

**CORE MATHEMATICS (C) UNIT 2 TEST PAPER 8**

1. The area of the cross-section of a tunnel of width 3.5 m was estimated using the following measurements, all taken from one side wall:

|                        |     |     |     |     |     |     |     |     |
|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Distance from side (m) | 0   | 0.5 | 1   | 1.5 | 2   | 2.5 | 3   | 3.5 |
| Height (m)             | 1.1 | 1.6 | 1.7 | 1.9 | 1.9 | 1.7 | 1.6 | 1.1 |

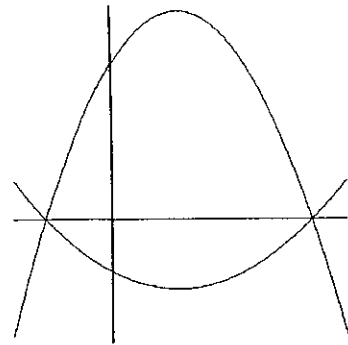
Use the trapezium rule with the given data to estimate the area of the cross-section.. [5]

2. In the triangle  $ABC$ ,  $AB = 3$  cm,  $BC = 5$  cm and  $CA = 6$  cm. Calculate
- (i) the smallest angle of the triangle, in radians to 2 decimal places, [3]
- (ii) the area of the triangle, in  $\text{cm}^2$  to 1 decimal place. [2]
3. (i) Expand  $(3 - x)^5$  by the binomial theorem, simplifying each term. [5]
- (ii) Hence find the expansion of  $(3 - x - x^2)^5$  in ascending powers of  $x$  as far as the term in  $x^2$ . [3]
4. Given that  $(x - 3)$  is a factor of  $f(x) \equiv 2x^3 - 3x^2 + kx + 6$ ,
- (i) find the value of the integer  $k$ . [3]
- (ii) Factorise  $f(x)$  completely. [3]
- (iii) Find the remainder when  $f(x)$  is divided by  $(2x - 3)$ . [2]
5. Solve, for  $0 \leq x \leq 360$ , the equations
- (i)  $\tan(2x - 45)^\circ = 1$ , [4]
- (ii)  $2 \sin^2 x^\circ + \cos x^\circ = 1$ . [5]
6. The gradient  $G$  of a curve at the point  $(x, y)$  is given by the formula
- $$G = 6x^2 + 2x - 3.$$
- The curve passes through the origin.
- (i) Find the coordinates of the other two points where the curve crosses the  $x$ -axis. [7]
- (ii) Sketch the curve. [3]

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7. The diagram shows the curves with equations  
 $y = x^2 - 4x - 12$  and  $y = k(x^2 - 4x - 12)$ , where  
 $k$  is a negative integer.

The distance between the maximum point on one curve  
and the minimum point on the other curve is 64 units.



- (i) Find the value of  $k$ . [5]
- (ii) Find the area of the finite region contained between the two curves. [7]
8. (i) The first three terms of an arithmetic sequence are  $-4, x, 5$ . Find
- (a) the value of  $x$ , [2]
- (b) the 11<sup>th</sup> term of the sequence, [2]
- (c) the smallest value of  $n$  for which the  $n$ th term of the sequence is more than 100. [5]
- (ii) The sum of the first two terms of a geometric series is 36 and the sum to infinity is 38.4.  
Find the two possible values of the common ratio and of the first term of the series. [6]

**CORE MATHS 2 (C) TEST PAPER 8 : ANSWERS AND MARK SCHEME**

1. Area  $\approx \frac{1}{2} (\frac{1}{2})(2.2 + 2(10.4)) = 5.75 \text{ m}^2$  M1 A1 M1 A1 A1  
5
2. (i)  $\cos C = (25 + 36 - 9)/60 = 13/15$  Angle  $ACB = 0.52$  radians M1 A1 A1  
(ii) Area =  $15 \sin 0.52 = 7.5 \text{ cm}^2$  M1 A1 5
3. (i)  $(3 - x)^5 = 3^5 + 5(3^4)(-x) + 10(3^3)(-x)^2 + 10(3^2)(-x)^3 + 5(3)(-x)^4 - x^5$  M1 A1 A1  
 $= 243 - 405x + 270x^2 - 90x^3 + 15x^4 - x^5$  M1 A1  
(ii)  $(3 - x - x^2)^5 = 243 - 405(x + x^2) + 270(x + x^2)^2 - \dots = 243 - 405x - 135x^2$  M1 A1 A1 8
4. (i)  $54 - 27 + 3k + 6 = 0$   $k = -11$  M1 A1 A1  
(ii)  $f(x) = (x - 3)(2x^2 + 3x - 2) = (x - 3)(2x - 1)(x + 2)$  M1 A1 A1  
(iii) Remainder =  $f(3/2) = 27/4 - 27/4 - 33/2 + 6 = -21/2$  M1 A1 8
5. (i)  $2x - 45 = 45, 225, 405, 585$   $x = 45, 135, 225, 315$  M1 A1 M1 A1  
(ii)  $2 - 2 \cos^2 x + \cos x = 1$   $2 \cos^2 x - \cos x - 1 = 0$  M1 A1  
 $(2 \cos x + 1)(\cos x - 1) = 0$   $x = 0, 120, 240, 360$  M1 A1 A1 9
6. (i) Integrating,  $y = 2x^3 + x^2 - 3x + c$   $y(0) = 0$  so  $c = 0$  M1 A1 A1  
When  $y = 0$ ,  $x(2x + 3)(x - 1) = 0$  Points are  $(-3/2, 0), (1, 0)$  M1 M1 A1 A1  
(ii) Curve sketched, crossing axes at  $(-3/2, 0), (0, 0), (1, 0)$  B3 10
7. (i) Turning points where  $2x - 4 = 0$   $x = 2$   $y = -16, y = -16k$  M1 A1 A1  
Difference =  $-16(k - 1) = 64$ , so  $k = -3$  M1 A1  
(ii) Curves cut  $x$ -axis where  $(x + 2)(x - 6) = 0$   $x = -2, x = 6$  M1 A1  
 $-4 \int_{-2}^6 (x^2 - 4x - 12) dx = -4 \left[ \frac{x^3}{3} - 2x^2 - 12x \right]_{-2}^6 = -4 \left( -72 - \frac{40}{3} \right) = \frac{1024}{3}$  M1 A1 A1 M1 A1  
12
8. (i) (a)  $x = (5 - 4)/2 = \frac{1}{2}$  (b)  $T_{11} = -4 + 10(4.5) = 41$  M1 A1 M1 A1  
(c)  $T_n = -4 + 9/2 (n - 1) > 100$  when  $n - 1 > 208/9$   $n = 25$  M1 A1 M1 A1 A1  
(ii)  $a + ar = 36$ ,  $a/(1 - r) = 38.4$  B1 B1  
 $38.4(1 - r)(1 + r) = 36$   $1 - r^2 = 15/16$   $r = \pm 1/4$  M1 A1  
 $a = 36/(5/4) = 28.8$  or  $a = 36/(3/4) = 48$  M1 A1 15