$ (B)

12. n^{th} term of a G.P. $= ar^{n-1}$

1^{st} term $= a = 7$ ...... (i

4^{th} term $= ar^3 = 189$ ...... (ii)

Put the value of a in (ii)

$$7r^3 = 189$$

$$r^3 = \frac{189}{7}$$

$$r^3 = 27$$

$$\therefore r = 3$$

Sum of the first n terms of a G.P.

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

$$S_3 = \frac{7(3^3 - 1)}{3 - 1} = \frac{7(27 - 1)}{2}$$

$$= \frac{7(26)}{2} = 91 \quad (C)$$

13. $3n^2 = 12n$

$3n^2 - 12n = 0$

$3n(n - 4) = 0$

$n = 0$ or $n - 4 = 0$

$\Rightarrow n = 0$ or $n = 4$

Since n is positive, $n = 4$ (B)

14. Each interior angle of a regular polygon with n sides $= \frac{(n-2)180^0}{n}$

$\therefore$ For a regular hexagon, each interior angle $= \frac{(6-2)180^0}{6}$

$$= \frac{4x180^0}{6} = 120^0 \quad (C)$$

15. $6x^2 - 14x - 12$

$= 2(3x^2 - 7x - 6)$

$= 2(3x^2 - 9x + 2x - 6)$

$= 2[3x(x - 3) + 2(x - 3)]$

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

16. $(0.303)^3 - (0.02)^3$

$= (30.3 \times 10^{-2})^3 - (2 \times 10^{-2})^3$

$= 30.3^3 \times 10^{-6} - 2^3 \times 10^{-6}$

$= 10^{-6}(30.3^3 - 2^3)$

$= 10^{-6}(27810.127) = 0.027810$

17. $(27/5 \div 3^3) \times (1/5)$

$= (\frac{27}{5} \times \frac{1}{3^3}) \times (1/5)$

$= \frac{27}{5} \times \frac{1}{27} \times \frac{1}{5}$

$= \frac{1}{25}$ (C)

18. $\log_2 4 + \log_2 7 - \log_2 n = 1$

$\Rightarrow \log_2\left(\frac{4 \times 7}{n}\right) = 1$

$$\frac{28}{n} = 2$$

$\Rightarrow n = \frac{28}{2} = 14$ (B)

19. Let the number of years $= x$

Tolu's age $= 24 + x$ while her father's age $= 45 + x$

Then $24 + x = \frac{1}{2}(45 + x)$

By multiplying through by 2

$48 + 2x = 45 + x$

$\Rightarrow x = -3$

Hence the year was 1984 –3 = 1981(B)

20. Since $x = 1$ is a root, we have that $x - 1$ divides $x^3 - 2x^2 - 5x + 6$

$$\begin{array}{r|l} & x^2 - x - 6 \\ x - 1 & x^3 - 2x^2 - 5x + 6 \\ & x^3 - x^2 \\ & -x^2 - 5x \\ & x^2 + x \\ & -6x + 6 \\ & -6x + 6 \\ & 0 \end{array}$$

The remaining roots are the roots of $x^2 - x - 6 = 0$

$\Rightarrow x^2 - 3x + 2x - 6 = 0$

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

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

$\Rightarrow x + 2 = 0$ or $x - 3 = 0$

Hence, x = -2 and 3 are the remaining roots. (C)

21. They are eleven numbers from 40 to 50 with three primes; 41, 43 and 47.

Hence, the probability of selecting a prime $= \frac{3}{11}$ (A)

22. $(3x + 1)cm$ is the hypotenuse side since it is more than the other two sides.

Using Pythagoras' theorem

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

$9x^2 + 6x + 1 = 9x^2 - 6x + 1 + x^2$

$\Rightarrow 10x^2 - 9x^2 - 6x - 6x + 1 - 1 = 0$

$x^2 - 12x = 0$

$x(x - 12) = 0$

$\Rightarrow x = 0$ or $x = 12$

But x cannot be 0, therefore

$x = 12$ (D)

23. $2 + 3 + 5 = 10$

Let the number of pencils shared $= x$

Then $\frac{2}{10} \times x = 5$

$\Rightarrow x = \frac{5 \times 10}{2} = 25$ (B)

OBAFEMI AWOLOWO UNIVERSITY, ILE IFE
2010 POST UTME TEST

1. If $\left(\frac{3}{4}\right)^x\left(\frac{2}{3}\right)^y = \frac{32}{27}$, find the value of $3y - 2x$.
(a) -1 (b) 7 (c) 1 (d) -7

2. The integral values of y which satisfy the inequality $-1 < 5 - 2y \leq 7$ are
(a) -1, 0, 1, 2 (b) 0, 1, 2, 3
(c) -1, 0, 1, 2, 3 (d) -1, 0 2, 3

3. If $x^2 - 5x + 6 = (x - a)^2 + b$, the value of b is
(a) - ¼ (b) $\frac{5}{2}$ (c) 2 (d) 3

4. The scores of 16 students in a mathematics test are 65, 65, 55, 60, 65, 60, 70, 75, 70, 65, 70, 60, 65, 65, 70. What is the sum of the median and modal scores?
(a) 125 (b) 130 (c) 140 (d) 150

5. Find x if $x^2 - 2x - 15 = 0$
(a) 3, -5 (b) -3, 5
(c) 1, 15 (d) -2, 15

6. A father leaves a legacy of N45 million for his children – Peter, David and Paul – to be shared in the ratio 7:5:3. What amount in million Naira would each receive respectively?
(a) N14, N7, N3; (b) N15, N5, N3
(c) N21, N15,N9 (d) N20, N16, N10

7. As θ tends to zero, what does $\cos\theta$ tends to?
(a) $\sin\theta$ (b) 0 (c) ½ (d) 1

8. The expression $2\cos\theta + \sin^2\theta$ has the numerical value
(a) 1 (b) 2 (c) 4 (d) 0

9. If $\tan x = \frac{\sin x}{\cos x}$, find $\tan(90^0 + x)$, for acute value of x
(a) $-\cot x$ (b) $-\tan x$ (c) $\cot x$
(d) $\tan x$

10. Evaluate the length of perpendicular from A to BC
(a) $\frac{\sqrt{52}}{12}cm$ (b) $\frac{12}{\sqrt{52}}cm$
(c) $\frac{14}{\sqrt{52}}cm^2$ (d) $\frac{14}{\sqrt{52}}cm$

11. The indefinite integral xe^x, for any real constant c is
(a) c (b) $x + e^x + c$ (c) $x^2 + e^x + c$
(d) $e^x(x-1) + c$

12. Find the area under the curve (Find the area under the curve $y(x) = \sin x$ between $x = 0$ and $x = \pi$.
(a) 2 (b) 1 (c) -2 (d) π

13. Let the letters P, Q, R and S denote parallelogram, quadrilateral, rectangle and square respectively. Using subset notation, which is these inclusions is correct?
(a) $Q \subset R \subset P \subset S$
(b) $R \subset Q \subset P \subset S$
(c) $S \subset P \subset R \subset Q$
(d) $S \subset R \subset P \subset Q$

14. In a convex polygon with n sides, the sum of interior angles is
(a) $(n-2)\pi$ (b) $2(n-1)\pi$
(c) $4(n-1)\pi$ (d) $(2n+4)\pi$

15. Find the equation of the line perpendicular to the line $y = 2x + 1$ and passing through a point (3, 1).
(a) $y = \frac{1}{2}x + \frac{5}{2}$ (b) $y^2 = \frac{1}{2}x + \frac{5}{2}$
(c) $y = x + 5$ (d) $2y = x + 5$

16. What is the distance between points (1, 2) and (4, 5) on a plane?
(a) $3\sqrt{2}$ (b) $2\sqrt{3}$ (c) 3 (d) 9

17. Integrate $\int 2\tan(2x + \pi)dx$
(a) $2\cot(2x + \pi) + k$
(b) $\log[cos(2x + \pi)] + k$
(c) $-\log[cos(2x + \pi)] + k$
(d) $4\cot(2x + \pi) + k$

18. Find the values of x for which $5 + 2x - 3x^2 = 0$
(a) -2 and $\frac{6}{5}$ (b) -1 and $\frac{5}{3}$
(c) -2 and -1 (d) $\frac{6}{5}$ and $\frac{5}{3}$

19. A businessman invested a total of N200,000 in two companies which paid dividends of 5% and 7% respectively. If he received a total of N11,600 as dividend, how much did he invested at 5%? (a) N160,000 (b) N140,000
(c) N120,000 (d) N80,000

20. If $a\sqrt{5} + b\sqrt{2}$ is the square root of $95 - 30\sqrt{10}$, the values of a and b are, respectively
(a) 5, 2 (b) 2, -5 (c) -5, 3 (d) 3, -5

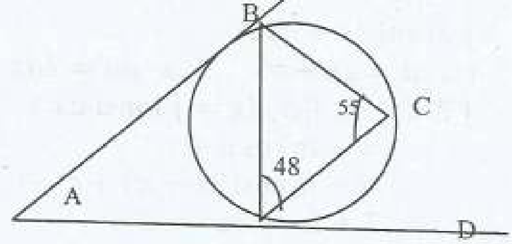
21. If $\frac{x}{y} = \frac{z}{w} = c$, find the value of $\frac{3x^2 - xz + z}{3y^2 - yw + w}$ in terms of c.
(a) $3c^2$ (b) $\frac{17c^2}{4}$ (c) $2c - c^2$ (d) c^2

22. Express $\frac{5y-12}{(y-2)(y-3)}$ in partial fractions
(a) $\frac{2}{y-2} - \frac{3}{y-3}$ (b) $\frac{2}{y-2} + \frac{3}{y-3}$
(c) $\frac{2}{y-3} - \frac{3}{y-2}$ (d) $\frac{5}{y-3} - \frac{4}{y-2}$

23. The second term of an infinite geometric series is $-\frac{1}{2}$ and the third term is $\frac{1}{4}$. Find the sum of the series.

(a) 2 (b) 1 (c) $\frac{3}{2}$ (d) $\frac{2}{3}$

24. In the figure AB and AD are tangents to the circle. If BCS = 55^0 and BDC = 48^0, find BAD.



(a) 55^0 (b) 70^0 (c) 77^0 (d) 84^0

25. Find the area of the triangle:

(a) 24cm (b) $24cm^2$ (c) $12cm^2$

(d) 12cm

SOLUTION

1. $\left(\frac{3}{4}\right)^x\left(\frac{2}{3}\right)^y = \frac{32}{27}$

=> $\frac{3^x \text{ x } 2^y}{2^{2x} \text{ x } 3^y} = \frac{2^5}{3^3}$

=> $3^{x-y} \text{ x } 2^{y-2x} = 3^3 \text{ x } 2^5$

=> $x - y = -3$ ... (i)

$y - 2x = 5$ ... (ii)

adding (i) to (ii)

$-x = 2$

=> $x = -2$

Putting the value of x in (i)

$-2 - y = -3$

=> $y = -2 + 3 = 1$

$3y - 2x = 3(1) - 2(-2)$

$= 3 + 4 = 7$ (B)

2. $-1 < 5 - 2y \leq 7$

=> $-1 - 5 < -2y \leq 7 - 5$

$-6 < -2y \leq 2$

Dividing through by -2

=> $3 > y \geq -1$

The integral values of y are -1, 0, 1, 2 (A)

3. $x^2 - 5x + 6$

Add and subtract $\left(\frac{5}{2}\right)^2$

$= x^2 - 5x + \left(\frac{5}{2}\right)^2 + 6 - \left(\frac{5}{2}\right)^2$

$= \left(x - \frac{5}{2}\right)^2 + 6 - \frac{25}{4}$

$= \left(x - \frac{5}{2}\right)^2 - \frac{1}{4}$

The value of b is $-\frac{1}{4}$ (A)

4. Re-arrange the scores in ascending order:

55, 60, 60, 60, 65, 65, 65, 65, (65, 65) 70, 70, 70, 70, 75

Median = 65

Mode = 65

The sum of the median and modal scores = 65 + 65 = 130 (B)

5. $x^2 - 2x - 15 = 0$

=> $x^2 - 5x + 3x - 15 = 0$

$x(x - 5) + 3(x - 5) = 0$

=> $(x - 5)(x + 3) = 0$

=> $x = 5$ or -3 (B)

6. $7 + 5 + 3 = 15$

Peter would receive $\frac{7}{15}$ x ₦45 = N21

David would receive $\frac{5}{15}$ x ₦45 = 15 Paul would receive $\frac{3}{15}$ x ₦45 = 9 (C)

7. $\cos\theta$ tends to 1 as θ tends to zero (D)

8. $\cos^2\theta + \sin^2\theta = 1$ (A)

9. $\tan(90^0 + x) = \frac{\sin(90^0 + x)}{\cos(90^0 + x)}$

$= \frac{\sin(90^0 - x)}{-\cos(90^0 - x)}$

$\frac{\cos x}{-\sin x} = -\cot x$ (A)

10. Incomplete question

11. $\int xe^x dx$

Using $\int u dv = uv - \int v du$

Let $u = x$ and $dv = e^x dx$

=> $du = dx$ and $v = e^x$

$\therefore \int xe^x dx = xe^x - \int e^x dx$

$= xe^x = e^x + c$

$= e^x(x - 1) + c$ (D)

12. The area under the curve is given by $\int_0^\pi \sin x\, dx$

$\int_0^\pi \sin x\, dx = (-\cos x)|_0^\pi$

$= -\cos\pi + \cos 0$

$= -(-1) + 1 = 2$ (A)

13. $S \subset R \subset P \subset Q$ (D)

14. $(n - 2)\pi$ (A)

15. Slope of the line $y = 2x + 1$ is 2. Therefore, the slope of the straight line perpendicular to it is -½. Using the equation $\frac{y - y_1}{x - x_1}$ = slope, the required equation is

$\frac{y-1}{x-3} = -\frac{1}{2}$

=> $2y - 2 = -x + 3$

=> $y = \frac{-x}{2} + \frac{5}{2}$ (A)

16. Distance between points (1,2) and (4,5)

$= \sqrt{(4-1)^2 + (5-2)^2}$

$= \sqrt{3^2 + 3^2}$

$= \sqrt{18} = 3\sqrt{2}$ (A)

17. $\int 2tan(2x+\pi)dx$

Let $u = 2x + \pi$. Then $du = 2dx$

$\int 2tan(2x+\pi)dx = \int \tan u \, dx$

$= -\ln\cos u + c$

$= -\ln\cos(2x+\pi) + c$ (C)

18. $5 + 2x - 3x^2 = 0$

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

$5(1+x) - 3x(1+x) = 0$

$(5-3x)(1+x) = 0$

=> $5 - 3x = 0$ or $1 + x = 0$

$x = 5/3$ or -1 (B)

19. Let the amounts invested at dividends of 5% and 7% be x and y respectively Then,

$x + y = 200{,}000$ …. (i)

$0.05x + 0.07y = 11{,}600$ …. (ii)

Multiply (i) by 0.05

$0.05x + 0.05y = 10{,}000$ ….(iii)

Subtract (iii) from (ii)

$0.02y = 1{,}600$

=> $y = \frac{1{,}600}{0.02} = 80{,}000$

The amount invested at 5% is

₦20,000 - ₦8,000 =₦12,000 (C)

20. Since $95 - 30\sqrt{10}$ has $a\sqrt{5} + b\sqrt{2}$ as its square root,

$(a\sqrt{5} + b\sqrt{2})^2 = 95 - 30\sqrt{10}$

=> $5a^2 + 2b^2 + 2ab\sqrt{10} = 95 - 30\sqrt{10}$

By comparing both sides

$5a^2 + 2b^2 = 95$ …. (i)

$2ab = -30$

$ab = -15$ ….. (ii)

Solving (i) and (ii) yields $(a, b) =$ $(-3, 5)$ or $(3, -5)$ or $\left(-\sqrt{10}, \sqrt{\frac{45}{2}}\right)$ or $\left(\sqrt{10}, -\sqrt{\frac{45}{2}}\right)$

21. By checking (substituting) each of the options, the answer is (D)

22. Let $\frac{5y-12}{(y-2)(y-3)} = \frac{A}{y-2} + \frac{B}{y-3}$

$5y - 12 \equiv A(y-3) + B(y-2)$ … (i)

Put $y = 2$ in (i)

$10 - 12 = -A$

=> $A = 2$

Put $y = 3$ in (i)

$15 - 12 = B(1)$

$B = 3$

Hence, $\frac{5y-12}{(y-2)(y-3)} = \frac{2}{y-2} + \frac{3}{y-3}$ (B)

23. n^{th} term of a G.P. $= ar^{n-1}$ where 'a' is the first term and 'r' is the common ratio

2^{nd} term $= ar = -\frac{1}{2}$ …. (i)

3^{rd} term $= ar^2 = \frac{1}{4}$ …. (ii)

Dividing (ii) by (i)

$r = -\frac{1}{2}$

Substituting the value of r in (i)

$a = 1$

Sum to infinity of a Geometric series

$S_\infty = \frac{a}{1-r} = \frac{1}{1-(-1/2)}$

$= \frac{1}{3/2} = 2/3$ (D)

24. $\left.\begin{array}{l} A\hat{B}D = 55^0 \\ A\hat{D}B = 55^0 \end{array}\right\}$ angle in alternate segment

$B\hat{A}D = 180^0 - (A\hat{B}D + A\hat{D}B)$

{sum of angles in a triangle}

$= 180^0 - (55^0 + 55^0) = 180^0 - 110^0$

$= 70^0$(B)

2011 POST-UTME TEST

1. If the universal set $U = \{1,2,3,4,5,6,7,8,9,10\}$, $M = \{1,3,5,7,9\}$and $N = \{2,4,6,8,10\}$, which of the following is equal to $(M \cup N)$?
A. $(M \cap N)'$ B. $M' \cup N'$
C. $M' \cap N'$ D. $M \cap N$

2. $cos(180 - \theta)$ is equivalent to
A. $\cos(180 - \theta)$ B. $\cos\theta$
C. $-cos\theta$ D. $-\cos(180 + \theta)$

3. Find the equation of the circle with centre (-1, 3) and radius 4.
A. $x^2 + y^2 - 6x + 2y = 6$
B. $x^2 + y^2 + 2x - 6y = 16$
C. $x^2 + y^2 - 6x + 2y = 16$
D. $x^2 + y^2 + 2x - 6y = 6$

4. Find $\frac{dy}{dx}$ if $y = \frac{3}{\sqrt{x}}$
A. $\frac{3}{2}x^{\frac{-3}{2}}$ B. $3x^{\frac{-3}{2}}$ C. $\frac{-3}{2}x^{\frac{-3}{2}}$ D. $\frac{3}{4}x^{\frac{-3}{2}}$

5. Integrate $\frac{1}{2x}$
A. Not defined B. 0
C. ½ ln x+C D. ¼x2+C

6. A die is tossed twice. What is the probability of obtaining a total of 6 if both numbers are odd? A. $\frac{1}{12}$ B. $\frac{1}{18}$ C. $\frac{5}{36}$ D. $\frac{1}{6}$

7. If the mean of the numbers a, b, c, d, e is x, find the mean of numbers a +k, b +2k, c – k, d-2k, e.
A. x B. x + k C. x – k D. 2x

8. Factorize $a^2 - b^2 + (a + b)^2$
A. $2a^2$ B. 2a(a–b) C. 2a(a+b) D. 2b(b–a)

9. Let α and β be roots of quadratic equation $x^2 + 2x - 3 = 0$, then $\alpha\beta$ is
A. -3 B. -2 C. 2 D. 6

10. Convert 6910 to a number in base two
A.1001101 B. 1010001 C. 1000101
D. 100101

11. The reciprocal of $\frac{\frac{3}{4}}{\frac{1}{4}+\frac{1}{3}}$
A. $1\frac{2}{7}$ B. $\frac{7}{9}$ C. $-1\frac{2}{7}$ D. $\frac{-7}{9}$

12. The speed of 30 kilometres per minute, expressed in centimeters per second is
A. 5 B. 50 C. 500 D. 5000

13. Evaluate x if log4(x + 3)(x – 3) = 2
A. 3 or -3 B. 5 or -5 C. 5 or -3 D. 3 or -5

14. Given that $a = \frac{1}{2-\sqrt{3}}$, $b = \frac{1}{2+\sqrt{3}}$, find the value of $a^2 + b^2$
A. $\frac{14}{37}$ B. 7 C. $14 + 2\sqrt{3}$ D. 14

15. If the binary operation * is defined as x * y = 2, find 2 * (4 * 5)
A. 4 B. 5 C. -5 D. 2

16. Find the value of

$$\sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 +}}}}}$$

A. -2 B. 2 C. 6 D. 3

17. Find the value of $\int_0^{\frac{\pi}{2}}(2\pi + 2cos2x)dx$
A. $\pi^2 + 1$ B. π^2 C. $\pi^2 - 4$
D. $\pi^2 + 3$

18. The circle $2x^2 + 2\left(y - \frac{3}{2}\right)^2 = 2$ has centre and radius respectively as
A. $\left(0, \frac{3}{2}\right)$ and 2 B. $\left(0, \frac{-3}{2}\right)$ and 1
C. $\left(\frac{3}{2}, 0\right)$ and 2 D. $\left(0, \frac{3}{2}\right)$ and 1

19. The line perpendicular to the straight line $y + \frac{3}{2}x - 1 = 0$ has the gradient
A. $\frac{-2}{3}$ B. $\frac{3}{2}$ C. 3 D. $\frac{2}{3}$

20. Find x if $2^{x^2} = 4^{(x+4)}$
A. -2 or 4 B. -2 or 2 C. -4 or 4 D. -4 or 2

21. Expressed in partial fraction $\frac{3x}{x^2-1} \equiv \frac{A}{x-1} + \frac{B}{x+1}$.Then A and B respectively is
A. -3, 3 B. $\frac{2}{3}, \frac{2}{3}$ C. $\frac{-3}{2}, \frac{-3}{2}$ D. $\frac{3}{2}, \frac{3}{2}$

22. A square has a perimeter of 40cm. What is the area in cm square?
A. 80 B. 1600 C. 100 D. 160

SOLUTION TO OBAFEMI AWOLOWO UNIVERSITY(2011)

1. $(M \cup N)' = M' \cap N'$ (C)

2. A and C are correct

3. Use the equation $(x - a)^2 + (y - b)^2 = r^2$ where (a , b) is the centre and r is the radius of the circle

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

4. $y = 3x^{-\frac{1}{2}}$

$\therefore \frac{dy}{dx} = 3x - \frac{1}{2}x^{-\frac{1}{2}-1}$

$= \frac{-3}{2}x^{-\frac{3}{2}}$ (C)

5. (C)

6. The required outcomes are (1, 5), (5, 1), (3, 3). There are 36 possible outcomes

$\therefore$ The probability $= \frac{3}{36} = \frac{1}{12}$ (A)

7. If the mean of a, b, c, d, e is x, then their sum is $5x$

Hence, mean of a + k, b + 2k, c – k, d – 2k and e

$= \frac{a+k+b+2k+c-k+d-2k+e}{5}$

$= \frac{a+b+c+d+e+0}{5} = \frac{5x}{5} = x$ (A)

8. $a^2 - b^2 + (a + b)^2$

$= (a - b)(a + b) + (a + b)^2$

$= (a + b)(a - b + a + b)$

$= 2a(a + b)$ (C)

9. $\alpha\beta = \frac{c}{a} = -3$ (A)

10. (C)

11. Reciprocal of $\frac{\frac{3}{4}}{\frac{1}{4}+\frac{1}{3}} = \frac{\frac{1}{4}+\frac{1}{3}}{\frac{3}{4}}$

$= \frac{7}{12} \times \frac{4}{3} = \frac{7}{9}$ (D)

12. $\frac{30km}{min} = \frac{30 \times 1000 \times 100cm}{60s}$

$= 50000cm/s$ None of the options

13. $\log_4(x+3)(x-3) = 2$

$\Rightarrow \log_4(x+3)(x-3) = \log_4 16$

Equate logs

$(x+3)(x-3) = 16$

By inspection, $x = 5$ or -5 (B)

14. $a = \frac{1}{2-\sqrt{3}}$ and $b = \frac{1}{2+\sqrt{3}}$

By rationalizing both,

$a = 2+\sqrt{3},\quad b = 2-\sqrt{3}$

$\therefore\ a^2 + b^2 = \left(2+\sqrt{3}\right)^2 + \left(2-\sqrt{3}\right)^2$

$= 4 + 4\sqrt{3} + 3 + 4 - 4\sqrt{3} + 3$

$= 14$ (D)

15. $4 * 5 = 2$

$\therefore\ 2 * (4 * 5) = 2 * 2 = 2$ (D)

16. $2 < \sqrt{6} < 3$

$\therefore \sqrt{6+\sqrt{6}} < \sqrt{6+3} = 3$

$\sqrt{6+\sqrt{6+\sqrt{6}}} < \sqrt{6+3} = 3$

$\sqrt{6+\sqrt{6+\sqrt{6+\sqrt{6}}}} < \sqrt{6+3} = 3$

Hence $\sqrt{6+\sqrt{6+\sqrt{6+\sqrt{6+\sqrt{6}}}}} < \sqrt{6+3} = 3$

(D)

17. $\int_0^{\frac{\pi}{2}} (2\pi + 2cos2x)dx$

$2\pi x + \frac{2sin2x}{2}\Big|_0^{\frac{\pi}{2}}$

$2\pi\left(\frac{\pi}{2}\right) + \frac{2sin2\left(\frac{\pi}{2}\right)}{2}$

$= \pi^2$ (B)

18. $2x^2 + 2\left(y - \frac{3}{2}\right)^2 = 2$

Divide through by 2

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

$\therefore$ The centre is $\left(0, \frac{3}{2}\right)$ and the radius is 1 (D)

19. $y + \frac{3}{2}x - 1 = 0$

$y = \frac{-3}{2}x + 1$

The gradient is $\frac{-3}{2}$.

Therefore, the gradient of the line perpendicular to it is $m_2 = -\frac{1}{m_1}$

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

20. $2^{x^2} = 4^{(x+4)}$

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

Equate the powers

$x^2 = 2x + 8$

$x^2 - 2x - 8 = 0$

$(x-4)(x+2) = 0$

$\Rightarrow x = 4$ or -2 (A)

21. $\frac{3x}{x^2-1} = \frac{3x}{(x+1)(x-1)} \equiv \frac{A}{x-1} + \frac{B}{x+1}$

$\Rightarrow 3x \equiv A(x+1) + B(x-1)$

Put $x - 1$

$3 = 2A$

$A = \frac{3}{2}$

Put $x = -1$

$-3 = -2B$

$B = \frac{3}{2}$ (D)

22. A length of the square $= \frac{40cm}{4}$

$= 10cm$

$\therefore$ Area of the square $= 10cm \times 10cm$

$= 100cm^2$ (C)

OBAFEMI AWOLOWO UNIVERSITY, ILE IFE
2012 POST UTME SCREENING TEST

1. Obtain the product of 1100_2 and 101_2
A. 111100_2 B. 110100_2 C. 2220_5
D. 1144_7

2. Simplify $\left(8\sqrt{n}/m^{3/2}\right)^2(4^{-1}m^2/2n^{-2})$
A. $128n^3m^{-1}$ B. $^8n^3m^{-1}$ C. $8n^4m$ D. $8n^3m$

3. Evaluate $\log_8 128 + \log_3 9$
A. 19 B. 48 C. 13/3 D. 6

4. Find the value of y if $½\log_3 y = 2$
A. 9 B. 18 C. 9/2 D. 81

The universal set U consists of all integers. Subsets of U are defined as:

$A = \{y: y \leq 3\}$
$B = \{y: -5 < y < 12\}$

$C = \{y: -2 \leq y < 5\}$

Use the information above to answer question 5.

5. $A \cap (B \cup C)'$ is
A. $\{y < -4\}$ B. ϕ C. $\{y < 0\}$
D. $\{-4 \leq y \leq 3\}$

6. Make k the subject of the formula
$m = \frac{2nk}{p} + \frac{k}{2p}$
A. $k = \frac{2mp}{2n+1}$ B. $k = \frac{2mp}{4n+1}$
C. $k = \frac{mp}{2n+1}$ D. $k = \frac{2n+1}{2mp}$

7. Which of the following is a perfect square?
A. $x^2 - 3x - 4$ B. $x^2 + 9x + 9$
C. $2x^2 + 2x + 2$ D. $x^2 + 2x + 1$

8. The quadratic equation whose roots are $(x-3)$ and $\left(x + \frac{1}{3}\right)$ is
A. $x^2 + \frac{8}{3}x - 1 = 0$ B. $x^2 - 2x - 3 = 0$
C. $x^2 - \frac{8}{3}x - 1 = 0$ D. $x^2 - 9 = 0$

9. What is the highest possible value of $\frac{8}{1+x^2}$ if $0 \leq x \leq 3$?
A. 8 B. 4 C. 2 D. 16

10. The fifth term in the progression 9, 27, 81, …
A. 243 B. 3^7 C. 729 D. 3^8

11. The interior angles of an hexagon are 120^0, 100^0, 80^0 150^0, x and 130^0. The value of x is
A. 170^0 B. 20^0 C. 120^0 D. 140

12. If the bearing of a town B from A is 145^0, the bearing of A from B is
A. 305^0 B. 325^0 C. 35^0 D. 145^0

The scores of students in a class test are shown in the table below. Use the information to answer Question 13.

Scores	1	2	3	4	5	6	7	8
No. of Students	0	1	3	5	3	4	2	0

13. The modal score is
A. 5 B 4 C. 6 D. 8

14. A number is selected randomly from the set of integers 1 to 30 inclusive. The probability that the number is prime is
A. 4/15 B 1/3 C. 3/15 D. 7/30

15. Differentiate $\cos ax$ with respect to x
A. $a \sin ax$ B. $1/a \sin ax$ C. $-a \sin ax$
D. $-1/a \sin ax$

16. Obtain the values of x in $|x - 9| = 16$
A. 25 B. -7 C. 25, -7 D. -25, 7

17. Integrate $\sqrt{2x+1}$
A. $\frac{1}{3}(2x+1)^{\frac{3}{2}} + K$
B. $\frac{1}{3}(2x+1)^{-\frac{3}{2}} + K$
C. $-\frac{1}{3}(2x+1)^{\frac{3}{2}} + K$
D. $-\frac{1}{3}(2x+1)^{-\frac{3}{2}} + K$

18. Obtain the centre of the circle $3y^2 + 3(x+5)^2 = 17$
A. (0,5) B. (-5,0) C. (0,-5) D. (5,0)

19. If $f(x+1) = \frac{x^2+1}{x^3}$, find $f(2)$

A. 5/8 B. 2 C. ¼ D. 1

20. Which of these numbers is an irrational number?

A. $\sin 0^0$ B. $\sin 30^0$ C. $\sin 60^0$ D. $\sin 90^0$

21. Given $\int_{-a}^{a} 15x^2 dx = 3430$, find the value of the constant a.

A. 8 B. 6 C. 7 D. 9

22. Which of these lines is at right angle with the line $x = -7$

A. $2x + y = -1$ B. $2x - y = 1$ C. $y = 0$ D. $x = 49$

SOLUTION

1.
$$\begin{array}{r} 1100_2 \\ \times 101_2 \\ \hline 1100 \\ 000 \\ 1100 \\ \hline 111100_2 \end{array}$$
(A)

2. $\left(8\sqrt{n}/m^{3/2}\right)^2 (4^{-1}m^2/2n^{-2})$

$= \frac{64n}{m^3} \times \frac{m^2 \times n^2}{4 \times 2}$

$= 8\frac{n^3}{m} = 8n^3m^{-1}$ (B)

3. Let $\log_8 128 = x$ and $\log_3 9 = y$

Then $8^x = 128$ and $3^y = 9$

=> $2^{3x} = 2^7$ and $3^y = 3^2$

=> $3x = 7$ and $y = 2$

=> $x = \frac{7}{3}$ and $y = 2$

$\therefore \log_8 128 + \log_3 9$

$= \frac{7}{3} + 2 = \frac{13}{3}$

4. $\frac{1}{2}\log_3 y = 2$

Multiply both sides by 2

$\log_3 y = 4$

=> $y = 3^4 = 81$ (D)

5. $A = \{..., 1, 2, 3\}$

$B = \{-4, -3, -2, ..., 11\}$

$C = \{-2, -1, 0, ..., 4\}$

$B \cup C = \{-4, -3, -2, ..., 11\}$

$(B \cup C)' = \{..., -7, -6, -5, 12, 13, 14, ...\}$

i.e. $\{y: y < -4\}$ together with $\{y: y > 11\}$

$\therefore A \cap (B \cup C)' = \{y: y < -4\}$ (A)

6. (B)

7. By inspection (D)

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

8. $(x-3)\left(x + \frac{1}{3}\right) = 0$

$x^2 + \frac{1}{3}x - 3x - 1 = 0$

$x^2 - \frac{8}{3}x - 1 = 0$ (C)

9. The value of $\frac{8}{1+x^2}$ is decreasing as the value of x is increasing in the given interval. Therefore the highest value will be at $x = 0$

i.e. $\frac{8}{1+0} = 8$ (A)

10. (C)

11. Sum of the interior angles of an n-sided polygon $= (n-2) \times 180^0$.

An hexagon has six sides. Therefore, sum of its inte4riorn angle is 720

$\therefore 120^0 + 100^0 + 80^0 + 150^0 + x + 130^0 = 720^0$

$x = 720^0 - 580^0 = 140^0$ (D)

12. (B)

13. (B)

14. There are 30 integers in the set {1, 2, …, 30} and the set of prime numbers there is {2, 3, 5, 7, 11, 13, 17, 19, 23, 29}

∴ Probability of selecting a prime number

$= \frac{10}{30} = \frac{1}{3}$ (B)

15. (C)

16. $|x - 9| = 16$

=> $x - 9 = \pm 16$

=> $x = 9 \pm 16$

$= 25, -7$ (C)

17. $\int \sqrt{2x+1}\, dx$

Let $U = 2x + 1$, then $\frac{du}{dx} = 2$

=> $\frac{du}{2} = dx$

$\therefore \int \sqrt{2x+1}\, dx = \int \sqrt{u} \cdot \frac{du}{2}$

$= \frac{1}{2}\int u^{1/2}\, du$

$= \frac{1}{2} \cdot \frac{u^{3/2}}{3/2} + K$

$= \frac{1}{3}u^{3/2} + K$

$= \frac{1}{3}(2x+1)^{3/2} + K$ (A)

18. $3y^2 + 3(x+5)^2 = 17$

Divide through by 3 and compare with the standard form of the equation of a circle.

$(x-a)^2 + (y-b)^2 = r^2$ where r is the radius and (a, b) is the centre. (B)

19. $f(x+1) = \frac{x^2+1}{x^3}$

$f(2) = f(1+1) = \frac{1^2+1}{1^3}$

$= 2$ (B)

20. $\sin 60^0 = \frac{\sqrt{3}}{2}$ (C)

21. $\int_{-a}^{a} 15x^2 dx = 3430$

$\left.\frac{15x^3}{3}\right|_{-a}^{a} = 3430$

$5a^3 - 5(-a)^3 = 3430$

$5a^3 + 5a^3 = 3420$

$a^3 = 343$

$a = \sqrt[3]{343} = 7$ (C)

22. (C)

OBAFEMI AWOLOWO UNIVERSITY, ILE IFE
2013 POST UTME SCREENING EXERCISE

1. If the probability of success in an even is $\frac{y}{x}$. What is the probability of failure?
A. $\frac{x-y}{x}$ B. $\frac{y-x}{x}$ C. $\frac{x-y}{y}$ D. $\frac{y-x}{y}$
2. What is the circumference of the circle $x^2 + y^2 = (\frac{7}{\pi})^2$?
A. 16 units B. 14 units C. 15 units D. 15 units
3. Find the diameter of the circle $2x^2 + 2y^2 - 50 = 0$
A. -10 units B. 10 units C. 25 units D. -25 units
4. Find point of intersection of the lines $3x - 2y = 5$, $2x + 5y = -7$
A. $x = \frac{11}{19}, y = -\frac{31}{19}$ B. $x = -\frac{11}{19}, y = \frac{31}{19}$
C. $x = -\frac{11}{19}, y = -\frac{31}{19}$ D. $x = \frac{11}{19}, y = \frac{31}{19}$
5. Solve $4x^2 + 20x - 24 = 0$
A. 1,6 B. -1,-6 C. 6, -1 D. -6,1
6. What is the 15th term of the sequence -3,2,7,...?
A. 65 B. 66 C. 68 D. 67
7. What is the distance between the points (-1,5) and (-7,-3)?
A. 9 B. 10 C. 11 D. 12
8. Evaluate $\frac{\log\sqrt{27} - \log\sqrt{8}}{\log 3 - \log 2}$
A. $\frac{2}{3}$ B. $-\frac{2}{3}$ C. $\frac{3}{2}$ D. $-\frac{3}{2}$
9. What is the remainder when $x^3 + 5x^2 - 6x + 1$ is divided by $x + 1$
A. -1 B. 2 C. -2 D. 1
10. If α, β *are the roots of equation* $6 + 5x - x^2 = 0$, *find* $\alpha\beta + \alpha + \beta$
A. 11 B. -11 C. 1 D. -1
11. What is the value of y for which the function $\frac{y-1}{y+1}$ is undefined? A. -1 B. 1 C. 0 D. 2
12. Resolve $\frac{1}{x(1+x)}$ into partial fractions.
A. $\frac{1}{x} + \frac{1}{1+x}$ B. $\frac{1}{1+x} - \frac{1}{x}$ C. $\frac{-1}{x} - \frac{1}{1+x}$ D. $\frac{1}{x} - \frac{1}{1+x}$
13. Solve the equation $5^{x^2} = 25^{x+4}$
A. -4,2 B. -4, -2 C. 4, -2 D. 4,2
14. Evaluate $\sum_{n=2}^{4}(2^n + 1)$
A. 28 B. 31 C. 29 D. 32
15. Integrate $4x^3 + \frac{1}{x}$ *with respect to* x
A. $\ln x + x^4 + K$ B. $x^{-1} + x^4 + K$
C. $12x^2 - x^{-2} + K$ D. $\frac{1}{5}x^5 + x^{-2} + K$
16. If X = {2,3,6,7,8} and Y = {6,7,10,3,17}, *find* $X \cap Y$
A. { } B. 3,6,7 C. {2,3,6,7,8,10,17} D. {6,3,7}
17. What is the coordinate of centre of the circle $x^2 + y^2 + 2x - 4y = 10$?
A. $(-1,-2)$ *B.* $(1,2)$ *C.* $(-1,2)$ *D.* $(1,-2)$
18. Simplify $\log_x x^4 + \log_4 4^x$
A. 4x B. $\frac{4}{x}$ C. 4 + x D. $4x \log_{4x} 4x$
19. Solve the equation $3^{x+1} = 27^{1-x}$
A. $\frac{1}{2}$ B. $-\frac{1}{2}$ C. ¾ D. $-\frac{3}{4}$
20. Given $f(x) = 3 + x$ *and* $g(x) = 3 - x$, *find* $g(f(x))$
A. 6 B. x C. –x D. 0
21. Differentiate $\sin(2x - 5)$ *with respect to x*
A. cos(2x – 5) B. –cos(2x – 5)
C. 2cos(2x – 5) D. -2cos(2x -5)
22. If δ, λ are the roots of the equation $x^2 - 5x + 7 = 0$, find the value of $\delta^2 + \lambda^2$
A. 25 B. -25 C. -11 D. 11

SOLUTIONS

1. $1 - \frac{y}{x} = \frac{x-y}{x}$ (A)
2. The equation of a circle with centre (a,b) and radius r is
$(x-a)^2 + (y-b)^2 = r^2$
Radius of $x^2 + y^2 = \left(\frac{7}{\pi}\right)^2$ is $\frac{7}{\pi}$
$\therefore circumference = 2\pi r$
$= 2\pi \times \frac{7}{\pi}$ = 14 units (B)
3. $2x^2 + 2y^2 - 50 = 0$
$x^2 + y^2 = 25$
$\Rightarrow r = 5$
$diameter = 2 \times 5 = 10\ units\ (B)$
4. *Solve the equations simultaneously,*
$3x - 2y = 5$ ...... (i)
$2x + 5y = -7$................(ii)
$(i) \times 5$ *and* $(ii) \times 2$
15x – 10y = 25 ....(iii)
4x + 10y = -14 ....(iv)
Add (iii) and (iv)
19x = 11
$x = \frac{11}{19}$,
substitute the value of x in (i)
$3(\frac{11}{19}) - 2y = 5$
$2y = \frac{33}{19} - 5$

$2y = \frac{-62}{19}$

$y = -\frac{31}{19}$ (A)

5. $4x^2 + 20x - 24 = 0$

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

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

$x(x+6) - 1(x+6) = 0$

$(x+6)(x-1) = 0$

$x = -6$ or 1 (A)

6. First term, $a = -3$

Common difference $= 7-2$ or $2-(-3) = 5$

$T_n = a + (n-1)d$

$T_{15} = -3 + 14(5) = 67$ (D)

7. $\sqrt{(-7+1)^2 + (-3-5)^2} = \sqrt{36+64} = \sqrt{100}$

$= 10$ (B)

8. $\frac{\log\sqrt{27} - \log\sqrt{8}}{\log 3 - \log 2} = \frac{\log\sqrt{\frac{27}{8}}}{\log\frac{3}{2}}$

$= \frac{\log(\frac{3}{2})^{\frac{3}{2}}}{\log\frac{3}{2}}$

$= \frac{\frac{3}{2}\log\frac{3}{2}}{\log\frac{3}{2}} = \frac{3}{2}$ (C)

9. $x - 1 = 0$; $x = 1$

Substitute the value of x in

$x^3 + 5x^2 - 6x + 1 = 1 + 5 - 6 + 1 = 1$ (D)

10. If α and β are the roots of the equation $ax^2 + bx + c = 0$,

$\alpha + \beta = -\frac{b}{a}$

$\alpha\beta = \frac{c}{a}$

for $6 + 5x - x^2 = 0$,

$\alpha + \beta = 5$,

$\alpha\beta = -6$

$\alpha\beta + \alpha + \beta = -6 + 5 = -1$ (D)

11. $\frac{y-1}{y+1}$ *is undefined when* $y + 1 = 0$

i.e $y = -1$ (A)

12. Let $\frac{1}{x(1+x)} = \frac{A}{x} + \frac{B}{1+x}$

$\therefore \frac{1}{x(1+x)} = \frac{A(1+x)+Bx}{x(1+x)}$

$1 \equiv A(1+x) + Bx$

Put $x = 0$; $A = 1$,

Put $x = -1$, $B = -1$

$\frac{1}{x(1+x)} = \frac{1}{x} - \frac{1}{1+x}$ (D)

13. $5^{x^2} = 25^{x+4}$

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

compare both sides

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

$x^2 = 2x + 8$

$x^2 - 2x - 8 = 0$

$x^2 - 4x + 2x - 8 = 0$

$x(x-4) + 2(x-4) = 0$

$(x-4)(x+2) = 0$

$x = -2$ or 4 (C)

14. $\sum_{n=2}^{4}(2^n + 1) = (2^2 + 1) + (2^3 + 1) + (2^4 + 1)$

$= 5 + 9 + 17$

$= 31$ (B)

15. $\int\left(4x^3 + \frac{1}{x}\right)dx$

$= x^4 + \ln x + K$ (A)

16. $X \cap Y = \{6, 3, 7\}$ (D)

17. $x^2 + y^2 + 2x - 4y = 0$

$x^2 + 2x + y^2 - 4y = 0$

Divide the coefficient of x and y by two, square and add the results to both sides

$x^2 + 2x + 1 + y^2 - 4y + 4 = 10 + 1 + 4$

$(x+1)^2 + (y-2)^2 = 15$

The centre is (-1, 2) (C)

18. $\log_x x^4 + \log_4 4^x$

$= 4\log_x x + x\log_4 4 = 4 + x$ (C)

19. $3^{x+1} = 27^{1-x}$

$3^{x+1} = 3^{3(1-x)}$

Compare both sides

$x + 1 = 3 - 3x$

$4x = 2$

$x = 2/4 = ½$ (A)

20. $f(x) = 3 + x$ and $g(x) = 3 - x$

$g(f(x)) = 3 - (3+x)$

$= -x$ (C)

21. $y = \sin(2x - 5)$

Let $u = 2x - 5$; $y = \sin u$

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

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

$= \cos u \times 2$

$= 2\cos u$

$= 2\cos(2x-5)$ (C)

22. $x^2 - 5x + 7 = 0$

$\delta + \lambda = \frac{-(-5)}{1} = 5$

$\lambda\delta = \frac{7}{1} = 7$

$\delta^2 + \lambda^2 = ((\delta + \lambda))^2 + 2\delta\lambda$

$= 5^2 - 2(7)$

$= 25 - 14$

$= 11$ (D)