**TOP EVALUATION EXAMINATION - 2016**

**Mathematics Paper 2**

**FORM 3**

**JULY/AUGUST**

**MARKING SCHEME**

**SECTION I: (50 MARKS)**

**Answer all the questions in this section in the spaces provided.**

1. Simplify:  . (4 marks)

 B1

 B1

 B1

 A1

2. Simplify:  (3 marks)

M1

 M1

A1

1. The length and width of a rectangular plot as 80m and 55m respectively. Find his percentage error in the area of the rectangular plot. `(3marks)

Max. 80.5 x 55.5 = 4467.75m2

Min. 79.5 x 54.5 = 4332.72m2

4467.75 – 4332.75

2

= 135 = 67.5

2

Actual => 80 x 55 = 4400m2

67.5 x 1~~00~~ = 1.5341%

44~~00~~

1. Make x the subject of the formula: (3mks)

A = 1 – x

1. + x

|  |
| --- |
| (A)2 = 1 – x  1 + x  (1 + x) (A)2 = 1 – x (1 + x)  1 + x  A2 + A2x = 1 – x  A2x + x = 1 – A2  x (A2 + 1) = 1 – A2x  x(A2 + 1) = 1 – A2  x = 1 – A2  A2 + 1 |

1. Without using mathematical tables or calculator; evaluate: (3 marks)

Cos 135o – Sin 30o

Sin 135o + Sin 30o

Cos 135o = - cos (180o – 135o)

= - cos45o = - √2

2

Sin 30o = ½

Sin 135o = sin (180o- 135o)

= sin 450

= √2

2

Cos 135o – sin 30o

Sin 135o + sin 30o

= - √2 - 1

2 2

√2 + 1

2 2

= -1

1. Calculate the percentage error in the volume of a cone whose radius is 9.0cm and slant length 15.0cm. (3mks)



1. It would take 18 men 12 days to dig a piece of land. If they work for 8 hours a day, how long

will it take 24 men if they work 12 hours to cultivate three quarters of the same land. (3mks)

Men hrs Land Days

18 8 1 12

24 12  - M1

Days required =

 M1

=  A1

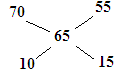
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1. A cold water tap can fill a bath in 10 minutes while a hot water tap can fill it in 8 minutes. The drainage pipe can empty it in 5 minutes. The cold water and hot water taps are opened for 4 minutes. After four minutes all the three taps are opened. Find how long it takes to fill the bath. (3 Marks)

|  |  |
| --- | --- |
| x 4 = x 4 =  + - = =  Time taken =  = = 4 Min | M1  M1  A1 |

9. A coffee dealer mixes two brands of coffee, x and y to obtain 40kg of the mixture worth Ksh.2,600. If brand x is valued at Ksh. 70 per kg and brand y is valued at Ksh. 55 per kg. Calculate the ratio in its simplest form in which brands x and y are mixed. (4mks)





2:3

10. A bucket in the shape of a frustrum as shown in the diagram. It has diameters of 36cm and 24cm. Calculate the volume of the bucket. (4mks)

A

B

C

B

24cm

28cm

36cm

h² = 28² - 6²

h = 27.349589 M1

Linear ratio = 



3 - 2 = 54.70

= 54.70

H = 27.35 + 54.70 = 82.05cm M1

Volume ratio = 3³: 2³ = 27:8

Volume of bucket =  M1

= 15598.229cm³

11. The difference between the exterior and interior angle of a regular polygon is 100. Determine the number of sides of the polygon. (3mks)

y - = 100

  M1

Interior = y = 140º

Exterior = 180 – 140 = 40º

 M1

= 9 side A1

12. Form the quadratic equation whose roots are x = - and x = 1 (2 Marks)

|  |  |
| --- | --- |
| Soln: = and x = 1  = -5 and x = 1  (3x + 5)(x – 1) = 0  3x (x – 1) + 5(x -1) = 0  3x2 – 3x + 5x – 5 = 0  3x2 + 2x – 5 = 0 | M1  A1 |

13. The two parallelograms ABCD and PQRS are known to be similar. If angle BAD is 110 0 , length BC is 2.5 cm, QR is 1 cm, and SR is 2 cm;

(a) Find the base DC of the large parallelogram. (2 marks)

DC= 5 cm

(b) Find the similarity ratio of: (2 marks)

i PQRS to ABCD

1:2.5 =2:5

ii ABCD to PQRS.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

2.5:1 =5:2

14. A routine assessment test was done by seven students and the scores were as follows:

20, 18, 9, 12, 23, 16, 14. Calculate the standard deviation of the data. (3 marks )

x = 20 + 18 + 9 + 12 + 23 + 16 + 14 = 16 B1

7

x 20 18 9 12 23 16 14

d 4 -2 -7 -4 7 0 -2 B1

d2 16 4 49 16 49 0 4

Variance = d2

N

= 138

7

= 19.71

S = 19.71

= 4.44 B 1

03

15. Solve the simultaneous equations (3mrks)

Log ( x - 1) + 2 log y = 2 log 3

Log x + log y = log 6

|  |  |
| --- | --- |
| y2(x - 1) = 9  xy = 6  y2 -6y + 9 =  (y - 3)2 = 0  y = 3 x = 2 | B1  M1  A1 |

1. Two containers have base area of 750cm2 and 120cm2 respectively. Calculate the volume of the larger container in litres given that the volume of the smaller container is 400cm3. (3 Marks)

|  |  |
| --- | --- |
| A.S.F = =  L.S.F = =  V.S.F = =  V.S.F = =  V = x 400cm3  Volume =  = 6.25 litres | M1  M1  A1 |

**SECTION II (50 MARKS)**

**Answer any five questions in this section**

1. Mr. Korir earned an annual basic salary of Kenya pounds 12360 when the rates of taxation were as in the table below.

Monthly income (pounds) Rates (%)

1 – 484 10

485 – 940 15

941 – 1396 20

1397 – 1852 25

1853 and above 30

Apart from the basic salary, he is entitled to a house allowance of Kshs. 12,000 and medical allowance of Kshs. 6,000 per month.

1. Calculate Chesingei’s monthly taxable income in Kenya pounds. (3marks)

Taxable income

Basic slary + allowances

Basic = 12,360

Allowances:

HA = 12000 = 600

20

MA = 6000 = 300

20

Taxable income = 12360 + 600 + 300 = 13260

1. Calculate Chesinge’s monthly net income if he is given a tax relief of Ksh. 980 per month. Give your answer in Kenyan shillings. (5marks)

1st slab

= 10 x 4.84 = 48.4

100

Slab 2 = 15 x 4.56 = 68.4

100

Slab 3 = 20 x 4.56 = 91.2

100

Slab 4 = 25 x 4.56 = 144

100

Slab 5 = 30 x 11408 = 3422.4

100

Total tax

= 48.4 + 68.4 + 91.2 + 144 + 3422.4

= 3774.4

1. How much more tax should he have paid per month in Kenya pounds if his monthly salary is increased by Ksh. 2500. (2mks)

Subtract relief

* 1. x 20 = 75488

1. A group of students in form 3 at Kyamuoso secondary school decided to raise funds amount to

3600 to finance their end of year party. Each student was to contribute equal amount. Before the

contributions were made, five students were sent away from the school. This meant that the

remaining contributors had to pay more to meet their budget.

(a) 3600 - 3600 M1

x - 5 x

3600x – 3600 ( x – 5)

x ( x – 5)

3600x – 3600x + 18000 M1

x2 – 5x

18000 shown A1

x2 – 5x

(b) 18000 = 24 M1

x2 – 5x

18000 – 24x2 – 120x

x2 - 5x – 750 = 0 M1

x = 5 25 + 4 x 750

2

= 5 3025 M1

2

Original number = 60/2 = 30 students A1

(c ) Original contribution = 120 ( 3600/30 )

New 3600 = 144 B1

25

144 – 120 100 = 20% M1A1

120

19. Water is flowing through a cylindrical pipe at the speed of 1.2m/s. If the pipe has an internal radius of 1.4cm, Calculate

(a) The volume of water delivered by the pipe per second in cm3 (Take = 22/7)

(2mrks)

(a) Volume of water delivered per second

= 22 x 1.4 x 1.4 x 1.2 x 100=739.2

7

(b) The depth to which the pipe fills a rectangular tank of base dimensions 1.5m x 2m in one hour to thenearest 0.1cm. (3mrks)

150 x 200 x x = 739.2 x 60 x 60

x = 739.2 x 3600

150 x 200

= 88.7cm

(c) The time taken, to the nearest second for the pipe to fill a 50 litre bath tub (initially empty) which has a hole at the base that drains the tub at the rate of 3 litres per minute. (5mrks)

Volume out per sec = 3000

60

= 50cm3

Net volume = 739.2 – 50

= 689.2

1. In the figure below O is the centre of the circle. DEF is a straight line. FCX is a tangent at C.. FCX is the tangent to the circle and 

B

A

D O E G F

C

X

1. Find the sizes of the following angles giving reasons.
   1.  (3 marks)
   2.  (2 marks)
   3.  (2 marks)
2. If GF is 10 cm and the radius of the circle is 7 cm.

Calculate GF (3 marks)

1. OAB is a triangle in which  M is a point on OA such that OM: MA = 2: 3

and N is another point on AB such that AN: NB = 1: 2. Lines ON and MB intercept at X.

1. Express the following vectors in terms of 

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(i) AB (1mk)

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(ii) ON (1mk)

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(iii) BM (1mk)

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1. If OX = KON and BX = hBM express OX in two different ways. Hence or otherwise

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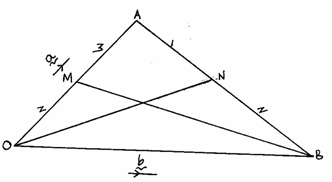
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find the values of h and K. (6mks)

1. Determine the ratio OX: XN. (1mk)
2. (i)  B1

(ii)  B1

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(iii) B1

(b)

 B1

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 M1

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 B1

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 B1

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10K = 6h K = 3 – 3h

10K – 6h = 0 K + 3h = 3  
 

 B1

(c) 

= 1: 1 B1

1. The product of the first three terms of a geometric progression is 64.If the first term is a and th

the common ratio is **r**.

(a) Express **r** in terms of **a.** (3mrks)

(b) Given that the sum of the three terms is 14; Find the values of a and r and hence write down two possible sequences each upto the 4th term. (5mrks)

(c) Find the product of the 50th terms of the two Sequences. (2mrks)

|  |  |
| --- | --- |
| (a) a x ar x ar2 = 64  a3r3 = 64  ar = 364  r = 4  9  (b) a + a 4 + a 4 2 = 14  9 9  a + 4 + 16 = 14  9  a2 – 10a + 16 = 0  (a - 8)(a - 2)  a = 8 , r = ½  a = 2 r = 2  1st sequence 8, 4, 2, 1  2nd sequence 2, 4, 8, 16  (c) T50= 2 x 249 and 8 x (½)49  8 x 2-49 x 2 x 249  = 16 | M1  M1  A1  B1  B1  B1  B1  M1  A1 |

1. The diagram below shows two circles centre A and B which intersect at point P and Q. Angle

PBQ = 400 and angle PAQ = 700, and PA = AQ = 8cm.

A

B

Q

P

)

700

400

(

Use the diagram to calculate to two d.p

1. The length PQ (2 marks)
2. The length PB (2 marks)
3. Area of minor segment of circle centre A (2 marks)
4. Area of minor segment of circle centre B (2 marks)
5. The area of shaded region. (2 marks)

|  |  |
| --- | --- |
| (a) Length PQ  Sin 35 = x = 8 Sin 35  PQ = 2(8 Sin 35) = 9.18cm  (b) Sin 20 =  PB = = 13.42  (c) Area of mini segment circle centre  x x 8 x 8 - x 82 Sin 70  39.11 – 30.07  9.04cm2  (d) Area of segment centre B  ( x x 13.42 x 13.42 ) –( x 13.42 Sin 40)  62.89 – 57.88  = 5.01cm2  (e) Area of shaded region  (30.07 + 57.88) - (5.01 + 9.04)  = 73.90 | M1 Expression  A1  A1  M1 Area equation  A1  M1 Area equation  A1 |
|
|

24. The probabilities of Maina, Omondi and Wambua scoring 80 percent in Mathematics are  and  respectfully. Find the probability that:-

(a) all the three candidates will pass (2mks)

(b) all the three candidates will not pass. (2mks)

(c) only one of them will pass (2mks)

(d) only two of them will pass. (2mks)

(e) at most two of them will pass. (2mks)

