School Name
Mathematics Test 2017

Year 8

Pythagoras Theorem

Calculator Allowed Test

Skills and Knowledge Assessed:

- Investigate Pythagoras' theorem and its application to solving simple problems involving right angled triangles (ACMMG222)
- Investigate the concept of irrational numbers, including π (ACMMG186)

Name_____

Answer all questions in the spaces provided on this test paper by:

Writing the answer in the box provided.

or

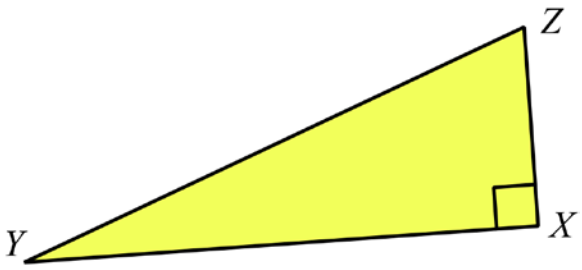
Shading in the bubble for the correct answer from the four choices provided.

Show any working out on the test paper. Calculators are allowed.

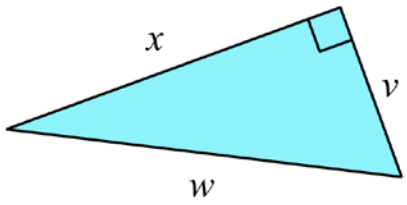
Diagrams are not to scale.

1. Which side is the hypotenuse of the triangle shown below?

- ☐ XY
- ☐ XZ
- ☐ YX
- ☐ YZ

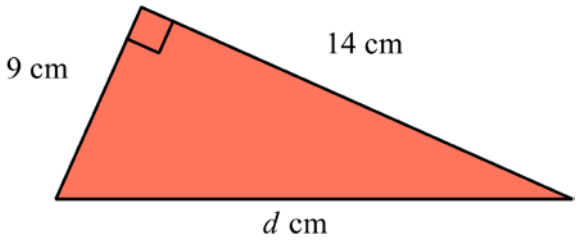


2. Write a statement of Pythagoras Theorem for the triangle shown.

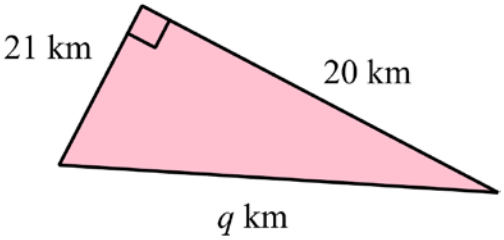


3. Which calculation could be used to find the value of d?

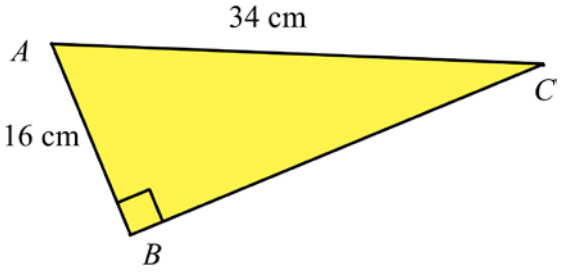
- ☐ $d^2 = 28 - 18$
- ☐ $d^2 = 28 + 18$
- ☐ $d^2 = 196 - 81$
- ☐ $d^2 = 196 + 81$



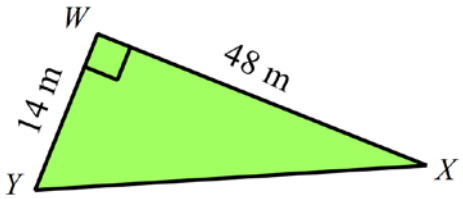
4. Find the value of q.



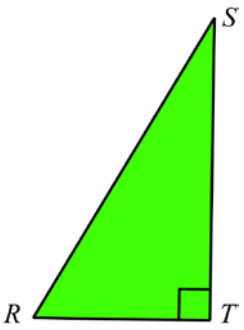
5. Find the length of BC.



6. What is the length of XY?

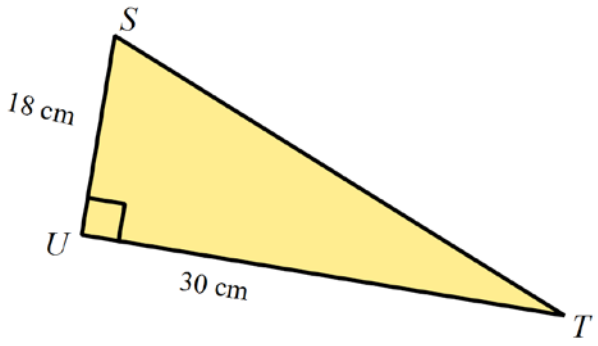


7. Write a statement of Pythagoras Theorem for the right triangle RST.

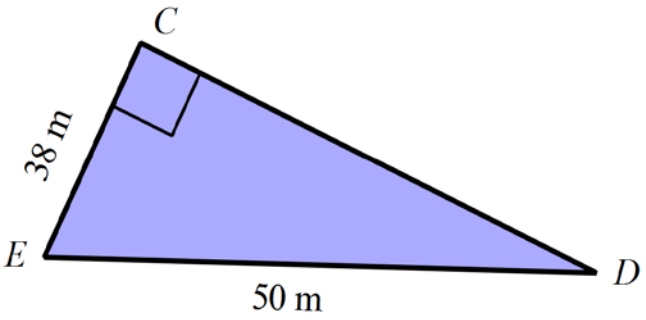


8. Find the length of *ST* (correct to 1 decimal place) in the triangle below.

- ☐ 4.9 cm
- ☐ 24.0 cm
- ☐ 35.0 cm
- ☐ 48.0 cm

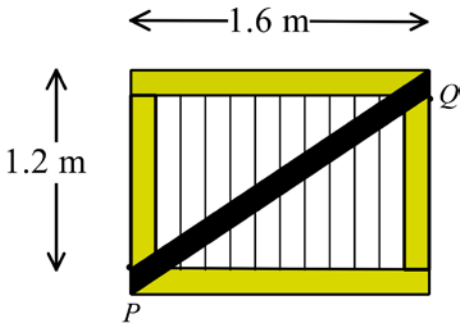


9. Find the distance *CD* to the nearest tenth of a metre.



10. A crate which measures 1.6 metres by 1.2 metres, has a supporting brace which goes from *P* to *Q* as shown on the diagram.

What is the distance *PQ*?



11. Which of these is a rational number?

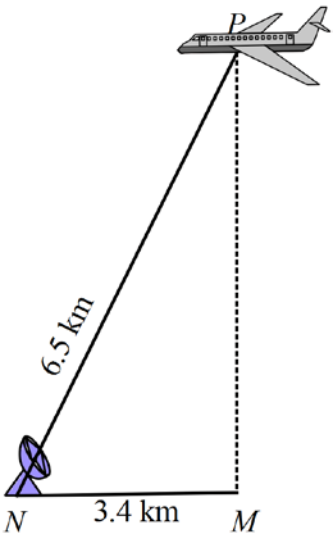
- ☐ $\sqrt{255}$
- ☐ $\sqrt{484}$
- ☐ $\sqrt{567}$
- ☐ $\sqrt{700}$

12. A plane *P* passes directly above a point *M*.

A radar is located at *N*, which is 3.4 km from *M*.

The radar records the direct distance to the plane to be 6.5 km

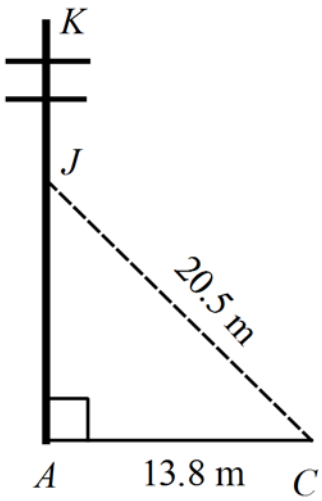
What is the altitude of the plane, *PM*?



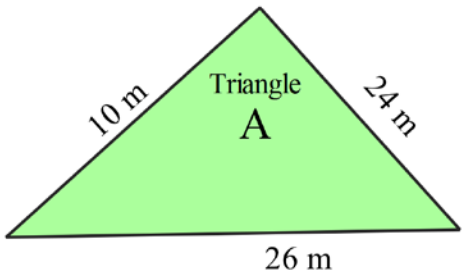
13. A power pole *AK* is to be supported by a 20.5 m long wire, which is attached to the pole at *J*.

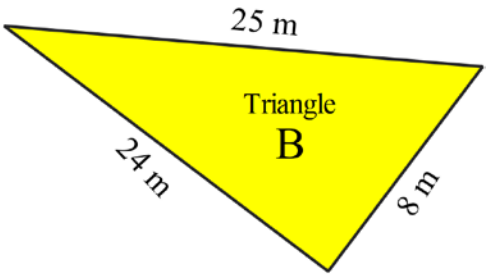
The wire is attached to the ground at C, which is 13.8 m from *A*.

How far above the ground, is the point *J*, correct to the nearest 10th of a metre?



14. Which of the triangles below are right angled?





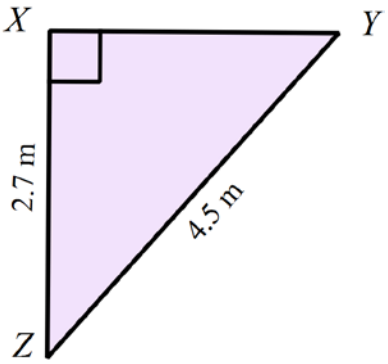
- ☐ Both triangles are right angled.
- ☐ Neither triangle is right angled.
- ☐ Only triangle *A* is right angled.
- ☐ Only triangle *B* is right angled.

15. Which of the following are Pythagorean triads?

More than one could be a Pythagorean triad, so mark all that are.

☐ {48, 68, 88} ☐ {48, 90, 102} ☐ {48, 64, 80} ☐ {48, 84, 100}

16. Find the length of *XY*.



☐ 1.8 m
☐ 3.6 m
☐ 5.2 m
☐ 7.2 m

17. Is a triangle with the dimensions below, right angled?

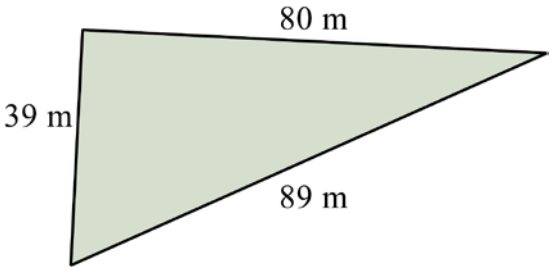
Explain why.

……

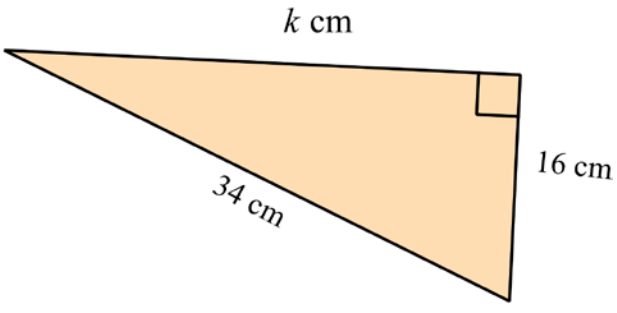
……

……

……



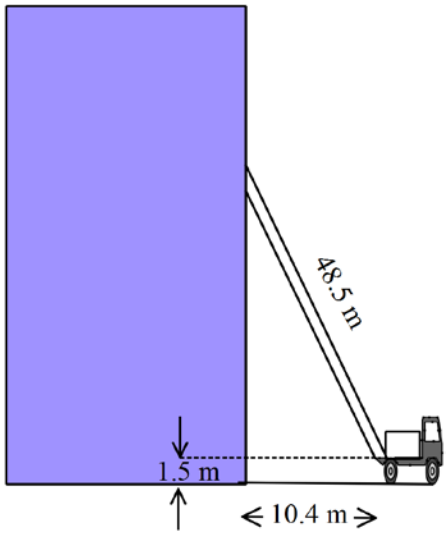
18. Find the value of *k*.



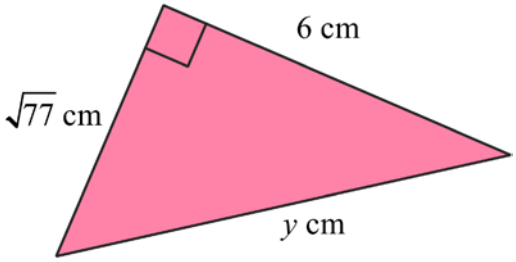
19. A fire engine has a ladder which is 48.5 m long and is mounted 1.5 m above ground level.

For safety reasons the engine must park at least 10.4 m back from a burning building when using its ladder.

How far above the ground could the ladder reach up the side of a building?

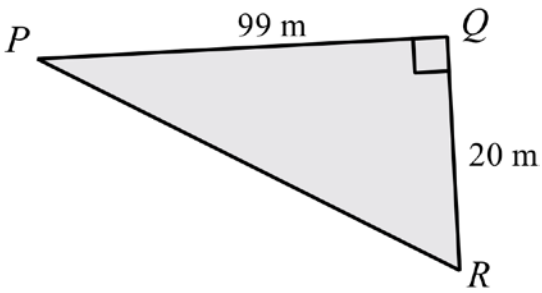


20. What is the value of y in the triangle shown?



- ☐ $y = \sqrt{85}$
- ☐ $y = \sqrt{113}$
- ☐ $y = 85$
- ☐ $y = 113$

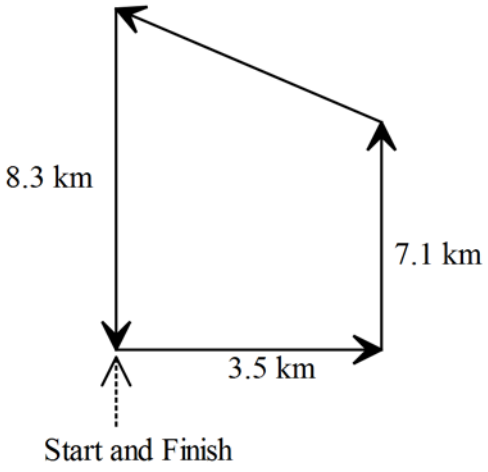
21. What is the perimeter of the triangle PQR?



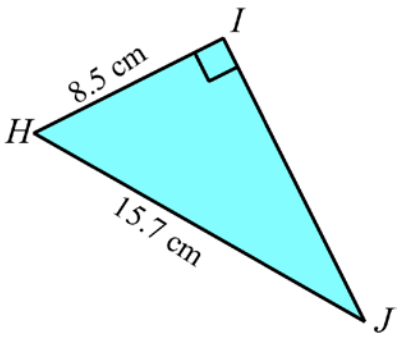
22. A footrace course has four legs as shown in the diagram.

Three of the legs run due East, North and South respectively.

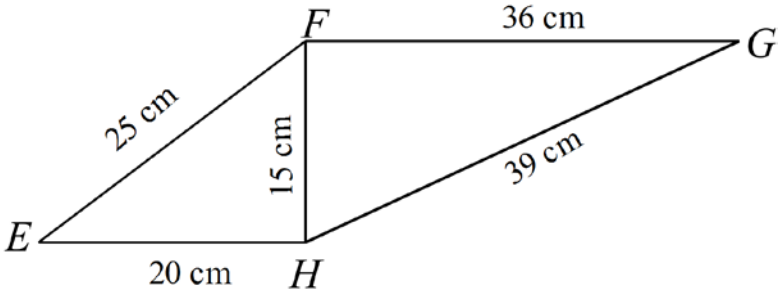
Calculate the total length of the course.



23. What is the area of triangle *HIJ*?

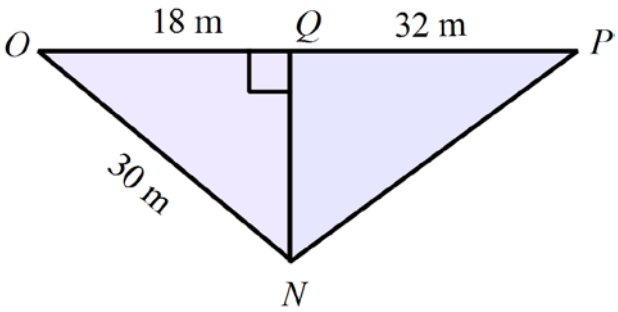


24. Which of the triangles below are right angled?

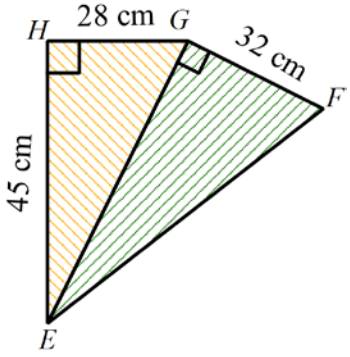


- ☐ Δ *EFH* and Δ *FGH* are both right angled triangles.
- ☐ Δ *EFH* is the only right angled triangle.
- ☐ Δ *FGH* is the only right angled triangle.
- ☐ Neither Δ *EFH* nor Δ *FGH* are right angled triangles.

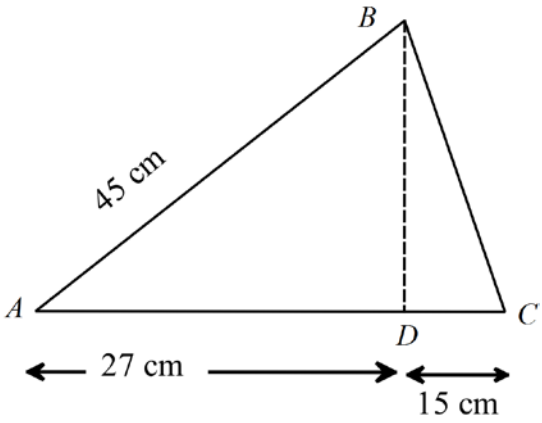
25. What is the length of *NP*?



26. Calculate the distance *EF*. (Answer to 1 decimal place.).



27. Find the perimeter of triangle *ABC*.



School Name
Mathematics Test 2017

Year 8 **Pythagoras Theorem**

ANSWERS

Question	Working and Answer
1.	Hypotenuse is **YZ** **4th Answer**
2.	w is the hypotenuse, so $\boldsymbol{w^2 = v^2 + x^2}$
3.	d is the hypotenuse, so $d^2 = 14^2 + 9^2$ $d^2 = 196 + 81$ **4th Answer**
4.	$q^2 = 20^2 + 21^2$ $= 400 + 441$ $= 841$ $q = \sqrt{841} =$ **29**
5.	$BC^2 = 34^2 - 16^2$ $= 1156 + 256$ $= 900$ $BC = \sqrt{900} =$ **30 cm**
6.	$XY^2 = 14^2 + 48^2$ $= 196 + 2304$ $= 2500$ $XY = \sqrt{2500} =$ **50 *m***

Question	Working and Answer
7.	$RT^2 + ST^2 = RS^2$ or variations on the same equation. or $r^2 + s^2 = t^2$
8.	$ST^2 = 18^2 + 30^2$ $= 324 + 900$ $= 1224$ $ST = \sqrt{1224}$ $= 34.985 = 35.0$ cm **3rd Answer**
9.	$CD^2 = 50^2 - 38^2$ $= 2500 - 1444$ $= 1056$ $CD = \sqrt{1056}$ $= 32.496 = 32.5$ m (nearest 10th m)
10.	$PQ^2 = 1.6^2 + 1.2^2$ $= 2.56 + 1.44$ $= 4$ $PQ = \sqrt{4}$ $=$ **2 m**
11.	Using a calculator, $\sqrt{484} = 22$ and the others give non recurring or terminating decimals, so $\sqrt{484}$ is rational. **2nd Answer**
12.	$PM^2 = 6.5^2 - 3.4^2$ $= 42.25 - 11.56$ $= 30.69$ $PM = \sqrt{30.69}$ $= 5.53955 =$ **5.5 km** (nearest 10th km)
13.	$AJ^2 = 20.5^2 - 13.8^2$ $= 420.25 - 190.44$ $= 229.81$ $AJ = \sqrt{229.81}$ $= 15.1594$ m $= 15.2$ m

Question	Working and Answer
14.	$10^2 + 24^2 = 100 + 576 = 676 = 26^2$ So Δ A is right angled $8^2 + 24^2 = 64 + 576 = 640 \neq 25^2$ So Δ *B* is not right angled Only A is right angled. **3rd Answer**
15.	$48^2 + 68^2 = 6928 \neq 88^2$ $48^2 + 90^2 = 10404 = 102^2$ $48^2 + 64^2 = 6400 = 80^2$ $48^2 + 84^2 = 9360 \neq 100^2$ 2nd and 3rd Answers
16.	$XY^2 = 4.5^2 - 2.7^2$ $= 20.25 - 7.29$ $= 12.96$ $XY = \sqrt{12.96}$ $= 3.6$ m **2nd Answer**
17.	$39^2 + 80^2 = 1521 + 6400$ $= 7921$ $89^2 = 7921$ ∴ it is a right triangle because the sum of the squares of the shorter sids is equal to the square of the longer side.
18.	$k^2 = 34^2 - 16^2$ $= 1156 - 256$ $= 900$ $k = \sqrt{900}$ $= 30$

Question	Working and Answer
19.	Call height from truck to top of ladder h $h^2 = 48.5^2 - 10.4^2$ $= 2352.25 - 108.16$ $= 2244.09$ $DF = \sqrt{2244.09}$ $= 47.371\ m$ $= 47.4\ m\ (1\ d\ p)$ Height from ground $= 47.4 + 1.5$ $=$ **48.9 *m***
20.	$y^2 = (\sqrt{77})^2 + 6^2$ $= 77 + 36$ $= 113$ $p = \sqrt{113}$ **2nd Answer**
21.	$PR^2 = 99^2 + 20^2$ $= 9801 + 400$ $= 10201$ $l = \sqrt{10201} = 101$ Perimeter $= 99 + 20 + 101$ $=$ **220 m**
22.	Difference in North and south legs $= 8.3 - 7.1 = 1.2$ Call oblique leg l $l^2 = 3.5^2 + 1.2^2$ $= 12.25 + 1.44$ $= 13.69$ $DF = \sqrt{13.69}$ $= 3.7$ km Perimeter of Course $= 3.5 + 7.1 + 3.7 + 8.3$ $= 22.6$ km
23.	$IJ^2 = 15.7^2 - 8.5^2$ $= 246.49 - 72.25$ $= 174.24$ $EF = \sqrt{174.24} = 13.2$ cm Area $= \frac{1}{2} \times 8.5 \times 13.2$ $=$ **56.1 cm^2**

Question	Working and Answer
24.	$15^2 + 20^2 = 625 = 25^2$ so ΔEFH is right angled. $15^2 + 36^2 = 1521 = 39^2$ so ΔFGH is right angled ΔEFH and ΔFGH are both right angled triangles. **1st Answer**
25.	$QN^2 = 30^2 - 18^2$ $= 900 - 324$ $= 576$ $QN = \sqrt{576} = 24$ $PN^2 = 24^2 + 32^2$ $= 576 + 1024 = 1600$ $PN = \sqrt{1600} = 40\ m$
26.	$EG^2 = 28^2 + 45^2$ $= 784 + 2025$ $= 2809$ $EG = \sqrt{2809} = 53$ $EF^2 = 53^2 + 32^2$ $= 2809 + 1024 = 3833$ $EF = \sqrt{3833} = 61.9112 = 61.9$ cm (1 d p)
27.	$BD^2 = 45^2 - 27^2$ $= 1296$ $BD = \sqrt{1296} = 36\ m$ $BC^2 = 36^2 + 15^2$ $= 1521$ $BC = \sqrt{1521} = 39$ "m" Perimeter = $45 + 27 + 15 + 39 = 126$ m