

Name.....Stream.....House.....



## DEPARTMENT OF MATHEMATICS

S.4 MATHEMATICS—2020

### PAPER 2 TEST 3

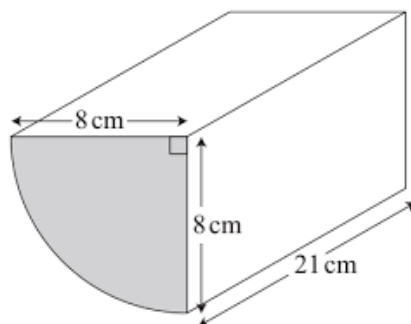
2 HOURS : 30 MINUTES

- Answer **all** the **ten** questions in section **A** and any **five** from section **B**.
- Any additional question(s) answered will **not** be marked.

### SECTION A: (40 MARKS)

1. It is given that  $10^x = 3$  and  $10^y = 7$ . What is the value of  $10^{x+y}$ ? (04 marks)
2. If  $f(x) = ax + b$  and  $f^2(x) = 4x + 15$ , find  $a$  and  $b$ . (04 marks)
3. The volume  $V \text{ cm}^3$  of a solid varies jointly as the square of the radius  $r \text{ cm}$  of its base and its height  $h \text{ cm}$ . Given that  $V = 180 \text{ cm}^3$ , when  $r = 3 \text{ cm}$  and  $h = 10 \text{ cm}$ ;  
(a) Determine the value of constant of proportionality.  
(b) Find the diameter of the base when  $V = 480 \text{ cm}^3$  and  $h = 15 \text{ cm}$ . (04 marks)
4. Find equation of a line passing through the point  $(-2, 3)$  and parallel to the line  $2y + 4x = 5$ . (04 marks)
5.  $A(2, 3)$ ,  $B(-1, 5)$ ,  $C(-1, 1)$  and  $D(k, 1)$  are four points in the Cartesian plane. If  $\overrightarrow{AC}$  is parallel to  $\overrightarrow{BD}$ , find  $k$ . (04 marks)
6. By changing  $0.425$  into a fraction, express  $m^{0.425}$  in the form  $\sqrt[a]{m^b}$  where  $a$  and  $b$  are whole numbers with no common factors. (04 marks)

7. Find the volume of the figure below.

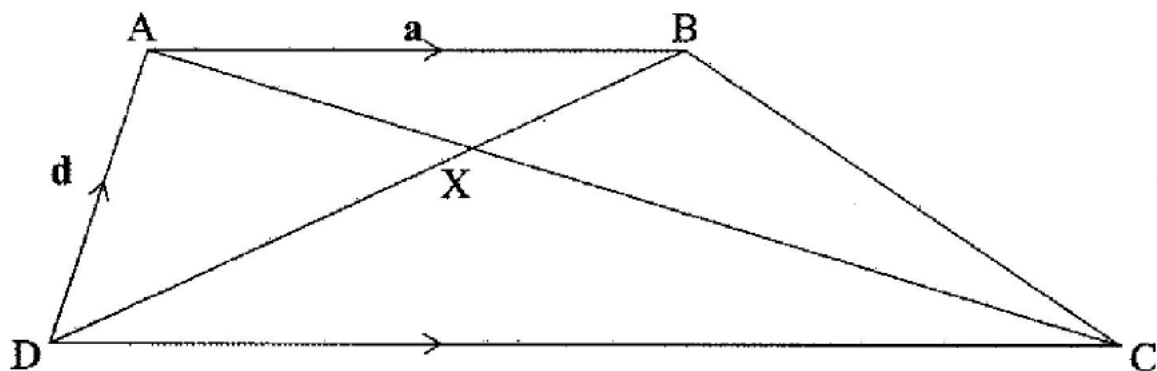


(04 marks)

8. A radio costs shs 120,000 when bought for cash. Ben makes 20 monthly payments of shs 8,000 on hire purchase. Calculate
- the total hire purchase cost
  - the extra amount of money Ben paid by using hire purchase. (04 marks)
9. Fatuma invested shs 450,000 in a saving scheme which offers a compound interest rate of 2% per annum. Calculate the amount she will get after five years. (04 marks)
10. In a class, 20 pupils like science, 13 like history and 8 like both subjects. Nine pupils do not like either subject. Use a Venn diagram to find how many pupils there are in the class. (04 marks)

## SECTION B: (60 MARKS)

11. (a) Given that  $f(x) = x^2 - 3x + 6$  and that  $g(x) = x + 6$ , solve the equation  $f(2x) = g(x) - 3$ .
- (b) If  $g : x \rightarrow \frac{a}{x-2} (x \neq 2)$ , find the values of  $a$  if  $g^2(-1) + 2g^{-1}(-1) = -3$ . (12 marks)
12. In the figure below ABCD, is a trapezium. AB is parallel to DC. Diagonals AC and DB intersect at X and  $DC = 2AB$ .  $\mathbf{AB} = \mathbf{a}$ ,  $\mathbf{DA} = \mathbf{d}$ ,  $\mathbf{AX} = k\mathbf{AC}$  and  $\mathbf{DX} = h\mathbf{DB}$ , where  $h$  and  $k$  are constants.



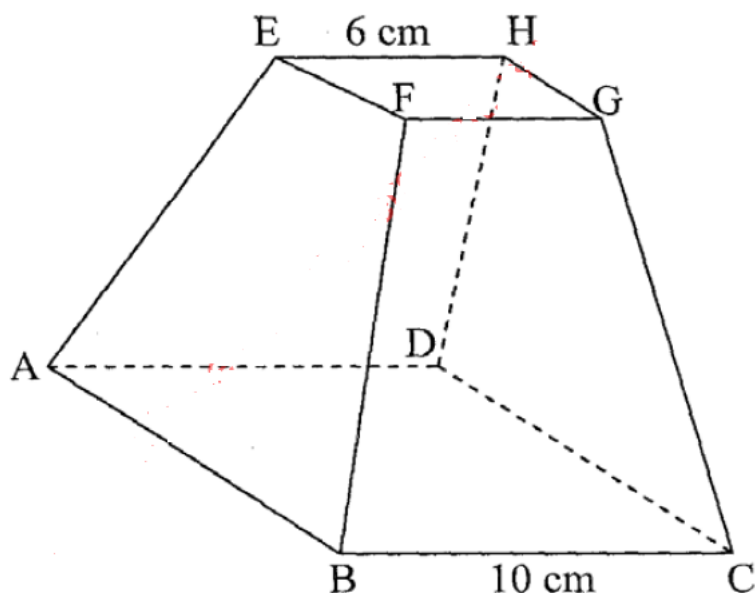
- (a) Find in terms of **a** and **d**:
- BC**,
  - AX**,
  - DX**.
- (b) Determine the values of  $h$  and  $K$ . (12 marks)

13. (a) Solve  $\left(\frac{1}{3}\right)^{x-5} = 81^x$ .

- (b) Use logarithms to evaluate

- $\sqrt[4]{0.8635}$ ,
- $\frac{19.43 \times 0.0365^2}{167.3}$ . (12 marks)

14. The figure below represents a solid frustum. The faces ABCD and EFGH are parallel squares of sides 10 cm and 6 cm respectively. Each of the slanting edges AE, BF, CG and DH are equal to 4 cm.



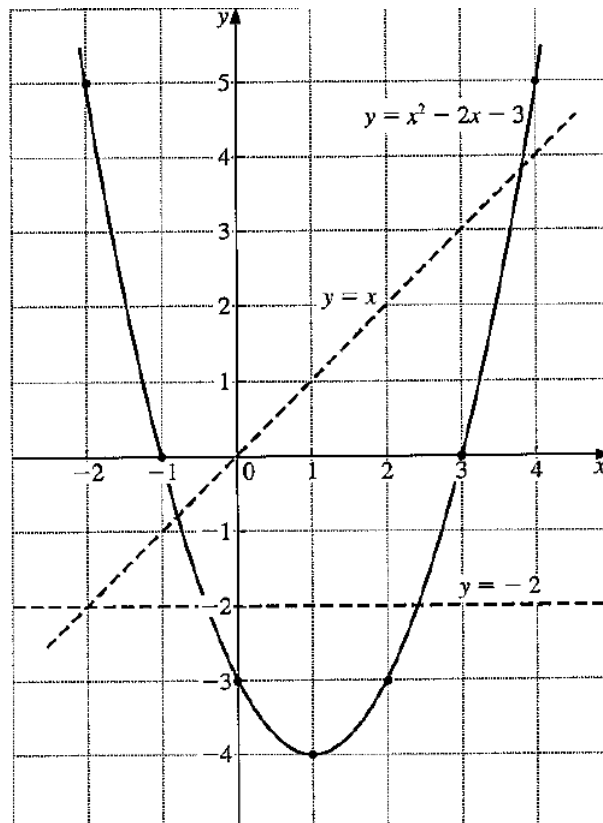
Determine the

- (a) length of the projection of AE on the plane ABCD.
- (b) angle between the line AE and the plane ABCD.
- (c) angle between the plane BCGF and ABCD.
- (d) total surface area of the frustum. (12 marks)

15. In a class of 40, 18 students can spell 'parallel' and 'rhombus'. 20 students can spell 'isosceles' and 'rhombus'. 19 can spell 'parallel' and 'isosceles'. 4 students can spell 'parallel' only. 3 students can spell 'rhombus' only. 2 students can spell 'isosceles' only. 2 students can spell none of these words. How many students can spell

- (a) all the three words.
- (b) at most two words.
- (c) only one word. (12 marks)

16. In the diagram, the graph of  $y = x^2 - 2x - 3$ ,  $y = -2$  and  $y = x$  have been drawn.



Use the graph to find the approximate solutions to the following:

(a)  $x^2 - 2x - 3 = 0$

(b)  $x^2 - 2x - 3 = -2$

(c)  $x^2 - 2x - 3 = x$

(d)  $x^2 - 2x - 1 = 0.$

(12 marks)

17. Use the advert below to answer the questions that follow.

<b>EASY TERM: T.V ON SALE!</b>	
<b>CASH VALUE:</b>	<b>Shs 1,200,000</b>
<b>HIRE PURCHASE:</b>	<b>Deposit 10% of the cash value and pay either Shs. 40,000 weekly for 32 weeks or Shs 200,000 for 6 months.</b>

- (a) Calculate the amount of money one would pay on weekly hire purchase.
- (b) Calculate the amount of money one would pay on monthly hire purchase.
- (c) Calculate the saving one would make by buying the T.V on cash terms rather than on monthly hire purchase.

(12 marks)

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