



Name : \_\_\_\_\_  
 Class : \_\_\_\_\_  
 Subject : **MATHEMATICS**  
 Topic : **Transformation & Matrix Transformation**

Date: \_\_\_\_\_  
 71 Marks

**1. 4024/O/N/2005/P1**

22 The diagram below shows the point  $P$  and triangles  $A$ ,  $B$  and  $C$ .

- (a) The reflection,  $M$ , maps  $\Delta A$  onto  $\Delta B$ .  
 Given that  $M(P) = Q$ , write down the coordinates of  $Q$ .

Answer (a) (....., .....) [1]

- (b) The rotation,  $R$ , maps  $\Delta A$  onto  $\Delta C$ .

Find

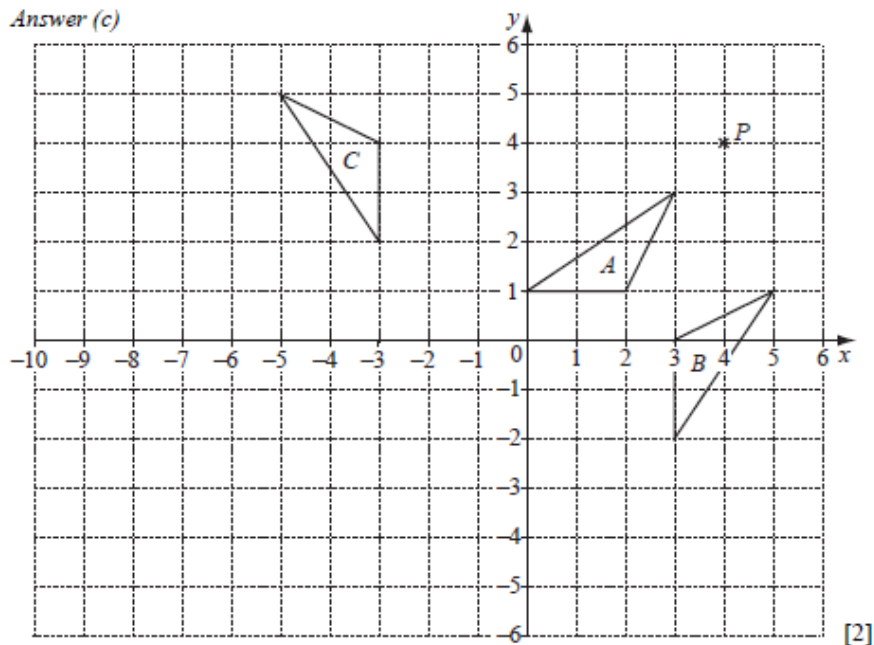
- (i) the coordinates of the centre of this rotation,  
 (ii) the angle and direction of this rotation.

Answer (b)(i) (....., .....) [1]

(ii) ..... [1]

- (c) The matrix  $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$  represents the transformation  $T$ .  
 Given that  $T(A) = D$ , draw and label  $\Delta D$  on the diagram.

Answer (c)

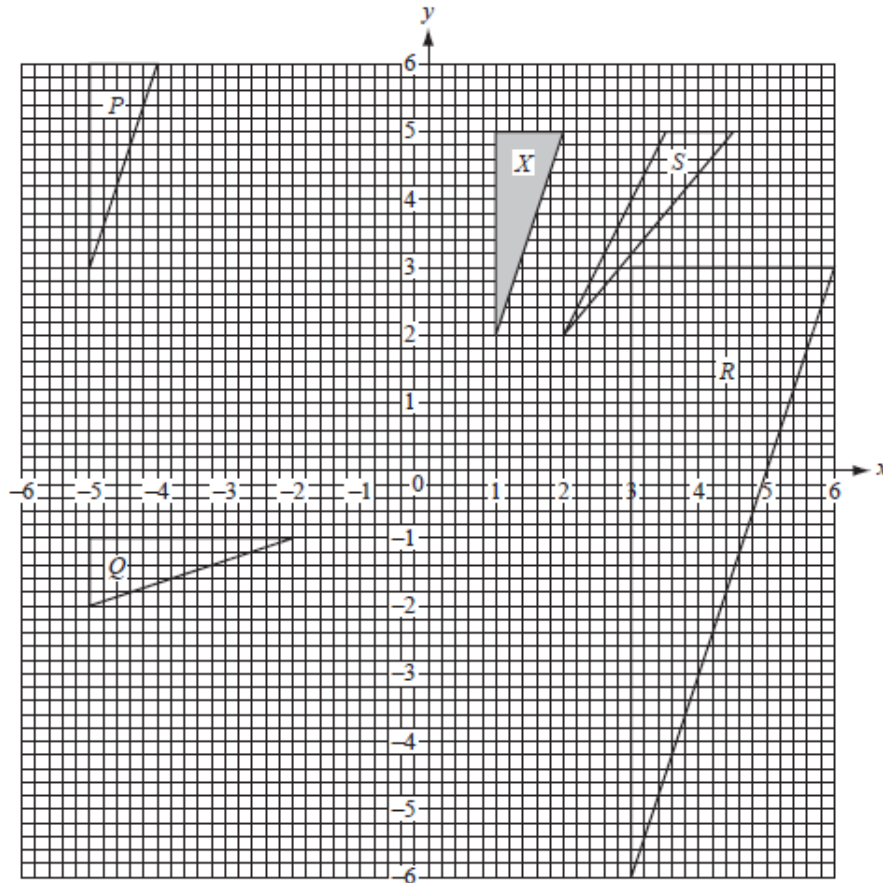


- (d) Given that  $FT(A) = A$ , find the matrix representing the transformation  $F$ .

Answer (d)  $\begin{pmatrix} \phantom{0} & \phantom{0} \\ \phantom{0} & \phantom{0} \end{pmatrix}$  [1]

2. M/J/2005/P4

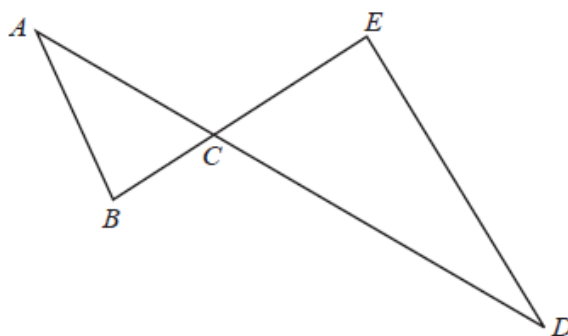
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- (a) Describe fully the single transformation which maps
- (i) triangle  $X$  onto triangle  $P$ , [2]
  - (ii) triangle  $X$  onto triangle  $Q$ , [2]
  - (iii) triangle  $X$  onto triangle  $R$ , [3]
  - (iv) triangle  $X$  onto triangle  $S$ . [3]
- (b) Find the 2 by 2 matrix which represents the transformation that maps
- (i) triangle  $X$  onto triangle  $Q$ , [2]
  - (ii) triangle  $X$  onto triangle  $S$ . [2]

3. 4024/M/J/2005/P1

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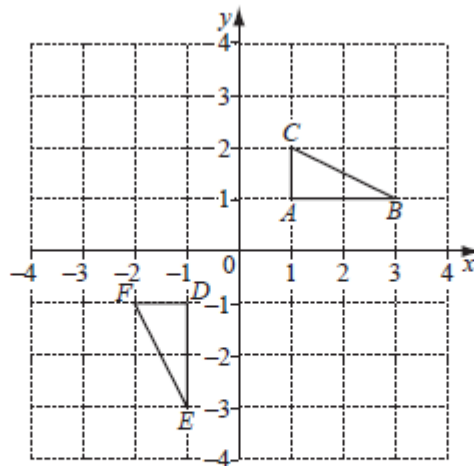
In the diagram,  $ACD$  and  $BCE$  are straight lines.

$$\frac{CB}{CE} = \frac{CA}{CD} = \frac{1}{2}$$

- (a) Describe fully the single transformation that maps  $\triangle CAB$  onto  $\triangle CDE$ .

4. 4024/M/J/2005/P2

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Triangle  $ABC$  has vertices  $A(1, 1)$ ,  $B(3, 1)$  and  $C(1, 2)$ .  
 Triangle  $DEF$  has vertices  $D(-1, -1)$ ,  $E(-1, -3)$  and  $F(-2, -1)$ .

The matrix  $P$  represents the single transformation,  $T$ , that maps triangle  $ABC$  onto triangle  $DEF$ .

(a) (i) Describe  $T$  fully. [2]

(ii) Write down the matrix  $P$ . [1]

(b) Another transformation is represented by the matrix  $Q$ , where  $Q = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ .

(i) This transformation maps  $B$  onto  $Y$ .  
 Find the coordinates of  $Y$ . [1]

(ii) This transformation maps  $K$  onto  $C$ .  
 Find the coordinates of  $K$ . [2]

(iii) Describe, fully, the single transformation which is represented by  $Q$ . [2]

(iv) The matrix  $R$  is given by  $Q = RP$ .  
 By considering the effects of transformations on triangle  $ABC$ , or otherwise, find  $R$ . [2]

(c) The point  $H$  lies on  $DC$  produced, where  $\vec{DH} = \begin{pmatrix} 18 \\ h \end{pmatrix}$ .

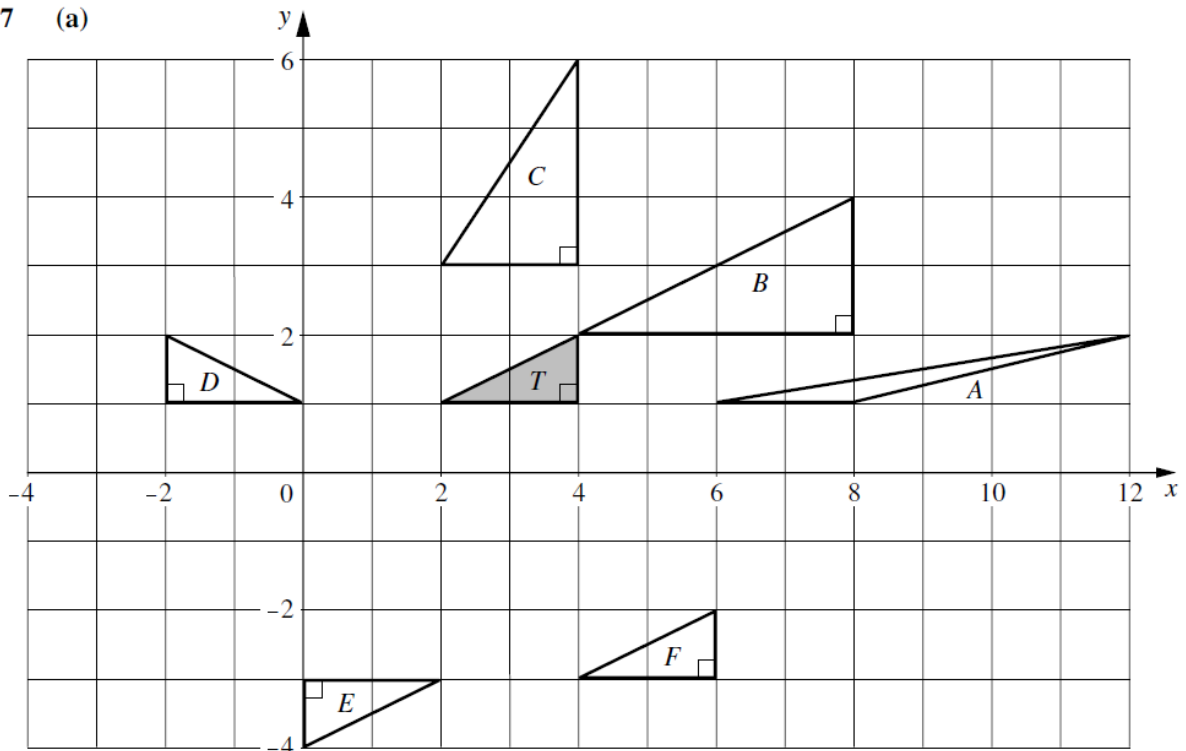
Calculate

(i) the ratio  $DC : DH$ , [1]

(ii) the value of  $h$ . [1]

5. O/N/2003/P4

7 (a)



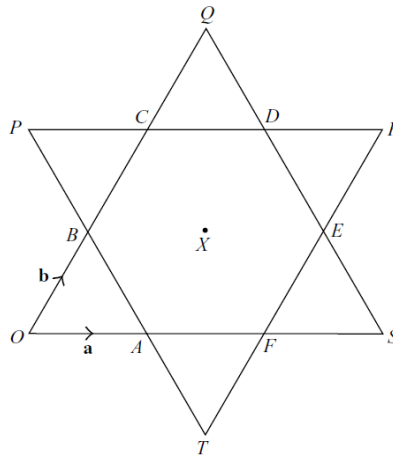
Use one of the letters *A, B, C, D, E* or *F* to answer the following questions.

- (i) Which triangle is *T* mapped onto by a **translation**? Write down the translation vector. [2]
- (ii) Which triangle is *T* mapped onto by a **reflection**? Write down the equation of the mirror line. [2]
- (iii) Which triangle is *T* mapped onto by a **rotation**? Write down the coordinates of the centre of rotation. [2]
- (iv) Which triangle is *T* mapped onto by a **stretch** with the *x*-axis invariant? Write down the scale factor of the stretch. [2]
- (v)  $\mathbf{M} = \begin{pmatrix} 1 & 4 \\ 0 & 1 \end{pmatrix}$ . Which triangle is *T* mapped onto by  $\mathbf{M}$ ?

Write down the name of this transformation. [2]

6. O/N/2003/P4

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(c) Describe fully a single transformation which maps

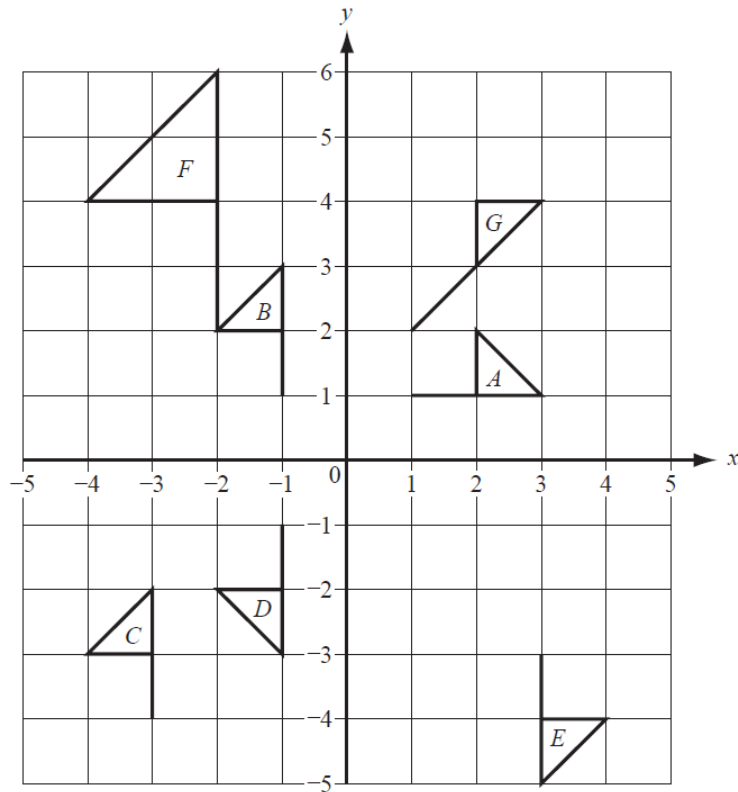
(i) triangle  $OBA$  onto triangle  $OQS$ ,

[2]

(ii) triangle  $OBA$  onto triangle  $RDE$ , with  $O$  mapped onto  $R$  and  $B$  mapped onto  $D$ .

[2]

7. M/J/2004/P4



(a) Describe fully the **single** transformation which maps

(i) shape *A* onto shape *B*, [2]

(ii) shape *B* onto shape *C*, [2]

(iii) shape *A* onto shape *D*, [2]

(iv) shape *B* onto shape *E*, [2]

(v) shape *B* onto shape *F*, [2]

(vi) shape *A* onto shape *G*. [2]

(b) A transformation is represented by the matrix  $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ .

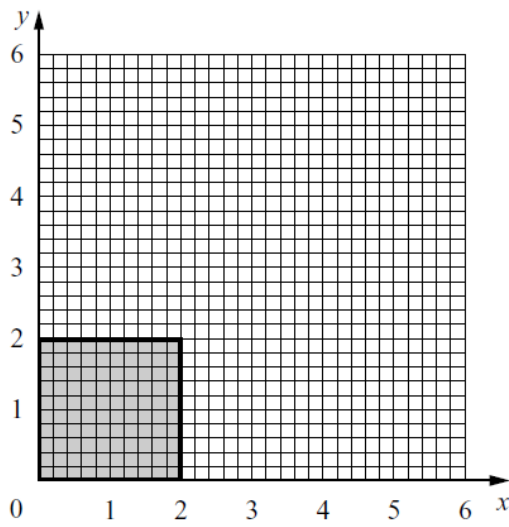
Which shape above is the image of shape *A* after this transformation? [2]

(c) Find the 2 by 2 matrix representing the transformation which maps

(i) shape *B* onto shape *D*, [2]

(ii) shape *A* onto shape *G*. [2]

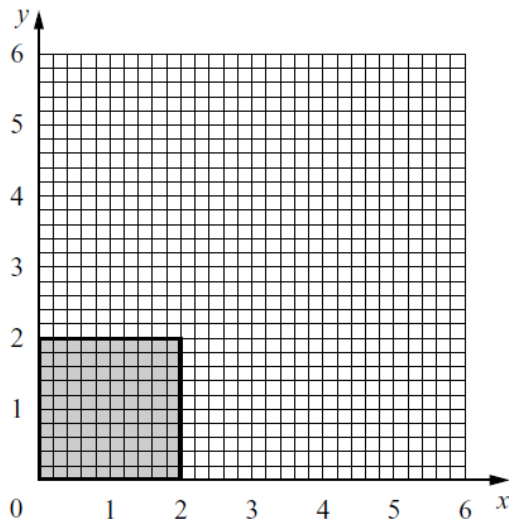
17 (a)



Draw the shear of the shaded square with the  $x$ -axis invariant and the point  $(0, 2)$  mapping onto the point  $(3, 2)$ .

[2]

(b)



(i) Draw the one-way stretch of the shaded square with the  $x$ -axis invariant and the point  $(0, 2)$  mapping onto the point  $(0, 6)$ .

[2]

(ii) Write down the matrix of this stretch.

Answer (b)(ii)  $\left( \begin{array}{c} \\ \end{array} \right)$  [1]

**End of Paper**