1.

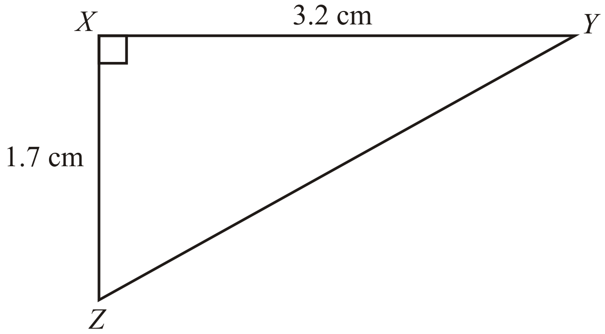


Diagram **NOT** accurately drawn

XYZ is a right-angled triangle.
XY = 3.2 cm.
XZ = 1.7 cm.

Calculate the length of *YZ*.
Give your answer correct to 3 significant figures.

………………………… cm
(Total 3 marks)

2.

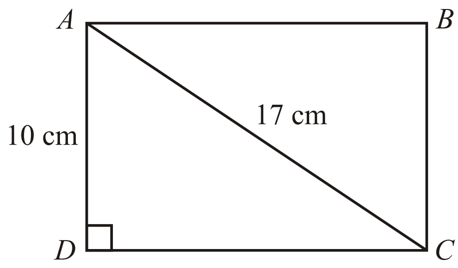


Diagram **NO**T accurately drawn

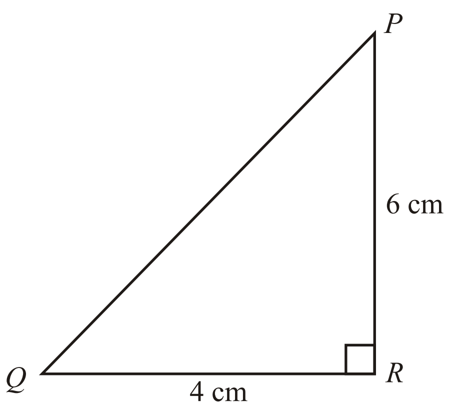
ABCD is a rectangle.
AC = 17 cm.
AD = 10 cm.

Calculate the length of the side *CD*.
Give your answer correct to one decimal place.

.... cm
(Total 3 marks)

3.

Diagram **NOT** accurately drawn



PQR is a right-angled triangle.

PR = 6 cm.
QR = 4 cm.

Work out the length of *PQ*.
Give your answer correct to 3 significant figures.

.....................................cm
(Total 3 marks)

4.

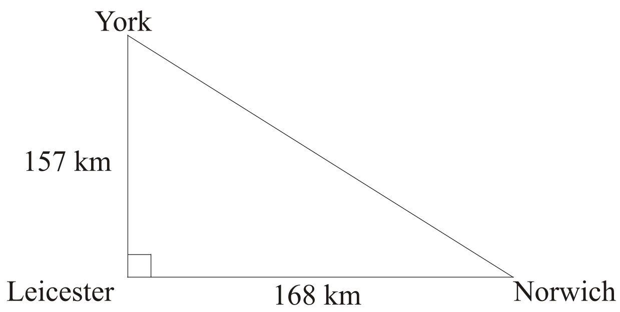


Diagram **NOT** accurately drawn

The diagram shows three cities.
Norwich is 168 km due East of Leicester.
York is 157 km due North of Leicester.

Calculate the distance between Norwich and York.
Give your answer correct to the nearest kilometre.

.... km
(Total 3 marks)

5.

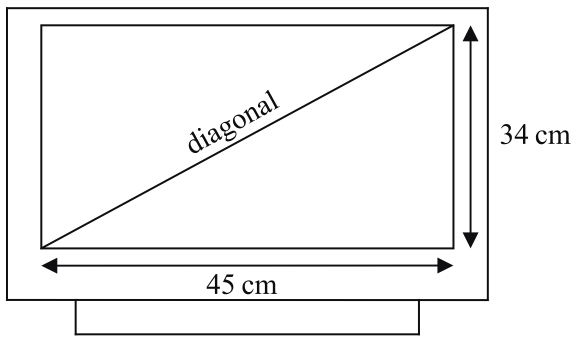


Diagram **NOT** accurately drawn

A rectangular television screen has a width of 45 cm and a height of 34 cm.

Work out the length of the diagonal of the screen.
Give your answer correct to the nearest centimetre.

.... cm
(Total 4 marks)

6.

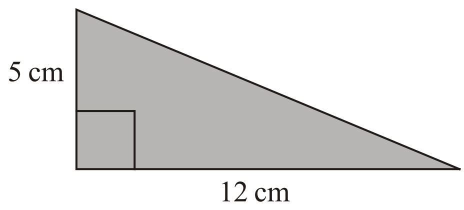


Diagram **NOT** accurately drawn

(a) Work out the area of the triangle.

………………. cm^2
(2)

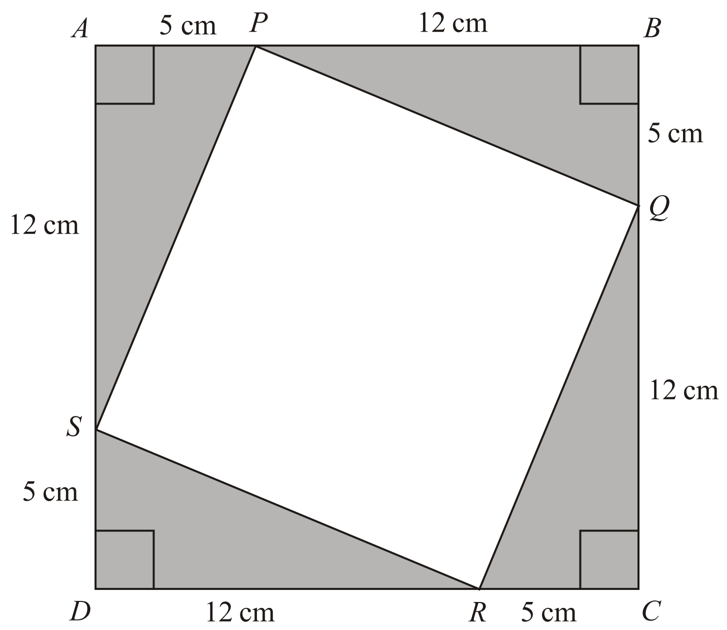


Diagram **NOT**
accurately drawn

4 copies of the triangle and the quadrilateral *PQRS* are used to make the square *ABCD*.

(b) Work out the area of the quadrilateral *PQRS*.

………………. cm^2

(3)

(Total 5 marks)

7.

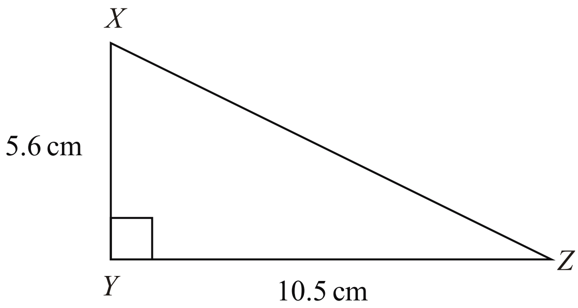


Diagram **NOT**
accurately drawn

In the triangle *XYZ*

XY = 5.6 cm

YZ = 10.5 cm

angle *XYZ* = 90

Work out the length of *XZ*.

.... cm
(Total 3 marks)

8.

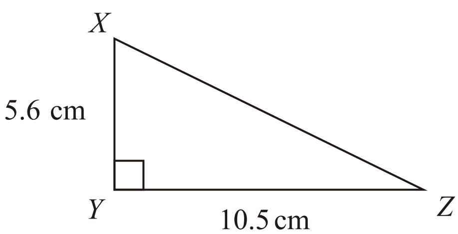


Diagram **NOT**
accurately drawn

In the triangle *XYZ*

XY = 5.6 cm
YZ = 10.5 cm
angle *XYZ* = 90

(a) Work out the length of *XZ*.

.... cm
(3)

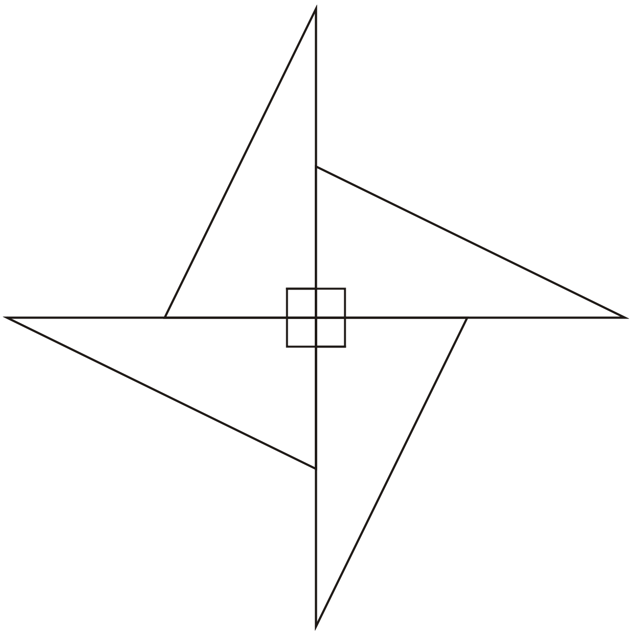


Diagram **NOT** accurately drawn

4 copies of the triangle are fitted together to make the shape shown in the diagram.

(b) Calculate the perimeter of the shape.

.... cm

(2)

(Total 5 marks)

9.

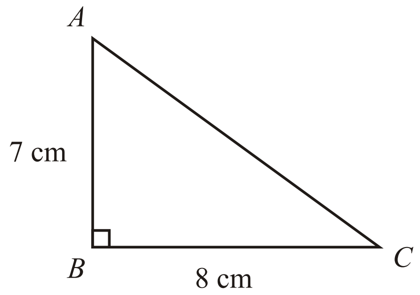


Diagram **NOT** accurately drawn

ABC is a right-angled triangle.
AB = 7 cm,
BC = 8 cm.

Work out the length of *AC*.
Give your answer correct to 2 decimal places.

.... cm
(Total 3 marks)

10.

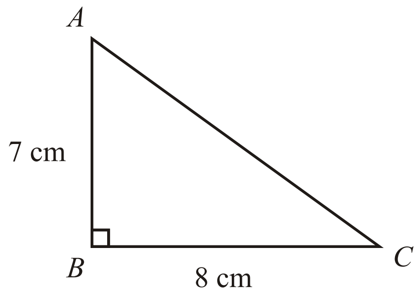


Diagram **NOT** accurately drawn

ABC is a right-angled triangle.
AB = 7 cm,
BC = 8 cm.

(a) Work out the area of the triangle.

.... cm^2

(2)

(b) Work out the length of *AC*.
Give your answer correct to 2 decimal places.

.... cm

(3)

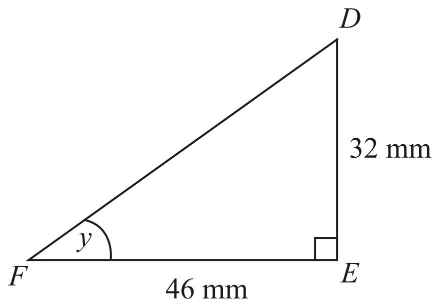


Diagram **NOT** accurately drawn

DEF is another right-angled triangle.
DE = 32 mm,
FE = 46 mm.

(c) Calculate the size of angle *y*.
Give your answer correct to 1 decimal place.

.... °

(3)
(Total 8 marks)

11.

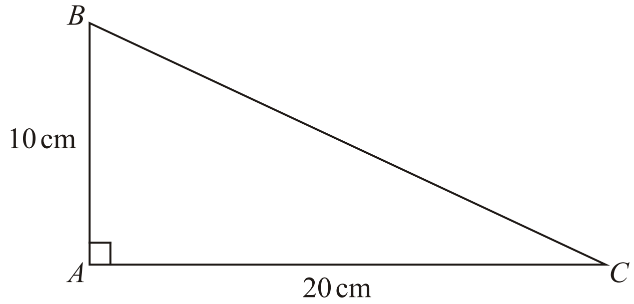


Diagram **NOT** accurately drawn

In triangle *ABC*,

AB = 10 cm
AC = 20 cm
angle *BAC* = 90°

Work out the length of *BC*.
Give your answer correct to 3 significant figures.
You must state the units in your answer.

....
(Total 4 marks)

12.

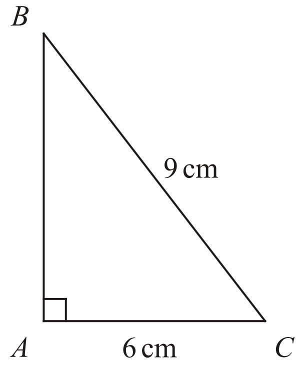


Diagram **NOT** accurately drawn

ABC is a right-angled triangle.

$AC = 6$ cm.
$BC = 9$ cm.

Work out the length of *AB*.
Give your answer correct to 3 significant figures.

.... cm
(Total 3 marks)

13.

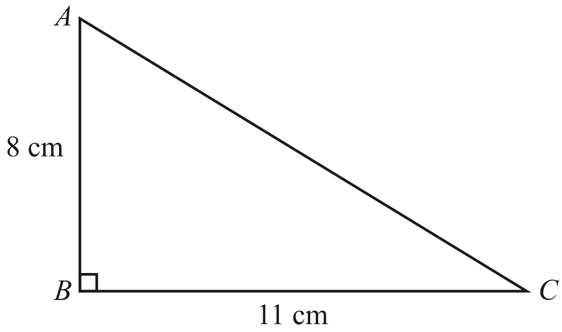


Diagram **NOT** accurately drawn

ABC is a right-angled triangle.

AB = 8 cm,
BC = 11 cm.

Calculate the length of *AC*.
Give your answer correct to 3 significant figures.

…………………………… cm
(Total 3 marks)

14.

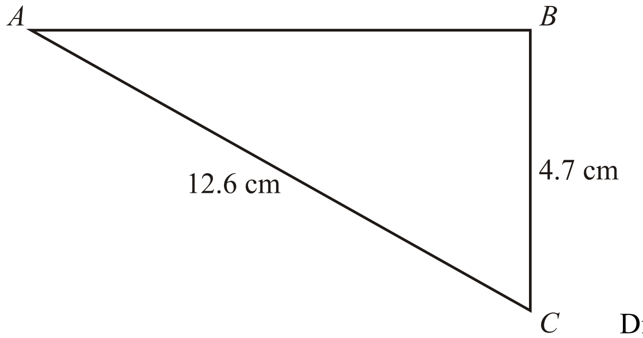


Diagram **NOT** accurately drawn

AC = 12.6 cm.
BC = 4.7 cm.
Angle *ABC* = 90°.

Calculate the length of *AB*.
Give your answer correct to 3 significant figures.

………………….. cm
(Total 3 marks)

15.

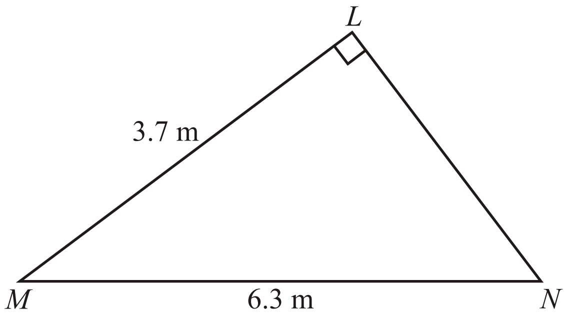


Diagram **NOT** accurately drawn

Angle *MLN* = 90°.
LM = 3.7 m.
MN = 6.3 m.

Work out the length of *LN*.
Give your answer correct to 3 significant figures.

LN = ……….…………….. m
(Total 3 marks)

16.

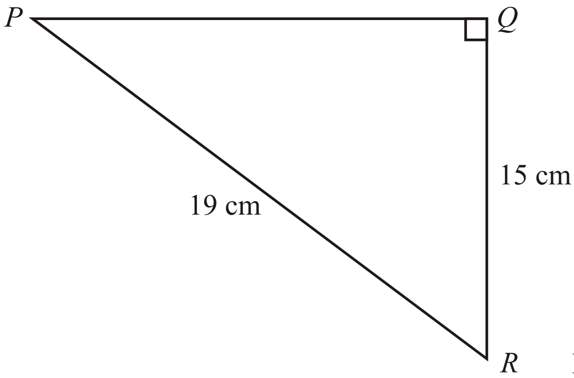


Diagram **NOT** accurately drawn

PQR is a right-angled triangle.
Angle *PQR* = 90°.
QR = 15 cm.
PR = 19 cm.

Work out the length of *PQ*.
Give your answer correct to 3 significant figures.

.... cm
(Total 3 marks)

17.

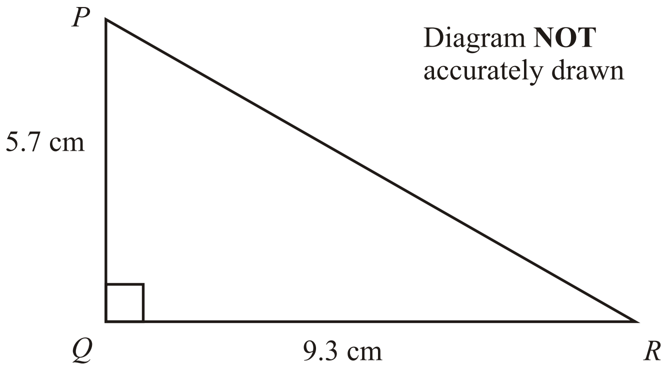


Diagram **NOT** accurately drawn

In triangle *PQR*,
QR = 9.3 cm.
PQ = 5.7 cm.
Angle *PQR* = 90°.

Calculate the length of *PR*.
Give your answer correct to 3 significant figures.

.... cm
(Total 3 marks)

18.

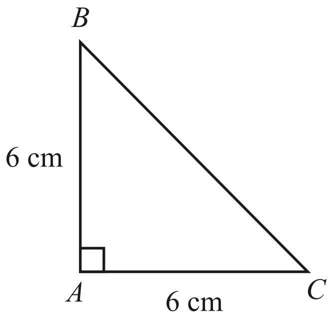


Diagram **NOT** accurately drawn

(a) Calculate the area of triangle ABC.

.... cm^2

(2)

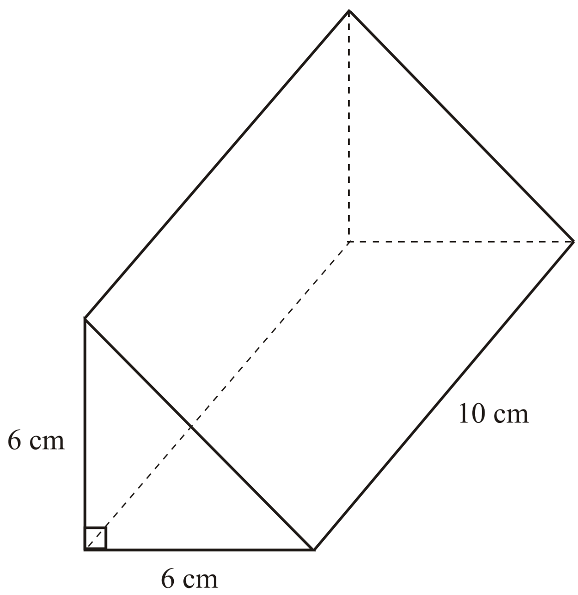


Diagram **NOT** accurately drawn

The diagram shows a solid triangular prism.

(b) Calculate the volume of the prism.

.... cm^3

(2)

(Total 4 marks)

1. 3.6 3

$1.7^2 + 3.2^2 = 2.89 + 10.24 = 13.13$

$\sqrt{13.13}$

M1 for $1.7^2 + 3.2^2$

M1 for $\sqrt{1.7^2 + 3.2^2}$

A1 for 3.62 to 3.624

[3]

2. 13.7cm 3

$17^2 - 10^2 = 189$

M1 for $17^2 - 10^2$ or $10^2 - 17^2$

M1 for $\sqrt{(289-100)}$ or $\sqrt{189}$

A1 13.7-13.75

SC: B1 for $17^2 + 10^2$ leading to 19.7 – 19.75

[3]

3. $4^2 + 6^2$

$16 + 36 = 52$

$\sqrt{52}$

7.21 3

M1 for $4^2 + 6^2$ or 16 + 36 or 52

M1 for $\sqrt{16+36}$ + 36 or $\sqrt{52}$

A1 for 7.21 – 7.212

[3]

4. $168^2 + 157^2 = 28\,224 + 24\,649$ 3

$= 52\,873$

$\sqrt{28224 + 24649}$

229.9 – 230

M1 for $168^2 + 157^2$

M1 $\sqrt{168^2 + 157^2}$ or $\sqrt{28224 + 24649}$

or $\sqrt{52873}$ ie not doubling

A1 for 229.9 – 230

[3]

5. $45^2 + 34^2 =$
$2025 + 1156 = 3181$
$\sqrt{3181} = 56.4$
$= 56$ 4

M1 for $45^2 + 34^2$

M1 for $\sqrt{(2025 + 1156)}$

A1 for 56.4 …

B1 for rounding their diagonal to the nearest integer (dep on evidence from decimal)

NB 56 with no incorrect working as the final answer gets full marks.

NB Scale drawings result in 0 marks.

[4]

6. (a) $\frac{1}{2} \times 12 \times 5 = 30$ 2

M1 $\frac{1}{2} \times 12 \times 5$

A1 cao

(b) Area *ABCD* = $17^2 = 289$ 3
Area *PQRS* = 289 – 4 × "30"

or

$(5 + 12)^2 = 289$

289 – 4 × "30" = 169

M1 for Area ABCD = 17^2 or 289 seen

M1 (dep) for Area PQRS = '289' – 4× '30'

A1 cao

or

M1 $5^2 + 12^2$

M1(dep) $\sqrt{25 + 144}$ 25 + 144 or 13 or 13^2

A1 cao

SC B2 for 169^2 or 28561 as answer

[5]

7. $5.6^2 + 10.5^2 = 11.9$ 3

$\sqrt{31.36 + 110.25} = \sqrt{141.61}$

M1 $5.6^2 + 10.5^2$

M1 (dep) $\sqrt{31.36 + 110.25}$

A1 cao

[3]

8. (a) $5.6^2 + 10.5^2$

$\sqrt{31.36 + 110.25} = \sqrt{141.61} = 11.9$ 3

M1 $5.6^2+10.5^2$

M1 (dep) $\sqrt{31.36 + 110.25}$

A1 cao

(b) '11.9' + (10.5 – 5.6) = 16.8 2

4 × 16.8 = 67.2

M1 '11.9' + (10.5 –5.6)

or 4 × '11.9' + 4 × (10.5 – 5.6)

A1 cao

(SC B1 for 68.6)

[5]

9. $8^2 + 7^2$

64 + 49 = 113

√113 = 10.630145

10.63-10.631 3

M1 $8^2 + 7^2$ or 64 + 49 or 113.
M1 √"(64 + 49)" or √"113"; where it is clear that the 8 and 7 have been squared.
A1 10.63 – 10.631 inclusive.
SC B1 for 10.6 with no working, with or without a scale drawing.

[3]

10. (a) ½ × 7 × 8 = ½ × 56 = 28 2

M1 ½ × 7 × 8 or $\frac{1}{2}$ × 7 × 8 × sin 90°

A1 cao

(b) $8^2 + 7^2$
$64 + 49 = 113$
$\sqrt{113} = 10.630145$
10.63 3

M1 $8^2 + 7^2$ or 64 + 49 or 113
or $8^2 + 7^2 - 2 \times 7 \times 8 \times \cos 90$
M1 √"(64+49)" or √"113" where it is clear that the 8 and 7 have been squared
A1 Any answer in 10.63 – 10.631 inclusive
SC B1 10.6 with no working with or without a scale drawing

(c) $\tan y = 32/46 = 0.6956$
$\tan^{-1} 0.6956 = 34.82°$
34.8 3

M1 $\tan (y =)\ \frac{32}{46}$

M1 $\tan^{-1} 0.695(6)$ or $\tan^{-1}\left(\frac{32}{46}\right)$ or $\tan^{-1}\frac{32}{46}$ oe

(e.g. 'shift tan' or 'inv tan' for $\tan^{-1}$)
A1 34.79° – 34.85°
Or
M1 for $\sqrt{(32^2 + 46^2)}$ (=56.03(5..)) and either

$$\frac{\sin 90}{56(0..)} = \frac{\sin y}{32} \text{ or } \frac{56.(0..)}{\sin 90} = \frac{32}{\sin y}$$

M1 $(y =)\sin^{-1}\left(\frac{32 \times \sin 90}{56.(0...)}\right)(= \sin^{-1}(0.571(06..)$

A1 34.79° – 34.85°
SC1 B2 Radians 0.607-0.608
B2 Gradians 38.65 – 38.7
(both using tan)
Alternative methods using Pythagoras and then sin or cos must have a fully correct method for Pythagoras and sin/cos before they score the first M1. The trigonometry could be SOHCAHTOA or Sine rule/Cosine rule

[8]

11. $BC^2 = 20^2 + 10^2 = 500$

22.4 cm 4

M1 for (BC^2 =) $20^2 + 10^2$ or 400 + 100 or 500 or
$20^2 + 10^2 - 2 \times 20 \times 10 \times \cos 90$ oe
M1 for $\sqrt{"400 + 200"}$ or $\sqrt{"500"}$ where it is clear that the 20 and 10 have been squared (could be implied by either 400 or 100 seen)
A1 for any answer in 22.36 – 22.4 inclusive
B1 (indep)cm

[4]

12. $9^2 - 6^2$
$81 - 36 = 45$
$\sqrt{45}$
6.705 – 6.71 3

M1 for $9^2 - 6^2$ or 81 – 36 or 45 or $9^2 = AB^2 + 6^2$ oe
M1 for $\sqrt{81-36}$ or $\sqrt{45}$
A1 for 6.705 – 6.71
*[**SC: M1 for** $\sqrt{81+36}$ or $\sqrt{117}$]*

[3]

13. 13.6 3

$8^2 + 11^2$
$\sqrt{64+121} = 13.6014\ldots$

*M1 for $8^2 + 11^2$ **OR** 64 + 121 **OR** 185*
M1 (dep) for $\sqrt{"64"+"121"}$
A1 for 13.6 or better

[3]

14. 11.7 3

$12.6^2 = 4.7^2 + AB^2$
$\sqrt{(158.76 - 22.09)}$

M1 for $12.6^2 = 4.7^2 + AB^2$ oe
M1 for $\sqrt{(158.76 - 22.09)}$ or $\sqrt{136.67}$
A1 for 11.7 or any answer that rounds to 11.7

[3]

15. 5.10 3

$\sqrt{(6.3^2 - 3.7^2)}$

M1 for $6.3^2 = 3.7^2 + LN^2$
M1 for $\sqrt{(6.3^2 - 3.7^2)}$
A1 for 5.10 or better (5.0990195…)

[3]

16. 11.7 or better 3

$\sqrt{(19^2 - 15^2)}$
$= \sqrt{136}$

M1 for $19^2 = PQ^2 + 15^2$
M1 for $\sqrt{(361 - 225)}$
A1 for 11.7 or better
[SC B2 For 11.6 only]

[3]

17. $PR^2 = 9.3^2 + 5.7^2$
$= 86.49 + 32.49 = 118.98$
$PR = \sqrt{118.98}$
10.9... 3

M1 for $9.3^2 + 5.7^2$
M1 for $\sqrt{86.49 + 32.49}$ or $\sqrt{118.98}$
A1 for 10.9 (0779)

[3]

18. (a) $\frac{1}{2} \times 6 \times 6$

M1 for $\frac{1}{2} \times 6 \times 6$ oe

18 2

A1 cao

(b) 18×10

M1 for "a" $\times$ 10 or $\frac{1}{2} \times 6 \times 6 \times 10$

180 2

A1 ft

[4]

1. **Paper 3**

Weaker candidates failed to find the square root of their calculations. A significant number of candidates suffered from premature approximation in their calculations, or even when writing the answer on the answer line. A few candidates incorrectly used trigonometry.

Paper 6

This was a standard question assessing Pythagoras. It was almost universally well done.

2. **Paper 4**

Only 30% of the candidates realised that Pythagoras was involved. A common error of these was to add the squares, rather than finding the difference. A surprising number found the area of the triangle, even though this was not asked for.

Paper 6

At this level, the fact that the problem is set in a rectangle does not prove to be a distractor from Pythagoras. The vast majority of candidates recognised this and got the correct answer of 13.7 cm. A few candidates applied the rule incorrectly, usually ending up with 19.7.

3. **Specification A**

Intermediate Tier

Candidates who used Pythagoras were often successful although sometimes mark was lost. Surprisingly, many candidates incorrectly evaluated 42 or 62 or incorrectly added 16 and 36. Some got as far as 16 + 36 = 52 and could get no further. Attempts using trigonometry were common. Not only were these unsuccessful but in many cases the candidates failed to appreciate that the answer given was not sensible. Some drew a scale drawing and measured the length.

Higher Tier

This was a standard Pythagoras and as such was answered correctly by the vast majority of the entry.

Specification B

Intermediate Tier

It is pleasing to note that very many candidates accurately used Pythagoras' theorem to gain the majority of the marks in this question. Often an answer of 7.2, not preceded by the correct answer, was seen; this lost one mark. Some candidates successfully found that $PQ^2 = 52$, but could then go no further. A number subtracted 4^2 from 6^2 by mistake and some tried trigonometric methods which usually failed.

4. Paper 5524

This question was answered quite well. Common errors included adding 157 and 168, or even subtracting the numbers. Premature rounding and failure to include working cost some candidates marks.

Paper 5526

This question assessed the understanding of the theorem of Pythagoras in a standard way. As a result, nearly all properly entered candidates at this level got the right answer.

5. Higher Tier

At this level, most candidates recognised that Pythagoras should be used to find the length of the diagonal. A well-answered question.

Intermediate Tier

This was not a popular question. Pythagoras' is normally done far better, but probably because this was set in a context, far more candidates failed to appreciate that Pythagoras was required. This resulted in many candidates showing a completely incorrect method, such as merely adding or multiplying the figures, or attempting to draw a scale diagram. Of those who did begin by squaring the sides, other errors occurred, such as dividing by 2 instead of finding the square root. Of those who did pursue a correct method, they then failed to round their answer as instructed in the question, thereby losing the final mark.

6. Foundation Tier

Surprisingly, only a small minority of candidates could find the correct area of the triangle in part (a) of this question. Most candidates gave "17", "29" or "60" as their answer. Little working of any value was seen in part (b). Often an incorrect answer, most commonly "68", was given without working.

Intermediate Tier

In part (a) many obtained the correct answer, but 60 was very common since many forgot "half" base times height. A significant number applied Pythagoras to the triangle in part (a). In the second part most candidates failed to use their answer from part (a), preferring to start again. Pythagoras was again seen, this time earning some marks. Some candidates spoilt their response by finding the perimeter of the square and not the area, weaker candidates giving 144 or 240 as their answer.

7. The weaker candidates simply added 10.5 and 5.6 to give an answer of 16.1 Others found the area of the triangle. Those who recognised the need to use Pythagoras' Theorem often got as far as 141.61, but failed to find the square root of it. Trigonometry was sometimes seen. There were many correct answer, but these were in the minority.

8. Part (a) was a standard Pythagoras question and most candidates were able to find an exact value of 11.9 (It is a 0.7 size model of the Pythagorean triple (8, 15, 17)).

Many candidates were able to complete part (b), but others assumed that the additional part of each quarter was half the length of the side (5.25) or added the perimeters of 4 separate triangles.

9. It was evident that few candidates understood Pythagoras, as attempts to square and add were rare. Common incorrect attempts included finding the area of the triangle, adding sides and then finding the square root, doubling rather than squaring, and again rounding of answers, this time incorrectly.

10. Part (a) was answered correctly by the overwhelming proportion of the candidature. There were a few 56s to be seen and some candidates took advantage of the formula sheet to use $\frac{1}{2}ab\sin C$.

Part (b) was a standard Pythagoras question . Most candidates knew that they had to square and add. Some did not notice that the answer had to be given to correct to 2 decimal places, so 10.6 was not acceptable for full marks, unless a more accurate value were given in the working.

Part (c) caused more problems. A sizable proportion of candidates did not know where to start and tended to guess at an angle or to misuse the idea of tangent and write such things as $\tan = \frac{32}{46}$ or tan32 × 46. Some candidates evaluated the fraction $\frac{32}{46}$ as 0.7 and thus were not able to pick up the final accuracy mark for the size of the angle.
A minority of candidates took advantage of the formula page and used Pythagoras to calculate the hypotenuse and then use the sin rule to calculate the angle. This can get full marks, but candidates tend to lose out through a lack of accuracy.

11. Fully correct answers were seen from just over 40% of candidates. Just under a quarter of candidates were unable to make any progress. A few candidates subtracted the squares, a few tried trigonometric methods, or the cosine rule – usually unsuccessfully. The main errors were in missing out the units or giving units as cm squared or in the accuracy of the answer.

12. **Specification A**

Many candidates realized the need to use Pythagoras' theorem and then applied it correctly. There were some though that took the required length to be the hypotenuse (finding root 117) and therefore lost marks. This question showed that some of the pupils did not have a clear understanding of what to do if the hypotenuse was given in a question. Some tried to treat it as a trigonometry question with some quite involved work. Many pupils did not round correctly (6.70 or 6.7); candidates should be reminded to give a full figure answer before rounding.

Specification B

A standard Pythagoras question involving squaring and subtracting, which many candidates could comfortably carry out. A few candidates squared and added.

13. Stronger candidates usually answered this question well giving fully correct solutions. Weaker candidates either found the area of the triangle or simply found the sum of the two given sides. A significant number calculated 185 and then could go no further.

14. This question was disappointingly poorly done. A straightforward Pythagoras question saw a wide variety of methods attempted, including trigonometry, area of a triangle and the most common method of 12.6 – 4.7 = 7.9 Those who attempted to use Pythagoras often obtained an answer of 13.4 (from addition), not appreciating the need for *AB* to be less than 12.6

15. Many candidates scored well on this question. Some missed the final accuracy mark by incorrect rounding, leaving 5.09 as the answer where the correct answer was not previously seen. One common error was to subtract the squares and obtain 23 instead of 26. Most of those who failed to score had added the squares of 6.3 and 3.7 giving a common answer of 7.31 for the missing side; occasionally candidates forgot to square at all.

16. Many candidates failed to realise that Pythagoras' Theorem was required and of those who did an answer of 24.2 (from $\sqrt{(15^2 + 19^2)}$) was as common as the correct one. Many candidates attempted to use trigonometry with very little or no success. A greater concern is in those candidates who found the mean of 15 and 19 or gave an answer of 15 (assuming the triangle to be isosceles). A number of candidates, using Pythagoras correctly, lost marks by incorrectly rounding their answer too early. Students should be advised to show more than the required number of significant figures before rounding.

17. Candidates recognising the need to apply Pythagoras usually demonstrated their method correctly to gain full marks, however an answer of 118….. was not uncommon. Weaker candidates often found the sum of the two given sides or subtracted the squares of the sides or measured the line *PR*. Scale drawings usually gave an answer of 11cm and scored no marks.

18. Although the majority of candidates accurately calculated the area of the given triangle in part (a), very many disappointingly gave an answer of 36 (6 x 6). Full marks were still however available in part (b) for accurately calculating 10 x their answer in (a).