

**Question 1**

Given:  $f(x) = \sqrt{\frac{2x}{3-x}}$

For which value(s) of  $x$  is  $f(x)$ :

- 1.1 equal to zero? (2)
- 1.2 undefined? (2)
- 1.3 unreal/ imaginary? (3) [7]

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**Question 2**

Simplify the following:

2.1  $3\sqrt{8} + \sqrt{32} - \sqrt{18}$  (4)

2.2  $\frac{2}{\sqrt{3}} - \frac{\sqrt{3}}{3}$  (4)

2.3  $\frac{4^x 2^{x+2} - 8^x}{2^x 5^0 2^{3x}}$  (5) [13]

**Question 3**

Solve for  $x$ :

3.1  $(x-3)(x+4) = 8$  (4)

3.2  $x^2 + 6x + 5 = 0$  (5)

3.3  $2x - 3 = \frac{4}{x}$  (5)

3.4  $3x - 5\sqrt{3x+1} = -5$  (6)

3.5  $3x^2 - 1 = \frac{27-x}{3}$  (5)

3.6  $x^2 - 2x \leq 15$  (5) [30]

**Question 4**

Solve the following equations simultaneously:

$x - y - 3 = 0$  .....(1)

and

$x^2 - xy = 2y^2 + 7$  .....(2) (7)

**Question 5**

Consider the following sequences:

A: -2; 3; 8; 13

B: 1; 5; 13; 25

5.1 Which sequence is linear and which is quadratic? Clearly state how you reached your conclusion. (5)

5.2 Find the formula for the general term ( $T_n$ ) of sequence B. (5)

5.3 Which term in sequence A will have the value of  $\frac{447}{13}$ ? (5) [15]

**Question 6**

Consider the following sequence:

-4; 8; -16; 32

6.1 Find the  $n^{\text{th}}$  term. (3)

6.2 Find the value of the 20<sup>th</sup> term. (2) [5]

**Question 7**

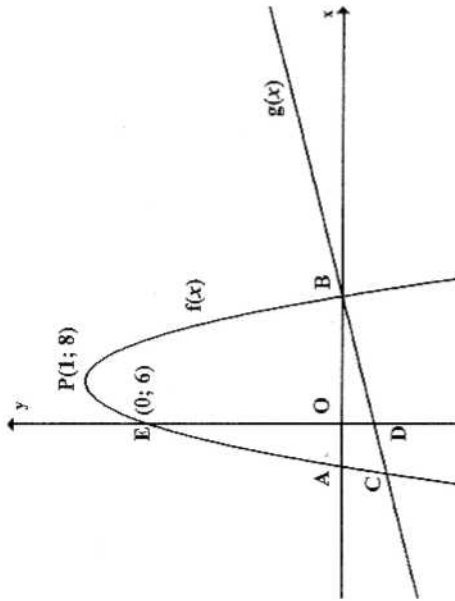
The first 3 terms of an arithmetic sequence are:

$2p + 3$ ;  $6 - p$ ;  $21 + 2p$

7.1 Determine the value of  $p$  and then write down the values of the first 3 terms. (6) [5]

**Question 8**

The graphs of a parabola  $f(x)$  and a straight line  $g(x)$  are shown.  $g(x) = \frac{1}{3}x - 1$ , and point  $P(1; 8)$  is the turning point of the parabola, which has y-intercept  $(0; 6)$ .



- 8.1 Find the equation of the parabola. (5)
- 8.2 If the parabola has the equation  $y = 2x^2 + 4x + 6$ , calculate distance AB. (3)
- 8.3 What is distance ED? (3)
- 8.4 Calculate the co-ordinates of C. (6)
- 8.5 For which values of  $x$  is: (2)

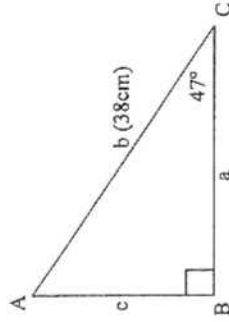
  - 8.5.1  $f(x) > 0$  ? (2)
  - 8.5.2  $f(x)$  decreasing? [21]

**Question 9**

9.1 If angle  $A = 27,3^\circ$  and angle  $B = 62,4^\circ$ , calculate the value of:

- 9.1.1  $\sin A$  (2)
- 9.1.2  $2\cos(A + B)$  (2)
- 9.1.3  $\tan B - \tan A$  (2)

- 9.2 If  $\sin A = 0,67$ , what is the size of  $A$ ? (2)
- 9.3.1 If  $\cos \theta = \frac{2}{5}$ , draw a triangle to show this function. (2)
- 9.3.2 Use the triangle to determine the value of  $\tan \theta$  (3)
- 9.4  $\triangle ABC$  is shown below. Side  $b$  is 38 cm and angle  $C$  is  $47^\circ$ . Solve the triangle, in other words, determine the sizes of all unknown angles and sides.



(7)  
[20]

**Question 10**

$\triangle ABC$  has vertices  $A(6; 8)$ ,  $B(12; -4)$  and  $C(-8; 1)$ .

- 10.1 Draw this triangle on the diagram sheet provided and label the co-ordinates of each point. (3)
- 10.2 Calculate the gradients of AB and AC. (4)
- 10.3 Hence, prove that  $\triangle ABC$  is a right-angled triangle. (2)
- 10.4 Determine the equation of line CB. (3)
- 10.5 Determine the equation of median CM, where M is the midpoint of AB. (4)

END OF PAPER

[16]