metatutor

1.
Rectangle A, pictured below, has length 22 metres and width 135 metres.
The length of Rectangle A is increased by 33% and the width is decreased by 12% to form Rectangle B.

22 m

135 m
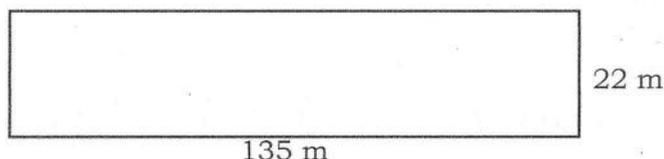
Area of A =
22×135 = 2970
m²

Find the percentage increase in the area of Rectangle A to Rectangle B.
Give your answer to the nearest percent.

Length of B = 22 × 1.33 = 29.26 m
Width of B = 135 × 0.88 = 118.8 m

29.26 × 118.8 = 3476.088 = area of B

$$\frac{3476.088 - 2970}{2970} \times 100 = 17.04$$

= 17%

(5)

2.
(a) Reflect Shape A in the line y = -1 and
label this Shape B.

(1)

(b) Enlarge Shape A by scale factor -0.5
using (1, 4) as the centre of
enlargement and label this Shape C.

(2)

(c) Describe fully the single transformation
that transforms Shape D into Shape C.

Translation $\begin{pmatrix} 2 \\ -11 \end{pmatrix}$

(2)
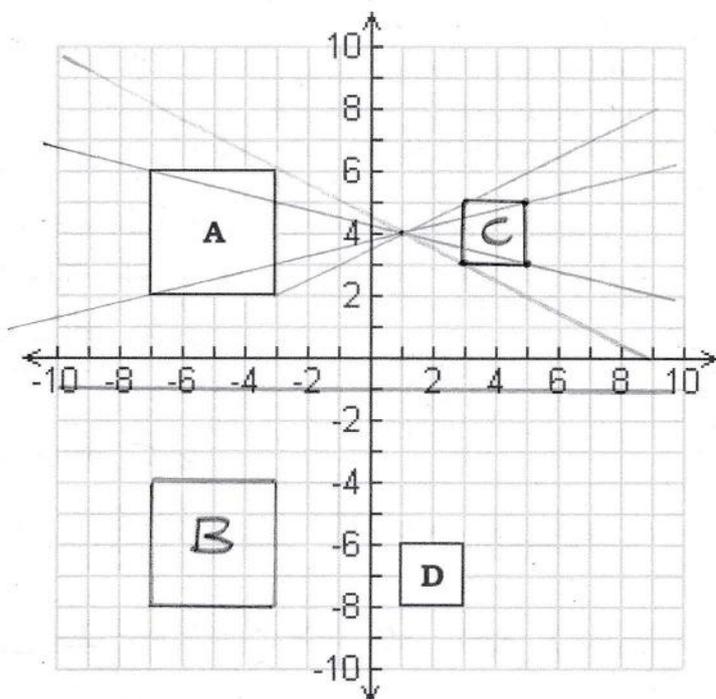
3.
Find the area of the triangle XYZ to the nearest square centimetre.

$\frac{1}{2} \times 9.9 \times 11.2 \times \sin 33$

$= 30.194...$

$= 30 \text{ cm}^2$

X

33°

9.9 cm   11.2 cm

Y   Z
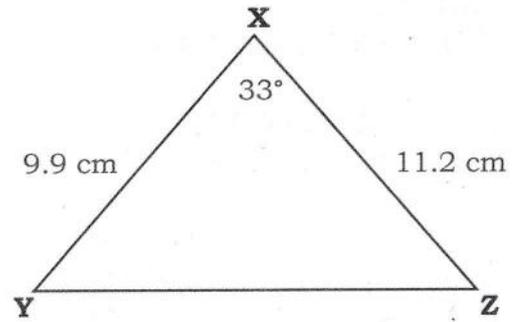
(2)

4.
The luminosity of a star is inversely proportional to its distance to the Earth, in light years.
Star A has a luminosity of 4×10^{-5} and is 60 light years from Earth.
Star B is 500 lightyears from Earth.

Find the luminosity of Star B. Give your answer in standard form.

$4 \times 10^{-5} = 0.00004$

L = luminosity
D = distance

$L = \dfrac{k}{D}$

$0.00004 = \dfrac{k}{60}$

$k = 0.0024$

$L = \dfrac{0.0024}{D}$

Star B: $L = \dfrac{0.0024}{500}$

$= 4.8 \times 10^{-6}$

(4)

5.
L and M are straight lines.
L has equation 2y + 5x = 8.
M crosses the x-axis at x = 5 and crosses the y-axis at y = -2.

Are L and M perpendicular to each other? Explain your answer.

Gradient of L: $2y = 8 - 5x$

$y = \dfrac{8 - 5x}{2}$

$y = 4 - \dfrac{5}{2}x$

Gradient of L $= -\dfrac{5}{2}$

Gradient of M $= \dfrac{0 - -2}{5 - 0} = \dfrac{2}{5}$

L and M are perpendicular because their gradients are negative reciprocals.
(4)