**MATHEMATICS PAPER 1**

**FORM THREE**

**END OF TERM 2 – 2019**

**MARKING SCHEME.**

1. Evaluate: (3mks)

$$^{1}/\_{2}\left(^{3}/\_{5}+^{1}/\_{4}\left(\frac{7}{3}-\frac{3}{7}\right)of 1\frac{1}{2}÷5\right)$$

**=** $^{1}/\_{2}\left(^{3}/\_{5}+^{1}/\_{4}\left(\frac{40}{21}\right)of 1\frac{1}{2}÷5\right)$

**=**$^{1}/\_{2}\left(^{3}/\_{5}+^{1}/\_{4}\left(\frac{40}{21}×\frac{3}{7}\right)÷5\right)$

**=**$^{1}/\_{2}\left(^{3}/\_{5}+^{1}/\_{4}\left(\frac{20}{7}\right)÷5\right)$

**=**$^{1}/\_{2}\left(^{3}/\_{5}+\left(\frac{1}{4}×\frac{20}{7}×\frac{1}{5}\right)\right)$

**=**$^{1}/\_{2}\left(^{3}/\_{5}+\frac{1}{7}\right)$

**=**$^{1}/\_{2}×^{26}/\_{35}$

**=**$^{13}/\_{35}$

1. A triangle has vertices A(2,5), B(1,-2) and C(-5,1). Determine;
2. The equation of line BC. (2mks)

***B (1, -2) C(-5, 1)***

***Gradient =*** $\frac{1- -2}{-5-1}$

***=***$\frac{-3}{6}$ ***=***$\frac{ -1}{2}$

***B (1,-2) (x-y)***

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

***y + 2 =*** $^{-1}/\_{2}x+ ^{1}/\_{2}$

***y =*** $^{-1}/\_{2}x+ ^{-3}/\_{2}$

1. The equation of perpendicular line from A to BC. (2mks)

***A (2,5) G = 2***

***=*** $\frac{y-5}{x-2}=2$

***y – 5 = 2x – 4***

***y = 2x + 1***

1. The shaded region in the figure below shows an area swept out on a flat windscreen by a wiper. Calculate the area of the region. Take π= 3.142. (3mks)

4cm

120o

16cm

 **3.142** $×\frac{120}{360}×20^{2}-3.142×\frac{120}{360}×16^{2}$

 **418.93 – 268.12**

 **= 150.81cm2**

1. A piece of metal has a volume of 20cm3 and a mass of 300g. Calculate the density of the metal in kg/m3. (3mks)

***D =*** $\frac{mass }{volume}$

***=***$\frac{20}{300}×1000$

***= 66.67kg/m3***

1. List the integral values of x which satisfy the inequalities below. (3mks)

$2x+21>15-2x\geq x+6$

**2x + 21 > 15 – 2x 15 – 2x ≥ x + 6**

**4x > -6 9 ≥ 3x**

**X > -1.5 3 ≥ x**

**-1.5 < x ≤ 3**

**Integral values -1, 0, 1, 2, 3**

1. Janet is a saleslady earning a basic salary of Kshs. 20,000 per month and a commission of 8% for the sales in excess of Kshs. 100,000. If in January 2010 she earned a total of Kshs. 48,000 in salaries and commissions. Determine the amount of sales. She made in that month. (3mks)

***48,000 – 20,000 = 28,000/=***

***28000 =*** $\frac{8}{100}×x$

***x = 350,000 + 100,000***

***= 450,000/=***

1. The interior angle of a regular polygon is 108o larger than the exterior angle. Find the number of sides of the polygon. (3mks)

***x + (x + 108) = 180***

***2x + 108 = 180***

***X = 36***

***Interior = 36 + 108 Exterior = 36o***

 ***= 144***

***No. of sides =*** $\frac{360}{36}$

***= 10 sides.***

1. Given that Cos A=$\frac{5}{13}$ and angle A is acute. Find the value of 2 tan A + 3 sin A without calculators. (3mks)

 ***2***$\left(\frac{12}{5}\right)$ ***+ 3***$\left(\frac{12}{13}\right)$

13

5

12

A

$\frac{24}{5}+\frac{36}{13}$

 ***=***$\frac{492}{65}$

1. Without using a calculator evaluate: (2mks)

$\frac{-9+\left(-7\right)×\left(-8\right)-(-5)}{-2+(-6)÷3×6}$

$-9+56+5 $ **-2 + (-2)** $×6$

 **52 -14**

$= \frac{52}{-14}= \frac{-26}{7}= $

**=** $-3\frac{5}{7}$

1. Solve for x in the equation below. (3mks)

$$\frac{6x-4}{3}-\frac{2x-1}{2}=\frac{6-5x}{6}$$

 **t2 t 6**

 **6x – 4 - 2x -1 = 6 – 5x**

 **3 2 6**

 **2( 6x – 4 ) – 3 ( 2x – 1) = 6 – 5x**

 **12x – 8 – 6x + 3 = 6 – 5x**

 **11x = 11**

 **x = 1**

1. Calculate the area of the trapezium show below. (3mks)

15cm

35o

20cm

8cm

***A = ½ x (15+20)*** $×$***8 sin 35***

***= 80.3cm2***

1. Solve the simultaneous equation. (4mks)

x2 + y2 = 26

x + y = 4

***x = 4 – y***

***(4 - )2 + y2 = 26***

***16 – 8y + y2 + y2 = 26***

***2y2 – 8y – 10 = 0***

***y2 – 4y – 5 = 0***

***y = -1 x = 5***

***y = 5 x = -1***

1. Express 72 and 125 as products of their prime factors. (2mks)

 ***72 125***

 ***2 36 5 25***

 ***2 18 5 5***

 ***2 9***

 ***3 3***

$72 = 2 × 2 × 2 × 3 × 3$$125 = 5× 5 × 5 $

1. A service vehicle left town P for town Q at 1000hrs had a puncture after travelling for 4 hrs 20 mins. Fixing a new tyre took 33 minutes. The vehicle then travelled for 1 hr 20mins to reach town Q. At what time did it arrive in 12 hour clock system. (3mks)

***1000hrs***

 ***420***

***1420 hrs***

 ***33***

***1453***

 ***120***

***1613***

***4:13p.m***

1. A tourist visited Kenya with 2500 US dollars and changed the US dollars into Kenya shillings at a local bank in Kenya when the exchange rates at the time were as follows:

*Buying Selling*

1 US dollar shs. 78.45 shs. 78.55

1 Sterling Pound shs. 120.25 shs. 120.45

1. How much did he get in Kenya shillings? (2mks)

**2500 x 78.45**

**= 196125**

1. While in Kenya he used shs. 80,000 and after his stay he converted the remaining amount into Sterling pounds. Calculate to 2 decimal places the Sterling pounds that he got. (2mks)

**196125 116123**

 **80000 120.45**

 **116125**

 **= 964.09 sterling pounds**

1. Use logarithms tables to evaluate: (4mks)

$$\sqrt[3]{\frac{497×9.84}{5.24×7.65}}$$

**No. std term log**

**497 4.97 x 102 2.6964**

**9.84 9.84 x 10o 0.9930**

 **3.6894**

**5.24 5.24 x 100 0.7193**

 **2.9701**

**7.65 7.65 x 100 0.8837**

 **2.0864**

**2.0864 = 0.6955**

 **3**

**Anti log 0.6955**

**= 4.959**

**=4.96**

1. A motorist left Embu for Nairobi a distance of 240km at 8:00 a.m and travelled at average speed of 90km/hr. Another motorist left Nairobi for Embu at 8:30a.m and travelled at 100km/hr. Find;
2. The time they met. (3mks)

 45 240km

 **Embu Nandi**

 **8: 00 am 90km/h**

 **T= 30mins**

 **S= 90km/h**

 **D= 45km**

 **D.A = 195km**

**RS = 190km/hr**

**T = 39/38**

**8.30 am**

 **62**

 **9.32 am**

1. How far they met from Nairobi. (3mks)

**T= 39/38hr**

**S = 100km/hr**

**D= 102.63 km**

1. The time of the day each motorist arrived at his destination. (4mks)

**Embu Nairobi Nairobi Embu**

**D = 240km D = 240km**

**S = 90km/hr S = 100km/hr**

**T= 2hr 40mins T = 2h 24mins**

**8.00 8.30**

**2.40 2.24**

 **10.40am 10.54 am**

1. A farmer has a rectangular farm which measures 100m by 80m. The farmer intends to fence the plot using post at intervals of 4m apart leaving a gate of 4m. Also he will use four strands of barbed wire. Each post cost shs. 125 and wire is sold at rolls of 60m costing 1,500/=. Calculate;
2. The number of post he will use. (2mks)

***P = 180*** $×$ ***2***

***=*** $\frac{360-4}{4}=89+1$

***= 90 posts***

1. The total length of the barbed wire. (2mks)

***(360 – 4)*** $×4$

***= 1424 m***

1. The total cost of fencing the farm if the cost of the gate is 8,000/= and labour is shs. 1,500. (5mks)

**(90 x 125) + (1424 x 1500) + 8000**

 **60**

 **11250 + 35600 + 8000 + 1500**

 **= sh. 56350**

1. The farmer wishes to subdivide further the farm into square plot. Find the maximum area of the plot.

**10 100 80**

 **2 10 8**

 **5 4**

 **G.C.D =20**

 **AREA = 20 X 20**

 **= 400m2**

1. The parents of a certain mixed school decided to buy a school van worth Kshs. 900,000. Each student was to contribute the same amount of money. 50 students were transferred from the school; as a result each of the remaining students had to pay kshs. 600 more.
2. Find the original number of the students in the school. (5mks)

**900000 - 900000 = 600**

**( x – 50) x**

**900000x – 9000000x + 45000000 = 600**

 **X (x -50)**

 **45000000 = 600x2 – 30000 x**

 **600x2 – 30000x – 45000000 = 0**

 **X2 – 50x – 75000 = 0**

 **50± √2500- 4 x 75000**

 **2**

 **50 + 550 50 - 550**

 **2 2**

 **X = 300 students**

1. Find the percentage change in contributions per student. (3mks)

**Original = 900000**

 **300**

 **= 3000**

 **New = 900000**

 **250**

 **= 3600**

 **= 600 x 100**

 **3000**

 **= 20%**

1. If the ratio of boys to girls in the school was 11:7, find the amount of money contributed by boys alone. (2mks)

**B G**

**11 7**

 **= 11 x 900000**

 **18**

 **= sh. 55,000**

1. The figure below shows two circles of radii 8cm and 6cm with centres O1 and O2 respectively. The circles intersect at points A and B. The lines O1O2 and AB are perpendicular to each other. If the common chord is 9cm;

(Take π=3.142.

**6cm**

**8cm**

**B**

**A**

**O2**

**O1**

Calculate to 4s.f

1. Angle AO1B (2mks)

$Sin^{-1} θ=\frac{4.5}{8}$

 $θ=34.23$

 ***AO1B = 34.23*** $×$***2***

 ***= 68.46o***

1. Angle AO2B

$ Sin^{-1}θ=\frac{4.5}{6}$

 $θ=48.59$

 ***AO2B = 48.59*** $× $***2***

 ***= 97.18o***

1. Area of the shaded region. (6mks)

$\frac{68.46}{360}×3.142×8^{2}-^{1}/\_{2}×8×8 Sin 68.46$

$38.24-29.76$

***= 8.48cm2***

$\frac{97.18}{360}×3.142×6^{2}-^{1}/\_{2}×6×6 Sin 97.18$

$30.53-17.86$

***= 12.67***

***Shaded Area = 8.48 + 12.67***

 ***= 21.15cm2***

1. A village water tank is in the form of a frustum of a cone of height 3.2m. The top and bottom radii of 18m and 24m respectively as shown below.

3.2m

18m

24m

1. Calculate;
2. The surface area of the tank excluding the bottom. (4mks)

**18**

**24**

**9.6 *x***

**3.2**

 $\frac{24}{18}=\frac{3.2+x}{x}$

$24x=57.6+18x$

$6x=57.6$

$x=9.6m$

 ***S.A Big Cone =*** $\frac{22}{7}×24×27.2$

 ***= 2051.66cm2***

 ***S.A Big Cone =*** $\frac{22}{7}×18×20.4$

 ***= 1154.06***

***S.A Big Cone =2051.66 – 1154.06 +*** $\left(\frac{22}{7}×24×27.2\right)^{2}$

 ***= 897.6 + 1018.29***

 ***= 1915.89m2***

1. The capacity of the tank in litres. (3mks)

$V=^{1}/\_{3}×\frac{22}{7}×24×24×12.8 $

***Big cone***

***= 7723.89m3***

$V=^{1}/\_{3}×\frac{22}{7}×18×18×9.6$

***Small cone***

***= 3258.51***

$V=7723.89-3258.51$

***4465.3757***$ ×$***1000***

***4465375.7 litres***

1. 15 families each having 15 members use the water tank and each person uses 65 litres daily. How long will it take for the full tank to be emptied? (3mks)

$\frac{4465375.7}{15×15×65}$

**= 305.3 days.**

1. Measurements of a maize field using baseline XY were recorded as shown below in metres

 Y

 240

To R 160 190

 180 75 To Q

 150 50 To P

To S 100 120

 100 100 To N

To T 30 50

 20 20 To M

 X

1. Show the map of the maize field by scale drawing. Take 1cm rep 20m. (4mks)



1. **A = ½ (a + b)h**

 **= ½ (20 +100)80**

 **= 4800m2**

1. **A = ½ (a + b ) h**

 **= ½ (20 + 100)60**

 **= 4500m2**

1. **A = ½ (a +b)h**

**= ½ (50 +75 ) 40**

**= 2500m2**

1. **A= ½ bh**

**= ½ x 75 x 60**

**= 2250m2**

1. **A = ½ bh**

 **= ½ x 160 x 50**

 **= 4000m2**

1. **A = ½ (a + b)h**

 **= ½ ( 100 + 160) 70**

 **= 4550m2**

1. **A = ½ bh**

 **= ½ x 30 x 50**

 **= 750**

1. **A = ½ bh**

 **= ½ x 20 x 20**

**= 200m2**

1. Find the area of the field in hectares. (4mks)

**= 4800 + 4500 + 2500 + 2250 + 4000 + 5600 + 4550 + 750 + 200**

 **= 29150m2**

 **1 ha = 10, 000m2**

 **= 29,150m2**

 **= 29150 x 1**

 **10000**

 **= 2.9150ha**

1. If the cost of one hectare is Kshs. 65,000, find the total cost of the maize field. (2mks)

**1 ha = shs 5000**

**2.9150 ha =**

**= 2.9150 x 65000**

 **1**

 **= ksh. 189475**

1. Using a ruler and pair of compass only construct the following.
2. Triangle XYZ where XY is 6cm and angle XYZ is 135o and YZ=7cm. Measure XZ. (3mks)
3. Drop a perpendicular from Z to meet line XY at K. measure YK. (3mks)
4. Bisect line XY and let the bisector meet line XZ at Q. (2mks)
5. Join Q to Y and measure angle XQY. (2mks)



1. Complete the table for the function.
2. y=1 – 2x – 3x2 in the range -3 ≤ x ≤ 3 (2mks)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
| -3x22 | -27 | **-12** | -3 | 0 | **-3** | -12 | **-27** |
| -2x | **6** | **4** | **2** | 0 | **-2** | **-4** | -6 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| y | -20 | **-7** | **0** | 1 | **-4** | -15 | **-32** |

1. Use the table above to draw a graph of y=1 – 2x – 3x2 on the graph provided. (4mks)



1. Use the graph in (b) above to solve;
2. y=1 – 2x – 3x2 = 0 (2mks)

**1 – 2x – 3x2=0**

**-1, 0.2**

1. 2 – 5x – 3x2 = 0 (2mks)
2. **2x – 3x2=0**
3. **5x – 3x2 = 0**

**-1 + 3x = 0**

**3x = 1**

**X = 1/3**