**MATHEMATICS PAPER 2**

**MARKING SCHEME**

|  |  |  |  |
| --- | --- | --- | --- |
|  | WORKINGS | MARKS | REMARKS |
| 1. | Maximum area ⇒ 8.65 x 5.35 = 46.2775  Actual area ⇒ 8.6 x 5.3 = 45.58  Minimum area ⇒ 8.55 x 5.25 = 44.8875  Absolute error = 46.2275 – 44.8875  2  % error = 0.695 x 100%  45.58  = 1.525% | M1  M1  A1  A1  A1 | Or equivalent |
|  |  | 03 |  |
| 2. | √ 3/2\_\_\_\_\_  1 +√ 3  √ 3\_\_\_ = √ 3(2-2√ 3)  2 + 2√ 3 (2 + 2 √3 ) (2-2√3)  -2/8√3 + 3/4  = 3/4 – 1/4 √3 | M1  M1  B1 | conjugate  for -2/8 √ 3 + 3/4 in  simplified form.  In the form a + b√ c |
|  |  | 03 |  |
| 3. | < OCT = 38o  < TOC = 102o  < CTB = 51o | B1  B1  B1 | Alternate |
|  |  | 03 |  |
| 4. | 70x + 55y = 65(x +y)  5x = 10y  x : y = 2:1 | M1  A1 | 1. 55   10 21:1 5 |
|  |  | 02 |  |
| 5. | (x – 3/2)2 + (y +5/2)2 = 16/4  Center = (9,t) = (3/2 – 5/2) = (1.5, -2.5)  r = √ 16/4 = 2  Or  x2 + y2 – 3x + 5y + 9/2 = 0  x2 + y2 + 29x + 2fy + c = 0  -2g = -3 -2f = 5  G = 3/2 f = -5/2  Radius r =√ (f2 + g2 - c) = 25/4 + 9/4 – 9/2  r = √ 16/4 = 2 | M1  A1  B1 | Completing the square/  Any other method  Centre(1.5 -2.5) or radius 2.  For radius |
|  |  | 03 |  |
| 6. | (a) (1 + 1/4x)4  (14 + 4x 1/4x) + 6 (1/4x)2 + 4(1/4x)3 + (1/4x)4  1 + 1/x + 3/8x2 + 1/6x3 + 1/6x4  b) 1 + 1/-10 + 3/8(-10)2+ 1/16(-10)3+ 1/64(-10)4  = 0.903689063  = 0.9037 | M1  A 1  M1  A1 |  |
|  |  | 04 |  |
| 7. | 60000 x 8xt = 14400  100  T = 3 years.  P x 5 x 3 = 12000  100  P = 80,000 | B1  M1  A1 |  |
|  |  | 03 |  |
| 8. | P(q + 3r) = 2q – r  Pq + 3pr = 2q – r  Pq -2q = -r – 3pr  Q(p-2)= -r -3p  Q= -r -3p or r + 2p  P – 2 2 – p | M1  M1  A1 |  |
|  |  | 03 |  |
| 9. | Let p be point (x, y, z)  x 3 4  1/3 y + 2/3 2 = 5  Z -4 -2  P(6,11,2)  10p1 = √ (6)2 + (11)2 + (2)2  = √ 161 = 12.69 units | B1  M1  A1 |  |
|  |  | 03 |  |
| 10. | Log72 + log7 (3x-4) = log7 98  49 (x - 4) = 98  3x – 4 = 2  3x = 6  X = 2 | M1  M1  A1 | Expressing 2 in log form to base 7  Dropping logs. |
|  |  | 03 |  |
| 11. | 31 = 65 + 17d ⇒ 17d = -34  d = -2  T8 = 65 + 7(-2)  = 65 – 14  = 51 | B1  M1  A1 |  |
|  |  | 03 |  |
| 12. | Let L and K be constants.  P=LQ + K √Q  30 = 9L + √9K  14 = 162 + √16 K  2K + 62 = 20  2K + 8L = 7  -2L = 13  L = -13/2  K + 3(-13/2) = 10  K = 10/1 + 392 = 59/2  P = -13/2Q = 59/2 √Q  P = -13/2 x 36 + 59/2 x √36  P = -234 + 177 = -57 | M1  M1  A1  B1 | For one equation  Attempt to eliminate one unknown.  For both constants. |
|  |  | 04 |  |
| 13. |  |  |  |
|  | People Huts days  7 5 30  9 27  7 x 30/27 x 9/5  = 14 people | M1  A1 |  |
|  |  | 02 |  |
| 14. | (a) d = 180/360 x 2 x 6370 x 22/7 Cos 40o  = 1/2 x 22/7 x 2 4879.7  = 15336.2 km  (b) 100/360 x 2 6370 x 22/7  = 11122.2 | M1  A1  M1  A1 | R=6370 Cos 40o  =4879.7  **1000**  **400**  **400** |
|  |  | 04 |  |
| 15. | Determinant = -3-2 =-5  -1 -1 1/5 1/5  -1/5  -2 3 = 2/5  -3/5 Inverse    1/5 1/5 3 1 x = 1/5 1/5 4  2/5 -3/5 2 -1 y 2/5 -3/5 1  1 0 x 1  01 y = 1  Point of intersection = (1,1) | B1  M1  A1 |  |
|  |  | 03 |  |
| 16. | (1-x)(1 +x) = 1 – x  1 + x  3  ∫ (1-x)dx  -2 3  X – x2/2 + c -2    3 - 32 /2 + c – 2 – (-2)2 + c  2  = 3 – 4.5 + c - -2 + 2 + c  -1.5 + c – c  = -1.5 | B1  M1  M1  A1 | For the integral  Substitution. |
| 17. | |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Marks | Mp(x) | d(x-A) | Fd | D2 | Fd2 |  | | 10-19 | 2 | 14.5 | -40 | -80 | 1600 | 3200 | | 20-29  30 –39  40 –49  50-59  60-69  70-79  80-89  90-99 | 6  10  16  24  20  12  8  2 | 24.5  34.5  44.5  54.5  64.5  74.5  84.5  94.5 | -30  -20  -10  0  10  20  30  40 | -180  -200  -160  0  200  240  240  80 | 900  400  100  0  100  400  900  1600 | 5400  4000  1600  0  200  4800  7200  3200 | |  |  |  |  | 140 |  | 31400 |   Mean = A + Σfd  Σf  = 54.5 + 140/100 = 55.9  (b) Variance= 31400/100 – (140/100)2  = 312.04  (c) standard varaitaion = √variance  √ 312.04 = 17.06 | B1  B1  B1  B1  M1  M1  A1  M1A1 | Correct values-  Column(d)  Correct – values –  Column (fd)  Correct values-  column(d2)  Correct values column(fd) |
| 18. | (a) P(WWR or WBR or BBR or BWR)  (4/12 X 3/11 X 5/10) + 4/12 X 3/11 X 5/10  + (3/12 x 2/11 x 5/10 + (3/12 x 4/11 x 5/10))  = 2/11  (b) (i) 5/12 x 4/11 x 3/10 = 1/22  (ii) P(RWB or RBW or WBR or WRB or BWR or BRW)  (5/12 x 4/11 x 3/10) + (5/12 x 3/11 X 4/10)  + (4/12 x 3/11 x 5/10)  = 6/52 = 3/11  (c) P(BBB or BBW or BWB or BWW or WWW or WWB or WBW OR WBB)  (3/12 x 2/11 x 1/10)+(3/12x2/11x4/10)+(3/12x4/11x2/10)+(3/12x4/11x3/10 )+  (4/12x3/11x2/10)+(4/12x3/11x3/10) +(4/12x3/11x2/10)  =7/44  (d) P(BBB or WWW or RRR)  (3/12x2/11x1/10)+(4/12x3/11x2/10)+(5/12 x 4/11x3/10)  = 1/220 + 1/55 + 1/55 = 9/220 | M1  A1  M1A1  M1  A1  M1  A1  A1 |  |
|  |  |  |  |
| 19. | (a) 6/10 =l/8 +L  12 = L  Base area = 102 = 100  Area of 4Δs = 4√25(25-20)(25-20)(25-20)  = 4√25 x 5 x 5x 15  = 4√ 9375  T.S.A of the pyramid = 100 + 387.28  = 487.28cm2  Area of the slanting edges of thr small pyramid  = 4√15(3)(3)(9)  = 139.44  Surface of the solid frustrum  = 487 .28 +36-139.44   * 383.84   (b) Volume  18.71 19.36  5  Volume = 1/3 x 100 x 18.71  = 62.61  L.S.F = 3/5 ⇒ V.S.F 27/125  Fraction representing Frustrum  = 98/125  ∴Volume of the frustrum = 98/125 x 623.61  = 488.91  (c)  18. 71 19.36  5  tanα=18.71  5  α = 75.03o | B1  B1  M1  A1  M1  A1  B1  M1  A1 | Identification of angle |
|  |  | 10 |  |
| 20. | 3C411CE2 | B1  B1  B1  B1  B1  B1  B1  B1  B1  B1 | AC = 5.8 ±0.1cm  √ 60o constructed  √6.5cm and 5cm drawn  √ Δ completed  √ 120o constructed  √ Besection of <s  at A and B  Locus of P  Locus of R |
|  |  | 10 |  |
| 21. | (a) Tax on 1st ksh 9680 = 9680 x 10/100 = kshs. 968  Tax on 2nd kshs. 9120 = 9120 x 15/100= kshs 1368  Tax on rem kshs. 5400 = 5400 x 20/100= ksh 1080  Total tax = 968 + 1368 + 1080 = kshs. 3416  (b) Tax paid= 3416-(1056 + 2400 x 15/100)  = kshs. 2000  (c) Increase in tax paid = 2000 x 36.3= kshs. 726  Increase in earnings= kshs. 726 x 100/20= ksh. 3630  % increase = 3630 x 100  24200 | M1  M1  M1  A1  M1  A1  M1  M1    M1  A1 |  |
| . |  |  |  |
|  |  | 10 |  |
| 22 | |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | X | -150o | -120 | -30o | 30 | 90 | 120o | 180o | | Sin x | -0.5 | -0.87 | -0.5 | 0.5 | 1.0 | 0.87 | 0.0 | | 2 sin (x-30) | 0 | -1.0 | 0 | 0 | 1.73 | 2.0 | 1.0 |   (b)  (c) (i) y = 2sin(x- 30o)  Amplitude = 3units  Period = 360o  (ii) SinX = 2Sin (x – 30o)  X = -126o cr 51.50 ±1o  (iii) +30  0 Translation | B2  P1 √  C1√  P1√  C1√  B1  B1  B2 | All √  B1 atleast 11 values√  Plotting of Y = Sin x  CaO  Plotting of Y= 2 Sin (x-30)  Cao  For both  For both |
|  |  | 10 |  |
| 23 | GRAPH 3(a) (i) 3x + 2 1/2y ≤ 600  (ii) x ≤ 100  (iii) Y ≥ 80, x ≥ 0  (b) line 3x + 2 1/2y ≤ 600 | B1  B1  B1  B1√  B1√  B1√  B 2√  B2 √ |  |
|  |  | 10 |  |
| 23 | |  |  |  | | --- | --- | --- | | 21 |  | M1  M1  A1  M1  A1  B1  B1  B1  M1  A1 | |  |  |
| 24 | |  |  |  |  | | --- | --- | --- | --- | | 17 | (a) (i) =  +  =  +  =  (ii)  =  +  = - +  =  (b)(i)  = k  =   1. = t  +   =  + t  (c )                (d) | B1  B1  B1  B1  B1  M1  A1  B1  M1  A1 | Or using ratio theorem.  graph  For both  For attempt to solve for t or s | |  |  |