

Properties of Quadrilaterals

Put a ✓ or a ✗ in each box to indicate whether the quadrilateral named has the property described

	PROPERTY	Parallelogram	Rhombus	Rectangle	Square	Kite	Trapezium
1	Interior angles add up to 360°						
2	All interior angles are right angles						
3	All sides are equal						
4	Both diagonals are equal						
5	The diagonals are perpendicular						
6	The diagonals bisect each other						
7	Both diagonals bisect the angles they run into						
8	Only one diagonal bisects the other						
9	Both pairs of opposite sides are equal						
10	Both pairs of opposite sides are parallel						
11	Exactly one pair of sides is parallel						
12	Adjacent sides are equal						
13	Each diagonal bisects the area of the quadrilateral						
14	The diagonals bisect each other perpendicularly						
15	Both pairs of opposite angles are equal						
16	Exactly one pair of opposite angles is equal						
17	Exactly one pair of angles is bisected by a diagonal						

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**WYNBERG BOYS' HIGH SCHOOL
GRADE 10 MATHEMATICS
GEOMETRY REVISION:
GRADE 8 TERMINOLOGY AND RULES**

Note: This information sheet does not cover congruency and similarity.

SOME IMPORTANT TERMINOLOGY

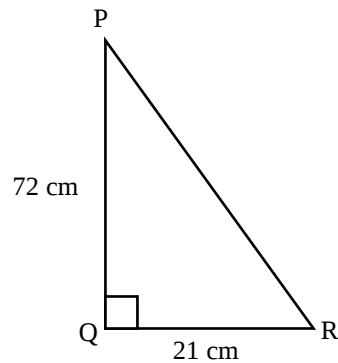
1. **Supplementary angles** - two angles which add up to 180°
2. **Supplement** - the difference between 180° and a given angle
3. **Complementary angles** - two angles which add up to 90°
4. **Complement** - the difference between 90° and a given angle
5. **Adjacent angles** - two angles which share a common arm, and have the same vertex

SOME "RULES" OF GEOMETRY

RULE	ABBREVIATED REASON
1. Angles around a point add up to 360° .	($\angle$'s around point ____) <i>Name the point.</i>
2. Angles on a straight line add up to 180° .	($\angle$'s on str. line ____) <i>Name the line.</i>
3. Vertically opposite angles are equal.	(vert. opp. $\angle$'s)
4. When a transversal cuts a pair of parallel lines, then... (a)... pairs of corresponding angles are equal. (Look for an "F" shape.) AND (b)... pairs of alternate angles are equal. (Look for a "Z" or "N" shape.) AND (c)... pairs of co-interior angles are supplementary. (Look for a "C" or "U" shape.)	(corres. $\angle$'s; ____ // ____) <i>Name the parallel lines.</i> (alt $\angle$'s; ____ // ____) <i>Name the parallel lines.</i> (co-int. $\angle$'s; ____ // ____) <i>Name the parallel lines.</i>
5. Two lines, cut by a transversal, are parallel if... (a)... two corresponding angles are equal. OR (b)... two alternate angles are equal. OR (c)... two co-interior angles are supplementary.	(corres. $\angle$'s equal; ____ = ____) <i>Name the equal angles.</i> (alt $\angle$'s equal; ____ = ____) <i>Name the equal angles.</i> (co-int. $\angle$'s suppl.; ____ + ____ = 180°) <i>Name the supplementary angles.</i>

QUESTION 2

- (a) State the theorem of Pythagoras in words. [HINT: *In a right-angled triangle ...*]
- (b) In $\triangle PQR$, shown alongside, $\hat{Q} = 90^\circ$,
 $PQ = 72$ cm and $QR = 21$ cm.

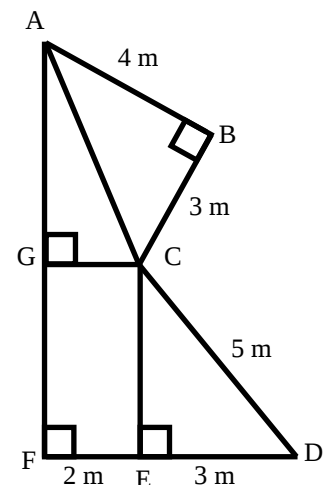


- (1) Determine the length of PR.
- (2) Determine the perimeter of the triangle.

QUESTION 3

The diagram below shows a film set being constructed. To reach and work on high spots on the construction site, the set-builders used a variety of cherry-picker type cranes, such as the one in the picture.

- (a) In the diagram, lines have been drawn to indicate what measurements are known. Note that CGFE is a rectangle and that ACD is not a straight line.



Using your knowledge of the theorem of Pythagoras, calculate the height (AF) at which a person would be working when standing on the platform of the crane. Show all necessary working and give your final answer rounded off correctly to one decimal place.

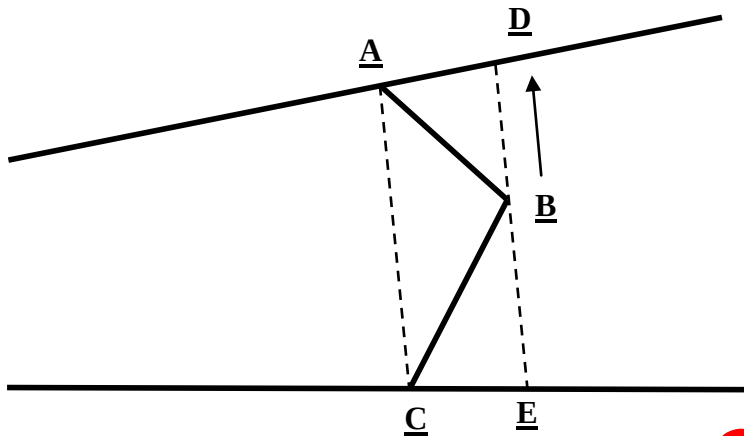
Fair Fence - SOLUTION

Join AC to form a triangle

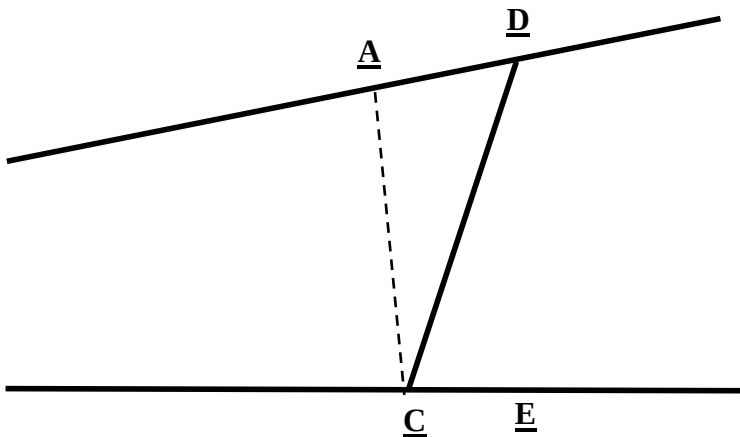
Draw DE parallel to AC through B

You now have a triangle between parallel lines and its area remains the same as long as its base remains the same.

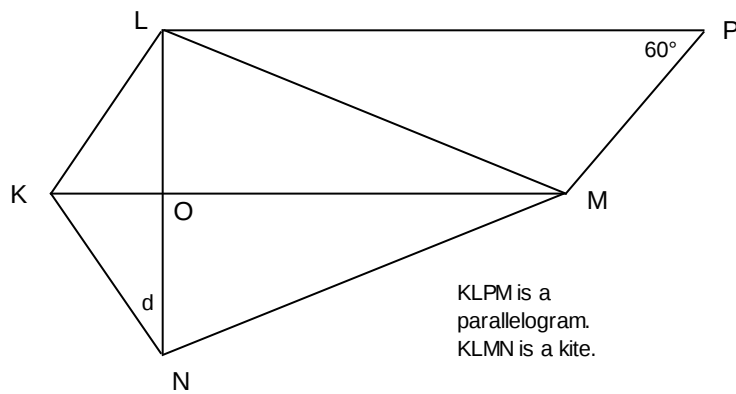
Drag B to D as shown.



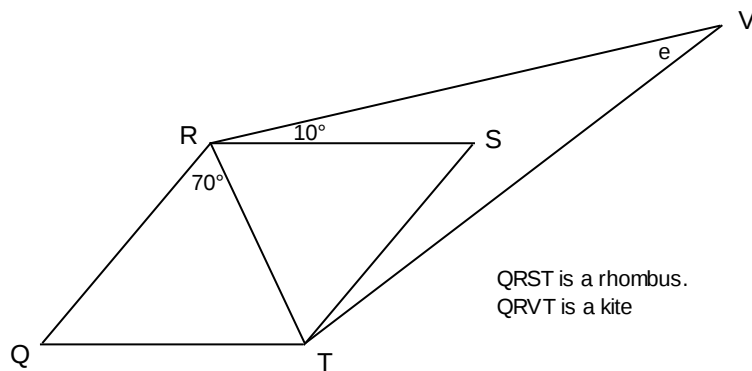
So triangle ADC has the same area as triangle ABC
Hence the one straight fence must be built along DC



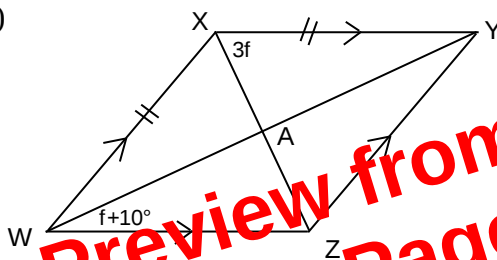
c)



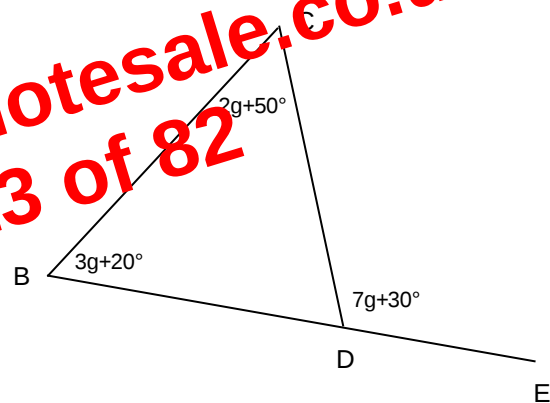
d)



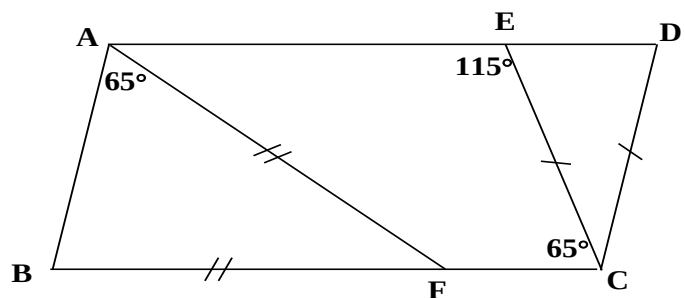
e)



f)

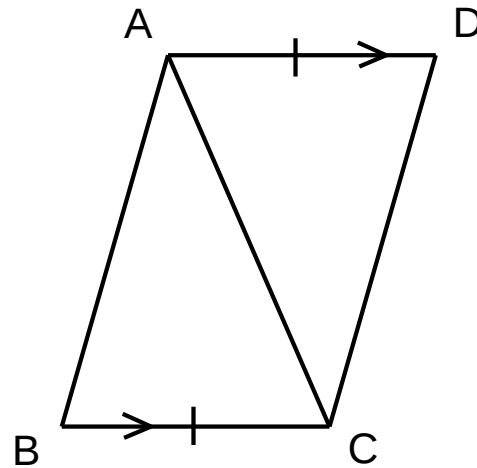


8. In the figure, AED and BFC are straight lines.
Prove that $ABCD$ is a parallelogram.



QUESTION 6

In the following diagram, $AD = BC$ and $AD \parallel BC$.



- a) Prove that $\triangle ABC \equiv \triangle CDA$.

- b) Hence prove that $ABCD$ is a parallelogram.

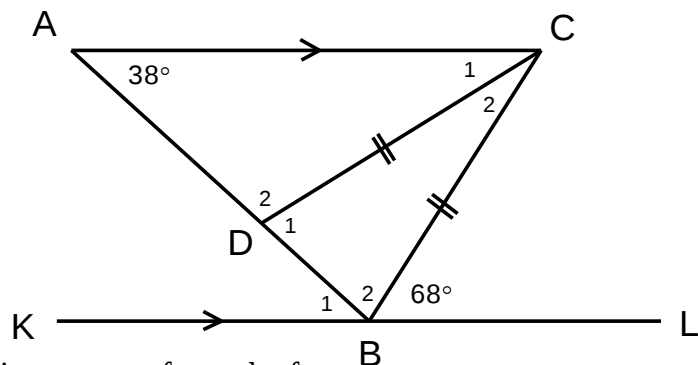
(4)

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QUESTION 2

- a) In the sketch alongside,
 $AC \parallel KL$ and $DC = BC$.
 $\hat{A} = 38^\circ$ and $\hat{CBL} = 68^\circ$.



Determine each of the following angles. Give a reason for each of your answers.

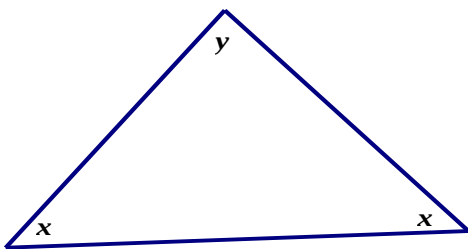
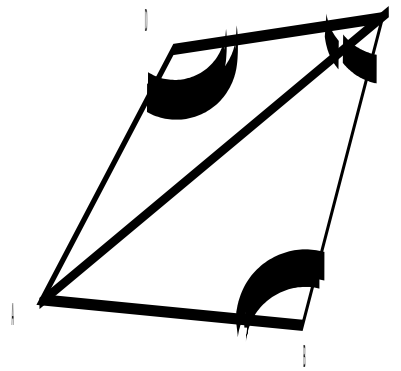
- 1) $\hat{B}_1$ _____

..... (1)

- 1.2 For quadrilateral ABCD it is given that $\hat{B} = \hat{D}$
and that AC bisects $\hat{B}\hat{C}\hat{D}$

What kind of quadrilateral is ABCD?(1)

[3]



In the above isosceles triangle, each base angle is x° and the apex angle is y°
If the apex angle is 15° larger than the base angles, find the size of each angle.

[6]

7. In $\triangle PQR$

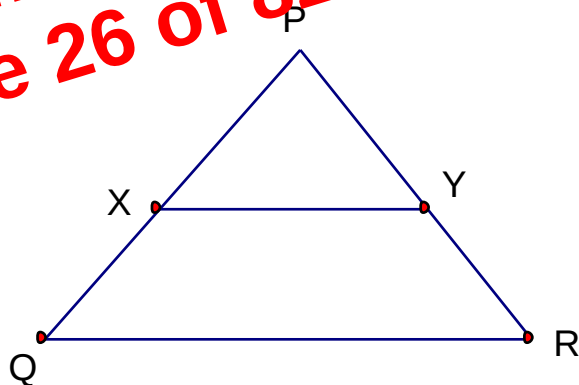
XY is parallel to QR,

$PQ = 6 = PY$,

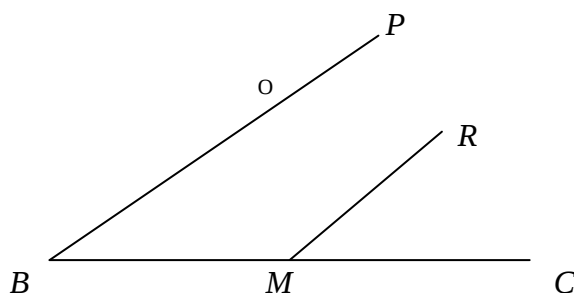
$2YR = 6$

$QR = 2PY$

Note: $\triangle PQR$ not drawn to scale



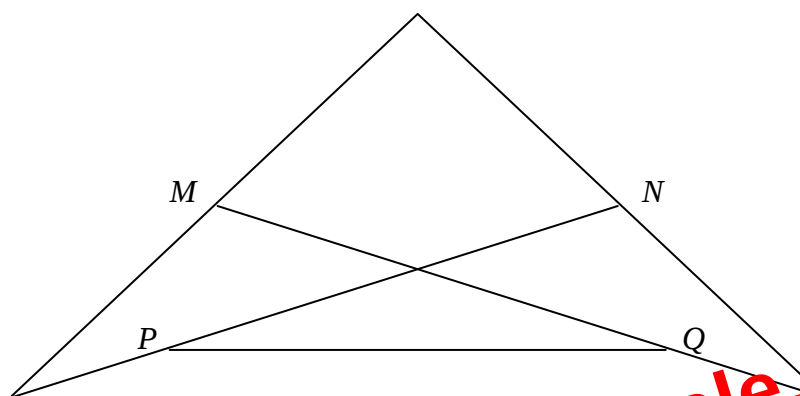
a) Calculate: XQ _____ (2)



If $AR = 8$ units, $BP \parallel MR$, $AO = OM$ and $BM = MC$, find the length of RC .
Give reasons for your statements.

[4]

1.5



1.5.1 There are many ways to prove a quadrilateral is a parallelogram.

Four of these are 1. both pairs of opp. sides are equal.

2. one pair of opp. sides are equal and parallel.

3. both pairs of opp. Sides are parallel.

4. diagonals bisect.

With this given information, explain why $MNPQ$ will form a parallelogram in the above sketch if $AM = MB$, $AN = NC$, $OQ = QC$ and $OP = PB$, (4)

1.5.2 Explain with reasons why?

$$NO = \frac{1}{3} NB.$$

(2)

QUESTION 1

1.1 Refer to Figure 1.

$AB \parallel PQ$

AM bisects $\hat{BAP}$ and PM bisects $\hat{APQ}$

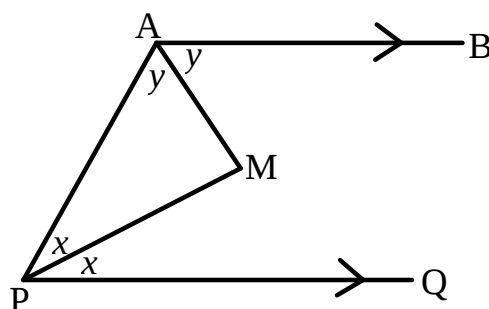


Figure 1

1.1.1 Write down, with a reason, the numerical value

of

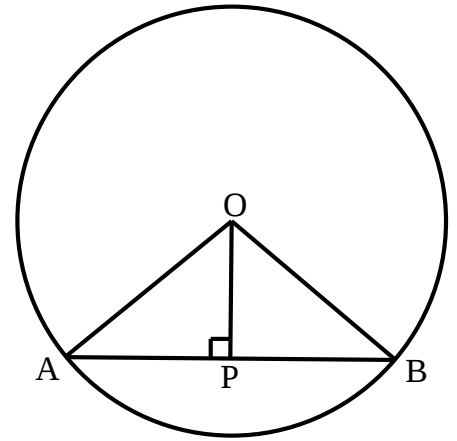
QUESTION 2

Refer to Figure 3.

The circle with centre O has a chord AB.

OP is drawn perpendicular to AB.

Figure 3



2.1 Prove that $\triangle OAP \equiv \triangle OBP$ (4)

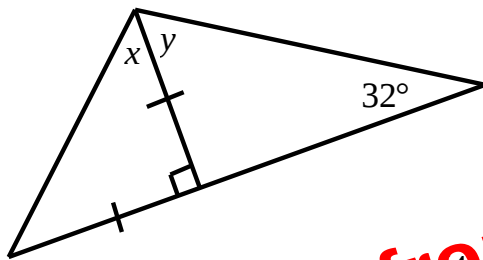
2.2 If $AB = 8$ cm and $OP = 3$ cm, determine the radius of the circle. (3)

[7]

QUESTION 1: Geometry

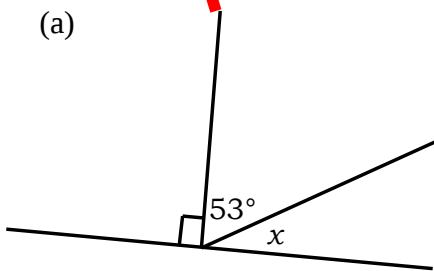
1.1 Write down (without reasons) the size of the angles marked x and y in the following:

(a) (b)

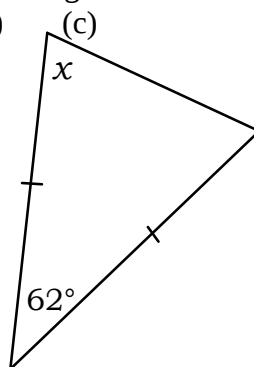


1.2 Work out the value of x in the following. Reasons must be given.

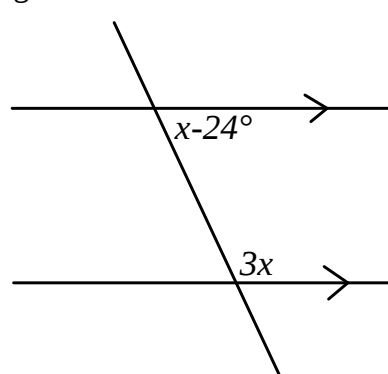
(a)



(b)



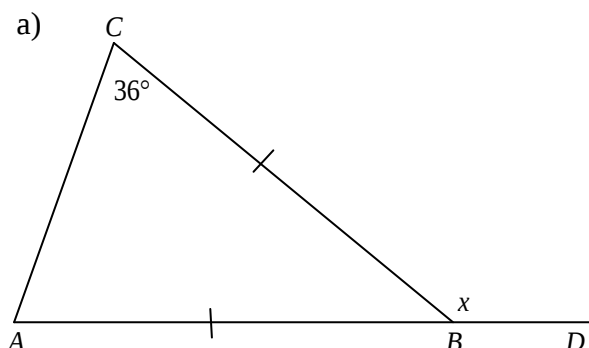
(c)



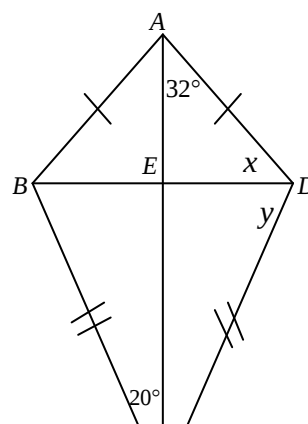
(6)

QUESTION 1. In each one of the following diagrams, find the size of the angle or side marked x or y (give reasons):

a)



b)

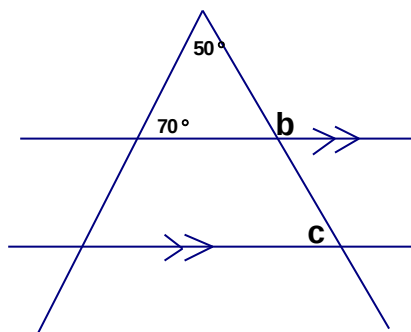


Start question 1 and question 2 on separate exam pad sheets.

Question 1

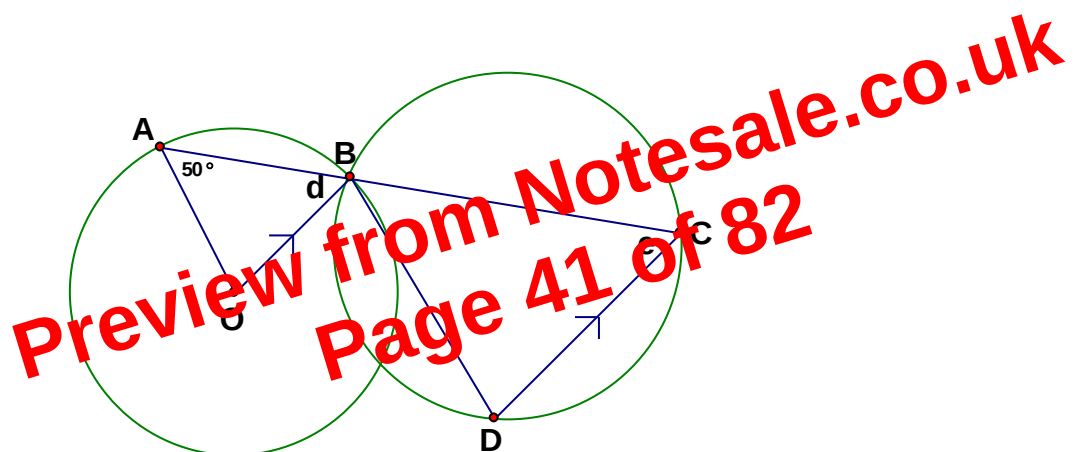
1.3 Find the values of the variables giving reasons:

1.1.1



(4)

1.1.2

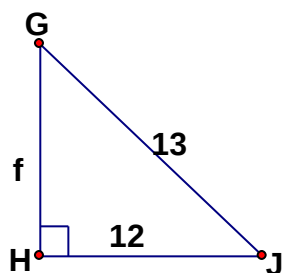


$OB \parallel DC$

$\hat{O}$ is the centre of the circle.

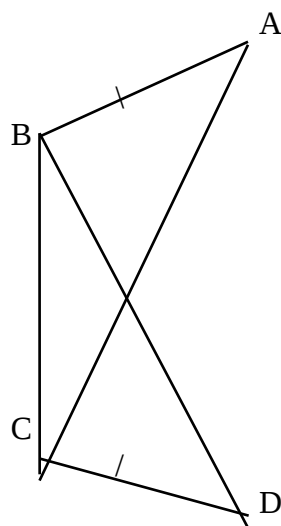
(4)

1.1.3



(3)

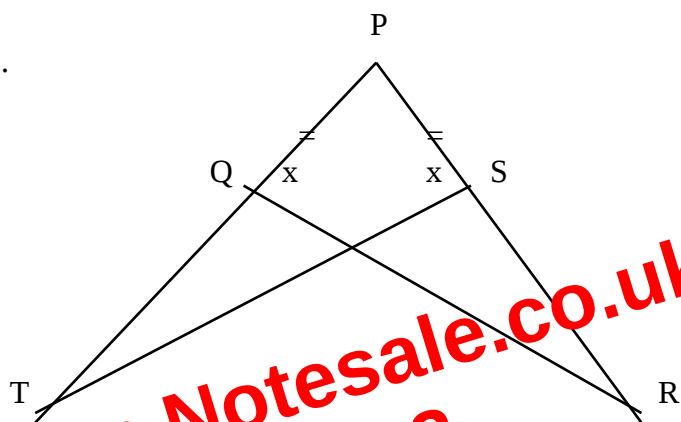
- 6 $AB = DC$ and $\angle ABC = \angle DCB$.
 Prove, using congruency, that
 $\angle ABC \cong \angle DBC$ and that
 $\angle A = \angle D$.



[5]

- 7 PQT and PSR are straight lines.
 $PS = PQ$.

Prove that $TS = RQ$.



[5]

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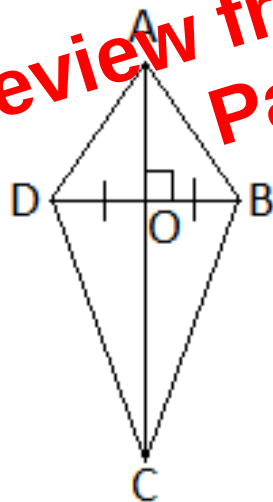
QUESTION 7**[4]**

Based on the information provided, make a conjecture about the quadrilaterals below. Then prove your conjecture.

You must give the best classification possible:

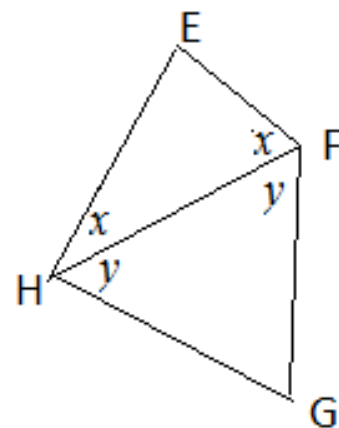
- If a quadrilateral is a rhombus, it is not good enough to classify it as a parallelogram.
- If a quadrilateral is a rectangle, it is not good enough to classify it as a parallelogram.
- If it is a square it should not be classified as a rectangle.

7.1)



(2)

7.2)



(2)

QUESTION 8**[11]**

In the diagram below $AD=AG$ and $EF \parallel DG$

8.1) If $\angle ADG = x$, State (with reasons) three other angles equal to x .

(3)

8.2) Prove that $ED = FG$.

(2)