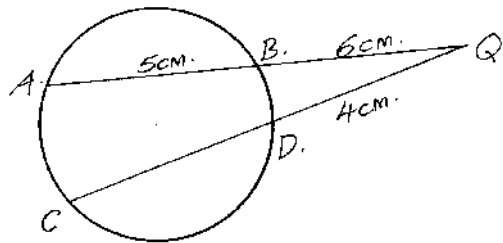# SECTION 9 (50mks)
Answer all questions

1. Factorize completely $6(x-4)^2 - 54$ (3mks) *TRZ*

2. Without using tables, rationalize the denominator in
$$\frac{2 \tan 45^0 \tan 60^0}{4\tan \sin 30^0 - \sqrt{3}}$$
(3mks) *TRZ*

3. (a) Write the expansion of $(2 - 1/5x)^5$ (1mk) *TRZ*

    (b) Hence use the expansion to find the value of $(1.96)^5$ correct to 3 decimal places
(3mks) *TRZ*

4. Make x the subject of the formula in
$Px^2 + qx + r = 0$ (3mks) *TRZ*

5. Solve the equation
$3 \sin (2x - 50^0) = -1.5$
Where $0^0 < x < 360^0$ (4mks) *TRZ*

6. Evaluate $\int_1^3 \frac{3x^3 + x^2 - 2x}{3x} \, dx$ (4mks) *TRZ*

7. The first term of an increasing A.P is 3. The third term, the sixth term and the tenth term of the A.P form the consecutive terms of the G.P. find the common difference of the AP. (3mks) *TRZ*

8. Given that $x = 2i + j - 2k$, $y = -3i + 4j - k$ and $z = 5i + 3j + 2k$ and that $P = 3x - y + 2z$, find the magnitude of vector p to 3 significant figure   (4mks) *TRZ*

9. A and B are two matrices. If $A = \begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}$

    Find B given that $A^2 = A + B$ (3mks) *TRZ*

10. Two teachers are chosen at random from a staff of three women and 2 men to attend a seminar. Calculate the probability that the two teachers chosen are
    (a) Of the same sex   (2mks) *TRZ*
    (b) Of opposite sex   (2mks) *TRZ*

11. Three taps A, B and C can fill a water tank in 30 minutes, 25 minutes and 15 minutes, respectively. If the three taps are turned on for 5 minutes, then A and C are closed, how long would it take before the tank is full   (3mks)

12. Given that $10.5 \leq x \leq 20$ and $1.5 \leq y \leq 3$, find the maximum value of and correct to 3 decimal places   (2mks) *TRZ*
$$\frac{x-y}{y+x}$$

13. Find the standard deviation of 17,2,4,5,6,8,10,11,12,14,15,16,2 and 18 correct to 3 decimal places
(3mks) *TRZ*

14. A sum of Ksh. 10,000 invested at 12% p.a. compound interest, the interest being added half quarterly. Find the amount after 2 years   (3mks) *TRZ*

15. In the figure below AB and CD are chords of a circle that intersect externally at Q. if AB=5cm, BQ=6cm and DQ=4cm, calculate the length of chord CD   (3mks) *TRZ*

16. Simplify $\dfrac{2x-2}{6x^2 - x - 12} \div \dfrac{x-1}{2x-3}$ (3mks) *TRZ*

SECTION II (50MKS)

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Answer any five questions

17. The cash price of a radio cassette is Ksh.27,000 it can also be bought using either of the two plans below

    PLAN A: A deposit of shillings 6,000 and 15 equal monthly installments

    PLAN B: 20 equal monthly instalments of shillings 1680 each.

    (a) If the total payment in plan A is 20% more than the cash price. Find
    - (i) The amount of each installment (2mks) *TRZ*
    - (ii) The annual rate of interest (3mks) *TRZ*

    (b) Find the annual rate of interest in PLAN B (3mks) *TRZ*

    (c) Which plan is cheaper and by how much (2mks) *TRZ*

18. (a) Complete the table below for the function $y=\text{Sin}(x+30^0)$ and $y=2\text{Cos}x$

X	0	30	60	90	120	150	180	210	240	270	300	330	360
Sin $(x+30^0)$	0.5		1.00			0	-0.5			-0.87			
2Cosx	2			0	-1								2

(2mks) *TRZ*

    (b) On the same axis, draw the graphs $y=\text{Sin}(x+30^0)$ and $y=2\text{Cos}x$ for $0^0 \le x \le 360^0$ (4mks) *TRZ*

    (c) Using the graphs solve $\text{Sin}(x+30^0)-2\text{Cos}\,x=0$ (1mk) *TRZ*

   (d) State the Amplitude of each graph (2mks) *TRZ*

19. A baby food manufacturer wishes to mix two brands of food so that the vitamin content per kg of the mixture is at least 18 units of vitamin A, 14 units of vitamin B, 20 units of vitamin C and 24 units of vitamin D, the vitamin content per kg of each brand is shown bellow.

Vitamin content				
Vitamin	A	B	C	D
Brand 1	4	2	2	2
Brand 2	2	2	4	6

    (a) By letting Brand 1 represented by x and Brand 2 represented by y. form all the linear inequalities satisfy the above information (4mks) *TRZ*

    (b) By representing the above on a graph, shade of the unwanted region (4mks) *TRZ*

    (c) If Brand 1 cost Sh. 10 per kg and Brand 2 Sh. 14 per kg, find the minimum cost per kg of such a mixture (2mks) *TRZ*

20. A and P are known to be connected by a law of the form $A=kp^n$ where k and n are constants the table bellow shows values of A and corresponding values of P.

P	0.5	1.2	2	4	6	9	15
A	0.25	3.46	16	128	432	1458	6750

    (a) Express $A=kp^n$ in linear form (1mk) *TRZ*

    (b) Draw the linear graph to represent the information given above (5mks) *TRZ*

    (c) Use your graph to estimate the value of k and n (3mks) *TRZ*

    (d) Find the law connecting A and P (1mk) *TRZ*

21. Given that P and QR and that Q=12, R=27 when P=18 calculate; (3mks) *TRZ*

    (a) The value of P when Q=9 and R=30

    (b) The value of R when P=60 and Q=30 (3mks) *TRZ*

    (c) The percentage by which P is changed when Q is decreased by 12% and R increased by 12% (4mks) *TRZ*

22. The roof of a ware house is in the shape of a triangular prism as shown below

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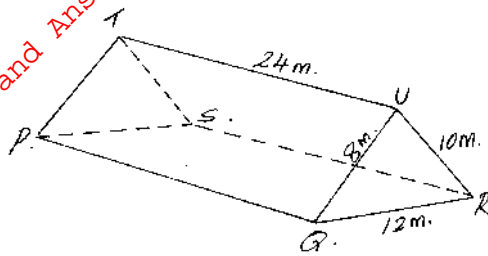
Calculate

(a) The angle between faces RSTU and PQRS (3mks) *TRZ*

(b) The space occupied by the roof (3mks) *TRZ*

(c) The angle between the plane QTR and PQRS (4mks) *TRZ*

23. Using a ruler and compass only

(a) Construct triangle ABC in which AB=7cm, BC=8cm and $\angle ABC=60^0$ (3mks) *TRZ*

(b) Construct a circle passing through the three points A,B and C. Measure the radius of the circle (3mks) *TRZ*

(c) Construct triangle PBC such that P is on the same side of BC as point A, $\angle PCB=\angle$ ½ ACB and $\angle BPC=\angle BAC$ measure $\angle PBC$ (4mks) *TRZ*

24. The figure below represents a cross-section of a horizontal cylindrical pipe of center O and radius of 25cm. The shaded region represents water in the pipe to a depth of 18cm. Calculate

(a) The length AB (2mks) *TRZ*
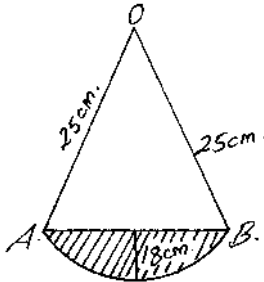
(b) The size of angle AOB (3mks) *TRZ*

(c) The area in cm^3 to 3 significant figures of the shaded region (3mks) *TRZ*

(d) If the pipe is 10m long, calculate the amount of water in liters in the pipe (2mks) *TRZ*