**Cambridge IGCSE™**

\*7392438156\*

**MATHEMATICS**

**0580/42**

Paper 4 (Extended)

**October/November**

**2023**

**hours 30 minutes**

**2**

You must answer on the question paper.

You will need:

Geometrical instruments

**INSTRUCTIONS**

* Answer **all** questions.
* Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
* Write your name, centre number and candidate number in the boxes at the top of the page.
* Write your answer to each question in the space provided.
* Do **not** use an erasable pen or correction fluid.
* Do **not** write on any bar codes.
* You should use a calculator where appropriate.
* You may use tracing paper.
* You must show all necessary working clearly.
* Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
* For r, use either your calculator value or 3.142.

**INFORMATION**

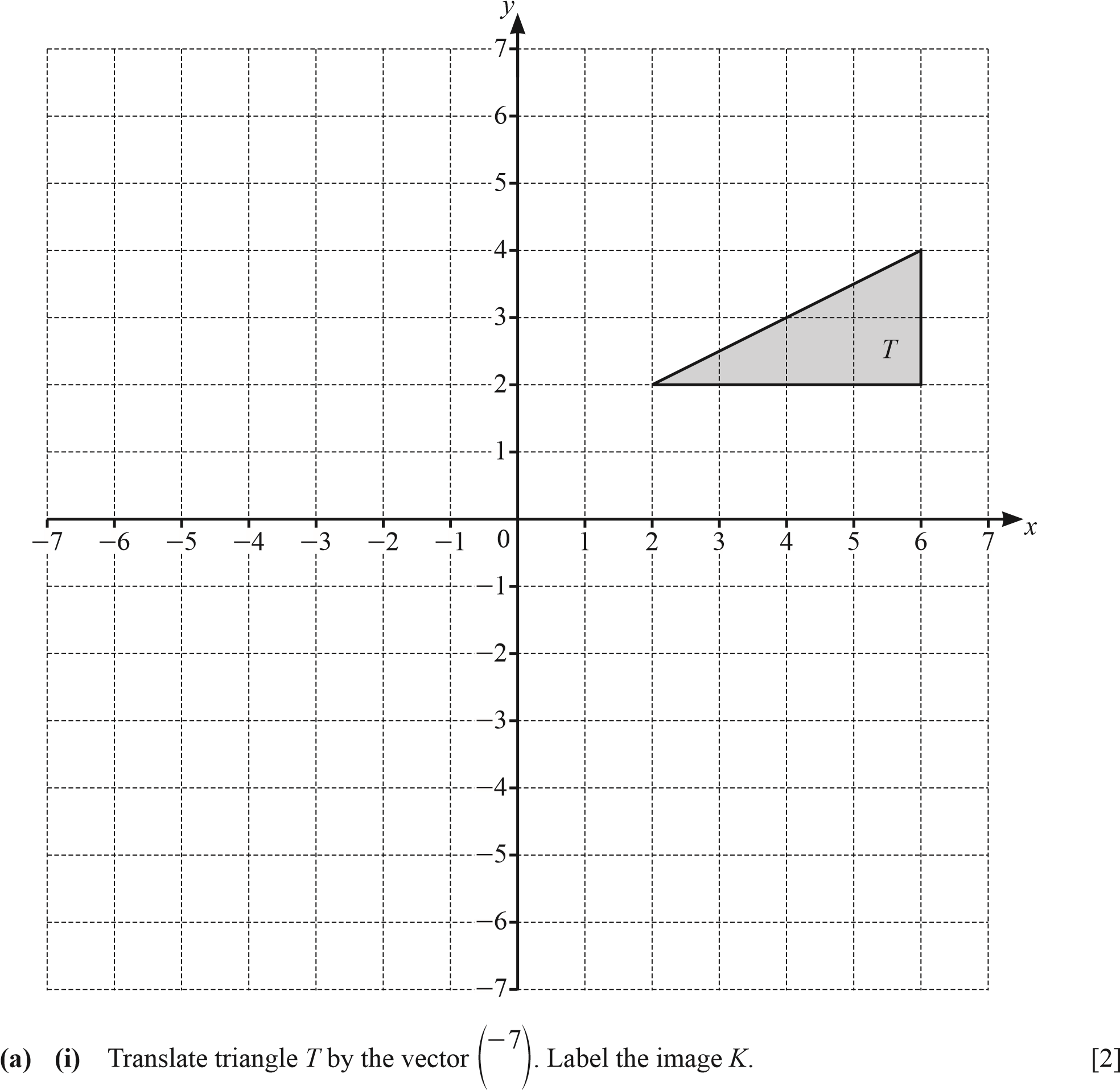
* The total mark for this paper is 130.
* The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

DC (CE/FC) 318220/3

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**1**

1

**(ii)** Describe fully the **single** transformation that maps triangle *K* onto triangle *T*.

.............................................................................................................................................

............................................................................................................................................. [1]

1. Reflect triangle *T* in the line *y* = 4. [2]
2. Rotate triangle *T* through 90° clockwise about (0, 0). [2]
3. **(i)** Enlarge triangle *T* by scale factor -, centre (0, 0). Label the image *P*. [2]

**(ii)** Describe fully the **single** transformation that maps triangle *P* onto triangle *T*.

.............................................................................................................................................

............................................................................................................................................. [2]

**2 (a)** Daisy records her 50 homework marks. The table shows the results.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Homework mark | 15 | 16 | 17 | 18 | 19 | 20 |
| Frequency | 1 | 3 | 19 | 11 | 10 | 6 |

* + 1. Write down the range.

................................................. [1]

* + 1. Write down the mode.

................................................. [1]

* + 1. Find the median.

................................................. [1]

* + 1. Calculate the mean.

................................................. [3]

**(b)**  21 33 20 25 21 34 22 21 20 30 18

The list shows Ed’s scores in 11 tests.

* + 1. Complete the stem-and-leaf diagram to show this information.

|  |  |
| --- | --- |
| 1 |  |
| 2 |  |
| 3 |  |

Key: 2|5 represents 25

[2]

* + 1. Find the median.

................................................. [1]

* + 1. Find the interquartile range.

................................................. [2] **3 (a)** The value of Priya’s car decreases by 10% every year. The value today is $7695.

* + 1. Calculate the value of the car after one year.

$ ................................................ [2]

* + 1. Calculate the value of the car one year ago.

$ ................................................ [2]

* 1. Ali invests $600 at a rate of 2% per year simple interest.

Calculate the value of Ali’s investment at the end of 5 years.

$ ................................................ [3]

* 1. Sara invests $500 at a rate of *r*% per year compound interest.

At the end of 12 years, the value of Sara’s investment is $601.35, correct to the nearest cent.

Find the value of *r*.

*r* = ................................................ [3]

**(d)** The mass of a radioactive substance decreases exponentially at a rate of 3% each day.

* + 1. Find the overall percentage decrease at the end of 10 days

............................................. % [2]

* + 1. Find the number of whole days it takes until the mass of this substance is one half of its original amount.



................................................. [3]

**4 (a)**

*O*

*O*

*A*

*B*

*B*

*A*

*x°*

7.5

cm

7.5

cm

NOT TO

SCALE

1.5

cm

The diagram shows a sector of a circle that is made into a cone by joining *OA* to *OB*.

The sector angle is *x*° and the radius of the sector is 7.5 cm. The base radius of the cone is 1.5 cm.

Calculate the value of *x*.

*x* = ................................................ [3]  **(b)**

NOT TO

SCALE

The diagram shows a cylinder with radius 8 cm inside a sphere with radius 17 cm. Both ends of the cylinder touch the curved surface of the sphere.

**(i)** Show that the height of the cylinder is 30 cm.

[2]  **(ii)** Calculate the volume of the cylinder as a percentage of the volume of the sphere.

[The volume, *V*, of a sphere with radius *r* is *V* = r*r*3.]

............................................. % [4]  **(c)**

15 cm NOT TO

SCALE

The diagram shows a solid sphere with radius 6 cm inside a cube with side length 20 cm.

The cube contains water to a depth of 15 cm. The sphere is removed.

Calculate the new depth of water in the cube.

[The volume, *V*, of a sphere with radius *r* is *V* = r*r*3.]

............................................ cm [3] **5 (a)** In a shop the cost of a fiction book is $*x* and the cost of a reference book is $(*x* +2).

The cost of 11 fiction books is the same as the cost of 10 reference books.

Find the value of *x*.

*x* = ................................................. [2]

**(b)** In another shop, the cost of a fiction book is $*y* and the cost of a reference book is $(*y* +2).

Maria spends $95 on fiction books and $147 on reference books.

She buys a total of 12 books.

* + 1. Show that 6*y*2 -109*y* -95 = 0 .

[4]

* + 1. Factorise 6*y*2 -109*y* -95 .

................................................. [2]

* + 1. Find the value of *y*.

*y* = ................................................ [1] **6**

NOT TO SCALE

*w*

°

(2

*t*

+

3)

cm

5

cm

*t* cm

The diagram shows a right-angled triangle.

Find the value of *w*.

*w* = ................................................ [7] **7 (a)**

NOT TO

2.8

m

7.1

m

*X*

*P*

*Q*

*R*

SCALE

The diagram shows a right-angled triangle *PQR* on horizontal ground.

*X* is vertically above *R* and the angle of elevation of *X* from *P* is 21°. *XR* = 2.8 m and *RQ* = 7.1 m.

* + 1. Calculate the angle of elevation of *X* from *Q*.

................................................. [2]

* + 1. Calculate *PQ*.

............................................. m [3]

**(b)**

9.1 cm NOT TO

16.7

cm

32

°

*M*

*L*

*K*

SCALE

Calculate the acute angle *KML*.

Angle *KML* = ................................................ [3]  **(c)**

NOT TO

SCALE

12.3

cm

21.5

cm

*C*

*A*

*B*

*D*

The area of triangle *ABC* is 62 89. cm2.

* + 1. Show that angle *BAC* = 28.4°, correct to 1 decimal place.

[2]

* + 1. Calculate *BC*.

............................................ cm [3]

* + 1. *AB* is extended to a point *D* such that angle *BDC* = 90°.

Calculate *BD*.

............................................ cm [3] **8**

1

2

2

2

3

3

Dice A Dice B

The diagram shows two fair dice.

Dice A is numbered 1, 2, 2, 2, 3, 6.

Dice B is numbered 2, 3, 3, 4, 4, 4.

**(a) (i)** Dice A is rolled once.

Write down the probability that it lands on the number 6.

................................................. [1]

**(ii)** Dice A is rolled 150 times.

Find the number of times it is expected to land on the number 6.

................................................. [1]

**(b)** Dice A and Dice B are each rolled once.

* + 1. Find the probability that the two numbers they land on have a total of 6.

................................................. [3]

* + 1. Find the probability that when the two numbers they land on have a total of 6, both numbers are 3.

................................................. [2]  **(c)** Dice B is rolled *n* times.

The probability that on the *n*th roll it first lands on a number 3 is .

Find the value of *n*.

*n* = ................................................ [2]

**9**

*y*

*x*

*A*

*B*

*O*

NOT TO

SCALE

The diagram shows a sketch of the graph of *y* = 4*x*3 - *x*4.

The graph crosses the *x*-axis at the origin *O* and at the point *A*. The point *B* is a maximum point.

* 1. Differentiate 4*x*3 - *x*4.

................................................. [2]

* 1. Find the coordinates of *B*.

(....................... , .......................) [3]

* 1. Find the gradient of the graph at the point *A*.

................................................. [3] **10 (a)**

# E D

NOT TO

SCALE

*F*

*C*

# A B

*ABCDEF* is a regular hexagon. *DF*, *DA* and *DB* are diagonals.

Complete the following statements using three different triangles.

Triangle *DEF* is congruent to triangle ..................

Triangle .................. is congruent to triangle ..................

[2]

**(b)**

NOT TO

SCALE

*P*

*O*

*T*

*Q*

*P* and *Q* are points on the circle with centre *O*.

*TP* and *TQ* are tangents to the circle from the point *T*.

Complete the following statements and reasons.

In triangles *OPT* and *OQT*

*OP* = .................. because each is a radius of the circle

*OT* is a common side

Angle *OPT* = angle .................. = 90° because ..............................................................................

Triangles *OPT* and *OQT* are congruent using the criterion ..................

This proves that the tangents *TP* and *TQ* are ..................................................

[5] **11**  f( )*x* = 1-3*x* g( )*x* = (*x* -1)2 h( )*x* = 3*x*, *x* ! 0

1. Find g(3).

................................................. [1]

1. Find f(*x* -2), giving your answer in its simplest form.

................................................. [2]

1. Find f-1( )*x* .

f-1( )*x* = ................................................ [2]  **(d)** gf( )*x* -g( ) ( )*x* f *x* = 3*x*3 + *ax*2 + *bx* + *c*

Find the value of each of *a*, *b* and *c*.

*a* = ................................................ *b* = ................................................ *c* = ................................................ [5]  **(e)** Find h( )*x* -f( )*x* , giving your answer as a single fraction in its simplest form.

................................................. [3]

**(f)** h(*xn*) = 3*x*7

Find the value of *n*.

*n* = ................................................ [1]

**12**

NOT TO

*A*

*B*

*O*

*y*

*x*

SCALE

*O* is the origin (0, 0), *A* is the point (8, 1) and *B* is the point (2, 5).

1. Write as column vectors.

**(i)** *OB*

|  |  |
| --- | --- |
| **(ii)** | *AB* |

*OB* =   f p [1]

*AB* =   f p [1]

1. Find the equation of the line *AB*.

Give your answer in the form *y* = *mx* + *c*.

*y* = ................................................ [3]

1. Find the equation of the perpendicular bisector of *AB*. Give your answer in the form *y* = *mx* + *c*.

*y* = ................................................ [4]

1. The line *AB* meets the *y*-axis at *P*.

The perpendicular bisector of *AB* meets the *y*-axis at *Q*.

Find the length of *PQ*.

................................................. [2] **BLANK PAGE**

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